

5ESS® Switch
System Description
5E13 and Later Software Releases

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1. INTRODUCTION

1.1 PURPOSE

The 5ESS[®] Switch System Description describes the 5ESS[®] switch as equipped for the 5E13, 5E14, 5E15, and 5E16.1 software releases.

This document is primarily intended for customers, consultants, and others involved in the product selection process. It is also used by persons to gain an understanding of the functionality of the 5ESS[®] switch.

1.2 UPDATE INFORMATION

1.2.1 Reason for Update

As the 5ESS[®] switch continues to evolve with new capabilities and features, this System Description manual will be updated. This issue adds technical information concerning the following sections and features:

- ☐ 97-CP-8002 SS7-PSU Removing Routing from Host GSM in Dedicated Configuration
- ☐ 99-5E-7537.A PHV5 Shadow Feature
- ☐ 99-5E-7537.B CDMA 3G-1X High Speed Data on PHV5
- ☐ 99-5E-7741 FRPH and IFRPH on PH22
- ☐ 99-5E-7807 Dynamic Allocation Of Vocoders On PHV5
- ☐ 99-5E-7872 G.168-2000 Compliance and Acoustic Echo Cancellation On PHV5
- ☐ 99-CP-7974 SS7 PSU Plant and 24-Hour Measurements

1.2.2 Supported Software Releases

In accordance with the 5ESS[®] Switch Software Support Plan, the 5E12 software release was rated Discontinued Availability (DA) as of September 2000. The information supporting 5E12 and earlier is being removed over time instead of concurrently from all documentation.

If you are supporting offices that use a software release prior to 5E13 and have a need for the information that is being removed, retain the associated pages as they are removed from the paper documents, or retain the earlier copy of the CD-ROM.

1.2.3 Terminology

1.2.3.1 Communication Module Name Change

The term Communication Module (CM) has been changed to the Global Messaging Server (GMS), representing the new portfolio name of this particular module. The current names of the specific types of the GMS (the CM2 and CM3) have not been changed. Where the CM name has been used in a generic way within this information product, the name will be changed to GMS. Where the specific version of GMS (CM2 or CM3) is being described or mentioned, the name will not be changed. However, the GMS name may be added to the description in certain places as a reminder of the change, and that the particular version is a part of the overall portfolio. The following list provides some examples of how you may see these names used together:

- ☐ Global Messaging Server (formerly Communication Module)

- ☐ GMS (formerly CM) Global Messaging Server-CM2
- ☐ GMS-CM2
- ☐ Global Messaging Server-CM3
- ☐ GMS-CM3.

These name changes will be made over time as other technical changes are required. Also these changes may not be reflected in all software interfaces (input and output messages, master control center screens, and recent change and verify screens). Where the information product references these areas, the names are used as they are within the software interface.

1.2.3.2 5ESS[®]-2000 Switch Name Change

This 5ESS[®] switch document may contain references to the 5ESS switch, the 5ESS[®]-2000 switch, and the 5ESS[®] AnyMedia[®] Switch. The official name of the product has been changed back to the 5ESS[®] switch. In the interim, assume that any reference to the 5ESS[®]-2000 switch or the 5ESS[®] AnyMedia[®] Switch is also applicable to the 5ESS[®] switch. It should be noted that this name change may not have been carried forward into software-influenced items such as input and output messages, master control center screens, and recent change/verify screens.

1.2.3.3 Bellcore/Telcordia Name Change

As of March 18, 1999, Bellcore officially changed its name to Telcordia Technologies. Not all pages of this document are being reissued to reflect this change; instead, the pages will be reissued over time, as technical and other changes are required. Customers on standing order for this document may see that, on previous-issue pages, the Bellcore name is still exclusively used.

Customers receiving new orders for this document will see the Telcordia Technologies name used as appropriate throughout the document, and the Bellcore name used only to identify items that were produced under the Bellcore name. Exceptions may exist in software-influenced elements such as input/output messages, master control center screens, and recent change/verify screens. These elements will not be changed in this document until such time as they are changed in the software code. Document updates will not be made specifically to remove historical references to Bellcore.

1.2.4 Lucent Technologies

Lucent Technologies reserves the right to revise this System Description for any reason. The reasons for revision will include, but are not limited to, conformity with standards promulgated by ANSI[®], Electronic Industrial Association (EIA), International Telegraph and Telephone Telecommunication Standardization Sector (TSS), International Standards Organization (ISO), or similar agencies; utilization of new advances in the state of the technical arts; or to reflect changes in the requirements of communications systems or equipment.

1.3 ORGANIZATION

This document provides descriptive information in the following 5ESS[®] switch areas:

- ☐ **System Architecture:** Provides an overall description of the 5ESS[®] switch, including system architecture, functions, and operation. Also included in this section is a description of the software subsystems used in call processing and maintenance.
- ☐ **Engineering and Service Standards:** Provides a description of the 5ESS[®] switch engineering process for the overall switch, as well as engineering information for the various interface units. This

section also describes the service standards for the 5ESS[®] switch.

- ☐ **Call Processing:** Provides a description of the 5ESS[®] switch call processing and an overview of the routing and screening architecture.
- ☐ **Administration:** Provides an overall description of the 5ESS[®] switch administration.
- ☐ **Maintenance:** Provides a description of the 5ESS[®] switch maintenance, terminal maintenance, system integrity, program updates, software release retrofits, and other areas of the 5ESS[®] switch overall maintenance.
- ☐ **Application Guides:** Provides a description of the various 5ESS[®] switch office types and growth scenarios.
- ☐ **Lucent Technologies Support Services:** Provides a description of the 5ESS[®] switch factory testing, shipping, and installation procedures, as well as other information on 5ESS[®] switch support.
- ☐ **User Support:** Provides a description of the 5ESS[®] switch documentation and training.
- ☐ **Features:** Provides a listing of the 5ESS[®] switch features available through the 5E15 software release.

The 5ESS[®] switch feature capability is continuously expanding. Individual availability and feature definitions should be verified with the Lucent Technologies Account Management Organization before such capabilities are planned for a specific application.

Warranty information applicable to the 5ESS[®] switch may be obtained from the Lucent Technologies Account Management Organization. Customer-modified hardware and/or software is not covered by this warranty.

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1.7 REFERENCES

The Compact Digital Exchange (CDX) and the Very Compact Digital Exchange (VCDX) are switching systems based on the 5ESS[®] switch. This document is a standard 5ESS[®] switch document that is also applicable to the CDX and VCDX switching systems. Information applicable only to CDX or VCDX may be found in:

- ☐ 235-120-120, *Very Compact Digital Exchange (VCDX) User's Guide*

When appropriate, this document contains references to the applicable CDX or VCDX documents.

The 5ESS[®] switch may be used in AutoPLEX[®] System 1000 applications. For information on this application, see 235-200-100, 5ESS[®] Switch FLEXENT[™]/AutoPLEX[®] Wireless Networks Applications OA&M Manual.

2. SYSTEM ARCHITECTURE

2.1 OVERVIEW

2.1.1 GENERAL

The 5ESS[®] switch is designed for application as a local, toll, combined local/toll, operator services, commercial automatic call distributor (ACD), or local tandem digital electronic switching system. The switch can also be the digital cellular switch (DCS) in the FLEXENTTM/AutoPLEX[®] wireless applications for FDMA, TDMA, and CDMA implementations.

The 5ESS[®] switch supports the integrated services digital network (ISDN), which provides integrated voice and data services by building incrementally on the 5ESS[®] switch using existing switching module units.

The architecture of the 5ESS[®] switch emphasizes flexibility through the use of distributed processing and a modular growth plan. The modular design allows switching capacity, system interfaces, and call processing capacity to be added incrementally. The 5ESS[®] switch can support over 200,000 lines and 45,000 trunks simultaneously. Hardware termination capacity is actually higher, but traffic, feature usage, service order activity, desired maintenance, etc., must be considered in the actual termination capacity. Specific model offices that are supported are described in 235-070-100, 5ESS[®] *Switch Administration and Engineering Guidelines*.

Through the use of remotely located modules, the features of the 5ESS[®] switch may be economically extended to small switching offices located nearby. The ability to host remote modules provides additional growth flexibility.

The 5ESS[®] switch has a distributed architecture (see Figure 2-1), which consists of three basic hardware elements:

- ☐ administrative module (AM)
- ☐ communication module (CM)
- ☐ switching module (SM)

The SMs and CMs are interconnected by Network control and timing (NCT) links, which are fiber optic links.

The 5ESS[®] switch offers various possibilities for the connection of remote subscribers, depending on the quantity and the grouping of the subscribers.

2.1.2 HARDWARE

A major design goal of the 5ESS[®] switch is to remain economically competitive over a wide range of line, trunk, and operator position sizes. This goal is accomplished through the development of an interconnected network of microprocessor-controlled switching modules (SMs) (Figure 2-2) High-capacity optical links are provided for calls between different SMs.

The major characteristics of the 5ESS[®] switch are as follows:

- ☐ provides virtually nonblocking access between nonconcentrated switch terminations
- ☐ provides integration of voice and digital data services into a single switch
- ☐ provides direct digital interfacing with digital facility terminations

- ☐ provides host capability for remotely located modules
- ☐ uses distributed control
- ☐ provides signaling and transmission treatment by an interface unit
- ☐ provides testing access to modular metallic facilities as an integral part of the interface units

2.1.3 SOFTWARE

The software architecture (Figure 2-3) of the 5ESS[®] switch follows the distributed nature of the hardware design. Distributed processing allows the processing power of the office to grow as the office load grows through the addition of SMs.

Software is distributed among modules and has the following characteristics:

- ☐ well-defined stable interfaces between major system components
- ☐ modular partitions in hardware and software
- ☐ remotely-located line/trunk interfaces capable of extensive stand-alone localized processing, homing on a host central office only for centralized facilities
- ☐ a distributed architecture with functions partitioned to allow smooth growth, enhanced fault isolation, overload containment, etc.
- ☐ advanced software characteristics as follows:
 - ☐ high-level language for better understanding and easier changes; the 5ESS[®] switch is programmed in "C" language
 - ☐ an operating system providing a stable high-level interface between most software and the underlying processor hardware
 - ☐ software designs oriented toward improved productivity
 - ☐ portability of software from circuit processor types to possible future processors
 - ☐ a data base management system to provide controlled high-level interfaces to office data
- ☐ an advanced software development system working within the UNIX[®] operating system environment.
- ☐ standard external interfaces to operational support systems and to other switching offices

2.2 HARDWARE FUNCTIONS

2.2.1 GENERAL

Hardware for the 5ESS[®] switch is arranged in a modular configuration to simplify the addition of new features and hardware units. A block diagram of the modular configuration is shown in Figure 2-2. The overall functions that each module performs are as follows:

- ☐ **Administrative Module (AM):** The AM is the central processing unit of the system that performs all processing functions that are done most efficiently on a centralized basis. Its primary functions are:
 - ☐ resource allocation

- ☐ handling of global administrative functions
- ☐ providing the operations and maintenance interface to the operating staff

Examples of the high-level global functions performed by the AM include:

- ☐ the busy/idle status of the network
- ☐ data storage, and backup capabilities for the 5ESS[®] switch

Some centralized functions have migrated to the communication module processor (CMP) in the communication module (CM). The AM uses the 3B21D computer (in 6-foot frames).

- ☐ **Communication Module (CM):** The CM performs two main functions:
 - ☐ it routes control messages between processors
 - ☐ it transfers calls between SMs

The time multiplexed switch (TMS) portion of the CM handles the switching of both speech and data channels between SMs. The message switch portion of the CM provides the facilities for messages between the SMs and between the SMs and AM. This messaging uses the internal X.25 message switching protocol.

The voice, data, and messages are transported between the SMs using network control and timing (NCT) links. These links are optical fiber cable, which allows freedom in the positioning of the equipment. This allows the high bandwidth signals to be transmitted over relatively long distances and are less sensitive to distortions compared to the conventional transmission techniques.

The CM contains the CMP which performs most of the call processing functions that were once performed in the AM.

- ☐ **Switching Module (SM):** The SM terminates subscriber lines and inter-exchange trunks interfacing with the 5ESS[®] switch. There are two types of switching modules, the SM and the SM-2000. Although both switching modules provide the same basic functionality, the SM-2000 can provide many more terminations and supports additional features.

The SM is the basic growth unit of the 5ESS[®] switch, which connects all external lines, trunks, and special services circuits. It can provide circuit switching and packet switching functions and it handles 90 percent of the call processing tasks as well as the operator services feature package.

Switching modules can be located at a distance from the main body of the switching system. They are then designated remote switching modules (RSMs), optically remote modules (ORMs), or extended switching modules (EXMs). An RSM uses T1 facilities and provides full stand-alone capabilities and can be used singularly or grouped in clusters. When required, it is possible to connect direct trunks from an RSM or ORM to other exchanges.

Both the SM and the RSM/ORM/EXM support even smaller remotely located units, the RISLUs, RAIUs, and SLCs, which can provide concentration and interface functions for analog and digital subscribers and Operator Services Position System (OSPS) positions.

Compact versions of the 5ESS[®] switch are available:

- ☐ The Compact Digital Exchange (CDX), which consists of a 3B21D processor, a CM2C communication module, two SMs or one SM and one SM-2000 and up to six RSMs

- The Very Compact Digital Exchange (VCDX), which consists of an Administrative Workstation (AW) and an SM or SM-2000.

For specific information on the 5ESS[®] switch Very Compact Digital Exchange (VCDX), refer to the 235-120-120, *Very Compact Digital Exchange User's Guide*.

2.2.2 ADMINISTRATIVE MODULE

2.2.2.1 General

The AM consists of the 3B21D (or 3B20D) processor units including I/O, disk storage, tape drive units, and an optional data services module (DSM). The AM primarily performs the operations, administration, maintenance, and provisioning functions of the 5ESS[®] switch and provides the I/O for operation systems (OSs) and technical personnel. The AM/CMP performs call processing that cannot be efficiently performed by the SM processors. Refer to Figures 2-4 and 2-5 for functional block diagrams of the 3B21D and 3B20D processors in the AM.

2.2.2.2 Processor Units

2.2.2.2.1 General

The AM processor performs the centralized processing functions, controls the flow of data between the disk drives and the high-speed tape, and controls the flow of data between the other dedicated processors distributed throughout the remaining units. The CMP performs most of the centralized call processing functions and some of the Recent Change work that the AM previously performed.

The AM processor functions are performed by modularized units that are housed in a processor cabinet. The processor cabinet contains the control unit (CU), the disk file controller (DFC), the input/output (I/O) units, the main store (MAS), the input/output processor (IOP) units, and the port switch. The cooling unit also resides in this cabinet.

The processor functions are fully duplicated (except for the port switch) in order to assure continued processing capability in the event of component failure.

2.2.2.2.2 Control Unit

The control unit (CU) is a 32-bit microprogrammed processor that provides high-speed control functions required by the AM.

The machine-level instructions for the processor are stored in the MAS as 40-bit words. There are 32 instruction bits, 4 parity bits, and 4 hamming bits which are generated and processed within the MAS. The CU can address and access all 32 bits, a 16-bit half word, or a single byte (8 bits) for either read or write operations. The time required by the CU to access the MAS is 900 nanoseconds (ns) for the 3B20D, and 585 ns for the 3B21D.

To increase the real-time capabilities of the processor, a high-speed, temporary cache store is used to store frequently read MAS locations. The access time for the cache store is 250 ns compared to the 850 ns access time of the MAS in the 3B20D, and 120 ns in the 3B21D.

Each word read from the MAS is stored in the cache store, and the cache address is linked to the MAS address. If a subsequent MAS fetch request is to a cache-linked address, the word in the cache store is accessed by the CU. In this manner, the most frequently fetched words are accessible to the CU in 250 ns for the 3B20D, and 120 ns for the 3B21D.

Power for the CU is provided by two power units and the CU power control circuit pack. The power units provide power directly to the multilayer backplane serving the CU. Current-programming resistors, instead

of fuses, provide backplane protection. The CU power control circuit pack is used to apply power to (or remove power from) the processor and provide a 5 V DC power supply for CU power-up initialization.

The 3B21D processor is a processor that replaces the 3B20D processor as the AM (Administrative Module) in the 5ESS[®] switch. The 3B21D processor resides entirely in two cabinets. One cabinet is for the 9-track tape drive and one cabinet is for everything else (control computer, input/output processors, disk file controllers and 1 GB Small Computer System Interface (SCSI) disks drives.

The 3B21D does not support the 340 MB Storage Module Disks (SMD), 322 MB physical SCSI disks, 600 MB physical SCSI disk, Kennedy tape drives or *KEYSTONE*[®] tape drives. However, 1 GB physical disks that are in the 3B21D computer can be formatted to the 322 or 600 MB Volume Table of Contents (VTOC) sizes. See Table 2-1 .

The specification for the 3B21D Processor meet or exceed all specifications for the 3B20D processor.

Table 2-1 highlights the differences between the 3B20D and the 3B21D. For additional information, refer to the 235-900-113, *Product Specification*.

Table 2-1 Differences between the 3B20D and 3B21D Processors

ITEM	3B20D	3B21D
Cabinets	3 - 5	2
DfCs	2 - 4	2
Disk Drives ^a	SMD, 322 MB/600 MB SCSI	1GB SCSI
Disk Layout	322 MB 300 MB	600 MB 1 GB
Tape Drives	Kennedy, <i>KEYSTONE</i> [®] 9-Track	SCSI 9-Track and DAT
Memory Type	Boards	Modules
Number of Memory Boards (per side)	16	1
Incremental Memory	2 MB, 4 MB	8 MB
Memory Range	32 - 64 MB	40 or 128 MB
DSCH per DMAC	2	4
Devices per DSCH	16	4
Total Devices per CC	64	32
Notes:		
a. Disk Drives with larger capacities may be substituted but only the designated capacity (600 MB for 3B20 or 1 GB for 3B21D) is actually available for use.		

2.2.2.2.3 Main Store, Input/Output, and Disk File Controller Unit

2.2.2.2.3.1 Main Store

The MAS is a 40-bit semiconductor memory. Each word stored in the MAS consists of 32 bits (4 bytes) of information, 4 parity bits, and 4 hamming bits.

The MAS is physically partitioned into a main unit and a growth unit. The main unit contains the main store controller (MASC) and eight main store arrays (MASAs). Each MASA occupies one circuit pack and contains two or four megabytes of addressable memory. With the addition of an MAS growth unit, up to 16 MASAs may be equipped.

The MASC controls access to the MAS and, in the case of multiple store requests, determines which unit has the highest priority. Hamming and parity checks are also performed by the MASC.

For both the 3B20D and 3B21D, the memory requirements are as follows:

5E10	40 MB
5E11	44 MB
5E12	56 MB
5E13	64 MB

Information for determining these variable-sized memory requirements is provided in 235-070-100,

Engineering and Administration Guidelines, or by using the 5ESS[®] Switch Digital Ordering and Planning System (5 DOPS).

2.2.2.2.3.2 Direct Memory Access Input/Output Circuitry

The direct memory access (DMA) I/O circuits are used whenever direct access to the MAS is required by the peripheral units. The I/O circuits transfer data to or from a peripheral device using dedicated data transfer control circuitry.

Each I/O circuit may contain a maximum of two direct memory access controllers (DMACs) and eight dual serial channels (DSCHs). Four DSCHs are located in the main I/O unit, and from one to four DSCHs may be contained in the growth unit. Each DSCH may interface up to 16 high-speed peripheral devices. This allows the I/O to control a maximum of 128 concurrently active peripheral units.

The 5ESS[®] switch is configured with two DMACs and DSCHs to the message switch (MSG), IOP, and the DFCs. The 3B21D DMA/DSCH interface provides the same interfaces and functions as the 3B20D DMA/DSCH. The few exceptions are as follow:

- ☐ The 3B20D supports two DSCH per DMAC; the 3B21D supports four DSCHs per DMAC.
- ☐ The 3B20D supports 16 devices per DSCH; the 3B21D supports four devices per DSCH.
- ☐ Overall, the 3B20D supports a total of 64 devices per CC; the 3B21D supports a total of 32 devices per CC.
- ☐ The 3B21D DMA/DSCH interface does not support the 340 MB SMD (storage module device) disk drives, 322 SCSI, or 600 SCSI.

2.2.2.2.3.3 Disk File Controller

The DFC is a microprocessor-controlled interface for the disk drive units (and the SCSI tape drive units on 3B21D) to the CU and MAS complex.

2.2.2.2.4 Input/Output Processor

The IOP functions as a front-end processor to control transfers between the MAS and the various peripheral units such as magnetic tape units, terminals, and other slow- and medium-speed peripheral units requiring block transfers of data to and from the MAS.

The IOP interfaces the MAS with up to four peripheral communities.

Each peripheral community contains four individual peripheral controllers (PCs). Each PC can serve up to four peripheral units. Thus, the maximum configuration may serve a total of 64 peripheral units.

Each IOP contains a duplex dual serial bus selector (DDSBS) circuit that interfaces with a DMAC in each processor. This arrangement allows either processor to communicate with an IOP.

2.2.2.2.5 Port Switch

The port switch provides the ability to select the active/standby states of the maintenance teletypewriter controllers. This switching ability is useful when testing the teletypewriter circuitry and allows the teletypewriter devices to operate in the event of a teletypewriter controller failure.

2.2.2.3 Tape/Disk Unit or Cabinets

2.2.2.3.1 General

The tape/disk units or cabinets are available in four possible configurations. The first configuration (available only on the 3B20D model 2 computer prior to the 5E10 software release), includes up to three storage module device (SMD) disk drive pairs with one pair reserved as an on-line spare. This configuration has an unformatted storage capacity of 300 MB per disk. The second configuration (available prior to the 5E10 software release) includes up to eight SMD disk drive pairs mounted in 30-inch cabinets, with one pair reserved as an on-line spare, and an unformatted storage capacity of 340 megabytes per disk. The first configuration, includes up to 16 small computer systems interface (SCSI) disk drive pairs on 2 DFC pairs mounted in 21 inch cabinets. One pair of MHDs is reserved as an on-line spare. This configuration has a formatted storage capacity of 322 MB per disk. Each disk drive unit has a dedicated power unit and switch unit. A single high-speed tape unit is included for office dependent data (ODD) backup capability and is also used to record automatic message accounting (AMA) data if the office is equipped with the local automatic message accounting (LAMA) option. The fourth option, available with the 5E8 through 5E13 software release, is a 600 MB SCSI disk drive unit. This unit is required for offices operating on the 5E8 software release. The 3B21D processor available in the 5E9(1) software release uses 1 GB SCSI (Small Computer System Interface) disk drives. The 3B21D does not support the 340 MB SMDs (storage module devices), 322 MB physical SCSI disks, 600 MB SCSI physical disks, Kennedy tape drives or *KEYSTONE*[®] tape drives. However, 1 GB physical disks that are in the 3B21D computer can be formatted to the 322 or 600 MB VTOC (Volume Table of Contents) sizes. See Table 2-1 .

2.2.2.3.2 340 MB SMD Disk Drive Unit

The 340 megabyte disk drive unit available prior to the 5E10 software release, is a high-speed, random-access memory device used for mass data storage. Each disk unit contains seven "fixed medium" rotating disks that provide the recording medium for the drive. The term "fixed medium" is used because the rotating disks are permanently mounted within the disk drive unit.

Information transfer between the DFC and each disk unit is accomplished over I/O cables. The I/O cables include the following:

- (a) **Cable A:** The "A" cable carries 30 control and address signals between the DFC and the disks.
- (b) **Cable B:** The "B" cable carries seven data signals between the DFC and the disks.

Reading and writing are performed by two electromagnetic heads that are positioned over the recording surfaces of each rotating disk. Data is stored on the disks at a nominal recording frequency of 9.67 MHz.

Each disk drive unit has a dedicated power supply mounted as a separate unit. The remote power supply is a multiple output DC-DC converter that operates with a -48 V DC input and provides nominal outputs of +5.1, -5.1, +24, -24, and +40 V DC.

2.2.2.3.3 322 MB SCSI Disk Drive Unit

The 322 MB disk drive unit is a high-speed, random-access memory device used for mass data storage. Each disk unit package (DUP) contains a dedicated power supply and a power control switch. The power supply operates with a -48 V DC input and provides nominal outputs of +5 and +12 V DC. Up to 16 DUPs may be located in the disk cabinet. The DFC may be located either in the disk cabinet for an office converted to SCSI, or in the AM for a new SCSI office.

Information transfer between the DFC and each disk unit is accomplished over two SCSI buses per DFC. The disk units are distributed between the two SCSI buses.

2.2.2.3.4 600 MB SCSI Disk Drive Unit

The 5E8 and later software release supports two types of disk interfaces: the 340 MB SMD disk drives and the 322 MB and 600 MB SCSI disk drives. The 340 MB SMD and 322 MB SCSI disks have a formatted capacity of 264.75 MB; the 600 MB SCSI disks have a formatted capacity of 576 MB. As in prior software

releases, mixing of SMD and SCSI disk drives in the same office is supported on 3B20D platforms.

NOTE: A pair of 600 MB SCSI disks are required as the system disks (pair 0/1) for 5E8 and the disks must be grown prior to retrofit to the 5E8 software release. All disks ordered after third quarter 1991 are 600 MB SCSI disks.

2.2.2.3.5 1 GB SCSI Disk Drive Unit

Although physically a SCSI MHD contains 1 GB capability, in the 5E9(1) software release only the 600 MB SCSI format is allocated. Therefore, the disk software capacity and corresponding disk memory layouts are independent of the processor used. Consequently, the 3B21D processor supports the "66" base configuration for new start offices. This consists of two pairs of disks with 600 MB software format. All other disk pairs, including software backup MHD disks 14 and 15, use 600 MB software format.

2.2.2.3.6 Base Disk Configurations

New ships receive the 3B21D processor as their AM module which includes 1 GB SCSI primary and secondary disks formatted at 1 GB on a 1010 disk configuration. The 3B21D DMA/DSCH interface does not support non-SCSI, storage module device (SMD) disks. The 3B21D does not support 322 MB or 600 MB SCSI disk drives either. The 5ESS[®] switch 3B21D can support up to 7 pairs of disk drives plus two software backup disks.

Offices retrofitting to the 5E10 and later software releases that do not already have 600 MB SCSI disk drives are required to install the SCSI interface with 3.5 inch format (1 GB) SCSI or 600 MB SCSI primary disk drives and, optionally, 3.5 inch format (1 GB) SCSI or 600 MB SCSI software backup drives prior to retrofit. Additionally, growth of optional 3.5 inch format (1 GB) SCSI drives is supported.

The characteristics of the 5E13 through 5E15 base disk configurations are shown in Table 2-2.

Table 2-2 5E13 through 5E15 Base Configurations

5E13 BASE CONFIGURATIONS		
CONFIGURATION	CHARACTERISTIC	
1010	5E	1 GB layout for primary and secondary disks. Provides 388 MB of AMA storage.
	VCDX	983 MB allocated for primary disks, 435 MB for secondary disk pairs. Provides 252 MB of AMA storage.
5E14 BASE CONFIGURATIONS		
CONFIGURATION	CHARACTERISTIC	
2010	Intended for 3B21D processor, 3B20D is no longer supported.	
	5E	1.0 GB allocated for primary disk and 1 GB allocated for secondary disk pair. Provides 925 MB of AMA storage.
	VCDX	1.4 GB allocated for primary disk, 1 GB allocated for secondary disk pair. Provides 515 MB of AMA storage.
5E15 BASE CONFIGURATIONS		
CONFIGURATION	CHARACTERISTIC	
2010	Intended for 3B21D processor.	
	5E	1.9 GB allocated for primary disk and 1 GB allocated for secondary disk pairs. Provides 767 MB of AMA storage.
	VCDX	1.4 GB allocated for primary disks, 1 GB allocated for secondary disk pairs. Provides 419 MB of AMA storage.

2.2.2.3.7 Disk Capacities

The 66 and 63 system and secondary disk drives use the same architecture as in previous software releases. However, no 340 SMDs are supported for the 5E10 software release. The 600 MB SCSI, the 1 GB SCSI and the 3.5 inch format (1 GB) SCSI disks all have a formatted capacity of 576 MB; each 322 MB

SCSI disk is populated with 264.75 MB. In addition, the 1 GB SCSI and the 3.5 inch format (1 GB) SCSI disks may have a formatted capacity of 264.75 MB if the smaller format is desired.

Optional disks can be added to either base configuration in order to satisfy a particular office's AMA and SMODD requirements. A maximum of 15 duplexed pairs of SCSI-only disk drives [either 322 MB, 600 MB, or 3.5 inch format (1 GB) SCSI] are supported. Two simplex drives of 3.5 inch format (1 GB) SCSI or 600 MB (MHD 14/MHD 15) can be optionally equipped for the software backup disk capability.

For the 1010 configuration, the 1 GB SCSI disks have a formatted capacity of 2,050,000 512 byte disk blocks. The 1010 configuration also allows 1 GB optional disk drives. There are three such optional layouts: one of 100% AMA, one of 75% AMA and 25% SMODD, and one of 50% AMA and 50% SMODD.

The characteristics of the optional disks 5E10 and 5E11 software releases are shown in Table 2-3 .

Table 2-3 5E10 and 5E11 Optional Disks

OPTION	SMODD (MB)	AMA (MB)	% SMODD	% AMA
0300	0	264	0	100
0325	62	192	25	75
0350	126	128	50	50
0375	190	64	75	25
03100	254	0	100	0
0600	0	576	0	100
0625	134	432	25	75
0650	278	288	50	50
0675	422	144	75	25
06100	502	0	100	0
0100	0	1001	0	100
0125	240	751	25	75
0150	490	500	50	50

2.2.2.3.8 3B20D High-Speed Tape Units

The backup medium for stored data on a 3B20D platform is the high-speed 9-track tape unit, a *KEYSTONE*® II or *KEYSTONE*® III tape drive.

The *KEYSTONE*® II tape drive is used only for offices equipped with the 300 MB disk drives. The *KEYSTONE*® II tape drive has a 1600 bits-per-inch data storage capacity and operates with a tape speed of 25 inches-per-second (start/stop mode).

The *KEYSTONE*® III tape drive has 1600 and 6250 bits-per-inch data storage capacity and operates with a tape speed of 25 inches-per-second (start/stop mode). This capability will ensure that a "fast backup" of ODD can be accomplished as follows:

- ☐ full office backup within 3 hours
- ☐ ODD disk image backup within 1 hour
- ☐ full office load disk from tape within 30 minutes for recovery of the AM
- ☐ AM ODD recovery within 15 minutes for an average size office (with no call processing)
- ☐ AM ODD recovery within 1 hour (concurrent with call processing)

Tape verification is not included in the backup times.

2.2.2.3.9 3B21D High-Speed Tape Unit

The 3B21D supports the SCSI 9-track tape drive only. The Kennedy and *KEYSTONE*® drives are not supported on the 3B21D. The SCSI 9-track tape drive has 1600 or 6250 bits-per-inch data storage capacity

and operates with a tape speed of 42 inches-per-second (start/stop mode).

2.2.2.3.10 SCSI Digital Audio Tape

The Digital Audio Tape (DAT) feature is deployed with the 5ESS[®] switch and 5ESS[®] Switch Compact Digital Exchange (CDX) systems based on the 3B21D processor and the 5E9(2) software release. It represents a new hardware configuration for the 5ESS[®] switch and CDX switch configurations. The DAT can be ordered on all new ships and can coexist with the SCSI 9-track tape drive. When the DAT is used as a replacement for the 9-track unit, it eliminates an entire frame on the 3B21D AM. The DAT will support the same functions as currently supported by the SCSI 9-track tape:

- ☐ AMA
- ☐ System Retrofit
- ☐ System Backup (GENBKUP)
- ☐ System Recovery

The 5ESS[®] switch CDX System configuration has an option of offering all new system ships with DAT Tape Drive option with 5E9(2) software release.

The Very Compact Digital Exchange (VCDX) offers only a DAT option which eliminates the 9-track tape for 5E9(2) software release. A SCSI 9-track tape is not available with a VCDX system configuration.

For specific information on the 5ESS[®] Switch Very Compact Digital Exchange (VCDX), refer to the 235-120-120, *Very Compact Digital Exchange User's Guide*.

2.2.2.4 Administrative Services Module (ASM)

The ASM is an adjunct processor introduced with 5E13 (and 5E12SU) to support rapid software delivery. The ASM introduces commercial hardware and software technology to the 5ESS[®] switch.

The ASM is a workstation based on the SPARC processor architecture. It connects to the 3B21D processor using a high speed dual serial channel computer interconnect (DCI) to the ASM system bus. The DCI uses direct memory access (DMA) over the dual serial channel (DSCH) to perform data transfers of up to 700 kbytes per second. The ASM provides a 10 Base T *Ethernet*[®] connection to customer's intranets. The *Ethernet*[®] connection enables the ASM to support a variety of open TCP/IP interfaces including UUCP, RCP, FTP, and Telnet. In addition, the ASM is equipped with a CD-ROM and DAT drive.

2.2.2.5 Master Control Center

2.2.2.5.1 General

The master control center (MCC) is the primary communication link between the 5ESS[®] switch and the personnel administering and maintaining the system. The MCC provides maintenance personnel with real-time system status indications, control and display capabilities, and input/output messages. The MCC also provides manual emergency recovery capabilities.

The MCC consists of the following items:

- ☐ a video display terminal with keyboard
- ☐ receive-only printer (ROP)
- ☐ key telephone set

2.2.2.5.2 Video Display

The MCC video display terminal provides the local office maintenance personnel with a means to interface with the 5ESS[®] switch for system status indications, configuration controls, and human-machine interface messages. The MCC video display terminal is not duplicated. For functional purposes, the video display terminal is divided into the following units:

- ☐ display
- ☐ alphanumeric keyboard
- ☐ numeric/function keypad

The video display has a general layout that consists of an identification line, a system summary area, a control and display page area, and an input message entry area.

The identification line is present at all times and displays the office name, the system type, the date, and the time.

The system status display provides an indication of the overall status of the office. This includes:

- ☐ individual unit status
- ☐ abnormal load conditions
- ☐ significant controls in effect
- ☐ alarms and other abnormalities

The various conditions are shown in distinctive graphics and type faces.

A color video display is also available for use at the MCC that uses a variety of colors to indicate the status of individual units in the 5ESS[®] switch.

The control and display area is provided to give the maintenance personnel the interface necessary to operate and maintain the system. This area displays information pertinent to the office and provides the controls for maintaining and operating the system.

The various screen formats are referred to as control and display pages. Each control and display page shows the operating condition and possible input commands for each subsystem. An index page is provided to allow quick access to the display pages. A blank page is displayed whenever other control and display information is not required. For additional information on the MCC display pages, see 235-105-110, *System Maintenance Requirements and Tools*.

The bottom two lines of the video display are used for message entry. This area displays the input messages from the MCC keyboard.

The MCC keyboard consists of an alphanumeric keyboard and a numeric/function keypad. Both are used to enter messages.

2.2.2.5.3 Receive-Only Printer

The ROP provides the local office personnel with a means for obtaining a hard-copy printout of system messages. This printout provides a permanent copy of messages for future reference.

Since the message may not always be displayed on the MCC video display, the printout may be the only

copy of the message available to the maintenance personnel.

Every message that the system generates is not necessarily printed at the ROP. Some messages are logged, while some are only printed at the originating terminal in response to an input message. Because of the large number of output messages that may be generated by the system, controls are available to the operating telephone company (OTC) personnel to limit the volume of messages printed as follows:

- (1) brevity control
- (2) log/print control
- (3) throttling

When brevity control is allowed, repetitive, functionally similar messages are suppressed after a predefined threshold has been reached. Brevity control can be allowed or inhibited by message class or by processor.

The log/print control feature allows the destination of the output messages to be controlled by the OTC personnel on the basis of the message class. With this option, certain messages can be logged (stored in disk), sent to output devices, both logged and output, or discarded.

Throttling controls the rate at which output messages are placed in the queue to be processed. This is done to prevent the overflow of the queue and also to selectively discard low priority messages when the queue is full and there are high priority messages that must be printed.

For further information on the 5ESS[®] switch output messages, see 235-600-750, *Output Messages*.

2.2.2.5.4 Key Telephone Set

The key telephone set provides a means of communicating with other work areas and is used in testing of trunks and lines. The key telephone set may be used as a regular telephone set or as a speakerphone.

2.2.2.6 Trunk and Line Work Station

The trunk and line work station (TLWS) is a local test facility providing capabilities for:

- ☐ complete testing of subscriber lines
- ☐ transmission and operational testing of trunks

The TLWS normally shares the same physical equipment as the MCC. However, the TLWS may not always be located at the MCC. When it is not at the MCC, it is called the supplementary trunk line work station (STLWS). The TLWS consists of the following:

- ☐ video terminal with keyboard
- ☐ key telephone set with loudspeaker
- ☐ ROP
- ☐ test access unit (TAU)

2.2.3 COMMUNICATION MODULE

2.2.3.1 General

The CM provides the capability for the 5ESS[®] switch to serve up to 190 host SMs or 192 host and remote

SMS. Offices using the CM2C are limited to 2 local SMs and 6 RSMs. The CM (Figure 2-6) consists of the following four units:

- ❑ **Message Switch Control Unit (MSCU):** The MSCU contains the foundation peripheral controller (FPC), the pump peripheral controller (PPC), the duplex dual serial bus selector (DDSBS), the bus interface controller (BIC), the peripheral interface controller (PIC) and its memory, and up to 4 input/output microprocessor interfaces (IOMIs).
- ❑ **Communication Module Processor Unit (CMPU):** The CMPU (required for offices equipped with the CM2, CM2C, or GMS-CM3) is a modified MSPU in which the CMP is located. If the CMPU is equipped with a QLPS Gateway Processor (QGP), the QGPs reside on the left half of the shelf while the CMP resides on the right half of the shelf.
- ❑ **Message Switch Peripheral Unit (MSPU):** The MSPU contains the module message processors (MMPs).
- ❑ **Communication Module Control Unit (CMCU):** The CMCU contains the network clock (NCLK), the dual message interface (DMI), and the time multiplex switch (TMS) controller.
- ❑ **Time Multiplexed Switch Unit (TMSU):** The TMSU provides the TMS fabric, the fabric control, and the link interfaces.

2.2.3.2 Quad Link Packet Switch Network

The Quad-Link Packet Switch (QLPS) Network, introduced with software release 5E9(2), is an overlay network providing high bandwidth/low latency message transport between an SM-2000 and other SM-2000s and between an SM-2000 and the following processors:

- ❑ SM
- ❑ AM
- ❑ FPC
- ❑ Direct Link Node (DLN)
- ❑ CMP

For this explanation, the QLPS may be considered to connect "endpoints." Figure 2-7 shows a simplified view of message transfer with QLPS. The two QLPS Networks are composed of the following major hardware elements:

- ❑ **QLPS** fits into the same slot as the Quad-Link Interface board in a CM3 single/dual fabric TMS, and has access to four TMS fabric ports. The QLPS, QLI1 and QLI2 can be equipped in the same TMSU. The QLPS provides the switching function for High Level Data Link Control (HDLC) data frames. It is based upon a number of closely coupled state machines rather than a central processor. The QLPS assembles frames received from the network endpoints, verifies frame integrity, determines the destination, and stores the frames until they are delivered to their destinations. The QLPS provides four 256 time slot links to the TMS fabric and four 32 time slot links out of 1024 time slots are used for QGPs. Time slots are switched based upon the destination field of the HDLC frame. Frames are received on multiple time slot channels. The QLPS supports 127 channels.
- ❑ **QLPS Gate Way Processor (QGP)** provides QLPS access to and from the MSCU/PIC. Configured in a dual *MOTOROLA*® MC68030 processor architecture, the MSGS processor performs I/O functions with the MSCU while the other processor, the AP, accesses the Packet Bus Media Access Controller (PBMAC). Both QLPS networks may contain 0, 1, or 2 QGPs per MSGS side. Depending on the QGP

configuration there may be 0, 4, or 2 QGLs per QGP. If there are 4 QLPSs and 4 QGPs, then each QGP has 2 equipped QGLs. That is, one to each QLPS in the network. Each QGP on an MSGS side serves 1 QLPS network. For example:

QGP 0-0, 1-0 and QLPS 0-0, 1-0 serve network 0

QGP 0-1, 1-1 and QLPS 0-1, 1-1 serve network 1.

If there are 4 QLPSs and 2 QGPs, then each QGP has 4 equipped QGLs. That is, one to each QLPS in both networks. Each QGP on an MSGS side serves both QLPS networks. For example:

QGP 0-0/1-0 and QLPS 0-0, 1-0 serve network 0

QGP 0-0/1-0 and QLPS 0-1, 1-1 serve network 1.

The PBMACs terminate the QGL links between the QLPS and QGPs and provide the necessary HDLC functions required by the QLPS Network. Each MC68030 processor has exclusive use of one MB of static RAM and both processors share another one MB. The QGP's function is to transmit and receive SM-2000 messages over the QGLs, administer and translate appropriate protocol functions, and transmit and receive messages for the AM, the CMP, and SMs by way of the IOMI interface to the MSCU.

- **Message Handler (MH)** □ provides access from the CORE40, CORE60 or CORE60MM to the QLPS Network. The MH uses a Synchronous/Asynchronous Protocol Data Formatter (SPYDER)-T device interface with the QLPS data stream. Based upon the MC68040 or MC68060 processor, the MH is allotted 32 time slots by the TSIU-4. These 32 time slots are transmitted and received in the MH by a SPYDER-T device. A subset of these 32 time slots is used to connect into the QLPS Network. The MH uses 14 time slots to connect each QLPS network, making two 14 time slot paths. The SPYDER-T provides all necessary HDLC functions required by the QLPS Network. One MB of static RAM resides on the MH for the sole use of the MC68040 or MC68060 processor. Another one MB resides on the MH and is shared by the SPYDER-T, the MC68040 or MC68060, and the SMP. The MH's function is to transmit and receive messages, performing all level 2 protocol functions, over the QLPS Network for the SMP.
- **QLPS-QGP Link (QGL)** □ interconnection between the QLPS and QGP. Each QGL has a two MB bidirectional bandwidth. Each QGP has four QGL connections, one to each QLPS in the OSDS messaging network.

2.2.3.3 Message Switch Control Unit

The MSCU controls the activities of the PCs, handles the information transfers between them, and provides an interface to the AM. The MSCU is composed of the FPC, the PPC, the DDSBS, the BIC, the PIC, the PIC memory or intelligent microcontrol store (IMCS), and the IOMI.

2.2.3.4 Communication Module Processor Unit

The CMPU is a modified MSPU that contains the CMP. The CMP is a *MOTOROLA*® MC68030 based processor that is installed in the 5ESS® switch CM by plugging into the CMPU. The CMP provides an increase in the call processing capacity and recent change performance of the 5ESS® switch by off-loading routing, global resource allocation, and part of recent change work from the AM to the CMP. If the CMPU is equipped with a QLPS Gateway Processor (QGP), the QGPs reside on the left half of the shelf while the CMP resides on the right half of the shelf.

2.2.3.5 Message Switch Peripheral Unit

The MSPU houses the MMPs. The MMPs provide AM-to-SM, SM-to-AM, and SM-to-SM communication.

Each MMP terminates communication links to eight SMs, through the MIB, to the CMCUs. Each of the eight paths can be selected from either CMCU.

2.2.3.6 Communication Module Control Unit

The CMCU provides the interface between the MMPs and TMSUs, and houses the TMS controller. The CMCU also houses the DMI which terminates the message interface buses (MIBs) from the MMPs. It also contains the metallic interface to the TMSU, the NCLK, and the TMS clock.

The NCLK allows the switch to use either a stratum 2 (high stability) or stratum 3 (medium stability) accuracy depending on the application.

2.2.3.7 Time Multiplexed Switch Unit

A TMSU contains the quad link interface (QLI) boards and space switching fabric. The QLIs terminate the network control and timing (NCT) links from each of the host and local SMs. The fabric provides the space switching of the time slots received over the NCT links. The fabric terminates all NCT links and is available in a single or dual configuration.

NOTE: The CM2C uses SMLIs, not QLIs, to terminate the NCT links and is limited to a single fabric configuration.

With the single fabric configuration, up to 94 host and local SMs (or 96 host plus remote SMs) can be served. This configuration provides a compact design for offices not planned to grow beyond the 94-SM limit. For larger offices, a second fabric (dual fabric) is available and allows the office to grow to the full 190 local SM limit (or 192 host plus remote SMs).

The single fabric is standard equipage. For large offices, or offices expected to approach the single fabric limit, the dual fabric is provided. A single to dual fabric conversion method is available for offices requiring an in-service conversion.

The internal network side of the TSI is served by expanded Network Control and Timing 2 (NCT2) links. These NCT2 links grow with the TSI in increments of 1024 network terminations (DSOs) up to a maximum of 2048 network time slots per TSI slice (TSIS).

2.2.3.8 Communication Module 2 Compact (CM2C) and CM2 Comparison

In the 5E9(1) software release, a new communication module is available for small office applications. The CM2C costs less and requires less floor space than the CM2 while exerting minimal impact on existing software. The CM2C is housed in 3 shelves of an SMC or LTP cabinet as opposed to at least 2 CM cabinets for the CM2.

The MSCU, FPC, and CMP images are identical to those of the CM2 but there is unique firmware associated with the TMS controller. In addition, both modules share functionality regarding:

- ☐ Message Switch Controller (MSC)
- ☐ Message Module Processor (MMP)
- ☐ Pump Peripheral Controller (PPC)
- ☐ Network Clock
- ☐ Single Fabric Time Multiplexed Switch (TMS).

A CMPU shelf is required by the compact module and both sides fit on one shelf. The following limitations apply to the CM2C:

- ☐ a maximum of 2 MMPs
- ☐ a maximum of 3 Network Clock References
- ☐ a maximum of 4 TMS Links
- ☐ only a single fabric configuration.

The CM2C supports up to two local switching modules, (HSM, LSM, ORM, or TRM) and six RSMs. The CM2C supports a single local SM-2000 in the 5E9(2) software release, but requires a local SM to also be configured. Thus, a CDX switch can support up to two SMs but only one can be an SM-2000. In the 5E10 software release, a single SM-2000 can be configured with the CM2C. No supporting SM is needed.

2.2.3.9 Global Messaging Server (GMS)

The Global Messaging Server (GMS-CM3) is a replacement for the CM2. With the GMS-CM3, the CM functions are condensed into a single frame configuration for all office sizes, providing substantial savings in floor space, sparing, and power consumption. GMS-CM3 also delivers increased reliability with simpler engineering and installation.

The GMS-CM3 supports the following hardware and software platforms:

- ☐ 3B21D
- ☐ Switching Module 2000 (SM-2000)
- ☐ Extended Switching Module (EXM) ☐ (via TRCU3)
- ☐ Remote Switching Module (RSM) ☐ (remoted from a Host SM-2000)
- ☐ Packet Switching Unit Based SS7 Signaling (PSU-SS7).

The Communications Module, Model 3 (GMS-CM3):

- ☐ Switches subscriber data and control messages between:
 - ☐ the switching modules, and
 - ☐ the switching modules and the AM.
- ☐ Generates and sends control messages in the MSGS to the ONTCCOM and the switching modules.
- ☐ Routes control messages between the processors of the switching modules, the GMS-CM3, and the AM.
- ☐ Generates and sends network clock pulses in the ONTCCOM to the MSGS and the switching modules.

In the area of conversions and growth, only CM2 to GMS-CM3 conversions are supported. With the introduction of the GMS-CM3, all new office shipments are now equipped with GMS-CM3s and existing offices cannot include a mix of CM2s and GMS-CM3s. In addition, the GMS-CM3 is only supported in an SM-2000 (and RSM) office configuration that uses PSU-based SS7 signaling. CM2 growth configurations and equipment will continue to be supported, but GMSs are required for new offices.

2.2.4 SWITCHING MODULE (SM)

2.2.4.1 General

The switching module (SM) is the basic growth module of the system. It aggregates a microprocessor-based call-processing computer, a time slot interchanger (TSI), digital signal processors (DSPs) for tone generation, and service circuits and peripheral units consisting of subscriber line and interoffice trunk circuits. A packet switching unit (PSU) can also be included. There are two types of SMs: the SM and the SM-2000.

All SMs have modular units housed in enclosed cabinets. The functions common to all SMs are located in the switching module control (SMC) cabinet. The peripheral interface functions are located in the line trunk peripheral (LTP) cabinets and can be engineered to the individual requirements of the office.

The SM provides for the termination of lines and trunks entering locally at the 5ESS[®] switch. The SM includes modularized equipment units that perform the following functions:

- ☐ receive analog signals from lines and trunks and convert these signals into the internal digital time-division format of the office
- ☐ receive digital signals from digital subscriber lines, and convert these signals into the internal digital time-division format of the office
- ☐ receive digital signals from carrier lines and trunks, and convert these signals into the internal digital time-division format of the office
- ☐ perform most of the call processing functions in the office such as recognition of requests for service and digit reception
- ☐ supported by the AM/CMP in completing intramodule and intermodule calls
- ☐ provide service circuits such as ringing circuits, tone generators, tone decoders, conference circuits, and test facilities

An SM also provides the interface (host) to the 5ESS[®] switch for the remote switching modules (RSMs). The host SM provides paths to the TMS for calls that cannot be completed within an RSM.

All SMs [including optically integrated remote switching modules (ORMs), and RSMs] can be equipped with the stand-alone option. This option provides autonomous local switching if communication between the SM and the rest of the switch fails. The stand-alone option is available on a per-SM basis for the host office SMs, and on a per site basis for remote modules (for example, ORMs and RSMs).

2.2.4.2 Switching Module Processor Unit - Common

The SMPU consists of a duplicated switching module processor (SMO), signal processor (SP), and control interface (CI).

The SMP provides the call processing, call supervision, and maintenance functions for the SM and communicates by way of messages with the other SMs and the AM. The call processing functions consist of feature control, routing and terminal allocation, and peripheral control. The SMP is also responsible for SM maintenance and implements and monitors self-checking hardware as well as operational software checks that provide terminal maintenance and system integrity functions.

The signal processor (SP) enhances the processing capacity of the SMP by performing the real-time intensive task of scanning changes of signaling states in the peripheral units. The line signaling information from the peripheral units is transferred over the PIDB by way of the TSI to the SP. The SP scans for signaling changes to notify the SMP. The SP also stores received signaling information in a fast-access memory, which can be read by the SMP at any time. Signaling changes introduced by the SMP are

transferred by the SP to the line.

The control interface (CI) distributes control messages and clock signals to the various peripheral units of the module by way of the PICB. In a peripheral unit, the control signals are used to initiate control functions and to report the status of equipment, which includes the control of test circuits and reporting of alarm states.

2.2.4.3 Switching Module Processor for SM

The switching module processor (SMP) in the SM is based on the *MOTOROLA*® MC68000 series microprocessor. One of the time-slots on each network control and timing (NCT) link is a fixed control time slot (CTS) to the message switch in the CM. This CTS link is used for the message communication between the SM, and other SMs, SM-2000s, and the AM. The dual link interface (DLI) separates this control time-slot and delivers it to the switching module processor. Similarly, the DLI receives control data from the SMP and inserts this data into a CTS that delivers it to the message switch.

2.2.4.4 Switching Module Processor for SM-2000

The switching module processor unit (SMPU) of the SM-2000 is based on the *MOTOROLA*® MC68060 microprocessor. The SMPU also contains the message handler (MH) board, which offloads message-processing functions from the SMP. The MH itself is based on a *MOTOROLA*® MC68040 microprocessor. The MH is a QLPS end-point and is connected to the QLPS by way of multiple (13) time-slot messages that are used to carry messages between the SM-2000s and the other modules in the switch (SMs and AM).

The SMPU also supports multiple control interface boards to provide control links to the peripheral units.

2.2.4.5 Switching Module Processor Types

There are five processors available for use in an SM:

- ☐ Switching module processor unit (SMPU)
- ☐ SMPU2
- ☐ Module controller and TSI unit (MCTU)
- ☐ MCTU2
- ☐ MCTU3

The SMPU is based on the *MOTOROLA*® MC68000 processor using the TSIU1 and supports up to eight memory boards. The SMPU2 is based on either the MC68000, MC68012, or MC68020 processor, using the TSIU2.

The MCTU is also based on the MC68000, MC68012, or MC68020 processor but uses the TSIU3. Both the SMPU2 and the MCTU support up to 12 memory boards with the memory expansion unit (MEU) or five boards without the MEU.

The MCTU2 is based on the MC68020 and uses the TSIU3. The MCTU2 supports up to six memory boards and no MEU is available.

The MCTU3 is based on the MC68040 but emulates the SMP20 processor. The MCTU3 combines several circuit packs into one and reduces the MCTU2 from two shelves to one. The existing TSIU3 together with the DIs, CIs, and peripherals are used.

There are two processors available for use in an SM-2000:

- SMPU4
- SMPU5

The SMPU4 uses either the CORE40 board (based on the MC68040 microprocessor), the CORE60 board (based on the MC68060 microprocessor), or the 64MB CORE60MM (based on the MC68LC060 microprocessor) and supports up to four memory boards. It uses 2 separate circuit packs to provide power/control, and display (PCD) but has no slots for DSC3s. The CORE60MM switching module processor is available in the 5E12 and later software releases, and is provided as a software update to the 5E11 software release.

The SMPU5 uses the 128MB CORE60MM (based on the MC68060 microprocessor) and supports up to two memory boards. It uses a single circuit pack (on a single board) to provide power and control display (PCD). It has 6 slots for DSC3s in the SMPU shelves.

The CORE60 switching module processor provides an enhanced processor platform. This allows the SM-2000 to support a larger number of terminations and features that are processor real time intensive. The CORE60 processor pack has CORE40 functionality and fits into the SM-2000 backplane without any modification to the backplane or other circuit packs.

The 5E12 software release introduced the CORE60MM module processor packs, which use an MC68LC060 microprocessor. It includes two new circuit boards - the UN594 (with 64MB of on-board RAM) for the SMPU4, and the UN588 (with 128MB of on-board RAM) for the SMPU5. The CORE60MM provides the same functionality as the CORE60 processor pack and improves the processor performance of the SM-2000.

The SM Processor Memory Equipage table lists the maximum memory equipage each of the seven available SM unit types can support, with the required number of memory boards. This table can be found in the 235-900-113, *Product Specification* manual.

A SMP23 core board (SMP23CDM) increases the RAM memory of the SMP23, without an MEU, from 20 MB to 32 MB and allows the SM to upgrade to the 5E10 software release. SMP12s with inadequate memory can also be replaced in this manner.

The SMP23CDMX allows the SMP23 to upgrade to 32MB on the core memory board plus 5 memory slots.

The 64 MB Memory Board feature provides additional Dynamic Random Access Memory (DRAM) for SMPU4 (SM-2000). With this feature, the SM-2000 dynamic memory spectrum is expanded from the existing 128 MB to 256 MB. In addition, this feature provides memory mixing allowing an SM-2000 to be simultaneously equipped with 32 (TN1685) and 64 (TN1806) MB memory boards. Mixing of memory boards is also allowed in the SMPU5 (SM2005) unit as shown in the SM Processor Memory Equipage table.

In software releases prior to 5E9(1), the SMs are available in three memory configurations: basic SM, standard SM, and loaded SM. In the 5E9(2) software release, the SM-2000 configuration is added. The VCDX in the 5E11 software release and the EXM-2000 in the 5E12 software release can be SS7 signaling switch modules for those co-resident SS7 trunks.

The 5E12 software release requires 26MB to 32MB of memory in the basic configuration. Offices retrofitting the 5E12 software release must replace the MC68000 based SMPU, SMPU2 and MCTU processors with an MC68020 based SMP23 processor.

In addition to the basic features, the standard SM configuration supports full common channel signaling, full toll applications, full government applications, TR008 IDCU applications, and OSPS originating treatment. This configuration requires 29MB to 34MB of SM memory in the 5E12 software release.

In addition to the standard features, the loaded SM configuration supports full OSPS applications, ISDN, and TR303 IDCU applications. This configuration requires 44MB to 50MB of SM memory in the 5E12 software release.

The VCDX and EXM-2000 when used as an SS7 signaling switch module requires 50MB to 58MB of SM memory in the 5E12 software release.

The variable sized memory requirements for each configuration can be determined for a particular application from information provided in the 235-070-100, *5ESS® Switch Engineering and Administration Guidelines*, by using 5 DOPS, or by execution of the on-line Memory Forecasting Tool.

Memory boards may be mixed only in the MCTU2, SMPU4, and SMPU5 unit types as shown in the SM Processor Memory Equipage table. This table can be found in the 235-900-113, *5ESS® Switch Product Specification* manual. The different processors can be mixed in an office as well as the different software configurations (standard, basic, loaded, and signaling for VCDX and EXM-2000). The SM Processor Memory Equipage table provides the recommended memory circuit pack configurations for the various SM memory sizes. Note that the CORE60 and CORE60MM processor boards for SMPU4 and SMPU5 include on-board memory, which must be added to the memory boards to determine total SM memory.

- ☐ UN560 - has 64 MB of on-board memory
- ☐ UN594 - has 64MB of on-board memory
- ☐ UN588 - has 128MB of on-board memory

Table 2-4 SM Memory and Circuit Pack Configurations

SM MEMORY RANGE	CIRCUIT PACK CONFIGURATION
13 MB to 16 MB	1 TN1661 (16 MB)
17 MB to 20 MB	1 TN1661 (16 MB) + 1 TN1374B (4 MB)
21 MB to 24 MB	1 TN1661 (16 MB) + 1 TN1376 (8 MB)
25 MB to 28 MB	1 TN1661 (16 MB) + 1 TN1376 (8 MB) + 1 TN1374B (4 MB)
29 MB to 32 MB	2 TN1661 (16 MB)
33 MB to 48 MB	3 TN1661 (16 MB)
128 MB	4 TN1685 (32 MB)
192 MB	3 TN1806 (64 MB)
256 MB	4 TN1806 (64 MB)

2.2.4.6 Time-Slot Interchanger-Common (TSI)

The time-slot interchanger represents the time (T)-stage of the time-space-time (T-S-T) circuit switching concept used in the *5ESS®* switch. Each SM or SM-2000 contains a duplicated TSI. The active TSI is associated with the active SMP and the standby TSI is associated with the standby SMP. The active SMP ensures that all paths set up in its associated TSI are also set up in the TSI associated with the standby processor. Although each TSI carries the same data, only the active TSI is selected for data transfer. The interface units contain an input switch that is used to select data, clock, and synchronization from the active TSI only.

Besides switching 64-kbits/s time-slots between the peripheral units within the SM, the TSI also connects time-slots from the peripheral unit to time-slots on NCT links. NCT link pairs provide the transmission medium from the SMs to the time multiplexed switch (TMS) in the CM. The NCT link is also the source of the office timing information for the SMs.

Voice and data interface to the periphery is over PIDBs or PCT links. Control from the SMP is over PICBs.

2.2.4.7 Time-Slot Interchanger for SM

The TSI of the SM consists of 1024 time-slots, 512 of which connect to the peripheral side with the other

512 time-slots connecting to the network side. The peripheral units connect to the TSI by means of peripheral interface data buses (PIDBs) by way of data interface (DI) boards. Each PIDB contains 32 time-slots. In total, 32 of those PIDBs connect to 2 DI boards (16 PIDBs to each DI). Each DI multiplexes 16 PIDBs with 512 time-slots into 256 time-slots (concentrating 2:1) directly to the TSI. This connectivity is bi-directional.

2.2.4.8 Time-Slot Interchanger for SM-2000

The SM-2000 has a modular TSI that ultimately may be grown to a capacity 30,720 time-slots. The TSI is composed of 1 to 10 TSI slices (TSISs) of 3072 time-slots each, with the size of each SM-2000 engineered individually.

Each TSIS has 4 ports of 768 time-slots each. The peripheral units interface with the TSI by way of a data expander (DX) board, which multiplexes 24 of the 32-time-slot PIDBs onto one of the 768-time-slot TSI ports. A maximum of 6 DX boards can be provisioned in the initial release of SM-2000.

While the SM requires a fixed allocation of 512 time-slots to the peripheral units and 512 time-slots to the CM, the SM-2000 provides variable time-slot allocation. The SM-2000 TSI does not distinguish between peripheral side and network (TMS) side time-slots, but provides a pool of time-slots that can be used for either. Thus, for intra-SM-2000 switched calls and nail-ups, time-slot allocation to the TMS is not required, making these *unused* time-slots available for other peripheral side or network side connections.

The SM-2000 TSI is selectively double buffered in order to support wideband N=64-kbit/s switched services. The double buffering guarantees that the N=64-kbit/s time-slots maintain their correct sequency. Single time-slots, such as speech calls, that are not part of an N=64 kbit/s pipe are not double buffered. The TSI provides double buffering selectively so that speech calls do not incur the extra frame delay of double buffering. The initial offering is N=6 (384 kbit/s), N=24 (1.54 Mbit/s), and N=30 (1.92 Mbit/s).

2.2.4.9 Distinctive Remote Module (DRM)

The DRM is a remoted module that differs from other switching modules in that it can be located over 2000 miles away from the host switch, has local processing and data sufficient to allow it to operate autonomously if communication is lost to the host, and does not backhaul bearer traffic to the host. The DRM relies only on the host to provide minimal control information, and as such, only requires a control connection but no umbilicals for sending voice or data. All bearer traffic, such as voice calls, are sent over the external telephony network. The DRM was introduced in 5E14.

The DRM consists of an SM2K module and local workstation. It provides the same services provided by an SM in the host 5ESS[®] switch, only at a distant location. The host switch of the DRM and the DRM itself are largely decoupled, since only minimal information need be exchanged in order to provide ongoing service. The OAM&P interface is provided by the host switch, and the interface to all the modules comprising that host switch is referred to as the Virtual Switch, in that all the modules it is composed of appear as a single OAM&P entity to the user. This gives the simultaneous advantages of providing a single OAM&P user interface, but at the same time, providing the extreme distribution and fault tolerance of a highly modular set of switching entities.

Although the DRM can interface to the host Virtual Switch by any data network capable of carrying the bandwidth of a single T1 over an *Ethernet*[®] interface, this is primarily used for the transmission of software and data updates and reports, and is generally less demanding. This allows a unified and consistent administrative interface with a distributed, potentially heterogeneous, and therefore growable and modular switching architecture.

2.2.4.10 Optically Integrated Remote Switching Module (ORM)

2.2.4.10.1 ORM

An ORM is an SM that is remoted from the 5ESS[®] switch through DS3 transmission facilities or through OC-3 SONET facilities. The later capacity becomes available in 5E12 time frame. The ORM can be located up to 600 miles away from the host 5ESS[®] switch over standard transmission facilities. The ability to place a remote SM at distances up to 600 miles from the host is enabled with the development of the Far Access Remote feature in 5E9 (2) software release. Prior to this development, the allowable remoting distances were determined by the tolerable grade of service, or an echo path delay of less than or equal to 0.75 msec. If a SLC[®] system is terminated on a remoted SM, the applicable distance shall be inclusive, that is end-to-end.

NOTE: The Far Access Remote (FAR) feature was introduced as a special feature in a software update to the 5E9(2) software release. This feature enhances the loss insertion capabilities of the 5ESS[®] switch and provides additional flexibility in loss control. A loss is inserted by the switch to control echo in voice connections. This feature enables remote switching modules to be located at greater distances from the host switching module. See Section 4, "Transmission and Synchronization" in the 235-900-113, 5ESS[®] Switch Product Specification.

The ORM provides the same services provided by an SM in the host 5ESS[®] switch at a geographically different location. It is similar in function to the RSM, but without requiring the services of a host SM or any of the RSM associated interface hardware. The ORM is remoted with a connection to the communication module. A transmission rate converter unit (TRCU) is required between the ORM and the 5ESS[®] switch. The TRCU is responsible for converting switch specific NCT signaling to the applicable standard transmission rates. The TRCU2 is used for rate conversion from NCT to DS3 transmission rates. The TRCU3, available as of 5E12, is used for rate conversions from NCT to OC-3 SONET. Two pairs of NCT links (odd/even pairs) 256 time slots each, are required per ORM. For DS3 transmission (using TRCU2), four DS3 links are required, for SONET transmission (using TRCU3) 2xSTS1 tributaries of an OC-3 link are required. These links carry control information and telephone traffic between the host switch and the remote (see Figure 2-9).

The 5E9 (2) software release supports the capability for providing timing and synchronization of the ORM from an external timing source based on Building Integrated Timing System (BITS). The BITS provides stratum 3E quality timing to the ORM over a T1/E1 timing interface terminated on the digital link interface (DLI) in the ORM. The ORM, like the SM in the host switch has stratum 4 internal clock. During stand-alone operation of the ORM when timing from the umbilical link is lost, the stratum 4 clock in the ORM is not stable or accurate enough to prevent digital facilities terminated on the ORM from sustaining excessive frame slips. A timing source based on BITS provides a robust and stable timing platform with a reliability approaching that of the host switch. The BITS system is capable of stratum 3E accuracy.

2.2.4.11 Extended Switch Module - 2000 (EXM-2000)

2.2.4.11.1 General

The extended switch module-2000 (EXM-2000) is an optically remote SM-2000, analogous to the ORM. Introduced with software release 5E9(2), the EXM-2000 supports optional stand-alone call processing, and stratum 3 clock capability based on customer provided BITS. The EXM-2000, like the ORM, is remoted from the CM2 using TRCU2 or TRCU3 as the interface for converting from switch specific NCT/NCT2 signals to standard transmission rates. The TRCU2 units terminate NCT links from the CM2 or EXM-2000, and converts these signals to DS3 format for use in the transmission network. A maximum of six TRCU2s may be equipped on an EXM-2000. At the EXM, the NCT links from the TRCU2 are terminated on the electrical network link interface (ENLI). The TRCU3 units available in 5E12(SU) may also be used to remote EXM-2000s. The TRCU3 (for EXM-2000s) terminates NCT2 links from the CM2 or from the EXM-2000. In this case the links from the TRCU3 are terminated on the network link interface of the EXM-2000. Each TRCU3, in minimum configuration, terminates two NCT2 pairs and generates two STS1 links to the transmission network. Each maximally equipped TRCU3 terminates three NCT2 pairs, generating three STS 1 links (OC-3) for the transmission network. The minimum configuration of the EXM-2000 must be supported with one TRCU3 providing two STS 1 transmission bandwidth. The number

of TRCU3 required for an EXM-2000 is growable to the maximum of four units. The EXM-2000 supported with TRCU3 has the full functionality and capacity of an SM-2000 in the host 5ESS[®] switch office.

Like the ORM, the EXM-2000 must be supported with stand-alone mode call processing capability as well as an external timing capability based on BITS. In stand-alone mode of operation, all ports in the ORM or EXM-2000 are able to reach any other port on the same module. This includes line to line, line to trunk, and trunk to trunk calls. This feature provides for the following:

- ☐ maintenance of stable intra-module calls while transitioning and during stand-alone
- ☐ POTS termination to lines, local MLHGs, local trunk groups, and global trunks and MLHGs terminated on the module
- ☐ emergency routing
- ☐ announcements off 13A machine (or other) using IMT
- ☐ intra-module trunking
- ☐ billing
- ☐ call waiting/forwarding/hold, speed calling

The EXM-2000 and ORM are equipped with an alarm status unit (ASU) that provides visual indications of alarms in a solitary site, displaying the degree of the alarm (critical, major, or minor), and the status of the switching module control unit (SMCU) (normal, stand-alone, simplex, or power alarm).

2.2.4.11.2 Transmission Considerations

Please refer to Section 4 of the 235-900-113, 5ESS[®] *Switch Product Specification*, for additional information about transmission distance limitations for the RSM/ORM/EXM-2000.

2.2.4.11.3 Host to EXM-2000 Distance

The distance limitations of the EXM-2000 are the same as those of the RSM. Please refer to "Host to RSM Distance," Section 2.2.4.12.3 .

2.2.4.11.4 Electrical Network Link Interface (ENLI) Engineering

A TRCU2, is used to subtend an EXM-2000, must be equipped in the SMC cabinet within four feet of the SMPU. Space must be provided in the SMC to accommodate up to the maximum of six TRCU2 that any EXM-2000 may need. The use of cabinet space for TRCUs will result in a lower limit of the number of peripheral units (e.g., line units) that can be equipped in an EXM-2000. These constraints disappear when the TRCU3 unit is used to subtend EXM-2000s.

The EXM-2000 with TRCU2s uses ENLIs rather than NLIs to bring network time slots into the TSI. However, the external name "NLI" is used for configuring and reporting about the circuit as it pertains to technicians actions:

- ☐ remove requests
- ☐ restore requests
- ☐ diagnose requests
- ☐ automatic error reports

Some MCC displays imply that a circuit is really an ENLI, due to the 256 time slot link. While a pure NLI has two TMSLNK (each of 256 time slots, visible on the TMS link page) the ENLI has only one. The ENLI, being a distinct circuit entity, is identified and treated differently than NLI by diagnostics.

2.2.4.12 Remote Switching Module (RSM)

2.2.4.12.1 General

The RSM provides the switching capabilities of the 5ESS[®] switch to areas that cannot economically support an ESSTM switch. This eliminates the expense of a host: an administrative module (AM), communications module (CM), and other associated equipment. The RSM offers custom calling features to areas normally served by community dial offices or small wire centers. The RSM may also be used to provide toll and assistance operator services in these areas. In addition, the RSM performs switching functions for large pair-gain systems.

The RSM is able to operate if control links to the host SM fail. The RSM can share the normalized office code designation of the host 5ESS[®] switch or may have assigned to it a dedicated normalized office code that is separate from the host.

The RSM has the following characteristics:

- ☐ provides the same service as a host SM
- ☐ the ability to transmit traffic and other administrative data to the host office
- ☐ a zero resistance point for the loop plant
- ☐ intraswitching of local RSM calls
- ☐ optional stand-alone capability to provide autonomous local switching if facilities at or between the host office and the RSM fail
- ☐ single-route access through the host office to the toll network as well as to other local offices
- ☐ a dedicated normalized office code, if required
- ☐ access to all operating support systems available to the host office

The RSM interfaces with the host SM or host SM-2000 (HSM-2000) through T1 lines. A minimum of two T1 lines to a maximum of 20 T1 lines connect the RSM to a host SM, and each host SM can interface with from one to five RSMs. The number of T1 lines is engineered according to the expected RSM to host switch or DLTU2 traffic. Each RSM is connected to the HSM-2000 by standard 24 channel, T1 lines. The SM-2000 supports up to 30 RSMs compared to the 5 RSMs supported by an SM. However, since HSM-2000 has 5 times the processor speed of an HSM, the time needed to send restoral requests to 30 RSMs does not significantly exceed the time required by existing HSMs.

A digital line and trunk unit (DLTU) is required in the host SM to terminate the T1 facilities from the RSM.

The RSM provides the ability to terminate analog lines and pair gain systems such as the SLC[®] carrier system and provides all the features available at the host SM.

The RSM consists of standard SM cabinets (up to four LTPs and one SMC). However, the RSM uses an FIU to convert data received from the host office. The function of the FIU is to recover data, control, and timing information from the T1 line; and to format this information into a pair of NCT link signals.

The RSM is available in a single or multimodule configuration. Any RSM can be subtended from a host 5ESS[®] switch through T1/E1 spans that may terminate on the Digital Line Trunk Unit (DLTU) or through T1

spans that are multiplexed to higher bandwidth and terminate as an STS1 facility on the Digital Network Unit-SONET (DNU-S).

2.2.4.12.2 Multimodule Remote Switching Module Description

The multimodule remote switching module (MMRSM) consists of from one to four RSMs connected to each other by dedicated T1 links. Each RSM is also connected to an SM at a 5ESS[®] switch by dedicated T1 links. A high-level block diagram of the MMRSM is shown in Figure 2-10 .

Although not recommended, the MMRSM can serve a maximum of 16,384 lines with 4 RSMs, each having a concentration ratio of 8:1. This number assumes no trunks and no optional equipment such as an announcement machine which requires trunk units (TUs). The MMRSM can serve a maximum of 2048 trunks. Depending on the customers needs, an MMRSM can be equipped with both trunks and lines within these limits.

Each RSM in the MMRSM is equipped with 1 FIU, which provides up to 20 T1 terminations. A minimum of two links (umbilicals) must connect an RSM to its host SM. However, it is recommended that, for additional reliability, at least four T1 links with two each over diverse routes be provided between the RSM and its host SM. Links from different RSMs in the multimodule RSM may terminate on more than one host SM. However, all umbilical T1 links between a given RSM and its host must terminate on one host SM.

The T1 links that connect the RSMs in the MMRSM with each other, are similar to those that connect the RSMs to the host 5ESS[®] switch. These links are called Inter-cluster links (ICL) and terminate on inter-RSM communication link digital facility interface (CDFI) circuits, which interface with the FIU.

The inter-cluster links for MMRSMs are not dependent on the way the umbilicals of each RSM in the cluster are terminated at the host switch.

2.2.4.12.3 Host to RSM Distance

The Far Access Remote (FAR) feature was introduced as a special feature in a software update to the 5E9(2) software release. This feature enables remote switching, optical remote modules and EXM-2000 modules to be placed up to a distance of 600 miles from the host switching module (refer to "ORM," Section 2.2.4.10). Without the FAR feature, meeting transmission performance requirements given in 235-900-113, *Product Specification*, the single module RSM must be within 104 miles of its host 5ESS[®] switch. However, the RSM can be optionally remoted up to 150 miles from the host 5ESS[®] switch with an increase in the echo path delay of less than or equal to 0.75 ms. Although this will violate the transmission requirements listed in the 5ESS[®] Switch Product Specification, the grade of service may still be acceptable to the customer. If a SLC[®] carrier system is hosted by an RSM, the maximum combined distance from the host 5ESS[®] switch to the SLC[®] carrier system is 120 miles (that is, host 5ESS[®] switch to RSM distance plus RSM to SLC[®] carrier system distance). The RSM can be remoted from 300 to 350 miles from the host 5ESS[®] switch in Operator Services Position System (OSPS) dedicated applications.

The distances to which RSMs can be remoted from the host switch are not dependent on the type of RSM umbilical terminations in the host switch .

2.2.4.12.4 Transmission Facilities

2.2.4.12.4.1 Overview

Transmission facilities other than copper T1 cable (or T1 compatible) can be used for the umbilical links. The transmission facilities include:

- ☐ fiber-optic
- ☐ digital radio

2.2.4.12.4.2 Fiber-Optic

The lightwave termination and multiplex assembly (LTMA) equipment is available and can be used to multiplex up to 28 T1 facilities into a single DS3 rate (44.736 Mb/s) channel for optical-fiber transmission. This equipment can be used in lieu of the copper T1 cable for the RSM umbilical.

Fiber regenerator technology offers a wide variety of transmission systems allowing communication links up to hundreds of miles. Consequently, the distance limitation due to a fiber link is based on the listener echo requirements. The recommended maximum 5ESS[®] switch host to RSM distance using a fiber connection is 104 miles, although an RSM can be located up to 150 miles from the host SM as stated in "Host to RSM Distance," Section 2.2.4.12.3. In addition, by using the Far Access Remote (FAR) feature, introduced as a special feature in a software update to the 5E9(2) software release, Remote Switching Modules can be placed up to a distance of 600 miles from the host Switching Module. Note that the fiber-optic repeaters must be located in a temperature-controlled environment.

2.2.4.12.4.3 Digital Radio

Digital radio (6 GHz) may also be used to provide the link between the host 5ESS[®] switch and the RSM. The maximum distance allowed between the host and the RSM with digital radio carrier is 104 miles. With digital radio, the distance limiting factor is not due to echo path delay requirements, but instead it is limited by the performance objectives. Performance impairments include multipath fading, obstruction fading, and equipment outages.

2.2.4.12.5 RSM Umbilical Order Wire

The order wire in the single module MMRS is used to provide an independent voice grade circuit between the MMRS and the host 5ESS[®] switch to extend the office belt line for teletypewriter access from the remote site. With applications where the umbilical is routed by microwave radio, the teletypewriter link can be treated the same as any other voice circuit multiplexed onto the carrier system as long as it remains independent of the RSM.

2.2.4.12.6 Remote Clock Unit

The stratum 3 remote clock unit (RCLKU) is an option available to support high-speed digital trunking in RSM applications. The stratum 3 RCLKU allows the RSM to provide local digital switch (LDS) timing features and reliability. This allows digital trunks from the RSM to connect to other digital switches and to support ISDN. The RSM or MMRS requires a RCLKU when the customer wants protection from loss of timing due to loss of the umbilicals to the host SM. This condition is known as stand-alone.

The RCLKU circuit packs and firmware are identical to those used in the NCLK in the local and toll 5ESS[®] switches. This hardware meets or exceeds the International Telegraph and Telecommunication Standardization Sector (TSS) requirements for stratum 3 or stratum 2 timing sources.

When the RCLKU option is provided, only one of the RSMs in the MMRS is equipped. If the umbilical links from the host are lost, the stratum 4 clock of one of the RSMs can use the output of the stratum 3 RCLKU as a reference and distribute this "stabilized" output to the stratum 4 clocks of the other RSMs, allowing the MMRS to maintain the stratum 3 timing necessary for digital data transmission and ISDN. The RCLKU also raises the timing signal quality on each RSM in the MMRS even under normal linked operation due to the jitter filtering performed by the RCLKU.

An MMRS without an RCLKU will operate with each SM deriving the timing from its umbilicals to the HSM directly. Should the umbilicals become unavailable, clocking in that SM reverts to its internal Stratum level 4 clock. With a RCLKU, one of the SMs is designated the "Master" and the RCLKU is installed in it. The RCLKU derives timing from the master's umbilicals and distributes it to other SMs over ICLs that have been designated as "Timing ICLs." The non-master SMs do not get their timing from their umbilicals, so if one of

them loses its umbilicals, timing is still maintained at the Stratum 3 level or better. If the master SM loses its umbilicals, the RCLK goes into holdover mode and timing for all SMs is maintained in accordance with holdover specifications (ANSI T1.101-1994)

2.2.4.13 Intermodule Trunks

The intermodule trunking feature provides the following intermodule trunks, where the modules are connected to the same base 5ESS[®] switch.

- ☐ MMRSM to/from MMRSM
- ☐ ORM to/from ORM
- ☐ MMRSM to/from ORM
- ☐ MMRSM to/from SM
- ☐ ORM to/from SM

These trunks can be either analog (2-wire and 4-wire) or digital, as described in 235-900-113, 5ESS[®] *Switch Product Specification*. Call traffic can be routed between the modules over these trunks as a preferred route, with overflow to the links in the host office. These trunks can also be used to complete intermodule calls in the event the host-to-remote link goes down. Additional alternate routes can be specified with the capability to tandem switch calls between the MMRSMs and/or ORMs.

An external timing source is required for an ORM (whereby, the ORM timing is derived from the external source and not from the umbilicals), if intermodule calls are to be completed in the event the host-to-remote link goes down.

2.2.4.14 Position Switching Module

To support the OSPS directory assistance (DA), listing services (LS), toll and assistance (T&A), and automatic call distributor (ACD) features, the SMs that serve operator positions must be equipped as position switching modules (PSMs). Each PSM consists of a packet interface/packet interface - unit 2 (PI/PI2) and a packet switch unit/packet switch unit - 2 (PSU/PSU2) in addition to the switching module processor (SMP) and the time slot interchange unit (TSIU). The number of SMs configured as PSMs is engineered depending on the number of data links served by the OSPS. The PSM (located at the host 5ESS[®] switch) may contain an integrated services line unit/integrated services line unit - 2 (ISLU/ISLU2) to terminate the operator positions and associated data links, or it may be connected via T1 facilities to the operator position controller (OPC) (at the remote site). Figure 2-11 shows the 5ESS[®] switch architecture with a PSM serving remote operator positions. The PSMs multiplex B- and D-channels onto the T1 facilities that terminate on the remote integrated services line unit (RISLU). The B-channels handle voice, and the D-channels handle signaling messages. The PI provides the packet interface with the SMP, and the PSU/PSU2 performs the packet handling functions of the PSM.

2.2.4.15 Switching Module Control and Data Units

2.2.4.15.1 Overview

The SMC cabinet is equipped with units that are common to all SMs. This common equipment includes the following:

- ☐ SMP and time slot interchange (TSI) unit (MCTU) or MCTU2
- ☐ memory expansion unit (MEU) (optional) in the MCTU

- ☐ local digital service unit (LDSU) or digital service unit - model 2 (DSU2). This unit is not required with the MCTU2.
- ☐ Digital Service Circuit (DSC3).

Each PSM includes the equipment common to the SM with the addition of the PSU/PSU2 and the PI/PI2.

2.2.4.15.2 MCTU and MCTU2

2.2.4.15.2.1 Overview

The MCTU combines the SMP and TSI into a single 2-shelf unit. The latest very large scale integration (VLSI) technology is used throughout the architecture of the MCTU. The MCTU performs the following functions:

- ☐ interfaces with the NCT links
- ☐ interfaces with other units within the SM to transmit control information from the SMP
- ☐ interfaces with units within the SM for PCM data
- ☐ provides call processing, call supervision, and maintenance functions
- ☐ provides time division switching under control of the SMP
- ☐ provides an interface between the SMP and the message time slots of the NCT links
- ☐ preprocesses the signaling and control bits of time slot data and provides SMP access to these bits

Four NCT link pairs provide the transmission medium from the MCTU to the TMS. The NCT link is the source of the office timing information for the SM. The MCTU extracts this timing information to allow the SM to operate in synchronization with the system. The MCTU selects one of the NCT link pairs as the master reference timing source.

The MCTU consists of the following circuitry:

- ☐ Time slot interchange (TSI)
- ☐ Data interface (DI)
- ☐ Dual link interface (DLI)
- ☐ Network link interface (NLI)
- ☐ Control interface (CI)
- ☐ Signal processor (SP)
- ☐ Switching module processor (SMP)
- ☐ Bootstrapper (BTSR)
- ☐ Packet interface/Packet interface 2 (PI/PI2)
- ☐ Quad-Link Packet Switch (QLPS)

2.2.4.15.2.2 Time Slot Interchange

The TSI provides time-division switching by delivering any of 512 time slots received from the DIs to both DLIs on any of the 512 network time slots.

Each SM contains a duplicated TSI. The active TSI is associated with the active SM processor, and the standby TSI is associated with the standby SM processor. Each TSI carries the same data; however, only the active TSI is selected for data transfer. The interface units contain an input switch that is used to select data, clock, and synchronization only from the active TSI.

A growable Time Slot Interchange Unit - Model 4 (TSIU4 or TSIU4-2), can be grown to 30K time slots on an SM-2000 compared with 512 network and 512 peripheral time slots on the SM. This enables enhanced support of the large-scale applications of wideband data switching, as well as continued support of narrowband services. Growth is in response to total bandwidth demand in increments of 3092 peripheral terminations (DSOs). Also, the fabric is configurable, providing additional network capacity toward the periphery of the switch or toward the internal network, as required. This flexibility permits a tailoring of bandwidth capacity. The internal network side of the TSI is served by expanded Network Control and Timing (NCT2) links. These NCT2 links grow with the TSI in increments of 1024 network terminations (DSOs) up to a maximum of 2048 network time slots per TSI slice (TSIS).

2.2.4.15.2.3 Data Interface

The DI provides the interface for the PCM data, the signaling bits, and the clock and time-slot synchronization between the TSI and the interface units.

The interfaces to the periphery are provided in two groups of 256 TSI time slots (Figure 2-12). One group interfaces even TSI time slots, and the other group interfaces odd time slots. A DI is required for each group. Each DI has 16 peripheral interface data buses (PIDBs) to the periphery. The PIDB contains a 32-time slot, 16-bit serial bus for each direction of transmission.

2.2.4.15.2.4 Dual Link Interface

The DLI contains a common clock and control circuit and two link interface (LI) circuits. Each LI receives time slots through NCT links from one of the two TMSs (see Figure 2-13). The DLI delivers these time slots to the TSI.

In the opposite direction, the DLI selects time slots from the active TSI and delivers these time slots to the TMS through NCT links. One time slot on each NCT link is permanently connected to the MSG through the TMS. This "nailed-up" time slot is called the control time slot (CTS). The DLI delivers the CTS to the SM processor as a 48 kb/s serial bit stream. Similarly, the DLI receives a serial control link from the SM processor and inserts it into the CTS for transmission to the MSG.

The SM clock is derived from the NCT link data stream by the DLI. This timing information is then delivered by the DLI to the TSI for distribution to the rest of the SM. The active TSI receives timing from the active DLI. To ensure that the TSIs can switch timing source from one DLI to another without introducing data errors, the DLIs are cross-coupled so that one DLI is directed from this timing source. The phase-locked loop (PLL) circuitry in the DLIs ensures that no rapid shifts in clock phase occur as the master responsibility is moved from one DLI to another.

2.2.4.15.2.5 Network Link Interface (NLI)

Functions performed by the DLI in prior software releases, are performed by the NLI in the 5E9(2) software release. For each of the two primary NLI links, a 5ESS[®] switch supports 14 time slots for QLPS messaging. The primary NLI provides the timing reference for the 5ESS[®] switch.

Functions performed by the DLI in prior software releases are performed by the NLI in the 5E9(2) software release. The current actions of the NLI are provided as they are for the DLI. These actions include:

- ☐ remove
- ☐ restore
- ☐ diagnose
- ☐ inhibit
- ☐ allow

2.2.4.15.2.6 Peripheral Link Interface (PLI)

Each side of a duplex peripheral control and timing (PCT) link terminates on a PLI paddle board at the SM-2000/EXM-2000. A minimum of two and a maximum of 24 PLIs are required per DNU-S. Each common optical termination (COT) requires a PLI.

2.2.4.15.2.7 Control Interface

The CI performs the following functions:

- (a) provides the means by which the SM processor communicates with the interface units
- (b) monitors communications between the SM processor and interface units and reports the errors detected
- (c) receives, latches, and reports service requests from the interface units to the SM processor

A CI provides up to 23 peripheral interface control buses (PICBs) to the various interface units of the SM. There can be two CIs equipped. Two PICBs are reserved for the DSU2 on CI0. The second CI is optional (except in an RSM) and has no DSU2 PICBs. Six PICBs on CI1 are reserved when a module is configured as an RSM. Each PICB connects to a service group (SG) of an interface unit. A PICB consists of five twisted wire pairs which carry clock, data, and controller select information to the interface units (IUs), and sends back data and service requests to the CI. Each PICB has the capability to access up to 256 source or destination registers in each interface unit.

2.2.4.15.2.8 Signal Processor

The SP provides the SM processor access to the signaling and control bits of the time slots transmitted to and received from the interface units. The SP enhances the processing capacity of the SM processor by performing the real-time intensive task of scanning for changes of signaling and control bits from the interface units.

The SP scans for supervision changes on time slots received from the TSI and notifies the SM processor of "hit-timing" supervision changes. The SP also stores received signaling bits after hit timing in an immediate access random access memory (RAM) that the SM processor can read at any time. In the opposite direction, the SP provides a means of transmitting constant values of the seven signaling bits for each time slot for the TSI.

The 3 ms scan for hit timing is performed on identical time slots by the SP of both active and standby controllers. This synchronization ensures that the same state changes are detected at the same time by both SPs. This is necessary to ensure that a switch to the standby controller complex can occur without loss of transient calls.

2.2.4.15.2.9 SM Processor

The SM processor is fully duplicated and is operated in an active/standby configuration. In the normal

configuration, the active SM processor controls the entire SM, and also keeps the data areas in the standby processor updated.

Each SM processor uses an MC68000 family microprocessor. The processing power of this microprocessor is augmented by a separate signal processor that performs the real-time intensive task of detecting changes of signaling states. Memory for each SM processor is supplied in the following two forms:

- (a) **Read-Only Memory (ROM):** The ROM contains data that is preset at manufacture. The ROM data is not lost if power is temporarily removed.
- (b) **Random-Access Memory (RAM):** The RAM contains data that can be changed under program control. The RAM data is lost when power is temporarily removed.

Most SM programs are kept in RAM with backup provided on disk at the AM. Therefore, new software releases can be introduced into the SM processors without replacing memory boards. These programs are transmitted over the NCT link from the AM processor when the system is initialized, a new software release is loaded, or program integrity is suspect.

2.2.4.15.2.10 Bootstrapper

The B TSR provides a means of initializing the RAM in the SM processor at a 192 K byte/second rate. The B TSR is a part of the "fast pump" data link. The other part of this link is the PPC located in the MSG.

In the MCTU, the B TSR is a simplex board which interfaces to the update bus, thereby gaining access to either SM processor memory (see Figure 2-14). In the MCTU2, the B TSR is duplex and an integrated part of the processor complex interfacing directly to the internal processor system bus used for altering processor memory (see Figure 2-15). The B TSR supplies address, data, and parity bits, and the necessary control signals for a DMA transfer. The selection of the SM processor side to be pumped is under software control.

The B TSR receives data over the PIDB in the form of 2K-byte blocks. Each block has a 16-byte header containing 2 bytes of start code, 2 bytes of word count, 1 byte of hashsum check, and 4 bytes of starting address for that block. The remaining 7 bytes in the header contain a fixed data pattern inserted between each byte of valid initialization data.

2.2.4.15.2.11 Packet Interface/Packet Interface 2

The PI is an optional subunit used to route packets between the module processor and the PHs in the PSU/PSU2. The PI/PI2 provides the following functions:

- (a) provides the means by which the SM processor communicates with the protocol handlers
- (b) monitors communications between the SM processor and protocol handlers and reports the errors detected

The PI/PI2 connects to each PSU/PSU2 service group through the packet bus. The PI has an internal environment similar to that of the PH, capable of distributed processing and local error recovery.

2.2.4.15.2.12 Quad-Link Packet Switch (QLPS)

The QLPS network (introduced in the 5E9(2) software release) is an overlay network which provides high bandwidth/low latency message transport between an SM-2000 and other SM-2000s, an SM-2000 and an SM, or the AM and CMP through the MSGS Peripheral Interface Controller (PIC). The SM-2000 retains the 48 Kbps Control Time Slot (CTS) link architecture to support Central Processor Intervention (CPI), pump, and maintenance backup. The QLPS network is restricted to offices equipped with Communication Module

2 (CM2).

2.2.4.15.3 MCTU3

The MCTU3 combines several circuit packs and reduces the MCTU2 from two shelves to one while consuming less power. The MCTU3 requires a different shelf/backplane, a different core board (SB20CORE), and a combined power control and display pack. It uses existing TSIU3s, DIs, CIs (or CI2) and peripherals. The MCTU3 is based on the SMP20 processor but uses an MC68LC040 processor. The MCTU3 has minimal impact on the existing software base. Run time checks distinguish between the following processor types:

- ☐ SMP12
- ☐ SMP23
- ☐ SMP20

All SM configurations are supported by the MCTU3 (for example, LSM, RSM, ORM, VCDX, ORM for SM-2000 or SM-2000 for CDX). The software image for the MCTU3 is compatible for all Pre-SM-2000 SMs.

An *Ethernet*[®] interface may be used to provide access between the MCTU3 and the 5ESS[®] switch VCDX. A paddle board located on the backplane of the MCTU3 provides the physical interface to the *Ethernet*[®] interface and handles the CPI message interface between the workstation and the SB20CORE.

2.2.4.15.4 Memory Expansion Unit

Beginning with 5E11, typical memory resource allocation for the SM is 26 MB when 4-megabyte memory boards are used in the MCTU. Memory may be expanded with the addition of an MEU. The MCTU2 is available with 4 MB or 8 MB boards; however, the MEU is not available.

2.2.4.15.5 LDSU/DSU2

The DSU2 is available as an upgraded replacement for the LDSU. The LDSU provides the tone generation and decoding functions required for call processing and also provides reverive pulsing (RP) capabilities. The DSU2 provides tone generation, condensing, and decoding. In addition to performing the local LDSU functions (tone generation and tone decoding), the DSU2 performs the following global functions:

- ☐ Service Announcement System (SAS)
- ☐ recorded announcement function (RAF)
- ☐ integrated services test function (ISTF)

In older offices equipped with LDSUs, local area signaling services (LASS) or common channel signaling (CCS) functions can be performed by an LDSU conversion in some of the SMs. This conversion upgrades the LDSU to a DSU2/LDSUF. The DSU2/LDSUF capabilities include:

- ☐ voice path assurance (VPA)
- ☐ individual calling line identification (ICLID)
- ☐ message waiting indicator (MWI)

The converted LDSU (now a DSU2/LDSUF) however, will still not be able to perform the RAF and ISTF

functions of the standard DSU2. The conversion also removes the RP functions of the LDSU. With this conversion, an office could have all three types of digital service units; LDSU, DSU2/LDSUF, and DSU2.

The three types can be mixed in the same 5ESS[®] switch office. However, they cannot be mixed in the same SM. Since RP is not available in the DSU2, an SM requiring RP must use an LDSU.

The LDSU is described in greater detail in "Local Digital Service Unit," Section 2.2.4.16.6.2.2, and the DSU2 is described in greater detail in "Digital Service Unit - 2," Section 2.2.4.16.6.2.3, as service circuits.

2.2.4.15.6 Local Digital Service Function (LDSF)

Two LDSF packs are required for an SM-2000 and up to 6 can be equipped. Each LDSF board contains 10 Digital Signal Processors (DSPs). Each circuit pack is a service group (SG) containing 4 duplex PIDBs providing 128 time slots terminating to a DX board. All PIDBs from one DSC3 must be on the same DX board.

The DSPs produce tones and provide for the outputting of tone sequences (cadencing) which are frequently used in most SMS. The following tones can be generated:

- ☐ audible ringing
- ☐ busy tone
- ☐ receiver off-hook tone
- ☐ operator zip tone
- ☐ busy line verification intrusion tone
- ☐ coin control signals
- ☐ ringback
- ☐ dial tone
- ☐ high tone
- ☐ low tone
- ☐ all pairs of multifrequency (MF) tones (15 total)
- ☐ call waiting tone
- ☐ touch-tone service pairs (16 total)

The VPA transponder in the terminating office monitors for a received check tone within the acceptable transmission and timing limits and generates response tone to the originating office. The tone continues to be generated while the check tone is being received.

The DSC provides the circuitry necessary for controlling and performing the VPA transceiver/transponder function including the following:

- ☐ initialization of the service state at DSC board initialization time
- ☐ parsing and implementation of VPA requests
- ☐ signal processing algorithms for tone generation and reception

- ☐ timing and control for tone generation and reception
- ☐ evaluation of timing results to determine success or failure of a VPA test
- ☐ formatting and transmission of VPA reports

2.2.4.15.7 Global Digital Service Function (GDSF)

The DSC3 packs can also be equipped to provide global digital service functions (GDSF) - conferencing (3-way and 6-way), transmission test functions (TTF), and integrated services test functions (ITSF). The TTF tests provided by the GDSF are as follow:

- ☐ 100 test call
- ☐ 102-106 test call
- ☐ Centrex test
- ☐ Step by step test
- ☐ ROTL
- ☐ 5000 TLWS series
- ☐ 5200 TLWS series
- ☐ 5400 TLWS series
- ☐ 5600 TLWS series.

The ISTF tests provided by the GDSF are as follow:

- ☐ 108 test call
- ☐ LBK
- ☐ LBKOCU
- ☐ LBKCSU
- ☐ MANSRCE
- ☐ MANSINK

2.2.4.15.8 Packet Switch Unit

The PSU provides a centralized high bandwidth interface to support packetized signaling messages, packet data switching, and wireless CDMA and TDMA vocoders. By centralizing the processing and vocoder functions in the PSU, efficient signaling, maintenance, and administrative interfaces are maintained, and the distributed processing architecture of the 5ESS[®] switch is enhanced.

The PSU has two major interfaces that allow it to communicate with peripheral units and with the SMP. Communication with the peripheral units is provided by the PIDBs from the TSIU and the directly connected peripheral interface data buses (DPIDBs) from the various peripheral units (for example, ISLU/ISLU2). Therefore, the packet information is passed between the PSU and the ISLU/ISLU2 through the DPIDBs. A RISLU transfers packet information over the PIDBs. The connection to the TSI is over either PIDBs (PSU1

and PSU2) or PCT links (PSU2 only). Communication with the SMP is through the PICBs which provide a low-level control interface, and the packet bus which provides a high-level control and signaling interface.

2.2.4.15.9 Packet Switch Unit 1 (PSU1)

The PSU1 occupies from one to five equipment shelves in a single cabinet and provides a 10Mbps backplane. It consists of the following circuitry:

(1) **Data Fanout**

- ☐ terminates PIDB and DPIDB
- ☐ performs time slot assignment between the DPIDB, PIDB, and protocol handler data bus (PHDB).

(2) **Control Fanout**

- ☐ communicates with the SMP through a PICB
- ☐ distributes configuration and control information to the data fanout and the packet fanout
- ☐ distributes time slot assignment information to the data fanout
- ☐ performs packet bus arbitration

(3) **Protocol Handler**

- ☐ communicates D-channel information through time slots from the data fanout
- ☐ supports a maximum of 128 D-channels or 32 sixty-four kb/s B-channels
- ☐ communicates over the packet bus to the SMP and to other protocol handlers
- ☐ provides a localized environment to support distributed processing
- ☐ PSU1 supports PH2, PH3, PH4, and PH22 protocol handlers

NOTE: See Table 2-5 for PH2, PH3, PH4, and PH22 attributes. See Figure 2-16 for a block diagram of PH2 and Figure 2-17 for a block diagram of PH3 and PH4.

(4) **Packet Fanout**

- ☐ distributes packet bus arbitration control signals to the protocol handlers
- ☐ concentrates packet bus requests from the protocol handlers to the control fanout
- ☐ distributes packet bus data to the protocol handlers

Figure 2-18 shows a functional block diagram of the PSU and its communication paths. The major PSU internal communication paths consist of the control interface bus (CIB), the control bus (CB), the PB (packet bus), the packet interconnect bus (PIB), and the PHDB.

Table 2-5 Protocol Handler PH2, PH3, PH4, and PH22 Attributes

Attribute	Attribute	PH3	PH4	PH22
AP	80186	68030	68030	68060

IOP	80186	68030	68030	68060
Local SRAM	64K	2 □ 256K	2 □ 1MB	2 □ 2MB
Dual SRAM	0	256K	1MB	1MB
Dual DRAM	1MB	4MB	0	16MB
EPROM	2 □ 32K	2 □ 32K	2 □ 32K	2 □ 32K
PSU	PSU1	PSU1/PSU2	PSU1/PSU2	PSU1/PSU2
Applications	ISDN/OSPS	ISDN/OSPS/CCS	ISDN/OSPS/ CDMA/TDMA	CCS

2.2.4.15.10 Packet Switch Unit 2 (PSU2)

The PSU2 provides a centralized higher bandwidth interface which supports packet switching of data and signaling messages on both the SM-2000 and SM platform. The PSU2 supports the D-channel signaling and switches customer packet data on the B- or D-channel. Packet switching features provided by the PSU2, PH4, PI2 platforms are transparent to end-users with the following exceptions:

- ☐ OSPS
- ☐ DSN

These features are still supported on the PSU, PH3, PI platform.

The PSU2 occupies from one to five equipment shelves in a single cabinet and provides a 100 Mbps backplane. It consists of combinations of the following circuitry:

(1) **Data Fanout**

- ☐ terminates one PIDB and up to six DPIDBs
- ☐ performs time slot assignment of the DPIDBs and PIDB to the PH4 using the protocol handler data bus (PHDB)

(2) **Data Fanout With Multiple PIDBs (DFMP)**

- ☐ terminates up to four PIDBs
- ☐ performs time slot assignment of the DPIDBs to the PH4 through the protocol handler data bus (PHDB).

(3) **Data Fanout - Unit 2 (DF2)**

- ☐ Communicates with the TSI through a PCT link.
- ☐ Supports up to 512 nailed-up time slots per shelf.
- ☐ Increases CDMA call capacity by providing more time slots to a PSU2 shelf.
- ☐ The new circuit utilizes a direct PCT link interface rather than four individual PIDB connections and configures protocol handler buses (PHDB) as "low speed - 32 slot link" or "high speed - 64 or 128 time slots link".
- ☐ The new data fanout circuit board is added on a per-shelf basis to existing PSU2 units equipped with DF-Flex or DFMP-Flex circuit boards.

(4) **Control Fanout - Unit 2 (CF2)**

- ☐ communicates with the SMP through a PICB

- ☐ distributes configuration and control information to the DF or DFMP and the PF2
- ☐ distributes time slot assignment information to the DF or DFMP
- ☐ performs packet bus arbitration

(5) **Protocol Handlers**

- ☐ The PSU2 supports protocol handlers PH3, PH4, PH22, PHV1, PHV2, PHV3, PHV4, and PHA

(6) **Protocol Handlers - PH3 and PH4**

- ☐ communicate D-channel information through time slots from the DF or DFMP
- ☐ support a maximum of 128 sixteen kbps D-channels or 32 sixty-four kbps B-channels
- ☐ communicate over the packet bus to the SMP and to other PHs
- ☐ provide a localized environment to support distributed processing

NOTE: See Table 2-5 for PH3, PH4, and PH 22 attributes. See Figure 2-17 for PH3 and PH4 block diagram.

(7) **Protocol Handlers for Voice - PHV1, PHV2, PHV3, PHV4**

- ☐ The PHV encodes and decodes the compressed packetized speech for sending and receiving to and from the cell sites over the packet pipe.
- ☐ PHV3 and PHV4 provide flexibility in supplying vocoder algorithms by being downloadable during initialization.

NOTE: See Table 2-6 for PHV1, PHV2, PHV3, and PHV4 attributes. See Figure 2-19 for PHV1, PHV2, PHV3, and PHV4 block diagram.

(8) **Protocol Handler for ATM (PHA)**

- ☐ provides ATM over OC3 link between PSUs
- ☐ allows, in the CDMA application, for greater percentage of soft handoffs

NOTE: See Table 2-7 for PHA attributes. See Figure 2-20 for PHA block diagram.

(9) **Packet Fanout - Unit 2 (PF2)**

- ☐ distributes packet bus arbitration control signals to the PH4
- ☐ concentrates packet bus requests from the PH4 to the CF2
- ☐ distributes packet bus data to the PH4

NOTE: The 5ESS[®] switch may be used in AutoPLEX[®] System 1000 applications. When used in this way, the PSU2 also includes PHV, PHA, and FRPH (on the PH4) circuits. For information on this application, see the 235-200-100, 5ESS[®] Switch FLEXENT[™]/AutoPLEX[®] Wireless Networks

Applications OA&M Manual.

Table 2-6 Protocol Handlers Vocoders - PHV1, PHV2, PHV3, and PHV4 Attributes

	PHV1 ^a	PHV ^a	PHV3	PHV4
Processor	68040	68040	68040	68040
RAM	1 M	512K	1 M	1 M
EPROM	512K	512K	512K	512K
Vocoder Type	QLECP ^c (8kbps)	QLECP (13kbps)	QLECP (8kbps, 13kbps) EVRC (8kbps)	QLECP (8kbps, 13kbps) EVRC (8kbps) ACELP ^{b d} VCELP ^{b e}
No. of Vocoders	12	12	16	32
Application	CDMA	CDMA	CDMA	CDMA/ TDMA
Notes: a. Not DSP based b. TDMA only c. Qualcomm Excited Linear Predictive d. Algebraic Code Excited Linear Predictive e. Vector Sum Excited Linear Predictive				

Table 2-7 Protocol Handler for ATM (PHA) Attributes

PROTOCOL	PROCESSOR	SRAM	EPROM	APPLICATIONS
PHA	68040	1 MB	512K	CDMA/ TDMA (ATM)

2.2.4.15.11 SS7 Packet Switch Unit (SS7 PSU)

The SS7 PSU was introduced in the 5E11 software release for the VCDX configuration and in the 5E12 software release for the SM-2000 and CDX configurations. The addition of the SS7 PSU to the SM-2000/EXM-2000 switching module provides an SM based SS7 signaling platform. The introduction of SM based SS7 signaling allows the continuation of basic subscriber features and services that require SS7 signaling to continue intra-module operation in stand alone mode (that is, if the switching module loses contact with the host and is provisioned for stand-alone operation).

The SS7 PSU provides the following:

- ☐ an SM based SS7 Message Transfer Point (MTP) and Signaling Connection Control Point (SCCP) signaling Platform (SS7 PSU) to the SM-2000 and EXM-2000 switching modules (other switching module types are optional)
- ☐ allows both the CNI (AM based) and the SS7 PSU signaling platforms to operate in the same office.
- ☐ MTP and SCCP measurements related to the SS7-PSU

SMs equipped with SS7 PSUs and terminating SS7 signaling links are known as Global Switching Modules (GSM). All SS7 signaling on a GSM is handled by the SS7 PSU. In the 5E12 software release, the SS7 PSU supports only trunk groups terminated on a GSM. In essence, the GSM emulates a single SM office, and up to sixteen GSMs are supported per 5ESS[®] switch.

Signaling capacity and routing capabilities on the SS7, PSU based signaling platform include:

☐ **Signaling Link Selector Code Expansion**

The **Signaling Link Selection (SLS) Expansion to 8 Bits** feature (99-CP-2316) allowed for the expansion of the SLS code field from five bits to eight bits on the CNI signaling platform. This allowed 256 individual logical paths (not links) between two signaling points rather than 32 logical paths. Since many more SLS codes are available, the distribution of SLS codes, and therefore traffic load, is much more even across the links. When links fail, the SLS codes can be more evenly redistributed with an 8-bit rather than five bit SLS code algorithm, and therefore the traffic load is much more balanced.

Load sharing procedures are provided to support the 8 bit SLS code field and the load sharing of traffic evenly across the available links.

☐ **Increase Linkset Size to 16 Links**

The SS7 PSU signaling platform, currently supporting up to 8 links per linkset, is enhanced to support up to 16 links per linkset.

☐ **Label A/E/F Links**

CNI provisioning allows the customer to label signaling links to a specific link type (A, E, or F) as defined in ANS[®] specifications. The labeling of the link afforded two items: (1) the E and F link types could be secured and thus deployed by customers wanting to purchase them and (2) the customer could easily identify the type of link and take appropriate action if problems arose.

Since the SS7 PSU makes no connection of link type to a provisioned link, existing 5E11-5E13 customers can provision A, E and F link connections. This capability is not secured since customers are already able to provision these link connections.

This feature allows SS7 PSU provisioning to label signaling links according to a link type to reach feature parity with CNI. In addition, autonomous and demand reports related to signaling links also report the link type.

☐ **ISUP Message Handling in the PSU**

When SS7 PSU software determines it cannot route an incoming Initial Address Message (IAM) to the appropriate switch module (SM), it has been enhanced to respond with an ISUP Release (REL) to gracefully terminate the incoming call.

2.2.4.16 Peripheral Interface Units

2.2.4.16.1 General

The LTP cabinet is equipped with units engineered according to service requirements for each SM as follows:

- ☐ analog interface units
- ☐ digital interface units
- ☐ ISDN interface units
- ☐ access interface units
- ☐ service units

2.2.4.16.2 Analog Interface Units

2.2.4.16.2.1 General

Analog interface units are designed to provide terminations for analog lines and trunks. Each analog interface provides the hardware that allows origination or seizure scanning, the reception of address signaling, alerting or outpulsing, and talking. Address signaling, outpulsing, and talking are all carried in real time on a channel of the PIDB.

Any special level signaling that is required for a facility connected to an analog interface (such as providing ringing voltage and performing coin collection for lines) is provided by hardware in the analog interface units.

Analog interface units provide access hardware to allow facility testing. Audio testing is performed by the transmission test facility (TTF). High-level testing is performed either from the local test desk (or equivalent) through a test trunk interface or with test equipment plugged into the jacks at the TLWS. Either of these test access points can be connected to the facility under test through the metallic test buses (MTBs).

The two types of analog interface units designed to terminate the standard analog facilities are the line unit (LU) and trunk unit (TU).

The following are the possible Analog Interface Unit interfaces:

- ☐ up to 640 analog lines from the main distributing frame (MDF)
- ☐ two metallic test bus (MTB) connections to the modular metallic service unit (MMSU)
- ☐ 2 to 12 peripheral interface data bus (PIDB) to the MCTSI (Active)
- ☐ 2 peripheral interface control bus (PICB) to the MCTSI (Active)

2.2.4.16.2.2 Line Unit

2.2.4.16.2.2.1 General

The LU provides the local customer interface to the 5ESS[®] switch for all single-party, multiparty, coin, and certain private branch exchange (PBX) lines. It is used to terminate subscribers within 18 KFT loop length, or subscribers on universal SLC[®] carrier systems (for example, SLC[®] 5, SLC[®] 96) through a central office terminal (COT). A functional block diagram of an LU is shown in Figure 2-21 .

Each LU consists of an analog space division line concentrator capable of terminating a maximum of 640 customers, and 2 SGs of customer interface hardware. Each SG contains enough customer interface hardware to accommodate 32 active calls. The customer interface hardware provides the signaling, control, and speech interface to the 5ESS[®] switch. The output of the LU is 64 time slots to the MCTU.

The LU performs the following functions necessary to interface to analog lines.

- (a) analog space division line concentration (10:1, 8:1, 6:1, 4:1)
- (b) origination scanning
- (c) BORSCHT functions
 - ☐ battery feed
 - ☐ overvoltage protection
 - ☐ ringing

- ☐ supervisory functions
- ☐ coder/decoder (CODEC) analog-to-digital conversions
- ☐ hybrid (2-wire to 4-wire conversion)
- ☐ test access

The LU is divided into two SGs. Each SG consists of the following hardware:

- ☐ common control and data circuits
- ☐ access network
- ☐ high-level service circuits
- ☐ channel circuit

The LU also contains a concentrator network that is shared by both of the service groups.

2.2.4.16.2.2.2 Concentration

A line concentrator provides the customer with switched access to the 5ESS[®] switch. Concentration of customer inputs is provided to interface relatively low-usage ports to the relatively high-usage channels. The concentration ratio (number of ports per number of channels) is adjustable and can be tailored to the specific customer activity in any given central office.

The concentrator network is made up of a series of solid-state gated-diode crosspoint (GDX) switching grids. The grids are divided into concentrator groups with two grids per group. The grids are made up of two half-grid circuits. An LU can be equipped with a maximum of 20 half-grid circuits. The 20 half-grids are grouped into 10 grids in 5 concentrator groups.

A half-grid concentrator circuit provides a 2-stage switch matrix for concentration, secondary line protection, and origination scanning. A half-grid circuit can be divided into parts according to these functions as described in the following paragraphs.

- (a) **Secondary Protection:** The half-grid concentrator provides additional protection for lines. Primary line protection is provided by gas tube protectors on the main distributing frame or in the optional line interface cabinet. The carbon block protector is also available as an alternative to the gas tube primary protection. (Refer to 235-900-113, *Product Specification*, for additional details.) The primary protector limits the potential on either conductor at the line terminal from □215 volts to □265 volts. Short-term transients are handled by the secondary protector which limits the potential to □265 volts maximum.
- (b) **Scan Cutoff Crosspoint:** Scan cutoff crosspoints sense line origination for up to 32 lines that connect to a half-grid concentrator.
- (c) **Low Voltage Destination and Source Control:** This function provides a mechanism for selecting information on any of the 64 line scan points. Scan point information can be accessed by addressing 64 latches (flip-flops) that are organized in 8 groups of 8 bits.
- (d) **High Voltage Destination Control:** This function provides a mechanism for selecting and operating crosspoints in the concentrator as follows:
 - (1) The crosspoints are the first- and second-stage switches in the concentrator. Whenever a path through a concentrator is established in each stage of the concentrator, two crosspoints

are operated: one for the line-ring lead and the other for the line-tip lead.

- (2) The scan cutoff crosspoints are located in the tip and ring leads of lines served by a concentrator.
- (e) **Stage 0 GDX Matrix:** The GDX switches provide the first stage (stage 0) of concentration in the half-grid. This stage of concentration connects the 32 lines terminated on the half-grid circuit to 16 A-links. An A-link is a path between the stage 0 matrix and the stage 1 GDX matrix. Each of the 32 lines has access to 4 of the A-links. Since there are 32 lines at the input, and only 16 A-links at the output, stage 0 provides a 2-to-1 concentration ratio.
- (f) **Stage 1 GDX Matrix:** This GDX matrix connects the 16 A-links to 32 B-links. A B-link is a path between the half-grid concentrator circuit and the access networks in each service group of the LU.

Even though each half-grid has 32 lines input and 32 B-links output, there is still a 2-to-1 concentration due to stage 0 only having an output of 16 A-links. The reason for providing 32 B-links is to provide a better distribution of the lines to the LU access network.

Since the half-grid circuits only provide a 2-to-1 concentration, the remainder of the concentration in the LU is provided by the backplane wiring of the B-links to the access networks. There are 64 inputs to the access network (32 per service group). The 512 outputs of the GDX half-grids are multiplexed together to the access network inputs in groups of eight. The switching system ensures that the crosspoints in the GDX matrix are never operated in a manner such that more than one GDX half-grid output is connected to the same access network input.

With the concentrator having a maximum input of 640 lines (32 lines times 20 half-grids) and the access network having only 64 inputs, the concentrator provides a 10-to-1 concentration ratio (640-to-64). Other concentration ratios can be provided by reducing the number of grids in the LU. With the 8-to-1 concentration ratio, 8 grids terminating a maximum of 512 lines are used (512-to-64). For a 6-to-1 concentration ratio, only 6 grids terminating a maximum of 384 lines are used (384-to-64). A 4-to-1 concentration is provided using 4 grids terminating a maximum of 256 lines (256-to-64).

2.2.4.16.2.2.3 Access Network

The access network is a space division matrix of crosspoints that resides behind the line concentrator and provides the following functions:

- ☐ high-level service circuit (HLSC) access to the B-links
- ☐ MTB access (linearized) to the B-links
- ☐ local test termination access to the B-links
- ☐ battery reversal capability for each of the B-links

An access network is provided in each SG and serves the associated 32 B-links and channel circuits. The access network is constructed using the same type of crosspoint (gated-diode crosspoint) that is used in the line concentrator. The power and control circuits are also similar. The access network crosspoints are electrically arranged into three identifiable groups.

- (1) A 32-by-8 matrix for B-link access to HLSCs and linearization circuits.
- (2) A 4-by-6 matrix for access to test terminations
- (3) 32 forward/reverse crosspoint network for connecting B-links to the channels.

The access network also contains a linearization circuit that is used whenever external test access through the MTB is required by an external bus and/or repair facility.

2.2.4.16.2.2.4 High-Level Service Circuit

The HLSC provides ringing current and operational tests on subscriber lines during call setup. These tests are as follows:

- (a) **False Cross and Ground (FCG) Test:** This test checks for foreign battery or ground within the LU concentrator.
- (b) **Power Cross and Continuity Test:** This test checks for power crosses and continuity from the stage 1 concentrator to the subscriber station set.
- (c) **Coin Tests:** Coin tests such as coin presence for coin collect and coin return are performed for coin lines.

The HLSC also performs self-diagnosis and is used as a resource in diagnosing other circuits such as the channel circuit and gated-diode switching network (concentrator group) in the LU.

2.2.4.16.2.2.5 Switching

The switches used in the concentrator groups are gated-diode switches and can withstand high voltages, voltage transients, and current surges; and can conduct and switch large currents on a line.

2.2.4.16.2.2.6 Channel Circuits

Channel circuits in the LU perform the following functions:

- ☐ convert analog signals from the B-links to PCM data
- ☐ decode PCM data from the common data circuits into analog signals
- ☐ perform line supervision scans (origination performed by concentrator)
- ☐ provide talking battery to the B-links
- ☐ provide software select per call loss capability of 0 or 2 dB in both the transmit and receive directions
- ☐ provide hybrid 2-wire to 4-wire conversion

There are 64 channel circuits in the LU (32 per SG). Within each SG, each channel circuit is directly associated with one B-link from the access network.

2.2.4.16.2.2.7 Common Data Circuits

Common data circuits sample PCM and supervision data from each of the channel circuits and distribute this data into a serial stream to PIDBs. In the opposite direction, common data circuits distribute data from the PIDBs to the channel circuits. In each SG, each of the 32 channel circuits is associated with one of the 32 PIDB time slots.

2.2.4.16.2.2.8 Common Control Circuits

Common control circuits in the LU distribute control data from the PICBs to the channel circuits, HLSCs, GDX control circuitry, and the access network. The following functions are performed by the GDX control circuit:

- ☐ distributes control to the concentrator groups
- ☐ receives scan information from the concentrator groups

2.2.4.16.2.3 Trunk Unit

2.2.4.16.2.3.1 General

A Trunk Unit (TU) (Figure 2-23) provides for the termination of voice frequency trunks such as interoffice trunks and trunks to switchboards, operator positions, announcement machines, and local test desks. Since an analog trunk is intended to carry a large volume of traffic, no front-end concentration is done. Simplex equipment is provided for the termination of up to 64 trunks. Trunk units may terminate on the SM-2000. A TU on an SM-2000 eliminates the reliance of an SM-2000 on SMs to access announcements and trunk testing.

Each TU is divided into 2 separate SGs and can terminate up to 64 trunks (32 trunks per SG). Each SG may be equipped with different types of trunk circuit packs.

The circuits within each SG are divided into two general categories as follows:

- (a) **Common Circuits:** Common circuits provide functions that are performed in common for all 32 trunk circuits. This includes the common data interface and test access. Continuous fault checks are performed.
- (b) **Trunk Circuits:** Trunk circuits provide functions that are performed on a per-circuit basis. Faults in an SG that can impair single trunk circuits are detected by periodic routine checks.

2.2.4.16.2.3.2 Common Circuits

Control and Data Interface

The control and data interface (CDI) provides the trunk SG interface to the SM processor through the PICB and PIDB. This interface is duplicated so that a trunk SG may be controlled from either side of the SM processor.

The CDI provides the following four basic functions for the trunk SG.

- ☐ generates timing signals for control messages and PCM and signaling data between the TU and TSI
- ☐ distributes control information, received through the PICB interface, to the individual test trunk circuit
- ☐ distributes data, received through the PIDB interface, to and from the individual trunk circuits
- ☐ provides fault-detection capability for TU maintenance

Test Access

The test access circuit (TAC) provides a metallic interface to the trunk circuits and the trunk facility for maintenance and routine test activities. The trunk facility is the metallic path over which the trunk circuits communicate and should not be confused with the trunk circuits. This metallic interface is provided through a relay matrix and is controlled by the CDI circuit.

A test access network is provided in the TU to facilitate trunk circuit diagnosis. This access network allows the connection of any one (and only one) trunk circuit to the test access circuits in the TU common

equipment at any one time. The facility is disconnected from the trunk circuit in this mode. Diagnostic testing is performed as follows:

- (a) Signaling and supervisory test signals are inserted into the trunk circuit by the TU test circuits.
- (b) The test signals are detected by monitoring the incoming data (A through G bits) at the SM processor. Outgoing tests are performed similarly with the SM processor being the test source and the TU test circuits being the points of detection.
- (c) Voice-frequency test signals are inserted by the TTF via the digital network and detected by the TTF and the TU test circuits.

This per trunk circuit diagnostic capability is exercised on a routine basis as a fault detection mechanism for per-trunk failures, and on a demand basis as a tool for trouble isolation within a TU.

2.2.4.16.2.3.3 Trunk Circuits

General

A trunk circuit detects trunk signaling states, performs the 2-wire to 4-wire conversion for 2-wire trunks, and encodes analog signals to PCM data and PIDB signaling bits. The trunk circuit also multiplexes and demultiplexes PCM data onto a serial data bus that connects to the CDI. Multiplexing, demultiplexing, encoding, and decoding functions are performed by a CODEC filter in the trunk circuit (Figure 2-24).

Voice Frequency Interfaces

The following voice-frequency trunk interfaces are provided by trunk circuits.

- (a) Loop supervision outgoing - Loop supervision to far-end, reverse battery supervision from far-end; 2-wire transmission.
- (b) Loop supervision incoming - Reverse battery supervision to far-end, loop supervision from far-end; 2-wire transmission.
- (c) 4-wire E&M - E&M supervision; 4-wire transmission.
- (d) 2-wire E&M - E&M supervision; 2-wire transmission.
- (e) Test trunk - Sleeve lead supervision; 2-wire transmission.

Four trunk circuits of the same type are provided per circuit board (except two trunk circuits on the test trunk circuit for use with local test desks, etc.). This includes the hybrid, trunk feed, detection of supervision, and protection circuits. Trunk feed circuits are of a nonfloating type. All hit timing of loop supervision is provided in the SP.

Address signaling is either dial pulse, dual tone multifrequency (DTMF), or multifrequency. For outgoing trunks, the received start signal may be either immediate dial, wink start, or delay dial. For incoming trunks, the transmitted signal is either immediate dial (that is, none) or wink start.

Coin control signaling is through either inband or expanded inband signaling. Either multifrequency or dial pulse signaling is used to identify class of intercept or combined-class intercept trunks to the intercept systems. Class-of-service tones can be used to identify regular or trouble intercept on combined-class intercept trunks to cord switchboards. The E&M circuits provide the option for either a type II or a type III interface.

Recorded Announcements

Recorded announcements, both passive (all units) and/or interactive (DSU2/RAF only) are available with the 5ESS[®] switch. Except for the DSU2/RAF, all recorded announcements are available on the 5ESS[®] switch. The 5ESS[®] switch provides announcement services using one or more of the following:

- ☐ 13A announcement system
- ☐ 14A announcement system
- ☐ 15A announcement system
- ☐ DSU2/RAF
- ☐ Service announcement system (SAS)

The 13A, 14A, and 15A announcement systems are described in more detail in "13A Announcement System," Section 2.2.7.2, and "14A Announcement System," Section 2.2.7.3, respectively. The DSU2/RAF is described in "Digital Service Unit 2 - Recorded Announcement Function," Section 2.2.4.16.6.2.3. The SAS is described in "Service Announcement System," Section 2.2.7.5.

The 13A, 14A, and 15A announcement systems use a recorded announcement interface (RAI) to communicate announcements to the 5ESS[®] switch. The RAI uses two 4-wire E&M trunk circuit packs. The RAI accepts eight channels of recorded announcements, converts each channel from analog to PCM data, and sends the data to the TSI for distribution. Each announcement channel requires that one trunk circuit be assigned. The 13A, 14A, and 15A announcement units provide non-barge-in type announcements.

When an announcement requested for a subscriber is in the middle of being played back, the subscriber is given an audible ring until the end of the announcement. At that time, the subscriber is disconnected from the audible ringing and connected to the announcement interface.

Analog Trunk Unit (ATU)

The ATU allows analog Trunk Units (TUs) to be provisioned on an SM-2000 in order to provide a direct interface between analog carriers and the 5ESS[®] switch to support inter-office trunking. Each SM-2000 may be equipped with a maximum of eight fully loaded TUs.

Each TU has the capacity to terminate 64 analog trunks (one voice per trunk).

The TU is a 1-shelf unit having two Service Groups (SGs). Each group consists of 1 CDI pack, 1 TAC pack, and up to 8 trunking packs.

2.2.4.16.3 Digital Interface Units

2.2.4.16.3.1 General

Digital interface units provide a direct connection between digital carrier facilities and the 5ESS[®] switch. The digital interface units used in the 5ESS[®] switch are as follows:

- ☐ DLTU
- ☐ DLTU-2
- ☐ digital carrier line unit (DCLU)
- ☐ integrated digital carrier unit (IDCU)
- ☐ Digital Network Unit - SONET (DNU-S)

2.2.4.16.3.2 Digital Line and Trunk Unit

2.2.4.16.3.2.1 General

The DLTU functions as the system interface for T1 lines operating at 1.544 kHz and carrying 24 digital trunks (Figure 2-25). Each SM may be equipped with a maximum of two DLTUs. A DLTU may contain ten DFIs. A DFI provides the following functions.

- ☐ terminates digital trunks
- ☐ converts between T1 format and the data time-slot format
- ☐ performs idle time-slot stuffing

A DFI has two 32-time-slot PIDB interfaces to the TSI and a PICB interface to the CI. Each DFI terminates one T1 line. The T1 carrier has 24 channels of information multiplexed onto it. With the RSM, the DFIs are connected to the facilities interface unit (FIU) through facilities interface data buses (FIDBs) and use network time slots.

In one direction, a DFI distributes 24 channels onto a 32-time-slot PIDB by "stuffing" every fourth (idle) time slot. Four different patterns of "stuffed" time slots are required to stagger the arrival of idle time slots at the TSI. Each DFI is programmable into any of the four "stuffing patterns."

In the other direction, the DFI takes 24 of the 32 time slots from the PIDB and places them on a T1 carrier.

The DLTU may interface with a large number of existing digital transmission terminals (DTTs). These DTTs may be grouped into the following categories.

- (a) **Autonomous-Nonintelligent:** These terminals have no local intelligence, but are capable of operating without control from the DLTU. Typical autonomous-nonintelligent DTTs are:
 - (1) D1D channel banks
 - (2) D2 channel banks
 - (3) D3 channel banks
 - (4) D4 channel banks
- (b) **Autonomous-Intelligent:** These terminals operate under control of a local intelligence. When a DLTU interfaces a DTT in this category, coordination between the two is required. Typical examples of autonomous-intelligent DTTs are as follows:
 - ☐ 1ESSTM switch digital carrier terminal
 - ☐ 4ESSTM switch digital carrier frame
 - ☐ another 5ESS[®] switch DLTU
 - ☐ digital access cross-connect system (DACS)
- (c) **Subordinate-Intelligent:** These terminals have some local intelligence, and operate under direction from the SM processor. Examples of a subordinate-intelligent DTT are the RSM and the RISLU.

2.2.4.16.3.2.2 DLTU for RISLU

In applications where the ISLU must be remoted at a distant site for network or operator services applications, additional hardware is required at both the host 5ESS[®] switch and the remote location. This hardware resides in the DLTU-RH (DLTU for RISLU - host end) and the DLTU-RR (DLTU for RISLU - remote end) and consists of the following:

- ☐ remote DFIs
- ☐ host DFIs
- ☐ remote clocks

The remote DFIs provide an interface between the facility and the RISLU, while the host DFIs provide an interface between the 5ESS[®] switch SMP and the facility. The remote clocks provide the timing for the remote DFIs and the RISLU.

At the remote site, the DLTU-RR is equipped with the remote DFIs and the remote clock. The remote DFI provides the interface between the facility and the common data (CD) and common control (CC) functions of the RISLU. It provides PIDBs and PICBs to the CD and CC functions, respectively.

Timing for the RISLU and the remote DFIs is provided by the remote clock, which derives its timing from the incoming facility. Control of the remote clock is accomplished by the use of a dedicated PICB supplied by the remote DFI. The RISLU is equipped with two remote clock units that operate in an active/standby configuration.

2.2.4.16.3.3 Digital Line and Trunk Unit - 2

The DLTU-2 provides the same functions as the DLTU while requiring less cabinet space. Each SM can be equipped with one DLTU-2, with each DLTU-2 having a capacity of 10 DFI-2 circuit packs. The SM-2000 can be equipped with up to 6 DLTU-2s.

The DFI-2 terminates two T1 lines or RSM Umbilicals per circuit pack. It requires two PIDB connections from the TSIU, and a PICB connection with the SMP. The DFI-2 consists of two data paths connecting the T1 carriers to the PIDBs and one communication path allowing the SMP to monitor and control the DFI-2 functions. No T1 carrier line equalizer card is required in the DLTU-2. The equalization function is performed by the DFI-2 circuit packs.

In the RSM, the DFI-2s are connected to the FIU through FIDBs.

2.2.4.16.3.4 Digital Carrier Line Unit

2.2.4.16.3.4.1 General

The DCLU provides the system interface for digital lines from the SLC[®] 96 carrier system or SLC[®] Series 5 carrier system remote terminals (RTs). The transmission interface for digital lines is at the DS1 rate. The DCLU provides the following functions:

- ☐ terminates digital lines
- ☐ terminates SS7 PSU signaling links
- ☐ converts between DS1 format and data time-slot format
- ☐ performs idle time-slot stuffing
- ☐ provides 32 by 64 time-slot switching

- ☐ provides service group select function
- ☐ provides call origination detection
- ☐ performs variable digital concentration (64 time slots or 128 time slots)

An SM may be equipped with a maximum of eight DCLUs. A DCLU may interface up to six RTs operating in either of two modes (Figure 2-26). A mode 1 RT terminates 96 customer lines and places them on 4 DS1 lines. Each DS1 line has 24 channels providing a total of 96 channels. A fifth DS1 line is optionally equipped for reliability. If a carrier should fail, its channels can be switched to the spare carrier.

A mode 2 RT terminates 96 customer lines and places them on 2 T1 carriers, providing 48 channels to the DCLU. This gives a 2-to-1 concentration through the RT. A spare carrier is again provided for reliability.

2.2.4.16.3.4.2 Digital Facility Interface for *SLC*[®] Carrier

Each *SLC*[®] carrier, including the spare, terminates on an subscriber digital facility interface (SDFI) (a DFI for subscriber carrier applications). The SDFI is a modified version of the DFI used in the DLTU. However, the SDFI has an SG between it and the TSIU. Each SG has the ability to process time slots (channels) from any of the SDFI circuits. In the case of an SG failure, the time slots going to the faulty SG are switched to the other SG.

Each SDFI has a control bus and data bus to each SG. Each SG provides an interface to the SM through one or two PIDBs to each duplicated TSIU, and through two PICBs to each duplicated SM processor.

The major addition in the SDFI is the time slot interchanger for *SLC*[®] carrier applications (TSI-S). Channels from Mode 1 RTs use the TSI-S to provide time switching. This arrangement provides equivalent access to the office for all digital lines without altering existing transmission equipment.

The TSI-S provides a 32 by 64 time-slot switch. The TSI-S receives 32 time slots (24 active) from the receive synchronizer to be switched to any one of 64 time slots. Thirty-two time slots are sent to SG 0 while the other 32 time slots go to SG 1.

In the other direction the TSI-S receives data streams from both SGs. The TSI-S selects any time slots from these two streams under control from the SM processor. The SM processor sends the control message to the microcomputer on the SDFI which sets up the TSI-S. The SM processor can only select between the two data streams on a per time-slot basis when the TSI-S is bypassed. Again, the SM processor sends a control message to the microcomputer on the SDFI which sets up the TSI-S.

Figure 2-26 shows only one data and control path terminating on the SDFI. In reality, there are two data and control buses; one to each SG. The select lead determines which control bus is active while both data buses are always active.

2.2.4.16.3.5 Integrated Digital Carrier Unit

2.2.4.16.3.5.1 General

The IDCU provides the 5ESS[®] switch with an integrated interface with the *SLC*[®] carrier system remote terminals. Each remote terminal can terminate a maximum of 96 lines and interfaces to the IDCU over a maximum of four active DS1s, plus one optional DS1 for protection. The IDCU can terminate a maximum of 40 DS1 facilities, and interface with eight fully equipped RTs. It can terminate larger numbers of RTs requiring fewer DS1s (partially equipped or concentrating) up to the limit of 40 DS1s. However, if an IDCU is filled with partially equipped RTs, future growth of the RTs will require moving one or more of the RTs to another IDCU.

The IDCU also supports ISDN lines, with concentration of the B-channels, and with four D-channels

multiplexed on a single time slot. The interfaces supported are the TR008 and the TR303.

For the TR008 interface, the IDCU supports *SLC*[®] 96 Carrier System and *SLC*[®] Series 5 Carrier System remote terminals with feature package B, enhanced feature package B, and feature package 303G (FP303G) operating in the TR008 mode. Each of these systems can be either Mode I or Mode II. With Mode I, each line is permanently assigned a time slot on the associated DS1 facility and robbed bit signaling is used. Originations are recognized in the IDCU by detecting changes in the signaling bits. With Mode II, two DS1s (48 time slots) are used for 96 lines, and DS1 time slots are assigned to a line only for the duration of a call for most types of lines. Originations are transmitted from the RT over a derived data link (derived from the framing bit) on each DS1. Robbed bit signaling is used after the call is set up. With Mode II, some services, such as coin lines, are not concentrated and are permanently assigned time slots on the DS1s. They use robbed bit signaling at all times.

The TR303 interface on the IDCU supports *SLC*[®] Series 5 Carrier System FP303G remote terminals. This interface uses a 64-Kbps time slot management channel (TMC) to report originations on non-ISDN lines terminating on the remote terminal. The IDCU software will then select a DS1 time slot to carry the call, and send a message over the TMC to the remote terminal to set up a connection between that time slot and the line. A message is also sent over the TMC for a call terminating on a line on an RT. For the remainder of the call, robbed bit in-band signaling is used. All signaling for ISDN lines is carried over D-channels which are permanently connected from the customer premises equipment (CPE) to the PSU in the SM. The D-channels are multiplexed, four to a time slot, over the DS1s from the remote terminal, through the IDCU, and over DPIDBs to protocol handlers (PHs) in the PSU. Messages are sent over the TMC to allocate and deallocate time slots on the DS1s to ISDN B-channels for nonprovisioned services.

A 64-Kbps embedded operations channel (EOC) is provided to transmit OA&M information between the RT and the IDCU. This includes time slot allocation messages for nailed-up connections, D-channels, and provisioned packet-switched B-channels.

The TMCs and EOCs are connected from the DS1s through the PIDB transmission interface (PTI) to DPIDBs and terminated on PHs in the PSU. The capacity of the PH is 32 channels. Each PH can handle eight RTs, each of which require an active and a backup TMC and an active and a backup EOC. The PH performs layer two processing and passes the TMC and EOC messages to the SMP.

A block diagram of the IDCU is shown in Figure 2-27. The following units comprise the IDCU:

- ☐ Electrical line interface (ELI)
- ☐ Loop side interface (LSI)
- ☐ PIDB transmission interface (PTI)

All of these units, except the ELI, are duplicated.

2.2.4.16.3.5.2 ELI

The ELI splits the received DS1 signals to the active and stand-by LSIs and combines the transmitted DS1 signals. Each ELI handles 20 DS1s. These units are not duplicated because they contain only passive components, and a single fault can affect only one DS1.

2.2.4.16.3.5.3 LSI

Each LSI terminates 20 DS1s. Two LSIs (duplicated) are required for a fully equipped IDCU. The LSI frames on each of the DS1s and converts it to a PIDB-like format on the internal bus to the PTI. It terminates a derived data link on each of the DS1s. These data links can be either Fs (superframe) for TR008 interfaces, or bit-oriented extended superframe/new data link (ESF/ndl) for TR303 interfaces. It also collects DS1 performance monitoring data and detects DS1 failures and alarms.

2.2.4.16.3.5.4 PTI

The PTI contains a TSI that can connect any DS1 time slot to any time slot on the PIDBs, to the SM TSIU, or on the DPIDBs to the PSU. The PTI performs a signal processing function which monitors incoming signaling to detect originations and transmits idle signaling. These functions are performed only for TR008 mode I RTs and mode II services that are not concentrated.

2.2.4.16.3.6 Digital Network Unit □ SONET

2.2.4.16.3.6.1 General

The Digital Network Unit □ SONET (DNU-S) is a peripheral interface unit for trunks in the SM-2000. The primary function of this unit is to terminate SONET facilities and to convert data and signaling to the peripheral control and timing (PCT) link format for the SM-2000. All information is passed between the DNU-S and the SM-2000 over these PCT links. With TR-303 capability, DNU-S support lines as well as trunks.

A PCT link is an optical 65.536 Mb/s time division multiplexed (TDM) serial interface containing 1024 bytes repeated at an 8 kHz rate. Of the 1024 bytes, 768 are data bytes that may be switched through the SM-2000 TSI, 192 bytes contain sub-sampled signaling information and 64 bytes contain framing and PCT link maintenance information.

An STSX-1 link is an electrical interface that has an STS-1 format conforming to the SONET standard. Each STSX-1 has a data rate of 51.84 Mb/s and supports up to 672 DS0 channels formatted as 28 DS1 Virtual Tributaries which may contain robbed-bit, or no signaling information. The STS-1 format also includes SONET path, line, and section overhead information.

The DNU-S may be equipped with up to 12 duplicated PCT links to the SM-2000 and up to 12 non-duplicated STSX-1 links to transmission equipment. As shown in Figure 2-29, the DNU-S is partitioned into two data groups, with each group terminating up to six duplicated PCT links and six non-duplicated STSX-1 links.

A single digit qualifier is used to identify the DNU-S data groups (0 and 1). Single digit 0 and 1 qualifiers are also used to identify the two CCs, which are common to both data groups.

A block diagram of the DNU-S is shown in Figure 2-29. The following units comprise the DNU-S:

- Common Control (CC)
- Common Optical Termination (COT)
- Common Data (CD)
- Transmission Multiplexer (TMUX)
- STSX-1 Facility Interface (SFI)
- STSX-1 Link Interface

2.2.4.16.3.7 Common Control

The DNU-S contains two CC circuit packs which implement a duplex unit controller that operates in active/standby mode. The CC performs the following:

- terminates the messaging and control channels originating from the SM-2000 and interfacing through the PCT links and CD circuit packs

- ☐ supervising unit initialization, maintenance and diagnostics
- ☐ implementing and handling the control interfaces to all of the circuits in the DNU-S
- ☐ non-volatile storing of CC and TMUX control programs in flash memory

The CCs pass control information to the other packs in the unit through duplicated ICBs.

2.2.4.16.3.8 Common Optical Termination

The DNU-S may be equipped with up to 24 paddle boards. Each COT terminates the optical fibers for one side of a duplex PCT link and performs the optical-to-electrical and electrical-to-optical conversion of data and control information received and transmitted over the PCT link interface with the SM-2000.

2.2.4.16.3.9 Common Data

The DNU-S may be equipped with either 2 or four CD packs, with 2 packs equipped in each data group. The 2 packs in each data group are called "mates". For example, CD00 and CD01 are mate CDs and CD10 and CD11 are mate CDs.

The mate CDs in each data group terminate up to six duplicated PCT links, with side 0 for each duplicated link terminating on one CD and side 1 terminating on the other CD. The mate CDs in each data group operate active/standby.

The CDs logically terminate the PCT links and perform rate conversion, selection and Multiplexing/Demultiplexing functions associated with passing data and control information between the PCT links and internal interfaces with other packs in the unit. Functions include:

- ☐ interfacing with up to six normally active (service) TMUX packs
- ☐ interfacing with a spare TMUX pack and supporting TMUX pack sparing capabilities
- ☐ conversion of data and signaling information between the PCT link format and the Bi-peripheral Interface Data Bus (BPIDB) format used internal to the DNU-S to pass information between the TMUX and CD packs

2.2.4.16.3.10 Transmission Multiplexer

The DNU-S may be equipped with up to 14 TMUX packs. The TMUX performs the format conversion of data between one STSX-1 link and 14 BPIDB structures, which includes the mapping of data time slots between the two formats and signaling bit format conversion. The TMUX also performs functions associated with terminating the STS-1 SONET and facility overhead, which includes:

- ☐ STS-1 line and section overhead termination
- ☐ STS-1 path overhead termination and Virtual Tributary (VT^{TM}) extraction
- ☐ DS1 framing and extraction
- ☐ detection of facility alarms
- ☐ DS1 Cyclic Redundancy Code (CRC) checking
- ☐ DS1 Facility Data Link (FDL) extraction
- ☐ initial collection of STE, VT1 and DS1 performance monitoring data

- ☐ facility data alignment to system clock

2.2.4.16.3.11 STSX-1 Facility Interface

Two or four SFI packs may be equipped in the DNU-S, with two in each data group. Each SFI pack pair implements a duplicated electrical interface for six STSX-1 links. SFIs perform the following functions:

- ☐ implementation of STSX-1 line drivers and receivers
- ☐ implementation of Bipolar 3-Zero Substitution (B3ZS) encoding and decoding
- ☐ interfacing each of the six STSX-1 links to either one service TMUX or the spare TMUX

2.2.4.16.3.12 STSX-1 Link Interface

Up to 12 SLI paddle boards may be equipped in the DNU-S, with each SLI terminating one STSX-1 link. The SLI paddle board is a passive circuit containing a splitting transformer for coupling the received STSX-1 signal to two SFI circuit packs and another transformer that couples the STSX-1 transmit signal from two SFIs to the facility. The SLIs also implement a Line Build Out function for short STX-1 interface links.

2.2.4.16.4 ISDN Interface Units

2.2.4.16.4.1 Integrated Services Line Unit

The ISLU is an SM peripheral unit which supports analog and digital line termination requirements in the 5ESS[®] switch. For analog lines, the ISLU can terminate 512 lines. As with other peripheral units, the ISLU interconnects to the rest of the SM via data and control buses. See Figure 2-28 .

Each analog line terminates on an individual line card, which provides the analog to digital conversion, battery feed, and overvoltage protection. The line cards are connected through buses to a common data multiplexer that multiplexes time slots from the line cards to time slots on the PIDBs. An ISLU can be connected to a minimum of 1 and a maximum of 8 PIDB pairs to provide concentration ratios of from approximately 2:1 to 16:1. The number of PIDBs plus the number of duplicated DPIDBs may not exceed 24.

A separate high-voltage, space-division metallic access network provides the interconnection between each line and the HLSCs, ringing generators, spare line cards, and test access buses.

A basic rate interface (BRI) card is available in the ISLU to terminate digital lines. Each BRI has two 64-kb/s channels (B-channels) for voice, circuit-switched or packet-switched data, and one 16-kb/s channel (D-channel) for signaling messages and packet-switched data. The B-channels are connected on a per-call basis to the TSI through the common multiplexer in the same way analog calls are set up. Each D-channel is permanently connected through the common data multiplexer over a DPIDB to the PSU. The PSU handles all of the signaling messages and packet-switched data.

Three types of BRI line cards are available for use on the ISLU:

- (1) an AMI-U card
- (2) an ANSI[®] U-card
- (3) a T-interface card

In addition, a Z card is also available to terminate analog lines.

The T-interface card supports the ISDN T-interface, a BRI specified by the TSS. The T-interface is a 4-wire digital interface conceived to support the transmission of the ISDN voice and data (two B-channels plus one D-channel) over relatively short distances. [For typical customer premises inside wiring (24 gauge DIW), the maximum distance is approximately 1900 feet.] The T-interface cards are generally used, therefore, when an ISLU or RISLU is located at or near the customer premises. The T-interface cards are also used with the OSPA feature to terminate lines originating from BSTs and VDTs.

The ANSI[®] U-card, available with the 5E6 and subsequent software releases, was designed to support the ISDN U-interface. It transmits and receives data encoded in the 2B1Q (2 bits encoded into 1 quaternary digit) line code, as specified by the ANSI[®] standards. The U-interface was designed to support transmission of ISDN voice and data (2B+D) over nonloaded, 2-wire loop facilities. The U-BRI line consists of a U-card (which terminates the line in the 5ESS[®] switch), a nonloaded, 2-wire loop, and an NT1 (which serves as the network termination at the customer premises). In addition to terminating the line, the NT1 translates ISDN voice and data from the 2-wire U-interface to the 4-wire T-interface.

The AMI-U card provides the same function as the ANSI[®] U-card described in the previous paragraph. It was designed before the ANSI[®] standard existed and utilizes an alternative line code, called alternate mark inversion (AMI). When the AMI-U line card is used in the ISLU, an NT1 that transmits and receives the AMI line code is required at the customer premises.

The Z line card provides the analog loop interface in the 5ESS[®] switch ISLU. It performs the majority of the BORISCHT functions, including battery feed, overvoltage protection, ringing access and ring trip, supervision, analog-to-digital conversion, 4-wire to 2-wire conversion (hybrid), and loop testing access. The Z card enables a single ISLU to support ISDN and POTS, allowing gradual migration to digital service and simplifying cutovers.

The ISLU also contains a duplex CC (one active and one standby). The interface between the CCs and the module processor is through the PICBs. The CC contains a microprocessor that controls all other portions of the ISLU.

2.2.4.16.4.2 Integrated Services Line Unit - Unit 2 (ISLU2)

The ISLU2 supports digital interfaces ANSI[®] U and T) on the SM and SM-2000. The ISLU2 is functionally equivalent to the ISLU but line packs from one unit do not fit the shelf of the other.

There are 8 separate line circuits per U and T line pack. Each line circuit can be assigned to a customer separately. Failures on a single line can be isolated and spared independently of the other line circuits within the pack. Operations can be performed on a pack level affecting all eight assigned lines or individual circuits affecting just one line circuit.

An ISLU2 can terminate up to 768 digital (U or T) interfaces. Traffic and blocking configurations must be engineered and limit the maximum physical configuration.

ISLU2 supports U and T interfacing with the PSU on the SM and the PSU2 on the SM and SM-2000.

2.2.4.16.4.3 Remote ISLU

The RISLU is an ISLU that can be remoted away from the 5ESS[®] switch. Two types of RISLUs are available with the 5ESS[®] switch. The RISLU used in OSPA and centrex-automatic call distributor (C-ACD) applications functions as the OPC. The RISLU used in non-OSPA applications is the universal RISLU and can be used in the following applications:

- ☐ pair gain system
- ☐ small community dial office replacement

- ☐ PBX replacement
- ☐ ISDN range extension, used to serve customers beyond the qualified loop requirements.
- ☐ the introduction of ISDN in non-ISDN exchanges (often referred to as digital overlay)

The universal RISLU supports ISDN and analog interfaces.

The RISLU is connected to the SM through PCM carrier facilities. The hardware in the SM converts data on the PIDBs and PICBs to PCM carrier format, and hardware at the remote location converts the data back to the PIDB and PICB format. The RISLU supports the T (4-wire) and U (2-wire) interface for ISDN BRI services and the Z interface for analog services. A RISLU can support up to 316 BRIs which can be a mixture of T and U cards. Also, Z cards may also be equipped in the same RISLU with the BRI. The maximum number of cards (T, U, and Z) that can be equipped per RISLU is 512, but no more than 316 of these may be BRIs. The clock signals at the RISLU are derived from the incoming data stream. A RISLU can be remoted up to 150 miles from the host.

2.2.4.16.5 Access Interface Unit (AIU)

2.2.4.16.5.1 Overview

The access interface unit (AIU) is a peripheral unit that provides a configuration option for the 5ESS[®] switch switching module (SM). This access platform is designed to serve all types of access lines, including basic dial tone service "POTS" and "COIN" as well as , integrated services digital network (ISDN). The AIU deploys a common architecture for all customers, but can quickly be adapted to meet local opportunities. The AIU accommodates up to 640 telephone lines per shelf and can be expanded in 32-line increments. A fully configured AIU cabinet can support 3,584 lines, twice the lines of the analog line unit. Power consumption is five to twenty percent lower and SM call handling capacity is 20 percent higher. Ease of engineering and maintenance contribute to faster deployment.

Advantages to deploying the AIU over existing interface peripherals (ISLU and ISLU2, LU2, and LU3) are floor space savings of 30 to 40 percent, power improvements of 5 to 20 percent, and simplified administration.

The Broadband Backplane for AIU (BAIU) enables the AIU to be equipped with ADSL AP cards to terminate ADSL traffic. Previously, each ADSL AP could terminate 4 broadband ADSL lines. This necessitated the AFM (ATM Feeder Multiplexer) on the same shelf as broadband controller. The ADSL APs in the AIU exchange information through 622 Mbps ATM Cell Bus supporting AAL5 protocol.

The broadband enabled AIU (BAIU) shelf supports at least 64 combined ADSL/POTS lines on an AIU. Furthermore, an SM-2000 supports at least 2240 combined ADSL/POTS lines.

NOTE: Total number of combined ADSL/POTS lines can be arrived at as follows: the current configuration supports an AIU cabinet with four shelves each with 64 combined ADSL/POTS lines, plus two "half-ADSL" shelves, which have 32 combined ADSL/POTS lines, 160 POTS-only lines and a pair of Ring Generator Units needed for the POTS service on the lines in the cabinet. Thus, a cabinet can support up to $64 \times 4 + 32 \times 2 = 320$ ADSL lines. Since each of these cabinets uses 6 PICB pairs and an SM-2000 only has 43 PICB pairs, at most 7 cabinets can be attached. Multiplying 320 by 7 yields 2240.

Based on customer needs, an AIU shelf can be equipped with 18 ADSL APs when no slots are used for POTS APs.

2.2.4.16.5.2 General

The AIU consist of common packs and application packs (see Figure 2-22). The common data and control

(COMDAC) circuit packs are provisioned as a pair for each AIU. Different application packs (APs) can be provisioned for specific services; POTS, COIN, and ISDN. The POTS application pack can terminate 32 POTS lines, the COIN application pack can terminate 16 COIN or POTS lines, and the ISDN application pack can support 16 ISDN lines (2B+D).

Up to 12 PIDBs can be provisioned (in multiples of two). The PIDB pairs are split across the COMDACs for reliability, but are in an active-active mode (that is, all PIDBs are counted when calculating traffic capacity). PICBs are also provisioned on a "one per COMDAC" basis (or two per AIU).

Different application packs can be provisioned for specific services: POTS, COIN, ISDN, and ADSL. The ADSL application pack can terminate 4 combined ADSL/POTS lines. When an analog call arrives at the ADSL AP, the POTS portion is split off in the hardware and sent to a POTS AP on the same AIU shelf and it is treated as a normal call origination. The ADSL portion of the signal is processed by the DSPs in the ADSL AP and sent to ATM cell bus in AAL5 protocol format to be received by the AFM in the AIU shelf.

2.2.4.16.5.3 Application Packs

The AIU has up to 20 slots for Application Packs (APs). When the application packs are mixed within a given AIU shelf, any application packs can be used in any available slot except for those slots that are reserved for the Ring Generators (RGs) or the ATM Feeder Multiplexer (AFM) packs if equipped. The POTS pack, COIN pack, and ISDN pack each requires one of the available pack slots. When required, the RING GENERATOR pack requires 2 slots per pack. These packs are provisioned in pairs for reliability reasons and must be provisioned in slots 16-19. The AIU becomes broadband capable when broadband APs (for example ADSL packs) and the required AFM pack(s) are equipped in a BAIU shelf. The application packs are connected to the COMDAC through a 32-timeslot bus called the PCM HIGHWAY. The pack selects the timeslot used on a given call and has the ability to connect to any of the 32-timeslots on the PCM HIGHWAY and to either COMDAC (see Figure 2-22). There will, however, be a small amount of blocking as timeslot occupancy approaches 100%. Thus the ability to connect to all the 32 timeslots may not be possible 100% of the time.

The AFM Application pack uses 800 Mbps ATM cell bus to communicate with the ADSL APs in the AIU shelf. The AFM pack must be equipped on the shelf when the AIU shelf supports ADSL.

2.2.4.16.5.4 High Call Capacity

The AIU provides much more CCS capacity than the traditional LU. The CCS capacity of the AIU is dependent on the equipage of PIDBs and is as follows:

Number of PIDBs	POTS CCS
(75% Occupancy)	Capacity
2	1,730
4	3,460
6	5,190
8	6,920
10	8,650
12	10,380

In addition to higher CCS capacity, the AIU does not concentrate the traffic in the application pack, thereby eliminating the need to do load balancing on an application pack basis. These two benefits of the AIU make it the perfect solution for today's Internet access problems.

2.2.4.16.5.5 Ring Generator Engineering

The ring generators in an AIU can serve other AIUs housed within the same cabinet. The ring generators in one AIU will provide ringing power for a total of three AIUs (the AIU in which the RGs are installed, and two additional ones). No other engineering will be necessary.

2.2.4.16.5.6 Cabling

The AIU has been developed with the concept of universal cabling. Regardless of which application pack is installed in a given slot, the cabling to the main distributing frame will support that pack. From each pack slot, 32 pairs of tip/ring cables are provided. For example, 32 POTS lines, or 16 ISDN 4-wire lines are supported with a common set of cables.

2.2.4.16.5.7 Cabinet Layout

AIUs must be installed in a cabinet dedicated for AIUs. Either an SM LTP cabinet or a new FAC cabinet can house AIUs. If the new global cable rack is installed, six AIUs can be provisioned in the new FAC cabinet. (The new global cable rack is needed to allow enough room for the large number of tip/ring cables.) If the new global cable rack is not installed, three AIUs can be provisioned in each cabinet.

2.2.4.16.5.8 Ease of Maintenance

Simplified engineering, maintenance, and operations are key characteristics of the AIU. These improvements include:

- ☐ Universal cabling allows installation of any application pack, in any slot, without modifying the cabling, thus simplifying engineering.
- ☐ Efficient system diagnostics reduce routing exercise (REX) testing time by 90 percent. Once installed, line packs are self-testing. Lines can be tested quickly and frequently, thereby improving reliability of service.
- ☐ Minimal spares are required to efficiently support AIU maintenance. For example, only three types of spare circuit packs are needed to support POTS applications.
- ☐ Front access to cabling facilitates trouble-shooting and equipment maintenance.

2.2.4.16.5.9 Operational Savings

The AIU provides significant savings throughout the life cycle of the 5ESS[®] switch. Areas of savings include:

- ☐ floor space requirements - decrease 40 percent to 60 percent when compared with traditional line units.
- ☐ switching module call capacity - increase up to 20 percent depending on the application due to the AIUs distributed processing design.
- ☐ significant power improvements - result from decreased watts used per line. Reductions in the range of 5 percent to 20 percent translate to considerable savings over the life of the switching equipment.

2.2.4.16.5.10 Expansion Access Interface Unit (EAIU)

The EAIU extends the number of AIUs that can be supported on an SM-2000 from 43 to 106. The EAIU accomplishes this by providing a T1 interface COMDAC that connects to the SM-2000 through the DNU-S.

2.2.4.16.5.11 MultipleXed Access Interface Unit (XAIU)

The XAIU has the functionality of the AIU, but is only capable of being used as a local AIU. Any of the remote applications (such as EAIU or RAIU) are not supported with the XAIU. The XAIU contains the same Application Packs (AP) as are already defined for the AIU. The objective of the XAIU is to drastically reduce AIU installation time by eliminating the installation associated with the PIDBs and PICBs. To achieve the reduction in the installation time, the XAIU was designed to reduce the number of cables associated with

the local AIUs installed in a SM-2000 by using a fiber optic link (PCT) between the MCTSI and the XAIU cabinet. The XAIU replaces all the PIDB/PICB cables to an entire cabinet with two fiber optic pairs. Because of the fiber optic links, the local XAIU can be located up to 2000 cable feet from the SM-2000 as opposed to the 28 cable feet with PIDB/PICB links.

The XAIU introduces two new hardware components:

☐ **PCT Data Exchanger Unit (PDXU)**

The PDXU consists of two Peripheral Control and Timing Data Exchanger (PCTDX) circuits that contain one Peripheral Link Interface (PLI) paddle board, a PCT Fiber pair and one Fiber Common Data (FCD) circuit pack. The FCD is a new pack designed to terminate one PCT fiber optic link and distribute data to the XAIU shelves in the cabinet.

☐ **XAIU.**

The XAIU is an AIU unit that resides in an XAIU cabinet. It uses a new version of the COMDAC that interfaces with the FCD (QCOMDAC).

The QCOMDAC is functionally similar to the RCOMDAC, which is used in the R/EAIU, except the QCOMDAC does not have the capability to terminate E1/DS1 facilities.

The FCD pack is used to terminate the PCT fiber links and distributes the data to each shelf in the XAIU cabinet. It also serves as the electrical to fiber optic interface between the QCOMDAC and the PCT link. The FCD circuit pack terminates the PCT link from the SM-2000 TSIU port and converts the signal into twenty-four (24) time slot groups which are distributed to up to six (6) XAIU shelves. Each set of Time Slot Groups (TSGRP) consists of 64 time slots, equivalent to the capacity of a single 5ESS[®] PIDB. There are two FCD packs per XAIU cabinet. One FCD pack is designated as FCD 0 while the other is designated as FCD 1. FCD 0 supplies time slots to each QCOMDAC 0 pack in the cabinet, and FCD1 supplies time slot groups to each QCOMDAC1 in the cabinet. The FCD packs runs in a ACTIVE-ACTIVE mode; that is, unique live traffic is supplied from both FCD sides in a non-faulted configuration. The FCD supports all unit configurations of the XAIU and it will only supply time slot groups to the units within its cabinet. A simplex version of the XAIU equipping only one QCOMDAC) is not supported.

2.2.4.16.6 Service Units

2.2.4.16.6.1 General

The 5ESS[®] switch is equipped with several service units which perform a variety of functions.

Most high-usage digital functions are performed in the DSU2. Since a DSU2 is equipped in each SM, physical paths through the TMS are not required.

Low-usage digital functions such as conference circuits and the transmission test facility are placed in a centralized pool of service circuits in one or more SMs. For these global functions, time slots are required.

Certain very low usage high-level testing functions are not normally performed in each SM but rather by a directly connected test unit (DCTU) located on one of the SMs. The MTBs run between each analog interface unit and the modular metallic service unit (MMSU) or the metallic service unit (MSU). The DCTU accesses analog facilities through the MMSU or the MSU.

The following service units are housed in an LTP cabinet.

- ☐ Global digital service unit (GDSU)
- ☐ MMSU or MSU
- ☐ DCTU

2.2.4.16.6.2 Digital Service Units

2.2.4.16.6.2.1 Global Digital Service Unit

General

The GDSU is used for the TTF and the universal conference circuits (UCCs) prior to the 5E10 software release. In the 5E10 and later software releases, these functions are provided by the Global Digital Service Functions (GDSF) unit (see Section 2.2.4.15.7). Because these circuits can be accessed by any user in the switch, they are termed global. Each GDSU utilizes a maximum of 64 time slots. Both the UCCs and the TTFs are engineered items. A GDSU performs the following service functions:

- ☐ provides conferencing capabilities
- ☐ generates test tones, responses to test tones, and processes test responses

The data link or data interface for a GDSU is a PIDB. Therefore, peripheral time slots are required. A GDSU is controlled by an switching module processor unit (SMPU) via PICBs.

Universal Conference Circuit

A UCC accepts time slots of PCM voice data from each party on the conference call, converts them into 16-bit linear code, and sums them. Each sum has subtracted from it the sender's signal. The resultant signal is converted into PCM and sent to the common circuitry. Each sender receives the sum of signals on the same time slot that the party sent on.

The GDSU service group can be equipped with up to ten 3-port UCCs or two 6-port UCCs. Each 6-port conference circuit is assigned six time slots, while a 3-port conference circuit is assigned three time slots. Each 3-port conference circuit is capable of conferencing up to three parties. A 6-port conference circuit is capable of conferencing up to six parties. Two 3-port conference circuits cannot be configured to work as a single 6-port circuit. Both the 3-port and 6-port conference circuits are engineered separately based on usage and can be mixed with each other and/or the transmission test function in a GDSU.

Control for adding and removing parties originates in call processing. Unused ports receive idle code. The switch supports simultaneous conference calls based on the number of conference circuits configured for the office. For example, if the switch has five 3-port UCCs and two 6-port UCCs, then up to five simultaneous 3-way type calls and two simultaneous n-way (greater than 3) are allowed.

The GDSF is provided for the SM-2000, enabling the SM-2000 to exist without the supporting SMs required in earlier software releases.

Transmission Test Facility

The TTF performs the voice-band transmission tests for the 5ESS[®] switch. Transmission tests on trunks, loops, and switched special services may be initiated and results received on terminals located at the TLWS.

All measurements and tests are performed on the digital PCM pulse stream but are described by their voice-frequency analog equivalent. The TTF includes tone sources, tone detectors, power and noise measurement capabilities, frequency shift keying detection, and multifrequency receivers. The TTF provides the following test lines:

- ☐ 100-test line
- ☐ 102-test line

- ☐ 105-test line
- ☐ remote office test line (ROTL)
- ☐ touch-tone service test line

Most TTF measurements are controlled by the SMPU. However, measurement sequences that require critical timing are controlled by a microprocessor within the TTF.

2.2.4.16.6.2.2 Local Digital Service Unit

The LDSU performs all tone generation and decoding functions required for call processing. Due to the high usage of these functions, each SM is equipped with an LDSU.

The LDSU may employ RP transceivers to provide RP signaling which may be needed for trunks connected to panel, No. 1 crossbar, or 1/1A ESSTM switch offices. The RP trunks are maintained in RP trunk groups which are 1-way digital trunks only. Each LDSU SG may have one RP transceiver board. Each RP transceiver board contains 32 RP transceiver circuits; therefore, when fully equipped, the SG can handle up to 32 concurrent RP calls. This may be any combination of originating or terminating calls.

To accommodate the LASS or CCS functions introduced in the 5E5 software release, a cost effective conversion of LDSUs is available. An office may have a mixture of SMs with an LDSU, a DSU2/LDSUF, and a DSU2. However, the DSU2/LDSUF and DSU2 do not support RP. If RP is required, then the LDSU is still required.

2.2.4.16.6.2.3 Digital Service Unit - 2

General

The DSU2 performs all tone generation and decoding functions required for call processing, tests CCS trunks, stores recorded announcements, and tests ISDN lines. The DSU2 consists of two SGs with the capability to grow the unit to four SGs in an SM. Each SM may have two DSU2 units but only one can have the LDSU function.

Each SG in the DSU2 can be equipped with one DSC. The central elements of the DSC are the logical processor and digital signal processors (DSPs). The logical processor controls all the functions of the DSC while the DSPs perform a particular digital service such as tone generation, outpulsing, or tone decoding.

The DSU2 interfaces with the TSIU through the LDSU bus. Permanently assigned peripheral time slots are not required. The LDSU bus is electrically equivalent to a PIDB at the DSU2. Unlike the PIDB, the LDSU bus does not block connections of peripheral time slots through the TMS. Each SG of the DSU2 is connected to each half of the TSIU through the LDSU bus.

Control information is passed between the DSU2 SG and the module processor across a PICB. Module processor software controls which PICB is used by each DSU2 SG.

Local Digital Service Unit Function

The DSPs produce tones and provide for the outpulsing of tone sequences (cadencing) which are frequently used in most SMs. The following tones can be generated:

- ☐ audible ringing
- ☐ busy tone
- ☐ receiver off-hook tone

- ☐ operator zip tone
- ☐ busy line verification intrusion tone
- ☐ coin control signals
- ☐ ringback
- ☐ dial tone
- ☐ high tone
- ☐ low tone
- ☐ all pairs of multifrequency (MF) tones (15 total)
- ☐ call waiting tone
- ☐ touch-tone service pairs (16 total)

The DSC provides the circuitry necessary to control and produce cadenced tone sequences. This function includes timing for tone cadencing, control of tone sequences, and signal processing for tone generation.

The DSC generates tones and sends them on a one tone (or tone pair) per time-slot basis. If the tones need to be sent through the TSI, they can be fanned out to as many TSI time slots as needed. This allows a tone to be sent to as many peripheral time slots as necessary.

The DSC provides the decoding of tones and digits received by sources outside the 5ESS[®] switch. The DSC reports the reception of tones and digits received to the module processor. There are three modes of operations for the tone decoding feature. In mode one, either touch-tone or dial pulse digits will be accepted. In mode two, multifrequency digits will be accepted. In mode three, only dial pulse digits will be accepted.

The DSU2/LDSUF does not provide RP transceiver services.

Digital Service Unit 2 ☐ Voice Path Assurance Test

The digital service unit 2 ☐ voice path assurance (DSU2-VPA) test is a continuity check made on a per-call basis over common channel signaling (CCS) trunks to verify the integrity of the line prior to the beginning of a call. A continuity check transceiver/transponder is used to perform the VPA function. The transceiver is used in the office originating the transceiver test, while the transponder is used in the office terminating the test.

The VPA transceiver in the originating office generates a check tone to the terminating office and monitors the line for a returned tone (within the acceptable transmission and timing limits). The generated check tone is then removed with the loss of tone verified. The transceiver analyzes the timing results to determine the success/failure of the VPA test.

The VPA transponder in the terminating office monitors for a received check tone within the acceptable transmission and timing limits and generates response tone to the originating office. The tone continues to be generated while the check tone is being received.

The DSC provides the circuitry necessary for controlling and performing the VPA transceiver/transponder function including the following:

- ☐ initialization of the service state at DSC board initialization time

- ☐ parsing and implementation of VPA requests
- ☐ signal processing algorithms for tone generation and reception
- ☐ timing and control for tone generation and reception
- ☐ evaluation of timing results to determine success or failure of a VPA test
- ☐ formatting and transmission of VPA reports

Digital Service Unit 2 - Recorded Announcement Function

The digital service unit 2 - recorded announcement function (DSU2-RAF) provides independent play back of prerecorded, variable length, and variable content announcements (replaced by SAS in 5E10, see Section 2.2.7.5). The DSU2-RAF uses the DSC, the announcement service circuit (ASC), and the DSU shelf as its main components. Each DSU2-RAF SG consists of a DSC and from one to three ASCs. A PIDB and PICB are used to communicate data and control information between the DSU2-RAF and the rest of the SM.

Each DSU2-RAF SG provides the following features:

- ☐ thirty-two simultaneous, independently phased, announcement channels
- ☐ a storage architecture where the prerecorded announcement phrases (software release dependent) are accessible by all of the channels simultaneously
- ☐ the ability to grow the announcement storage capacity to 750 seconds of speech
- ☐ the ability to play back stored variable length and variable content announcements
- ☐ the ability to provide additional integrated services with pumped software modifications
- ☐ allows customers to customize announcements (See 235-190-115, *Local and Toll System Features*.)

For toll and assistance applications, the dial through announcement (DSU2-RAF-DTA) configuration is used and provides:

- ☐ sixteen simultaneous, independently phased, announcement channels
- ☐ other features as described in the previous paragraph

The SM configurations for DTA include basic, standard, and loaded, depending on the application.

A community of DSU2/RAF announcements for BRCS (DSU2/RAF-BRCS) features is available and serves the following features:

- ☐ automatic customer station rearrangement (ACSR)
- ☐ remote access to call forwarding (RCAF)

In addition, the LASS screening list editing (SLE) feature is served by the DSU2/RAF-BRCS with the 5E6 and later software releases.

A community is provided to the DSU2/RAF for the advanced services platform (ASP) feature.

All features provide the capability to customize announcements and the LASS SLE feature provides the

capability to customize ISDN display messages in the field.

Digital Service Unit 2 - Integrated Services Test Function

The digital service unit 2 - integrated services test function (DSU2-ISTF) replaced by GDSF in 5E10 (see Section 2.2.4.15.7) provides a peripheral unit for ISDN that supports transmission testing of interoffice digital trunks and basic rate interfaces (BRIs) through the use of a pseudo-random number (PRN) bit pattern. The ISTF is physically located on the DSU2 shelf in "loaded" SMs. Each DSU2 shelf can have up to four ISTF units. The ISTF is a global unit and, as such, can serve SMs which do not have units on them. The ISTF performs the following two types of services:

- (1) transmit pseudo-random number bit pattern (XMIT of PRN)
- (2) digital loop-back of the bits received

The XMIT service consists of a send side and a receive side. The send side generates an 11-bit shift register PRN which has been recommended by the TSS for digital testing (0.152). It expects a far-end device to loop back the bits so the receive side can tell if any bits were altered during transmission. Each ISTF can perform up to three simultaneous XMIT services.

The loopback service also consists of a receive side and a send side. This service takes the bits from the input channel and places them on the output channel. This service has two options; inverting and noninverting. The noninverting option copies the bits from the input channel directly to the output channel. The inverting option changes the polarity of each bit. When the input bit is a 1, that bit is placed on the output channel as a 0. Each ISTF unit can perform up to 31 simultaneous loopback services.

The non-inverting loopback test line for ISDN trunking meets the functional requirements announced in the ANSI[®] standard T1.206-1988, *Digital Exchanges and PBXs - Digital Circuit Loopback Test Line*. The ANSI[®] standard designates the test line as a 108-type test line. With the 5ESS[®] switch 108-type test line, the timeout is fixed at one hour for instances where the caller fails to disconnect.

2.2.4.16.6.3 Metallic Service Units

2.2.4.16.6.3.1 General

Metallic access to lines and trunks for testing and monitoring are provided by the MSU and the MMSU.

The MSU and MMSU provide the following functions used for evaluating the quality of subscriber lines and trunks:

- (a) **Metallic Access:** The metallic access circuits provide an access network that can interconnect analog facilities to voice-frequency test equipment.
- (b) **Automatic Line Insulation Test (ALIT) Capability:** The ALIT circuits perform resistance measurements to test for proper insulation between the pairs of wires used in a line.
- (c) **GDX Compensation:** The GDX compensation circuit corrects for crosspoint leakage currents and bias resistor loading in the concentrator during line testing.
- (d) **Scanning:** The scanner circuitry autonomously detects state changes and reports these changes in states of scan points to the AM via the SM processor. However, the scanner has direct scan capabilities for audits and maintenance purposes under the direction of the AM.
- (e) **Signal Distribution:** The distributor circuitry opens and closes relays to perform signaling outside the office (that is, sleeve leads). It may also be used to operate some common system circuitry within the office.

- (f) **Subscriber Line and Instrument Measurement Circuit - 2 (SLIM2):** provides metallic (electrical) testing through the Trunk and Line Work Station (TLWS) interface.

Any combination of these functions may be provided.

2.2.4.16.6.3.2 Metallic Service Unit

All functions in the MSU are distributed over two SGs (SG 0 and SG 1) for reliability. Each SG is controlled by the SM processor through a PICB. The common backplane on the MSU allows each office to equip each SG as needed. The hardware interfaces to the MSU are shown in Figure 2-30. Included are control, power, MTBs, the scan leads, and distribute leads.

Twelve -48 volt power feeders run from the fuse panel to the MSU; six for each SG.

The MTBs originate at the metallic access circuits and terminate on low-frequency test units and analog facility interface units. The MTBs are a part of the MSU, and all run through the main distributing frame (MDF) before terminating. Each analog interface unit terminates two MTBs, one from each SG for reliability.

External testing facilities gain access to the office through a test trunk. Each test trunk terminates on a special trunk circuit in a TU. Two MTBs (one from each SG) terminate on this trunk circuit and are dedicated to that test trunk.

Jacks are provided at the TLWS for the use of portable test equipment. Each jack terminates an MTB (DC jack 1 for SG 0, DC jack 2 for SG 1), and these MTBs are distributed across both SGs.

The metallic access circuits make up an access network capable of interconnecting any two MTBs in an SG. A protocol circuit tests the MTBs before they are used in a test connection.

2.2.4.16.6.3.3 Modular Metallic Service Unit

The MMSU is a repackaged version of the MSU, providing growth capability in small increments. All functions provided by an MSU are provided by an MMSU. As the office grows, up to three single-shelf MMSU extensions may be added.

Each MMSU shelf contains two SGs (SG 0 and SG 1). Each SG has a power converter, a common circuit, and space for nine circuit packs. Eight of the nine circuit packs contain standard MSU functions, while the ninth location is used to provide connections to an metallic test interface bus (MTIB). An MTIB allows a test port to access any line on any SG in the office. With this interconnection capability, a metallic connection can be set up from an MTB that terminates in one MMSU service group to an MTB that terminates in a second MMSU.

Each shelf has a power converter and MTIB, but uses a common circuit residing in the basic MMSU.

2.2.4.16.6.4 Subscriber Line and Instrument Measurement Circuit - 2 (SLIM2)

The Trunk and Line Work Station (TLWS) Metallic Test capacity is provided by the SLIM2 circuit of the MMSU. The following tests are provided for lines:

- ☐ voltage, resistance, and capacitance measurements
- ☐ distance to open measurement
- ☐ coin phone testing - detect, collect, return coin, home totalizer
- ☐ monitor for short function

- ☐ send ROH
- ☐ ring line
- ☐ add, drop, and change mode of Talk and Monitor phone
- ☐ perform all line tests on Integrated SLC[®] systems

The following tests are provided for analog trunks:

- ☐ voltage, resistance, and capacitance measurements
- ☐ cause trunk on hook, trunk off hook signals on trunks
- ☐ add, drop, and change mode of Talk and Monitor phone

2.2.4.16.6.5 Directly Connected Test Unit

The DCTU provides low-frequency testing of lines, trunks, and special circuits. The SM processor provides the software interface between the DCTU and the AM. Figures 2-31 and 2-32 show block diagrams of the DCTU in minimum and maximum configurations, respectively.

The DC and voice-frequency circuits are located in the DCTU. Two to twelve MTBs distributed over both SGs in the MSU terminate on the DCTU, depending on the size of the office and test traffic. The 5ESS[®] switch Digital Ordering and Planning System (DOPS) is used to determine the proper number of MTBs, MSUs, and DCTUs required for testing lines in a given application.

The metallic path originates from the DCTU port circuit. Test pairs from each LU in the office terminate on the MSU, which concentrates access to the DCTU ports. The MSU, under SM processor control, makes the cross-connection between the circuit under test and the test pairs. The DCTU uses the same precision measurement unit and tone generator as the Mechanized Loop Test System (MLT-2).

A test sequence typically begins with an external test request to the AM. It is then forwarded to the SM processor that sets up the metallic path from the circuit to be tested to the DCTU. At that point, the test request is sent to the DCTU along with a port number and DCTU identifier. After performing the test, the DCTU returns the results to the AM through the SM processor.

Test capabilities of the DCTU include open circuit foreign electromotive force (EMF), coin station testing, and three terminal admittance tests.

2.2.5 NETWORK CONTROL AND TIMING LINKS

2.2.5.1 General

The NCT link is a full duplex 32.768-megabit serial link that carries digital control, timing, and network information. Each NCT link provides 256 time slots with each time slot containing 16 bits of information. The NCT link (Figure 2-8) consists of optical transmitters and receivers connected by lightweight fiber-optic cable. One NCT link contains two strands of glass fibers (one for transmitting and one for receiving).

The optical terminal components used with the NCT links include the 1250A transmitter and the 1350A positive-intrinsic-negative (PIN) receiver. The dual fiber-optic lightguide cable (LB2B-B) is used with these components and is manufactured at a specified length with the optical connectors already installed. These connectors allow the fiber-optic cable to be easily connected to the optical transmitter or receiver.

A peripheral control and timing (PCT) link is an optical 65.536 Mb/s time division multiplexed (TDM) serial interface containing 1024 bytes repeated at an 8 kHz rate. Of the 1024 bytes, 768 are data bytes that may be switched through the SM-2000 TSI, 192 bytes contain sub-sampled signaling information and 64 bytes contain framing and PCT link maintenance information.

2.2.5.2 LB2B-B1 Lightguide Cable

The fiber-optic data links provide advantages over conventional metallic cable links. These advantages include complete electrical isolation, immunity from electromagnetic interference, high-data rates, small lightweight low-loss cable, data security, and low cost.

The glass fiber requires a thin-film waveguide that is built from a transparent and nonconducting material. The fiber-optic cable consists of a low-loss fiber with a reinforced jacket for additional mechanical strength and protection. The fiber is a graded index fiber, consisting of a 50-micrometer diameter germanium-doped silica core, surrounded by a 125-micrometer outer diameter pure silica cladding. The KEVLAR® outer jacket (.01 inch outer diameter) is a lightweight and durable reinforced construction that gives the cable a minimum breaking strength of 15 pounds. To assure negligible macrobending losses, a 1-½ inch minimum bending radius is recommended, and an absolute minimum of ½-inch is advised to avoid breakage due to static fatigue. When coiled for storage, the NCT link should not be coiled with a diameter of less than 6 inches. The fiber-optic cable must not be pinched when using cable ties or lacing.

2.2.5.3 1250A Transmitter

The data link transmitter converts the electrical input into an optical signal replica using a light-emitting diode (LED) optical source. This signal travels along the fiber cable to a receiver which converts the optical signal back into an electrical signal with a PIN photodiode. Control circuits are used to modulate the LED output and to amplify and regenerate the detected optical signal at the PIN receiver.

The terminal components are dual in-line pin (DIP) compatible modules designed to operate with standard power supplies and standard transistor-transistor logic (TTL) signals. These modules are mounted on paddle boards inserted onto the wire-wrap backplane of the frame. A connectorized lens-coupled optical device is an integral part of the module package and provides a connection to the fiber-optic cable by mating to a molded optical connector termination on the fiber-optic link.

The 1250A optical transmitter uses the 601A (GaAlAs double heterojunction) LED as the emitting device. The transmitter operates on a single +5 volt supply and converts a standard TTL binary input into an optical binary output signal. This is achieved by using a complimentary bipolar integrated circuit (CBIC) chip to drive the LED. Temperature compensation is provided for the LED by increasing the diode current with temperature, during the "on" state, to compensate for a slightly negative temperature coefficient for the optical power output.

2.2.5.4 1350A Receiver

The 1350A optical receiver uses the 101B PIN photodiode as the optical detector. The PIN photodiode is a semiconductor diode in which the reverse current increases whenever light falls on the diode. Operating with a +5 volt supply and a -48 volt PIN supply, the receiver converts optical binary data back to standard TTL signal levels. The 1350A receiver consists of a trans-impedance preamplifier following the PIN photodiode, an automatic gain control (AGC) post-amplifier, and a comparator circuit. The preamplifier and post-amplifier are designed into a CBIC, and the comparator is designed into a separate integrated circuit to reduce cross-coupling from the high-level circuit back into the low-level amplifier circuit.

2.2.6 SLC® 96 CARRIER SYSTEM AND SLC® SERIES 5 CARRIER SYSTEM

The SLC® 96 Carrier System and the SLC® Series 5 Carrier System are digital loop carrier pair gain systems designed as a supplement to or a replacement for cable. Both of these carrier systems serve up to 96 subscribers over T1 transmission facilities.

The 5ESS[®] switch provides a digital interface to the SLC[®] carrier systems either from an RSM or directly from a local SM. This interface is a DCLU. See "Digital Carrier Line Unit," Section 2.2.4.16.3.4 . With the 5E8 software release, the IDCU is available and provides an integrated interface with the SLC[®] carrier systems. The IDCU supports the TR008 and TR303 interfaces to the remote terminals. The ISDN lines are also supported from the remote terminals. See "Integrated Digital Carrier Unit," Section 2.2.4.16.3.5 .

2.2.7 RECORDED ANNOUNCEMENT SYSTEMS

2.2.7.1 Overview

The recorded announcements provided for the 5ESS[®] switch consist of hardware and software combinations for supplying information to customers through the use of recorded announcements. Announcements are used to inform customers and operators of certain conditions. Calls can be terminated to an announcement in one of two ways. First, a call can be directed to an announcement by the call origination process. Secondly, a call can be connected to an announcement if the routing and terminal allocation (RTA) program cannot complete the routing of the call. The following types of announcements can be provided:

- ☐ dial-tone-first (DTF) coin
- ☐ local coin overtime
- ☐ partial dial
- ☐ permanent signal
- ☐ no 1+ dialing error
- ☐ invalid digit
- ☐ extra 1+ dialing error
- ☐ custom calling error
- ☐ vacant code
- ☐ emergency overload
- ☐ coinless public telephone (charge-a-call)

Intercept announcements may also be provided through trunks to the Automatic Intercept System (AIS).

There are optional announcements available for local area signaling services (LASS). Three announcements (13A type) are associated with customer-originated trace (COT), and six announcements (13A type) are associated with automatic recall/automatic callback (AR/AC).

The three announcements for COT are as follows:

- (1) successful activation of COT request
- (2) COT not available
- (3) COT buffer full

The six announcements for AR/AC are as follows:

- (1) AC confirmation

- (2) AR confirmation
- (3) AR/AC time-out without completion of AR/AC request
- (4) AC cancellation
- (5) AR cancellation
- (6) AR/AC party busy

Local announcements may be provided by an RAU which employs the 13A Announcement System. Announcements may also be provided by the 14A Announcement System. The DSU2/RAF can also be used to provide announcements to customers. See "Digital Service Unit 2 - Recorded Announcement Function," Section 2.2.4.16.6.2.3. The Announcement Systems Manager (ASM) is also available and allows for the centralization of both record keeping and administration of announcement system in a cost effective manner. See "15A Announcement Systems Manager," Section 2.2.7.4. Finally, the Service Announcement System (SAS) offers a high capacity announcement system for the switch. See "Service Announcement System," Section 2.2.7.5.

2.2.7.2 13A Announcement System

The main component of the RAU is the 13A announcement system which is located in the miscellaneous cabinet. The 13A announcement machine is a completely electronic, microprocessor controlled large modular telephone announcement system that has the capability to grow along with the needs of the OTC. A fully equipped 13A is equipped with eight message modules, each of which records and plays back an announcement. Each message module can handle up to 500 calls simultaneously (for a total of 4,000 calls). The OTC personnel can record messages locally with a tape recorder or with a G-Type handset plugged into the jacks on the front of the 13A unit. Messages can also be recorded remotely using the optional remote record unit. The different message lengths available are:

- ☐ 12 seconds
- ☐ 24 seconds
- ☐ 3 minutes

As announcements are recorded, they are electronically encoded and stored in digital format in static random access memory (SRAM).

The 5ESS[®] switch can host up to four 13A announcement systems (32 channels).

The recorded announcement interface uses 4-wire E&M trunk circuit packs. This interface converts each of the announcement channels from analog to PCM and sends the data to the TSI for distribution. When a call is to be routed to an announcement, a connection is made between the calling party and the trunk circuit through the TSI. The recorded announcement is a non-barge-in type of announcement.

2.2.7.3 14A Announcement System

The 14A announcement system is a reliable, easy to use system that allows the OTC to record their own announcements remotely (using the optional remote record unit) or on site, as well as play back a variety of prerecorded messages. The message length is variable in 1-second increments up to 2 minutes maximum. The standard memory medium is erasable, programmable, read-only memory (EPROM). When equipped with the optional remote record unit, the 14A has a 1-MB SRAM with on-board long-life battery backup for message storage. The 14A system can connect to either a trunk or a 2-wire telephone line (which is particularly applicable to RSM installations).

The 14A announcement system has two plug-in modules, each having a dedicated announcement channel. Each of these channels can handle a single call. Therefore, only two calls may be connected to the announcement system at a time. The 5ESS[®] switch can host up to sixteen 14A announcement systems (32 channels).

Because the 14A has line as well as trunk terminating capabilities, it can be especially cost effective in applications such as the 5ESS[®] switch RSM, where trunk units might not be present. Connecting the 14A to a line unit avoids the cost and space of a trunk unit.

The 14A can be equipped for playback service only. With this configuration, the 14A is equipped for 1 or 2 channel playback service only from a selection of 53 standard prerecorded plug-in announcement modules. The announcements are changed by changing the plug-in module. Customized modules are available on special order.

When equipped with the optional remote record unit, the 14A can provide 1-or 2-channel record/reproduce service. The announcements can be recorded live with the handset, dubbed from tape at the front of the system, or recorded remotely.

2.2.7.4 15A Announcement Systems Manager

The Announcement Systems Manager (ASM) is a PC (6386) based software and hardware system which allows for the centralization of both record keeping and administration of announcement systems in a cost effective manner. Its function is to manage recorded announcements and to keep organized records of the associated channels, frames, switches, and number of trunks for one or more central offices. The system also eliminates the need for announcement tapes by providing a means of digitally encoding and storing the messages on a hard disk. The ASM can interact with 13A/14A remote record unit allowing users to change recorded messages from a remote location, thus allowing the centralization of the announcement administration. This centralization and ease of administration leads to increased efficiency, whether the system is used for a single central office or a large region comprised of many central offices.

The ASM has three main subsystems:

- ☐ The data base provides the organized record keeping of announcement channels and all associated information.
- ☐ The speech file manager allows the ASM user to administer (record, delete, edit, etc.) the announcement files. These announcement files are speech files stored on the hard disk which have been digitally encoded by a speech processing board.
- ☐ The remote record interface provides the link between the ASM system and the 13A/14A remote record unit, thus allowing downloading and monitoring of messages remotely with the 13A, 14A, or other commercial announcement systems.

The ASM is available in three versions which are distinguished by the limitation of the data base size. The data base is limited by the number of switches that will be accommodated. The smallest version accommodates up to 100 switches. The next version will accommodate 500 switches. The largest version is limited only by the available hard disk space. For all versions, there are no limits to the number of announcement frames and channels associated with each switch.

An optional concentrator unit allows the ASM to access up to 64 message channels from a single line.

2.2.7.5 Service Announcement System

The Service Announcement System (SAS) is a high capacity announcement system for the 5ESS[®] switch introduced with the 5E10 software release. The SAS circuitry is located on a DSU2 shelf and provides 32 announcement ports and MF/DTMF Coin Detection. The SAS provides a significant increase in the number

of announcements and announcement seconds supported. The SAS provides transparency with the existing RAF functionality, and can be used for Dial Through Announcement (DTA), Announcement Only Channel (AOC), Directory Assistance (DA), or COIN applications.

The SAS hardware is modified from the Digital Service Circuit 3 (DSC3) technology. Each SAS Physical Service Group (PSG) requires one SAS DSC which interfaces with a single PIDB/PICB to provide full support for 32 announcement ports and/or MF/DTMF/Coin Detection. In addition to the SAS DSC board (TN1841), a SAS PSG consists of 1 to 4 memory boards (TN1842), with each memory board containing 1 to 8 industry standard (PCMCIA/JEIDA) flash cards. The number of announcement seconds that can be provided depends on the flash card memory density.

2.2.7.6 16A Announcement System

The 16A Announcement System is a digital record and playback system that provides up to 24 broadcast announcements for 5ESS[®] Switch central office switches and for Network Wireless Systems Mobile Switching Centers. The 16A interconnects with the switch using DS1 or E1 digital trunk facilities. The 16A can also be configured to provide 20 recorded announcements and four channels with an external audio source for music on queue or music on hold.

Each 16A is equipped with one BLD10 digital interface circuit pack and up to three announcement circuit packs. The BLD10 encodes, frames, and formats the analog announcements into either a DS1 signal with D4 format and AMI line coding or an E1 signal.

Three different types of announcement circuit packs are available, each of which may be equipped with the optional 400B Remote Record Module. They are listed below:

- ☐ **BLD3** ☐ eight one-minute announcements
- ☐ **BLD4** ☐ eight one-minute cascaded or phased announcements: one announcement is recorded automatically on all eight channels. The starting times for the eight announcements are spaced apart by approximately 1/8th of the announcement length. The BLD4 is typically used with Automatic Call Distributor (ACD) applications.
- ☐ **BLD5** ☐ eight two-minute announcements
- ☐ **400B** ☐ a dial-up Remote Record Module that mounts on top of each of the BLD3, BLD4, or BLD5 (BLD3/4/5) circuit packs.

The 16A is modular in design; it can be equipped with 1, 2, or 3 announcement circuit packs, that is, any combination of the BLD3, BLD4, or BLD5. Each announcement is stored on a non-volatile chip so the announcement is not lost when power is removed. New announcements can be recorded over existing announcements as often as necessary. As many as 60 callers can receive an announcement, simultaneously. Thus, 24 announcements can be heard by as many as 1440 callers at any one time. The 16A contains no disks, batteries, or fans and requires no maintenance during its life cycle.

Announcements are recorded locally either by using a handset that comes with the equipment and plugs into a telephone jack at the front of a BLD3/4/5 announcement circuit pack, or by using a tape recorder that plugs into a tape jack on the front of an announcement circuit pack.

Announcements are also recorded remotely from any touch tone telephone or from an Announcement Systems Manager (ASM) via a standard analog POTS line. For remote access, the optional 400B Remote Record Module must be mounted on the BLD3, the BLD4, and the BLD5 announcement circuit packs. In addition, a user can place any channel (announcement) off-line or on-line, perform diagnostics, change security codes, and manage individual channel passwords.

Remote access security is provided by a unique 8-digit master security code that the service provider can assign to each BLD3, BLD4, and BLD5, equipped with a 400B. The service provider can also assign a

unique security code to an individual channel and lease this channel to a commercial customer. Customers of leased channels can access only their channels for recording and playback.

2.2.7.7 17A List 6 Announcement System

The 17A, List 6 Announcement System is a digital announcement system with storage capacity for up to 166 announcements. The 17A interconnects with a digital switch using one DS digital facility that provides 24 trunk channels. The DS1 signal uses the D4 format and AMI line coding.

The 17A is compatible with Lucent and non-Lucent digital switches and provides an effective way to manage a large number of announcements on a limited number of trunks.

Each caller may listen to any one of 166 unique announcements or all 24 callers may listen to the same announcement, but with different announcement starting times depending on when the caller was connected to the trunk channel. The maximum length of the announcements recorded on the 17A is flexible. The memory space for the announcements is allocated as follows:

- ☐ 121 announcements ☐ up to one minute each,
- ☐ 30 announcements ☐ up to two minutes each, and
- ☐ 15 announcements ☐ up to four minutes each.

Any 17A announcements can be used as an immediate start announcement or as a broadcast announcement at the same time depending on how the 17A is programmed by the administrator. Each announcement is stored on non-volatile flash memory cards. The Announcement is not lost when power is removed. A new announcement can be recorded over an existing announcement as often as necessary after erasing the old announcement. The solid state design of the 17A does not require the use of computer hard drives.

Announcements are recorded remotely from any touch tone telephone or from a Recorded Announcement Systems Manager (RASM) via a standard analog POTS line assigned to the 17A. Announcements cannot be recorded locally at the 17A. Voice prompts guide the administrator through a variety of administration functions without taking the 17A out of service. In addition to recording announcements, the administrator can:

- ☐ play back an announcement
- ☐ obtain the status of an announcement
- ☐ assign or unassign an announcement to an MF code,
- ☐ link or unlink an announcement to an announcement trunk channel.
- ☐ erase an announcement
- ☐ select answer or no-answer supervision signaling
- ☐ select how the automatic number announcement is played, that is, either voice or DTMF tones
- ☐ set the combined prefix and ANAC access code used by the 17A for identifying an ANAC request
- ☐ link or unlink an external audio source to an announcement trunk channel
- ☐ perform diagnostics
- ☐ change a security code.

In addition to recording announcements by speaking the announcement into the telephone handset, announcements can also be recorded from audio sources such as tape, CD, or a computer by using a *Headset Switcher™* and a headset included with the 17A. The Headset Switcher provides an audio interface for a tape player, CD player, or a computer through the telephone. If an immediate start announcement is routinely updated or if an immediate start announcement must be replaced, the new announcement can first be recorded on an unused memory location or slot. The new announcement is then assigned to the MF code to which the old announcement is assigned, thereby immediately placing the new announcement in service and taking the old announcement out of service. The old announcement can then be erased so that the slot can be reused in the future for a new announcement. In a similar manner, if a network broadcast announcement must be updated or replaced, the new broadcast announcement can be recorded on an unused slot and assigned to an unused MF code. The new broadcast announcement is then linked to the announcement trunk channel to which the old announcement was linked, thereby immediately placing the new broadcast announcement in service and the old broadcast announcement out of service.

To ensure remote access security, a unique 8-digit master security code is assigned by the 17A administrator. The 17A is not compatible with the Remote Record Concentrator.

2.2.7.8 18A Announcement System

The 18A Announcement System is a general purpose, one-channel, two-message announcement unit. It provides audio record, storage, and playback announcement service for use with telecommunications systems applications. The 18A is designed to interface with the following:

- ☐ a conventional analog two wire tip and ring telephone line interface
- ☐ the Lucent Technologies Call Management System (CMS) for *MERLIN®* II and *MERLIN®* LEGEND
- ☐ contact-activated start (CAS) and On-Hold systems

Two versions of the 18A Announcement System are available: Model A, and Model B. Model A has 2 announcements and 210 seconds of total recording length. It allows remote access and external announcement selection. Model B also has 2 announcements but only 70 seconds of total recording length. It does not allow remote access, but does allow external announcement selection.

The 18A Announcer provides the following capabilities:

- ☐ Announcements may be recorded from a telephone handset, a pre-recorded cassette tape or, optionally, a remote location over a telephone line.
- ☐ Announcements may be monitored via the telephone handset or, optionally, from a remote location over a telephone line.
- ☐ Announcements are stored using EEPROM technology that does not require batteries to retain the announcements during a power failure.
- ☐ To facilitate installation, two 10-second announcements are prerecorded on each 18A at the factory.
- ☐ All 18A systems include an external announcement selection feature where an external switch (not provided) or contact closure can be used to change the active announcement.

The Model A version includes remote access capability, which is provided over the analog tip/ring line interface. This feature takes advantage of the already existing line interface circuitry and can be used whenever the tip/ring circuit is idle. The unit can be accessed from a remote location via a touch-tone telephone. Either voice or tone prompts can be used to guide the user through the remote access session. Using the telephone's touch-tone keypad, the user enters a security code and a series of commands to

record and monitor announcements.

2.2.8 COMMON NETWORK INTERFACE RING

A common network interface (CNI) must be equipped in offices using CC (exceptions are the VCDX (5E11) and EXM-2000 (5E12) which set the SS7 PSU for CCS signaling). The CNI has a community of peripheral processors serially interconnected and a central processor that performs the basic duties of the system in controlling the message flow and system operation. The processors, known as link nodes, function as routing devices for the messages that are transmitted over the network. The following link nodes are available with the CNI.

- **Ring Peripheral Controller Node (RPCN):** Provides communication between the ring and the 3B20D or 3B21D central processor. There is an RPCN placed in position 0 of each group. Two are always used in the 5ESS[®] switch CNI application.
- **Link Node (LN):** Provides communication between the CNI ring and the CCS network. The LN data speed can be 4.8 kb/s or 56 kb/s, encrypted or nonencrypted.
- **Interprocess Message Switch User Node (IUN):** This is an active node on the CNI ring, but performs no signaling or processing. One use of the IUN, in the 5ESS[®] switch application, is to electrically hold a place for a future DLN or LN and provide the foundation of common circuitry on which the DLNs or LNs are built. This avoids ring cabling at the time of growth. The IUN may control an adjacent interframe buffer that is used to connect ring nodes across a physical frame boundary; however, it is generally a temporary filler during growth or reduction periods.
- **Direct Link Node (DLN):** The DLN, an optional node, is used in 5ESS[®] switch offices equipped with the CM2 or CM2C. An upgraded DLN is available to provide higher CCS message capacity: The DLN30 is based on a MOTOROLA[®] MC68030 microprocessor rather than the MC68000 microprocessor of the DLN. The DLN30 also provides more memory to support a larger number of trunks. CNI rings with DLN30 also require upgraded link nodes and RPCs.

Figures 2-2 and 2-33 show the 5ESS[®] switch CNI ring configuration.

The CNI for the 5ESS[®] switch consists of two equipment cabinets. One cabinet, the ring node cabinet, contains the dual token data ring. The other cabinet contains all the data sets and is known as the digital facility access (DFA) cabinet.

The fully equipped ring node cabinet can interface to a maximum of 19 duplicated digital signaling links (that is 38 links). These links are driven by data sets in the DFA cabinet and are designated as A-links or E-links or F-links. The A-links provide a transmission path between a local/tandem switch and the local signal transfer point (STP). Signaling messages transferred over the data links consist of call setup/tear down, transmission query services, and network management signals.

Refer to 235-200-115, *5ESS[®] Switch CNI Common Channel Signaling*, for further information on the CNI.

NOTE: The 5ESS[®] switch may be used in AutoPLEX[®] System 1000 applications. CNI may also be used as D links to ECPC in AMPS DCS and CDMA applications. For information about DCS and CDMA, see the 235-200-100, *5ESS[®] Switch FLEXENTTM/AutoPLEX[®] Wireless Networks Applications OA&M Manual*.

2.3 SOFTWARE FUNCTIONS

2.3.1 GENERAL

Software in the 5ESS[®] switch is divided into different software subsystems, each with a different function

(see Figure 2-34). Parts of each software subsystem exist in both the SM processor, the AM processor, and the CMP (with the 5E6 and subsequent software releases). Distributed architecture allows the processing power of the office to grow as the office grows through the addition of SMs. The software implements the circuit voice/data and packet data switching capabilities provided by the 5ESS[®] switch including analog and ISDN. Beginning with the 5E8 software release, National ISDN 1 was supported. Beginning with 5E9(2), National ISDN 2 is supported. The major functional software areas are as follows:

- ☐ operating system
- ☐ call processing
- ☐ maintenance
- ☐ administration
- ☐ office data

2.3.2 OPERATING SYSTEM

An operating system is software that governs the control of equipment resources and software functions in the 5ESS[®] switch such as memory management, input and output activities, file system management, communications, timing, and process management. The operating system acts as an interface between software subsystems and the 5ESS[®] switch physical hardware. The 5ESS[®] switch software is controlled by two operating systems as follows:

- (a) **UNIX[®] RTR Operating System:** The UNIX[®] RTR operating system is the operating system for the 3B20D or 3B21D computer.
- (b) **Operating System for Distributed Switching (OSDS):** The OSDS consists of the following versions:
 - ☐ Operating System for Distributed Switching in the AM (OSDS-C): The OSDS-C interfaces with the UNIX[®] RTR operating system, input/output, and software in other subsystems in the AM.
 - ☐ Operating System for the Switch Maintenance Software in the AM (OSDS-SM): The OSDS-SM interfaces with the maintenance software and the switch maintenance processes in both the MSG and the SM.
 - ☐ Operating System for Distributed Switching in the CMP (OSDS-CMP): The OSDS-CMP provides interfaces with other subsystems in the CMP and communication software that is used to send messages to the AM or SMs.
 - ☐ Operating System for Distributed Switching in the SM (OSDS-M): The OSDS-M provides interfaces with other software subsystems in the SM and communication software that is used to send messages to the AM, CMP, or other SMs.
 - ☐ Operating System for Packet Interface and Protocol Handlers (OSDS-P): The OSDS-P provides interfaces with other subsystems in the local processor and communication software to send messages to the PIs, PHs, and associated SMs.
 - ☐ Solaris[®] operating system for VCDX: The work station that takes the place of the AM for the VCDX and simulates the UNIX[®] RTR system.

The various versions of OSDS provide an environment that supports distributed processing and allows the application processes to share system resources efficiently. The operating system manages the software

processes that are running under a processor and provides communication among the different processes. The operating system also provides identical interfaces to software subsystems regardless of the processor in which they are running.

2.3.3 CALL PROCESSING

2.3.3.1 General

Call processing functions are distributed among the CMP, SM, and the AM processors. Terminal and system processes perform the call processing functions within the SM processor. The CMP takes over most of the AM call processing functions.

Terminal processes are temporary, existing only while the terminal controlled by the terminal process remains active. There are different types of terminal processes. The type of terminal process created to control a terminal depends on whether the terminal is a line or a trunk and whether the terminal is requesting service (origination) or is being used for termination. For a typical line-to-line call, there is a line origination terminal process to control the originating end of the call and a line termination terminal process to control the terminating end of the call.

Associated with each terminal process is a data block containing terminal data. Each terminal type uses a different set of procedures to perform function(s) for feature control, administrative services, and terminal maintenance or data base management. These procedures vary based on the data in the data block.

Call processing software consists of three software subsystems as follows:

- ☐ feature control
- ☐ routing and terminal allocation
- ☐ peripheral control

The stand-alone mode of operation is available as an option on all SMs.

2.3.3.2 Feature Control

Feature control is a set of subsystems implementing procedures that comprise the primary component of the terminal process. The feature control portion of a terminal process is responsible for receiving all external inputs and sequencing the operation on the terminal.

Feature control sequences call processing actions by calling on other software such as data base management, the operating system, routing and terminal allocation, and peripheral control.

2.3.3.3 Routing and Terminal Allocation

Routing and terminal allocation software consists of procedures that reside in both the SM and the AM/CMP. These procedures reside in the terminal process in the SM, a routing system process in the AM/CMP, and a routing system process in the SM. Routing and terminal allocation procedures in the terminal process serve as an interface between the feature control terminal process in the SM and the routing process in the AM/CMP. Requests for routing are made by feature control to the routing process in the AM/CMP. The terminal process sends messages via the operating system to the routing process in the AM/CMP.

The terminal allocation portion of routing and terminal allocation software resides in the SM. Terminal allocation is a process that consists of routing and terminal allocation procedures that are responsible for line and trunk subgroup, and operator position member selection. Once a terminal is selected, the terminal allocation process requests that the operating system create an active terminal process. While active, a terminal is under control of the terminal process.

2.3.3.4 Peripheral Control

Peripheral control provides abstract resources of the switch for feature control and terminal maintenance. Feature control uses these resources to perform call processing functions. Peripheral control provides the following abstract resources.

- (a) **Logical Ports:** Logical ports are an abstraction of customer terminals attached to the 5ESS[®] switch.
- (b) **Paths:** Paths are an abstraction of interconnections between logical ports and connectors. Each logical port and connector has a set of time slots to which paths may be attached.
- (c) **Connectors:** Connectors are an abstraction of various types of conferencing capabilities.

The abstract resources provided by peripheral control isolate feature control and terminal maintenance from the switching hardware. Because feature control and terminal maintenance are isolated, changes to hardware do not affect these software systems. This arrangement allows hardware changes to be made without having to change feature control and terminal maintenance software.

2.3.4 SM SOFTWARE OPTIONING

Prior to the 5E9(2) software configuration, the 5ESS[®] switch SMs are available in three different software configurations. The three levels of SM software configurations, basic, standard, and loaded, are shown in Figure 2-35. In the 5E9(2) software release, the SM-2000 configuration is added.

The basic configuration includes all analog features except OSPS (with the exception of C-ACD originating treatment which is in the basic SM), toll, government, and IDCU support for analog lines. Analog features, including POTS, BRCS, C-ACD originating treatment, LASS, RSM, ORM, electronic tandem network (ETN), and the analog portion of shared DNS, are placed in this configuration.

The standard configuration is targeted for specialized markets [for example defense switched network (DSN), toll, and OSPS]. Any analog feature targeted for these markets should be placed in this configuration. In addition to all the features of the basic SM, the standard SM includes OSPS, toll, government, and IDCU (with TR008 remote terminals). The OSPS features in this configuration are for originating treatment only (that is, do not require ISDN hardware).

In addition to the features of the standard SM, the loaded SM includes all ISDN features and full operator services.

The SM-2000, available with the 5ESS[®] switch running 5E9(2) software release is available in the SM-2000 software configuration only. "FEATURES," Section 10, provides a listing of all 5ESS[®] switch features and the SM software configuration required to support them.

2.3.5 MAINTENANCE SOFTWARE

2.3.5.1 General

Maintenance software contains the logic for providing reliable system operations. Maintenance software provides the following capabilities.

- (a) **Human-Machine Interface:** This feature consists of the programs for the MCC, system alarms, and peripheral frame control/display.
- (b) **Switch Maintenance:** This feature maintains a working switch configuration, aids in hardware repair, updates the hardware availability status in the data base used by other software systems, and notifies the human-machine interface, system integrity, and terminal maintenance subsystems

whenever faults are detected.

- (c) **Terminal Maintenance:** This feature is responsible for the testing of lines and trunks, maintaining a status record, and analyzing signaling errors detected by the system.
- (d) **System Integrity:** This feature detects and responds to faults encountered in the SM, CMP, and AM software by using audits, integrity monitors, and overload detection.
- (e) **Program Update:** This feature performs the file transfer and verification functions, the program update disk file partition management, the AM update functions, the SM update functions, and the downloadable microprocessor update functions.

For more detailed information, see "MAINTENANCE," Section 6 .

2.3.5.2 Human-Machine Interface

The human-machine interface consists of three basic elements as follows:

- **Master Control Center:** The MCC serves as the primary communication link between the 5ESS[®] switch and maintenance personnel assigned the task of administering the system. The MCC provides the maintenance personnel with real-time system status indications, control and display capabilities, and human-machine interface message I/O. With these capabilities, maintenance personnel can observe the overall status of the system and communicate commands to the system for operation and maintenance.

Another primary function of the MCC is to furnish manual emergency recovery capabilities for times of major system failure. Automatic recovery capabilities are built into the 5ESS[®] switch software, but the possibility exists that the system may not recover automatically. In such situations, the ability to override the automatic functions and initiate manual emergency actions may enable the maintenance personnel to restore the system to operation.

The MCC failures will not affect the operation of other units in the system. The MCC may be physically detached from the 5ESS[®] switch without any adverse effect on system operation. Another MCC design feature is that the MCC is compatible with remote support systems.

- **System Alarms:** The system alarms are output at the MCC and the maintenance teletypewriter and are issued to alert the maintenance personnel of the presence of a trouble condition in the 5ESS[®] switch.
- **Peripheral Frame Control/Display:** This function provides the maintenance personnel with limited control and display capabilities at the frame.

2.3.5.3 Switch Maintenance

2.3.5.3.1 General

The overall system philosophy dictates that the peripheral units do as much of the maintenance function as possible. Errors and changes of configuration are reported to the AM only when necessary.

2.3.5.3.2 Administrative Module Maintenance

Most maintenance of the AM is under the control of the UNIX[®] RTR operating system. The AM fault recovery software, resident in the AM, is responsible for maintaining a working AM configuration of CU, IOP, and DFC units.

Routine processor and peripheral diagnostics and other diagnostic-related functions are in the category of deferrable maintenance functions. Since diagnostics tend to be background tasks, there is no need for the diagnostic monitor to reside at the supervisory level.

The I/O diagnostics consist of tests of the processor control, main store, I/O channels, and the DMA controller. The diagnostics are organized in such a way that the core portion of the processor is diagnosed first. When these tests pass, this portion of the processor is used to diagnose another portion of the processor. This procedure continues until correct operation of the total processor is verified.

The processor diagnostic consists of micro and macro execution levels. Microdiagnostics written in microcode execute microinstructions and provide the best possible access to pinpoint faults within the processor, especially in the hard-core portion. Macrodiagnostics are written in machine instructions and are provided by pumping up the main store with the segments of macrocode to be executed.

2.3.5.3.3 Switching Module Maintenance

Maintenance is performed individually by each SM. An SM reports all maintenance actions to the AM, but acts under orders from the AM only under the following conditions:

- ☐ manual requests
- ☐ coordination of scheduled maintenance

The SM will recover from internal faults even if the control channels to the AM are not operating. The SM processor keeps a record of the status of the SM subunits and determines if manual requests can be carried out. Whenever diagnostics are to be run in the SM, either as a result of a manual request or as a part of recovery action, the AM is requested to page the appropriate diagnostic into the SM processor memory.

2.3.5.3.4 Communication Module Maintenance

From a maintenance viewpoint, the CM is composed of the following four entities that are reconfigurable by the switch personnel:

- (1) MSG
- (2) office network timing complex (ONTC)
- (3) communication link (CLNK)
- (4) CMP

The MSG consists of the MSCU and the PCs. The MSCU and the PCs have a parent-child relationship in that a PC (child) cannot be in service without the MSCU (parent) being in service. (Note that the term MSCU as used in this section refers to the reconfigurable entity consisting of the DDSBS, the BIC, the PIC, and the IOMI. It should not be confused with the term MSCU as used for the shelf name in "Message Switch Control Unit," Section 2.2.3.3.) There are five types of PCs: the MMPs, the FPC, the PPC, the QGP, and the CMP. The MSCU and the PCs are all individually reconfigurable by the switch personnel.

The ONTC consists of the ONTC common (ONTCCOM), the DLIs, and the TMS to a DLI in an SM. The ONTCCOM includes the TMS, the MI, and the NCLK. These subunits of the ONTCCOM cannot be reconfigured individually by the switch personnel.

The CLNK represents the path over which interprocessor messages pass between the AM and an SM, or between a pair of SMs. A CLNK passes through CM hardware consisting of the MSCU, an MMP, over a MIB to the DMI, over a metallic link to the TMS, then over an NCT link to a DLI in an SM. The MSCU is

responsible for correctly routing the messages destined for the AM or an SM. For further information on interprocessor communications, refer to "COMMUNICATION," Section 2.4.3 .

The CMP is a major processor that has been added to the system. The CMP handles the bulk of the call processing functions and is heavily involved with recent change processing. Although the CMP has software to handle faults internal to itself, it still relies heavily on the AM for controlling its overall recovery. The CMP is reconfigurable by fault recovery or the OTC personnel.

Most of the maintenance software (for fault recovery, diagnostics, and switch personnel requests) for the CM resides in the AM. The remainder is distributed among the various CM units. The CM maintenance is responsible for establishing and maintaining communication links between the AM and SMs for maintenance, network control, and call-related message signaling.

Diagnostics on the new hardware of the 5ESS[®] switch are performed through continuous checking. Continuous checking consists of continuous in-service checking and off-line routine tests. These functions test for and detect all service affecting and non-service affecting faults internal to the switch. In the 5E9(2) software release, this includes the QLPS.

In-service checking is performed on units that are actively processing messages or are ready to process messages if needed. Off-line routine tests supplement in-service checking by periodically taking units off line and checking portions of the hardware that are not tested by in-service checking, and returning the unit to service. Appropriate alarms, status indications, and output messages are generated in the event of a fault.

2.3.5.4 Terminal Maintenance

2.3.5.4.1 General

The terminal maintenance subsystem is responsible for preventing problems in trunks, lines, service circuits, and signaling paths which can degrade customer service. To accomplish this protection, there are two major divisions of responsibility for the terminal maintenance software.

The first division of responsibility includes the following:

- ☐ providing a maintenance plan, totally contained within the 5ESS[®] switch, that will perform fault detection, fault monitoring, fault reporting, sectionalization, and isolation
- ☐ furnishing a set of tools for maintenance personnel to use for circuit administration and repair

The second division of responsibility is to provide interfaces to external maintenance operations systems (OSs).

In addition to access, circuit test capabilities will exist at the 5ESS[®] switch for use by the external system. Wherever possible, test access and test capabilities will be shared by the internal and external maintenance systems.

2.3.5.4.2 Fault Detection

Fault detection is done both automatically and manually. Automatic fault detection is performed by software and special fault detecting circuits. The per-call tests detect most of the faults. Examples of per-call tests for lines are power cross, continuity, and low leakage resistance. These tests are run as part of normal call processing. The circuit capabilities for making the tests are built into the SM. When problems are detected by the call processing programs during the per-call tests, the call is turned over to terminal maintenance for further actions.

Automatic routine tests are scheduled and run by the terminal maintenance subsystem. These tests are

intended to test line and trunk circuits as well as service circuits and interconnecting elements such as time slots and transmission links. The intent of the tests is to detect problems in unused circuitry before the circuit is used in a call. These tests are used for fault analysis and sectionalization and can also be called on demand by the maintenance personnel.

Some other mechanisms used for fault detection are:

- ☐ Carrier group alarm (CGA)
- ☐ Trunk error analysis (TERA)
- ☐ Error analysis (EA)
- ☐ Showering line detection

A CGA removes a facility from service on a facility failure event to avoid routing calls to a degraded facility. The CGA reports the faulty facility to the ROP and when the failure is rectified, the CGA restores the facility.

The TERA identifies all trunks that are having excessive failures.

Error analysis monitors the transmission errors and when the errors exceed a threshold, it starts a recovery action.

Showering line detection is a built-in error detection mechanism. An insulation fault on a line can cause intermittent off-hook signals to the switch. On detecting this error condition, port status administration turns off the faulty line.

2.3.5.4.3 Fault Handling

Fault handling deals with faults associated with a single call or those that could affect many subscribers or calls. Examples of the latter are faults in carrier facilities shared by many customers. System faults are handled by switch maintenance.

Faults associated with a single call require some immediate actions and some deferrable actions. The subscriber must be released from the call as soon as possible, and all circuits involved in the call must be marked unavailable to call processing and reserved for further maintenance. All relevant data associated with the call must be preserved for later fault analysis, that is, the state of the call and the connections and circuit state at the time of the failure. This information is used to reproduce the failure so that sectionalization and fault isolation can be performed.

The sectionalization consists of specified tests on the suspected circuit to determine if the fault is internal to the 5ESS[®] switch or in the external connecting facilities. If the problem is internal to the 5ESS[®] switch, an attempt is made to pinpoint the faulty circuit elements.

Most fault analysis is performed by terminal maintenance. Call processing programs will generally not do retries or attempt to save the call by using alternate routes. The terminal maintenance subsystem handles the processing of irregularities that occur with a call. This fault analysis work is referred to as call irregularity processing.

Some of the call handling functions are performed by terminal maintenance. For example, clean-up and disposition of a call that has encountered failure is in this category. The network connection must be taken down; circuits associated with the call that are not faulty must be idled and made available for system use. Software facilities may have to be initialized. Faulty circuits are placed in a maintenance state and made unavailable to call processing.

Faults that affect many circuits or customers require more extensive software interfaces with call

processing and maintenance. For example, the loss of a line or trunk could result in the loss of all its associated calls. Interfaces exist between terminal maintenance and call processing to handle these situations.

2.3.5.5 System Integrity

2.3.5.5.1 General

System integrity software detects and responds to faults encountered in system software through the following methods:

- ☐ auditing
- ☐ integrity monitors
- ☐ overload detection
- ☐ software initialization

2.3.5.5.2 Auditing

Auditing is a technique used to check the states of hardware and software resources to insure that information is not lost due to software or data base errors. All AM/CMP audits reside in the AM/CMP and verify the data that is not related to the peripheral community, such as the operating system tables and status tables, message switching, mass storage devices, and data links.

Peripheral audits verify the data dedicated to the SM, such as the line concentrator path map, transient data with a call, and process states. Peripheral audits are autonomous from the AM, but do report all errors to the AM. The AM may request the periphery to run audits. Interprocessor (between AM/CMP and SM) audits deal with distributed, redundant data bases, resources controlled and shared by different processors, and call information distributed among different processors. There is no central control for this type of audit. Consistency validation is achieved cooperatively through autonomous audits on different processors.

2.3.5.5.3 Integrity Monitors

Integrity monitors are provided to monitor major system functions and to inform the system when any such functions fail. The AM is notified if the timing values exceed specified intervals. Mechanisms are provided to monitor the performance of the scheduling algorithms in the OSDS and *UNIX*® RTR operating systems, and excessive delays are reported to the AM. Hardware sanity timers are provided in the AM, the CMP, and the SM.

2.3.5.5.4 Overload Detection

Overload is the state of the system where the load exceeds the system capacity. Unless the overload condition is detected and controlled properly, the performance of the system is severely degraded. Manual and automatic controls are provided to minimize degradation of service while maximizing call completions.

During an overload situation, processing preference is given to terminating traffic. Internal overloads caused by the unavailability of certain hardware resources, such as service circuits, or software facilities, such as buffers, are controlled by reducing the timing intervals for related functions. This provides a faster release of the circuits and buffers.

Dynamic service protection is invoked when origination delays exceed some specified value and other overload controls have failed to reduce the load. Dynamic service protection continues to serve all essential lines (for example, police, fire department) and serves a reduced number of nonessential lines. Service to

nonessential lines is rotated among all lines such that all lines are served equally at a reduced grade of service.

2.3.5.5.5 Software Initialization

Software initialization provides a means for restoring or reinitializing hardware or software whenever resets are generated as a result of hardware and software errors. An initialization is automatically implemented whenever the failure of a check indicates the integrity of a processor or data base is questionable. Initializations may also be manually initiated by request.

2.3.5.6 Program Update

Program update is the process of applying orderly changes to the 5ESS[®] switch software with minimal impact on service. In general, it is impossible to apply all possible types of program changes without disrupting service. The goal of minimal impact of service is met by introducing substantial program changes on a periodic basis through a new software release and limiting interim program changes to essential overwrites which do not require system reinitialization. Program changes normally require a system reinitialization that disrupts service for a short time. Error corrections (program updates) will be introduced with as little service interruption as possible. A program update consists of the following five categories.

- (a) **Administration:** Administration is the maintenance of the source files (text and data) as well as the changes to these files.
- (b) **Generation:** Generation is the formulation of a program update into a software update.
- (c) **Distribution:** Distribution is the process of making the changes available to a field site.
- (d) **Installation:** Installation is the process of inserting changes into the software release executing at the field site.
- (e) **Documentation:** Documentation is the process of supplying enough information to the maintenance personnel so that they can determine exactly what software is resident in the switch and where that software is loaded.

The 5ESS[®] switch software consists of an AM package, an SM package, a CMP package, and a collection of packages for the various microprocessor-controlled components (for example, message switch, peripheral controllers, pumpable SM peripherals). The software that executes in the AM, CMP, or SM is contained in files that adhere to the common object file format. The downloadable microprocessor software exists in a file that has a format compatible with the requirements of the target microprocessor.

Except for certain types of downloadable microprocessor software, most 5ESS[®] switch software is written in the C programming language. A limited number of assembly language programs, dictated by real-time constraints, exist in the 5ESS[®] switch software. Regardless of the language, the programs are structured into functions, and the functions are collected into processes. The program update subsystem supports the replacement of functions and processes in real time with no impact on the system.

2.3.6 ADMINISTRATIVE SOFTWARE

Administrative software is resident in the CMP, SM, AM, PSU, and PH. The CMP administrative software collects information from switching software in the CMP and reports this information to the AM administrative software. The SM administrative software collects information from switching software in the SM and reports this information to the AM administrative software. The AM administrative software performs data analysis and input/output of this data through data link or office data channels from the SMs.

Each subsystem consists of a set of programs and data. These programs execute as both system and terminal processes. Several types of report generating routines execute as terminal and system processes

at different rates. For example, the program that generates the daily plant measurement schedule executes as a terminal process daily. The data recording routines execute as part of the feature control terminal processes and as part of the routine system process.

The software to accomplish administrative tasks is organized functionally as follows:

- (1) **Call Record Assembler:** The call record assembler is the software component of the call record assembler (CRA) subsystem that receives and correlates per-call data. A call record is dynamically allocated to every call for temporarily storing per-call data needed by one or more of the administrative features.
- (2) **Measurements:** The 5ESS[®] switch measurements subsystem is composed of the following measurements:
 - (a) **Traffic Measurements:** Traffic measurements include office totals, component, network, customer validity, division of revenue measurements, as well as data base information.
 - (b) **Plant Measurements:** Plant measurements are divided into the following types:
 - (1) base measurements (used to evaluate equipment performance)
 - (2) plant service measurements (used to evaluate the impact of troubles on customer service)
 - (3) performance measurements (used to calculate the performance index)

The measurement subsystem generates, collects, and reports these measurements with the only differentiation by category occurring at the reporting level. See "ADMINISTRATION," Section 5 , and "MAINTENANCE," Section 6 , for further information on the traffic and plant measurements.

- (3) **Billing:** The billing software in the 5ESS[®] switch is part of the AMA subsystem in the SMs, CMP, and AM.
- (4) **Network Management:** Network management is a real-time surveillance and control activity utilizing techniques to optimize use of the call carrying capacity in a network under stress because of traffic overload or failure.
- (5) **External Data Link Communications Package:** The external data link communications package, a component of the AS subsystem, provides a path between the OS data links and a community of processes within the 5ESS[®] switch that use the links.
- (6) **Service Evaluation:** Service evaluation, a component of the AS subsystem, provides for an automated means of assessing the overall quality of network service and a means of identifying problems in the network.

2.3.7 OFFICE DATA

2.3.7.1 Data Base

Office data is contained in a relational data base under control of a data base management (DBM) system. The DBM system provides interfaces and access mechanisms between the different types of software systems and data in the data base. There are two levels of access to the data base supported by the DBM system:

- ☐ tuple-level access used by call processing and other operational software
- ☐ view-level access used by administrative input/output systems such as recent change and verify (RC/VFY), office data administration (ODA), and office records programs

The two levels of access provide different degrees of data independence for different data base users.

The tuple-level access is a lower level of interface than the view level and has stricter real-time requirements. Unlike the view level, the user of the tuple level reads the data as it is physically stored in the data base. With the 5E7 software release, a mechanism exists to provide independent operational views of physical stored data.

The view level access provides users such as RC/VFY with a high degree of data independence. The user of the view-level access does not read the data in the form that it is physically stored. Data access through the view level is constructed from one or more relations in the data base using mapping algorithms.

In addition to access mechanisms, the DBM system provides flexible growth of ODD (for the AM and SM) and memory management. In memory management functions, the DBM acts as an interface between users of the data base and the operating system.

2.3.7.2 Recent Change and Verify

The RC system provides the ability to change the system data base to reflect changes in customer or system capabilities. The VFY system provides the ability to determine the contents of the system data base. The RC/VFY system is composed of three steps:

- ☐ interpret the RC/VFY message to determine the appropriate view and data entries to be made
- ☐ determine that the RC/VFY message is complete and consistent
- ☐ make the changes in the data base consistent with the RC message or obtain the information from the data base requested by the VFY message

The RCs are made by entering new data in a form displayed on a video display terminal. The existing and/or default values are displayed automatically and only the entries to be changed must be entered. A VFY request uses the same display format as the RC.

2.3.8 RSM SOFTWARE

2.3.8.1 Overview

The RSM call processing architecture design objectives are threefold:

- (1) to process intra-RSM calls totally within the RSM
- (2) to simplify the provisioning of custom calling features in the RSM
- (3) to minimize the differences in operation between operating when linked to the host and when that link is not operable

The maintenance philosophy employed in the RSM is an extension of the 5ESS[®] switch concept of a network of loosely coupled processors. Recovery and maintenance strategies for the RSM are largely the same as those for the host SM.

The switch personnel is given the ability to add or remove RSM specific hardware from the RSM and

associated host SM. The 5ESS[®] switch host provides centralized maintenance control over the RSM, requiring switch personnel to be at the remote site only for circuit pack replacement. In addition, growth procedures are provided to allow RSMs to be added to or removed from an existing 5ESS[®] switch.

The RSM has certain data base relations for call routing that exist in the AM/CMP but do not exist in other SMs. When these relations are updated by recent change, they are updated both in the AM/CMP and the appropriate RSMs. There are also usage and maintenance counts that are handled by the administrative services software indicating the traffic over the T1 links between the RSM and its host SM.

2.3.8.2 RSM Call Processing

2.3.8.2.1 General

The RSM provides a full complement of line-oriented services. It supports all line types, including coin, single-party, multiparty, and hotel/motel. The RSM also offers the customer a complete set of 5ESS[®] switch digital system custom features. In addition, the software supports the same trunking capabilities as the host.

2.3.8.2.2 Routing of RSM Calls

The RSM calls between subscribers on the remote module lines are completely processed within the RSM. After collecting the digits for a call, the RSM transfers control to its own local call routing software. This software determines the identity of the called customer line without communication with the AM/CMP. However, if the destination of the call is a line outside the RSM, the AM/CMP is required to determine the destination address.

2.3.8.2.3 Digital Connections

Calls between SMs at the host site involve time division switching at the TSI in each SM and space division switching at the TMS. A digital path from an RSM line to a line on another module requires an additional stage of time division switching at the associated host SM. This extra switching stage requires additional software to set up and tear down these paths. Each digital path through the host SM is set up and controlled by a special terminal process in the host.

Each RSM allocates and deallocates its own time slots in both linked and stand-alone modes. For SMs at the host site, the AM/CMP controls the allocation and deallocation of the time slots that connect originating and terminating modules. Only a portion of the RSM time slots are connected to T1 digital facilities. The remaining time slots are used for connecting intra-RSM digital paths through a loop-back arrangement in the TSI. If none of the RSM time slots are available, idle time slots connected to T1 facilities can be used for intra-RSM calls.

2.3.8.2.4 Multimodule RSM Linked Mode

The MMRSR linked mode of operation refers to the normal operating mode of the RSMs. In the linked mode, each RSM is able to send messages to any other module using the message switch in the CM. Messages are passed between the RSMs in the MMRSR using the control time slots on the T1 links to the host and the message switch component of the CM. Because the RSMs in the MMRSR communicate in this manner, all interprocessor messages within the 5ESS[®] switch pass through the message switch during linked operation.

During the linked mode, any feature provided by the host 5ESS[®] switch is also available in the RSM.

2.3.8.2.5 MMRSR Stand-Alone Mode

If the umbilical T1 links from an RSM to the host are cut, or the RSM cannot complete calls to the host for any reason, then the RSM enters an operating state called stand-alone. If some, but not all, of the RSMs in

an MMRS cannot complete calls to their hosts, then the MMRS is in partial stand-alone. If no RSM can complete calls to a host, then the MMRS is in full stand-alone.

During full stand-alone operation, the RSMs in the MMRS communicate directly with one another over the derived data link of the ICLs. The derived data link uses every other framing bit of a T1 link for data transmission. During partial stand-alone operation, communication between the modules in stand-alone takes place over the derived data links. In the linked mode, the RSMs communicate using the control time slots of the umbilical T1 links. The derived data links are not used during linked operation.

During stand-alone operation, the MMRS provides, on an optional basis, continued call processing. Billing during stand-alone operation is also provided as an option. Most custom calling features are also available; however, some full feature capabilities may not be available. For example, during any partial stand-alone situation, calls originating at the host which are to terminate on global hunt groups at the RSM are not completed. A global hunt group is defined as one which is under the control of the AM/CMP (SMs with the 5E5 software release), while a local hunt group is controlled by an RSM. However, calls to local hunt groups on RSMs still linked to the host are completed. During stand-alone, OSs are unavailable. If an RSM is equipped with the optional 13A recorded announcement system, then calls may be routed to any announcements normally available, during stand-alone operation. In addition, a special announcement may be provided for calls which cannot be completed due to the stand-alone state of the RSM.

2.3.8.3 Maintenance Software

2.3.8.3.1 Human-Machine Interface

The MCC displays and switch personnel input/output messages specific to the RSM are provided to add full RSM maintenance capability at the host site. These additions provide the switch personnel with a consistent view of the switching module, showing the associations between the RSMs and their host SMs.

At the RSM site, the remote alarm unit provides audible and visual display of alarm states (critical, major, or minor) and RSM status. The status indicators include: switch hardware off-normal, building/power/miscellaneous alarms, processor sanity, and stand-alone operation conditions. Furthermore, key switches are provided to manually force an RSM processor initialization, to request a software controlled test of the alarm system, and to reset the alarm indicators.

The software continuously monitors the alarm scan points for building, power, and miscellaneous alarms at the remote site. This software also includes full switch personnel interface capability via MCC display pages and switch personnel input/output messages alerting switch personnel at both the host and remote sites when an alarm condition is detected.

2.3.8.3.2 Switch Maintenance

Initialization of the control communication path from the RSM to the CM is patterned after that used for standard SMs. Link initialization is somewhat more complex in an RSM due to the added remoting hardware and the routing of the paths through the host SM. The RSM design takes advantage of the added degree of independence afforded by the additional switching stage in the host SM, permitting the remote link interface (RLI) to be reconfigured without a coordinated reconfiguration of the CM and other SMs. This permits greater flexibility in the RLI and facility configurations, adding significantly to the reliability of the remoting scheme.

The maintenance strategy employed for the RLI is an extension of that used for existing DLI maintenance software. However, the error analysis and fault recovery programs are modified to include additional hardware error possibilities and configuration constraints.

2.3.8.3.3 Recovery Strategy

The memory of the RSM is initialized from host office disk storage on initial startup or during recovery from catastrophic system failures in much the same way as a standard SM. For the RSM initialization, however,

special software is available to set up the data path through the host SM and over the digital remoting facilities.

2.4 SYSTEM OPERATION

2.4.1 THE SWITCHING PATH

The major aspects of the 5ESS[®] switch switching path are shown in Figure 2-36. In general, an intermodule call goes through a time-space-time switching path.

Each SM contains a number of interface units that provide the actual physical terminations. For the case of a typical line-to-line POTS call, each interface unit contains a space-division concentrator which provides up to 640 analog lines with access to 64 digital, time-multiplexed time slots. Each of these time slots contains 16 data bits, 8 of which are the PCM code for the analog signal which is sampled 8000 times per second.

These 64 time slots are organized into groups of 32 on two PIDBs. Each PIDB carries a serial data stream made of frames of 32 data words repeated each 1/8000 sec (125 microseconds). The PIDBs from all interface units in an SM converge on the peripheral side of the TSI.

The TSI has the ability to reorder any of the 512 time slots arriving at its peripheral side to any of the 512 time slots leaving its network side (out of the SM) for transmission to another SM. This time-switching property allows the calling and called parties to occupy different time slots on the peripheral side of their respective SMs (for intra-SM calls, the time slots are simply transferred from one PIDB to another through the TSI through a similar process).

The network side of the TSI is connected to the NCT high-speed, fiber-optic links which carry the time slots to another SM via the CM. One NCT link carries the 256 odd time slots, and the other carries the 256 even time slots. The CM also provides the timing interface for office synchronization.

The pairs of NCT links from each SM terminate on the TMS. The TMS has the ability to connect time slots (odd-to-odd and even-to-even) from one SM to another through an electronic crosspoint connection (space switch). This switch can be configured differently for each of the 512 time slots. In this way, full interconnection can be provided between the SMs.

At the terminating SM, the TSI acts to reorder the arriving NCT time slots for proper sequence as they are distributed to the PIDBs. The remote interface unit then demultiplexes the PIDB time slots, performs digital to analog conversion, and completes the path to the remote termination.

The interface units and TSI are controlled by the SMPU, and the TMS is controlled through messages from the AM/CMP processor. All switching elements and links have a receive half and a transmit half that operate simultaneously.

2.4.2 CONTROL PATH

Call processing and many other 5ESS[®] switch functions require coordinated activities between SM processors and between the AM/CMP processor and SM processors. To facilitate this coordination, special message channels are provided for interprocessor communication. These channels, which share the call-carrying inter-SM links, are designed to transmit packets of information within X.25 level 2 frames. This technique is consistent with the advanced, process-oriented nature of the 5ESS[®] switch operational software and supports the loosely coupled nature of the distributed processing complex.

To avoid using a dedicated control bus for SMs, the 5ESS[®] switch uses one time slot of each NCT link to carry control information. This control time slot is fixed by hardware strapping for each SM and cannot be used for call data. The control time slots transport bi-level messages between SMs and between SMs and the AM/CMP.

2.4.3 COMMUNICATION

2.4.3.1 General

Each SM has two independent data paths, one through each NCT link. The two CTSS terminate on different MMPs and can be used in a load-sharing mode where they handle messages simultaneously. Communication between SMS, between SMS and the AM, or between SMS and the CMP, are handled in a similar way. The messages are sent to the MSG, the destination address is read and interpreted, and the message is delivered to the proper receiving entity.

2.4.3.2 SM Communication

The SMS provide an interface to lines and trunks. Information arriving at the SM is first digitized and can then be switched to other terminations on the SM or to other SMS.

The interconnection between peripheral terminations is accomplished with a time-space-time interconnection network. The outputs of the terminating interfaces are first time multiplexed into two 256-time-slot buses and then terminated on the peripheral side of the TSIU. The network side of the TSIU is connected to two NCT links that carry the time slots to the TMS. One of these links is dedicated to the even-numbered time slots, while the other carries the odd-numbered time slots. The TSIU has the ability to connect any peripheral time slot to any time slot on either of the two NCT links.

The pairs of NCT links from each SM terminate on the TMS. The TMS has the ability to connect any single time slot from one SM to the same time slot in another SM through crosspoint connections, with the restriction that even time slots are connected to evens, and odd time slots to odds.

The connections between SMS can be reconfigured differently for each of the 512 time slots. In this way, full interconnection can be provided between the SMS, so that the TMS is an essentially nonblocking switching network. Note that "blocking" occurs when a connection between two terminals cannot be found in the current configuration of a switching network.

2.4.3.3 AM-to-SM Communication

The SM performs many of the call processing and maintenance functions. However, overall system maintenance, and many aspects of system level initialization require the AM processor. Inter-SM call routing for trunk call processing is performed by the AM/CMP.

To avoid using a dedicated control bus from the AM processor to each SM processor, one time slot of each NCT link is used to carry control information. This CTS is fixed by hardware strapping for each SM and is not used for call data.

A message is transmitted from the AM processor to the SM processor as follows:

- (1) The message is assembled in MAS and queued for transmission. The message contains the SM destination as well as the expected interprocess protocol.
- (2) The MSCU polls the AM for messages and receives them from the AM memory through a high-speed serial data link. The MSCU determines which SM is to receive the message and then transfers the message to the MMP assigned to that SM.
- (3) The MMP then queues the message for transmission to the SM using X.25 level 2 protocol, with hardware assistance by an synchronous data link controller (SDLC) chip. The message is then sent over the CTS to the message interface control unit (MICU), where it is time multiplexed onto a single NCT link with the messages destined for the other SMS. This control NCT link contains only control time slots whose configuration and sequence are predetermined (that is, each particular control time slot is uniquely associated with a particular SM).

- (4) The control NCT link from the MICU terminates on the TMS, which performs the switching of each CTS to the proper SM in sequence. In this way, the CTS is inserted into the time slot stream on the proper NCT link. The CTS position is "nailed-up" so that the TMS must repeat the same connection for each frame (256 time slots) between the MICU and the SM.
- (5) At the SM, the NCT link terminates on the DLI. The DLI strips out the CTS and sends it to an SDLC circuit in the SM. This SDLC checks protocol and transmits the message to the SM memory. The module processor performs the remaining level 2 protocol functions.

A similar set of events occur for messages sent from the SM processor to the AM processor.

The CTS system has several levels of error checking which are used in isolating faulty hardware. These errors are grouped as level 1 and level 2 errors. Level 1 errors are comprised of parity errors, synchronization errors, etc. Level 2 errors consist of SDLC protocol errors between the SM and the MMP. Much of the hardware is self-checking and can report other types of errors, such as overflows, time-outs, etc.

Another method of AM-to-SM communication is the central processor intervention (CPI) media. The CPI allows the AM to send messages that bypass the MMPs and do not require the attendant level 2 protocol.

The CPI messages are carried in a dedicated bit position in each control time slot. Special circuitry in the message interface and control unit is used to insert the message under the control of the AM. The MMP and the SDLC protocol are entirely avoided.

The CPI messages are used as control messages where speed and directness are needed. They cannot be used for general purpose messages, however, because of their relatively small data size and low transmission rate for individual SM messages.

2.4.3.4 SM-to-SM Communication

The inter-SM communications are handled over the CTSs similar to AM-to-SM communications. Messages from one SM destined for another SM are sent to the MSG through the CTS. The MSCU recognizes that the destination is another SM and transfers the message to the appropriate MMP. Fractional switching on SM-2000 allows the following types of ISDN calls:

- ☐ Intramodule calls on HSM-2000, LSM-2000, and EXM-2000.
- ☐ Intermodule SM-2000 calls:
 - ☐ EXM-2000 to EXM-2000, LSM-2000, or HSM-2000
 - ☐ LSM-2000 to LSM-2000, or HSM-2000
 - ☐ HSM-2000 to HSM-2000
- ☐ Intermodule SM/SM-2000 calls:
 - ☐ LSM to EXM-2000*, LSM-2000, or HSM-2000
 - ☐ HSM to EXM-2000*, LSM-2000, or HSM-2000
 - ☐ ORM to EXM-2000*, LSM-2000, or HSM-2000
 - ☐ TRM to EXM-2000*, LSM-2000, or HSM-2000
 - ☐ RSM to EXM-2000*, LSM-2000, or HSM-2000 (via IMTs)

- DNU-S terminations for wideband-capable PRI trunk groups

2.4.3.5 AM-to-CM Communication

The AM must have a control interface with the MICU and the TMS. Since these elements cannot be controlled through the NCT link network, a special interface medium, the control and diagnostic access link (CDAL), has been provided. The CDAL operates as follows:

- (1) A message is queued in the AM. The MSCU relays the message from the AM to the FPC.
- (2) The FPC, after queuing and reformatting, retransmits the message along a serial link to the subdevice. The address of the subdevice to be accessed is part of the CDAL protocol.

2.4.3.6 AM-to-CMP Communication

A message to be passed from the AM to the CMP is queued in the AM. The MSCU then relays the message from the AM to the CMP. Similarly, a message to be passed from the CMP to the AM is queued in the CMP. The MSCU then relays the message to the AM.

2.4.3.7 CMP-to-SM Communication

A message is transmitted from the CMP to the SM processor as follows:

- (1) The message is queued for transmission in the CMP.
- (2) The MSCU receives the message from the CMP. The MSCU determines which SM is to receive the message and then transfers the message to the MMP assigned to that SM.
- (3) The MMP then queues the message for transmission to the SM using X.25 level 2 protocol, with hardware assistance. The message is then sent over the CTS to the MICU, where it is time multiplexed onto a single NCT link with the messages destined for the other SMs. This control NCT link contains only control time slots whose configuration and sequence are predetermined (that is, each particular time slot is uniquely associated with a particular SM.)
- (4) The control NCT link from the MICU terminates on the TMS, which performs the switching of each control time slot to the proper SM in sequence. In this way, the control time slot is inserted into the time slot stream on the proper NCT link. The control time slot position is ``nailed-up" so that the TMS must repeat the same connection for each frame (256 time slots) between the MICU and the SM.
- (5) At the SM, the NCT link terminates on the DLI. The DLI strips out the control time slot and sends it to an SDLC circuit in the SM. This SDLC checks protocol and transmits the message to the SM memory. The module processor performs the remaining level 2 protocol functions.

A similar set of events occur for messages sent from the SM processor to the CMP.

NOTE: For an explanation of QLPS/QFP methods of message transport on SM-2000 see "Quad Link Packet Switch Network," Section 2.2.3.2, and Figure 2-7.

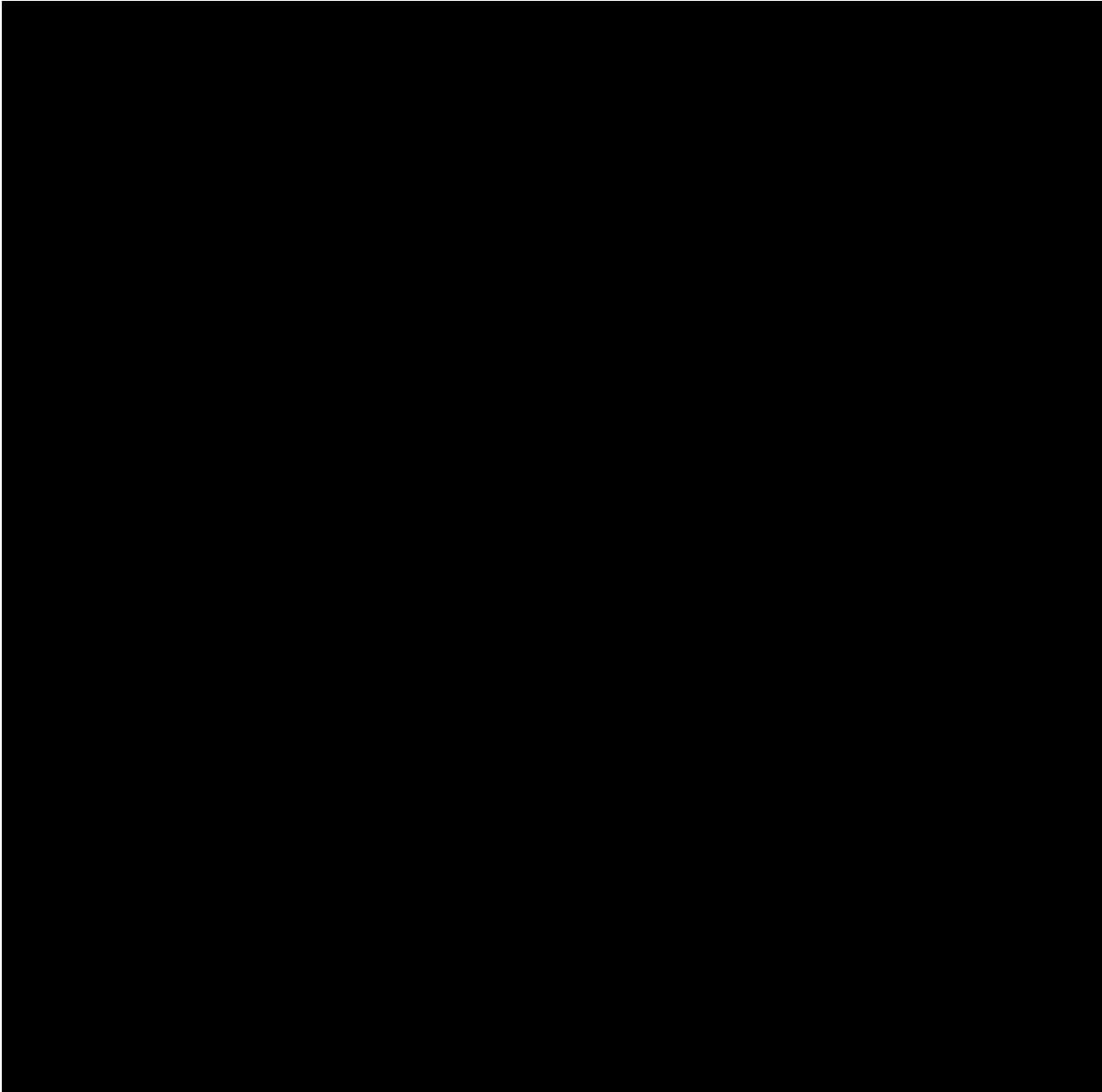


Figure 2-1 5ESS Switch Distributed Architecture 5ESS switch distributed architecture Hardware architecture, 5ESS switch Architecture, 5ESS switch hardware

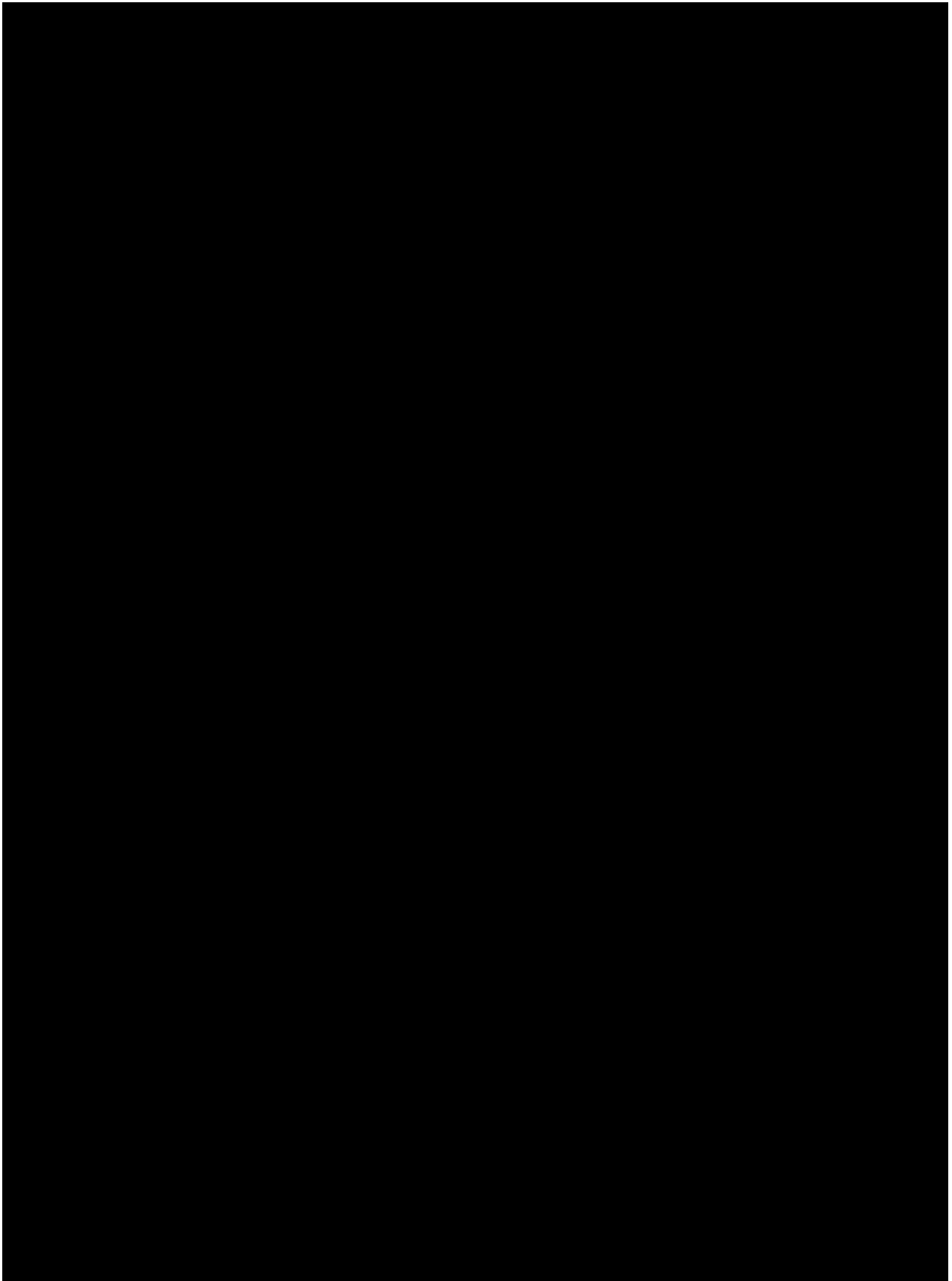


Figure 2-2 5ESS Switch Architecture 5ESS switch architecture Hardware architecture, 5ESS switch Architecture, 5ESS switch hardware

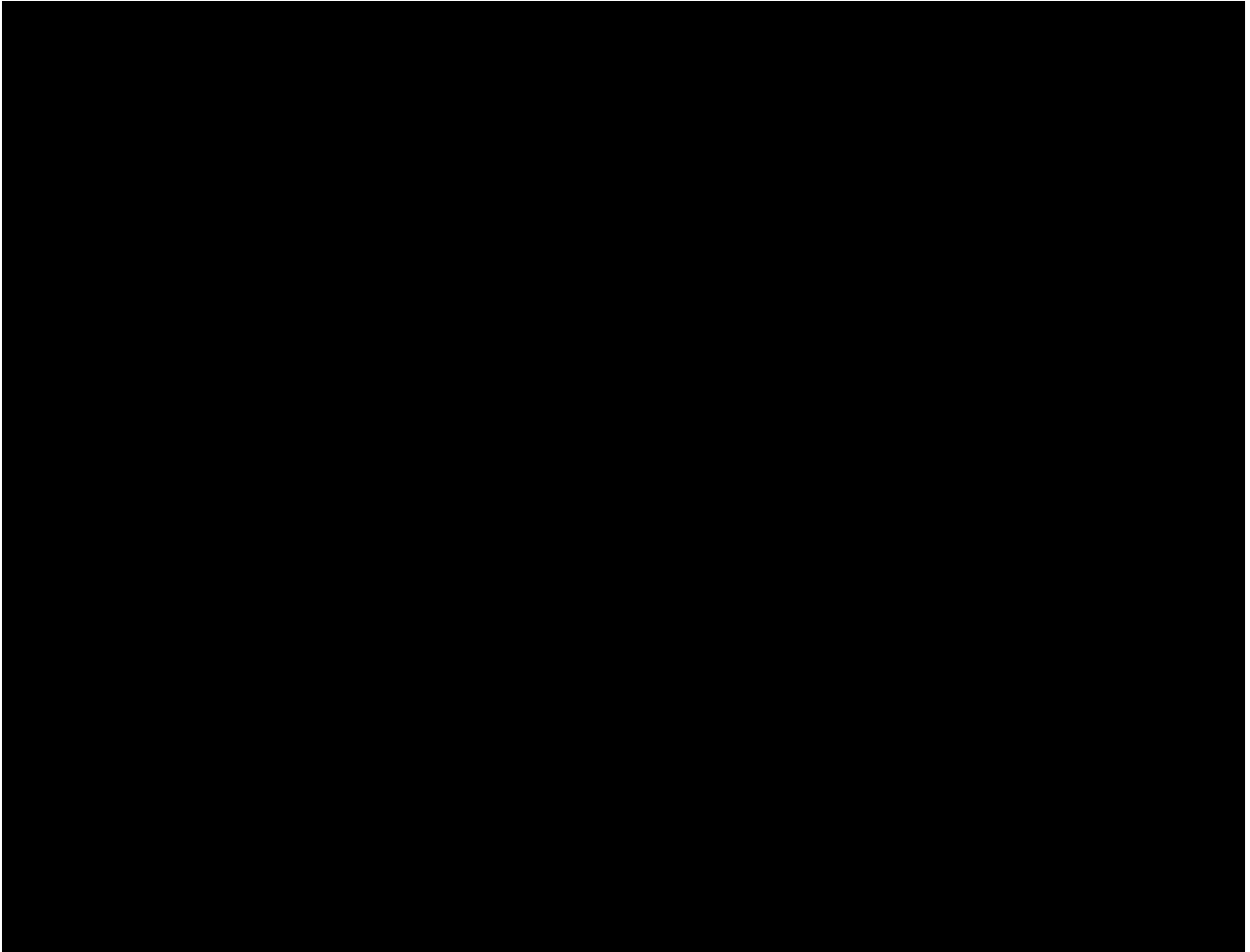


Figure 2-3 5ESS Switch Software Architecture 5ESS switch software architecture Architecture, 5ESS switch software Software architecture, 5ESS switch

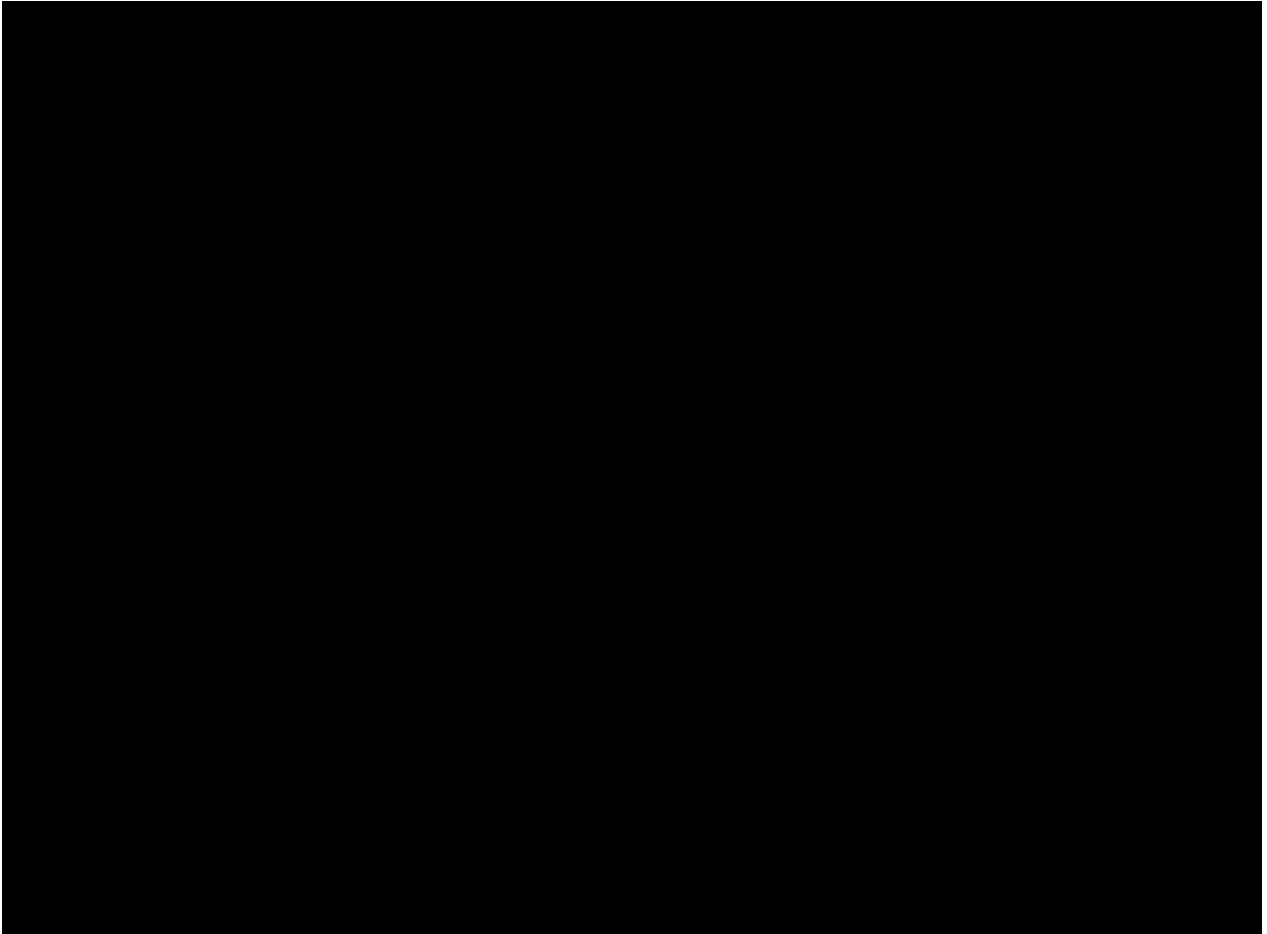


Figure 2-4 3B20D Computer Functional Block Diagram 3B20D computer functional block diagram

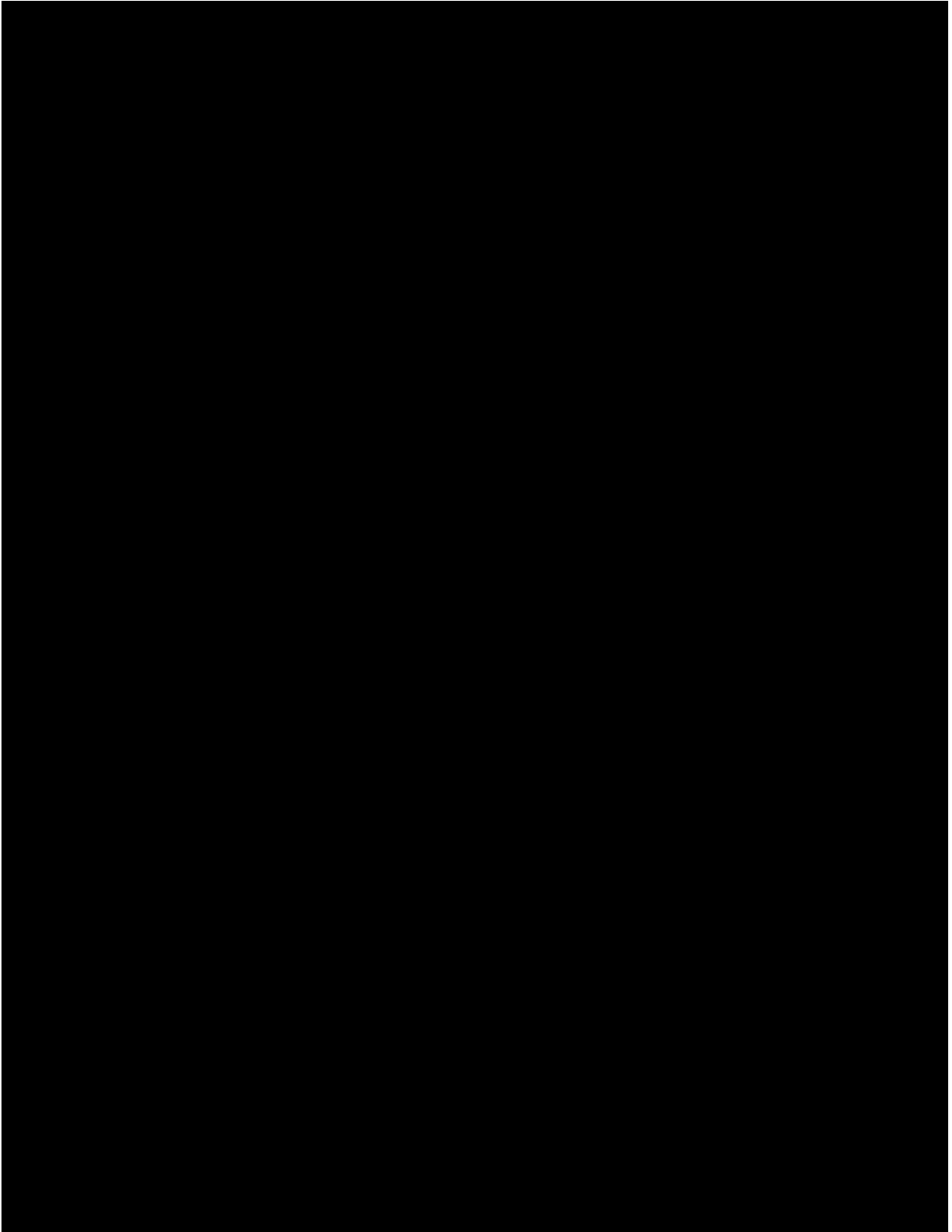


Figure 2-5 3B21D Computer Functional Block Diagram 3B21D computer functional block diagram

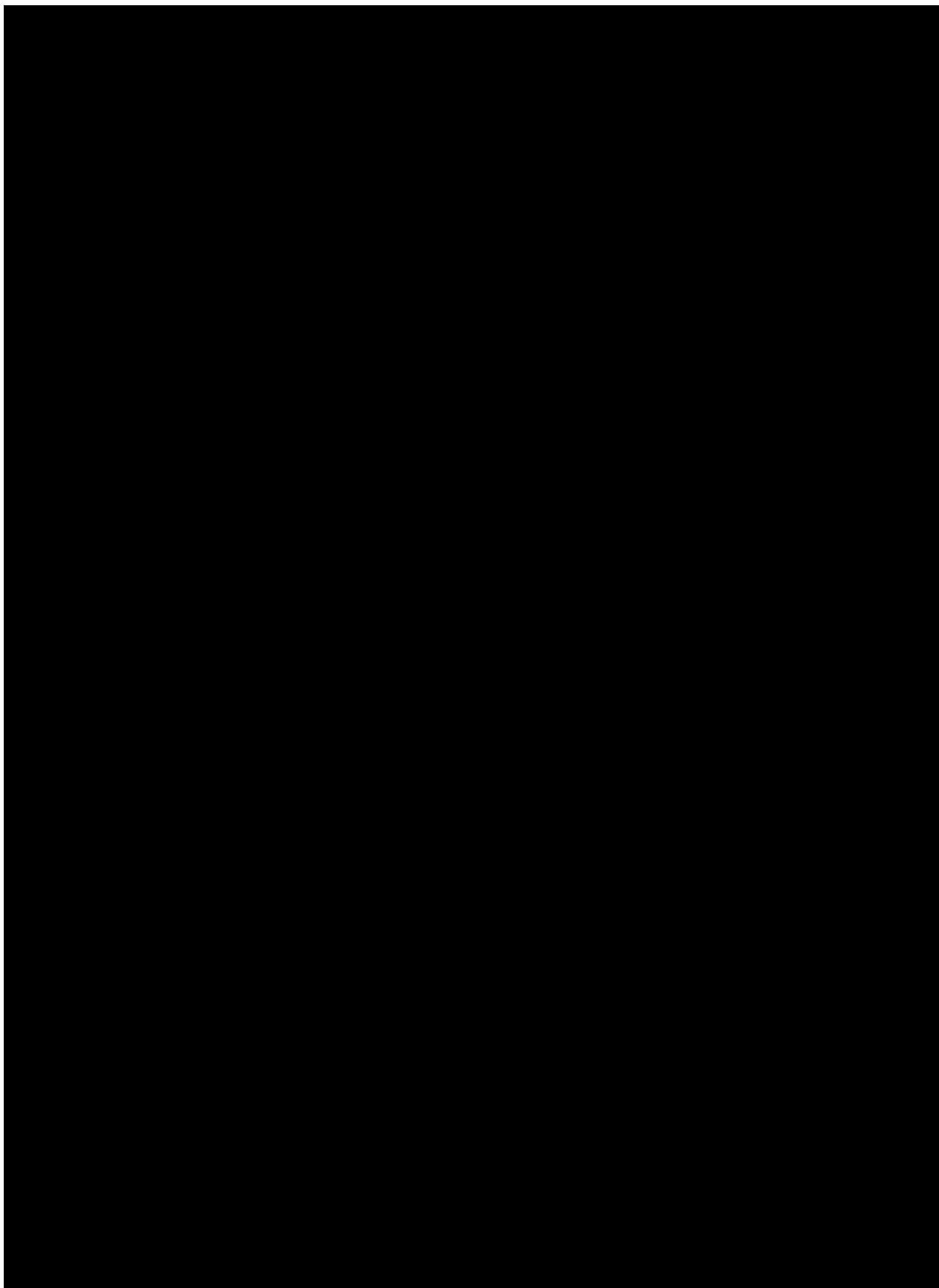


Figure 2-6 Communication Module Block Diagram (CM2 or CM2C) Communication module block diagram

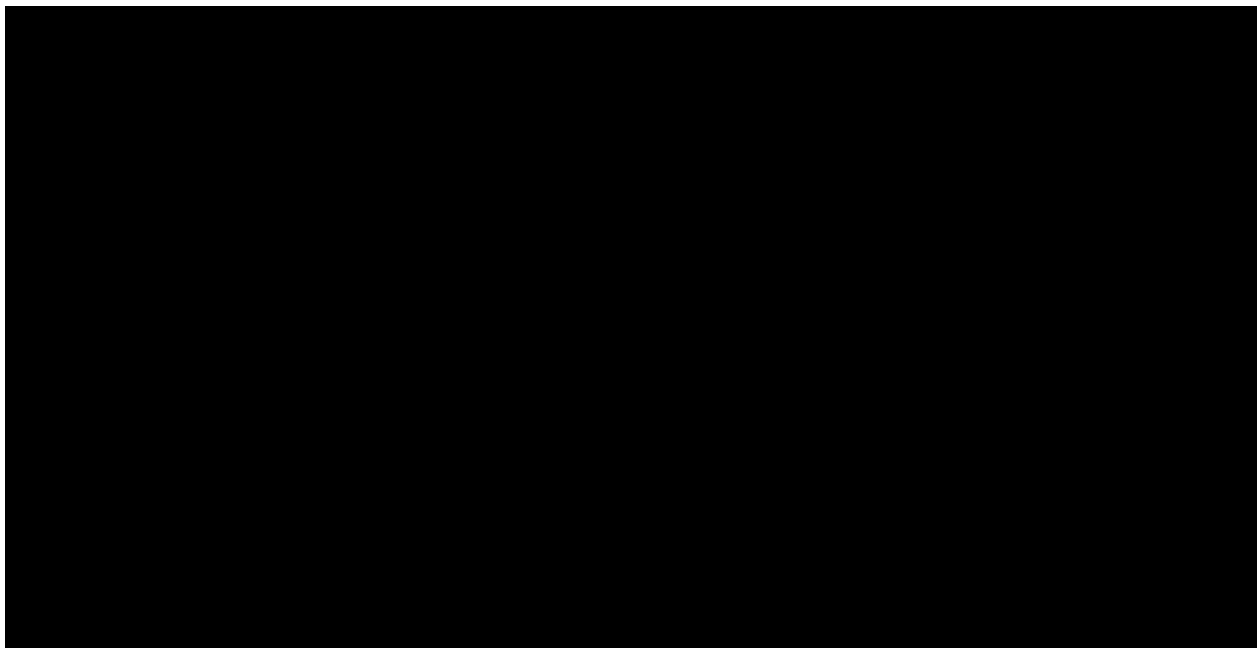


Figure 2-7 Simplified View of QLPS Message Transfer Simplified view of QLPS message transfer

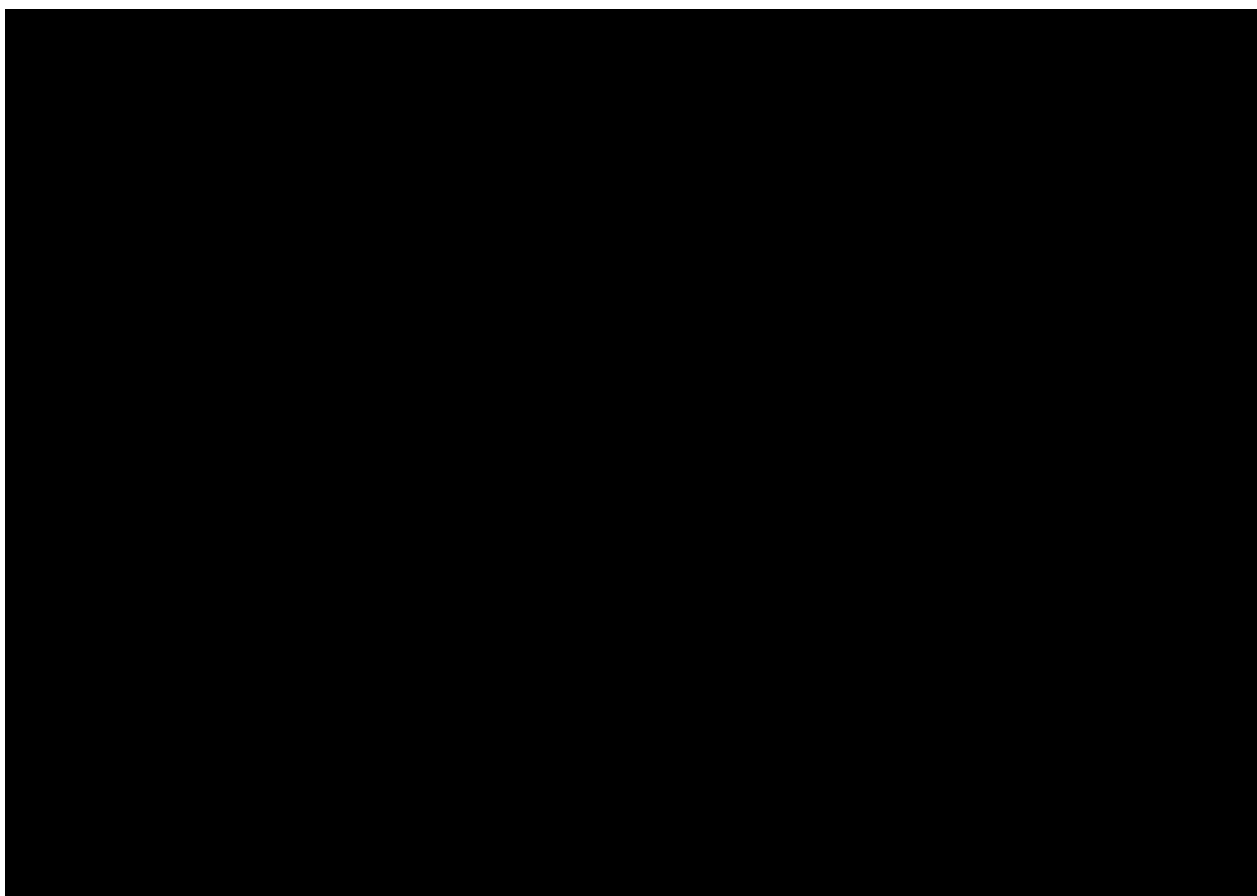


Figure 2-8 Network Control and Timing Link Time Division Layout Network control and timing link time division layout NCT link time division layout Time division layout, NCT link

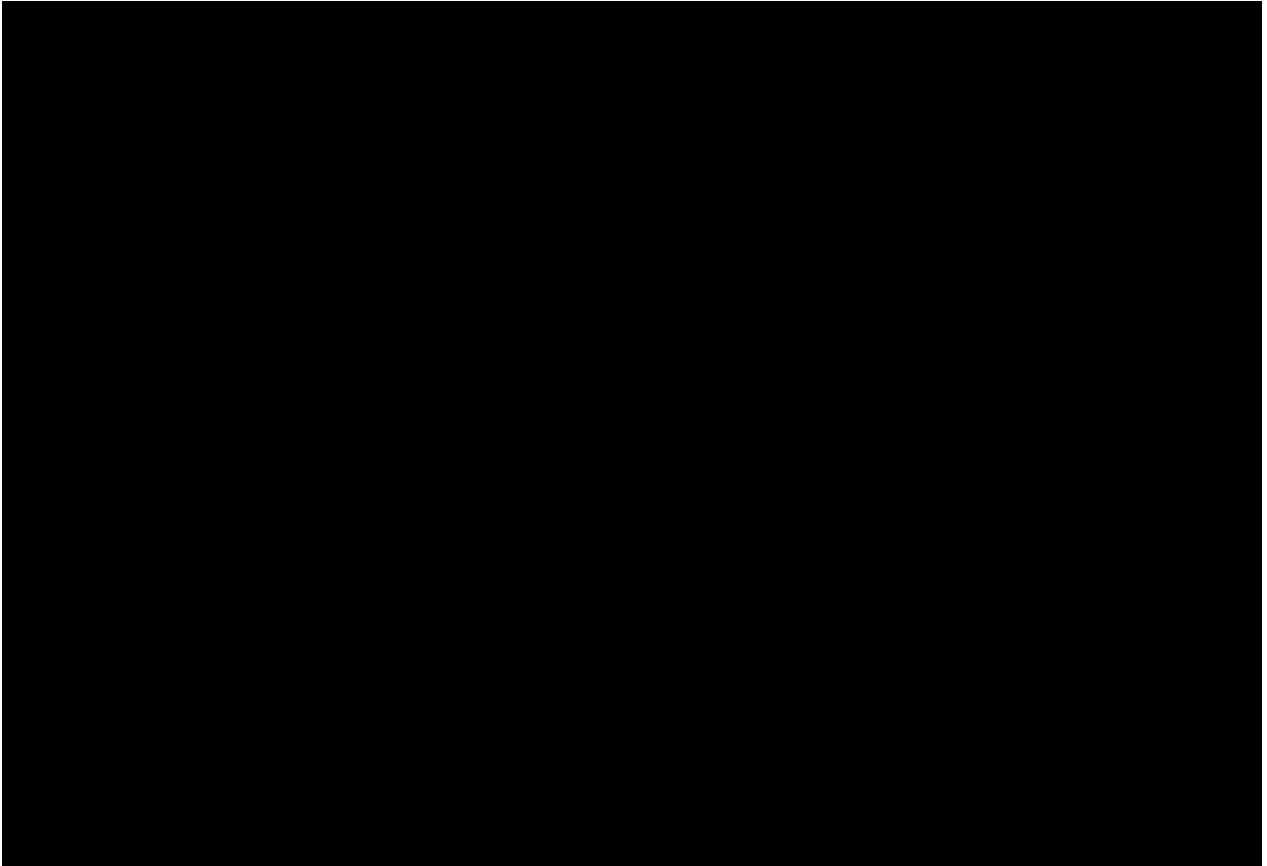


Figure 2-9 5ESS Switch Optically Integrated Remote Module Architecture ORM architecture
Optically integrated remote module architecture

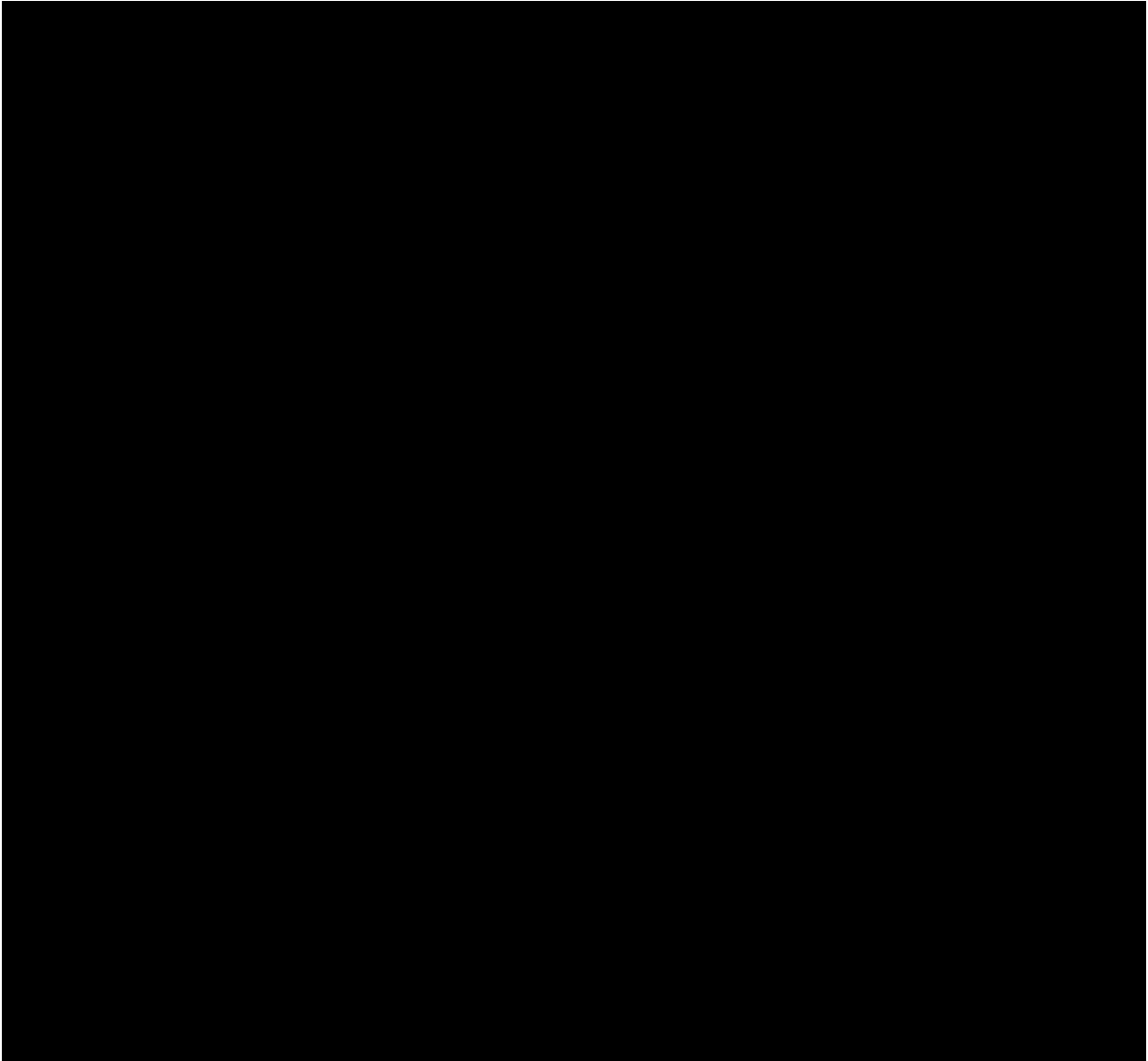


Figure 2-10 Multimodule Remote Switching Module Block Diagram MMRSM block digram
Multimodule remote switching module block diagram

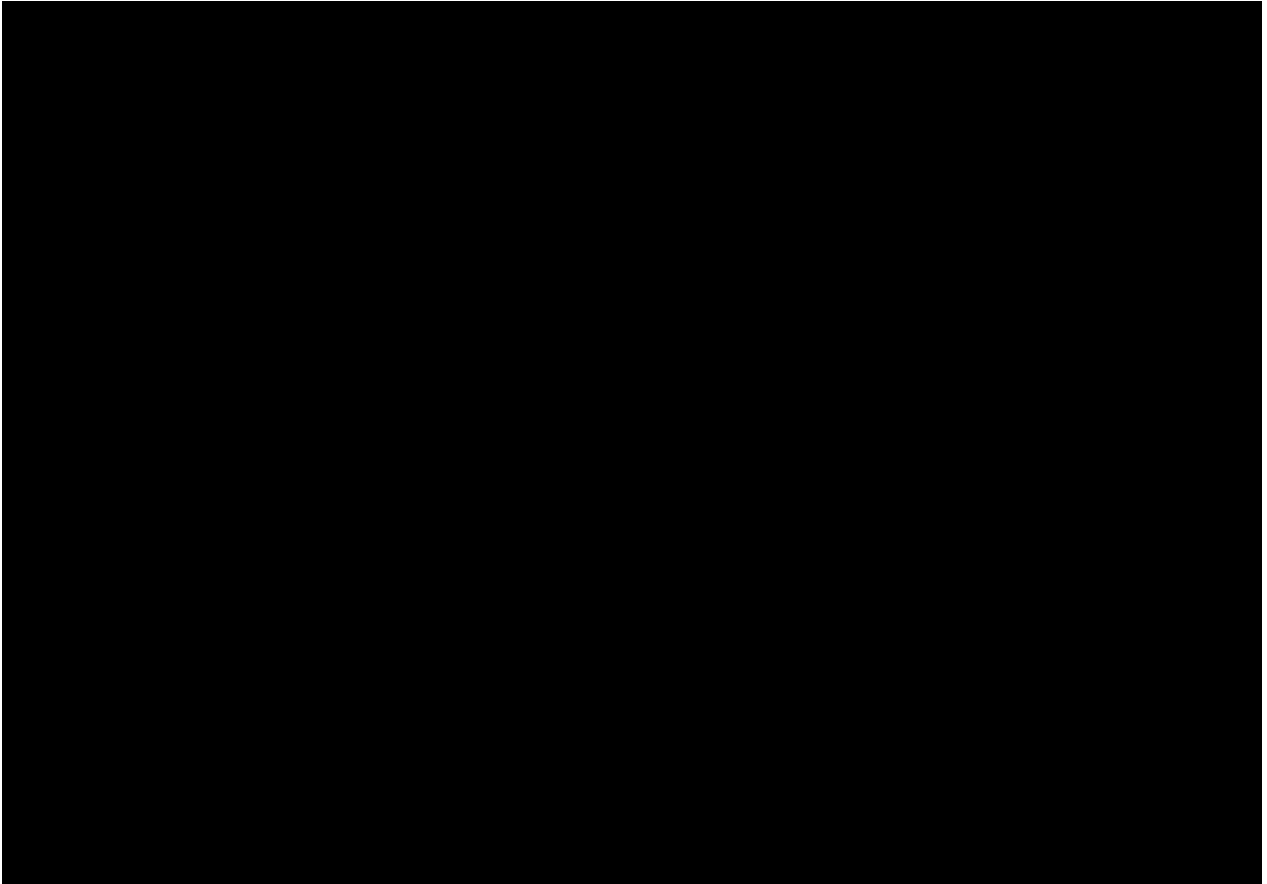


Figure 2-11 Position Switching Module/Remote Integrated Services Line Unit Block Diagram PSM block diagram Position switching module block diagram RISLU block diagram Remote integrated services line unit block diagram

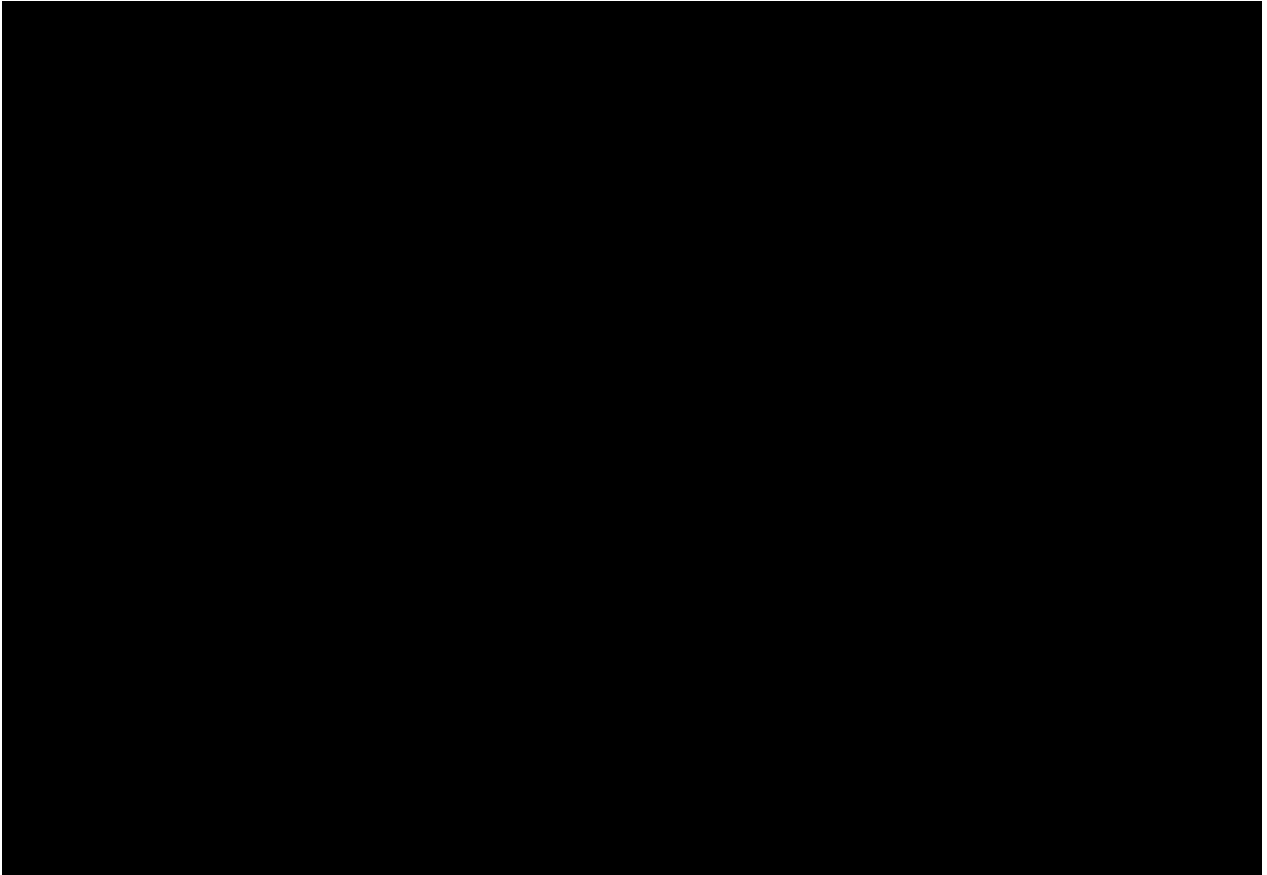


Figure 2-12 Time Slot Interchange Time Slots TSI time slots Time slot interchanger time slots

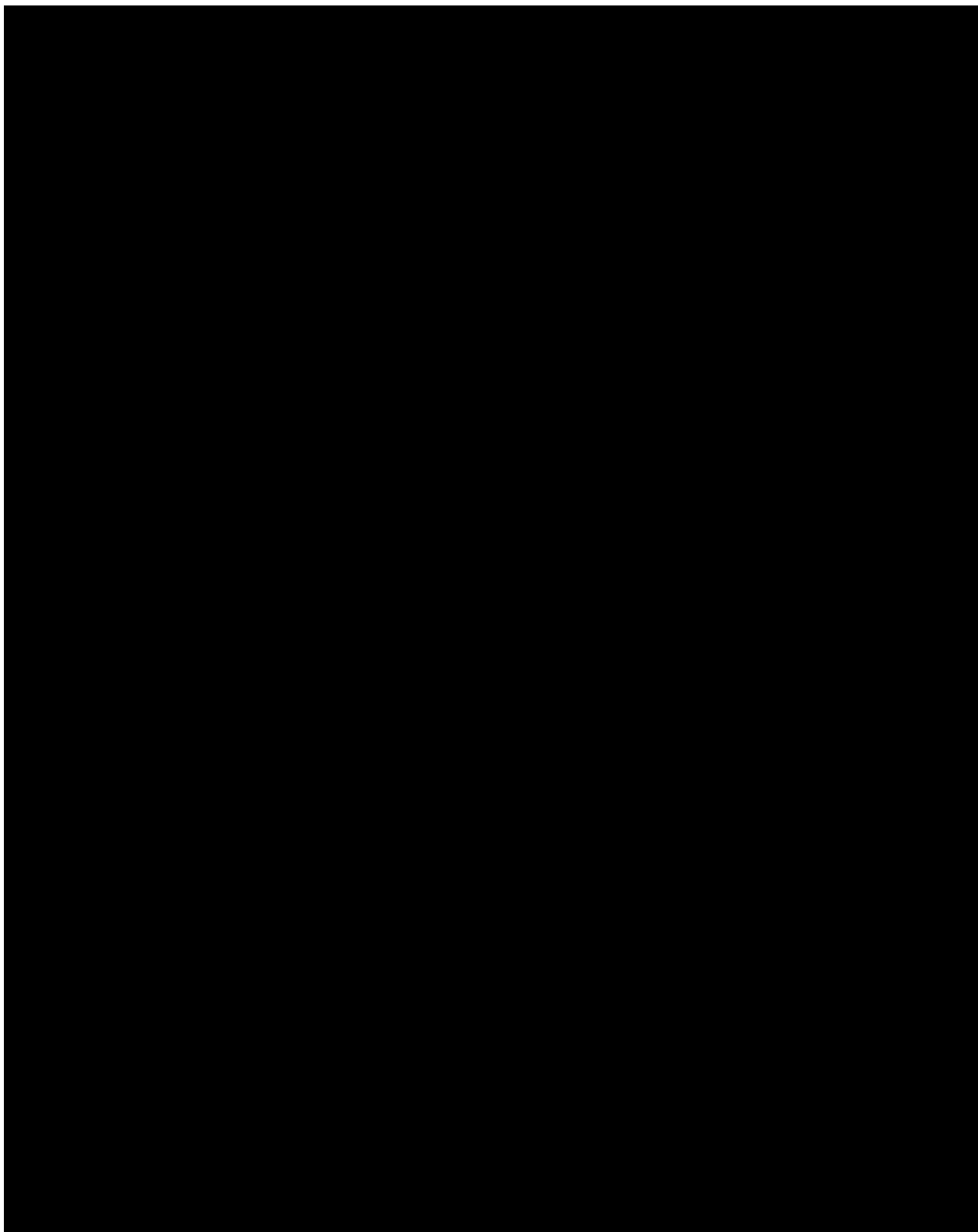


Figure 2-13 Dual Link Interface DLI Dual link interface

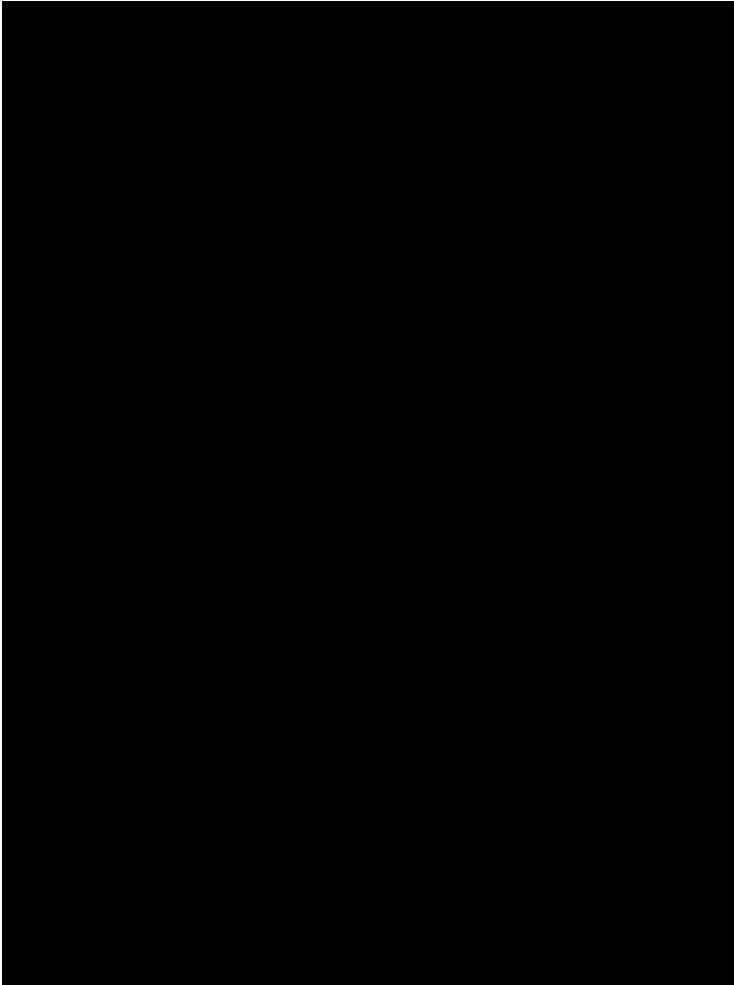


Figure 2-14 MCTU BTR Block Diagram

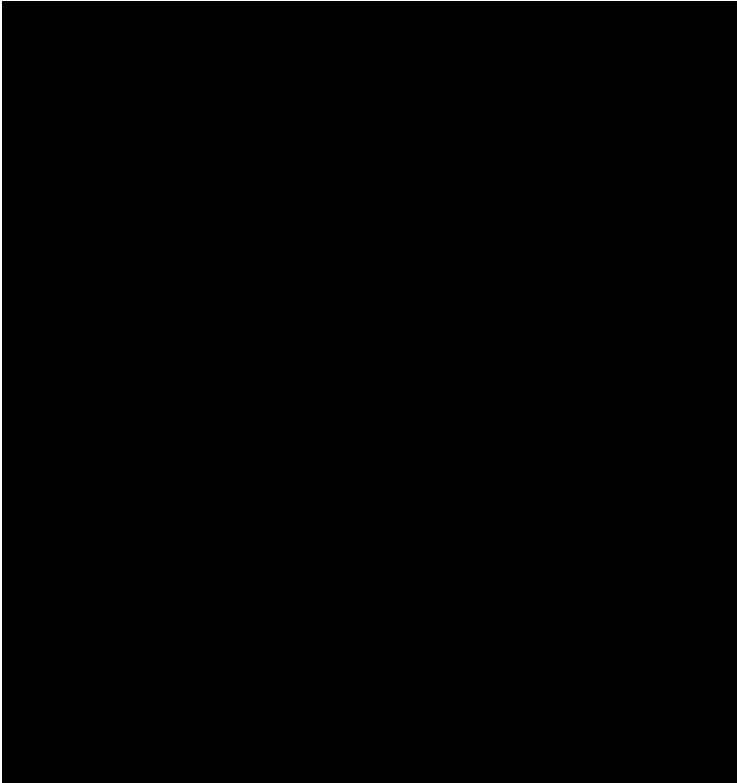


Figure 2-15 MCTU2 BTSR Block Diagram MCTU2 BTSR block diagram

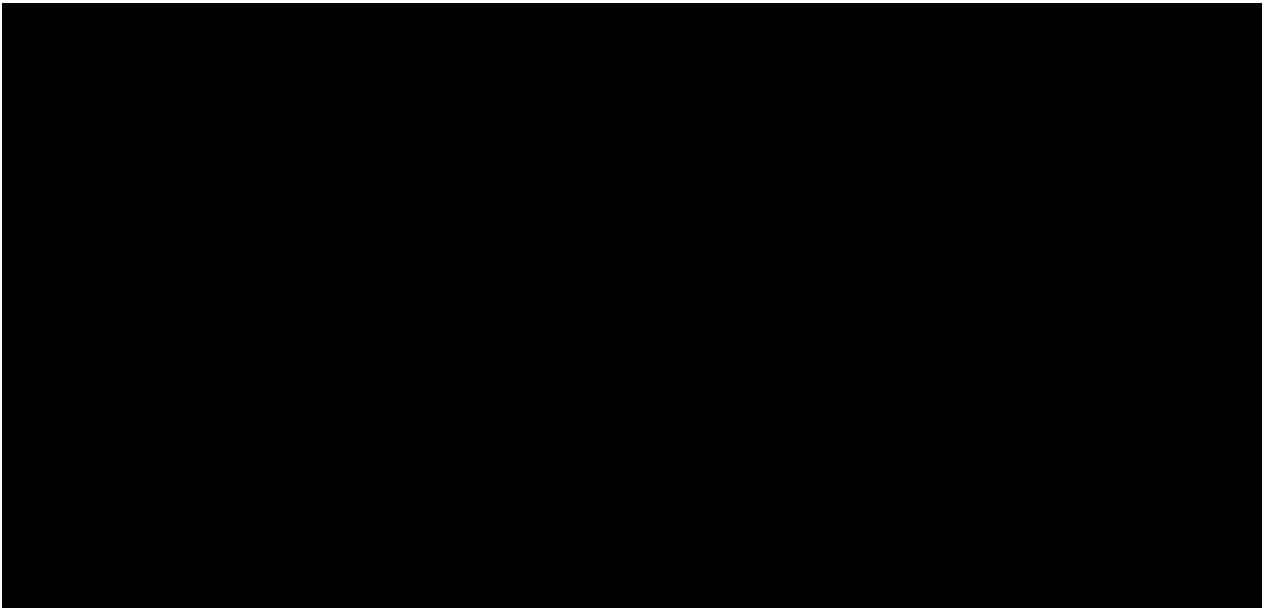


Figure 2-16 Protocol Handler (PH2) Block Diagram Protocol handler (PH2) PH2

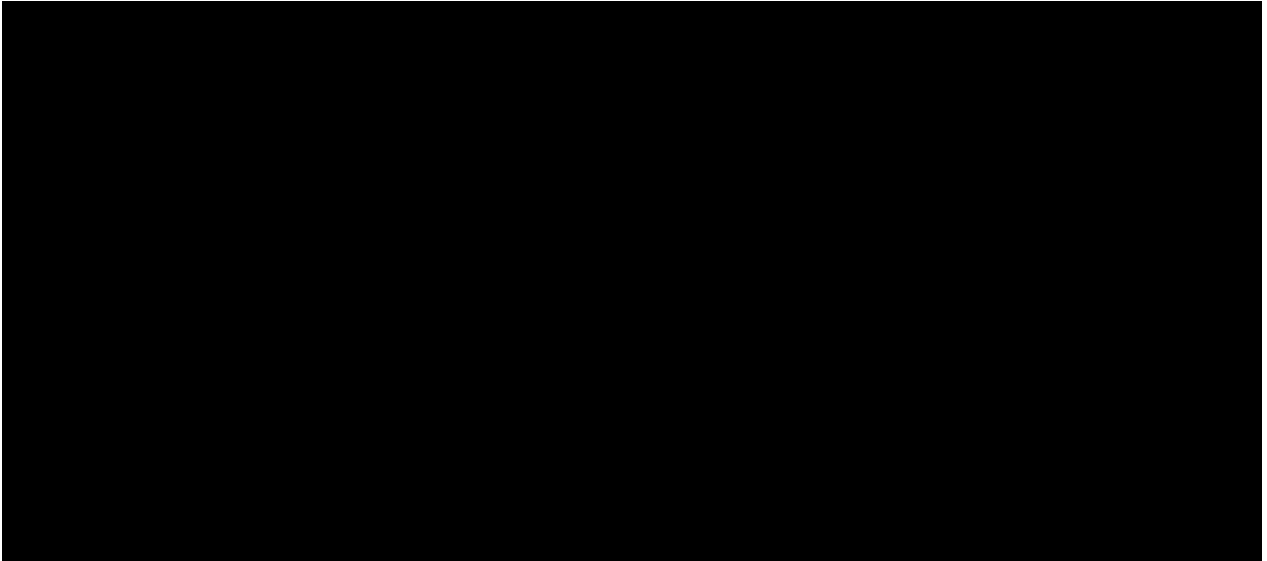


Figure 2-17 Protocol Handler (PH3 and PH4) Protocol Handler (PH3 and PH4) PH3 PH4

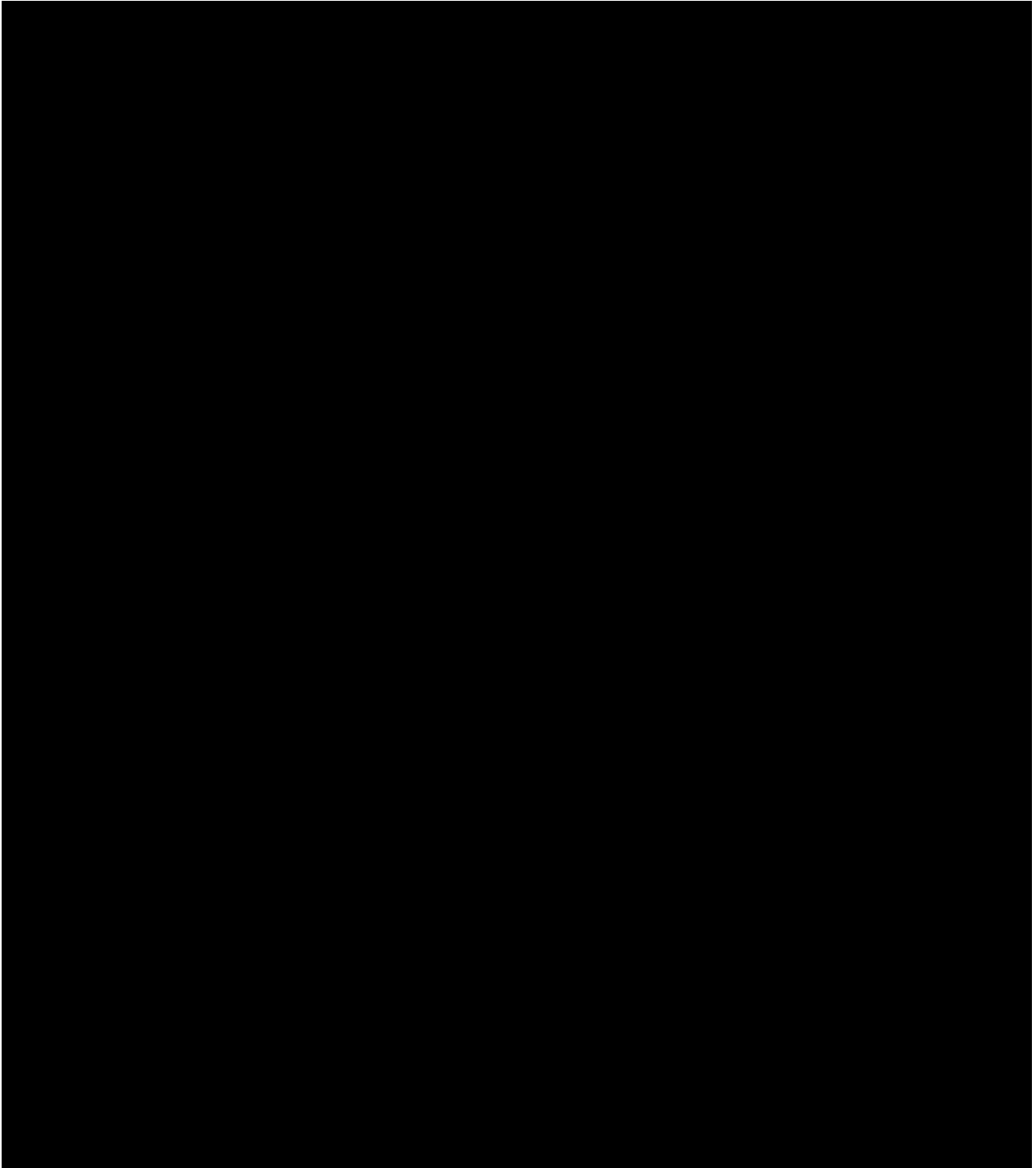


Figure 2-18 Packet Switch Unit (PSU) Block Diagram Packet switch unit (PSU) PSU

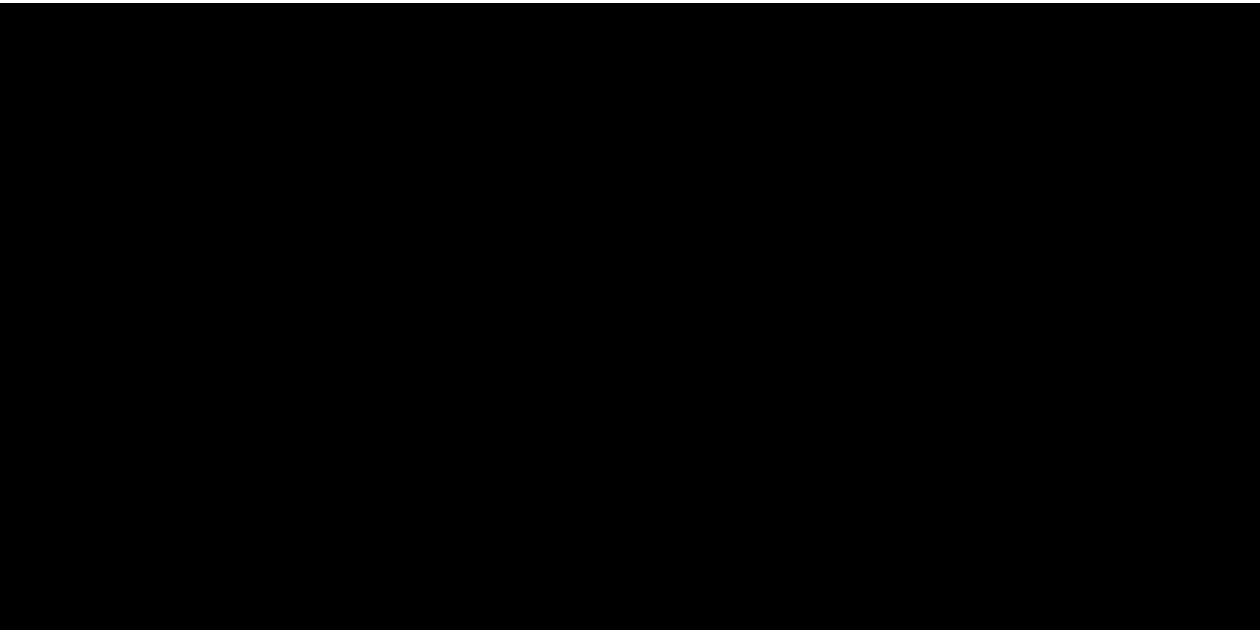


Figure 2-19 Protocol Handler (PHV1, PHV2, PHV3, and PHV4) Protocol handler (PHV1, PHV2, PHV3, and PHV4) PHV1 PHV2 PHV3 PHV4

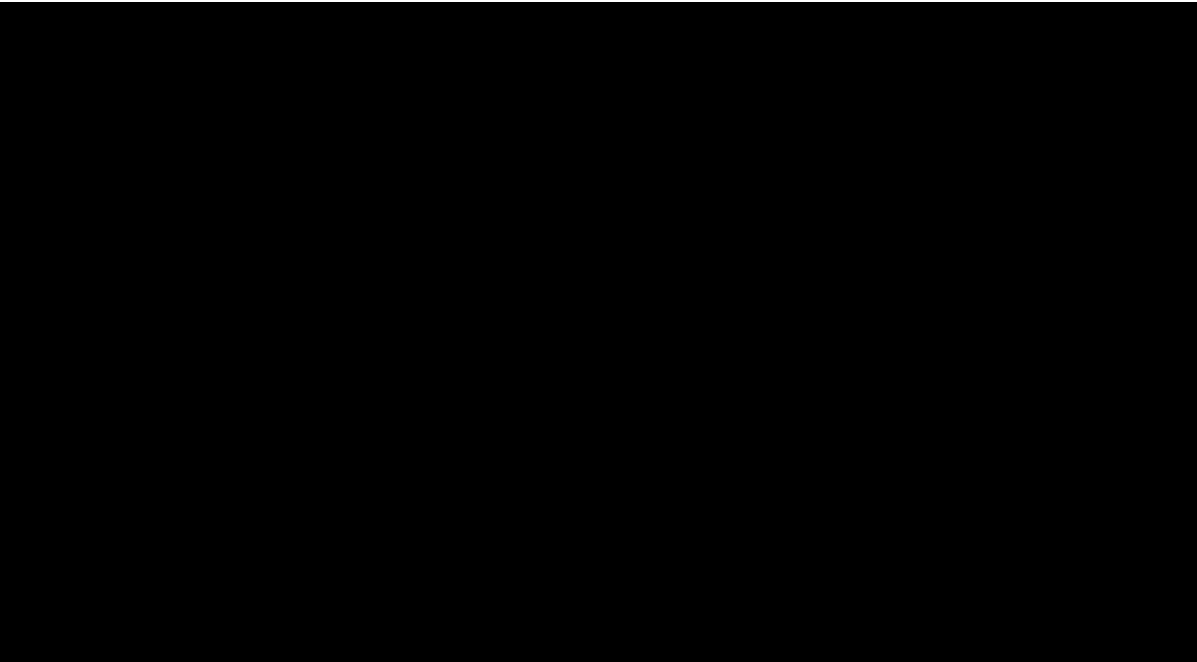


Figure 2-20 Protocol Handler for ATM (PHA) Block Diagram Protocol handler for ATM ATM

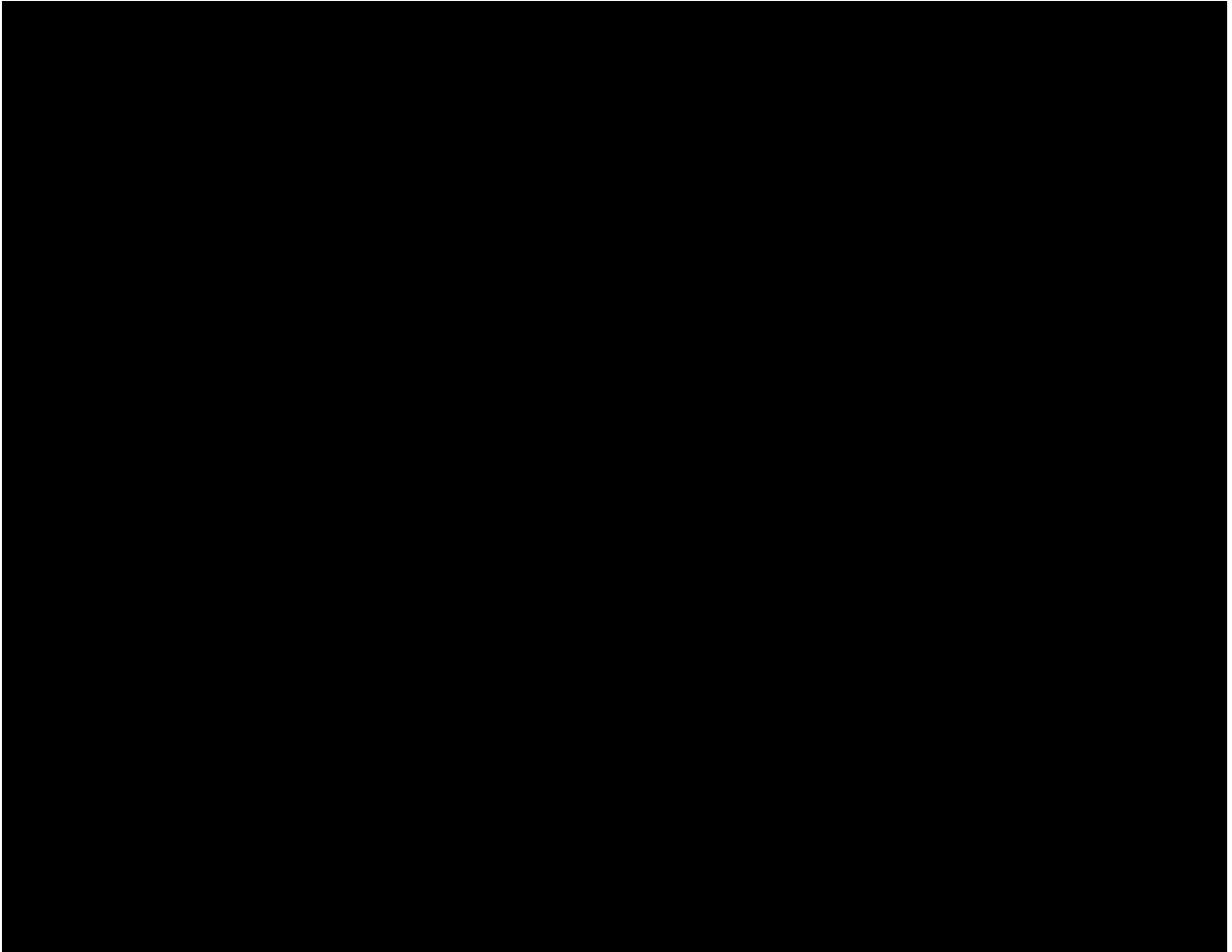


Figure 2-21 Line Unit Organization Line unit organization

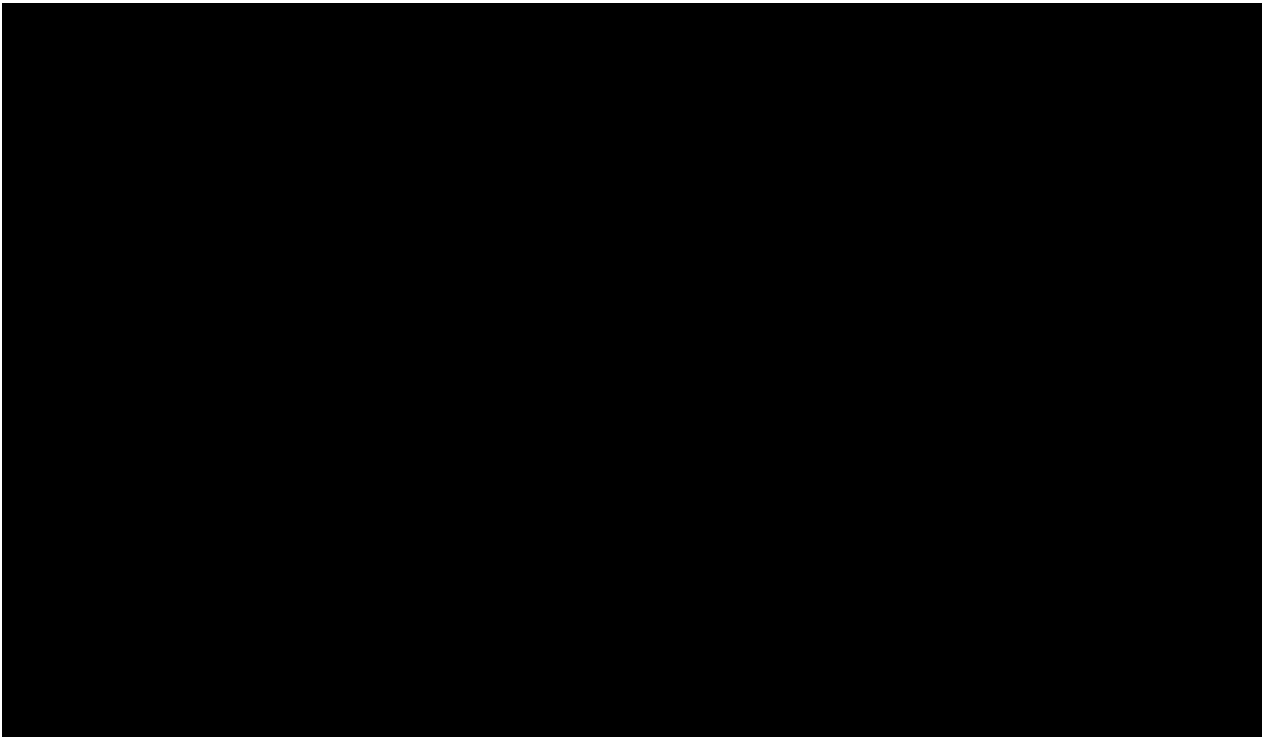


Figure 2-22 Access Interface Unit (AIU) Block Diagram Access interface unit (AIU) AIU

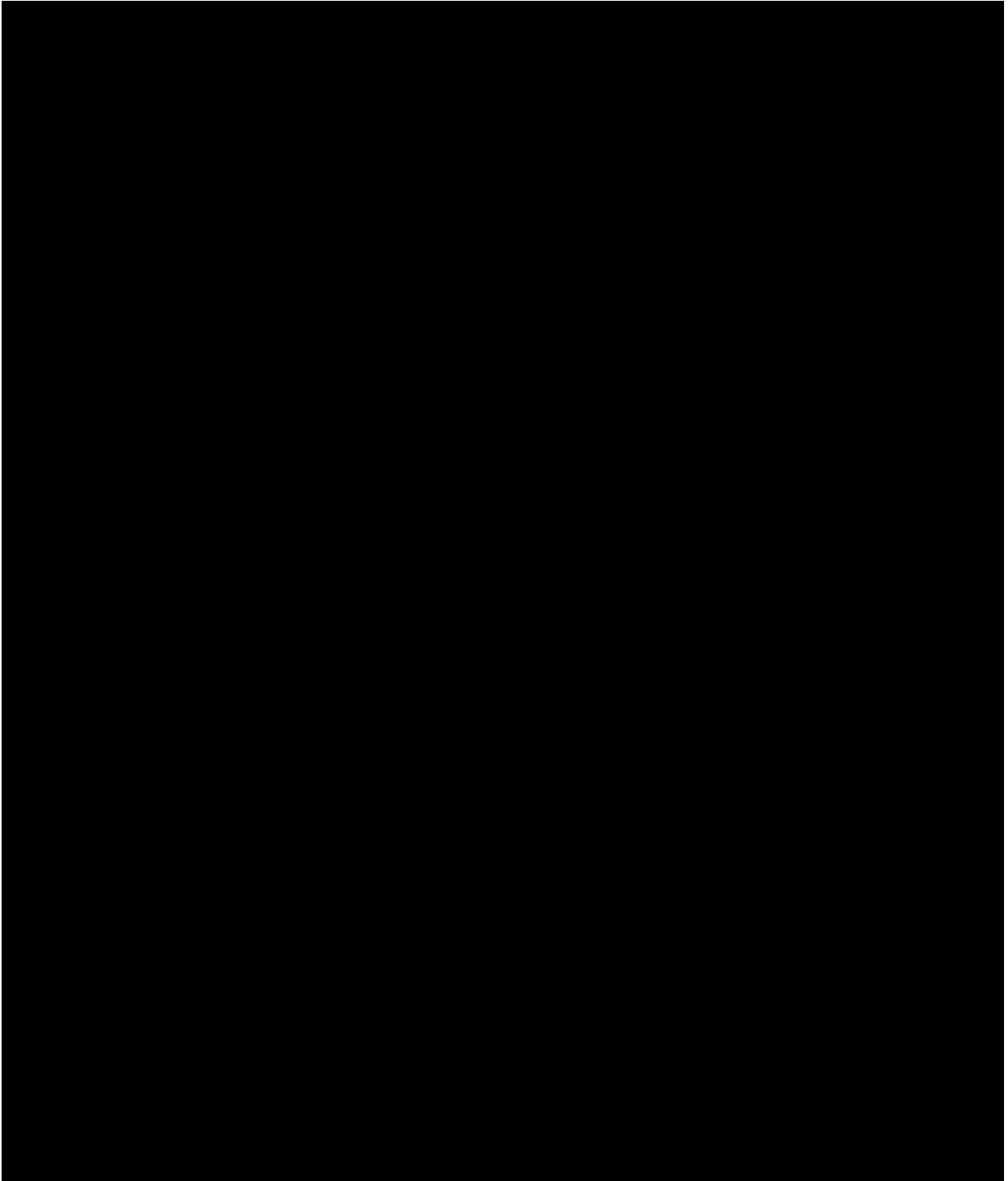


Figure 2-23 Trunk Unit Organization Trunk unit organization PSU

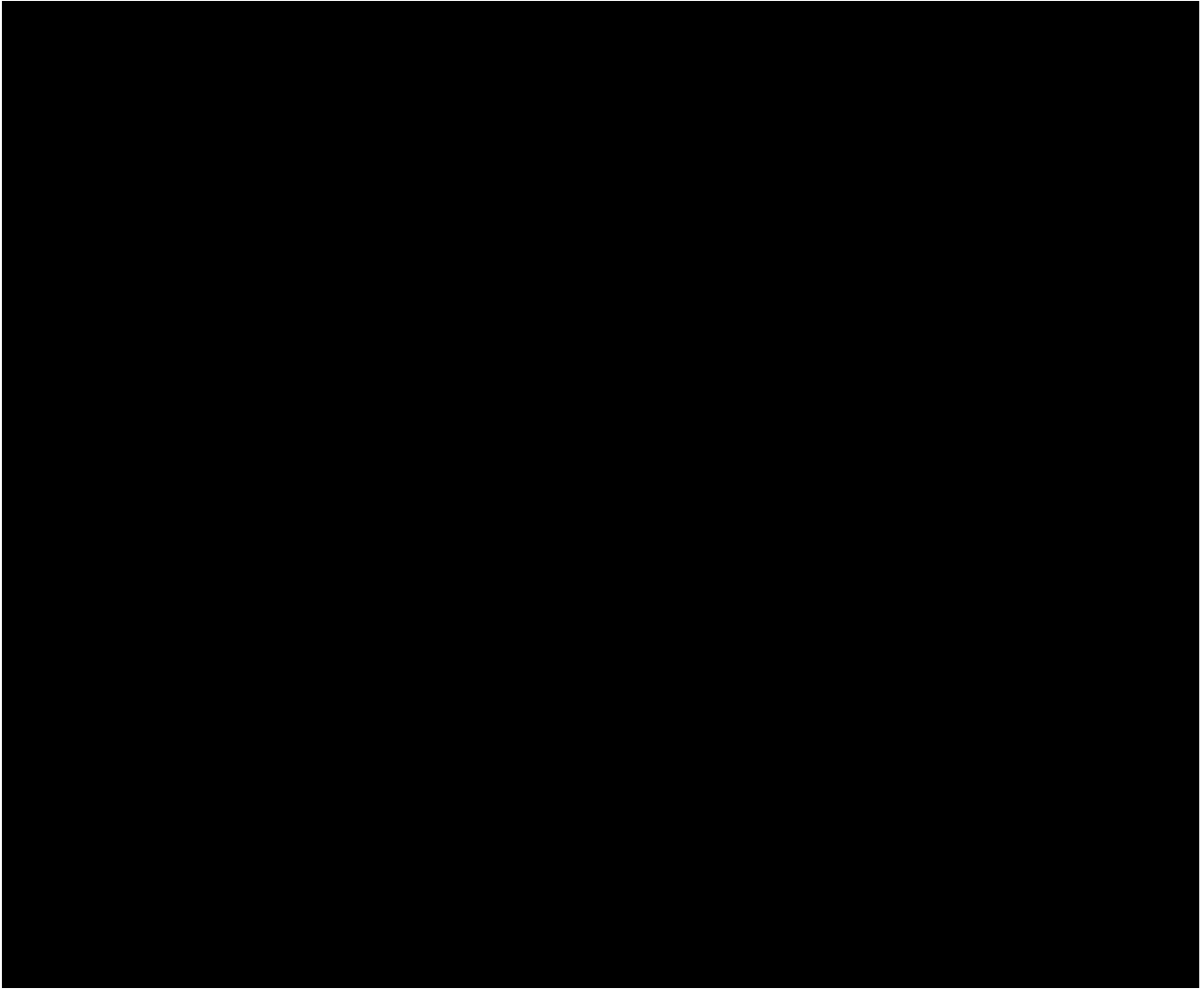


Figure 2-24 2-Wire E&M Trunk Circuit 2-wire E&M trunk circuit E&M trunk circuit, 2-wire

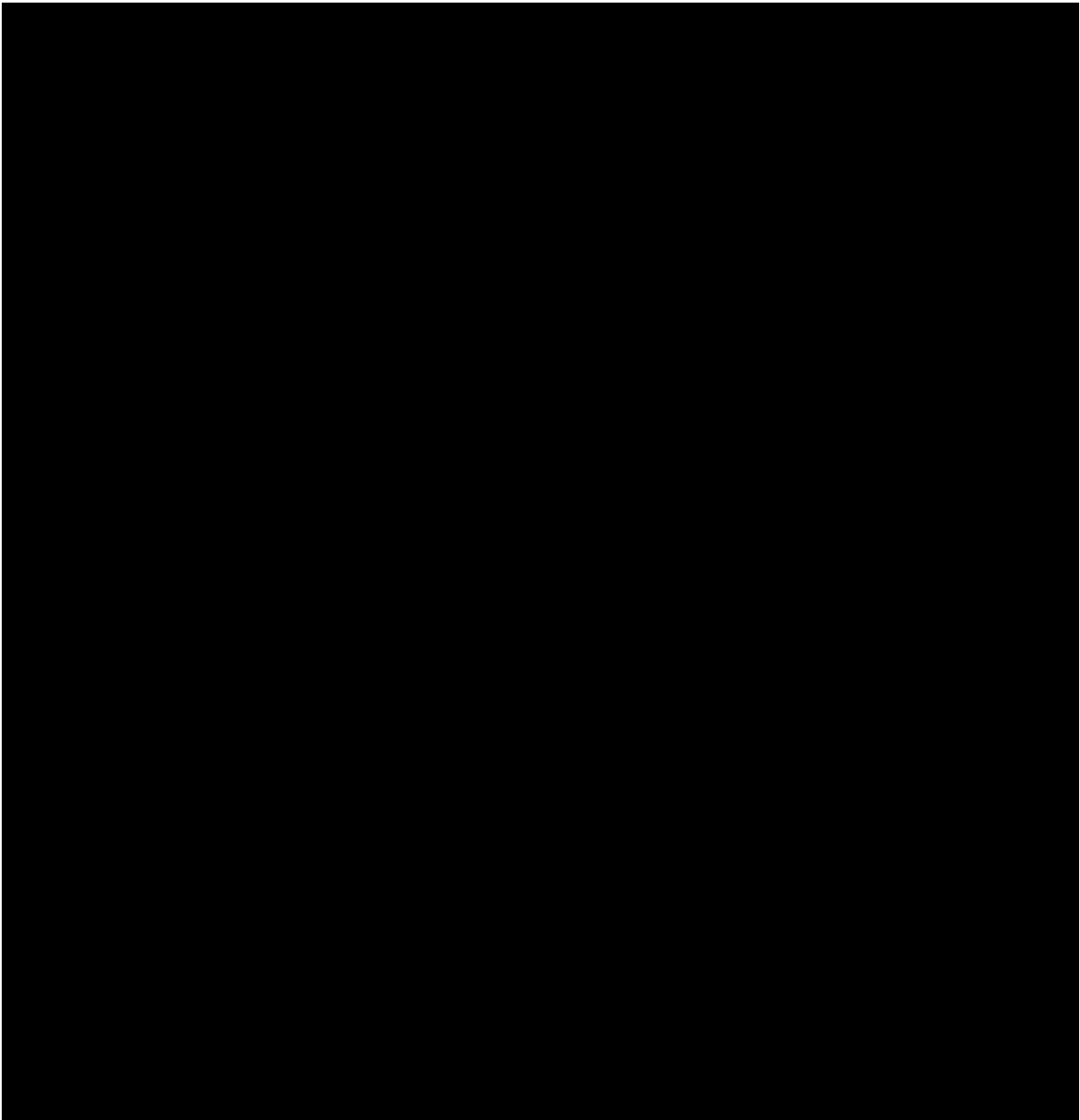


Figure 2-25 Digital Line and Trunk Unit Interface DLTU interface Digital line trunk unit interface

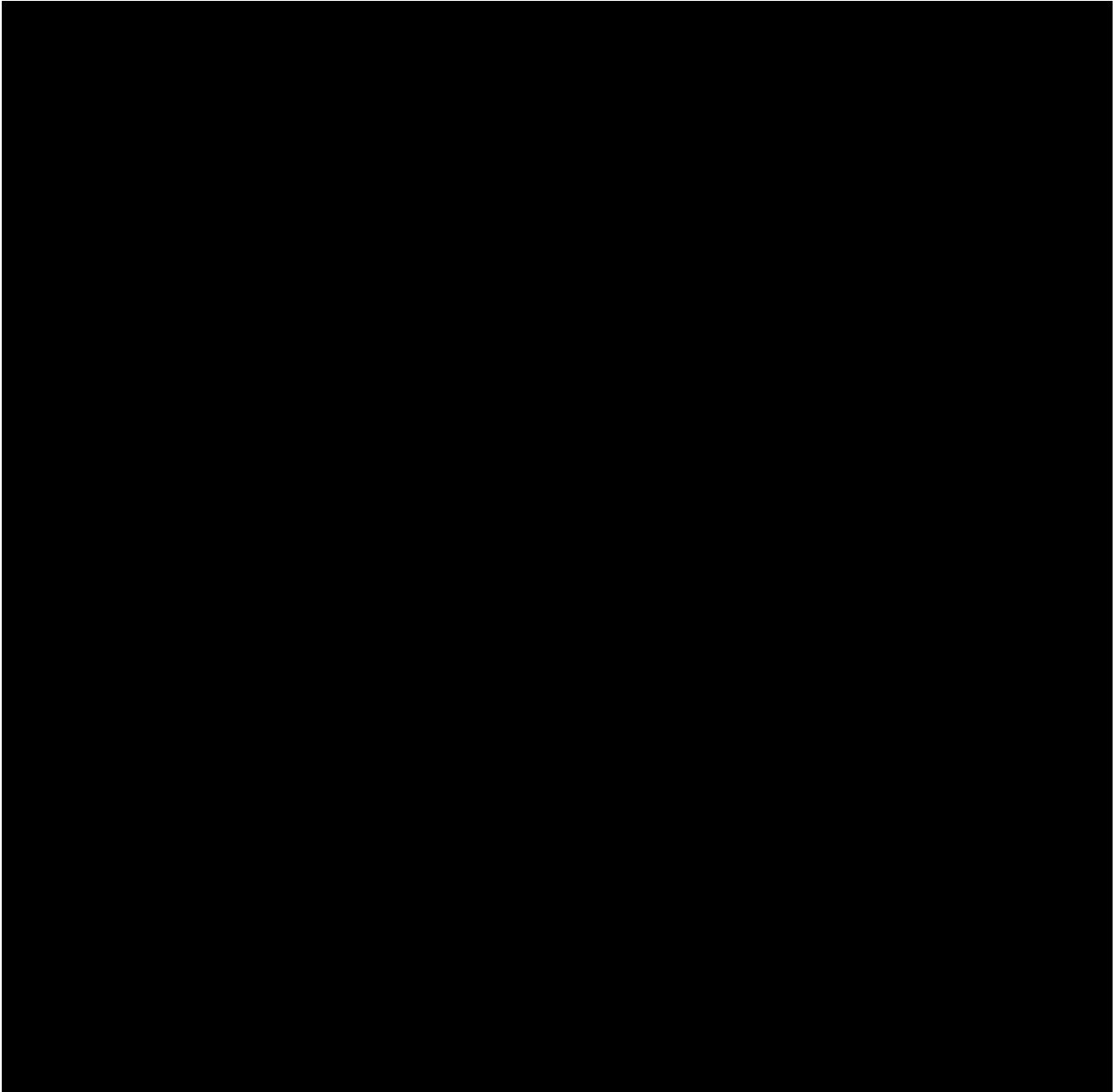


Figure 2-26 Digital Carrier Line Unit Digital carrier line unit DCLU

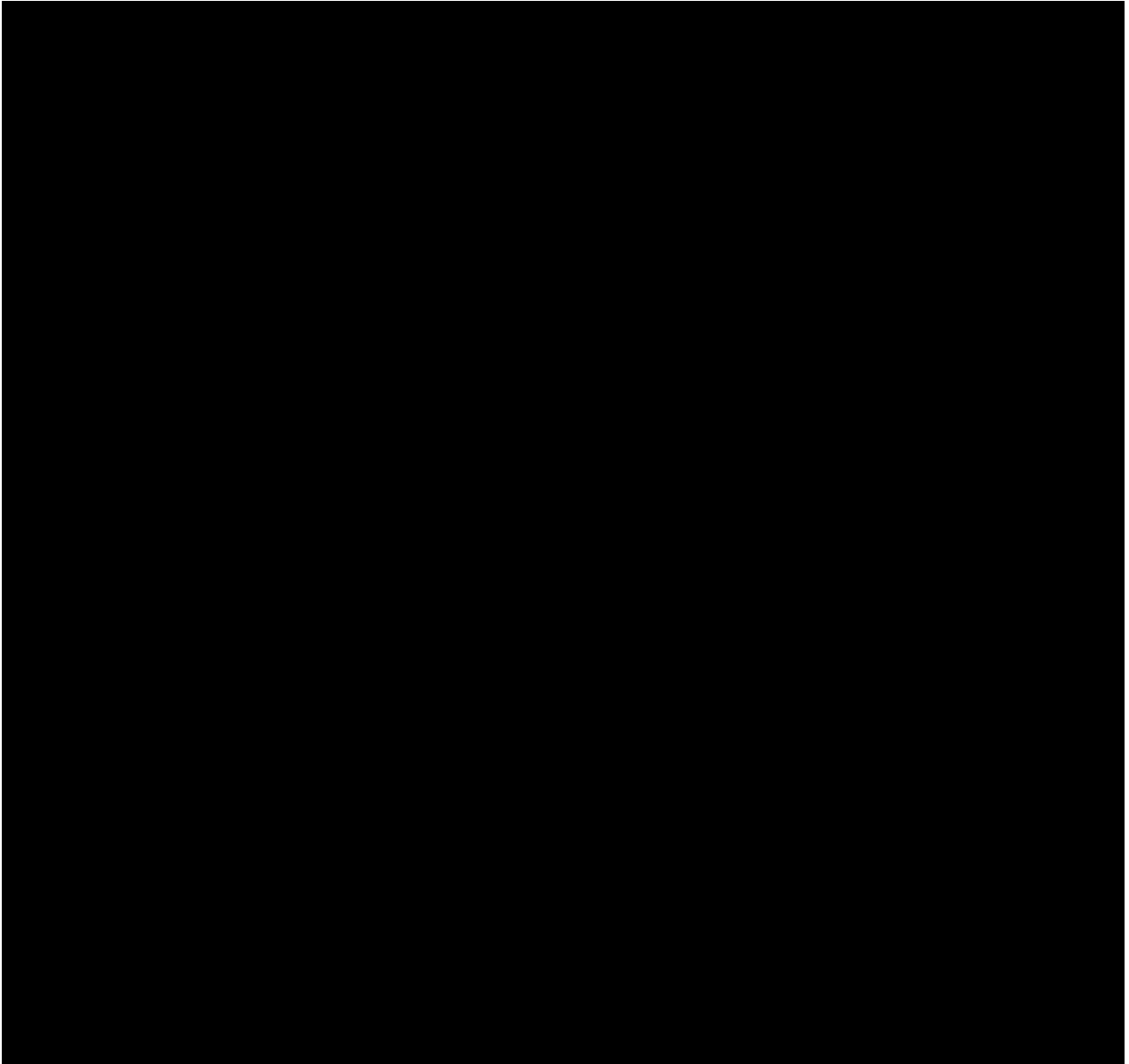


Figure 2-27 Integrated Digital Carrier Unit IDCU Integrated digital carrier unit

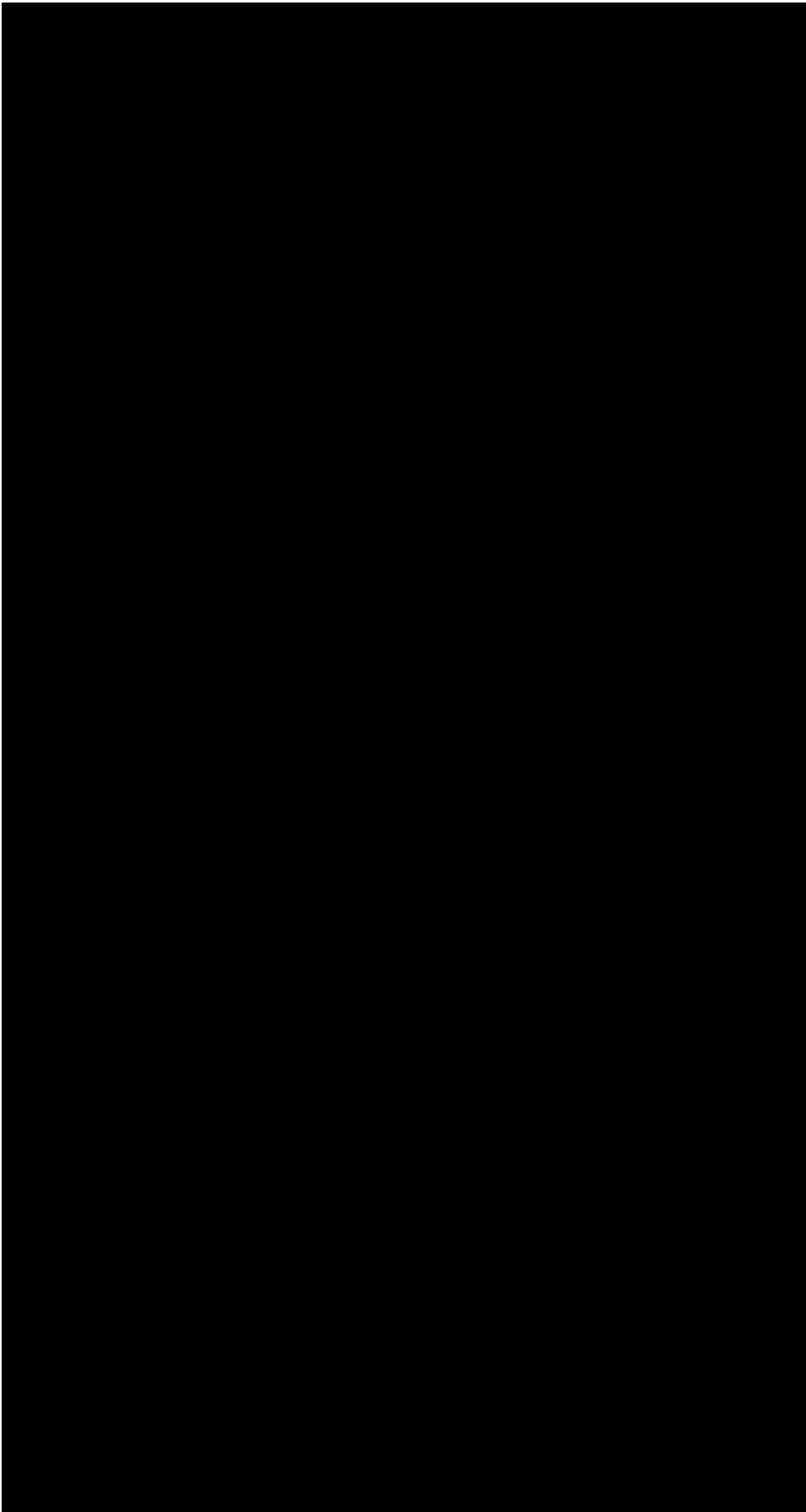


Figure 2-28 ISLU Block Diagram ISLU block diagram

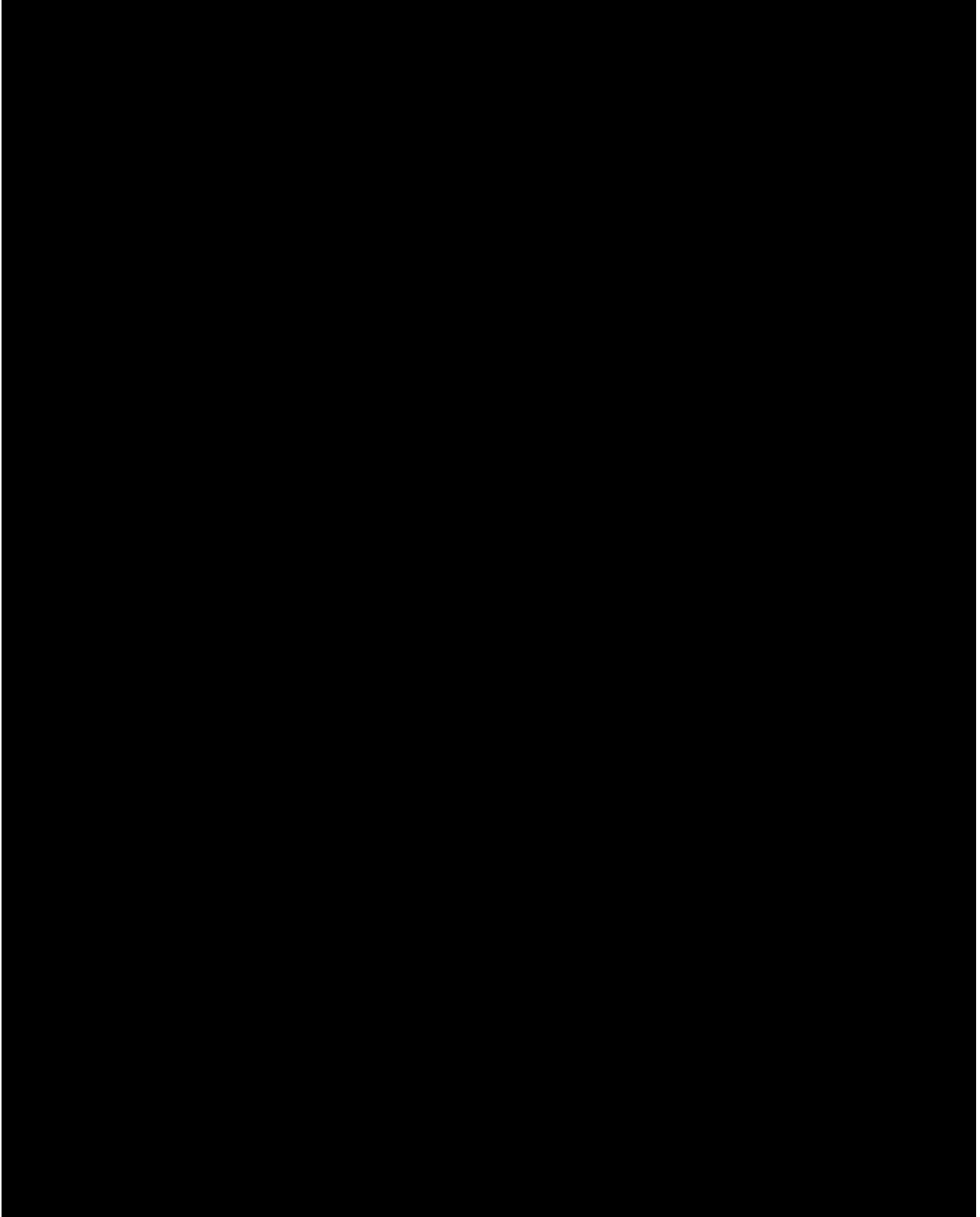


Figure 2-29 Digital Network Unit - SONET DNU-S Digital network unit - SONET

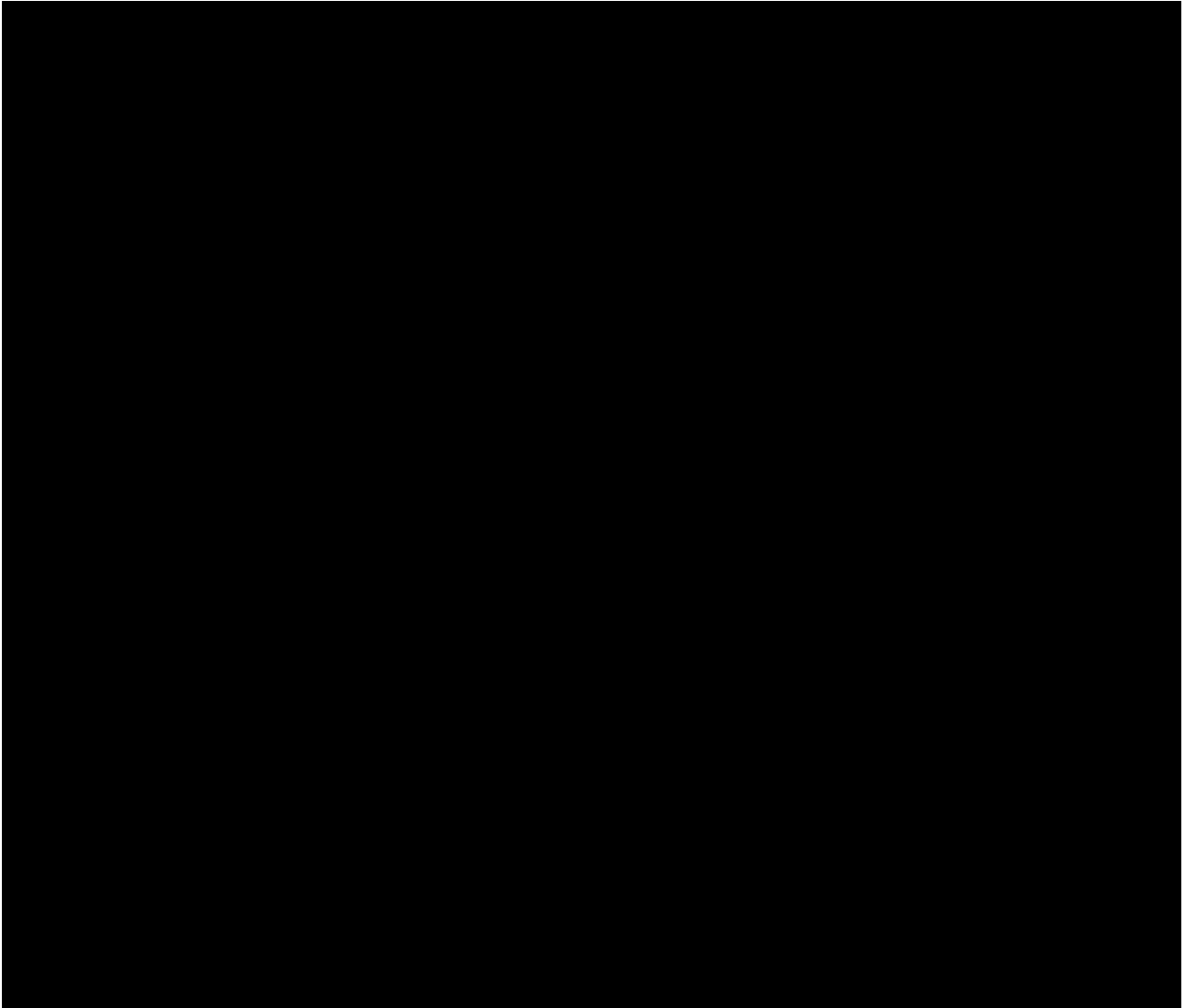


Figure 2-30 Metallic Service Unit Hardware Interface MSU hardware interface Metallic service unit hardware interface

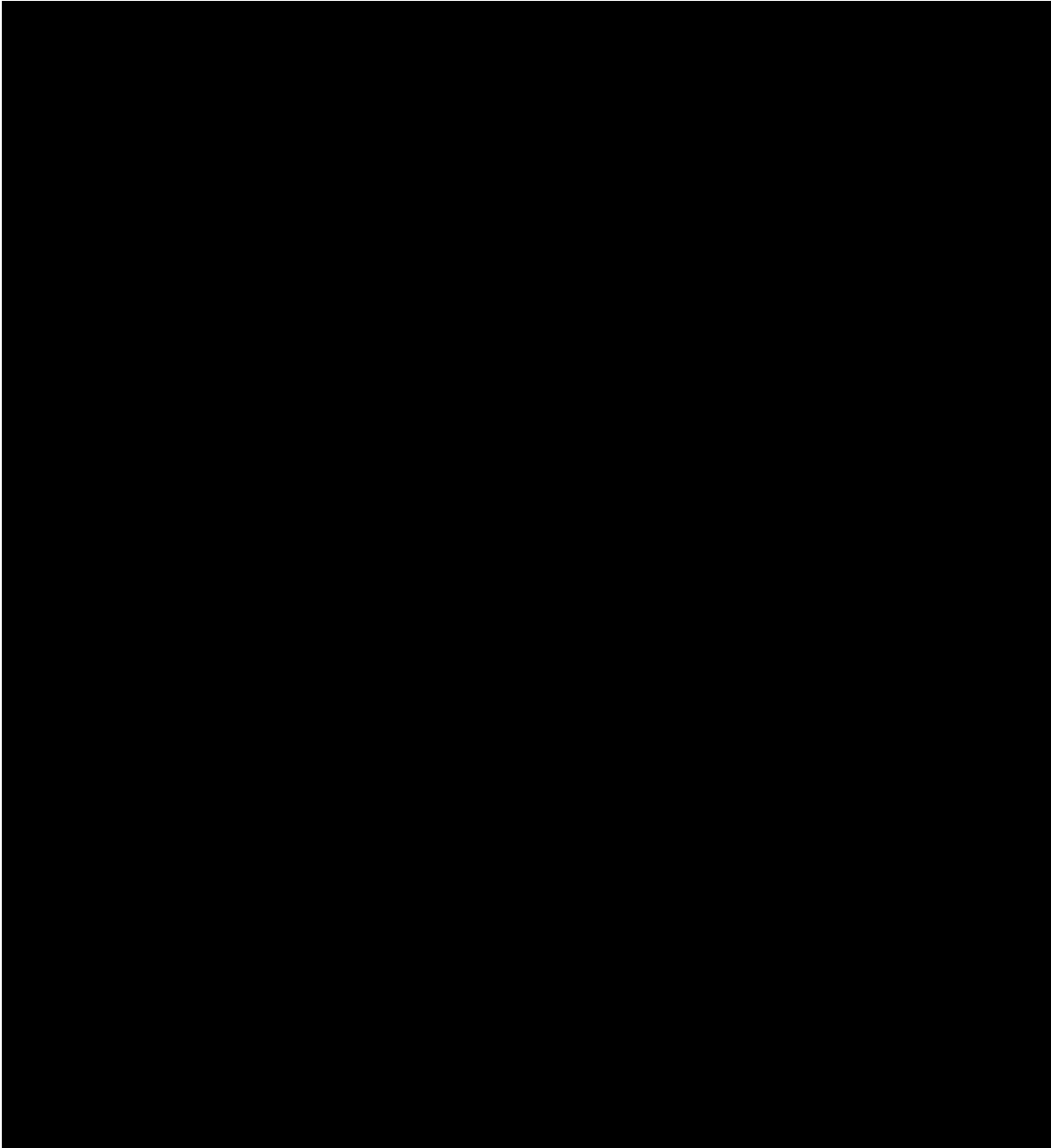


Figure 2-31 Directly Connected Test Unit in Minimum Configuration DCTU Directly connected test unit

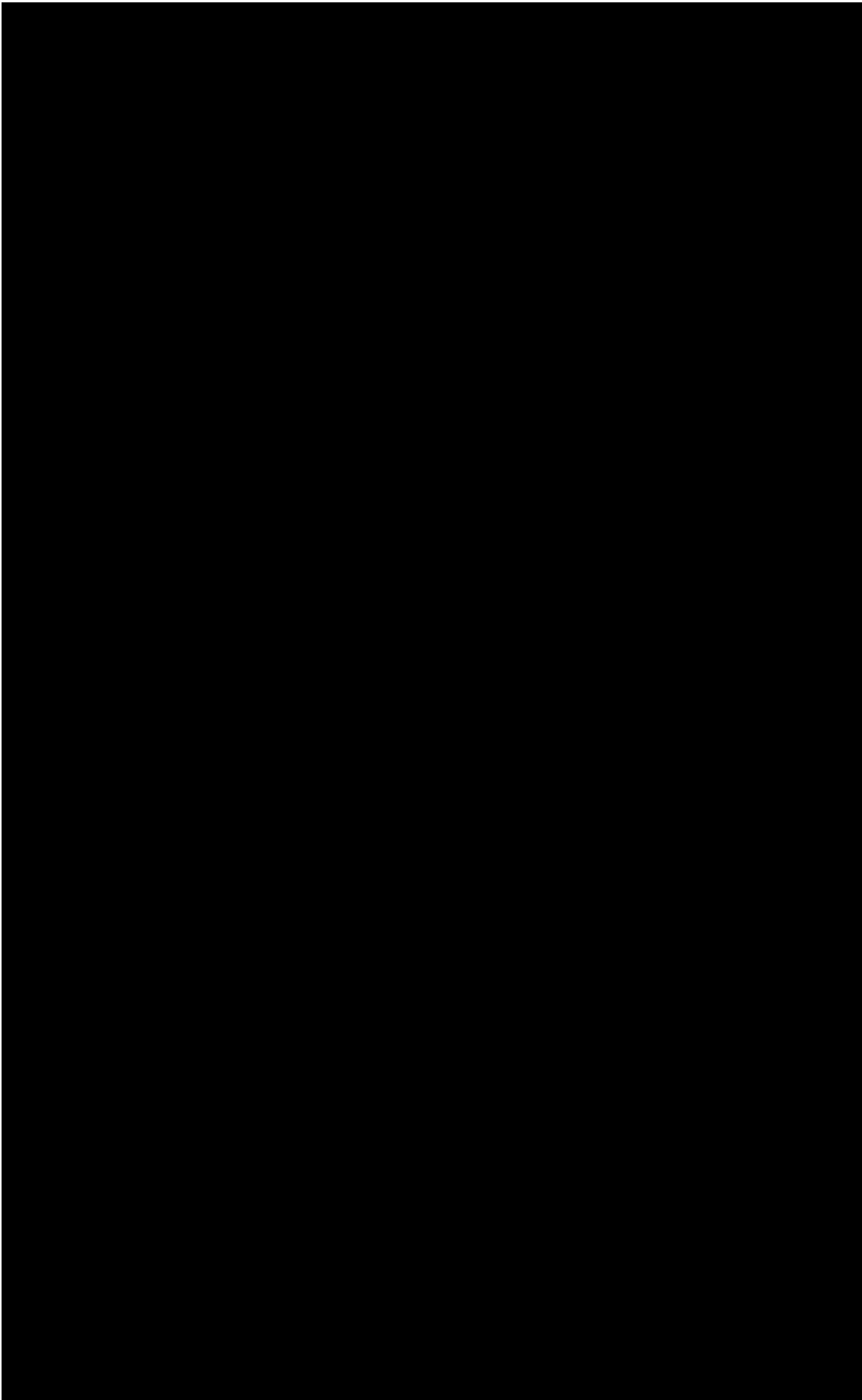


Figure 2-32 Directly Connected Test Unit in Maximum Configuration DCTU Directly connected test unit

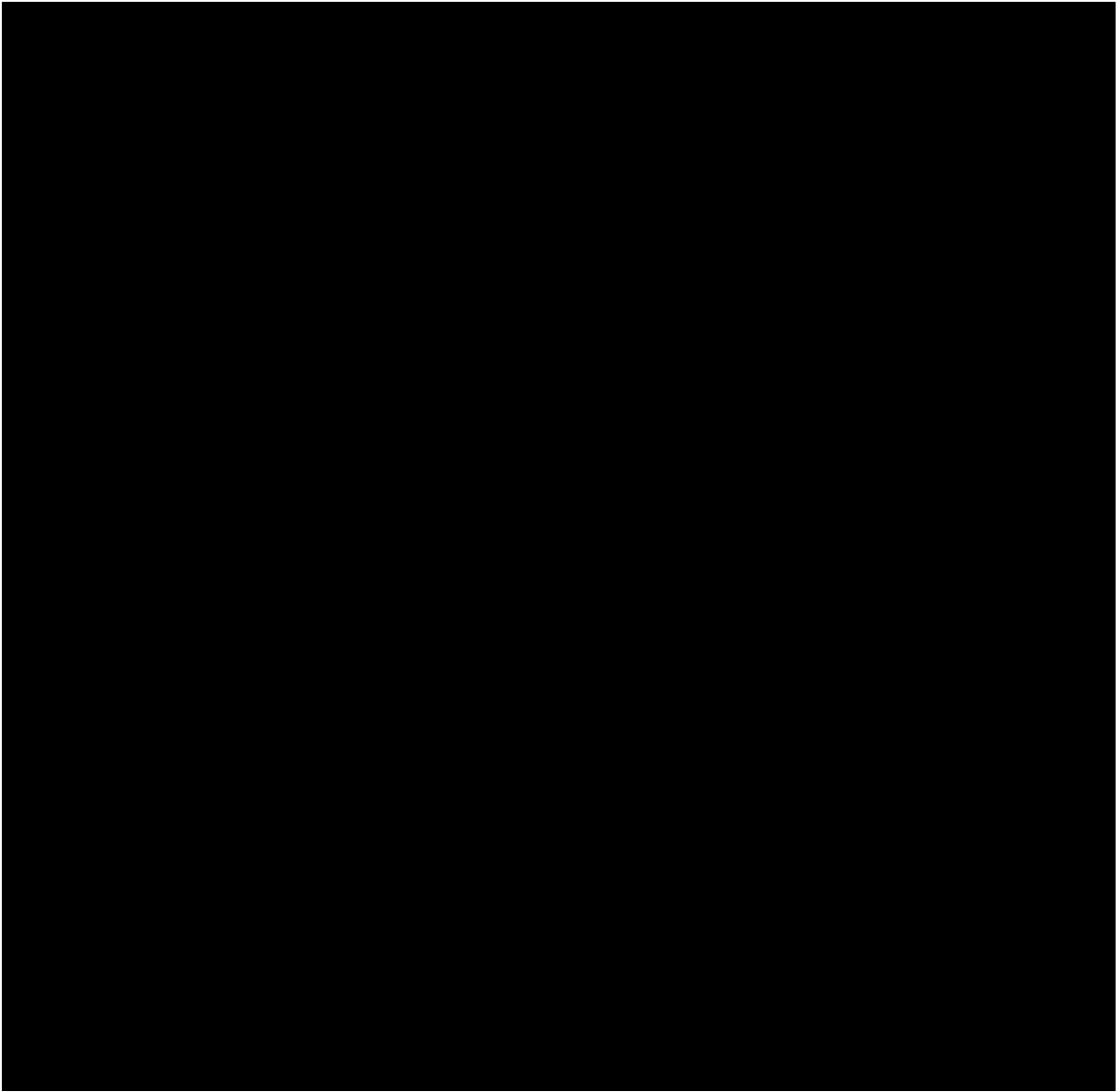


Figure 2-33 5ESS Switch CNI Ring Configuration CNI ring configuration, 5ESS switch

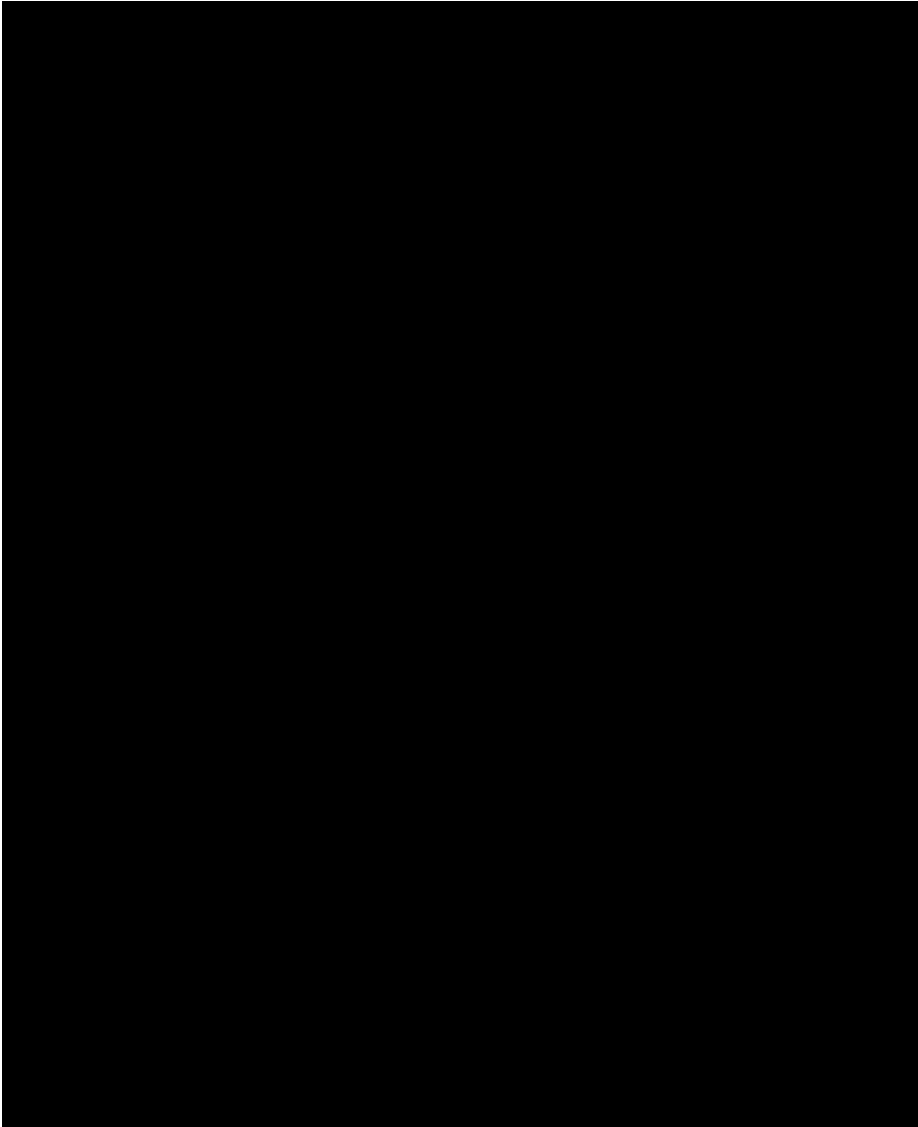


Figure 2-34 5ESS Switch Software Functional Decomposition Software, functional decomposition

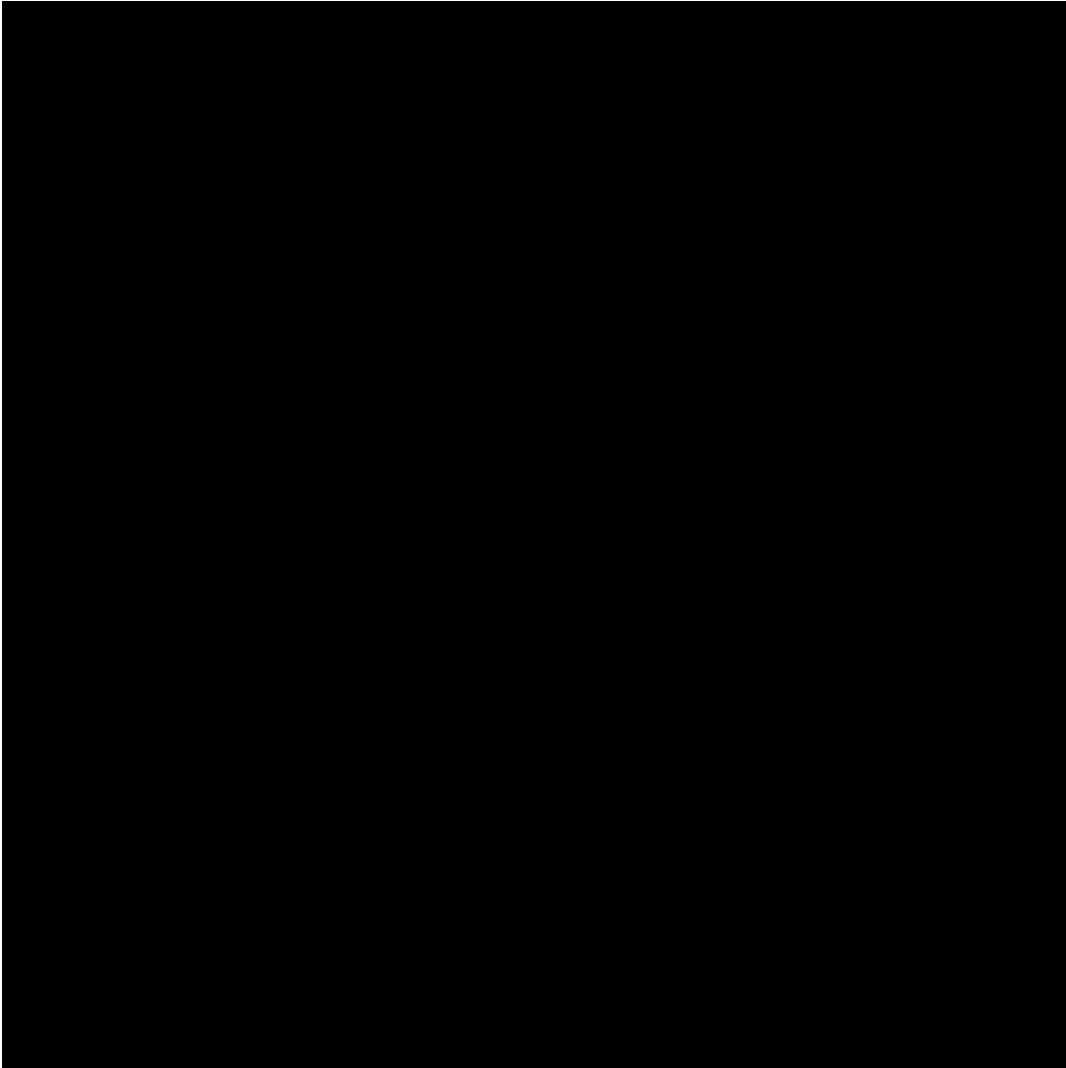


Figure 2-35 Switching Module Software Configurations Switching module software configurations

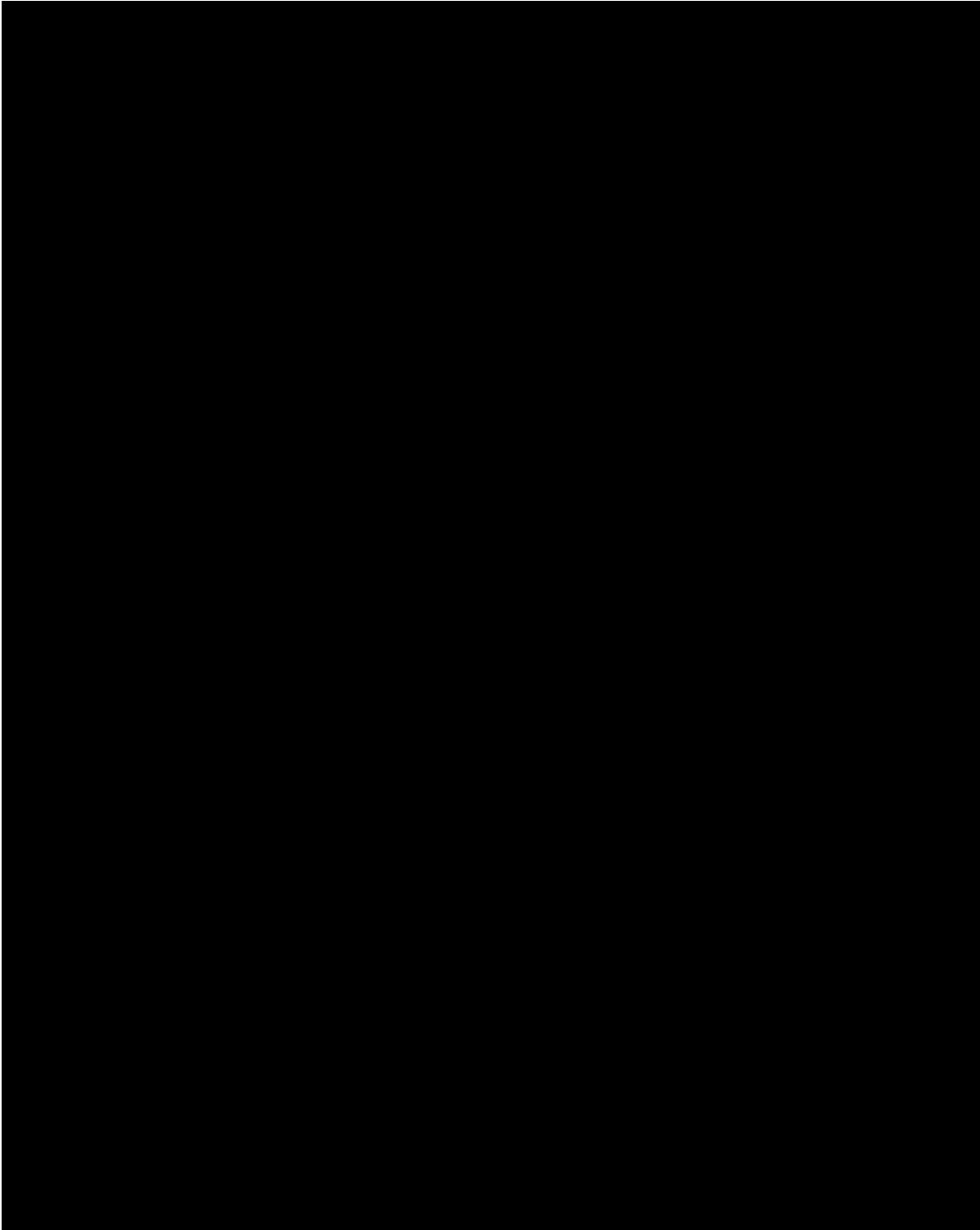


Figure 2-36 5ESS Switch Switching Path Switching path

3. ENGINEERING AND SERVICE STANDARDS

3.1 ENGINEERING

3.1.1 ENGINEERING PROCESS

3.1.1.1 Overview

Most equipment for a 5ESS[®] switch is provided on the basis of traditional traffic engineering parameters; number of lines, number of trunks, and usage. Engineering methods follow closely the modular architecture of the system. Traffic parameters are used to determine the number of interface units (IUs) required. Unit quantities are then used to define the office size in switching modules (SMs). The number of SMs determines the engineering for the communication module (CM). With the 5E6 and later software releases, a nonoptional pair of communication module processors (CMPs), one active and one standby, are plugged into the message switch (MSG) (side 0 and side 1).

The basic building block of the 5ESS[®] switch is the SM. An SM has the capability of serving varying numbers and types of IUs [for example, line units (LUs), trunk units (TUs)] up to its time slot interchange unit (TSIU) capacity of 512 time slots. The general algorithm for sizing a 5ESS[®] switch and accommodating individual variabilities is as follows:

- (a) given traffic characteristics, calculate IUs required
- (b) given IUs required, calculate time slots required
- (c) given time slots required, calculate SMs required

3.1.1.2 5 DOPS

The standard method for engineering and ordering a 5ESS[®] switch is the *Digital Ordering and Planning System (5 DOPS)*, a mechanized engineering tool. Detailed traffic engineering information, as well as full 5 DOPS documentation, can be found in 235-060-110, *Engineering Procedures*. The 5 DOPS supports time-consistent busy hour (TCBH), extreme value engineering (EVE), and coefficient of variation engineering as engineering user options. Refer to "SUPPORT SERVICES", Section 8, for additional information on the 5 DOPS.

3.1.1.3 EVE

An important consideration in the engineering and administration of traffic-sensitive equipment on a distributed digital switch is the method used to forecast traffic loads. The EVE method provides a sound statistical alternative to traditional forecasting and administration methods.

The methodology has been proven to be a good choice, although the selection of the name "extreme value engineering" has caused many engineers to falsely believe that EVE engineers forecast extreme loads. The EVE method engineers for any grade of service by using tools from the branch of statistics called extreme value theory to characterize the traffic.

The basic engineering calculations in the EVE methodology are the once-a-month (OAM) and expected value high day (EVHD). Both OAM and EVHD are statistical projections.

One of the benefits of the EVE methodology is the elimination of the need for busy hour determinations. These determinations are expensive and time consuming.

3.1.2 TRAFFIC ENGINEERING

3.1.2.1 EVE Methods/Procedures

Much of the equipment in the telephone companies is sensitive to traffic peaks. In the TCBH mode, this equipment is engineered for the most limiting case of high-day or average busy season (ABS). However, the TCBH high-day engineering for traffic-peak-sensitive components is error prone because high-day loads are volatile and difficult to forecast. This can easily lead to overprovisioning. Furthermore, the high-day load is generally selected from one or, at most, a few busy hours, and thus, the actual high-hour load may not be observed.

The EVE procedures avoid these problems with TCBH engineering and are currently in use in the telephone companies for the 5ESS[®] switch subscriber loop multiplexer and loop switching system pair gain systems, the 10A remote switching module (RSM), and for small step-by-step offices on the small office network data system. Since virtually all traffic components in the 5ESS[®] switch are peak-load sensitive, it is a natural candidate for EVE.

The EVE methods avoid high-day problems by monitoring data 24 hours a day and by providing more robust estimates of traffic, based on the collection of saved (daily) peak measurements. There are additional benefits to EVE methods, such as providing service protection during all hours and eliminating the need for busy hour determination studies.

Engineering traffic-sensitive equipment using EVE methods is not materially different from using TCBH methods. For example, for traffic-sensitive nonprocessor components in the 5ESS[®] switch, half-hour measurements are transmitted to data collection systems in much the same way they are in the rest of the electronic switching system family. The data collection system creates hourly traffic loads and selects the daily peak hour load data that is used for engineering and administration in the 5ESS[®] switch.

Traffic measurements are also available at the receive-only printer (ROP) (all reports) and through a local traffic channel (30-minute traffic and division of revenue reports only). The local traffic channel outputs measurements in an American Standard Code for Information Interchange (ASCII) format, RS232C interface, and may be connected to a printer or computer system for measurement processing.

The EVE engineering criteria corresponds to the TCBH engineering criteria (that is, the same amount of equipment is required with either method). Using EVE methods, a measured ABS TCBH load and corresponding 1.5 percent blocking criterion for line units is replaced by an EVE load that occurs once a month and a corresponding 4 percent OAM blocking criterion.

3.1.2.2 EVE Measurements and Estimates in the 5ESS[®] Switch

The traffic-sensitive components in the 5ESS[®] switch are the LUs, tone decoders (TDs), universal conference circuits (UCCs), digital carrier line units (DCLUs), integrated digital carrier units (IDCUs), RSM umbilicals, RSM inter-RSM communication links (ICLs), intermodule trunks (IMTs) (5E5 and later software releases), switching module processors (SMPs), the administrative module (AM), MSGs, and module message processor (MMP). The data is collected for each component on a daily basis.

At the 5ESS[®] switch, all relevant data is collected at 30-minute intervals throughout the day. With the exception of the processors (call attempt limited; 30-minute measurements saved), the data collection system forms and passes downstream for engineering and administration the hourly traffic measurements for the busy hour each day when one of a small set of "master" traffic counts peaks. For example, during the hour of the day when the LU traffic usage less maintenance (master) is largest (or peaks), the "slaved" LU termination attempts, LU termination concentrator blocking, and LU maintenance usage hourly values are saved. The daily peak hour LU usage (master) is used for EVE.

Estimates of the EVE loads are calculated from the latest month of daily peak hour loads. These values are reported on the monthly (demand) reports from the 5ESS[®] switch equipment reporting system and are the values used for engineering and administration using EVE methods. The three months during the engineering year when this value is the largest define the busy season.

3.1.2.3 Extreme Value Engineering

The EVE load that is exceeded an average of once a month is called the OAM load. It is easily calculated for a component from the mean and standard deviation of the saved daily peak loads for the latest month as

$$\text{OAM} = (\text{mean of peaks}) + [1.74 \times (\text{standard deviation of peaks})]$$

assuming a month consists of 20 possible high-traffic days. This OAM load is the load which exceeds or equals 95 percent of the daily peak loads.

For terminal or network equipment, the OAM load is the key value used for EVE. For processors, an estimate of high-day calls is used for initial engineering and is referred to as EVHD calls. The EVHD is a once-a-year processor occupancy estimate used for growth engineering.

The EVE engineering criteria should be derived for each traffic-sensitive component. This provides, on the average, the same grade of service as the TCBH engineering criteria. For initial engineering, Table 3-1 summarizes the TCBH service criteria, the EVE criteria, and the corresponding EVE capacities for most of the traffic-sensitive components in the 5ESS[®] switch.

Table 3-1 EVE Criteria and Capacities for 5ESS[®] Switch Components

COMPONENT	TCBH BLOCKING CRITERIA	EVE BLOCKING CRITERIA	EVE CAPACITY
LUs	7% HD 1.5% ABS most limiting	4% OAM	1870 CCS OAM (10:1 LCR) 1870 CCS OAM (8:1 LCR) 1840 CCS OAM (6:1 LCR) 1710 CCS OAM (4:1 LCR)
TDs	5% HD 1% ABS	3% OAM	681 CCS OAM(28 TDs/SM) 1540 CCS OAM(56 TDs/SM)
UCCs	0.1% ABS	(a) 5% OAM Blocking (b) 85% OAM Occupancy	Minimum OAM CCS for (a) or (b)
DCLU	7% HD 1.5% ABS	4% OAM	See Table 3-7
RSM T1 Lines (umbilicals)	0.1% HD	0.05% OAM	14,100 CCS OAM, Max Per SM
RSM ICLs	4% HD	2% OAM Per SM at RSM Site	13,430 CCS OAM, Max

The following example uses LUs to illustrate EVE in the 5ESS[®] switch. The sum of the estimated OAM loads for each LU in a 5ESS[®] switch divided by the number of main stations (MSs) in the central office (CO) is reported monthly. The 3 months during the engineering year when this value is the largest define the busy-season. For some offices, it may be more appropriate to use a 1- or 2-month busy-season, if the load during the second and/or third busiest month(s) is significantly lower. The average of OAM/MS over the three busy-season months is projected to the end of the engineering period (using current TCBH forecasting procedures) and multiplied by the projected number of MSs at the end of the period. The number of LUs in the office required by usage is determined by dividing the resulting load by the individual LU OAM capacity of 1,870 hundred call seconds (CCS) (assuming 8:1 line concentration ratio). In addition to this usage limit, there is also a termination limit for LUs.

For administration, EVE methods provide complete 24-hour surveillance and reporting, including cumulative measures, daily peak hour values of load and service, and related slaved measurements, where applicable. The estimated (extreme value) distribution of the latest month of daily peak values for a component allows for improved validation of measured data and better thresholding for generating exception reports.

Refer to "ADMINISTRATION", Section 5, for further details on network administration.

3.1.2.4 Initial Engineering

As stated in "5 DOPS", Section 3.1.1.2, the 5 DOPS may be used to engineer the office using EVE. If EVE data is unavailable, the engineer should use the ABS value and a valid HD/ABS value as input to the 5 DOPS.

Once this information is projected to the end of the engineering period, the EVE input can be entered directly into the 5 DOPS. The TCBH engineering will continue to be supported for initial and growth engineering.

The usage capacities given in the following sections are OAM values. The time-consistent busy-hour values are provided in parentheses for comparison.

3.1.3 INTERFACE UNIT ENGINEERING

3.1.3.1 Line Unit

An LU is required to terminate all switched customer lines except:

- ☐ Those working on integrated *SLC*[®] carrier system remote terminals
- ☐ Private branch exchange - direct inward dialing (PBX-DID) trunks.
- ☐ 2B+D basic rate interface (BRI) lines.

Local plant facilities terminating on an LU that require CO terminal equipment for subscriber carrier demodulation, or transmission treatment in existing analog switching systems, require the same equipment in the *5ESS*[®] switch.

The LU is available in four line concentration ratios (LCRs), each with its own terminating and originating plus terminating usage capacity. The LCR selection is based on a break-even CCS per line estimate which reflects the cost benefit of additional LUs versus deloading a given LCR. Regardless of the LCR chosen, an LU requires 64 SM time slots. Table 3-2 details the LU OAM utilization parameters.

Table 3-2 OAM Line Unit Parameters

CONCENTRATION RATIO a	O+T CCS CAPACITY	TERMINALS PER LU (100% FILL)	CCS/LN (100% FILL) CCS/LN	BREAK EVEN
10:1	1870	640	2.65	3.21
8:1	1870	512	3.55	4.21
6:1	1840	384	4.60	6.09
4:1	1710	256	6.47	---
Notes:				
a. The OAM capacities are based on a 0.04% blocking probability.				

Line unit capacities are also calculated based on ABS and HD. The ABS capacities are based on a 1.5 percent blocking probability and the HD capacities are based on a 7 percent blocking probability. Tables 3-3 and 3-4 detail the line unit ABS and HD utilization parameters, respectively.

Table 3-3 ABS Line Unit Parameters

CONCENTRATION RATIO a	O+T CCS CAPACITY	TERMINALS PER LU (100% FILL)	BREAK EVEN CCS/LN
10:1	1700	640	2.92
8:1	1700	512	3.85

6:1	1650	384	5.45
4:1	1470	256	---
Notes:			
a. The ABS capacities are based on a 1.5% blocking probability.			

Table 3-4 HD Line Unit Parameters

CONCENTRATION RATIO a	O+T CCS CAPACITY	TERMINALS PER LU (100% FILL)	BREAK EVEN CCS/LN
10:1	1960	640	3.35
8:1	1960	512	4.41
6:1	1940	384	6.38
4:1	1840	256	---
Notes:			
a. The HD capacities are based on a 7% blocking probability.			

The high-level service circuits (HLSCs), provided with each LU, perform high-voltage service functions for the lines terminated only in that LU. In addition to ringing and coin control, these functions include false cross and ground and continuity tests. Circuits that require external ringing require separate sources. The HLSCs are engineered based on usage and are time-shared between these service functions. The number of HLSCs provided can be engineered, based on usage, at four, five, or six circuit packs. See Table 3-5.

Table 3-5 HLSC CCS Capacity

ENGINEERING METHOD	NUMBER OF CIRCUITS		
	4	5	6
P.005 OAM	40	65	82
P.001 HD	43	68	86

3.1.3.2 Access Interface Unit (AIU)

This section highlights the major areas that need to be engineered in the AIU.

The entities that need to be engineered for AIU are:

- ☐ Number of PIDBs/PIDB Centum Call Seconds (CCS) capacity

The number of PIDBs per AIU are based on an occupancy factor determined by load service studies. Additionally, engineering practices are not the same for the SM and the SM-2000. The occupancy for the SM and SM-2000 are as follows:

- ☐ SM - ABS (38%), HD (45%)
- ☐ SM-2000 - ABS (75%), HD (90%).

- ☐ Ringing Generators (RG)

The AIUs are installed as Orderable Items (OIs) with either 2 or 3 in a group. Within the OI, the RG are installed if analog lines are present. The number of RG are fixed at 2 per OI. The RG are always located in the first (bottom) AIU of the OI and in the last four pack positions. Each RG requires two slots.

- ☐ Physical constraints

The AIU is engineered based on traffic considerations. The AIU supports a mix of application packs which should be considered when engineering the AIU to provide the appropriate line ratio.

3.1.3.2.1 AIU PIDB Engineering

Table 3-6 shows the traffic capacity for the SM and SM-2000 Environment. The CCS columns are for ABS and HD configurations.

Table 3-6 AIU PIDB Engineering

SM PIDB PAIR	ABS CCS	HD CCS
1	875.52	1036.8
2	1751.04	2073.6
3	2626.56	3110.4
4	3502.08	4147.2
5	4377.6	5184
6	5253.12	6220.8
SM-2000 PIDB PAIR	ABS CCS	HD CCS
1	1728	2073.6
2	3456	4147.2
3	5184	6220.8
4	6912	8294.4
5	8640	10368
6	10368	12441.6

3.1.3.2.2 AIU DPIDB Engineering

The directly-connected PIDB (DPIDB) connects the AIU to the PSU and carries packet switched traffic from the B Channels and the D Channels of the ISDN customers. DPIDBs are required when ISDN lines are supported on the AIU.

The quantity of DPIDBs decreases the number of PIDBs that may be equipped. It should also be noted that if the AIU supports only ISDN customers, access to ringing generators is not required.

3.1.3.2.3 XAIU ENGINEERING

The XAIU is functionally the same as the AIU, with the exception that the XAIU will be deployed only as a local AIU and connect to the MCTSI via PCT links. Therefore besides the additional interfaces required for mapping PIDB/PICB into PCT links, the XAIU supports the same AP packs as the AIU. The XAIU will not support any R/EAIU applications in terms of remoting distances, the maximum cable distance allowed for the PCT link between the FCD and MCTSI is 2000 ft. (605 meters) and the maximum allowed distance difference between the two PCT links cannot exceed 10 ft. (approximately 3 meters). The following engineering rules apply to the XAIU:

- ☐ Two QCOMDACs circuit packs must be equipped per XAIU shelf
- ☐ Up to a maximum of 6 XAIU shelves may be equipped in an XAIU cabinet
- ☐ Two FCD packs must be installed in an XAIU cabinet
- ☐ For fixed configurations of the XAIU, only the needed QPIDBs may be equipped.
- ☐ For growth XAIU configurations, the cabinet must be equipped for seventy-two QPIDB cables whether or not all the associated QCOMDACs are equipped. The cabling of the growth XAIU must be done in the factory in order to support XAIU unit growth capability.
- ☐ One pair PCT fiber must always be equipped per FCD circuit pack, this link will be either 1/2 PCT link with 384 timeslot capacity of the full PCT link with 768b timeslot capacity depending on traffic needs.
- ☐ The maximum number of QPIDBs per FCD is 36

- ☐ The maximum number of TSGRPs per PCT is 24
- ☐ The maximum number of TSGRPs per XAIU cabinet is 48
- ☐ Each QCOMDAC must always be equipped with 6 QPIDBs cables.

3.1.3.3 Trunk Unit Engineering

The TU provides system access for all analog interoffice trunks. The TUs are provided on the basis of total trunk circuit pack requirements. Each circuit pack has four trunk circuits (except those for test trunks which have two). Circuits have been developed to provide an interface to the following multipurpose trunk types:

- ☐ Loop supervision, outgoing, 2-wire, local
- ☐ Loop supervision, outgoing, 2-wire, toll
- ☐ Loop supervision, incoming, 2-wire, local
- ☐ Loop supervision, incoming, 2-wire, toll
- ☐ E&M supervision, 2-wire, local
- ☐ E&M supervision, 2-wire, toll
- ☐ E&M supervision, 4-wire, local
- ☐ E&M supervision, 4-wire, toll
- ☐ Test trunk
- ☐ Foreign exchange - remote office test line (FX-ROTL).

Separate local and toll circuits are required to meet the more stringent transmission requirements of toll trunks. Their applications are governed by the required encode level points/decode level points (ELPs/DLPs) required for trunk terminals. Local circuits are used for 0 dB ELPs and DLPs, and toll circuits are used for -3 dB ELPs and DLPs. See the transmission requirements in 781-030-100, Notes on the Network, for more detail. In functional terms, toll circuits are used for any class 4 operation [for example, toll access (class 4 end only) and intertoll]. When 2-wire toll circuits are used, impedance compensation external to the 5ESS[®] switch is required.

The following functions are provided by the TU circuits:

- ☐ Local test desk (LTD), local test cabinet (LTC), and mechanized loop test (MLT) line tests are performed through a test trunk circuit (similar to no-test trunks of earlier switching system). The connection can be through dedicated metallic facilities from the test center or through the direct distance dialing (DDD) network or nonmetallic dedicated facilities using standard external remote testing arrangements. This circuit is optioned for outgoing service when used in this manner. This circuit can also be optioned for outgoing service to an LTD or for accessing an optional coin station test line (CSTL) circuit.
- ☐ The E&M 4-wire local trunks are used to provide system interfaces with 13A announcement machines and the test access unit (TAU) of the trunk and line work station (TLWS).
- ☐ Loop supervision, outgoing, 2-wire trunks are used to serve PBX-DID customers. (Note that other PBX trunks, including the out-dial trunks of PBX customers, appear on the LU.) They are also used for precutover office-to-office (often referred to as board-to-board) continuity testing. These trunks are also

used to connect to automatic number announcement circuits (ANACs).

- ☐ A voice-grade, dedicated trunk of any type is required for service observing (T1 carrier trunks may also be used) with a minimum of one and a maximum of four.
- ☐ Interoffice trunks of each circuit type are adjusted to include an administrative spare. To each circuit quantity, the appropriate additional trunks for "special" uses are added.

A test trunk circuit pack is added to the total interoffice circuit pack requirement for every two LTD, MLT System, LTC, etc., trunks. The TUs are provided based on the total circuit packs, 1 unit for every 16 packs. Each unit is allocated 64 module time slots.

The TU engineering is done on a circuit-pack basis only. Usage engineering is not required. A uniform spread over all TUs of trunks by circuit type and trunk group is recommended for reliability and service protection.

3.1.3.4 Digital Line and Trunk Unit

The digital line trunk unit (DLTU) provides a direct interface between the 5ESS[®] switch and T1 carrier facilities for interoffice trunks, IMTs, primary rate interfaces (PRIs), and RSM umbilicals [or links between RSMs of a multimodule RSM (MMRSM)].

Standard cross-connections in terminating T1 carrier to the system require an office repeater bay (ORB) and a digital cross-connect (DSX) span or frame. A T1 span enters the 5ESS[®] switch through a digital facilities interface (DFI) circuit pack mounted in the DLTU; DFIs (ANN 5) for RSM umbilicals, and DFIs (ANN 1 or ANN 3) for interoffice trunks.

The DLTU has a capacity of 10 DFI packs of either type. Time-slot efficiency is generally increased if interoffice trunk DFIs are limited to eight per unit. This leaves time slots available for an additional peripheral unit. Ten RSM umbilical DFIs may be reserved per DLTU (with two DLTUs per SM) to ensure that the maximum umbilical size of 20 T1 spans can be reached. All the umbilicals for an RSM must terminate on the same SM.

The method for engineering DLTUs is to allocate T1 lines in sets of eight or ten and provide one DLTU to mount the DFIs thus allocated. For fully loaded DLTUs (10 DFIs), 240 time slots are required; however, 256 effective time slots are reserved. Partially loaded DLTUs are allocated sufficient SM time slots in sets of 64, to serve the T1 channels (for example, 8 DFIs in 1 DLTU require 192 time slots).

3.1.3.5 Digital Line and Trunk Unit - 2

The DLTU2 is initially available with the 5E5 software release and can support up to ten DFI-2 circuit packs. A fully equipped unit consists of a power start circuit and ten DFI-2 circuits.

Each DFI-2 can terminate two T1 lines, two peripheral interface data buses (PIDBs), and one peripheral interface control bus (PICB). Therefore the SM limit of 20 T1 lines, which require 480 of the 512 available time slots, can be achieved with 1 DLTU2.

The DFI-2 circuit packs can also be partially equipped, with only one of the T1 terminations connected. In this configuration, a second PIDB is not equipped and therefore a second set of 24 time slots is not necessary to support it.

With two T1 lines terminating on each DFI-2, office engineers should spread members of a trunk group between DFI-2 circuit packs, to guard against isolating a remote location. This is especially important when engineering MMRSMs. The host SM for the MMRSM terminates T1. There can be as many as 20 T1 lines running between a host SM and an MMRSM. Either two or four (normally four) of these may be designated as potential carriers for the two control time slots (CTSS) and their duplicates, which the RSM needs to communicate with the AM. For reliability purposes, the CTSS to an RSM should not travel over two T1 lines

terminating to a single DFI-2 circuit pack.

3.1.3.6 Digital Carrier Line Unit

The DCLU provides the direct interface between integrated *SLC*[®] 96 carrier system mode 1 and/or mode 2 or the integrated *SLC*[®] 5 carrier system remote terminals and the *5ESS*[®] switch. The DCLU is composed of two service groups (SGs). Each DCLU multiplexes the T1 lines from up to six *SLC*[®] carrier remote terminals (RTs) onto two or four PIDBs for a maximum line concentration ratio of 9:1 or 4.5:1, respectively. The amount of concentration, a function of both the number of RTs and PIDBs per DCLU, is determined from Table 3-7. It should be noted that this concentration is the total concentration including the 2:1 concentration at the *SLC*[®] carrier mode 2 RT.

Table 3-7 *SLC*[®] Carrier RT DCLU Loading Guidelines

REMOTE TERMINALS	TSI TIME SLOTS	MODE 1		MODE 2		OVERALL CONCENTRATION RATIO
		4% OAM	1.5% ABS	4% OAM	1.5% ABS	
6	64	3.4	3.2	3.3	3.1	9.0 ^a
5	64	4.1	3.8	3.9	3.7	7.5
4	64	5.1	4.8	4.8	4.5	6.0
6	128	7.3	6.9	6.9	6.6	4.5
5	128	8.7	8.3	8.2	7.8	3.8
4	128	10.9	10.4	10.0	9.5	3.0
3	128	14.4	13.8	11.1	10.0	2.3
2	128	21.5	20.2	-	-	1.5
Notes:						
a. This represents the total concentration ratio including the 2:1 concentration at the <i>SLC</i> [®] carrier mode 2 RT.						

The lower CCS per line of the mode 2 loading reflects the 2-stage concentration provided by a 2:1 concentration at the RT coupled with the additional concentration at the DCLU. When mixing remote terminals of both modes in the same DCLU, the more conservative mode 2 loading guidelines should be used. This is recommended to provide equitable service to both mode 1 and mode 2 RT customers.

The quantity of DCLUs required in an office is determined by dividing the total number of RTs by the number of RTs permitted per DCLU. If it is desired to segregate mode 1 and mode 2 terminals in separate units, the previous calculations must be performed for both modes. The decision to segregate modes is more appropriate in large *SLC*[®] carrier terminal applications, and involves a trade-off between DCLU breakage costs and a deloading penalty cost resulting from following mode 2 guidelines. Administrative costs may also be a factor. The 5 DOPS engineers segregated units, except for the last one in which it permits mixed modes.

The DCLU cannot terminate mode 3 *SLC*[®] carrier remote terminals. However, split mode operation (A, B, digroups in mode 1 or mode 2 and B, C digroups in mode 3) can be accommodated with the use of a subscriber loop interface module (SLIM). The SLIM replaces the standard office repeater bay used in the direct mode 1 or mode 2 interfaces and terminates the T-carrier from the mode 3 shelves in D4 format. Therefore, it can be routed around the switch to other terminal equipment, such as the digital access and cross-connect system (DACS). The remaining T-carrier lines from the mode 1 or 2 shelves pass through the SLIM and terminate on the DCLU as they would in the direct interface. For this application, the clocks of the *5ESS*[®] switch and the DACS must be synchronized.

Each DCLU is allocated 128 peripheral side time slot interchanger (TSI) time slots (two time slot sets on four PIDBs) when a 4.5 to 1 or lower concentration ratio is used. Note, only 64 peripheral side TSI time slots (one time slot set on two PIDBs) are allocated for 6 to 1 or greater concentration ratios.

The DS1 lines from a *SLC*[®] carrier enter the DCLU through specially designed subscriber DFI circuit packs (SDFI, ANN 4). Each DS1 line (active and protection) requires one SDFI. Each DCLU shelf can mount up to ten DFI packs. A unit is equipped with two shelves. To handle the additional DS1 spans required, mode 1 *SLC*[®] carrier applications require a supplementary (third) shelf. The DS1 facilities from the DCLU to the

SLC[®] carrier RT are cross-connected through a DSX-1 to either a standard ORB or a SLIM as local practices dictate. Either the ORB or the SLIM can be used to provide the DS1 line powering function. These may also be used in conjunction with a main distributing frame (MDF), or a supplementary digital distributing frame (SDDF) if the congestion of shielded jumpers is a problem on the MDF. The following configurations are possible:

- ☐ DCLU/DSX/ORB/MDF
- ☐ DCLU/DSX/SLIM/MDF
- ☐ DCLU/DSX/ORB/SDDF
- ☐ DCLU/DSX/SLIM/SDDF.

The choice between a SLIM and an ORB is one of operations and economics. If a SLIM is used, the SLIM provides protection line switching, the alarm interface to either switching system scan points or a separate telemetry system, and the switch personnel interface for DS1 line and RT maintenance. With the ORB arrangements, the 5ESS[®] switch performs the protection line switching, provides an integrated treatment for alarms, and uses a teletypewriter terminal at the DSX for DS1 line and RT maintenance. The higher price of the SLIM over the standard ORB is slightly offset by eliminating the need for the protection line SDFI in the DCLU.

3.1.3.7 Integrated Digital Carrier Unit

3.1.3.7.1 General

The integrated digital carrier unit (IDCU) (initially available with the 5E8 software release) provides an integrated interface for SLC[®] carrier system remote terminals. It can terminate an SLC[®] with a maximum of 2048 lines and 28 DS1s including the protection DS1. The IDCU provides the same functionality as the DCLU, but will provide both an analog and ISDN interface to customers on the remote terminal. Like the DCLU, the IDCU removes the need for a central office terminal. The IDCU supports the TR8 and TR303 interfaces.

The TR8 interface supports SLC[®] Series 5 carrier system (feature package B, enhanced B, and 303G) and SLC[®] 96 carrier system remote terminals. Mode I (no concentration) and Mode II (concentration) are supported for both SLC[®] 5 carrier system and the SLC[®] 96 carrier system. With Mode I, each line on the remote terminal is assigned a time slot on the DS1, therefore, 96 lines require 4 DS1s. With Mode II, the line on the remote terminal is only assigned to a time slot on the DS1 for the duration of the call. A 2:1 concentration is provided by 96 lines on the remote terminal accessing 48 time slots on the DS1. Some services are not concentrated (such as coin lines) and are assigned permanent time slots on the DS1. Robbed bit (high bit of every third time slot) signaling is used for nonconcentrated lines and a derived data link (derived from the framing bit) is used for signaling on concentrated lines. This is the only signaling information that is passed from the remote terminal to the switch with the TR8 interface.

The TR303 interface requires two control channels (each with a stand-by backup). The time slot management channel (TMC) is a 64-Kbps channel used to report originations on non-ISDN lines terminating on the remote terminal. Signaling for ISDN lines is over the D-channel. The D-channels are multiplexed four to a DS1 time slot, from the remote terminal through the IDCU to the PSU. The embedded operations channel (EOC) is a 64-Kbps channel for OA&M messages. These messages include allocation messages for nailed up connections, D-channels, and provisioned packet-switched B-channels. The TMC and the EOC channels are packet switched data; therefore, the TR303 requires an ISDN SM equipped with a PSU and PH. The PH capacity is 32 channels and each remote terminal on the TR303 requires four (two active and two stand-by) channels; therefore, one PH can support up to eight remote terminals on the TR303.

The TR8 and TR303 both allow the IDCU to provide hairpin and nailup time slot paths through the IDCU. A

nailed up is a semi-permanent path through the SM (or the SM and the CM), between a DS0 channel on the IDCU and a DS0 port on another SM peripheral. An SM can have a maximum of 190 nailed up time slots. Nonswitched (single channel) and nonlocally switched lines may be nailed up. A hairpin is a connection in which a semipermanent path between two DS0 channels on the same IDCU is assigned. The hairpin connection does not use SM or CM time slots. Nonswitched (single or multichannel), nonlocally switched lines, and ISDN BRIs may be hairpinned.

Up to 20 DS1 lines may be terminated on each electrical line interface (ELI). An optional second ELI can be provided to terminate an additional 20 DS1 lines. The maximum number of DS1s per IDCU is 40. The maximum number of remote terminals per IDCU is 31. The ELI splits the DS1 lines to feed two loop side interfaces (LSIs) with one side active and one side stand-by. The LSI converts the DS0 channel to a 5ESS[®] switch time slot format. The time slot connects to the PIDB transmission interface (PTI) through the internal data bus (IDB). The PTI is also duplicated with one side active and the other side stand-by. The PTIs have an update bus between them to keep time slot information current in both sides. The PTI has a TSI that allows any incoming DS0 to be connected to a PIDB time slot, a DPIDB, or to another DS0 channel on the same IDCU. A maximum of 15 PIDBs and 7 DPIDBs, or 8 PIDBs and 11 DPIDBs may be connected to the PTI. The rule is that the number of PIDBs plus two times the number of DPIDBs must be less than or equal to 30.

Each PIDB assigned to a PTI has 32 time slots and is engineered at 90 percent occupancy. The number of PIDBs required is dependent on the CCS load offered by the remote terminal. The concentration ratio is dependent upon the number of remote terminals and PIDBs per IDCU.

3.1.3.8 Digital Network Unit □ SONET

3.1.3.8.1 General

The Digital Network Unit □ SONET (DNU-S) is a peripheral interface unit for trunks in the SM-2000. The primary function of this unit is to terminate SONET facilities and to convert data and signaling to the Peripheral Control and Timing (PCT) link format for the SM-2000. All information is passed between the DNU-S and the SM-2000 over these PCT links.

The following Digital Networking Unit-SONET (DNU-S) items are engineerable:

- **STSX-1 Link Interface (SLI)** - Each SLI terminates one STSX-1 link. A minimum of 1 and a maximum of 12 may be equipped per unit.
- **STSX-1 Facility Interface (SFI)** - Two SFIs are provided in each data group of TMUXs. A minimum of 2 or a maximum of 4 are provided per unit.
- **Transmission Multiplexer (TMUX)** - TMUXs are provided 1 per STSX-1 link plus 1 spare for each group of 6 TMUXs. A minimum of 2 (1 spare) and a maximum of 14 (2 spares) are provided per unit.
- **Common Control** - The DNU-S comes equipped with 2 Common Control boards.
- **Common Data** - A minimum of 2 and a maximum of 4 Common Data boards may be provided per unit.
- **Common Optical Terminations (COT)** - A maximum of 24 COT boards may be provided per unit. Each COT terminates the optical fibers for 1 PCT link and performs the optical-to-electrical conversion of data and control received and transmitted over the PCT link interfaces.
- **Peripheral Link Interface (PLI)** - Each side of a duplex PCT link terminates on a PLI paddle board at the SM-2000.

Table 3-8 describes the pack count for a single DNU-S at varying quantities of STSX-1 interfaces. Each STSX-1 is terminated by an SLI. Table 3-8 assumes the most economical equipage of TMUXs, and buys

the second spare only after the first data group is fully equipped.

Table 3-8 Pack Count for Single DNU-S

SLI (STXS-1)	SFI	TMUX	CC	CD	COT	PLI
1	2	2	2	2	2	2
2	2	3	2	2	4	4
3	2	4	2	2	6	6
4	2	5	2	2	8	8
5	2	6	2	2	10	10
6	2	7	2	2	12	12
7	4	9	2	4	14	14
8	4	10	2	4	16	16
9	4	11	2	4	18	18
10	4	12	2	4	20	20
11	4	13	2	4	22	22
12	4	14	2	4	24	24

Table 3-9 shows the SM-2000 engineering for the DNU-S.

Table 3-9 DNU-S Engineering for 100 Percent Inter SM Traffic

PCT PER SM	TRUNKS PER DNU-S	DNU-S PER SM-2000	NCT2 PER SM-2000	TRUNKS PER SM-2000	TSIS PER SM-2000
1	672	1	1.3125	672	2
2	1,344	1	2.625	1,344	2
3	2,016	1	3.9375	2,016	3
4	2,688	1	5.25	2,688	3
5	3,360	1	6.5625	3,360	4
6	4,032	1	7.875	4,032	5
7	4,704	1	9.1875	4,704	5
8	5,376	1	10.5	5,376	6
9	6,048	1	11.8125	6,048	7
10	6,720	1	13.125	6,720	7
11	7,392	1	14.4375	7,392	8
12	8,064	1	15.75	8,064	8
13	8,064+672	2	17.0625	8,736	9
14	8,064+1,344	2	18.375	9,408	9
15	8,064+2,016	2	19.6875	10,080	10
16	8,064+2,688	2	21	10,752	10

In the 5E10 software release, the SM-2000 is offered with a non-square TSI. The peripheral-to-peripheral feature enables a trunk (or line) to talk to another trunk (or line) without using any network side time slots, as long as the calls originate and terminate on the same SM. A line-to-line, trunk-to-trunk, line-to-trunk, or trunk-to-line call on an SM requires 2 peripheral time slots and 2 network time slots even if the calls originate and terminate on the same SM.

Tables 3-10 and 3-11 show the equipment required for 50 and 100 percent tandem trunk traffic within the same SM-2000 respectively. Note the number of TSISs decreases as the tandem traffic increases.

Table 3-10 50 Percent Intra SM Tandem Trunk Traffic

PCT PER SM	TRUNKS PER DNU-S	DNU-S PER SM-2000	NCT2 PER SM-2000	TRUNKS PER SM-2000	TSIS PER SM-2000
1	672	1	0.6563	672	2
2	1,344	1	1.3125	1,344	2
3	2,016	1	1.9688	2,016	3
4	2,688	1	2.6250	2,688	3
5	3,360	1	3.2813	3,360	3
6	4,032	1	3.9375	4,032	4
7	4,704	1	4.5938	4,704	4
8	5,376	1	5.2500	5,376	4
9	6,048	1	5.9063	6,048	5
10	6,720	1	6.5625	6,720	5
11	7,392	1	7.2188	7,392	6

12	8,064	1	7.8750	8,064	6
13	8,064+672	2	8.5313	8,736	7
14	8,064+1,344	2	9.1875	9,408	7
15	8,064+2,016	2	9.8438	10,080	8
16	8,064+2,688	2	10.5000	10,752	8
17	8,064+3,360	2	11.1563	10,752	8
18	8,064+4,032	2	11.8125	10,752	9

Table 3-11 100 Percent Intra SM Tandem Trunk Traffic

PCT PER SM	TRUNKS PER DNU-S	DNU-S PER SM-2000	NCT2 PER SM-2000	TRUNKS PER SM-2000	TSIS PER SM-2000
1	672	1	0	672	2
2	1,344	1	0	1,344	2
3	2,016	1	0	2,016	2
4	2,688	1	0	2,688	2
5	3,360	1	0	3,360	3
6	4,032	1	0	4,032	3
7	4,704	1	0	4,704	3
8	5,376	1	0	5,376	3
9	6,048	1	0	6,048	4
10	6,720	1	0	6,720	4
11	7,392	1	0	7,392	4
12	8,064	1	0	8,064	4
13	8,064+672	2	0	8,736	5
14	8,064+1,344	2	0	9,408	5
15	8,064+2,016	2	0	10,080	5
16	8,064+2,688	2	0	10,752	5
17	8,064+3,360	2	0	10,752	6
18	8,064+4,032	2	0	10,752	6

3.1.3.9 Global Digital Service Unit (GDSU)

The global digital service unit contains the transmission test facility (TTF) circuits and the UCCs that perform functions for all lines and/or trunks in the system.

The calculation of 3-port conference circuit requirements is identical to that of 3-port conference circuits in other systems with the exception that 3-way calling and operator verification are the only 5ESS® switch features requiring them. The engineering criteria are a probability of blocking of 0.05 or 85 percent occupancy once a month (P.001 ABS). At least one conference circuit is required.

An SM may be equipped with a maximum of seven GDSUs.

The basic TTF circuit requires 10 of the GDSU's 64 time slots. As the office size in lines and trunks increases, additional transmission test circuits and measurement packs, are required. Each additional measurement pack requires four additional time slots. The TTFs are used on a routine basis for trunk transmission tests, LU and TU channel tests, and electronic loop segregation tests. The basic TTF and up to two additional measurement packs must be in the same GDSU SG.

There are two kinds of 3-port UCC circuit packs. The UCC circuit packs each contain two 3-port conference circuits. The UCC2 circuit packs each contain five 3-port conference circuits. The UCC circuit packs, UCC2 circuit packs, and the 6-port conference circuit packs utilize time slots remaining after allocation to the TTF and measurement packs. Each unit is allocated 64 module time slots (2 PIDBs). Some examples of GDSU loading are shown in Table 3-12 .

In the service groups fully dedicated to conference packs, the following combinations are available:

- ☐ Five UCCs (ten 3-port conference circuits)
- ☐ Two UCC2s (ten 3-port conference circuits)
- ☐ Two 6-port conference circuits and a UCC

- ☐ A 6-port conference circuit and 3 UCCs.

There will always be at least one measuring pack with each TTF except when there is only a single TTF in the entire office.

Table 3-12 GDSU Loading

BASIC TTF REQ.	ADDITIONAL MEAS. PACKS	3-PORT SETS	TIME SLOTS USED
1	0	16	58
1	1	16	62
1	2	14	60
0	0	20	60

With the 6-port conference circuit pack, each 6-port circuit is assigned six time slots. One 6-port conference circuit cannot be used as two 3-port circuits. Also, each 6-port conference circuit pack must be completely assigned (that is, the use of partial packs is not permitted). Like the 3-port conference circuits, the 6-port conference circuits are engineered based on usage. The 6-port conference circuits can be mixed with the 3-port conference circuits and/or the TTF. Each circuit pack must be totally assigned, that is, the use of partial packs is not permitted. The CCS usage of the 6-port conference circuit may be estimated based on the penetration of the multiway calling feature of business and residence custom services (BRCS).

3.1.3.10 Global Digital Service Function (GDSF)

In the 5E10 software release, the Global Digital Service Function (GDSF) unit is a single unit that replaces the GDSU found on the SM. The GDSF can be assigned on the SM-2000 or an SM, and is based on the DSC3 technology already on the SM-2000. This feature includes 3- and 6-port conference circuit functionality on the GDSF, as well as the Transmission Test Facility (TTF) circuits and Integrated Services Test Function (ISTF) circuits functionality.

The GDSF can be provisioned for SMs with 1 or 2 active PIDBs and 32 or 64 time slots. There may be one GDSF per CSU shelf and one CSU per SM.

The SM-2000 can be provisioned for 4 active PIDBs and 128 time slots. There can be from 1 to 32 GDSF units per SM-2000.

Varying levels of support for conference calling, TTF, and ISTF can be programmed for the GDSF through the ODA and recent change.

Inputs to the DOPS 5 system are the same as for GDSU.

3.1.3.11 Modular Metallic Service Unit

3.1.3.11.1 Overview

The modular metallic service unit (MMSU) does not require SM time slots (or PIDBs) and, therefore, does not affect SM quantity requirements. The MMSU provisioning is based primarily on maintenance and testing considerations relating to office size and working lines.

The MMSU is a 1- to 4-shelf unit with 16 circuit pack positions per shelf that contains a variety of service functions. Thirty-two pairs of wires are cabled to the distributing frame from each circuit pack position that contains a scan or a signal distributor circuit pack. Cross-connections are made as required, depending on the circuit function of the pack installed in a particular position.

The MMSU provides the following service functions:

- ☐ Metallic test buses - Provides a metallic network between test sources [LTD trunks, TLWS, and the directly connected test unit (DCTU)] and circuits under test (LUs, TUs, and SLC[®] carrier facilities).

- ☐ Automatic line insulation test (ALIT) circuits - Utilizes the metallic access buses to perform ALIT tests on lines.
- ☐ Subscriber line and instruments measurement circuit - 2 (SLIM2) - Utilizes the metallic access buses to perform metallic tests on lines and trunks.
- ☐ Gated diode crosspoint (GDX) compensation circuit - Compensates for leakage currents in the line unit GDXs which may affect precision of the measurements made on the subscriber line unit.
- ☐ Scan and distribute points - Required only for circuits and services external to the AM and SM [for example, nonintegrated carrier group alarms, multiline hunt group stop hunt keys, other miscellaneous alarm circuits, and the contact for the test bus control unit (TBCU)].
- ☐ Metallic test interconnection bus (MTIB) - Allows the interconnection of the service groups within an MMSU and also between MMSUs.

Scan and distributor point requirements are based partly on local input (for example, quantities of nonintegrated carrier group alarms and stop hunt keys). Metallic test buses are based primarily on the quantity and types of other units installed. The ALIT and GDX compensator circuits are engineered according to the number of lines and the rate at which the lines are tested.

In the 5E10 software release, metallic testing capacity is provided by adding a SLIM2 circuit pack to the MMSU. The SLIM2 packs may be mounted in any position of the MMSU. In addition, a GDX compensator pack is required. The SLIM2 and GDX compensator circuit are engineered according to the number of lines and the rate at which the lines are tested.

3.1.3.11.2 Test Bus Control Circuit

The test bus control circuit (TBCC) is needed to permit line testing of a *SLC*[®] carrier RT from the *5ESS*[®] switch when an integrated *SLC*[®] carrier system or a mixture of universal and integrated *SLC*[®] carrier systems is used. The TBCC provides an interface to the metallic test pair (MTP) that is associated with the *SLC*[®] carrier system and the MMSU of the *5ESS*[®] switch. An MTP provides metallic access to an RT location of the *SLC*[®] carrier system to the *5ESS*[®] switch. Multiple RTs may be served by one MTP when the RTs are in the same location (within 100 feet of each other). A maximum of ten RTs may share the same MTP when manual line testing is performed (LTD, LTC, etc.). If automatic line testing is employed (MLT-1, MLT-2 etc.), then a maximum of 20 RTs may be served by 1 MTP. A TBCC is required for each MTP served by the *5ESS*[®] switch.

The TBCU houses 2 TBCCs, and up to 15 TBCCs can be mounted in a frame that is located near the location of the DSX that terminates the DS1 lines for the *SLC*[®] carrier systems. The TBCU is not part of the *5ESS*[®] switch.

3.1.3.12 Directly Connected Test Unit

The DCTU does not require SM time slots (or PIDBs) and, consequently, does not affect SM quantity requirements. The provisioning is based primarily on maintenance and testing considerations relating to office size and working lines.

The optional DCTU provides direct connect line and trunk testing capabilities from the master control center (MCC), the Switching Control Center System (SCCS), or the Loop Maintenance Operations System/Mechanized Loop Testing (LMOS/MLT) system. The DCTU provides DC access to the centralized trunk test unit (CTTU); however, it is not required in a 100 percent digital office. The DCTU also provides voltage, resistance, and capacitance measurements on analog circuits, and provides limited manual ringing and callback features for 2-party lines. In the absence of the DCTU, maintenance personnel must perform direct connect tests through the TLWS using test equipment external to the *5ESS*[®] switch. The DCTU ports

are provided in sets of four in one precision measurement unit. Each DC test source requires one port.

NOTE: In the 5E10 software release, the Trunk and Line Work Station (TLWS) Metallic Test capacity is provided by the MMSU through the SLIM2 circuit. The DCTU is required for MLT as the SLIM2 does not provide that service.

3.1.3.13 Combined Service Unit (CSU)

The CSU combines functions of the DLTU2, MMSU, SAS, and the GDSF into one shelf. This eliminates the need for three backplanes. It is compatible with existing DLTU2, DSU2-RAF2, and GDSU units in the same office and in the same or different SMs. This compatibility allows the small offices using CSU units to grow to conventional office configurations.

The MMSU portion of the CSU contains a single service group. If a single SM office grows to a configuration requiring more metallic services, the MMSU portion of the CSU must be degrown and a standard MMSU must be provided. If the office grows to more than one SM, it may retain the MMSU in the CSU. If this growth requires two service groups to provide expanded metallic services, a standard MMSU is needed. The standard MMSU may be in a different SM than the one containing the CSU. The CSU supports up to 5 DF12 type circuit packs for trunking purposes, one GDSF circuit pack arranged to provide integrated services test functions (ISTF), trunk testing and conference circuit functionality, 250 seconds of RAF capacity, metallic testing through SLIM2 with optional compensator circuit pack and up to 64 scan points and 64 signal points.

3.1.4 SWITCHING MODULE ENGINEERING

3.1.4.1 Real Time

3.1.4.1.1 Switching Module (SM)

The SMP call capacity of 7,500 calls (15,000 half calls) (5E6 and later software releases) of the simplest call types is considered sufficient for all applications and is therefore not normally engineered. However, for Operator Services Position System (OSPS) applications, the call holding time is very short and the SM call capacity is real time limited. If it is desired to verify the real time requirements of the SMs, it may be done manually using half-calls. Future plans are to incorporate these checks in the 5 DOPS.

Half-calls are allocated to units (originating and terminating to LUs and DCLUs, incoming and outgoing to TUs and DLTUs) and a "worst case" module is tested for total half-call demand. If the demand is less than the SMP half-call capacity, the modules are time-slot limited and the real time module requirement is less than the time slot requirement. If the demand test fails, unit assignments are made in an attempt to meet real time capacity within time slot constraints. If this cannot be done, the module quantity is increased beyond that required for time slots. Contingency should be provided for the effects of feature calls.

3.1.4.1.2 Switching Module 2000 (SM-2000)

The SMP call capacity for SM-2000 is as follows:

Smp 40	70,000 full calls 140,000 half calls (EQPOTS) 95,000 full calls (toll application)
Smp 60mm	120,000 full call (EQPOTS) 160,000 full call (toll application)

3.1.4.2 Interface Units

3.1.4.2.1 Switching Module (SM)

The SM requirements are based on time slots except for the SMs that carry a high concentration of OSPS traffic or when the SM is serving as a position switching module (PSM). (The PSMs are dedicated and are not normally time slot engineered.) Time slots required for engineered peripheral units are summed and divided by 512 to determine the total number of SMs required. The LU, TU, or GDSU requires 64 time slots. The DLTU requires up to 256 effective time slots in multiples of 32. The DCLU requires 64 or 128 time slots.

Units may be assigned to modules in any manner, limited by the 512 TSI time slot capacity or, if applicable (see real time test in preceding text), SMP capacity.

3.1.4.2.2 Switching Module 2000

An SM-2000 may have up to 10 TSI boards, 1 SMC cabinet, and a maximum of 28 LTp cabinets. A maximum of 6 digital expansion boards (DX) may be equipped per SM-2000. Each DX board handles up to 24 PIDBs. A maximum of 4 duplicated control interface (CI) packs may be supplied in an SM-2000. Each CI carries up to 23 PICBs. A maximum of 3 duplicated message handlers (MHs) can be equipped in an SM-2000. The maximum number of NCT2 links in an SM-2000 is 22. An SM-2000 may have up to 144 PIDBs.

The following units may be equipped in an SM-2000:

- (1) TU
- (2) DLTU2
- (3) AIU, EAIU
- (4) DNU-S
- (5) LU3
- (6) ISLU2
- (7) IDCU
- (8) GDSF
- (9) LDSF
- (10) SAS (DSU2)
- (11) PSU2
- (12) MMSU
- (13) DCTU

3.1.4.3 Digital Service Unit - Model 2

Tone decoders, unlike tone generators, are used on a per-call basis and must be engineered. This is done by estimating total dual tone multifrequency (DTMF), multifrequency (MF), and originating and nonbylink incoming dial pulse OAM (or ABS and high-day) usage, and allocating it to each required module. Per module OAM usage is read into Poisson 0.03 blocking probability tables (TCBH engineering criteria are blocking probability of 0.01 ABS or 0.05 high day, whichever is limiting) and is increased to provide a minimum of one pack per SG. This is performed to accommodate expected decoder usage variation that occurs between modules and is caused by unit loading.

The digital service unit - model 2 (DSU-2) provides digit reception, tone generation and outpulsing, and cadencing and control of tone sequences. In addition, the DSU-2 performs special tone generation and reception functions such as voice path assurance (VPA) and analog visual message waiting indicator (AVMWI). An DSU-2 consists of two service groups, each consisting of a single circuit pack. Each circuit pack contains seven digital signal processors (DSPs). Each DSP can be dedicated to perform any one of the following functions:

- (1) five tone decoder circuits (five channels)
- (2) thirty tone generator circuits (30 channels)
- (3) five tone transceiver circuits (five duplex tone generation and tone reception channels)
- (4) centralized automatic message accounting (CAMA) tone decoder (ten channels)

Engineering of these units ensures that DSPs are available to add new services to the DSU-2.

Voice path assurance, AVMWI, and analog incoming calling line identification (AICLID) are performed by the tone transceiver circuits.

3.1.5 INTEGRATED SERVICES DIGITAL NETWORK ENGINEERING

3.1.5.1 Integrated Services Line Unit Engineering

3.1.5.1.1 Overview

The integrated services line unit (ISLU) is the peripheral unit of the integrated services digital network (ISDN) on which analog and digital subscriber access lines terminate. The ISLU provides for the concentration of the ISDN lines.

Each ISLU consists of the following hardware:

- ☐ BRI cards
- ☐ Line group controllers (LGCs)
- ☐ Line interface data buses (LIDBs)
- ☐ Common data (CD) boards
- ☐ Duplex peripheral interface data buses (DPIDBs).

3.1.5.1.2 BRI

Each BRI has two B-channels and one D-channel. The B-channels may or may not be used. The D-channel can be used for packet switching (X.25) and/or for Q.931 signaling for circuit-switched call setup. The X.25 packet switching can be provided on both the D- and B-channels, as well as packet switching on interswitch packet trunks. The B-channels can also be circuit switched. With the 5E5 and later software releases, the BRI supports multipoint operation.

3.1.5.1.3 LGC

Up to 32 BRI's are grouped and controlled by an LGC over two group interface data buses (GIDBs). There can be up to 16 line groups (each with a line group controller) per ISLU for a maximum of 512 BRI cards per unit. The analog cards are called ``Z" cards, and the BRI cards are called ``T" (4-wire) or ``U" (2-wire)

interface cards. The cards in the line groups can be mixed, but additional equipment (for example, HLSC circuit packs, ringing generator circuit packs, and metallic access network circuit packs) is required for the Z-cards.

3.1.5.1.4 LIDB

The output of each LGC is two LIDBs, each with 32 time slots. The output of a single LGC is referred to as an LIDB pair. No time slot interchanger function is performed at the LGC. Two duplicated control time slots (total of four) and eight duplicated time slots (total of 16) are reserved for the D-channels. If B-channel packet traffic is required, then additional time slots are nailed up on the LIDB pair; one time slot on each of the LIDBs of that LIDB pair.

A single time slot can carry up to four D-channels (Q.931 +/- X.25) or one B-channel (X.25 or circuit switched). Each D-channel is transported at a 16 kb/s rate and each B-channel is transported at 64 kb/s. Each time slot is transported at 64 kb/s.

If the B-channel is circuit switched, only one time slot on one of the GIDBs (and LIDBs and PIDBs) is used. If the B-channel time slot is packet switched, then the time slot appears on each LIDB (and GIDB and DPIDB) of the GIDB-LIDB-PIDB pair. The D-channels are always packet switched, while the B-channels can be either packet or circuit switched.

There is no concentration of the D-channels. The BRI in an LGC has a duplicated, dedicated path for its D-channel to the 5ESS[®] switch network. This reliability is required because the signaling, supervision, and control for all of the BRI traffic channels is performed over the D-channel.

There is no concentration of the B-channels if they are packet switched. This results from an architecture that supports dedicated, duplicated packet-switched channels.

The time slots allocated for D-channels (Q.931 +/- X.25) plus the B-channels (X.25) are established at initialization time or through recent change. The remaining time slots are used for circuit-switched B-channels and are assigned on a demand basis.

The control and dedicated (D- or B-channel packet traffic) time slots are allocated in static data to minimize blocking and distribute the allocated time slots evenly. The B-channels that are circuit switched can be concentrated, if desired for a particular application. The D-channels are duplicated whether they are Q.931 or Q.931 + X.25.

The LIDBs provide 648 CCS of carrying capacity. When the B-channels (X.25) appear on both LIDBs of the pair from one LGC, they reduce the capacity of the LIDBs by 72 CCS per X.25 B-channel; that is, if more than eight time slots (duplicated) are required per LIDB pair, the capacity is reduced by 72 CCS for each dedicated time slot pair.

If the user has many single B-channel packets, an entire LGC can be dedicated to this function. In this case, up to 16 BRIs with B-channel X.25 traffic can be allocated. Each B-channel (X.25) requires a time slot (total of 16) and every 4 BRIs require a time slot (total of 4 for Q.931) for a total of 20 time slots. Twenty time slots is the static data software limit of the LGC.

3.1.5.1.5 CD Boards

The LIDBs connect the LGCs to the CD boards. There are two service groups of CDs on the ISLU. There are physically two cards in each service group. These two boards function together as one, that is, if one CD board in the SG fails, the entire SG is out of service.

The CD boards have several outputs. Each CD board is controlled by a duplicated common controller (CC) over peripheral control and data buses. Control messages to the LGCs and BRI cards arrive at the CD boards from the CC over the control interface data buses (CIDBs) where they are broadcast over the LIDB control time slots to all LGCs.

Traffic on the B- and D-channels is switched by the CD boards to output PIDBs. The PIDBs that go to the TSIU carry the B-channel circuit-switched traffic. The PIDBs that go directly to the packet switch unit (PSU) are called DPIDBs. The DPIDBs carry:

- ☐ Signaling information (Q.931) for the circuit-switched B-channels
- ☐ Packet-switched D-channels (X.25)
- ☐ Packet-switched B-channels (X.25).

The quantity of output buses (PIDBs to TSIU) is engineered for each ISLU and is CCS dependent. A BRI that uses a time slot on a GIDB for a circuit-switched call uses a time slot on either GIDB. Both B-channels can appear on one GIDB, or each on a separate GIDB. The same time slot used on the GIDB is also used on the LIDB and on the PIDB to the TSIU. There is no time slot interchange until the time slot gets to the TSIU. These PIDBs transport only circuit-switched B-channel information. This information can be voice or data.

The quantity of DPIDBs is a function of the number of digital cards in an LGC (which in turn is CCS dependent) and the number of B-channels that are packet switched.

Four time slots per LGC can appear on any one DPIDB. Although only four time slots per LGC are used by any one LGC on a DPIDB, eight LGCs may be assigned to the same DPIDB, therefore using the 32 available time slots.

A maximum of 12 PIDBs (the sum of PIDBs to the TSIU plus the DPIDBs to the PSU) per service group (6 per CD board), and 24 per ISLU are allowed. Because of the duplication, there will always be even numbers of PIDBs going to either or both the TSIU and the PSU. All 24 PIDB positions are not always used.

3.1.5.1.6 DPIDBs

The DPIDBs are provided in pairs, one bus per SG, for reliability. The D-channel signaling (Q.931) and/or D-packets (X.25) are dedicated to a particular protocol handler (PH) at initialization or during recent change. Up to four D-channels can share one time slot.

Assuming the packets per second for each BRI is less than eight, a fully equipped ISLU with no B-channel packet traffic would require four duplicated DPIDBs for a total of eight DPIDBs. If B-channel packet switched traffic is involved, additional DPIDBs would be required.

A partially equipped ISLU requires enough time slots to provide the D-channels (Q.931 +/- X.25) and any B-channel X.25 switching. The B- and D-channels can be mixed on a DPIDB. They occupy independent time slots.

3.1.5.2 Integrated Services Line Unit - Unit 2 (ISLU2) Engineering

The ISLU2, available in the 5E10 software release, supports digital (U and T) interfaces on the SM and SM-2000. Engineering inputs for the ISLU2 are the same as for the ISLU. The basic three shelf unit is equipped with all 16 "LGs" (LIDB pairs) and up to 512 DSLs with 32 DSLs for each LIDB pair. If additional DSLs are equipped, two shelves are added, and the DSLs are assigned to the second Line group on the LIDB pair. Up to 16 DSLs may be assigned per LIDB pair. Although a maximum of 1024 subscribers are allowed per ISLU2, it is recommended that no more than 768 lines are assigned. Although U line packs may not be spared, Individual line circuits on a line board may be paired. Up to 27 partially equipped ISLU2s or 4 fully equipped ISLU2s may be placed on an SM-2000.

3.1.5.3 Universal Remote Integrated Services Line Unit Engineering

The universal remote integrated services line unit (RISLU) is an ISLU that can be remoted away from the

host 5ESS[®] switch and is used in all applications of the RISLU with the exception of OSPS and centrex automatic call distributor (ACD). See "Remote Integrated Services Line Unit", Section 3.1.6.8, for the OSPS and ACD RISLU engineering. The RISLU is connected to the SM through pulse code modulation (PCM) carrier facilities.

The RISLU can support a maximum of 316 2B+D BRIs, which can be a mixture of T- or U-interface cards. The RISLU can also support a 2-wire analog interface Z-card. The maximum number of interface cards a RISLU can support is 512. In order to engineer a RISLU, it is necessary to determine the number of time slots required for each of the following functions:

- (1) D-channel transport
- (2) B-channel X.25 packet switching
- (3) circuit-switched traffic

By determining the total number of time slots required, the number of DS1 spans and LGCs required can be calculated. The DS1 lines terminate at the RISLU and at the host SM on a digital line trunk unit for RISLU - remote end (DLTU-RR) and a digital line trunk unit for RISLU - host end (DLTU-RH), respectively. At the RISLU, the DLTU-RR terminates the remote PIDBs from the CD board of the RISLU, and maps the time slots to the 64 kb/s DS0 channels of the DS1 line. At the host SM, the DLTU-RH terminates the DS1 line and re-creates the 64 kb/s time slot, which is delivered to the DI of the TSI through the PIDBs.

The BRI D-channel is a 16 kb/s channel. Four D-channels can be multiplexed by the RISLU on a single time slot; however, RISLUs remoted through nonclear channel DS1 lines do not have full use of the 64 kb/s DS0 channel. For nonclear DS1 lines, the RISLU multiplexes three D-channels per time slot. Since each BRI has one D-channel, the number of time slots required for D-channel transport through clear channel facilities can be calculated by dividing the total number of BRIs by four. Similarly, the number of time slots required for D-channel transport via nonclear facilities can be calculated by dividing the total number of BRIs by three.

The BRI B-channel is a 64 kb/s channel. The B-channels with X.25 packet switching require one time slot. The B-channels used for circuit-switched voice and/or circuit-switched data are load shared (CCS sensitive). The Z-cards, when active, require one time slot and are also load shared. The number of time slots required for BRI circuit switching can be calculated by dividing the BRI CCS by 32.4 CCS per time slot (90 percent occupancy). The number of time slots required for Z-card circuit switching can also be determined by dividing the Z-card CCS by 32.4 CCS per time slot.

The total time slots required per RISLU is the sum of the BRI requirement and the Z-card requirement.

There are two separate modes in which the DS1 lines used to remote a RISLU are operated. Mode 1 has 22 DS0 channels for traffic and 2 DS0 channels reserved for control (carries control bus for the RDFI in the DLTU-RR of the RISLU cabinet and the control bus for the ISLU hardware). For normal operation, two mode 1 DS1 lines are required per RISLU. The RISLU will function in a simplex state with one mode 1 DS1 line. Mode 2 has 23 DS0 channels for traffic and 1 DS0 channel for control of the RDFI in the RISLU cabinet. Up to 10 mode 2 DS1 lines can be equipped on a RISLU.

Each LGC in a RISLU is equipped with up to 32 cards (T, U, or Z). A RISLU can have up to 512 cards, but is limited to 316 BRI cards due to a 128 nail-up limit on the TSI in the host SM.

Each LGC in a RISLU has 32 time slots. The number of LGCs per RISLU can be limited by the number of cards or by the number of time slots required. The number of LGCs required for BRIs due to time slots can be calculated by dividing the total number of BRI time slots by 32. The number of LGCs required for BRIs due to card constraints can be calculated by dividing the total number of BRIs by 32.

Also, the number of LGCs required for Z-cards due to time slots can be calculated by dividing the total number of Z-time-slots by 32. The number of LGCs required for Z-cards due to card constraints can be

calculated by dividing the total number of Z-cards by 32. The larger of the two requirements should be provided. The total number of LGCs (a maximum of 16) required is the sum of the BRI requirement and the Z-card requirement.

If Z-cards are present in the RISLU, two ringing generators must be provided. The metallic access network (MAN) circuit packs are provided only if the software controlled sparing function is desired or Z-cards are equipped. Two MAN circuit packs (one duplicated) will provide one spare per RISLU, and four MAN circuit packs (two duplicated) will provide two spares per RISLU. If the Z-cards are not equipped, four MAN circuit packs are always required. Spare line cards should not be included in the time slot calculations, but need to be considered in the calculation of the LGCs. Spares do not count toward the 316 BRI limit. Up to six HLSCs can be equipped in a RISLU, and are provided on the same basis as in an ISLU. The HLSCs are not required for RISLUs equipped with only T-cards.

The minimum number of PSU shelves required for a RISLU is determined by the number of time slots nailed up to the TSI. Each PSU shelf can have a maximum of 32 time slots. Also, the number of PSU shelves may be limited by the number of PHs. A maximum of 16 PHs can be equipped per shelf.

The number of interswitch module (ISM) time slots and the number of ISM PHs is dependent upon the total PPS in the network and the PPS in each SM. The quantity of ISM PHs and ISM time slots can be determined by using the 5 DOPS. Once these values are known, they must be allocated to the PSU shelves. Note that each PSU shelf has a limit of 16 PHs and a 32 time slot limit to the TSIs. One spare PH is recommended for each PSU shelf.

The number of ISM time slots available can also be estimated. If multiple RISLUs are hosted on the same SM, they can use the same ISM time slots per SM.

An SM can host up to 20 RDFIs, 4 DLTU-RRs, and 8 RISLUs. An SM is allowed a maximum of 316 BRIs from RISLUs due to the 128 nail-up restriction. In addition, an SM can be DI port limited or time slot set (TSS) limited in its engineering. Since one DI port is reserved for the pump function, a maximum of 31 ports can be engineered. There is a total of eight TSSs available in an SM.

The SM hosting the RISLU must be equipped with the fully loaded software configuration, and either the SMP12 or SMP20.

3.1.5.3.1 Access Interface Units (AIU, EAIU, XAIU)

The continually evolving AIU is the access platform product that is designed to serve all types of access lines including dial tone service "POTS" and coin as well as ISDN. The AIU deploys a common architecture for all customers and has been rapidly adapted to meet evolving customer needs. Deploying the AIU product line provides space, power consumption, and teledensity advantages over existing interface peripherals (that is, LU3, ISLU2, and RISLU2).

A broadband backplane for AIU product line enables the AIU product to support broadband services when equipped with broadband application circuit packs. Since the end of 2000, the AIU has been deployed in all new situations calling for the Line Unit Model 3 or the ISLU2 or the RISLU2.

3.1.5.4 PSU Engineering

3.1.5.4.1 Overview

The PSU is a peripheral unit that is required in every ISDN SM. The DPIDBs terminate to the PSU. If only analog Z-cards are present in the ISLU, the PSU is not required.

3.1.5.4.2 PSU Shelves

The PSU can have a maximum of five shelves on the LTP cabinet. There can be a maximum of four LTP cabinets plus the SMP cabinet per SM. Up to two ISLUs can occupy an LTP cabinet if the fan unit or shelf

zero is removed. Each LTP cabinet is equipped with six shelves. The ISDN SM is limited to five ISLUs if the SMP20 [SMP and TSI unit - model 2 (MCTU2) or MCTU3] processor is used. If the SMP12 is used (MCTU), a maximum of three ISLUs and a PSU or four Z-ISLUs can be equipped. Each shelf of the PSU can have a maximum of 16 PHs assigned to it. One PH is assumed to be a spare for a total of 15 engineerable PHs per shelf and a total of 75 engineerable PHs per PSU. (See "Protocol Handlers", Section 3.1.5.4.3 .)

A maximum of 14 PIDB connections (7 duplicated) per PSU shelf at the data fanout (DF) are allowed. Seven connections are to the active DF and seven to the standby DF.

Twelve of the fourteen connections (six duplicated) are for the DPIDBs. An additional two PIDBs, one from the active DF and one from the standby DF connect each PSU shelf to two ports on an active DI and two ports on a standby DI. The active PIDB carries only clock timing if no inter-SM traffic is present. When intermodule or interswitch B- and D-channel (X.25) traffic are included in the engineering, time slots are required on this PIDB. These peripheral side time slots then require TSIU time slots. Care must be taken in the assignment of the PIDBs at the DIs so that the maximum port termination (16 on DI odd and 15 on DI even) as well as the switching capacity (256 time slots per DI) is not exceeded.

The DF performs a TSI function, distributing the packets along the protocol handler data buses (PHDBs) to the PHs. While a total of 6 DPIDBs times 32 time slots per DPIDB (total of 192 time slots) can terminate to a shelf, the DF has the capability to distribute 512 time slots. There are 32 time slots on each of the PHDBs and a total of 16 PHDBs, 1 for each of the 16 PHs including the spare.

In addition to the PIDBs from the PSU shelves, the PIDBs for B-channel circuit-switched traffic connect to the TSIU (more specifically to the DIs). Each DI can terminate 16 PIDBs. The 2 DIs, even and odd, can therefore terminate 32 PIDBs minus the 1 that is reserved for pump for a total of 31 usable terminations. This represents the active DIs; the standby side is an exact duplicate. Both the PIDBs from the PSU and the PIDBs for circuit-switched traffic compete for the ports on the DIs.

3.1.5.4.3 Protocol Handlers

The 5ESS[®] switch may be equipped with different types of protocol handlers, depending upon the software release of the office. The PH3 is available with the 5E6 and later software releases. The PH4 is available with the 5E10 and later software releases and is required with the PSU4. The PH3 uses the *MOTOROLA*[®] MC68030 processor and is rated at 160 pps. The PH3 provides the same number of physical channels as the PH2 (that is, 128 16-kb D-channels or 32 64-kb B-channels), however, more channels demanding high throughput can be engineered on the PH3 because of the increased processing power. The ISDN lines using X.25 access features must be on PH3s prior to retrofitting to the 5E9(1) software release. All packet access features introduced in the 5E8 software release require PH3s. Inter-SM PHs and gateway (packet trunk) PHs may remain PH2s in the 5E9(1) software release. For circuit-switched applications, channel engineering and PH engineering does not change.

The PH2 and the PH3 can be mixed within the same PSU and the same PSU shelf. A spare is required for each hardware type on a shelf. This makes office engineering easier since the PSUs do not have to be converted from existing PHs to the PH3s to obtain 5E6 PH features or obtain increased throughput for pre-5E6 software release features.

The number of PHs required is dependent upon the packets per second (PPS) per D-channel and the PPS per B-channel. The minimum number of PHs required for B-channels can be calculated by multiplying the number of B-channel time slots by the average PPS per B-channel (total B-channel PPS) and dividing by the PPS capacity of the PH.

Each PH, depending on the function it is performing, has a distinct throughput and termination limit associated with it.

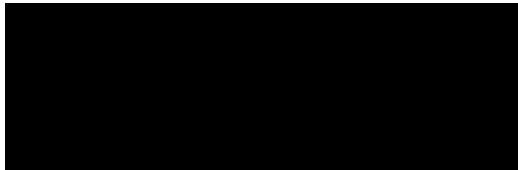
The DPIDBs must terminate to the shelf on which the access PH appears. The PHs can be shared by ISLUs and ISLU halves. Partial PHs may be assigned and then totaled and rounded up when the PHs and

DPIDBs are assigned to the PSU shelves.

Each PSU shelf requires two ports on one of the active DIs, such that if a failure occurs on the active DF, then the standby DF becomes active. Similar connections exist for the standby side of the DI. This takes care of all failures whether they are on the DFs or on the DIs. Both ports must be on the same DI.

When the SMs are configured, the inter-SM and link PHs must be included. All non-link SMs require access and inter-SM PHs as the application requires. If the SM is the link SM, then the inter-SM PHs must be augmented by an amount equal to the link PHs. This is because the link SM sees (on the inter-SM PHs in the link SM) all of the gateway traffic that appears on the inter-SM PHs of all other SMs, as well as on the link PHs in that SM.

Two to five percent of the total packet traffic is assumed to be gateway traffic. Each X.75 trunk group may contain up to 24 trunk member numbers. A PH2 supports one trunk group member. The number of PHs for inter-SM traffic is as follows:



where PPS is BRI/SM multiplied by PPS/BRI, and n is the number of ISDN SMs with inter-SM traffic.

3.1.5.5 PSU2 Engineering

3.1.5.5.1 Overview

The PSU2 hardware platform consists of a 5 shelf, 100 MB backplane PSU2 unit equipped with Control Fanout 2 (CF2), Packet Handler 4 (PH4) circuit packs. The PSU2 also supports the Data Fanout (DF) interface, which supports up to 6 DPIDBs, and one PIDB per shelf or the Data Fanout Multiple PIDB (DFMP) interface, which supports up to 4 PIDBs per shelf. The PSU2 interfaces to the SM-2000/SM's Module Controller and Time Slot Interchange Unit (MCTU) through the Packet Interface 2 (PI2).

NOTE: The 5ESS[®] switch may be used in FLEXENT[™]/AutoPLEX[®] Wireless Networks applications. When used in this way, the PSU2 also includes PHV, PHA and FRPH (on the PH4) circuits. For information on this application, see the 235-200-100, 5ESS[®] Switch FLEXENT[™]/AutoPLEX[®] Wireless Networks Applications OA&M Manual.

3.1.5.5.2 PSU2 Provisioning

The PSU2 can be provisioned on either an SM or SM-2000. The PSU2 has three data fanout options:

The Data Fanout (DF) terminates six DPIDBs and one PIDB to the active side (and one to the standby side). The DF is required if any BRIs are terminated to a particular PSU2 Shelf. This unit is engineered in the same way as a PSU.

The Data Fanout Multiple PIDB (DFMP) is introduced in the 5E10 software release. It provides 1 to 4 active PIDBs and 1 to 4 standby PIDBs to the active DI. No DPIDBs may be provisioned. Therefore, at a minimum, each DFMP requires 2 PIDB ports to the active side and 2 PIDB ports to the standby side of the TSI. At a maximum, each DFMP requires 8 PIDB ports to the active side and 8 PIDB ports to the standby side of the TSI. In an SM-2000 application, a 5 shelf PSU2 fully equipped with DFMPs requires 40 PIDB terminations on the active DX and the same on the standby DX (SM-2000 has a 136 active side PIDBs available for optional peripherals).

The Data Fanout - 2 (DF2) terminates one STS-1 for a total of 512 timeslots. One PH3, PH4, or PH22 is used for Sparc, making 480 nail-up timeslots available per PSU2 shelf. DF2 is available for TR303 on DNU-S only.

The DFMP may be used in applications where there are concentrations of nail-up trunks (that is, IP, X.75, X.75', XAT, or PRI) in one SM/SM-2000 and the use of the DF would limit the PSU2 shelf on the PIDB time slots to the time slot interchange.

3.1.5.5.3 PSU/PSU2 Engineering Differences

Engineering the PSU2 is very much like engineering the PSU. Among the differences are the following:

- ☐ Within the same PSU2, the DF and the DFMP can be provisioned on different PSU2 shelves.
- ☐ DFMP PIDBs are engineerable. 1 to 4 active PIDBs can be connected to the time slot interchange.
- ☐ 160 nail-up time slots can be provided to the TSI using the DF (5 PSU2 shelves multiplied by 32 time slots per shelf).
- ☐ The DFMP can provide 640 time slots to the TSI (5 PSU2 shelves multiplied by 128 time slots per shelf).
- ☐ The SM has a 190 time slot nail-up limit while the SM-2000 has a 2000 time slot limit.
- ☐ The DF2 can provide 2,400 time slots to the TSI (5 PSU2 shelves multiplied by 480 time slots per shelf).

3.1.5.5.4 PH4 and PSU/PSU2

The PH4 is a protocol handler available on the PSU and the PSU2 in the 5E10 software release. It is the only PH that may be provisioned on the PSU2. The PH4 has significantly improved throughput over the PH3. The PH3 is rated at 200 PPS for the 5E10 software release.

When mixing PH4s with PH3s and/or PH2s on the PSU, each shelf must have at least one spare of each type of PH resident on the shelf. PH4s cannot be used to spare PH3s or PH2s.

As with the PH2 and PH3, the PH4 can terminate up to 128 BRIs (1/4 time slot for each access D-channel). Packet trunk engineering remains the same as in previous software releases. PRI Engineering varies slightly between SM and SM-2000. The PH4 can terminate the following trunk quantities:

- ☐ X.75 and X.75'= 4 trunks per PH4
- ☐ IP = 6 trunks per PH4
- ☐ PRI = 20 National PRI "D" channels per PH4 in the SM and 32 "D" channels per PH4 in the SM-2000.

3.1.5.6 SS7 PSU Engineering

The SS7 PSU is introduced in the 5E11 software release to provide an SS7 signaling platform on the SM-2000 and EXM-2000 switching modules. A signaling link arrives as a time slot at a 24-channel, T1 facility of a DFI on a DLTU2. A nailed-up, semi-permanent path through the TSIU connects the timeslot on the DFI to a Protocol Handler (PH) in the PSU. The PH manages individual signaling links and routes SS7 signaling messages. The PH sends an incoming signaling message across the Packet Bus to the Packet Interface 2 (PI2) which sits in the TSIU. The PI2 hands off the signaling message to call processing software in the SMP. Call Processing software in the SMP sends an outgoing message to the PI2 which passes the message across the Packet Bus to the PH. The PH routes the message to the link-level manager of a signaling link. The link-level manager sends the message across the nailed-up connection to the timeslot on the DFI. The DFI transmits the message in serial form on a T1 PCM bit stream.

The SS7 PSU requires the following hardware units:

- ☐ A DFI in a DLTU2 or an STS-1 on a DNU-S
- ☐ Data Fanout (DF)
- ☐ Protocol Handler (PH)
- ☐ Packet Fanout (PF)
- ☐ Control Fanout (CF) in the PSU
- ☐ PI2 in the TSIU

3.1.6 OSPS ENGINEERING

3.1.6.1 Overview

With the 5E4 software release, the 5ESS[®] switch provides the following OSPS features:

- (1) directory assistance (DA)
- (2) toll and assistance (T&A)
- (3) automatic call distributor (ACD)

NOTE: In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. Information pertaining to ACD in this section apply to the 5E8 and prior software releases. See 235-190-104, *ISDN Feature Description*, for a full description of this feature and its operation.

The DA feature allows the integration of DA operator positions into a 5ESS[®] switch using ISDN. The T&A feature provides additional operator services that include the following:

- ☐ billing for collect
- ☐ person-to-person
- ☐ calling card
- ☐ bill to third number
- ☐ operator-assisted completion of calls
- ☐ time and charge
- ☐ notify
- ☐ busy line verification
- ☐ automated calling card service (ACCS)
- ☐ automated coin toll service (ACTS)
- ☐ automated multileaf bulletin (AMLB)
- ☐ automatic charge quotation service (ACQS)

The ACD feature is used by commercial agents to provide call handling services to businesses such as

service bureaus, reservation offices, and phone-in mail-orders. The ACD feature uses the DA position terminals or agent communications terminal (ACT) to provide call handling capabilities. The ACD is used to provide call distributor functions. A management information system (MIS) provides ACD administrators with a limited access to OSPS system administration for making changes and receiving activity reports. Call handling services include:

- (1) interflow
- (2) customer account services (CAS)
- (3) line information data base (LIDB) features for T&A
- (4) DA/ACD reroute feature for DA and ACD
- (5) intraflow

The 5E6 software release provides enhancements to the existing operator services areas (DA, T&A, and ACD).

The DA feature receives the following enhancements for the 5E6 software release and is referred to as listing services (LS):

- ☐ combined services (DA/T&A) from the combined services terminal (CST)
- ☐ switched-access external audio response unit (ARU) interface

The T&A features for the 5E6 software release include the following:

- ☐ more efficient call handling (MECH)
- ☐ direct international originations (DIOR)
- ☐ multiple data base access (MDBA)
- ☐ improved third number acceptance (ITNA)
- ☐ combined services from the CST

The ACD enhancements for the 5E6 software release include increasing the system/PSM position capacities, the music on hold feature, and the introduction of the call vectoring feature which significantly impacts the engineering of CMP and originating SM real time.

The 5E6(2) software release provides the following LS enhancements:

- ☐ directory assistance call completion
- ☐ intercept services using an external information system (EIS)
- ☐ IBM[®] external audio response unit.

The 5E7 software release provides the following T&A enhancements:

- ☐ terminating code screening release 2
- ☐ customer account services release 3 (CAS R3)

- ☐ alternate access to operator services/software defined network - network remote access (AATOS/SDN NRA)
- ☐ voice messaging service interface (VMSI) release 2
- ☐ local exchange carrier (LEC) alternate credit card format
- ☐ automated alternate billing system/automated position AABS/AP

The ACD enhancements for the 5E7 software release include the following features:

- ☐ alternate external dialing
- ☐ direct intelligence interface (DII)
- ☐ ACT-PLUS terminal
- ☐ using an ORM as the PSM
- ☐ data base access from the ACT or ACT-PLUS through D-channel packet switching
- ☐ using the basic rate interface transmission extension (BRITE) to remote ACD positions
- ☐ call interaction interface for inbound call management (CIICM), also known as the "prompt step" in call vectoring
- ☐ live mike
- ☐ direct agent access
- ☐ calling party number delivery
- ☐ improved conference and transfer on outbound calls

The 5E7 software update (SU) introduces three new and enhanced T&A features as follows:

- ☐ VMSI release 3
- ☐ CAS carrier specific routing
- ☐ CAS enhanced service provider/credit checking

The 5E8 software release provides the following T&A features:

- ☐ 5E6 to 5E8 retrofit skip
- ☐ ISP feature group B (FGB) carrier identification code (CIC) expansion
- ☐ OSPS FGB CIC expansion.

The 5E8 software update provides the following T&A features:

- ☐ honor credit cards and provide operator assistance for 900 services
- ☐ differentiate card service charge
- ☐ CAS purchase limit

- ☐ CAS inward validation identification
- ☐ CAS customer-defined bill segmentation for international calling card validation
- ☐ CAS customer-defined bill segmentation for sequence calling
- ☐ CAS enhanced operator cut-through of callers to an operator for calls not honored
- ☐ terminating code screening release 3
- ☐ VMSI release 4
- ☐ DIOR rate quotation

The 5E9(1) software update provides the following features:

- ☐ OSPS/ISP FGD CIC expansion
- ☐ DA call completion 2
- ☐ interchangeable NPA
- ☐ IBM® combined service terminal
- ☐ credit card information forwarding
- ☐ volume and duration limits
- ☐ enhanced limits
- ☐ ICCV - purchase limit
- ☐ ICCV - call duration and charge
- ☐ ICCV - geographic restriction
- ☐ all cards fail
- ☐ calling and enhanced called number restriction
- ☐ non-secured transport
- ☐ non-English language announcement

NOTE: In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. Information pertaining to ACD in this section apply to the 5E8 and prior software releases. See 235-190-104, *ISDN Feature Description*, for a full description of this feature and its operation.

The OSPS can be deployed in a 5ESS® switch dedicated to OSPS services (any combination of LS, DA, T&A, and ACD) or integrated into a network switch serving other toll, tandem, and/or local traffic as well. The only exception to this is with the 5E6(2) software release where the 5ESS® switch must be dedicated to OSPS.

As a feature of the 5ESS® switch, the OSPS and ACD rely on the services, features, functions, and facilities already provided by the switching system in the areas such as administration, billing, maintenance, support systems, power, trunking, etc. The ACD also relies on a dedicated management information system for additional administration and support.

3.1.6.2 OSPS System Limits

The operator service center (OSC)/customer call center (CCC) located remotely from the host can contain a varying number of operator positions and other OSPS services, but these positions must connect with the host PSM through RISLUs. However, if the OSC/CCC is collocated with the host, the operator positions and other BRIs may connect with the host PSM through an ISLU. A restriction for the connectivity is that a RISLU cannot be distributed across PSMs. Each RISLU of any capacity must connect to only one PSM, though any PSM can support multiple RISLUs, as well as ISLUs, or a combination of the two. The 5ESS[®] switch OSPS limits are a maximum of 32 OSCs/CCCs and 8 force management centers (FMCs).

The total number of positions which can be supported by an OSPS is dependent upon the OSPS features being offered on the switch. If the switch is dedicated to ACD, 1,000 (4,000 with the 5E6 and later software releases) agent positions can be supported. This is dependent upon the features being offered on the switch, and on varying traffic characteristics and procedures between offices. The LS and DA features allow a total of 1,000 [1,250 with the 5E6(2) and later software releases] call handling positions, assuming a 20-second average work time (AWT) for LS and DA calls with the external audio response unit and a 90 percent operator occupancy. The T&A capacity depends on whether or not the MECH feature is active. The introduction of the MECH feature with the 5E6 software release impacts the AWT of the T&A call mix. Prior to 5E9(1) software release, a typical call mix using the MECH feature and an AWT of 28.5 seconds has a corresponding effective capacity of approximately 700 call handling positions. For the same model setup without the MECH feature and an AWT of 30 seconds, the corresponding capacity is approximately 800 call handling positions. In the 5E9(1) and later software releases, the call capacity is 980 call handling positions with MECH and 1090 without. These capacity numbers may differ because of varying traffic characteristics and office procedures between offices.

For OSPS combined services offices prior to the 5E9(1) software release (for example, providing both LS and T&A call handling services), the call handling position capacity is between 700 (MECH on) / 800 (MECH off) and 1,000 [1,250 with the 5E6(2) and later software releases] for the entire switch. In the 5E9(1) and later software releases, the call capacity is 980 call handling positions with MECH and 1090 without. However, system capacity may differ because of varying traffic characteristics and procedures between offices. An office using the 5E6(2) features, namely intercept and directory assistance call completion, will not likely reach these position capacities.

The system capacity limits for intercept [5E6(2) and later software releases] are based upon call volume capacity, rather than call handling position capacity, as it is generally implemented as an automated feature. The call capacity for a dedicated intercept system is 400,000 calls per hour. This is based upon an office model that has 95 percent fully automated intercept calls and 5 percent operator-assisted intercept calls. This also assumes that intraflow is not being used and that call completion is not offered on these calls. If either of these features is offered along with intercept, the call capacity would decrease.

3.1.6.3 PSM-RISLU Transmission Facilities

When the OSC/CCC is not collocated with the 5ESS[®] switch, the RISLU must be used as the operator position controller (OPC) [agent position controller (APC) with ACD]. The PSM and the RISLU are connected by T1 or other compatible transmission facilities operating in the DS1 format. These facilities carry the 5ESS[®] switch control time slots for the RISLU, the B-channels (for voice), and the D-channels (for data) associated with the B-channels assigned to the facility. A minimum of two control time slots on two separate DS1 facilities or equivalent are required by each RISLU, resulting in a minimum of two facilities per RISLU.

In general, the DS1 facilities allow for remoting RISLUs up to 1,000 miles away from the 5ESS[®] switch host office. However, the limitation is that of a transmission delay and not specifically distance. The system is tolerant to an 18 ms transmission delay. A 1,000-mile, one-way trip over cable using repeaters that have been spaced according to recommended standards, as well as having no conversion of facility type in the span, is within this delay limit. The introduction of converters, repeaters, or using nonstandard

arrangements, may manifest a delay greater than the 18 ms while staying within the 1,000-mile distance. It is for this reason that the 18 ms maximum transmission delay is the enforced limitation rather than the 1,000-mile distance.

Each DS1 facility operating at maximum occupancy can support 18 class-1 BRIs (positions) or 20 BRIs in total. This capacity relies upon packaging four 16 kb/s D-channels into one 64-kb/s DS0 time slot on the facility. Such a packaging scheme is referred to as clear-channel packaging and can be implemented on nonclear facilities, that is, facilities utilizing zero code suppression, without encountering significant error rates. Data lost when using nonclear facilities are detected by the protocol and recovered through retransmission.

The total number of facilities equipped for a RISLU is determined by the number of BRIs served by the RISLU. For example, a RISLU supporting 60 BRIs could require three active DS1 facilities. Of these, no more than 54 BRIs can be class-1s. In addition to the facilities required, an extra DS1 facility is recommended as a spare in order to meet office reliability requirements, provided it is not part of a common failure group with other DS1 facilities.

All of the facilities from a given RISLU must terminate on the same group of data interface (DI) ports located on the MCTU on the PSM. With these assignment rules, a RISLU with 8 DS1 facilities, including the spare, is the maximum size RISLU that can be supported.

3.1.6.4 Position Switching Module

3.1.6.4.1 Overview

The PSM is an ISDN-SM which supports operator services/agent positions. In addition to hosting operator positions, the PSM supports the communication links to the OAP in the OSC/CCC and FMC, the call processing data link (CPDL), the data base access (DBA) PRIs, the directory assistance system/computer (DAS/C) links, the interflow PRIs, and links to the management information system (MIS). It may also host miscellaneous data links, such as real time rating system (RTRS), hotel billing information system (HOBIS), agent information data base (AIDB), etc.

The PSM can contain trunks and ISDN lines. Except for the digital service unit 2 - recorded announcement function - directory assistance (DSU2-RAF-DA) of the DA application, it is recommended that service circuits or test ports not be located on a PSM. However, they can reside on lightly loaded PSMs. Three- and six-port conference circuits can also reside on PSMs, but it is recommended that standard SMs be used to host these circuits.

The capacity of the PSM can be limited by position connectivity, real time, and time slot availability. The position connectivity limit is 100 (200 with the 5E6 and later software releases) positions per PSM. These 100 (200 with 5E6 and later software releases) positions can be any combination of LS, DA, ACD, and T&A positions. However, the ACD feature is generally the only one which may approach the connectivity limit, as the other features experience other limitations before realizing the connectivity limit. The connectivity limit is software imposed, and although additional real time may be available on a PSM with 100 (200 with 5E6 and later software releases) ACD positions, it cannot be realized by adding more positions of any type. The remaining capacity of this PSM can be used to support other functions such as service circuits, trunks, PRIs, EDSLs, and data links.

The capacity of the PSM for the DA application is limited by the processing capacity of the synchronous terminal adapter (STA) on the DAS/C data link to approximately 60 positions. The LS application can support up to 130 LS positions using the core cache SMP20, and 108 positions using the SMP20. The T&A application can support approximately 100 positions using the core cache SMP20 and 85 positions using the SMP20. However, if the LS application is supporting any intercept calls, or is exercising call completion of any LS calls [5E6(2) and later software releases], these position capacities will decrease. These position capacities depend on the operator AWT and the call mix, which varies between different offices and different applications. This is especially true with the MECH feature which reduces operator work time and, therefore, increases the call capacity of a given operator position. The PSM, however, is more real time

limited in an office using the MECH feature, and the position limits for T&A are 85 for the core cache SMP20 and 70 for the SMP20. For combined services offices, the position termination capacity is between the limits associated with each application.

In the case where the OSPS is dedicated to the LS intercept feature [5E6(2) and later software releases], the capacities are given as call capacity limitations rather than position limitations. This is because intercept may be implemented as a nearly fully automated feature with few operator positions required. Therefore, PSMs dedicated to intercept can handle up to 40,000 calls per hour. It is recommended that intercept PSMs be dedicated to that function.

The maximum number of positions that can be supported on a particular PSM is also reduced by the existence of the following: interflow extended digital subscriber lines (EDSL) on that PSM; call completion or intercept features on that PSM; and the traffic on the various links [Hotel Billing Information Center (HOBIS/HOBIC), Autoquote, AMLB, CPDL, MIS, AIDB, and RTRS], service circuits [digital service unit 2 (DSU2), 3- and 6-port conference circuits], and trunk utilization in that PSM.

Physically, a PSM without service circuits can host up to seven RISLUs located in as many as four OSCs/CCCs. The restriction of four OSCs/CCCs maximum per PSM is software-imposed to limit the required data storage space. The restriction on the allowable number of RISLUs results from the limit of 16 fully active PIDBs per TSI, 2 of which are required by the PSU, and by a requirement of 2 PIDBs for the minimum 2 DS1 links per RISLU. The real time requirements limit a PSM to a few RISLUs supporting a maximum of 60 positions for DA, 108 to 130 positions for LS, or 70 to 100 positions for T&A. The position termination capacity for a combined services office is between the limits associated with each application.

Within the PSM, the PSU and the DLTU-RH (if using the RISLU) are traffic engineered. Also, if the OSC/CCC is collocated with the 5ESS[®] switch, the ISLU must be traffic-engineered since it will be used as the OPC rather than the RISLU. The data interface (DI) of the MCTU hosts PIDBs from both the ISLU and the PSU; though the DI is only traffic sensitive and is not a traffic engineerable item, the PIDBs are traffic engineered.

3.1.6.4.2 Packet Switch Unit

3.1.6.4.2.1 General

The PSU PHs are the only traffic-engineerable entity in the PSU. The PH2 and the PH3 (5E6 and later software releases) are the supported protocol handlers for the OSPS.

The PHs can be used for access PHs and inter-SM PHs. The access PHs allow OSPS ports (for example, BSTs, VDTs, OAPs, ACTs, MISs) access to the switch, while the inter-SM PHs are dedicated to the packet switching function between SMs (and/or PSMs). Any SM that requires communications with another SM in the packet switch mode must designate some PHs as inter-SM PHs. At initialization of an inter-SM PH, nailed-up time slots are established to the inter-SM PHs in other SMs with which it will communicate. For OSPS in the 5E6 software release, inter-SM PHs are used by the data base access from the CST and the AMLB feature of the T&A application. For OSPS in the 5E6(2) and later software releases, inter-SM PHs are used only by the AMLB feature of the T&A application. The required number of inter-SM PHs and nailed-up time slots depends on packet traffic and which SM the AMLB data links are connected to. For ACD in the 5E7 software release, inter-SM PHs are used only by the "Data Base Access from the ACT or ACT-PLUS through D-Channel Packet Switching" feature.

The PSU can occupy up to 5 shelves with 16 PHs per shelf. One PSU shelf is required per PSM, and one additional PH per shelf is recommended as a maintenance spare. The various OSPS features may share protocol handlers; that is, DA and T&A may pool their PHs together, minimizing the number that need to be engineered. The PH2 and PH3 type protocol handlers may share the same shelf on the PSU, but each type must have its own spare. Also, B- and D-channels must not be mixed on a PH.

3.1.6.4.2.2 PH Engineering

3.1.6.4.2.2.1 Overview

Although the PH2 protocol handler can physically support 128 D-channels or 32 B-channels, the actual number of OSPS ports assigned to a PH depends upon the port type and the traffic. Different capacities are specified for the ACD agent positions, as they have a slower packet throughput rate, and may have high deviations in AWTs on a per customer basis. See "ACD", Section 3.1.6.4.2.2.3.

3.1.6.4.2.2.2 OSPS

The PH2 engineering is performed for access PHs and inter-SM PHs separately. The access PH engineering is done separately for BRI D-channels, EDSL D-channels, and B-channels. For the BRI D-channel engineering, the PH capacity consumption for various data link terminations is expressed in terms of "T&A port-type" equivalency. For example, the T&A port-type equivalency factor for the RTRS BRI is 1.5 which means the data load on the RTRS BRI D-channel is 1.5 times that for a T&A BRI.

The PH3 is engineered according to the port type and traffic placed on it. One PH3 is capable of handling the data traffic of 72 non-MECH T&A ports. The port-type equivalencies for the PH3 are the same as for the PH2. Table 3-13 shows the T&A port type equivalencies for the OSPS BRI D-channels.

Table 3-13 PSM Access PH BRI D-Channel Engineering Requirements

PORT TYPE	T&A PORT-TYPE EQUIVALENCY FACTOR
T&A	1.0
LS without packet switching to an EIS	1.0
DA	1.0
LS with packet switching to an EIS	2.0
OAP	6.0
CPDL	12.0
DAS/C	12.0
ACC	1.5
RTRS	1.5
HOBIS/HOBIC	1.5
AMLB	0.0
RAS ACC ^a	0.0
Autoquote	1.5
Notes:	
a. The alarm conversion circuit (ACC) does not impact PH engineering when environmental alarms are idle. However, if alarming becomes necessary, the ACC does generate packet data and impacts PH engineering. Even when alarming, the packet traffic generated is nominal, and therefore is given a T&A port type equivalency of 0.0. Where possible, it is advisable to place the ACC on an unloaded PH (one which hasn't reached the port-type equivalency) to ensure the ability of the ACC to generate alarms without adversely affecting the other BRIs which share the same PH.	

For the EDSL D-channels, one access PH2 is required for every interflow EDSL terminated on the PSM. With the PH3, one is required for every three interflow EDSLs terminated on the PSM.

For the DBA-PRI B-channels, 1 access PH3 is required for every 2 fully equipped (that is, 24 CSTs) B-channels of a DBA-PRI terminated on this PSM. With the PH3, one is required for every 6 fully equipped (that is, 72 CSTs) B-channels of a DBA-PRI terminated on this PSM.

For the BRI B-channels, 1 access PH2 is required for every 8 AMLB BRIs connected to a PSM. With the PH3, 1 is required for every 24 AMLB BRIs connected to the PSM.

The inter-SM PH engineering requirements are as follows:

- ☐ One inter-SM PH2 if T&A operator positions on this PSM need to access an AMLB data base connected to some other SM. If the PH3 is used in this application, one is required.
- ☐ One inter-SM PH2 for every 16 AMLB data links connected to this PSM if there are T&A positions in other PSMs that need access to the AMLB data base.

- ☐ One inter-SM PH3 for every 32 AMLB data links connected to this PSM if there are T&A positions in other PSMs that need access to the AMLB data base.
- ☐ If the AMLB data base is connected to the same PSM as all the T&A operator positions requiring use of the data base, no inter-SM PHs are required.
- ☐ One inter-SM PH2 for every 48 packet switching CSTs connected to this PSM if the DBA-PRI is located on some other SM.
- ☐ One inter-SM PH3 for every 144 packet switching CSTs connected to this PSM if the DBA-PRI is located on some other SM.
- ☐ One inter-SM PH2 for every 4 inter-SM links for DBA-PRIs connected to this PSM if there are CSTs on some other PSM that require access to the DBA-PRIs on this PSM. If PH3s are used, 1 is required for every 12 inter-SM links for DBA-PRIs connected to this PSM if there are CSTs on some other PSM that require access to the DBA-PRIs on this PSM.
- ☐ If the DBA-PRI is connected to the same PSM as all the CSTs requiring use of the DBA-PRI, no inter-SM PHs are required.

It should be noted that AMLB data links need to be considered twice in the engineering of access PHs. The D-channel (for signaling) of AMLB can be 1 of 32 BRIs on a PH2, while the B-channel (for data) of AMLB can be 1 of 8 AMLB BRIs on a PH2. The B- and D-channels may not be mixed on a PH2; a PH2 must be dedicated to perform packet switching for either the D-channels or the B-channels.

If the AMLB data links are hosted on an ISDN-SM, the inter-SM PHs are traffic engineered to carry the AMLB data between the ISDN-SM and the PSMs. Generally, one PH2 is needed in the ISDN-SM for every 16 AMLB links connected to this ISDN-SM.

The following rules apply to PH channel assignments:

- ☐ Ensure that the T&A port-type equivalency on an individual PH does not exceed the capacity of that PH
- ☐ Assign all members of a subline group (SLG) to the same PH; that is, members of an SLG may not be split across various PHs.

3.1.6.4.2.2.3 ACD

NOTE: In the 5E9(1) software release ACD is available only as a Custom ISDN BRCS feature. Information pertaining to ACD in this section apply to the 5E8 and prior software releases. See 235-190-104, *ISDN Feature Description*, for a full description of this feature and its operation.

The number of ACD ports assigned to a PH depends upon the port type and traffic unless the agent work time is sufficiently high and the packet traffic is sufficiently low that 128 D-channels does not exhaust the PHs supply. Different capacities are specified for the ACD agent positions depending on the agents AWT and the frequency of data base access in each customer's office. For this reason, when performing BRI D-channel engineering, the PH capacity consumption for various data link terminations is expressed in terms of "ACT port-type" equivalency. For example, the ACT port-type equivalency factor for the MIS BRI is 6, which means the data load on the MIS BRI D-channel is 6 times that of an ACT BRI with the port type equivalency of 1.

Currently, one PH2 is capable of handling data traffic on 24 ACT D-channels if the agent's AWT is not greater than 28.80 seconds and the agent does not access the AIDB. However, if any agent needs to access the AIDB, the impact of the data base access on the PH needs to be considered, as it impacts the port-type equivalency factor. The frequency of data base access is expressed in terms of packets per call

(PPC). A full screen display contains 24 lines by 80 columns which takes 1,920 bytes, or 15 packets of data. As a first approximation, the PPC can be calculated as follows:

$\lceil \text{CEILING}(\text{amount of screen displayed}) \div 15 \rceil + 1$.

CEILING() is the mathematical function rounding up the computed number in parentheses to the smallest integer. For example, a display of information which uses a half screen per call translates into $\lceil \text{CEILING}(0.5 \div 15) \rceil + 1$, or 9 PPC. When determining the number of PHs required, one needs to know the appropriate ACT port-type equivalency factor to use. Both the AWT of an agent, as well as the PPC, need to be considered to determine the appropriate port type to use from Table 3-14. Call center administrators are encouraged to monitor the packet traffic on the BRIs in order to determine if a change in BRI-to-BRI assignment is necessary.

Similarly, the PH3 needs to be engineered according to the port type and the traffic placed upon it. One PH3 is capable of handling the data traffic of 72 ACT ports (assuming the agent's AWT ≤ 28.80 seconds and the agent does not access the AIDB). The port-type equivalencies for the PH3 are the same as for the PH2.

Table 3-14 shows the ACT port-type equivalencies for the various ACD BRIs, including the cases where the ACT is used for packet access to the AIDB.

Table 3-14 PSM C-ACD PH Engineering Requirements

PORT TYPE	ACT PORT-TYPE EQUIVALENCY FACTOR	TOTAL BRIs PER PH2
C-ACD (Base) (AWT=28.8 PPC=0)	1.0	24
C-ACD (General) (if PPC $\leq$ 19)	$24/\min [20 \div \text{AWT}/24, 128]$	$\min [20 \div \text{AWT}/24, 128]$
C-ACD (General) (if PPC>19)	$24/\min [20 \div \text{AWT}/(\text{PPC}+5), 128]$	$\min [20 \div \text{AWT}/(\text{PPC}+5), 128]$
RAS ACC	0.0	2 (RISLU Site Max.)

For the BRI B-channels, one access PH2 is required for every 5 AIDB BRIs (B1 channel) connected to a PSM. With the PH3, one is required for every 15 AIDB BRIs (B1 channel) connected to this PSM.

The inter-SM PH engineering requirements are as follows:

- ☐ One inter-SM time slot is required per pair of communicating SMs. Further, the inter-SM time slots should be engineered to a maximum of 32 pps.
- ☐ One inter-SM PH2 or PH3 if inter-SM packet switching is used, as a PH cannot perform both access and inter-SM work.

The following rules apply to PH channel assignments.

- (1) Ensure that the ACT-equivalency on an individual PH does not exceed the capacity of that PH.
- (2) Assign all members of an SLG to the same PH; that is, members of an SLG may not be split across multiple PHs.

If agents on other SMs need to access AIDB links on this PSM, then access PHs need to be provided for the B-channels. Also, if a selected number of positions is allowed access to AIDB, these positions can be restricted to selected PSMs.

As a PH approaches reaching its capacity, the addition of an SLG with a high ACT equivalency makeup may exceed the remaining PH capacity. However, an SLG with a low ACT equivalency makeup may be easily accommodated on that same PH. The situation may arise where there is no PH left which has sufficient capacity for the assignment of the last SLG(s), and an additional PH would have to be provided.

3.1.6.4.3 Digital Line and Trunk Unit - Remoting Host

The OSC/CCC may be located remotely from the 5ESS[®] switch. When such an arrangement exists, the DLTU-RH can be used to terminate the digital facilities from the RISLU on the PSM. The major component of the DLTU-RH is the DFI. The following two types of DFIs are used:

- (1) **DFI-H1** □ Used at the host end of a type 1 facility that carries voice, data, and control time slots
- (2) **DFI-H2** □ Used at the host end of a type 2 facility that carries only voice and data time slots.

Each DFI terminates one DS1 facility. Since a RISLU requires at least two facilities, a minimum of two DFIs is needed for each RISLU and both must be type 1. Additional DFIs are provided as needed and are type 2.

The DLTU-RH can be equipped with up to four type 1 DFIs and up to twelve type 2 DFIs. Since each RISLU requires at least two type-1 DFIs, a DLTU-RH can host a maximum of two RISLUs. Multiple DLTU-RHs are required if the PSM hosts more than two RISLUs, or if the two RISLUs have more than fourteen active and spare facilities between them.

With ACD, two other options are also available to locate the CCC remotely from the 5ESS[®] switch. The first option involves using the ORM rather than a PSM. See "Optically Integrated Remote Switching Module", Section 3.1.6.5. The second option involves using the BRITE configuration. See "Basic Rate Interface Transmission Extension for ACD", Section 3.1.6.6.

3.1.6.5 Optically Integrated Remote Switching Module

The optically integrated remote switching module (ORM) is a standard 5ESS[®] switch SM whose NCT links are extended through various optic and electrical transmission equipment beyond the constraints of the host 5ESS[®] switch location. The ORM can be used as the PSM to support the ACD functions. This allows remoting the CCC away from the host office. The engineering of the ORM as a PSM is similar to the standard PSM engineering, except that data links and conference circuits are not recommended in the ORM. The optically remoted switching module for the SM-2000 is called EXM-2000. The EXM-2000 may have up to six TRCU2s or four TRCU3s at the host, and it provides the same peripheral units as the SM-2000. See "Optically Integrated Remote Switching Module", Section 2.2.4.10, for further information on the ORM.

3.1.6.6 Basic Rate Interface Transmission Extension for ACD

The basic rate interface transmission extension (BRITE) configuration can also be used to remote ACD agents from the host 5ESS[®] switch office. Using the BRITE channel units, ACD agent positions can be extended to distant areas from the line termination point in the 5ESS[®] switch.

The BRITE channel unit can be equipped in two types of host carrier systems: SLC[®] carrier, and D4 channel bank. Three configurations are supported as shown in Figure 3-1. The first configuration consists of two BRITE channel units, one being placed in the central office terminal (COT) of the SLC[®] and the other installed in the remote terminal (RT). The COT, RT, and DS1 transmission facility constitute the SLC[®] carrier system. The second configuration also consists of two BRITE channel units, one being placed in the D4 channel bank in an ACD serving central office and the other located in a D4 channel bank in a tandem or remote local central office. The last configuration uses four BRITE channel units; two in the SLC[®] and the other two in the tandem D4 channel banks. Cascading two carrier spans makes the switch access even more flexible.

The BRITE channel units provide remote access for the ACD positions. Channels available for ISDN services are 2B+D (where both B1 and B2 are used), B1+D, B2+D, and D only. The BRITE channel unit occupies one physical channel slot in a D4 channel bank, SLC[®] carrier COT, or SLC[®] carrier RT. However, one, two, or three time slots are used depending on the B- and D-channels required. The B1- and

D-channels are used for the ACD operation.

Two versions of BRITE channel units are available to customers. These include the AHG13 BRITE channel unit, as well as the companioned AHG18 and AHG28 BRITE channel units.

The AHG13 BRITE channel unit can be used with 5E4 and later software releases using alternate mark inversion (AMI) coding. The AHG13 channel unit can be used in a D4 channel bank or a *SLC*[®] carrier COT or RT.

The AHG18 BRITE II channel unit can be used for a *5ESS*[®] switch with the 5E6 and later software releases with the *ANSI*[®] U-interface. The channel unit can be used in a D4 channel bank or a *SLC*[®] carrier COT. The AHG18 BRITE II channel unit functions as a network termination unit. The AHG28 BRITE II channel unit functions as a line termination unit as a companion to a network termination AHG18 BRITE II channel unit.

The host carrier system for the BRITE or BRITE II channel units can be D4 channel bank or *SLC*[®] carrier. The BRITE or BRITE II does not support the concentrated mode of operation for *SLC*[®] carrier. The *SLC*[®] carrier must be configured to operate under mode 1 or 3 with D4 or D1D channel counting sequences. Depending on the channel counting sequence, the mode of operation, and the channel service being provided, certain channel slots in the host carrier system cannot contain BRITE or BRITE II units. For the ACD B1+D service, the next adjacent physical channel slot to the right of the BRITE channel unit must be vacant except when the *SLC*[®] carrier terminal is operating in Mode 1 with D1D counting.

The transmission facility with DS1 format (1.544 Mbps) can be used for connecting D4 channel banks and *SLC*[®] carrier COT and RT. A D4 channel bank can be equipped with 2 DS1 facilities to transmit data over a total of 48 time slots, and a *SLC*[®] carrier can be equipped with four DS1 facilities to deliver data on a total of 96 time slots.

Each ACD agent position requires the following:

- ☐ At least two AHG18 BRITE channel units, or one AHG18 BRITE II channel unit and one AHG28 BRITE channel unit (additional pairs of channel units may be required for multiple carrier span configurations).
- ☐ One physical channel slot in the D4 channel bank, *SLC*[®] carrier COT, or *SLC*[®] carrier RT.
- ☐ Two time slots (B1 and D) in the host carrier system.
- ☐ Two time slots on the transmission facility.

Additionally, when using the BRITE II channel units in the host carrier system, the *ANSI*[®] U-card, *ANSI*[®] U power pack, and the *ANSI*[®] U network termination 1 (NT1) have to be used. The BRITE or BRITE II channel units draw power from the U-interface power chip in the R(ISLU). With two-channel (B1 and D) services, no additional power supply is needed.

3.1.6.7 Integrated Services Line Unit.

A PSM can support an ISLU which permits directly hosting positions and other OSPS/ACD ports on the *5ESS*[®] switch. The ISLU is the standard external interface for an ISDN-SM. Since the ISLU does not rely on transmission facilities for connections with the host PSM (or ISDN-SM), the ISLU termination capacity for BRIs is limited in principle only by the time slots available in the PSM (512 maximum). Currently, however, the same restrictions that apply to the OSPS port assignments also apply to the ISLU since the PSU real time capacity remains unchanged.

In the case where the OSC/CCC is collocated with the host switch, it is desirable to use the ISLU, rather than the RISLU, as the OPC/APC, as less equipment is required.

3.1.6.8 Remote Integrated Services Line Unit

3.1.6.8.1 Overview

The RISLU is the required part of the OPC/APC when the OSC/CCC is remoted from the 5ESS[®] switch (and not using an ORM or BRITE configuration with ACD). A remote OPC/CCC includes at least one RISLU, an optional power distribution cabinet, and an optional data set cabinet. The RISLU also supports external data links (for example, AMLB). It is a single cabinet unit that provides the ISDN interface for operator/agent positions at the OSC/CCC and is remoted off the PSM using DS1 facilities.

Since all the facilities that terminate on a given RISLU must emanate from one PSM, the maximum number of BRIs (operator positions/agent positions) that a fully configured RISLU can accommodate is limited by the PSM real time, or PSM physical connectivity restrictions. The capacity of the RISLU is also contingent on the availability of the remoting facilities.

Data links (BRIs) connected to the RISLU are classified into two categories depending on the channel capacity to be used. Class-1 links require a B-channel (64 kb/s), or a B-channel and a D-channel (16 kb/s). Links requiring only a D-channel are labeled class-2.

Class-1 links include the following:

- ☐ ACT
- ☐ ACT-PLUS
- ☐ AIDB
- ☐ AMLB
- ☐ Autoquote Z
- ☐ BST-DA
- ☐ BST-LS
- ☐ CST
- ☐ Window CST
- ☐ VDT

Class-2 links include the following:

- ☐ Alarm Conversion Circuit (ACC)
- ☐ Autoquote T
- ☐ CPDL
- ☐ DAS/C
- ☐ HOBIS/HOBIC
- ☐ MIS
- ☐ OAP

□ RTRS

Note that autoquote uses a loop-around arrangement, requiring a T-card at one end and a Z-card at the other. The T-card provides a digital interface from the switch to the autoquote data set, while the Z-card provides an analog interface from the autoquote data set back to the switch. The analog signal is carried out over the autoquote lines to the hotel printer.

The maximum number of class-1 BRIs or the total number of BRIs (class-1 plus class-2) terminating on a RISLU is determined by the available DS1 facilities, and the processor being used in the PSM.

Table 3-15 summarizes the class-1 and class-2 BRI limitations for a RISLU with one through eight digital facilities. Table 3-15 assumes the RISLU is connected to a PSM using the SMP20 processor. The use of the core cache SMP20 would increase these limitations.

Table 3-15 RISLU Termination Limits for SMP20

DS1 FACILITY NO SPARE	DS1 FACILITY WITH SPARE	MAX LS POSITION	MAX DA POSITION	MAX T&A POSITION W/OUT MECH ^a	MAX T&A TOTAL POSITION WITH MECH ^a	MAX TOTAL C-ACD/ CLASS1	MAX TOTAL BRI
8	□	108	60	85	70	144	160
7	8	108	60	85	70	126	140
6	7	108	60	85	70	108	120
5	6	90	60	85	70	90	100
4	5	72	60	72	70	72	80
3	4	54	54	54	54	54	60
2	3	36	36	36	36	36	40
	2	18	18	18	18	18	20
Notes:							
a. Includes automated positions if AABS/AP feature is used.							

One spare facility per RISLU is strongly recommended. Table 3-15 indicates the capacities both for when a spare is provided as well as when one is not. Table 3-15 also shows that in order to reach the position connectivity of 200 positions per PSM, at least 2 RISLUs are required.

3.1.6.8.2 Digital Line and Trunk Unit - Remoting Remote

The DLTU-RR is similar to the DLTU-RH except that it uses different DFI packs than the host unit and is located at the RISLU. The DLTU-RR has two types of DFIs to correspond to the following two different uses of the DS1 facilities.

- (1) DFI-R1 - Used at the remote end of a type 1 facility that carries voice, data, and control time slots.
- (2) DFI-R2 - Used at the remote end of a type 2 facility that carries only data time slots, but no control time slots.

One DLTU-RR, with as many DFI packs as the number of DS1 facilities terminating at the RISLU, is required per RISLU cabinet and is supplied as standard.

A DLTU-RR can be equipped with up to ten type 2 DFIs, in addition to the two type 1 DFIs that are always required. Sharing of DLTU-RRs among collocated RISLUs is not allowed.

3.1.6.8.3 ISLU in the RISLU

The ISLU provides the ISDN 2B+D T-interface to the BST-DA/VDT/BST-LS/ACT/ACT-PLUS/CST at the operator/agent work positions, and to the terminal adapters (TAs) and rate adapters (RAs) in the LAU, as well as to the direct intelligent interfaces (DIIs). The use of the T-interface cards restricts the distance from the RISLU to the operator/agent terminal to 1 km (0.62 miles) within the same building. The T-card rates a

transmission loss of 6 dB at 96 kHz; greater loss can lessen the distance allowed between a RISLU/ISLU and the ISDN terminal. The U-card provides a 2-wire interface, and limits the distance to 5 km. The U-card rates a loss of 32 dB at 80 kHz. The cable run distance between the RISLU and the BST or ACT can be extended to 6 km (3.75 miles) by using a U-interface card intended for ACD. The ISLU may contain Z-cards at the analog end of autoquote BRIs. A Z-card is equipped similarly to a T-card. Four or eight T-, U-, or Z-cards, which constitute a failure group, can be equipped per LGC. The larger failure group option (8 per LGC) permits denser LGC equipage to take advantage of expanded PSM position connectivity or less demanding operator activities (for example, ACD). A RISLU can be equipped with up to 16 LGCs distributed among 4 drawers.

3.1.6.8.4 Link Adapter Unit

The LAU provides the interface for data links and environmental alarms. The data links are used to connect with the OAP, MIS, AIDB, DAS/C, RTRS, external information system (EIS), HOBIS/HOBIC, autoquote (AQ), and AMLB. The LAU interfaces these data links through TA and RA boards. The TA converts the RS232C protocol of an external data link to the ISDN D-channel protocol. A synchronous rate adapter (SRA) is used to convert from the RS232C to the ISDN B-channel protocol.

The different types of TAs are realized using the same hardware (micro-coded circuit packs). For autoquote, the asynchronous low-speed terminal adapter (ALTA) is a firmware version for low data rate operation (110- or 300-baud). The baud rate is determined by options placed in the cabling and must be the same for the entire office (that is, all autoquote lines for a given OSPS must be either 110- or 300-baud). For all other D-channel protocols, the STA and asynchronous terminal adapter (ATA) are defined by different cable options (for 1.2 kb/s or 9.6 kb/s, synchronous or asynchronous operation. The SRA used by AMLB is a different hardware and firmware version from the TAs for operation at either 9.6 kb/s or 19.2 kb/s. The LAU can accommodate up to 14 TA/SRA boards for data links.

The LAU can be equipped with up to two alarm conversion circuits (ACCs) and up to two scan applique circuits (SACs). When both ACCs are equipped, a duplex alarm control function is formed. The simplex SAC boards can provide up to 24 environmental alarms each, but no more than 32 alarms total. Each ACC requires one T-card and one ATA board.

The DII provides the same functions as the TA and RA boards, but with enhanced performance and greater throughput. Therefore, it is recommended that the DII be used to connect the OSPS support systems to the 5ESS[®] switch with the 5E6(2) and later software releases and required for new office applications.

3.1.6.9 RISLU Versus ISLU as the OPC/APC

When the OSC/CCC is remoted from the host 5ESS[®] switch office using a RISLU, this necessitates the engineering of many other components in the system. If, for ACD applications, the CCC is remoted from the host and the ORM and BRITE configurations are not being used, this arrangement is mandatory. If the OSC is collocated with the host office, or if the ORM or BRITE solution provides a viable alternative (for ACD), then the ISLU can function as the OPC/APC, thereby reducing the amount of equipment needed, and simplifying the engineering for the office.

When the ISLU is used as the OPC/APC, there is no need for transmission facilities (DS1s) to connect the ISLU to the PSM. There is also no need for the terminations of these facilities at either the host or the remote side of the transmission (DLTU-RHs and DLTU-RRs). Additionally, the collocated OSC/CCC can use the power distribution cabinet and the data set cabinet at the switch, rather than needing the additional sources at a remoted OSC/CCC.

The ISLU and RISLU are capable of functioning exactly the same in performing the tasks of an OPC/APC. Any BRI which can be supported from a RISLU arrangement can also be supported from an ISLU arrangement, and vice versa. The connectivity limitations for BRIs are the same for the two units, and capacity is limited by PSM real time for both.

The ISLU and RISLU do differ in the number of physical connections allowed per PSM. A physical

restriction of 7 RISLUs per PSM does not apply to the ISLU. This is because the ISLU does not use transmission facilities, and therefore, no PIDBs are required for the DS1 facilities. However, a limit of 4 ISLUs per PSM does apply. It is essential that the same limits which are given for RISLU connectivity and assignments be followed for the ISLU as the OPC/APC.

3.1.6.10 Position Terminals

The ACD requires agent positions for controlling calls through the switch. Each ACD agent position is equipped with an ACT, or an ACT-PLUS terminal. The ACT is an ISDN 7516 station set. The ACT-PLUS is a hybrid position consisting of a standard ACT position, the ISDN 7516, as well as the 7102 analog set. The ACD agents can converse with the caller on the 7516 set while simultaneously making outgoing calls from the analog set. Additionally, conferencing among the agent, caller, and the party on the analog set is supported by the connection provided in the ACT-PLUS.

The positions interface with the ISLU/RISLU through a BRI connected to a T- or U-interface card in the ISLU/RISLU. The T-interface card provides a 4-wire interface between an ISLU/RISLU and the ISDN terminal. The T-card rates a transmission loss of 6 dB at 96 kHz. The U-interface card provides a 2-wire interface and rates a 32 dB loss at 80 kHz. The U-interface allows for using commercial power. Since the ACD agents may not be collocated with the ISLU/RISLU, the U-interface may be necessary for their positions. The DC power plants are also available for this arrangement.

The agent positions can also be used for service assistant (SA) positions and monitoring positions. The functionality of these is an ODD option and does not have any hardware consequences on the position.

The agent positions are designed to meet the Bellcore Operator Services Systems Generic Requirements given in Bell Communications Research, Inc., Operator Services Systems Generic Requirements, TR-TSY-000271. The positions, when used with headsets complying with requirements provided in Bellcore Technical Reference Bell Communications Research, Inc., Generic Requirements for Telephone Headsets at Operator Consoles, TR-NPL-000314, provide protection from steady-state, high-level acoustic signals. If headsets with higher receiver efficiency and/or amplification is used, the headsets must provide appropriate signal amplitude limiting. If this is not done, operators may not be protected from unexpected high-level signals if such signals exist in the service provider networks, thereby potentially subjecting operators to acoustic shock.

3.1.6.11 Operator Terminals

The OSPS requires operator positions for controlling calls through the switch. Each T&A operator position is equipped with a VDT or a CST. A single CST may receive LS, intercept, and T&A calls. The VDT can access simultaneously up to 2 external data bases, while the CST allows for up to 6 data bases. The LS operators may use either a CST, or the BST-LS. A BST-DA is provided for each DA position.

The LS and intercept operators using the CCI EIS may use either a CST or the BST-LS. However, listing service calls that are recalled should always be handled by a CST. Listing services operators using the *IBM*[®] EIS/DAS can only use the BST-LS.

The VDT and BST require -48 V DC power, while the CST requires 115 V AC. The positions interface with the ISLU/RISLU through a BRI, which is connected to a T-card in the ISLU/RISLU. The T-card provides a 4-wire interface between an ISLU/RISLU and the ISDN terminal, and limits the distance between the two to up to 1 km. The T-card rates a transmission loss of 6dB at 96 kHz.

The operator positions can also be used for service assistant (SA) positions and monitoring positions. The functionality of these is an ODD option and does not have any hardware consequences on the position. Additionally, the DA position may have a vendor-supplied DAS/C-related terminal for directory data base query and retrieval.

Operator positions are designed to meet the Bellcore Operator Services Systems Generic Requirements given in Bell Communications Research, Inc., Operator Services Systems Generic Requirements,

TR-TSY-000271. The positions, when used with headsets complying with requirements provided in Bellcore Technical Reference Bell Communications Research, Inc., Generic Requirements for Telephone Headsets at Operator Consoles, TR-NPL-000314, provide protection from steady-state, high-level acoustic signals. If headsets with higher receiver efficiency and/or amplification is used, the headsets must provide appropriate signal amplitude limiting. If this is not done, operators may not be protected from unexpected high-level signals if such signals exist in the service provider networks, thereby potentially subjecting operators to acoustic shock.

3.1.6.12 Automated Positions

With the 5E7 and later software releases, automated positions (APs) automate certain alternate billed T&A 0+ calls made on the 5ESS® switch using the OSPS feature, and may be provided to complement the force of operator positions.

Each AP connects to a PSM through a T-card into an ISLU or RISLU, thus having the appearance of a BRI. Four APs are grouped together to form an automated position system (APS). The APS is comprised of the following components:

- (1) PC-6386
- (2) four intelligent peripheral interface bus (IPIB) cards
- (3) one tip/ring board
- (4) speech processing (SP) and SP companion boards
- (5) local area network board

The APS is networked to a cluster support system (CSS) through a local area network (LAN) which serves other APSs as well. The cluster support system is the operation, administration, and maintenance (OA&M) unit of the architecture. It is used to tailor the service offered by the APs, and to download this tailored service into each AP. It also monitors the service offered by the APs and responds to trouble which is reported to it. Physically, the CCS is an PC-6386 based system capable of supporting up to 25 APSs residing on one LAN. The CCS is connected to the SCCS through an asynchronous serial data link, allowing the office administrator to initialize or make recent changes to the data stored on APSs through the CCS. The CCS is also connected to the ACC in the LAU so that alarming may be performed when trouble is reported within the CCS or the APSs associated with the CCS.

The 5ESS® switch views APs as any other position on the switch, and the office data is populated as for other operator positions. Some AP specific data is also populated. Refer to the following documentation for details on data requirements and recommendations:

- ☐ 250-600-100, *AABS-AP Description and Operation*
- ☐ 250-600-110, *AABS-AP Engineering Guidelines*
- ☐ 250-600-120, *AABS-AP Administrative Guidelines and Recent Change*
- ☐ 250-600-130, *AABS-AP Installation, Growth, and Maintenance*.

3.1.6.13 Data Link Interfaces

3.1.6.13.1 Overview

A 5ESS® switch with the OSPS feature requires several external interfaces to provide supporting services to the capabilities. These include:

- ☐ basic rate interface (BRI) connections
- ☐ primary rate interface-like (PRI-like) connections
- ☐ common channel signaling (CCS) network connections

3.1.6.13.2 Basic Rate Interface Connections

Data links are used to exchange data between external data bases and the OSPS (for example, between the RTRS and the OSPS), to deliver special services to the OSPS (for example, HOBIS/HOBIC), or to communicate with external processors (for example, the OAP). All of these external systems are "remoted" BRIs, and all use a similar means of connecting to the 5ESS[®] switch.

The data link to a BRI typically terminates on a T-card in an ISLU or a RISLU. An adapter to convert transmission rates, or to convert the standard non-ISDN interfaces protocol (for example RS-232C, X.25) to standard ISDN is required, and may be provided in one of two ways.

- (1) terminal adaptors (TAs) and rate adapters (RAs)
- (2) direct intelligent interface (DII)

The DII is recommended for the 5E6(2) and later software releases and required for all new offices.

The DII may be used in the place of TAs and RAs in every instance with the exception of the alarm conversion circuits (ACCs), where A-TAs are required. The supported configurations, including the correct cabling, are specified in the OSPS applications schematic, SD-5D135-01, and the ACD/MIS application schematic, SD-5D137-01.

Most of the OSPS external BRIs use the simple S-TA or A-TA mode of the DII. However, the S-RA mode for the AMLB application uses the direct interface function on the B1 channel, while the A-TA mode for the autoquote application uses the A-TA function with the clock source off and the baud set for 110/300 bps.

3.1.6.13.3 Primary Rate Interface-Like Connections

3.1.6.13.3.1 Overview

The OSPS requires access to a couple of external systems by means of PRI-like connections. The interflow feature requires an interface to a cooperating 5ESS[®] switch OSPS, while the CST providing LS requires a packet-switching interface to the EIS. Both of these connections are obtained using PRI-like facilities. The interflow feature uses EDSLs while the CST uses DBA-PRIs. These PRI-like facilities terminate on DFIs within a DLTU at the 5ESS[®] switch.

3.1.6.13.3.2 Extended Digital Subscriber Loop

The EDSL is standard 5ESS[®] switch equipment which supports an ISDN 23B+1D channel format on a single line. The OSPS interflow capability requires use of EDSLs dedicated to supporting the interflowed traffic.

The EDSL provides the communication path between a sending and receiving OSPS. It carries T&A traffic requiring an operator to the cooperating OSPS. The EDSL can have up to twenty-four 56- or 64-kbps channels, composed of 23 B-channels and one D-channel. The B-channels carry voice and data, while the D-channel carries all signaling data associated with the 23 B-channels.

In order to ensure proper functionality of the interflow feature, it is important that certain transmission criterion be met by the EDSL as follows:

- ☐ The transmission error rate of an EDSL should be less than one bit out of a million bits to ensure tolerable delays. Facilities that cannot meet the previous quality standard should be avoided.
- ☐ The data under voice (DUV) microwave transmission takes advantage of the unused spectrum beneath the regular bandwidth used in standard microwave transmission. The DUV transmission is highly susceptible to the external conditions, such as atmospheric conditions, sun spots, etc., and digital data carried by DUV is subject to intermittent, high-bit-error rates. Therefore, DUV facilities are not appropriate for OSPS interflow applications.
- ☐ The use of a digital access and cross-connect switch (DACS) to split the traffic on an EDSL, while potentially possible, needs to be evaluated on a case-by-case basis.
- ☐ Office engineers must ensure that the extended super frame (ESF) is a viable parameter for the DS1 span which supports the OSPS EDSL. Any equipment that could potentially interrupt an end-to-end CRC check (for example, the ESF) may not be used in the typical EDSL arrangement.

The following DFI modes are supported for the interflow EDSLs:

- ☐ For D4 framing:
 - ☐ 56 kbps, with zero code suppression
 - ☐ 64 kbps, restricted, inverted, with zero code suppression
 - ☐ 56 kbps, with B8ZS
 - ☐ 64 kbps, restricted, inverted, with B8ZS
 - ☐ 64 kbps, restricted, non-inverted, without ZCS or B8ZS.
- ☐ For ESF framing:
 - ☐ 56 kbps, without zero code suppression
 - ☐ 64 kbps, restricted, inverted, without zero code suppression
 - ☐ 56 kbps, with zero code suppression
 - ☐ 64 kbps, restricted, inverted, with zero code suppression

Note that:

- ☐ 56 kbps channels do not need to be restricted; only 64 kbps channels have the restriction
- ☐ Inversion applies only to restricted channels
- ☐ B8ZS does not need restriction or inversion as it is "clear channel"

3.1.6.13.3.3 Data Base Access Primary Rate Interface

The data base access primary rate interface (DBA-PRI) relies on 24 B-channel packet switching to request and retrieve LS information to be displayed on a CST. The facility is able to perform permanent B-channel X.25 packet switching on a PRI without D-channel signaling. This interface is also called the X.25 access on the T1 channel (XAT).

3.1.6.13.4 Common Channel Signaling Network Connections

The CCS data links provide the OSPS with access to the CCS networks which support various network control points (NCPs), and carry queries and responses to and from the external data bases that support the OSPS capabilities [for example, LIDB, BVA, CAS, NCD, international credit card validation (ICCV)]. They also carry trunk signaling to support switching of traffic.

The architecture of the CCS network allows for two link speeds to be supported: high-speed and low-speed. Some applications can only use high-speed links, while others can use high- or low-speed links. The 5ESS[®] switch accesses the CCS network through the common network interface (CNI) ring. The 5ESS[®] switch equipment of the ring has up to 5 link node pairs which carry CCS messages from the 5ESS[®] switch to a No. 2 signal transfer point (2STP). The 2STP determines the destination of the message and routes it through the CCS network via other 2STPs until the message reaches the appropriate destination. The destination may be another switch, as is the case in trunk signaling, or it may be an external data base which is to be queried, as is the case for the LIDB and CAS capabilities. It may even be an international STP (STPI) which provides access to the international credit card validation NCP.

3.1.6.14 External Interfaces and Systems

3.1.6.14.1 Overview

The OSPS communicates with the following external systems using the connection listed with each one.

- **OSPS Administrative Processor (OAP):** Uses an OAP link (BRI connection)
- **Directory Assistance System Computer (DAS/C):** Uses a DAS/C link (BRI connection)
- **Real-Time Rating System (RTRS):** Uses an RTRS link (BRI connection)
- **Hotel Billing Information System/Center (HOBIS/HOBIC) and Autoquote:** Uses a HOBIS/HOBIC link and possibly, an autoquote link (BRI connections)
- **Automated Multi-Leaf Bulletin (AMLB):** Uses multiple AMLB links (BRI connections)
- **External Information System (EIS):** Uses a call processing data link (CPDL) (BRI connection), and possibly, a data base access primary rate interface (DBA-PRI) (PRI-like connection).
- **A Cooperating 5ESS[®] Switch for Interflow:** Uses EDSLs (PRI-like connection)
- **Line Information Data Base:** Uses high-speed CCS links (CCS network connection)
- **Customer Account Services Network Control Point (CAS NCP):** Uses high- or low-speed CCS links (CCS network connection) for CAS release 1 and 2, and high-speed links for CAS release 3.
- **Network Call Denial Network Control Point (NCD NCP):** Uses high- or low-speed CCS links (CCS network connection).
- **Billing Validation Acceptance/Billed Number Screening (BVA/BNS) Data Base:** Uses high- or low-speed CCS links (CCS network connection).
- **International Credit Card Validation Network Control Point (ICCV NCP):** Uses high-speed CCS links (CCS network connection).
- **Management Information System (MIS):** Uses an MIS event link (BRI connection).
- **Agent Information Data Base (AIDB):** Uses AIDB links (BRI connections).

3.1.6.14.2 BRI-Linked Systems

3.1.6.14.2.1 Overview

The following systems interface with the OSPS, and rely on the standard BRI connection:

- ☐ AIDB
- ☐ AMLB
- ☐ DAS/C
- ☐ EIS
- ☐ HOBIS/HOBIC and Autoquote
- ☐ OAP
- ☐ RTRS

3.1.6.14.2.2 OSPS Administrative Processor (OAP)

The OAP, an NCR 3B2 computer, provides the administrative interface for the OSCs and FMCs. It supports administrative printers (APs) and administrative terminals (ATs) which allow recent change/verify (RC/V) access to selected OSPS-related ODD and allows the FMC/OSC managers access to traffic and performance reports related to OSPS. The OAP is also the vehicle through which security terminals and printers are supported, as well as the printer for operator trouble reports (OTRs). Offices which support only ACD traffic do not need an OAP, as the MIS provides a similar functionality for each ACD customer.

Four models of NCR 3B2 computers can be used as the OAP: 3B2-310, 3B2-400, 3B2-500, and 3B2-522. The manufacturing of model 300 and 310 has been discontinued. The 3B2-400 (package Q2), 3B2-500 (package B), or the 3B2-522 is recommended for new OAPs. These processors all have larger memory and hard disk capacity than the 3B2-300 line. Four megabytes of memory is the recommended configuration for 5E6 and later software release OAPs. However, the 3B2-300 line can only support two megabytes of memory. Therefore, offices retrofitting from the 5E5 software release to the 5E6 software release that use the 3B2-300 are required to replace it with a 3B2-400. Additionally, the 5E6 and later software releases require that *UNIX*[®] system software release 3.1 or later be installed on the OAP.

The OAPs can only be connected to RISLUs/ISLUs associated with PSMs. A maximum of four OAPs may be associated with one PSM. On the switch side, the OAP interfaces to the RISLU/ISLU associated with a PSM via a T-card and either a DII or TA. Although TAs are supported for current links, DIIs are required for all new office applications. On the OAP side, the data link terminates to a port on an EPORTS board on the OAP.

Only asynchronous links can be used for the OAP link connection to the PSM; the synchronous link configuration is no longer supported. With the required modems, an OAP using an asynchronous link and ATA can be remoted up to 200 miles. Using the DII rather than the ATA renders greater message throughput, and is the recommended mode of operation.

Each FMC and OSC normally has its own OAP. In this configuration, an OSC OAP normally receives a 15-minute traffic report and a 24-hour operator performance report for calls within that OSC. An FMC OAP normally receives a 15-minute traffic report covering a set of OSCs. The FMC version of the 15-minute traffic report contains breakdowns of the workforce and traffic by OSC, OSC serving team, and OSC serving team queues.

The OSPS does support a single OAP configuration for small size offices. In this configuration, the customer must choose whether to configure this OAP as an FMC OAP or an OSC OAP. Selecting one

OAP to support multiple OSCs is limiting for a number of reasons. First, there is a recommended limit of four ports that can be used for the ATs simultaneously. If an office needs an AT at the FMC and at all OSCs, four AT ports may not be sufficient. Second, there is only one data link connection between the switch and an OAP. If this link should experience a failure, the OAP data associated with all OSCs and the FMC will be lost, rather than only the data associated with a single OSC or FMC. Another limitation to the single OAP configuration concerns the memory needs of an OAP. The amount of memory needed for an OAP grows with the number of OSCs/FMCs for which it is providing administrative services. If a large number of OSCs/FMCs are to be supported by a single OAP, the processor could run out of memory. It is good practice to leave approximately 100,000 bytes of memory free for adequate system performance. If an OAP is serving multiple OSCs or FMCs, this may not be possible, and system performance would suffer. It is for this reason that four megabytes of memory is required for the OAP, thus insuring adequate memory for the FMC/OSC data while leaving 100,000 bytes free. Another limitation is that FMC OAPs are unable to purge operator positions. If this functionality was desired, the OAP would have to be equipped as an OSC OAP. Also, if an office chooses to share an OAP among the FMC and OSCs, then the office needs to provide lines compatible to the RS-232C asynchronous format to all of the remoted ATs and APs.

The number of ATs and APs to be used is determined by the customer. As a guide, one AT and one AP per OSC/FMC are recommended. In addition, a security terminal (ST) and a security printer (SP) in security quarters are recommended per T&A OSPS for reporting on and administering potentially fraudulent calling card call attempts. If the security feature is desired, both a security printer and a security terminal are required. Each OSPS may also have one operator trouble report printer (OTRP), which is usually located in an FMC but can be located in an OSC. The OAP supports both local operator trouble report (OTR) printers, as well as remote links (using X.25) to external OTR analysis systems (EOASs). Beginning with the 5E6 software release, it is no longer necessary to have a local OTR printer equipped when using an external OTR link. When using an external OTR link, the OAP should be equipped with X.25 software release 1.1 or later.

The E-port (EPORTS) feature card/board and EPORTS 1.3 software release or later is required for each OAP. The EPORTS board offloads the CPU from doing I/O. Up to 12 boards can be plugged into a 3B2/400 OAP, and this leads to a total of 96 expansion ports. In its minimum configuration, the OAP with EPORTS has 10 asynchronous I/O ports. These ports are allocated as follows:

- (1) Console/AT
- (2) AP
- (3) 5ESS[®] switch data link.

The remaining ports may be required by the OTRP, ST, or SP. If none of these are required, they can be allocated to more ATs or APs. Additional EPORTS expansion boards can be equipped if needed. The 3B2/400 (package C2 or Q2) with EPORTS boards and EPORTS software release 1.3 or later is the required configuration, and yields the best OAP performance.

The terminals and printers are vendor supplied. The following terminals and printers are explicitly supported by the 5ESS[®] switch (equivalent terminals and printers may also be used):

VT100(TM) (terminal)

VT220(TM) (terminal)

572 (printer)

Dot matrix printer.

[AT&T and TELETYPE(R) products are no longer manufactured. When necessary, these products should be replaced by the equivalent RS-232C compatible equipment.]

5310 (printer)

705 or 605 (terminal)

5410 (terminal)

5425 (terminal)

It is recommended, though not required, that the OAP be provided with a protected power supply. If power is lost to the OAP, even momentarily, the system must be rebooted, though the processing of calls does not depend on the status of the OAP.

3.1.6.14.2.3 MIS

A 5ESS[®] switch providing ACD services may communicate with an external MIS. The MIS provides the following functions:

- (1) It receives agent event messages from the 5ESS[®] switch, and performs calculations on the data received.
- (2) It provides limited access to RC/V operations.
- (3) It provides statistics to supervisory work stations in the form of graphics and reports.

There are two configurations of MIS hardware which are supported. One configuration provides a direct link from the 5ESS[®] switch to the MIS, while the other provides an indirect connection through an event control link (ECL) system.

The ECL system is necessary in instances where one MIS is insufficient to support the amount of ACD traffic and/or customers in a given application. It is also necessary in instances where the MIS is located on customer premises. The ECL System is an adjunct processor (3B2-600) for the 5ESS[®] switch which supports the interface between multiple MISs and one 5ESS[®] switch. Any PSM hosting ACD agents requires one 9.6 kb/s data link to the ECL with one telebit trailblazer modem at each end of the link. This link is referred to as the MIS link. An ATA is necessary at the RISLU/ISLU end of the MIS link to provide an interface for the D-channel from the ECL to the PSM. The MIS link terminates on a T-interface card at the RISLU/ISLU. A maximum of 12 PSMs may have an MIS link to the ECL, and no link may be shared with another PSM. The ECL may have one to four links to each MIS that it supports. This link is called the call data link. The call data link is similar to the MIS link; it is a 9.6 kb/s data link with one telebit trailblazer modem at each end of the link. However, no TAs are required, and a maximum of 24 call data links may be supported by a single ECL (four per MIS and a maximum of six MISs per ECL). Again, no link may be shared among the MISs.

In the instance where one MIS is sufficient for a ACD application, an ECL is not necessary. No call data links are necessary, and one may use either a 3B2/1000-60, 3B2/1000-80, or a PC6386 WGS for the MIS. Every PSM hosting ACD positions still requires one 9.6 kb/s MIS link to the MIS with one telebit trailblazer modem at each end of the link, an ATA at the RISLU/ISLU, and a T-card. A maximum of 10 PSMs may have an MIS link, and the MIS links may not be shared among PSMs.

An operator/administrator console is necessary at the ECL and/or MIS to perform functions such as setting up new customers or assigning additional agent IDs to existing customers. An 615 terminal or equivalent is used for this function, and is located with the ECL or MIS.

Supervisor work stations provide real time reports and displays on operator activity and system response time to supervisors. The supervisor work stations may be an PC6286, PC6386, or other compatible device.

One megabyte of memory is necessary, as well as a 20-megabyte hard disk and a floppy disk [either 1.2 MB (5.25") or 1.44 MB (3.5")]. In addition to the main unit, one color monitor and one EGA monitor card or compatible are required for each work station. The software requirements include DOS (version 3.2 or later) and MIS release 5 for the supervisor work station. The work station is remoted from the MIS by using a Multi-Tech 224E Modem with MNP (level 3) on a 2-wire leased line which runs to the customer premises. This is a 2400 bps modem. A maximum of 32 supervisor work stations may be supported on one MIS.

A parallel printer may be connected to each supervisor work station to produce copies of screen displays and reports. Any of the following RS-232C compatible printers may be used:

- ☐ Epson® LX, MX, FX
- ☐ HP® LaserJet, or compatible.

A final parameter to engineer in the ACD system is the recent change operations system (RCOS) link. In an ECL configuration, one RCOS link may exist from the ECL to an I/O port in the AM of the 5ESS® switch. Multiple customers may access a limited set of RC/V operations at the supervisor work station over an RC/V link from the MIS to the ECL. Each MIS may support only one RC/V link. If an ECL is not being used, only one RCOS link is necessary from the MIS to an I/O port in the AM; no RC/V links are needed.

The RCOS connection from the AM to the ECL or MIS that permits the preceding interface uses the BX.25 RC/V text interface. This is a synchronous link with a rate of 4800 baud. Use of DATAPHONE® II (model 2048A) modems, or 2048A-compatible modems, is required at both ends of the transmission. The STAs terminate the transmission on an intelligent serial card (ISC) at the 3B2-600, while a TN75C board interfaces the BX.25 protocol at the AM.

The RC/V link connection from the MIS to the ECL is the same as the RCOS connection, except no TN75C board is required. A 4800-baud, synchronous link carrying BX.25 RC/V text is supported with DATAPHONE® II modems at each end of the transmission. Again, STAs terminate the transmission on an ISC at the 3B2-600.

The capacity of an MIS is expressed in two terms: real time capacity, and physical connectivity. The following list summarizes the many connectivity requirements.

Maximum number of ECL System Processors per 5ESS® switch	1
Maximum number of administrative consoles per 5ESS® switch	1
Maximum number of PSMs per ECL	12
Maximum number of MISs per ECL	6
Maximum number of customers per MIS	32
Maximum number of work stations per MIS	42
Maximum number of agent positions per MIS	1,000
Maximum number of call queues per MIS	128
Maximum number of serving teams per MIS	128
Maximum number of printers per work station	1
Maximum number of RCOS links	1
Maximum number of RC/V links per ECL	7
Maximum number of RC/V links per MIS	1

An MIS is capable of handling a call volume of 40 Kcph (40 thousand calls per hour) for a sustained period of time. Up to 60,000 calls per hour can be accommodated for 1-minute intervals before system degradation occurs. The ECL is capable of handling more than 90,000 calls per hour, which is adequate for any ACD call volume the 5ESS® switch would generate.

In addition to the connectivity requirements, one needs to consider the real time capacity of the ACD system. Heavy use of the MIS's periphery, such as the supervisor work stations and RC/V link, may degrade the call handling capacity of the system. When overload conditions occur, the following priority system is enforced (highest priority functions listed first):

- (1) Call Event Handling
- (2) Recent Change Operations
- (3) MIS Administrative Functions (reports, displays).

In the instance of overload, the low priority functions will slow down noticeably. Should the system experience sustained overload conditions, call data could be lost. The ACD administrators should use their resources wisely to ensure that call handling is not interrupted by excessive use of administrative functions during peak busy periods.

If the PCMIS (for example, PC6386/25) is used, the following connectivity requirements apply:

Maximum number of customers per MIS	4
Maximum number of work stations per MIS	13
Maximum number of agent positions per MIS	400
Maximum number of call queues per MIS	20
Maximum number of serving teams per MIS	20

A PCMIS is capable of handling a call volume of 15 Kcph for a sustained period of time. Up to 333 calls can be handled for one minute before system degradation occurs.

3.1.6.14.2.4 AIDB

With the 5E5 and later software releases, the ACD agent can access an external data base from the ACT or ACT-PLUS station via packet switching over the D-channel of the position. This data base is referred to as the AIDB and is vendor supplied.

The data terminal that the agent uses for accessing the data base is connected to an RS-232 port in the ACT or ACT-PLUS. The query request that the agent enters on the data terminal is sent to the switch through the D-channel of the ACT BRI. The D-channel in this case is shared between call processing and the ISDN packet-switched data applications. Through the packet switching network in the 5ESS[®] switch, the data base query request and reply information can be forwarded to the data base and back to the data terminal. The type of data terminals used at the ACD agent's position must be compatible with the data base system being accessed. The switched virtual circuit (SVC) and standard ISDN packet switching interfaces are supported. In this case, the circuit is allocated on demand and released when the call is finished.

3.1.6.14.2.5 DAS/C

A 5ESS[®] switch providing DA services may communicate with an external DAS/C. The DAS/C is a vendor-supplied data base for directory listings information. The DA operators access the DAS/C using a vendor-supplied terminal, sometimes referred to as the DAS/C-KDT.

Every PSM hosting DA positions and using automatic directory announcements requires a pair of duplexed 9.6 kb/s data links to the DAS/C. Each data link to the DAS/C uses a T-card and a high-speed STA, as well as a pair of modems.

3.1.6.14.2.6 RTRS

An interface can be provided between the 5ESS[®] switch and an RTRS data base external to it. This interface consists of a duplicated pair of load-shared BX.25 data links capable of 9.6 kb/s synchronous transmission between the OSPS and the RTRS. The RTRS data links can terminate on an ISLU or RISLU, and both links in the pair must be on the same SM. For reliability, it is recommended that the RTRS links terminate on an ISLU rather than a RISLU; however, if using a RISLU, it is recommended that the RISLU not use radio facilities on the T1 carrier. Each full duplex RTRS data link requires an STA at the RISLU T-interface and a pair of customer-supplied modems between the STA and the RTRS. The correct version of the RTRS software must be used to support the features in a specific software release.

Each OSPS can interface with only one RTRS, and both data links must be served by the same PSM or ISDN-SM.

3.1.6.14.2.7 HOBIS/HOBIC and Autoquote

The OSPS has an ability to send billing information to a centralized charge quotation system for calls originating from specified line numbers. The calls can originate from hotels, motels, hospitals, law firms, or other establishments. The centralized system can either be a HOBIS or a HOBIC. A 5ESS[®] switch has access to one HOBIS/HOBIC center.

The OSPS uses up to 8 full-duplex, 1200-baud links to transmit asynchronous ASCII data to the HOBIS or HOBIC. The exact number of data links is traffic-engineered, but a minimum of two is recommended for the HOBIS, and a minimum of three for the HOBIC. This recommendation allows one spare link for the HOBIS and two spare links for the HOBIC. The data transmitted to the HOBIS or HOBIC is distributed over all the data links.

At the HOBIS, all incoming data links are routed to a common switch function that allows one or two HOBIS processors access to all data links. The duplicated processors should be configured such that the active processor receives all data from OSPS. At a HOBIC, the data links are connected to individual teletypewriters.

The HOBIS/HOBIC data links can terminate on an ISLU or RISLU. One ISDN-SM (or PSM) is assigned for all HOBIS/HOBIC message transmissions. Each HOBIS/HOBIC data link requires a T-card, a high-speed ATA, and a pair of customer-supplied modems.

The AQ feature of OSPS provides information similar to HOBIS/HOBIC with the charge quotation output sent directly to a printer on the hotel/motel premises as well as to the HOBIS/HOBIC. Since AQ provides a copy of the charge quotation to HOBIS/HOBIC, the HOBIS/HOBIC is required to provide the AQ feature. Up to 16 full-duplex 110- or 300-baud data links can be used. Mixing of 110- and 300-baud data links is not allowed. An AQ BRI terminates both ends on an ISLU or RISLU in a looped-around configuration. In addition to a T- and a Z-interface card, a low-speed ATA and a modem are required for the connection. The AQ BRIs must be hosted by the ISDN-SM or PSM that supports the HOBIS/HOBIC.

3.1.6.14.2.8 Automated MultiLeaf Bulletin

The AMLB feature provides an interactive multipage display facility between an external data base and a T&A operator. In response to short queries, a screen of text can be downloaded to a VDT or CST. The AMLB is an automated replacement for multisheet bulletins typically issued to cover office practices and operator information, though it can be used for other functions. Links between the AMLB data base and the host PSM or ISDN-SM are engineered for a nominal load of 300 queries per link per hour. This load has been determined using the assumption that each query reply contains, on the average, 1,000 bytes of display information necessary to put up the proper VDT/CST display. For smaller average display sizes, more queries can be carried by each data link.

Connections between the vendor-supplied data base and the ISDN-SM (or PSM) use a packet-switched B-channel within the switch and an SRA for the 9.6 or 19.2 kb/s external data link. In addition, one D-channel must be allotted on access PHs for each AMLB link for signaling. Up to 32 AMLB synchronous data links can be provided. Each AMLB data base BRI requires a T-interface card on a RISLU or an ISLU. The supported configuration uses modems with an 3B2 as the data base server. Other BRI configurations and data base servers may be considered as an installation customization.

Two standard link configurations are supported. One consists of synchronous links, operating at either 9.6 or 19.2 kb/s, between the SRA and the AMLB data base processor. The data base processor must then be capable of synchronous communications protocol handling. A pair of synchronous modems and cabling as specified in the SD-5D135-01, Issue 11B, Application Schematic should be used.

The second configuration uses a PAD to convert between the synchronous link to the RISLU/ISLU and the several asynchronous links to the data base processor. An asynchronous link must be provided for each operator position that has simultaneous access to the AMLB data base. If distances greater than 15 meters (50 feet) separate the R/ISLU from the AMLB data base, it is probably more economical to provide a pair of synchronous modems for the links between the R/ISLU and the PAD rather than a large number of synchronous (though less expensive) modems between the PAD and the data base processor.

If operator positions hosted on one PSM need access to an AMLB with links on another PSM or ISDN-SM, inter-SM PHs and "nailed-up" time slots are required to support the inter-SM data transfer. Inter-SM PHs are traffic engineered on the basis that they have twice the capacity of access PHs.

3.1.6.14.2.9 External Information System

A 5ESS[®] switch providing LS services may communicate with an EIS via a CPDL which is a BRI interface. Like the DAS/C, the EIS is a vendor-supplied data base for directory listings information. The CPDL provides the EIS with information about the progress of a given call by sending call control data, such as position seizure, from the PSM to the EIS or vice versa. This information is necessary so that the audio response unit (ARU), or the DSU2-RAF-DA if using an IBM[®] EIS/DAS for basic LS and internal announcement unit, can provide the correct announcement to a given call.

The CPDL is a traffic engineerable link. Every PSM hosting LS positions or handling intercept traffic requires a 9.6 kbps CPDL to the EIS. One CPDL can usually support a maximum of 60 operators, and a maximum of 16 CPDLs may terminate on one PSM. Additional CPDLs may be provided to ensure uninterrupted service in the case of a failure of a CPDL or of the switch control unit (SCU) to which it maps. The SCU is a front-end to the CCI EIS. It is part of the vendor-supplied EIS arrangement. Each CPDL to the EIS uses a T-card and an STA as well as a modem. For reliability, it is recommended that CPDLs should be distributed among LGCs. Therefore, if an LGC with a CPDL should experience a failure, one of the other CPDLs could still carry its traffic, thus minimizing the service impact of an LGC failure.

A second link to the EIS may exist if listing services are being offered with the combined services terminal. Note that the IBM[®] EIS/DAS does not support the use of the CST. This link, known as a DBA-PRI, provides direct access from the CST to the EIS data base.

The LS feature has been designed with an open interface so that customers may choose any data base vendor that meets the LS interface requirements. CCI and IBM[®] have each developed listing services data bases to the LS interface specification. Despite conforming to the LS interface, there are some known constraints when using each of these vendors. First, when using the CCI EIS, a PSM numbering restriction must be followed. The 5ESS[®] switch using CM2 allows for SMs to be numbered in the range of 1 to 192. (Although the CM2C is limited to 2 local SMs and 6 RSMs, it still supports the 1 to 192 SM numbering convention). The CCI system can only accommodate an interface to PSMs numbered in the range of 1 to 127. Therefore, all PSMs interfacing to a CCI EIS must be numbered in the range of 1 through 127. This rule must be followed in the preparation of the ODD if CCI is the vendor of the EIS.

A second constraint exists in the offering of the NSD 800 DA service with CCI as the data base vendor. The interface for this configuration requires that the NPA of the calling party be signaled to the EIS in the forward number field with the position seizure message. This can be done by stripping the number of all digits except the NPA. This can be performed through office records form 5300-2 or RC/VFY view 9.2.

The final restriction is the use of internal announcements for LS. The CCI system does not support the use of internal announcements for LS; external announcements must be used. IBM[®] supports internal or external announcements for basic LS. However, if call completion or intercept are to be used, IBM[®] also requires that external announcements be provided. IBM[®] also allows the use of a combination of internal and external announcements. If an office uses a combination of internal and external announcements, the engineering of announcements should be based upon the load offered to the respective announcement source (that is, internal DSU2-RAF-DA or external ARU source). Also, CPDL link engineering may be nominally impacted.

3.1.6.14.3 PRI-Like Interfacing Systems

3.1.6.14.3.1 Overview

The PRI-like interfacing systems include:

- (1) EIS for the combined service terminal
- (2) cooperating interflow offices

3.1.6.14.3.2 EIS for the CST

The DBA-PRI provides access from the CST to the CCI EIS data bases. The DBA-PRI is an X.25 packet-switched interface which allows LS operators access to up to 15 different EISs from a CST. This interface is a DS1 facility which provides 24 B-channels per facility. This facility is able to perform permanent B-channel packet switching on a PRI without D-channel signaling. The information that is carried over this facility includes requests for information from the EIS, and the responses which are then displayed on the operator's terminal.

The DBA-PRI usually terminates on the same PSM as the CPDL on the switch side and must terminate on the same SCU as the CPDL at the vendor side. Individual B-channels may be shared among up to 12 operator positions. Each DBA-PRI terminates on a DFI in the DLTU. Each DBA-PRI has 24 B-channels and one DBA-PRI provides sufficient capacity for an entire PSM. However, a spare is recommended for service protection.

3.1.6.14.3.3 Cooperating Interflow Offices

The interflow capability requires the establishment of an EDSL as the communication channel between two cooperating OSPS offices. When a T&A call requiring an operator is interflowed, the sending OSPS performs most call processing for the call while the receiving OSPS performs all operator functions for the received call. The responsibilities of a sending OSPS may continue to include the provision of operator functions for any operator traffic that is not being interflowed. The receiving OSPS may also handle some noninterflowed traffic, and would, therefore, need to perform all call processing and operator functions for a given call. Note, however, that the received interflowed traffic is not allowed to be interflowed to another switch. Fully automated T&A calls, including ACCS and ACTS calls, will not be interflowed.

It is recommended that the EDSLs be engineered to a P.001 blocking factor, which essentially guarantees that a call being interflowed from one switch to another will not be blocked.

Each EDSL terminates on a DFI in the DLTU, and requires a PH2 or a third of a PH3 to handle the signaling data of the D-channel. The DFI2 circuit packs in a DLTU2 can be used in the place of a DFI to terminate interflow EDSLs. However, the use of a DFI2 may need an additional stand-by EDSL for service protection purposes. For this reason, DFI2s and DLTU2s are not recommended. The mixing of DFI and DFI2s in the same DLTU is not allowed.

The EDSL must be on a PSM at the sending OSPS. Each B-channel that is initialized on a PSM counts as one position on that PSM. Engineers must be careful to follow position connectivity limits when engineering EDSL B-channels to ensure that the PSM limit of 200 positions is not exceeded on any PSM. For example, if 100 T&A positions are equipped on a PSM that is also sending traffic to another switch, and therefore, EDSLs are terminating on that PSM, no more than 100 EDSL B-channels may be initialized, or the PSM position connectivity limit will be exceeded.

The EDSL may terminate on either a PSM or an ISDN-SM at the receiving OSPS. When EDSLs terminate on a PSM or ISDN-SM at the receiving OSPS, the B-channels do not count against the 200-position limit, though positions on that PSM do. Such a receiving PSM could have, for example, 85 T&A positions, as well as 14 EDSLs, given sufficient processor real time availability. If EDSLs terminate on an ISDN-SM at the receiving switch, the 200 B-channel limit does not apply. The maximum number of in-service EDSLs on an ISDN-SM depends on the availability of PIDBs on that particular SM. A maximum of 14 can be equipped, as 2 PIDBs are necessary for the PSU of the ISDN-SM, leaving 14 PIDBs for the EDSLs.

In addition to staying within the termination limits, one must ensure that the real time consumed on these SMs and PSMs has not exceeded their respective capacities. In general, an interflowed call at the sending OSPS takes 1.2 times as much PSM real time as a noninterflowed call. An interflowed call at the receiving OSPS takes 1.8 times as much PSM real time as a noninterflowed call. An interflowed call at the receiving OSPS on an ISDN-SM takes 0.8 times as much SM real time as a noninterflowed call. These factors are used in determining the real time consumption of an interflow arrangement.

While an EDSL provides 23 B-channels, not all of them need to be utilized. Situations may exist where partial use of an EDSL is preferable. For instance, if 160 B-channels are required for the traffic, 10 EDSLs could be provided and utilize only 20 B-channels per EDSL so that the 200 B-channel per SM limit at the sending OSPS is not exceeded, while allowing adequate spares for service protection. This is assuming no positions are connected to the PSM.

Although a PSM at the sending OSPS can support only 200 simultaneously active B-channels, it can physically terminate up to 14 EDSLs. This large EDSL connectivity can be beneficial if a customer wants to interflow traffic normally from one OSPS to another particular OSPS, but needs the ability to redirect traffic in case of problems at the receiving OSPS. In this case, standby EDSLs to a third OSPS can be equipped without needing additional PSMs at the first OSPS provided that the stand-by EDSLs are not activated until needed.

3.1.6.14.4 CCS Data Links

3.1.6.14.4.1 Overview

The 5ESS[®] switch may communicate with two distinct STP networks. One network is accessed using high-speed links, while the other is accessed using low-speed links. Connection to additional STP networks may be achieved by using the network interconnect feature (5E6 and later software releases) along with CNI 4.2. The number of link node pairs required for each network is traffic engineerable.

3.1.6.14.4.2 High-Speed CCS Data Links

The high-speed CCS data links have a throughput rate of 56 kb/s, and are engineered to a maximum occupancy of 40 percent. Typically, two high-speed links are engineered together as a mated pair, requiring one of the five CNI link node pairs which may be equipped. Each link carries nonredundant data from the 5ESS[®] switch to a 2STP. If one link, link node, or 2STP should fail, the other link would carry all of the traffic, thereby incurring a link occupancy of 80 percent. By engineering the links in this manner, it is guaranteed that a single link can carry all normal traffic and have some reserve capacity for peak periods, should failure of the other link occur.

3.1.6.14.4.3 Low-Speed CCS Data Links

The low-speed CCS data links have a throughput rate of 4.8 kb/s and are engineered to an occupancy of 35 percent. Two low-speed links requiring one link node pair of the CNI ring will carry nonredundant data from the 5ESS[®] switch to two distinct STPs, as is done for high-speed links. It should be noted that the pair of STPs being routed to may be the same pair of STPs being routed to for high-speed links. It is not the case that, if both low- and high-speed links are supported by one 5ESS[®] switch, two pair of 2STPs are required; one pair is sufficient. However, limitations at the 2STP may require that high-speed and low-speed links route to separate STPs.

Some features may use either low- or high-speed CCS links. This is due to two factors. The first factor is the flexibility of the high-speed links to accommodate various types of traffic. For example, high-speed links may carry SS7 formatted messages, as well as DCIS6 formatted messages. The second factor is the packaging scheme of some of the OSPS features. Prior to the development of high-speed access to the CCS network, features were developed to work with low-speed access using CCIS6 protocol (that is, BVA, NCD, CAS release 1). With the high-speed access development came the development of a message enveloping feature which transforms CCIS6 messages to DCIS6 messages (an SS7 look alike). The DCIS6 CAS messages can travel on the high-speed data link. If a 5ESS[®] switch has both high- and low-speed links, the CAS message traffic may be directed to one or the other pair of links. If low-speed access is desired, the CAS message will use the CCIS6 message format. If high-speed access is desired, the enveloped CCIS6 message (DCIS6) will be used. The OSPS capabilities from 5E4 (for example, BVA, NCD) can also take advantage of the availability of high-speed links in the same manner as CAS.

The link traffic is dependent upon the number and sizes of CCS queries and responses. The size of these

queries and responses may vary as the applications using the link(s) may vary.

In general, any application which uses low-speed CCS data links may use high-speed CCS data links if they are available, however, not all applications which use high-speed CCS data links may use low-speed links. The format of the SS7 messages cannot be reconstructed to look like a CCIS6 message.

Applications which must use high-speed data links are:

- ☐ LIDB
- ☐ CAS release 3
- ☐ ISDN user part (ISUP) SS7 trunk signaling
- ☐ service switching point (SSP)/800
- ☐ PVN
- ☐ LASS
- ☐ ICCV

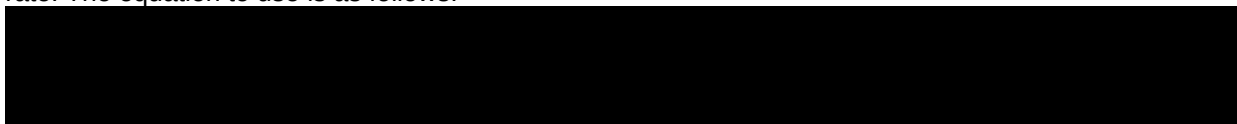
The remaining CCS applications may use high- or low-speed links.

Table 3-16 represents the maximum capacity for low- or high-speed links for the various OSPS capabilities which use CCS signaling. It also shows, by placement of an "X" in the appropriate column(s), which types of CCS traffic can be generated/carried by an Lucent Technologies Network Service Division (NSD) or service provider OSPS. Capacities for non-OSPS applications have been provided for completeness. Table 3-16 assumes that 100 percent of the traffic on a pair of links belongs to one application. The resulting numbers represent the maximum number of calls per hour per pair of links, with 100 percent of the link traffic generated by queries of that call type.

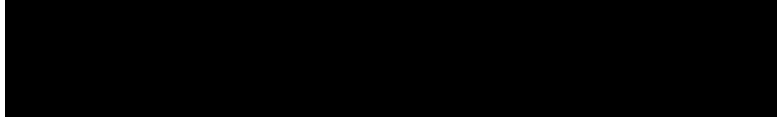
Table 3-16 CCS Data Link Capacity

SIGNALING LINK TRAFFIC TYPE	LOW SPEED	HIGH SPEED	NSD	TELCO
LIDB/BNS	-	104 Kcph	X	X
LIDB/CCD	-	98 Kcph	X	X
LEC 891/CCC CCD	-	91 Kcph	X	X
CAS Release 1	11 Kcph	109 Kcph	X	
CAS Release 3	-	56 Kcph	X	
ICCV	-	63 Kcph	X	
NCD (OSPS)	42 Kcph	240 Kcph	X	
BVA/BNS	65 Kcph	283 Kcph	X	X
BVA/CCD	60 Kcph	276 Kcph	X	X
INWATS	70 Kcph	375 Kcph	X	
CCIS6 (trunking)	40 Kcph	250 Kcph	X	
NCD (toll)	55 Kcph	340 Kcph	X	
ISUP/SS7 trunking	-	115 Kcph	X	X
SSP/800	-	160 Kcph		X
PVN	-	200 Kcph		X
LASS/AC or AR	-	60 Kcph		X

It is likely that a pair of links would carry a combination of message traffic for a mixture of the applications listed in Table 3-16. If a link pair is shared among multiple compatible applications, the link capacity will deviate. Office engineers should be careful to consider all CCS traffic that may be generated or carried by their type of office, all applications included. To calculate the number of link pairs necessary for shared use of CCS links, the capacity values given in Table 3-16 should be used along with their anticipated query rate. The equation to use is as follows:



For example, consider an office that expects a traffic load of 50 K calls per hour of LIDB/CCD, 100 K calls per hour of LIDB/BNS, and 40 K calls per hour of SSP/800. Since SSP/800 and LIDB must use high-speed links, this example illustrates the link calculation for applications sharing a high-speed link. The calculation is as follows:



This calculation indicates the need for two high-speed (56 kbps) link pairs.

3.1.6.15 Power Distribution Cabinet

A power distribution cabinet is available for use at OSCs/CCCs. Each fuse panel can hold up to 24 fuses. Two BSTs or one VDT per fuse is the recommended maximum for most OSPS sites. These cabinets can be used to supply power (-48 V DC) for the RISLUs, LTP cabinet, and operator/agent terminals (VDT/BST/ACT), and can be remoted with the terminals. Power may not be more than one floor level away from the terminals, as grounding beyond this restriction becomes hazardous. The power distribution cabinet is line engineered from the SD-5D135-01 OSPS application schematic which shows current and power requirements for the operator display terminals and other OSPS related hardware.

For an OSC/CCC collocated with the 5ESS[®] switch, it might be more economical to use the switch power distribution cabinet. Distances for cable runs, the floor distance limit, availability of conduit capacity between floors, and fuse capacity must be considered by the line engineer if a separate OSPS power cabinet is to be avoided.

The power distribution cabinet is optional. A customer may choose to provide their own. Some operations, such as ACD, require a commercial power supply if they use the U-interface cards and are beyond the distance limit for receiving power from the OSPS power distribution cabinet. Also, use of the ACT position mandates different power and fusing requirements than the other OSPS positions. If the ACT is being provided, the 533-700-100, 5ESS[®] *Switch ISDN Customer Premises Planning Guide*, should be used to provide engineering information regarding power supplies, cabling, terminating resistors, and the use of the NT1.

3.1.6.16 Data Set Cabinet

The data set cabinet provides mountings for data sets associated with the OAP, EIS, MIS, AIDB, DAS/C, RTRS, HOBIS/HOBIC, AMLB, AQ, and remoted MIS display terminals (supervisor work stations). The data set mountings are powered by one or two power inverters within the cabinet, which invert -48 V DC to 117 V AC on separate buses. Both inverters should be provided if the multiple data links of a particular type need to be powered by redundant sources for reliability. Examples of such links are the DAS/C, RTRS, and AMLB data links.

In cases where the current requirements exceed the capacity of the 1,000 VA inverters, an external 117 V AC power supply is required. The power distribution cabinet and external AC power source are line engineered from the SD-5D135-01 OSPS application schematic which the data sets and their current drain.

For an OSC/CCC collocated with the 5ESS[®] switch, it is possible to use a data set cabinet from the switch if one is equipped. If the distances between the LAU and the 5ESS[®] switch data set cabinet are short enough (less than 15 meters or 50 feet), a separate OSPS data set cabinet may be unnecessary.

The data set cabinet is optional. A customer may choose to provide their own, or may dispense with a data set cabinet entirely if reliability through redundant power supplies is not necessary.

3.1.6.17 Service Circuits

3.1.6.17.1 Overview

Service circuits support automated or semi-automated OSPS features or provide conferencing capability. Coin and calling card services can be entirely automated. The announcement of a directory number is provided by these circuits. All service circuits except for the DSU2-local digital service unit function (LDSUF) and conference circuits operate only on SMs running the loaded configuration of the software. Service circuits are generally real time intensive. While most of them are specific to the OSPS application, they (except DSU2-RAF-DA) should be distributed across SMs which do not support positions to preserve PSM real time.

Service circuits are either local or global. Local service circuits provide services only to the SM where they reside. Global service circuits, on the other hand, perform functions across SM boundaries and are accessible by all SMs. All the service circuits discussed in the following subsections except the DSU2-LDSUF, and, in the instances discussed before, the DSU2-RAF-DA, are global resources.

Every SM that handles OSPS/ACD calls requires two service groups of local service circuits, that is, DSU2-LDSUF. Each DSU2-LDSUF service group is connected with the TSI using a special data bus which does not count toward the 16 active PIDB limit of the TSI.

Global service circuits are traffic engineered on a switch-wide basis and are provided in increments of one service group. Each service group contains a varying number of circuits depending on the circuit type. One spare service group per type is recommended for service protection. Requiring a PIDB for connection to the TSI, a service group of global service circuits consumes 32 time slots (or half a time-slot set).

The DSU2-RAF-DA, DSU2-RAF dial-through announcement (DTA), DSU2-RAF-COIN, DSU2-RAF announcement-only channel (AOC), integrated services test function (ISTF), and DSU2-LDSUF all reside in the digital service unit - model 2 (DSU2). Each DSU2 shelf has room for four service groups of RAFs (DA, DTA, AOC, or COIN), one service group of ISTF, and the two service groups of LDSUF. Different versions of RAFs can mix on the same DSU2 shelf. Real time and time slot capacity permitting, an SM can house multiple DSU2 shelves. However, only the first shelf will be equipped with the DSU2-LDSUF; the corresponding space on the subsequent shelves remain vacant.

The SM processor real time required for supporting service circuits depends not only on the circuit type but also on the usage level.

3.1.6.17.2 DSU2-RAF

The 5E6 and later software releases support customized RAF announcements on the COIN, DA, and DTA RAF units.

The RAF unit (that is, service group) is composed of up to four circuit packs. The first circuit pack is a mandatory processor, the TN833. One of these is required per RAF. The remaining three circuit packs act as announcement stores, which, for OSPS, hold the phrase sets for DA, 800 DA, COIN, and ACCS calls. Phrase sets are stored on one TN1053 which can store 250 seconds of recorded announcements, and up to two TN1054 circuit packs which can each store 500 seconds of recorded announcements.

A typical RAF configuration for OSPS is one TN833, and one TN1053, though it is potentially possible for OSPS to also use TN1054s. Should a customer require customization of any of the existing phrases, the customization would be done on a TN1054 circuit pack. Its firmware is left unencoded so that customizing may be performed through the customized announcement process.

Customers should be aware that customizing announcements may impact the holding time of the various RAF units. Longer holding times require the provisioning of more RAF units, while shorter holding times require fewer.

Customers should also be aware that RAF units may require firmware upgrades to provide the appropriate announcements for a given feature. Care should be taken when placing retrofit orders so that the

appropriate firmware for the RAFs is also ordered.

3.1.6.17.3 DSU2-RAF-DA

A directory assistance position is usually accompanied by an announcement facility to provide the directory number to the caller and, thereby, reduce the operator working time per call. A DA position uses a DAS/C-keyboard display terminal (KDT) to interface with an external DAS/C. The DAS/C is designed to provide the selected number to the DSU2-RAF-DA for announcement. This service circuit is used exclusively by the DA application and should reside on the PSMs that host DAS/C data links.

With the 5E6(2) and later software releases, the *IBM*[®] EIS/DAS supports the use of internal announcements for basic LS. That is, for listing number retrieval only, the *IBM*[®]/DAS may either use a DSU2-RAF-DA, or use an external ARU with incoming ARU trunks. If the *IBM*[®] EIS/DAS is supporting intercept or DA call completion, the latter configuration is required.

If the OSPS office configuration is using the *IBM*[®] DAS/C and more than four PSMs require access to it, the DSU2-RAF-DA service circuits must be engineered for local, rather than global use.

Each DSU2-RAF-DA service group supports 31 DA announcement ports (circuits). The recommended number of service groups to be provided is traffic engineered for P.001 blocking. In addition, one spare service group per switch should be provided if engineered globally; one spare service group per PSM should be provided if engineered locally.

3.1.6.17.4 DSU2-RAF-DTA

The ACCS requires the ability to generate announcements while simultaneously decoding customer-entered touch-tone digits on the same peripheral time slot (or port). This is the DTA function. The DSU2-RAF with the DTA function is referred to as DSU2-RAF-DTA. All 0+ calls are treated as potential ACCS calls and require a DSU2-RAF-DTA circuit, even though the call may eventually be handled by an operator.

The number of usable DTA ports per service group is limited by the real time of the processor in the digital service circuit (DSC). It is estimated that the DSC real time for the DTA can support 20 ports for DTA, and up to 11 ports for AOCs.

The DSU2-RAF-DTA circuits, like other DSU2-RAF circuits, are global resources and should be engineered on a per system (instead of per SM) basis. They can reside in any SM running the loaded software configuration including the PSM. However, they are typically provided in non-ISDN SMs, since no ISDN hardware is required to support the DTA function. The number of DTA circuits required is dependent on the rate of 0+ calls the switch is expected to handle, including both ACCS and operator-assisted traffic. It also depends on the expected holding time of the circuit, which, in turn, is a function of the relative volume of ACCS and 0+ operator-handled calls.

The use of automated positions (APs) in an office can greatly impact the use of DSU2-RAF-DTAs, especially if a 1-stage protocol is used. A 1-stage protocol implies that all calls dialed 0+ from select line numbers and arriving on trunks specified for APs are delivered to APs. The ACCS treatment is never given to these 0+ dialed calls. Rather, the DSU2-RAF-DTA function is provided within the AP itself, thus reducing the number of DSU2-RAF-DTAs required in the office. With a 2-stage protocol, all calls dialed 0+ receive ACCS treatment first. The ACCS calls require DSU2-RAF-DTAs. Therefore, when using APs and a 2-stage protocol, DSU2-RAF-DTAs are used in the same manner as when the APs are not present. If the customer fails to respond to the RAF or dials 0, the call is then sent to an AP for further handling. Most card calls are handled by the ACCS service; only calls which require intervention are sent to an operator or AP.

The OSPS provides a queuing mechanism for the DSU2-RAF-DTA circuits. A call requesting a DSU2-RAF-DTA circuit and not receiving one immediately is queued, not blocked. To minimize delays for ACCS call handling, a delay probability of C.01 is recommended as the engineering objective for the DSU2-RAF-DTA. No queuing for a DSU2-RAF-DTA occurs for calls released from operators or APs to

detect # signal for potential sequence calls if the AP feature is used. In this case, if a DSU2-RAF-DTA cannot be obtained immediately, the call is not queued and the call receives standard operator-handled card calling treatment (that is, # detection is not available before the called party disconnects after answering the call).

With the 5E7 software update, and later software releases, a TN1054 board is required in addition to the TN1053 to store the standard announcement phrases for the DSU2-RAF-DTA. If an OSPS office with the 5E7 software update elects to use customized announcements, the phrases for the customized announcements can be on a separate TN1054 board or on the same TN1054 board that stores the standard announcement.

3.1.6.17.5 DSU2-RAF-COIN

The automated coin decoding and announcement facility (COIN) is physically identical to the DTA circuits. The difference in function occurs with the firmware and the specification listed for the circuit in ODD. All of the physical restrictions described for DTA apply as well to the COIN circuits. A DSU2-RAF service group can support 20 COIN circuits (or 20 DTA circuits), and 11 AOCs.

The OSPS does not provide a queuing mechanism for the DSU2-RAF-COIN circuits. The DSU2-RAF-COIN circuits should be engineered to P.001 blocking. They can reside in any SM with the loaded configuration software. However, attempts should be made to restrict them to non-ISDN SMs, unless significant spare capacities exist in other SMs.

3.1.6.17.6 DSU2-RAF-AOC

The MECH feature of the 5E6 software release may require that a delay announcement be played to the called and calling parties, informing them to hold for an operator. The DSU2-RAF-AOC unit does no special functions beyond making an announcement to the parties. Such an RAF unit is only required when using MECH, and when there is not a sufficient number of AOCs remaining on a DSU2-RAF-COIN or DSU2-RAF-DTA.

The DSU2-RAF-AOC is the same physical piece of hardware as a DSU2-RAF-COIN or DSU2-RAF-DTA. However, all 31 ports are initialized to provide an announcement-only function for the sole purpose of providing a delay announcement for MECH calls.

The OSPS does not provide a queuing mechanism for the DSU2-RAF-AOC circuits. The DSU2-RAF-AOC circuits should be engineered to P.001 blocking. Such blocking criterion essentially guarantees that a circuit is available. The circuit can reside in any SM with the loaded configuration of software.

3.1.6.17.7 Conference Circuits

An OSPS used for T&A is a high-volume user of conference circuits to support 3-, 4-, and 5-way connections between operators, calling parties, called parties, operator supervision, and other operators. An ACD office requires conference circuits to support 3-way connections between agents, calling parties, agent supervision, and other agents. The OSPS/ACD uses the existing 3- and 6-port conference circuits to meet these needs and shares these resources with other applications (for example, BRCS). Conference circuits can reside in any SM, basic, standard or loaded, ISDN or non-ISDN. As global resources, they are accessible by all SMs (including PSMs) and any conference circuits residing in a PSM can be accessed by other SMs. A conference circuit in a PSM will reduce the real time available for operator activities, so it is recommended to avoid installing these circuits in a heavily loaded PSM. It is recommended that conference circuits be distributed across SMs.

Conference circuits are provided by the DSU1-based GDSU. A GDSU is subdivided into two service groups. Among many possible configurations, a fully equipped GDSU service group can provide ten 3-port conference circuits or four 6-port plus two 3-port conference circuits. The required number of service groups should be engineered on a traffic basis.

If the information on usage counts is not available, one 3-port conference circuit per 2.4 T&A positions and one 6-port conference circuit per 10 T&A positions are recommended. This recommendation reflects an OSPA with approximately 150 positions, a 20-second conference circuit holding time, and 45 percent and 6 percent of operator-assisted T&A calls requiring 3-port and 6-port conference circuits, respectively.

Billing to a third party, person-to-person, and collect calls typically involves a 3-port conference circuit. Calls needing service assistance also require a 3-port conference circuit. Person-to-person calls from an ACTS coin phone and service assistance on an operator-assisted call already requiring a 3-port conference circuit are two examples of service requiring a 6-port conference circuit.

The interflowed T&A calls use conference circuits at the sending interflow OSPA except for internal conference and monitoring or calls that received more efficient call handling (MECH) treatment.

The use of APs in an OSPA also impacts 6-port engineering where the APs conference to an operator position.

With ACD, only calls needing service assistance require a 3-port conference circuit. The ACT-PLUS, which allows conferencing among the calling party on the ISDN line, the agent, and a called party on the analog line, makes use of a conference circuit internal to the ACT-PLUS, and does not require a conference circuit from the switch to perform this function.

3.1.6.17.8 Integrated System Test Facility

The ISTF performs loop tests for the BST-DA, BST-LS, ACT, ACT-PLUS, VDT, CST, and interflow EDSLs. It can reside in the PSM or any loaded configuration SM. Except while performing loop tests, the ISTF circuits consume little SM processor real time. An ISTF can be equipped on the PSM. Two ISTF service groups are required per switch.

3.1.6.17.9 DSU2-LDSUF

3.1.6.17.9.1 Overview

The LDSUF provides tone generation and decoding functions for regular lines and trunks, intrusion tone generation for BLV, and tone decoding for transfer-CAMA trunks. It also has the capability to perform ringback and to exchange coin control signals with the end office. These service circuits must be equipped on all SMs that handle OSPA calls.

Each SM must be equipped with the LDSUF consisting of two service groups, each with seven digital signal processors (DSPs). Each service group can provide 30 incoming channels and 31 outgoing channels. A DSP can be dedicated to:

- ☐ Tone generation (UTG) with a maximum of 31 transmit time slots
- ☐ Tone decoding (UTD) with a maximum of 5 receive time slots
- ☐ Tone transceiver (UTX) with a maximum of 5 receive and transmit time slots
- ☐ CAMA transfer decoder (CAMA-TD) with a maximum of 10 receive time slots.

3.1.6.17.9.2 Tone Decoders

The call interaction interface for inbound call management (CIICM) feature for ACD requires a simplex path between the calling party and the 13A type unit, and a simplex path between the calling party and the universal tone decoder (UTD). The first path allows the calling party to listen for the prompting announcement, and the second path allows the calling party to enter the touch-tone input that will be acknowledged and acted upon by the 5ESS® switch.

Each service group must allocate one DSP to the UTG function. If voice path assurance (VPA), analog visual message waiting indicator (AVMWI), or analog incoming calling line identification (AICLID) is to be used on the SM, one DSP per service group must be allocated for UTX. If transfer-CAMA trunks are to terminate on the SM, another DSP per service group must be allocated for CAMA-TD. Therefore, there are either four, five, or six DSPs remaining for UTD per service group (that is, 40, 50, or 60 UTDs per LDSU per SM).

All usage of the UTDs needs to be considered in order to establish whether or not sufficient UTDs are available for the CIICM feature, and it needs to be considered on a per SM basis (the UTDs are locally engineered). In addition to DTMF reception for the CIICM feature, UTDs are required for line originations, as well as DP or MF trunk calls.

3.1.6.17.9.3 Tone Outputers

The time and charges feature requires the OSPS to send ringback signals toward the local office so that the charges for the call can be quoted to the customer even after the customer has gone off-hook. Ringback signals are used to instruct the local office to perform actions on coin stations. Ringback consists of either a wink or an expanded inband signal. The type of signal to be generated is dependent on the type of trunk and the type of switching office connected to that trunk. With the 5E5 software release, the expanded inband signaling is added to the DSU2-LDSUF. The new functionality is built into the existing tone outputers and does not require the use of additional digital signal processors. This tone outputer also serves for coin signaling and busy line verify/emergency interrupt.

The expanded inband signals are generated in the originating SM. Consequently, all the SMs that carry operator-assisted traffic in an OSPS must be equipped with a DSU2-LDSUF. The SMs equipped with a DSU2-LDSUF that generate expanded inband signals must also be equipped (or retrofitted) with the improved version of the TSIU2 or the TSIU3 so that the signaling bits can be handled properly by the DSU2-LDSUF.

The tone outputers currently required for other per-call tone generations are more than adequate to meet the OSPS ringback needs. No special traffic engineering needs to be performed for OSPS. Each DSU2-LDSUF service group can contain up to 30 tone outputers, and up to 60 per SM.

3.1.6.17.9.4 CAMA Tone Decoder

The OSPS has the ability to identify a transfer-CAMA call as either automatic number identification failure (ANIF) or operator number identification (ONI) from the different signaling tones associated with each classification. The decoding of CAMA tones is a function of the DSU2-LDSUF and involves the use of previously unassigned DSPs.

Each of the two redundant DSU2-LDSUF service groups can provide up to 10 CAMA tone decoders, sufficient to handle 3.7 K transfer-CAMA calls per hour. The exact equipage should be based on the traffic count and transfer trunk distribution across SMs.

Because of short holding times of transfer-CAMA calls, a transfer trunk generally imposes a much greater demand on SM real time than trunks carrying calls with longer holding times. In an office with a high volume of transfer-CAMA traffic, it is desirable to spread transfer-CAMA trunks across several SMs. As a rule of thumb, the ratio of transfer trunks to other trunks should not exceed the ratio of their respective expected holding times. Transfer-CAMA trunks may be distributed across a maximum of 20 SMs; a maximum of 32 trunk groups are allowed per switch.

3.1.6.18 Trunking

Most OSPS calls arrive at the switch through dedicated trunks using MF or DP signaling. Nondedicated trunks can be used only for inward and ACD calls. Except for DA and ACD traffic, CCS signaling is not supported on incoming trunks. Both digital and analog trunks can be used for incoming calls.

The OSPS can complete calls on outgoing CCS trunks using CCS6 or CCS7 signaling, as well as MF/DP trunks. These trunks can either be digital or analog. Outgoing OSPS traffic does not require dedicated trunks. In an office that also serves non-OSPS traffic, outgoing trunks should be engineered for combined traffic.

Trunks carrying OSPS traffic can be connected to any SM (including the PSM) or RSM running the standard or loaded software configuration. The call handling capacity of trunk terminating SMs can be limited by either real time or time slots. The SMs with a larger number of short holding-time trunks, such as DA and transfer-CAMA trunks, tend to be more real time intensive. The SMs with mostly other types of trunks, on the other hand, are likely to be time-slot limited. In distributing trunks across SMs, it is advisable to mix short-holding-time trunks with long-holding trunks. A high concentration of short-holding-time trunks on one SM can lead to premature exhaustion of the SM's real time capacity. Conversely, SMs/PSMs with exclusively long-holding-time trunks may under utilize the SMs/PSMs call processing potential.

The provision of trunk termination on PSMs with ACD application allows for use of significant amount of remaining real time. The new option of trunk termination on PSMs with DA, LS, and T&A applications in the 5E6 software release provides an alternative engineering to balance consumption of real time and time-slot capacities.

The ACD incoming trunks can be DP, MF, or CCS trunks. Prior to the 5E6 software release, the engineering of these trunks is rather straight forward. A load was generated for incoming trunks and was derived by using the projected trunk holding times and the busy hour peg counts. The varying holding times on trunks of different customers was easy to account for. However, with the call vectoring feature in the 5E6 and later software releases, the customer is able to create their own front-end treatment on their own calls. This treatment may vary substantially from one customer to another, and therefore, the real time impact of the trunks can vary substantially from one customer to another. For this reason, with the 5E6 and subsequent software releases, it is necessary to engineer incoming trunks for ACD calls independently for each customer. A customer can deactivate the call vectoring feature, use one call vector, or use multiple call vectors, thereby affecting the real-time usage of a given SM.

With ACD, intraoffice trunks, also known as loop-around trunks, are required in the following cases:

- (1) When there are line originations on the same 5ESS[®] switch that is going to handle the call as part of the ACD traffic.
- (2) When the *CONVERSANT*[®] II computer program is used, it uses a line side call appearance and transfers the call to an appropriate call queue based on the digits entered by the calling party and received by the *CONVERSANT*[®] II computer program. Note that with the 5E6 and later software releases, the number of intraoffice trunks required for this application can be reduced by the use of the CIICM feature.
- (3) When calls are originating from ACD agents, loop arounds are needed for billing, and to make use of some associated BRCS features (for example, ARS, IDP, etc.).

The first two conditions ensure that the line origination is translated into a trunk origination (ACD requires call originations to be on trunks, not lines). Since call type determination can be done on a dialed digits basis, these intraoffice trunk facilities can be engineered efficiently as one large trunk group. These facilities are called type I trunk groups. The third condition (billing) requires intraoffice trunk groups on as detailed a basis as is desired. Typically, this is done on a per serving team basis. These facilities are called type II trunks. Therefore, a typical ACD site will have one (potentially large) type I trunk group, and, if outbound billing or BRCS features are desired, many small type II trunk groups.

3.1.6.19 13A Recorded Announcements.

Under control of the ACD, a suite of announcements can be made available for incoming calls requiring

operator assistance. When a call arrives at the ACD for distribution to an operator, an assessment can be made of the expected delay time to connect with an operator. While the call remains on queue for appropriate service, an announcement can be provided to the caller with advice of the expected delay or change of service. This type of announcement is made only when there are more than two calls on queue.

The OSPS has provisions for the following typical types of announcements that can be provided by the 13A unit:

- ☐ level 1 queuing delays (default of 20 seconds) (DA, LS, T&A, ACD)
- ☐ level 2 queuing delays (default of 40 seconds) (DA, LS, T&A, ACD)
- ☐ level 3 queuing delays (default of 60 seconds) (DA, LS, T&A, ACD)
- ☐ fold down (DA, LS, T&A, ACD)
- ☐ turn back (T&A)
- ☐ customer announcement (ACD)
- ☐ music on hold and music on queue (ACD)
- ☐ prompt announcements for the CIICM feature (ACD).

All calls received at the office after the call queue is closed are routed to a 13A fold-down announcement. The caller is informed that the office is closed and when it will reopen. The customer announcement allows the ACD customer to remotely tailor announcements for the delay conditions being experienced, rather than having to use the standard announcements provided by the office.

The music on hold and music on queue is no different than any other type of delay treatment, except that the listening time is expected to be longer when holding with music than for that of a typical announcement. For each music source required, the number of channels required is calculated by generating a load from the request rate and the average holding time, and using the P.001 tables. The number of ports is then calculated as for any other delay treatment. It is desirable to spread music ports over available SMs since the music ports will have many people listening to them at any one time which heavily impacts available network time slots.

The turn-back announcements are used when an operator system receives a call that is legally prevented from completing. In this case, the caller receives the turn-back announcement which gives the caller instructions on how to reach an operator who can legally complete the call. The customer announcement is available with the 5E6 and later software releases for ACD, and allows the ACD customer to remotely tailor announcements for the delay conditions being experienced, rather than having to use the standard announcements provided by the office.

The software provides the flexibility to have up to five unique announcements for each call type. Seventy traffic assistance call types are identified with for the 5E5 software release. Many of the incoming call types can be adequately served by the same announcements, so the maximum number of announcement units (70 call types times five levels per type) need not match the number of call types. With point distribution bridging, approximately 50 calls can simultaneously receive the same announcement from a single announcement unit. The 13A announcement unit and the ACD can also be configured to provide special announcements which may be desired for certain applications without returning answer supervision (for example, a general warning to all incoming calls that collect calls are not accepted).

Each announcement requires a 4-wire E&M local analog trunk and either a ud4 or ud6 circuit pack in the 13A unit on the 5ESS[®] switch miscellaneous cabinet. The number of announcements and the type of announcements are provided by the customer engineer. Each announcement can be distributed digitally within the 5ESS[®] switch to serve a number of trunks requiring the same announcement.

3.1.6.20 ISDN Lines in the PSM

3.1.6.20.1 Overview

Two approaches for performing engineering for ISDN lines on a PSM are presented in the following text. The first method (simplified) is shown in "Simplified ACD/ISDN Line Engineering", Section 3.1.6.20.3. It is a trivialized approach which imposes many assumptions of the ACD and ISDN models to produce the combined limits for lines and positions on a PSM. The second approach (flexible) is shown in "Flexible ACD/ISDN Line Engineering", Section 3.1.6.20.4. It allows engineers to use data which describes their own office to determine quantities of ISDN lines which can be supported, given a particular need for ACD positions and data links. In the 5E9(1) software release, ACD is provided as an ISDN service. It is engineered like any other ISDN feature and does not require use of a PSM. See "Custom ISDN ACD/BRCS for the 5E9(1) Software Release", Section 3.1.6.20.2, for a description of the ISDN ACD/BRCS feature.

3.1.6.20.2 Custom ISDN ACD/BRCS for the 5E9(1) Software Release

In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. The Automatic Call Distributor/Business and Residence Custom Services (ACD/BRCS) Interworking feature gives the end-users the ability to use both ACD capabilities and ISDN BRCS capabilities from the same ISDN station set over a BRI. The ACD/BRCS Interworking feature is a secured feature. The specific BRI interfaces supported for ACD/BRCS Interworking are the type B or type D protocols. An ACD Hunted Call (also called hunted call) applies only to circuit-switched voice calls. A hunted call is an incoming call which has come to the ACD by the dialing of an ACD DN. The hunted call receives either standard delay treatment, standard queuing treatment, or vectoring treatment. The hunted call is directed to the most idle agent position in a serving team that handles this type of call. A hunted call is not targeted for a specific agent, but rather is intended for any agent who is a member of a serving team handling calls made to the ACD DN. When the call is delivered to the selected agent, it comes in as an "ACD Hunted Call". The BRCS features are allowed for outgoing calls and incoming non-hunted calls, with minor exceptions, and in some cases for hunted calls. Multiple call appearances and multiple DNs are available to the station set. Shared DN is not allowed on the primary DN at a terminal to which ACD is assigned (known as the Position DN) but it is allowed on a secondary DN. A terminal with ACD assigned is not allowed to be part of a multiline hunt group.

The ACD agents can conference and transfer between ACD calls and external (outside the ACD) parties, and the ACD agents can "hand off" or transfer a call after a conference has been established. There are no new limitations on which kinds of calls could be combined in conferences due to ACD. For example, ACD agents can conference and transfer with other ACD agents, or with any other parties they can be connected to.

An ACD agent can place an active ACD call on hold to answer a non-ACD call. This is an inherent part of BRCS multiple call appearances which addresses a previous ACD customer problem. Agents can use 5ESS[®] switch ISDN data services, such as circuit-switched data, on demand B-channel packet switching (ODB), and permanent packet B-channel packet switching (PPB). Data calls are not impacted by the ACD functionality at the terminal. The ACD/BRCS Interworking feature eliminates the need of telephone companies for loop-around trunks that were used for originations into the ACD from lines, terminations from ACD agents to lines, and for billing of agent originated calls.

Current ACD functions are maintained, such as Management Information System (MIS) statistics on ACD calls, direct agent access by dialing a directory number that links to a specific agent, service observing (also known as monitoring), the ability to dial agents by an access code plus an agent ID, and the ability to dial queues by access code plus queue number. Also, MIS information is provided on calls on ACD call appearances when an agent is not logged in, but they are tracked against the physical position rather than an agent ID.

During the transition period from the ACD/OSPS platform to the ACD/BRCS platform, this feature also

provides the ability to mix ACD/OSPS and ACD/BRCS agents. This is known as Interoperability. Interoperability should allow a smooth transition to the ACD/BRCS platform.

See 235-190-104, *ISDN Feature Description*, for a full description of this feature and its operation.

3.1.6.20.3 Simplified ACD/ISDN Line Engineering

In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. It can be equipped like any other ISDN line. However, it must be noted that lines with this feature usually have a much higher occupancy rate (20 to 25 CCS) than regular lines (5 CCS). See 235-190-104, *ISDN Feature Description*, for a full description of how to engineer this feature.

In the 5E6 through 5E8 software releases, simplified ACD/ISDN line engineering is performed using reasonable call loads on both B-channels and the D-channel. The following assumptions were made:

- ISDN BRI engineering is done at 8.10 hundred call seconds (CCS) circuit-switched per line (not per B-channel). Packet-switching, on the D-channel only, is done at 0.39 pps equivalent. No multipoint or shared DN is used in this model, however, adjustments can be made to provide these capabilities.
- Both ISDN lines and ACD positions are terminated on ISLUs. In order to increase reliability and provide a uniform grade of service, it is assumed that ISDN lines and ACD positions will not share the same ISLU.
- The ACD ISLU will run in an active/active configuration (like its ISDN counterpart) in order to minimize the number of PIDBs required.
- Up to 32 ISDN lines per LGC may be equipped while only 16 ACD positions per LGC may be equipped. It is also assumed that no Z-cards are used.
- The ISDN lines must meet the origination (O) plus termination (T) holding time limits given in Table 3-17 for each configuration. The P.001 tables are used to determine these limits. This model assumes that ISDN calls last 2 minutes. These limits can restrict the ISDN features that can be supported when ACD positions utilize more than 130 call build data blocks (CBDBs) (that is, less than 100 remain for ISDN features).

Based on these assumptions, the allowable number of ISDN lines and ACD positions on the same PSM with the 5E6 through 5E8 software releases is given in Table 3-17.

The real time checking is not done in this model, therefore, monitoring the real time usage on a PSM is essential if the ACD call's AWT is short or the PSM is heavily loaded with agent positions and other equipage (for example, global service circuits, trunks, etc.). A good practice is to avoid global service circuits and trunks on the PSM if ISDN lines terminate on the same PSM.

The ISDN ACD/BRCS feature, available in the 5E9(1) software release, allows real time checking as described in 5 DOPS 235-060-110, *Engineering Procedures*.

Table 3-17 Allowable Number of ISDN Lines and ACD Positions on a PSM

ACD POSITIONS	ISDN LINES	O+T CBDB LIMIT (SEC)
32	1408	59.5
64	1280	53.8
96	1280	42.1
128	1152	33.8
160	1024	24.2
192	896	12.8

3.1.6.20.4 Flexible ACD/ISDN Line Engineering

In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. It can be equipped like any other ISDN line. However, it must be noted that lines with this feature usually have a much higher occupancy rate (20 to 25 CCS) than regular lines (5 CCS). See 235-190-104, *ISDN Feature Description*, for a full description of how to engineer this feature.

In the 5E6 through 5E8 software releases, flexible ACD/ISDN line engineering is based on the traffic load on both B-channels and the D-channel for the ISDN BRIs. When combining ISDN and ACD on a PSM, the following two configurations are supported:

- (1) using a dedicated ISLU for ISDN lines plus a dedicated ISLU for ACD positions in a PSM (configuration I).
- (2) using a dedicated ISLU for ISDN lines plus a dedicated RISLU for ACD positions in a PSM (configuration II)

The engineering rules are based on the following assumptions:

- ☐ No multipoint or shared DN for ISDN lines is used in this model; however, adjustments can be made to provide these capabilities.
- ☐ Up to 32 ISDN lines per LGC may be equipped, and no Z-cards are used.
- ☐ The processor real time will not be exhausted after the time slots and the DI ports are fully utilized in the PSM.
- ☐ Mapping ISDN lines and ACD positions do not share the same ISLU or RISLU in the PSM.
- ☐ There are no DSU2-RAFs in the PSM.
- ☐ There are no analog line units in this PSM.
- ☐ There are no BX.25 packet-switched channels in this PSM.
- ☐ There are no PRIs in this PSM.
- ☐ There are no X.75, X.75, or IP packet trunks in this PSM.
- ☐ ISDN features beyond the 5E4 software release are not supported (for example, multipoint BRI, etc.).

Based on these assumptions, the allowable number of ISDN lines and ACD positions on the same PSM with the 5E6 through 5E8 software releases is given in Table 3-17.

3.1.6.21 Remote Switching Module

If OSPS services are to be provided on an RSM, then that RSM can only connect operator/agent trunks. The specific switching module of the MMRS that carries OSPS call traffic to the host can only connect with trunks. Since an RSM may be located across a local access and transport area (LATA) boundary from the host switch, all operator-assisted calls to an RSM are routed out through the same RSM. One exception to this RSM call restriction is *ALLIANCE*[®] teleconferencing service where the conference call may be completed using other SMs on the central switch. Stand-alone mode precludes any access to OSPS services.

The umbilicals and ICLs must be engineered to allow for the rates and holding times of OSPS (and *ALLIANCE* teleconferencing) calls. An extended DS1 format transmission facility is used to connect the RSM to the host 5ESS[®] switch (for example, T1 carrier, microwave). The facilities are traffic-sensitive and simulate the NCT links of a local SM, carrying both network (call) and control data. A minimum of two T1 lines must be provided for reliability, and all umbilical facilities from an RSM must terminate on the same

host module.

The provision of OSPS features to an RSM requires that sufficient voice channels (22-23 channels per T1 umbilical) be made available for the load (call rate and hold time) from the remote to the OSPS on the host switch. Also, enough ICL capacity must be made available to avoid back-hauling call traffic through the host switch. (If all ICLs are busy between two switching modules in an MMRS, a DDD call can be handled using the umbilicals and the host switch; this might occupy two umbilical time slots for a relatively long time and block other OSPS calls. This feature must be inhibited for OSPS traffic.)

The placement of the RSMs relative to the host SM needs to be done in such a manner that the sum of all of the transmission delays incurred in call completion through the RSM is less than or equal to 18 ms. Four components need to be considered when evaluating the total delay in an RSM arrangement. The components that make up the delay are as follows:

- (1) the umbilical between the RSM and the host SM
- (2) the "tail" between the calling party and the RSM
- (3) the "tail" between the called party and the RSM
- (4) delay incurred in bridging the call in the host

Bridging the call in the host SM may cost as much as 5 ms, leaving 13 ms for the other three components. A general guideline of allowing 1.6 ms per 100 miles of transmission can be used to approximate the total end-to-end transmission delay from the calling party to the RSM, to the host SM, back to the RSM, and finally to the called party. It is strongly recommended that the end-to-end delay in an RSM arrangement actually be measured to ensure that the 18 ms delay is not exceeded.

An alternative to the RSM arrangement is the ORM arrangement. The ORMs provide switching services to remoted communities in a manner similar to RSMs. However, rather than requiring a host SM to interface to the 5ESS[®] switch, an ORM uses fiber optics to connect directly into the CM, just as any other SM. It may be remoted up to 100 miles from the 5ESS[®] switch over standard transmission facilities. See "Optically Integrated Remote Switching Module", Section 2.2.4.10.

Where an ORM differs from other SMs, including PSMs, is in the area of hardware configurability. There are a number of restrictions which apply to an ORM which do not apply to other SMs. First, the OSPS data links (for example, HOBIS, RTRS) and service circuits (for example, GDSUs, DSU2-RAFs) may be equipped on PSMs, though, in general, this equipage is not recommended in order to preserve the PSMs real time for call processing. In the case of an ORM, these data links and service circuits are not allowed. The need for high reliability of these links and circuits motivates the recommendation to equip them on SMs rather than ORMs. An additional restriction of the ORM is that an ISLU must be used as the OPC rather than an RISLU.

3.1.7 RSM/MULTIMODULE REMOTE SWITCHING MODULE (MMRS) ENGINEERING

3.1.7.1 RSM Umbilicals

The T1 carrier facilities are used to connect the RSM to the host 5ESS[®] switch. The link is traffic-sensitive and simulates the NCT links of a local SM, carrying both network (call) and control data. The two control time slots are dedicated to channels in two separate T1 lines with the capability of automatically switching to dedicated channels on separate backup lines should the primary lines fail. This arrangement requires a minimum of two T1 lines and is limited by the requirement that all umbilical facilities from an RSM must terminate on the same host module.

The interface between the T1 facilities and the TSI of the RSM is the facilities interface unit (FIU). The FIU converts T1 carrier format to NCT link format and vice versa. A single FIU can accommodate the maximum

of 20 T1 lines for the umbilical. The T1 lines terminate at the RSM through DFI circuit packs mounted in DLTUs. This use of the DLTU does not use any of the RSM time slots or call capacity. Standard cross-connections through a repeater bay or DSX frame are required.

A separate metallic facility is required to provide remote maintenance terminal access to the host Lucent Technologies 3B20D computer from the RSM. The order wire provided with T1 facilities may be used. To improve reliability, route diversity of the T1 facilities is recommended.

The engineering of T1 lines for the umbilical follows methods developed for the remote switching system voice channels. The OAM (high day) usage is estimated for outgoing and incoming traffic (including traffic to and from the host) and 3-way calling (3-port conference usage, multiplied by three, to reflect the usage of each port). The blocking probability 0.0005 (blocking probability 0.001, high day) table is then used to determine the number of channels required. Added to this total are four channels for control and control backup, and one channel for each announcement to be provided from the host. This total is then divided by 23 to determine the number of T1 lines required (one channel per T1 line is required for signaling). A minimum of two T1 lines must be provided. At the host, DFIs are provided to terminate the umbilicals. The umbilical T1 lines are included in DLTU engineering.

A subtending RSM effects the host beyond the additional T1 line terminations as follows:

- ☐ Additional usage on the host UCCs
- ☐ Additional load on central and host SM processors. The additional community dial office (CDO) load on the host is mitigated to the extent that the host processes interoffice calls to/from the RSM prior to cutover. The AM is used only for calls that leave the RSM.

3.1.7.1.1 ISDN RMS UMBILICALS

The ISDN circuit-switched digital capability, ISDN/CSDC, provides circuit-switched B-channel transport between ISDN terminals at 56 kbs or 64 kbs clear channel data rate. The intra-switch data rate capability is dependent on the data rate of Host-RSM or Host-RISLU transmission facilities if RSMs or RISLUs are in the figure configuration. To provide 64 kbs ISDN circuit switched data capability on an RSM, the umbilical to that RSM must support that data rate. To provide 64 kbs clear channels on the RSM umbilical links, the signaling format used on those links must be the Bipolar Eight Bit Substitution (B8ZS) format.

3.1.7.2 MMRSUM Umbilicals and Inter-RSM Communication Links

The MMRSUM consists of one to four RSMs connected to a host 5ESS[®] switch and to each other by T1 lines. There may be as many as 20 T1 lines which connect to each RSM. At least two of the T1 links must serve as umbilicals back to the host 5ESS[®] switch office; the remainder may be used as ICLs distributed as needed by traffic engineering among all the neighboring RSMs. The number of ICLs between RSM pairs are engineered based on the expected amount of traffic between the RSMs. The ICLs are used to carry telephone traffic between the RSMs within the MMRSUM. As traffic patterns change, the number of ICLs may have to be adjusted between the various RSMs. These links carry 24, 8-bit channels of data where 23 are pulse-coded modulation data, and the 24th channel is used to carry signaling information. The maximum number of ICLs between any given 2 RSMs is 18, and the minimum is 2. The maximum number of ICLs is dependent upon the number of available FIDBs which connect from the DLTU to the FIU in the RSM.

3.1.7.3 MLHG Engineering on MMRSUMs

3.1.7.3.1 Overview

The correct engineering of MLHG resources is necessary in order for the MLHG to function well during stand-alone operation of the MMRSUM. The engineering guidelines given here are recommendations, rather than rules because some of the MLHG resources, such as announcement frames and metallic service

units, are expensive. If an MMRS cluster services only a few MLHGs, it may not be worth the expense of providing these resources on the MMRS cluster simply to support stand-alone configurations. Stand-alone is an infrequent, and usually brief, condition. Since the 5E7 software release optimized global MLHG functionality, these guidelines are particularly relevant to offices on the 5E7 software release. Some existing offices may not be engineered according to these recommendations, and modifying them during retrofit to the 5E7 software release could be difficult.

3.1.7.3.2 Local MLHGs

When possible, MLHGs with members on an RSM or MMRS cluster should be local hunt groups. The hunting order is preserved during stand-alone for all software releases. The transition into stand-alone overhead is reduced since temporary data does not need to be created for call processing.

3.1.7.3.3 Hunting Module within MMRS

If an MLHG with members on an MMRS cluster is a global MLHG, the hunting SM should be located within the MMRS cluster (5E7 software release). If the hunting module is not located within the MMRS, then jump hunting must be performed during stand-alone. Jump hunting does not fully support the correct order of hunting members, hunt key activations, queuing, or feature interactions such as call forwarding.

3.1.7.3.4 Queuing Module

The queuing module should be the same as the hunting module. This is a good engineering practice even in linked mode, since it reduces the number of inter-module messages. If the queuing module is the same as the hunting module, queuing will work correctly during stand-alone (5E7 software release). If the queuing module is not the same as the hunting module, the hunting and queuing modules should both be located within the MMRS cluster.

3.1.7.3.5 Metallic Service Unit

The metallic service unit supporting analog hunt key scan points should be located within the MMRS cluster. If the hunt key scan points are located within the MMRS, hunt key activations and deactivations will work correctly during stand-alone.

3.1.7.3.6 Global MLHG Members within MMRS

A global MLHG should not have some members in an MMRS cluster and some members outside of the MMRS. If the MLHG member associated with an MLHG individual DN is located outside of the cluster, DN translation for the individual DN may not be available within the MMRS cluster during stand-alone. If the DN translation data is unavailable, the originator will receive reorder or a stand-alone announcement.

In particular, member 1 should never be located outside of the MMRS cluster if most of the MLHG members are located within the MMRS cluster. Features such as call forwarding and LASS do not work correctly during stand-alone unless member 1 is available. If member 1 of a regular or circular MLHG is located outside of the MMRS cluster, the DN translation for the MLHG group DN may not be available within the MMRS. Calls to the group DN would receive reorder or a stand-alone announcement.

3.1.8 INTERMODULE TRUNKING ENGINEERING

The intermodule trunking (IMT) feature (5E5 and later software release) provides direct trunking between SMS, MMRSs, or ORMs connected to the same 5ESS[®] switch. In general, intermodule trunks operate as trunks connecting two independent switches. Three mutually exclusive options are available to the operating telephone companies (OTCs).

- (1) Use the IMTs only when one or both of the modules connected to the IMT is isolated from the host switch.

- (2) Use the IMTs as the primary route and the communication links to the switch as an alternate or overflow route.
- (3) Use the IMTs as the primary route and disallow using the communication links to the switch as an alternate or overflow route.

When CCS7 trunks are deployed on a 5ESS[®] switch, it may be desirable to include CCS7 IMTs on the switch. The decision of whether to deploy the CCS7 IMTs is dependent upon the intended use of the IMTs.

In some applications, the OTC may choose to provide IMTs between SMs (or MMRSMs, or ORMs) with the IMTs serving as the primary route. If Local Area Switching System (LASS) features or other features requiring CCS7 trunks are desired to work between the SMs (or MMRSMs, or ORMs) consistently, then all of the IMTs should be CCS7 trunks. If there is also a desire to support communications between the SMs (or MMRSMs, or ORMs) when one or both of the modules are in stand-alone, then an additional multifrequency (MF) IMT trunk group should be available as an alternate or emergency route. This is necessary because when an SM (or MMRSM, or ORM) goes into stand-alone because communications with the host switch are lost, all CCS7 trunks associated with that SM (or MMRSM, or ORM), including the CCS7 IMTs are lost. The MF IMT will allow communications between the two SMs (or MMRSMs, or ORMs), however, the LASS features will not work since they require the CCS7 trunks.

When engineering the number of IMTs to be provided in an office, consideration should be given to the number of time slots that will be tied up with each IMT. Refer to the section on the appropriate trunk for the number of time slots used. It is recommended that IMTs provide a zero dB loss connection to ensure an equivalent transmission grade of service whether the call is routed through the IMTs or through the umbilicals.

3.2 SERVICE STANDARDS

3.2.1 OVERVIEW

The call processing, traffic carrying, termination, and service unit capacities of the 5ESS[®] switch can be arranged to meet the traditional service standards that follow. The 5ESS[®] switch design is capable of exceeding these criteria when appropriately engineered and operated. It can be engineered to meet other service criteria which may affect the performance and quantities of traffic-engineered items required.

The following definitions are used in the specifications of the service criteria:

- (a) **Time-Consistent Busy-Hour:** The four consecutive 15-minute intervals commencing at the same time each day for which the average traffic is the greatest during the days of observation.
- (b) **Average Busy Season Busy-Hour Load:** The average of the TCBH traffic loads for 3 months, not necessarily consecutive, that have the highest average traffic. The busy season data excludes extremely high-traffic days that can be attributable to unusual events. It may also exclude weekends if the traffic is low during these days.

3.2.2 BLOCKING

An overall measure of the grade of service provided by an exchange can be expressed in terms of: (1) the probability of loss in setting up a connection, and (2) the probability of delay in setting up a connection. To achieve the desired grade of service at capacity, the exchange must be engineered for this objective.

The loss probability is defined in terms of the failure to connect a call after sufficient address information has been received. It includes network and service circuit blocking and any system faults, but excludes trunk blocking.

The requirements used in the United States for the loss probabilities are listed in Table 3-18.

Table 3-18 Loss Probability Values

CALL TYPE	ABS
Internal calls	< 0.02
Incoming calls	< 0.02
Outgoing calls	< 0.01
Transit calls	< 0.005

3.2.3 DIAL TONE DELAY

On an average busy-season busy-hour (ABSBH) basis, no more than 1.5 percent of attempts should wait over 3 seconds for dial tone. On a 10 high-day basis, no more than 8 percent of attempts should wait over 3 seconds for dial tone. At the annual high-day, busy-hour load, no more than 20 percent of attempts should wait over 3 seconds for dial tone. The ABSBH dial tone delay should not exceed 0.6 second on the average.

3.2.4 SERVICE UNITS

To meet the requirements established for LATA switching systems, service units in the 5ESS[®] switch are engineered based on the criteria shown in Table 3-19.

Table 3-19 Blocking Probabilities for Service Circuits

SERVICE CIRCUITS	ABS
Global Digital Service Unit, UCCD	0.001ABS
Tone Decoder	0.05HD (most limiting) 0.01ABS

3.2.5 OTHER

3.2.5.1 Post Dialing Delay Objective

It is desirable that the portion of the post dialing delay introduced by an originating stored program control system (SPCS) not exceed 0.4 second at ABSBH-engineered load and that the portion of the delay introduced by a terminating system not exceed 0.4 second. The 0.4-second originating system delay objective excludes the outpulsing interval. The 0.4-second terminating system delay objective excludes an interval between seizure of a ringing circuit and the start of called-party alerting and also excludes the interval between the start of called-party alerting and initiation of the audible ring signal to the caller.

The originating and terminating system delay objectives control the contribution of each to the total delay between dialing and the occurrence of an audible response to the caller. These allocations are based on the operation of SPCSs now in use. In particular, power ringing circuits and audible ring circuits are assumed to meet the requirements of the loop signaling section. The delays inherent in their operation have been considered in establishing terminating system delay objectives.

3.2.5.2 Answer Supervision Delay Objective

To meet an overall system answer supervision delay objective of 0.5-second mean and 0.1-second standard deviation on a multioffice call, the delay time distribution introduced by a terminating switching system and customer equipment must have a mean of 0.2 second or less and a 95th percentile less than 0.35 second.

3.2.5.3 Cutoff Calls Objective

Overall, the probability that a stable call will be cut off by any switching system for any cause should not exceed 0.000125. This corresponds to a long-term average cutoff call rate of no more than 0.000125 cutoffs per call. This objective is based on call holding times with a mean value and distribution typical of

local exchanges.

3.2.5.4 Standard Incorrect Treatment Requirement

When operating at ABSBH load, under standard conditions, the switch is designed such that less than one call in 10,000 will be incorrectly treated.

3.2.5.5 Ineffective Attempts Objective

The overall objective for an SPCS recommends that for all causes, including congestion, the long-term average ineffective attempt rate should not exceed 0.003 ineffective attempts per attempt.

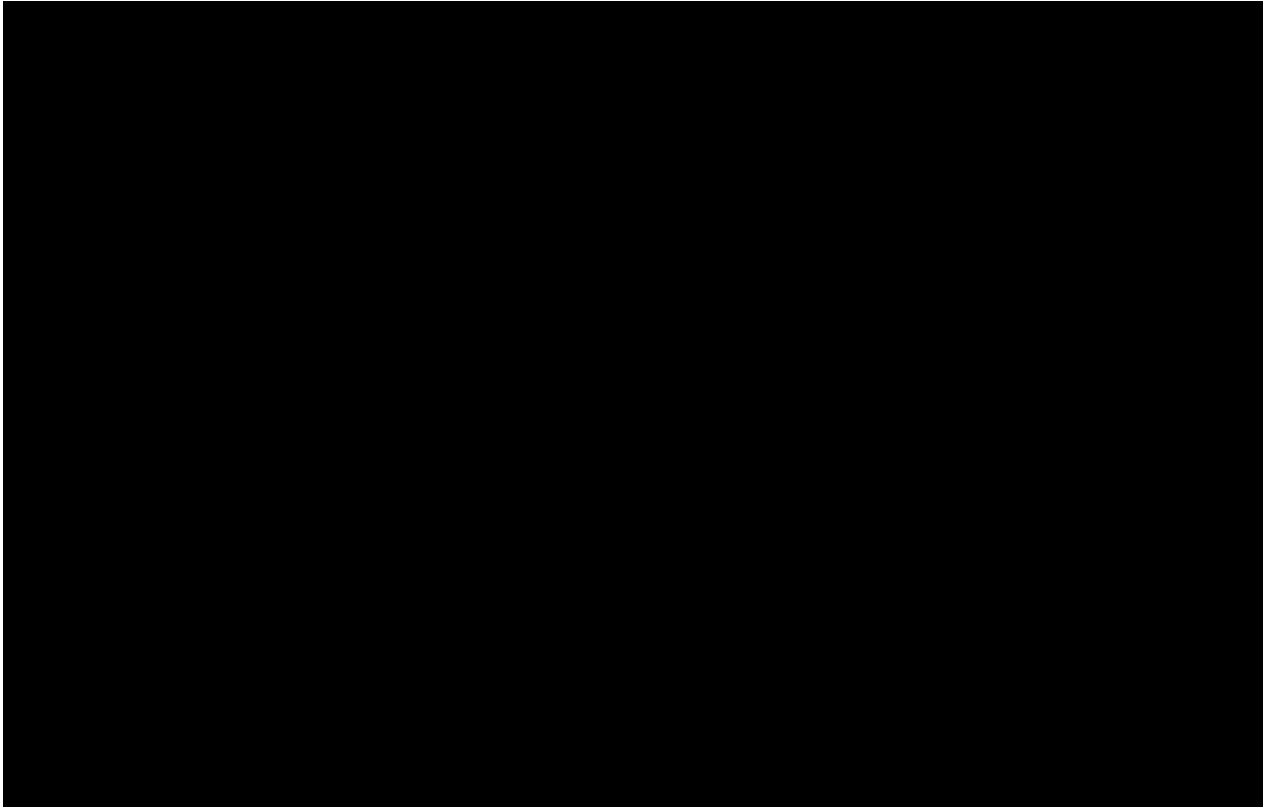


Figure 3-1 Remoting ACD Positions Using BRITE

4. CALL PROCESSING

4.1 OVERVIEW

Due to the architecture of the 5ESS[®] switch, call processing concepts and translations are different than with previous electronic switches. The 5ESS[®] switch software system is made up of a number of software subsystems. Each software subsystem performs different functions, and parts of each software subsystem exist in the switching module (SM), the communications module processor (CMP), and administration module (AM). As much processing as possible is performed by the SM. Distributed processing allows the processing power of the office to grow as the office grows through the addition of SMs.

The 5ESS[®] switch operating system software governs the control of resources and software functions such as memory management, input and output activities, file system management, communications, timing, and process management.

The primary call processing software is made up of the following subsystems:

- ☐ peripheral control (PC)
- ☐ feature control (FC) family
- ☐ routing and terminal allocation (RTA) family
- ☐ administrative services

Parts of these subsystems, with the exception of the FC subsystem which is only in the SMs, are located in the AM, the CMP, and the SMs. Call processing is performed by using PC provided primitives which manage and control the switching equipment. Feature control uses the PC primitives to set up both POTS and feature calls. The RTA subsystem provides screening, routing, charging information, DN translation, terminal hunting, digit prefixing and deletion functions, and several other functions for the various subsystems. Figure 4-3 shows the various 5ESS[®] switch call processing programs. Figures 4-4 and 4-5 show the POTS message flow between the subsystems and the progression of events in a line-to-line call.

"PLAIN OLD TELEPHONE SERVICE (POTS) CALL PROCESSING", Section 4.2, describes a plain old telephone service (POTS) call scenario. "INTEGRATED SERVICES DIGITAL NETWORK (ISDN) CALL PROCESSING", Section 4.7, describes integrated services digital network (ISDN) call processing.

NOTE: The 5ESS[®] switch may be used in AutoPLEX[®] System 1000 applications. For information about call processing in this application, see the 235-200-100, 5ESS[®] Switch FLEXENTTM/AutoPLEX[®] Wireless Networks Applications OA&M Manual.

4.2 PLAIN OLD TELEPHONE SERVICE (POTS) CALL PROCESSING

4.2.1 POTS LINE-TO-LINE CALL SEQUENCE

A line-to-line call is defined as a call that originates on a line served by a 5ESS[®] switch and terminates to another line served by the same switch. See Figure 4-1. This scenario assumes that the lines terminate on an analog line unit.

For more detailed information see 235-145-100, *Call Processing Description*.

In the 5ESS[®] switch, each subscriber line is monitored for on-hook and off-hook conditions by an origination scanner (OS). The OS is part of each line units (LUs) equipped in the SMs. The OS scans the state of subscriber lines when the SM requests that a scan be made. Results from a summary scan of the lines indicate if a change of state from a previous scan has occurred. When a change of state has occurred, a directed scan is ordered to determine exactly which line is requesting service. Once the line is

identified, it is marked busy, and data assigned to the line is retrieved. This data indicates the type of features assigned, type of service, and other line feature data.

A tone generator is connected to the line. Dial tone [in a pulse-coded modulation (PCM) format] is supplied to a channel circuit in the LU. The channel circuit in the LU converts the PCM data into an analog audible signal (dial tone). At this point, the originating subscriber hears dial tone.

When the originating subscriber dials the first digit, dial tone is removed from the line. Each digit dialed is sent to the SM for analysis. Subsequent dialed digits are processed in the same way until the SM determines (through analysis of the digits) that all digits have been collected. The tone decoder is then released from the connection.

After digit analysis, a control message (including the dialed digits) is sent to a routing SM for further network routing.

The routing SM identifies the terminating SM from the dialed data in the message. In this example, the call is an intermodule call. An intermodule call is a call that originates on one SM and terminates on a different SM.

The terminating SM then checks the busy/idle status of the terminating line. If the line is busy, busy tone is sent to the originating customer. If the line is idle, call processing continues as follows.

Per-call tests of false cross and ground, power cross, and continuity are made on the terminating line. Once the per-call tests are completed, ringing is applied to the terminating line. The control interface is enabled to detect the customer's answer (ring-trip).

The terminating SM requests the AM/CMP to find a time multiplexed switch (TMS) path, that is, a common time slot between the originating and terminating SMs. When the path is determined, the terminating SM then notifies the originating SM. A path is provided through the Time Multiplexed Switch (TMS) for the intermodule call. The terminating SM instructs the TMS to connect the Network Control and Timing (NCT) links (associated with the originating and terminating SMs) on the selected common time slot. A bidirectional path between the originating SM, TMS, and the terminating SM through the NCT links is established.

For an intramodule call (originates and terminates on the same SM), a path is selected and established by sending a message to the AM/CMP. Two network time slots are required for an intramodule call, but no TMS connections.

The originating customer now receives audible ringing tone while the terminating customer receives ringing.

When answer is detected, that is, customer goes off-hook, a talking path is provided between both subscribers.

When the terminating subscriber goes on-hook, the terminating signal processor (SP) detects the line change of state and notifies the terminating SM. The terminating SM determines that the change of state is an on-hook and sends a clearback control message to the originating SM. The originating SM begins 10-second timing before initiating any action to disconnect the talking path. If the terminating party goes off-hook before the 10-second timing is complete, the talking path is reconnected. However, when the originating subscriber goes on-hook after the terminating subscriber, the originating SP detects the change of state and notifies the SM to cancel the 10-second timing.

Once disconnect is verified, the originating SM requests idle code (silence) be connected to the previously used peripheral time slot. Idle code is code or data that is inserted into idle or unused time slots. A control message indicating that the network time slot is idle is sent by the terminating SM to the AM/CMP.

4.2.2 POTS TRUNK-TO-LINE (INCOMING) CALL SEQUENCE

A trunk-to-line call is defined as a call originating over an incoming trunk and terminating to a line served by the 5ESS[®] switch.

Each trunk on the 5ESS[®] switch is connected to an origination scanner (OS) in its trunk unit. When an off-hook signal is sent from a connecting office, an incoming request is recognized. The signal processor (SP) in the SM detects the seizure of an incoming trunk as a change of state. This incoming service request is reported to the SM. Data stored about the trunk is retrieved from the data base relations. This information includes the type of supervision (E&M, loop-reverse battery), type of signaling (multifrequency or dial pulse), and type of start signal (wink, none, etc.). The SM in response to the origination request connects the trunk to a tone decoder in the Digital Service Unit (DSU) through the TSI. A start signal is sent from the switch over the trunk to the distant office to indicate that digits can be sent.

Digits are received one at a time from the connecting telephone office over the trunk. As each digit is received, the SM is notified that a digit is present. The incoming digits are analyzed and call processing from this point on occurs like the line-to-line call.

4.2.3 POTS LINE-TO-TRUNK (OUTGOING) CALL SEQUENCE

A line-to-trunk outgoing call is defined as a call that originates from a line on the 5ESS[®] switch and is routed to an outgoing trunk that connects to another switching office. See Figure 4-2. This scenario assumes that the trunk group involved is a global trunk group. When local trunk groups are used, the scenario is slightly different.

A line-to-trunk call is similar to that of a line-to-line call. This call example assumes that the originating customer has completed dialing, and the SM determines that the call must be routed over an outgoing trunk. The originating SM sends a message containing the dialed information to the AM/CMP. The AM/CMP determines which trunk group, member and terminating SM as well as a network time slot path through the TMS. This information is sent to the terminating SM.

The terminating SM sends a message to the TMS specifying the network time slot path through which the NCT links are to be connected.

When all trunks are busy, an alternate route is provided by the AM/CMP. If the alternate route is busy, busy-tone is returned to the customer. A seizure signal is sent by the trunk unit under direction of the terminating SM over the outgoing trunk to the distant connecting office.

The terminating SM sends path description information to the originating SM. This information identifies the assigned network time slot and trunk identification. The originating SM receives the path description information and requests the connection of the peripheral time slot to the chosen network time slot.

The incoming trunk at the far-end office attached to the 5ESS[®] switch outgoing trunk responds to the seizure signal by sending a start signal. [This example assumes the trunks use multifrequency (MF) signaling and a timed polarity reversal acts as the start signal (wink).] The start signal is detected by the outgoing trunk circuit in the trunk unit and is reported to the SM through the signal processor (SP).

Next, the digits that were dialed by the originating line are outpulsed over the outgoing trunk. The terminating SM attaches a tone generator to the outgoing trunk. The tone generator sends the digits out one at a time. Each digit from the tone generator is sent on to the trunk unit. The trunk unit converts the PCM digit to a voice-frequency signal and sends it out over the outgoing trunk. This procedure is repeated until all digits are transmitted.

After all digits are transmitted and the far-end office(s) makes its connection, audible ringing tone from the far-end office is transmitted to the originating customer.

When the terminating subscriber answers, the far-end trunk signals (with a battery reversal) the outgoing trunk. The polarity detector in the trunk unit in the terminating SM detects the battery reversal. The terminating SM is notified of the change in supervision, and it notifies the originating SM that answer has

occurred. At this point, the talking path is complete.

In this example, the terminating subscriber hangs up first. The far-end trunk signals the outgoing trunk with a battery reversal. The battery reversal is detected by the polarity detector in the trunk unit and is reported to the SM through the TSI and SP. The terminating SM then sends a control message to the originating SM to begin on-hook timing. When the originating customer goes on-hook, the on-hook is detected by the SP, and the originating SM cancels the on-hook timing. The originating SM then requests the TSI to connect the peripheral and the network time slots to a TSI time slot containing idle code.

The originating SM starts line disconnect operations by requesting per-call line tests. These tests are performed by a High Level Service Circuit (HLSC) being connected to the line. Once these tests are completed, the HLSC is idled, and the SM path is taken down. The terminating SM also requests the TSI to connect the peripheral and the TMS time slots to a TSI time slot containing idle code. Next, the outgoing trunk is released. The terminating SM sends a message to the AM/CMP indicating that the network time slot is idle in the terminating TSI.

4.2.4 POTS TRUNK-TO-TRUNK CALL SEQUENCE

A trunk-to-trunk call is defined as a call originating over an incoming trunk and terminating to an outgoing trunk that connects to another switching office.

When an off-hook signal is sent from a connecting office, an incoming request is recognized. The signal processor (SP) in the SM detects the seizure of an incoming trunk as a change of state. This incoming service request is reported to the SM. Data stored about the trunk is retrieved from the data base relations. This information includes the type of supervision (E&M, loop-reverse battery), type of signaling (multifrequency or dial pulse), and type of start signal (wink, none, etc.). The SM in response to the origination request connects the trunk to a tone decoder in the DSU through the TSI. A start signal is sent from the switch over the trunk to the distant office to indicate that digits can be sent.

Through translations, the AM/CMP determines an idle trunk group member, the terminating SM and the common network time slot to be connected by the TMS. Digits are received one at a time from the connecting telephone office over the trunk. The digits are collected in the tone decoder of the DSU. As each digit is received, the SM is notified that a digit is present. The digits are transferred one at a time into the SM memory. The incoming digits are analyzed and the SM determines that the call must be routed over an outgoing trunk.

The AM/CMP determines through translations from the data base relations an idle trunk group member, the terminating SM, and the common network time slot to be connected by the TMS. A message is sent to the TMS specifying the network time slot that the NCT links are to be connected on. Another message is sent to the terminating SM which includes the network time slot assigned, the originating line identification, the dialed digits, the route index, and outgoing trunk/port identification.

When all trunks are busy, an alternate route is provided by the AM/CMP. If the alternate route is busy, busy-tone is returned to the customer from the originating DSU. A peripheral time slot to the trunk in the terminating SM is assigned. A seizure signal is sent by the trunk unit under direction of the terminating SM over the outgoing trunk to the distant connecting office.

The terminating SM sends path description information to the originating SM. This information identifies the assigned network time slot and trunk identification. The originating SM receives the path description information and requests the TSI to connect the peripheral time slot to the chosen network time slot.

The incoming trunk at the far-end office attached to the 5ESS[®] switch outgoing trunk responds to the seizure signal by sending a start signal. [This example assumes the trunks use multifrequency (MF) signaling and a timed polarity reversal acts as the start signal (wink).] This signal is detected by the outgoing trunk circuit in the trunk unit and is reported to the SM through the signal processor (SP). The SM determines that a supervision change has occurred and begins timing the change. After another polarity reversal is sent over the trunk, the SM is notified, and it cancels the timer.

Next, the digits that were received on the incoming trunk are outpulsed over the outgoing trunk. The terminating SM attaches a tone generator in the DSU to the outgoing trunk. The tone generator converts the digits from binary coded decimal into pulse-coded modulation (PCM) and sends the digits out one at a time. Each digit from the tone generator is sent through the TSI and on to the trunk unit. The trunk unit converts the PCM digit to a voice-frequency signal and sends it out over the outgoing trunk. This procedure is repeated until all digits are transmitted.

After all digits are transmitted and the far-end office(s) makes its connection, audible ringing tone from the far-end office is transmitted to the originating customer over the incoming trunk.

The trunk unit converts the analog audible ringing to PCM data and sends it to the TSI. From the TSI in the terminating SM, the data is interchanged with the assigned network time slot. The data is sent to the originating SM where the originating TSI interchanges the data with the time slot assigned to the incoming trunk. The trunk unit converts the PCM data into an analog voice-frequency signal and sends it to the originating customer through the incoming trunk.

When the terminating subscriber answers, the far-end trunk signals (with a battery reversal) the outgoing trunk. The polarity detector in the trunk unit in the terminating SM detects the battery reversal. The terminating SM is notified of the change in supervision, and it notifies the originating SM that answer has occurred. At this point, the talking path is complete.

During the talking state, both trunks involved in the tandem connection are monitored at the signal processor for disconnect. If a disconnect signal is detected on either trunk, the paths through the TSIs and the TMS are idled, and a disconnect signal is sent forward over the trunk to the connecting office that did not send the disconnect signal. At this point, both trunks and their paths through the TSIs and the TMS are idle and are available to be reused on other calls.

4.2.5 CALL IRREGULARITIES

4.2.5.1 Overview

The following paragraphs describe the treatment and disposition of some of the call irregularities in the 5ESS[®] switch. Both traffic and plant measurements are made on these irregularities.

For more detailed information see 235-145-100, *Call Processing Description*.

4.2.5.2 Incoming Trunk Partial Dial Time-Outs

Incoming calls for which interdigital timing has been exceeded are usually routed to reorder.

4.2.5.3 Incoming Trunk Permanent Signal

Incoming requests for which digit receiving has timed out with no digits received are usually routed to reorder.

4.2.5.4 Originating False Starts

This is an originating request for which dial tone was returned and for which a disconnect signal was received by the system prior to the receipt of digits or determination that digits are not required.

4.2.5.5 Originating Partial Dial Time-Out

All originating line calls for which interdigital timing has been exceeded are routed to partial dial time-out treatment.

4.2.5.6 Originating Permanent Signal

All originating line requests for which permanent signal treatment was initiated (that is, digit receiving has timed out with no digits received) are routed to tone/announcement.

4.2.5.7 Switch Cutoff Calls

This is an established call which drops the talking connection unexpectedly prior to the receipt of a disconnect indication from the customer due to a time slot discontinuity. The call is removed from the system. A count of these events appears only on the plant report. Individual reports are optionally available.

4.3 ROUTING AND SCREENING ARCHITECTURE

4.3.1 PERIPHERAL CONTROL

The PC subsystem isolates the FC and terminal maintenance subsystems from switching machine hardware. To accomplish this, PC maps the switching periphery into a high-level abstraction of the switching machine hardware. This makes FC and terminal maintenance subsystems hardware independent, thus isolating them from future changes to system hardware. Peripheral control provides primitives to these subsystems for controlling all the switching periphery, including the network, and maintains the status of the switching resources.

4.3.2 FEATURE CONTROL

Feature control is responsible for the sequencing of a call which includes collection of digits and interpretation of customer signals. It receives customer inputs from PC, interprets them according to the current state of a terminal, and requests PC to perform the required actions. System, customer, and business features are implemented in the FC subsystem and actions are accomplished using primitives provided by other subsystems.

Feature control performs call processing at a hardware independent level. It is responsible for the sequencing of call processing actions and calls on other subsystems such as the data base system, operating system, RTA, and PC. Feature control also notifies the administrative subsystems of the usage of switching facilities in a call for billing and statistical purposes.

The data required by FC for POTS is of four types: translation data about a terminal (telephone number, feature data, and equipment options); system parameters; dynamic data which pertains to a call; and inter-LATA carrier information, line data associated with carrier interconnect (CI), and other carrier data that is not line dependent.

The terminal translation data is described by a set of data relations with a key that will be used to access the data. The key for some of the relations in the feature programs is a port name. A port is a logical connection of a customer terminal attachment to the 5ESS[®] switch.

System parameters include items such as permanent signal time, partial dial time, and flash time. System parameters have values which are used to give treatments for all different types of dialing conditions, trunk conditions, etc. lists parameter types and values that are used by the FC subsystem.

Dynamic data is data that is kept about a line, trunk, logical test port, multiline hunt group, or trunk groups, to indicate its state or condition during an origination, ringing, or talking condition. This type of data changes as a call progresses through successive stages.

4.3.3 ROUTING AND TERMINAL ALLOCATION

The RTA subsystem provides a set of RTA capabilities necessary for supporting switching functions in the 5ESS[®] switch. The RTA subsystem is responsible for finding and assigning resources for other software systems. These functions consist of screening, routing, hunting, and DN translation.

The RTA subsystem makes use of the system translation data to properly support the other software

systems. Routing and charging translations are at the heart of the 5ESS[®] switch translations. As indicated in Figure 4-6, line/trunk translation data coupled with digit analysis, route type, and route index data produce a code index and a screening index, both of which determine the correct rate and route treatment for a given call.

4.3.4 ORIGINATION

4.3.4.1 Digit Analysis

Peripheral control detects the first dial pulse or touch-tone signal and notifies the originating terminal process. (See Figure 4-7) The originating terminal process removes dial tone and calls a digit analysis routine to collect the digits that will follow (Figure 4-8). The digit analysis routine performs the following functions:

- ☐ Interdigital timing
- ☐ Examines the digit stream.

Digit analysis determines when a sufficient number of digits have been dialed. Timing and digit collection are performed and digit analysis begins to interpret the dialed digits using information in the digit interpreter tables. If overlap outpulsing is used for Error Analysis (EA), the call is routed, and overlap outpulsing is started before the completion of dialing. If the call is an inter-LATA call, carrier data which provides all the necessary data about the dialed digit sequence and the inter-LATA carrier chosen to handle the call is accessed in the switch. Information about the originating line, the dialed digit sequence, and the inter-LATA carrier chosen for the call are inputs to the screening, routing and charging process.

The digit analysis routine uses the digit analysis selector to determine the code index for the dialed number. The digit analysis selector provides one of two outputs as follows:

- (a) A prefix/feature digit interpreter table (PDIT) and a local digit interpreter table (LDIT) for lines
- (b) An incoming trunk preliminary digit interpreter table (INDIT) and an LDIT for trunks.

The prefix/feature digit interpreter table is used to interpret prefixes (0+, 1+, 01, 010, 011, 10XXX and 101XXX) and feature access codes. For an inter-LATA call, the PDIT recognizes the 10XXX prefix or the 101XXX prefix in 5E9(1) and later software releases, and the LDIT indicates that the call prefix is an inter-LATA call. Carrier destination information is then retrieved from the 5ESS[®] switch data base. Digit analysis for all line-originated calls begins in the PDIT. The LDIT is used to define all dialable codes from one to seven digits in length and serves as both the local and foreign area translator. The incoming digit interpreter table is used to interpret the digits received over incoming and 2-way trunks.

Code conflicts involving numbering plan area codes and office codes (NXX, where N = digits 2 through 9 and X = digits 0 through 9) are resolved either by timing or prefix dialing. Some dialed numbers require code conversion such as emergency 911. The 911 code is converted to a 7-digit telephone number.

4.3.4.2 Routing and Charging

A call type and code index are produced as a result of digit interpretation. Once digit analysis is complete, the RTA software in the SM makes a route request to RTA in the routing SM or AM/CMP to route the call. All the necessary information such as the prefix index, route type, route index, screening index, code index, and carrier (if the call is an inter-LATA call) obtained in previous translations is included with the request and inserted into a routing data block (Figure 4-9). The screening, prefix, code indexes, and carrier are used to access the route and charge indexes. In the case of an outgoing call to an inter-LATA carrier, the inter-LATA carrier routing and charging information is accessed. If the call is a carrier call, there may be two charge indexes, one charge index for the carrier call and another for wide area telephone service

(WATS) band. The route index is used to access expanded routing information. The expanded route information consists of either a trunk group or office code, route type (hunt, DN translation, reorder, and test), and the next route index.

The office code indicates that the call is terminating within the 5ESS[®] switch. A call terminating within the office requires a DN translation. The trunk group indicates that the call is to be routed to a specific trunk group. The next route index is an alternate route if the primary route is not available. If an alternate route is not required, a route index with a route type of reorder is specified. A route type of hunt indicates that the system will hunt for an idle trunk member in the trunk group. If the route type is hunt, the data base is accessed to retrieve the trunk direction and trunk hunt type. The trunk direction indicates the direction of the trunk group such as 2-way, incoming, or outgoing. The trunk hunt type indicates the type of hunting used to hunt for an idle trunk member such as 2-way backward, 2-way forward, and first-in, first-out. Using the trunk group, the data base is accessed to determine the availability of a trunk member. If a member is available, the trunk group member number is used to access the logical port number of the idle trunk member. If the route type is test, the trunk group is a test trunk group.

4.3.4.3 Network Path

The RTA software in the AM/CMP calls the PC functions which set up the network connections and notify the terminating SM. The RTA software in the AM passes information such as the terminating logical port from previous translations to the terminating SM. In the terminating SM, a terminating terminal process is created. Using the logical port, the terminating SM data base is accessed to provide busy/idle status of the line and terminating class of service. The terminating terminal process calls PC to set up a path to the port. Once a path is established, the terminating terminal process notifies the originating terminal process that a path has been set up. The originating terminal process calls PC to set up the originating end of the connection.

4.3.4.4 Charging

The charging of a call is performed by call record assembly software. The charge index, which is inserted into the routing data block, is used to access expanded charging information. Information retrieved from the data base consists of the following:

- ☐ Automatic message accounting (AMA) call type
- ☐ Message billing index/wide area telephone service band
- ☐ Wide area telephone service indicator.

The AMA call type indicates the type of charging that will be used to bill the call. The AMA call types include flat rate, local coin, wide area telephone service, free, detailed bill message rate timed or untimed, message rate timed or untimed, originating LATA calls (feature group A, B, or D) or terminating LATA calls (feature group A, B, or D). Calls normally designated as free include calls to announcements or tones, free terminating lines, or an operator services facility except when involving an inter-LATA carrier. When involving an inter-LATA carrier, an inter-LATA station paid record is generated for all inter-LATA calls to an operator services facility. The message billing index/wide area telephone service band defines a message billing index number or a wide area telephone service band number.

4.3.5 SERVICE CATEGORIES AND CLASSES

4.3.5.1 Overview

All lines and trunks have class-of-service information associated with them. The classes of service provide types of information dealing with privileges, restrictions, and treatments associated with a line or trunk.

4.3.5.2 Line Class Code

The line class code (LCC) is a 3-character alphanumeric code that describes the class of service of a DN. The LCC also provides the screening index and rate area for routing and charging of calls. For example, in an LCC expansion relation, the LCC and rate center are used as keys to the relation. A particular LCC and rate center in the relation has associated with it the following types of information:

- (a) **Terminating Treatment:** The terminating treatment describes the terminating service and routing. Examples of valid entries consist of an individual line, multiline hunt group, test line, inward wide area telecommunications service (INWATS), party line (2-, 4-, 5-, 8-, or 10-party), paging, or termination to route index.
- (b) **Class of Service:** The class of service describes originating and terminating service as well as feature handling. Examples of valid entries for the class of service consists of an individual line, 2-party, multiparty line (4-, 5-, 8-, and 10-party), coin phone, charge-a-call, emergency 911 line, private branch exchange (PBX), hotel-motel PBX, and test line.
- (c) **Screening Index:** An index associated with a particular type of originating class of service.
- (d) **Digit Analysis Selector:** The DAS is used to analyze the dialed digits. The DAS is numbered from 1 to 99 and is used to select the digit interpreter tables.
- (e) **Line Screening:** This data indicates whether special screening occurs for lines with a particular LCC.

4.3.5.3 Rate Area

Any DN in a 5ESS[®] switch may be assigned to any rate area. The rate area combined with the LCC designates which digit analysis selector will be used for the routing and charging of calls.

4.3.5.4 Hunting Arrangements

There are two hunting arrangements available for hunting an idle line as follows:

- (a) Series completion
- (b) Multiline hunting.

4.3.5.5 Inter-LATA Carrier Data

Data required for the CI feature is as follows:

- ☐ Carrier identifier
- ☐ Access type [only accept 950-WXXX (or 950-XXX in the 5E9(1) and later software releases), only accept long-term dialing plan [optionally prefixed by a 10XXX access code (or 101XXXX in the 5E9(1) and later software releases), or accept both]
- ☐ Carrier type (inter-LATA carrier, intra-LATA carrier, world zone 1 only, international only, or world zone 1 and international)
- ☐ Detailed terminating billing record indicator
- ☐ Route index (RTI)/code index for each type of carrier call
- ☐ Intra-LATA traffic indicator
- ☐ Overlap output pulse indicator

- ☐ Charge-a-call screening indicator
- ☐ Abbreviated dialing indicator

4.3.5.6 Line Feature Data

There are several custom calling features and equipment options which may be assigned to a DN. Some of these features include the following:

- (a) Touch-tone
- (b) 1-digit or 2-digit speed calling
- (c) Three-way calling
- (d) Call waiting
- (e) Call forwarding
- (f) Essential line service
- (g) Free terminating service
- (h) Deny originating service
- (i) Deny terminating service
- (j) Loop start or ground start
- (k) Range extension
- (l) Hot-line service
- (m) Manual line service
- (n) Series completion
- (o) Coin line service
- (p) 2-, 4-, 5-, 8-, or 10-party service
- (q) Individual line service
- (r) Multiline hunt service
- (s) Line sleeve lead control
- (t) Carrier identification dialing privileges [cannot dial 10XXX (or 101XXXX for the 5E9(1) and later software releases), may dial 10XXX (or 101XXXX for the 5E9(1) and later software releases), or must dial 10XXX (or 101XXXX for the 5E9(1) and later software releases)]
- (u) Primary carrier.

4.3.5.7 Trunk Feature Data

There are several types of data that are assigned to a trunk. This data consists of the following:

- ☐ Trunk group number

- ☐ Trunk group member number
- ☐ Type of signaling (E&M or reverse battery)
- ☐ Type of trunk (incoming, outgoing, or 2-way)
- ☐ Type of start signal (immediate, wink, or delay)
- ☐ Carrier identifier (indicates whether the trunk group is connected directly to an inter-LATA carrier)
- ☐ Trunk class [indicates the trunk service class of the trunk group, Traffic Services Position System (TSPS), centralized automatic message accounting (CAMA), etc.]
- ☐ Free answer (indicates whether or not answer supervision is returned on this trunk group if the call completes to a free line).

4.3.5.8 Prefix Index

The value of the prefix index represents a dialing prefix such as 0, 01, and 011.

4.3.5.9 Screen Index

A screen index is an integer whose value is associated with a type of originating class of service (LCC for lines and trunk group for trunks). Valid entries are from 1 to 999. The screening index along with a prefix index and code index are used by RTA to obtain routing and charging indexes.

4.3.5.10 Code Index

A code index is associated with a type of destination such as a trunk group or a terminating line. Using the code, screen, and prefix indexes as keys, the data base manager accesses a screening data relation to obtain a charge and route index, as well as the route type.

4.3.5.11 Route Index

A route index is required for dialed digits that route calls to outgoing trunk groups. Valid entries are from 1 to 999. For each route index entry, there is associated with it a unique set of data which is used by the RTA subsystem to route a call. The route index is obtained from the screening process or digit analysis and is used to fetch expanded routing data from the data base. The route index is used as an argument to access this data.

4.3.5.12 Charge Index

A charge index is an integer with a value that is associated with a set of charging data specifically applicable to the call being processed.

4.3.5.13 Route Type

The route type represents the type of routing to be done. The types include the following:

- (a) Port hunt
- (b) DN translation
- (c) Reorder
- (d) Terminal maintenance (test)

- (e) Busy failure
- (f) Private facility simulated facility group
- (g) Modular feature customization route
- (h) Carrier interconnect route type.

To find the route type, the route index is obtained from the screening process and used as a key to access data from a routing data expansion relation. The accessed data includes the following:

- (a) Route type
- (b) Port group identifier
- (c) Number of digits to delete
- (d) Prefix digits
- (e) Secondary route index
- (f) Signaling protocol (EAS, traditional, international)
- (g) Automatic number identification (ANI) indicator
- (h) Overlap indicator
- (i) Route destination type.

4.3.5.14 Secondary Route Index

A secondary route index is used for alternate routing and is obtained from the routing process. The secondary route index is accessed along with other information from the routing data expansion relation as discussed previously.

4.4 BUSINESS AND RESIDENCE CUSTOM SERVICES FEATURES CALL PROCESSING

4.4.1 GENERAL

Because of the design and modular architecture of the 5ESS[®] switch, a modular feature construction (MFC) concept has been developed. This modular concept offers the customers flexibility in the traditional custom calling and centrex features. These features are being marketed as part of a new business and residence custom services (BRCS) option. Many benefits are derived through this approach. Some of the key benefits are as follows:

- ☐ Unbundle features which were formerly available only in interdependent packages
- ☐ Customization makes a broad range of features available to all customers instead of a select group and allows customers to change certain feature parameters
- ☐ Provides for customer control of features through dial control.

4.4.2 MODULAR FEATURES

The MFC concept offers the customers a choice of capabilities and feature parameters such as call progress tones, feature activation/deactivation schemes, methods of billing, digit interpretation, etc. Some

of these capabilities may be transparent to the customer since the 5ESS[®] switch control programs can switch options in a feature module to provide the kinds of specific services the customer desires. The marketing power of this approach is that one set of capabilities can provide an array of revenue-producing packages. For complete descriptions of capabilities that can be provided as modular feature groups and customer activation and deactivation options, see the 235-190-101, *Business and Residence Modular Feature Description*, and the 235-190-102, *Business and Residence Non-Modular Features*.

4.4.3 MAJOR FEATURE INTERACTIONS

Feature interactions occur when various features coexist on a given customer's line. The different functions related to each feature can cause inadvertent reactions in other features when they are active at the same time. See the 235-190-101, *Business and Residence Modular Feature Description*, and the 235-190-102, *Business and Residence Non-Modular Features*, for descriptions of feature interactions that can exist among the four major custom calling features (speed calling, call waiting, call forwarding, and three-way calling).

A complete listing of system features with brief definitions for each is contained in "FEATURES", Section 10 , for reference.

4.4.4 BRCS FEATURE GROUPING

The BRCS feature grouping (BFG) enables the switch owner to build compatible groups of BRCS features and parameters, which can be assigned to lines through RC.

The BFG saves memory usage by replacing individual line BRCS data in ODD with a common set of BRCS data. This also improves RC response time.

4.4.5 ASSIGNABLE FEATURES BY CLASS OF SERVICE

Features that can be assigned to a customer line are indicated in the office record by a line class-of-service. For specific class-of-service information related to the various features and services available, the 235-080-100, *Switch Translation Guide (TG-5)*, should be consulted.

4.4.6 ISDN/BRCS COMPATIBILITY

The following BRCS features are compatible in the ISDN environment, that is, voice calls over basic rate interfaces (BRIs):

- ☐ Account codes
- ☐ Authorization codes
- ☐ Automatic callback-calling
- ☐ Automatic route selection
- ☐ Call forwarding
- ☐ Call pickup
- ☐ Distinctive ringing
- ☐ Individualized dialing
- ☐ Modular queuing
- ☐ Multiline hunting additions and attendant services

- ☐ Precedence and preemption
- ☐ Private facilities access
- ☐ Terminal group station restriction
- ☐ Time of day
- ☐ Multiway calling.

The ISDN/BRCS compatibility feature interacts and interfaces with the following features:

- ☐ Feature buttons
- ☐ Shared directory numbers
- ☐ Multiple call appearances.

4.4.7 FEATURE BUTTONS

The feature buttons feature provides the ISDN terminal user with on-hook activation/deactivation and customer control. It also provides these same functions while off-hook if the functions are being performed in parallel with an active call. The feature buttons provide a visual notification of feature use through the lighting and extinguishing of associated lamps.

4.4.8 SHARED DIRECTORY NUMBERS

The shared directory number (SHDN) feature provides a configuration of up to eight (32 with the 5E8 and later software releases) distinct terminals with the same DN. All of the terminals are collectively referred to as an SHDN group. Each terminal in the group is called a group member. An SHDN group where the lead member is an analog phone is called an analog SHDN group, and a group with all ISDN members is called a basic SHDN group. All of the ISDN members can be on a single BRI or on separate BRIs.

The shared call appearances at the SHDN members reflect the state of a shared DN call. A call origination on an SHDN results in the status of that call being indicated at all of the members' stations that share that DN. A termination on a shared DN results in the call being offered to all members of the group, that is, any member can answer the call.

The SHDN feature provides the following capabilities:

- ☐ Bridging - Allows another member to get the conversation, forming a 3-way conversion.
- ☐ Remote Hold Retrieval - This allows a call to be put on hold by one member and to be retrieved by another member.
- ☐ Manual Exclusion - This provides privacy for a call. When manual exclusion is activated, bridging and remote hold retrieval are prohibited.
- ☐ Delayed and Abbreviated Alerting - Any member can have either delayed, abbreviated, normal, or no ringing pattern assigned. A member with delayed ringing starts ringing after delay time-out. Abbreviated ringing allows a member to stop ringing after delay time-out. A member with no ringing does not ring, but still receives visible alerting.

4.4.9 MULTIPLE CALL APPEARANCES

The multiple call appearances (MCA) feature allows more than one origination or termination (appearance)

for the same DN on a single station set. These appearances are referred to as call appearances. The MCA feature supports station set types A, B, C, and D, as follows:

- ☐ Terminal type A is a terminal with a single telephone number or multiline hunt group (MLHG) member where the subscriber has available up to 16 subaddresses administered by the 5ESS[®] switch.
- ☐ Terminal type B is a terminal with a single TN or MLHG member and terminal management function (TMF). With TMF, the 5ESS[®] switch manages the call appearance buttons on the terminal. The terminal interacts with TMF on the 5ESS[®] switch by passing button numbers which include the call appearances.
- ☐ Terminal type C provides TMF and button management within the terminal itself. This terminal interacts with the 5ESS[®] switch through the use of call appearance numbers. The terminal translates call appearance numbers to specific buttons on the terminal.
- ☐ Terminal type D is terminal type C with TMF performed by the 5ESS[®] switch. This terminal may have multiple DNs and must have TMF capabilities on the 5ESS[®] switch.

The station set type depends on whether the switch or the station set itself provides the station set maintenance function. The following description applies to station set types B and D.

Each call appears on the station set as a call appearance, and has an associated call appearance button as well as an in-use and status lamp. The call appearance button allows the user to select an idle call appearance, retrieve a held call, or answer an alerting call. The in-use lamp identifies the current call appearance selected. The status lamp describes the state of the call associated with the call appearance.

It is also possible to have multiple DNs on the same station set. In turn, each station set will have a set of call appearances.

Incoming calls to a busy DN's call appearance attempt to complete to the second call appearance. Also, a call may be originated from the second call appearance while there is a call on hold on the first call appearance.

4.5 CARRIER INTERCONNECT (CI) CALL PROCESSING

4.5.1 GENERAL

Inter-LATA carriers may interface either directly with an equal access end office or indirectly by tandeming calls through an access tandem in the same LATA. The type of interconnection used is specified by the carrier (in agreement with the telephone company). A multifrequency signaling protocol (EAS) is used to interface with inter-LATA carriers. A modified dialing pattern [10XXX prefix (or 101XXXX in 5E9(1) and later software releases) where XXX specifies the carrier] for inter-LATA calls allows customers to identify the inter-LATA carrier to be used. Detailed billing records are made at both the originating and terminating ends of a call and are used to bill the inter-LATA carrier for access to the LATA. All inter-LATA carriers are given equal access to administrative and maintenance capabilities in the 5ESS[®] switch, and measurements of trunk usage are kept for each inter-LATA carrier. Customers may also presubscribe to an inter-LATA carrier of their choice. This allows all inter-LATA calls to be routed to the chosen carrier using standard 1+ dialing.

Refer to the 235-900-10X, 5ESS[®] *Switch Product Specification*, for further details on EA signaling.

4.5.2 ROUTING AND SCREENING OPTIONS

4.5.2.1 Nonpayer Screening

A customer's failure to pay for inter-LATA service should not result in the termination of local service. A

customer who fails to pay one inter-LATA carrier service should not be denied access to other carriers. The telephone company must retain the capability to terminate intra-LATA service because of nonpayment; this action will also deny a customer access to all carriers. In addition to denying service to nonpayers, selective carrier screening allows the telephone company to perform nonsubscriber screening for a carrier. The telephone company would recover the cost of this function from the inter-LATA carrier.

4.5.2.2 Charge-A-Call Screening

The charge-a-call screening option allows the service provider to provide, on a per-international carrier (IC/INC) basis, the ability to choose to receive calls that were previously prohibited from charge-a-call telephones (for example, 10-digit call dialed 1+).

4.5.2.3 Flexible Routing

Each carrier can request that more than one trunk group be used for routing inter-LATA calls to the carrier. This is called multidimensional routing. These routes are determined by the type of service of the originating line, the prefix dialed, the type of call (for example, abbreviated dialing 1, 0+, 0-) or the service access code (for example, 800-NXX) dialed. For each of these options, an inter-LATA carrier can specify if ANI and/or layered overlap outpulsing should or should not be used in the signaling. The transmittal of ANI is dependent upon the type of call and not the trunk group.

When a call is placed from an equal access end office and direct trunks are available to the inter-LATA carrier, the call will be routed over a direct trunk. If all direct trunks to the inter-LATA carrier are congested, an equal access end office may cause traffic to overflow into a trunk group connected to an access tandem. (These trunks need not be dedicated to a particular carrier.) If overflow is not allowed, the calling party will receive Receiver Off Hook (ROH) tone. If no trunks are available to the access tandem office from the equal access end office, the calling party will receive off-hook tone (optional). If a trunk to an access tandem is seized, that access tandem will route a call to the appropriate inter-LATA carrier.

4.5.3 TOLL INTERFACES AND CHARACTERISTICS

The Carrier Interconnect (CI) feature also allows a toll 5ESS[®] switch office to accept EAS. The EAS is a signaling protocol that toll machines use to meet the EAS interface. The capabilities provided by the interface are compatible with existing procedures, such that existing features (traditional signaling and Traffic service Traffic Service Position System (TSPS) signaling) are preserved.

In the local office, EAS is offered to all inter-LATA carriers to provide equal access to the interexchange (long distance) network. The trunks that connect to a LATA utilize EAS signaling. The EAS is different from traditional signaling. (Refer to 235-900-10X, *Product Specification*, for more information on signaling.) Trunks which connect to a LATA use EAS signaling and may be of the following types:

- ☐ 2- or 4-Wire Loop Supervision
- ☐ 2- or 4-Wire E&M Supervision.

These trunks must have multifrequency signaling and be capable of wink signaling over 2-wire or 4-wire facilities. No new hardware is required for this feature.

4.6 COMMON CHANNEL SIGNALING CALL PROCESSING

The common channel signaling (CCS) trunk signaling feature provides CCIS6, ECIS6, and two standardization sector (SS7) user part signaling protocols to the 5ESS[®] switch. The network of CCS links is connected through packet switching nodes called signal transfer points (STPs). The signaling and address information enter the 5ESS[®] switch at a common network interface/interprocessor message switch (CNI/IMS) ring. From here, the messages are passed to the AM.

4.7 INTEGRATED SERVICES DIGITAL NETWORK (ISDN) CALL PROCESSING

4.7.1 OVERVIEW

The ISDN is a single integrated transport network that provides simultaneous voice and data service access to a fully integrated network. The ISDN provides a completely digital interface to the end user using B- and D-channels. The B-channels are used only for customer information (voice, data, video), and the D-channels are used for signaling and/or data.

Two interfaces defined in the Telecommunication Standardization Sector (TSS) recommendations are the BRI and the primary rate interface (PRI). Both interfaces can provide voice or data services simultaneously, and circuit-switched or packet-switched connections on the same transmission channel.

The BRI consists of two 64 kb/s B-channels and one 16 kb/s D-channel (2B+D), and is intended to serve small-end systems such as voice-data workstations, multibutton voice stations, and terminal adapters for non-ISDN devices. The BRI supports circuit-switched data (CSD) and packet-switched data (PSD) services. These services can be offered by one of several channel configurations chosen by the user.

The PRI consists of twenty-three 64 kb/s B-channels and one 64 kb/s D-channel, and is intended to serve large customer premises equipment such as PBXs or main frame computers. This interface is implemented on a 1.544 megabit per-second digital connection called an ISDN PRI. The PRI configuration provides the end-user access to circuit-switching (with the 5E6 and subsequent software releases) features of the 5ESS[®] switch. The B-channels are controlled by out-of-band, D-channel message signaling. This allows 64 kb/s clear channel circuit switching within the 5ESS[®] switch which can be used for voice and data calls. End-user access to the packet switching services of the 5ESS[®] switch is provided through the X.25 packet switching service on T1 facilities (XAT) feature (5E6 and subsequent software releases). This feature uses any number of individual DS0 channels on the T1 carrier up to the full 24 channels available. If the packet-switched channels do not use the entire T1, a PRI can occupy the remaining channels to provide a combined PRI and X.25 packet-switched connection.

The 5ESS[®] switch ISDN provides integrated voice and data services by building on the existing 5ESS[®] switch hardware. A 5ESS[®] switch SM is transformed into an ISDN SM by the addition of software, and the packet switch unit (PSU) and one or more integrated services line units (ISLU/ISLU2s) or integrated digital carrier units (IDCUs). The PSU provides routing and protocol functions for packet data, as well as signaling, supervision, and control messages. A PSU is required for every ISDN SM. The ISLU/ISLU2 or IDCU terminates and concentrates ISDN lines to the 5ESS[®] switch. These units operate under the control of the SM.

The same switch hardware supports the ISDN offering introduced in the 5E4 software release as well as the National ISDN (NI). The interface for the IDCU or for NI is limited, however, to the ANSI[®] standard U-interface. Custom ISDN and National ISDN can easily coexist in the network and even in the same business group. Call processing from the end-user view is highly dependent on the CPE characteristics. For information on the feature sets supported by the 5ESS[®] switch, refer to 235-190-104, *ISDN Feature Description*.

It should be noted that some features may be provided by the CPE rather than the switch.

With the 5E5 software release, the BRI will support multiple end users and multiple terminals, each accessing an independent set of services. Supporting a set of end users introduces a variety of complications that are addressed by the multipoint BRI feature. These include B-channel competition, per terminal maintenance functionality, per user service order functionality, etc.

With the 5E12 software release, the ISDN U-Interface on Auxiliary Interface Unit feature provides an interface for ISDN U-Interface lines on the auxiliary interface unit. The auxiliary interface unit replaces the ISLU2 in markets where these lines types are required. A new application board is added to the auxiliary

interface unit that provides an interface for ISDN U-Interface lines.

4.7.2 PACKET CALL ROUTING

Call processing software located in the AM/CMP and SM provides the packet switching call routing. As the central location maintaining X.25 services data, this software is used to determine the route of a packet call, and interfaces with the X.25 access software and the protocol handler software to provide the X.25 services to the end users.

The packet switch call routing software determines a path within the 5ESS[®] switch that will connect the originator to the destination. The exact path from the packet user on the originating PH (also called the packet service port) to the packet user of the terminating PH is determined on a per-call basis for virtual call service or on a permanent basis for permanent virtual circuit service.

A packet service port is the unique physical end point of the B- or D-channel on the access PH, a trunk end point on the link PH, or an inter-SM nailed-up channel on the inter-SM PH. A packet service port identifier contains the SM number, the PH number, and the channel number.

The path from a line card to the packet service port of the PH is nailed up by a directly connected peripheral interface data bus (PIDB) for B- and D-channels, or by a nailed-up path through the TSI.

For an inter-SM connection, the channel of the originating PH to the channel of the terminating PH includes an intermediate path associated with an inter-SM PH on the originating side to the data fanout. From here, the path is to the originating TSI, through the communication module (CM), the terminating TSI, the data fanout, the inter-SM PH, and finally the terminating PH. The inter-SM time slots are also nailed up for the connection from the originating side inter-SM PH to the terminating side inter-SM PH. Nail-up data is stored in write-protected memory and used for all inter-SM packet calls.

4.7.3 INTERSWITCH TRANSPORT CALL PROCESSING

The 5ESS[®] switch interswitch transport (IT) feature provides X.25 packet switching services to ISDN customers who may or may not subscribe to ISDN voice or circuit-switched data services.

The X.25 service is provided to ISDN subscribers in four different offerings. The first gives the subscriber X.25 service over the 16 kb/s D-channel on an ISDN BRI. This service uses the link access protocol D (LAPD) (ISDN D-channel) as the level 2 protocol. The second service is called B-channel packet switching. This service provides the subscriber with X.25 services over a 56 kb/s or 64 kb/s access link that is implemented on a BRI B-channel. This service requires that a subscriber's B-channel be "nailed up" to a channel or port on the PSU protocol handler. The third offering, X.25 packet switching access on T1 facilities (XAT), is available with the 5E6 and subsequent software releases and allows a T1 facility to be configured to carry X.25 packet-switched data. Up to 24 of the DS0 rate channels can be configured for packet switching. The fourth offering, on-demand B-channel packet-switching, is available with the 5E5 and subsequent software releases and allows the B-channels on a BRI to be used to support packet-switching on a dynamic basis.

The interswitch interface for the IT feature is through T1 trunks to a 1PSS for the 5E4 software release. With the 5E5 and later software releases, the connection through the 1PSS is optional. The interswitch transport of packets is possible by using internal protocol (IP) trunks to a 1PSS or between 5ESS[®] switches. Connections between a public packet-switched network (PPSN) and a 5ESS[®] switch which cross LATA boundaries are implemented with the X.75 protocol. Connections between a PPSN and a 5ESS[®] switch within the same LATA are implemented with the X.75' protocol.

For information on the 5ESS[®] switch ISDN signaling specifications, refer to the following 5ESS[®] switch documentation:

- 235-900-307, *Packet Switched Public Data Network (X.75) Interface Specification*

- 235-900-315, *Public Packet-Switched Network (X.75') Interface Specification*
- 235-900-331, *ISDN Basic Rate Interface Specification*.

4.7.4 PACKET-SWITCHED MODEM CALL PROCESSING

4.7.4.1 Overview

The packet-switched modem call processing (PSMCP) feature provides for the setup and teardown of an intraoffice or interoffice data call between a BRI terminating an ISDN terminal adapter (including the customer's data processing equipment), and an analog line terminating a modem (including the customer's data processing equipment). The connection is set up by routing the call through an appropriate member of a modem pool to perform the protocol conversions (that is, analog-to-digital or digital-to-analog).

A modem pool is a collection of modems (with the same set of transmission characteristics) and their associated terminal adapters. A 5ESS[®] switch will have one or more modem pools for each type of modem the operating company wishes to provide modem pool service for, as well as privately-owned customer modem pools. Each modem pool is implemented as an MLHG. A modem pool consists of modem pool members, with each modem pool member assigned to an MLHG. Modem pooling has three interfaces: the user's ISDN interface, the modem pool ISDN interface, and an analog interface.

For more detailed information see 235-145-100, *Call Processing Description*.

4.7.4.2 Intraswitch Analog-to-BRI/XAT Modem Pool Call

When a customer originates a data call by dialing the access DN of the called BRI or XAT terminator, normal call processing collects and analyzes the dialed digits and routes the call. The dialed DN is marked for receiving modem pool calls from the analog network. The RTA subsystem determines that the call is a modem pool call and obtains the true DN of the terminator that has subscribed to receive data calls from the analog network. The access DN is the DN of the modem pool MLHG for analog lines. The RTA subsystem first routes the analog call using the modem pool DN.

If no idle member of the modem pool is available, the switch returns busy to the analog customer. If an idle port is available, the member of the corresponding modem pool MLHG is marked busy.

The RTA subsystem controls the setup of the network connection from the originating port to a suitable modem pool number. A modem pool terminating process is created to set up the connection to the terminating modem pool port, and to alert the modem pool member analog line.

The modem pool modem detects the incoming call and automatically answers and initiates a handshake with the calling customer's modem. The call connection is cut through and the calling customer's modem completes the handshake with the modem in the modem pool. Three billing records are initiated. A bill is created for the analog portion of the call. A modem pool usage record is initiated using the BRI or XAT terminating DN as the billing DN. Finally, a bill is created for the digital portion of the call from the modem pool to the terminating BRI or XAT port using the BRI or XAT terminating DN as the billing DN.

The MPTA auto originates an X.25 call with a zeroed called address, which is translated by the RTA subsystem to the true DN of the BRI or XAT customer, and the 5ESS[®] switch sets up the X.25 portion of the modem pool call. Once the customer equipment answers the call, the data exchange can proceed between the calling and the called parties.

When the called or calling party disconnects, both stages of the connection are torn down.

4.7.4.3 Intraswitch BRI/XAT-to-Analog Modem Pool Call

To initiate a BRI/XAT-to-analog modem pool call, the customer must dial the E.164 address of a suitable

modem pool to which the customer has subscribed. The modem pool must contain modems that match the analog terminator's modem. The packet switching software establishes a packet-switched connection (X.25) from the originator to the modem pool member BRI. The MPTA automatically answers the incoming call and places the attached modem in the call origination state, ready to receive the keyboard dialing characters from the customer.

Using the previously established X.25 call connection, the ``dialed" characters are transported to the modem which then outputs the touch-tone signals to the switch through the analog line.

At this point, the 5ESS[®] switch sets up the circuit-switched analog connection. Three bills are initiated. A bill is initiated for the digital portion of the call from the originating BRI or XAT port to the modem pool using the BRI or XAT originating DN as the billing TN. A modem pool usage billing record is initiated, and finally, the circuit-switched analog call record is also initialized using the BRI or XAT originating DN as the billing DN. The terminating DN is alerted of the incoming call, and once the call is answered, data exchange can proceed between the calling and called parties.

Call disconnects are handled by the customer premises equipment and the 5ESS[®] switch to ensure that both stages of the call are torn down.

4.7.5 CIRCUIT-SWITCHED VOICE/DATA

4.7.5.1 Overview

Circuit-switched voice or data connections between two BRIs, and voice connections between a BRI and existing port types on the 5ESS[®] switch, such as POTS lines, 911 lines, and trunks, are provided by the ISDN circuit-switched voice/data feature. The circuit-switched voice/data feature sets up and tears down circuit-switched connections for the call types listed in Table 4-1.

Table 4-1 ISDN Circuit-Switched Voice/Data Call Types

CALL TYPE	INFORMATION	
	VOICE	DATA
BRI to BRI	Yes	Yes
BRI to POTS Line	Yes	No
POTS Line to BRI	Yes	No
BRI to Coin Line	Yes	No
Coin Line to BRI	Yes	No
BRI to Party Line	Yes	No
Party Line to BRI	Yes	No
BRI to TSPS Operator	Yes	No
BRI to 911 Line	Yes	No
BRI to AIS Trunk	Yes	No
BRI to 3CL Recording Complete Trunk	Yes	No
Busy Verify Operator to BRI	Yes	No
BRI to PBX Line	Yes	No
PBX Line to BRI	Yes	No
BRI to DID PBX Trunk	Yes	No
BRI to Announcement Machine Trunk	Yes	No
BRI to Hotel/Motel Line	Yes	No
Hotel/Motel Line to BRI	Yes	No
BRI to Intercept Trunk to Operator	Yes	No
BRI to CAMA-ANI Trunk	Yes	No
CAMA-ANI/ONI Trunk to BRI	Yes ^a	No
BRI to DDD Trunk	Yes	Yes
DDD Trunk to BRI	Yes	Yes
BRI to CSDC Trunk	No	Yes
CSDC Trunk to BRI	No	Yes
Notes:		
a. For a BRI on a local/toll 5ESS [®] switch.		

4.7.5.2 Call Setup

4.7.5.2.1 Originating Side

When an existing line type originates a call, digits are collected and routing is performed in the normal manner. When an ISDN user originates a call, the customer premises equipment (CPE) sends a setup message to the switch. Once the setup message is received in the PH, the PH forwards the message to the SM. Here, the message handler checks the ISDN message type and queues the setup messages for subsequent origination processing. The BRI origination processing dequeues the setup message and calls RTA. The RTA allocates the B-channel requested by the user, if available, creates the originating terminal process, and forwards the setup message to the originating terminal process (TP). The address information is collected from the initial setup message or from additional information messages.

When the complete address information has been collected, the originating terminal process calls RTA to request routing.

4.7.5.2.2 Terminating Side

When terminating to an existing line type, the routing, ringing, and answer detection are performed in the normal manner. For a BRI on the terminating SM, RTA allocates a B-channel, creates the terminating TP, and sends the termination request to it. If all call appearances are being used, the originator is given busy treatment.

The terminating TP sends a setup message over the D-channel requesting the addressed user to perform alerting. A user can respond to the setup message with a call proceeding message (indicating the user is setting up the call), an alerting message (indicating that the user is being alerted), or a connect message (indicating that the user has answered). If an alerting message is received at the terminating TP, audible ringing is returned to the originating customer.

Audible ringing continues until the connect message is returned, at which point the network path is cut through to the terminating user's B-channel and a message is sent to the originating TP. The call then enters the active state.

4.7.5.3 Call Disconnect

4.7.5.3.1 Originating Side

Call disconnect involving an originating TP for existing line types follows the normal procedures with the exception that the 11-second disconnect timing does not apply if the terminating side of the call is ISDN. The originating TP tears down the network path immediately after it detects a disconnect from the ISDN party. An 11-second wait for on-hook is still performed before idling the line and killing the terminal process; therefore, the customer does not receive immediate dial tone as a result of the far-end BRI tearing down the call.

4.7.5.3.2 Terminating Side

If the terminating side ISDN user disconnects first, the CPE sends a disconnect message to the network. The terminating TP receives this message and tears down the call path.

4.7.6 INTER-SM PACKET TRANSPORT

The inter-SM packet transport feature is responsible for maintaining a network of nailed-up paths between the channel groups (CGs) in SMs that serve packet switching subscribers and interswitch links to a 1PSS. The following inter-SM (ISM) nail-up connections are provided:

- ☐ Local SM/Host SM to Local SM/Host SM
- ☐ Local SM/Host SM/MMRSM (multimodule remote switching module) to MMRSM
- ☐ Remote switching module (RSM) to RSM [via inter-RSM communication links (ICLs)].

The purpose of this feature is to maintain a fully interconnected network of ISM nail-ups with high availability. This allows packet subscribers and interswitch links to be connected to any ISDN SM in a 5ESS[®] switch, and they will have the capability to communicate with each other. Routing information in the SM is used to determine the proper routing path through an ISM nail-up.

4.7.7 ATTACHED PROCESSOR INTERFACE (API) VIA ISDN-SM

The applications processor communications package feature provides message communication between the BRCS feature application software in the 5ESS[®] switch and an attached processor (AP). Any attached processor conforming to the 235-900-303, *Application Processor Interface Specification*, can be used. The BRCS feature code specifies the desired AP site and the AP message to be sent. This feature will determine on which SM the AP is located, format an operating system for distributed switching (OSDS) message containing the AP message, and then forward that message to the appropriate AP through the host ISDN SM (that is, loaded software configuration). Messages received by the 5ESS[®] switch from the AP are distributed to the appropriate BRCS processes in the 5ESS[®] switch.

Other features using the API link include E911 and LASS bulk calling line identification (BCLID).

One SM can have up to 16 API links. Up to 10 APs can be linked to an SM, but five is the recommended maximum. There can be up to 96 APs on a 5ESS[®] switch. An AP can have up to 16 API links, but they must all terminate on one SM. In the 5E10 software release, 32 APs are supported.

For more detailed information see 235-190-104, *Non-Modular Business and Residence Feature Description*.

4.7.8 PRIMARY RATE INTERFACE

4.7.8.1 Overview

The PRI feature provides the primary rate ISDN interface between CPE and the 5ESS[®] switch. The 5ESS[®] switch PRI offering with the 5E9(1) software release conforms to the Bellcore requirements for National ISDN (NI). This interface consists of a 64 kb/s D-channel path between a PRI customer premises equipment and the protocol handler in the PSU. The path is implemented with a time slot interchange unit (TSIU) intra-SM cut-through.

Circuit-switched voice calls are supported between the PRI user and the following equipment:

- ☐ BRI
- ☐ PRI
- ☐ Outgoing trunk
- ☐ Individual line
- ☐ Coin line
- ☐ Party line (2-, 4-, 5-, 8-, 10-party)
- ☐ 911 line
- ☐ Automatic intercept system (AIS) trunk
- ☐ 3CL recording completing trunk
- ☐ Busy verify operator trunk

- ☐ PBX line
- ☐ Announcement machine trunk
- ☐ Hotel/Motel line
- ☐ Intercept trunk to operator
- ☐ CAMA trunk
- ☐ CCS trunk.

Circuit-switched data calls are supported between a PRI and the following equipment:

- ☐ BRI
- ☐ PRI
- ☐ Circuit-switched digital capability (CSDC).

The following call processing scenario describes the actions taken to complete a PRI to PRI call.

4.7.8.2 Call Origination

When an ISDN customer originates a call on the CPE, a Q.931 message is sent to the network over the D-channel of the PRI facility.

The network termination of the T1 facility is at the digital facility interface (DFI). From the DFI, the 23 B-channels and D-channel are routed to the TSIU. The D-channel is nailed up through the TSIU to the PH of the PSU, creating a semi permanent connection. The B-channels are switched through the TSIU on a per-call basis as part of call setup.

The message sent from the CPE over the D-channel is packaged in a LAPD format at layer 2. The PH will extract the Q.931 message from the layer 2 envelope and pass it to the SM where it is placed on the packet interface (PI) to SM first-in first-out (FIFO) queue. The PC subsystem will unload the packet and send it to the Q.931 message handler. If the incoming message to the message handler is a setup message, the RTA subsystem is called.

The RTA allocates the requested B-channel, creates the originating terminal process (OTP), sets up the data block linkage, and passes the setup message to the OTP. The OTP receives the setup message and translates the destination information into the dialed digits and passes these digits to RTA.

4.7.8.3 Termination

If the terminating end is non-ISDN, the normal call setup, ringing, talking, and disconnect procedures are followed.

For calls that terminate to a PRI, RTA allocates an available B-channel to the terminating CPE. The PRI B-channels are arranged according to trunk groups. The RTA subsystem identifies the appropriate trunk group based on normal route request processing procedures. Once the RTA has determined the trunk group, normal trunk hunting procedures are used to find an available B-channel. If RTA cannot find an available B-channel for the requested termination, the call is routed to the appropriate announcement. When the call is routed to an announcement, a message is returned to the originator of the call indicating that the terminating party is non-ISDN. Any tone/announcement played by the terminating end of the network is sent back to the originator in-band.

If RTA determines that a B-channel is available, a terminating terminal process (TTP) is created, and a

message is returned to the OTP. Upon receipt of this message, the OTP will send any additional information sent from the originating CPE for the outgoing setup message and establish the network path.

A setup message containing the channel identification of the B-channel selected by the network, the bearer capability, low layer compatibility, and any user-to-user information passed from the originating side, is sent over the D-channel of the PRI facility to the terminating CPE. The terminating CPE will determine if the information in the setup message is compatible and will respond with either a call proceeding, alerting, or connect message.

If the PRI B-channel Negotiation feature is active, the terminating CPE is able to select the B-channel that is used on calls coming from the network. When the terminating CPE responds to the call offering from the network, it may request that the call be connected on a different B-channel from the one that was offered by the network. The first response from the terminating CPE on a Custom PRI must be a CALL PROCEEDING message; the first response on a National ISDN PRI can be a CALL PROCEEDING, ALERTING, or CONNECT message. The network then completes the setup of the call using the B-channel that the terminating CPE specified.

4.7.8.4 Alerting

After the call proceeding message has been sent, the terminating CPE responds with an alerting or connect message. If the alerting message is received, the TTP passes the alerting information to the OTP. The OTP sends an alerting message to the originating CPE. Both terminal processes wait for an answer to be returned.

4.7.8.5 Connect

When the called party on the terminating CPE goes off-hook, a connect message is generated by the CPE and sent to the TTP. The TTP acknowledges the connect message and sends the information contained therein to the OTP through an OSDS message. The OTP sends a connect message to the originating CPE to inform the originator that the called party has answered.

4.7.8.6 Disconnect

The events which occur due to a disconnect depend upon which party disconnects first.

If the called party goes on-hook, a disconnect message is sent to the network from the terminating CPE. The TTP will send a message to the OTP informing it of the disconnect request. The OTP will release the network path and send a disconnect message to the originating CPE. A release message is also sent to the TTP at this time. The OTP sends a disconnect message to the originating CPE and releases the B-channel. When the TTP receives the release message, it releases the network path first and finally the B-channel.

If the calling party goes on-hook first, the originating CPE sends a disconnect message to the OTP. The OTP, in turn, sends a release message to the originating CPE and releases the network path (causing E-bit discontinuity). The TTP waits for the loss of E-bit continuity before tearing down the call.

4.8 OPERATOR SERVICES POSITION SYSTEM CALL PROCESSING

4.8.1 OVERVIEW

The Operator Services Position System (OSPS) toll and assistance (T&A) and directory assistance (DA) features reside primarily in the SM. Operator positions are associated with ISDN-equipped SMS, known as position switching modules (PSMs). The number of PSMs in an office is engineered depending upon the number of operator positions. Refer to "SYSTEM ARCHITECTURE", Section 2, of this document for the PSM hardware description.

With the 5E6 and subsequent software releases, the listing services (LS) application provides the DA

function, as well as other services such as yellow pages (business listings), customer name and address, zip code provision, address provision, and name and telephone number provision.

The PSM multiplexes the B- and D-channels onto the DS1 facilities which terminate at the remote integrated services line unit (RISLU). The RISLU provides the B- and D-channels for the video display terminals (VDTs), basic services terminals (BSTs), and the D-channels for the terminal adapters (TAs).

Each operator position VDT requires a B-channel for the operator voice path, and a D-channel for a data path for operator key strokes or other data sent to and from the SM.

4.8.2 DIRECTORY ASSISTANCE

4.8.2.1 Overview

The OSPS DA feature provides the capability for logging onto a BST position as an operator, handling a request for operator service, and responding to that request by routing the call to an available position. Once connected to an operator position, the caller can request and receive DA information. This feature also provides the capability for OSPS administrators to monitor operator performance.

On DA calls incoming to the OSPS, the origination is detected and an originating terminal process is created in the SM. The originating terminal process activates the originating port and analyzes the digits received. Once it is determined that the call is to be routed to an operator, the automatic call distributor (ACD) call type is identified and a routing message is sent to the ACD.

Incoming calls that are to be routed to an operator position can be placed on queue, routed to an announcement, or routed to an operator position. When a call is placed on queue without being given an announcement, audible ringing is returned to the calling party's port until a position is seized or the calling party abandons.

If the calling party is routed to a delay announcement, the announcement is returned to the customer. The announcement can be interrupted by a position seizure; however, if the announcement completes and the call has not been routed to an operator position, the calling party receives audible ringing.

If the customer abandons the call when it is connected to audible ringing or a delay announcement, or when it is in transit to an operator position, the call is torn down and the port is idled. In addition, if the operator initiates a position release before the customer disconnects, the call is torn down and the port is idled.

4.8.2.2 Operator Log-On

The OSPS DA feature provides the ACD function to the operators. The operators are stationed at BSTs in the Operator Service Center (OSC). To initiate the operator log-on procedure, the operator plugs the headset into the headset jack at the BST. This sends a message to the SM which returns a log-in display to the BST. When the operator logs on the BST, the position is placed in the "MAKE BUSY" state. The operator must depress the "MAKE BUSY" key to let the ACD know that the position is available to receive calls.

4.8.2.3 Automatic Call Distribution

NOTE: In the 5E9(1) software release, ACD is available only as a Custom ISDN BRCS feature. Information pertaining to ACD in this section apply to the 5E8 and prior software releases. See 235-190-104, *ISDN Feature Description*, for a full description of this feature and its operation.

When the originating treatment of a call determines that this call should be routed to an operator, the ACD software checks the size of the call's ACD-provided call queue and checks the availability of operator positions serving this call queue. If the ACD software receives a call queue request for which no operator positions are logged in, the ACD will notify the OSPS administration of this event, and reorder tone is

returned to the calling party.

If a position serving this call queue is available, the ACD will route the call to this position. If no operator positions serving this call queue are available, but at least one operator is logged in, the call is placed in the queue. If that particular queue is full, then the ACD denies the operator request, and reorder is returned to the calling customer.

When calls are placed on queue, the call queue specified delay treatment is checked to determine whether the call is to be given an announcement or audible ringing. If the calling party abandons the call while the call is on a call queue, it is removed from the queue. When the delay for calls waiting on a call queue exceeds an OSPS administration-specified threshold for that queue, the members for the serving team that serves that queue are notified of a "calls waiting" situation through an indicator at the BST. When the delay drops below another threshold, the indicator is removed.

When an operator position is released from a previous call, the ACD software will route a call from the call queue that has the longest queued time and that can be served by the position, to the idle position. If the operator's serving team serves more than one call queue and there are calls on more than one of those queues, the ACD software routes the call that has waited the longest time relative to its call queue service objective. This is called delay ratio queuing. If no call is waiting (queued), the operator position is queued in a serving team specific list of available operator positions. This is an FIFO list where the operator with the longest idle time is the first operator in the list. Idle positions that are in the "make-busy" state are not queued. These positions are placed on a "busy" list. When an operator releases from a make-busy state, it is placed at the top of its serving team's available list.

As new positions log in, the ACD software adds the position to that serving team's busy list. Positions that log off are removed from the serving team list they occupied and are placed on the unoccupied position list. If an attempt is made to place a call on a queue that is closed (not available to receive calls), it is routed to a "closed queue" announcement.

4.8.2.4 Termination to Operator

When an operator position is seized, a message is sent to the directory assistance system/computer (DAS/C), and the display data and an operator alerting tone are sent to the BST. The DAS/C is a vendor-supplied computer and is not a part of the OSPS DA feature. The interface to the DAS/C is provided as part of the OSPS DA feature. The data sent to the BST indicates to the operator that a call has arrived and indicates the call type.

The operator can request an automated announcement of a directory listing by depressing a key on the DAS/C VDT. This action sends a message containing the directory information to the position terminal process (PTP) via the DAS/C data link. If a digital service unit model 2 - recorded announcement facility (DSU2-RAF) or Service Announcement System (SAS) are available and an automated announcement can be made on this call, an announcement terminal process (ATP) is created to control and monitor the DSU2-RAF/SAS. The connection to the RAF/SAS is completed, and the position is released from the call. The directory information is then passed to the ATP which then does the recall timing or releases the call, as instructed by the DAS/C.

Following the recall time-out period, if the calling party has not disconnected, the call may be routed to the ACD to recall an operator in the same way the original operator was seized. The recall may be queued in the same or different queue than the original call. When an operator position is seized to handle a recall, the PTP sends a message to the DAS/C with a recall tag attached to it. This allows the DAS/C VDT to display the directory information retrieved during the last operator seizure to the recall operator.

If instead, the calling party disconnects or recall is not allowed, the talking path is released, the DAS/C is instructed to remove the call record, the RAF/SAS port is released, and the call is terminated.

4.8.2.5 Operator Position Monitoring

The OSPS managers have the capability to bridge onto an operator-serviced call to evaluate the service an operator supplies the customer.

The monitoring can be performed on an operator position or on an operator identification (OID) basis. The manager logs into an operator position and selects the monitoring option at the operators terminal. The PTP displays a prompt indicating that a password must be entered before the manager can enter the monitoring state.

When an OID is entered to be monitored, the monitoring PTP checks to see if the OID exists and then calls the ACD to request the monitoring of the OID. The monitored data can be collected and printed at the OSPS administrative processor (OAP) if desired. The monitoring PTP prompts the manager with this option after bridging onto the monitored OID voice path. The OID monitoring is terminated when either the monitored operator logs off or the manager releases the monitored OID.

When an operator position number is entered to be monitored, the ACD sends a message to the PTP to set up the monitoring path. As with the OID monitoring, the operator position number data can also be collected and printed at the OAP if desired. The monitoring PTP prompts the manager with this option before bridging onto the monitored position voice path. The operator position monitoring is terminated when the manager releases the monitored position.

4.8.3 LISTING SERVICES

4.8.3.1 Overview

The LS application provides a telephone operator with access to information from a variety of external data base systems. The most well-known LS feature is basic directory assistance (white pages). The LS features include yellow pages (business listings), customer name and address, zip code provision, address provision, and name and telephone number provision. Listing services calls are signaled to the OSPS using the familiar codes 411, 555-1212, and NPA-555-1212. In addition, the OSPS provides the flexibility to introduce new codes for specific services.

To provide listing services that require access to large data bases that are not resident in the OSPS, a general interface is used between the OSPS and a vendor-supplied external information system (EIS). The EIS has access to one or more data bases of information, such as a DAS/C, and may act as a gateway through which the operator can access multiple data bases serving different purposes.

The OSPS and the EIS communicate over call processing data links using an EIS vendor-specific message set. The switching system software advises the EIS of its actions along with internal data and vice versa. The OSPS can request services of the EIS and the EIS can request services of the OSPS. The OSPS performs the switching functions of interfacing with the telephone network, controlling the connections of operators and announcement units to the caller, controls the actions of the BST, outpulsing calls, and generating billing records. The EIS performs the functions of information retrieval, display of this information to the operator on a keyboard display terminal, announcement of the information to the caller using an external (to OSPS) audio response unit (ARU), data base administration, and operator performance statistics.

4.8.3.2 EIS to OSPS Interfaces

Each EIS has some or all of the following interfaces with an OSPS:

- (1) A call processing data link interface for the control of call processing, maintenance, and status information. These data links communicate information such as seizure or release of positions or requests to transfer a call to an automated announcement.
- (2) An arrangement allowing the provision of automated announcements. The announcements may be provided by hardware internal to the OSPS or by an external ARU in the EIS.

- (3) An interface for a single operator terminal that is connected to the OSPS and serves as an EIS terminal. The terminal data is transmitted over a X.25 switched virtual circuit between the OSPS and the EIS.

4.8.4 TOLL AND ASSISTANCE

4.8.4.1 Overview

The OSPS T&A features provide comprehensive operator services integrated into the 5ESS[®] switch. Automated calling features, including automated calling card service and automated coin toll service are provided, as well as operator assistance services. The ability to originate calls to and receive calls from other operator systems is provided as is the ability to handle transferred number identification from CAMA offices. Operators can originate busy line verification calls at the customer request. The operators work at state-of-the-art VDTs, designed for maximum efficiency and ease of use. Automated services use digital signal processing and digital voice synthesis with the flexible DSU2. All of the major features of the TSPS are available with the OSPS.

Incoming calls to the OSPS arrive on operator trunks. The address and ANI digits are collected from the originating office. The intermediate switch point capability detects those calls that are intended to be handled by a resident OSPS, and passes these calls to OSPS originating treatment. This begins the OSPS portion of operator call handling.

4.8.4.2 Automated Coin Toll Call

4.8.4.2.1 Overview

The automated coin toll service (ACTS) feature provides for the rating of calls, announcements of charges to the caller, detection of coin deposits, reprompting on partial deposits, routing of calls, interim and end of call charge due announcements and coin collection, and charge due ringback. Calls go to an operator if the calling party does not comply with the instructions.

4.8.4.2.2 Initial Call Treatment

When an incoming call on an intermediate switch point (ISP) trunk is detected by peripheral control, an OTP is created. If the trunk group and the received digits indicate that this is a coin call dialed with a 1+ prefix, a request is made for a DSU2 coin RAF (CRAF)/SAS. A connection is established to the CRAF/SAS and a coin terminal process is created.

4.8.4.2.3 Coin Collection

The coin terminal process sends a query to a rating data base. Upon receipt of the query response, an announcement is given to the caller requesting the required amount. The CRAF/SAS monitors the call for coin deposits. If incomplete deposits are detected and a timing threshold is exceeded, additional announcements requesting the remainder of the deposit are given.

4.8.4.2.4 Completing the Call

When all deposits are detected, the CRAF/SAS is disconnected and the call is routed to an outgoing trunk. When the called party answers, answer timing is started. The OTP times the call and monitors supervision. An announcement may be given at the end of the initial period, depending on the tariff. If the call duration reaches a threshold specified by the rating data base, an "interim charge due" seizure is made. A CRAF/SAS and both parties are connected by a conference circuit and the interim charge announcement is made. The coin deposits are detected by the CRAF/SAS. Partial deposits are given announcements to request the remainder of the charge. When the full amount is detected, the CRAF/SAS and conference circuit are released and the original connection is established.

4.8.4.2.5 Call Disconnect

If any charges are due at the end of a call, a CRAF/SAS is used to give an announcement for the remaining charges, and the deposits are credited. Partial deposits are given announcements for the remaining charges. If the calling party has disconnected with charges due, a ringback signal is sent on the originating trunk to instruct the local serving office to ring the coin telephone. When the calling party answers, the CRAF/SAS is connected to give the charge due announcement. When the call is complete, an AMA record is made.

4.8.4.2.6 Sent to Operator

If a timing interval with no coin deposits is exceeded when deposits are expected, the call is sent to an operator with the charges due indicated. If the charges due exceed a threshold amount, the call is also sent to an operator. The CRAF/SAS is connected to detect coin deposits while the operator is on the call, but no automated announcements are given.

4.8.4.3 Automated Calling Card Service Call

4.8.4.3.1 Overview

The automated calling card service (ACCS) feature provides for the automated handling of calling card calls without the need of an operator, and also allows the calling party the option of connecting to an operator. The automated calling card service provides tone prompts, error and acknowledgment announcements as appropriate, reception of the calling card number, validation of the calling card number, and routing of the call to the called party. It also provides sequence calling, allowing the calling party to place a sequence of calls without having to reenter the calling card number for each call. Fraud detection features are also provided.

4.8.4.3.2 Initial Call Treatment

When a 0+ incoming call is received from an ISP, an OSPA OTP is created. The OTP performs originating line screening, and if the data indicates that automated service is appropriate, a request is made to connect to a DSU2 RAF-DTA/SAS.

4.8.4.3.3 Validating the Billing Number

When the connection is made from the originating trunk to the DSU2 RAF-DTA/SAS, a tone and optional announcement are given to prompt the calling party to enter the calling card number. The RAF-DTA/SAS provides the announcements and detects dual tone multifrequency (DTMF) digits. A query is made to the appropriate data base to validate the calling card number. If the calling party fails to dial the calling card number within an OTC specified time period of from 2 to 9 seconds (the default value is 5 seconds), the call is connected to an operator and handled as an operator assisted call.

4.8.4.3.4 Connection to the Called Party

Upon successful validation of the calling card number, the OTP calls RTA to route the call to an outgoing trunk. A trunk to trunk termination is made with the RAF-DTA/SAS still attached to the call. Upon answer, the RAF-DTA/SAS is removed from the call, leaving the calling and called parties connected.

4.8.4.3.5 Sequence Calls

At the completion of the call, the originating terminal process monitors the state of the call, waiting for the called party disconnect. If the called party disconnects first, the calling party is given the opportunity to make a sequence call. The calling party can also request to make a sequence call while waiting for the called party to answer, or if the called party is busy. To make a sequence call, the calling party must enter ``#", and is then instructed by an RAF-DTA/SAS announcement to enter another called party number. The

DSU2 RAF-DTA/SAS detects the DTMF telephone number. The OTP analyzes the called number, and calls RTA to select an outgoing trunk. A new trunk to trunk termination is made and the new called party number is outpulsed. The RAF-DTA/SAS is removed from the call after answer, and the OTP monitors the call again. Additional sequence calls can also be made. An AMA record is made at the end of each call.

4.8.4.4 Operator-Handled Incoming Calls

4.8.4.4.1 Overview

Operators handle many different kinds of calls. Toll and assistance calls are received on ISP trunks and are completed to outgoing trunks, reaching the calling party over the telephone network. These calls reach an OSPS operator either as the result of a bail-out from an automated service, or directly, when automated services are inappropriate or not desired by the customer.

Great flexibility is provided to the operator. The called number can be entered or changed by the operator. The calling number can also be entered if it was not received. The method of charging for the call can be established and changed. The operator can release the call as it is being completed, or stay on the call until the called party answers, as in collect calls. The operator can also enter charging information given by the called party.

To provide these services, the operator is equipped with a VDT. The VDT is capable of displaying call states to the operator, accepting operator key actions, and displaying external data base information. The operator has a headset which, when plugged into the VDT, provides voice communications. The VDT also provides three independent call appearances (loops). The operator can be actively connected to a call on only one loop at a time, but can have calls on hold on other loops, and can see changes in the on-/off-hook status of these lines. The operator also has the ability to split the voice path toward the calling or called parties.

4.8.4.4.2 Initial Call Treatment

When an incoming call is received from an ISP, an OSPS OTP is created. The OTP performs originating line screening, and then alerts the ACD that an operator is needed on the call. The ACD determines the call type and serving team, and sends the call data to the PTP of the chosen operator position. The OTP and PTP establish the talking path from the incoming trunk to the operator. The VDT displays the call seizure information and provides an alerting zip tone to the operator.

4.8.4.4.3 Operator Actions

The operator has many choices about how each call will be handled. The way calls are handled is determined by operator practices set by the operating telephone company, and taught to the operators.

The operator uses the VDT to modify or add to the call data, and to request additional connections on the call. The VDT transmits key actions to the PTP. The PTP responds to the key action messages, and changes the state of the call and the VDT display accordingly. The operator has control over the called number, the voice paths, the class of charge, a manually entered calling card number, and all other important aspects of the call.

4.8.4.4.4 Completing the Connection

A called number is required by the switch to complete a call. The calling party can enter the calling number when the call is placed, or the operator can enter the number. Once the number is entered, the call is routed to an outgoing trunk and outpulsed.

4.8.4.4.5 Floating the Call

When an operator releases a call with a calling and called party connected, or a calling party waiting for answer, the call is said to be floated. Depending on the call being handled, the operator may release the

position before outpulsing, or remain on the call.

With the 5E6 and subsequent software releases, the more efficient call handling (MECH) feature is available and provides additional operator work time savings on collect and person calls. This feature uses one operator to handle the initial part of a call, floating the call while waiting for forward party answer. The difference in the OSPS call processing architecture is that there is no operator on the call while waiting for the forward party answer. A second operator is not put on the call unless there is forward party answer, saving operator work time on an unanswered call.

4.8.4.4.6 Recall

A caller on a floated OSPS call may recall an operator to the call by flashing the switchhook at the telephone station set. The flash is passed by the intervening offices to the OSPS. The OTP detects the flash and requests an operator. The operator is connected to the calling party and the called party if one is present.

4.8.4.4.7 Operator Hold

The OSPS controls call disconnect in cooperation with the local office. Following a calling party on-hook, a call is disconnected at the local office only after an on-hook signal is given by the OSPS. This permits ringback to the calling party (following an on-hook) for a time and charges quotation, to request coin deposits from a party at a coin station, or in emergency situations.

4.8.4.4.8 Ringback

The calling party can be brought back onto a call, in the event of a premature on-hook, with a ringback. The OTP sends the originating office a ringback signal over the incoming trunk, which directs the office to ring the caller's telephone. The system may automatically send a ringback signal for a time and charges call or for a coin call if the caller disconnects before all charges are satisfied. The operator can also send a ringback signal with a key action.

4.8.4.4.9 Disconnect

Disconnect for floated calls is under the control of the OSPS via operator hold. The OTP monitors supervision of both the calling and called parties. If no further OSPS action is required, the OTP signals a disconnect to the originating office and releases the connections. If further actions are required or requested, such as coin collection or time and charge information, the call is brought to an operator or given automated treatment, as appropriate, when a disconnect is detected.

When the call is complete, an AMA record is made. For automated charge quotation service (ACQS) calls, a billing record is also sent to the ACQS billing center, or directly to the establishment from which the call was made. This service is commonly provided to hotels and motels.

4.8.4.5 Transfer CAMA Calls

The OSPS operators can provide calling number identification for calls from offices that require operator number identification (ONI) or for ANI failures. The CAMA offices which normally provide these features may send traffic to an OSPS over special paired transfer CAMA trunk groups. On these calls, the operator prompts the caller for the calling telephone number and enters it at the VDT. The OSPS transmits the number back to the CAMA office over the paired trunk. The CAMA office is then responsible for completing and charging the call.

4.8.4.6 System CAMA Calls

The OSPS may also provide system CAMA service. As with transfer CAMA, the OSPS operator obtains and keys in the calling telephone number. However, the OSPS retains this data, completes the call, and writes the AMA record for the call.

4.8.4.7 Outgoing Inward Calls

Calls may be originated to other operator services systems, including other OSPSs, in order to obtain services not available locally. One example is to verify a busy line in a distant area. Another is to complete special services calls, which require a local operator. These calls are sent out over outgoing trunks with a special inward code.

4.8.4.8 Incoming Inward Calls

The OSPS can receive inward calls from other operator systems, including other OSPSs. These calls, arriving on incoming direct distance dialing (DDD) trunks, are identified as OSPS calls by digit analysis of the special inward code. The incoming inward OSPS operator can provide many of the OSPS services for the inward calls. Automated treatment is also provided, such as for calling card validation.

4.8.4.9 Operator-Initiated Calls

The OSPS operators can initiate calls on outgoing DDD trunks. Calls can be made over one trunk, or over two trunks. A call made over two trunks, to two parties, can be connected with one of the parties being considered the caller. An appropriate AMA record is made for this type of call.

4.8.4.10 Busy Line Verify Calls

An OSPS operator may respond to a request by a caller to verify the busy status of a telephone, local practices permitting. If the line to be verified is within the verification domain of the OSPS, the caller is split (unable to hear), and a verify call is initiated over a special verify trunk. A verify network completes a call to the local office of the line to be verified, and provides a no-test connection to the line. A scrambler is inserted into the operator's listening path, allowing the operator to detect speech, or system tones, and to distinguish tones, but not to understand the speech.

The caller may request an emergency interrupt, which the operator, according to local practices, may effect by a key operation at the VDT. The interrupt disables the scrambler and attaches an interruption tone to the verified line. The operator can then arrange to have the verified line go on-hook to be able to receive a call from the caller. The operator cannot connect the caller through the verify connection, and the caller cannot hear the conversation on the verified or interrupted line. If the verified party agrees to go on-hook, the operator can drop the verify connection, return to the caller, and complete the call over an outgoing trunk. A verify AMA record is made.

4.8.4.11 OSPS More Efficient Call Handling

4.8.4.11.1 Overview

The MECH feature (5E6 and subsequent software releases) provides a means of saving operator work time on person and collect calls. It divides the operator actions for eligible calls which receive forward party answer between two operators, each providing service at a different point in call handling.

A MECH call begins with the caller requesting a collect class of charge or a person rate class. The first operator enters a valid class of charge, the forward number if necessary, and optionally, the forward or back name as appropriate. At this point in the call, the OSPS indicates that the call may be released by displaying the position release okay indicator in the loop supervision area. If the operator releases the call, the MECH treatment is applied. If the operator chooses to handle the call manually, then the operator proceeds by outputting the call.

If the first operator MECHs the call by releasing it from the position, the OSPS outputs the forward number and waits for forward answer supervision. Upon forward party answer, the call is connected to a second operator, or queued if an operator is not available. Announcements are optionally available to request that the forward and back party hold for an operator. When the call reaches an operator position,

the operator obtains the proper person and/or acceptance of the charges and releases the call with both parties fully connected.

4.8.4.11.2 MECH Call Type Eligibility

Eligibility for MECH treatment is determined after the back number has been determined and the forward number, rate class, and class of charge have been entered and the billing checks have been satisfactorily completed for a non-operator-initiated call at an operator position. Collect and person calls, including bill-to-third person calls which are not operator-initiated, are candidates for MECH treatment.

If the call is eligible for MECH, then this is indicated at the operator position. The operator can use the MECH feature on the call by releasing from the call. The operator identifier and the OSC are placed in the first operator fields of the call record. Three operator IDs (and OSC IDs) can be tracked in the call record in the handling of MECH calls. The first operator ID is the ID of the operator who releases the call for MECH treatment. The MECH operator is the operator ID of the operator who receives the seizure after forward party answer. The other operator ID is the ID of the most recent of any other operators who have been attached to the call. If an AMA record is required for this call, then the operator and OSC IDs are copied into the corresponding positions in the AMA record.

4.8.4.12 MECH Originating Treatment

4.8.4.12.1 Overview

When a call is handled using the MECH feature, an indication that it is a MECH call is written in the call record and the call is passed to the OTP. Originating treatment then takes control of the call through outpulsing and forward party answer. When an operator is available after forward party answer, originating treatment passes the call back to the PTP.

4.8.4.12.2 Outpulsing

When a call is released from an operator position for MECH treatment, the OSPA allocates a 3-port conference circuit for noncoin calls. For ACTS compatible coin calls, a 6-port conference circuit is allocated (as required by the addition of the RAF/ATP or SAS, the forward party, back party, and the operator). If a conference circuit cannot be obtained, the OSPA returns reorder to the caller.

Once a conference circuit is allocated to the call, the OSPA outpulses to the forward number. Reorder is returned to the caller if originating treatment is unable to route to the forward number. Originating treatment begins timing at outpulsing, and will idle the call if no forward answer is received within the timed interval. The default value of the timed interval is 4 minutes, however, the timer is recent changeable. A value of zero disables the timing and allows a call to remain in the ringing state indefinitely.

4.8.4.12.3 Forward Party Answer

At forward party answer, the OSPA mutes both the forward and back parties, and requests a MECH operator. The muting configuration for the MECH position seizure is recent changeable (one, both, or neither party muted). If the OTP does not receive a response to a request for a MECH operator within 10 seconds, it assumes an error condition and standard treatment is applied. If a call using MECH cannot be queued because the maximum number of calls allowed for the MECH queue is exceeded, both parties are routed to reorder. If the OTP receives a route failure indication from the ACD in response to the request for an operator, it returns reorder to both the calling and called parties.

4.8.5 OSPA INTERFLOW

The OSPA interflow feature provides for the handling of toll and assistance calls between a sending OSPA, which has a call origination for an OSPA, and a receiving OSPA, which provides the operator services. This feature is initially available with the 5E5 software release. The automated portion of an OSPA call is

handled at the sending OSPS, including call completion, charging, originating line screening, and other switch functions. The receiving OSPS provides only operator service (including monitoring and service assistance). An OSPS can function as a sending OSPS, a receiving OSPS, or as both a sending and receiving OSPS, but incoming interflowed calls cannot be interflowed again to another receiving OSPS. An OSPS can receive interflowed traffic from and/or send interflowed traffic to 16 other OSPSs.

The OSPS interflow feature is administered on a per-serving team basis, with each serving team individually designating whether interflow is on or off. A serving team can be associated with only one receiving OSPS. When the interflow is on, all call types associated with an interflowed serving team are served by operators at its designated receiving OSPS.

Three applications of interflow are:

- ☐ **Permanent Interflow:** With permanent interflow, part or all of the OSPS traffic has the operator call handling permanently provided by receiving OSPS(s). Permanent interflow can be complete or partial. If complete, all of the operator-assisted traffic is interflowed. The sending OSPS handles only fully automated calls, and therefore is not equipped with operator positions. The data defining which serving teams are permanently interflowed is resident in the office data of the sending OSPS. If partial, part of the operator-assisted traffic is handled at the sending OSPS, and the remainder is interflowed. The interflow parameters may be included in the office data or can be activated permanently by a single scheduled configuration.
- ☐ **Scheduled Interflow:** The interflow schedule consists of a set of serving team configurations that are put into effect at specified days of the week and at certain times of the day. Each configuration may specify the interflow parameters for all 128 serving teams in the sending OSPS. For each serving team, the following interflow parameters are specified:
 - (1) The receiving OSPS
 - (2) State of the interflow feature (on or off)
 - (3) Time-of-day and day-of-week the configuration is initialized.

At the day and time a configuration takes effect, the new set of interflow parameters overrides the previous set.

Scheduled interflow can be partial or complete. If partial, interflow is activated to close down some of the serving teams in the sending OSPS and interflow their traffic to receiving OSPSs at specified times. At other scheduled times, interflow is deactivated for those serving teams that are being staffed with operators at the sending OSPS. If complete, interflow is activated to close down all of the serving teams in the sending OSPS at specified times. At other scheduled times, interflow is deactivated and all serving teams are again staffed by operators at the sending OSPS. Night closing is an example of scheduled complete interflow. At a scheduled time each night, interflow is activated, and all serving teams of operators at the sending OSPS are closed for the night. At a scheduled time the next morning, interflow is deactivated, and all operator calls are handled by serving teams of operators at the sending OSPS.

- ☐ **Immediate Activation:** Immediate activation allows the activation or deactivation of interflow for a serving team(s) to a receiving OSPS immediately. Subsequent scheduled activations for the same team, if any, override the immediate activation/deactivation.

For an interflowed call, both the sending switch ACD and the receiving switch ACD are involved. The sending switch ACD has interflow links associated with each receiving OSPS to which it is connected. A call type is assigned to a call queue, with each queue assigned to a serving team. A serving team can have one or more call queues.

Pseudo-positions on the sending switch correspond on a one-to-one basis to an operator voice path and data channel between the sending and receiving OSPS. There is an interflow position terminal process (IPTP) associated with each pseudo-position. Real operator positions on the sending OSPS have an associated PTP. An OSPS call can be routed to either an IPTP or to a PTP. These two terminal processes perform differently on an OSPS call. The IPTP has call processing models and loop dependent data structures which interact with interflow call processing models on the receiving OSPS operator PTP. The IPTP will only handle a single call (loop) while a PTP can have up to three loops.

The OSPS PRI links with 23 B-channels and an associated D-channel are used to transport the operator voice and data between the OSPSs. The IPTP is associated with a B-channel for operator voice and the D-channel for data.

The receiving OSPS has an interflow originating terminal process (IOTP) associated with the B- and D-channel from an IPTP in the sending OSPS. A call arrival at the IPTP in the sending switch causes a message to be sent to the IOTP which is treated as an OSPS call origination on the receiving switch. The IOTP determines the call type for the receiving OSPS based on data in the call origination message received from the IPTP in the sending OSPS. The IOTP then initiates an operator request to the ACD on the receiving OSPS. The receiving OSPS ACD distributes the call to an operator position on the receiving OSPS. The IOTP identifies this call as an interflowed call in an existing message to the PTP assigned to handle the call.

Only operator services are furnished at the receiving OSPS. Customer originating treatment, call terminating treatment for final routing, billing, screening, queries to data bases for the sending switch, much of the operator processing actions associated with the loop, and other functions are still provided by the sending OSPS. Fully automated calls, such as ACTS and ACCS, are handled by the sending OSPS, and are not interflowed. When an operator is needed for these automated calls, the operator-assisted portion can be interflowed.

4.8.6 COMBINED SERVICES

Traditionally, T&A and DA are provided by separate groups of operators in different OSCs, each equipped to handle either T&A or DA. This arrangement becomes inefficient when operator call traffic patterns change, resulting in excess traffic at one operator service center and low traffic at the other. To ensure proper service, telephone companies have to reserve enough operator staff and equipment for maximum traffic load, some of which are idled during low traffic periods.

To address this inefficiency, the OSPS (with the 5E6 and subsequent software releases) provides the ability for an operator at a combined services terminal (CST) to handle LS and T&A calls intermixed on a call-by-call basis. In fact, the operator may have a T&A call on hold at the same time that an LS call is actively being serviced.

Combining the two services on the same operator terminal requires an architecture that includes:

- ☐ A CST to replace both the BST and the keyboard display terminal
- ☐ Use of the multiple data base access capability to establish switched virtual circuits between the CST and the external data bases
- ☐ Integration of the LS call processing software with the T&A software
- ☐ Taking advantage of the ACD's ability to route diverse incoming call types to the same operator serving team.

The CST is based on personal computer technology. The CST contains all the functionality of the VDT for T&A calls and adds new functionality to support LS calls. Additions to the CST include an expanded keyboard that is designed to efficiently interact with an EIS and a presentation layer protocol for communicating with the EIS's internal terminal control software. The presentation layer protocol minimizes

the amount of data sent between the EIS and the CST for typical data base lookup functions.

The multiple data base access feature allows the CST to establish switched virtual circuits between one or more external data bases. For combined services, the CST would normally communicate with an operator reference data base for the T&A calls and with an EIS for LS calls. To minimize operator work time, the CST automatically reveals the EIS window when an LS call arrives. The window associated with the operator reference data base is revealed only by operator request because of the relative infrequency of referring to the operator reference data base for T&A calls.

4.9 MULTIMODULE REMOTE SWITCHING MODULE CALL PROCESSING

4.9.1 GENERAL

The MMRSRM consists of from one to four collocated SMS, remotely located from a host 5ESS[®] switch, and connected to the host office and to each other by T1 carrier or other transmission facilities. Each SM in the MMRSRM is called an RSM. The MMRSRM can operate in either a linked or stand-alone mode.

Linked mode refers to the normal operating condition of the MMRSRM. While in the linked mode, any feature available at the host 5ESS[®] switch is also available at the MMRSRM, except the ability to host another MMRSRM.

The stand-alone mode of operation is an optional feature that provides local service to the customer of the MMRSRM when communications with the host 5ESS[®] switch office is lost. Most of the custom calling features available in the normal linked mode of operation are also available in the stand-alone mode.

4.9.2 MMRSRM LINKED MODE OPERATION

4.9.2.1 Overview

All the call processing features available to the host 5ESS[®] switch customers are available at the MMRSRM during the linked mode of operation. The MMRSRM call processing is shared between intra-RSM call processing and AM/CMP-routed call processing. Intra-RSM call processing provides the MMRSRM with most call processing features during the linked mode of operation. The AM/CMP-routed call processing capability provides those features not provided by intra-RSM call processing.

4.9.2.2 Intra-RSM Call Processing

Intra-RSM call processing provides POTS, MFC features (except those that require conference circuits, or data that is only resident in the AM/CMP), and the local 13A announcement machine to subscribers served by the MMRSRM. Local routing is used to process most of the calls that originate and terminate within the RSM, independent of the AM/CMP (including calls to local hunt groups..). The talking paths for these calls are set up over the ICLs that interconnect the RSMs comprising the MMRSRM. Routing and digital path setup for terminal maintenance are also provided.

The intra-RSM call processing capability will determine the terminating port on intra-RSM calls and set up the talking path between the originating and terminating ports. Determination of the terminating port requires that the appropriate routing data be available in the RSM. In the event a call cannot be routed locally (that is, the terminating party is not within the RSM or another processor is required to provide a special function or service for the call), the responsibility for routing is switched to another processor.

The digital path between ports on different RSMs is established over the ICLs connecting the two RSMs. If all of the channels on the ICLs are busy or out of service, then the digital path is established through the host over the umbilicals connecting the RSMs to their host SMs. When the digital path is set up within the RSM, it is done without external intervention. When the digital path is set up through the host SM, AM/CMP call processing is required.

4.9.2.3 AM/CMP-Routed Call Processing

The AM/CMP-routed call processing provides features that use trunks (except for local trunk groups), conference circuits, and nonlocal multiline hunt groups (MLHGs) (with 5E5 software release features that use nonlocal MLHGs, call processing is performed in the SMs), as well as various MFC features. It also provides administrative capabilities that interface with the AM. The AM/CMP can also recognize that an ICL path can be used for intra-RSM calls routed by the AM/CMP.

Intra-RSM calls that cannot be routed locally are routed by the AM/CMP. With the 5E5 software release, these calls are routed by data located in other SMs.

4.9.3 MMRSR STANDALONE OPERATION

Stand-alone call processing is an optional feature of the MMRSR. This feature provides local service to customers when one or all of the RSMs lose communications with the host office. In the MMRSR if some but not all RSMs cannot complete calls to the host, then the MMRSR is in partial stand-alone. If none of the RSMs in the MMRSR can complete calls to the host, then the MMRSR is in full stand-alone. This may be due to loss of umbilicals to the host office. When this happens, the communication between the RSMs in the MMRSR is over the ICLs, instead of the control time slot on the umbilical links to the host office. The stand-alone call processing option must be purchased for all RSMs of an MMRSR or for none.

Call processing treatment for calls involving an MMRSR in partial stand-alone depends on whether the involved RSMs are in module standalone and whether the call is direct or hunted. Direct calls between RSMs are completed, regardless of the stand-alone state of the modules. Direct calls (that is, calls not sent to AM/CMP hunted ports) are completed into or out of the MMRSR from RSMs which are not in module stand-alone. Calls to global hunt groups are handled as if the MMRSR were in full stand-alone. Global groups with ports on both RSMs and on SMs not on the MMRSR are split into two parts by either stand-alone or partial stand-alone. An origination on any RSM must be able to reach any port on the MMRSR of a hunted group with appearances on any RSMs. It is not, however, routed outside the MMRSR even if the MMRSR is in partial stand-alone and the origination is from an RSM which is not in module stand-alone.

During the linked mode of operation, the routing of calls between the host 5ESS[®] switch and the RSMs of the MMRSR is done in the AM/CMP through the host SM. If a host SM becomes isolated, these connections cannot be made, and the RSMs of an MMRSR hosted by this host SM enter module stand-alone. The other RSMs of that MMRSR (hosted by a different host SM) enter partial stand-alone.

The RSM in a stand-alone condition is nondisruptive to calls not associated with the hardware or software problem which caused the transition. All stable intra-RSM (a call originating and terminating on the same RSM) and inter-RSM (call between two RSMs on the same MMRSR) calls are maintained. All calls between an RSM and the host 5ESS[®] switch receive stand-alone call treatment. Stand-alone call treatment is either reorder tone or a recorded announcement. If a CAMA ONI trunk call is in progress when the RSM goes into stand-alone, due to the loss of communications with the host, the call is allowed to complete free of charge. The stand-alone announcements are available as an option which requires an announcement machine. Announcements typically interface with a 5ESS[®] switch through a trunk unit. A line side stand-alone announcement interface is available for the RSM applications that do not otherwise require a trunk unit. Without the stand-alone announcement option, calls that cannot be routed in the RSM are given reorder tone.

Stand-alone billing allows the MMRSR to buffer call record data during stand-alone operation. Upon the restoration of the umbilical links to the host 5ESS[®] switch, this call record data is sent to the AM.

Most of the local services that are provided in the normal linked mode of operation are provided while in stand-alone. The basis for providing most of the services is the local routing capability of the RSM. The local routing data is kept redundantly in both the AM/CMP and the RSM. If a telephone company chooses not to purchase the stand-alone option, the RSM routes all call attempts to reorder tone, and no calls are completed by the RSM while it is in the stand-alone state.

Stand-alone call processing provides service to all line equipment options currently available on RSMs; these are:

- ☐ Dial pulse
- ☐ Touch-tone calling
- ☐ Sleeve lead
- ☐ Group alerting
- ☐ Make-busy key
- ☐ Integrated SLC[®] carrier system.

Stand-alone call processing provides service to the following classes of lines during stand-alone operation:

- ☐ Single-party lines.
- ☐ 2-party lines.
- ☐ 4-, 5, 8-, and 10-party lines ☐ During linked operation, an operator is attached to these lines to determine the caller's number if the call involves toll or message unit charges. During stand-alone operation, the operator cannot be connected to the call in the MMRSMS unless there is an operator trunk on the RSM. Reverting calls (calls to another party on the same 2-party or multiparty line) are allowed during stand-alone operation.
- ☐ Coin station lines ☐ These include dial-tone-first and coin-first coin stations. In order to connect the necessary coin collection announcements to local overtime calls from coin stations, conference circuits are necessary. Since there are no conference circuits on an RSM, calls in which either party is on an RSM in stand-alone cannot be given local overtime announcements. These calls will not be disconnected if no coins are inserted. However, if coins are inserted, they will be collected.
- ☐ Charge-a-call lines ☐ Calls other than emergency calls made from these lines require attachment to an operator trunk to gather billing information. These calls will be completed if there is an operator trunk available on the MMRSMS.
- ☐ PBX lines.
- ☐ Outgoing trunks to a direct inward dialing (DID) PBX.
- ☐ Hotel/motel lines ☐ The RSM will bill the hotel or motel from these lines if the billing option has been purchased and peg any message registers associated with the lines.

Stand-alone call processing uses the following strategy to complete calls during stand-alone operation:

- ☐ Intra-RSM calls made to nonhunted lines, or to local hunt groups, will be completed as during linked operation.
- ☐ Inter-RSM calls made to nonhunted lines, or to local hunt groups, will be completed over the ICLs as during linked operation.
- ☐ Calls made to emergency numbers not terminated on the MMRSMS are rerouted to lines or trunks that do terminate on the MMRSMS. This rerouting will be engineered by the telephone company. The ability to reroute such calls is provided for a maximum of 10 numbers per MMRSMS (100 numbers in the AM). From 1 to 15 digits can be rerouted plus a prefix digit (separate field). The OTC provides the valid

numbers for this relation. The stand-alone test line can be used, in the linked operation mode, to perform a call-through test to verify that proper stand-alone emergency rerouting occurs.

- ☐ Calls originating on an RSM in "module stand-alone" that must complete to a hunt group (multiline or trunk) are routed in the RSM. Calls made to global hunt groups that have terminations on the RSM are routed to the subset of the hunt group that terminates on the RSM. If the call to a hunt group cannot be completed on the originating RSM and there are members on one or more of the other RSMs in the MMRS, then an attempt is made to complete the call on one of the other modules. If the call cannot be completed to any of the RSMs, then the appropriate busy treatment is given. This type of modified hunting in stand-alone is called "jump hunting." For trunk groups, all alternate routes which may exist are tried on an RSM prior to the "jump." Note that if the derived data link (DDL) is used to send the jump hunt requests, that the time to hunt from RSM to RSM is approximately 1 second. This time is sufficient to avoid timing out hunted calls on an MMRS with four or fewer RSMs, as the architecture requires. For RSMs that are in "module partial stand-alone," calls to hunt groups are routed the same way as an RSM in stand-alone except, if the called number is not on the MMRS, it is routed to the AM/CMP for completion at an SM on the host or at some other RSM (with the 5E5 software release, these calls are routed by data located in other SMs).
- ☐ Calls made to nonhunted lines not terminating on the RSM during full stand-alone are rerouted to either reorder tone or an announcement. This rerouting is a telephone company option.
- ☐ Calls made to nonhunted lines, not terminating on the MMRS during partial stand-alone, from an RSM not in stand-alone, are routed as in the linked mode of operation.

Stand-alone call processing provides the same originating and terminating line treatments during stand-alone operation as during linked operation.

The MFC features consist of business and residence constructed features. Some of the features work while the MMRS is in stand-alone, while other features work with reduced capabilities. Still other features do not work at all because they use resources on the host 5ESS® switch. For a call to complete, the originating and terminating parties must be in the same RSM of the MMRS. Other resources must also be available for the call to complete and assignments relating to routing, queuing, and hunt keys must be made appropriately.

The MMRS provides measurements on "partial stand-alone" and "full stand-alone" faults and usage. See "MEASUREMENTS", Section 5.1.2.

Network management controls may be implemented on MMRS trunks while the RSM is in the linked mode of operation. These controls are not in effect on trunks terminating on the MMRS while it is in partial or full stand-alone.

4.9.4 MMRS TRUNKING

All trunk types which are operational on a 5ESS® switch SM are supported on the MMRS during the linked mode of operation. During the stand-alone mode of operation, all trunk types that are operational on a 5ESS® switch SM are supported on the MMRS, except for the following:

- ☐ No queuing to CAMA ONI trunks
- ☐ No network management controls
- ☐ Private facility access (PFA) trunk group busy lamps are modified in the way they are handled
- ☐ No modular queuing to PFA trunks (modular queuing to local PFA groups is provided if the RSM has modular queuing)
- ☐ Loss of CCS trunks due to the RSM losing access to the CNI ring transport.

The EAS trunk types are shown in Table 4-2 . The tandem (toll) trunk types are shown in Table 4-3 .

Table 4-2 MMRSM EAS Trunk Types

TRUNK CATEGORY	TRUNK TYPE	FEATURE NUMBER
Incoming Interoffice	Local - RB supervision, MF or DP	25-05-0100
	Local - E&M lead supervision, MF or DP	25-05-0200
	Tandem - RB supervision, MF or DP	25-05-0300
	Tandem - E&M lead supervision, MF or DP	25-05-0400
	Immediate Start - RB supervision, DP	25-05-0500
	Immediate start - E&M lead supervision, DP	25-05-0600
	Tandem completing toll	25-05-0700
Switchboard or Desk	Toll switching	25-05-0901
	Verification	25-05-0903
	Local test desk or cabinet access	25-05-0905
Outgoing Interoffice	RB supervision, MF or DP	25-06-0100
	E&M lead supervision, MF or DP	25-06-0200
	Directory assistance	25-06-0300
	Switchboard	25-06-0501
	TSPS	25-06-0502
	Repair service bureau access	25-06-0503
	Access to local test desk	25-06-0504
	Centralized intercept	25-06-0505
Two-Way Trunks	Interoffice, MF and DP	25-07-0100
	Switchboard and desk	25-07-0300

Table 4-3 MMRSM Toll Tandem Trunk Types

TRUNK CATEGORY	TRUNK TYPE	FEATURE NUMBER
Toll Connecting	CAMA	60-01-0102
	DDD access	60-01-0101
	TSPS - SP	60-01-0103
	Toll completing - TC	60-01-0104
	2-way operator	60-01-0105
	2-way toll connecting	60-01-0106
Intertoll	Primary intertoll	60-01-0201
	Emergency access	60-01-0202
	Regular access	60-01-0203
	TSPS verification	60-01-0204
Secondary Intertoll	Toll tandem - TT	60-01-0301
	Operator assist and leave word	60-01-0302
	Residual trunks	60-01-0303
	Delayed call - DC	60-01-0304
Auxiliary Service	Rate and route	60-01-0401
	Rate quote	60-01-0402
	Directory assistance	60-01-0403
	Time and weather	60-01-0404
Special Service	DID - DI	60-01-0501
	800 service trunk	60-01-0502
Miscellaneous	CAMA operator	60-01-0601
	Data processing system	60-01-0602
	Trouble reporting	60-01-0603
DID		60-08-0000

4.9.5 MMRSM MULTILINE HUNT GROUPS

4.9.5.1 Overview

This section describes how the hunting, queuing, and hunt key features work for a multiline hunt group (MLHG) located on an MMRSM in stand-alone. The level of service of these MLHG features in stand-alone depends upon the location of that MLHG's hunting, routing, queuing, and metallic service unit (MSU) modules.

4.9.5.2 Routing, Hunting, Queuing, and MSU Modules

When an RSM in an MMRS cluster loses its link to the host SM, it is in full stand-alone and its cluster mates are in partial stand-alone. A call originating outside the MMRS cluster will be blocked from terminating to an MLHG hunted line on an RSM that is either in partial or full stand-alone.

The routing module is the SM where the DN translation data resides for any particular DN. If DN translation data is not available during stand-alone for the dialed DN, the call fails to route and receives reorder.

When a call is made to an MLHG, hunting data is accessed to determine the busy/idle status of the MLHG members. An SM is designated as the hunting module for each MLHG. The hunting module contains the dynamic hunting data for that MLHG.

The queuing module is the SM where the dynamic queuing data resides. The queuing module contains all of the resources needed to provide delay treatment (queuing announcement frame and/or music source trunk). Both the hunting and queuing modules must be accessible during stand-alone for the MLHG queuing feature to work.

The MLHG hunt keys include group make busy, position make busy, member make busy, random make busy, and stop hunt keys. These are available for both analog and ISDN MLHG members. Unlike ISDN hunt feature buttons, analog hunt keys require an MSU for operation. The MSU module is the SM that contains the MSU necessary for toggling MLHG analog hunt keys. To activate or deactivate (toggle) analog hunt keys during stand-alone, access to the MSU SM is required.

4.9.5.3 MMRS MLHG Configurations

4.9.5.3.1 Overview

The configuration of an MLHG within an MMRS affects the level of service available during stand-alone. Specifically, the location of the MLHG members (particularly member 1), and the location of the MLHG hunting, routing, queuing, and hunt key data determines stand-alone performance.

4.9.5.3.2 MMRS Local Configuration

All members of a local MLHG within an MMRS are on the same RSM. That RSM is also the hunting module for the MLHG. The hunting order is preserved during stand-alone. If the queuing module is also within the MMRS, queuing will be available during stand-alone. If the MLHG uses analog hunt keys and the MSU module is within the MMRS, the hunt keys will function correctly during stand-alone. This local MLHG configuration, with all required SMs within the MMRS, is the recommended MLHG configuration. It provides the same MLHG service during standalone as in linked mode for all software releases.

4.9.5.3.3 MMRS Global Configuration

A global MLHG has members on more than one SM. Functionality of the global MLHG during standalone depends upon the location of the hunting data. Whenever a stand-alone condition prevents access to the AM or hunting SM, global MLHG members are hunted using a strategy called jump hunting. Jump hunting begins on the originator's RSM where the subset of MLHG members on that RSM are hunted. If no member is available, the call then "jumps" to the next RSM and hunts the subset of members there. This process continues until an idle member is found or until all the RSMs in the MMRS have been hunted. Jump hunting is necessary in 5E6 and earlier software releases and with the 5E7 software release when the hunting SM is outside the MMRS. The hunting order is not preserved when jump hunting is employed.

With the 5E7 and later software releases, a global MLHG functions the same in the stand-alone mode as in the linked mode if the hunting and routing modules and all MLHG members are within the MMRS cluster. If the queuing module is also within the MMRS, queuing will be available during standalone. If the MLHG uses analog hunt keys and the MSU module is within the MMRS, the hunt keys will function correctly during standalone. Non-MLHG features that use data on the hunting module such as call forwarding and

LASS will function correctly during standalone.

4.9.5.4 MMRSM MLHG Stand-Alone Hunting

When an MMRSM cluster is in standalone, the result of dialing an MLHG DN depends on the location (inside/outside the MMRSM) of the originator of the call and the location of the hunting module.

If all members of a global MLHG are located inside the MMRSM cluster, then the hunting SM should also be located inside the MMRSM in order to provide MLHG hunting that is the same as linked-mode hunting. Although not recommended, there may be situations where it is necessary or desirable to have MLHG members both inside and outside the MMRSM. If the hunting SM is inside the MMRSM, the members outside cannot be hunted during standalone. If the hunting SM is outside the MMRSM, the members outside will be hunted by calls originating outside and the members inside will be jump hunted by calls originating inside the MMRSM.

Table 4-4 summarizes hunting during a stand-alone condition.

Table 4-4 MMRSM Stand-Alone Hunting

HUNTING SM LOCATION	ORIGINATOR LOCATION	
	INSIDE MMRSM	OUTSIDE MMRSM
Inside MMRSM	Hunt Subset of MLHG Members Inside MMRSM	Originator Blocked
Outside MMRSM	Jump Hunting	Hunt Subset of MLHG Outside MMRSM

4.9.5.5 Stand-Alone MLHG Hunt Key Updating

An analog hunt key can be activated/deactivated during standalone if the MLHG member, MSU module, and the hunting module are all located within the MMRSM cluster. An ISDN hunt feature button (FB) can be activated/deactivated if the hunting module and the module where the member with the FB resides are located within the MMRSM cluster.

Table 4-5 summarizes hunt key updating during standalone for the 5E7 software release configurations where the hunting module is located within the MMRSM.

Table 4-5 Stand-Alone Hunt Key Updating

HUNTING SM LOCATION SA STATUS	MSU SM OR FB MEMBER SM LOCATION	
	INSIDE MMRSM	OUTSIDE MMRSM
Inside MMRSM Full Standalone	Hunt Key Data Updated Correctly	Hunt Key Data Not Updated
Inside MMRSM Partial Standalone	Hunt Key Data Updated Correctly	Hunt Key Data Updated Correctly

4.9.5.6 MLHG Stand-Alone Non-Service After Delay Announcement (SADA) Queuing

When an MMRSM cluster is in stand-alone, MLHG queuing of a call depends upon the location (inside/outside the MMRSM) of the originator of the call, the hunting module, and the queuing module. If the hunting SM is located inside the MMRSM, the queuing SM should also be located inside the MMRSM. If the hunting SM is located outside the MMRSM, the queuing SM should also be located outside the MMRSM.

Tables 4-6 and 4-7 summarize the functioning of non-service after delay announcement (SADA) queuing during standalone.

Table 4-6 Stand-Alone Non-SADA Queuing (Originator Inside MMRSM)

HUNTING SM	QUEUING SM LOCATION	
	INSIDE MMRSM	OUTSIDE MMRSM

LOCATION		
Inside MMRS	Queueing Supported	No Queueing
Outside MMRS	No Queueing	No Queueing

Table 4-7 Stand-Alone Non-SADA Queueing (Originator Outside MMRS)

HUNTING SM LOCATION	QUEUEING SM LOCATION	
	INSIDE MMRS	OUTSIDE MMRS
Inside MMRS	Calls Blocked, No Queueing	Calls Blocked, No Queueing
Outside MMRS	No Queueing if Q-SM in Full SA Queueing if Q-SM in Partial SA	Queueing Supported

4.9.5.7 MLHG Stand-Alone SADA Queueing

The SADA queueing is used to provide an announcement to all calls coming into an MLHG. If the SADA queueing feature is assigned and active, every call to the MLHG is queued, even if a MLHG member is available. During standalone, if a configuration does not support queueing, then calls to a MLHG with SADA queueing must receive busy treatment, even if some members of the MLHG are idle.

4.10 SM STANDALONE CALL PROCESSING

With the 5E5 software release, the stand-alone mode of operation is available as an option on all SMs [that is, host SMs, local SMs, optically integrated remote switching module (ORMs)]. This feature is an extension to the stand-alone feature currently available for the MMRS and provides the following capabilities:

- (1) **Stand-Alone Call Processing:** This feature provides the capability to complete calls from any port appearance on an SM to any other port on the same SM while isolated from the rest of the 5ESS[®] switch. This includes all circuit switched and ISDN calls on the same SM. The completion of calls to other switches is dependent upon other features (that is, the intermodule trunking feature allows communication over peripheral trunks as alternate or primary routes from the SM.)
- (2) **Stand-Alone Emergency Number Access:** This feature provides for the routing of up to 500 emergency numbers to a locally terminated DN or route indices appearing on that SM.
- (3) **Stand-Alone Billing:** This feature provides the ability to collect billing information for more than a minimal set of calls during the isolation mode period.
- (4) **Stand-Alone Announcements:** This feature provides the connection to adjunct announcements when the SM is in the stand-alone mode of operation.

The SM stand-alone feature provides POTS terminations to lines, local MLHGs, local trunk groups, and the ports in global trunk and MLHGs that physically terminate on the module. The following features are supported during SM standalone:

- ☐ Speed calling
- ☐ Call waiting
- ☐ Call forwarding - don't answer
- ☐ Call hold.

Features that require shared resources such as a global digital service unit (GDSU), access to routing data stored in the AM/CMP, or access to hardware associated with the AM [for example, the direct link node (DLN) for CCS] are not supported during standalone. This includes the following features:

- ☐ Three-way calling

- ☐ Conference calling - 6-way
- ☐ Directed call pickup with barge-in
- ☐ Outward Wide Area Telecommunications Service (OUTWATS)
- ☐ Simulated Facility Groups
- ☐ Call transfer (if controller disconnects before third party answers)
- ☐ Trunk terminating calls requiring CCS protocol such as ISDN.

If the SM stand-alone feature is not provided on an SM, all calls (except emergency calls routed to alternate lines) are routed to reorder when that module becomes isolated from the host 5ESS[®] switch. Locally terminating emergency calls will also not complete without the stand-alone option. Only emergency calls that are rerouted will complete.

Note that the appropriate resources must be available on the stand-alone SM for the feature to work properly.

4.10.1 EMERGENCY ROUTING

Switching modules on the 5ESS[®] switch have the emergency routing capability when isolated from the 5ESS[®] switch. This capability exists regardless of whether or not the switching module has the stand-alone (SA) feature.

Emergency routing is attempted only if all other attempts to terminate the call have failed because the switching module is isolated from the 5ESS[®] switch. Emergency routing may occur in isolated switching modules or MMRSMs under the following conditions:

- ☐ If for the called MLHG, no MLHG members exist on the isolated SM, RSM, MMRSMS, or ORM.
- ☐ If the called DN is a no-hunt DN in the MLHG and the no-hunt member does not exist on the isolated SM, RSM, MMRSMS, or ORM.
- ☐ If the isolated SM, RSM, MMRSMS, or ORM is not the routing SM for the called DN and the called DN port is not on this SM, RSM, MMRSMS, or ORM. This condition is stated because the stand-alone module must be a routing module for the called DN in order to know if that DN is part of an MLHG.
- ☐ If for the isolated SM, RSM, MMRSMS, or ORM, the end of the routing chain for trunk terminations has been reached without finding a route.

Emergency routing allows the isolated switching module to compare the called DN, with a list of up to ten emergency numbers if the switching module does not have the SA feature, or up to 100 emergency numbers if the switching module does have the SA feature.

Each entry in the emergency routing list is either a DN, or a range of DNs that need to have the same alternate routing treatment when a switching module is isolated from the host 5ESS[®] switch. Ranges of DNs are specified by entering the wild card digit '*' in the appropriate DN digit positions. This wild card digit matches any dialed digit at that position. The wild card digits '*' are available with the 5E5 and later software releases. The following rules apply to the use of the wild card matching digit '*':

- ☐ **XXX-XX****: Reroute a hundreds group to the same destination.
- ☐ **XXX-XXX-XX****: Reroute a hundreds group to the same destination.

- ☐ **XXX-****:** Reroute an entire office code to the same alternate destination.
- ☐ **XXX-XXX-****:** Reroute an entire office code to the same alternate destination.
- ☐ *****-****:** Reroute all office codes within an area code to the alternate destination.
- ☐ **XXX-***-****:** Reroute all office codes within an area code to the alternate destination.
- ☐ ***_*_*_*_*_*_*_*_*_*_*_*_*_*_*_*:** Reroute all dialed calls (up to 15 digits) to the same destination.

The X is a value 0-9. The wild-card (*) character matches any dialed digit at that position.

When determining the order of precedence for matching emergency routing DNS, if an exact match fails on the entire DN, then partial matches are attempted with wild card digits (``*''s) in the hundreds group, in the whole office code, in the entire area code, and lastly for all 15 digits.

If the called DN matches with one of the emergency numbers, that number is routed to either a local DN or to a route index. The local DN is associated with a local POTS/ISDN line or a local MLHG, and the route index is associated with a local trunk group.

An emergency routing table also exists in the AM for 5E5 and earlier software releases and in the CMP with the 5E6 and later software releases. Prior to the 5E5 software release, this emergency routing table allows up to 100 emergency numbers (with ``wild card" digits) to be compared with a called DN. With the 5E6 and later software releases, this table allows up to 500 emergency numbers (with ``wild card" digits). This emergency routing table is accessed when failing to terminate to a switching module or MMRSM that is isolated from the 5ESS[®] switch. However, if the call is destined to a member of a hunt group that has ports on non-isolated switching modules as well, then the call may be routed to one of these other members of the hunt group.

A range of telephone numbers specified with a wild-card character must not overlap another range of telephone numbers for a remote site or local SM in this relation. If an overlap occurs and the modules in stand alone are connected by IMTs, a routed number that is overlapped would appear to terminate in both modules. This would result in the number looping through all the members of the IMT group until it is blocked.

The software was modified to give reorder instead of emergency routing after a call has been routed to a fixed route or announcement trunk. For example, this would occur when a mis-dialed call to an unassigned DN accesses the routing module for that number. Calls to the Operator or 911 that would have terminated to announcement because of a stand alone condition are allowed to emergency alternate route.

Stand-Alone Test Lines allow testing of emergency number rerouting for a RSM/ORM/SM site when the RSM/ORM/SM site is not in stand alone mode. The lines must have a LINE CLASS CODE (LCC) with a SERVICE CLASS of "SATSTLN" and a TERMINATING TREATMENT of "INDIV". When conducting the stand-alone rerouting test from the RSM/ORM/SM Site, the lines may be used to originate and dial each of the emergency numbers which is normally rerouted during stand-alone operation.

4.11 INTERMODULE TRUNKING FEATURE CALL PROCESSING

The intermodule trunking (IMT) feature provides direct trunking between SMs, MMRSMs, and/or ORMs, connected to the same 5ESS[®] switch. The intermodule trunks can be used to increase reliability by providing an alternate link for routing calls to and from SMs.

NOTE: An external timing source is required for an ORM (whereby, the ORM timing will be derived from the external source and not from the umbilicals), if features (for example, intermodule trunking, ISDN features, etc.) which need a high accuracy of timing have to be supported during stand-alone operation.

The IMT feature utilizes the existing call processing routing and digit analysis structure to achieve call routing for intermodule trunks. A call between switching modules that traverses an intermodule trunk is treated as either a line-to-trunk or trunk-to-trunk call in the originating module, and as a trunk-to-line or trunk-to-trunk call in the terminating module. The 5ESS[®] switch call processing does not make any distinction between calls terminating to interoffice trunks and calls terminating to intermodule trunks.

If the IMT is designated as the primary route, calls may be allowed to overflow through the NCT links when the IMTs are busy. If the stand-alone call processing feature is purchased, the IMT feature allows a range of DNs to be rerouted over the IMTs (or anywhere else), using emergency routing, when a call is made to or from a module in standalone.

Intermodule trunks can be used in one of three ways:

- (1) As a primary route with overflow or alternate routing going to the NCT links
- (2) As a primary route with no overflow or alternate routing to the NCT links
- (3) As an alternate emergency route only when the SM becomes isolated from the rest of the switch. This will work only if the SM has the stand-alone call processing option.

Only interswitch BRCS features will work over intermodule trunks. The CCS7 calls will complete provided the intermodule trunks are designated CCS7 and the switch has CCS7 capabilities.

The Local Area Switching System (LASS) features will work over the IMTs if the following conditions are met:

- (1) The IMTs are CCS7
- (2) The host 5ESS[®] switch has CCS7 capabilities
- (3) The modules on both ends of the IMT have communication with the AM.

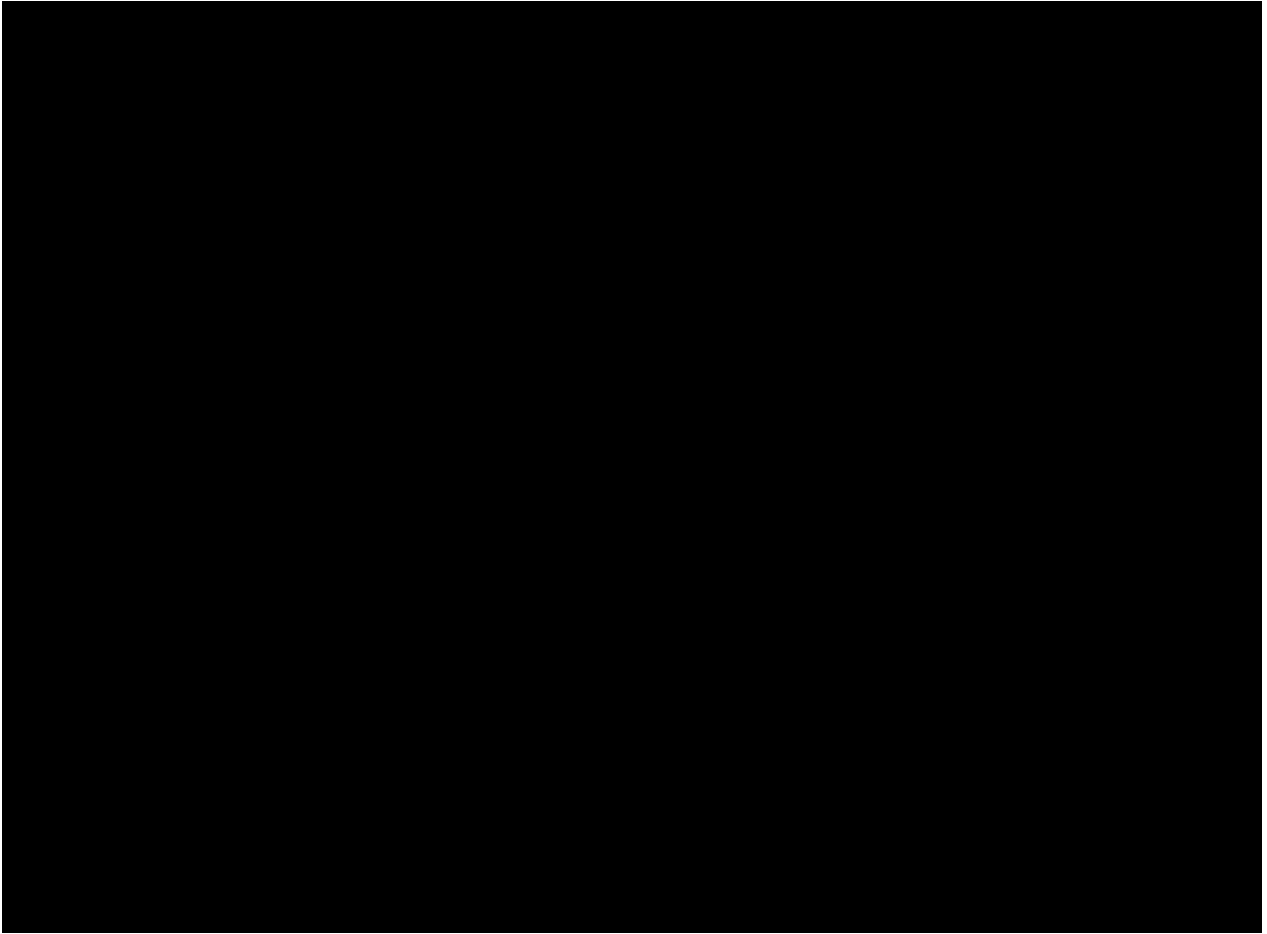


Figure 4-1 Intraoffice Line-to-Line Call Path Intraoffice line-to-line call path

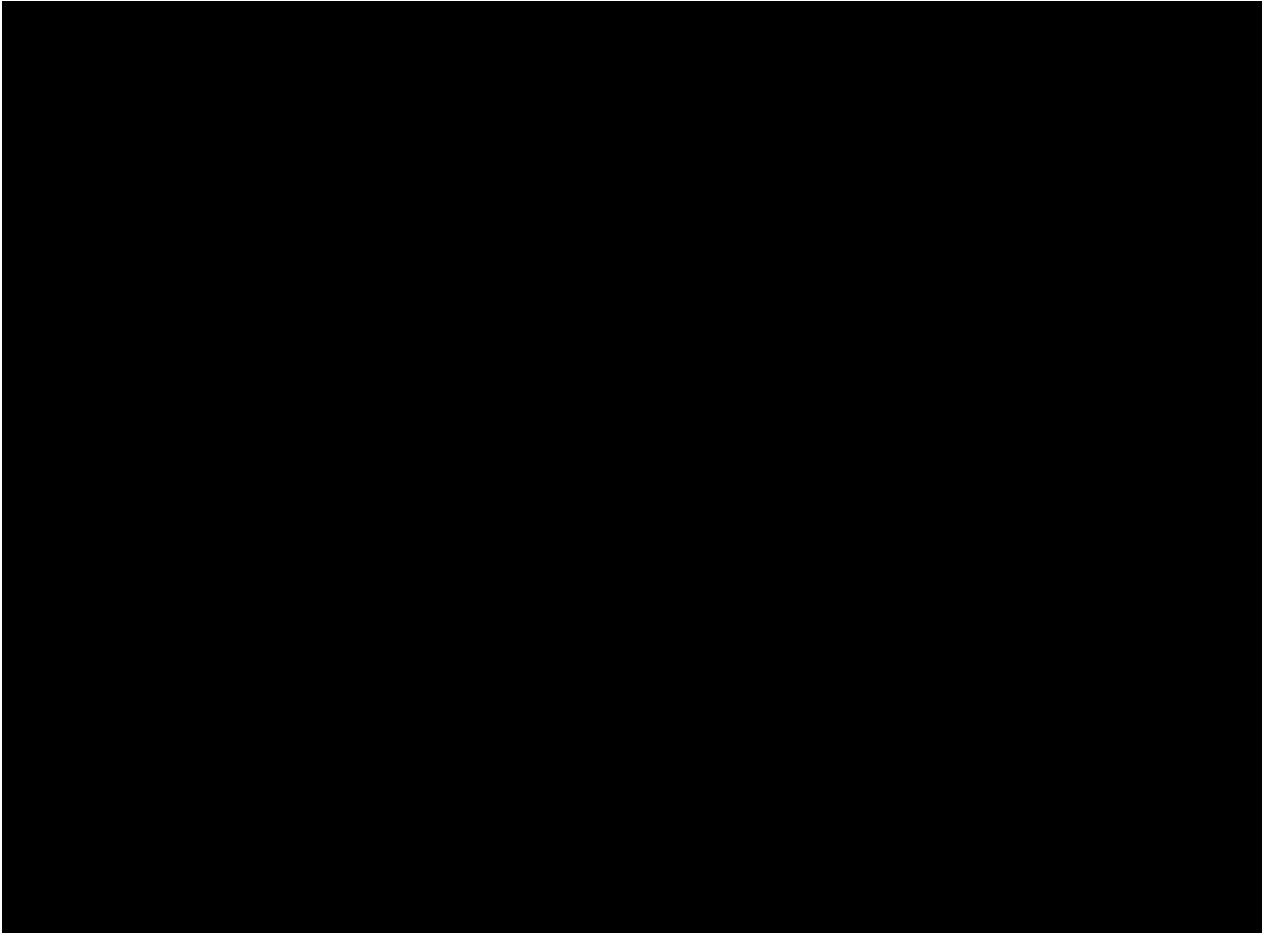


Figure 4-2 Interoffice Line-to-Trunk Call Path Interoffice line-to-line call path

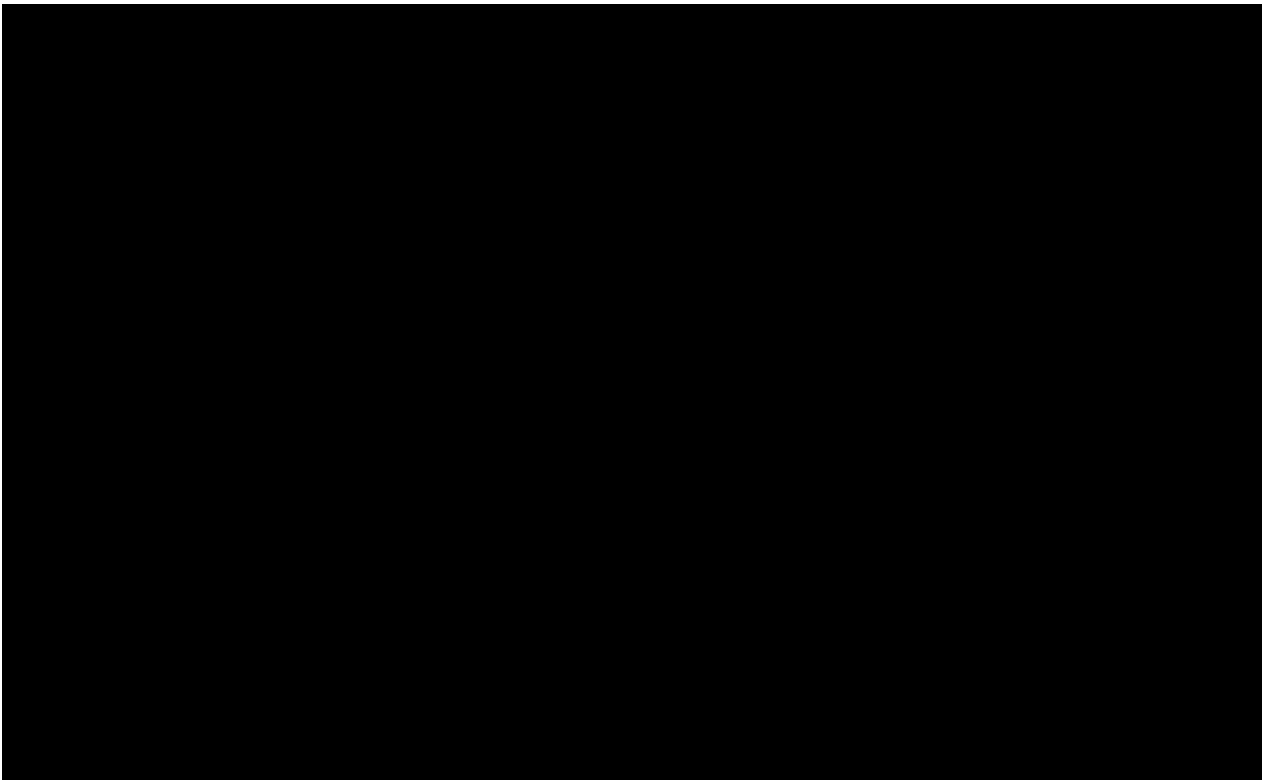


Figure 4-3 5ESS Switch Call Processing Programs

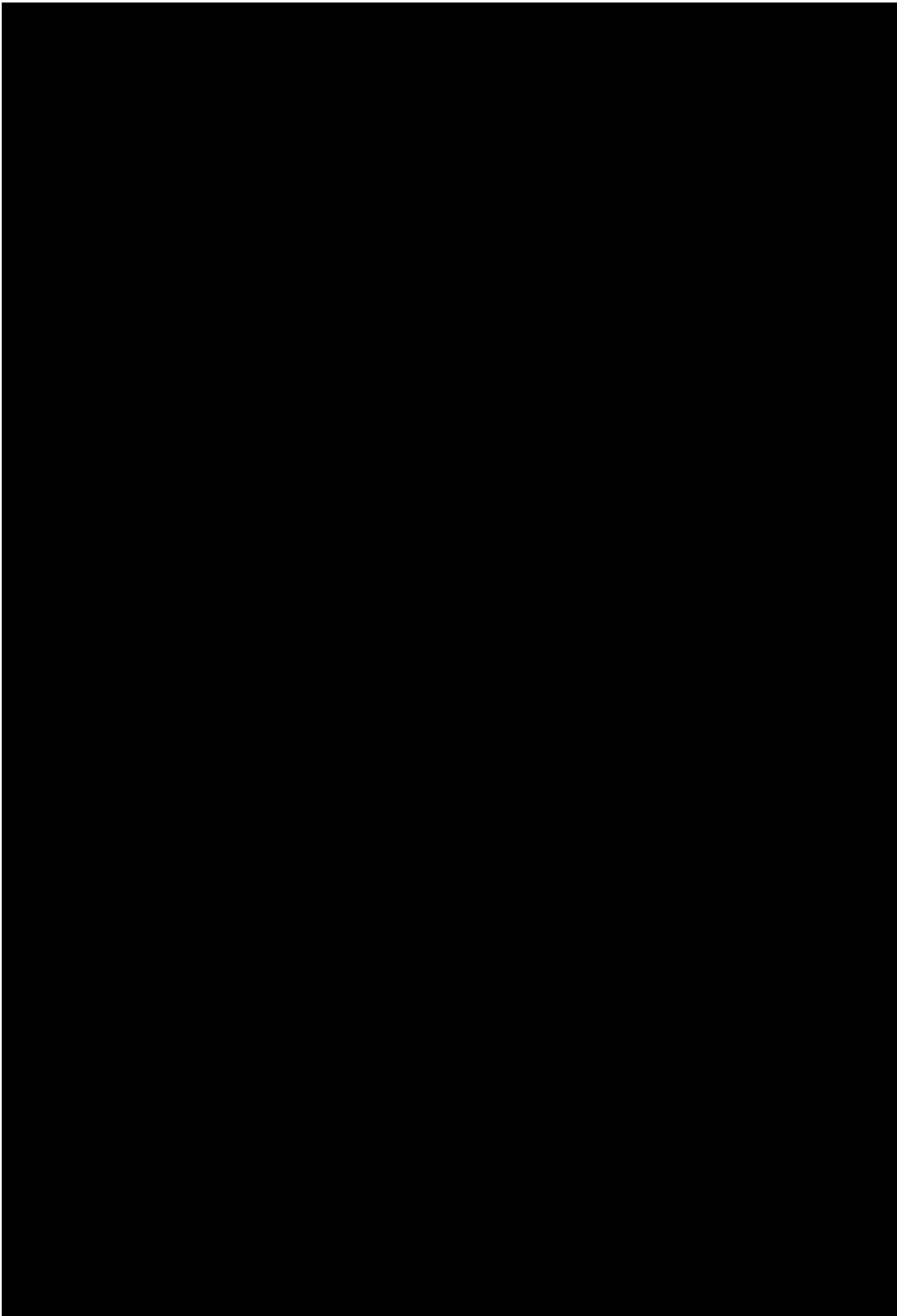


Figure 4-4 POTS Call Message Flow POTS call message flow

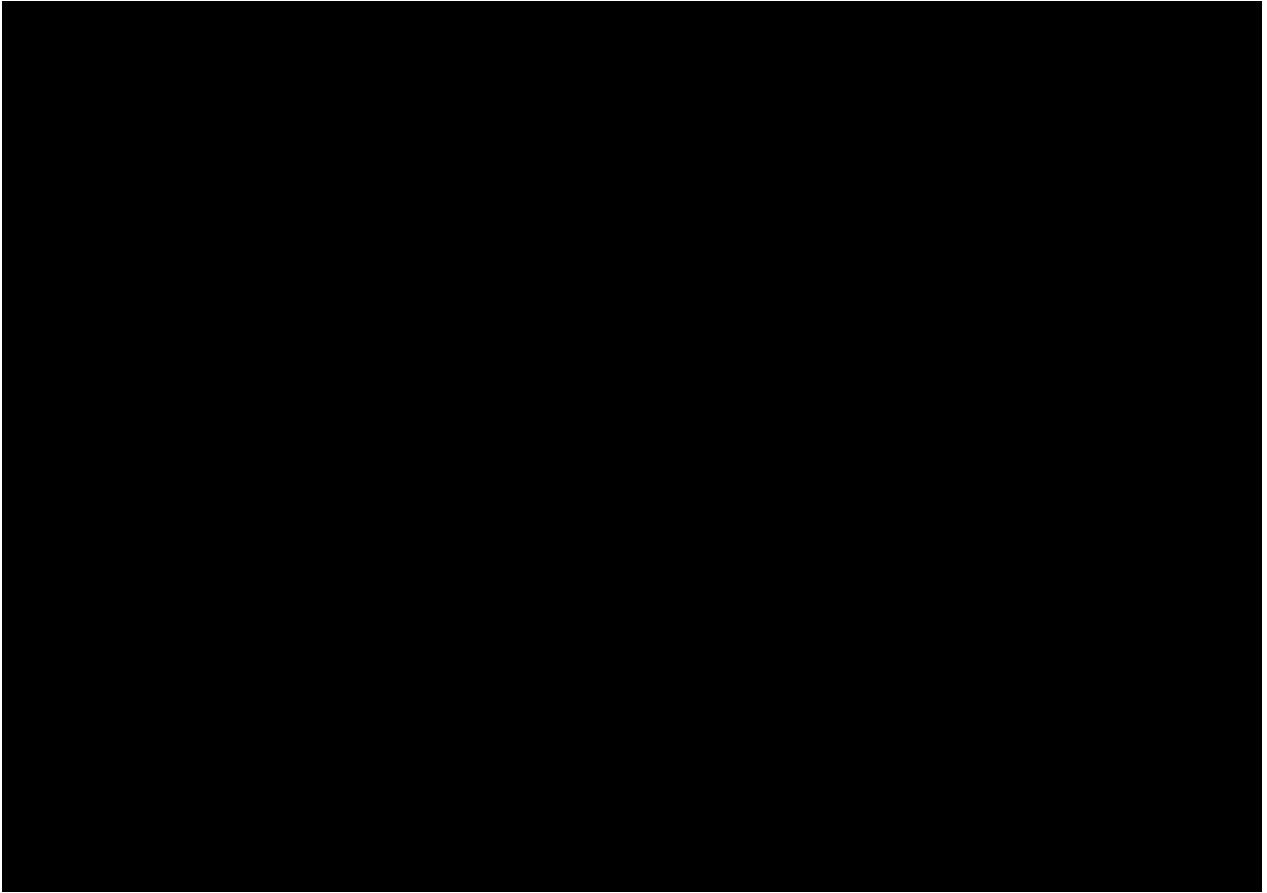


Figure 4-5 Line-to-Line POTS Call Line-to-line POTS call

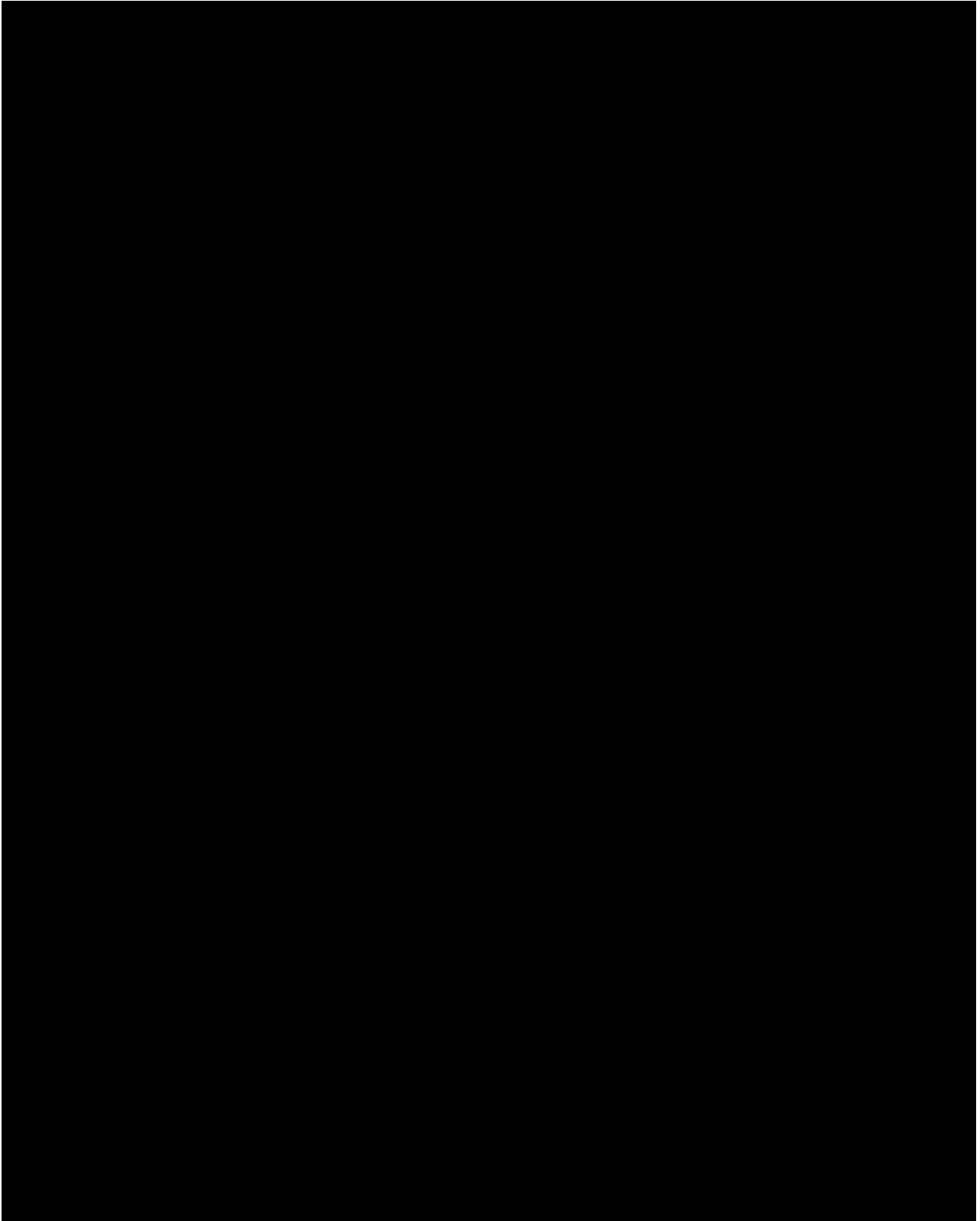


Figure 4-6 Routing and Charging Block Diagram Routing and charging block diagram

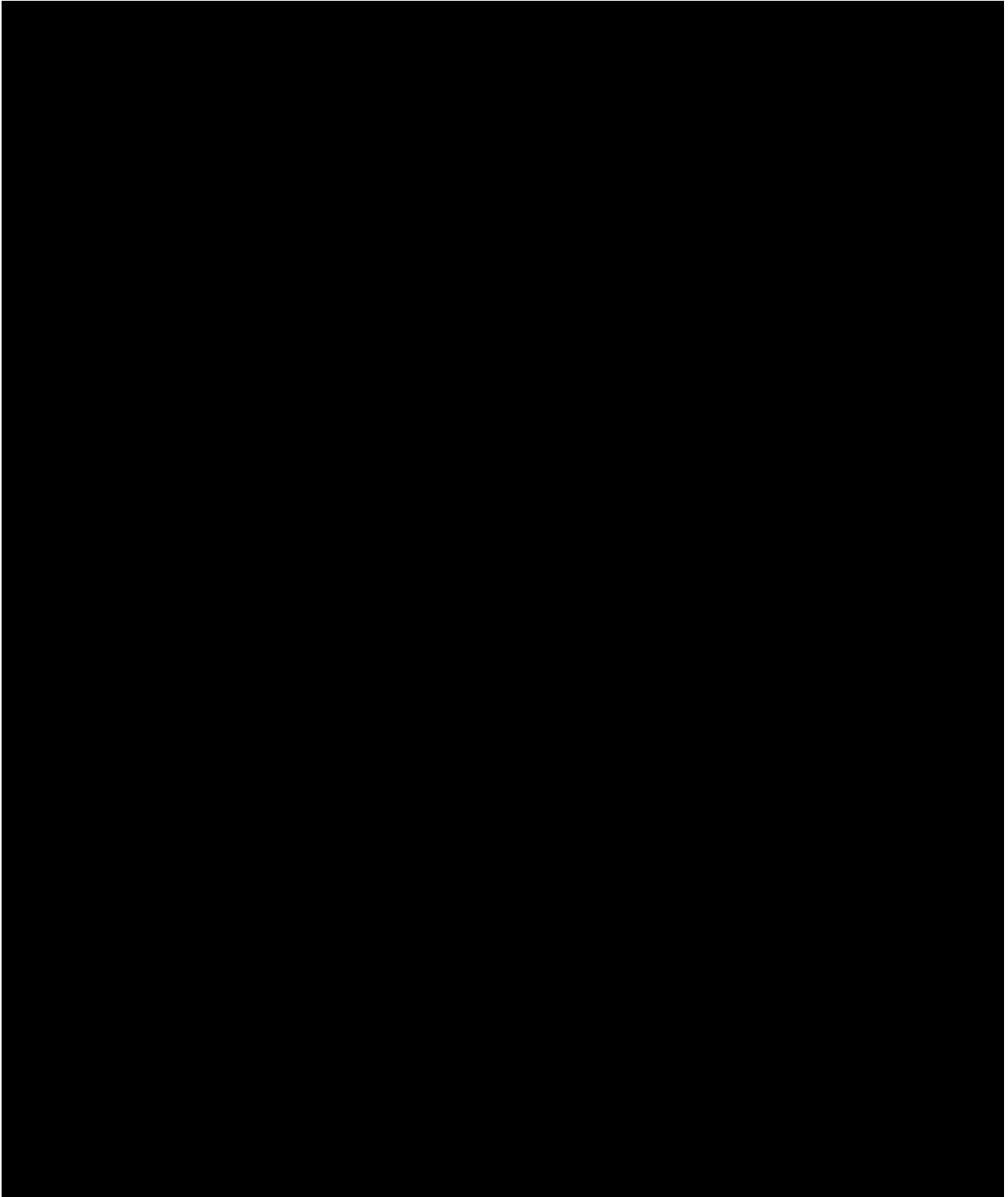


Figure 4-7 Line Origination and Dial Tone Application Line origination and dial tone application

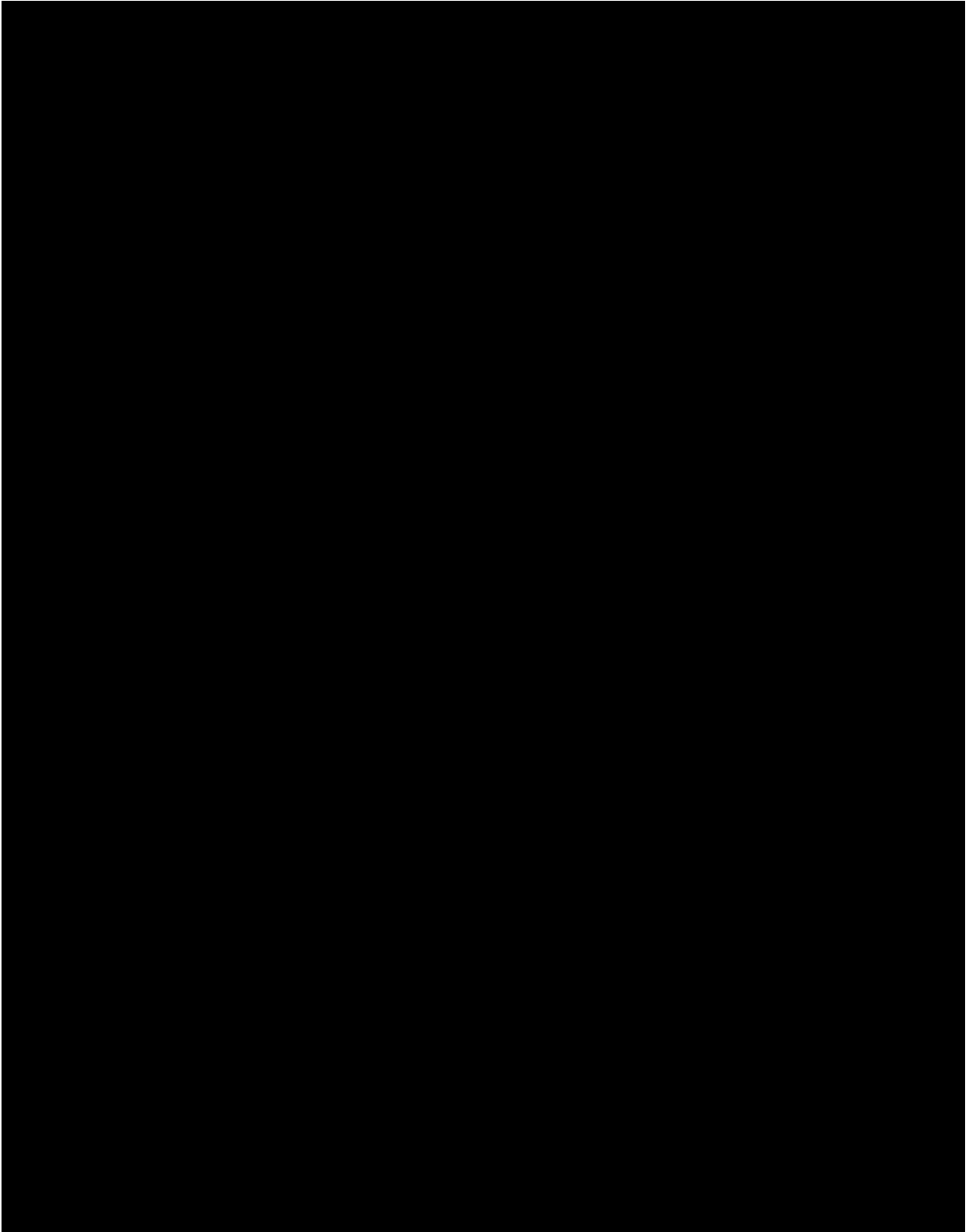


Figure 4-8 Digit Reception and Analysis Digit reception and analysis

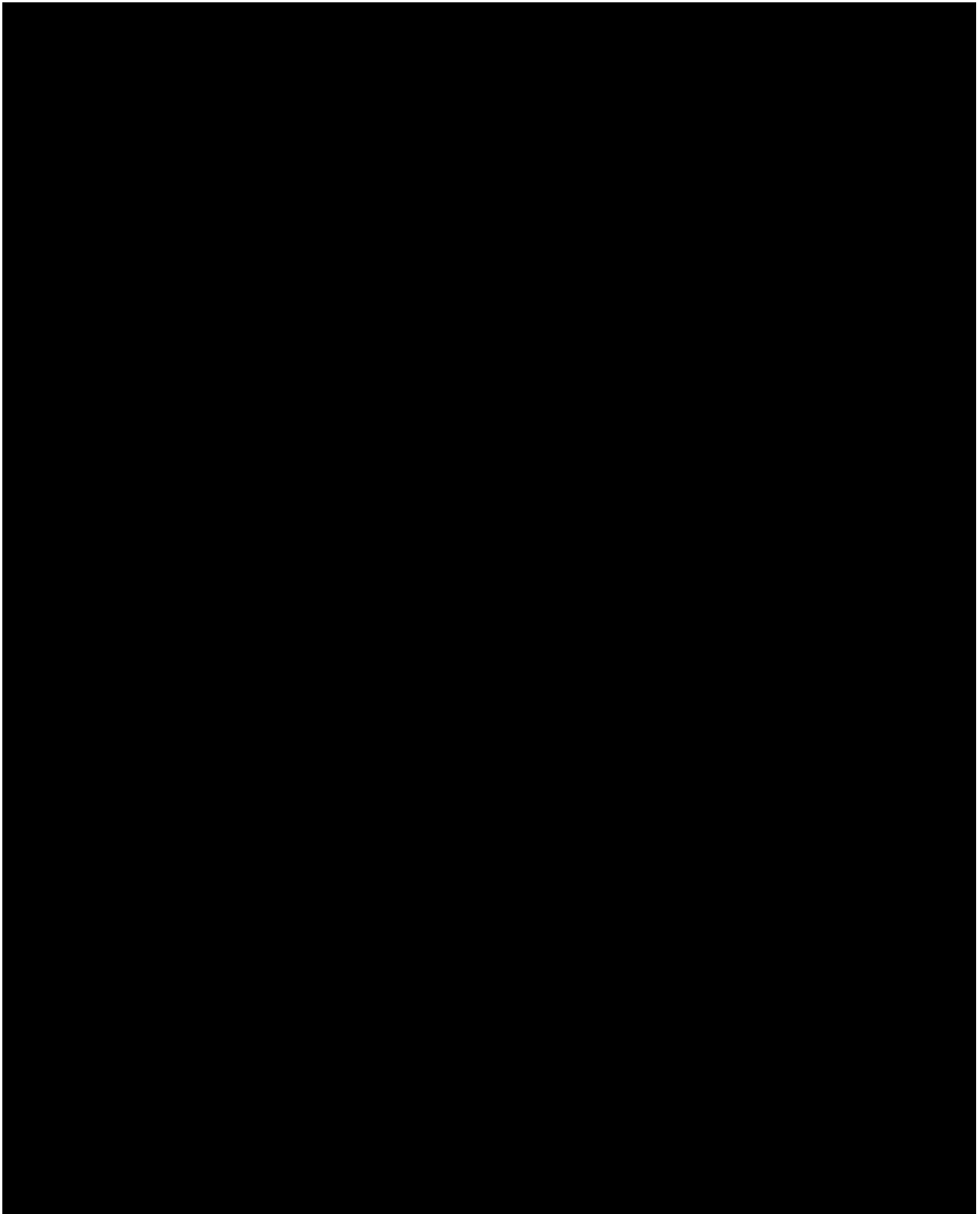


Figure 4-9 Rate and Route Flow Rate and route flow

4.12 NUMBER PORTABILITY

Number Portability (NP) provides the telephone subscribers with the ability to move (port) their directory numbers (DN) from one switch to another. The initial implementation allows subscribers to change service providers within a rate center. NP is based on the use of a Location Routing Number (LRN) for call routing

instead of on the dialed (called) DN. An LRN is a 10-digit number (NPA-NXX-XXXX) that uniquely identifies a switch that serves ported DNs. The first six digits (NPA-NXX) of the LRN are significant. Any given switch may be assigned one or more LRNs; however, only a single switch is identified by a given LRN. The LRN is obtained using Advanced Services Platform (ASP) triggering mechanisms. When a call is placed to a DN for which a NP trigger is active and certain checks are passed on the switch (To determine if a query should be launched), a NP query is launched to the NP database (NPDB) to obtain the LRN associated with this DN. Upon receipt of the LRN from the NPDB, the switch routes the call based on digit analysis of the LRN. Rating and billing of the call is based on the dialed number.

5. ADMINISTRATION

5.1 SWITCH ADMINISTRATION

5.1.1 LINE AND NUMBER ADMINISTRATION

5.1.1.1 Overview

This section provides an overview of the line and number administration considerations for the 5ESS[®] switch. Controlled assignment is necessary to ensure that equipment utilization is in accordance with design specifications and meets service criteria. The technical and administrative restrictions that affect line and number assignment are described herein. Detailed information can be obtained in the TG-5 and the 235-070-100, *Administration and Engineering Guidelines*.

5.1.1.2 Loading

The 5ESS[®] switch loading is simpler than other switches because there are no junctors. Therefore, there is no need for junctor balancing or to redistribute the load after network additions. It is important, however, to maintain a class-of-service balance and not to exceed the capacity in order to maintain acceptable service levels. More complete information is available in the TG-5 and the 235-070-100, *Administration and Engineering Guidelines*.

5.1.1.3 Telephone Numbers

There are no restrictions inherent in the 5ESS[®] switch that restrict assignment of telephone numbers. The 235-070-100, *Administration and Engineering Guidelines*, provides further details on the assignment of telephone numbers.

5.1.1.4 Line Equipment

5.1.1.4.1 Overview

Any class of service can be assigned to any 5ESS[®] switch line equipment location. Essential service and ground start are software options in the 5ESS[®] switch and may be assigned to any telephone number.

5.1.1.4.2 Line Units

An assignment algorithm is recommended in order to best utilize capacity in the line units (LUs) and memory in the switching module processor (SMP). This algorithm consists of two parts: (1) assignment of lines within a switch group or half grid, and (2) assignment of business and residence custom services (BRCS) lines sharing an individual dialing plan (IDP).

The lines within a switch group should be assigned across all switches in the following order (SW 0, 1, 4, 5, 2, 3, 6, 7). This scheme maximizes LU utilization.

The 5ESS[®] switch software releases provide centrex-like features through the BRCS features. This arrangement provides much more flexibility in the types of features available for lines or groups of lines. Generally, BRCS consists of unbundled business (that is, centrex) and residence (that is, custom calling) features that may be offered by the operating telephone company in any desired combination. Additionally, these features may be customized by the operating telephone company as desired.

Lines for any customer group sharing a BRCS IDP are assigned in a different manner than other lines. The lines of such a customer group are of the same class (business), but are assigned to a reduced number of switching modules (SMs) in the office in order to avoid unnecessary data duplication, thus saving memory. However, within an SM, the lines are assigned in the same manner as other lines. Assigning IDP lines in this manner avoids data duplication.

The number of SMs to which a BRCS IDP group is assigned should be limited, depending on the size of the group. The guidelines shown in Table 5-1 may be used. These guidelines limit the amount of data duplication while permitting the assignment flexibility required for efficient line unit capacity utilization.

Table 5-1 BRCS IDP Group Assignment

GROUP SIZE	SMs
Less than 10	2
10 to 25	3
25 to 50	4
50 to 100	6
100 to 200	10
200 to 500	12
500 to 1000	15
More than 1000	20 or more

As an example, if a customer group that shares a BRCS IDP has 30 lines; then, according to Table 5-1, these lines should be assigned to four SMs or less. These guidelines may be altered based on the number of SMs available in a particular office and the availability of lines.

5.1.1.4.3 Concentration Ratios

The 5ESS[®] switch offers four concentration ratios for the line equipment in the LU. They are 4:1, 6:1, 8:1, and 10:1. These ratios are applied based on the number of concentrators equipped in an LU as shown in Table 5-2.

Table 5-2 LU Concentration Ratios

EQUIPPED CONCENTRATORS	CONCENTRATION RATIO
0-9	10:1
0-7	8:1
0-5	6:1
0-3	4:1

On a digital carrier line unit (DCLU), the concentration ratios are either 4.5:1 or 9:1 and are based on the number of equipped peripheral interface data buses (PIDBs). Table 5-3 lists the number of PIDBs equipped for each concentration ratio.

Table 5-3 DCLU Concentration Ratios

PIDBS EQUIPPED	RATIO CONCENTRATION
2	9:1
4	4.5:1

More information on the LU and DCLU can be found in "SYSTEM ARCHITECTURE", Section 2.

5.1.1.4.4 Equipment Numbering

5.1.1.4.4.1 Overview

A knowledge of the equipment provided in the office is not sufficient for line equipment number (LEN), access interface unit equipment number (AIUEN), subscriber loop carrier line equipment number (SLEN), trunk equipment number (TEN), and digital equipment number (DEN) range checks and assignments. The originating equipment (OE) numbers for each type include both the module number and the unit number, so the actual placement within the frames determines what the valid OEs are.

5.1.1.4.4.2 Trunk Units and Digital Line and Trunk Unit

There is no concentration in the trunk units (TUs) or the digital line and trunk units (DLTUs); therefore, it is only necessary to spread trunks among the units for service protection reasons.

5.1.1.4.4.3 Integrated SLC[®] 96 Carrier/SLC[®] Series 5 Carrier and DCLU/IDCU

The SLC[®] 96 Carrier / SLC[®] Series 5 carrier remote terminal (RT) may be assigned (either mode 1 or mode 2) to a DCLU or an integrated digital carrier unit (IDCU). The TR303 standard is supported only on the IDCUs. Because the assignment of lines to an RT is determined by outside plant configurations, an assignment algorithm and capacity monitoring is recommended to prevent the overloading of DCLUs/IDCUs.

The assignment algorithm is accomplished in two steps:

- (1) Estimating hundred-call-seconds usage for each RT
- (2) Assigning RTs to DCLUs or IDCUs.

More complete information is available in the TG-5 and the 235-070-100, *Administration and Engineering Guidelines*.

5.1.2 MEASUREMENTS

5.1.2.1 Overview

Traffic, plant, and service measurements are intended to be used to view a particular aspect of 5ESS[®] switch system operation over a specified period of time: 5 minutes, 15 minutes, 30 minutes, 1 hour, and 24 hours. These measurements provide a summary of events that have taken place. For example, traffic measurements provide the current status of the switch as well as an indication to support the switch with additional resources. For a complete listing of the 5ESS[®] switch traffic and plant measurements, refer to 235-070-100, *Appendix 1, Traffic and Plant Measurements*.

5.1.2.2 Reports

5.1.2.2.1 Overview

The various measurements reports generated by the 5ESS[®] switch are described in the following paragraphs. The contents and interval of each report are specified on a per-software release basis and cannot be altered by operating telephone company (OTC) personnel. Some reports are automatic and others are demand-only. Also, some measurement information is available only to operations systems (OSs) and not as output to the switch.

5.1.2.2.2 Call Monitor Reports

The call monitor allows for the early detection of loss of call processing when all other system indicators appear normal. It requires a global digital service unit (GDSU) equipped with the transmission test facility (TTF) hardware. The call monitor reports to the OTC personnel by receive-only printer (ROP) report and major alarm when a failure in call completion analysis occurs. The analysis is based on passing 50 percent of test calls in a 5-minute interval and 90 percent over a 15-minute interval. The output is also directed to the daylog file in the form of a REPT CALLMON message.

The range of valid trunk group decimal numbers in the data base is 0-2001. The call monitor uses the decimal value 2002 to indicate that no trunk group has passed a test call since the last time the call monitor was initialized.

The call monitor can be inhibited (MCC Page 110) or requested to print the past 15-minute history and the

per-test call results (verbose mode).

In the event the REPT CALLMON CURRENT [5 or 15] MINUTE REPORT message is printed (along with a major alarm) the data to analyze is the call completion summary. The failure indicates a less than expected call completion percentage (50 percent in the current 5 minutes or 90 percent in the current 15 minutes). The number of failed tests may indicate a possible call processing, hardware, or network problem. The CCS data (if equipped) should be compared with non-CCS data to determine if a common problem exists or if the problem is related only to CCS. The OP:CALLMON input message can be used to compare the past 15 minutes of data.

Additional information on the call monitor reports can be found in 235-105-110, *System Maintenance Requirements and Tools*.

5.1.2.2.3 15-Minute Traffic Report

This report contains the machine integrity data that is used for real-time monitoring of the switching system. The report is generated by the 5ESS[®] switch every quarter-hour and is sent to the Switching Control Center System (SCCS), the master control center (MCC), and the network administration work group (NAC) channel on a scheduled basis. The latest report may be requested at any time during the 14-minute interval following initial issue of the message. The 15-minute traffic report can be inhibited through an input message at the MCC or SCCS.

The 15-minute traffic report is run in 15-minute intervals, from 23:59 to 00:14 to 00:29 to 00:44 to 00:59, etc.

5.1.2.2.4 30-Minute Traffic Report

This report contains the bulk of the switching system data and, as such, supports a majority of the functions of the network administration and network engineering functions. The size of this report is closely linked to office size because much of the data is collected and reported on a per-component [for example, SM, high-level service circuit (HLSC), LU, trunk group (TG)] basis rather than strictly office totals.

The 30-minute traffic report is generated every half-hour and is sent to the Engineering and Administrative Data Acquisition System (EADAS) in response to a polling request. If a traffic channel is in place, the 30-minute report can be made available on that channel. This report can also be requested by the MCC, the SCCS, and the NAC channel.

5.1.2.2.5 Separation Reports

Division of revenue is the process by which revenues are shared among the telephone companies based on the resources used. The hourly division of revenue report assists in the development of call-holding time factors and toll-calling volumes by incoming separations class (INSEP) and destination separations class (DESEP). For traffic separation purposes, every incoming and originating call is assigned an INSEP or DESEP based on the following criteria:

- ☐ Geographical area in which the line or trunk originates
- ☐ Ownership
- ☐ Class of service
- ☐ Type of traffic (local exchange, toll, etc.).

If enabled, the hourly separations report is sent to EADAS in response to a request or to the local traffic channel.

The 24-hour division of revenue report is sent to the EADAS at 24:00:00. This report is also available at the

local traffic channel.

5.1.2.2.6 Plant Reports

The 24-hour plant report contains data regarding originating, incoming and outgoing calls, call connect setup troubles; and, as such, reflects the maintenance effect on traffic during the past 24-hour period. See "MAINTENANCE", Section 6, for information on Maintenance.

The 24-hour plant report is generated and issued by the 5ESS[®] switch once a day at 02:07:00. The report is sent to the SCCS and the MCC and is saved for the next 24 hours to fulfill additional requests initiated by an SCCS.

The 24-hour plant report is divided into several parts. Each part provides different types of counts or counts for a particular application as follows:

- ☐ Parts 1A and 1B ☐ Service Measurements
- ☐ Parts 2 and 3 ☐ Performance Measurements
- ☐ Part 4 ☐ Remote Switching Module (RSM) Measurements
- ☐ Part 5 ☐ Trunk Error Report Analysis (TERA) Measurements
- ☐ Part 6 ☐ Inter-LATA Carrier (IC) Measurements
- ☐ Part 7 ☐ Network Call Denial (NCD) Measurements
- ☐ Part 8 ☐ Multimodule RSM (MMRSM) Measurements
- ☐ Part 9 ☐ Integrated Services Digital Network (ISDN) Packet Switching Office Totals
- ☐ Part 10 ☐ Operator Services Position System (OSPS) Measurements
- ☐ Part 11 ☐ ISDN Office Totals
- ☐ Part 12 ☐ OSPS Common Channel Signaling Query Measurements
- ☐ Part 13 ☐ OSPS Real Time Rating Query Measurements
- ☐ Part 14 ☐ OSPS Facility Administration Measurements
- ☐ Part 15 ☐ OSPS Toll and Assistance Measurements
- ☐ Part 16 ☐ OSPS Interflow Measurements (5E5 and subsequent software releases)
- ☐ Part 17 ☐ OSPS Line Information Data Base (LIDB) Measurements (5E5 and subsequent software releases)
- ☐ Part 18 ☐ OSPS Customer Account Services (CAS) Measurements (5E5 and subsequent software releases)
- ☐ Part 19 ☐ Advanced Communications Package (ACP) for Software-Defined Networks (5E5 and subsequent software releases)
- ☐ Part 20 ☐ There is no part 20 in the plant report.
- ☐ Part 21 ☐ Leased Networks (5E6 and subsequent software releases)
- ☐ Part 22 ☐ OSPS Intercept Measures (5E6 and subsequent software releases)

- ☐ Part 23 ☐ OSPS CAS CCS7/International Credit Card Validation (ICCV) Signaling Measures (5E7 and subsequent software releases)
- ☐ Part 24 ☐ Machine Detected Interoffice Irregularities (MDII) Trunk Group Measurements (5E7 and subsequent software releases)
- ☐ Part 25 ☐ ISDN User Part Office Totals (5E7 and subsequent software releases).
- ☐ Part 26 ☐ DS1 Measurements
- ☐ Part 27 ☐ Static Proportionate Bidding Measurements
- ☐ Part 28 ☐ OSPS ICCV Measures By Foreign Database
- ☐ Part 29 ☐ OSPS Line Applications for Consumers Measurements

The hourly plant report is a subset of the 24-hour plant measurement report. All the reports given in Parts 1A, 1B, 2, and 3 of 24-hour plant measurement report are provided in the hourly plant report and include service and performance measurements. Service measurements consist of base counts of incoming, outgoing, originating, and terminating calls during the 1-hour period. Also included are counts of ineffective attempts and cutoff calls.

The monthly plant report consists of Parts 1 through 23, 25, and 28. It is an accumulation of the daily plant updates for the month. It is printed on the read-only printer.

Performance measurements provide counts of events such as outages, errors, or faults that are related to the maintenance condition of the office.

5.1.3 DATA COLLECTION OPTIONS

5.1.3.1 Overview

There are several ways to access measurements in the 5ESS[®] switch. The various methods available are described in the following paragraphs.

5.1.3.2 MCC Interface

The MCC provides the maintenance personnel with an interface to the 5ESS[®] switch. The MCC is part of the local 5ESS[®] switch input/output (I/O) channel that always receives the 24-hour plant, hourly plant, and 15-minute traffic reports. The hourly, 15-minute traffic, and the 24-hour plant reports are output at the receive-only printer (ROP).

Maintenance personnel can also interface with the 5ESS[®] switch generic utilities subsystem through commands entered at the MCC. For ISDN, this provides the maintenance personnel the ability to debug the packet interface (PI), the protocol handler (PH), and the common controller (CC) in the field using dump, load, and execute commands.

5.1.3.3 NAC Channel

The NAC channel provides an interface to the 5ESS[®] switch to ensure the quality of service given by the 5ESS[®] switch and to ensure efficient utilization of the installed equipment. The NAC channel is a separate virtual channel on the BX.25 link between the 5ESS[®] switch and the SCCS. The NAC work station interfaces to the 5ESS[®] switch through the SCCS. The 5ESS[®] switch restricts the NAC I/O channel to the NAC input and output messages only. Text recent change/verify (RC/VFY) is available on this channel as well as manual network management (NM) controls.

5.1.3.4 Traffic Channel

The local traffic channel is an optional RS232, 1200-baud, 1-way outgoing interface used to support administrative functions in offices which do not have EADAS and/or SCCS interfaces. The traffic channel data (30-minute traffic report and, the hourly and 24-hour separation reports) may be printed locally, printed remotely, or collected for downstream processing through passive data buffering.

5.1.3.5 SCCS

The SCCS provides the facilities to control, administer, and maintain the 5ESS[®] switch from a remote centralized location. The SCCS receives the 15-minute traffic reports (when enabled), hourly plant, and the 24-hour plant reports automatically, and can request other reports (that is, the 30-minute section reports).

5.1.3.6 Engineering and Administrative Data Acquisition System

The No. 1A and 1B EADAS are centrally located computer systems that provide an automatic traffic collection facility for the 5ESS[®] switch (as well as other types of switching systems). Both EADAS systems request the traffic output data from the 5ESS[®] switch at predefined times.

The No. 1A EADAS is the earlier version of EADAS that collects traffic data, performs calculations, generates exception and summary surveillance reports, and formats and distributes data for use by downstream systems such as central office equipment reports (COER). The No. 1B EADAS performs the same functions with more memory storage capability. Traffic data can still be sent to other downstream systems if desired.

The 5ESS[®] switch EADAS interface is a dedicated synchronous binary data link that supports the BX.25 protocol and operates at a 2400-baud transmission rate. The EADAS requests the following types of data from the 5ESS[®] switch:

- ☐ Network management measurements
 - ☐ Audits - on an EADAS/NM specified interval
 - ☐ Discretes - typically a 30-second interval
 - ☐ Trunk data - on a 5-minute interval
- ☐ Traffic measurements
 - ☐ Office totals - 30-minute interval
 - ☐ Trunk traffic - 30-minute interval
 - ☐ BRCS traffic - 30-minute interval
- ☐ Division of revenue measurements
 - ☐ Hourly separations - on an hourly interval
 - ☐ 24-hour separations - on a 24-hour interval

Data is requested by interval not by data type. For example, the 30-minute traffic report contains office totals, trunk traffic, and BRCS traffic data.

The EADAS provides the following surveillance reports:

- ☐ Load service summary report
- ☐ Service exception report
- ☐ Component exception report
- ☐ Measurement apparatus surveillance summary report
- ☐ Service performance summary report
- ☐ Multiline hunt group (MLHG) overflow exception report
- ☐ MLHG overflow summary report
- ☐ Trunk overflow exception report
- ☐ Trunk overflow summary report
- ☐ Modular features customization capability summary report
- ☐ BRCS customer group reports
 - ☐ Individualized dialing plan (IDP) report
 - ☐ Attendant group report
 - ☐ MLHG report
 - ☐ Alternate route selection (ARS) group report
 - ☐ Private facilities access/simulated facility group (PFA/SFG) report
 - ☐ Terminal group.

The EADAS forms and writes to magnetic tape the following schedules, and sends them downstream (if desired by the user).

- ☐ H schedule - contains office totals and component data
- ☐ C schedule - contains trunk data
- ☐ P schedule - contains processor capacity data
- ☐ E schedule - contains extreme value engineering (EVE) data
- ☐ S schedule - contains hourly separations data
- ☐ D schedule - contains separations data.

For further information, refer to the EADAS user documentation series OPA-3B000-01 through OPA-3B003-01 for 1A EADAS and OPA-3B501-01 through OPA-3B509-01 for 1B EADAS implementation.

5.1.3.7 Central Office Equipment Reports

The central office equipment reports (COER) system is used to help with 5ESS[®] switch engineering. The

COER system will process traffic data for electronic switching system offices; screen the data for completeness, consistency and format; flag and report on suspect data items; store the processed data; and produce engineering and administrative reports. These reports can be generated on-line or scheduled to run in a low-cost batch processing (background) mode. These reports may be used for monitoring service levels or for determining future equipment requirements.

The EADAS system produces traffic schedules, containing traffic value measurements, which are sent to COER. Upon receipt of the traffic schedules, the COER system will process the data and store the processed results in the office's data base.

The COER system provides features that assist the switch administrator in the management, administration and long-term surveillance of the 5ESS[®] switch. These features include:

- ☐ User COER System - User definable specifications (calculations, validations, busy hour engineering (TCBH).
- ☐ Capacity determination (CAPFIT) for all 5ESS[®] switch processors.
- ☐ Busy hour determination (BHD) for all 5ESS[®] switches.
- ☐ Automatic reporting of exceptions and flagging of data items where exceptions are found based on the user-defined validations.
- ☐ Condensed and detailed monthly, intermediate and machine load and service summary (MLSS) reports for any combination of component, hour, and day.
- ☐ Presentation and summation of data by user-defined communities of interest (COI).
- ☐ Reports can be generated on-line or scheduled to run in an off-line (background) mode. Reports can be routed to multiple destinations. Valid destinations are a terminal, printer, tape, and data link.
- ☐ Timely access to all information for early problem detection and correction: on-line record base validations and queries to data availability and processability.
- ☐ On-line access to large quantities of traffic data statistics and related traffic engineering calculations.
- ☐ On-line access to COER user documentation for the operations and use of the COER system features.

5.1.3.8 Network Management Center (NMC)

The current Network Management Centers (NMCs) are EADAS/NM, RNMS, and Net Minder. Every 5 minutes the NMC sends a request through EADAS to poll the 5ESS[®] switch for these counts. The request indicates which of these packages should be sent as follows:

- (a) Delayed readiness counts
- (b) Overload counts
- (c) Call direction counts
- (d) Basic failure to match and no circuits counts
- (e) Critical service circuit counts
- (f) Additional ineffective machine attempts
- (g) Network management control counts

- (h) Basic trunk group measurements
- (i) Code control counts
- (j) Reroute control counts
- (k) IC start signal time-out counts
- (l) IC shared trunk group counts
- (m) Common channel signaling (CCS) counts
- (n) CCS special counts
- (o) Trunk group flags
- (p) Service switching point (SSP)
- (q) Software defined network (SDN)
- (r) Leased network (LN).

Each package consists of several counts. For example, the "call direction" package consists of counts for the following:

- ☐ Originating calls
- ☐ Incoming calls
- ☐ Outgoing calls
- ☐ Terminating calls
- ☐ Intrasystem calls
- ☐ Tandem calls.

The 5-minute traffic counts and discretely are provided for direct signaling CCS features [originating screening office/inward wide area telecommunications service (OSO/INWATS)]. These counts are sent to EADAS.

5.1.4 TRANSLATION ADMINISTRATION

5.1.4.1 Data Base and Record Changes

It is worth noting that the 5ESS[®] switch data base is different both in content and format from those for previous switches (for example the 1A ESSTM switch). The data base is relational and is managed by a Data Base Management System (DBMS). The DBMS provides two levels of access for different users to meet varying requirements. The two levels are the lower level for call processing (called base relations) and the higher level used by RC/VFY (called views). From the operations point of view, the format and mappings and integrity checks between the RC views and the base relations are supplied by the RC software.

The major data base content changes relative to previous switches include the addition of parameters, remarks, transmission information, and the removal of schedule information. Critical timing functions, such as interdigital timing, can be assigned on a class-of-service basis. In the area of routing and charging, a new digit analysis strategy which uses a digit-by-digit interpreter table has been implemented. This enables

dial services [for example, number plan areas (NPAs), NXXs, feature access codes] to be translated at various levels of interpretation, unlike the traditional 3- and 6-digit translators and the generically coded feature access codes in other switching systems.

5.1.4.2 Initial Office Provisioning

The initial office dependent data base of a 5ESS[®] switch is provided through a series of interactions between the OTC (and their OSs and paper records) and Lucent Technologies [and their office data administration (ODA), 5ESS[®] switch Digital Ordering and Planning System (5 DOPS) and video interactive regional ordering specification (VIRGOS) programs].

An on-line ODA process can be used by the OTC, and the Lucent Technologies region to build and manipulate a "forms" data base prior to its compilation into the 5ESS[®] switch translations. A Lucent Technologies product, the On-Line Data Base Integrity System (ODIN) software system, is used for human interfaces to the data base. Office records formatted from the data as input, are available to the OTC for translation form transcription and error resolution. These records are printed directly at the user's work station.

The data base is compiled at Lucent Technologies and shipped to the office on magnetic tape. A portable tape drive (either Lucent Technologies-supplied or OTC-owned) is used to load the data into the switch and onto the disk packs where it can be used by the software release.

Batch ODA processes may be used for line information. Copies of ODA inputs are printed as part of ODA and may be used as an initial set of office records.

5.1.4.3 Office Records

5.1.4.3.1 Overview

Office records may be obtained through the stand-alone RC/VFY capability of the switch or through the Remote Memory Administration System (RMAS). More detailed information can be obtained in 235-118-311, *Recent Change Procedures - Using RMAS*. (The RMAS is not supported for the 5E7 software release.)

5.1.4.3.2 Via RC/VFY

The office records feature describes the logical structure of the 5ESS[®] switch data base. It formats the data items and their logical organization into administrative forms. All sets of office records are printed in a tabular (or columnar) format similar to that of the TG-5. Line records are ordered on the telephone number. This feature allows the OTC to update office records without manually performing repeated verifies.

These records are requested through the MCC or SCCS and are directed to an ROP. It is recommended that this be done during off-hours.

5.1.4.3.3 Via RMAS

The RMAS can also be used to create and maintain versions of office records. Currently, RMAS provides mechanized updates and reprints for the 5ESS[®] switch line and trunk translations. (The RMAS is not supported for the 5E7 software release.)

5.1.4.4 Memory Administration

The 5ESS[®] switch DBMS automatically stores the office dependent data (ODD) on pages (areas of storage from 256 to 8192 bytes long) within the memory of the AM and the SMs. As lines and trunks and other services are added to the 5ESS[®] switch, the use of ODD memory increases. Because ODD data items are stored on pages, the usage of memory is a function of the number of pages used and their size rather than

being directly related to the amount of lines, trunks, or other services.

Since changes in the ODD impact its size, ODD memory size can be monitored using the memory monitoring capability available via the MCC and SCCS. This applies to both the AM or SM ODD which may exceed its engineered size and require the allocation of more space or the addition of memory boards.

An input command may be used to monitor memory. The command may be entered at the MCC or the SCCS: **op:odd,sm=1&&192,cmp=0,am**
The output of this command consists of:

- ☐ The amount of memory space used
- ☐ The amount of memory space allocated
- ☐ The percent of allocated memory space used.

The output of this command may be used to roughly trend the use of memory. In addition to the manual use of this command, automatic reports and alarms are generated when memory exceeds 90, 95, 96, 97, 98, and 99 percent of its allocated space.

Increases in the allocated static ODD space within the memory of the AM and SM can be done using switch personnel commands. Physical memory growth can be done using RC without any service impact. There is an upper limit for the static ODD space in each processor regardless of the amount of physical memory on that processor. For further details, refer to the 235-070-100, *Administration and Engineering Guidelines*.

5.1.5 RECENT CHANGE ADMINISTRATION

5.1.5.1 Overview

The 5ESS[®] switch RC/VFY capability provides both a menu-driven screen and a text format. This capability is sometimes referred to as the stand-alone RC/VFY package. The stand-alone RC/VFY is used as the primary human interface to the data contained in the 5ESS[®] switch data base.

The capabilities provided for RC/VFY are as follow:

- (a) Stand-alone RC/VFY
 - (1) Text RC/VFY
 - (2) Batch RC/VFY
 - (3) Dial-up RC/VFY
 - (4) Immediate Menu RC/VFY
 - (5) Telephone administration support capability (TASC)
 - (6) Multiple line query.
- (b) Via RMAS (The RMAS is not supported for the 5E7 software release.)
- (c) OSPS/automatic call distributor (ACD) for 5E8 and prior software releases
- (d) Application processor (AP)
- (e) Global trunk recent change and enhanced trunk verify

- (f) Customer station rearrangements (CSR).

5.1.5.2 Stand-Alone RC/VFY

5.1.5.2.1 Overview

The stand-alone RC/VFY capability provides the user with the ability to add, delete, update, or verify the 5ESS[®] switch data using a menu select/mask or text format. A menu select/mask is a formatted video display with different types of data present in a menu format and a capability to add, delete, update, or verify the data. The text format provides an RC interface using input messages and commands on a terminal without the need for a video display terminal.

5.1.5.2.2 Immediate Menu RC/VFY

The RC/VFY interface provides a 2-level menu. See Figure 5-1 for an example of the menu format. Figures 5-1 and 5-2 are based on the 5E6 software release and are included here for completeness. Their purpose is to illustrate the basic formats rather than detail the views and data items.

After selecting both a view from the menu and the operation to perform on the data base, the appropriate view is displayed. The user is guided by a cursor and help messages in completing the view data items. In the case of an input error, an error message is displayed. If an input is not provided by the user for nonrequired fields, logical default values are provided when the data is inserted into the data base.

When the view input is completed, the data items within the view are checked for validity, and the view is evaluated for consistency with the existing data base. All errors are flagged with detailed error messages. More complete descriptions of the RC/VFY capabilities of the 5ESS[®] switch can be found in 235-118-240, *Recent Change Procedures*.

Features to enhance RC operations are provided, including the availability of on-line help pages and the batch RC capability. The batch RC capability allows RCs to be entered in advance and released for activation at a specific time or on a demand basis. (See "Batch RC/VFY", Section 5.1.5.2.4.)

The 5ESS[®] switch RC provides the capability to print hard-copy records of the RC transactions performed. Each RC session creates a print file containing a record of that session. Several options are available to the OTC personnel for obtaining a hard-copy output at the ROP from the RC session.

5.1.5.2.3 Text Interface

The RC capability also provides a text interface available on I/O channels which use American Standard Code for Information Interchange (ASCII) text formats, such as the virtual maintenance channel on the BX.25 link to the No. 2 SCCS. This reduces the need for separate cathode ray tubes (CRTs) for RC at several locations and permits the No. 2 SCCS to input RCs. The NAC channel also provides RC capabilities.

The 5ESS[®] switch RC/VFY text interface is an integral part of the existing RC subsystem. The RC text interface is necessary for providing the 5ESS[®] switch with the means to communicate with some of the established OSs such as the SCCS. Any terminal device that is compatible with the 5ESS[®] switch switch personnel interface, including the SCCS can be used to access the RC subsystem. There are no restrictions for verify access. However, RC access must be turned on/off through an input message at the MCC. Also, the text interface allows remote access to the RC subsystem from locations such as an RSM via a simple portable terminal. The text interface allows for an RC interface using input messages and commands on a terminal without the need for a video display terminal.

The text interface is designed so that users familiar with the menu view interface can easily use the text interface input method. The background text names (attributes) on the menu views and the data input

names (keywords) in text interface look very much alike. Thus, the transition from one system to the other is easy for the user. For more information on the text interface, refer to the 235-118-222, *Recent Change Procedural* □ *Menu Mode/Text Interface*. With the 5E7 software release, refer to 235-118-240, *Recent Change Procedures*.

5.1.5.2.4 Batch RC/VFY

The batch input feature for the 5ESS[®] switch allows RCs to be input specifying the date and time the RC should be performed or allows RCs to be input as a demand batch file. Large numbers of RCs can be entered quickly in a batch mode. The RCs can be input at any time, stored until they are needed, and then released for use by the system. Also, once the RCs are stored, the dates and times for release can be changed by the user. Once released, RCs are kept as history records until the system performs batch file administration processing which removes them. Administrative reporting is included to display the contents and status of all RCs entered in the batch mode and aid in file administration activities. For more information on the batch mode, refer to the 235-118-240, *Recent Change Procedures*.

5.1.5.2.5 Dial-Up Interface

A dial-up RC port can be configured in a 5ESS[®] switch office. The dial-up port is simply an RC channel that is remoted over a telephone line rather than being connected to the switch via a dedicated link. The dial-up port can be accessed by a remote terminal in order to perform RC operations on the 5ESS[®] switch ODD. Logins with passwords can be used on these channels for security purposes.

The dial-up RC/VFY port and the corresponding RC/VFY software are designed so that a person can access RC/VFY through a terminal over the link. In addition, a computer can be connected to the dial-up channel and communicate with the 5ESS[®] switch through a terminal emulator package.

5.1.5.2.6 TASC

The telephone administration support capability (TASC) provides various specialized reports detailing the contents of the ODD that are output locally at the 5ESS[®] switch. The TASC allows a user to obtain categorized, selected data about the BRCS features available on the switch via RC/VFY views. Three reports are provided and include lines, trunks, and individualized dialing plans. These reports are valuable for maintenance, office administration, engineering, and marketing activities.

5.1.5.2.7 Multiple Line Query

The multiple line query feature provides the OTC personnel with the capability to obtain categorized line data at the local ROP. The multiple line query feature is designed to retrieve non-BRCS line data from the data base. The OTC personnel use an RC view to input a set of attribute values, or ranges of values. A report is then generated of all the lines that satisfy this set. The fact that there are no required fields with respect to the attributes, allows the OTC personnel the flexibility of specifying a particular value (or range of values) for any attribute, or combination of attributes.

5.1.5.3 RC/VFY Using RMAS

5.1.5.3.1 Overview

The 5ESS[®] switch user interface to RMAS is designed to be similar to those of other switching systems in order to make it easy to use for operators who enter RCs for all types of electronic switching systems. Note that the RMAS is not supported with the 5E7 software release.

The RMAS is a network of microcomputers used to assist in the administration of RC/VFY messages or views for the local 5ESS[®] switch. The RMAS supports a number of OSs such as the SCCS as well as others.

The user interface to the 5ESS[®] switch data base using RMAS utilizes video display masks. A video display mask is a formatted video terminal display that provides the principal input medium for administrative and system tables as well as RC or VFY messages. The masks allow the user the flexibility to input RC information that is specifically tailored to a customer order.

5.1.5.3.2 Customer Station Rearrangements

The CSR feature provides the business customer with the ability to change or verify data associated with their telephone service (via the RMAS) from an on-premises terminal.

The RMAS provides the interface between a CSR customer and the 5ESS[®] switch. The CSR customer has dial-up access to the RMAS, and through this access, requests for change/verification are sent to the 5ESS[®] switch. The RMAS has a data base for each CSR customer, through which it can verify the legitimacy of each request from the CSR customer.

For more information on RC/VFY using RMAS, refer to 235-118-311, *Recent Change Procedures* □ *Using RMAS*.

5.1.5.4 RC/VFY Using OSPS/ACD

In 5E8 and earlier software releases, the OSPS administrators could change and verify OSPS static relations through a restricted RC/VFY interface at the OSPS force management center (FMC) or operator services center (OSC). The OSPS administrators were not able to execute all the available 5ESS[®] switch RC/VFY input messages from an OSPS administrative terminal. Data that is not related to the OSPS cannot be changed or verified from an OSPS administrative terminal. Screening is performed on messages input at the OSPS administrative terminal to enforce this restriction.

All OSPS RC/VFY input messages allowed at the administrative terminal are also valid at the MCC and other standard 5ESS[®] switch RC terminals. Commercial ACD customers perform RC/VFY via an administrative work station connected to the Management Information System (MIS). The MIS presents the screens to the end user in a user-friendly fashion. The MIS then translates the screens into text RC/VFY messages and sends them over the text RC/VFY interface to the 5ESS[®] switch. An ACD customer can perform RC/VFY on any of the resources assigned to that customer. The OTC personnel also have an RC/VFY terminal from which they can assign resources to customers and define new customers.

5.1.5.5 RC/VFY Using the Application Processor Recent Change Interface

An AP is an auxiliary 3B computer (3B2, 3B15, or 3B20S) used to provide certain BRCS features. The AP can be either collocated at the 5ESS[®] switch or at the customer premises. The communication with the 5ESS[®] switch SM is through a basic rate interface (BRI). This feature enables the business customers to administer their private telecommunications facilities by performing RC/VFY operations on the 5ESS[®] switch. The business customer initiates messages (via menu screens that are similar to RC/VFY screens) with appropriately modified information that are sent to the 5ESS[®] switch. These messages are interpreted by the switch and result in the update of the relations specified. A response to the AP provides the result of the update request.

5.1.5.6 Global Trunk Recent Change and Enhanced Trunk Verify

The global trunk recent change and enhanced trunk verify feature provides the OTC personnel with the capability to perform the following operations on a single RC/VFY form:

- Assign multiple trunks
- Assign multiple codes for a single local digit interpreter table (LDIT)
- Assign multiple route indexes.

The 5ESS® switch can accept multiple trunk assignments from a single RC form. For a specified common set of attributes, the RC command provides a quantity field to allow multiple trunk member number assignments for a given trunk group number.

Multiple code assignments for a single LDIT from a single RC form are provided as follows: for a specified common set of attributes, the RC command will accept up to ten individual incoming digit codes or ranges of codes. When an LDIT conflict resolution is required, a single code LDIT can be used.

The 5ESS® switch can also accept multiple route index assignments from a single RC form. The RC command can contain a primary and up to five alternate route indexes.

5.2 NETWORK MANAGEMENT

5.2.1 OVERVIEW

When call attempts in a telephone network rise beyond the capacity of that network, the overall performance of the network degrades. Network management provides real-time surveillance and control techniques to minimize this degradation, optimize call-carrying capacity, and maintain network integrity during periods of stress caused by either traffic overload or failure conditions. Network managers use the NMC system to perform this function.

The 5ESS® switch network management feature provides an interface to process messages from the on site capability. The on site capability allows NM requests to be made in the event that the links between the NMC, EADAS, and the 5ESS® switch are not operating.

The following requests are allowed from either NMC or on site:

- ☐ 30-second discrete report (a subset of the discrettes are displayed automatically on the MCC and cannot be specifically requested from on site).
- ☐ 5-minute package list command messages
- ☐ 5-minute surveillance data report
- ☐ Dynamic overload control demand audit and command messages
- ☐ NM - schedule audit and command messages
- ☐ Manual code control demand audit and command messages
- ☐ Manual trunk group control demand audit and command messages
- ☐ Selective incoming load control (SILC) demand audit and command messages.
- ☐ Trunk reservation (TR) control demand audit and command messages.

The following requests are only allowed by the NMC:

- ☐ RSM outage list demand audit
- ☐ Interexchange carrier data location demand audit
- ☐ Trunk group reference data demand and change audit.

5.2.2 NMC INTERFACE (VIA EADAS)

The primary interface for NM is the NMC using a 2400-bps or a 9600-bps synchronous data link through EADAS. There are also interfaces to the NAC channel via the SCCS and to the local MCC.

The NM software for the 5ESS[®] switch accepts commands from and outputs data to the following:

- ☐ NMC through the EADAS interface
- ☐ NAC channel through the SCCS
- ☐ MCC at the switch.

Both the EADAS and SCCS data links use BX.25 protocol. The format of the data on the EADAS link is binary, and on the SCCS link, the format is ASCII. The NAC channel, or SCCS when the NAC channel is unstaffed, will function as a backup for the NMC if the EADAS link is down.

5.2.3 SELECTIVE INCOMING LOAD CONTROL

5.2.3.1 Overview

The SILC provides a means to control traffic that originates from non-CCS trunks. The SILC is a software control and operates without hardware interfacing to connecting offices. When an office experiences a machine congestion level 1 or 2, incoming calls, on specified trunk groups, are blocked. When these controls are specified by NMC or NM on site, a response is sent to the request originator.

5.2.3.2 Description of Control

When a call is received on a trunk group specified for SILC, the call is terminated if all of the following conditions are present:

- (1) The SILC is not inhibited.
- (2) The 5ESS[®] switch is in machine congestion level 1 or 2.
- (3) The percentage of calls to be blocked is not yet reached.

When a call is blocked, the trunk is put on the high-and-wet list until the far-end abandons. Once the abandon occurs, scanning resumes, and the trunk is available to originate another call.

5.2.3.3 Application of SILC

Up to 128 trunk groups may be specified for SILC treatment. The NM software installs and deletes individual controls in response to requests received from the NMC or NM on site. These controls may be inhibited, or the NMC or NM on site may request that all controls be removed. The percentage of traffic to control (specified separately for machine congestion levels 1 and 2) may be modified through recent change. Installation of the SILC control does not activate the control. The control only activates automatically when the machine reaches congestion.

5.2.4 MANUAL TRUNK GROUP CONTROLS

5.2.4.1 Overview

Manual trunk group controls requests originate at the NMC and reach the 5ESS[®] switch through EADAS. Manual trunk group controls may also be made at the 5ESS[®] switch. The NM software in the 5ESS[®] switch processes these requests and takes appropriate actions. These actions include installing a new control,

deleting an existing control, or modifying an existing control. An appropriate response is sent to the NMC and an echo of the control command message is sent to the switch personnel at the MCC, the NAC channel, and the SCCS.

5.2.4.2 Description of Trunk Group Controls

Manual trunk group controls are of two types: protective and expansive. Protective controls can be used to inhibit the spread of congestion in the network by restricting normal trunk group access and overflow. Expansive controls are used to expand routing beyond normal in-chain routes when in-chain routes are busy or have failed.

Trunk group controls can be divided into the following two classes:

- (1) Prehunt: Controls applied after a trunk group has been chosen and before the hunt for an idle member starts
- (2) Post-hunt: Controls applied after the trunk group hunt failed to locate an idle member and before alternate route treatment is applied.

The controls take effect on a specified percentage of calls. The percentage for prehunt controls is the percentage of all calls attempting to select a member in a trunk group; and for post-hunt controls, it is the percentage of all calls failing to select a member in a trunk group. For all prehunt and post-hunt controls, the percentages are given in terms of:

- ☐ Direct route (DR) traffic
- ☐ Alternate route (AR) traffic.

The DR refers to the first choice trunk group in the normal routing chain, and AR refers to the subsequent choice trunk group(s) in the normal routing chain. The percentage values are defined from 0 to 100 in increments of 12.5 percent.

The following protective trunk group controls are available with the 5ESS[®] switch:

- ☐ Cancel-to (CANT) ☐ This prehunt control cancels traffic destined for a specified trunk group.
- ☐ SKIP ☐ This prehunt control causes a given trunk group to be skipped and alternate routing to another trunk group in the routing chain occurs.
- ☐ Cancel-from (CANF) ☐ This post-hunt control is applied to traffic overflowing or skipping a given trunk group.

One expansive control is provided in the current implementation:

- ☐ Reroutes (RR) ☐ This post-hunt control modifies the normal in-chain route advance pattern by substituting one or more out-of-chain trunk groups for the rest of the routing chain or, optionally, before the next in-chain trunk group.

5.2.4.3 Application of Controls

Up to four different trunk group controls (CANT, SKIP, RR, and CANF) may exist at once on any given trunk group up to a total of 128 controls in the entire office. Each control on the same trunk group counts as one of this total. In addition, there is a limit of 16 spray and ordered RR controls that can be active in the office simultaneously as part of the 128 total controls possible. Each RR control specifies one to seven through trunk routes.

When multiple controls are active on the same trunk group, the order of application is as follows:

(1) Manual prehunt controls

- ☐ CANT
- ☐ SKIP.

(2) Manual post-hunt controls

- ☐ RR
- ☐ CANF.

The NM software will install and delete individual controls in response to requests received from the NMC. In addition, control parameters such as threshold percentages can be modified on request from the NMC or on site without removing the initial control. The NMC or on site can also request that all controls of a particular type (for example, SKIP) be removed.

5.2.5 NM SCHEDULE MODIFICATION

The NM schedule is a list of trunk groups on which the NMC has indicated that it wishes to receive data in the 5-minute TG measurements package. The NMC may assign up to 250 (500 with the 5E6 software release) (2000 with the 5E7 and later software releases for offices with a direct link to the NMC) trunk groups to the NM schedule. The assignment to or deletion from the schedule is accomplished through a message from the NMC through EADAS to the 5ESS[®] switch. The NM software maintains and administers the NM schedule in response to these requests. On site may also change the NM schedule (up to eight trunk groups at a time).

5.2.6 NM DOMAIN SELECTIVITY

5.2.6.1 Overview

The NM controls are not always introduced in the office they are protecting. With the growing number of private networks, overlapping numbering plans are used to allow the same digit string to identify different termination points depending upon the domain of the originator. For NM, a call's switching domain is the only way to distinguish one call from another when overlapping numbering plans are routed on the same switch.

The domain value associated with a call is initially determined by the domain assigned to the originating port. This value, referred to as the digit analysis selector (DAS) value, has a primary function of determining the translation structures to be used during digit analysis, and then is discarded. The association of a domain value with a call throughout the entire call processing phase permits domain selective manual controls to be implemented in an office. To be able to effectively perform NM, the DAS value must be carried beyond the digit analysis phase and made available when the NM controls are executed. The NM needs the domain value for both code control and trunk group control application.

Without the NM domain selectivity feature, the reroute trunk group control is restricted to apply only to calls in certain domains. These domains are limited to calls with DN's in the North American Numbering Plan (NANP). With the NM domain selectivity feature, the reroute control can apply to calls in all domains. This means that the reroute prefix/delete algorithm will be applied to all rerouted calls, and that it will process outpulsed DN's which can be in any numbering plan. Interactions between the NM domain selectivity feature and existing call types are as follows:

- ☐ **Action Point Numbering (APN) Plan Calls:** The APN DN's are always 10 digits. The first three digits (the SSS code) do not overlap with the NPA and are not affected by the prefix/delete algorithm.
- ☐ **International Calls:** These calls are outpulsed with DN's of various lengths, and the first three digits may overlap with some NPAs. These calls, however, have a destination type of international direct distance dialing (IDDD). These calls are ignored by the prefix/delete algorithm.

Without the domain selectivity feature, trunk group controls would be applied to all calls in the network regardless of domain. If all of the calls in the network were controlled regardless of domain, it would be possible for protective trunk group controls to cancel calls that should not normally be canceled (that is, calls in a domain that are not contributing to the overload situation in the office). Domain selective protective trunk group controls provide the granularity of control needed to protect the network without unwanted side effects.

Expansive trunk group controls without domain selectivity would suffer the same type of consequences as protective trunk group controls if the controls were applied to all domains. However, when all calls receive expansive controls without consideration to domain, it is possible to reroute a call and inadvertently lose the associated domain. This results in not just a lost call but possibly a call completed to an incorrect termination point. Associating a domain with a call throughout the call processing phase along with the specification of a domain on the trunk group control itself alleviates these problems.

5.2.6.2 NM Controls

With the 5E5 and subsequent software releases, the NM domain selectivity feature provides the 5ESS[®] switch with the ability to support NM requests on a domain value basis. The NM controls affected by the NM domain selectivity feature are as follow:

- ☐ Code controls
- ☐ Expansive trunk group controls (reroute)
- ☐ Protective trunk group controls (cancel-to, cancel-from, and skip).

Each control is restricted to affect only the calls whose domain matches the domain(s) associated with the controls. The switching domains that are associated with each control are specified by the network manager at the time each control is installed or modified.

The domain selectivity for NM controls on the 5ESS[®] switch is primarily supported through on site commands and NMC commands. The feature is available in its entirety through on site commands; however, the domain selective controls are remotely accessible only through the NMC.

The following requirements apply to all domain selective NM manual controls:

- (1) Any valid domain is accepted. An invalid domain value in the NMC or on site command will invalidate the entire command.
- (2) The domain is determined from existing relations that define the port characteristics. However, this static value can be dynamically overwritten by the domain value derived from one of the following sources:
 - ☐ Data base post query processing.

When a call's domain is dynamically changed, the new domain value is used to determine whether or not a control applies to that call.

5.2.7 CODE CONTROLS (CALL GAP)

Code controls [synonymous with manual call gap (MCG) in the 5ESS® switch] are a manual NM control. This control blocks traffic to destination codes that are difficult to reach. Code controls are often used for controlling focused overloads, in which traffic from many parts of the network is destined for a single point. The 5ESS® switch provides call gapping on codes of 0 to 15 digits, inter-LATA carrier prefix, and domain (5E5 and subsequent software releases). The control options include gap interval and disposition. A maximum of 64 code controls may be installed.

5.2.8 TRUNK RESERVATION (5E6 AND SUBSEQUENT SOFTWARE RELEASES)

The TR is an automatic NM control. It provides the ability to reserve a specified number of individual trunks within a group for preferred traffic.

The network manager assigns a trunk group to TR by specifying the reservation levels (the number of trunks to reserve), the response category, the action to take, and the TR override status. The automatic reservation adjustment (ARA) option may also be specified. This option causes the switch to dynamically adjust the reservation levels to achieve the optimum results from the control.

5.2.9 NMC DEMAND AUDIT REQUESTS

5.2.9.1 Trunk Group Reference Data Audit Response

At the request of the NMC for the demand reference data audit, NM provides the following data to the NMC for each trunk group on the NM schedule:

- ☐ Trunk group identifier
- ☐ Number of incoming circuits
- ☐ Number of outgoing circuits
- ☐ Number of 2-way circuits
- ☐ Number of service circuits
- ☐ Transmission type
- ☐ Signaling type
- ☐ Ability to handle wideband traffic.

NOTE: With the exception of the Trunk Group Reference Audit Response, all audits are only available in demand forms.

5.2.9.2 Active Manual Trunk Group Control Audit Response

At the request of the NMC or on site for the active manual trunk group control audit, the NM software provides the following information for each active control in the office:

- ☐ Trunk group
- ☐ Control type
- ☐ Switching domain(s)
- ☐ Alternate routed traffic type: percentage control

- ☐ Direct routed traffic type: percentage control
- ☐ Disposition of calls affected
- ☐ Reroute type
- ☐ Reroute details
- ☐ One to seven through routes.

5.2.9.3 Selective Incoming Load Control Audit Response

At the request of the NMC or local personnel for the SILC control audit, the NM software provides the following information:

- ☐ The percentage of traffic to block during machine congestion level 1
- ☐ The percentage of traffic to block during machine congestion level 2
- ☐ The trunk groups for which an SILC control is specified.

5.2.9.4 Code Control Audit Response

The audit provides information about all code controls in the office including:

- ☐ Control identifier
- ☐ Switching domain
- ☐ Call gapping interval
- ☐ Disposition of call
- ☐ Special prefix
- ☐ Destination code.

5.2.9.5 Automatic Trunk Group Control Audit Response

The audit provides information concerning all automatic trunk group controls, dynamic overload controls, and trunk reservation (5E6 and subsequent software releases). The following information is provided:

- ☐ TG identifier
- ☐ TR override status
- ☐ TR thresholds
- ☐ TR response action
- ☐ TR response category
- ☐ Dynamic overload control receive override status
- ☐ Machine congestion levels received

- ☐ Dynamic overload control receive response action
- ☐ Dynamic overload control receive response category
- ☐ TR ARA.

5.2.9.6 Inter-LATA Carrier Reference Data Audit Response

The audit provides the following information concerning the inter-LATA carriers in the office:

- ☐ Carrier prefix
- ☐ Five minute data locations in IC package.

5.2.9.7 Remote Switching Module Audit Response

This audit reports outage information about the RSMs in the office as follows:

- ☐ RMS identifier
- ☐ Status of the RSM.

5.2.10 NETWORK MANAGEMENT SWITCH PERSONNEL INTERFACE

An echo of each control request from the NMC is provided to the switch personnel. In addition, several switch personnel input messages are provided by the message administration software for NM. For example, a message may be used to remove all active manual controls from the office.

5.2.11 COMMON CHANNEL SIGNALING NETWORK MANAGEMENT

The CCS NM feature provides the basic NM components for CCS. This feature provides the following NM components for CCS:

- ☐ CCS dynamic overload control (DOC)/automatic congestion control (ACC)
- ☐ Group signaling congestion (GSC) control
- ☐ Manual trunk group control (TGC) enhancements
- ☐ NM discretes
- ☐ NM related data.

The CCS NM feature provides NM controls for the following protocols:

- ☐ Common channel interoffice signaling 6 (CCIS6)
- ☐ Embedded common channel interoffice signaling (ECIS)
- ☐ CCS7 Integrated services digital network users part (ISUP).

The CCS NM feature provides the following NM controls for CCIS6/ECIS protocol signaling:

- ☐ ACC

- ☐ Enhancements to the existing TGCs to: avoid overflow of calls to the source office, allow for reroute of previously rerouted calls, allow for reroute of inbound international calls, and to automatically cancel hunt for certain elements of spray reroute for a period of time upon receiving a national trunk congestion (NTC) or national switching congestion (NSC) indication
- ☐ Process a GSC indication in a manner similar to a SKIP
- ☐ Provide data on prevailing CCS controls and switching congestion conditions.

The CCS NM feature provides the following NM controls for the CCS7 ISUP protocol signaling:

- ☐ DOC
- ☐ Enhancements to existing TGCs to: avoid overflow of calls to the source office, allow for reroute of previously rerouted calls, allow for reroute of inbound international calls, and to automatically cancel hunt for certain elements of spray reroute controls for a period of time upon receiving a circuit group congestion (CGC) or switching equipment congestion (SEC) indication in the national network
- ☐ Provide data on prevailing CCS controls.

Signaling capabilities on the SS7, PSU based signaling platform include:

☐ **MTP Network and Cluster Routing**

Prior to this feature MTP routing capabilities for an SS7 PSU required the service provider to provision a Full Point Code routeset for each signaling point destination. This feature supports additional routing capabilities that allow the service provider to provision routesets to signaling destinations based on the following fields of the destination point code (DPC):

- ☐ Network Identifier (NID) field only, thus referred to as MTP Network Routing
- ☐ Network Identifier (NID) and Network Cluster (CLU) fields, thus referred to as MTP Cluster Routing.

The ability to provision network and cluster routesets reduces a service provider's administrative provisioning overhead as signaling points are added/removed from their local and interconnecting SS7 networks.

☐ **MTP Cluster Route Management**

MTP Cluster Route Management procedures update the cluster routing status upon reception of cluster and member routing failure messages and also initiate cluster route set test messages to test whether a cluster route has become available. This feature supports MTP cluster route management procedures on the SS7 PSU signaling platform.

☐ **Alias Point Codes**

Prior to this feature, the service provider would assign one primary point code to each GSM in the office. This feature allows the service provider to provision up to 15 additional logical point codes, known as **alias** point codes, for each GSM. Each alias point code allows ISUP trunk groups to be logically grouped together and monitored as if it was a single office. As an example, an office could denote trunk groups to one LATA with one alias point code, to another LATA with another alias point code, and so. This allows the office to assume a multiple point code appearance. TCAP and SCCP messages originated by the switch, however, will continue to use the primary GSM point code as is done currently.

5.2.12 AUTOVON NETWORK MANAGEMENT

5.2.12.1 Overview

The 5ESS® switch can function as an automated voice network (AUTOVON) tandem switch. The AUTOVON NM controls are entered at the MCC or supplementary trunk and line work station (STLWS) in response to directives issued by the network manager. These controls can also be initiated or removed remotely from the AUTOVON NM control center. The NM controls in effect at a switch can also be removed through input messages entered at the local MCC.

Reports of the 5-minute surveillance data and the 30-second discrete data can be requested from the MCC, and input messages are available to request the status of all NM controls currently in effect for the switch.

The NM for AUTOVON provides the NMC with traffic surveillance data for analysis of network congestion. Based on this data, controls at particular switches may be implemented or removed. The following features are provided:

- ☐ Alternate route cancellation
- ☐ Destination code cancellation
- ☐ Line load control [essential service protection (ESP)]
- ☐ The custom interface.

The first two features provide manually-initiated and manually-removed NM controls to regulate trunk access and routing. The line load control feature is an automatic overload control that regulates call originations. This is a customer protection feature, and once it is enabled, it is dynamically triggered in a switching system in response to certain overload conditions. The custom interface concerns the NM data and the NM interface to the NM control center.

With the 5E13 software release, six NM controls have been added to a DSN office:

- ☐ Automatic Congestion Control (ACC)
 - ☐ Trunk Reservation (TR)
 - ☐ Cancel To (CANT)
 - ☐ Cancel From (CANF)
 - ☐ SKIP
 - ☐ Reroute (RR)
-
- ☐ these six controls (and their measurements and discretetes) are not available via an EADAS interface link in a DSN office where GLDSNOPT=Y.
 - ☐ ARC is not available on a VCDX (neither Classic nor SM-2000).
 - ☐ An EADAS interface link is not available on a VCDS (neither Classic nor SM-2000).
 - ☐ The limit on the number of simultaneous controls, Trunk Groups per SM/SM-2000 for DSN NM Measurements, and Precedence and Pre-emption Trunk Groups per DSN office.

5.2.12.2 Alternate Route Cancellation

The alternate route cancellation (ARC) feature is implemented at the switch that has direct trunk groups to the switch in congestion. The ARC is office selective instead of trunk group selective. The ARC can provide the following two controls:

- (1) **CANF:** Traffic that terminates in a congested switch is not allowed to alternate route through other switches to reach that switch. However, the traffic that is switched through the congested switch is allowed to alternate route. This control restricts calls of a selected level (routine or all levels of precedence) terminating in the congested switch from overflowing from the direct route. The CANF control is provided to reduce the spread of the congestion.
- (2) **CANT:** Traffic that does not terminate in the congested switch is not allowed to access the direct trunks to that switch. This control prevents calls from being alternate routed through the switch in congestion to reach their destination offices. Therefore, through-traffic bypasses the direct trunk to the traffic-congested office. This control relieves an overloaded office of traffic which can probably complete by another route.

Both the CANF and CANT controls affect the routing of a call. They can be initiated for traffic of all levels of precedence. They can be removed for either precedence or all traffic. Either one or both of the two controls can be activated to the same office at the discretion of the network manager.

5.2.12.3 Destination Code Cancellation

The destination code cancellation (DCC) control limits traffic to particular destination codes that are difficult or impossible to reach. With this control, specific calls are routed to a special announcement to free up resources for calls that are more likely to be completed. The DCC is an effective control for a focused overload where a large volume of calls are directed toward one destination.

The DCC control is NNX selective. The DCC can be implemented whether or not a direct trunk group to the affected office exists. The DCC control blocks the call at the point where the control is implemented, before trunk group hunting begins. When a switching office is detected to be in trouble, the DCC may be applied at all other connected switches. This allows calls to be blocked at or near their originations.

A DCC control can be applied for traffic of routine or all levels of precedence. It can also be removed from routine or from all traffic. The blocking applied to the destination office should not be total, unless the destination office is completely disabled through disaster or equipment failure.

The DCC code blocking allows the controlled code to be NPA, NNX, NPA-NNX, or NPA-NNX-XXXX. It also allows the network manager to control the rate at which calls are permitted to be sent to the affected code. The code-blocking capability allows simultaneous existence of up to 64 code controls in a switch.

Therefore, the network management personnel can establish a DCC control specifying the maximum rate at which calls are released toward a problem destination code. When the DCC control exists, each call's terminating code is compared with the code(s) being controlled. If a match occurred, the call is terminated to an announcement, depending on its precedence and the controlled traffic rate.

5.2.12.4 Line Load Control

The line load control (LLC) feature restricts the availability of serving office equipment to essential subscribers. It is used to reduce the originating traffic loads placed on a switching system that is encountering delays in serving originating attempts. When this control is implemented, nonessential subscribers receive degradation or temporary denial of service, where essential subscribers are given priority service. The LLC does not affect incoming calls or calls already in progress, nor does it interfere with calls completing to access lines.

The LLC is implemented at a switch overloaded by a large volume of originations. The LLC is automatically triggered, if previously enabled, when certain overload conditions exist.

The ESP feature in the 5ESS[®] switch is utilized to implement the LLC feature. The ESP feature ensures that lines designated as essential by the switching office are given a priority originating grade of service under conditions of severe overload. This is achieved by giving essential lines preferred treatment over the nonessential lines. With the ESP feature, lines are classified as essential by the office data.

The ESP feature can be enabled or disabled from the MCC display or through teletypewriter input messages. When the ESP feature is enabled, it is triggered by an SM or AM overload.

5.2.12.5 Custom Interface

The custom interface feature provides a means of transmitting the AUTOVON NM data to the NMC. The following two types of NM data are provided at the NMC:

- ☐ Traffic surveillance data
- ☐ Status discrete data.

The surveillance data items are counts of events over a 5-minute interval. Refer to the 235-070-100, *Administration and Engineering Guidelines*, for a list of the counts that are provided.

The status discrete data consists of binary indicators that show the presence or absence of associated events in a 30-second interval. With AUTOVON NM, the existing 30-second discrete data is expanded to include the following additional discrettes:

- ☐ DCC discrettes ☐ One for routing traffic level and one for all traffic
- ☐ ARC discrettes ☐ One for routing traffic level and one for all traffic.

The 5-minute data and the 30-second discrete data are available for access to the NM control center and the ROP. The NM data collection is automatically triggered in the AUTOVON switching system and is performed independently of the data transmission.

Data transmitted to the NMC through the traffic channel is analyzed, and the controls that should be taken are determined. A video display terminal and an ROP are used to interface with the NMC. The NM status and the system status of the AUTOVON network are displayed on the terminal. The 5-minute and 30-second data are output at the ROP upon request from the MCC.

5.2.12.6 Defense Switch Network Enhanced Network Management Control

The Defense Switch Network (DSN) Enhanced Network Management Control feature adds six network management controls to a DSN office (where GLDSNOPT=Y). These six network management controls allow the switch, when operating as a DSN office, access to network management controls that were previously unique to non-DSNs. These network management controls provide various combinations of Automatic versus Manual, and Restrictive versus Expansive controls.

The Network Management controls of this feature include:

- ☐ Automatic Congestion Control (ACC) ☐ an automatic, pre-hunt restrictive control, affecting both the switch in congestion, and adjacent (connected) switches. It serves to restrict traffic sent to/via a switch, when that switch is in an overload condition.
- ☐ Trunk Reservation (TR) ☐ an automatic, pre-hunt restrictive trunk group control, having functionality only in the switch where it is activated. TR serves to limit access to outgoing trunks on two-way TGs,

when the TG is nearly full. TR helps to reduce call volume on a distant switch by shifting traffic away from selected trunk groups.

- ☐ Cancel To (CANT) ☐ a manual, pre-hunt restrictive control, having functionality in the switch in which they are implemented.
- ☐ Cancel From (CANF) ☐ a manual post-hunt restrictive control.
- ☐ SKIP ☐ a manual pre-hunt restrictive control.
- ☐ Reroute (RR) ☐ manual, post-hunt expansive trunk group control, having functionality in the switch in which it is applied.

Since these controls are designed to be used in a DSN office, they are also being enhanced to account for the DSN's precedence feature. This enhancement consists of two parts:

- ☐ Calls affected by the controls: ACC will not apply to precedence calls above ROUTINE, and CANT and CANF will not apply to FLASH and FLASH OVERRIDE calls.
- ☐ Interaction with Preemption: NM controls apply during the friendly hunt (both pre- and post-hunt), and do not apply if doing a preemptive hunt on that trunk group.

TR will apply to all calls, regardless of precedence level. This is because TR is used as an implementation for the HITS RFP's DRZ and DRE, which requires DRZ and DRE to apply to all calls.

5.3 SERVICE EVALUATION SYSTEM

Service evaluation provides for an automated means of assessing the overall quality of network service and a means of identifying problems in the network. The 5ESS[®] switch supports service evaluation by interfacing with the No. 2 Service Evaluation System (SES) by means of one 2-way data link and one to four voice monitor links. The No. 2 SES measures end-to-end service by randomly sampling customer call attempts and identifying sequences of sounds such as ringing, busy, and speech. Although it can tell speech from other sounds, the No. 2 SES cannot understand speech. From these sounds, the No. 2 SES can determine whether calls reached their destination and if not, why not.

Service evaluation is controlled by the No. 2 SES with the switching system acting as a slave. An evaluation begins with a request from the No. 2 SES for the switch to bridge onto the next call of a specific type. The SES software in the switch selects a call of the appropriate type, collects call data, and establishes a bridge connection between the originating port and a voice monitor link. After the No. 2 SES has analyzed the call to its satisfaction, it requests the switch to terminate the connection.

Two types of evaluation are provided on the 5ESS[®] switch. The dial line service observation (DLSO) evaluates the disposition of calls which originate from lines on the switch. The mechanized evaluation of call completion anomalies (MECCA) monitors calls outgoing from the switch which have long holding times (90 seconds) without answer supervision. The primary intent of MECCA is to identify potential trunk problems which may result in unbilled calls, including potential fraud.

5.4 5ESS[®] SWITCH AND OS SOFTWARE RELEASE COMPATIBILITY

Refer to 235-700-100, *Interface/Compatibility Guide*, for software release compatibility.

5.5 BILLING

5.5.1 BILLING OPTIONS

5.5.1.1 Automatic Message Accounting Teleprocessing System

The Automatic Message Accounting Teleprocessing System (AMATPS) feature provides the capability to assemble automatic message accounting (AMA) billing data, generated by the AMA billing software, into a single-entry AMA record for each call requiring billing, and store and forward the AMA records to the host collector. The single-entry AMA record contains all the necessary information about the call needed for billing. The 5ESS[®] switch stores the AMA records on disk until the host collector, a centralized AMA data collection system, polls for the records or the AMA tape is written. The 5ESS[®] switch then sends the records over a data link to the host collector. The host collector is a computer facility which may collect data from several telephone switching offices. The host collector collects AMA data and interfaces with a revenue accounting office (RAO).

5.5.1.2 Local Automatic Message Accounting

The local AMA (LAMA) feature provides control, collection, and local recording of billing information and other pertinent information on magnetic tape. The billing information that is recorded on tape is the same information that would be teleprocessed with AMATPS.

5.5.1.3 High-Capacity Billing

The 5ESS[®] switch high-capacity billing provides the capability to direct AMA data into two separate disk partition groups. This is a load balancing feature and data is separated on a per SM basis. This allows two streams of data to be stored and forwarded. It also allows the simultaneous use of the local AMA tape and/or AMA teleprocessing on the two streams of data.

The 5ESS[®] switch high-capacity billing allows the 5ESS[®] switch office to bill all originating calls. High-capacity billing provides:

- ☐ The ability to maintain multiple disk partitions for storing large amounts of AMA data
- ☐ Two billing data streams that can be independently teleprocessed or written to AMA tapes
- ☐ 56 kb/s links (using the BX.25 protocol) to the RAO.

5.5.1.4 Automatic Message Accounting Toll Recording

Automatic message accounting toll recording is provided for toll 5ESS[®] switch offices that serve as points of interface for a LATA, contain RSMs, or have customers directly connected to the switch. This allows the toll 5ESS[®] switch to generate detailed per-call AMA record information for all direct connect customers [using private branch exchange (PBX) lines or direct connect lines] and for all calls transmitted [with automatic number identification (ANI)] from a LATA via equal access signaling (EAS). In addition, the AMA recording allows the toll 5ESS[®] switch to generate AMA records for wide area telecommunications service (WATS) users and cellular mobile carriers (CMC).

The toll AMA WATS capability is used to measure the service provided to outward wide area telecommunications service (OUTWATS) customers directly connected to the toll 5ESS[®] switch. Also, all originating INWATS calls will generate station-paid AMA records.

The toll CMC billing capability generates AMA records for all calls from CMC trunks connected to the toll 5ESS[®] switch. The inter-LATA carrier will bill the CMC instead of the individual user. The following is a list of the AMA components generated by AMA recording for the toll 5ESS[®] switch:

- ☐ AMA record generation of calls that enter the inter-LATA network using EAS signaling.
- ☐ The generation of AMA records for OUTWATS customers directly connected to the toll 5ESS[®] switch.

- ☐ The creation of OUTWATS records for cellular mobile carriers connected to the toll 5ESS[®] switch.
- ☐ The generation of AMA records for all direct connect customers [measured time service (MTS), OUTWATS, and INWATS]. The possible connections are from a PBX or from direct customer lines to the toll 5ESS[®] switch.
- ☐ The ability to turn AMA recording on/off by trunk group. This does not apply to direct connect customers from a PBX line or direct individual line. In this case, an AMA record is always generated for these customers.
- ☐ An option to block EAS calls entering the inter-LATA carrier network, unless ANI is provided. This option is provided on a trunk-group basis.
- ☐ The production of hourly INWATS statistical overflow records. An hourly record is made which contains the cumulative counts of the number of overflow calls due to busy INWATS terminating lines. These counts are formatted and placed on the AMA stream every hour, with the counter reset at 4:00 a.m.
- ☐ The creation of AMA records for those calls that are blocked due to network call denial.
- ☐ The creation of AMA records for all test calls that enter the inter-LATA network. These records are generated on any trunk that connects an OTC to the toll 5ESS[®] switch.

5.5.1.5 Carrier Interconnect Billing

5.5.1.5.1 Overview

The primary function of billing in the 5ESS[®] switch is to provide the RAO with per-call AMA records containing all the information necessary to bill the customer. The originating and terminating access records contain the following information for carrier interconnect (CI):

- ☐ International carrier (IC)/INC prefix field identifies the IC/INC and whether the call was direct-dialed or if an IC/INC operator was requested.
- ☐ For originating LATA records, the carrier connect date field indicates the date that carrier connect was established with the IC/INC. For terminating LATA records, this field contains the date the incoming trunk seizure is processed.
- ☐ The elapsed time from carrier connect (ETFCC) field contains the time that has elapsed from carrier connect time until disconnect. For calls to a test panel, disconnect time is the time the test panel is released (terminating record). For calls to an operator services facility, disconnect time is the time the operator disconnects (originating record). For a long duration call prior to the 5E10 software release, the sum of the contents of this field for all A, B, and C records yields the total elapsed time from carrier connect. For a long duration call in the 5E10 or later software release, the sum of the contents of this field for the first record and all continuation records yields the total elapsed time from carrier connect.
- ☐ The IC/INC call event status field will contain the last event that occurs on an IC/INC call (up to and including answer supervision) which precedes disconnect. The IC/INC call event will also record failures for incomplete calls.
- ☐ For originating calls, the ANI/CPN indicator field shows whether ANI and/or CPN were provided to the carrier. For terminating calls, the ANI/CPN indicator is recorded only for calls where CPN is received from the carrier through SS7 signaling.
- ☐ The trunk group field will contain the outgoing trunk group number for the originating LATA record and the incoming trunk group number for the terminating LATA record. This field also contains information on the type of trunk signaling used (inband or SS7).

- ☐ For originating calls, the dialing indicator field indicates if the customer used a presubscribed carrier (10XXX not dialed), dialed 10XXX or a service access code, or if the customer dialed 950-1XXX or 950-0XXX. For terminating calls, the dialing indicator field (if recorded) is populated with fill characters (that is, no information is provided).

5.5.1.5.2 Originating LATA

5.5.1.5.2.1 Overview

Originating LATA access records are made on all originating IC calls at the office that supplies dial tone. An exception can occur (for example, in an ASP call) when the originating switch passes the call to a service switching point (SSP), which generates the access record. These records are used by the OTC to bill the IC/INC for access to the originating LATA. Billing begins on establishment of carrier connect rather than at answer as for non-CI calls.

Overflow records are also required at the originating LATA. These records contain counts of the number of calls that could not be delivered to the IC/INC because a direct trunk was not available [direct trunks from either an equal access end office (EAEO) or an access tandem (AT)]. These counts are included in the originating overflow record and output once each hour.

The standard format call codes required in the originating LATA are as follows:

- ☐ Inter-LATA station-paid (call code 110)
- ☐ Inter-LATA WATS, station-detail (call code 111)
- ☐ Inter-LATA WATS, billing number (call code 114)
- ☐ Inter-LATA CSDC (call code 117)
- ☐ Originating LATA overflow counts (call code 120)
- ☐ IC number services (call code 141)
- ☐ ASP call using OUTWATS (call code 166)
- ☐ ASP inter-LATA station paid (call code 173)
- ☐ Originating access to IC virtual private network (call code 263).

Table 5-4 contains the structure codes that are recorded for these call codes.

5.5.1.5.2.2 Access Records

Originating access records (call codes 110, 111, 114, 117, 141, 166, 173, and 263) are generated by the office that supplies dial tone to the calling party. An exception can occur (for example, in an ASP call) when the originating switch passes the call to an SSP, which generates the access record. Access records are generated for all calls that progress to the point of carrier connect time.

5.5.1.5.2.3 Calls to an Operator Service

An IC/INC station-paid record (call code 110) is generated for all IC/INC calls to an operator services facility [Traffic Service Position System (TSPS), OSPS, or similar]. If an IC/INC shares an operator services facility with the OTC, an access record is generated for IC/INC calls. Carrier connect time is when the 5ESS[®] switch receives the first wink back from the operator services facility. The operator services facility responds with a steady off-hook signal upon receipt of the called number. Reception of the off-hook is

indicated in the call event status field. Disconnect time is the time the operator services facility disconnects rather than when the customer disconnects. Answer supervision (called party answer) is not returned when this type of signaling occurs, and the call is recorded as unanswered. No short supervisory transition (SST) records are generated with these types of calls.

5.5.1.5.2.4 WATS

For an IC/INC providing special services such as WATS, an IC/INC WATS station number (call code 111) is output.

5.5.1.5.2.5 Service Access Code Calls

An IC/INC carrier access record is generated for service access calls (SAC) (800, 900, etc.) calls.

5.5.1.5.2.6 INC Access Record

International carrier calls are recorded using an IC/INC station-paid record (call code 110). Overseas calls designate the number of digits dialed in the overseas indicator for calls outside the NANP.

5.5.1.5.2.7 Hourly Records

5.5.1.5.2.7.1 Overflow Records

An originating LATA overflow counts record (call code 120) that contains overflow counts on a per-IC/INC basis is output once an hour.

5.5.1.5.2.7.2 Tracer Records

During the data collection phase, sensor tracer counts are pegged for IC/INC records recorded and IC/INC records output. The IC/INC counts are separate from the OTC intra-LATA counts. The collection of these counts and the generation of the records is done hourly.

5.5.1.5.2.8 Long Duration Calls

Prior to the 5E10 software release, any call that remains connected through two consecutive midnights is a long duration call. There are four types of long duration call records as follows:

- ☐ Type A (beginning)
- ☐ Type B (continuation)
- ☐ Type C (end)
- ☐ Type D (customer disconnect between second midnight and third midnight).

For type A records, the elapsed time for carrier connect is equal to the time that has elapsed since the second midnight minus the time the 5ESS[®] switch office recognized carrier connect. Type B records contain data collected over a period of 24 hours from the previous midnight. Type C records are collected from the previous recorded midnight to disconnect. Type D records are collected from connect to disconnect for calls over two but under three midnights. Prior to the 5E10 software release, Any call that remains connected through two consecutive

In the 5E10 and later software releases, any call that is connected for more than 24 hours at the scheduled long duration generation time is a long duration call. There are two types of long duration call records as follows:

- ☐ First records
- ☐ Continuation records.

The first record is generated at the occurrence of the first scheduled record generation time after the call's elapsed time is over 24 hours. For first records, the elapsed time for carrier connect is equal to the interval from when the 5ESS[®] switch office recognized carrier connects to the time the record was generated. A continuation record is generated at each record generation time that occurs between the time of the call's first record and call disconnect. For continuation records, the elapsed time is the interval from the time when the previous record was generated to the time the current record is generated.

5.5.1.5.2.9 Short Supervisory Transitions Records

The SST records are generated by the originating LATA but are not generated by the terminating LATA. The timing indicator indicates if an SST record is generated.

5.5.1.5.3 Terminating LATA

5.5.1.5.3.1 Overview

A terminating access record (call code 119) or a CSDC terminating access record (call code 121) is generated in standard format for IC/INC calls that enter the terminating LATA. The 5ESS[®] switch office has the option of either recording or not recording terminating access records.

Unless a terminating LATA study (for example, studies to determine how effectively the OTC is using its facilities, use of invalid called numbers by the IC/INC, etc.) is in effect, a short terminating access record (call code 119) is generated for all terminating IC/INC calls on which answer supervision is returned to the IC/INC. This includes test calls and service calls (N11 codes). The study indicator field is set accordingly to indicate that the record is being generated for a test call.

If a study is in effect, a long terminating access record is generated instead of a short record. The long terminating access record is made for answered and unanswered calls on a per-carrier basis. The study is put into effect through recent change. It is possible to request that detailed records be made for all ICs/INCs without listing all of them through recent change. The study remains in effect until it is removed by the OTC switch personnel.

In addition to the information contained in the short record, the detailed record also contains the carrier connect time, the carrier connect date, elapsed time from carrier connect, and the IC/INC call event status. The time that the trunk seizure is recognized by the 5ESS[®] switch is used as the carrier connect time.

If INC traffic is routed through an IC to the LATA, the IC/INC prefix field identifies the IC, and the access charges are billed by the OTC to the IC. It is not possible to use the OTC terminating access record to bill the INC for the IC access.

5.5.1.5.3.2 Long Duration Calls

Prior to the 5E10 software release, if a long terminating access record is generated, the elapsed time for carrier connect is equal to the time that has elapsed from the second midnight minus the time the 5ESS[®] switch received the first wink from the IC/INC for record type A. Type B records contain data collected over a period of 24 hours from the previous midnight. Type C records are collected from the previous recorded midnight to disconnect. Type D records are collected from connect to disconnect for calls over two but under three midnights. No calculations for the elapsed time for carrier connect are performed if a short terminating access record is being recorded.

For the 5E10 and later software releases, if a long duration terminating access record is generated, the first record is generated at the occurrence of the first scheduled record generation time after the call's elapsed

time is over 24 hours. For first records, the elapsed time for carrier connect is equal to the interval from when the 5ESS[®] switch office received the first wink from the IC/INC to the time the record was generated. A long duration continuation record is generated at each record generation time that occurs between the time of the call's first record and call disconnect. For continuation records, the elapsed time is the interval from the time when the previous record was generated to the time the current record is generated.

5.5.1.6 ISDN Billing

5.5.1.6.1 Circuit-Switched Calls

5.5.1.6.1.1 Overview

The 5ESS[®] switch has the ability to record Bellcore standard ISDN billing information in the AMA record using the extended Bellcore AMA format (EBAF). Two ISDN core modules are recorded for different applications. The ISDN core module 070 is used for an ISDN circuit-switched call with the use of ISDN signaling capabilities. For calls where no signaling or supplementary service is used, the ISDN abbreviated core module 071 is recorded.

The ISDN core module 070 contains LSSGR tables 410, 411, 412, and 413, and is appended currently defined structures for detail billed calls. The ISDN core module (abbreviated) 071 contains LSSGR tables 410, 411, and 412. Table 410 identifies interworking situations, 411 is used to provide release cause information, 412 records the bearer capability delivered to the user, and table 413 records the use of signaling or supplementary service capabilities on a yes/no basis. Table 413 is designed to record one, all, or any combination of usage in a single record.

5.5.1.6.1.2 EBAF

A data module that records the usage of a new service can be appended to an existing AMA record. The data module is identified by its unique module code. Although existing structure codes can be used, an EBAF record makes use of the 10,000's digit of the BAF structure code. The 10,000's digit has the value of 4. The remaining digits identify the special list of data fields presented in a BAF record since it is formed by appending a data module to the BAF record. In addition, a record descriptor word, a 4-byte field, provides the total number of bytes of a record including the data module appended to the structure code and the trailer module 000.

5.5.1.6.1.3 Fill Procedures for Unused Data Fields

For fill procedures, the Hex F character use is extended to allow an indication that a data field included in an AMA record is intentionally unused or contains null or irrelevant data. The Hex F character is used in every position, including the field's sign position. This procedure does not affect the Hex-ID of the record. This procedure is used to adapt existing BAF records for new services. This procedure is used instead of the current practice of using zeros to show null or irrelevant data.

5.5.1.6.1.4 AMA Record Generation

When a call setup is completed, charge treatment is determined. If the call requires AMA treatment, a call type is derived. If the billable call is ISDN, either module 070 or module 071 is appended to the AMA data structure. If a signaling or call management service is used, module 070 is appended. Otherwise, if the bearer capability shows that it is a circuit-switched data call, module 071 is appended regardless of the office options.

5.5.1.6.1.5 ISDN Data Call Records

When the office parameters (miscellaneous) option selected is no, then the existing AMA call codes and structure codes for circuit-switched data calls are used. In addition, module 070 or 071 is appended to the structure code:

The following AMA call types are assigned to ISDN circuit-switched related services.

- ☐ 072 - Circuit-Switched Digital Capability
- ☐ 117 - Inter-LATA CSDC
- ☐ 121 - CSDC Terminating Access
- ☐ 148 - Intranetwork High Bandwidth
- ☐ 149 - Originating Access High Bandwidth
- ☐ 150 - Terminating Access High Bandwidth

5.5.1.6.1.5.1 Circuit-Switched Digital Capability

Call type 072 is used for local (intra-LATA) ISDN data calls. Structure codes 00190, 00192, 00194, 00195, 10191, and 10193, are used, depending on the call condition.

In the 5E9(1) software release, call type 148 and the associated structure code 00190 are available for intra-LATA wideband CSD calls.

5.5.1.6.1.5.2 Inter-LATA CSDC

Call type 117 is used for inter-LATA circuit-switched data call originating access. Structure codes 00645, 00646, 00647, 00648, 10645, 10646, 10647, or 10648 are used, depending on the call condition.

In the 5E9(1) software release, call type 149 and the associated structure code 00645 are available for originating access wideband CSD calls.

5.5.1.6.1.5.3 CSDC Terminating Access

Call type 121 is used for inter-LATA circuit-switched data call terminating access. Structure codes 00656, 00657, 10656, or 10657 are used, depending on the call condition.

In the 5E9(1) software release, call type 150 and the associated structure code 00645 are available for terminating access wideband CSD calls.

5.5.1.6.2 Packet-Switched Calls

5.5.1.6.2.1 Overview

The ISDN packet-switching billing provides billing data collection and the AMA record generation required for the ISDN packet-switched calls on the B and D channels, and for the modem pool call processing feature. The usage of the 5ESS[®] switch and network resources are recorded in billing records based on the call, the number of segments transmitted over the call, and the call holding time.

The following AMA call types are assigned to ISDN packet switching related services. They are as follow:

- ☐ 090 - Sensor Tracer Records
- ☐ 180 - Standard Virtual Circuit Calls
- ☐ 181 - Permanent Virtual Circuit (PVC) Calls
- ☐ 349 - Data Facility Pool Usage

- ☐ 377 - On-Demand Packet B-Channel Usage
- ☐ 378 - Intrapacket Business Group.

5.5.1.6.2.2 Sensor Tracer Records

The call assembly tracer records for packet-switched calls are formatted with structure code 09057 and call type 090.

5.5.1.6.2.3 Standard Virtual Circuit Calls

Call type 180 is used for standard switched virtual circuit services. Four possible AMA structure codes are produced in association with this call type. Structure codes 00670 and 00671 (LDC) are used to record intranetwork virtual circuit calls. Structure codes 00672 and 00673 (LDC) are used for internetwork virtual circuit calls which use an X.75 interface in software releases prior to 5E8. In the 5E8 and later software releases, Structure codes 00685 and 00686 (LDC) are used.

5.5.1.6.2.4 Permanent Virtual Circuit (PVC) Calls

Call type 181 is used for PVC service. Prior to the 5E8 software release, structure code 00676 is used for intranetwork PVC calls. In the 5E8 and later software releases, structure code 00693 is used for intranetwork PVC calls. Structure code 00692 is used for internetwork PVC calls.

5.5.1.6.2.5 Data Facility Pool Usage

Call type 349 is used to record the usage of the modem pool facility. Service providers have the ability to turn on or off this billing capability. Structure codes 01120 and 01121 (LDC) are produced for this call code.

5.5.1.6.2.6 On-Demand Packet B-Channel Usage

Call type 377 records the connecting time of a B-channel for packet switching service. The packet switching service is established for an on-demand basis. Structure codes 01128 and 01129 (LDC) are produced in association with this call code to record the usage of the PH.

5.5.1.6.2.7 Packet Switching Data Business Group

Call type 180 with a module 074 is used to record intrapacket group calls. Service providers have the ability to turn this billing capability on or off. The structure codes for standard virtual calls are 00670 and 00671 (LDC). If the call is not an intrapacket business group call, no module is added.

Module 074 is also appended to PVC records to show Packet Business Group usage.

5.5.1.7 Account Codes

Account code billing permits a customer to add an account number to the AMA record for every call. An optional customer-dialed account recording (CDAR) data field can be appended to any AMA record for an 8-digit binary coded decimal (BCD) field using structure codes 2XXXX or 3XXXX (CDAR and TNN). An optional account code data field can be appended to any AMA record for a 15-character EBCDIC field using structure codes 8XXXX or 9XXXX (Account code and TNN). An account code (ACCT) is entered as part of the dialing sequence and may be included with the information on the customer's bill. This provides the customer with a means for cost allocation of incoming and outgoing calls, by associating a particular call with a specific customer business account.

The account codes are passive codes; that is, the only analysis is to check for the correct length, and it can contain any dialable character accepted by the switch. Once the ACCT is entered, dial tone prompts the user for the destination. Some valid numbers entered after the ACCT are a private network call, a direct

distance dialing (DDD) call, or a feature activation code.

5.5.2 COLLECTION METHODS

The host collector is a computer facility which is capable of collecting data from several telephone switching offices. The host collector collects AMA data, and interfaces with an RAO. The following host collectors are compatible with the 5ESS[®] switch:

- ☐ BILLDATS[®] AMA data collector.
- ☐ No. 1A HOC.

The host collector interface requires only one data link; either a 4.8-kb/s dial-up, or a 9.6-kb/s or 56-kb/s (BILLDATS[®] data collection apparatus only) dedicated link. The necessary link is determined by the daily AMA call traffic. A 4.8-kb/s link can serve approximately 27-k records per hour, a 9.6-kb/s link can serve approximately 54-k records per hour, and the 56-kb/s link can serve approximately 315-k records per hour. The following algorithm can be used to determine the applicable link speed for a 5ESS[®] switch.

- (1) Determine the number of daily AMA records to be transmitted
- (2) Divide the number of daily AMA records by the number of calls that can be transmitted per hour over the 4.8-kb/s link (that is, 27-k). The result is the number of hours required to transmit all data to the host collector at the 4.8-kb/s rate.
- (3) If the time required to transmit the AMA data is less than 8 hours, then this switch can be combined with other switches on a dial-up 4.8-kb/s link, provided the total aggregate transmission time of all the switches does not exceed 20 hours.
- (4) If the time required to transmit the AMA data is greater than 8 hours, repeat Step 2 using the value given previously for the 9.6-kb/s link (or two 4.8-kb/s links) (that is, 54-k).
- (5) If this result is less than 8 hours, then a 9.6-kb/s link is suitable for the application; otherwise use a 56-kb/s link.

The DATAPHONE[®] II data sets (2048 @ 4800 b/s; 2096 @ 9600 b/s) are recommended for the data link. Only the Electronic Industry Association (EIA) RS-449 interface to the 5ESS[®] switch is supported. Other data equipment, such as a 43A single number dialer and a 48FR1 data unit, must also be provided for dial-up only. For details, refer to SD-1P195-01.

The 4.8-kb/s link is a 4-wire dial-out/dial-back link composed of two 2-wire dial-up channels. Additional data equipment, such as a 48FR1 data unit must be provided to control the establishment of the dial-out/dial-back link. The 4.8-kb/s link can serve over 30,000 AMA calls per hour of data transmission.

The 9.6-kb/s link is a 4-wire dedicated data link which has a capacity of over 60,000 AMA calls per hour of data transmission. On-line, dedicated backup links are not required; however, a capability to provide an alternate dedicated link to a backup collector should be considered. This capability would be used in case of a long-term collector or data link outage. It is also possible to write data to tape at the 5ESS[®] switch if valid AMA tapes are available. The 5ESS[®] switch can send the AMA records over a 9600 bits per second modem link.

The simplex data link is synchronous and may be dedicated (at 9600 baud) or dial-up (at 4800 baud) from the host collector. It uses the BX.25 protocol. The interface between the data link and the 5ESS[®] switch is a synchronous port in the I/O processor (IOP). For planning purposes (assuming the link is operated 10 hours per day), the link has a capacity of approximately 290-k total day billed calls at 4800 baud or 580-k total day billed calls at 9600 baud. The record size for ordinary calls (that is, not carrier interconnect, 46

bytes/record) is approximately 40 bytes/record. The record size for calls (that is, not carrier interconnect, 70 bytes/per record) is on average approximately 60 bytes per record.

For a typical office configuration prior to the 5E8 software release, the 5ESS[®] switch can hold approximately 5 million plain old telephone service (POTS) AMA records per disk pair. Starting with the 5E8 software release, the 5ESS[®] switch can hold up to 2.5 million AMA records on the primary and secondary disk partitions. Starting in the 5E9(1) software release, the switch can hold up to 10 million AMA records per optional disk pair. The 5ESS[®] switch supports up to seven pairs of disks (15 pairs for the 5E6 and subsequent software releases). Note that in addition to AMA records, other information (such as backup copies of AM and SM software releases and static ODD, backup copies of the UNIX[®] operating system, disk-resident ODD, and logging data) are also stored on the disk pairs. Thus the customer can purchase ample quantities of disk space to meet the Bellcore Five Day Storage Requirement for the end office.

The host collector can poll the office at any time. For automatic polling, entries in the polling list are restricted to be on-the-hour. If polling is to be done during the office busy hour, care should be given to the scheduling of other administrative tasks. The 5ESS[®] switch can reject polling requests that occur between start and stop times set by the office switch personnel or the SCCS.

All *BILLDATS*[®] collectors software releases support the 5ESS[®] switch. The No. 1A HOC 1AAC(1.1) software release is required to support the 5ESS[®] switch.

5.5.3 AMA FORMATS

5.5.3.1 Overview

All customer-usage-related data produced by the switching system for processing by an RAO conforms to the format listed in the following paragraphs.

5.5.3.2 Record Structure

5.5.3.2.1 Overview

Each record is a stand-alone record that contains complete information about a call or statistic. A record consists of the following data:

- (a) Record descriptor word
- (b) Hexadecimal identifier
- (c) Structure identifier code
- (d) Data fields as defined by structure code.

A data module that records the usage of a new service, can be appended to an existing AMA record. The data module is identified by its unique module code. Although, existing structure codes can be used, an EBAF record makes special use of the 10,000's digit of the BAF structure code. The 10,000's digit has its value increased by 4. The remaining digits identify the special list of data fields presented in a BAF record since it is formed by appending a data module to the BAF record. In addition, a record descriptor word, a 4-byte field, provides the total number of bytes of a record including the data module(s) appended to the structure code and the trailer module 000.

5.5.3.2.2 Record Descriptor Word

The AMA records are variable in length. A 4-byte record descriptor word begins each AMA record. The first two bytes contain the length of the AMA record in binary. The next two bytes are always zero.

5.5.3.2.3 Hexadecimal Identifier

Each AMA record contains a 1-byte field of two hexadecimal characters followed by several fields of data. The first character of the hexadecimal identifier is a hex A. The second character is also a hex A if all the fields in the record contain good data (that is, no missing data). If any field is unknown or erroneous, then missing data characters (that is, hex F) are inserted, and the second character of the hex identifier is a hex B.

5.5.3.2.4 Field Structure

Data fields follow the hex identification (ID). Each data field is a signed packed decimal number. Numbers are right adjusted, within a field, with unused characters padded with zeroes. The maximum field length is 14 characters (including the sign character). The least significant character (low order four bits) represents the sign of the number. The positive sign (hexadecimal C) is used when no error flags are recorded in the field. The minus sign (hexadecimal D) is used when error flags are recorded. The hexadecimal F is used as the sign character when the field is intentionally filled with hexadecimal F to indicate an unused field. The error flag is a hexadecimal ``F" and is recorded when there is an error and the machine does not know what to record. If any space in the record must contain a hexadecimal ``F" because the correct data is unknown, the hexadecimal identifier is recorded as a hexadecimal AB. This format enables the processing office to deal with each record as an entity, while warning the program about records that need special processing (the hexadecimal AB) and flagging the field(s) (with a minus sign) that require special attention. The hexadecimal F can also be used as a filler for an unused field. In such case, the hexadecimal identifier will be AA, so that the processing office can still process the record through normal procedures.

5.5.3.2.5 Structure Code

Immediately following the hexadecimal identifier is a 6-character field. Characters 1 through 5 contain the structure code. The structure code defines a set of data fields that comprise a record and the ordering of the fields within the structure. A structure code is defined for each recognized call condition variation. All data fields called for by a structure code must be present within a record. The RAO expects that the data reported is correct except where a hexadecimal ``F" is used as described in the previous paragraph.

5.5.3.3 Data Fields

5.5.3.3.1 Common Fields

The following fields always appear at the beginning of each record following the structure identifier code.

5.5.3.3.1.1 Call Type

The second common field to appear in every record is the 4-character call type descriptor. Three characters define the type of call or statistic being recorded. See Table 5-4 .

5.5.3.3.1.2 Sensor Type

The third common field is the 4-character sensor type field. This field defines the sensor from which the record information was received.

The sensor type field of 008c indicates that a 5ESS[®] switch is generating the records.

5.5.3.3.1.3 Sensor Identification

The fourth common field is the 8-character sensor ID field. Six characters identify the individual sensor. This number is assigned by the OTC. The first character is an information digit and the eighth character is the sign character.

The sensor ID field is a number that uniquely identifies which 5ESS[®] switch is generating the data. The first digit of the sensor ID field is an information digit that indicates whether the record was repolled. This is set by the host collector.

5.5.3.3.1.4 Recording Office Type

The fifth common field is the 4-character recording office type field. Three characters define the recording machine type that outputs this record. The fourth character is the sign character.

If the 5ESS[®] switch writes AMA data onto magnetic tape, then the recording office type field is 008c. If a host collector is the actual recording machine, the field contains 032c. The recording office identification number is assigned by the OTC.

5.5.3.3.1.5 Recording Office Identification

The sixth common field is the recording office identification field. Six characters identify the individual recording machine. This number is assigned by the OTC. The first character is padding, (a zero) and the eighth character is the sign character.

5.5.3.3.2 Data Fields for AMATPS

The sensor type, sensor ID, recording office type, and recording office ID fields are not sent from the 5ESS[®] switch to the host collector in an AMATPS environment. Since these fields are common to all the AMA records per office, they are not recorded and are not stored on disk or teleprocessed to the host collector. This saves disk space for storage of AMA records and also increases data link throughput. These fields are inserted by the host collector to meet the stand-alone AMA record format required by the RAO. These fields are also inserted when an AMA tape is made at the 5ESS[®] switch office.

5.5.3.4 Call Types and Structure Codes

5.5.3.4.1 Overview

The structure code is determined based upon the call type and whether certain conditions occurred on the call. For example, an answered station-paid call (call code 006) has structure code 00001. If the same call were unanswered, it would have structure code 10002, and the terminating port and seizure time would be included in the record.

Table 5-4 lists the call types that are recorded by the 5ESS[®] switch. Tables 5-5, 5-6, 5-7 lists, by call type, the structure codes that are recorded. The OSPS call types are also listed in the AMA Call Types table.

Most calls are recordable in more than one structure type. The reasons for this are explained in the following paragraphs.

Table 5-4 AMA Call Types

CODE	CALL TYPE
001	Detailed Message Rate, Timed, MBI (Message Billing Index): This call code is recorded for a local message rate call or a measured service call. The call is timed and includes the originating and terminating numbers. An MBI is included to indicate rate treatment, if applicable.
002	Message Rate, Timed, MBI: This call code is recorded for a local message rate call or a measured service call. This call code is used for calls that do not require full call details for billing. The call is timed but the terminating number is not included. An MBI is included to indicate the rate treatment, if applicable.
003	Detailed Message Rate, Untimed, MBI: This call code is recorded for a local message rate call. This call code is used for calls that are not timed. It includes the originating and terminating numbers. An MBI is included to indicate the rate treatment, if applicable.
004	Message-Rate, Untimed, MBI: This call code is recorded for a local message rate call. This call code is used for calls that do not require full details or timing for billing. The call is not timed and does not include the terminating

	number. An MBI is recorded to indicate the rate treatment, if applicable.
005	Detailed Message-Rate, Timed, No MBI: This call code is recorded for a local message rate call or a measured service call. The call is timed and includes both originating and terminating numbers. An MBI is not included.
006	Station Paid: This call code provides full call details for a direct-dialed, station-paid toll call (7-digit toll, 10-digit toll or IDDD). It is also used to record a call to a foreign NPA directory assistance (NPA-555-1212) and to 800 service. This call code may also be used to provide details for a local coin call where AMA data are generated for studies. The OSPS records this type of entry on all system CAMA (centralized automatic message accounting) calls received on operator trunks.
007	WATS, Station Identification: This call code provides identification of the calling station on a call routed over a WATS facility. The full business day or measured time indication and the WATS band information are included.
008	INWATS, Terminating Entry: This call code is recorded for an INWATS call terminating at an 800 service line. "Terminating entry" refers to the process of generating AMA data for incoming calls at the called point. This contrasts to the normal process of generating billing information at the calling point. The originating number field of this record contains the terminating number.
009	Directory Assistance (411): This call code is recorded for a 411 directory assistance call when a directory recording trunk is used. In this case, no called number is passed and the OSPS assumes 411. All other directory assistance calls are recorded with the appropriate special calling code and structure code. In this case, the terminating NPA field contains zeros and the terminating number field contains 4110000. This is the normal recording configuration for all N11 calls (N110000).
010	Station-Paid, Operator-Handled: This call code is recorded in the OSPS for all operator-handled, station-paid calls as well as ACTS (automated coin toll service), time and charges, and notify calls.
011	FX, AFR: This call code is recorded for a call that was initiated as an FX (foreign exchange) call but was routed via AFR (automatic flexible routing) to another service. The details recorded will reflect the type of call that the AFR routed to.
014	Station Collect: This call code is recorded for station-to-station collect calls.
015	Station Special Calling: This call code is recorded for calling (credit) card, third number, and special billing number station-to-station calls.
016	Person Paid: This call code is recorded when a person-to-person call is billed to the originating number.
017	Person Collect: This call code is recorded when a person-to-person call is billed to the called number.
018	Person Special Calling: This call code is recorded when a person-to-person call is billed to a third number, calling (credit) card, or special billing number.
019	Automatic Collect: This call code is recorded for calls to special numbers that are automatically billed collect (for example, Enterprise, Zenith, or operator-dialed INWATS).
021	CCSA Sampling: This call code is recorded for calls routed over a CCSA facility. Typically, 20 percent or 100 percent of such calls are recorded.
022	Station Special Called: This call code is recorded when the called party passed a third number, special billing number, or calling card number, to be billed for a station-to-station call.
023	Person Special Called: This call code is recorded when the called party passed a third number, special billing number, or calling card number, to be billed on a person-to-person call.
024	Direct Distance Dialing, Operator-Assisted: This call code is recorded on an operator-assisted toll call in order to bill at DDD rates. It is necessary in special cases, such as when the operator assisted because of reported troubles.
025	Station Coin Zone: This call code is recorded for coin calls in areas where the rate tariff designates multiple zones.
029	Person Coin Zone: This call code is recorded for person-to-person coin calls in areas where the rate tariff specifies multiple zones.
032	Tandem Tie Trunk: This call code is recorded for calls placed over tie trunks. Up to 24 dialed digits can be recorded.
033	Directory Assistance (555-1212): This call code is recorded for calls to home NPA directory assistance (555-1212).
034	Signaling Irregularities: This call code records the details of an SST.
035	Non-Revenue: This call code indicates that no billing is to be done from this record. An entry containing this call code is output for all uncompleted calls that have either an operator override or operator-keyed coin fraud. On nonrevenue calls, the study indicator flag "no class of charge" is set unless the operator has keyed a "no AMA class of charge" or no calling and/or called number is available. Nonrevenue calls can also output a study flag indicating that the calling and/or called number is not available.
041	Local Coin: This call code indicates a local coin call which is recorded for study purposes only.
042	Time Change: This call code is recorded to indicate a time clock change in the AMA recording system.
043	Verify-Paid: This call code is recorded for a verify call to be billed to the originator.
044	Emergency Interrupt-Paid: This call code is recorded for an emergency interrupt call to be billed to the originator.
054	Verify, Special Calling: This call code is recorded when a customer asks the operator to verify that a line is busy but wishes to bill the call to a third number, special billing number, or calling card number.
055	Emergency Interrupt, Special Calling: This call code is recorded when a customer asks the operator to break into a busy line for an emergency, but wishes to bill the call to a third number, special billing number, or calling card number.
056	Traffic Counts: Approximately every half-hour, the OSPS outputs a series of statistical records containing counts of some occurrences. Each record contains (in addition to standard data such as call type) a number of peg count type

	fields, each followed by a count field containing the number of occurrences identified by the peg count type field.
057	Verify, Nonrevenue: This call code is recorded for all nonrevenue verify calls.
058	Emergency Interrupt: This call code is recorded for emergency interrupt nonrevenue calls.
060	Toll Station Paid Call.
067	Flat Rate: This call code provides AMA details for a call within a customer's flat-rate area. This call code is recorded for study purposes.
068	WATS Billing Number: This call code is recorded for customer-dialed, ANI outward WATS (measured time or full business day) calls. The originating number field contains a WATS billing number that is assigned locally.
071	INWATS Overflow Count: This call code is used in the AMA record, recorded at the terminating end of INWATS calls, which contains the counts of the number of INWATS calls which were blocked. The NPA and DN of the terminating lines are included in this record.
072	CSDC (Circuit-Switched Digital Capability): This call code records on intra-LATA CSDC calls. The record distinguishes CSDC from MTS (message telephone service) and provides a service chosen indication and a rate of data chosen indication. The customer is billed on a usage-sensitive basis.
074	Free Call, Flat Rate Call: This call type provides AMA details for a call within a customer's free area. This call normally does not require AMA data for billing, but data are provided, as required, for studies. The OSPS recognizes a call as being a free call only if the call was required to rate another call (that is, to query the external rating data base for the charges on a call).
076	Extension Changes: Part of the CSR feature. This call code is recorded when a customer changes extension numbers associated with one station to another station. The change will carry all the features and characteristics over to the new station.
078	Station Verification: Part of the CSR feature. This call code is recorded when a Centrex/ESSX-1 customer searches an extension number to see which features are associated with that extension.
080	Public Packet-Switched Network (PPSN) (5E4 and 5E5): This call code is recorded to account for the large usage of an ISDN customer in various rate periods. The number of rate periods per day and their respective time-of-day boundary definitions are fixed for every day of the year.
081	PPSN Permanent Virtual Circuit (PVC) (5E4 and 5E5): This call code is recorded for each PVC. This record does not include duration fields and is recorded once a day.
083	Inward Call Extended to Centrex Station: This call code is recorded for inward calls extended to a centrex station. It allows for a terminating station number of from 1 to 6 digits.
084	Inward Call Extended to a Tie Trunk: This call code is recorded for inward calls extended to a tie trunk. It allows for a terminating access code of from 1 to 5.
085	ETS (Electronic Tandem Switching): This call code is recorded for an electronic tandem switched call over normal ETS trunks.
090	Sensor Tracer: This call code identifies a tracer record for a sensor. It is a statistical entry containing attempt and completion data provided by a particular sensor (such as BDT or CDT) and also used for call assembly trailers and records.
099	ETS Call via CCSA: This call code is recorded on electronic tandem switched calls routed via a CCSA private-switched network.
107	Credit Adjustment Record: This call code identifies adjustments or credit requests to previous AMA messages.
110	Inter-LATA Station-Paid: This call code is recorded for direct-dialed, station-paid toll calls routed via an interexchange carrier. The record contains carrier information for applying access charges.
111	Inter-LATA WATS, Station Detail: This call code is recorded for WATS call routed via an interexchange carrier and identifies the calling station. The record contains carrier information for applying access charges.
114	Inter-LATA WATS Billing Number: This call code is recorded for WATS calls routed via an interexchange carrier and provides the WATS billing number assigned locally. The record contains carrier information for applying access charges.
117	Inter-LATA CSDC: This call code is recorded for inter-LATA CSDC calls.
119	Terminating Access Record: This call code is recorded for terminating access records. The record contains carrier information for applying access charges.
120	Originating LATA Overflow Counts: This call code is recorded to provide an hourly count of overflows to an inter-LATA carrier, that is, a count of all calls not delivered to a carrier due to no outgoing trunk to the carrier being available.
121	CSDC Terminating Access: This call code is recorded for terminating access CSDC calls. The record contains carrier information for applying access charges.
124	CDAR Local and Untimed Message Rate: This call code is recorded for local nonbillable and untimed message rate calls utilizing the CDAR feature.
131	Feature Group A Originating: This call code is recorded when a feature group A customer originates a call that accesses an interexchange carrier network.
132	Feature Group A Terminating: This call code is recorded when an interexchange carrier terminates a call to a feature group A customer.
134	Feature Group B Originating: This call code is recorded when a feature group B customer originates a call that accesses an interexchange carrier network.
135	Feature Group B Terminating: This call code is recorded when an interexchange carrier terminates a call to a

	feature group B customer.
141	Interexchange Carrier Number Service Call: This call code is recorded for calls to an interexchange carrier extended area data base.
142	OTC Number Service Call: This call code is recorded for calls to an OTC extended area data base.
148	Intra-Network High Bandwidth: This call code is recorded for calls with an information transfer rate greater than 64 kb/s (ISDN access by originating party).
149	Originating Access High Bandwidth: This call code is recorded for calls with an information transfer rate greater than 64 kb/s (ISDN access by originating party).
150	Terminating Access High Bandwidth: This call code is recorded for calls with an information transfer rate greater than 64 kb/s (ISDN access by originating party).
160	On-Net ASP Call
161	On-Net ASP Overflow Call
162	Off-Net ASP Call
163	Off-Net ASP Overflow Call
164	ASP Call Using FGA
165	ASP Call Using FX
166	ASP Call Using OUTWATS
167	ASP Call Using Tie Trunks
172	Terminating Access Records - ASP
173	Originating (Inter-LATA Station Paid) - ASP
180	ISDN Virtual Call Detailed (5E6): This call code is recorded to account for the large usage of an ISDN customer in various rate periods. The number of rate periods per day and their respective time-of-day boundary definitions are fixed for every day of the year.
181	ISDN PVC Detailed (5E6): This call code is recorded for each PVC. This record does not include duration fields and is recorded once a day.
183	ISDN Daily Aggregate Service Event
260	BRI Dial Up Test Line
263	Originating Access to IC Virtual Private Network (5E6)
306	Toll cellular mobile carrier call
309	Special access MEGACOM [®] telecommunications service billing number (5E5)
315	Line/Feature/Verify or Change (CSR): This call code is recorded when the RMAS forwards the RC/V changes to the 5ESS [®] switch data base. This call code is also recorded when customer line or group data is changed or displayed.
318	Special access WATS billing number (5E5)
319	Message service (owner billing)
320	Message service (end-user billing)
321	Special service record
330	LASS service (5E5)
332	ICLID LASS record (5E5)
349	Modem pooling
351	Electronic dictionary service
360	OSO Recording: This call code is recorded to indicate the delivery of ANI digits or acknowledgment that ANI was received at the terminating station.
369	Intercom calling restriction
377	On-demand B-channel usage (5E5)
378	Intrapacket business group (5E5)
381	PBX-DID no answer (5E6)
550	Suppressed Ringing

NOTE: Wideband does not use CGIDX through the ODD as do narrowband calls. Call type is generated from a combination of bearer capability and the type of wideband call.

5.5.3.4.2 Structure Code by Call Type - Class 5 Office Recording

Table 5-5 Structure Code by Call Type - Class 5 Office Recording (001-019)

CALL TYPE	STRUCTURE CODE	CONDITIONS
001	00020	Answered
001	00061	Answered with Customer Identification (5E6)
001	00120	Long Duration (Prior to 5E10)
001	00161	Long Duration with Customer Identification (5E6)
001	00502	High Runner - Answered
001	10021	Unanswered
001	10502	High Runner - Unanswered
002	00015	Answered
002	00020	Answered - Full Details
002	00115	Long Duration (Prior to 5E10)
002	00120	Long Duration - Full Details (Prior to 5E10)
002	00503	High Runner - Answered

002	10016	Unanswered
002	10021	Unanswered - Full Details
002	10503	High Runner - Unanswered
003	00020	Answered - Full Details
003	00024	Answered
003	00120	Long Duration (Prior to 5E10)
003	00504	High Runner - Answered
003	10021	Unanswered - Full Details
003	10087	Unanswered
003	10504	High Runner - Unanswered
004	00019	Answered
004	00020	Answered - Full Details
004	00120	Long Duration (Prior to 5E10)
004	10021	Unanswered - Full Details
004	10086	Unanswered
005	00001	Answered
005	00101	Long Duration (Prior to 5E10)
005	10002	Unanswered
006	00001	Answered
006	00014	Answered with Customer Identification (5E6)
006	00101	Long Duration (Prior to 5E10)
006	00114	Long Duration with Customer Identification (5E6)
006	00500	High Runner - Answered
006	01200	OSPS Basic
006	01202	OSPS Basic, RSM and Screening Code
006	01216	OSPS Long Duration
006	10002	Unanswered
006	10500	High Runner - Unanswered
007	00035	Answered - WATS Administration
007	00055	Answered - WATS Administration Customer Identification
007	00135	Long Duration - WATS Administration (Prior to 5E10)
007	00155	Long Duration - WATS Administration Customer Identification (Prior to 5E10)
007	00501	High Runner - Answered
007	10054	Unanswered - WATS Administration
007	10056	Unanswered - WATS Administration Customer Identification
007	10501	High Runner - Unanswered
008	00027	Answered - WATS Administration
008	00079	Answered
008	00080	Unanswered
008	00127	Long Duration - WATS Administration (Prior to 5E10)
008	00179	Long Duration (Prior to 5E10)
008	10097	Unanswered - WATS Administration
009	00028	Answered
009	00128	Long Duration (Prior to 5E10)
009	01215	OSPS Basic
009	10068	Unanswered
010	01200	OSPS Basic
010	01201	OSPS Basic Plus Charge Indicator and Amount of Charge
010	01202	OSPS Basic Plus RSM and Screening Code
010	01203	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, and Screening Code
010	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
010	01205	OSPS Basic Plus RSM, Screening Code, and RTA/SSAS
010	01216	OSPS Long Duration
010	01219	OSPS Basic Plus ATP/SSAS
010	01220	OSPS Basic Plus ATP/SSAS, SSAS Indicator, Coin Credit, and Walkaway
010	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
010	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
010	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
010	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
011	00001	Answered
011	00014	Answered - Customer Identification
011	00101	Long Duration (Prior to 5E10)
011	00114	Long Duration - Customer Identification (Prior to 5E10)
011	10002	Unanswered
011	10081	Unanswered - Customer Identification
014	01206	OSPS Basic
014	01207	OSPS Basic Plus RSM and Screening Code
014	01208	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
014	01209	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and

		ATP/SSAS
014	01217	OSPS Long Duration
015	01210	OSPS Basic
015	01211	OSPS Basic Plus RSM and Screening Code
015	01212	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
015	01213	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
015	01218	OSPS Long Duration
015	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
015	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
015	01232	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
015	01233	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
015	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
016	01200	OSPS Basic
016	01201	OSPS Basic Plus Charge Indicator and Amount of Charge
016	01202	OSPS Basic Plus RSM and Screening Code
016	01203	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, and Screening Code
016	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
016	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
016	01216	OSPS Long Duration
016	01219	OSPS Basic Plus ATP/SSAS
016	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
016	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
016	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
016	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
016	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
017	01206	OSPS Basic
017	01207	OSPS Basic Plus RSM and Screening Code
017	01208	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
017	01209	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
017	01217	OSPS Long Duration
018	01210	OSPS Basic
018	01211	OSPS Basic Plus RSM and Screening Code
018	01212	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
018	01213	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
018	01218	OSPS Long Duration
018	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
018	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
018	01232	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
018	01233	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
018	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
019	01200	OSPS Basic
019	01202	OSPS Basic Plus RSM and Screening Code
019	01216	OSPS Long Duration

5.5.3.4.3 Structure Code by Call Type - Class 5 Office Recording

Table 5-6 Structure Code by Call Type - Class 5 Office Recording (021-060)

CALL TYPE	STRUCTURE CODE	CONDITIONS
021	00001	Answered
021	00014	Answered - Customer Identification
021	00101	Long Duration (Prior to 5E10)
021	00114	Long Duration - Customer Identification (Prior to 5E10)
021	00500	High Runner
021	10002	Unanswered

021	10081	Unanswered - Customer Identification
021	10500	Unanswered - High Runner
022	01210	OSPS Basic
022	01211	OSPS Basic Plus RSM and Screening Code
022	01212	OSPS Basic Plus Charge Indicator, Amount of Charge and ATP/SSAS
022	01213	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
022	01218	OSPS Long Duration
022	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
022	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
022	01232	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
022	01233	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
022	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
023	01210	OSPS Basic
023	01211	OSPS Basic Plus RSM and Screening Code
023	01212	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
023	01213	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
023	01218	OSPS Long Duration
023	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
023	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
023	01232	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
023	01233	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS Plus Subaccount Indicator and Subaccount Billing Number
023	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
024	01200	OSPS Basic
024	01202	OSPS Basic Plus RSM and Screening Code
024	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
024	01216	OSPS Long Duration
024	01219	OSPS Basic Plus ATP/SSAS
025	01200	OSPS Basic
025	01202	OSPS Basic Plus RSM and Screening Code
025	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
025	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
025	01216	OSPS Long Duration
025	01219	OSPS Basic Plus ATP/SSAS
025	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
025	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
025	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
025	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
025	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
029	01202	OSPS Basic Plus RSM and Screening Code
029	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
029	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
029	01216	OSPS Long Duration
029	01219	OSPS Basic Plus ATP/SSAS
029	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit and Walkaway
029	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
029	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
029	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
029	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
032	00025	Answered
032	00026	Answered - Customer Identification
032	00125	Long Duration (Prior to 5E10)
032	00126	Long Duration - Customer Identification (Prior to 5E10)
033	00028	Answered
033	00128	Long Duration (Prior to 5E10)

033	10068	Unanswered
033	01215	OSPS Basic
034	10002	Answered/Unanswered
035	01200	OSPS Basic
035	01202	OSPS Basic Plus RSM and Screening Code
035	01216	OSPS Long Duration
041	00001	Answered
041	00101	Long Duration (Prior to 5E10)
041	10002	Unanswered
042	09000	Output Whenever a Time Change Occurs
043	01200	OSPS Basic
043	01201	OSPS Basic Plus Charge Indicator and Amount of Charge
043	01202	OSPS Basic Plus RSM and Screening Code
043	01203	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, and Screening Code
043	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
043	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
043	01216	OSPS Long Duration
043	01219	OSPS Basic Plus ATP/SSAS
043	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit and Walkaway
043	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
043	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit and Walkaway
043	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
043	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
044	01200	OSPS Basic
044	01201	OSPS Basic Plus Charge Indicator and Amount of Charge
044	01202	OSPS Basic Plus RSM and Screening Code
044	01203	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, and Screening Code
044	01204	OSPS Basic Plus Charge Indicator, Amount of Charge, and ATP/SSAS
044	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
044	01216	OSPS Long Duration
044	01219	OSPS Basic Plus ATP/SSAS
044	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
044	01221	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, and ATP/SSAS
044	01222	OSPS Basic Plus Charge Indicator, Amount of Charge, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
044	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
044	01224	OSPS Basic Plus Charge Indicator, Amount of Charge, RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
054	01210	OSPS Basic
054	01211	OSPS Basic Plus RSM and Screening Code
054	01218	OSPS Long Duration
054	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
054	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
054	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
055	01210	OSPS Basic
055	01211	OSPS Basic Plus RSM and Screening Code
055	01218	OSPS Long Duration
055	01230	OSPS Basic Plus Subaccount Indicator and Subaccount Billing Indicator
055	01231	OSPS Basic Plus RSM and Screening Code Plus Subaccount Indicator and Subaccount Billing Number
055	01234	OSPS Long Duration Plus Subaccount Indicator and Subaccount Billing Number
056	01900	OSPS All Calls
057	01200	OSPS Basic
057	01202	OSPS Basic Plus RSM and Screening Code
057	01216	OSPS Long Duration
058	01200	OSPS Basic
058	01202	OSPS Basic Plus RSM and Screening Code
058	01216	OSPS Long Duration
060	00001	Answered
060	00101	Long Duration (Prior to 5E10)
060	00500	High Runner
060	10002	Unanswered
060	10500	Unanswered - High Runner

5.5.3.4.4 Structure Code by Call Type - Class 5 Office Recording

Table 5-7 Structure Code by Call Type - Class 5 Office Recording (067-381)

CALL TYPE	STRUCTURE CODE	CONDITIONS
067	00001	Answered
067	00101	Long Duration (Prior to 5E10)
067	10002	Unanswered
068	00035	Answered - WATS Administration
068	00055	Answered with WATS Band, WATS Administration Customer Identification
068	00135	Long Duration - WATS Administration (Prior to 5E10)
068	00155	Long Duration - WATS Administration, Customer Identification (Prior to 5E10)
068	00501	High Runner - Answered
068	10054	Unanswered - WATS Administration
068	10056	Unanswered with WATS Band, WATS Administration Customer Identification
068	10501	High Runner - Unanswered
071	09003	Recorded Once a Day
072	00190	Answered - Full Details
072	00192	Answered - Customer Identification - Full Details
072	00194	Answered - Long Duration - Full Details
072	00195	Answered - Long Duration - Customer Identification - Full Details
072	10191	Unanswered - Full Details
072	10193	Unanswered - Customer Identification - Full Details
074	00001	Answered
074	00101	Long Duration (Prior to 5E10)
074	01200	OSPS Basic
074	01202	OSPS Basic Plus RSM and Screening Code
074	01205	OSPS Basic Plus RSM, Screening Code, and ATP/SSAS
074	01216	OSPS Long Duration
074	01219	OSPS Basic Plus ATP/SSAS
074	01220	OSPS Basic Plus ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
074	01223	OSPS Basic Plus RSM, Screening Code, ATP/SSAS, ATP/SSAS Indicator, Coin Credit, and Walkaway
074	10002	Unanswered
076	00092	One record for each extension moved
078	00094	One record for input command
080	00670	Intranetwork Call (5E4 and 5E5)
080	00671	Intranetwork Call - Long Duration (5E4 and 5E5)
080	00672	Internetwork Call (5E4 and 5E5)
080	00673	Internetwork Call - Long Duration (5E4 and 5E5)
081	00676	Intranetwork PVC Call (5E4 and 5E5)
081	00692	Internetwork PVC Call (5E4 and 5E5)
083	00615	Answered
083	00617	Answered - Customer Identification
083	00662	Long Duration (Prior to 5E10)
083	00663	Long Duration - Customer Identification (Prior to 5E10)
083	10616	Unanswered
083	10618	Unanswered - Customer Identification
084	00615	Answered
084	00617	Answered - Customer Identification
084	00662	Long Duration (Prior to 5E10)
084	00663	Long Duration - Customer Identification (Prior to 5E10)
084	10616	Unanswered
084	10618	Unanswered - Customer Identification
085	00001	Answered
085	00014	Answered - Customer Identification
085	00101	Long Duration (Prior to 5E10)
085	00114	Long Duration - Customer Identification (Prior to 5E10)
085	10002	Unanswered
085	10081	Unanswered - Customer Identification
090	01229	Call Assembly Tracer (5E5)
090	09029	Call Assembly Tracer
090	09036	Beginning of Recording Record
090	09037	End of Recording Record
090	09038	Collector Logical Data Set Header
090	09039	Collector Logical Data Set Trailer
090	09042	AMATPS Primary Tracer
090	09043	AMATPS Secondary Tracer
090	09057	Packet Switching Call Assembly Tracer (5E4 and 5E5)
090	09058	Call Assembly Tracer (5E6)
090	09059	Packet Switching Call Assembly Tracer (5E6)
099	00001	Answered

099	00014	Answered - Customer Identification
099	00101	Long Duration (Prior to 5E10)
099	00114	Long Duration - Customer Identification (Prior to 5E10)
099	10002	Unanswered
099	10081	Unanswered - Customer Identification
107	01214	OSPS Basic
110	00625	Answered - Full Details
110	00626	Answered with Customer Identification (5E6) - Full Details
110	00627	Long Duration - Full Details (Prior to 5E10)
110	00628	Long Duration with Customer Identification (5E6) - Full Details
110	10625	Unanswered - Full Details
110	10627	Unanswered Long Duration - Full Details (Prior to 5E10)
110	10628	Unanswered Long Duration with Customer Identification - Full Details (Prior to 5E10)
111	00631	Answered - WATS Administration - Full Details
111	00632	Inter-LATA - WATS Administration - Customer Identification - Full Details
111	00635	Long Duration - WATS Administration - Full Details (Prior to 5E10)
111	00636	Long Duration - WATS Administration - Customer Identification - Full Details (Prior to 5E10)
111	10631	Unanswered - WATS Administration - Full Details
111	10632	Unanswered - Inter-LATA - WATS Administration - Customer Identification - Full Details
111	10635	Unanswered - Long Duration - WATS Administration - Full Details (Prior to 5E10)
111	10636	Unanswered - Long Duration - WATS Administration - Customer Identification - Full Details (Prior to 5E10)
114	00631	Answered - Full Details
114	00632	Answered - Customer Identification - Full Details
114	00635	Long Duration - Full Details (Prior to 5E10)
114	00636	Long Duration - Customer Identification - Full Details (Prior to 5E10)
114	10631	Unanswered - Full Details
114	10632	Unanswered - Customer Identification - Full Details
114	10635	Unanswered - Long Duration - Full Details (Prior to 5E10)
114	10636	Unanswered - Long Duration - Customer Identification (Prior to 5E10) - Full Details
117	00645	Answered - Full Details
117	00646	Answered - Customer Identification - Full Details
117	00647	Answered - Long Duration - Full Details (Prior to 5E10)
117	00648	Answered - Long Duration - Customer Identification - Full Details (Prior to 5E10)
117	10645	Unanswered - Full Details
117	10646	Unanswered - Customer Identification - Full Details
117	10647	Unanswered - Long Duration - Full Details (Prior to 5E10)
117	10648	Unanswered - Long Duration - Customer Identification - Full Details (Prior to 5E10)
119	00625	Answered - Full Details - ANI or CPN
119	00627	Long Duration - Full Details - ANI or CPN (Prior to 5E10)
119	00653	Answered - Full Details
119	00654	Long Duration - Full Details (Prior to 5E10)
119	00664	Answered
119	00665	Long Duration (Prior to 5E10)
119	10653	Unanswered - Full Details
119	10654	Unanswered - Long Duration - Full Details (Prior to 5E10)
120	00655	Generated Hourly
121	00656	Answered - Full Details
121	00657	Answered - Long Duration - Full Details (Prior to 5E10)
121	10656	Unanswered - Full Details
121	10657	Unanswered - Long Duration - Full Details (Prior to 5E10)
124	00079	Answered
124	00620	Answered - Customer Identification
124	10080	Unanswered
124	10621	Unanswered - Customer Identification
131	00079	Answered
131	00179	Long Duration (Prior to 5E10)
131	10080	Unanswered
132	00001	Answered
132	00101	Long Duration (Prior to 5E10)
132	00500	High Runner - Answered
132	00625	Inter-LATA Call for FGA Line - Full Details
132	00626	Answered - Customer Identification - Full Details
132	00627	Inter-LATA Call for FGA Line - Full Details
132	00628	Long Duration - Full Details (Prior to 5E10)
132	10001	Unanswered
132	10500	High Runner - Unanswered
132	10625	Unanswered Inter-LATA Call for FGA Line - Full Details
132	10627	Unanswered Inter-LATA Call for FGA Line - Full Details
134	00625	Answered - Full Details
134	00626	Answered with Customer Identification (5E6) - Full Details
134	00627	Long Duration - Full Details (Prior to 5E10)
134	00628	Long Duration with Customer Identification (5E6) - Full Details

134	10625	Unanswered - Full Details
135	00653	Answered - Full Details
135	00654	Long Duration - Full Details (Prior to 5E10)
135	10653	Unanswered - Full Details
141	00360	Number Services - IC - Full Details
141	00362	Number Services - IC - Long Duration - Full Details (Prior to 5E10)
142	00364	Number Services - OTC - Full Details
142	00366	Number Services - OTC - Long Duration - Full Details (Prior to 5E10)
142	00368	Number Services - OTC - Unanswered - Full Details
148	00190	Intra-LATA High Bandwidth CSD
149	00645	Originating Access High Bandwidth CSD
150	00645	Terminating Access High Bandwidth CSD
160	00001	All Conditions
161	00001	All Conditions
162	00001	All Conditions
163	00001	All Conditions
164	00001	All Conditions
165	00001	All Conditions
166	00001	All Conditions
167	00001	All Conditions
172	00653	Inter-LATA Call
172	00654	Inter-LATA, Long Duration (Prior 5E10)
172	00664	Inter-LATA, Short Record
172	00665	Inter-LATA, Long Duration, Short Record
173	00625	Inter-LATA Call
173	00627	Inter-LATA Call, Long Duration (Prior 5E10)
180	00670	Intranetwork Call (5E6)
180	00671	Intranetwork Call - Long Duration (5E6)
180	00672	Internetwork Call (5E6)
180	00673	Internetwork Call - Long Duration (5E6)
181	00676	Intranetwork Permanent Virtual Circuit Call (5E6)
181	00692	Internetwork Permanent Virtual Circuit Call (5E6)
183	40690	ISDN Special Structure - Daily Aggregate of Service Event Deliveries
260	00001	Answered
263	00625	Answered (5E6) - Full Details
263	00626	Answered with Customer Identification (5E6) - Full Details
263	00627	Long Duration (5E6) - Full Details
263	00628	Long Duration with Customer Identification (5E6) - Full Details
263	10625	Unanswered (5E6) - Full Details
263	10627	Unanswered, Long Duration (5E6) - Full Details
263	10628	Unanswered, Long Duration, Customer Identification (5E6) - Full Details
306	00020	Answered
306	00120	Long Duration (Prior 5E10)
306	00501	High Runner
306	10021	Unanswered
306	10120	Unanswered, Long Duration (Prior 5E10)
306	10501	Unanswered - High Runner
309	00020	Answered and Unanswered (5E5)
309	00120	Long Duration (5E5)
315	01037	Feature Subscription Information
318	00020	Answered and Unanswered (5E5)
318	00120	Long Duration (5E5)
319	01057	Message Service
320	01058	Message Service
321	01215	OSPS Basic
330	01030	LASS Service (5E5)
330	01360	LASS Service (5E5)
332	09015	Recorded Daily for Usage-Sensitive Customers (5E5)
349	01120	Data Facility Pool Record
349	01121	Data Facility Pool Record, Long Duration (Prior 5E10)
351	01107	Electronic Directory Service
360	01059	OSO Recording
360	01061	Long Duration, OSO Recording (Prior 5E10)
360	01130	OSO Recording
360	01131	Long Duration, OSO Recording (Prior 5E10)
360	11059	Unanswered, OSO Recording
360	11130	Unanswered, OSO Recording
369	00001	Answered
369	00101	Long Duration (Prior 5E10)
369	01901	Intercom Calling Restriction Counts
369	10002	Unanswered
377	01128	Standard B-Channel Usage (5E5)
377	01129	Long Duration B-Channel Usage (5E5)
378	00670	Standard Virtual Call (5E5)
378	00671	Long Duration Virtual Call (5E5)

378	00676	Permanent Virtual Call (5E5)
381	00002	Answered After Time-out, Full Details (5E6)
381	00101	Long Duration Answered After Time-out, Full Details (5E6)
381	10002	Unanswered, Full Details (5E6)
381	10101	Long Duration Unanswered, Full Details (5E6)

5.5.3.4.5 Answered vs Unanswered Calls

Answered calls have a ``0" recorded in the answer field. Unanswered calls have a ``1" recorded. On answered calls, the connect time field contains the answer time. For unanswered calls, the connect time field contains the trunk or line seizure time, and the date field contains the trunk or line seizure date. Unanswered calls record in structures that include the circuit date and circuit time fields. The date and time of trunk or line release is recorded in these fields. The trunk network number (TNN) field is recorded for all unanswered calls.

5.5.3.4.6 Switch Supervisory Unit Number Recording

Whenever switch supervisory unit (SSU) recording is in effect, the TNN field is appended to the structure that would otherwise have been recorded. The TNN field is appended for all unanswered calls.

5.5.3.4.7 WATS Recording

The WATS calls record in a number of different structures depending on available features and capabilities of the sensor. On a WATS billing number call (call code 068), the WATS indicator field is always present. The WATS band field should also be present but there are some sensors that do not presently record the WATS band so structures are available which do not include the field. (The WATS band is available as part of the WATS billing number.)

The WATS station detail (also called WATS station billing number) calls record the station number in the originating number field; and, therefore, must record both the WATS indicator and WATS band fields.

If the sensor is equipped to handle the WATS administration feature, the WATS administration field is present in the structure.

5.5.3.4.8 Customer Identification Recording

If the sensor is equipped to provide a customer identification number, the structure used for recording calls for which this data is applicable contains the customer identification field.

5.5.3.4.9 Tracer Record Recording

The various types of tracer records use relatively few different call codes. The specific type of the tracer is indicated instead in the type of tracer field. In addition, the contents of the sensor-type-dependent tracer records may vary as the generic issue of the sensor changes. Therefore, the structure used to record a tracer-call type depends on the type of tracer and possibly the software release issue of the equipment generating the tracer.

5.5.3.4.10 Tandem Digit Recording

The tandem digit dialed field appears in structures used for recording tandem calls and suspected fraud. The two fields together are large enough to hold 24 characters. The significant digits in the ``Next Field" field always precedes this pair. The digits are recorded left adjusted as if the two fields were one field (except for the sign character at the end of the first field).

5.5.3.4.11 Customer Station Rearrangement Recording

If the sensor is equipped to handle the customer station rearrangement (CSR) feature, unique structures are used for each of the four customer-initiated changes and hunts.

5.5.3.4.12 High-Runner Call Data Compression

5.5.3.4.12.1 Overview

In order to decrease processing time, transmission time, and storage requirements, certain frequently used (high-runner) call codes are recorded in short formats when certain conditions are satisfied. Short formats omit fields related to these conditions. The following paragraphs specify the call codes for which short formats apply, the conditions necessary for recording a short format, and the structure to be used.

5.5.3.4.12.2 Call Codes

The call codes that can be recorded using short formats are as follow:

- (a) Detailed message-rate, timed, MBI (call code 001)
- (b) Message-rate, timed, MBI (call code 002)
- (c) Detailed message-rate, untimed, MBI (call code 003)
- (d) Station-paid (call code 006)
- (e) WATS, station identification (call code 007)
- (f) CCSA sampling (call code 021)
- (g) WATS billing number (call code 068)
- (h) Feature group A terminating (call code 132)
- (i) BRI dial-up test line (call code 260)
- (j) Toll cellular mobile carrier call (call code 306).

A short format omits some of the fields that would otherwise be recorded. In order to omit these without the resultant loss of pertinent information, only calls in which these fields would be zero can be shortened. A short format is used when the following conditions are met:

- (a) No condition requiring a timing indicator flag with a value greater than 0 occurred on the call.
- (b) A study flag is not applicable on the call.
- (c) The call was not traffic sampled.
- (d) No recordable operator actions took place during the call.
- (e) The called number was domestic (as opposed to overseas).

If the call is unanswered and all conditions are met for the unanswered call, recording flag does not apply. If short formats are used during network completion studies, the receiving RAO must be advised to do a date check rather than a flag check since the unanswered call recording flag is omitted from the short formats. In either case, the call is marked as answered or unanswered.

5.5.3.4.12.3 High-Runner Structure Codes

Since short formats do not contain the circuit date and time fields, unanswered calls are recorded in a structure specified for an answered call; the abandon date and time are recorded in the date and connect

time fields, respectively. The trunk network number and the customer-dialed account recording number can be appended to high-runner call structures. When either or both of these fields are appended to a structure, the first digit of the structure identifier code indicates this fact.

5.5.3.4.13 Billing and Statistical Fields

5.5.3.4.13.1 Overview

The following billing and statistical fields are provided in AMA records. Each field within the AMA record is a signed packed decimal number, except the field containing a character ACCT. The numbers are right-justified within a field. Unused characters are padded with zeroes. Each field contains an odd number of BCD characters and a 4-bit sign character. The sign character is positive (hex C) if no fill characters are in the record. The sign character is negative (hex D) if the record contains any fill characters. The fill character is hex F.

5.5.3.4.13.2 Date

This 5-digit number indicates the date in the format YMMDD.

5.5.3.4.13.3 Timing Indicator

This field contains a number of flags indicating timing anomalies. The following is a discussion of what the entries mean:

- (a) **SST and Under Minimum Charge Duration:** The minimum chargeable duration of a call is typically 2 seconds. Any SST under 2 seconds, in which circuit release is not accomplished, is referred to as an SST. If circuit release occurs at the end of the SST, this is referred to as an under minimum chargeable duration.

Two AMA records are output when an SST is reported. The first is an SST record that reports the SST timing information. The second is the record of the call; this record contains an indication in the timing field that an SST under minimum chargeable duration occurred on the call. The timing indicator indicates that an SST under minimum chargeable duration occurred and whether or not an SST record was also generated. The SST record does not contain the SST indications in the timing indicator field.

- (b) **Long Duration Calls, Service Activation/Deactivation:** Prior to the 5E10 software release, long duration calls/service activation are defined as those calls that remain connected through two successive midnights. On these calls/activations, the call assembly process must output ``A", ``B" and ``C", or ``D" records for the AMATPS option. The timing indicator is used to distinguish between different types of long duration call records.

In 5E10 or later software releases, long duration calls/service activation are defined as those calls that have been connected for more than 24 hours at the scheduled long duration generation time. On these calls/activations, the call assembly process must output first and continuation records for the AMATPS option.

- (c) **Charge Guard:** Whenever the elapsed time of a call is in question, the charge guard flag is raised in the fourth character of the timing indicator field. This includes the following:
 - (1) Allowances have been taken to ensure no overbilling using the elapsed time field.
 - (2) At least the minimum chargeable duration is to be billed.

When the charge guard flag is set, the call is billed for 2.0 seconds.

5.5.3.4.13.4 Study Indicator

This field is used in the call record to indicate any studies being made pertaining to the call and other study-related information. The following indicators are presently assigned for use by class 5 offices:

- (a) Point-to-point
- (b) SLUS
- (c) Complaint observed
- (d) Test call
- (e) Unanswered call recording
- (f) Study-generated record
- (g) Validation test.

Whenever a call record is output only because a study is in effect, the third BCD character of the study indicator field indicates this is a study-generated record.

The unanswered call recording flag is merely a convenient indicator to the RAO, to indicate that unanswered calls are being recorded, for some reason. The flag should not be used if the associated data qualifies for recording in a shortened format.

5.5.3.4.13.5 Answer

The charged called party off-hook indicator field indicates whether the call record in which it appears is for a detected (0) call or nondetected (1) call.

5.5.3.4.13.6 Service Observed, Traffic Sample

This field indicates whether the call record in which it appears is for a call being service-observed (sample for service evaluation) and/or traffic-sampled.

5.5.3.4.13.7 Operator Action

This field indicates whether the call in which it appears was operator-dialed and/or operator-identified.

5.5.3.4.13.8 Service Feature

The purpose of this field is to indicate any special service associated with the call.

5.5.3.4.13.9 Originating Numbering Plan Area

The NPA of the originating number is recorded.

5.5.3.4.13.10 Originating Number

The 7-digit originating number is recorded.

5.5.3.4.13.11 Overseas Indicator

This field indicates whether the call record in which it is recorded is for an overseas call. If it is an overseas call, it indicates the number of digits dialed. If it is not an overseas call, it indicates whether the called NPA was dialed or derived. When recording an overseas call, the dialed digits may appear (depending upon the

number of digits dialed) in both the terminating NPA and terminating number fields.

5.5.3.4.13.12 Terminating NPA

For domestic calls, the first two characters are zeros. Characters three through five contain the called NPA. For overseas calls, see the explanation previously described.

5.5.3.4.13.13 Terminating Number

For domestic calls, this field contains the 7-digit terminating number. For overseas calls, see the explanation previously described.

5.5.3.4.13.14 Time

The time field is used to record the time of day.

5.5.3.4.13.15 Elapsed Time

The elapsed time field is used to record duration in terms of minutes (5 digits), seconds (2 digits), and tenths of seconds (1 digit).

5.5.3.4.13.16 TNN/SSU Number

This field provides the numerical identification of the physical unit within the switch that responds to changes in called party supervision during the ringing state. For example, the switch supervisory unit is the terminating port in the 5ESS[®] switch. The switch supervisory unit number is always associated with the same physical switch supervisory unit, independent of when that unit is in use. This association provides data for patterning supervisory events such as zero percent or 100 percent completion on individual switch supervisory units.

5.5.3.4.13.17 Customer-Dialed Account Recording Number

This field contains the account number dialed for the call.

5.5.3.4.13.18 Circuit Time

This field is used to record seizure or release (abandon) times in various recording structures.

5.5.3.4.13.19 WATS Indicator

This field is recorded to differentiate between full business day and measured time WATS service.

5.5.3.4.13.20 WATS Band or Message Billing Index

This field is used to record the WATS band or MBI which are mutually exclusive.

5.5.3.4.13.21 WATS Administration

This field is used to record the trunk or pseudo trunk number when simulated facility groups are available.

5.5.3.4.13.22 Customer Identification

This field is used to record a customer identification number when the feature is available.

5.5.3.4.13.23 Tandem Digits Dialed

Originally intended for tandem digit recording, this field is used for that purpose and others with long (up to

24 digits) numeric strings are dialed.

5.5.3.4.13.24 Type of Tracer

This field defines a specific use of a tracer; it provides information in addition to that provided by the call-type code.

5.5.3.4.13.25 Circuit-Switched Digital Capability Service Indicator

This field is used to distinguish between alternate voice/data and data only on CSDC calls. The ``A" digit dialed by the CSDC customer is recorded.

5.5.3.4.13.26 CSDC Data Rate Indicator

This field is used to indicate the data rate of the service used on CSDC calls. The ``B" digit dialed by the CSDC customer is recorded.

5.5.3.4.13.27 Centrex Feature Number

This field is used to indicate the features used on records for the centrex rearrangement feature.

5.5.3.4.13.28 Significant Digits in Next Field

This field is recorded in front of the tandem digits dialed fields. It indicates how many significant digits are recorded in the next field.

5.5.3.4.13.29 Terminating Company

This field indicates whether the terminating company is a Bell Operating Company or independent, and whether the call is interstate or intrastate.

5.5.3.4.13.30 Inter-LATA/International Carriers Prefix

This field identifies the IC/INC and indicates whether the call was direct-dialed or an IC/INC operator was requested. In the 5E9(1) software release, an indication is recorded for FGB or FGD calls.

5.5.3.4.13.31 IC/INC Call Event Status

The IC/INC call event status field is used to record the last event (up to and including answer supervision) which preceded disconnect.

5.5.3.4.13.32 Routing Indicator

The routing indicator field is used to indicate a direct call (that is, a call from an end office not passing through an AT or a call from a station connected to the AT) and is a one for tandem calls.

5.5.3.4.13.33 ANI/CPN Indicator

The ANI/CPN indicator field is used to indicate whether ANI and/or CPN was sent to an interexchange carrier.

5.5.3.4.13.34 Tables Unique to Point-to-Point Studies

These fields contain information unique to point-to-point administrative messages.

5.5.3.4.13.35 Trunk Group Number

The trunk group number indicates the number of the trunk group used. (The outgoing trunk group is recorded in the originating exchange records, and the incoming trunk group is recorded in the terminating exchange records.)

5.5.3.4.13.36 Dialing Indicator

The dialing indicator field is used to indicate that the primary carrier (PIC) or default carrier was used and the caller did not dial 10XXX or 101XXX, that the caller dialed 10XXX or 101XXX (not 950-WXXX or 950-XXXX), or that the caller dialed 950-WXXX or 950-XXXX.

5.5.3.4.13.37 Software Release Issue

This field contains the software release issue number of the AMA system; it is normally contained in tracer records. The field may be used to alert a downstream processing program, such as the next AMA component or the RAO, that a new software release was installed in the AMA sensor or recording system.

5.5.3.4.13.38 Peg Count

This field is used to report a peg count. The particular count reported is specified by the structure.

5.5.3.4.13.39 Usage Hundred Call Seconds

The usage hundred call seconds field is used to report usage measured in hundred call seconds. The particular type of usage item reported is specified by the structure.

5.5.3.4.13.40 Usage Count

This field is used to report the usage of a particular service.

5.5.3.4.13.41 AMA Sequence Number

This field is used to report a "vintage number" of an AMA transmitter. Its use is determined by the manufacturer of the transmitter. It may identify only the software release, or the total set of switching system and transmitter hardware and software currently in use. The number can have any value in the range 0000 to 9999.

5.5.3.4.13.42 Sent-Paid Coin Revenue

This field, used for the coin box accounting for revenue allocation (CBA-RA) feature, indicates the number of collected 5-cent deposits which were monitored by the local office during the period associated with a particular call record.

5.5.3.4.13.43 Coin-Deposit-Monitoring Trouble Indicator

This field, used with the CBA-RA feature, counts the number of operator-attached intervals in which the local office was unable to monitor collected sent-paid deposits and indicates whether coin-tone detection errors were encountered during the period associated with a particular call record.

5.5.3.4.13.44 Number Recording

Whenever a number is to be recorded for which no further explanation is necessary (or available), every field contains an odd number of digits followed by a sign character.

5.5.3.4.13.45 Tracer Record Fields

Counts unique to tracer records are recorded in fields formatted according to Bellcore tables prefixed with the letter "C".

5.5.3.5 Extended Bellcore AMA Format (EBAF)

5.5.3.5.1 Overview

The current standard AMA format uses the AMA structure code to identify the exact layout of an AMA record. The data fields in an AMA record are presented in a predefined sequence. Therefore, the AMA record is self-identified by the structure code. The extended Bellcore AMA format (EBAF) is composed of a number of data modules. Each data module presents a group of predefined data fields, and is identified by its module code. The structure code of an EBAF record provides the indication of the appearance of modules.

A data module contains one or more network usages that need to be recorded for the purpose of billing. The number of data modules in an AMA record may depend on the number of services provided by the network. Consequently, a data module, which records the usage of a new service, can be appended to an existing AMA record without defining new structure codes or new call codes. In some cases, more than one data module is needed.

The concept of EBAF is not new to the AMA standard. In order to append the trunk network number (TNN), customer detailed account recording (CDAR), and account code to an AMA record, the 5ESS[®] switch changes the 10,000s digit of a structure code from 0 to 1, 2, 3, 8, or 9, to indicate the appearance of additional information. The EBAF extends this application to allow one or more data modules to be appended. The 10,000s digit of a structure code is changed from 0, 1, 2, or 3 to 4, 5, 6, or 7, respectively, without changing the call code. The 10,000s digits 8 and 9 are used for account/authorization code service.

5.5.3.5.2 EBAF Structure and Data Module

An EBAF AMA record is composed of a Bellcore AMA format (BAF) record with one or more additional data modules appended. Each data module is identified by a unique module code. A data module contains a module code field, followed by a number of predefined data fields. Table 5-8 lists the data modules generated by the 5ESS[®] switch.

5.5.3.5.3 Structure Code

The EBAF uses the same structure code field used in BAF. However, an EBAF record makes special use of the 10,000s digit of the BAF structure code. The remaining four digits (xxxx) identify the specific list of data fields presented in a BAF record. When an EBAF is composed entirely of data modules (with one basic module in front), 0000 is used.

5.5.3.5.4 OSPS

To inform the RAO that an OSPS structure code has modules appended to it, the existing OSPS structure code has 40,000 added to it. For OSPS applications, all structure codes with modules appended to them begin with a 4.

5.5.3.5.5 Record Descriptor Word

This 4-byte field provides the total number of bytes of a record including any data modules appended plus the trailer module 000.

Table 5-8 AMA Data Modules

MODULE NUMBER	DESCRIPTION
000	Trailer Module
021	Carrier Access
022	Long Duration
023	WATS

025	Circuit Seizure/Release
026	ASP
027	Business Customer ID
028	Additional Digits Dialed
029	Alternate Billing Number
070	ISDN Core
071	ISDN Core (Abbreviated)
072	Daily Aggregate Service Event
074	Basic Business Group
300	Customer Account Services (OSPS)
301	Subaccount Billing (OSPS)
302	Operator ID (OSPS)
305	Account/Authorization Code
910	Improved Third Number Acceptance (OSPS)

5.5.4 TIMING AND ERROR SPECIFICATIONS

5.5.4.1 Overview

The 5ESS[®] switch timing requires the following:

- ☐ The occurrence of called party answer to be time-stamped to within ± 5 seconds of the true time of day at the locale of the originating station. The timing should always reflect the actual time zone of the originating station.
- ☐ The duration of a call which lasts less than or is equal to an established period, called the adjustment interval, to be calculated to within ± 1 second of the actual duration.
- ☐ An allowance to be subtracted from the duration of each call to ensure that the recorded duration does not exceed the true duration (+0, -2 seconds).
- ☐ All times to be recorded with 100-ms precision.
- ☐ At least 95 percent of completed calls have billable duration of less than one adjustment interval.

The 5ESS[®] switch objective is to meet the following accuracy and reliability standards:

- ☐ 16 in 100,000 calls partially underbilled
- ☐ 11 in 100,000 calls not billed
- ☐ 27 in 1,000,000 calls partially overbilled
- ☐ 3 in 1,000,000 calls charged to the wrong customer.

5.5.4.2 Long Duration Calls

Prior to the 5E10 software release, a call that remains connected through two successive midnights is a long duration call. For 5E10 and later software releases, any call that has been connected for more than 24 hours at the scheduled long duration generation time is a long duration call.

For single-entry recording, the 5ESS[®] switch provides the following:

- (a) Keeps track of how many midnights a call is connected
- (b) Knows whether a day lasted 23, 24, or 25 hours (that is, the effects of daylight saving time).

5.5.4.3 Tracer Records

There is a need to provide both quality assurance and quality control functions from which operating company organizations can ensure that acceptable billing services are provided to the customer. This requires that quality assurance and quality control data be collected by the billing system, in the form of tracer records, and transmitted through the billing data stream to the RAO. Tracer records are used to provide data to the operating company to ensure that acceptable billing takes place. Counts of calls requiring AMA treatment, and the number and types of AMA records produced are kept by the switch.

The sensor tracer record (structure code 01229 for the 5E5 software release or structure code 09058 for the 5E6 and subsequent software releases for circuit-switched calls) (structure code 09057 for packet-switched calls) is output hourly. The format of structure code 09058 is shown in Table 5-9.

Table 5-9 Call Assembly Tracer Record - Structure Code 09058

INFORMATION	NUMBER OF CHARACTERS
Call Type	4
Sensor Type	4
Sensor Identification	8
Recording Office Type	4
Recording Office Identification	8
Date First Data Inserted In Tracer	6
Time First Data Inserted In Tracer	8
Generic Program Issue	6
Type of Tracer	4
Auditability Flag	2
Count of Calls	
-Where dialing is complete	8
-Requiring AMA treatment	8
-Not requiring AMA treatment	8
-In progress	
-In progress more than 3	8
midnights (Prior to 5E10)	
-Count of Long Duration Calls	8
in progress (5E10)	
-Lost before AMA treatment was	8
determined	
-Calls with unknown AMA call	8
type - answered or unanswered	
Count of AMA Records Not Recorded	
-Toll answer	6
-Local answer	6
-Special services answer	6
-Operator-assisted answer	6
-Other answer	6
-Unanswered	6
-Miscellaneous	6
-Long duration A and B (Prior to 5E10)	6
-Non-Inter-Exchange Long Duration (5E10)	6
-Inter-LATA	6
-Inter-LATA long duration A and B (Prior to 5E10)	6
-Inter-Exchange Long Duration (5E10)	6
Count of AMA Records Output	
-Toll answer	8
-Local answer	8
-Special services answer	8
-Operator-assisted answer	8
-Other answer	8
-Unanswered	8
-Miscellaneous	8
-Long duration A and B (Prior to 5E10)	8
-Non-Inter-Exchange Long Duration (5E10)	8
-Inter-LATA	8
-Inter-LATA long duration A and B (Prior to 5E10)	8
-Inter-Exchange Long Duration (5E10)	8

5.5.4.4 Packet-Switched Calls Tracer Records

The 5ESS[®] switch packet switching call assembly tracer record provides the auditability for the generation and collection of the AMA records for the packet-switched calls.

The sensor tracer record (structure code 09057) is output hourly. This provides the OTC personnel with information to indicate whether data loss is the result of traffic conditions, equipment malfunction, or an unknown cause. The tracer counts are accumulated on a daily basis. All counts are added toward the end of the day and are zeroed and audited after the midnight tracer record polling. The number of AMA candidates, undetermined AMA status calls, and AMA calls in progress are calculated and restored whenever those counts are zeroed.

5.6 OSPS ADMINISTRATION

5.6.1 OVERVIEW

The OSPS administration is provided by OSPS OSCs and FMCs. Additional administration capabilities are provided through the MCC, SCCS, and the NAC.

Each OSPS operator position in an OSC has a basic services terminal (BST), a combined services terminal (CST), and/or a video display terminal (VDT) that is directly attached to an integrated services line unit/remote integrated services line unit (ISLU/ISLU2/RISLU). Each OSC and FMC consist of OSPS administrative terminals and administrative printers that are attached to an OSPS administrative processor (OAP).

The OAPs are connected to the 5ESS[®] switch through position switching modules (PSMs) and ISLU/ISLU2/RISLUs.

5.6.2 OPERATOR SERVICES CENTER

An OSPS call is handled by an OSPS operator at an OSPS operator position assigned to an OSC. Each OSC is a separate physical and administrative entity that typically contains from 50 to 100 operator positions. As many as 32 OSCs can be associated with one 5ESS[®] switch. The maximum number of operator positions per switch is 1024 (4096 with the 5E6 and subsequent software releases).

To increase the call handling efficiency of the OSPS, OSPS operators are assigned to serving teams, and each team handles only calls within the OSPS call types defined and assigned by the OSPS administrators. Incoming OSPS calls are sent to an operator in the appropriate serving team by the OSPS ACD function. Each operator ID is assigned to one of the 128 possible serving teams; therefore, an operator is automatically assigned to a serving team upon logging in. The members of a serving team can be distributed among any or all OSCs.

One or more serving teams can be designated to provide service assistance and any operator position can be assigned for use by management personnel as monitoring positions. An operator can transfer a call to a service assistance position in a service assistance team when the need arises. The monitoring positions can be used by managers to monitor the performance of the operators in either an undetected or detected mode.

The OSC has the capability of producing a 15-minute OSPS Traffic Report, the 24-Hour OSPS Operator Performance Report, and monitoring the operator activities.

5.6.3 FORCE MANAGEMENT CENTER

The FMCs coordinate the OSCs resources to provide an acceptable grade of call handling service. The FMC personnel provide schedules that specify the quantity of operators that each OSC must have on each serving team at any given time in order to meet service objectives. These schedules are based on past traffic data and present traffic trends.

The FMC personnel also evaluate the service currently being provided, and recommend to the OSCs any changes in team size or operator practices that might be necessary to correct unsatisfactory conditions. During periods when the FMC is routinely closed (for example, midnight to 7:00 a.m.), these functions are

performed at an OSC that is designated to act as an FMC.

5.6.4 ADMINISTRATIVE EQUIPMENT FUNCTIONS

5.6.4.1 Overview

Each OSC and FMC has an OAP that serves at least one administrative terminal and at least one administrative printer. This equipment is provided for use in administering the OSPS ACD and operator work force.

An administrative terminal is a video display terminal. Input messages can be entered at the administrative terminal keyboard to perform the following functions:

- ☐ Request that status or performance displays be shown on the administrative terminal video display (for example, operator position status)
- ☐ Perform system configuration changes
- ☐ Request that periodic reports are printed or not printed at the administrative printer (for example, 24-hour OSPS operator report)
- ☐ Request that specific output messages are displayed at the administrative terminal and/or printed at the administrative printer (for example, providing the current values of the ACD parameters).

5.6.4.2 Security Terminal/Printer

An optional vendor supplied security terminal/printer can interface with an OAP. This printer can be located at either an FMC or OSC site. The security terminal/printer is used by telephone company administration (TCA) security personnel and is normally located at an area that is only accessible to them. All input to the security terminal is password controlled. A Recent Change interface is provided to allow the following changes to be made to the APF [All Personal Identification Numbers (PINs) Fail] and All Cards Fail (ACF) parameters:

- ☐ ACF activation/deactivation
- ☐ The ACF Fraud Attempt Threshold specifies the number of ACF attempts allowed in a given interval for a calling number/PIN pair before it is placed on the fraud list.
- ☐ The ACF Fraud Candidate Interval is the time interval in minutes over which successive failures count toward the fraud attempt threshold.
- ☐ The ACF Lockout Interval is the duration of the lockout interval in minutes for subsequent attempts for a calling number/PIN pair given after the threshold has been reached during which the call will be blocked.

A Security Report is printed daily (or on demand) at the security printer and includes the following data:

- ☐ The number of calling card number/calling number pairs placed on the APF and/or the ACF fraud list.
- ☐ The number of calling card number/calling number pairs that could not be placed on the APF list due to space limitations.
- ☐ Number of calls that were blocked because the calling card number/calling number pair were on the APF and/or the ACF fraud list.

An activity report message is also printed at the security printer when a calling card number/calling number

pair is added to or deleted from the APF or ACF fraud list, and when a call is blocked because the calling card number/calling number pair is on the APF or ACF fraud list.

5.6.5 OSPS REPORTS

5.6.5.1 Overview

Two scheduled reports that provide periodic OSPS measurements are available at the administrative printer. These reports include a 15-minute OSPS traffic report and a 24-hour OSPS operator report. These two reports contain only OSPS specific measurements.

5.6.5.2 15-Minute OSPS Traffic Report

5.6.5.2.1 Overview

The 15-minute OSPS traffic report consists of measurements that indicate the number of OSPS calls of each call type handled during a 15-minute period and the performance of the ACD queues (in the 5E8 and prior software releases) serving teams, and OSCs in serving those calls. This report is used by OSPS managers and administrative personnel to determine if satisfactory service is being provided and, if not, to provide data that may help in choosing the appropriate corrective actions.

This report consists of the following three sections:

- ☐ OSPS traffic summary
- ☐ ACD call queue performance (5E8 and prior software releases)
- ☐ Serving team performance.

This report or any combination of sections of this report can be printed out at an administrative printer by entering a request at the administrative terminal.

5.6.5.2.2 OSPS Call Traffic

This section provides traffic measurements broken down by OSC. These measurements can be reported at any OSC or FMC as follows:

- ☐ Number of operator-initiated outgoing call attempts
- ☐ Number of operator-initiated outgoing call completions
- ☐ Number of operator trouble reports generated
- ☐ Number of monitored calls
- ☐ Number of monitored operators
- ☐ Number of emergency calls handled
- ☐ Number of position seizures
- ☐ Number of interflow T&A calls received (5E5 and subsequent software releases).

5.6.5.2.3 Call Queue Performance

This section provides traffic measurements associated with OSPS call types within the OSPS call category

that were handled during the previous 15-minute period. In the 5E8 and prior software releases, each OSPS call type is assigned to a separate ACD call queue. This section also provides call queue performance measurements that indicate how well the ACD is performing in distributing calls to the designated operator serving teams. These measurements assume that every incoming OSPS call enters the call queue to which it has been assigned regardless of whether or not the operator is available to immediately serve that call. The following information is specified for each of the 128 possible call queues:

- ☐ Call queue number
- ☐ Call queue name (not more than ten alphanumeric characters)
- ☐ Primary serving team assigned to queue
- ☐ Number of queue entries
- ☐ Number of calls designated for this queue which were sent to reorder
- ☐ Number of calls that received delay announcement 1
- ☐ Number of calls that received delay announcement 2
- ☐ Number of calls that received delay announcement 3
- ☐ Number of calls that were abandoned after being placed on this queue
- ☐ Number of calls for which a position seizure occurred
- ☐ Average length of queue
- ☐ Amount of time all calls spend in the queue
- ☐ Average queue answer delay [average time that a served call spent on this queue (including calls that experienced no delay)]
- ☐ Ratio of actual value to service objective for average answer delay
- ☐ Percentage of time that the queue was in the call-waiting indicator state
- ☐ Number of calls unable to be placed on queue because the queue is full (queue overflow)
- ☐ Number of recalls
- ☐ Average call handling time
- ☐ Interflow T&A calls sent per call queue (5E5 and subsequent software releases)
- ☐ Interflow T&A calls received per call queue (5E5 and subsequent software releases)
- ☐ Forward party abandons on more efficient call handling (MECH) calls before receiving an announcement (5E6 and subsequent software releases)
- ☐ Forward party abandons on MECH calls after receiving an announcement (5E6 and subsequent software releases)
- ☐ Back party abandons on MECH calls before receiving an announcement (5E6 and subsequent software releases)
- ☐ Back party abandons on MECH calls after receiving an announcement (5E6 and subsequent software releases)

- ☐ Number of calls eligible for MECH treatment (secure feature activated for the 5E7 and subsequent software releases)
- ☐ Percentage of calls that received MECH treatment (secure feature activated for the 5E7 and subsequent software releases).

5.6.5.2.4 Serving Team Performance

This section provides serving team performance information that indicates how well the operator serving teams are performing in handling calls distributed to them by the ACD in the 5E8 and prior software releases. This information includes the following data for each of the 128 possible serving teams:

(a) Serving team identification number:

- ☐ Average number of positions occupied ☐ This is the average number of positions where an operator is logged in but not in the idle state.
- ☐ Operator occupancy ☐ This is the average percentage of time that an occupied position is not available to be seized by a call (that is, work time is being measured for the position).
- ☐ Work volume ☐ Work volume is measured while a position is connected to a calling and/or called party, in the made-busy state, connected to or on queue for connection to a service assistance position, or connected to any other dialed port.
- ☐ Team average work time ☐ This is the average time used by an operator in handling the calls from the call queues to which the serving team is assigned.
- ☐ Call queues handled by this serving team ☐ This field contains the following information for each of these call queues:
 - ☐ Call queue number.
 - ☐ Call queue name.
 - ☐ Number of position seizures.
 - ☐ Call handling volume ☐ This is the total amount of work time spent by operators while connected to a calling and/or called party, or to a service assistance position. This does not include time in the made-busy time.
 - ☐ Queue average call handling time ☐ This is the average per-call handling time.
 - ☐ Average queue answer delay ☐ This is the average queue answer delay time of the calls served by this operator.
 - ☐ Percent of time that the call queue was in the call waiting indicator state.
- ☐ Number of calls transferred by the serving team.
- ☐ Number of requests for conferences by the serving team.
- ☐ Number of transferred calls served by the serving team.
- ☐ Number of conferences served by the serving team.
- ☐ Number of interflow T&A calls received by the serving team (5E5 and subsequent software releases).

- ☐ Number of calls eligible for MECH treatment by the serving team (secure feature activated for 5E7 and subsequent software releases).
 - ☐ Percentage of calls that received MECH treatment by the serving team (secure feature activated for 5E7 and subsequent software releases).
- (b) The OSC identification number ☐ The following data is provided to the FMC for each OSC that has occupied a position on the serving team:
- ☐ Average number of occupied positions for this serving team in this OSC.
 - ☐ Position seizures for this serving team in this OSC.
 - ☐ Work volume for this serving team in this OSC.
 - ☐ Average work time (AWT) for this serving team in this OSC.
 - ☐ Call queues handled by this serving team in this OSC ☐ The following information is provided for each of these queues:
 - ☐ Call queue number.
 - ☐ Number of position seizures.
 - ☐ Call handling volume.

5.6.5.3 24-Hour OSPS Operator Report

When this report is enabled at the administrative terminal, a 24-hour OSPS operator report is output daily on the OAP at the OSC where the input message was entered. The 24-hour OSPS operator report for an OSC provides information on all of the operators that were logged on at an operator position in that OSC during the previous day. The following information is provided for each operator:

- (a) Operator identification number.
- (b) Serving team(s) on which the operator served during the day up to a maximum of four, and for each of the serving teams the following data is provided:
- ☐ Call handling volume.
 - ☐ Number of calls handled.
 - ☐ Number of calls eligible for MECH treatment by the serving team (secure feature activated for 5E7 and subsequent software releases).
 - ☐ Percentage of calls that received MECH treatment by the serving team (secure feature activated for 5E7 and subsequent software releases).
 - ☐ Average call handling time.
 - ☐ Combined duration of work periods while on that team, where a work period is measured from the time that an operator logged on to a position until the time that the operator logged off.
 - ☐ Total number of work periods while on that team.

- ☐ Average team call handling time.
- ☐ Average team/OSC call handling time.
- ☐ Group manager operator services (GMOS) group summary.

Up to seven days of reports can be retained at the OAP and printed out as desired. Typically, an FMC does not receive this report, and each OSC receives operator data for only those operators in that OSC.

5.6.5.4 Special OAP Reports

The following special reports are printed at the OAP:

- ☐ Operator trouble reports
- ☐ Emergency call warning/ticket
- ☐ Automatic reconfiguration reports
- ☐ ACD errors (5E8 and prior software releases)
- ☐ Monitoring call detail record (CDR) reports
- ☐ Manual Ticket
- ☐ All PINS fail
- ☐ All cards fail
- ☐ Interflow activation/deactivation
- ☐ Double interflow error
- ☐ Real-time call detail record reports.

5.7 ISDN ADMINISTRATION

5.7.1 ISDN/BRCS FEATURE ASSIGNMENT

The BRCS features can be assigned to ISDN terminals, their directory numbers (DNs), and multiline hunt group (MLHG) members, in addition to analog lines and trunks. This is accomplished through changes and additions to recent change and office records. This allows the OTC personnel to define terminal button configuration groups for terminal components to be assigned to, and to define (for each group) which buttons correspond to which features.

The following feature assignment views are provided:

- ☐ Line - telephone number
- ☐ Line - equipment number and party
- ☐ Line - MLHG and member
- ☐ Trunk - equipment number
- ☐ Trunk - trunk group number.

5.7.2 ISDN ATTENDANT DN BUSY AND TRUNK GROUP THRESHOLD INDICATORS

5.7.2.1 ISDN Attendant DN Busy Indicators

The ISDN attendant DN busy and trunk group threshold indicators feature provides users in a business customer group with the capability to visually check the busy idle status of an extension served by an attendant console, and to check the busy idle status of trunk groups associated with the business group.

The attendant is required to have a main attendant console along with the optional direct station select/busy lamp field (DSS/BLF) console to use this feature.

The attendant can monitor up to 100 consecutive DNs (beginning at NPA-NXX-XX00) on the optional DSS/BLF console. This provides a visual check of the busy idle status of any extension served by the attendant console. Each indicator in the busy lamp field has a direct relationship with a DSS button. The DN associated with a particular DSS/BLF button/lamp set, is determined by the status of the 100s group select buttons at the bottom of the DSS/BLF console, and by the status of the optional range shift feature buttons present on the attendant console. The lighting of the lamp indicates that all call appearances associated with the indicated DN are occupied.

The software for the attendant busy indicators feature supports the display of 800 or 10,000 DNs per attendant group. Each group can consist of up to 40 attendant consoles. This feature also limits the number of monitored DNs to 100 per console at a single time. If it is required that more than 100 DNs be monitored at a single time, multiple consoles are required. At least one 100s group select button must also be provided on the customer premises equipment (CPE).

5.7.2.2 Trunk Group Threshold Indicators

The trunk group warning (TGW) indicators are located on the ISDN attendant console module 0, with one assigned per trunk group. The indicator for a particular trunk group will light when the number of occupied trunks exceed a customer assignable threshold. In addition, there is one trunk group busy (TGB) indicator for each assigned trunk group. This lamp will light when all the members of the particular trunk group become occupied. As an example, if the customer has 10 trunks in a trunk group and an assigned warning threshold of 5, the TGW indicator will light when 5 members of the trunk group become occupied, and the TGB indicator will light when all 10 members become occupied.

The trunk group threshold indicators feature supports up to 16 TGB and 16 TGW lights per console. Additional consoles are required if it is necessary to monitor trunk groups in excess of these numbers.

5.7.3 ISDN/BRCS HUNTING AND QUEUING

5.7.3.1 General

A hunt group is available to serve ISDN attendant consoles, and queuing is available to queue calls to these groups. The ISDN attendant console groups handle multiple incoming call types (ICIs). A group subscribes to a number of ICIs, and each of its members subscribes to a subset of those ICIs. Even call distribution to multiple attendant positions is implemented by hunting over a subset of the members defined by which members serve the ICI of the incoming call. Within that subset, uniform call distribution (UCD) hunting is performed for an idle member. The ICIs served by the group may include special hunting ICIs which are derived from the precedence level of a call rather than its true ICI.

Queuing for the ISDN attendant consoles is based on the incoming call types. Call regulation ensures that when calls are waiting to be answered and the attendant is active on a voice call, alerting is only applied to an attendant when the attendant becomes idle. The 5ESS[®] switch supports two call waiting indications for the attendant. One is given when at least one call is waiting for the attendant, and the other indication is given when a customer-specified number of calls are waiting for the attendant. The queuing is based on the ICI and on the availability of attendant positions that handle that particular ICI. The removal of calls on

queue is based on a first in, first served priority, and nonblocking algorithms. There are eight possible priorities that are customer assignable to ICIs on a per hunt group basis. The algorithms handle the priorities assigned to the ICIs. Emergency calls are an exception to the nonblocking algorithm. All members of an attendant group must be capable of handling emergency call types. Other exceptions to the nonblocking algorithm are queued timed reminder calls, and calls on a defense switched network (DSN) switch. The timed reminder calls are placed at the head of the subqueue for their hunted ICI. For calls on a DSN switch, absolute priorities are used for dequeuing.

5.7.3.2 ISDN Hunting

The ISDN hunting feature allows the customer to choose which of a number of possible terminations to utilize for a given call. The voice ISDN services provide the following possible types of terminations:

- ☐ ISDN attendant consoles with ICIs
- ☐ ISDN attendant consoles with hunting and queuing unaware of ICIs
- ☐ Multibutton key terminals with multiple call appearances
- ☐ Multibutton key terminals with shared terminations
- ☐ Multibutton key terminals with shared analog terminations
- ☐ Multibutton key terminals with multiple and shared call appearances.

These termination types cannot be mixed freely in hunt groups. A given hunt group can have a configuration which is one of the following:

- ☐ All analog individual lines
- ☐ All analog attendant consoles
- ☐ All ISDN nonattendant terminals
- ☐ All ISDN nonattendant terminals plus shared analog lines
- ☐ All ISDN attendant consoles.

When a shared analog line participates in a shared hunt group member, there is only one analog sharer, and the analog sharer cannot have the same service class as the rest of the group. However, the ISDN members of the shared set must have the same service class as the rest of the group.

Because of the mechanism of dynamic data initialization in the RSM, all sharers of a member must be on the same MMRS.

The ISDN attendant (ISAT) hunt group can be assigned any of the following ICIs:

- ☐ ATND - Station dialing the attendant
- ☐ MAN - Manual Line (no dial access)
- ☐ ICPT - Intercepted call
- ☐ CFDA - Call forwarding don't answer
- ☐ CFBL - Call forwarding busy line

- ☐ CFV - Call forwarding variable
- ☐ FXY - Foreign exchange trunk (where Y = 1 to 8)
- ☐ TIEY - Tie trunk (where Y = 1 to 8)
- ☐ WATY - WATS (where Y = 1 to 5)
- ☐ LNDY - Listed directory number (where Y = 1 to 8)
- ☐ EMER - Emergency
- ☐ OVFL - Overflow
- ☐ CNET - Corporate Network (CCSA)
- ☐ DIV - Toll/code diversion
- ☐ PRCY - Precedence levels (where Y = 1 to 6)
- ☐ OTHR - Hunt only default.

5.7.3.3 Queuing

When a possible termination cannot be found by executing the hunting algorithms, calls are routed to some form of busy treatment. The queue for attendants is a variation of a first-in first-out (FIFO) queue. The FIFO queue is based on call types as opposed to all calls. Each call follows the FIFO algorithm for calls of the same call type. The dequeuing of a call is determined by the combination of available attendant console, ICI, and the priority of the ICI. The queue makes use of a nonblocking algorithm through the use of priorities. This prevents blocking that could occur if an ICI that is assigned a low priority was consistently queued behind other ICIs that were assigned to the same attendant with higher priorities.

The queuing feature for ISDN attendants supports the following two queuing lamps on the ISDN attendant consoles related to queuing:

- ☐ Call waiting on queue
- ☐ Call waiting warning.

The call waiting lamp on a given console is illuminated whenever there is at least one call waiting on queue of any given ICI that the console handles. The call waiting warning lamp is illuminated whenever there are more than a customer specified threshold value of calls waiting on queue which are of the subset of ICIs that the member handles. On a DSN switch, the call waiting warning lamp indicates that at least one precedence call is in the queue, that is, not that any threshold has been exceeded.

The following queue information can be displayed at the ISDN attendant terminal for each queue:

- ☐ Number of calls on queue for each ICI
- ☐ Total number of calls served (all ICI types)
- ☐ Average time on queue for served calls (in seconds)
- ☐ Total number of calls on queue that abandoned before being served
- ☐ Average time on queue for calls that abandoned before being served (in seconds)

- ☐ Time of the call waiting on queue the longest (in seconds).

When a possible termination cannot be found for a call by executing the hunting algorithms, calls are queued until a possible termination becomes available.

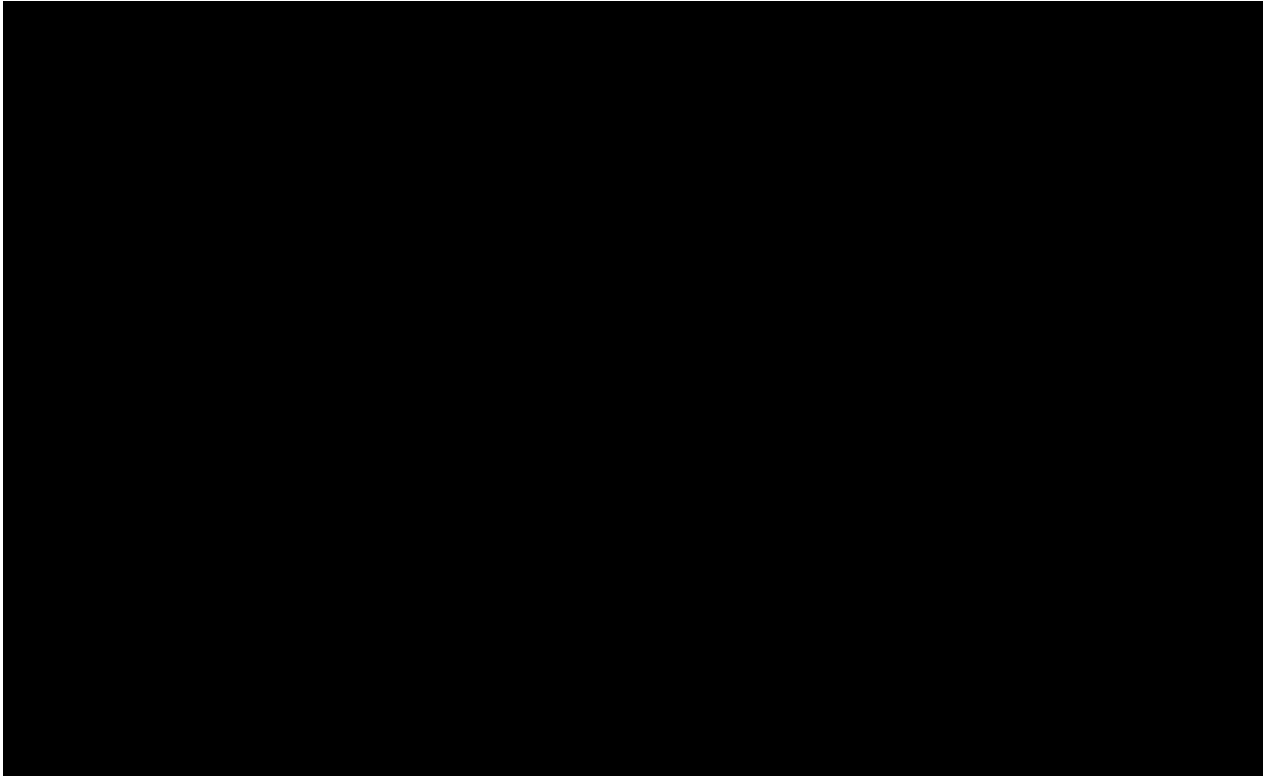


Figure 5-1 Recent Change and Verify Class Menu

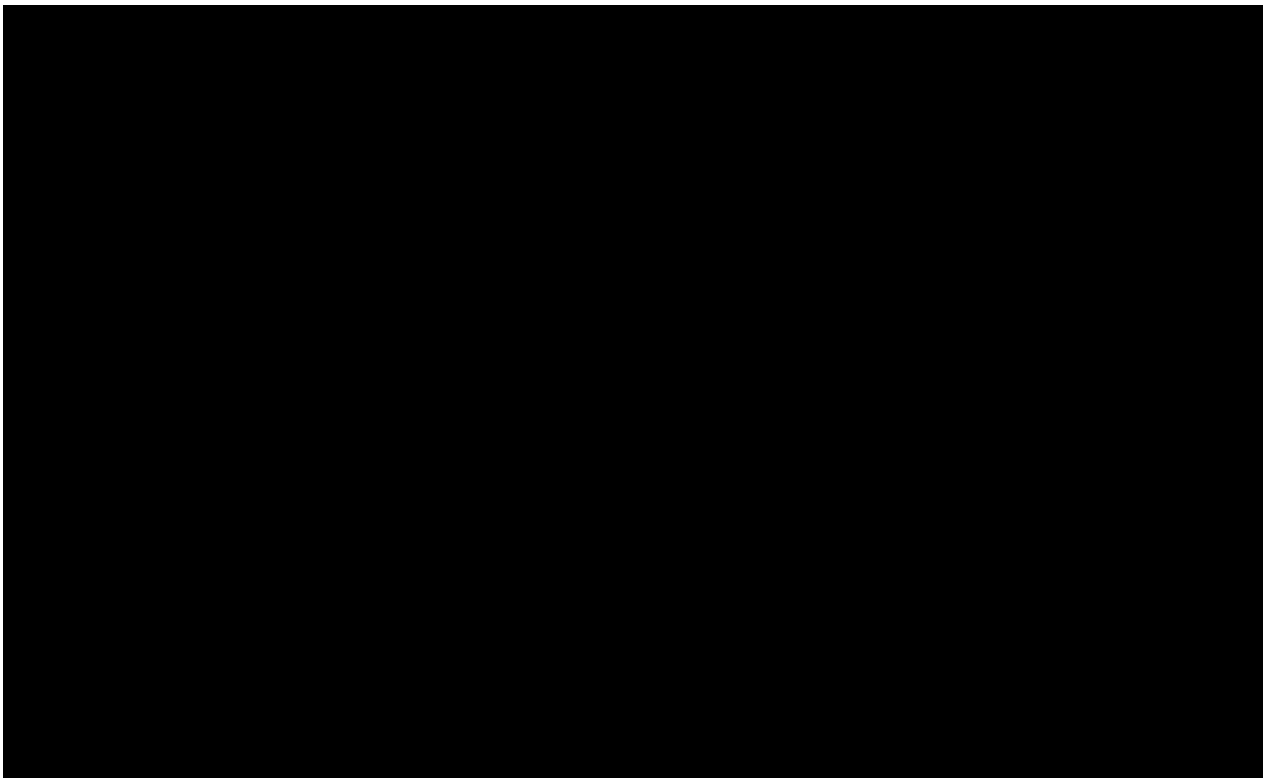


Figure 5-2 Recent Change Line Assignment View Menu

5.8 ADMINISTRATIVE SERVICES MODULE (ASM) Administration

5.8.1 Introduction

The Administrative Services Module (ASM) extends the 5ESS[®] Switch by providing a platform based on commercially-available hardware and software components that supports services common in the data center world, but that are relatively new to the telecommunications environment. The ASM plays a central role as the point of integration for the Distinctive Remote Module (DRM). It also serves as the bridge between the 5ESS[®] Switch and Lucent's 7R/ETM Packet Solutions family of products. This section provides an overview of ASM administration for planning purposes.

The ASM runs on a Sun Microsystems *Netra t-1120*TM workstation that is NEBS-certified and runs on -48V DC central office power. It is engineered to be rack mounted in a 5ESS[®] Miscellaneous Cabinet equipped with an MFFU and located within 100 ft. of the 3B21D AM. The ASM operating system is Solaris 2.6. The ASM connects through a proprietary interface to the 3B21 AM on the Dual Serial Channel (DSCH). It also connects to the DRM AMs using TCP/IP via a 100 Base-T *Ethernet*[®] connection. The ASM also supports a 10/100 Base-T *Ethernet*[®] connection into a switch owner-provided local area network (LAN) and a 10/100 Base-T *Ethernet*[®] connection to a Packet Driver Solution Element Management System. The ASM does not support 3B20D AMs. To increase the reliability of data stored on the ASM, its disks are mirrored. The ASM is a simplex unit, and thus does not have the high-availability characteristic of most 5ESS[®] components. It has a rated availability of 99.9%.

NOTE: The loss of ASM functionality has no impact on the call handling or billing abilities of the 5ESS[®] Switch.

There are two field-replaceable units for the ASM: a disk drive, and the entire unit. It is not necessary to open the ASM unit to perform any field maintenance procedure.

5.8.2 ASM Software

ASM software is defined in three layers:

- **Operating System** □ third-party software bundled with the ASM. Lucent Technologies is the contact for the support of this software, therefore switch owners need not interface with the third-party vendor. Updates to third-party software will be provided by Lucent via software updates for the ASM.
- **ASM Base Software** □ core set of services available to applications and provides for the ASM OA&M. This layer provides the interface to the 5ESS[®] Switch AM. The ASM Base software is a secured feature and must be licensed from Lucent Technologies. The secure feature ID for the ASM Base software is 297. The ASM supports applications through an Applications Programming Interface (API). A portion of the API is exposed as shell commands for use by customers. This command set is documented via HTML manual pages. Third Party Software packages provided by companies outside of Lucent such as a web server and CORBA middleware are also provided as part of the ASM Base software.
- **ASM Application Software** □ any of several optional value-added applications installed on the ASM. Each application is individually secured and can be purchased on its own. All applications require that the ASM Base package be enabled. An up-to-date software image is maintained on the ASM disk for all applications whether or not they are purchased. This allows an application to be easily purchased and activated after an ASM is installed.

A portion of ASM Base and Application software resides on the AM to allow the ASM and AM to work together in concert to provide powerful networking services to the 5ESS[®] Switch.

Under certain conditions, a switch owner may want to install switch owner-provided software on the ASM in order to enhance its ability to capitalize on the ASM's facilities. This should be discussed with Lucent support personnel prior to installation to avoid potential conflicts with system configurations.

5.8.3 Maintenance and Operation

The ASM introduces MCC page 124 (ASM/DCI Status). This page provides a high-level status for the ASM and DCI. Three aspects of ASM operation are depicted: the DCI link, the ASM processor, and the ASM Console link. This page reflects status for both ASM hardware and software and is used as the starting point for fault resolution procedures.

At the top of the page, the current status of the DCI link (that is, Active, Out of Service) is shown along with poke commands to remove, diagnose, and restore this link. An indicator for the ASM unit itself is in the center of the 124 page that reports on the availability of the ASM (Active, Unavailable) and, when a fault is present, identifies the probable cause. The ASM Console link status is displayed together with poke commands to remove and restore this link. Note that the ASM Console link is only provided on 3B21 AMs.

Key messages regarding ASM operation are reported to the 5ESS[®] Switch Output Report Log (ROP). Many of these messages begin with REPT DCI or REPT ASM and are contained within a distinct output message class. Other messages are reported locally on the ASM via the logging facility built into the ASM software. A simple log file browser is provided.

If DRM or Packet Driver services have been purchased for an ASM, a set of Graphical User Interface screens is available to support selected system management functions.

Administration of the ASM is performed through a shell interface that will be familiar to anyone with *UNIX*[®] experience. Detailed *UNIX*[®] system administration background is not required, however, as Lucent configures the system prior to shipment and provides an easy-to-use set of commands needed to configure and maintain the ASM. The commands needed to operate the ASM are documented online via HTML manual pages from a built-in web server.

5.8.4 Login Administration

The ASM supports the login/password access control that is familiar to *UNIX*[®] system users. Standard facilities to enforce password aging, complexity, and length are available. In order to preserve access security for the AM, ASM logins are maintained separately from AM logins. If a user does not have access privileges on the AM, he or she will be unable to obtain services (e.g. file transfer) on the AM from the ASM. Details on login administration can be found in 235-105-210, *Routine Operations Manual*.

There are three types of logins on the ASM:

- ☐ **Primary logins** ☐ Primary logins are created before installing an application so that files created by these applications can be owned by these logins. (example: **asm**, **rc**, **osde**) Primary logins are administrative and are not intended for use as normal shell logins. In most cases, a group name is created to match the primary login. Primary logins are created and maintained by ASM Base software.
- ☐ **Standard logins** ☐ Standard logins are intended for normal shell access. They are associated with a particular application or job function (example: **asmtech**, **rcv1**, **prism**). Standard logins are created by ASM Base software. Most standard logins are required for the software to work correctly. The primary logins and the standard logins can be further classified into "Customer" and "Lucent" owned logins. This is to enhance overall system security by eliminating the need for the sharing of passwords between the switch owner and Lucent personnel.

NOTE: Use of the same logins by switch owner and Lucent personnel is discouraged.

The Lucent-owned logins are intended for support purposes: access to the ASM by Lucent support personnel will be governed by access to the switch owner's LAN. Passwords for the customer-owned

logins are initialized at installation and must be reset upon first use. Passwords for the Lucent-owned logins are set at the time that the ASM and application software are installed. Lucent will protect the security of these logins.

- **User-defined logins** □ Switch owners may create additional user logins, as desired. Use of standard *UNIX*[®]/*Solaris*[®] login administration tools will not grant the user access to the AM. To administer logins with access permissions on both the ASM and AM, two special commands (**addnusr** and **rmnusr**) are provided which provide a front-end to the appropriate Solaris and RTR login administration tools and set up the login according to the ASM conventions and restrictions. Such logins are assigned to the group **asmusr**. This facility is provided to aid a switch owner in utilizing the ASM in their network and should be used with care. It is not a general-purpose mechanism. Misuse of user-defined logins can degrade or interrupt the processing of the ASM and its applications.

The password for the root login is set at ASM installation to a string of the switch owner's choosing. An additional login, **asmroot**, is defined that has superuser privileges. This permits software which requires special system privileges to operate - without requiring knowledge of the switch owner's root password. Because the switch owner retains access to the root login, the login and password conventions described above can be overridden in accordance with local security practices. It is highly recommended, however, that any such changes be reviewed with Lucent Technologies customer technical support beforehand to ensure that they do not compromise the security and supportability of the ASM.

The ASM uses the *Solaris*[®] System Accounting services to collect data on user activity on the system.

5.8.5 Software Updates and Patches

Updates and patches to most ASM software (OS, Base, and Applications) are integrated into existing Lucent procedures for software updates and retrofit. To simplify administration, all ASMs maintain a common image of software regardless of whether a particular ASM has all the software components installed. Patches and new capabilities are submitted to the software update process where they are packaged, tested, and released together with all other *5ESS*[®] components. The download and application of SUs for the ASM is tied into the existing *5ESS*[®] software update application software on the 3B21D AM (a DRM AM does not update the ASM). No additional steps or new procedures are required. For retrofit, any necessary updates to ASM software are performed late in the retrofit procedures after the 3B21 AM and SMs are prepared to commit to the new release.

Lucent ships ASMs with standard software to allow it to communicate with the *5ESS*[®] Switch and a network. As part of the installation process, the Lucent installer will synchronize the ASM software with the software release and software update level of the *5ESS*[®].

Offices equipped with ASMs must purchase feature 99-5E-3438 to support high-speed downloads of software for the ASM and *5ESS*[®]. This provides improved performance when downloading *5ESS*[®] software as compared to the *5ESS*[®] alone. These high-speed transfers are essential to manage the rapidly increasing sizes of today's software images.

5.8.6 Networking

Three types of network connections are supported by the ASM: an external network to the rest of the switch owner's network, an internal network to DRMs, and a maintenance network to the Packet Driver Solution Element Management System. The latter two are only supported if the features requiring them have been purchased. The ports for these connections have fixed assignments on the ASM and do not typically require administration by the customer.

5.8.6.1 External Network

The ASM supports an *Ethernet*[®] network connection to communicate with the rest of the switch owner's

network. This interface is used to support a variety to TCP/IP services including:

- ☐ UUCP
- ☐ FTP
- ☐ RSH
- ☐ Telnet
- ☐ HTTP
- ☐ CORBA

An office installing an ASM must have an *Ethernet*® hub with one or more available connections that connect into a corporate wide area network. Lucent recommends that the connection to the WAN be at least 1.5 Mbps to achieve the desired performance from the ASM's networking capabilities. Other systems needed by ASM applications, such as a software update file server or a billing collection center, must be available from this network. Installation procedures for the ASM assume that the switch owner has already configured its network (billing centers, software update servers, routers, etc.) to be aware of the ASM. Switch owners need to supply an IP hostname and address in order to complete installation.

If a corporate wide area network is not available, the switch owner is responsible for defining and installing the network infrastructure needed to interface with the ASM, based on their needs. Networking hardware is not supplied with the ASM. Lucent Professional Services can provide switch owners with assistance in setting up a suitable network.

The switch owner must provide access to certain Lucent file servers (for example, SCANS) to support the installation, maintenance, and support of the ASM. In most cases, this is expected to be a connection via the switch owner's network through a firewall that accesses either a dedicated connection to Lucent or the public Internet. The connection should be able to sustain a 1.5 Mbps (or better) connection, support applicable security protocols, and pass through the TCP/IP services listed above. This interface is used to transfer files to and from Lucent, and to support interactive access to the ASM for support personnel. This connection must be in place in order for ASM installation to be completed. The details of the network interconnection must be worked with Lucent prior to the deployment of the first ASM in the switch owner's network. Access to the SCANS system is available on the internet, however, a switch owner may choose to obtain a dedicated connection from their network to Lucent to provide guaranteed levels for quality of service. Lucent's Electronic Media Network Services (EMNS) group can be contacted to arrange for a dedicated connection. "Getting Started with SCANS and ASM" provides details on how to set up an office profile to download software updates via the ASM. This document is available from the Lucent SCANS organization.

The ASM is configured to utilize only its local files to determine the Internet settings for its networking operations. Network File Services (NFS) are not used. Information on the names and addresses of other key switch owner computer systems, such as a software update file server or billing center, are placed in the `/etc/hosts` file. `/etc/passwd` and `/etc/shadow` contain the ASM's login information. A switch owner may choose to override these settings (for example, to configure Directory Name Service or Network Information Service) in order to streamline administrative procedures. Lucent Technologies support should be consulted before doing this.

5.8.6.2 Internal Network

The ASM supports an *Ethernet*® connection to communicate with up to 15 DRMs. See the DRM feature description (99-5E-3850.V) for more information.

5.8.6.3 Maintenance Network

The ASM supports an *Ethernet*[®] connection to communicate with a Packet Driver Solution Element Management System if feature 99-5E-7332 has been purchased. This connection is isolated from the switch owner-provided network.

5.8.7 User Interfaces

The simplest user access to the ASM is via the Telnet protocol. This interface operates in the standard fashion, allowing a user to provide a login and password to invoke a defined shell program locally on the ASM. The ASM supports 48 simultaneous network terminal sessions (for example, telnet, rsh).

The ASM provides a "Virtual Terminal" interface to the AM that emulates the operation of a real terminal connected to the IOP on the AM. The virtual terminal interface supports a number of standard AM shell interfaces (Craft shell, Control and Display, RTR shell, RCV shell) plus a remote execution facility to the RTR shell. One of the significant advantages of the virtual terminal capability is that, when used with a Telnet connection, it permits maintenance access to the 5ESS[®] at much higher speeds (*Ethernet*[®] rates) than is possible with the 3B IOP (4800 - 9600 baud). Eight virtual terminals have been defined on the ASM. However, each Control and Display Tal consumes 2 terminals, so a smaller number is available if any are being used as Control and Display terminals. These terminals have been assigned TTY letter names of non-alphanumeric ASCII characters (for example, #, !,), &, ^).

For ASMs supporting DRM, it is possible to re-map an arbitrary number of AM physical terminal devices to ASM virtual devices. This is done by degrowing the physical device and regrowing it as a virtual terminal. Virtual terminals do not change the number of terminal devices supported by an AM, nor the number of Recent Change transactions that occur simultaneously on the 5ESS[®] switch.

For some features, such as DRM (99-5E-3850.V), a Graphical User Interface (GUI) is provided on the ASM. The ASM GUI can be accessed using either PCs or SUN[™] workstations equipped with the Netscape[™] Browser software.

A special connection called the ASMLNK allows a user on the 3B21 AM to control the ASM Console. This provides the switch owner with the ability to access that ASM in emergencies from any location from which the 5ESS[®] can be accessed. The ASMLNK is supported via a 3B21D connection on a UN582 in the AM's IOP. If a UN582 is not equipped on the IOP, one can be added to an IOP otherwise equipped with TN74 packs. As a final option, a TN74 can be used; however, the capabilities and quality of the connection will be severely reduced. The ASMLNK uses a 3B-based program called DSMCON (for Distributed Services Maintenance Console) to provide a means to log in to the ASM for maintenance purposes if the LAN is not available for some reason. In addition to access to the ASM's console port, DSMCON provides a mechanism to access the ASM's boot firmware. This provides a failsafe mechanism to recover the ASM if the system becomes unstable.

For more details on how to use each of these interfaces, see 235-105-210 *Routine Operations and Maintenance*.

5.8.8 Backup and Recovery

The ASM backs up its software to its DAT device. The backup process archives the ASM Base software, applications programs, and selected data needed to restore the state of the machine. Certain portions of transient data, such as scratch files and log files, are not included in the backup. Lucent recommends that ASM backups be made whenever a 5ESS[®] Switch tape backup is performed. However, the two operations are independent.

Recovery procedures allow for three degrees of granularity:

- ☐ Retrieval of selected files from a backup tape
- ☐ Restoral of all ASM Base and applications from tape

- ☐ Recovery of the complete disk image by reloading from CD-ROM and/or a backup tape

For more details on backup and recovery, see 235-105-220 *Corrective Maintenance Procedures*.

5.8.9 Additional Information

More detailed procedures and information for the ASM can be found in the following documents:

- ☐ 235-040-100 OA&M Planning Guide
- ☐ 235-105-210 Maintenance Requirements and Tools
- ☐ 235-105-110 Routine Operations and Maintenance
- ☐ 235-105-220 Corrective Maintenance Procedures
- ☐ 235-105-231 Hardware Change Procedures - Growth
- ☐ 235-105-500 Maintenance Reference Handbook
- ☐ 235-106-104 Software Release Retrofit Procedures (5E13 to 5E14)
- ☐ 235-600-313 Equipment Configuration Data/System Generation (ECD/SG) 5E14 Release
- ☐ 235-200-150 Distinctive Remote Module (DRM) User's Guide

6. MAINTENANCE

6.1 OVERVIEW

Maintenance is that overall process designed into the switching system to minimize the effects of failures on system performance while providing the switch personnel with the information and tools required to locate and repair the troubles quickly. Through the use of hardware and software error detectors, automatic fault recovery procedures, and duplicated units, the 5ESS[®] switch is able to locate and reconfigure around faulty units, schedule and run diagnostics, and generate trouble reports without service interruption.

Provisions are made for remote centralization of the maintenance functions through a BX.25 interface to a remote maintenance system, thus allowing the office to be unstaffed except for functions such as circuit pack replacements, line rearrangements, and battery checks which require a switch personnel to be at the remote site.

The 5ESS[®] switch maintenance software contains the logic for providing reliable system operations through the human-machine interface, switch maintenance, terminal maintenance, system integrity, program updates, and integrated services digital network (ISDN) maintenance. See "MAINTENANCE SOFTWARE", Section 6.2 .

In addition to the automatic recovery and diagnostic processes, capabilities are provided for manual control of diagnostics, system configuration, and office data base parameters. Procedural information manuals are available and provide procedures to help the switch personnel locate and repair troubles and to initiate system recovery. Refer to the 235-105-210, *Routine Operations and Maintenance Procedures*, for more information.

The 5ESS[®] switch multimodule remote switching module (MMRSM) is similar to the standard switching module (SM) at the host, and for the most part is maintained in much the same way as the SM. However, because of the physical separation from the host switch, additional maintenance features are provided.

A facilities interface unit (FIU) is required in the RSM (remote switching module) to convert the multiline T1 data from the host into serial network control and timing data for the RSM. In addition, an alarm status circuit (ASC) or an remote alarm unit (RAU), and an alarm and status panel augment the standard SM maintenance interface. Hardware monitors and diagnostics provide the same levels of trouble detection, verification, recovery, and notification as are provided in the host SMs. The RSM troubles are reported at the host switch master control center (MCC), and at the Switching Control Center System (SCCS) over the remote maintenance channel. Equipment removals, diagnostics, and restorals can be initiated from the host MCC, from the SCCS, or from the RSM using a portable remote terminal. Also, a manual RSM initialization capability is provided at the RSM to allow the switch personnel at the remote site to restore normal operation in the unlikely event of the loss of local calling capability and the failure of normal recovery sequences while in the stand-alone mode.

6.1.1 TROUBLE-DETECTION CAPABILITIES

Capabilities for trouble detection are provided both in hardware and software. The hardware is tested regularly by:

- (a) Continuous automatic tests
- (b) Per-operation or per-call tests
- (c) Parity and cyclic redundancy checks
- (d) Routine exercises.

Per-call and per-operation tests detect cutoff calls, network path troubles, and tip and ring reversal troubles

as they occur. In addition, periodic automatic tests are performed to detect troubles before they can affect system performance.

Error analysis identifies transient or intermittent troubles. The integrity of the software and office data base is maintained by:

- (a) Continuous software monitoring
- (b) Audits and hash sum checks
- (c) Manual change capability.

Software correction is made through the audits and hash sum checks. Regular plant measurements monitor the service and performance of the overall system.

6.1.2 TROUBLE-DETECTION STRATEGY DOCUMENTATION

Strategies used by the system for trouble detection are described in system documentation to aid the switch personnel in the interpretation of system outputs and the determination of what manual actions are required. General maintenance considerations are given in 235-105-220, *Corrective Maintenance Procedures*. An overview of alarm surveillance and trouble clearing is provided, as well as detailed procedures on system recovery and trouble clearing. The 235-105-210, *Routine Operations and Maintenance Procedures*, provides a description of detailed procedures necessary for routine operations and maintenance. This manual includes coverage of memory alterations, the remote office test line (ROTL), office alarm tests, call trace procedures, and fan unit tests.

6.1.3 TROUBLE-DETECTION STRATEGY

6.1.3.1 Overview

Facilities are provided to detect all possible troubles using detection strategies in the following order:

- (a) Continuous automatic tests (hardware and software)
- (b) Per-operation or per-call automatic tests
- (c) Periodic automatic tests
- (d) Semiautomatic tests
- (e) Manual routine tests.

In service-affecting situations, such as severe overload, the system has the capability to selectively inhibit one or more of the trouble-detection strategies so as to maintain call processing capacity, or to provide limited service rather than no service at all.

6.1.3.2 Continuous Automatic Tests

Continuous automatic tests are provided to monitor and detect troubles in the following areas:

- (a) Data transmission
- (b) Active and standby equipment
- (c) Equipment power
- (d) Overall system operation.

An example of continuous automatic tests are audits which detect, record, and correct data errors before they can propagate and lead to system outages. Another example of these tests is the sanity test which monitors program sequences and timing to ensure overall system sanity and normal call processing.

6.1.3.3 Per-Operation or Per-Call Automatic Tests

Per-operation or per-call trouble detection tests are performed to detect the following:

- (a) Call-processing data base troubles
- (b) Lack of call-processing resources
- (c) Ineffective attempts
- (d) Cutoff calls
- (e) End-to-end network path troubles
- (f) Lack of customer privacy
- (g) Tip and ring reversals.

6.1.3.4 Periodic Automatic Tests

Periodic automatic tests are designed to detect latent system troubles before they affect service. These tests run with call processing in a time-shared mode so as not to interfere with normal system operation. The design takes advantage of the distributed architecture and allows concurrent diagnostic activities on the multiple processors within the system. These tests routinely exercise standby, and possibly active, units of duplicated unit pairs operating in an active/standby mode; and may include a switch from standby to the active state to ensure that the standby units can perform in an active state configuration. Test failures will inhibit switching from the standby to active state and result in an alarmed message.

6.1.4 SEMIAUTOMATIC AND MANUAL TESTS

All automatic tests are also capable of being run on manual request from the MCC, through the remote maintenance channel, or from the equipment frame locations. Tests run from the MCC or through the remote maintenance channel may be initiated using text message input commands. From the frame locations, tests are initiated with text messages using a portable terminal. Test results through output messages are available at the location from which the test is initiated.

6.1.5 TROUBLE-DETECTION INHIBITING

6.1.5.1 Overview

Under certain abnormal conditions, trouble detection or recovery operations may be modified or inhibited by operating telephone company (OTC) personnel until normal conditions are restored.

6.1.5.2 Automatic Inhibits During Overload

During periods of severe traffic overload, an overload control feature automatically determines actions to be taken to eliminate or minimize the effects of the condition and maximize system performance during the period of overload. Nonessential trouble detection functions such as routine audits or routine exercises may be deferred to run at a given minimum rate. At the same time, call-processing inputs are limited to allow essential work including nondeferrable maintenance functions to continue at a predetermined maximum rate. This feature is described in detail in 235-190-115, *Local and Toll System Features*.

6.1.5.3 Automatic Inhibits to Maintain Service

Failing trunks or faulty members of engineered equipment groups such as service circuits are normally removed from service automatically. Automatic removals are inhibited when predefined thresholds have been reached to provide limited service rather than no service at all. An alarmed message is generated each time the system is prevented from removing a faulty unit when the failure limit has been reached.

6.1.5.4 Notification of Inhibits

Output messages and continuous critical indicator displays on each MCC page indicate when overload controls and inhibits have been invoked. The MCC display pages provide details on overload and inhibits, and output messages provide lists of OOS units on demand.

6.1.6 REMOTE MAINTENANCE CENTER INTERFACE TROUBLE DETECTIONS

The remote maintenance center interface consists of duplex circuits using BX.25 protocol. Each circuit provides a complete interface capability. Controllers for these circuits are monitored through automatic periodic tests, and level 2 protocol provides continuous monitoring from both ends of the link. Failure in either the active or the standby link will result in recovery action and an alarm output message.

6.1.7 LOCAL MAINTENANCE CENTER INTERFACE TROUBLE DETECTIONS

The local maintenance center interface is monitored through the controllers through regular repetitive checks. Failures in these tests or detected interrupts will initiate recovery actions and alarmed output messages.

In the event of a failure on the active link when the standby link is out of service, the active link will not be removed from service in order to maintain the interface at as high a functional level as possible.

6.2 MAINTENANCE SOFTWARE

The 5ESS[®] switch maintenance software contains the logic for providing reliable system operations through the following capabilities:

- (a) **Human-Machine Interface:** This feature consists of switch personnel interface programs for the MCC, system alarms, and peripheral frame control/display.
- (b) **Switch Maintenance:** This feature maintains a working switch configuration; aids in hardware repair; updates the hardware availability status in the data base used by other software systems; and notifies the human-machine interface, system integrity, and terminal maintenance subsystem whenever faults are detected.
- (c) **Terminal Maintenance:** This feature is responsible for the testing of lines and trunks, maintaining a status record, and analyzing signaling errors detected by the system.
- (d) **System Integrity:** This feature detects and responds to faults encountered in the SM, communications module (CM), and administrative module (AM) software by using audits, integrity monitors, and overload detection.
- (e) **Program Update:** This feature performs the file transfer and verification functions, the program update disk file partition management, the AM and SM update functions, and the downloadable microprocessor update functions.
- (f) **ISDN Maintenance:** Maintenance for ISDN comprises switch maintenance, terminal maintenance, and system integrity capabilities. For ease of reference, maintenance capabilities that are unique to ISDN have been collected together into a common section. (See "ISDN MAINTENANCE", Section 6.10).

6.3 HUMAN-MACHINE INTERFACE

6.3.1 OUTPUT MESSAGES

6.3.1.1 Overview

Output messages are provided by the system to inform the OTC personnel of trouble areas in the switch, overall switch status, and traffic impacts on the switch.

6.3.1.2 Output Message Categories

All maintenance output messages are assigned categories or classes which allow them to be routed selectively to input/output (I/O) ports or devices. Certain informational messages that are normally not required are routed to an internal log file and stored for about 24 hours, or they may be printed on demand. These messages can also be routed to the local and remote maintenance channels where they may be needed for analysis.

6.3.1.3 Trouble Message Formats

System output messages are formatted such that trouble messages contain sufficient text to be used with the aid of an output manual and with a minimum of additional documentation, conversion, or analysis. To further simplify trouble location, the trouble locating procedure (TLP) option for trouble diagnostic messages provides a list of suspect circuit packs. This list is given in the order of probability that each of the packs is the source of the trouble.

6.3.1.4 Status Messages

Hourly status messages and call-on-demand status messages supplement the MCC displays, and provide the switch personnel with lists of faulty and out of service (OOS) equipment.

6.3.1.5 Office Measurements Report

6.3.1.5.1 24-Hour Plant Report

The 5ESS[®] switch plant measurements are compiled and automatically output at the SCCS and on the MCC receive-only printer (ROP) once a day at 02:07:00. A retained copy of the last report can be requested at any time of the day except when the new report is being compiled. The validity of the counts is indicated in the heading of the report. If the counts are incomplete or suspect (for example, a processor has experienced a selective initialization since the last report), the report is marked ``DATA MAY BE INVALID."

The primary measurement counts are listed in Parts 1A, 1B, 2, and 3 of the 24-hour plant report. All are office total counts. These consist of base, service, and performance counts.

Part 4 of the report gives RSM measurements. These measurements are compiled and output on a per-RSM basis. The validity is determined and reported independently for each RSM, and only the validity of the data in the AM or in the RSM affects the RSM report validity.

There are three base counts, eight service (ineffective attempts) counts, and nine performance counts for each RSM.

The rest of the 24-hour plant report contains the following measurement categories:

- ☐ Part 5 ☐ Trunk Error Report Analysis (TERA) Measurements
- ☐ Part 6 ☐ Carrier Interconnect (CI) Measurements

- ☐ Part 7 ☐ Network Call Denial (NCD) Measurements
- ☐ Part 8 ☐ MMRS Measurements
- ☐ Part 9 ☐ ISDN Packet Switching Office Totals
- ☐ Part 10 ☐ Operator Services Position System (OSPS) Measurements
- ☐ Part 11 ☐ ISDN Measurements
- ☐ Part 12 ☐ OSPS Common Channel Signaling Query Measurements
- ☐ Part 13 ☐ OSPS Real Time Rating Query Measurements
- ☐ Part 14 ☐ OSPS Facility Administration Measurements
- ☐ Part 15 ☐ OSPS Toll and Assistance Measurements
- ☐ Part 16 ☐ OSPS Interflow Measurements (5E5 and subsequent software releases)
- ☐ Part 17 ☐ OSPS Line Information Data Base (LIDB) Measurements (5E5 and subsequent software releases)
- ☐ Part 18 ☐ OSPS Customer Account Services (CAS) Measurements (5E5 and subsequent software releases)
- ☐ Part 19 ☐ Advanced Communications Package (ACP) for Software-Defined Networks (5E5 and subsequent software releases)
- ☐ Part 20 ☐ No part 20 in plant report
- ☐ Part 21 ☐ Leased Networks (5E6 and subsequent software releases)
- ☐ Part 22 ☐ OSPS Intercept Measures (5E6 and subsequent software releases)
- ☐ Part 23 ☐ OSPS CAS CCS7/International Credit Card Validation (ICCV) Signaling Measures (5E7 and subsequent software releases)
- ☐ Part 24 ☐ Machine-Detected Interoffice Irregularities (MDII) Trunk Group Measurements (5E7 and subsequent software releases)
- ☐ Part 25 ☐ ISDN User Part Office Totals (5E7 and subsequent software releases).
- ☐ Part 26 ☐ DS1 Measurements
- ☐ Part 27 ☐ Static Proportionate Bidding Measurements
- ☐ Part 28 ☐ OSPS ICCV Measures By Foreign Database
- ☐ Part 29 ☐ OSPS Line Applications for Consumers Measurements

6.3.1.5.2 Hourly Plant Report

The hourly plant report contains data pertaining to originating calls, incoming calls, terminating calls, outgoing calls, and call connect setup troubles. This data reflects the maintenance effect on traffic during the past hour.

If enabled for ROP output, the hourly plant report is automatically printed. A copy of the last scheduled

report can also be requested at any time.

The hourly plant report consists of parts 1 through 3 of the 24-hour plant report.

6.3.1.5.3 Monthly Plant Report

The monthly plant report is an accumulation of the existing 24-hour plant reports. Each day at approximately 02:07, when the 24-hour plant report is generated, the daily totals are accumulated in a monthly plant measurements data area.

Every month, on the 23rd day of that month, the monthly totals are printed at approximately 03:07 using the same format as the 24-hour plant report.

The monthly report which is generated on the 23rd of each month, may also be printed on demand at any time until the 24th of the month at approximately 02:07. At this time, the 24-hour plant report is generated, the previous month's totals are zeroed, and the monthly counts begin accumulating again.

For further information on the 5ESS[®] switch plant reports, see 235-070-100, *Appendix 1, Traffic and Plant Measurements*.

6.3.1.6 Recovery Action Messages

Output messages resulting from recovery actions are printed on the ROP and routed to the remote maintenance channel for display and logging in the SCCS. In addition, processor recovery messages are sent to the MCC display. After system sanity is restored, a postmortem dump message is generated within approximately 1 to 5 minutes, giving detailed data (for example, control process name, control register values, error register contents, and counter values) related to the trouble.

6.3.2 MASTER CONTROL CENTER

6.3.2.1 Overview

The 5ESS[®] switch is designed to allow one switch personnel at the MCC to monitor overall switching system status and performance and control the switching system maintenance functions. The MCC supports a video display terminal with keyboard, ROP, key telephone set with loudspeaker, and the trunk and line work station (TLWS) test access unit. This position is designed to allow one switch personnel to perform fault recovery, fault isolation, and repair functions using the built-in equipment. In a small percentage of cases, additional available test equipment and documentation may be needed. All activities performed through the MCC are available at the TLWS, except emergency actions.

The MCC is fully functional without any external support systems such as an SCCS.

6.3.2.2 Impact of Single Faults on Maintenance Center Operations

The MCC is designed such that no single equipment fault can totally, and simultaneously disable all visibility into the condition of the switching system or disable access to the switching system for control functions. This same reliability is also provided with the remote maintenance interface to an SCCS. However, the loss of the terminal itself will result in loss of the MCC capability.

6.3.2.3 Switching System Control and Display Interface

6.3.2.3.1 Overview

The MCC video terminal provides a complete control and display interface including graphic system displays (with color enhancement when an optional color video terminal is provided), menu command operation, and text message input capability. The ROP can provide paper copy of system output messages. This interface provides the following features:

- ☐ Emergency action interface (EAI)
- ☐ Switching system control and reconfiguration capability
- ☐ Recovery control independence
- ☐ Controls for manual trouble verification
- ☐ Summary status indicators
- ☐ Recovery status.

6.3.2.3.2 Emergency Action Interface

The EAI is provided through a display page available at the MCC video terminal as well as through a remote terminal (for example, the SCCS). The emergency action functions include manual recovery capabilities during periods of system emergency when normal recovery procedures prove inadequate. A menu of control and initialization commands is provided which allows the switch personnel to:

- (a) Recover from duplex AM failures
- (b) Boot the system
- (c) Disable hardware checks
- (d) Disable software checks
- (e) Disable the sanity timer
- (f) Force reconfigurations of duplex processor units.

6.3.2.3.3 Switching System Control and Reconfiguration Capability

Through menu commands and display pages, recovery from most equipment outages is provided at the MCC. (Duplex AM processor outages require the use of the EAI previously described.) System control is also available using text input commands.

This recovery includes the capability to select a set of subsystems, interconnections, and software to assemble a working switching system configuration in the event the system fails to reconfigure automatically.

6.3.2.3.4 Recovery Control Independence

All recovery capabilities are functional even when other systems have failed. The EAI is fully duplicated and is independent of the sanity of the AM processor. The RSM troubles are reported at the host switch MCC.

All system troubles including activated hardware or software inhibits are displayed. Full test capabilities for all equipment are also provided from the MCC.

6.3.2.3.5 Controls for Manual Trouble Verification

The MCC provides all features necessary for manual trouble verification to aid corrective maintenance procedures.

6.3.2.3.6 Summary Status Indicators

A status summary is displayed on the video terminal indicating the real-time equipment status of the 5ESS[®] switch. Each equipment type is indicated as in a normal or trouble state. Alarm displays include severity (critical, major, or minor) information.

6.3.2.3.7 Recovery Status

During recovery operations, periodic feedback is provided giving recovery progress and configuration information. This information is available as part of the EAI and MCC capability, even during duplex AM processor recovery actions.

6.3.2.4 Changing Office Dependent Data

The recent change/verify (RC/VFY) terminal at the MCC provides the capability to access the office dependent data such as office parameters, information on lines and trunks, customer features, and routing data. This access provides the capability to verify and/or change the data, including the addition of new office data for growth and rearrangements.

Separate work stations providing equivalent or functionally restricted access to the office dependent data may be optionally provided.

6.3.2.5 Extended Maintenance Center Capabilities

In addition to the MCC, a belt line input terminal capability is provided. Jacks are provided in the equipment frames allowing a portable I/O device to be located near the equipment undergoing test or repair.

The belt line access provides complete text message input and output capability.

6.3.2.6 MMRSM Switch Personnel Maintenance Capabilities

The primary switch personnel interface for MMRSM maintenance is the video display terminal (the MCC at the host or the work station terminal at the SCCS). In addition, audible and visual alarms and status displays of the status of the remote site; monitoring of remote building, power, and miscellaneous alarms; manual initialization capabilities; and a teletypewriter [interfacing directly to the host office input/output processor (IOP) or through the SCCS] make up the switch personnel interface for MMRSM maintenance.

6.3.2.7 MMRSM MCC Displays

The MCC displays clearly identify the remote modules, providing the same level of status displays and the same menu select commands for unit or circuit testing as are provided for all SMs. In addition, a status display is provided for the remote location that includes the associated SM hosting the remote modules and the status of these SMs, as well as other summary information. A separate display page is provided for display and control of the remote building and power alarms.

6.3.3 ALARMS

6.3.3.1 Overview

The 5ESS[®] switch is designed to provide trouble notification to alert the switch personnel to the existence and severity of any switching system troubles.

6.3.3.2 Alarmed Trouble Notification

The system trouble notification includes audible and visual alarm severity, trouble type, and other diagnostic information associated with troubles which have immediate or potential impact on system operation and performance. In addition to printing alarm trouble messages on the ROP, the system displays alarms and critical indicator status at the top of each MCC display page. Display pages identify

and indicate the status of the specific units reporting troubles.

6.3.3.3 Centralized Reporting of Troubles and Alarms

The 5ESS[®] switch provides trouble notification at the MCC as well as the SCCS interface. This includes alarms, messages, and MCC display page information.

Alarms reflecting troubles outside the 5ESS[®] switch (for example, building, environment, power) are provided both at the MCC and the remote maintenance interface through the 5ESS[®] switch.

6.3.3.4 Notification of Machine Actions

The results of all automatic actions, in response to a trouble condition, are reported to the switch personnel. Examples include system reconfiguration, equipment taken out-of-service, and automatic diagnostic results. Unsuccessful automatic recovery attempts by the system are also reported.

6.3.3.5 Notification of Single Troubles

Normally a single trouble will generate one and only one alarm message. However, all initializations, whether resulting from a single trouble or multiple troubles, will be reported.

Also, the 5ESS[®] switch is designed such that certain single troubles, such as battery discharging, will not result in the loss of call processing capability or physical damage to equipment. These single troubles result in repeating the alarm message with a clear indication of the type of trouble to periodically remind the switch personnel of the trouble condition.

6.3.3.6 Three-Level Alarm Structures

The 5ESS[®] switch incorporates three levels of severity of alarms; critical, major, and minor. Each level has a distinctive audible tone and visual indication as follows:

- (a) **Critical Alarm:** Critical alarms indicate severe service-affecting troubles. These conditions require immediate corrective action.
- (b) **Major Alarm:** Major alarms report hardware or software trouble conditions which indicate the malfunction or failure of important circuits, or troubles which may cause a serious disruption in service. These troubles require immediate attention to restore or maintain system capability.
- (c) **Minor Alarm:** Minor alarms are associated with troubles which do not have an immediate or potential serious effect on customer service, or for troubles in circuits that are not essential to switching system call processing operation.

6.3.3.7 Priority of Notification by Alarm Levels

Trouble notification is provided with the following priority order: critical alarms, major alarms, minor alarms, and nonalarmed messages.

6.3.3.8 Office Alarm Subsystems

In addition to the MCC and optional remote interface to an SCCS, an office alarm subsystem is provided. This unit provides visual and audible alarms and is functionally independent from the MCC and remote maintenance interface. Power to the alarm subsystem is provided through a separate cable and fuse; a failure in either will initiate an audible alarm and output message.

6.3.3.9 Alarm Retire

An alarm retire capability is provided at the MCC and at the remote alarm and status panel to silence audible alarms and retire visual alarm indications. This alarm retirement does not remove the status display information that indicates when a trouble exists in the system.

6.3.3.10 Alarm Retire Mode

The capability is provided to retire alarms either automatically or manually. In the automatic mode, audible and visual alarm indications in the office self-retire, and status displays are updated to reflect any changes in system status. This eliminates the need for a switch personnel to be in the office to silence the audibles; the alarm indicators correctly reflect only the most recent alarms, and system status is maintained to reflect all trouble conditions.

In the local or manual retire mode, audible and visual alarm indicators in the office remain on until manually retired by the switch personnel. This assures a positive response to every alarm while the switch personnel is in the office and assures that no alarms are missed.

6.3.3.11 Other Visual Alarm Indicators

Added alarm indicators for fuse failures and equipment cooling fan failures are provided at the equipment frames on the 5ESS[®] switch. These indicators supplement the status and display information displayed on the MCC to aid in trouble location. End-guards on each equipment aisle are marked to identify the equipment in each aisle. Output messages available on the ROP identify faulty units by means of equipment location codes corresponding to the end-guard markings. End-guard markings, together with the equipment location codes given in the output messages, direct the switch personnel to the correct aisle, frame, and unit to locate a failing circuit. Indicator lamps on control and display packs and power converters within the frames supplement the visual indicators for rapid trouble location.

These alarm indicators are not provided by the RSM alarm process.

6.3.3.12 Trouble Status Indicators

Trouble status indicators for major equipment groups or functions are displayed at the top of each display page and remain on until the trouble is cleared. The status of individual units and circuits is also displayed on the display pages associated with the particular units or circuits. Additional status indicators such as power, OOS states, and alarms for major hardware units are provided on the control and display circuit packs within the equipment frames where appropriate.

6.3.3.13 State of Health Indicators

A control unit sanity indication for the AM is provided on each display page to indicate when the control unit is functioning normally. Processor sanity indicators are also provided at the RSMs for each module processor.

6.3.3.14 Alarm and Display Color Assignments

Alarm and status display colors for hardware indicators are assigned as follows:

- (a) **RED:** Critical or major alarms; any condition that has or may have a significant effect on service or revenue.
- (b) **AMBER or YELLOW:** Minor alarms; conditions having only minor effect on the system or conditions requiring caution on the part of the switch personnel.
- (c) **GREEN:** Normal, favorable, or active conditions.
- (d) **WHITE:** Information indicators (for example, standby).

For black and white MCC terminals, alarms and status conditions are displayed in flashing or steady-state reverse video supplemented by printed status states for units and circuits on the various display pages. For color MCC terminals, the basic color assignments are augmented with contrasting backgrounds, and additional colors are used to identify special conditions.

6.3.3.15 Notifications and Alarms for IDCU Equipment

General guidelines for designating alarm severity for IDCU hardware and software failures are as follow:

- ☐ A critical alarm indicates a severe, service-affecting condition that causes more than 128 customer lines to be out of service or reduces the call capacity by more than 50 percent or a duplex hardware failure.
- ☐ A major alarm indicates a service-affecting condition that causes 24 through 127 customer lines to be out of service or reduces the call capacity by more than 25 percent or a simplex failure of a duplicated hardware unit.
- ☐ A minor alarm indicates a condition that is service affecting for 2 to 23 customer lines or a significant operations event that does not routinely occur (that is, failure of a nailed-up connection, a successful DS1 protection switch, etc.).
- ☐ An automatic message indicates a nonservice-affecting condition or a condition that is service affecting for a single customer line.

6.3.3.16 Alarm and Status Displays at the MMRSM

An alarm and status panel at the MMRSM indicates alarm levels and overall status of the remote site. There are two different alarm and status panels used in the MMRSM. One is used to report the status of the RSM in which it is located, and the other indicates the status of RSM in which it is located as well as the status of the entire MMRSM.

Indicators for CRITICAL, MAJOR, and MINOR alarms and STAND-ALONE status are supplemented by audible alarms. The status displays are updated to reflect any changes in the system status. Status indicators remain on until the troubles are cleared. A system cycle and stand-alone indicator, together with indicators for SM, building, and power troubles, provide a continuous display of overall MMRSM and building status.

The alarm and status panel is controlled through the modular metallic service unit (MMSU) and the alarm and status panel circuit packs. The alarm and status circuits can be tested with a pushbutton on the ASC, and an indicator on the panel shows when an alarm test is in progress. At the end of the test, alarm lamps are set correctly. Status indicators are set correctly, and if any alarms occurred during test, they are sounded following the test.

6.3.3.17 Universal RISLU Alarms

With the universal remote integrated services line unit (RISLU), the LAU remote alarm section (RAS) is not supported. An alarm status unit (ASU) may be equipped to provide visual alarm and status information to the OTC personnel at the remote site. Critical, major, and minor alarms for the RISLU are reported by the DFI. In addition to the normal ISLU conditions, the following alarms are provided:

- ☐ Critical alarms for CC and CD duplex failures caused by DFI outages.
- ☐ Major alarms for camp-on time-out on a DFI removal.
- ☐ Major alarm for the failure of a peripheral fault and recovery initiated restore of a DFI.

The universal RISLU does not support an integrated environmental alarm capability (that is, the RAS). The RISLU sites requiring environmental alarms will need to provide this capability via telemetry equipment.

6.3.3.18 OSPS RISLU Alarms

The 5ESS[®] switch provides for the maintenance of the OSPS RISLU. Each OSPS RISLU site reports its own fan and fuse alarms. Each remote site has an RAS and an ASP. The RAS allows the monitoring of up to 32 external scan points and the ASP summarizes the alarm conditions at the remote site. Only one RISLU at a site reports the battery and power alarms for the entire complex. This RISLU also hosts the RAS. There is only one RAS for each RISLU site. When a scan point changes state, a message is sent to the host SM where a report is generated at the ROP. The MCC page is changed to reflect the new condition. These conditions can be clear, alarming, or system inhibited. Any changes at the host MCC are duplicated at the remote MCC. An hourly report is generated that contains all of the off-normal points at a site. A command is also provided to allow the OTC personnel to get a printed report of the alarm states on demand.

Of the 32 scan points, the first two are reserved for fire and fire alarm trouble and are critical alarms. The fire alarm indicates that the building is burning. The fire alarm trouble alarm indicates that there is a problem with the fire alarm. The 30 remaining scan points are office definable using RC/VFY and may have an alarm level of major or minor. They can also have the following states:

- ☐ Clear
- ☐ Alarming
- ☐ Manually inhibited
- ☐ System inhibited.

The ASP is located at the remote site and is attached to the RISLU frame. It provides an on-site visual summary of the alarm conditions. The LEDs are used to provide the following status information:

- ☐ Status of the RAS hardware
- ☐ Status of RAS-SM communication
- ☐ Alarm status (critical, major, minor)
- ☐ Alarm retire mode
- ☐ Building power status.

The ASP also has an alarm retire button, an alarm mode change button, a test button, and a trouble lamp.

When a scan point goes off-normal, the hardware turns on an alarm. The alarm is critical for the first two designated scan points, and is office definable for the remaining scan points. When an alarm is activated, the LED on the ASP corresponding to the alarm level, will light and an audible alarm will sound. If the current alarm mode is automatic, the alarm will retire after a predetermined period of time (10 seconds). For the manual alarm mode, the alarm will sound until it is manually retired by the OTC personnel.

The building/power LED is a summary of all the 32 scan points and the complex's power and battery alarms. The trouble alarm is a summary of the common controller (CC), common data (CD), line group controller (LGC), line card (LC), digital facility interface - host end (DFIH), and remote clock (RCLK) circuits in addition to the BRI status, Carrier Group Alarm (CGA), and AM-SM communication status for any SM which co-hosts the site.

Input/output messages are available to allow the OTC personnel to request the current status of the 32 scan points, to selectively inhibit or allow the scan points, and to change the alarm retire mode.

6.3.3.19 Building/Power Alarms

The RSM building and power alarms are monitored through the MMSU in the RSM. A separate MCC display page for these identifies active alarms, and menu commands allow the switch personnel to inhibit or allow inhibitable alarms. Inhibited alarms are displayed as such on the alarms page, and the alarms inhibit indicator on the RSM status page is set. Names for the miscellaneous alarms and most building alarms are assignable by the switch personnel with recent change type input messages, and the assigned names are included in the alarm messages for ease of identification. The alarm level and normal state of the alarm indicator are also assignable.

6.4 SWITCH MAINTENANCE

6.4.1 OVERVIEW

The 5ESS[®] switch maintenance provides for the overall hardware and software maintenance of the 5ESS[®] switch. Trouble-verification techniques are used by the system prior to notification or initiation of repair activity. Trouble verification is also used after repair to confirm that the trouble has been cleared.

6.4.2 DISTINCTION OF FAULTS FROM ERRORS

The 5ESS[®] switch provides facilities and procedures to verify the presence of a trouble condition. For major service-affecting equipment, the system distinguishes between errors and faults. Errors reflect those trouble conditions that cannot be reproduced at will, and faults are those that can be reproduced at will or are evidenced by high error rates.

6.4.3 TROUBLE NOTIFICATIONS

The 5ESS[®] switch provides a trouble notification prior to verification for certain trouble symptoms that indicate potential hazards to the capabilities of the system.

6.4.4 SERVICE PROTECTION DURING VERIFICATIONS

Verification tests are performed without a detrimental effect to system operation or customer service.

Major system hardware is duplicated or arranged such that on detection and verification of a fault, the system will automatically switch to a standby unit or bypass the faulty unit with little or no effect on service. Redundant hardware, programs, data, and self-checking and correcting hardware maximize the completion rate of any calls in progress after the system has recovered from a failure. At the lower levels of initialization, no stable calls are lost, and the number of transient calls affected is minimized. Rapid automatic corrective actions restore the system capability to respond to all new service requests after a trouble has been detected.

6.4.5 VERIFICATION TESTS

Automatic verification tests are provided for troubles that may clear without any specific action taken by the system.

Manually initiated verification tests are also provided. The results of manually initiated verification tests are available at the location where the test was requested.

6.4.6 INTERNAL VERIFICATION THRESHOLDS

The 5ESS[®] switch provides an internal logging and thresholding capability for certain types of errors which

individually require no manual intervention.

6.4.7 AUTOMATIC ISOLATION TO A MINIMUM NUMBER OF REPLACEABLE ELEMENTS

The 5ESS[®] switch uses software diagnostics and self-checking circuitry at the board level to detect hardware faults. The diagnostics themselves are noninterfering with switch activity. Only the circuit being tested and any circuits needed as resources to perform the tests are unavailable for call processing during a diagnostic. No circuits are taken out of service or utilized for diagnostic purposes while they are involved in an active call. Each identifiable circuit type has a diagnostic associated with it. Diagnostic programs are structured such that several phases constitute the test of a repair group which may consist of several circuit packs. Capability is provided to run an entire diagnostic, a single phase to test only one circuit pack or interface within the group, or a phase segment to test a single function. Segments may be run repeatedly in a loop to assure consistency of results. The TLP feature of the diagnostics provide the ability to pinpoint faults to a small number of circuit boards. Troubles are usually isolated to a single circuit pack.

6.4.8 DIAGNOSTICS

6.4.8.1 Overview

Diagnostics can be invoked by manual, automatic, and routine exerciser (REX) requests in the 5ESS[®] switch. Manual and automatic requests always produce some type of termination message which is printed at the ROP. The REX requests normally do not produce a per diagnostic termination message. The termination message types include diagnostic completed, diagnostic stopped, or diagnostic aborted. The completed and stopped messages will include another field indicating the progress of the diagnostic at termination. This field will indicate all tests passed (ATP), conditional all tests passed (CATP), some tests failed (STF), or no tests run (NTR). The CATP refers to the fact that no tests failed, but some tests, segments, or phases were skipped because a needed resource was not available. A stopped message indicates that the diagnostic terminated prematurely but gracefully. An abort message indicates premature termination in a nongraceful manner. After an abort, system resources, which the diagnostic was using, may be in an inconsistent state and audits must be relied upon to clean up the affected resources. The STF messages consist of phase, segment, test, and mismatch data. Optional information can also be printed in the STF message. The optional data includes the actual and the expected results. The mismatch data is derived from this data. The TLP list is a ranked list (highest to least) of the suspected faulty circuit boards. The TLP will isolate at least 75 percent of the reported troubles to four or fewer elements, and at least 90 percent of the reported troubles to seven or fewer elements. (Field experience indicates that 95 percent of the troubles are being detected by the diagnostics, and that 85 percent of those troubles are being cleared with the first circuit pack replacement.

The board code and office location information make up each line of the TLP information. The combined use of the TLP list and the frame and shelf designation strips provide direct access to circuit boards. For some rare troubles that may not be cleared by circuit pack replacement, the diagnostics provide an option for output of the raw test data which may be used in conjunction with the program listings or in consultation with the 5ESS[®] switch Diagnostic Center. A summary of options for diagnostic request messages follows:

- ☐ **RAW:** This option prints the actual and the expected results in addition to the mismatch data about each test failure.
- ☐ **TLP:** This option prints a ranked list of suspected faulty circuit boards along with the board location data.
- ☐ **UCL:** The unconditional option causes data for all failing diagnostic tests to be printed instead of only data for the first test failure.
- ☐ **RPT:** The repeat option causes a diagnostic to repeat execution for a specified number of iterations.
- ☐ **PH:** The phase option allows a single phase, a range of phases, or a list of phases to be specified. The

request then executes only the phases specified.

- **RETRO:** This option is used with the module controller/time slot interchanger (MCTSI) diagnostic and executes the phases needed to verify the circuit board containing the software release erasable programmable read-only memory (EPROM) which is replaced during a software release retrofit.

The previous options are not dependent upon one another and may be combined in any combination for a particular diagnostic request. The effect of that request will be the combined output of the options included.

6.4.8.2 Automatic Diagnostics

Automatic diagnostic requests result when fault recovery detects that a circuit has reached a fault threshold. The circuit will automatically be taken out of service and diagnostics will be scheduled on that circuit. If the diagnostics pass, the circuit is restored to service. If the diagnostics fail, the circuit will remain out of service and a failure message, including the TLP, will be printed at the ROP.

6.4.8.3 Manual Diagnostics

Manual diagnostics are initiated by the switch personnel. Requests for manual diagnostics may be entered at the MCC or at other switch personnel terminals such as the TLWS. The MCC provides the capabilities to enter the full diagnostic request as shown in the input manual or a menu-driven interface. The basic menu commands provided are to remove, restore, and diagnose circuits. The restore command will execute the diagnostic first. If the diagnostic passes, the circuit is restored to service; if it fails, the circuit is left out of service. If the UCL option is used with the restore request, the diagnostic is skipped and the circuit is restored to service. The menu commands restore and diagnose, always use the diagnostic RAW and TLP options. In addition to diagnostic requests, manual stop and abort requests are also available. These are not available through the menu-driven interface.

Another form of the manual diagnostic request is the exercise (EX) command. The EX command provides interactive diagnostic execution at the segment level. The EX allows single stepping one segment at a time, executing a specific segment or range of segments, and repeating on a segment or range of segments. All of the options for the DGN command also apply to the EX command.

6.4.8.4 REX Diagnostics

6.4.8.4.1 Overview

The REX diagnostics are automatically invoked on a routinely scheduled basis during periods of minimal system activity. The REX diagnostics are used to systematically exercise the hardware and to detect latent system faults before they affect system performance. The REX is typically limited to those circuits that are in an "active" or "standby" state. Out-of-service circuits are skipped by the REX. In duplex circuits, the standby member is diagnosed by REX and will be restored to active if the diagnostic passes. Some circuits that fail diagnostics remain in the out-of-service state, while others that could be service affecting are restored to service.

6.4.8.4.2 REX Scheduling

Prior to the 5E8 software release, REX scheduling is performed by the switch maintenance personnel. With the 5E8 and later software releases, the automatic calculation of REX schedule feature provides the switch owner with one-step REX scheduling. The REX scheduler reads the configuration data to determine the type and quantity of hardware present in the office and calculates an optimal REX schedule based on a fixed set of rules and the constraints (days of the week to run, start time, duration, etc.) given by the user. A recommended REX schedule is created and output to the ROP. The ALIT and REX RC views are updated when requested by the user. Any of the schedule data can also be modified through the RC/VFY views.

6.4.8.5 Demand Diagnostics

These diagnostics may be invoked manually whenever the need arises. The PH option is used to explicitly request demand phases. Demand phases are usually limited to extremely long run time events or very specialized test tools for the switch personnel or factory. Demand diagnostics must be used with caution since the usual noninterference criteria does not always apply to demand phases.

6.4.8.6 Fabric Exerciser

The 5ESS[®] switch line unit has a special diagnostic for the gated diode crosspoint (GDX) network. The GDX network is composed of such a large number of crosspoints that the diagnostic run time is very long. If the standard diagnostic strategy were followed, portions of the GDX network would be out of service for an unacceptable amount of time. Therefore, the fabric exerciser was developed to perform an in-service test of the GDX network.

6.4.9 FUSE TROUBLE ISOLATION

An open fuse is reported with the appropriate equipment frame information. Each frame includes an open fuse indicator for fuses in that frame, and individual fuses have open fuse indicators.

6.4.10 ERROR ANALYSIS

The 5ESS[®] switch provides error analysis capabilities which include maintenance of data required by system fault recovery programs. Statistics on transient errors are kept and analyzed. When error thresholds are exceeded, trouble notification occurs and service protection action is taken.

Error analysis, which varies depending on the hardware and software processes involved, is characterized by the following:

- (a) Error history data is collected and maintained within the switching system for automatic analysis by fault recovery programs.
- (b) Status of equipment monitored by error analysis is available on MCC displays or through manually requested status lists.
- (c) Whenever error analysis indicates that an equipment unit or circuit is faulty, the faulty equipment is automatically removed from service except as follows. Removals result in output messages which may be alarmed depending on the circuit removed and the effect on service.
- (d) In forced equipment configurations, standard maintenance actions may be suspended to lessen the impact on the rest of the system. Critical indicator displays on each MCC page indicate when system inhibits are in effect, and the associated display page identifies all inhibits invoked.
- (e) Two types of error analysis are performed on trunks: quick check and peer-group analysis. Error analysis monitors trunk groups, group members, and service circuits by using machine-detected interoffice ineffective attempts. Quick check analyses measure repeat failures on each failing trunk against a trunk threshold and remove the failing circuit when the threshold is reached. Peer-group analysis measures failures on members within a group against a group threshold to determine whether maintenance action is required on the group or on specific members within the group. Thresholds for allowable OOS trunks or service circuits are functions of group sizes. When a threshold has been reached, the system will inhibit further removals and generate an alarm trouble message each time a faulty circuit is encountered.

6.4.11 RSM INITIALIZATION CAPABILITIES

To insure against some combination of failures that might prevent normal RSM initialization through the communication link to the host, the capability is provided to manually initialize the RSM from the remote

site. Two pushbuttons, protected against inadvertent operation, are mounted on the alarm and status panel. These allow the switch personnel to selectively force and initialize either module controller and time slot interchange unit (TSIU) to reestablish normal communication with the host. These controls also give the switch personnel the means for restoring local calling capability in the unlikely event that call processing is interrupted, and automatic recovery sequences fail while the module is in the stand-alone mode.

6.4.12 REMOTE I/O INTERFACE

Input and output message capability is provided at the remote site through a portable terminal connected to the host IOP on an extension of the host office belt line. Thus the RSM will appear and have the same feature support as a belt line terminal at the host office.

In those cases where the host office is maintained through an SCCS, the switch personnel can access the host through the SCCS using the SCCS secure dial-back feature. Operating in the remote work station mode, the switch personnel will have access to past output messages related to the RSM, as well as limited use of SCCS features, such as "filter" and "sort" for analyzing troubles.

Two voice circuits, provided by the OTC and independent of the RSM, will provide simultaneous capability for an I/O terminal connection with the SCCS and voice communication with the SCCS or host office. A third circuit terminating on the RSM will provide an alternate voice circuit, as well as the capability to quickly test for local call processing, should the RSM be in the stand-alone mode.

6.5 TERMINAL MAINTENANCE

6.5.1 OVERVIEW

The 5ESS[®] switch incorporates extensive software to provide sophisticated trouble isolation. This process automatically isolates troubles to a unit, allowing the system to take recovery action so as to protect stable calls and retain the highest level of call processing capability. The trouble isolation capability also minimizes the repair effort required with equipment failures.

6.5.2 CIRCUIT MAINTENANCE

6.5.2.1 Overview

The 5ESS[®] switch has an extensive set of capabilities for the testing and maintenance of the trunks, lines, and data links it serves. Per-usage testing detects errors and troubles as they occur. In addition, capabilities are provided for automatic and manual tests to effect early trouble detection and repair. These capabilities make extensive use of special hardware units within the switch including the transmission test function (TTF), the digital services unit 2 - integrated services test function (DSU2-ISTF), the Modular Metallic Service Unit (MMSU), the metallic service unit (MSU), and the directly connected test unit (DCTU). These units are accessed by built-in test features, and external operations systems to perform a wide range of trunk and loop tests within the 5ESS[®] switch.

6.5.2.2 Call Monitor Feature

The call monitor feature provides an early detection mechanism for loss of call processing functionality when all other system indicators appear normal. The call monitor feature reports to the OTC personnel (via a ROP report and a major alarm) when a failure in call completion analysis occurs. The analysis is based on passing 50 percent of test calls in a 5-minute interval and 90 percent over a 15-minute interval. This output is also directed to the day log file.

The call monitor feature will also perform separate analysis for Common Channel Signaling (CCS) test calls (if equipped) along with the non-CCS test calls. The call monitor utilizes the terminal maintenance automatic progression testing (APT) functionality to make these operational test calls. Non-CCS test calls are based on the default APT test for the trunk group in the AM ODD relations RT_TRKG and TM_ATTT.

All CCS test calls use the voice path assurance (VPA) continuity test.

The call monitor routinely cycles through the AMA ODD relation RT_TRKG and selects trunk groups to use for making the test calls. A test call is attempted every 30 seconds; two will be attempted (non-CCS and CCS) if CCS is equipped. It is recommended that the OTC set up the APT schedule to allow testing on at least one trunk group from each possible SM. This schedule will maximize the benefit from the call monitor. The call monitor keeps an ever-changing list of possible trunk groups to select from in case it does not find a testable trunk group at the 30-second entry as it continues to step through the ODD. This list guarantees that the call monitor feature will always have a trunk to test.

The call monitor can be inhibited or requested to print the past 15-minute history and print per-test call results (verbose mode).

Additional information on call monitor is provided in 235-105-110, *System Maintenance Requirements and Tools*, and 235-105-210, *Routine Operations and Maintenance Procedures*.

6.5.3 RSM CIRCUIT MAINTENANCE

6.5.3.1 Facility Maintenance

The T1 lines between the host SM and RSM are monitored for errors, slips, and misframes. Faulty lines will be removed from service, and output messages will identify the troubles. Redundant communication links are provided on separate T1 lines, and a communication-link line failure will result in the communication link being switched to an alternate line.

6.5.3.2 Loop Testing

The principal switch personnel interface for remote loop testing will be the TLWS and the associated displays. Most test features available on the displays for local loop testing will also be applicable to RSM loop tests. A remote line test capability using a DCTU (or MMSU through the SLIM2 circuit in 5E10 and later software releases) in the RSM will be used for testing loops on the RSM, because the T1 interface and distances to the remote sites make DC access from the TLWS jacks impractical. An MSU in the RSM will provide access from the remote test facility to the customer loops. Limited loop testing can also be performed from the remote site using the portable terminal.

6.5.4 TRANSMISSION TEST FUNCTION

The TTF is a group of circuit boards in the 5ESS[®] switch global digital service unit (GDSU) which provides those functions required for transmission measurements on trunks and lines served by the switch. It provides the equivalent of six independent tone sources, one to three tone detectors, as well as one to three touch-tone test lines, depending on the number of boards.

6.5.5 INTEGRATED SERVICES TEST FUNCTION

The digital service unit 2 - integrated services test function (DSU2-ISTF) is a peripheral unit for ISDN that supports transmission testing of interoffice digital trunks and basic rate interfaces (BRIs) through the use of a pseudo-random number (PRN) bit pattern. The ISTF is located on the DSU2 shelf and provides the following services:

- (1) Transmit pseudo random number bit pattern (XMIT of PRN)
- (2) Digital loopback of the bits received (includes the 108-type test line)

6.5.6 METALLIC SERVICE UNIT

The MSU provides metallic access to lines and trunks within the 5ESS[®] switch. This is done by arranging

connections between metallic access points throughout the switch and the metallic test buses (MTBs), which join in the MSU. By setting up a metallic path from a suitable test source [for example, DCTU, MMSU, mechanized loop test (MLT), system, automatic line insulation test (ALIT), or the local test desk (LTD)] through the MSU to a line or trunk, testing of that facility can be performed.

6.5.7 DIRECTLY CONNECTED TEST UNIT

The DCTU provides both DC and low frequency AC measurement capabilities for the integrated testing of loops, trunks, and special service facilities. Using the MSU, the DCTU can gain metallic access to ports in the switch. The DCTU can make measurements of AC and DC voltage, resistance, capacitance, distance to open, and ringer count, as well as run coin phone tests (home totalizer, detect coin, return coin, and collect coin).

NOTE: In the 5E10 software release, the Trunk and Line Work Station (TLWS) Metallic Test capacity is provided by the MMSU through the SLIM2 circuit.

6.5.8 TEST SYSTEMS

6.5.8.1 Overview

Circuit testing capabilities in the 5ESS[®] switch using the previous features include the TLWS, automatic progression test (APT), electronic loop segregation (ELS), and line insulation test (LIT). External operation systems supporting circuit maintenance that use these features include the Centralized Automatic Reporting on Trunks (CAROT) System, the centralized trunk test unit (CTTU), the SCCS, and the MLT System.

6.5.8.2 Trunk and Line Work Station

The TLWS is a 5ESS[®] switch feature that uses the MCC video terminal, and associated test jacks to perform transmission and operational tests of trunks as well as complete testing of subscriber lines. Using menu commands from the TLWS displays, the switch personnel can access ports; make metallic measurements of resistance, capacitance, and foreign potentials; make coin phone tests; and make operation and transmission measurements including tests of supervision, return loss, level, and noise. Test results are printed out at the TLWS.

In addition, the TLWS provides plug-in jacks in a test access unit. These jacks provide AC and DC access under system software control for testing with portable test equipment.

The TLWS provides the following additional capabilities:

- ☐ A summary page describing the test connections at all of the testing positions. (Prior to the 5E9(1) software release there were eight testing positions. In the 5E9(1) and later software releases, 32 testing positions are available.)
- ☐ Color test position pages.
- ☐ Command menus listing the valid testing commands.
- ☐ Fewer commands required for setting up a test.
- ☐ More detailed information on the line/trunk under test (for example, equipment number and port status information).
- ☐ Immediate removal of the line/trunk/data link from call processing when test data is entered.
- ☐ Camped-on access to the line/trunk/data link if it is busy.

- ☐ An improved transmission measure command that samples different frequencies and reports the correct measurement.
- ☐ Continuous voltage, resistance, and capacitance metallic measurements.
- ☐ Command for monitor for a short.
- ☐ Commands for wink test and quick wink test.
- ☐ Remove and restore commands.
- ☐ Automatic test commands for running line insulation test on lines and test calls on trunks.
- ☐ Diagnostic commands for the line unit channel for lines and the trunk equipment number for trunks.

6.5.8.3 Automatic Progression Test

The APT is a 5ESS[®] switch feature that provides routine testing of trunk supervision and signaling. Tone generation circuits are checked for the presence of tone. Supervision and signaling problems may indicate incorrect office-dependent data, wiring or cross-connect errors, or faulty trunk circuit hardware. Faulty circuits are removed from service and a trouble report is generated. Safeguards are in place to limit the number of circuits that can be automatically removed from service. The APT is run on a regular nightly schedule. It can also be manually scheduled to run at any time through a switch personnel input command. The individual tests it performs can also be requested for individual trunks or groups of trunks from the TLWS.

6.5.8.4 Electronic Loop Segregation Test

The ELS test is an automatic 5ESS[®] switch test that makes use of the TTF to periodically analyze customer loops in order to determine whether each line is loaded or nonloaded. This information is stored in the office data and used on each call to select the proper terminating impedance for the line. This matching of impedance ensures the proper loop operating characteristics by minimizing undesirable transmission disturbances such as echo.

6.5.8.5 Line Insulation Test

The LIT is a 5ESS[®] switch test feature used to determine the electrical condition of the customer loops. Using the ALIT circuit in the MSU, the switch checks for shorts and opens (or resistances out of acceptable range) as well as for the existence of foreign potential on the line. This test can be requested by a switch personnel from the MCC (demand LIT) for a single line or range of lines. This test is also performed automatically (ALIT) each night on all types of lines except 4-party fully selective or 8-party lines. While ALIT is run, test results are automatically generated showing test results for any lines which failed the test.

6.5.8.6 Centralized Automatic Reporting on Trunks System

The 5ESS[®] switch provides an interface to the CAROT system which is an external operations system for automatic testing of trunks. The current software releases of the CAROT system that are compatible with the 5ESS[®] switch are provided in 235-700-100, *Interface/Compatibility Guide*. The CAROT system tests the transmission characteristics of the trunks. The CAROT system and the 5ESS[®] switch communicate with each other using an equivalent ROTL. This is a dial-up link which utilizes a combination of multifrequency (MF) signals and frequency shift keying that is currently used by the CAROT system to communicate with a variety of ROTLs. The CAROT system is capable of testing both analog and digital 5ESS[®] switch trunks, once the trunk and equipment data is entered in the CAROT data base.

The TTF works with the 5ESS[®] switch software to provide an equivalent 105-type test line and responder

capability. This is used to act as the terminating end of a test initiated by a ROTL/responder in a distant office. The TTF consists of several circuit boards providing the functions of digital tone generation and measurement capabilities in the switch. The identity of the equivalent 105 test line should be entered in the CAROT data base for the far-end switch.

The CAROT tests can be run automatically on all or some portion of the trunks in the office each night, or the same test can be requested on individual trunks or trunk groups from the TLWS. The ROTL is capable of providing a wide variety of tests, including loss measurements, gain measurements, noise measurements, and return loss. These measurements can also be requested on trunks or trunk groups from the TLWS using manual transmission testing.

6.5.8.7 Foreign Exchange - Remote Office Test Line

The FX-ROTL (foreign exchange lines for the remote office test line) capability provides the CAROT system access to the ROTL in a toll or tandem 5ESS[®] switch which is not assigned an office code. The CAROT controller communicates with the ROTL in a toll or tandem switch in the same way that it communicates with the ROTL in a local switch.

A toll ROTL is assigned a directory number on a nearby central office and accessed through an FX line. The FX line is connected to a ROTL access trunk in the digital line and trunk unit (DLTU) through a D4 or D4-compatible (D1D, D2, and D3) channel bank which provides a plug-in FX channel unit. Since the local office does not outpulse digits on the FX line, an incoming CAROT call must be recognized as a ROTL access call via the initial on-hook on the dedicated ROTL access trunk.

6.5.8.8 No. 2 Switching Control Center System

The No. 2 SCCS provides facilities to control, administer, monitor, and maintain electronic switching systems from a remote, central location. Approximately 12 5ESS[®] switch offices, depending on their size, can be served by a No. 2 SCCS.

The No. 2 SCCS requires additional software and hardware for interfacing with the 5ESS[®] switch. The following additions are required at the No. 2 SCCS:

- (a) A J1C016T-1 cabinet for every nine entities, equipped with:
 - ☐ One protocol converter for every three entities plus one backup
 - ☐ One display driver for every 18 entities.
- (b) A minimum of two 2A control consoles per SCCS.
- (c) The 2ACC6 or 2ACC7 control console software release for use with the 2ASC8 or 2ASC9 SCCS software release.
- (d) The appropriate SCCS software release. (See 235-700-100, *Interface/Compatibility Guide*.)
- (e) The J1C016D-1 critical indicator insert for each entity.

The J1C016B-1 cabinet must also be modified for interconnection with the J1C016T-1 cabinet in accordance with J1C016T-1, List 4.

Each 5ESS[®] switch office requires two data links to the SCCS. The facilities between the 5ESS[®] switch and the No. 2 SCCS consist of one primary and one backup data link. They are equivalent modems. The switch from primary to backup link is automatic upon detection of link failure.

6.5.8.9 SCCS - Trunk Maintenance Package

The SCCS is an external operations system providing remote monitoring and maintenance capabilities for switching systems. The trunk maintenance package (TRUMP) is a feature of the SCCS designed to monitor trunk performance within the central office, initiate tests on failing or suspect trunks, request removals of faulty trunks, and automatically issue related trouble tickets. The TRUMP interfaces with switching systems through the remote maintenance channel using trunk-related input and output messages. By monitoring trunk state changes, the TRUMP maintains a data base of OOS trunks. This allows various types of analyses to be performed and makes possible the automatic identification of problem trunks. Trunks which have failed APT, for example, are automatically later retested by the TRUMP. If the trunk passes the second test, it is restored to service, thus helping to reduce the number of good trunks OOS due to transient failure. Likewise, trunks demonstrating an excessively high rate of machine-detected interoffice irregularities (MDIIs), are removed from service, thus limiting the number of bad trunks left in service. When a faulty trunk is detected, a trouble ticket describing the trunk and the failure is printed automatically. This substantially reduces the amount of manual effort required for trunk maintenance.

6.5.8.10 Mechanized Loop Testing

The MLT feature (MLT, MLT-1 and MLT-2), is an external operations system for testing of the customer lines (loops) [including digital subscriber lines (DSLs)] in the 5ESS[®] switch. By using metallic connections provided by the MSU together with the capabilities of the SN-107 test trunk and either an external loop testing frame (MLT-1) or a loop testing system (MLT-2), this feature provides standard metallic testing such as resistance, capacitance, and voltage. These tests can also be run on pair-gain systems such as a SLC[®] 96 carrier system.

In testing loops on the integrated SLC[®] 96 carrier system for the channel test, MLT also can use the TTF to perform a test of the operational characteristics of the channel unit serving a tested line. Channel unit tests include signal loss and noise level, and response to signaling. All the previous test sequences are requested by the switch personnel from a remote terminal and controlled by computer, which returns results back to the terminal.

The MLT system provides automated subscriber line testing. The current software releases of the MLT that are compatible with the 5ESS[®] switch are provided in 235-700-100, *Interface/Compatibility Guide*. The MLT-1 requires a loop test frame (LTF). The MLT-2 requires a loop testing system (LTS) frame. Both of these frames must be located within 1,500 ohms of the test trunk of the 5ESS[®] switch.

6.5.8.11 Integrated MLT-2

The IMLT-2 (integrated MLT-2) interface capability provides the functions necessary for the MLT-2 to remotely test lines connected to the 5ESS[®] switch, its main distributing frame, the RSMs, and the SLC[®] carrier systems. The communications between the MLT-2 and the 5ESS[®] switch I/O processor is over a dedicated BX.25 data link. The IMLT-2 replaces the external LTS which the MLT-2 uses to test and monitor the lines of the 5ESS[®] switch. With the IMLT-2, metallic access to the line under test is obtained through the metallic network of the 5ESS[®] switch and through talk/monitor access through the digital network.

Included with this feature is the ability to perform main distributing frame (MDF) testing from the switch. Testing is accomplished using test equipment integrated into the 5ESS[®] switch (that is, DCTU, TTF). The DCTU is used to perform all the DC and low frequency AC measurements, and the TTF is used to perform the touch-tone analysis tests requested by the MLT-2.

6.5.8.12 Centralized Trunk Testing Unit

The CTTU is planned for use as the common trunk work station for the SCCS. The CTTU software releases that are compatible with the 5ESS[®] switch are provided in 235-700-100, *Interface/Compatibility Guide*. The CTTU communicates with a 5ESS[®] switch using a BX.25 binary command language dial-up link to perform manually initiated (demand) trunk testing from the SCCS or other appropriate work center.

The 5ESS[®] switch uses the DCTU and TTF to perform most of the functions of a remote trunk testing unit (RTTU).

6.5.8.13 TM Automatic Task Administrator

The AM system process Automatic Task Administrator (ATA) receives TM messages that correspond to automatic tasks. The ATA system process checks the input message for correctness and creates a terminal process to process the request. The ATA must be modified to handle the I/O message changes being made for this capability.

6.5.8.14 Port Status Administration

The port status administration (PSA) handles automatic (for example, placing a line ``high and wet'') and demand (that is, through the PSA switch personnel interface) requests for port status changes to remove and restore ports to service.

6.5.8.15 PSA switch personnel Interface

The PSA software allows the switch personnel to remove/restore, query for status, and convert equipment identifications such as DN, LEN, SLEN, DEN, TEN, MLHG, TKGMN, and port.

6.5.8.16 Stuck Coin Test

The 5ESS[®] switch provides a list of coin lines that appear to have a stuck coin, and the number of attempts that have been made to dispose of the coin.

6.5.8.17 Call Failure Handling

Call failure handling includes the following:

- ☐ Per call test failures (for example, power cross, low line resistance, ringing continuity)
- ☐ MDII signaling failures over trunks
- ☐ TERA
- ☐ Showering lines (multiple on-hook off-hook transitions)
- ☐ Lines that are ``high and wet" due to ground faults.

6.5.8.18 Carrier Group Alarms

Carrier group alarms are mechanisms that remove T1 facilities and other ports from service in the event of carrier failures and restore them when service is restored. The CGAs also supply users with various performance levels of DS1s.

6.5.8.19 Operational Trunk Testing

Operational trunk testing enables testing of analog and digital trunks. Types of tests that can be run include synchronous, non-synchronous, permanent signal, 103-type tests, and 105-type tests.

6.5.8.20 Office-to-Office Testing

Office-to-office testing verifies that office wiring and the data base are correct for a given DN before cutting over to a new office. This capability does not apply for office-to-office testing on ISDN business and residence custom services (BRCS) basic rate interfaces (BRIs).

6.5.8.21 Test Lines

The set of test line terminations provided by the 5ESS[®] switch includes:

- (1) 100-type (balance)
- (2) 101-type (communications)
- (3) 102-type (1 mW)
- (4) 103-type (signal supervisory)
- (5) 104-type (transmission measuring and noise checking)
- (6) 105-type (automatic transmission measuring test line)
- (7) 108-type (digital loopback test line).

6.5.8.22 Routine Conditioning

Routine conditioning is the process by which the 5ESS[®] switch resynchronizes the hardware to the software port states.

6.6 SYSTEM INTEGRITY

6.6.1 OVERVIEW

The 5ESS[®] switch system integrity detects and responds to software faults in the AM, the SMs, and the communication module processor (CMP) (5E6 and subsequent software releases).

6.6.2 SERVICE RECOVERY

6.6.2.1 Overview

Service recovery capabilities are designed into the system to automatically recover the system from detected errors or troubles, both internal and external to the switching system, to protect service with minimal impact on customers.

The distributed architecture of the 5ESS[®] switch is such that the only components of the switch which can take down the entire office are the AM and the communication module (CM). The peripheral elements which could cause system failure in other systems, due to subsystem fault isolation failure, are connected to the SMs in the 5ESS[®] switch. These SMs are isolated from the CM by fiber optic network control and timing (NCT) links and do not share common buses with other system elements. Therefore, SM failures cannot escalate throughout the system and cause a total system outage. The SMs also have powerful dedicated processors.

The following provides an outline of the recovery actions taken at each of the initialization levels. It should be noted that, although slightly different specific actions may take place at each level in the AM, SMs, and CMP (5E6 and subsequent software releases), in general the philosophy and objectives of the initializations are the same.

6.6.2.2 Return to Point of Interrupt

This is the lowest level of software recovery. It is performed automatically in response to user program defensive check failures (asserts) and restarting from maintenance interrupts. Action associated with this level may be: (a) localized initialization of user-owned global data, (b) scheduling elevated audits, and (c)

logging failure information. Control flow is then returned to the previously interrupted point.

6.6.2.3 Single Process Purge

The single process purge level is used whenever an error is detected which is severe enough to make it unsafe to return to the point of interrupt. The initialization action varies somewhat with the processing environment, but the primary objective is to restore a software configuration that can support resumption of normal processing. In general, the recovery actions associated with a single process purge are: (a) the running process or task is purged and, if essential, reinitialized, (b) any global data being used by the process is restored, (c) any hardware or software resources are recovered, (d) any associated processes are informed, (e) control is reestablished at a "safe point", and (f) failure information is logged. Some recovery may be performed on a deferred basis by audits requested by the purge. In terms of call processing, if the current process is associated with a call, the call will be idled, and the subscriber given reorder or dial tone.

6.6.2.4 Directed Audits

Directed audits are used as an initialization action whenever inconsistencies are discovered in critical data structures such that continued operation is not possible. This level is generally invoked from either an integrity monitor or a user program defensive check failure (assert). The action taken is to audit, in an unsegmented mode, enough data to ensure that system operation can resume, and to schedule on a deferred basis any additionally required audit activity. Restart from a directed audit is generally through a single process purge of the current process. Again, failure information is logged. If the running process was associated with a call, the call will be idled, and the subscriber given reorder or dial tone.

6.6.2.5 Purging Initialization

This is an intermediate level of initialization for a CMP (5E6 and subsequent software releases). It is requested from the AM, from fault recovery and switch personnel, and consists of a full hardware initialization and the equivalent of a single process purge level of software recovery.

6.6.2.6 Full Process Initialization

This is a full initialization of a single AM kernel process. All dynamic nonshared data is initialized or audited. All data shared among known processes is audited. During this short initialization, AM route request processing is suspended.

6.6.2.7 Selective Initialization

6.6.2.7.1 Administrative Module

In the AM, this initialization includes an unconditional bootstrap of all software release dependent static text and data [that is, non-equipment configuration data/office dependent data (ECD/ODD)] for the *UNIX*[®] real-time reliable (RTR) operating system, the *5ESS*[®] switch application processes, and the common channel signaling (CCS) processes (if equipped). The ECD/ODD are booted in at *UNIX*[®] RTR operating system level four through recent change. Refer to "ADMINISTRATION", Section 5, for *5ESS*[®] switch recent change information.

6.6.2.7.2 Switching Module

The selective initialization in a switching module processor (SMP) is an attempt to clear up the problem while trying to preserve the nonproblem areas. This is accomplished by the following actions:

- (a) Save all consistent high-runner stable call types
- (b) Maintain all consistent IS (in-service)/OOS status

- (c) Save all consistent switch personnel control information (software inhibits, hardware inhibits, hardware forces)
- (d) Maintain all consistent hardware configurations.

Dynamic data is either audited or initialized during an SMP selective initialization. During the selective initialization, data not associated with preserved status is reinitialized as it is during a full initialization. Audits are then run in a fixed sequence to verify and recover the software resources associated with all transient/stable calls, IS/OOS status of ports and circuits, and all other preserved data structures.

Following the audits, selective peripheral initialization is performed using the validated data structures to determine which hardware to initialize and which to protect. The selective initialization is time-optimized recovery, and as such, there is a tradeoff between coverage and time. The selective initialization is designed to recover from all high-runner failures (that is, 95 percent of all failures). All traffic idle hardware, regardless of its maintenance state, is initialized or verified to ensure that the hardware and software states are consistent.

6.6.2.7.3 Communication Module Processor (5E6 and Subsequent Software Releases)

In the CMP, this initialization is an autonomous and switch personnel requestable high level of initialization. Most hardware and data structures are fully initialized, and audits are called to verify dynamic data that is preserved. No pumping or hash sum checking of the text and data is performed.

6.6.2.8 Full Initialization

6.6.2.8.1 Administrative Module

In the AM, this initialization includes an unconditional bootstrap of all software release dependent static text and data for the *UNIX*[®] RTR operating system, the *5ESS*[®] switch application processes, and the CCS processes (if equipped). An AM full initialization loses only office network and timing complex (ONTC) switched stable calls; intra-SM calls are saved. During the initialization of the AM, the SMs are supplying dial tone and giving reorder to the customers. The SMs with stand-alone capability (most RSMs and other optioned SMs) are performing intra-SM call processing.

6.6.2.8.2 Switching Module

With the SMP full initialization, the SMP initializes the software data structures to the idle state. The hardware is initialized to match its software status. All stable calls in the SM are torn down.

Options to back out temporary recent changes and program updates are available, as is a manual system [that is, AM, all CMPs (5E6 and subsequent software releases), and all SMs] full initialization to use during office bring-up and dead-start situations.

6.6.2.8.3 Communication Module Processor (5E6 and Subsequent Software Releases)

With a CMP full initialization, the CMP initializes all hardware and data structures. Options to back out temporary recent changes and program updates are available, as is a manual system (that is, AM, all CMPs, and all SMs) full initialization to use during office bring-up and dead start situations.

6.6.2.9 Recovery Strategies

Recovery strategies are designed such that stable calls are protected first, and then transient calls. Recovery is hierarchical in nature, beginning first with the smallest element that can be corrected without affecting other software or hardware, and escalating to a higher level only when a lower level recovery action is not successful in clearing the problem.

6.6.2.10 Automatic Service Recovery

Automatic recovery is supplemented by the capacity to reinitialize or reconfigure the system manually from either the local maintenance terminal or through the remote maintenance interface. A detailed description of the 5ESS[®] switch system recovery can be found in 235-105-250, *System Recovery Procedures*.

Initialization is the mechanism for recovering from errors, faults, or failures through a sequence of software and hardware actions that bring a processor to a known, sane state. Processors [AM, CMP (5E6 and subsequent software releases), and SM] are initialized independently of each other and, except for possible resynchronization of redundant data, initialization in one processor normally does not trigger recovery actions in others.

Automatic recovery is characterized by the following:

- (a) Each processor has several predefined levels of initialization in a hierarchical structure. Automatic recovery begins with the lowest level, which may only affect a single transient call or no calls at all, and escalates only when the first level is not successful in correcting the problem. This protects stable calls, affects the smallest number of transient calls, and retains the capability to respond to subsequent call attempts. At each level, the recovery process is designed to protect as many stable calls as possible and have minimum impact on transient calls. The highest initialization levels, which can affect all stable calls, can only be initiated manually.
- (b) During CMP initialization, transient calls that cannot complete during recovery are given dial tone to indicate retry.
- (c) Software errors are monitored by mechanisms such as hardware checks, defensive software checks, and audits and are corrected when detected to prevent propagation and more serious effects on call processing.
- (d) Major hardware units are duplicated, and service groups are engineered with sufficient redundancy to allow faulty units to be removed from service without affecting normal call processing.
- (e) Faulty hardware is removed from service as soon as a trouble is detected unless removal will cause system operation to be more severely degraded or the removal is inhibited by previous manual action. Transient hardware errors are monitored, and when the number of detected errors for a unit exceeds an established threshold, the unit is removed from service.
- (f) The number of server group units or circuits that can be taken out of service is limited to prevent an entire group from being removed and to ensure at least a level of degraded service in lieu of no service at all. When such a removal would exceed an established threshold, the unit is kept in service, and an alarmed message is generated.
- (g) For incompleting calls requiring special treatment such as reorder or recorded announcement, special treatment is not applied when the system detects a hazardous condition (for example, power cross on the line) in order to protect the system from potential damage.

6.6.2.11 Manual Service Recovery

Manual service recovery is provided to initiate any initialization level manually using the emergency action page on the MCC terminal or the remote maintenance terminal, or by means of text input messages. Manual recovery actions can be directed toward any single SM, CMP (5E6 and subsequent software releases), or AM, or to various combinations of modules.

6.6.3 REPAIR

6.6.3.1 Overview

As previously described, the 5ESS[®] switch provides a highly automated trouble-location capability to identify faulty circuit boards. In addition, detailed raw diagnostics are available for cases where normal trouble-locating procedures fail.

Once the trouble is isolated and a trouble notification is given, the manual repair procedure should begin.

6.6.3.2 One-switch Personnel Repairs

The 5ESS[®] switch is designed with the objective of greater than 90 percent of all repair activity requiring no more than one switch personnel.

6.6.3.3 Identification of Equipment Frame Locations

The 5ESS[®] switch identifies the equipment frame locations of suspected faulty circuit packs as part of the TLP option on diagnostic outputs.

6.6.3.4 Ensuring of Out of Service State Prior to Repairs

The 5ESS[®] switch is designed to automatically place faulty equipment in an OOS state. The system also provides the ability for the switch personnel to ensure equipment is out of service prior to repair activity by using a manual request.

Manual requests to remove equipment from service may be made from the MCC and the remote maintenance center as well as from the equipment frame locations.

In response to a manual OOS request for duplex equipment, the system will automatically check to ensure the indicated equipment unit is not in an active state. The switch personnel will be notified if the mate unit is not in an active or standby state (not available for service). The switch personnel has the ability to force the mate unit to the active state.

Simplex equipment is monitored by the system, and OOS requests are normally honored only after the indicated equipment becomes idle. Circuits may also be removed unconditionally in cases where failure to do so might jeopardize service.

The 5ESS[®] switch notifies the switch personnel when the transition of equipment state is completed.

For replaceable elements with multiple circuits, the system provides the capability to manually request all circuits to be placed in an OOS condition. Notification is provided when this action is completed.

6.6.3.5 Power Removal Prior to Repairs

Power may be manually removed from equipment repair groups prior to repair without affecting any other equipment repair groups on the frame. This permits a safer repair procedure and eliminates potential hazards to both the switch personnel and the switching system.

6.6.3.6 Physical Repairs

The physical design of the 5ESS[®] switch allows repairs to be made to maintain as high a performance level as possible with a minimum of switch personnel effort during the repair procedure.

Normal repair activity is accomplished without additional test equipment and requires activity only at the front of the equipment frame.

6.6.3.7 Restoration of Equipment to Active or Standby States

The system will automatically restore a repaired equipment unit to the active or standby state if all verification tests pass. If any verification tests fail, the repaired equipment unit is left out of service, and

notification is provided. The system provides a manual override to force the repaired equipment into the active state.

6.6.4 PRECUTOVER TESTING

When an old telephone office is completely or partially replaced by a 5ESS[®] switch, the customer lines to be transferred are bridged from the old office to the new switch (for example, SM or RSM). The office-to-office testing program is designed to verify the correctness of this wiring to the new office before cutover.

Office-to-office (formerly called "board-to-board") testing is accomplished by the use of a standard 5ESS[®] switch SN-102 outgoing trunk, which is used to interface with an incoming test trunk from the old office. In the 5ESS[®] switch, a circuit called the HLSC (high-level service circuit) is used to access each customer line through the new office wiring. The correctness of the new wiring path is verified by detecting a closure across the tip and ring conductors of the SN-102 trunk at the HLSC in the new switch. Therefore, incorrectly wired connections are spotted by the absence of this closure and signaled to installation switch personnel. Shorts and polarity errors (tip and ring reversals) are also reported to the switch personnel.

6.6.5 CUTOVER PROGRAM

The cutover program for the 5ESS[®] switch provides an automatic method of transferring service responsibility for a set of customer lines between offices. Cutover can be performed via flash or gradual cut methods. Flash cutover converts all subscriber lines at once to the new office, while gradual cutover allows groups of lines to be transferred at one time, thereby phasing the office into full operation. The gradual cutover method allows lines to be grouped by SM or thousands groups. When this is used, only partitions of the data base and hardware may need to be installed, tested, and placed into service.

Also, when an outside call attempts to terminate to an inactive line in the 5ESS[®] switch, the cutover program interacts with software in the switch to provide an alternate route for the call. This alternate routing treatment can route the call either to an outgoing trunk group to the old office, to a recorded announcement, or to reorder tone. The treatment applied is determined by the OTC and is reflected in the 5ESS[®] switch ODD.

The MCC provides the interface between the OTC personnel and the cutover program. Through the MCC, OTC personnel can both control and monitor the cutover process status.

6.7 PROGRAM UPDATES

6.7.1 OVERVIEW

The PSU2 software update feature allows updates to the Packet Handler (PH) by installing these updates in PH memory during the APPLY stage. The PH unit will no longer require a conditional remove and restore (PMPPERF) during the SOAK stage.

Program updates are in the form of software updates. The software update originates program enhancement or system problem. A modification request (MR) number is assigned and a fix is made, tested, and formatted in standard software update form in the Programmer Support System by Lucent Technologies. Usually, each program change will completely replace sections of the program. The software updates are assigned a 6-digit number of the form YY-NNNN, where YY represents year and NNNN represents a sequential software update number (for example, 83-0016). The software update consists of six types of files:

- (a) Header □ The software update number, software release(s) affected, sequence number and, if applicable, the total number of files along with the name and size of each file to be updated.
- (b) Package information □ This file describes which loadable package the update affects; and provides

a cross-reference between loadable packages, their file or configuration name, and their associated update files.

- (c) Sequence □ This file contains a list of all the loadable packages with their associated sequence numbers. This is used as an audit for the sequence numbers.
- (d) Message □ Switch personnel commands necessary to install the software update, plus any special instructions required.
- (e) Update □ Actual binary data for each of the 0 to n files to be updated.
- (f) Software Change Administration and Notification System (SCANS) □ The software update number, software update type (software release or informational), associated software update(s), software release(s) affected, general descriptive information, person to contact in case of trouble and, if applicable, total number of files with the name and size of each file.

These files are sent from the Programmer Support System to SCANS where the Operating Telephone Company (OTC) may obtain access to information in the SCANS file and also request that these files be sent to a target 5ESS[®] switch. The 5ESS[®] switch will store the information received from SCANS on the disk in directory ``etc/bwm." The switch personnel can then request the 5ESS[®] switch to print the message file to obtain instructions for inserting the software update, either by manual input command or by menu display pages.

In case of an emergency, and if SCANS is not available, the software update information may be sent directly from the Programmer Support System to a 5ESS[®] switch target office. Requests for emergency software update transmission from Programmer Support System are handled through Lucent Technologies Customer Technical Support.

6.7.2 SCANS

The SCANS is a centralized computer facility used for the administration and distribution of software updates. This facility is used by stored program control (SPC) switching systems to access software release overwrites.

The SCANS access to the 5ESS[®] switch is through a 4-wire, 4800-baud, dial-up data link. This BX.25 protocol link requires a 48FR1 automatic answer data set, and a 2048 DATAPHONE[®] II data set or equivalent (for example, 2048A).

The SCANS originates two calls to the 5ESS[®] switch. The telephone numbers may be local or FX numbers. One line is used for transmit and the other for receive. The 48FR1 provides answer origination for SCANS-originated calls. The 48FR1 will only provide answer after the 5ESS[®] switch input message for SCANS has been entered.

The 5ESS[®] switch, along with other 3B computer-based systems, requires a different operational sequence when using SCANS for software update administration. Unlike other SPC systems, which have their software updates sent to the No. 2 Switching Control Center System (SCCS) for administration, the 5ESS[®] switch has the overwrites dumped directly onto the on-line disk in the 5ESS[®] switch office. Therefore, the only task the No. 2 SCCS has to perform is to request a security password from the 5ESS[®] switch and request the software updates from SCANS. The software updates can then be installed by the SCCS or the local switch personnel. Refer to the SCANS User's Manual, PA-591152, for further details

6.7.3 CSCANS INTERFACE

The Customer Service Computer Access Network System (CSCANS) interface is available with the 5E7 software release and provides an additional external interface that is employed to provide for the

distribution of software updates in offices equipped with CSCANS. The CSCANS is a Regional Bell Operating Company (RBOC) owned and operated computer system for automated software updates distribution. Offices that subscribe to CSCANS can access CSCANS to retrieve software updates.

6.7.4 UPDATES

Updates are normally controlled from an SCCS; therefore, no on-site personnel are required. However, if an SCCS is not available or if the central office (CO) controls the software update, program updates can still be performed using a different procedure as follows:

- ☐ Dial SCANS from a 1200-baud terminal or SCCS work station and receive SCANS or intracompany bulletins. Request a status report for the target 5ESS[®] switch. The status report should provide a list of software updates to be applied, plus the size of each listed software update.
- ☐ From the SCCS work station or the 5ESS[®] switch MCC,
 - ☐ Copy the current ROOT (in the UNIX[®] operating system, ROOT is the file system) partition into the backup ROOT (BROOT) partition. Request the available space in the software update directory. If required, clear space in the software update directory to receive applicable software updates.
 - ☐ Prime the 5ESS[®] switch to receive software updates from SCANS.
- ☐ Request SCANS to transmit the selected software updates to the target office. The SCANS will dial up two simultaneous network connections for 4800-baud transmission of the software update. A message will be printed at the 5ESS[®] switch to indicate start and completion of the actual software update transmission from SCANS.
- ☐ Request the 5ESS[®] switch to verify the existence and integrity of all files required for the selected software update.
- ☐ Follow the instructions in the software update message file to install the software update in a temporary mode.
- ☐ For pumpable processors, the switch personnel must pump new image by remove from service/restore to service (RMV/RST) commands.
- ☐ Soak the software update for the recommended period. The recommended soak period is specified in the software update instructions. The typical soak period is 24 hours.
- ☐ Follow the instructions given to make the software update permanent.
- ☐ Update office status and profile data in SCANS.

6.8 SOFTWARE RELEASE RETROFIT

6.8.1 OVERVIEW

A software release is the set of instructions that controls call processing, maintenance, and administrative functions. The software release is usually supplied by the switching system manufacturer and is generally applicable to offices of the same system type.

The switching system design provides a means to install/update to a new software release in a working office while limiting any adverse impact on service and reliability.

An office must sequentially transition through each software release as the office evolves. With the 5E11

software release, the 5E9(2) to 5E11 software release skip feature provides the ability to directly retrofit from the 5E9(2) to 5E11 software release without going through the intermediate 5E10 software release. This includes the ODD and ECD off-site evolution, RC and CORC on-site evolution, retrofit procedures, tools and other related services such as changing the SM images from their 5E9(2) configuration to the corresponding 5E11 images.

A software release retrofit is defined as any program alteration for the purpose of:

- ☐ Providing new features or enhancements to existing features, or
- ☐ Enhancing the overall system performance or consolidating accumulated program corrections.

The 5ESS[®] switch meets the general requirements for software release retrofit. These requirements include:

- ☐ System evaluation tests
- ☐ Program loading and verification
- ☐ Cutover verification
- ☐ Retrofit consolidation.

The 5ESS[®] switch will preserve all 2-port calls (for example, line-to-line, trunk-to-trunk), including SLC[®] 96 carrier calls, for retrofits to the 5E2(1) and subsequent software releases. Feature calls involving more than two ports (for example, 3-way calls) will not be preserved. The ISDN 2-port calls are saved with the 5E5 and later software releases.

6.8.2 GENERAL

The major sections of the retrofit interval are as follows:

- ☐ Planning
- ☐ Advance Preparation
- ☐ System Evaluation
- ☐ Retrofit Implementation.

Refer to 235-106-102, *Software Release Retrofit Procedures*, for a more detailed description of the 5ESS[®] switch retrofit procedures.

6.8.3 PLANNING

Prior to Advance Preparation of site activities, Planning for the Retrofit Process includes:

- ☐ Utilize Memory Forecasting Tool to forecast, plan, and order the associated memory and installation services.
- ☐ Execute On-Switch ECD Verification Tool.
- ☐ Execute On-Switch Hardware Audit Tool which verifies the release specific hardware needed for retrofit.
- ☐ Execute ODD Retrochk tool to audit ODD critical checks needed for Retrofit.

More detailed information on these scheduled maintenance activities will be referenced throughout the document in preparation for a successful 5E12 Retrofit.

6.8.4 ADVANCE PREPARATION

Advance Preparation starts at a maximum of 9 weeks before the Retrofit. It runs for 6 weeks and is completed 17 days before the Retrofit. In addition to ensuring certain supplies are on hand, you will have to:

- (a) At a maximum of 9 weeks before the Retrofit:
 - ☐ Prepare acceptance test plan to verify lines/trunks for use after the Retrofit to the 5E12 software release.
 - ☐ Review critical item list (Table 6-1) and verify materials.
 - ☐ Ensure that office has sufficient number of disk pairs to support the office after the Retrofit.
 - ☐ Verify SM configuration parameter. Complete any processor conversion changes [Switching Module Processor Unit (SMPU) to Module Controller and Time Slot Interchanger Unit (MCTU), etc.].
 - ☐ Execute ODD Retrochk tool to audit ODD critical checks needed for Retrofit.
 - ☐ Run AM off-line boot to verify the ability to boot the switch.
 - ☐ Re-run memory forecasting tool and ensure that office has sufficient Administration Module (AM) and Switching Module (SM) memory.
 - ☐ Run Equipment Configuration Data (ECD) Audit and Hardware Check Audit.
 - ☐ Verify CNI routing data and destination point codes.
 - ☐ Ensure that all growth activity must be complete before the data base dump.
 - ☐ Diagnose, exercise, and ensure that tape unit is functional.
 - ☐ Ensure that all Operator Services Position System (OSPS) growth/upgrading is complete.
 - ☐ Make provisions for Foreign Exchange (FX) lines at central office and remote sites.
- (b) At up to 4 weeks before the Retrofit:
 - ☐ Ensure that the office is up to date on Software Updates (SUs).
 - ☐ Perform full office backups.
 - ☐ Check for utility breakpoints.
 - ☐ Ensure that OOS trunks are in correct state.
 - ☐ Diagnose, exercise, and ensure that tape unit is functional.
 - ☐ Re-run memory forecasting tool and ensure that office has sufficient Administration Module (AM) and Switching Module (SM) memory.
 - ☐ Re-run ECD audit and hardware check audit.

- ☐ Re-run ODD Retrochk tool to audit ODD critical checks.
- ☐ Start double-logging of Recent Changes (RCs) and Customer Originated Recent Changes (CORCs).
- ☐ Perform the data base dump (at -17 days, Wednesday).
- ☐ Ship the data base tapes to the Lucent Technologies tape processing department in Lisle, IL.
- ☐ Verify a list of lines/trunks to be tested after the Retrofit.
- ☐ Review the procedures to perform the Retrofit.

Table 6-1 Retrofit Critical Item List

ITEM	SUPPORT INFORMATION
Ensure required Hardware on switch	Execute On-Switch Hardware Audit. Refer to 235-105-210, <i>Routine Operations and Maintenance Manual</i> .
Ensure all disk configurations are SCSIs	Refer to 235-106-102, <i>Software Release Retrofit Procedures</i> .
Ensure error-free ECD database	Execute On-Switch ECD Audit
Ensure office has sufficient AM/SM Memory	Refer to the output from the memory forecasting tool as detailed in 235-106-102, <i>Software Release Retrofit Procedures</i> and also 235-070-100, <i>Administration and Engineering Guidelines</i>
Tape Unit	3B20 Computer Peripheral KS-22762,L1 (or equivalent) The 3B21 Requires KS-23909, L10 or L21. Also for DAT, Model 35470A, NCR Specification NCR006-3503341/60, Rev. A.
Blank Tapes	Refer to J5D008R-1 (latest issue)
Software Update Level	From Retrofit Notes ^a
5E12 Documents	235-001-001, <i>Documentation Description and Ordering Guide</i>
Software Release Text Tapes (two full sets)	TP-5D00x-yy (latest issue)
Data Base Tapes (two full sets)	From Network Software Center in Lisle, Illinois
Retrofit Notes	Latest Issue from Network Software Center (CTS Retrofit Support Group) in Lisle, Illinois ^a
Foreign Exchange Lines	There should be at least two FX lines in the central office. There should also be one at each remote site and at least one FX for each NXX in the office. These FX lines are for use on the day of the retrofit.
Notes:	
a. The latest issue of the Retrofit Notes can be obtained via PIMS/SCANS.	

6.8.5 SYSTEM EVALUATION

Pre-Retrofit system evaluation consists of a set of tests and exercises designed to demonstrate that the switch is in an operating condition suitable for Retrofit. The tests will normally take about 2 days to run and must be performed within the period 10 days before the Retrofit. The following must be done:

- ☐ Verify that all major units successfully pass diagnostics and can run duplex with either unit active.
- ☐ Perform AM off-line boot check.
- ☐ Perform SM off-line pump check.
- ☐ Perform optional Off-Site Recent Change Reapplication (OFFRCR) Reverse Software Change Administration and Notification System (RSCANS) transmission (at -4 days, Monday).

6.8.6 RETROFIT IMPLEMENTATION

6.8.6.1 General

Retrofit implementation begins the morning of the planned transition to the new software release and consists of eight separate and distinct stages followed by duplex regression tests.

CAUTION: All input messages must be entered at the Master Control Center (MCC). Failure to do so could result in missing the output responses to messages and jeopardize the transition because of differences in the MCC and other terminals in the office.

6.8.6.2 System Setup Stage

The System Setup stage should begin the morning of the Retrofit. The system setup consists of the following:

- ☐ Prepare environment.
- ☐ Check office records queue.
- ☐ Check/remove utility breakpoints.
- ☐ Perform final Software Update (SU) check.
- ☐ Make office backups.
- ☐ Run Module Controller/Time Slot Interchanger (MCTSI) diagnostics.
- ☐ Run Communications Module Processor (CMP) diagnostics.
- ☐ Clean and test the tape drive.
- ☐ Install Retrofit software tools.
- ☐ Select the proper tapes to be used in the Enter stage.
- ☐ Run a tape header check.
- ☐ Perform final Out-Of-Service (OOS) dumps.
- ☐ Check the Automatic Customer Station Rearrangement (ACSR) queue.
- ☐ Start a Backup ODD.
- ☐ Verify a quiet duplex system.

6.8.6.3 Begin Stage

The Begin stage is the starting point for the Retrofit to the new software release and should last approximately 1 to 12 hours. In the Begin stage, the technician should do the following:

- ☐ Check the automatic Office Dependent Data (ODD) backup schedule.
- ☐ Run an AMA session.
- ☐ Start up the Retrofit process.
- ☐ Stop any active or scheduled Routine Exerciser (REX) diagnostics.
- ☐ Execute APPLLOG

- ☐ Execute APPLHOOK.
- ☐ Execute BEGINHOOK.
- ☐ Perform a backup ODD.

6.8.6.4 Enter Stage

In the Enter stage, new software release text and the ODD and ECD data bases are loaded from tape to the off-line disks. A full tape should take about 30 minutes to read. The odd-numbered disks are marked off-line. At the end of this stage, the off-line disks will contain the new software release and the ODD and ECD databases.

In the Enter stage, each SM will be forced simplex (MCTSI side 0 ACTF/MCTSI side 1 UNV). All MCTSI side 1 will be off-line pumped with the new software release data.

The procedure will take from 2 to 4 hours (or more) depending on office size. Other activities in this stage are:

- ☐ Execute Enter Preparation.
- ☐ Execute SUPR.
- ☐ Disk Preparation X
- ☐ Wait Backup ODD.
- ☐ Execute APPLHOOK.
- ☐ Execute LOOKODD.
- ☐ Execute ENTERHOOK.
- ☐ Mount Off-Line Partitions.
- ☐ Execute POST ENTER.
- ☐ Execute CNI_UPDATE.
- ☐ Execute Pump Pause.

6.8.6.5 Proceed Stage

The Proceed Stage is expected to last from approximately 1 to 2 hours. Activities in this stage include:

- ☐ Prepare the Environment.
- ☐ Perform EAI Setup.
- ☐ Prepare ECD.
- ☐ Execute SUPR.
- ☐ Start WRTAMA.
- ☐ Execute AMA session.
- ☐ Execute TSM OLD.

- ☐ Execute APPLHOOK.

The software release transition downtime reduction via OFLBOOT feature makes use of the OFLBOOT feature to reduce downtime incurred in Retrofits. Previously, the AM was initialized by doing a "54" boot on the EAI page. With this feature, OFLBOOT replaces the "54" boot during the Software Release Retrofit.

6.8.6.6 Switchforward Stage

In the Switchforward Stage, the Administrative Module (AM), Communication Module Processor (CMP) and MCTSI of each SM are switched to the new software release. During the switch forward, 2-port stable calls with a talking path are maintained and all transient calls are routed to reorder. New originations are also routed to reorder. Because stable calls are maintained, the switch forward may be scheduled earlier in the evening at a time acceptable to the operating company. Recent change is allowed and the AM and CMP are duplexed on the new software release.

The switch (with the exception of the SMs and disk drives) is duplexed after the transition on the new software release.

Activities included in this stage are:

- ☐ Confirm Switchforward.
- ☐ Execute APPLHOOK.

6.8.6.7 Recovery Preparation Stage

Activities included in this stage are:

- ☐ Prepare environment.
- ☐ Execute APPLHOOK.

6.8.6.8 Post-boot Stage

Activities included in this stage are:

- ☐ Execute TSM NEW.
- ☐ Stop Off-Line Boot.

6.8.6.9 Soak Stage

The Soak stage consists of acceptance testing, reconfiguring AMA disk partitions (if necessary), and the starting of the reapplication of RCs and CORCs.

Acceptance testing is expected to last up to 1 hour. During this interval, the operating company performs a series of locally-developed tests to assess the reliability of the new software release before committing the switch to full-duplex operation. Other activities in this stage include executing manual actions.

6.8.6.10 Commit Stage

During the Commit stage, the remaining units will be duplexed.

In the Commit stage, the disks containing the old software release are off-line until all SMs are duplex on

the new software release. (This ensures a clean backout possibility until the even-numbered disks are committed to the new software release.)

Duplexing the disks is the last major task. This stage is expected to last from 1½ to 6 hours depending on the number of disks in the office. Other activities in this stage are:

- ☐ Duplex the SMS.
- ☐ Execute reapplication check.
- ☐ Execute SUPR.
- ☐ Execute APPLHOOK.
- ☐ Execute CMTHOOK.

6.8.6.11 End Stage

The End stage completes the Retrofit interval. During this stage, the Retrofit cycle is completed, and RC and REX are allowed. This is followed by a series of general cleanup steps to reset Automatic Line Insulation Testing (ALIT) parameters, AMA passwords, automatic ODD backup schedule, and call trace lines.

The final task is to make full office backups. As the backups are essential for system recovery, they should be made at this time.

Discounting full office backups, the End stage is expected to last approximately 30 minutes to 1 hour. Additional time for full office backups is dependent on office size/equipage and should be calculated into the overall Retrofit planning schedule. Other activities in this stage are:

- ☐ Execute APPLHOOK.
- ☐ Execute ENTHOOK.
- ☐ Execute RMVTOOLS.

6.8.6.12 Cleanup Stage

Activities in this stage include:

- ☐ Pauses and prompts the technician not to resume until all RC and CORC REAP activity is complete.
- ☐ Remove ECD modifications that made it possible to restart the Retrofit if interrupted by an unexpected AM INIT.

6.8.6.13 Duplex Regression Tests

The operating company should monitor office performance for several days following the Retrofit. This should include 1 full, normal business day. Any abnormal conditions that arise should be promptly reported per local procedures.

6.8.7 EQUIPMENT REQUIREMENTS

The magnetic tape containing the new software release load is provided by Lucent Technologies. A UN32 circuit pack is required in the IOP frame to interface with the tape drive. This pack is a needed IOP equipage option.

6.8.8 BACKOUT PROCEDURES

A switch back to the original side of the SMs can be made and, in addition, the backup disk copy of the current software release and data base can be used as a system backup contingency. Specific backout procedures are provided as part of the instruction package provided by Lucent Technologies.

6.9 FIRMWARE UPDATES

6.9.1 OVERVIEW

Firmware is defined as computer programs or tabular data stored in read-only memories (ROMs), programmable read-only memories (PROMs), or erasable programmable read-only memories (EPROMs). It also includes information stored in electrically erasable programmable read-only memory (EEPROM) or on-board battery backed-up random access memory (RAM) that is not pumped-up in its service position by means of a data line or local bulk store. In short, any software stored in a memory that can only be updated by means of manual intervention with external equipment is called "firmware." Firmware changes originate in much the same way as other program changes but are implemented similarly to new issues for nonfirmware circuit packs. An informational software update is issued to advise the OTC that a change has been issued. If coordination of a program update, ODD, or wiring change is required, it will be explained in the software update.

6.9.2 FIRMWARE ADMINISTRATION

Firmware circuit packs appear in one or more subsystems of several 5ESS[®] switch units. Each pack is assigned an apparatus code, a series, a CLEI code, a circuit pack microcode (CPMC) number, and an issue number. A typical labeling example is as follows:

Latch Tab	-	Apparatus Code	=	TN-130
	-	CP Series	=	P5
	-	CLEI Code	=	E5MQ0001A
Push Tab	-	CMPC number	=	MC5D0001A1
	-	Issue number	=	2

The characteristic apparatus code identifies the microcode carrier only. The CLEI code number is on the bar code label. The basic microcode followed by the characters "A1" is used to identify the circuit pack with its assigned microcode for ordering purposes and for specification in J drawings. The "A1" following the basic microcode number indicates that the microcode is contained in one circuit pack. In cases where circuit packs are equipped in sets with microcode common to more than one pack, a suffix other than A1 is used. Issue numbers are assigned to the microcode to identify the vintage or level of change within the version.

6.9.3 IMPLEMENTATION PROCEDURES

Actual circuit pack replacement is accomplished with documentation, circuit packs, related software or hardware change information, and a procedure provided by Lucent Technologies.

6.9.4 BACKOUT PROCEDURES

Procedures include the recommended simplex system soak time and any testing required before proceeding with duplex operation. During the simplex period, a simple uncoordinated change can be backed out by switching controllers. Coordinated changes require more complex backout procedures. Changes are accomplished during periods of low usage, so some special cases may require retention of old issue circuit packs during a normal load period to assure minimal service impact if unacceptable operation is experienced. Spare circuit packs should be updated in a manner that will provide backup for modified and unmodified frames in cases of multiple frame modifications.

6.10 ISDN MAINTENANCE

6.10.1 OVERVIEW

The ISDN is a single integrated digital network providing end-to-end digital connectivity supporting a wide range of services. These services include voice and non-voice (data), accessed by users through a set of standard multipurpose user-network interfaces.

The two interfaces that provide the ISDN services with the 5ESS[®] switch are as follows:

- ☐ Basic rate interface
- ☐ Primary rate interface.

Both interfaces can provide voice or data services simultaneously, and circuit-switched or packet-switched connections on the same transmission channel. The following paragraphs provide the maintenance capabilities provided by the 5ESS[®] switch to maintain these facilities.

6.10.2 HUMAN-MACHINE INTERFACE

6.10.2.1 General

The same human-machine interfaces described in "HUMAN-MACHINE INTERFACE", Section 6.3 , (output messages, master control center, and alarms) also apply to ISDN maintenance. Additional alarming capabilities, described in the following text, are present when ISDN service is provided through the universal RISLU.

6.10.2.2 Universal RISLU Alarms

With the universal remote integrated services line unit (RISLU), the LAU RAS is not supported. An ASU may be equipped to provide visual alarm and status information to the OTC personnel at the remote site. Critical, major, and minor alarms for the RISLU are reported by the DFI. In addition to the normal ISLU conditions, the following alarms are provided:

- ☐ Critical alarms for CC and CD duplex failures caused by DFI outages.
- ☐ Major alarms for camp-on time-out on a DFI removal.
- ☐ Major alarm for the failure of a peripheral fault and recovery initiated restore of a DFI.

The universal RISLU does not support an integrated environmental alarm capability (that is, the RAS). The RISLU sites requiring environmental alarms will need to provide this capability.

6.10.3 SWITCH MAINTENANCE

6.10.3.1 RISLU/ISLU Maintenance

A RISLU is an integrated services line unit (ISLU) remoted from a central office over primary rate carrier facilities. The universal RISLU is used in ISDN applications and uses host and remote digital facility interface (DFIs) to extend the peripheral interface data buses (PIDBs) and peripheral interface control buses (PICBs) that normally connect an ISLU within an SM.

The host DFIs reside in a DLTU for RISLU - host end (DLTU-RH) and serve as the interface between the line facilities and the SM in the central office. At the remote end, the remote DFIs terminate the line facilities, and the remote clock circuit packs provide the timing for the remote unit. The remote DFIs reside in a DLTU for RISLU - Remote End (DLTU-RR).

Two types of host DFIs are available. The DFI-H1 terminates the PICB for the ISLU common control in addition to terminating the DFI PICB used for controlling and maintaining the facility and a PIDB for data. The DFI-H1 uses a dedicated time slot for communicating with the ISLU common control and the remote DFI. This control channel uses X.25 level 2 protocol to insure message integrity. The DFI-H2 terminates only one PICB for controlling and maintaining the facility and a PIDB for data. A four kb/s derived data link is used to transfer information to the remote DFI. The X.25 protocol is also used to ensure message integrity.

Two types of remote DFIs also exist. The DFI-R1 provides the interface between the facility and the CD and CC functions of the ISLU over the PIDBs and PICBs. The DFI-R2 provides an interface between the facility and the CD over a PIDB. The RCLK packs provide clock and synchronization timing signals for both the ISLU and the DFI-R1s and the DFI-R2s by deriving their timing from the incoming DFI-R1 facilities. Control of the RCLK is supplied by the DFI-R1s.

There are a minimum of two carrier facilities required for a RISLU. These facilities are connected to the DFI-H1 and the DFI-R1 circuit packs. This is the minimum required since there are two CCs in a RISLU. They also provide the first two PIDB connections to the CDs. The CDs in a RISLU are configured as active/standby. Data received on the remote DFIs is sent to both CDs over the remote PIDBs. A maximum of ten additional facilities may be connected to the RISLU through DFI-H2 and DFI R2 circuit packs. These facilities connect to the CDs through the remote PIDBs.

There are two RCLK circuit packs in the RISLU. They are configured in an active/standby mode where the standby is locked to the active side by means of a cross-couple signal. One of the DFI-H1/R1 pairs is in control of the RCLKs. It is the master and is designated by an asterisk "*" on the MCC display page for the RISLU DFI circuits. It is also the facility that is providing the timing reference for the RCLKs. Since control of the RISLU circuits is done at the SM, the DFI-H1/R1 pair and the DFI-H2/R2 pair are treated as single circuits, with the host DFI being used as the reference circuit.

Traffic is load shared over all the facilities. The time slot paths for D-channels, B-channel packets, and circuit-switched calls between the RISLU and the TSIU are hunted from a pool of time slots that have been engineered for the RISLU in the SM. The channels for RISLU lines can be assigned on any facility, as long as time slot matches can be found on the DFI PIDB and CD LIDB for the LGC.

Facility faults are reported as carrier group alarms by the host DFIs. Any traffic on the facility is moved to another facility, as long as the same time slot position is idle on another facility. If the same time slot is not available, the path is torn down. If there are other vacant time slots available, a path can be reestablished. When the facility fault is cleared, the time slots are automatically made available for traffic.

Hardware faults on the DFI pair result in the same scenario as far as moving traffic is concerned. Once the fault is cleared and the DFI pair is restored, the facility is available to handle traffic.

When a DFI-H1/R1 pair experiences a problem (pack or facility), the associated ISLU CC is removed. The CC is automatically restored when the DFI problem is cleared. If the faulty DFI-H1/R1 pair is the RCLK master, the other DFI-H1/R1 pair will automatically be switched to become the new RCLK master.

Losing both DFI-H1/R1 pairs cause both ISLU CCs to be removed and both RCLKs to be removed. This prevents any communication between the SM and ISLU. Although no new calls can be completed, calls can be maintained over the DFI-H2/R2 facilities as long as the RCLKs can still lock to a reference and provide timing to the ISLU CDs and DFI-R2 circuit packs.

Faults that cause the CC to be removed from service do not cause the DFI-H1/R1 pair or transmission facility to be removed. Although communication cannot take place to the CC over the facility, all calls are maintained, and new calls can be established over this facility as long as the other CC is operational.

Losing all DFI pairs will cause the CDs to be automatically removed. No call processing can take place until one of the DFI-H1/R1 pairs is restored. This will automatically restore the CDs.

Faults on an RCLK will cause the RCLK to be removed from service. Since the RCLKs are duplex, the

remaining RCLK can provide full call processing capabilities to the RISLU. Duplex RCLK failures will disable the RISLU.

Errors that occur in the ISLU hardware of a RISLU are handled the same way as in the ISLU. Errors in the CDs, CCs, LGCs, and LCs are reported to the SM over the facility associated with the active CC. Recovery actions are handled as though it is an ISLU. Since the CDs are configured as active/standby, the CD reconfigurations are handled differently. All paths are duplex in the CD; removing a CD does not result in the preemption of any paths+.

The same per-call tests that are performed for ISLU line cards are also performed for the RISLU line cards. This includes the detection of a power cross on the Z line cards.

6.10.3.2 Packet Switching Unit Maintenance

6.10.3.2.1 General

The packet switching unit (PSU) hardware maintenance is responsible for the initialization of all PSU and packet interface (PI) hardware and the detection, analysis, and recovery from hardware errors in the PSU and PI. In addition, the PSU hardware maintenance will isolate faulty BRIs (that is, those that are the source of layer 2 errors) and request their removal.

The PSU hardware involves three classes of service groups as follows:

- (1) Packet switching unit common controller (PSUCOM)
- (2) Protocol handler (PH)
- (3) MCTSI (includes the PI).

6.10.3.2.2 PSUCOM Maintenance

A PSUCOM is removed from service, restored to service, and switched as a single entity. Under normal conditions, the PSUCOM is in an active-standby configuration.

When a fault is detected in an active PSUCOM, the standby PSUCOM is made active. The faulty PSUCOM is removed from service and diagnosed. If the diagnostics pass, that side is restored to service and made active; otherwise, it is left out of service.

If a fault occurs when a PSUCOM is in the active-OOS configuration and the OOS side is undergoing routine exercises, the routine exercises are terminated, and the OOS side is restored to service. If the PSUCOM is OOS due to either a manual or fault recovery request, it is placed in the duplex failure state. A critical alarm indicating PSUCOM duplex failure is sounded. A major alarm is sounded when the duplex failure is the result of a manual remove. All active calls using this hardware are then torn down. No attempt is made to abort a diagnostic on an OOS PSUCOM; however, if the diagnostic passes, that side is restored to service and made active.

6.10.3.2.3 PSU Last Chance Function

The PSU "last chance" mechanism is used as an attempt to recover PSUCOM and PH circuits that are somehow in the OOS state due to unexplained circumstances or due to one of the following reasons:

- ☐ Non-reproducible diagnostic failure
- ☐ Effects of bad hardware components
- ☐ Insufficient software resources.

This mechanism tries to recover any OOS circuit if it is safe to do so. It does not try to recover any OOS circuit that is:

- ☐ OOS by manual action
- ☐ In a growth state
- ☐ Currently involved in other activity such as:
 - ☐ fault recovery has a request pending
 - ☐ already on the restoration queue
 - ☐ failed diagnostics many times.

At most, two attempts are made to recover any given OOS circuit. At this time, Peripheral Fault Recovery (PFR) automatically puts the circuit in the trouble analysis state (TBLA). A circuit is put in the TBLA state by PFR if that circuit had been removed and passed DGN three times during a certain period (usually 30 minutes). Since this function already inherited one OOS count, the maximum number of attempts to recover the circuit by this function is two times.

A circuit that has failed DGN will continually be put on the restoral queue the next time the last chance function is called. Even if the DGN failure of a certain unit is valid, the repeating DGN failure messages can force some switch personnel responses.

6.10.3.2.4 Protocol Handler Maintenance

Each PSU shelf contains up to 16 active and spare PHs. If a failure occurs in one of the active PHs, the failed PH is removed from service if a spare PH is available on the shelf. The spare PH is made active, and the channel group on the failed PH is moved to the spare. Each channel group is assigned to a PH on a particular PSU shelf.

If no spare PHs on that shelf are in service, and if the fault is such that at least one channel can remain in service, then all the affected channels within the channel group are removed, and the PH is degraded. All calls associated with the removed channels are torn down, while all other calls are unaffected. If the fault affects the entire PH such that no channels remain in service, the PH is removed from service.

After the faulty PH has been removed, it is diagnosed and restored (if the diagnostics pass). If the diagnostics fail to pass, the PH is left out of service. A major alarm is sounded for each PH failure.

6.10.3.2.5 Packet Interface Maintenance

The PI is treated as part of the MCTSI service group. As part of the MCTSI, the PI is normally configured for duplex operation. The PI is an MCTSI subunit and is reconfigured as part of the MCTSI. Recovery from PI errors is included in the existing MCTSI recovery strategies.

6.10.3.2.6 D-Channel Maintenance

Error recovery will ensure that all errors detected are treated appropriately, regardless of their source. There is sufficient analysis to distinguish errors internal to the PSU from those external to the PSU. Error types requiring special treatment are layer 2 protocol errors observed on individual D-channels. The D-channel is the link between the PH and the customer premises equipment. Such errors have many potential sources including the customer premises equipment, transmission facilities, the ISLU, RISLU, TSIU, and the PH. When the layer 2 communication with the customer premises equipment is lost, a loopback test from the PH to the line card is initiated. If the loopback test fails, then, depending on where the loopback test failed, either the line card or the PH is removed, diagnosed, and restored. If the loopback

test passes, the BRI is temporarily placed on an OOS list and periodically returned to service.

6.10.4 TERMINAL MAINTENANCE

6.10.4.1 Test Systems

6.10.4.1.1 Port Status Administration

The PSA handles automatic (for example, out of service blocked) and demand (that is, through the PSA switch personnel interface) requests for port status changes to remove and restore ports to service.

The PSA updates dynamic data associated with the port, establishes the layer 1 protocol, activates layer 2 protocol, and transfers control to the appropriate application BRI initialization function.

6.10.4.1.2 Trunk and Line Work Station

The TLWS menu pages provide interactive test access to BRIs. These pages display information about the line or trunk under test.

With ISDN, the TLWS also provides the following:

- ☐ Digital testing
- ☐ Customer premises equipment (CPE) digital loopbacks
- ☐ Metallic access to U-cards.

6.10.4.1.3 Custom BRI Test Line (BRITL)

The custom BRI dial-up test line (BRITL) feature provides a means by which the OTC personnel can test a custom DSL from the CPE end of a DSL. By placing a call to a preassigned DN, the OTC personnel gains access to a set of commands through the CPE keypad, which allow the OTC personnel to verify the capabilities of the DSL without involving anyone at the central office. A set of commands is available to perform digital loopback tests on either of the B-channels from the 5ESS[®] switch. The switch personnel can specify some of the parameters of the tests including the channel (B1 or B2) and the termination (NT1 or CPE). Pass/fail information is reported to the switch personnel through a combination of CPE display test and in-band tones.

By dialing a special directory number, the switch personnel places a call to the test line. The switch software detects that the test line has been called and returns a confirmation to the switch personnel that the call has completed and is waiting to accept test line commands. Test call origination is allowed on single point and multipoint DSLs for all users subscribing to originating circuit-switched voice services.

At any time, if the switch detects that the switch personnel has gone on-hook, the switch will terminate the test call and release all call- related resources.

On receipt of a specific keypad sequence during an active test line call, the switch will perform a digital bit error rate test on the specified B-channel and report the results back to the CPE. Testing is permitted on B-channels assigned to circuit-switched voice, circuit-switched data, on demand B-channel packet switching, and permanent packet B-channel packet switching. The circuit-switched channels are tested using the integrated services test function (ISTF). The packet switched B-channels are tested using the PH as the test source. The custom BRI test line (BRITL) provides essentially the same testing capabilities provided to the switch personnel in the central office by the TST:DSL input command. In addition, keypad sequences can request the display of the PDN and the Office Equipment type and number (LCEN, LCKEN, or ILEN) for the line under test.

After the test call is established, all upstream information (CPE to switch) is sent as keypad information on the D-channel. All downstream information is sent in two forms that include the following:

- ☐ Text information is sent to the CPE display and is intended to be the primary switch personnel interface.
- ☐ In-band tones are sent on the B-channel whenever the B-channel is available (that is, not during a loopback test). These tones are sent from the local digital service unit (LDSU) tone generator.

The 5E6 and subsequent software releases provide the ability to verify the DN associated with each call appearance and to offer the use of the test line to end customers on a usage sensitive billed basis.

6.10.4.1.4 BASIC RATE INTERFACE VERIFICATION (BRIV)

Prior to the 5E10 software release, the office equipment (OE) number could only be displayed by Custom ISDN BRI users through the BRITL feature. In the 5E10 and later software releases, the BRIV feature allows switch personnel to identify the OE connected to a National ISDN BRI (other BRITL test capacities are not duplicated by BRIV). This is a valuable tool for identifying cable pair assignment mismatches during installations or moves.

BRIV is accessed from a National ISDN terminal or test set at the customer premises. The OE information is retrieved by BRIV and displayed on the terminal or test set. A terminal used to access BRIV must be capable of originating circuit-switched voice (CSV) and/or circuit-switched data (CSD) calls, and must be connected to a National ISDN BRI line provisioned for those services.

If the National ISDN BRI is provisioned with standard default service, BRIV can be accessed from a terminal that is not associated with a user service order profile (USOP).

The BRIV feature is accessed by dialing 3-digit access code or a 7-digit DN that has been assigned in recent change. The same access code or DN used for BRIV may also be used for Custom ISDN BRITL. The switch routes a test call to BRIV or BRITL based on the type of line (National or Custom) associated with the terminal that originated the call, not in the number dialed. When the switch connects the test call to BRIV, it informs the terminal of the connection and the terminal displays "Connected". One second later, the switch sends the OE ID to the terminal which then displays the information. The OE ID is displayed for 60 seconds unless the user terminates the test call first.

6.10.4.1.5 MLT/ISDN

This feature provides an enhancement of the existing interface between the 5ESS[®] switch and the MLT system. The interface is a digital interface through an IOP port on the 5ESS[®] switch, and the added functions are implemented with command/response oriented transactions. The added functions enable MLT/ISDN to remotely access the data and execute the tests which the 5ESS[®] switch provides for the surveillance and maintenance of the ISDN service on BRI ports. These added functions include:

- ☐ The ability to query the switch for configuration, status, and performance monitoring information associated with the switch hardware and the subscriber line serving a specific customer
- ☐ The ability to query the switch for information stored in its protocol error record memory
- ☐ The ability to query the switch for information on the status of the test equipment and on the version of the interface specification between the MLT/ISDN and the 5ESS[®] switch
- ☐ The ability to execute the digital tests provided by the 5ESS[®] switch for trouble analysis and performance evaluation of the BRI port and the DSL
- ☐ The ability to restore a user line to service when it has been removed by automatic maintenance

action.

The 5E6 and subsequent software releases provide the ability to perform mismatch detection (determine if a line is terminated with the proper NT1) and to obtain performance monitoring data.

6.10.4.1.6 Automatic Line Evaluation

The automatic line evaluation (ALE) detects and displays layer 1, 2, and 3 transmission error information for BRIs. If a primary LT port is entered, then ALE will output the requested information. If a secondary-only LT port is entered, then a failure message is output.

For layer 1 (performance monitoring), ALE provides measurements of the following:

- ☐ CRC errors
- ☐ Severely errored seconds (SES)
- ☐ Errored seconds (ES).

These are provided on a current hour, previous hour, current interval, previous intervals, current day (ES and SES only), and previous day (ES and SES only) basis.

For layer 2 errors, frame CRC errors are evaluated.

For layer 3, protocol error records are provided.

6.10.4.1.7 Integrated Services Test Function

The ISTF provides digital loopback test for BRIs and digital trunks.

6.10.4.1.8 Automatic Line Insulation Testing

The ALIT detects metallic insulation line faults. The ALIT is not provided on ISDN BRIs.

6.10.4.1.9 Office-to-Office Testing

Office-to-office testing verifies that office wiring and the data base are correct for a given DN before cutting over to a new office. This capability does not apply for office-to-office testing on ISDN BRCS BRIs.

6.10.4.1.10 PSA Switch Personnel Interface

The PSA software provides RMV/RST control over lines, trunks, and data links. It also provides a means to list OOS lines, trunks, and data links, and to convert from one form of equipment identification to another [for example, from DN to line card equipment number (LCEN)]. This capability enhances the PSA switch personnel interface to handle ISDN.

6.10.4.1.11 Call Failure Handling

Call failure handling for ISDN provides digital error analysis (over layers 1, 2, and 3) that is similar to showering lines in the analog environment.

6.10.4.1.12 Operational Trunk Testing

Operational trunk testing for ISDN enables testing of packet switching trunks and PRI trunks.

6.10.4.1.13 Routine Conditioning

The 5ESS[®] switch routinely synchronizes the hardware to the software port status. For ISDN, routine conditioning also synchronizes the state of lamps found on ISDN terminals

6.10.4.1.14 Digital Line Testing.

Digital line testing provides for the testing of BRI lines. These tests can be initiated either from the TLWS or the MCC. The tests that can be run include the following:

- ☐ Bit error rate (BER) tests
- ☐ Loopbacks
- ☐ Cyclic redundancy code (CRC) checks (5E6 and subsequent software releases)
- ☐ Sectionalization (5E6 and subsequent software releases).

The CRC checks and sectionalization can be performed with and without BRITE channel units.

6.10.4.1.15 Switch-Based Protocol Analysis and Monitoring

Protocol monitoring provides the ability to monitor an ISDN D- or B-channel through the collection of frames and packets/messages around a predefined ``trigger" event and make that data available to the switch personnel. The data surrounding the ``trigger" is captured and made available at the MCC, TLWS, or printed at the ROP. The data can also be accessed through the SCCS or the MLT/ISDN operations systems. The protocol monitoring capability has the following characteristics:

- ☐ Protocol monitoring is enabled on-demand for a limited number of channels.
- ☐ Some event (for example, PERs) triggers a ``snapshot" of the monitored channel.
- ☐ A limited number of frames/packets adjacent to the event (that is, preceding and/or following) are collected.
- ☐ The ``data" is displayed.

6.10.4.1.16 Remote Protocol Monitoring

The remote protocol monitoring feature (5E7 software release) provides the service provider with the capability to nonintrusively (that is, without interruptions of service to the customers) access the ISDN interfaces from a Customer Service Center (CSC) to monitor the protocol exchanges between the 5ESS[®] switch and the customer premises equipment (CPE). This feature provides an interface to a protocol analyzer at the CSC. The CSC is a work center that provides the maintenance for all the ISDN troubles reported and is located at a centralized remote location.

This feature provides a split test capability for the PRI only. The split test access feature allows the protocol analyzer, at the remote location, to be placed in effect between the ISDN capable CPE and the 5ESS[®] switch to which the CPE connects. The split test access capability permits the protocol analyzer to actively participate in protocol exchanges.

Whenever an ISDN trouble is reported to the GSC, the switch personnel at the CSC sends an input message to the originating switch (the switch connected to the complaining customer) to request a protocol monitoring session. The monitored data can be either switched or carried over the dedicated facilities to the switch connected to the CSC and subsequently directed over the output facilities to the CSC.

There are three main types of access connections as follows:

- ☐ A noninterruptive monitor connection
- ☐ An interactive split test access connection
- ☐ A direct access connection to an idle port.

The types of ports that may be placed under test through an RDTA connection are as follow:

- ☐ Circuit-switched ISDN BRI and PRI D-channels. The BRI channels may be terminated at either a U- or T-interface.
- ☐ ISDN BRI B-channel.
- ☐ ISDN BRI D-channel carrying Q.931 messages.
- ☐ ISDN PRI D-channel carrying Q.931 messages and X.25 packets.
- ☐ Packet-switched trunks including IP, X.75, X.75', and XAT.

6.10.4.2 Basic Rate Interface Maintenance

6.10.4.2.1 General

The BRI supports circuit-switched data (CSD) and packet switched data (PSD) services. The U-interface maintenance software provides the terminal maintenance software necessary to maintain the 2-wire BRI up to the NT1.

6.10.4.2.2 U-Interface Diagnostics

The primary purpose of the U-interface diagnostic is to identify faulty components at the U-card level. The U-card is a 2-wire BRI line card for the ISLU or AIU. The diagnostic results are used to guide switch personnel in the replacement of defective equipment. Additionally, the automated request for diagnostics, such as REX or fault recovery scheduled diagnostics, uses the diagnostic results to configure the U-card for reliable operation.

Manual requested diagnostics may interrupt service. The diagnostic executes within a reasonable time and provides fault isolation in accordance with the standards established for the 5ESS[®] switch.

6.10.4.2.3 U-Interface Terminal Maintenance Software

The U-Interface terminal maintenance provides both digital and metallic tests on a demand basis.

This software provides the ability to isolate faults to the U-card or 2-wire loop, and the ability to measure digital performance in terms of bit error rate and errored seconds.

These functions are provided through the use of both digital and metallic tests. Digital tests isolate the fault to the U-card or the 2-wire loop, but not between the loop and the NT1. Metallic tests isolate a fault to the loop and measure the approximate distance to the fault. If the U-card loopback and metallic loop tests pass, the fault is assumed to be with the customer equipment.

6.10.4.2.4 Multipoint BRI Maintenance

The multipoint BRI feature provides support for connecting a maximum of eight users, belonging to the same customer, to a single BRI. The users share the two B-channels for circuit or packet mode services and the D-channel for signaling and additional packet data services. The multipoint BRI maintenance capability provides the ability to remove and restore packet services to an individual user of the BRI.

6.10.4.2.5 T1D1 Standard U-BRI for (R)ISLU Maintenance (5E6 and Subsequent Software Releases)

The T1D1 standard U-BRI for (R)ISLU feature provides the hardware and software to support the T1D1.3 standards subcommittee of the ANSI[®] domestic standard U-BRI. This feature supports this standard for lines terminating on an ISLU or a RISLU.

The maintenance features for the T1D1 standard U-BRI consist of a recognizable DC loop termination at the network termination (NT) and loopback capabilities at the NT. Performance monitoring capabilities are also supported at the network side of the standard U-BRI.

The NT equipment provides a polarity insensitive DC termination to the line that is recognized by metallic test systems. The NT metallic termination is characterized as a normally open shunt switched resistance. The termination is closed by the application of metallic voltage and held closed by loop current flow.

6.10.4.2.6 NT Loopbacks

Two types of loopbacks are actuated by the U-interface for use in trouble sectionalization and performance verification.

- ☐ A full 2B+D loopback intended to be located as close to the 4-wire T-interface as possible (in the NTs). This loopback provides an end-to-end appraisal of the customer's service. Because this loopback includes the D-channel, the BRI is out of service for its duration.
- ☐ A per B-channel loopback that allows the B-channels to be looped back without taking the D-channel out of service. This loopback is intended to be located as close as possible to the loopback location of the T-interface echo D-channel in the NT.

6.10.4.2.7 Performance Monitoring

Performance monitoring for the standard U-interface is derived from the cyclic redundancy checks calculated over the entire 2B+D channels and the M4 bits of the maintenance channel. Periodic counts of block errors, errored seconds, and severely errored seconds are maintained for each direction of transmission on a per line basis. These counts are maintained at an hourly and daily rate.

6.10.4.2.8 BRITE Channel Unit Maintenance (5E6 and Subsequent Software Releases)

The basic rate interface transmission extension (BRITE) channel unit maintenance feature provides the software necessary to operate loopbacks and access performance monitoring counts in T1D1 BRITE channel units, and to operate loopbacks for the 5E4 software release BRITE channel units. The BRITE channel units extend the distance that ISDN customers can be served by the 5ESS[®] switch.

Using the BRITE channel unit maintenance feature, the OTC personnel can enter on-demand messages to perform the following:

- ☐ Perform a loopback of either channel
- ☐ Perform a complete (2B+D) loopback test
- ☐ Perform a mismatch test at the first channel unit
- ☐ Read performance counts
- ☐ Reset performance counts
- ☐ Perform corrupt cyclic redundancy check tests.

With the following two exceptions, no automatic system maintenance actions are performed by the 5ESS[®] switch:

- ☐ Issuing the performance monitoring freeze
- ☐ Scheduling a mismatch test on the loss of layer 1.

6.10.4.2.9 OSPS (BST and VDT)

6.10.4.2.9.1 Basic Services Terminal

6.10.4.2.9.1.1 Overview

Remote maintenance of the basic services terminal (BST) is available from the SMP by using the BRI test messages. The BST also contains the hardware and firmware necessary for local manual recovery and switch personnel testing.

6.10.4.2.9.1.2 Manual Recovery Functions

Overview

Four manual recovery functions are available to an operator at a BST as follows:

- ☐ Refresh display
- ☐ Recover call
- ☐ Init position
- ☐ Reset position.

The previously described functions are listed in order of increasing severity. These functions are initiated by depressing the appropriate key, along with the ``CTRL" key, at the BST. Due to the severity of the ``init position" and ``reset position" functions, they cannot be executed while the operator is plugged into the BST.

Refresh Display

This function blanks the display and all the LEDs, and then restores them from the display and LED buffers in the BST memory.

Recover Call

This function blanks the display and the LEDs, and the display and LED buffers in the BST memory are cleared. The BST then sends a message to the SMP requesting a new copy of the present call data. The display and call data are restored to a state based on the call data received.

Init Position

This function displays the maintenance indicator at the BST, and a message is sent to the SMP requesting a purge of the current position terminal process.

Reset Position

The reset position function causes the BST software to generate a hardware reset.

6.10.4.2.9.1.3 Maintenance Login Key

Switch personnel can log in to a BST by depressing the ``CTRL" and ``MAKE BUSY" keys simultaneously. The switch personnel can then execute the BST self-test diagnostics or run manual tests such as voice and transmission tests.

6.10.4.2.9.1.4 Maintenance Indicator

The BST video display is used to display the ``MAINTENANCE" indicator. The ``MAINTENANCE" indicator is displayed on power-up by the reset handler firmware after initializing the display hardware. The indicator will remain displayed during terminal initialization and power-up diagnostics. The ``MAINTENANCE" message is also displayed when the BST application layer is notified by the layer 3 protocol that it has lost communication with the SMP.

6.10.4.2.9.1.5 Power On-Off Switch

The operator is not allowed to turn power off to the BST while the position terminal process is still active. Therefore, the power on-off function is placed under control of the BST firmware.

The on-off switch is scanned for an ``off" indication. When the ``off" side of the switch is depressed, the firmware reads the ``off" state and only shuts down the BST power converter if there are no plug-ins. If an operator is plugged into the BST, the ``off" reading is ignored.

6.10.4.2.9.2 Video Display Terminal

6.10.4.2.9.2.1 Overview

Firmware located in the video display terminal (VDT) provides local maintenance. The local maintenance mode for the VDT can be entered through two different procedures. Auto-diagnostics are performed following a power-on, or a VDT firmware controlled reset. If a hardware error is detected during auto-diagnostics, the VDT automatically enters the local maintenance mode and an error number is displayed. Once the local maintenance mode is entered, the hardware problem responsible for the entry must be resolved, or another auto-diagnostic must be performed successfully.

The local maintenance mode can also be entered through depressing the ``LOCAL MTCE" soft-key on the maintenance soft-key row. This can only be done when all headsets are removed from the VDT. When the VDT has been placed in the local maintenance mode, a headset or transmission test set can be plugged into the VDT. The maintenance soft-key row is displayed by depressing the CONTROL and SOFT KEY SCROLL keys simultaneously a sufficient number of times.

6.10.4.2.9.2.2 Local Maintenance Mode

When the local maintenance mode is entered, the manual diagnostic soft-key row and the MTCE page are displayed. The manual diagnostic soft-key row provides the following keys:

- ☐ LOCAL MTCE
- ☐ KYBD & PORT
- ☐ D-PATH TEST
- ☐ VOICE CIRCUIT
- ☐ CRT TEST

- ☐ TRAINER PORT.

A particular diagnostic is entered by depressing the appropriate soft-key. Instructions are provided on the maintenance page describing how to enter a desired diagnostic or exit the local maintenance mode. Auto-diagnostics are also run whenever the local maintenance mode is exited.

A particular diagnostic can be exited by depressing a diagnostic soft-key at which time that particular diagnostic will be entered. Depressing the LOCAL MTCE soft-key while in a diagnostic exits that diagnostic and enters auto-diagnostics.

Once a particular diagnostic is entered, a menu of the tests for that diagnostic will be displayed.

6.10.4.2.9.2.3 Keyboard and Port Diagnostic (KYBD & PORT)

Overview

When the keyboard and port diagnostic is entered, the maintenance page will display a menu with the following options:

- ☐ Keyboard diagnostic
- ☐ Headset plug-in
- ☐ Maintenance LED
- ☐ Buzzer
- ☐ Key test.

Keyboard Diagnostic

The keyboard diagnostic checks the keyboard RAM, EPROM checksums, and looks for stuck keys. It also verifies the MPSC within the VDT, the keyboard, and the communication interface between the two units. A pass or fail indication is displayed at the VDT.

Headset Plug-in

The headset plug-in test reflects the state of both headset jacks.

Maintenance LED

The maintenance LED test toggles the LED on and off while indicating the status of the LED on the VDT screen.

Buzzer

The buzzer test operates the buzzer for 1 second. An on/off status of the buzzer is displayed on the VDT screen during the test.

Key Test

The key test allows the keycode for each key on the keyboard to be displayed. The keycodes are 2-digit uppercase pairs displayed in a highlighted field.

6.10.4.2.9.2.4 D-Path Test

Overview

The D-path test verifies the ability to transmit and receive data through the VDT T-interface and is conducted in a series of four tests as follows:

- (1) Display info state
- (2) Establish Level 1
- (3) Remove loopback
- (4) Echo D test.

Connection to the 5ESS[®] switch or a terminal interface control board is required for these tests.

Display Info State

This test verifies the T-interface for proper operation. The status of the test is reflected on the VDT.

Establish Level 1

This test checks the T-interface registers for level 1 protocol. If level 1 protocol is not established, two attempts are made to activate it. The status of the protocol is reflected at the VDT.

Remote Loopback

This test sets the local loopback within the T-interface. The status of the loop is reflected at the VDT.

This test initiates a transmit from the T-interface. After a short delay, the T-interface receive register is checked. The information transmitted should have been looped and received. The T-interface local loopback is implemented for this test. The status of the test is reflected at the VDT.

6.10.4.2.9.2.5 Voice Circuit

Overview

The voice circuit diagnostic is entered by depressing the VOICE CIRCUIT soft-key. Upon entering the voice circuit diagnostic, the following menu items are displayed:

- ☐ Analog loopback
- ☐ Digital loopback
- ☐ Mute
- ☐ Bypass digital signal processor (DSP)
- ☐ DSP self-test
- ☐ DSP program
- ☐ Tone generator
- ☐ Volume control.

Analog Loopback

The analog loopback test supports remote testing of the voice function from the 5ESS[®] switch TTF. The TTF sends a tone to the VDT and measures the performance of the looped-back tone. During this test, the analog output of the coder/decoder (CODEC) is switched to its analog input; the voice path from the CODEC output to the operator headset is opened (blocked); and the DSP passes through the voice path from the switch disabling all signal processing [automatic gain control (AGC), volume control, sidetone, voiced switched attenuator (VSA)]. The state of the analog loopback test is reflected on the VDT as SET or CLEAR.

Digital Loopback

The digital loopback test verifies the VDT. When the digital loopback test is selected, the digital information sent to the T-interface for transmission to the 5ESS[®] switch is looped-back internal to the T-interface and is output from the T-interface as digital data received from the 5ESS[®] switch. The performance of a tone looped-back from the transmission test set (TTS) is measured. The state of the digital loopback test is reflected on the VDT as SET or CLEAR.

Mute

The mute test operates a switch in the analog voice path between the microphone and the CODEC. The switch is either opened or closed. The state of the mute function is reflected on the VDT as SET or CLEAR. The SET state opens the analog voice path from the microphone to the CODEC analog input. The CLEAR state restores the analog voice path.

Bypass DSP

This test digitally removes the DSP from the active voice function, and the digital bit stream is fed directly into the CODEC. Any of the DSP functions (DSP self-test, DSP program, tone generator, and volume control) which follow, although requested, will not act on the voice circuit if bypass DSP is set. The state of the bypass DSP function is reflected as SET or CLEAR on the VDT.

DSP Self-Test

The DSP self-test program verifies the voice path of the VDT by generating a test tone and measuring the level and frequency of the DSP input.

DSP Program

The DSP program provides a series of programs as follows:

- (1) **Normal:** The normal program allows the DSP to handle volume control, sidetone, echo suppression, and automatic gain control. This program reads inputs from the customer voice, operator voice, and volume control. The volume control program allows one of five volume levels to be selected. As the volume level number increases, the attenuation increases by approximately 2 dB.
- (2) **Tonegen:** The tonegen program generates a tone at a given level and frequency. Five different tones can be generated as follows:

TONE	FREQUENCY	SOUND LEVEL
ZIP	480 Hz	-21 dBmO
BELL	2000 Hz	-24 dBmO
DMW	1000 Hz	0 dBmO ^a
IDLE	SILENCE	SILENCE
M16	1000 Hz	-16 dBmO

Notes:

a. Digital Milliwatt

- (3) **Wire:** The wire program takes the customer voice input and outputs it without doing any processing, treating the DSP as a ``wire." This program is useful for diagnosing the DSP hardware interface.
- (4) **Wirest:** The wirest program takes the operator voice, attenuates it (sidetone loss), and adds it to the customer voice input. This program is useful for diagnosing the DSP hardware interface.
- (5) **Sidetone:** The sidetone program takes the operator voice, attenuates it (sidetone loss), and outputs it. This program is useful for diagnosing the DSP hardware interface.
- (6) **Self-Test:** This program generates a tone until both the customer and the operator voice inputs to the DSP detect the same tone coming in.

6.10.4.2.9.2.6 CRT Test

Overview

The CRT test consists of the following three subtests:

- (1) Pattern generation
- (2) Dithering
- (3) Brightness.

Pattern Generation

This test verifies the ability of the VDT to produce an alternating pattern (checker board). When the test is entered, the area where the menu is displayed is overwritten with the pattern. The test lasts about 1 minute. Following the completion of the test, the diagnostic menu for the CRT test is restored to the screen.

Dithering

This test verifies that both the horizontal and vertical dither circuits function properly. The screen display moves quickly left and right while moving first up then down and finally up to the initial starting point.

Brightness

This test verifies the ability to remotely control the brightness of the monitor through the keyboard and VDT control board. When entered, the cursor is relocated to the right of the test and a level of brightness (1 to 8) can be entered. Eight is the brightest while one is the darkest.

6.10.4.2.9.2.7 Trainer Port

The trainer port exercises the data communication channel within the VDT. An external test fixture is needed for this test which performs an external loopback test.

6.10.4.2.9.3 Auto-Diagnostics

The VDT auto-diagnostics are composed of six major functional tests as follows:

- (1) Sanity timer
- (2) EPROM
- (3) RAM

- (4) Sanity maze
- (5) Keyboard interface
- (6) High-level data logic control (HDLC).

Although the sanity timer test is completed first, a portion of the RAM must be verified in order to assure integrity. When the auto-diagnostics are running, the VDT screen is forced to normal intensity all white. Upon the completion of auto-diagnostics, one of two possible modes of operation will be entered. If an error is encountered during auto-diagnostics, the VDT is placed in the local maintenance mode and an error code is displayed. The VDT will not return to the normal operating mode until the problem is corrected or until auto-diagnostics are run successfully. The lower portion of RAM memory is diagnosed prior to sanity timer testing. The RAM address leads, the ability to write and read zeros into RAM, and the ability to write and read RAM cells are tested.

Following the verification of the RAM, the sanity timer test is entered. The sanity timer test consists of the following three parts:

- (1) Verify that the sanity timer has not fired
- (2) Verify that the sanity timer has fired
- (3) Verify that the sanity timer is reset.

In the first part of the sanity timer test, a loop is entered and run a set number of cycles after which time the sanity timer status bit is checked. If the status bit is set, the sanity timer fired too soon, and an error flag is raised. If the status bit is not set, the first part of the test is successful, and the second part is entered.

The second part of the sanity timer test verifies that after a second calculated number of loop interactions, the status bit is set. If the status bit is not set, an error indication is sent.

The final sanity timer test allows the loop to continue running. In this test, however, the desired results are that the calculated number of loop iterations not be reached. Not reaching the third loop count indicates that the central processing unit (CPU) has been reset. If the third value of loop counts is reached, an error is indicated.

In the EPROM test portion of auto-diagnostics, two EPROM tests are conducted. The EPROMs are first checked as a matched set. This test is performed by comparing the date stamp in each EPROM. The second test performed on the EPROMs is a cyclic redundancy code check. The results from this test are compared with a precalculated sum stored in the EPROM.

Following the EPROM test, the full RAM diagnostics are performed (this does not include the lower part of RAM that was tested earlier). As with the short RAM test performed prior to the sanity timer test, the following three checks are made:

- (1) Verify address leads
- (2) Verify that all RAM can be written to zero
- (3) Verify that test data can be read and written successfully.

The RAM diagnostics are started by initializing all RAM to zero.

The address lead test verifies that no address leads are open or shorted to other address leads. This test writes the address of the RAM location being addressed into that RAM location.

The keyboard diagnostic verifies the ability to program the multiprotocol serial controller (MPSC), generate a diagnostic request signal, receive keycode information from the keyboard, and assure through keyboard resident diagnostics, that the keyboard is good. The keyboard resident diagnostics check for stuck keys, keyboard RAM, and keyboard EPROM checksum errors.

The HDLC diagnostic verifies the ability to program the HDLC and transmit and receive an assortment of messages. While testing the HDLC, the ability to program the T-interface and loop information through the T-interface is tested.

6.10.4.3 Primary Rate Interface Maintenance

6.10.4.3.1 General

The primary rate interface (PRI) maintenance software establishes and maintains an ISDN PRI D-channel and its associated B-channels.

A T1 facility is the physical transmission medium over which PRI service is provided. The DS0 refers to the individual bandwidth (64 kb/s) of each of the 24 channels which compose a DS1. The DS1 refers to the total bandwidth of 1.536 Mb/s available on a T1 facility.

The major components of the PRI maintenance software are as follow:

- ☐ Initialization of the D- and B-channels
- ☐ Administration of the D- and B-channel port status
- ☐ B-channel path verification and performance testing
- ☐ Fault isolation
- ☐ Subscriber requested loopbacks
- ☐ Status coordination of the PRI channels between the CPE and the 5ESS[®] switch
- ☐ Collect, analyze, and print messages pertaining to errored second count alarms.

6.10.4.3.2 Initialization of the D- and B-Channels

The 5ESS[®] switch SM provides the sequencing for the PRI feature D- and B-channel initialization. It nails up a full 64 kb/s PIDB time slot from the DFI to a PH in the PSU through the TSIU and establishes the D-channel path layer 2 protocol. The layer 2 data rate is set to 64 kb/s or 56 kb/s in the PH to accommodate PRI. After initialization of the D-channel, the B-channels associated with the D-channel are brought in service but remain idle until used.

6.10.4.3.3 Administration of the D- and B-Channel Port Status

For a PRI, each B- and D-channel on a T1 carrier has the port appearance of a digital trunk entering the 5ESS[®] switch at a DFI on the DLTU. Each B- and D-channel is supported as an individual PRI port for port status administration. A port is defined as a trunk termination for this capability.

This capability modifies the existing port administration to:

- ☐ Manage the internal port status for controlling the in service and OOS state of the PRI ports
- ☐ Support system initialization and verification of all the PRI ports
- ☐ Provide the switch personnel facility to change or query the status of PRI ports

- ☐ Support RC/VFY to assign or unassign PRI ports.

When a B-channel is placed OOS, the remaining B-channels governed under that D-channel remain unaffected. When a D-channel is removed from service for reasons other than fault recovery, the B-channels controlled by that D-channel are placed OOS. If DFI or facility is removed, the channels on that DFI or facility go out of service. If the D-channel is affected, the B-channels on other facilities that are controlled by that D-channel go OOS in 90 seconds. If the D-channel goes OOS during fault recovery for 90 seconds, the B-channels it controls go OOS.

The PRI trunk groups always have an automatic maintenance limit (AML) of 100 percent. This means that members of any PRI outgoing and 2-way trunk group are allowed to be OOS without reaching the AML for that trunk group.

Routine port conditioning is performed on PRI B- and D-channel trunks.

6.10.4.3.4 B-Channel Path Verification and Performance Testing

The B-channel path verification, including call routing data verification, is performed by this capability using DS0 loopback testing. The loopback test is performed by setting up a call between a test port on the digital services unit 2 ☐ integrated services test facility and a loopback port on the CPE through a specified B-channel.

The digital test patterns and test durations are consistent with those used for loopback testing of digital trunks. The customer is not billed for loopback tests initiated at the 5ESS[®] switch.

6.10.4.3.5 Fault Isolation

The TSIU to PH and the TSIU to DFI parity checks are used to isolate D-channel faults to the 5ESS[®] switch hardware. Faults within the switch cause one of these parity checks to fail. The PH faults are isolated by use of PH loopback tests. The DFI faults are detected and reported by DFI fault detection hardware and software. Otherwise, if level 2 cannot be established on the D-channel, the DS1 transmission facility or CPE is at fault. If the fault is external to the switch and coincident with a CGA, the fault is in the DS1 transmission facility. Otherwise, the fault is with the CPE.

The DFI detected faults may include certain faults within the DFI. These are isolated using DFI diagnostics or the manually implemented loopback capability at the digital switch cross-connect. Both of these loopbacks loop all 24 channels (DS1 loopbacks), and thus take the entire T1 out of service. Transmission facility faults include certain faults in the CPE terminal equipment. These may be isolated by manually implementing a DS1 loopback at the customer interface to the DS1 transmission facility.

The DFIs contain a number of error counters that are incremented when data transmission and framing errors are detected. The OP:REG input message may be used to display the following information:

- ☐ Errored seconds count
- ☐ Severe errored seconds counts (extended framing mode only)
- ☐ Out of frame count
- ☐ Bipolar violation count
- ☐ Change of frame alignment count
- ☐ Slip count
- ☐ Cyclic redundancy code-6 (CRC-6) error count (extended framing mode only).

These error counts assist the switch personnel in detecting DS1 transmission facility degradation.

6.10.4.3.6 Subscriber Requested Loopbacks

To allow subscribers to perform their own loopback tests, the CPE may request the switch to loop back a B-channel by sending a standard call setup message with a destination address that routes to a loopback termination.

6.10.4.3.7 Coordination of the PRI Channels Between the CPE and the 5ESS[®] Switch

During restart, the CPE is notified when PRI B-channels are placed into or removed from the locked-out or an

6.10.4.3.8 Errored Seconds AlarmOOS state. The CPE is also notified when B-channel ports are idled as a result of clearing hung calls.

A DFI alarm alerts the switch personnel when the errored seconds count exceeds 1706. Another DFI alarm alerts the switch personnel when the errored seconds count increases by more than 13 or 75 during a 15-minute interval.

6.10.4.3.9 OSPS

6.10.4.3.9.1 Interflow Maintenance

6.10.4.3.9.1.1 Overview

The OSPS interflow maintenance covers the initialization, maintenance, and administration of a 56/64 kb/s D-channel and up to 23 B-channels associated with the D-channel between the originating and terminating interflow office. The originating interflow office is a local OSPS, which has a call origination for OSPS, and the terminating OSPS is a cooperating OSPS which provides operator services. The main areas of the interflow maintenance are as follow:

- ☐ Initialization of B- and D-channels
- ☐ Port status administration
- ☐ Interswitch port status coordination
- ☐ B-channel path verification and performance testing
- ☐ Fault isolation
- ☐ Recent change.

6.10.4.3.9.1.2 Initialization and Recovery for OSPS-EDSLs

The integrated services port administrator (ISPA) system process and the ISDN software initializes the extended digital subscriber lines (EDSLs) when they are returned to service for each of the following events:

- ☐ PSM full processor initialization
- ☐ PSM selective processor initialization
- ☐ Single process purge of an OSPS-EDSL terminal process representing the B- and D-channels

- ☐ Restoration of a parent circuit
- ☐ OSPS EDSL switch personnel restoral
- ☐ Periodic attempts by terminal maintenance to restore the OSPS EDSLs in the OOS/DSLINIT, OOS/LVL2ERR, or OOS/LVL3ERR states.

The initialization of the OSPS EDSLs can be requested by system integrity (SI), terminal maintenance (TM), or the maintenance request administrator (MRA). There are two basic stages of initialization tasks for OSPS EDSLs as follows:

- ☐ ISDN base initialization
- ☐ OSPS EDSL application specific initialization tasks.

The ISDN base initialization tasks consist of the following for the OSPS EDSL application:

- ☐ Obtaining ownership of the OSPS EDSL
- ☐ Establishing a digital path for the D-channel from the protocol handler to the DFIs
- ☐ Activating the protocol handler
- ☐ Establish multiframe on the D-channel
- ☐ Calling the OSPS ``application hook" to perform the OSPS EDSL specific initialization tasks.

The second stage of initialization consists of the OSPS EDSL application specific initialization task. This stage provides the initialization steps to establish level 3 communication. It verifies ownership of the OSPS EDSL, obtains an L# logical channel, initialize the logical channel for data transmission, establish L3 end-to-end connection, and send data to the peer terminal process.

The requirements to establish level 3 communication include the following:

- ☐ Create one terminal process for the D-channel and one terminal process for each of the 23 B-channels.
- ☐ Reserve and set up X.25 logical channels for the D- and each B-channel
- ☐ Static data relations shall be verified as having tuples associated with the OSPS EDSLs.
- ☐ Call OA functions to set up dynamic data structures.
- ☐ Ensure the establishment of level 3 protocol.
- ☐ Coordinate the initialization between the incoming and outgoing switch.

Each B- and D-channel on an OSPS EDSL T1 carrier has the port appearance of a 1-way outgoing digital trunk at the sending end of the OSPS EDSL, and a 1-way incoming digital trunk at the receiving end of the EDSL, at a DFI on the 5ESS[®] switch DLTU. Each B- and D-channel is supported as an individual EDSL port by PSA. The OSPS EDSLs are members of a trunk group. Trunk assignments are such that all D-channels terminating at the same terminating switch are placed in the same trunk group. Likewise, all B-channels terminating at the same destination are also part of the same trunk group. However, B- and D-channels are members of different trunk groups. A trunk group may contain trunks from more than one

OSPS facility.

The PSA performs the following functions:

- ☐ Manages the internal port status for controlling the in-service and out of service state of the OSPS EDSL ports utilizing the existing port states
- ☐ Supports system initialization and verification of all the OSPS EDSL ports
- ☐ Provides the switch personnel the facility to change or query the status of the OSPS EDSL ports using switch personnel input and output messages
- ☐ Provides B- and D-channel timed camp-on
- ☐ Supports recent change and verify to assign or unassign OSPS EDSL ports.

When a B-channel is placed out-of-service, the remaining B-channels associated with the same D-channel will remain unaffected. The AML is used to prevent the removal of an excessive number of trunks within a single trunk group from service. An AML count is a percentage of the total trunk group members that can be removed before the AML alarm is generated. The value is set through RC. The AML feature will not prevent the removal of a B-channel trunk group member, but provides a mechanism to notify the switch personnel when more than the acceptable number of B-channels are out of service.

6.10.4.3.9.1.3 Interswitch Port Status Coordination

The Q.931 maintenance messages are used to keep the status of the B-channels correct at either end of an OSPS-EDSL link. These messages are used to inform the other end of the EDSL that specified B-channels are restored or removed from service.

6.10.4.3.9.1.4 B-Channel Path Verification and Performance Testing

The B-channel path verification, including office dependent data verification is performed by the OTC personnel from the TLWS or teletypewriter. The loopback test is performed by setting up a path between a test port on the DSU2-ISTF in the originating switch and the DSU2-ISTF loopback function in the terminating switch through a specified B-channel. A request is then sent to the ISTF to perform the loopback test. The B-channel path verification can only be initiated by the switch personnel from the originating switch.

6.10.4.3.9.1.5 Fault Isolation

Upon the detection of a D-channel layer 2 fault, the TSIU to PH and the TSIU to DFI parity checks are used to isolate D-channel faults to the ISDN SM hardware. If the fault is external to the switch and a carrier group alarm occurs within 384 ms, the fault is assumed to be in the T1 transmission facility.

The DFI detected faults may include certain faults within the DFI. These can be isolated using the software controlled loop back in the DFI or manually implemented loop back capability at the DSX-1 (digital switch cross-connect). Both of these loop-backs loop back all 24 channels. Manual loop-backs may be performed at the DSX-1 by repatching the patch cords to connect the transmitter output to the receiver input.

The DFI also contains error counters that are incremented when data transmission and framing errors are detected. The human machine (HM) subsystem will read and display the following information in response to OTC personnel requests:

- ☐ Errored seconds count
- ☐ Severe errored seconds count (extended framing mode code)

- ☐ Out of frame count
- ☐ CRC-6 error count (extended framing mode only).

These error counts will assist the OTC personnel in detecting T1 facility degradation.

6.10.4.3.9.1.6 Recent Change

The OSPS interflow ports are activated/deactivated via recent change

6.10.4.3.9.2 ACD

The maintenance for the ACD application of OSPS provides for the maintenance of the data link to the MIS. This includes the following capabilities:

- ☐ Terminal maintenance will restore a port to service, set up and initialize the D-channel path between the SM and the MIS, control and monitor the status of the D-channel, and initialize the MIS terminal process.
- ☐ Switch maintenance controls the switch personnel requested LGC removal requests for LGCs that are equipped with the new data link port type.
- ☐ Switch maintenance controls the switch personnel requested line card removal requests for line cards that are equipped with the MIS data link port type.
- ☐ System integrity provides a switch personnel requested single process purge input message for the MTP.

6.10.4.4 XAT

The X.25 packet switching access on T1 facilities (XAT) feature allows a T1 facility to be configured on a subscription basis to carry X.25 packet-switched data. Up to 24 DS0 rate channels of a T1 facility can be configured for packet switching. Any remaining channels on the T1 facility can be used for other digital services available on the 5ESS[®] switch. The maximum number of logical channels supported on an XAT channel is the same as for the BRI B-channels (128). The number of 64 kb/s channels that can be supported on PH2s, PH3s, and PH22s is 32.

The OTC personnel are able to remove/restore an XAT channel, obtain the status associated with the XAT ports, and request interactive loopback testing. Automatic fault recovery will also remove the facility from service when critical hardware faults/level 2 protocol problems are detected, and restore the facility to service when those problems are resolved. The SM audits routinely check the sanity of the XAT channel's dynamic data structure as well as condition all XAT ports.

6.10.4.5 Interswitch Links (Trunks)

6.10.4.5.1 Interswitch Internal Protocol Links Maintenance

6.10.4.5.1.1 Overview

This feature provides the base maintenance capabilities for testing interswitch internal protocol (IP) trunks. The IP trunks are used for routing packet traffic between 5ESS[®] switches (5E5 and subsequent software releases), or between the 5ESS[®] switch and a 1PSS switch (5E4 and 5E5 software releases). The 5ESS[®] switch continuously monitors traffic over the IP trunks, and automatically removes a trunk from service when that trunk's service falls below a certain threshold. When the trunk is automatically removed from service, the 5ESS[®] switch will generate alarms at the MCC and SCCS. The OTC personnel can

automatically test a particular trunk by remotely forcing a loopback at intermediate points. The 5ESS[®] switch supports level 1 and level 2 test runs from the TLWS. The OTC personnel can also manually force the 5ESS[®] switch to loop back a trunk to the far-end switch.

The OTC personnel can remove a particular trunk from service without disconnecting any transient or stable calls or causing the loss or mutilation of any packets. Trunks can also be smoothly restored to service.

The level 2 protocol on the interswitch trunks is the link access protocol - balanced (LAPB).

6.10.4.5.1.2 Service States

Interswitch trunks can be either in-service or out-of-service. When in-service, the trunk is active and able to handle calls. When out-of-service, level 2 on the trunk is down, the appropriate alarms are generated by the switch at the MCC and SCCS, and traffic that is normally routed over that trunk is routed over another trunk in the same trunk group (if another in-service trunk is available).

The 5ESS[®] switch does not routinely test or exercise in-service trunks. The protocol and measurements are used in detecting trunk problems.

6.10.4.5.1.3 Automated System Maintenance

The automated system maintenance for the IP trunks includes:

- (a) The 5ESS[®] switch will automatically detect and report internal faults affecting service on an IP trunk.
- (b) The 5ESS[®] switch will automatically generate alarms at the SCCS and MCC when a trunk is removed from service automatically (due to a failure) or manually (per a switch personnel request). The OTC personnel can specify a threshold for each trunk group for major and minor alarms. If after the trunk is removed from service, fewer trunks are in service than are specified in the threshold for that trunk group, the switch will generate a major alarm. If, however, there are still sufficient trunks in service (that is, more than the OTC specified threshold for that trunk group) after the failure, the 5ESS[®] switch will generate a minor alarm. The cause of the alarm, (for example, 5ESS[®] switch internal failure, level 2 failure, switch personnel request, etc.), the trunk group and member numbers, and the equipment number of the failed trunk are included in the message sent to the SCCS and MCC.
- (c) The 5ESS[®] switch will automatically restore level 2 on interswitch trunks in the case of a switch initialization (except for the highest level of initialization).
- (d) With a carrier group alarm (CGA), the 5ESS[®] switch will remove all affected trunks from service and generate the appropriate alarms at the SCCS and the MCC. When the switch detects that the CGA has been removed, it automatically restores level 2 on the affected trunks, returns the trunks to the in-service state, and clear the alarms.
- (e) The 5ESS[®] switch can differentiate between level 1 and level 2 failures and include the cause of this failure in the corresponding alarm message sent to the SCCS and MCC. If the cause is indicated as level 1, it is assumed that the failure has occurred in the DDS network. If the cause is level 2, the trouble is probably at the far-end switch.
- (f) The 5ESS[®] switch will automatically monitor LAPB frames over interswitch trunks and take measurements to evaluate the trunk performance. If a threshold is exceeded, the trunk is automatically removed from service and the appropriate alarms are generated at the SCCS and MCC. The 5ESS[®] switch will not attempt to automatically restore level 2 if the trunk is removed from service due to poor performance.

- (g) If level 2 on an active trunk fails, the 5ESS[®] switch will remove the trunk from service and generate the appropriate alarms. If level 2 is restored as a result of an attempt by the far-end switch personnel request, the trunk is automatically returned to the in-service state and the alarms are cleared.

6.10.4.5.1.4 Manual System Maintenance

6.10.4.5.1.4.1 Overview

In the case of a trunk failure, the 5ESS[®] switch supports manual level 1 loopback tests for locating and diagnosing failures. Upon completion of the tests, the OTC personnel is able to restore a trunk to service and clear the alarms. The switch personnel can also remove an active trunk from service for testing.

6.10.4.5.1.4.2 Level 1 Tests

The level 1 tests are either sectionalization or performance as follows:

- ☐ Sectionalization tests are used to determine a hard failure and, as such, should be of short duration. A 15-second loopback test is used to isolate the failure. The threshold for this test is three or more errored seconds in one 15-second test.
- ☐ Performance tests are used to verify that the trunk is operating properly, and must be of long enough duration to ensure statistical confidence. The performance test are performed in 5-minute intervals. If during the first interval, 3 or fewer errored seconds are observed, the trunk is functioning properly. If 6 or more errored seconds are observed, then the trunks performance is unacceptable. If 4 or 5 errored seconds are observed, another 5-minute test should be performed, up to a maximum of three 5-minute intervals. If more that 11 total errored seconds are observed during the three test intervals, then the trunk is not performing acceptably.

The 5ESS[®] switch also reports the bit error rates for these tests. Longer tests are also available. As an option, the OTC personnel can choose a test duration of 5, 10, or 30 minutes, or 1, 2, 4, 8, 12, or 24 hours. The 5-minute interval is the default.

6.10.4.5.1.5 Maintenance I/O Messages

The 5ESS[®] switch provides input/output messages to allow the OTC personnel to perform the following functions:

- ☐ Check the status of a trunk
- ☐ Request diagnostics and audits of 5ESS[®] switch equipment
- ☐ Remove a trunk from service
- ☐ Restore a trunk to service
- ☐ Initiate and abort level 1 and level 2 tests
- ☐ Start trunk recovery actions
- ☐ Scan error log to identify chronically bad trunks.

All maintenance operations except for the physical replacement of circuit packs can be performed at the MCC and SCCS. Status displays are provided at the MCC depicting the state of the individual interswitch trunks.

6.10.4.5.2 X.75' Links Maintenance

6.10.4.5.2.1 Overview

The X.75' feature uses the same physical facilities as the IP trunk groups and a level 2 protocol similar to that of the IP trunks. The automated maintenance strategy is different because of the fact that virtual calls and permanent virtual circuits (PVCs) on the X.75' trunks are not automatically rerouted in the case of a trunk failure as with the IP trunk failures.

6.10.4.5.2.2 Service States

The following service states are possible on an X.75' trunk. These states assume that the T1 carrier system is installed and active:

- (a) **Out of Service Administration:** The trunk has been assigned to an X.75' trunk group, assigned to a PH but not necessarily tied to it, level 2 and level 3 protocols are not active, not available for data traffic, can apply test bit patterns at level 1 and analyze the looped back return signal, has the ability to be put into a level 1 loopback condition for use by the distant switch, has the ability to cause loopbacks at DDS equipment. This state is only entered by a switch personnel command.
- (b) **Out of Service - Maintenance Disabled:** This state has all the characteristics of OOS-circuit administration except that this state is entered by automatic or manual, conditional or unconditional removal procedures as well as by a switch personnel command. If entered from an in-service state, disconnect is sent upon entry.
- (c) **Out of Service - Maintenance Locked Out:** A state in which the level 2 protocol is in the disconnected mode, responds to receiver not ready (RNR) queries or set asynchronous balance mode (SABM) or any control frame with the poll bit set to 1 by sending disconnected mode (DM), not available for call traffic, sends disconnect (DISC) when the state is entered, sends interframe fill flags. This state is used in the trunk turn-up procedure in which the controlling end wants to maintain control of the exact time of start-up but in the meantime wants to respond to a transmission from the other end (with a DM frame) so that the noncontrolling end will know that the controlling end is provisioned and ready to go. This state can also be used as a test state in which test equipment such as oscilloscopes and protocol analyzers may be used to observe signals on the line without having actual data traffic in progress.
- (d) **Out of Service Blocked:** A state in which the level 2 process waits for an initiating message (SABM) from the far end but makes no attempt to send such a message, not available for call traffic, sends interframe fill flags. This is a variation of the protocol disconnected mode, but DISC is not sent when the state is entered.

There are two variations of this state, manual and auto. If the state is entered by direct switch personnel action, it is in the OOS-blocked-manual state and the behavior is as described in the previous paragraph. This state is used in a trunk turn-up scenario in which this is the noncontrolling end. In that role, the trunk is made active and ready to go in response to initiation from the other end but does not initiate a start-up action.

If the state is entered by the automated maintenance process because of failure to start or restart the level 2 transmissions or because a disconnect is received from the other end, the state is considered to be OOS-blocked-automatic. The behavior of this state is the same as "OOS-blocked manual" except that the condition of the line is checked periodically and, if there are flags being received from the far end, the trunk is automatically restored to the start-up state. In that state, there is an attempt to reestablish communications through a trunk setup procedure. The automatic restore operation is performed approximately every 2 minutes. The periodic attempt to restart the protocol process is necessary to prevent a deadlock situation where both ends of the trunk wait passively for the other end to start the protocol processes.

- (e) **Out of Service, Blocked Startup:** A state in which the level 2 process sends the SABM command to initiate the link level communication. During this initializing process, calls are not to be routed to the trunk. If the command is successful, the trunk changes to the in-service state.

If the setup is not successful, the process is repeated a number of times according to the rules of the protocol. If the attempts are still unsuccessful, the trunk is changed to the "listen only" state (OOS-blocked) and OTC personnel are informed of the failure with as much detail as possible on the reason for failure. The following is a list of possible conditions which may be encountered on a failure to start and which should be considered for possible reporting to the switch personnel.

- ☐ No link level fill flags received
- ☐ No response to requests (SABMs)
- ☐ Response frames have CRC errors
- ☐ Response is not logical (for example, wrong type of frame or wrong A-B address)
- ☐ Disconnect mode response.

This detailed description of the protocol failure is provided when the start-up is initiated by the switch personnel. If the start-up is initiated by the automated maintenance processes, a less detailed transition message is produced. During an attempt to execute the protocol start-up procedure as a result of a level 2 failure or an idle link condition, new call requests are not routed to the trunk and existing calls are left active.

- (f) **In Service:** In this state the trunk is available to accept and process level 3 traffic. Within this state, the only limitations on acceptance of traffic from either end are a function of overload, availability of logical channels, or protocol flow control actions. These represent busy conditions on the trunk but do not require a different state on the trunk or notification of the switch personnel.

When the OTC personnel executes a command for conditional removal, this state continues to process level 3 virtual calls but does not accept new ones from either end. Outgoing calls are blocked by routing and incoming calls are cleared. When virtual calls are completed, the trunk is taken out-of-service maintenance disabled. The PVCs are reset. The length of time that the trunk will wait for the completion of calls before "giving up" is set by the switch personnel (maximum of 24 hours). If this period of camp-on completes before the virtual calls have completed, the trunk begins full service by accepting new calls.

- (g) **In Service Degraded Link Level Quality:** This state is a variation of the in-service state which does not accept new outgoing calls. This variation of in-service is entered as a result of automatic maintenance actions due to level 2 quality problems in which it is desirable to inhibit new traffic on the trunk and yet continue to provide some service in a degraded form. The degraded service is used to keep PVCs active which would be denied service totally if the trunk was taken out of service. Incoming calls are given degraded service rather than denying them service with no explanation to the far end. Trunks in this state are automatically restored to full in service approximately once per day. If the level 2 quality problem has cleared, the trunk is successfully restored to service. If the quality problem persists and the trunk is returned to the degraded quality state, the accompanying notification reminds the switch personnel that the problem requires attention.
- (h) **Out of Service Facility Failure:** This is a state in which a CGA exists and all communication on the trunk is lost. The level 2 process is not active. When the carrier failure is repaired, the trunk is automatically restored to the start-up in-service state.

6.10.4.5.2.3 Automated Maintenance

The automated maintenance system monitors level 1 and level 2 processes for proper logical function and for transmission quality. The automatic switch actions are as follows:

- (a) **Switch Initialization:** Automatically restore level 2 on X.75' trunks.
- (b) **Carrier Group Alarm:** The affected X.75' trunks are unconditionally removed from service, and the switch personnel is notified of the event.
- (c) **Level 2 Failures:** This condition is indicated by the lack of response to transmissions followed by an unsuccessful time-out recovery procedure.

When this condition occurs, attempt is made to reestablish communications by sending SABMs. If the number of attempts dictated by the protocol parameters have been made and the setup is not successful, the trunk is unconditionally removed to the listen-only mode (OOS blocked automatic), and the trunk is reported as "OOS blocked automatic" with added information as to the cause of the failure.

If flags are being received from the distant switch, an attempt to reestablish communications is made at approximately 2 minute intervals. This attempt consists of automatically restoring the trunk to the start-up state.

- (d) **Idle Link:** This condition is detected by the absence of interframe fill flags for a time period measured by the level 2 protocol procedures. When this condition is detected, the trunk is unconditionally removed to the OOS-blocked automatic state and reported as such with the added information "no fill flags". In this state the trunk is periodically checked for the presence of flags and if they are present, the trunk is automatically restored to the in-service/start-up state to try to reestablish communications.
- (e) **Level 2 Quality:** If the quality assessing measures indicate that a trunk should be removed from service, the trunks are put in the service-degraded link level quality state in which no new outgoing calls are accepted but existing outgoing calls are allowed to complete. The trunk is left in the service-degraded link level quality state. The OTC personnel can take action to remove it or restore it. The 5ESS[®] switch will attempt to restore it approximately once a day. The OTC personnel is notified of the transition to this state.

While in the service-degraded link level quality state, new incoming calls are accepted even though they may get poor quality service and that PVCs are left in service. Therefore it is important for the OTC personnel to take prompt action to correct the problem and/or notify the distant switch personnel that the condition exists. Also note that the automatic removal to this state is denied if the removal would result in less than the minimum number of trunks in service.

- (f) **Disconnect Received from Far End:** The trunk is unconditionally removed to the listen only state (OOS blocked), and the OTC personnel are notified of the action with the added information of disconnect received.

The fact that the protocol procedures and error checking mechanisms are continually monitoring the service on a packet trunk and that the quality of the level 2 process is being continually assessed reduces the need for periodic testing of packet trunks. In addition, PVCs represent a pseudo "nailed up" connection which should not be interrupted. Therefore, the routine exerciser does not remove any hardware units which are required to support these trunks and automatic trunk testing processes such as automatic progression testing should not be applied to these trunks.

6.10.4.5.2.4 Manual Maintenance

For the analysis of problems, OTC personnel must access and examine the error rate data that is accumulated at each trunk by the performance monitoring system. There are four manually controlled out-of-service states as follows:

- ☐ OOS Circuit Administration
- ☐ OOS Maintenance Disabled
- ☐ OOS Maintenance Locked Out
- ☐ OOS Blocked.

Transitions between all states are allowed. Transitions from the four OOS states to in-service state are allowed. The switch may automatically perform loopback tests on such transitions.

Transitions from the in-service state to the OOS states include removal to the OOS maintenance locked out and the OOS maintenance disabled states. Removal to the OOS blocked state may be allowed but the trunk will most likely be immediately restored by trunk setup procedures from the distant switch.

The OTC personnel can remove a trunk conditionally or unconditionally. Unconditional removal executes the transitions from in-service. Conditional removal first causes restriction of traffic (camp-on function) and, when the camp-on functions have been met, a transition to the specified OOS state occurs.

Trouble detection and isolation (local, trunk, or remote) is possible through the execution of various levels of loopback tests combined with coordination with the remote administration. The loopbacks are all on a trunk basis. All transmitted and received bit patterns are processed only at level 1. The switch must have the following loopback test capabilities under the control of the switch personnel:

- (a) Execute loopback tests, consisting of level 1 test patterns, to the office channel unit or the data service unit/channel service unit of a T1 carrier system including the automatic establishment of the loopbacks. This test can be executed from the MCC or the TLWS. It can be run in the OOS state or, if there are no active calls and no PVCs on the trunk, it may be run in an in-service state. This type of loopback testing is automatically executed in response to "test trunk" commands unless the trunk is provisioned to inhibit the automatic tests. In that case, the request is denied and an indication that the test is "not allowed" is provided to the switch personnel.
- (b) Execute loopback tests consisting of level 1 test patterns to the remote switch after the remote administration has put that trunk into a loopback mode by request of the local OTC personnel. This is a manually setup test requiring the cooperation of switch personnel with access to both ends of the trunk. The test can be requested to process a looped back signal which is identical to the one sent. This test is executed through the TLWS.
- (c) Establish a loopback state on a trunk in the local switch for use by OTC personnel at the distant switch. This loopback can be set up to produce a return signal identical to the one sent to the switch. This test is executed through the TLWS.

6.10.4.5.2.5 Notification and Alarms

The notification and alarms are produced to indicate transitions between the various trunk states as follows:

- ☐ Notification of transitions between states is provided and gives a meaningful indication of the actions on a trunk. When maintenance actions or massive failures result in numerous changes, it is possible to suppress the reporting of all transitions.
- ☐ A minor alarm is generated if an automatic or manual trunk removal puts PVCs out of service, or the removal results in a number of trunks in service which is less than that specified by the automatic maintenance limit or the minimum number includes trunks which are forced in service by AML.
- ☐ The OTC personnel is notified if a trunk is automatically put into the "in-service degraded link level quality state."

6.10.4.5.3 X.75 Links Maintenance

6.10.4.5.3.1 Overview

The X.75 feature uses the same physical facilities as the X.75' and the IP trunk groups. The level 2 protocol is identical to the X.75' trunks and is very similar to that of the IP trunks. The X.75' maintenance strategy applies entirely to the X.75 trunk feature.

The only differences are that the far end of the X.75 trunk is terminated in devices controlled by a different administration and that the level 3 protocol has a few differences.

6.10.4.5.3.2 Service States

The service states for the X.75 trunks are the same as specified for the X.75' trunks.

6.10.4.5.3.3 Automated Maintenance

6.10.4.5.3.3.1 Overview

The automated maintenance actions in response to level 1 and level 2 problems are identical to the X.75' trunk.

6.10.4.5.3.3.2 Routine Maintenance Actions

The fact that the protocol procedures and error-checking mechanisms are continually monitoring the service on a packet trunk and that the quality of the level 2 process is being continually assessed reduces the need for periodic testing of packet trunks. In addition, the PVCs represent a pseudo ``nailed-up" connection which should not be interrupted. Therefore, the REX will not remove any hardware units which are required to support these trunks and automatic progression testing is not applied to these trunks.

6.10.4.5.3.3.3 Monitoring Actions

The ALE function which evaluates the performance of all ports will also monitor and report on ports serving X.75 trunks.

6.10.4.5.3.3.4 Protocol Monitoring

The protocol monitoring and trouble notification includes:

- ☐ The detection of protocol anomalies and the generation of protocol error records when the anomalies occur in the level 2 protocol (single link procedure) or the X.75 level 3 protocol. The anomalies that are defined for the X.75' protocol are applicable to the X.75 protocol.
- ☐ The ability to enable protocol monitoring on any trunk group member and to designate the event which triggers the monitoring.
- ☐ The ability to access the protocol error records and to identify and examine entries associated with a particular trunk.
- ☐ Requirement that a count of the PERs generated be kept per trunk and reported through the ALE system and that a time threshold be applied to the rate of generation of PERs for each trunk. If that threshold is exceeded, the switch personnel is notified through an output message.

6.10.4.5.3.4 Manual Maintenance

6.10.4.5.3.4.1 Switch Personnel Controls

The OTC personnel have the ability to alter the states of service of the X.75 trunk through remove and restore commands.

6.10.4.5.3.4.2 Switch Personnel Test Capabilities

Trouble detection and isolation (local, trunk, or remote) is possible through execution of various levels of loopback tests combined with coordination with the remote administration. The test capabilities are the same as those specified for the X.75' trunks.

6.10.4.5.3.5 Notification and Alarms

Notifications and alarms are produced to indicate transitions between the various trunk states. The requirements for such notification are the same as those for the X.75' trunks.

6.10.5 RETROFIT

6.10.5.1 OSPS Retrofit

6.10.5.1.1 Software Retrofit

6.10.5.1.1.1 Host 5ESS[®] Switch Software

The retrofit of the switch-side software must be performed in accordance with the guidelines established for core software release retrofit. Switch-side software changes may be necessary to support new firmware in the OSPS equipment or new releases of OSPS administrative processor (OAP) (3B2), directory assistance system/computer (DAS/C), real-time rating system (RTRS), or automatic centralized charge quotation system/manual centralized charge quotation system (ACCQS/MCCQS) software.

6.10.5.1.1.2 OAP Software

The OAP software changes must be coordinated with the 5ESS[®] switch changes. Switch-side software changes must be installed and be downward compatible.

6.10.5.1.1.3 DAS/C Software

All DAS/C software changes affecting the interaction with OSPS must be coordinated at the application level with OSPS personnel before implementation and should only appear in point releases of the software release. The DAS/C link software changes must be compatible with L2 [link access procedure B (LAPB)] synchronous terminal adapter (STA). Level 3 (DAS/C) and application software changes must be downward compatible. Switch-side software changes must be installed first and must be downward compatible.

6.10.5.1.1.4 RTRS Software

The RTRS changes must be coordinated with 5ESS[®] switch software changes. Switch-side software changes must be installed first and must be downward compatible.

6.10.5.1.1.5 ACCQS/MCCQS Software

The ACCQS/MCCQS changes must be coordinated with 5ESS[®] switch software changes. Switch-side software changes must be installed first and must be downward compatible.

6.10.5.1.2 Firmware Retrofit to Add New Functionality

6.10.5.1.2.1 Overview

The OSPS equipment contains firmware to provide the functions of link synchronization, message handling, alarm services, local diagnostics and local operating service systems. This firmware is not pumpable from the host 5ESS[®] switch. The equipment affected includes the BSTs and the VDTs. When new OSPS features are added, the new firmware is installed at the VDT/BST.

Automatic loopback testing consists of a test initiated by a single switch personnel from the near-end switch. In automatic testing, the switch personnel selects the channel to be tested, and then the switch sends a series of control codes which is recognized by the transmission equipment. The transmission equipment responds to these control codes by providing the loopback path at the transmission equipment. The switch then sends the test patterns which are looped back by the transmission equipment. The returned test patterns are analyzed by the switch to evaluate the performance of the interswitch link.

Both automatic and manual loopback testing is provided by link administration and maintenance (LA&M) using ISTF hardware and firmware.

6.10.5.1.2.2 Interswitch Link Routine Tests

All the routine tests that are scheduled regularly for regular trunks have to be disabled for the IP trunks. Since IP trunks can be uniquely identified in the static data base (through their port type attribute), the routine trunk tests should identify these ports and disable routine tests on them.

6.11 COMMON CHANNEL SIGNALING MAINTENANCE

6.11.1 OVERVIEW

The common channel signaling (CCS) trunk maintenance provides trunk and carrier group status administration and the testing of CCS trunks used with the 5ESS[®] switch. This includes the following functions:

- ☐ Blocking and unblocking of circuits and circuit groups (sending and receiving)
- ☐ Continuity check request and demand continuity testing
- ☐ Circuit reset sending and reception
- ☐ Hardware CGAs
- ☐ Machine detected interoffice irregularities (MDII) reporting
- ☐ Trunk testing
- ☐ Trunk query.

6.11.2 BLOCKING AND UNBLOCKING OF CIRCUITS AND CIRCUIT GROUPS

Circuit and circuit group blocking and unblocking signals can be sent by the 5ESS[®] switch. This allows the switching equipment or the maintenance personnel to remove/restore traffic from/to the far end of a trunk or trunk group because of a fault, or to permit testing.

A switch receiving a circuit blocking or group blocking signal will prohibit outgoing traffic on the affected trunks. Stable calls are not affected by the blocking; however, the trunk will be made unavailable for outgoing traffic after the stable calls are disconnected. A circuit unblocking or group circuit unblocking signal is used to remove the blocking state.

A switch sending a blocking or unblocking signal will receive an acknowledgment signal from the far end switch within a prespecified interval after the signal is sent.

6.11.3 CONTINUITY CHECK REQUEST AND DEMAND CONTINUITY TESTING

During normal call setup, call processing may initiate a continuity test voice path assurance test (VPA) on the trunk. This test ensures that both switches are in agreement on the translations of trunk identifier to trunk, and that the trunk is working. When a continuity check fails during a call setup sequence, trunk maintenance begins a continuity recheck procedure that quickly restores the trunk to service if the failure is transient. The continuity checks are run on a timed basis until continuity is restored or until they are stopped by maintenance personnel.

Maintenance personnel can also run a demand continuity check when a test to determine end-to-end trunk continuity is needed on the trunk.

6.11.4 CIRCUIT AND CIRCUIT GROUP RESET SENDING AND RECEPTION

The trunk and trunk group circuit reset is used to return a trunk to the idle state. A group reset message is sent to the connecting offices to restore a range of trunks to the idle condition.

Reset messages are used when a call is torn down abruptly by audits, when an SM initializes, when an RLC is not received during a call disconnect, or when a call has lost sanity due to reception of an unexpected message.

Prior to the 5E9(1) software release, the 5ESS[®] switch does not send group reset message but does support their reception. In the 5E9(1) software release, the 5ESS[®] switch supports sending of group reset messages for wideband calls only and their reception in general.

In the 5E9(1) software release, group reset messages are sent when an RLC is not received during a wideband call disconnect, or when a wideband call has lost sanity due to reception of an unexpected message.

When an RSC or GRS message is received during a call, an MDII is printed. Table 6-2 shows the MDII reported.

Table 6-2 Reset MDII Mapping

CIRCUIT CONDITION	MDII
Incoming Call on Trunk Circuit	CRR
Outgoing Call on Trunk Circuit	RST

The exchange sending RSC must wait until an RLC is received from the far-end switch before idling the trunk.

The exchange sending GRS must wait until a GRA is received from the far-end switch before idling any trunks.

The sending switch must repeat sending the RSC message, if an RLC is not received within a timing interval. If the receiving office does not acknowledge, the sending switch must resend the RSC every 4 to 15 seconds for a period of 1 minute. At the 1-minute mark, an REPT MDII CAF is printed and the trunk state

The sending switch must repeat sending the RSC message, if an RLC is not received within a timing interval. If the receiving office does not acknowledge, the sending switch must resend the RSC every 4 to 15 seconds for a period of 1 minute. At the 1-minute mark, an REPT MDII CAF is printed and the trunk state changes to OOS,MTCE,CCSINIT. After the 1-minute mark, each trunk in the OOS,MTCE,CCSINIT status sends a RSC message. This sending continues until the far-end office returns an RLC message or the OOS,MTCE,CCSINIT is removed from the trunk.

Similarly, the 5ESS® switch sends identical GRS messages in a pair (with a maximum of 5 seconds between the messages). The sending switch must repeat sending of the GRS pair, if a GRA is not received within a timing interval. If the receiving office does not acknowledge, the sending switch must resend the GRS pair every 4 to 15 seconds for a period of 1 minute. At the 1-minute mark, all trunks indicated in the GRS message change status to OOS,MTCE,CCSINIT resulting in a RMV TRK messages being printed. As in the preceding RSC sending scenario, after the 1-minute mark, each trunk in the OOS,MTCE,CCSINIT status sends a RSC message. This sending continues until the far-end office returns an RLC message or the OOS,MTCE,CCSINIT is removed from the trunk.

6.11.5 HARDWARE CARRIER GROUP ALARM

The hardware carrier group alarms alert the personnel at one end of the facility that the facility is unavailable for service. This allows call processing to avoid the use of the trunk associated with the call failure. The CCS hardware group alarm allows the end detecting the failure to notify the opposite end of the failure, thus allowing the far-end call processing to skip the associated trunk groups.

6.11.6 MACHINE-DETECTED INTEROFFICE IRREGULARITIES

A report of MDIIs is generated to identify failures to the local switch personnel. When the MDII handler receives an MDII from call processing and/or trunk maintenance events, the REPT MDII output message that corresponds to the particular irregularity is printed.

The following is a list of MDIIs that are associated with common channel signaling. For a detailed description of the messages, refer to 235-600-750, *Output Message Manual* (formerly OM-5D000-01).

- ☐ Automatic number identification (ANI)
- ☐ Address complete time out (ATO)
- ☐ Blocking acknowledgment failure (BAF)
- ☐ Circuit reset acknowledgment failure (CAF)
- ☐ Address incomplete received (CAI)
- ☐ Circuit initial address message irregularity (CII)
- ☐ Continuity check failure (CKF)
- ☐ Circuit reset address (CRA)
- ☐ Continuity recheck failure (CRF)
- ☐ Continuity time out (CTO)
- ☐ Vacant national number received (CVN)
- ☐ Extra digits (EXD)
- ☐ Incomplete address detected (IAD)
- ☐ Initial address message (IAM)
- ☐ Reset received (RST)
- ☐ SF1
- ☐ SF0

- ☐ Unequipped label received (UQL)
- ☐ Vacant code (VCA)
- ☐ Voice path assurance (VPA).

6.11.7 TRUNK TESTING

The CCS trunk maintenance supports all the existing TLWS capabilities that affect out-of-band signaling facilities. Existing transmission tests from the TLWS or CAROT are also provided. Existing operational tests that test the signaling capabilities of a trunk are not provided for CCS trunks. This is because the signaling is different from the voice path on CCS trunks. The VPA tests are provided and are available on a demand basis for CCS trunks.

6.11.8 TRUNK QUERY (5E11 and earlier)

The trunk query test allows an exchange to audit the software state of circuits between the near-end and connecting offices.

There are 14 states which are classified into six major categories as follows:

- ☐ Unequipped
- ☐ Transient
- ☐ Active
- ☐ Remotely blocked
- ☐ Locally blocked
- ☐ Remotely blocked and locally blocked.

The last four categories can be subdivided into the three circuit processing categories that follow:

- ☐ Idle
- ☐ Incoming circuit busy
- ☐ Outgoing circuit busy.

The trunk query verifies the state consistency of both ends of a trunk. Inconsistent states are corrected by sending the appropriate messages to the far end and adjusting the near-end state.

The trunk query requests are run automatically on a daily basis beginning at a Recent Change specified time of day.

Request for queries can be originated on a demand basis from a maintenance center. A demand trunk query that starts before the daily automatic trunk query interval starts will complete before the automatic trunk query process begins. Once the demand trunk query is complete, the automatic trunk query function starts. The 5ESS[®] switch supports the following input/output messages concerning automatic trunk query:

- ☐ **ALW:CCSTQ**; to allow the automatic trunk query to run
- ☐ **INH:CCSTQ**; to inhibit automatic trunk query from running

- ☐ **OP:CCSTQ**; to see if automatic trunk query is currently allowed.

A trunk query may be sent to determine the condition of the trunk or trunk groups. A response returned to the originating office may indicate a possible need for maintenance in one or more trunks or trunk groups. The trunk verification test message is sent to test a particular trunk or trunk group. The result of this test may be blocking of trunk, or the blocking of an entire trunk or trunk group.

6.11.9 TRUNK CIRCUIT QUERY (5E12 and later)

Circuit Query (CQ) is an SS7 inter-office auditing mechanism used to check and correct (if needed) the status of each end of an SS7 trunk. It can be run periodically or on demand.

The demand CQ reception and automatic CQ scheduling is handled by the AM as well as the common network interface (CNI) Circuit Query message (CQM) reception and final Circuit Query response (CQR) sending. The SM handles the trunk status queries and any required corrective action as well as PSU CQM reception and final CQR sending.

There are six ways to initiate an outgoing Circuit Query:

- (1) By an entire office - manually.
- (2) By an originating point code/destination point code (OPC/DPC) - manually.
- (3) By a trunk group - manually.
- (4) By a trunk group member number - manually.
- (5) By an entire office scheduled once daily - automatic.

There are also two ways that a running outgoing CQ can be halted:

- (1) By stopping a currently running request.
- (2) By aborting a currently running request.

The automatic CQ mechanism can be turned on and off by service provider personnel who can then query what CQ requests are currently running.

Incoming CQM requests are expected from the CNI and PSU; the expected reply is a CQR message containing the current trunk states.

Automatic Circuit Queries for the entire office or for specific trunk groups are provisioned through Recent Change. Typical Circuit Query message requests that control both automatic and demand CQs are briefly described here:

- ☐ **ALW:CCSCQ** - allows the next scheduled daily automatic CQ.
- ☐ **EXC:CCSCQ** - with appropriate options, initiates demand CQ jobs.
- ☐ **INH:CCSCQ** - inhibits scheduled daily automatic CQ jobs from running, but does not affect currently running jobs.
- ☐ **OP:JOBSTATUS** - shows service personnel which automatic and demand outgoing CQ requests are currently running.
- ☐ **STP:CCSCQ** - gracefully stops CQ request and optionally provides summary report.

For further information on CCS maintenance, refer to 235-200-116, *5ESS[®] Switch Signaling Gateway Common Channel Signaling*.

7. APPLICATION GUIDES

7.1 OFFICE TYPES

7.1.1 OVERVIEW

The 5ESS[®] switch has a modular hardware and software architecture. This enables building blocks of a single design to be used in all local switching system applications rather than separate designs for rural, suburban, and metropolitan systems. The modular architecture also permits economical growth of the 5ESS[®] switch throughout the entire range of office sizes. Thus, the 5ESS[®] switch can be used in all the following local switching system applications:

- ☐ New entity to satisfy growth demands in existing wire centers.
- ☐ Local switch modernization by replacing existing electromechanical or electronic switching systems with a 5ESS[®] switch or an multimodule remote switching module (MMRSM), [for example, to provide integrated services digital network (ISDN) services]. The MMRSM configuration consists of from one to four collocated single module remote switching modules (RSMs) that have been remoted from the 5ESS[®] switch host office through T1 facilities.
- ☐ New starts to establish new wire centers, particularly using the remote switching capability of the 5ESS[®] switch.
- ☐ Network element for intelligent network.
- ☐ Direct replacement of existing local/tandem electromechanical or electronic switching systems using the 5ESS[®] switch local/tandem feature.
- ☐ Operator services for tandem or local offices.
- ☐ Commercial automatic call distribution (ACD) [Management Information System (ACD/MIS) teleservices] for tandem or local offices.
- ☐ Private network switch.
- ☐ Automatic voice network (AUTOVON) tandem switch.

As a result of the potential service capabilities and economic advantages which a digital switch has over an analog switch, and the new network architecture in which the 5ESS[®] switch is applied, new opportunities exist for its application. These new opportunities include (but are not limited to) the following applications:

- ☐ As an extended office (XO), in outside plant feeder relief applications where a remote switch may be more economical than multiple pair gain systems.
- ☐ As a replacement vehicle, for exhausted analog stored program control (SPC) systems, for example, the 10A Remote Switching System (RSS), the 3ESSTM switch, the 2/2B ESSTM switch, or the 1ESSTM switch.
- ☐ As a capping vehicle, where replacement of an existing analog SPC switch is not economical but the office growth can be placed on a collocated 5ESS[®] switch or MMRSM.

These traditional and new applications are discussed in more detail in the following sections.

7.1.2 HOST APPLICATIONS

7.1.2.1 Local Switch Modernization

The majority of the initial applications for the 5ESS[®] switch consists of local switch modernization through the direct replacement of existing electromechanical and electronic switching systems. Larger electromechanical switching systems [for example, step-by-step (SXS) and No. 5 Crossbar] may be economically replaced with a 5ESS[®] switch or an MMRSM.

Modernization is further stimulated by the ability of 5ESS[®] switches to host RSMs. The combined local/tandem 5ESS[®] switch as a host for MMRSMs provides a strong economic incentive for converting entire rural clusters of offices to digital transmission and digital SPC technology.

The desire for digital services can also be a reason for modernization of the local switch. The 5ESS[®] switch ISDN provides an end-to-end digital environment that can handle digital voice, circuit-switched data, and packet switched-data simultaneously.

When used as part of the Metro-Digital Plan, digital services can be provided to customers previously served by an analog switch by collocating a 5ESS[®] switch with the analog switch in the same wire center. In this way, the 5ESS[®] switch can handle the digital needs of the customers as well as provide for additional growth.

For 5E12 a new feature - "Number Portability - NPA-NXX Growth" enhances wire center consolidation by allowing the same NXX to be assigned to multiple area codes. The feature is also helpful in area code splits.

7.1.2.2 Combined Local Tandem

The 5ESS[®] switch time division network provides an inherent 4-wire capability without modification to its network fabric. This capability, in conjunction with the optional local/tandem features, affords the opportunity to economically modernize many of the existing electromechanical combined local/tandem offices. These opportunities are stimulated by the 5ESS[®] switch direct interface with digital facilities and by its growable, modular design that permits local offices to be equipped for tandem operation or vice versa. The 5ESS[®] switch can also serve as an equal access tandem office.

7.1.2.3 Cap Analog Switching Entities

In large high-growth wire centers (such as those currently served by a 1/1A ESSTM switch), it may be desirable to begin providing growth on a digital switch. With the modular architecture of the 5ESS[®] switch, the economic benefits of digital synergy can begin to be realized by capping the existing analog switch and serving growth with an MMRSM, ORM (optically integrated remote module), or 5ESS[®] switch. Initially, this strategy may appear to be only marginally economical, but when applied in major metropolitan areas, it begins positioning the network for economical end-to-end digital connectivity with many potential new service offerings for major business customers (for example, ISDN). Also, with the availability of a 5ESS[®] switch host, deployment of an MMRSM or ORM in an XO mode becomes an economically attractive alternative for providing relief. This is especially apparent in metropolitan areas where outside plant additions, structure relief, building additions, and main frame rehabilitations are so costly.

7.1.2.4 Replace Analog SPC Systems

Many opportunities exist for applying the 5ESS[®] switch as a replacement vehicle for exhausted analog SPC systems, for example, the 10A RSS, the 3ESSTM switch, the 2/2B ESSTM switch, or the 1ESSTM switch. The following are examples of situations when replacement of an existing SPC switching system with a 5ESS[®] switch may be attractive:

- ☐ At exhaust of the SPC switching system when expansion, retrofit, or establishment of a multientity wire center is more costly than replacement.

- Where the advantages of digital growth or conversion in the local loop or interoffice facilities on digital switch are substantial enough to justify replacement of the analog switch, especially when combined with the value of reuse of the analog SPC equipment for growth at other locations.
- To establish a replacement program which supplies enough intracompany reused analog SPC equipment to minimize or eliminate future purchases of new equipment for that system. This may occur when the cost of maintenance and growth of the analog SPC system warrants such a program.

7.1.2.5 New Wire Center

A small 5ESS[®] switch can be an economically attractive way to establish a new wire center when significant distribution services expenditures are required for growth. The 5ESS[®] switch can expand as the area continues to grow, or later be converted to an MMRS when a suitable host becomes available (see "CONFIGURATION CHANGES", Section 7.1.4).

The 5ESS[®] switch is designed with a number of options. It can be adapted to most national networks; interface with either 24- (1,544 kb/s) or 30-channel (2,048 kb/s) digital circuits; and meet the International Telecommunication Standardization Sector (TSS) recommendations for timing for local, transit, and international gateway switching systems. Therefore, the 5ESS[®] switch uses standardized protocols and optionally supports both domestic and international standards. This gives it access to all markets, local and foreign. It is a digital machine that can interface with both foreign and domestic digital and analog switches. To be compatible with the timing accuracy requirements of any particular application, the plesiochronous mode (a cesium beam frequency standard) and the synchronous mode (using an external reference over digital links) are interchangeable.

7.1.2.6 Intelligent Network Applications

The Advanced Intelligent Network (AIN) allows OTC personnel to create, trial, and deploy revenue generating services quickly by using an advanced set of service creation tools. The Advanced Network Services (ANS) intelligent network products are designed to help OTCs meet their AIN goals. The 5ESS[®] switch is a key element of the ANS intelligent network products family. The advanced services platform (ASP) is a software package that runs on the 5ESS[®] switch and provides a platform of service-independent network functions and interworking capabilities allowing the OTC to offer a range of revenue generating services to their customers. The 5ESS[®] switch can serve as either a service switching point (SSP) or a network access point (NAP). Other elements of the ANS family of products include the ANS service control point (SCP), providing a database of service logic programs and customer data needed to provide intelligent network services; the ANS service circuit node (SCN), providing various information services to users through the use of highly specialized service circuits; the ANS service creation environment (SCE), providing a programming platform that lets OTC personnel create, trial, and deploy new services on the SCN and SCP; and the ANS service management system (SMS), providing a multi-faceted system that allows the OTC personnel to administer, test, and provision intelligent network services.

The ASP capabilities are built in a manner that allows their use for support of multiple services, and allows the evolution of the ASP and other network elements to future intelligent network specifications. ASP supports a network architecture that encompasses both digital and key analog switches (by using network access point functions) to provide good service area coverage while limiting the investment required in embedded base systems. The ASP provides a complete package of capabilities that includes, call processing, testing, administration, and maintenance capabilities. The ASP platform (initially available with the 5E6 software release) has standard interfaces, meaning service providers can use it with equipment from different vendors. Some of the services that can be offered using the ASP platform include personal communications services such as Follow Me, Origination-Based Routing, Multi-Location Business Group Extension Dialing, Incoming Call Management, Outgoing Call Management, Virtual Private Network, Network Call Distribution, and Televoting. All such services can be created by the OTC personnel using the service creation tools provided by the ANS SCE and can be deployed on the SCP. For complete description of the ASP capabilities, refer to 235-190-125, *Advanced Services Platform Feature Document*.

7.1.2.7 Operator Services

The 5ESS[®] switch is designed to provide operator services by interfacing with operator positions using a basic rate interface (BRI) T-interface. The OSPS (Operator Services Position System) feature of the 5ESS[®] switch offers a new generation operator service vehicle. It takes full advantage of the 5ESS[®] switch distributed architecture, digital time division switching, and modular hardware and software to efficiently and economically provide the following services:

- ☐ Automatic call distribution to operator positions [both directory assistance (DA) and toll and assistance (T&A)]
- ☐ Operator-assisted alternate billing services (ABS) including collect, calling card, and bill to third number
- ☐ Automatic calling card services (ACCS)
- ☐ Automatic coin toll service (ACTS)
- ☐ Operator-assisted coin services
- ☐ Operator-assisted international service
- ☐ Automatic charge quotation service/centralized charge quotation service (ACQS/CCQS)
- ☐ Connection to Automated Centralized Charge Quotation System/Manual Centralized Charge Quotation System (ACCQS/MCCQS)
- ☐ Call screening and calling card validation via billing validation application (BVA) queries
- ☐ Interface to vendor-supplied DA system/computer
- ☐ Automated announcement of directory numbers
- ☐ Direct access to the ISDN.

The OSPS design is sophisticated, yet flexible enough to allow economical introduction of new services using the ISDN capabilities provided by the 5ESS[®] switch. Another advantage of the OSPS feature is that its engineering, administration, and maintenance are common with the 5ESS[®] switch.

7.1.2.8 ACD/MIS Teleservices

The 5ESS[®] switch ACD/MIS system gives the local exchange carriers (LECs) the flexibility and sophistication they need to target the commercial ACD market as a source of new revenue, as well as providing a powerful base for inter-LEC applications. The 5ESS[®] switch ACD/MIS system extends the capabilities of the 5ESS[®] switch ACD by providing ACD features that are easy to understand yet powerful in their support of call center decision making. At the same time, the design of the system comfortably supports call centers ranging in size from a few agents up to a thousand agents.

The 5ESS[®] switch ACD/MIS provides for:

- ☐ Intelligent distribution of calls
- ☐ Queuing of incoming calls
- ☐ Detailed, easy to understand information for management.

The ISDN technology is used to furnish voice and data to the agent workstation. The combination of the 5ESS[®] switch ACD/MIS provides detailed information that ACD managers need to monitor the use of their call center resources and improve the performance and morale of the agents.

The 5ESS[®] switch ACD/MIS system provides for call center applications with unique advantages over other ACD alternatives. Inherent advantages of a network-based service offering, flexible growth, reliability, telephone company maintenance, feature evolution, can be combined with effective management information to give the customer total control over their ACD resources.

A 5ESS[®] switch based commercial ACD also has advantages for the service provider, an offering based on the proven capabilities of the 5ESS[®] switch and an MIS offering designed specifically to support commercial ACD applications.

The ACD software of the 5ESS[®] switch performs the essential task of distributing calls evenly to teams of agents. The agent who has been idle the longest receives the next call. Call center supervisors have the ability to monitor their agents; agents are notified of the origination of incoming calls, and incoming callers are provided with announcements when all agents are busy and unable to answer their calls. These and many other needs are fulfilled by the feature set of the 5ESS[®] switch ACD/MIS.

The 5ESS[®] switch ACD/MIS can distribute calls to as many as 999 different serving teams of agents. It can queue 999 categories of calls by type, and then distribute those calls to agents within the appropriate serving teams. These efficiencies derive from the capability to distribute large call volumes over large numbers of agents located, if desired, over a wide geographical area.

7.1.2.9 Private Network Applications

The 5ESS[®] switch has been tailored to meet the specific requirements of private networks. The 5ESS[®] switch private branch exchange (PBX) is a business communications system which offers state-of-the-art digital communications voice and data features, and advanced switching technology. It is registered (AS593M-71282-PF-E) to be used as a PBX under the Federal Communications Commission (FCC) Part 68 rules and regulations.

The traditional method of connecting a PBX to the public-switched network is by using a ground-start trunk to terminate on a line unit in the central office. In the 5ESS[®] switch, this ground-start interface is obtained by using digital line trunk unit (DLTU) trunks connected to a D4 channel bank. A 2FXO channel interface circuit pack in the D4 channel bank is the ground-start trunk. The D4 channel bank is registered separately (EFE 6BT-13792-WP-N) with the FCC.

As a stand-alone switch, a single 5ESS[®] switch PBX can efficiently serve a range of customer location sizes, from medium-sized businesses to very large business complexes. The single switch strategy simplifies operations, administration, and maintenance for these large networks, and reduces operating costs. At the same time, the 5ESS[®] switch PBX delivers the same standard of reliability as that of the public network 5ESS[®] switch.

Because the 5ESS[®] switch PBX is based upon the same design as the public network 5ESS[®] switch, the full complement of station features, remote switching, and network interfaces are available. For very large private networks, the 5ESS[®] switch PBX may be used as a tandem switch, linking together many other PBXs throughout the electronic tandem network.

The 5ESS[®] switch PBX connects to other PBXs through tie trunks. These tie trunks can be either digital T-carrier or analog (2-wire or 4-wire E&M). The 5ESS[®] switch PBX interfaces include the following:

- ☐ Direct inward dialing
- ☐ Direct outward dialing

- ☐ Listed directory number calls to PBX attendant
- ☐ Foreign exchange calls
- ☐ Wide area telecommunications service.

In all these cases, the 5ESS[®] switch fully complies with the FCC, Part 68 regulations governing connection to the public network. The 5ESS[®] switch is also fully compliant with the FCC Part 15 regulations that limit electromagnetic interference by customer premises computing equipment.

7.1.2.10 AUTOVON Network Tandem Switch

The modular architecture of the 5ESS[®] switch and its state-of-the-art communication technology allow the 5ESS[®] switch to be easily integrated into the defense switched network (DSN)/AUTOVON network. The customer can specify a DSN/AUTOVON interface initially; or with a subsequent software release, select a DSN/AUTOVON nodal or DSN/AUTOVON multifunction switch.

7.1.2.11 ISDN

The ISDN is a single integrated transport network that provides simultaneous voice and data services to a fully integrated network. An ISDN 5ESS[®] switch provides an end-to-end digital environment that can handle digital voice, circuit-switched data, and packet-switched data simultaneously. Prior to ISDN, customers needed separate telephone lines for voice and data. With ISDN, both voice and data can be transmitted simultaneously over the same interface.

Two types of switching exist in the ISDN environment:

- ☐ Circuit switching
- ☐ Packet switching.

With circuit switching, a dedicated path is used by the caller to provide for continuous voice or data flow. Each call is assigned its own path.

With packet switching, one path is used simultaneously by many users. This information is split up into smaller packets that are switched independently. Packet switching is only used for data transmission at the present.

7.1.3 REMOTE APPLICATIONS

7.1.3.1 Local Switch Modernization

Elements of the 5ESS[®] switch can be used in office modernization or consolidation. For example, small electromechanical local offices may be replaced economically, depending on its size, with any combination of the following:

- (1) An RSM, ORM, MMRSM, or EXM-2000 subtended from a host 5ESS[®] office located up to 600 hundred miles away.
- (2) A small 5ESS[®] office consisting of an administration module, a communication module, and any combination of one or more SM, SM-2000, and capable of subtending its own satellite of remotes.
- (3) Any small office created in the manner as (2) above, may itself become a candidate for being converted to a remote with colocated ORMs and EXM-2000 with the AM and CM degrown.

- (4) An ORM, or EXM-2000, or RSM may also be colocated with 1A ESS, other vendor switches for capping purposes or providing additional capabilities (for example, ISDN).

Possible combinations are numerous, pointing to a switching system that enables great flexibility in switch deployment.

7.1.3.2 New Wire Centers

An MMRS is an economically attractive way of establishing new wire centers. The application of the MMRS to new wire centers is enhanced by the fact that the MMRS can share the NXX designation of the host 5ESS[®] switch (provided the two wire centers are within the same rate area). If, however, the MMRS will eventually be converted to a host office, NXX sharing is not recommended.

Like the 10A RSS, the MMRS can be used to economically bring SPC switching technology to new wire centers at, in many cases, a smaller initial line size than with stand-alone SPC systems. This approach reduces the need for long loop plant. If the new wire center is expected to remain small for the duration of the planning horizon, the MMRS can be the long-term solution to a particular wire center problem. The MMRS may, of course, only be an interim solution and may grow to a stand-alone 5ESS[®] switch as demand increases.

Some of the capabilities provided by the MMRS which make it suitable for both local switch modernization and new wire center applications are as follows:

- (a) Zero resistance point for the loop plant.
- (b) Access to operational support systems through the host office.
- (c) Stand-alone capability to provide autonomous intra-MMRS switching in the event that T1 facilities to the host or the host itself fails.
- (d) The MMRS can share the office code of the host office if a new wire center is not planned, or can have its own dedicated office code.
- (e) Access through the host 5ESS[®] switch to the toll network.
- (f) Automatic and manually initiated diagnostics, automatic error recovery, and internal error analysis of failure(s).
- (g) Local alarm indications at the MMRS.
- (h) All features provided at the host are available to customers served by the MMRS.

7.1.3.3 Extended Office

The MMRSs may be economical alternatives for feeder relief within a wire center served by a 5ESS[®] switch. In this type of application, called XO, the remote switch serves a specified segment of the wire center; and provides the desirable features of both a pair gain and a new wire center application. The XO has a colocated remote distributing frame which provides service flexibility and efficient equipment utilization; and positions the area for possible conversion to a new wire center.

7.1.3.4 New Entity

Service and growth demands may eventually exhaust the switching capability of many existing local switching systems. At these trigger points, one service option is to add a new switching system entity to serve the additional growth demand. The 5ESS[®] switch is designed to be an economical system for this type of local switching application, particularly because of the ability to transition from an MMRS to a

stand-alone switch. This MMRS to 5ESS[®] switch conversion capability is being planned for future software releases.

7.1.3.5 MMRS

Planned or unplanned growth at a single module MMRS may be effectively dealt with by the addition of up to three RSMs at the MMRS site for collocated operation.

The MMRS can be remoted up to 104 miles from the 5ESS[®] switch. The MMRS can also be optionally remoted up to 150 miles from the host 5ESS[®] switch with an increase in the echo path delay of less than or equal to 0.75 ms. Although this will violate the transmission requirements listed in the 235-900-10X, *Product Specification*, the grade of service may still be acceptable to the customer. If a SLC[®] 96 carrier system is hosted by the RSM, the maximum combined distance from the host 5ESS[®] switch to the SLC[®] 96 carrier system is 120 miles. The MMRS can be remoted from 300 to 350 miles from the host 5ESS[®] switch in OSPS dedicated applications.

Multiple collocated RSMs are remoted from the 5ESS[®] switch via T1 facilities. The links between the RSMs allow completion of intrasite calls without routing them through the host 5ESS[®] switch. The optional stand-alone capability, which includes a provision for stand-alone billing (also an option), can be provided with the MMRS.

7.1.3.6 Optically Integrated Remote Module

7.1.3.6.1 Overview

The 5ESS[®] switch also offers a remote switching capability via the ORM. The ORM provides a DS3 (44.736 Mb/s) interface on the network control and timing (NCT) links, thus providing a remote switching module (SM) connected directly to the communications module (CM) through the standard fiber-optic transmission facilities. The DS3 transmission rate provides the customer with flexibility in the selection of the transmission equipment allowing the use of either single-mode or multimode fiber.

The ORM is available with two different host/remote transmission interfaces as follows:

- ☐ 100-Mile ORM
- ☐ 44-Mile ORM

The Far Access Remote (FAR) feature was later introduced as a special feature in a software update to the 5E9(2) software release. This feature enhances the loss insertion capabilities of the 5ESS[®] switch and provides additional flexibility in loss control. (Loss is inserted by the switch to control echo in voice connections.) This feature enables Remote Switching Modules to be located at greater distances from the host Switching Module. In some cases remotes can now be placed up to a distance of 600 miles from the host switch.

7.1.3.6.2 100-Mile ORM

The 100-mile ORM utilizes a transmission rate converter unit (TRCU) at each end of the NCT links to interface to standard transmission facilities. This option allows the ORM to be remoted up to 100 miles from the host 5ESS[®] switch. This eliminates the need for a host SM and provides full time slot allocation on the host-to-remote links. It also eliminates the need for additional traffic engineering.

The ORM can be optionally remoted up to 150 miles from the host 5ESS[®] switch with an increase in the echo path delay of less than or equal to 0.75 ms. Although this will violate the transmission requirements listed in the 235-900-10X, *Product Specification*, the grade of service may still be acceptable to the customer. If a SLC[®] 96 carrier system is hosted by an ORM, the maximum combined distance from the

host 5ESS[®] switch to the SLC[®] 96 carrier system is 120 miles (that is, host 5ESS[®] switch to ORM distance plus ORM to SLC[®] 96 carrier system distance).

The ORM is cost effective in metropolitan applications where fiber-optic facilities are already in place. The capabilities of the ORM are similar to the RSM with the exception of the stand-alone and multimodule features.

7.1.3.6.3 44-Mile ORM

With the 5E5 and subsequent software releases, a 90 Mb/s multiplexed transmission rate converter unit - model 2 (TRCU2) direct fiber optic transmission link is available to remote the ORM up to 44 miles from the host 5ESS[®] switch. The TRCU2 can transmit and receive optical signals, without the need for intervening transmission equipment.

The TRCU2 is available in two configurations; the TRCU2-O is available to drive the optical fiber as described in the previous paragraph, and the TRCU2-E supports the clear channel DS3 electrical signals.

The 44-mile ORM provides a point-to-point connection of ORMs to the CM of the 5ESS[®] switch using the TRCU2-O. The TRCU2-O converts the 32 Mb/s NCT rate to the 45 Mb/s DS3 rate and multiplexes the two DS3 channels (odd and even time slots from one CM) onto a single 90 Mb/s channel. The output of this channel can drive a single-mode fiber link (without repeaters) for a distance of up to 443 miles without any transmission loss.

7.1.3.7 Extended Switch Module - 2000

The Extended Switch Module - 2000 (EXM-2000) is an optically remote SM-2000, analogous to the ORM. Introduced with software release 5E9(2), the EXM-2000 supports optional stand-alone capability and an optional Stratum 3 clock capability and is remoted from a CM2 using QLIs, NCT link formatted fiber optic, and TRCU2 equipment. For the 5E9(2) software release, the SM-2000 does not support ISDN, IDCU, DCLU ATU, etc. These functions are supported by one or more SMs coexisting in the same office. The EXM-2000 accesses the functions provided by the local SMs during normal operations. In the 5E10 and later software releases, IDCU, ISLU2, and PSU2 are used to support ISDN.

When an EXM-2000 is isolated from the host switch, optional stand-alone functionality is available if purchased by the company. In the stand-alone mode, all ports in the module are able to reach any other port on the same module. This includes line to line, line to trunk, and trunk to trunk calls. This feature provides for the following:

- ☐ Maintenance of stable intra-module calls while transitioning and during stand-alone
- ☐ POTS termination to lines, local MLHGs, local trunk groups, and global trunks and MLHGs terminated on the module
- ☐ Emergency routing
- ☐ Announcements off 13A machine (or other) using IMT
- ☐ Intra-module trunking
- ☐ Billing
- ☐ Call waiting/forwarding/hold, speed calling.

7.1.3.8 Universal RISLU

The universal remote integrated services line unit (RISLU) is a RISLU used in all applications except OSPS

and C-ACD, and can provide ISDN and analog services to remote locations up to 150 miles from the host 5ESS[®] switch. The universal RISLU can be used in the following applications:

- ☐ Pair gain system
- ☐ Small CDO replacement
- ☐ PBX replacement
- ☐ ISDN range extension (used to serve customers beyond the qualified loop requirements)
- ☐ The introduction of ISDN in non-ISDN exchanges (often referred to as ``digital overlay’’).

The RISLU is an ISLU that can be remoted from the host 5ESS[®] switch via PCM carrier facilities. Hardware in the host SM converts data on the peripheral interface data buses (PIDBs) and control information on the peripheral interface control buses (PICBs) into pulse code modulation (PCM) format. Hardware at the remote site converts the PCM data back into the PIDB and PICB format. The synchronization signals at the RISLU are derived from the incoming data stream and a remote clock is provided in the RISLU to maintain critical timing. The RISLU supports the T- (4-wire) and U- (2-wire) interfaces for ISDN basic rate interface (BRI) services and the Z-interface for analog services. A RISLU can support up to 312 BRIs which can be a mixture of T and U cards. The Z-interface cards can also be equipped in the same RISLU with the BRI. The maximum number of cards (T, U, and Z) per RISLU is 512, but no more than 316 of these can be BRIs.

7.1.4 CONFIGURATION CHANGES

A small (1 to 4 modules) 5ESS[®] switch can be installed in an area with the objective that the area will ultimately be served by an MMRS from a different host office. When the host becomes available, the single module system can be converted to an MMRS, and the AM and CM can be reused in another part of the network. This 5ESS[®] switch to MMRS conversion capability is being planned for future software releases.

7.1.5 WIRELESS APPLICATIONS

7.1.5.1 Overview

This section contains an overview of the *AutoPLEX*[®] System 1000 communications system. The system elements, background information, and how a typical call is processed in the *AutoPLEX*[®] System 1000 are also discussed in this section.

The *AutoPLEX*[®] System 1000 provides a public wireless or mobile telecommunications network. The system includes radio communications facilities for access by the wireless/mobile customers. It also provides interconnections between the radio facilities and the Public Switched Telephone Network (PSTN). The radios are arranged in cells of 15 to 20 mile radius (flatland) or 5 mile radius (tall buildings or mountains), so that mobile units within the cell have access to the PSTN. Radio cells are installed adjacent to each other to allow mobile customers to move from cell to cell without losing the call. Calls can be placed to and from mobile units like any other telephone connected to the PSTN.

A cellular system eliminates the need for high-powered radio transmissions. Instead of servicing an entire coverage area from a single high-powered central transceiver at a high elevation, the cellular or Personal Communications Systems (PCS) service provider distributes several moderately-powered transceivers over a wide service area. A cellular or PCS system divides a service area into regions or cells. Within a cell, each channel can support one mobile phone user at a time. Channels are assigned dynamically for the duration of a call, and any user can be assigned to any channel. This results in a more efficient use of available channels and better service to the users, than assigning a user to a permanent specific frequency. In addition, cells that are not adjacent to each other are far enough apart in the system to allow

a user in another cell to be assigned to the same channel(s). This is called channel reuse. Channel reuse permits a cellular telephone system to handle a number of simultaneous calls; thus, making the cellular system more efficient.

Cellular and Personal Communications Systems (PCS) use one or more of the three air interface technologies; Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), and Code Division Multiple Access (CDMA). All systems provide individual channels for subscribers but with differing means and spectral efficiency. FDMA channels occupy one frequency pair. TDMA channels are one of six time slots on a frequency pair. CDMA channels are a code on a wide band carrier. Both TDMA and CDMA provide several times as many channels in a geographic area as FDMA.

Located at the physical center of each cell is a radio frequency transceiver, known as the cell site. Each cell site (CS) is responsible for the radio connection between subscriber units in its area and the rest of the network. The cell site is equipped with radio and control equipment. Each cell site connects to a mobile switching center (MSC) through traditional leased telephone lines or fiber optic cable. The MSC provides connections to the PSTN through Network Interface Trunks.

TDMA and CDMA are digital systems. Voices are encoded in a compressed form and transmitted as digital signals. Speech coders are required at the mobile to convert from analog, and at the MSC to convert to mu-law PCM voice encoding for transmission over digital telephony facilities. Speech transcoding introduces an end-to-end delay in the voice path necessitating echo cancellers to cancel echo from the land party, even on short connections.

The cellular system locates each subscriber unit (mobile unit or portable unit) in each area, and sets up a call as soon as it is requested. Each mobile unit can be either hand-held (portable) or vehicle mounted. Both types contain a microprocessor that continually performs operations and communications within the cell site, even when the mobile unit is not in use (but it is in standby mode).

7.1.5.2 *AutoPLEX*[®] System 1000

The current cellular communications system is built on the *AutoPLEX*[®] System 1000 platform.

The *AutoPLEX*[®] System 1000 interfaces through the PSTN through Network Interface Points (NIP). The NIP could be a central office or equal access switch that provides the MSC with an access to the PSTN. The *AutoPLEX*[®] System 1000 offers flexibility in serving cellular markets of various sizes with varying growth potential. The *AutoPLEX*[®] System 1000 contains the following system components:

- ☐ Mobile Switching Center (MSC)
- ☐ Cell Sites
- ☐ Trunking Connections to PSTN.

7.1.5.3 Mobile Switching Center (MSC)

7.1.5.3.1 General

The MSC is the heart of the system. It controls the switching between the PSTN and the cell sites. The MSC is equipped with switching and interface equipment. It provides the switching functions required to process calls to and from the cellular subscriber. It also provides diagnostic information, and compiles billing statistics. The MSC handles status data of mobile units received from the cell sites. In addition to performing all of the typical call-related functions of a telephone end office, the MSC also switches calls to adjacent cell sites in real time, as the mobile unit moves from the coverage area of one cell area to another. This process is known as call handoff. In addition, the MSC performs a paging function. During paging, the MSC broadcasts a message (mobile unit's identification number) throughout a service area through all the cell sites. The mobile unit monitors the messages being sent out by the cell sites, and responds when it

recognizes its own identification number. Paging is done to locate the mobile unit so that it can be notified of an incoming call. Paging also supports call delivery since the system usually does not know which cell area the mobile unit resides in when a call is placed into a network.

The MSC contains the following units:

- ☐ Executive Cellular Processor (ECP) Complex
- ☐ Digital Cellular Switch (DCS)
- ☐ Interprocessor Message Switch/Common Network Interface (IMS/CNI).

7.1.5.3.2 Executive Cellular Processor (ECP) Complex

The ECP complex is a collection of processors that controls the operation of the *AutoPLEX*® System 1000 system. It directs the DCS and the cell sites. The ECP complex acts as the overall control processor, and provides instructions for connecting trunks, outpulsing digits, etc. to the DCS over the data links. The ECP complex is the system component responsible for mobility management and system integrity.

Other functions of the ECP complex include the following:

- ☐ Data Communications: The ECP complex sends high-level switching messages to the DCS through the IMS/CNI ring to accomplish specific tasks. It communicates with the mobile units by sending high-level messages to the cell sites.
- ☐ Call Processing: The ECP complex performs the following call processing functions:
 - ☐ Verifying a call request
 - ☐ Processing subscriber unit originations received from the cell sites
 - ☐ Analyzing dialed digits
 - ☐ Routing calls
 - ☐ Processing incoming calls received from the DCS
 - ☐ Direct subscriber unit paging
 - ☐ Processing custom calling requests
 - ☐ Direct handoffs
 - ☐ Processing call disconnects.
- ☐ Charge Recording: The ECP complex collects billing information via the IMS/CNI ring for calls from each cell.
- ☐ Data Collection: The ECP complex collects scheduled measurements from its own software and from the cell sites to aid in system administration and maintenance. These measurements include counts of call traffic, usage of system resources, and equipment failures. The ECP complex collects this data from the IMS/CNI ring.
- ☐ System Maintenance: The ECP complex runs automatic diagnostics on its peripherals. Maintenance personnel at the ECP complex terminal can run diagnostic programs for cell sites and the IMS/CNI ring.

7.1.5.3.3 Digital Cellular Switch (DCS)

The Digital Cellular Switch (DCS) provides the cellular network switching to and from the cellular subscriber. It also provides switching functionality and voice connectivity to the PSTN. It is responsible for trunk switching and signaling in the system. Calls from and to the PSTN and mobile-to-mobile calls pass through the DCS. Other DCS functions include the following:

- ☐ Call Processing: The DCS performs call processing tasks that include:
 - ☐ Communicating with the ECP through the IMS/CNI ring
 - ☐ Switching trunks in response to ECP messages
 - ☐ Detecting incoming calls
 - ☐ Detecting answer and release on Network Interface Trunks (NITs).
- ☐ Administration interface: The DCS has an administration interface to aid in its operation and maintenance.
- ☐ Maintenance: The DCS performs its own maintenance functions without directions from the ECP.
- ☐ Initialization: The DCS performs its own initialization without directions from the ECP.
- ☐ Vocoder: The DCS provides vocoders for CDMA, and starting in 5E12SU provides TDMA vocoders.

7.1.5.3.4 Interprocessor Message Switch/Common Network Interface (IMS/CNI) Ring

The ECP uses the IMS/CNI ring as its message transport mechanism. The IMS/CNI ring handles message traffic and signaling between the ECP, DCSSs, and cell sites.

The IMS/CNI ring supports a number of nodes. These nodes provide interfaces between the IMS/CNI ring and other cellular components. Nodes contain processors which pass messages between the ECP, DCS, cell sites, and other networked *AutoPLEX*® Systems. The CNI ring then distributes messages down to the DCS, where they are further distributed throughout the switch. Message acknowledgements, failure messages, status changes, additional requests, etc. are exchanged throughout the course of the call.

The ECP and DCS interface consists of application level signaling messages that are transported over the IMS/CNI ring.

7.1.5.4 Cell Site

The cell site is the system component that provides the basic interface between the cellular system MSC and an end user's mobile telephone unit. The cell site contains the necessary radio and associated control equipment to link the cellular subscriber through the MSC, into the PSTN, and to other cellular subscribers. It contains radio and transmission equipment used to connect the system (via radio waves) with the subscriber's mobile unit. The *AutoPLEX*® System 1000 uses both Series I and II cell sites and Plan R microcells.

7.1.5.5 Trunking and Data Link Connections

7.1.5.5.1 General

The *AutoPLEX*® System 1000 uses voice trunks, packet pipes (PP), and data links to interconnect system components.

7.1.5.5.2 Voice Trunks

The *AutoPLEX*® System 1000 uses various types of voice trunks that are defined as follows:

- ☐ Cell site trunks provide a voice path between the cell site and the DCS for FDMA and TDMA with cell site vocoders.
- ☐ Packet pipes for CDMA and TDMA with switch-based vocoders.
- ☐ Loop-around trunks are used for mobile-to-mobile calls.
- ☐ Zone office trunks provide a voice path between the central office (in the PSTN) and the DCS.
- ☐ Intervendor trunks provide a clear channel voice path to the other vendor's systems, such as cell sites or cellular systems.
- ☐ Integrated Services Digital Network (ISDN) User Part (ISUP) trunks use special Signaling System 7 (SS7) signaling for interoffice connections.
- ☐ Recorded announcement trunks connect an incoming call to prerecorded announcement equipment.

7.1.5.5.3 Data Links

Data Links connect the ECP to the DCS, and the ECP to cell sites. Cell sites have dual data links, both of which are normally active. One data link handles call processing messages, while the other data link handles maintenance and administrative messages. If one data link fails, all message traffic with the cell is routed over the remaining data link.

The DCS data links are SS7 link sets with standard redundancy and link changeover for maintenance and recovery.

Separate cellular systems connect through intersystem data links. These are also dual data links, with one active while the other is in standby mode.

7.1.5.5.4 Signaling Types

Most trunk types require some type of signaling protocol to be followed. Trunks between the DCS and the PSTN use the following signal protocols:

- ☐ Wink-Start Signaling: A wink start signal is a momentary off-hook signal (on-hook to off-hook to on-hook) which lasts 140 to 290 milliseconds (ms). The receiving switch sends the wink-start signal approximately 100 ms after the initial trunk seizure by the originating switch. The wink-start signal lets the originating switch know that the receiving switch is ready to accept digits.
- ☐ Immediate-Start Signaling: When the receiving switch gets a call on a trunk group which uses immediate-start signaling, it expects to receive digits from the originating switch without having to send a start-dial signal (like a wink-start). The originating switch starts outputting digits about 70 ms after seizing the trunk on the receiving switch.
- ☐ Nonsignaling Facilities: These signaling types provide a clear channel for applications that do not require any type of signaling.
- ☐ ISUP Signaling: ISDN user part of Signaling System 7 common channel signaling using a message-based signaling protocol carries call setup and supervision information.

7.1.5.5.5 Cell Site Trunking

Cell sites providing FDMA use digital facilities for trunking to the MSC. Two methods are available for carrying voice: digital voice trunks for FDMA and TDMA with vocoders in the cell sites, and packet pipes for CDMA or TDMA with vocoders in the DCS. Packet pipes are fractional T1 carrying voice in frame relay layer 2 frames.

NOTE: For more information, see the 235-200-100, *5ESS® Switch FLEXENT™/AutoPLEX® Wireless Networks Applications OA&M Manual*.

7.1.6 COMMUNICATIONS ASSISTANCE FOR LAW ENFORCEMENT ACT (CALEA) APPLICATION

The CALEA - Core feature provides compliance to the Communications Assistance for Law Enforcement Act (CALEA) of 1994 for 5ESS®-2000 switches providing service to wireline subscribers. The CALEA Act requires that a telecommunications service provider be able to support lawful surveillance of the traffic in its network. CALEA requires that two levels of surveillance be supported:

- ☐ Level I: Provides call progress data for all of the subject's calls and call progress data for all calls redirected by the subject. Call content is not provided. This level is intended to satisfy Pen Register as well as Trap and Trace court orders. Level I corresponds to the "No CCC Option" defined in Bellcore GR-2973-CORE.
- ☐ Level II: Provides call progress data and all call content. It is equivalent to Level I plus call content. This is intended to satisfy a Title III court order which specifically authorizes the surveillance of call content for the subject's calls and for all calls redirected by the subject. Level II corresponds to the "All Content CCC Option" defined in Bellcore GR-2973-CORE.

The CALEA - Core feature provides this functionality for both circuit-switched and packet-switched calls in accordance with standard J-STD-025, produced by the Telecommunications Industry Association (TIA) TR45.2 subcommittee. J-STD-025 defines call data messages which report call events and are delivered to a Law Enforcement Agency over a Call Data Channel for both Level I and Level II surveillances. For a Level II surveillance, circuit switched call data correlates with call content, which is sent to the Law Enforcement Agency over a Call Content Channel. Also for a Level II surveillance, packet switched call data correlates with call content, which is sent to the Law Enforcement Agency over a Packet Data Channel. The call data messages defined by J-STD-025 (for both Level I and Level II surveillances unless otherwise specified) are as follows:

- ☐ Origination: reports a call origination attempt or number translation for a subject.
- ☐ TerminationAttempt: reports a call termination attempt to a subject.
- ☐ Answer: reports that a call or leg has been answered.
- ☐ Change: reports merging or splitting of call identities.
- ☐ Redirection: indicates that an incoming call attempt, originally directed toward a subject, has been redirected by the subject.
- ☐ PacketEnvelope: delivers intercepted ISDN user-to-user signaling packets to a Law Enforcement Agency. (Not used by the 5ESS® switch CALEA implementation.)
- ☐ Release: used to report that a call has been released.
- ☐ ConnectionTest: sent to verify the connectivity of the CDC.
- ☐ CCOpen: used to report the beginning of call content delivery on the Call Content Channel (Level II surveillances only).

- ☐ CCClose: used to report the end of call content delivery on the Call Content Channel (Level II surveillances only).

The CALEA - Core feature includes the 5ESS[®] switch functionality necessary to access and deliver call data and call content to a Law Enforcement Agency and the functionality necessary to administer surveillances and provision and maintain Call Content Channels, Call Data Channels, and Packet Data Channels. As part of the Call Content Channel maintenance, it supports providing C-tone, an idle circuit continuity tone (high tone) on each idle Call Content Channel connecting the switch to a Law Enforcement Agency.

7.2 5ESS[®] SWITCH GROWTH

Growth is the systematic modification of central office equipment to provide increased call-handling capacity and improved service. Growth is required to make a 5ESS[®] switch evolve economically over a wide range of services and traffic needs.

Growth (or degrowth) can be described as two distinct phases. These are switch growth and terminal growth. Switch growth is the addition of hardware that is part of the 5ESS[®] switch. Terminal growth is the addition of lines and trunks that are attached to the ports of the 5ESS[®] switch.

The term growth, relative to switch hardware, refers to the addition of equipment units to the office and/or the expansion of equipment units already present by adding circuit packs to existing cabinets. The term degrowth refers to the removal of equipment units and the removal of circuit packs from an equipment unit.

Since growth takes place in an operational office, one objective of growth procedures is to maintain the reliability and availability of the office. Reliability considerations dictate that growth does not interfere with normal office call processing programs. The integrity of growth units must be ensured before these units are made available to the operational office. Transient and stable calls are maintained throughout growth procedures.

The universal architecture of the 5ESS[®] switch requires a further definition of growth. Different types of growth will vary in complexity. The simplest and most straightforward types of growth include the addition of circuit packs to existing, partially equipped interface units, the addition of interface units to existing switching modules, and the addition of switching modules to an existing multimodule office.

Structural growth refers to conversions and retrofits. Retrofit is a change in the software release, for example, 5E5 to 5E6. Conversion refers to the change or replacement of hardware. The more complex growth in the 5ESS[®] switch will generally involve both retrofits and conversions; for example, from a single module office to remote switching module, or from a single module office to a multimodule office.

The ability to remove equipment, or degrowth, is also needed in a 5ESS[®] switch. Some ordinary degrowth is anticipated over the life span of a typical 5ESS[®] switch. Such degrowth may be necessary to support other growth procedures. Degrowth also allows for equipment to be removed and reused when office engineering overestimates the capacity of the system.

All software necessary to support growth is available with the corresponding software release.

In the 5ESS[®] switch, cabinets can be added to a working system with relatively few wired connections. Translation changes in the data base instead of wired logic modifications provide most of the information required by the 5ESS[®] switch as new cabinets are added.

When new equipment or equipment cabinets are added to a 5ESS[®] switch, they are added with minimum interruption in telephone service. The duplicated design of the 5ESS[®] switch permits numerous working configurations among the duplicated system units. After the new equipment is wired into the system, selected recent change updates are made to allow the system diagnostic and fault recognition programs to

test the new equipment. This testing takes place without interference to call processing.

In some cases, due to changes in office traffic, equipment or equipment cabinets must be removed from a working office. This is accomplished by using a reverse procedure from that required to add the same equipment or equipment cabinets to an office.

For additional coverage of 5ESS[®] switch growth and degrowth procedures, see 235-105-231, *Hardware Changes Procedures - Growth*, and 235-105-331, *Hardware Change Procedures - Degrowth*, respectively.

8. SUPPORT SERVICES

8.1 FACTORY TESTING

8.1.1 OVERVIEW

The factory testing (FT) process is the final stage of factory testing which ensures that each 5ESS[®] switch meets stringent hardware quality standards before being shipped to the field. The 5ESS[®] switch FT process is designed to be both effective and efficient, with the specific objective of clearing component and system level hardware problems in the factory rather than in the field. Factory testing makes full use of the 5ESS[®] switch environment to provide the final check of the 5ESS[®] switch. Factory testing for the 5ESS[®] switch is composed of basic and special circumstance testing. Factory tests are described in the following paragraphs.

8.1.2 5ESS[®] SWITCH FACTORY TESTING BASIC PROCEDURES

8.1.2.1 Overview

The FT basic procedures consist of separate system environment tests for each module type. These tests are performed concurrently. All modules are subject to quality control and/or quality assurance sampling at the completion of the test cycle. Modules are shipped directly from their respective test areas except under the special circumstances described in "5ESS[®] SWITCH FACTORY SYSTEM TESTING SPECIAL PROCEDURES", Section 8.1.3 .

8.1.2.2 Administrative Module System Test (AMST)

Administrative modules (AMs) are tested in a system environment using the 5ESS[®] switch software release diagnostics, which are loaded onto the AM disk drives as part of the operating system. A factory and installation test translations (FITTS) version of the office dependent data (ODD) is loaded during AMST and is available for use by the installer during the early part of the installation interval. The equipment configuration data (ECD) is customized during the AMST interval.

Each AM must meet the following test requirements:

- ☐ All modules must pass a power verification test; -48 V DC power is applied to the module. The intramodule power distribution system is verified by observing that all unit power circuit packs respond to the application of power.
- ☐ The AM must demonstrate the ability to "boot" from both the minimum configuration and full application mode versions of the operating system, from each set of disk drives, and on each simplex processor half.
- ☐ The AM must demonstrate the ability to recover to duplex operation from a forced simplex condition.
- ☐ All processor circuitry, memory, and input/output processor (IOP) interfaces must pass all diagnostics.
- ☐ All AMs must pass heat tests to ensure meeting reliability requirements. The heat test interval is 12 hours.

8.1.2.3 Communication Module System Test (CMST)

Communication modules (CMs) are tested in a system environment by a host AM using the 5ESS[®] switch software release diagnostics. The dual serial channel (DSCH) and scan and signal distribute (SCSD) interfaces are verified. All NCT links are looped-back during CMST.

Each CM must meet the following test requirements:

- ☐ All modules must pass a power verification test; -48 V DC power is applied to the module. The intramodule power distribution system is verified by observing that all unit power circuit packs respond to the application of power.
- ☐ All intermodule cables must be installed and duplex operation must be verified. Each simplex half of the CM must demonstrate the ability to communicate with each AM simplex half over the DSCH.
- ☐ The CM must demonstrate the ability to report alarms and power loss conditions to the AM over the SCSD links.
- ☐ The CM must demonstrate the ability to recover to duplex operation from a forced simplex mode.
- ☐ All CMs must pass heat tests to ensure meeting reliability requirements. The heat test includes two ramp-up/ramp-down cycles to eliminate marginal circuitry.
- ☐ Each hardware unit must pass 5ESS[®] switch software release diagnostics.
- ☐ The CM must maintain synchronization with a network clock reference during the entire CMST interval.

8.1.2.4 Switching Module System Test (SMST)

The basic building block of the 5ESS[®] switch is the switching module (SM). The majority of switch maintenance is carried out within each SM using the intelligence of the SM controller. All SMs are tested in a configuration known as switching module system test (SMST). The SMs under test are served by a factory-installed host complex composed of an AM, a CM, and a host switching module which supports remote SM (RSM) testing and provides the transmission test facility (TTF) required for line and trunk unit diagnostics.

Each SM must meet the following test requirements before the completion of the SMST:

- ☐ All circuit packs and spares must meet reliability requirements to ensure a failure-in-time (FIT) rate of two times steady-state by the end of the installation period.
- ☐ Each hardware unit must pass respective diagnostics. The diagnostics are part of the 5ESS[®] switch operating system, also known as the software release, and are the same diagnostics used in a working office environment.
- ☐ Each line unit (LU) grid must pass the grid exercise test in addition to diagnostics. The grid exerciser opens and closes crosspoints within the switching fabric.
- ☐ Each SM must pass a heat test. The SMST heat test is designed to eliminate marginal circuits or potential temperature-sensitive troubles. During the heat test, the temperature is raised from ambient room temperature to 49 degrees Celsius. After the temperature has stabilized between 47 and 49 degrees Celsius, the SM must pass all diagnostics including the LU grid fabric exerciser. The stabilized temperature interval must last at least 12 hours per controller.

8.1.3 5ESS[®] SWITCH FACTORY SYSTEM TESTING SPECIAL PROCEDURES

8.1.3.1 Overview

There are two types of special circumstance system test procedures. Both are based on the multimodule system test (MMST) concept. The MMST uses the AM, CM and at least two SMs from a customers order to set up a mini or base system. No factory owned "host" equipment is used in this environment. In either case, the required modules are routed from their respective module test areas through the MMST test area

prior to shipment.

8.1.3.2 First Factory Application (FFA) Tests

When a new 5ESS[®] switch software release is introduced to the factory, the first two customer orders assigned to the new software release are subjected to MMST testing. This is known as a first factory application (FFA) test. The primary goals of FFA testing are as follow:

- ☐ Demonstrating that the new software release retains the ability to download from the AM through the CM to the SMs. The mini system must operate in full application mode without any software or hardware inhibits set and without exhibiting any unexpected alarms or interrupts.
- ☐ Verifying that new factory office data base assembler (ODA) tools are reliable. The ODA tool problems are often exposed by alarm or interrupt conditions.
- ☐ Verifying the integrity of circuit diagnostics.
- ☐ Verifying the integrity of fan and fuse alarms and the ability of the switch to report intentional alarms to the switch personnel.
- ☐ Demonstrating the call processing capability of the new software release. A 6-hour call volume test is performed with the requirement that 99.99 percent of all originated calls be completed.
- ☐ Demonstrating the call processing capability of the new software release during a forced simplex and recovery to duplex condition.

8.1.3.3 Periodic Product Qualification (PPQ)

Software and hardware are normally considered stable products within 6 months after the Bell Laboratories first office application (FOA) interval. However, minor part and process changes, software updates, etc., may cause unintended deviations from the original design intent. To monitor compliance with design specifications a program of periodic product qualification (PPQ) has been implemented at the factory. The PPQ program operates on customer equipment in the MMST environment. Various portions of PPQ are performed at 2-month intervals (6 times per year) with the goal being to complete the entire set of tests within one year.

Besides the same type of tests described in the "First Factory Application (FFA) Tests", Section 8.1.3.2, additional tests performed are as follow:

- ☐ Residential Features
- ☐ Business Features
- ☐ Equal Access Signaling
- ☐ Transmission
- ☐ AMA Recording
- ☐ T1 Digital Measurements.

8.2 5ESS[®] SWITCH OFFICE DATA ADMINISTRATION

8.2.1 OVERVIEW

The initial provisioning of a 5ESS[®] switch with office data consists of a series of interactions between the

operating telephone company (OTC) and Lucent Technologies.

The primary purpose of the 5ESS[®] switch Office Data Administration (5 ODA) is to construct the initial office dependent data base, commonly called "translations," required by the 5ESS[®] switch for its call processing and diagnostic functions. In order to achieve this purpose, the 5 ODA system provides tools for interactive and batch data entry, data validation, and the data base construction process. In addition, the 5 ODA system provides immediate printouts of user-selected data on demand. Information and instructions for creating, modifying, and retrieving data in the 5 ODA system are provided in 235-080-100, *Translation Guide (TG-5)*.

8.2.2 DATA ENTRY

The data entry capability of the 5 ODA system is used to populate the office data base. With the 5 ODA system, there is no keypunching of records as with the other existing Lucent Technologies electronic switching systems. The entering of office data is completed by the telephone company and Lucent Technologies line engineering personnel using the following two data entry methods:

- ☐ Interactive data entry and validation through cathode ray tube (CRT) displays at a user work station.
- ☐ Batch data entry through magnetic tape.

With the first data entry method, data is input on-line through a time-shared computer, using a software tool which allows for human interface to the data base. The work station configuration and requirements are as follows:

- ☐ **CRT Terminal:** TELETYPE[®] teletypewriter terminal, model 5425, DEC[™] model VT100[™] terminal, or equivalent.
- ☐ **Printer:**
 - (a) Requirements:
 - ☐ 1200-baud communication rate
 - ☐ Employs "XON/XOFF" to signal host to start communications
 - ☐ Electronic Industries Association (EIA) RS232-C communications
 - ☐ 132 characters wide
 - ☐ 96-character American Standard Code for Information Interchange (ASCII) uppercase/lowercase print set.
 - (b) Desirable Features:
 - ☐ Receive only (keyboard is ineffective in this application)
 - ☐ Tractor paper drive.
 - (c) Suggested Printer: DEC[™] model LA120-RA (dot matrix, 180 cps), or equivalent.

Displays that appear on the CRT screen are known as "forms." These forms are used as the input records for the 5ESS[®] switch. The 5ESS[®] Switch Translation Guide documents the forms available.

All the validity checks that can be performed with solely the data on a given form are done at the time of data entry. Error messages are displayed immediately to the user who then makes the appropriate corrections.

At approximately 60 percent of the data entry interval, the initial entry data are complete enough for consistency checks to be made on all forms in the data base. At this point, the telephone company Translation Administrator must request that the Lucent Technologies engineer run the required data base consistency checks. The results of these checks are made available at the OTC and Lucent Technologies work stations so that corrections may be entered. Additional consistency checks are run as required.

During the processing interval, the user may request office record printouts of all or part of the data base at any time. These office records are printed directly at the user's work station and do not require a special order.

The second type of data entry, magnetic tape interface to the data base, allows data to be bulk loaded from an operations system (OS) or off-line data bases. This is useful when the telephone company already has data bases containing its line and trunk information. The data on the tape must be self-defining.

Self-defining means that there is information on the tape which defines the content of the data records. If the telephone company wishes to add, change, or delete a field, it does not have to coordinate the change with Lucent Technologies. The telephone company must, instead, change the definition on the tape. A specification on this interface is available from Lucent Technologies, along with a definition of the tape format.

8.2.3 ODA INTERVALS

Three sets of translations are provided for every 5ESS[®] switch. One set is used for factory testing and is known as the Factory and Installation Test Translation System (FITTS). The FITTS translations are forwarded to the Lucent Technologies manufacturing location by the Network Software Center (NSC). A second set known as Selected Line and Trunk Translation System (SLATTS) translations include equipment definitions, trunking, routing and charging, and test line translations, and are sent to the site. The full translations (FULLS) are translations which are forwarded to the site. The FULLS translations normally include customer line translations.

Office dependent equipment configuration information is delivered through the 5ESS[®] switch ODA "sendimst" process. The SLATTS translations are not required for factory system tests. However, any modifications in equipment configuration must be communicated to the factory through additional "sendimst" executions.

The data entry interval and the on-site date for the FULLS translations, depends upon the office size. The data must be error free at the "data entry complete" date. The data base is frozen at that time, and no further changes are permitted. The data can be updated in the 5ESS[®] switch through recent change once the translations are on site. The data entry intervals are subject to change by Lucent Technologies.

8.3 SHIPMENT AND INSTALLATION OPTIONS

8.3.1 SHIPMENT OPTIONS

Due to the increased strength of the 6-foot cabinets, the cabinets can be bolted together and moved as one block without requiring the reinforcement of unitizing steel. This allows flexible shipment options that can match unique site configurations. The following shipment options are available to meet central office constraints:

- ☐ Block unitization
- ☐ Loose (required for SM-2000).

The standard method of shipment is the block unitization. A block is a set of up to five cabinets bolted together and moved as a unit. A standard 4-foot by 8-foot equipment door can accommodate this size of block shipment. If the block exceeds four cabinets, careful consideration must be given to the turning radius for the lineups entering the equipment area.

A "loose" shipment consists of individual cabinets to be assembled on site.

8.3.2 CUTOVER PREPARATION SERVICES INSTALLATION OPTION

Turnkey projects are orders in which Lucent Technologies assumes centralized project coordination responsibility to engineer, manufacture, install, and test a 5ESS[®] switch. The cutover preparation services (COPS) installation option consists of Lucent Technologies support services which range from telephone office building construction to cutover of the 5ESS[®] switch. The package consists of 21 service modules. The OTC which opts for turnkey package services may elect for any or all of the 21 service modules to be performed by Lucent Technologies. The modules themselves may be segmented. Therefore, the turnkey package may be tailored by the OTC to fit individual needs.

The turnkey installation option provides effective product management and eliminates the need for costly and time-consuming liaisons with organizations involved in the project. The specialized skills of Lucent Technologies minimize effort and concentrate all efforts for maximum efficiency.

The following 20 modules comprise the cutover preparation services associated with the turnkey package:

- (A) **Mechanized Subscriber Line/Data Base Preparation (MSL/DBP):** Lucent Technologies provides the MSL/DBP service which verifies subscriber line terminations and outside plant cables. This service acquires, merges, compares, and formats subscriber line circuit data; and must be performed to assure an accurate data base from which to start.
- (B) **Building Preparation Functions:** Lucent Technologies provides planning, engineering, ordering, and placement of office equipment. This also includes the establishment of building maintenance (janitorial services). This module provides, but is not limited to, the following: building survey, fire fighting apparatus, temporary buildings, office furniture, data terminal supplies, bulletin boards, first aid kits, etc.
- (C) **Inventory Control System:** Lucent Technologies sets up an inventory control system for circuit packs, and provides a status of those that are spare, active, or in for repair. This module also establishes storage of packs, and an inventory and storage for tools.
- (D) **Protector, Connector, Cable Vault Operations:** Lucent Technologies performs mounting, stamping, cable running, securing, and splicing operations at protector frames and cable vault areas. The OTC selects the operations to be performed and furnishes the source documents.
- (E) **Cross-Connections:** Lucent Technologies performs all cross-connecting efforts on various distributing frame configurations for lines and trunks, and all trouble-clearing effort.
- (F) **Operational Support Systems:** Lucent Technologies provides end-to-end link integrity for OSs that connect to the 5ESS[®] switch.
- (G) **Trunk Testing:** Lucent Technologies tests the trunk network facilities between the 5ESS[®] switch and other end offices. Lucent Technologies will clear trouble within the end offices only.
- (H) **Cutover:** Lucent Technologies provides the effort, tools, and material to do a cutover, and installs and operates cutover devices.
- (I) **Supplemental Line Testing:** Lucent Technologies runs a test on every line of the switching network (assigned in translations initially) to ensure that dial tone can be drawn from every line before making the cross-connections to the outside world. This also includes an automatic line insulation

test (ALIT).

- (J) **Load Box Testing:** From turnover to cutover, Lucent Technologies provides the call processing activity requested.
- (K) **Mechanized Board-to-Board Testing:** Lucent Technologies performs the board-to-board line testing and merges the test results with the Computer System for Main Frame Operations (COSMOS) to produce trouble tickets. This includes trouble clearing.
- (L) **Service Orders/Recent Change Activities:** Lucent Technologies provides all service order and recent change operations including associated work operations (for example, adding, removing, swinging cross-connects, trouble clearing, and verification).
- (M) **Turnover to Cutover System Maintenance:** Lucent Technologies maintains operating integrity between turnover and cutover and provides maintenance experience to the OTC.
- (N) **Alarms:** Lucent Technologies provides temporary protection during the initial installation and turnover-to-cutover period of a new switch for building and equipment during unattended periods or off-hours.
- (O) **Power:** Lucent Technologies provides for on-going maintenance and surveillance of power equipment rectifiers and batteries.
- (P) **Recorded Announcement Function (RAF) Recordings:** Lucent Technologies provides a standard set of announcements, phrases, and ISDN display messages. If customization is requested (5E6 and later software releases), Lucent Technologies has them recorded, verifies their accuracy, and provides an RC tape to install the changes. (See 235-190-115, *Local and Toll System Features*.)
- (Q) **Service Announcement System (SAS) Recordings:** Lucent Technologies provides a standard set of announcements and phrases. SAS is available in the 5E9(2) software release for SMs and in the 5E10 software release for the SM-2000. (See 235-190-115, *Local and Toll System Features*.)
- (R) **Line Feature Test and Verification:** Lucent Technologies provides central office feature testing using various telephone sets (for example, speed calling, call forwarding).
- (S) **System Tests:** Lucent Technologies provides this module as a familiarization and training aid for the OTC switch personnel. The Lucent Technologies personnel will perform any requested Lucent Technologies procedure with the OTC observing the process; or the OTC can perform the procedures, and Lucent Technologies will provide technical support and guidance.
- (T) **Extended Postcutover Support:** Lucent Technologies provides extended postcutover support and surveillance for any period and will include all work necessary to assure old office and new office separation.
- (U) **Special Request:** Lucent Technologies addresses any additional special requests specifically identified by the OTC (for example, terminal relocation, touch-tone fraud, gas tube coil test, etc.).

8.3.3 HOT SLIDE-IN OPTION

8.3.3.1 Overview

The replacement of the older switching equipment with the new 5ESS[®] switching equipment in existing central offices may require building additions for turn-around space. Building additions require more property and may be costly in terms of construction costs. However, since the new 5ESS[®] switching equipment will require considerably less space than the equipment it replaces, large amounts of reusable space will be generated. It is therefore desirable to consider ways of reducing the need for building additions and to make use of the existing space. The hot slide-in technique offers a solution to this

problem.

The hot slide move is a procedure which is utilized to move a 5ESS[®] switch from a temporary location into a permanent location while the 5ESS[®] switching equipment is processing calls. The new 5ESS[®] switch is cut into service while located in temporary housing adjacent to the existing building, or in a temporary location within the existing building. Once the 5ESS[®] switch is in service, the permanent building is cleared of the former switching system and prepared for receiving the new system. The 5ESS[®] switch is then moved into its new position through air pallets.

8.3.3.2 Temporary Building

The land area must be large enough to accommodate the temporary size building required.

8.3.3.3 Permanent Building Preparation

The permanent building requires modifications for the 5ESS[®] switch and for the hot slide. Changes to duct work, cabling, etc., should be analyzed to ensure they will not interfere with the movement of the cables for the hot slide. If these changes do interfere with the cable movement, an alternative cable-moving technique must be planned.

8.3.3.4 Grounding

The temporary housing must be grounded. The telephone company engineering will dictate the type of grounding required. If the temporary building is used, a 4-point ground is recommended. Whichever type is used, it should be connected to the office ground. Refer to the 802-Series documentation for general grounding practices.

8.4 INSTALLATION AND TESTING

8.4.1 OVERVIEW

The Lucent Technologies company will install and test the 5ESS[®] switch on site for the OTC for a fee. A series of activities are performed by an Lucent Technologies installation team using installation and test procedures (see Figure 8-1). The installation interval is referenced from the point labeled "installation start" and terminates with the completion date of the order. The length of the installation interval varies with office size. The installation activities proceed in a sequential fashion over the installation interval; however, some tasks may be performed in parallel.

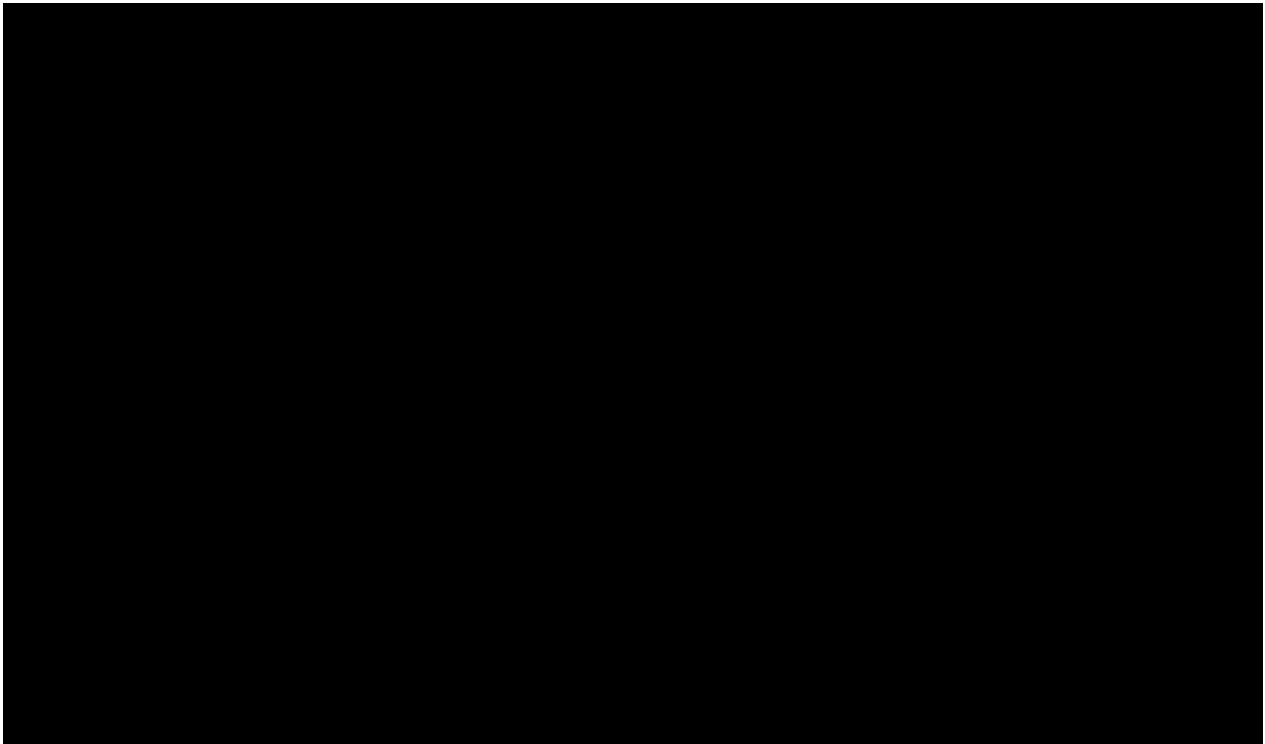


Figure 8-1 5ESS Switch Installation Interval Activity Sequence Installation interval activity sequence

8.4.2 INSTALLATION ACTIVITIES

Installation effort consists of a sequence of major activities performed by different levels of installers. Also, the number of installers used is a function of the size of the office. All of the major activities are prerequisites to subsequent activities. Portions of some of these tasks may be performed concurrently. Following is a list briefly describing the major steps in the installation process:

- (1) **Hardware Erection:** The hardware erection procedures and time will vary depending on the type of shipment chosen for the office (that is, block unitized or loose) and the size of the office. Floor preparation is a prerequisite for this step.
- (2) **Cabling and Continuity Verification:** Continuity testing is performed on all installer on-site wiring. Due to factory testing, connectorization, and the use of fiber optics, cabling and continuity verification is minimal.
- (3) **Frame/Unit Power Verification:** Power verification is performed from the power distribution frame to the 5ESS[®] switch equipment.
- (4) **AM Testing:** Software diagnostics are executed on the 3B20D or 3B21D computer (depending on how the switch is equipped).
- (5) **CM Testing:** Software diagnostics are performed on the message switch and the time-multiplexed switch.
- (6) **SM Testing:** Software diagnostics are performed on all the units within each SM.
- (7) **System Operation Verification:** At this point, all units have been successfully tested. This activity tests the units as a system using simulated calls.
- (8) **Acceptance Testing (Optional):** This consists of verification of installation of hardware completeness with a demonstration by the installer of machine integrity (with customer observance).

The FITTS or "final" translations may be used during this activity. Demonstration tests consist of the following:

- (a) **Half-Office Test:** The system runs with one-side of all duplex equipment powered down. After these tests are complete, the office is restored to full service, and the other half of the office is powered down. During this process, a simulated call load is being carried by the system. This load meets system performance requirements.
- (b) **Integrated Volume Tests:** The integrated volume tests demonstrate the ability of the office to meet performance requirements during a realistic 24-hour period with a simulated call load and diagnostic activity. The system performance requirements consist of:
 - ☐ A call completion rate of 99.99 percent or greater
 - ☐ Not more than one interrupt per 10,000 calls
 - ☐ Not more than one unrelated audit or process purge event per 2,000 calls
 - ☐ Critical or major alarms during the test:
 - ☐ No penalty after cause correction if no calls lost
 - ☐ If calls lost, test extended for twice the period condition existed after cause correction.
 - ☐ No system inhibits set during the test
 - ☐ No duplex controller shall be out-of-service (OOS) except as directed in a manual procedure or expected during diagnostic operations.

8.4.3 TRANSLATION UPDATING

The "final" translations should arrive on site approximately 4 to 7 weeks before turnover for local offices or 5 to 8 weeks for toll offices. The translations in the system prior to the arrival of the "finals" are normally SLATTS. The OTC must implement and verify any recent changes to the "final" translations through the recent change/verify (RC/VFY) facility.

8.4.4 TRUNK AND LINE TESTING

The installer tests the trunk hardware (switch hardware) and the trunk and line work station (TLWS) hardware. The OTC normally tests the trunk network facilities. The OTC may begin trunk network (outside plant) testing after the turnover date of the installation interval. Office-to-office testing of lines by the OTC can start after the turnover date.

8.4.5 REMOTE SWITCHING MODULE INSTALLATION

The test activities for the remote switching module (RSM) are very similar to those performed for the host. An RSM can also be installed and tested in a growth mode, that is, after the host has already been cut over.

8.4.6 PRIVATE BRANCH EXCHANGE INSTALLATION

When the 5ESS[®] switch is used as a private branch exchange (PBX), it is connected to the public-switched network through a standard network interface jack [universal service order code (USOC) RJ21X]. The

connection to private line network channels requires a USOC RJ2FX or RJ2HX jack, depending on the tie line application. These can be ordered from the local telephone company.

Before the 5ESS[®] switch is installed as a PBX, the local telephone company must be given the following information from the PBX customer:

- (a) The public switch network lines (that is, the telephone number) and the private lines that will be connected to the PBX
- (b) The PBX registration number (AS593M-71282-PF-E) and the ringer equivalence number (0.0B)
- (c) For private line connections, the facility interface code (TL12M and TL32M for tie lines), and the service order code (9.0P)
- (d) The quantities and USOC numbers of the jacks required
- (e) For each jack, the sequence in which the lines are to be connected, the type of line, and the facility interface code or the ringer equivalence number by position when available.

The local telephone company must also be notified when any of this equipment is permanently disconnected.

8.4.7 FIELD SUPPORT

The Lucent Technologies installation team has access to Regional Technical Assistance Centers (RTACs) and Installation Test Centers (ITCs) in some locations. Accessing an ITC is a decision made by the installation supervisor. Specific tests may be performed remotely at the ITC through a data link between the ITC and the installation site. The ITC does not replace the on-site installation testing, but acts as an optional support service for the installation personnel, and provides a pool of experts to help solve difficult problems.

8.5 SPARES EXCHANGE SERVICE FOR 5ESS[®] SWITCHING EQUIPMENT

The spares exchange service for the 5ESS[®] switch (SES-5) is a service offering available to domestic customers owning a 5ESS[®] switch. The SES-5 is designed to provide spare circuit pack and plug-in replacements on an expedited basis by featuring centralized ordering, 24-hours per day/7-days a week telephone order entry, and shortened delivery intervals. The service will provide spare circuit packs and plug-ins normally required to support a 5ESS[®] switch including the circuit packs and plug-ins embedded in the 3B20D or 3B21D computer. The customer has the option of exchanging certain material during warranty and post-warranty periods. These SES-5 features will assist in reducing the level of inventory that must be maintained by the customers for spares.

The SES-5 is an additional service option intended to be a maintenance support service. Its primary purpose is to meet a customer need for immediate replacement of circuit packs or plug-ins while minimizing the amount of total inventory maintained. The customer still has the option to utilize the existing repair service and return procedures (RS+R) to repair material or the traditional hard-copy entry routines to obtain new material. The SES-5 is not intended to be the vehicle for obtaining large quantities of materials associated with establishment of central stocks nor is it intended to be a means of upgrading equipment. These orders should be entered under normal hard-copy routines.

The SES-5 can be used to obtain any circuit pack or plug-in which is typically maintained as a maintenance spare for the 5ESS[®] switch. Detailed information on equipment and identification of on-site spares can be found in ED-5D133-10, 5ESS[®] Switch Spare Circuit Pack Requirements. The 5ESS[®] Switch Spares Exchange Service Catalog (ED4C168-14) is available and includes the circuit packs eligible for exchange through the SES-5.

8.6 IN-SERVICE OFFICE TECHNICAL SUPPORT

A 5ESS[®] switch Customer Technical Support is staffed with personnel who have knowledge and expertise on the 5ESS[®] switch. These experts resolve problems referred to them by the in-service offices through an escalation hierarchy. After local technicians have exhausted their internal escalation procedures, the problem is referred to the RTAC serving that customer. Customer Technical Support is then contacted if needed.

Twenty-four hour emergency support is available through the Customer Technical Support Diagnostic Center. The Customer Technical Support will access in-service offices through the SCCS dial-up data link, or direct dial-up link to offices not served by the SCCS.

8.7 5ESS[®] SWITCH ENGINEERING AND ADMINISTRATION SUPPORT

The network administration and engineering support (NAES) group, part of the 5ESS[®] switch customer technical support (CTS) organization, provides support for the planning, engineering, ordering and administration of 5ESS[®] switches. Internal customers include account teams, technical consultants, regional engineers, customer business management and customer documentation/training organizations. External customers include service provider planners, traffic/equipment engineers and administrators and Bellcore.

One area of support involves customer documentation. Switch engineering information (SEI) documents are provided to convey early engineering and ordering information related to new 5ESS[®] switch software releases/features being introduced. Engineering information (EI) documents are produced to serve as user documentation associated with current engineering/ordering tools. A translations and switch administration (TSA) newsletter is distributed periodically highlighting new and changed information regarding 5ESS[®] switch translations and administration issues.

Another area of NAES is custom support. One type of custom support is "assist line" support interfacing through the customer technical assistance and management (CTAM) center; questions and issues from customers about the engineering and administration of 5ESS[®] switches are addressed by the NAES Group. Tool development and support for the digital ordering and planning system MODULE (DOPSMOD), which is an adjunct to the 5 DOPS tool, is also performed by the NAES Group. DOPSMOD was introduced with the 5E9(2) software release and currently supports the bid preparation, traffic engineering sensitivity analysis and order realization functions. A variety of enhanced technical services (ETS) are offered by the NAES group including tutorials, consultation, data studies and engineering special studies used in assessing and improving the resource utilization of the 5ESS[®] switch.

The NAES Group also actively participates in customer forums such as the enhanced network engineering committee (ENEC) and the translations and switch administration (TSA) forum. 5ESS[®] switch engineering and administration information is presented to meet the customers planning and provisioning needs, and issues are identified and resolved working directly with the customers.

The NAES Group can be contacted by calling the CTAM Center at 1-800-225-4672.

8.8 ORDER TO SERVICE INTERVALS

Lucent Technologies is reducing the order-to-service interval for NAFTA and Lucent Technologies Affiliates Customer Business Unit customers. We will cut the interval needed to fill telephone companies' 5ESS[®] switch growth orders from 14 weeks to 10 weeks starting with normal 1 or 2 switching modules (SMs), without unique office conditions, and a normal forecast period. Larger SM growth is provided with slightly longer intervals, depending on growth size and complexity of order.

The interval for new 5ESS[®] switch Compact Digital Exchanges (CDXs) and new 5ESS[®] switch Very Compact Digital Exchanges (VCDXs) is 16 weeks. All other 5ESS[®] switch offerings for a normal new host office (17,500 lines) have had the order-to-service interval reduced from 30 to 20 weeks, with the same

conditions.

Your Lucent Technologies account executive and customer service representative can provide you the specific interval for your order, depending on order conditions and your interval needs.

This customer service program utilizes Process Quality Management and Improvement (PQMI) guidelines to streamline processes within the ordering, engineering, furnishing, and installation functions required for 5ESS® switch provisioning.

This program is based on using standard 5ESS® switch product offerings. Standard product offerings are designed to be implemented readily for most customers. Standard offerings assure that SMs containing identical equipment are configured identically. Standard SMs permit customers to receive product offerings in the shortest possible interval, do not require additional or unnecessary equipment, and are provided at the same current contract price. Customers ordering standard growth SMs can now have service within 10 weeks of order placement.

A standard product offering consists of a set of models, based on customer buying trends, for a given SM (providing specific equipment location, inter-bay assignments, and inter-bay cabling). Any order that the customer allows Lucent Technologies to use standard product offerings, wherever possible, or does not deny the use of standard product offerings is considered a "standard" order. Standard product offerings will be delivered in all cases whenever a customer does not restrict equipment within an SM.

Previously, Lucent Technologies has used only customized SM engineering. Customized engineering results in many SM variations of identical equipment with identical functionality. An order is considered "customized" when a customer specifies or restricts the location of equipment within any SM in that order.

Lucent Technologies will continue to offer custom engineering to meet a customer's need.

Customers requiring information on growth (in less than the 10- week interval described) should refer to "SHORT INTERVAL GROWTH," Section 8.9 .

For additional information or assistance, please contact your Lucent Technologies account executive. This information is for planning purposes only and does not modify or supplement specifications or warranties relating to Lucent Technologies products or services.

8.9 SHORT INTERVAL GROWTH

In order to accommodate rapid growth, Lucent Technologies' *Service ADDvantage*SM provides 5ESS® switch product offerings in "near emergency" intervals (shorter-than-normal planning intervals) to support our customers' responsiveness to their customers' needs.

For additional information or assistance, please contact your Lucent Technologies account executive. This information is for planning purposes only and is not intended to modify or supplement specifications or warranties relating to Lucent Technologies products or services.

8.9.1 *Service ADDvantage*SM

*Service ADDvantage*SM is a service provided by Lucent Technologies that provides up-front planning and provisioning to allow the customer to grow switching modules in as little as 20 days, as well as evolution to packet technology in as little as 30 days.

8.9.1.1 The *Service ADDvantage*SM Process

Our customer team, together with the customer's staff, assess the customer's offices to identify "hot" growth offices, appropriate solutions, and growth levels in anticipation of switch growth. Lucent Technologies produces a *Service ADDvantage*SM detailed offices report that assesses major components and identifies obstacles to switch growth. Lucent Technologies also provides a summary report that

analyzes all surveyed offices across the customer's network, prioritizing offices that need the most urgent preparation and equipment.

Based on these reports the customer places the order to prepare selected offices for growth. Lucent Technologies installs the necessary equipment, (cable racks, power distribution frame and panels, cross-connect facilities as well as switch infrastructure including Administration Modules (AM), Communication Modules (CM), and Metallic Test in the host office.

8.9.1.2 *Service ADDvantage*SM Product Offerings

There are two types of product offerings available with the *Service ADDvantage*SM service:

- ☐ EZ - SM2000 Models
- ☐ Select SiZe Models

8.9.1.3 EZ - SM2000 Models

Lucent Technologies' EZ-SM2000 is a pre-designed, pre-configured 5ESS[®] Switch -EZ SM2000. After preparing the office for growth with *Service ADDvantage*SM, network capacity can be increased efficiently with reduced order intervals with the EZ-SM2000 models.

8.9.1.4 Configurations

The EZ-SM2000 is currently available in 7 configurations as indicated in the following table:

- ☐ **SM2K- Trunk DLTU2**
- ☐ **SM2K- PRI/Trunk DLTU2** ☐ 120 DS1s for PRIs or Trunks
- ☐ **SM2K-PRI/Trunk DNU-S** ☐ 56 DS1s for PRIs or Trunks
- ☐ **SM2K-PRI/Trunk DNU-S** ☐ 224 DS1s for Trunks or PRIs
- ☐ **SM2K-PRI/Trunk DNU-S** ☐ 448 DS1s for PRIs or Trunks
- ☐ **SM2K Trunk Dual DNU-S** ☐ 448 DS1s for Trunks
- ☐ **SM2K Trunk Single DNU-S** ☐ 336 DS1s for Trunks

Contact your Lucent representative for details.

8.9.1.5 Select-SiZe Platform

The Select-SiZe SM2000 Growth application is designed to provide more flexibility and shorter intervals for tailored growth of an SM2000 switch module platform. This application provides more options than the EZ models, while still providing the short-interval growth. These needs can be tailored with circuit packs to meet market demands through the use of pre-defined scalable hardware configurations. This flexibility allows you to select types of quantities of pre-defined LTP cabinets in order to design a SM configuration that satisfies your business needs. These SM2000 switching modules can be used for analog and ISDN lines, Remote Terminal terminations, inter-office trunking, inter-module trunking and PRI. They can also serve as a host for EAIU, BEAIU, and MSM growth.

Coupled with Service ADDvantage Program, the Select SiZe application helps to realize shortened intervals, tailored solutions, and includes the quality aspects of Lucent Manufacturing, and engineering.

This application has minimum requirements of a core Switch Module cabinet with at least one tailored

Line/Trunk Peripheral (LTP) cabinet, up to 14 total LTP cabinets as long as the cabinets do not exhaust the resources on the Core Switch Module. See Figure 8-2 for the platform components.

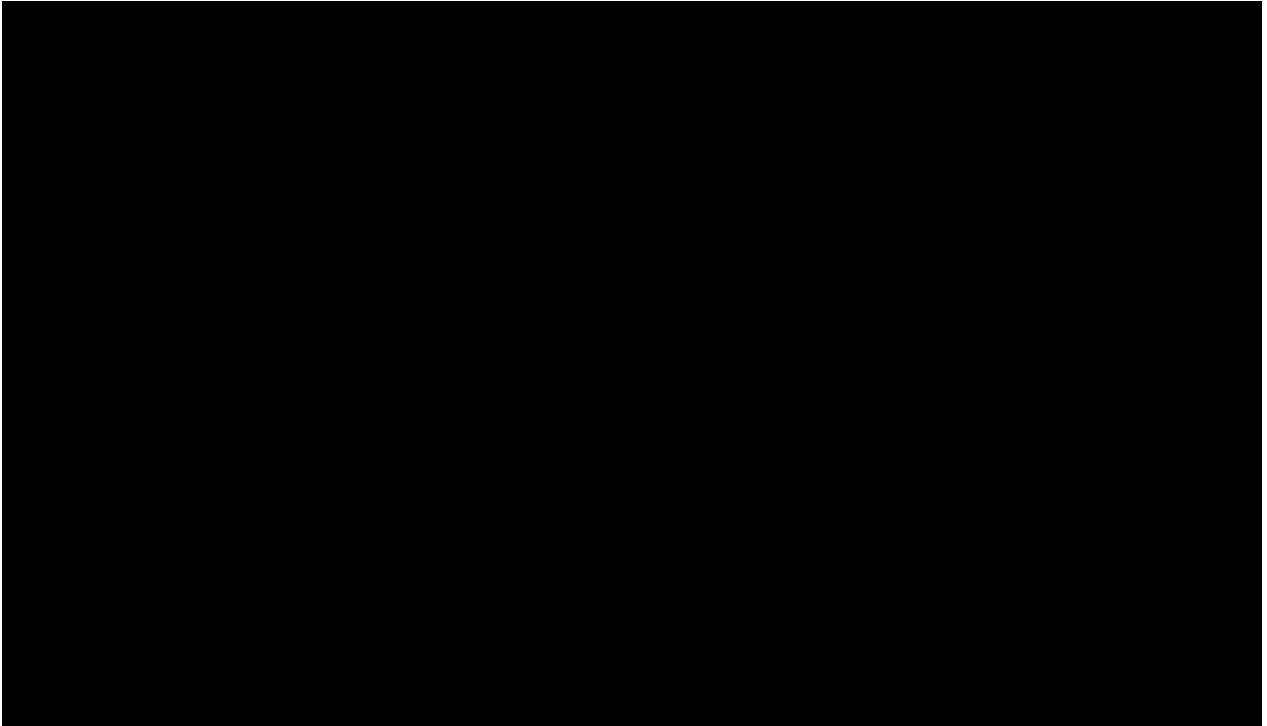


Figure 8-2 Select SiZe Platform Components

9. USER SUPPORT

9.1 DOCUMENTATION

9.1.1 OVERVIEW

All documentation available for the 5ESS[®] Switch was previously listed in an H-drawing. A unique H-drawing was issued for each software release. The 235-001-001, *Documentation Description and Ordering Guide*, has replaced the H-drawings. This guide includes the use of 9-digit numbers as ordering codes for functional groups of drawings and program documents.

9.1.2 DELIVERY MEDIA ALTERNATIVES

The 5ESS[®] switch documentation is available on paper, as well as on three electronic alternative methods.

There are several advantages to using electronic documentation rather than paper. An immediate advantage is a requirement for less physical space. All three alternate media delivery methods require much less space than the corresponding paper documents. Other advantages are that document maintenance time is reduced to zero, the time required to find and access information is also significantly reduced, and the electronic documentation is updated monthly, supplying the customer with the most current information available. Since the electronic documents can be easily carried or remotely accessed, there is less need for multiple copies. In addition, occasional users of a given document do not need to obtain their own copies; they can access the documents through one of the electronic methods. These alternatives to delivery of paper documentation are as follow:

- ☐ compact disk ☐ read-only memory (CD-ROM)
- ☐ magnetic tape
- ☐ on-line dial up

Some hardware packages are available to be used in conjunction with the electronic media offerings. These packages have been tested and configured to provide a complete solution to the customer. Compatible hardware can also be used. For further information on electronic documentation, refer to the 235-001-001, *Documentation Description and Ordering Guide*.

9.1.3 ORDERING INFORMATION

The 5ESS[®] Switch documentation is divided into two main categories: site package and supplemental.

One copy of each site package document is provided to the customer with the initial purchase of the switch. The customer is also placed on standing order for updates to the documentation included in the site package for the duration of the initial warranty. The address to which the site documentation is to be shipped must be provided in the appropriate space on the first page of the E-8175 questionnaire. Included in the site package are documents necessary to perform administrative and maintenance tasks [for example, input/output (I/O) manuals, schematic drawings (SDs), circuit descriptions (CDs), and procedural maintenance documents]. Additional copies of these documents may be purchased.

Other documentation is classified as supplemental. This category includes information relating to growth, feature descriptions, and detailed troubleshooting. Customers need to initiate a request for standing order distribution for those documents for which they wish to receive updates on a continual basis. Telephone Companies can place orders through their technical information resource manager (TIRM) coordinator. If you do not know who your TIRM coordinator is, you may call **1-888-LUCENT-8 (1-888-582-3688)** to obtain their name and number.

Other customers and Lucent Technologies employees can order the documentation for the 5ESS[®] Switch

directly from the Customer Information Center in Indianapolis, Indiana. Proper billing information must be provided. These orders may be mailed to:

Lucent Technologies
Customer Information Center
Order Entry
2855 N. Franklin Road
Indianapolis, IN 46219

Orders may also be called in on **1-888-LUCENT-8 (1-888-582-3688)** or faxed in on **1-317-322-6484**.

If an order is received for a document that is not available at the time the order is received, the document is placed on back order. When the Customer Information Center receives the document, it is shipped to all back-order customers and to all customers who had requested a standing order for the document.

The following are the basic types of documentation. Refer to 235-001-001, *Documentation Description and Ordering Guide*, for a list of the specific documents.

- ☐ Manuals
- ☐ Drawings
- ☐ Program documents.

9.1.4 MANUALS

There are numerous manuals covering a wide variety of information. Each manual is targeted at a major telephone company function, such as engineering, administration, or maintenance. These manuals cover the information that is both descriptive and procedural. Information that was previously contained in the program application (PA) documents is now contained in these manuals. For a comprehensive listing of the various manuals, refer to the 235-001-001, *Documentation Description and Ordering Guide*.

Information on the 3B20D computer used in the 5ESS[®] Switch administrative module (AM) is contained within each functional manual, where applicable.

9.1.5 DRAWINGS

Hardware information is provided on various types of drawings. These include SDs, CDs, equipment drawings (EDs), J-drawings, circuit pack schematics (CPSs), circuit pack schematics for manufacturing (CPSMs), and office record drawings.

The SDs provide the internal and external wiring connections of a circuit along with a list of circuit components. They contain such information as an index, functional schematic figures, and notes. The CDs describe the operation of the circuit shown on the associated SD, as well as maintenance and testing information in some cases. The SD and its associated CD have the same number.

The ED may be used to provide hardware information or to provide other specific information on a topic. As an example, it could be used to provide connectorized cable or lighting equipment information, or it may provide information regarding recommended cable rack layouts or spare circuit pack requirements.

The J-drawings provide equipment design requirements for equipment units or systems. It provides a description of the nature of the unit and its application. It also generally provides references to specific SDs, CDs, EDs, and/or other documentation.

Floor plan information is contained in an SD that provides detailed space requirements for the switch, the physical arrangement of equipment frames, interframe cabling requirements and restrictions, and power, air conditioning, and grounding requirements.

The CPSMs document the circuitry of an apparatus-coded printed wiring board and include manufacturing

information. They contain proprietary information and can be provided only after nondisclosure agreements have been signed.

The CPSs document the circuitry of an apparatus-coded printed wiring board.

The office record drawings provide the equipment configuration for a specific 5ESS® Switch.

9.1.6 PROGRAM DOCUMENTS

Program documents pertain to the design and interpretation of the software release. Included in the program documents are a program index (PG), the translation guide (TG-5), the input manuals (IMs), output manuals (OMs), program change (PC), the program listings (PRs), and the PKs (supplementary program information documents). If corrections are required to the software, they will be transmitted through a software update on Software Change and Administrative Notification System (SCANS).

NOTE: Some Program Listings (PRs) are available only through dial-up electronic media. See the 235-001-001, *Documentation Description and Ordering Guide*, for information about dial-up electronic media.

The PG provides a listing of other program documents and the appropriate issue of each document that pertains to the specific software release issue.

The TG contains the necessary instructions, procedures, and forms for the preparation and management of the office dependent data (ODD) or translation data, which includes information relating to line and trunk assignments, routing, charging, and measurements.

9.1.7 SOFTWARE SUPPORT PRODUCT POLICY (SSPP)

9.1.7.1 General

The Software Support Product Policy defines the level of software support for all in-warranty and post-warranty software releases. This plan identifies five product ratings in the software release life cycle. The phases and levels of technical support are identified in Table 9-1 .

Table 9-1 Levels of Technical Support

PRODUCT RATING	TECHNICAL SUPPORT LEVEL
Provisional (PROV)	CR, MJ, and MN
Standard (STD)	CR, MJ, and MN
Additions and Maintenance (A&M)	CR and MJ ^a
Limited Availability (LA)	CR ^a
Discontinued Availability (DA)	Essential ^b
Notes: a. Technical support upgrades, which may exceed what is normally provided, are available through service contracts. See section 9.1.7.5 for definitions of support. b. Essential support provides switch recovery only. No software change or revision is provided.	

Each software release passes through these product ratings during its life cycle, eventually reaching the DA phase.

9.1.7.2 Intent of the Software Support Product Policy

The Software Support Product Policy does not change hardware or software warranty, support agreements, contracts, or establish pricing for technical support services. This plan establishes a window for the availability of software products, services, and support.

Lucent Technologies has several retrofit plans available to meet various customer needs. Some customers use a normal retrofit progression (5E5 to 5E6 to 5E7). Some customers skip retrofits when a skip is

available (5E6 to 5E8), and still others utilize the switch upgrade service (SUS) to jump several retrofits (5E3 to 5E7 or 5E4 to 5E7). We encourage each customer to evaluate each plan, consider its application within the SSPP, and select the one that best suits their needs based on their particular budget, employee expertise, and their customer needs.

To accommodate each customer's need, Lucent Technologies will make available support to all 5ESS[®] Switch offices, while tailoring the level of software support to the age and stability of the software release. At all times, Lucent Technologies will make available quality support of all 5ESS[®] Switches in the field at a level that is appropriate for the software release and consistent with our warranty commitments. The following sections provide a detailed list of product ratings and support services that are available for the 5ESS[®] Switch software releases.

For additional information or assistance, please contact your Lucent Technologies Account Executive. This material is for planning purposes only, and is not intended to modify or supplement specifications or warranties relating to Lucent Technologies products or services.

9.1.7.3 SSPP Coverage

The software product ratings cover the support of the base release. Any special feature, enhancement, software release update, fix, remaining First Feature Application (FFA) testing, etc., that follow the Beginning of Managed Introduction (BMI) date will not affect the product rating of the base release. In practice, any software modification or enhancement made available to the customer at any time in the product's life cycle will not cause the software product rating to change or technical support to automatically change because of the software modification or enhancement.

Any special feature, enhancement, software release update, etc., deployed after the BMI date is considered as part of the release, and maintains the same product rating as the release in which it is contained.

9.1.7.4 Product Life Cycle

When a new software release product is introduced, it is under the Provisional (PROV) rating until BMI, at which time the product ratings become Standard (STD). The release remains in STD rating until the next (second) release's BMI date. Then, the first release becomes Additions and Maintenance (A&M). When the next (third) release becomes STD, the second release becomes A&M, and the first release becomes Limited Availability (LA). The releases progress through the first four phases only when new releases are issued.

Only one release is in the PROV, STD, A&M, or LA phases at a single time. The Discontinued Availability (DA) rating is the terminus for all releases; therefore, more than one release is contained within this classification.

Using an example of a software release every year, it takes approximately 36 months to progress from STD to DA status; but in reality, this will vary depending upon the schedule of new releases. (Historically, new software release intervals have varied between 10 to 16 months, with 12 months being typical.)

The DA product rating is applied to releases based on age of a release.

9.1.7.5 Software Product Ratings and Available Services

Each 5ESS[®] Switch software release migrates through five product ratings and four technical support levels during its life cycle. The product ratings are PROV, STD, A&M, LA, and DA. Rating sequence is shown graphically as follows, with their respective technical support levels:

□PROV□ 1	□STD□ 1	□A&M□ 2	□LA□ 3	□DA□ 4

The technical support levels are as follows:

- 1 = Critical, Major, and Minor
- 2 = Critical and Major (Note 1)
- 3 = Critical (Note 1)
- 4 = Essential (Note 2)

- (1) Technical support upgrades, which may exceed what is normally provided, are available through service contracts.
- (2) Essential support provides switch recovery only. No software change or revision is provided.

Customers should be aware that if they permit software to go out of warranty, the preceding technical support may no longer be applicable, since the support is then defined by the software service agreement, if any, entered into between the Customer and Lucent Technologies.

Descriptions of the ratings are as follows:

- ☐ Provisional (PROV) -- A new software release is rated PROV when introduced during the First Feature Application period. At BMI, it will then be rated STD for subsequent office applications. The PROV rating also includes First Feature Applications and any other offices turned over or retrofitted before BMI. Technical support levels include Critical, Major, and Minor fixes (see Table 9-2).
- ☐ Standard (STD) -- A STD software release is available at BMI. After BMI, all new start offices must be cut over with the STD software release. A STD software release program is available for an application in the process of being installed or available for retrofit in a working office with an A&M release. All services such as retrofits, growth, and large terminal growth may be done with this software release. Special features and enhancements will be provided to the STD software release. Also, nonservice affecting engineering complaint (EC) fixes will be provided to the next STD software release at the time the Final Report On Investigation (FROI) is issued. Technical support levels include Critical, Major, and Minor fixes (see Table 9-2).
- ☐ Additions and Maintenance (A&M) -- A software release with this rating, in conjunction with the STD rated software release, supports retrofits, growth, and large terminal growth. However, the A&M software release cannot be used for cutover in an installing office. Technical support levels include Critical and Major fixes. Additional technical support can be negotiated through service contracts, if desired (see Table 9-2).
- ☐ Limited Availability (LA) -- Retrofits, growth, and large terminal growth services are available for a switch on this release. A software release is rated LA with the understanding that the level of technical support has diminished as a result of declining customer need, due to the focused technical support during the PROV, STD, and A&M rating periods. The LA level of support is defined as Transitional Support, depends upon customer need, resource availability, and varies with each service and release. Technical support level consists of Critical fixes. Additional technical support within Limited Availability can be negotiated through service contracts, if desired (see Table 9-2).
- ☐ Discontinued Availability (DA) -- The end of the software life cycle where the software is isolated from current updates and any software activity. The Lucent Technologies technical support organizations archive all release specific information (that is, documentation, tools, files, procedures, data bases, etc.) for software releases within this rating. This information can be de-archived only within the first year of becoming discontinued. Consequently, the availability of services (that is, growth and large terminal growth) that require archived information are limited to the most recently DA'd release only. A customer can retrofit from any DA release to a current release. Growth and large terminal growth is only provided to the most recent release on DA. When a software release reaches Discontinued Availability, ECs are no longer addressed. Lucent Technologies does not retain test laboratories for releases within a DA rating. Any fix or work around provided within this rating is tested in the

customer's switch. Essential support provides a fix or work around applied by a switch personnel overwrite only and the customer copy of the software release is the sole vehicle of any fix or work around. Additional technical support within this rating is very limited (only available to the most recent DA release) and may be negotiated through service contracts, if desired (see Table 9-2).

Table 9-2 Technical Support Availability for the 5ESS® Switch

SUPPORT	PROV	STD	A&M	LA	DA
Outage	X	X	X	X	X
In-Hours Support	X	X	X	X	X
OOH Svc Affecting	X	X	X	X	NA ^c
Eng Complaints ^a	X	X	X	X	NA ^c
On-Site Support Avail	X	X	NA ^c	NA ^c	NA ^c
On-Site Verify (FOA)	X	NA ^c	NA ^c	NA ^c	NA ^c
OOH Non Svc Affecting	NA ^c	NA ^c	NA ^c	NA ^c	NA ^c
SOFTWARE UPDATES ISSUED	X	X	X	X	NA ^c
SOFTWARE MODIFICATIONS MADE					
Outage	X	X	X	X	NA ^c
Billing/Call Processing	X	X	X	X	NA ^c
Non Svc Affecting	X	X	NA ^c	NA ^c	NA ^c
Software Enhancements	X	X	NA ^c	NA ^c	NA ^c
Special Features	X	X	NA ^c	NA ^c	NA ^c
PROCEDURES					
Retrofit	X	X	X	X	X
Growth	X	X	X	X	X ^b
Large Terminal Growth	X	X	X	X	X ^b
Procedures Archived	NA ^c	NA ^c	NA ^c	NA ^c	X
Support Tools Archived	NA ^c	NA ^c	NA ^c	NA ^c	X
New Start Cutover	X	X	NA ^c	NA ^c	NA ^c
RELEASE SPECIFIC					
Software Maintained	X	X	X	X	NA ^c
Doc Maint	X	X	X	X	NA ^c
Software Archived	NA ^c	NA ^c	NA ^c	NA ^c	X
Doc Archived	NA ^c	NA ^c	NA ^c	NA ^c	X
TRAINING					
Available	X	X	NA ^c	NA ^c	NA ^c
Notes: a. Engineering complaints will be accepted at any pre-DA product rating. Resulting software modifications affecting outage complaints will be provided for release reported. Software modifications for nonservice affecting complaints will be provided to the next Standard software release at the time the FROI is issued. b. Growth is limited to the first year of DA rated software release. c. NA = Not available under warranty, but may be made available with a service contract, as mutually agreed. For more detail, see 235-099-243NP, dated 7/94, 5ESS® Switch Warranty Policy Plan					

9.1.7.6 Notification Interval

Customers are notified of the software product ratings for in- service releases through two methods. A 2-year software rating view is provided twice a year (March and September) in the 235-390-520, 5ESS® Switch Two-Year Feature Planning Guide, as well as through the Discontinued Availability Notification and Tracking System (DANTS).

9.1.7.7 Additional SSPP Information

If you have questions on the policies or services of the software support product policy, or require special support services that exceed those outlined in this plan, contact your Lucent Technologies Account Representative. If you require details on technical support guidelines, or require special support service

contracts for services that exceed those outlined in this plan, contact your Regional Technical Assistance Center (RTAC) or Customer Technical Support (CTS) technical support staff.

9.1.7.8 Technical Support Severity Definitions

Descriptions of the technical support severity definitions are as follows:

- ☐ Essential Problem -- Identical to critical problem definition except that no software change or revision is provided or documented.
- ☐ Critical Problems -- Those that affect call processing and/or system operation in the following ways:
 - ☐ System failure or significant reduction in traffic handling capability.
 - ☐ Loss of emergency capability (for example, 911 calls)
 - ☐ Loss of duplex capability on main processors
 - ☐ Total system outage
 - ☐ Partial system outage
- ☐ Critical Problems also are those that affect billing, data base and recovery operations in the following ways:
 - ☐ Loss of billing capability
 - ☐ Significant revenue loss from customers
 - ☐ Loss of access to recovery operations
 - ☐ Corruption of billing or system [that is, equipment configuration data (ECD)] data bases that require initialization actions to correct
 - ☐ Loss of critical and major alarm reporting functions
- ☐ Problems -- Those that affect call processing and system operation in the following ways:
 - ☐ Short system or subsystem interruptions whose durations accumulate to greater than 2 minutes in any 24-hour period, or that continue to repeat during longer periods
 - ☐ Cutoff call rates that exceed 1.25 per 10,000 calls
 - ☐ Ineffective machine attempt rates that exceed 5 per 10,000 calls
 - ☐ Failure of any portion of duplex operations for periods in excess of 30 seconds
 - ☐ Significant degradation in any capacity/traffic measurement function.
- ☐ Major Problems also are those that affect billing, data base, and recovery operations in the following ways:
 - ☐ Significant degradation of access for recovery operations
 - ☐ Significant degradation of system alarm reporting function reports
 - ☐ Billing error rates that exceed the rates specified in LSSGR.

- ☐ Corruption of billing or system (for example, ECD) data bases that do not require initialization actions to correct.
- ☐ Minor Problems -- Those that affect administrative functions, routine maintenance, and diagnostics but do not significantly affect service to customers.

9.1.7.9 Resource Allocation

The Lucent Technologies Customer Technical Support team provides the resources necessary to remedy switching problems as defined previously. However, there also may be a need for data or resources from the customer, to help us to provide timely resolution to trouble reports.

Critical problems are continuously worked by the Lucent Technologies support team and the customer until resolution, implying that data and/or resources needed from the customer will be made available immediately. Major severity problems require that data and/or resources be provided by the next business day after the problem is reported to Lucent Technologies. Minor severity problems, data and/or resources needed to work the problem should be negotiated between Lucent Technologies and the customer.

If customer resources are not available as stated previously, the trouble ticket severity will be lowered to the next level.

9.1.7.10 Planned Software Rating Schedules

Effective with 5E15 BMI (August 2000), the 5ESS[®] Switch product ratings are planned as follows [5E11 becomes DA]:

Release	BMI Date	Software Product Rating
☐ 5E15	(4Q/00)	Standard
☐ 5E14	(4Q/99)	Additions and Maintenance
☐ 5E13	(4Q/98)	Additions and Maintenance
☐ 5E12	(4Q/97)	Limited Availability
☐ 5E11	(4Q/96)	Discontinued Availability

9.2 TRAINING

9.2.1 OVERVIEW

Lucent Technologies is committed to providing technical training programs designed to meet the needs of individuals who have responsibilities for planning, administering, and maintaining the 5ESS[®] Switch. The curricula described herein is designed to meet those needs as efficiently as possible. As new software release features for the 5ESS[®] Switch are developed, the training courses are updated to reflect such changes. Information on any new courses is provided to our customers and is included in the Products Training Catalog and the on-line COMputerized CATlog (COMCATS).

The following 5ESS[®] Switch training programs are provided at the Lucent Technologies Customer Training and Information Products Centers:

- ☐ 5ESS[®] Switch Administration Training
- ☐ 5ESS[®] Switch Engineering Training
- ☐ 5ESS[®] Switch ISDN Training
- ☐ 5ESS[®] Switch Translations Training
- ☐ 5ESS[®] Switch Maintenance - Technician Training

- ☐ 5ESS[®] Switch Maintenance - Management & Technical Support Training
- ☐ 5ESS[®] Switch Software Release Differences Training.

In addition to the 5ESS[®] Switch training programs previously identified, a wide range of supplemental training is also available to meet the customer needs. There are training courses available in the areas of:

- ☐ 4ESS[™] Switching System
- ☐ 1A ESS[™] Switching System
- ☐ Basic Telecommunications
- ☐ Operations Systems (OS)
- ☐ Common Channel Signaling (CCS7)
- ☐ Integrated Services Digital Network/ Customer Premise Equipment (ISDN/CPE) Terminals and Applications
- ☐ Automatic Call Distribution/Management Information System (ACD/MIS)
- ☐ Advanced Communication Package (ACP)
- ☐ Advanced Network Services (ANS).

9.2.2 5ESS[®] SWITCH TRAINING FACILITIES

The 5ESS[®] Switch training courses are conducted at Lucent Technologies Customer Training and Information Products (CTIP) training centers. CTIP provides the most timely and cost-effective solutions to training needs in the industry.

CTIP offers product support training in many different media, including the following:

- ☐ Instructor-led training
- ☐ Hands-on training
- ☐ Self-directed training
- ☐ Computer-based training (CBT)
- ☐ Satellite teletraining
- ☐ Video tape training

The following are CTIP training locations:

- ☐ Hickory Ridge Conference Centre
1195 Summerhill Drive
Lisle, Illinois 60532
- ☐ Dublin Training Center

5151 Blazer Memorial Parkway
Dublin, Ohio 43017



Altamonte Springs, Florida
307 North Northlake Blvd. 32701



Garden City, New York
990 Stewart Avenue 11530

The CTIP training center in Dublin, Ohio provides hands-on technical training for telecommunications technicians, maintenance and supervisory personnel on Lucent Technologies products. There are 50 modern, fully equipped classrooms containing the latest test equipment and documentation available to support the training. The central part of the classroom area houses two large equipment bays and minicomputer labs. Lodging accommodations are made at local hotels/motels. Transportation arrangements are provided for the students to and from the training center.

The CTIP training center in Lisle, Illinois provides technical training for managers, engineers, and technical support personnel who design, plan, provision, administer and maintain a 5ESS[®] Switch. The training center houses training labs, 22 fully equipped classrooms, over 70 caserooms, and an auditorium. The center also provides hotel and dining accommodations for 400 people and indoor/outdoor sports facilities.

The CTIP regional training centers provide technician maintenance training on the 5ESS[®] Switch using hands-on and computer based and machine simulation techniques. These centers are equipped with classrooms and a training lab.

9.2.3 5ESS[®] SWITCH MAINTENANCE TECHNICIAN TRAINING

The 5ESS[®] Switch maintenance technician training is task-specific training which is designed to prepare technicians to perform in any of the following five functional areas. These are as follow:

- ☐ Switch Maintenance
- ☐ Trunk Maintenance
- ☐ Switch Surveillance
- ☐ Switch Translations
- ☐ Switch Analysis.

Various combinations of the courses can be taken depending upon the functional area being trained for. The total number of training days can vary from 5 to 57.

All 5ESS[®] Switch technician maintenance training courses (except for hands-on courses) use computer-based and machine simulation training techniques.

9.2.4 5ESS[®] SWITCH INTEGRATED SERVICES DIGITAL NETWORK TRAINING

The integrated services digital network (ISDN) will change the way Local Exchange Carriers do business in the future. With ISDN, the procedures used, the equipment worked with, the services offered, and the costs involved will all change with ISDN.

The ISDN involves different principles, capabilities, and components than previous communications techniques employed, and has far reaching implications on many types of products, services, and systems.

It is necessary, therefore, to provide training that addresses these changes as they relate to 5ESS® Switch features, components, and requirements.

The ISDN training courses give students an understanding of the concepts, capabilities, and requirements of this technology, and their role in building an advanced communications system.

9.2.5 5ESS® SWITCH ADMINISTRATION, ENGINEERING, AND TRANSLATIONS TRAINING

Training is provided for individuals who have responsibilities for the overall administration, planning, engineering, and translations of the 5ESS® Switch.

Administration training is available for managers and supervisors responsible for the administration of the 5ESS® Switch. Engineering training is available for managers and supervisors responsible for traffic and/or equipment orders. Translations training is available for managers and supervisors responsible for populating translations forms for the 5ESS® Switch, supervising the input of forms, and handling the day-to-day maintenance of translations data.

9.2.6 5ESS® SWITCH MAINTENANCE MANAGEMENT AND TECHNICAL SUPPORT TRAINING

Training is provided for those individuals who provide maintenance support on the 5ESS® Switch. This includes first and second level maintenance engineers, Central Office Supervisors, Switching Control Center (SCC), Electronic Switching Assistance Center (ESAC), Customer Technical Support, Bell Labs, Operating Company support, and Regional Technical Assistance Center (RTAC) personnel.

9.2.7 5ESS® SWITCH SOFTWARE RELEASE DIFFERENCES TRAINING

Software release differences training is designed to survey major changes and enhancements in specific 5ESS® Switch software releases with a focus on those changes with significant impact on switch owner operations. This training strategy is designed to meet the needs of experienced technicians and technical management. Differences training will be provided for each new software release and should be ready by the first office application (FOA) (except for the CBT differences training). Engineering courses will reflect the latest DOPS issue; consequently, these courses will always be updated in their entirety.

Software releases affect the architecture, translations, maintenance, and retrofit procedures on the 5ESS® Switch. Persons who plan, order, maintain, and perform retrofit procedures and translations will benefit from understanding how software releases impact their jobs. Courses are available in the following functional areas:

- ☐ Switch architecture
- ☐ Switch translations
- ☐ Switch maintenance
- ☐ Switch retrofit procedures.

These courses are designed for experienced personnel who have already taken previous 5ESS® Switch training and need only updates on the new software release changes. This training requires less time off the job and saves on travel and living expenses. Training courses are available on either self-directed, 1/2 inch VHS videotape or live satellite broadcasts.

9.2.8 ON-LINE COURSE CATALOG AND LUCENT TECHNOLOGIES PRODUCT TRAINING CATALOG

For detailed information on courses, training locations, or registration, try our on-line, computerized catalog, COMCATS. To access the latest course information, any time of the day, seven days a week call the following number:

Phone: 1-800-662-0662 or 1-614-764-5566

Login: comcats

Password: lucent1

In addition, information on courses may be obtained by calling the registration number in "REGISTRATION", Section 9.2.10, and requesting a copy of the Lucent Technologies Product Training Catalog.

9.2.9 MARKETING AND SALES TRAINING CONTACT

The marketing and sales contact for 5ESS[®] Switch training is Dennis Thomas (630-224-8421, fax 630-224-6462).

9.2.10 REGISTRATION

Registration for all courses should be made well in advance of the actual course date. Written or verbal notification of cancellation must be received by the registrar at least 15 days prior to the start date of the course for full tuition reimbursement. If notice of cancellation is received less than 15 days prior to the course start date, full tuition will be charged. However, this tuition penalty will be waived if the canceled seat is resold by the registrar prior to the course start date. Inquiries, registration information, and requests for training at customer locations may be directed to:

LUCENT TECHNOLOGIES CTIP CUSTOMER SERVICE

1-800-TRAINER (Select option 2 when prompted)

1-800-872-4637 (Select option 2 when prompted)

1-800-221-1647 (inside Canada).

10. FEATURES

10.1 FEATURE LIST

This section provides the user with a summary of the 5ESS[®] switch features for the 5E1 through the 5E16.1 software releases. Tables 10-1, 10-2, 10-3, 10-4 provide a listing of these features by feature number, lists the initial software release the feature was available with, and the switching module (SM) software configuration required to support the feature.

An entry of "basic" in the SM configuration column means that the feature is available when the SM is basic (that is, the minimum software configuration). The "standard" SM configuration supports (in addition to the basic features) full common channel signaling (CCS), full toll applications, full defense switched network applications, and Operator Services Position System (OSPS) originating treatment. The "loaded" SM configuration supports (in addition to the standard features) full OSPS support and integrated services digital network (ISDN)]. See "SM SOFTWARE OPTIONING", Section 2.3.4. An entry of SM-2000 indicates that this feature is applicable to the SM-2000.

Note that the 5E4 software release supported only "standard" and "loaded" SMs.

Immediately following Tables 10-1, 10-2, 10-3, 10-4 a definition for each feature listed is provided. These definitions are provided as a quick reference source only and do not represent the requirements for the features. The individual feature availability and definition should be verified with the Lucent Account Management Organization before such capabilities are planned for a specific application.

NOTE: For information regarding whether a particular feature is optioned or secured or if a Right To Use fee is associated with a particular feature, please refer to the appropriate 235-190-XXX, *Feature Description* manual.

10.1.1 5ESS[®] Switch Feature List

Table 10-1 5ESS[®] Switch Feature List (01-00-0000 - 30-26-0200)

FEATURE NUMBER	FEATURE TITLE	SM CONFIG	SOFTWARE RELEASE
01-00-0000	RESIDENCE AND BUSINESS CUSTOMER FEATURES		
01-01-0000	RESIDENCE FEATURES		
01-01-0100	Four- and Eight-Party Line	Basic	5E1(2)1
01-02-0000	FEATURES COMMON TO RESIDENCE AND BUSINESS		
01-02-0100	Individual Line	Basic	5E1(1)
01-02-0200	Two-Party Line	Basic	5E1(1)
01-02-0300	AUTOMATIC ORIGINATING FEATURES		
01-02-0301	Manual Line Service	Basic	5E1(1)
01-02-0302	Direct Connect	Basic	5E1(1)
01-02-0303	Direct Connect for Two-Party	Basic	5E1(2)1
01-02-0400	Free Terminating Line Service	Basic	5E1(1)
01-02-0500	Denied Terminating Line Service	Basic	5E1(1)
01-02-0550	Denied Originating Line Service	Basic	5E1(1)
01-02-0600	Toll Restricted Line Service	Basic	5E1(1)
01-02-0700	Code Restriction	Basic	5E1(1)
01-02-0800	HUNTING FEATURES		
01-02-0801	Series Completion Service	Basic	5E1(1)
01-02-0802	Multiline Hunt Service	Basic	5E1(1)
01-02-0803	Circle Hunting	Basic	5E1(1)
01-02-0805	Uniform Call Distribution	Basic	5E2(1)
01-02-0806	Stop Hunt Key	Basic	5E1(1)
01-02-0807	Queuing for Lines	Basic	5E2(2)
01-02-0808	Delay Announcement for Queued Calls on Hunt Group	Basic	5E2(2)
01-02-0809	Make-Busy Key	Basic	5E1(1)
01-02-0900	Dial Pulse Dialing	Basic	5E1(1)
01-02-1000	Dual Tone Multifrequency (DTMF) Dialing	Basic	5E1(1)
01-02-1100	ABBREVIATED DIALING FEATURES		
01-02-1101	Speed Calling	Basic	5E1(1)
01-02-1101A	Speed Calling (for BRCS)	Basic	5E2(1)
01-02-1102	Customer-Changeable Speed Calling	Basic	5E1(1)

01-02-1102A	Customer-Changeable Speed Calling (for BRCS)	Basic	5E2(1)
01-02-1200	CALL WAITING FEATURES		
01-02-1201	Call Waiting	Basic	5E1(1)
01-02-1201A	Call Waiting (for BRCS)	Basic	5E2(1)
01-02-1202	Call Waiting Originating	Basic	5E2(1)
01-02-1203	Dial Call Waiting	Basic	5E2(1)
01-02-1204	Cancel Call Waiting	Basic	5E2(1)
01-02-1300	THREE-WAY CALLING SERVICE FEATURES		
01-02-1301	Three-way Calling	Basic	5E1(1)
01-02-1301A	Three-way Calling (for BRCS)	Basic	5E2(1)
01-02-1302	Call Transfer Individual - All Calls	Basic	5E2(1)
01-02-1302A	Call Transfer Outside	Basic	5E2(1)
01-02-1400	CALL FORWARDING FEATURES		
01-02-1401	Call Forwarding	Basic	5E1(1)
01-02-1401A	Call Forwarding Variable (for BRCS)	Basic	5E2(1)
01-02-1402	Remote Call Forwarding	Basic	5E2(1)
01-02-1404	Call Forwarding - Busy Line	Basic	5E2(1)
01-02-1407	Call Forwarding - Don't Answer - All Calls	Basic	5E2(1)
01-02-1408	Call Forwarding Over Private Facilities	Basic	5E5
01-02-1409	Remote Activation of Call Forwarding	Basic	5E5
01-02-1600	INTERNATIONAL DIRECT DISTANCE DIALING (IDDD)		
01-02-1601	IDDD Via TSPS	Basic	5E1(1)
01-02-1700	Flat-Rate Charge Service	Basic	5E1(1)
01-02-1800	Message-Rate Charge Service	Basic	5E1(1)
01-02-1900	Customer Premises Message Registers	Basic	5E1(2)1
01-02-2000	PRIVATE FACILITY INTERFACES		
01-02-2001	Foreign Exchange Lines	Basic	5E1(1)
01-02-2002	Eight-Hundred (800) Service (INWATS)	Basic	5E1(2)1
01-02-2003	Eight-Hundred (800) Service - SFG	Basic	5E2(1)
01-02-2004	OUTWATS	Basic	5E1(1)
01-02-2005	OUTWATS - Simulated Facility Group (SFG)	Basic	5E2(1)
01-02-2006	Dial Access to Private Facilities	Basic	5E2(1)
01-02-2500	Automatic Callback	Basic	5E2(1)
01-02-2600	Conference Calling - 6-Way Station Controlled	Basic	5E2(1)
01-02-2700	Call Hold	Basic	5E2(1)
01-02-2800	CALL PICKUP FEATURES		
01-02-2801	Call Pickup	Basic	5E2(1)
01-02-2802	Directed Call Pickup	Basic	5E2(1)
01-02-2803	Directed Call Pickup Without Barge-In	Basic	5E2(1)
01-02-2900	Customer-Dialed Account Recording (CDAR)	Basic	5E3
01-02-3000	Distinctive Ringing Tone Originating/Terminating	Basic	5E2(1)
01-02-3300	Radio Paging	Basic	5E2(1)
02-00-0000	SMALL BUSINESS (CENTREX) CUSTOMER FEATURES		
02-01-0000	LINE FEATURES		
02-01-0100	Business Group Line	Basic	5E2(1)
02-01-0200	Group Numbering Plan	Basic	5E2(1)
02-01-0201	Critical Interdigital Timing for Dialing Plan	Basic	5E2(1)
02-01-0300	Intercom Dialing	Basic	5E2(1)
02-01-0400	Semi-Restricted (Originating and Terminating)	Basic	5E2(1)
02-01-0500	Fully Restricted (Originating and Terminating)	Basic	5E2(1)
02-01-0600	Toll Diversion to Attendant	Basic	5E2(1)
02-01-0700	Customer Access Treatment Code Restrictions	Basic	5E2(1)
02-01-0800	Trunk Answer Any Station	Basic	5E2(1)
02-01-0900	Authorization Codes	Basic	5E3
02-01-1000	Call Waiting Incoming Only	Basic	5E2(1)
02-01-1100	CALL FORWARDING		
02-01-1101	Call Forwarding - Incoming Only	Basic	5E2(1)
02-01-1102	Call Forwarding - Within Group Only	Basic	5E2(1)
02-01-1103	Call Forwarding - Busy Line - Incoming Only	Basic	5E2(1)
02-01-1104	Call Forwarding - Don't Answer - Incoming Only	Basic	5E2(1)
02-01-1200	Special Intercept Announcements	Basic	5E2(1)
02-01-1300	CALL TRANSFER SERVICES		
02-01-1301	Add-On - Consultation Hold - Incoming Only	Basic	5E2(1)
02-01-1303	Call Transfer Attendant	Basic	5E2(1)
02-01-1304	Call Transfer - Internal Only	Basic	5E2(1)
02-01-1305	Call Transfer - Individual - Incoming Only	Basic	5E2(1)
02-02-0000	PRIVATE FACILITY TRUNK FEATURES		
02-02-0100	TIE TRUNK FEATURES		
02-02-0101	Tie Trunk Access	Basic	5E2(1)
02-02-0102	Tandem Tie Trunk (Tie line) Dialing	Basic	5E2(1)
02-02-0103	Dial Transfer to Tandem Tie Line	Basic	5E2(1)
02-02-0300	Automatic Route Selection (ARS)	Basic	5E2(1)
02-02-0400	Deluxe ARS	Basic	5E2(1)
02-02-0500	Simulated Facility Groups For In and Out Calls (No	Basic	5E2(1)

02-02-0600	Intercom)		
02-02-0700	CCSA Access	Basic	5E2(1)
02-02-0900	EPSCS Access	Basic	5E2(1)
02-02-1000	Access to ETS Trunks	Basic	5E2(1)
	Message Detail Recording of Private Facility Calls Via	Basic	5E2(1)
	Revenue Accounting Office		
02-03-0000	ATTENDANT FEATURES		
02-03-0100	Attendant Access to Code Calling	Basic	5E2(1)
02-03-0200	Non-Data-Link Attendant Console	Basic	5E2(1)
02-03-0300	Attendant Conference	Basic	5E2(1)
02-03-0400	Attendant Camp on (Non-Data-Link Console)	Basic	5E2(1)
02-03-0500	Night Service	Basic	5E2(1)
02-03-0600	Attendant ID on Incoming Calls	Basic	5E2(1)
02-03-0700	Attendant Control of Facilities	Basic	5E2(1)
02-03-0800	Dial Through Attendant	Basic	5E2(1)
02-03-1000	Trunk Group Busy Lamps	Basic	5E2(1)
02-03-1100	Attendant Direct Station Selection	Basic	5E2(1)
02-03-1200A	Multiposition Hunt	Basic	5E2(1)
02-03-1300	Call Waiting Lamps for Attendant	Basic	5E2(2)
03-00-0000	LARGE BUSINESS (CENTREX-ESSX TYPE)		
	CUSTOMER FEATURES		
03-01-0000	SYSTEM FEATURES		
03-01-0100	Uniform Numbering	Basic	5E3
03-01-0200	Traveling Class Marks	Basic	5E3
03-01-0500	Centrex Complex	Basic	5E2(1)
03-01-0600	Main - Satellite Service	Basic	5E2(1)
03-01-0600B	Attendant Recall From Satellite	Basic	5E2(1)
03-01-0600C	Satellite Attendant Transfer	Basic	5E2(1)
03-01-0600E	Trunk Dial Transfer	Basic	5E2(1)
03-01-0700	Centralized Attendant Service	Basic	5E5
03-01-0800	Release Link Service	Basic	5E5
03-01-1000	PRIVATE SWITCHED NETWORKS	Basic	5E3
03-01-1020	Common Control Switching Arrangement (CCSA)	Basic	5E3
	Switching Capability		
03-01-1030	ETN Switching	Basic	5E3
03-02-0000	ATTENDANT FEATURES		
03-02-0500	Attendant Call Through Tests on Tie Trunks	Basic	5E7
03-02-0900	Message Service	Basic	5E4
03-03-0000	ADMINISTRATIVE FEATURES		
03-03-0100	Customer Station Rearrangements (CSR) via RMAS	Basic	5E2(2)
03-03-0200	Customer Control	Basic	5E3
03-03-0300	Selective Control of Facilities (SCOF)	Basic	5E2(1)
03-03-0400	Traffic Data to Customer Location	Basic ^a	5E3
03-03-0500	Automatic Circuit Assurance	Basic ^a	5E3
03-03-0600	Customer-Polled Traffic Data	Basic ^a	5E3
03-03-0700	Message Detail Recording to Customer Location	Basic ^a	5E3
03-03-0800	WATS Administration Data	Basic	5E2(1)
03-04-0000	OTHER FEATURES		
03-04-0100	Code Calling	Basic	5E2(1)
03-04-0300	Loudspeaker Paging	Basic	5E2(1)
03-04-0400	Recorded Telephone Dictation	Basic	5E2(1)
04-00-0000	EXTENDED BUSINESS FEATURE INTERFACES		
04-01-0100	PBX Line - Features	Basic	5E1(1)
04-02-0000	Direct Inward Dialing (DID)	Basic	5E1(1)
04-04-0000	Toll Diversion	Basic	5E1(1)
04-05-0000	Hotel-Motel Calls Route to TSPS	Basic	5E1(2)1
04-06-0000	Outward Calling Features (OCF) for PBX	Basic	5E2(1)
04-07-0000	DTMF Outpulsing to PBX	Basic	5E2(1)
10-00-0000	COIN AND CHARGE-A-CALL FEATURES		
10-01-0000	Coin Line - Coin First	Basic	5E1(1)
10-02-0000	Coin Line - Dial-Tone-First	Basic	5E1(1)
10-03-0000	Coin Collect and Return Signaling	Basic	5E1(1)
10-04-0000	Coin With or Without Local Overtime Charging	Basic	5E1(1)
10-05-0000	Coin Distance Dialing With TSPS	Basic	5E1(1)
10-08-0000	Expanded Inband Signaling	Basic	5E1(1)
10-09-0000	IMPROVED PUBLIC TELEPHONE SERVICE		
10-09-0001	Local Rate Flexibility	Basic	5E1(1)
10-10-0000	Charge-a-Call (Coinless Public Telephone Service	Basic	5E1(1)
10-11-0000	Stuck Coin Administration	Basic	5E1(1)
10-12-0000	Inband Signaling	Basic	5E1(1)
15-00-0000	PUBLIC SAFETY FEATURES		
15-01-0000	Basic Emergency Service (911)	Basic	5E1(1)

15-03-0000	Tracing of Terminating Calls	Basic	5E1(1)
15-04-0000	Outgoing Call Tracing	Basic	5E1(1)
15-05-0000	Tandem Call Trace	Basic	5E1(1)
15-06-0000	Trace of a Call in Progress	Basic	5E1(1)
15-07-0000	Group Alerting	Basic	5E1(1)
20-00-0000	MISCELLANEOUS LOCAL SYSTEM FEATURES		
20-01-0000	LOOP RANGE FEATURES		
20-01-0100	Compatibility With 1300-Ohm Loops	Basic	5E1(1)
20-01-0300	Compatibility With 1500-Ohm Loops	Basic	5E1(1)
20-01-0410	Compatibility With External Per-Line Range Extension	Basic	5E1(1)
	Devices		
20-01-0600	Compatibility With Dial Long Line Circuits	Basic	5E1(1)
20-02-0000	PAIR GAIN INTERFACES		
20-02-0100	Integrated Pair Gain Interfaces	Basic	5E1(2)2
20-02-0200	Compatibility With Conventional (Nonintegrated) Pair	Basic	5E1(1)
	Gain System		
20-03-0000	LINE SIGNALING		
20-03-0100	Loop-Start Line	Basic	5E1(1)
20-03-0200	Ground-Start Line	Basic	5E1(1)
20-03-0300	Line - Sleeve Lead Control	Basic	5E1(1)
20-04-0000	Emergency Ringback (Including 4/8 Party)	Basic	5E1(2)1
20-04-0000A	Emergency Ringback (Not for 4/8 Party)	Basic	5E1(1)
20-05-0000	Two-Digit Translation on Incoming Trunks	Basic	5E1(1)
20-06-0000	ANNOUNCEMENTS		
20-06-0100	Recorded Announcement Service (Local)	Basic	5E1(1)
20-06-0500	Special Information Tones	Basic	5E1(2)1
20-07-0000	RINGING	Basic	5E1(1)
20-07-0100	Individual Line Ringing	Basic	5E1(1)
20-07-0200	Two-Party Line Ringing	Basic	5E1(1)
20-08-0000	Multiparty Ringing	Basic	5E1(2)1
20-09-0000	Audible Ringing Tone	Basic	5E1(1)
20-10-0000	Reverting Call Service	Basic	5E1(1)
20-11-0000	Bridge Lifters	Basic	5E1(1)
20-13-0000	Prevention of Service Requests by Induced Voltages	Basic	5E1(1)
20-14-0000	Class of Service	Basic	5E1(1)
20-16-0000	Nailed-Up Special Services and Message Trunks	Basic	5E3
20-16-0000	Nailed-Up Special Services and Message Trunks	Basic	5E3
20-18-0000	Subscriber Loop Echo Return Control	Basic	5E1(1)
20-19-0000	Nonsegregated T1 Special Services	Basic	5E3
20-20-0000	Automatic Number Identification (ANI)	Basic	5E1(1)
20-21-0000	Software Controlled Connection Loss	Basic	5E1(1)
20-22-0000	Synchronization to Incoming DS1 Facilities	Basic	5E1(1)
20-24-0000	Inter-LATA Carrier/International CI	Basic	5E2(1)
20-24-0200	Feature Group A	Basic	5E1(2)3
20-24-0300	Feature Group B	Basic	5E2(1)
25-00-0000	INTEROFFICE FEATURES		
25-01-0000	INTEROFFICE ADDRESS SIGNALING		
25-01-0200	Revertive Pulsing	Basic	5E2(1)
25-01-0300	Dial Pulsing	Basic	5E1(1)
25-01-0400	Multifrequency Pulsing	Basic	5E1(1)
25-01-0500	Common Channel Interoffice Signaling (CCIS)		
25-02-0000	ADDRESS PULSING CONTROL		
25-02-0100	Immediate Start	Basic	5E1(1)
25-02-0200	Wink Start	Basic	5E1(1)
25-02-0300	Delay Dial	Basic	5E1(1)
25-02-0400	Stop-Go	Basic	5E1(2)1
25-03-0000	CALL STATE SUPERVISORY SIGNALING		
25-03-0100	LOOP SIGNALING ARRANGEMENTS		
25-03-0101	Reverse Battery	Basic	5E1(1)
25-03-0102	High Low	Basic	5E1(1)
25-03-0200	E and M Lead Interfaces	Basic	5E1(1)
25-04-0000	Intraoffice Connecting Arrangements	Basic	5E1(1)
25-05-0000	INCOMING INTEROFFICE TRUNKS		
25-05-0100	Local - RB Supervision, MF or DP	Basic	5E1(1)
25-05-0200	Local - E and M Lead Supervision, MF or DP	Basic	5E1(1)
25-05-0300	Tandem - RB Supervision, MF or DP	Basic	5E1(1)
25-05-0400	Tandem - E and M Lead Supervision, MF or DP	Basic	5E1(1)
25-05-0500	Immediate Start - RB Supervision, DP	Basic	5E1(1)
25-05-0600	Immediate Start - E and M Lead Supervision, DP	Basic	5E1(1)
25-05-0700	Tandem Completing Toll	Basic	5E1(1)
25-05-0900	SWITCHBOARD OR DESK		
25-05-0901	Toll Switching, Distant Building	Basic	5E1(1)
25-05-0903	Verification	Basic	5E1(1)
25-05-0905	Local Test Desk or Cabinet Access	Basic	5E1(1)

25-06-0000	OUTGOING INTEROFFICE TRUNKS		
25-06-0100	Loop Supervision, MF or DP	Basic	5E1(1)
25-06-0200	E and M Lead Supervision, MF or DP	Basic	5E1(1)
25-06-0300	Directory Assistance	Basic	5E1(1)
25-06-0500	SWITCHBOARD OR DESK		
25-06-0501	Switchboard	Basic	5E1(1)
25-06-0502	Traffic Service Position System (TSPS)	Basic	5E1(1)
25-06-0503	Repair Service Bureau Access	Basic	5E1(1)
25-06-0504	Access to Local Test Desk	Basic	5E1(1)
25-06-0505	Centralized Intercept	Basic	5E1(1)
25-07-0000	TWO-WAY TRUNKS		
25-07-0100	Interoffice (MF and DP)	Basic	5E1(1)
25-07-0300	Switchboard and Desk	Basic	5E1(1)
25-08-0000	Outgoing CAMA Trunks	Basic	5E1(1A)
25-09-0000	DIRECT PORTS TO PCM FACILITIES		
25-09-0100	Direct Ports to DS1 Facilities	Basic	5E1(1)
30-00-0000	CALL PROCESSING FEATURES		
30-01-0100	Automatic Internal Overload Control	Basic	5E1(1)
30-01-0200	Essential Service Protection	Basic	5E1(2)1
30-02-0000	CUSTOMER LINE CHECKS		
30-02-0100	Power Cross Test	Basic	5E1(1)
30-02-0200	Ringing Continuity Test	Basic	5E1(1)
30-03-0000	Numbering Plan	Basic	5E1(1)
30-04-0000	Direct Distance Dialing (DDD)	Basic	5E1(1)
30-05-0000	Permanent Signal	Basic	5E1(1)
30-06-0000	Digit Interpretation	Basic	5E1(1)
30-07-0000	DIGIT INTERPRETATION TIMING		
30-07-0100	Partial Dial	Basic	5E1(1)
30-07-0200	Critical Interdigit Timing	Basic	5E1(1)
30-07-0300	End of Dial	Basic	5E1(1)
30-08-0000	Screening	Basic	5E1(1)
30-09-0000	Routing	Basic	5E1(1)
30-10-0000	Alternate Routing	Basic	5E1(1)
30-12-0000	Subscriber Directory Number Dialing Features	Basic	5E1(1)
30-12-0100	Prefix '1' For Toll Calls	Basic	5E1(1)
30-12-0200	Prefix '1' for 10-Digit Calls	Basic	5E1(1)
30-12-0300	No Prefix Required for 7- or 10-Digit Calls	Basic	5E1(1)
30-12-0301	Prefix '1' Allowed on 10-Digit Calls Only	Basic	5E1(1)
30-12-0302	Prefix '1' Allowed on 7- or 10-Digit Calls	Basic	5E1(1)
30-13-0000	Foreign Area Translation (6-Digit Translation)	Basic	5E1(1)
30-14-0000	Operator Assistance - Dial '0'	Basic	5E1(1)
30-15-0000	Special Toll Calls - Dial '0' Plus 7- or 10-Digits	Basic	5E1(1)
30-16-0000	SERVICE CODES		
30-16-0100	Service Codes N11	Basic	5E1(1)
30-16-0100A	Service Codes N11 (Enhanced)	Basic	5E1(2)1
30-17-0000	Directory Assistance	Basic	5E1(1)
30-18-0000	Custom Calling Service Access Codes	Basic	5E1(1)
30-19-0000	INTERSYSTEM ADDRESS OUTPUTSING (MF AND DP)		
30-19-0100	Output 2-10 Digits MF and DP	Basic	5E1(1)
30-19-0200	Delete Digits (up to 7)	Basic	5E1(1)
30-19-0300	Prefix Digits (up to 3)	Basic	5E1(1)
30-19-0400	Output 7 Digits for Valid Service Codes	Basic	5E1(1)
30-20-0000	Reception of Outputting From Other Systems (MF and DP)	Basic	5E1(1)
30-21-0000	INTERCEPT ROUTING FOR CALLS TO BLANK, CHANGED, DISCONNECTED, OR UNASSIGNED		
	DIRECTORY NUMBERS		
30-21-0100	Announcement - Local or Remote	Basic	5E1(1)
30-21-0200	Operator	Basic	5E1(1)
30-21-0300	Remote Intercept System (AIS)	Basic	5E1(1)
30-23-0000	REMOTE SWITCHING UNITS (RSU)	Basic	5E1(2)2
30-23-0200	Single Module Remote Switching Module (RSM)	Basic	5E1(2)2
30-25-0000	Timed Release Disconnect	Basic	5E1(1)
30-26-0000	TANDEM CAPABILITY		
30-26-0100	Limited Local Tandem Switching	Basic	5E1(2)1
30-26-0200	Local Intertandem Switching	Basic	5E1(2)1
Notes:			
a. One loaded SM required for attached processor interface (API) link.			

10.1.2 5ESS® Switch Feature List (continued)

Table 10-2 5ESS® Switch Feature List (35-00-0000 - 98-5E-2522)

FEATURE NUMBER	FEATURE TITLE	SM CONFIG	SOFTWARE RELEASE
35-00-0000	SYSTEM MAINTENANCE FEATURES		
35-01-0000	TROUBLE DETECTION	Basic	5E1(1)
35-01-0100	Hardware Redundancy	Basic	5E1(1)
35-01-0200	Hardware Checks	Basic	5E1(1)
35-01-0300	Software Checks	Basic	5E1(1)
35-01-0310	Continuous Automatic Tests	Basic	5E1(1)
35-01-0311	Audits Programs	Basic	5E1(1)
35-01-0312	Sanity Tests	Basic	5E1(1)
35-01-0320	Per-Call and Per-Operation Trouble Detection Tests	Basic	5E1(1)
35-01-0321	Call Processing Data Base Trouble Detection	Basic	5E1(1)
35-01-0322	Call Processing Resource Availability Tests	Basic	5E1(1)
35-01-0323	Ineffective Attempt Detection	Basic	5E1(1)
35-01-0324	Cut-Off Call Trouble Detection	Basic	5E1(1)
35-01-0325	Network Path Integrity End-to-End Test	Basic	5E1(1)
35-01-0326	Assurance of Customer Privacy of Communications Test	Basic	5E1(1)
35-01-0327	Tip and Ring Polarity Check Test	Basic	5E1(2)1
35-01-0330	Periodic Automatic Test	Basic	5E1(1)
35-01-0340	Semi-Automatic Trouble Detection Tests	Basic	5E1(1)
35-01-0350	Manual Tests	Basic	5E1(1)
35-01-0360	Inhibit of Trouble Detection	Basic	5E1(1)
35-02-0000	SERVICE RECOVERY	Basic	5E1(1)
35-02-0100	Fault Recovery Programs	Basic	5E1(1)
35-02-0200	Initializations	Basic	5E1(1)
35-02-0300	AUTOMATIC SERVICE RECOVERY	Basic	5E1(1)
35-02-0310	Automatic Treatment of Errors	Basic	5E1(1)
35-02-0320	Automatic Treatment of Faults	Basic	5E1(1)
35-02-0330	Equipment Selection Procedures	Basic	5E1(1)
35-02-0340	Out-of-Service Limit for Server Group Equipment	Basic	5E1(1)
35-02-0400	Manual Service Recovery	Basic	5E1(1)
35-03-0000	TROUBLE NOTIFICATION	Basic	5E1(1)
35-03-0100	Three-Level Alarm Structure	Basic	5E1(1)
35-03-0200	Audible Alarms	Basic	5E1(1)
35-03-0300	Visual Alarm Indicators	Basic	5E1(1)
35-03-0400	Output Messages	Basic	5E1(1)
35-03-0500	Trouble Status Indicators	Basic	5E1(1)
35-03-0600	Office Alarm Subsystem	Basic	5E1(1)
35-04-0000	Trouble Verification	Basic	5E1(1)
35-05-0000	TROUBLE ISOLATION	Basic	5E1(1)
35-05-0100	Trouble Location Procedure	Basic	5E1(1)
35-05-0200	Diagnostics	Basic	5E1(1)
35-05-0300	Error Analysis	Basic	5E1(1)
35-06-0000	REPAIR	Basic	5E1(1)
35-07-0000	MAINTENANCE PERSON-SWITCHING SYSTEM		
	INTERFACES		
35-07-0100	Maintenance Control Center (MCC)	Basic	5E1(1)
35-07-0200	Switching System Control and Display Interfaces	Basic	5E1(1)
35-07-0210	Alarm Release	Basic	5E1(1)
35-07-0220	Alarms Transfer	Basic	5E1(1)
35-07-0300	Switching System Maintenance I/O Devices	Basic	5E1(1)
35-07-0400	Extended Maintenance Center (Beltline)	Basic	5E1(1)
35-08-0000	Remote Maintenance Center	Basic	5E1(1)
35-08-0200	Switching Control Center System (SCCS) Synchronous Interface	Basic	5E1(1)
35-09-0000	Maintenance Measurements	Basic	5E1(1)
40-00-0000	TRUNK, LINE, AND SPECIAL SERVICE CIRCUIT TEST FEATURES		
	TRUNK MAINTENANCE		
40-00-1000	Trunk and Line Control and Display Interface	Basic	5E1(1)
40-00-1200	Trunk and Line Maintenance I/O Interface	Basic	5E1(1)
40-00-1300	Trunk and Line Work Station I/O Interface (Enhanced) 4	Basic	5E1(2)1
40-00-1300A	Supplementary Trunk and Line Work Stations	Basic	5E1(2)1
40-00-1400			
40-01-0000	TRUNK TEST FEATURES AT THE TLWS (TRUNK AND LINE WORK STATION)		
	Diagnostic Tests	Basic	5E1(1)
40-01-0100	Output Tests	Basic	5E1(1)
40-01-0200	Make-Busy/Make Idle Control	Basic	5E1(1)
40-01-0300	DC Voltmeter	Basic	5E1(1)
40-01-0400			
40-01-0500	TRANSMISSION MEASUREMENTS		
40-01-0501	Basic Transmission Measurements	Basic	5E1(1)
40-01-0600	Supervisory Tests	Basic	5E1(1)
40-01-0700	Trunk Circuit Diagnostics	Basic	5E1(1)

40-01-0800	Monitor	Basic	5E1(1)
40-01-0900	Talk	Basic	5E1(1)
40-01-1100	Test Set Connections	Basic	5E1(1)
40-02-0000	REMOTE TRUNK AND LINE MAINTENANCE		
40-02-0100	REMOTE TRUNK MAINTENANCE	Basic	5E1(1)
40-02-0101	Centralized Trunk Test Unit (CTTU) Interface	Basic	5E1(2)2
40-02-0200	Remote Office Test Line (ROTL)	Basic	5E1(2)1
40-02-0300	REMOTE LINE MAINTENANCE	Basic	5E1(2)1
40-02-0301	Interfaces to Local Test Desk and Related Systems	Basic	5E1(1)
40-02-0302	Mechanized Loop Test System No. 2 (MLT-II) Interface	Basic	5E2(1)
40-03-0000	LOCAL OFFICE TEST LINES		
40-03-0100	100-Type Test Line	Basic	5E1(1)
40-03-0200	101-Type Test Line	Basic	5E1(2)1
40-03-0300	102-Type Test Line	Basic	5E1(1)
40-03-0500	105-Type Test Line	Basic	5E1(1)
40-03-0600	Synchronous Test Line	Basic	5E1(1)
40-03-0700	Nonsynchronous Test Line	Basic	5E1(1)
40-03-0800	Permanent Busy Test Line	Basic	5E1(1)
40-04-0000	Coin Station Test Line Access	Basic	5E1(1)
40-05-0000	Station Ringer Touch-Tone Test Line	Basic	5E1(1)
40-08-0000	Automatic Progression Trunk Testing	Basic	5E1(1)
40-09-0000	Line Insulation Test	Basic	5E1(1A)
40-10-0000	System Line Insulation Test	Basic	5E1(1)
40-11-0000	Test Incoming Trunks in Tandem or Local States	Basic	5E1(1)
40-12-0000	AUTOMATIC RETEST (TREATMENT) OF PERMANENT SIGNALS		
40-12-0100	Lines	Basic	5E1(1)
40-12-0200	Trunks (False Seizures)	Basic	5E1(1)
40-17-0000	MANUAL TESTING		
40-17-0100	Manual Test of Lines	Basic	5E1(1)
40-17-0200	Manual Test of Trunks	Basic	5E1(1)
40-18-0000	TREATMENT OF TRUNKS WITH MDII		
40-18-0100	Removal From Service of Trunks With Machine-Detected Interoffice Irregularities	Basic	5E1(2)1
40-18-0200	Selective Suppression of MDII Messages	Basic	5E1(2)1
40-18-0500	CALL IRREGULARITIES DUE TO TRUNK FAILURES		
40-18-0501	Detection, Reporting, Automatic, Diagnostic, and Trunk Removal Safeguards	Basic	5E1(1)
40-18-0502	Trunk Error Analysis	Basic	5E1(2)3
40-18-0600	Identification of Tip-Ring Reversals Associated With Spurious Answer Signals	Basic	5E1(2)1
40-19-0000	Demand Listing of Trunk Numbers of Specified Trunk Group	Basic	5E1(1)
40-20-0000	Print the Trunk-Out-of-Service (TOS) List	Basic	5E1(1)
40-22-0000	Trunk Group - Remove From Service (Make-Busy)	Basic	5E1(1)
40-23-0000	Trunk Group - Restore to Service (Make Idle)	Basic	5E1(2)1
40-24-0000	Transmission Testing of Trunk Groups	Basic	5E1(1)
40-27-0000	Line Access to TLWS	Basic	5E1(2)1
40-28-0000	Multiple Trunk Test Capability	Basic	5E1(1)
40-29-0000	Trunk-to-Trunk Test Connection	Basic	5E1(2)1
40-32-0000	Carrier Group Alarm (CGA)	Basic	5E1(1)
40-32-0000A	Carrier Group Alarm (CGA) (Enhanced)	Basic	5E1(2)1
45-00-0000	ADMINISTRATIVE FEATURES		
45-01-0000	DATA BASE MANAGEMENT - MEMORY ALTERATION		
45-01-0100	Assignments	Basic	5E1(1)
45-01-0200	Recent Change and Verify	Basic	5E1(1)
45-01-0300	Initialization and Growth	Basic	5E1(1)
45-01-0400	Office Records Verification	Basic	5E1(2)2
45-01-0500	Memory Backup and Recovery	Basic	5E1(1)
45-01-0600	Program Alteration	Basic	5E1(1)
45-01-0700	Interface to Centralized Data Base Management Centers	Basic	5E1(2)1
45-01-0701	RMAS Interface	Basic	5E1(2)1
45-01-0800	Direct Terminal Interface for Recent Change and Verify	Basic	5E1(1)
45-01-0900	DATA BASE INTEGRITY AND SECURITY		
45-01-0910	Data Base Integrity	Basic	5E1(1)
45-01-0920	Data Base Security	Basic	5E1(1)
45-03-0000	Delayed Activation Recent Change (Batch Recent Change)	Basic	5E1(2)2
45-05-0000	Teletypewriter Input/Output	Basic	5E1(1)
45-06-0000	AUTOMATIC TRAFFIC MEASUREMENTS		
45-06-0100	TYPES OF MEASUREMENTS		
45-06-0101	Event Measurements	Basic	5E1(1)
45-06-0102	Usage Measurements	Basic	5E1(1)

45-06-0200	MEASUREMENT APPLICATIONS		
45-06-0201	Office Totals	Basic	5E1(1)
45-06-0201A	Office Totals (Enhanced)	Basic	5E1(2)1
45-06-0202	Component Measures	Basic	5E1(1)
45-06-0203	Network Measures	Basic	5E1(1)
45-06-0205	Validity Measures	Basic	5E1(1)
45-06-0206	Division of Revenue Measures	Basic	5E1(1)
45-07-0000	SERVICE MEASUREMENTS		
45-07-0100	Customer Access Service Measurements	Basic	5E1(1)
45-07-0200	Plant Service Measurements	Basic	5E1(1)
45-07-0200A	Plant Service Measurements (More)	Basic	5E1(2)1
45-09-0000	TRAFFIC MEASUREMENT OUTPUT	Basic	5E1(1)
45-09-0100	Engineering and Administrative Data Acquisition System	Basic	5E1(1)
	(EADAS) Interface		
45-10-0000	NAC I-O CHANNEL		
45-10-0100	NAC Verification of Translation Data	Basic	5E1(2)1
45-10-0200	System Status Information Retrieval	Basic	5E1(2)1
45-10-0300	Traffic Data Query Capability	Basic	5E1(2)1
45-11-0000	Verification of Traffic Schedules	Basic	5E1(1)
45-13-0000	SERVICE EVALUATION INTERFACE		
45-13-0100	Service Evaluation	Basic	5E1(2)1
45-13-0200	No. 2 SES Interface	Basic	5E1(2)1
45-15-0000	Black Box Fraud Protection	Basic	5E1(1)
45-16-0000	Signaling Irregularities (Blue Box Fraud Detection	Basic	5E2(1)
45-18-0000	NETWORK MANAGEMENT (NM)		
45-18-0200	MANUAL NM CONTROLS		
45-18-0201	Code Controls	Basic	5E2(1)
45-18-0202	Trunk Group Controls	Basic	5E1(2)1
45-18-0202A	Trunk Group Controls (Enhanced)	Basic	5E2(1)
45-18-0300	NM Surveillance Data	Basic	5E2(1)
45-18-0400	CENTRALIZED NETWORK MANAGEMENT		
45-18-0401	NM Audits and Alerts	Basic	5E1(2)
45-18-0401A	NM Audits and Alerts (Enhanced)	Basic	5E2(1)
45-18-0402	Message Administration	Basic	5E1(2)1
45-18-0402A	Message Administration (Enhanced)	Basic	5E2(1)
45-18-0403	EADAS/NM Interface	Basic	5E2(1)
45-18-0500	On-Site Network Management Capabilities	Basic	5E2(1)
45-19-0000	Trunks Out-of-Service for Data Changes	Basic	5E1(1)
50-00-0000	CUTOVER AND GROWTH FEATURES		
50-01-0000	On-Line Growth Procedures and Tests	Basic	5E1(1)
50-02-0000	Automatic Board-to-Board Testing	Basic	5E1(2)1
50-02-0000A	Automatic Board-to-Board Testing (Enhanced)	Basic	5E1(2)2
55-00-0000	BILLING AND COMPTROLLERS FEATURES		
55-01-0000	AUTOMATIC MESSAGE ACCOUNTING (AMA)		
55-01-0100	Local Automatic Message Accounting (LAMA)	Basic	5E1(2)1
55-01-0300	Connection to CAMA Offices	Basic	5E1(1A)
55-01-0400	AMA Teleprocessing	Basic	5E1(2)1
55-02-0000	AMA RECORDING FOR SPECIAL STUDIES		
55-02-0200	Complaint Observing	Basic	5E1(1)
55-02-0300	Traffic Sampling	Basic	5E1(1)
55-02-0400	Subscriber Line Usage (Originating)	Basic	5E1(1)
55-03-0000	BILLING SERVICES		
55-03-0100	Class of Service - Billing	Basic	5E1(1)
55-03-0200	AMA Detailed Record on Timed and Untimed MU Calls	Basic	5E1(1)
55-03-0300	Calling Area Assignments	Basic	5E1(1)
55-03-0500	Directory Assistance Charging	Basic	5E1(1)
55-03-0600	Free Calls	Basic	5E1(1)
55-06-0000	Verification of Billing Number Assignments	Basic	5E1(1)
55-07-0000	Billing Records of WATS Calls	Basic	5E1(1)
55-08-0000	AMA Reel Mounting Protection and Automatic Positioning	Basic	5E1(2)1
60-00-0000	TOLL FEATURES		
60-01-0000	DOMESTIC TOLL OFFICE TRUNKS	Basic	5E1(2)1
60-01-0100	TOLL CONNECTING TRUNKS	Basic	5E1(2)1
60-01-0101	DDD Access (DD) Trunks	Basic	5E1(2)1
60-01-0102	CAMA Trunks	Basic	5E1(2)1
60-01-0103	Traffic Service Position System Trunks	Basic	5E1(2)1
60-01-0104	Toll Completing (TC) Trunks	Basic	5E1(2)1
60-01-0106	Two-Way Toll Connecting Trunks (Not Coded)	Basic	5E1(2)1
60-01-0200	INTERTOLL TRUNKS	Basic	5E1(2)1
60-01-0201	Primary Intertoll (IT) Trunks	Basic	5E1(2)1
60-01-0203	Regular Access Trunks	Basic	5E1(2)1
60-01-0204	TSPS Verification Trunks	Basic	5E1(2)1
60-01-0300	SECONDARY INTERTOLL TRUNKS	Basic	5E1(2)1
60-01-0301	Toll Tandem (TT) Trunks	Basic	5E1(2)1
60-01-0302	OA and LW Trunks	Basic	5E1(2)1

60-01-0303	Residual Trunks	Basic	5E1(2)1
60-01-0304	Delayed Call (DC) Trunks	Basic	5E1(2)1
60-01-0400	AUXILIARY SERVICE TRUNKS	Basic	5E1(2)1
60-01-0401	Rate and Route Trunks	Basic	5E1(2)1
60-01-0403	Directory Assistance (DA) Trunks	Basic	5E1(2)1
60-01-0500	SPECIAL SERVICE TRUNKS		
60-01-0501	Direct Inward Dialing (DID)	Basic	5E1(1)
60-01-0600	MISCELLANEOUS TRUNKS	Basic	5E1(2)1
60-01-0601	CAMA-Operator Trunks	Basic	5E1(2)1
60-02-0000	CALL PROCESSING FEATURES		
60-02-0100	Trunk-to-Trunk Test Connections	Basic	5E1(2)1
60-02-0200	3-DIGIT TRANSLATION	Basic	5E1(2)1
60-02-0201	0/1XX Terminating Toll Center and Operator Codes	Basic	5E1(2)1
60-02-0202	NXX Central Office and Special Purpose Codes	Basic	5E1(2)1
60-02-0203	NXX Area Codes	Basic	5E1(2)1
60-02-0300	6-Digit Translation	Basic	5E1(2)1
60-02-0400	Digit Deletion	Basic	5E1(2)1
60-02-0500	Digit Prefixing	Basic	5E1(2)1
60-02-0600	Code Conversion	Basic	5E1(2)1
60-02-0700	Route Advance Logic	Basic	5E1(2)1
60-02-0800	IDDD Via Function	Basic	5E1(2)1
60-02-0900	Capability for Satellite Connections	Basic	5E1(2)1
60-02-1000	Recorded Announcement Service (Toll)	Basic	5E1(2)1
60-02-1200	Vacant Code Screening	Basic	5E1(2)1
60-02-1300	Trunk Class Screening	Basic	5E1(2)1
60-02-1400	CAMA Unauthorized Code Screening	Basic	5E1(2)1
60-02-1500	CAMA for Adjacent NPAs	Basic	5E1(2)1
60-03-0000	TOLL SIGNALING		
60-03-0100	CCS Trunk Signaling	Basic	5E3
60-03-0200	Interoffice Trunk Signaling (Toll)	Basic	5E1(2)1
60-04-0000	LINE AND TRUNK TEST FEATURES		
60-04-0100	TEST LINES		
60-04-0101	All 10X-Type Test Lines Used on Class 5 Offices	Basic	5E1(2)1
60-04-0102	103-Type Test Line	Basic	5E1(2)1
60-04-0103	104-Type Test Line	Basic	5E1(2)1
60-04-0200	Multiple Trunk Test Capability	Basic	5E1(2)2
60-04-0500	Selection of Transmission Test Levels (TLP2, TLP3)	Basic	5E1(2)1
60-04-0600	FX Line for ROTL in Toll and Tandem Offices	Basic	5E2(1)
60-04-0700	Two-Way Trunk Maintenance	Basic	5E1(2)1
60-04-0800	Quick 'Go or No-Go' Trunk Test	Basic	5E1(1)
60-04-0900	Voice Path Assurance (VPA) Test	Basic	5E3
60-05-0000	NETWORK MANAGEMENT FEATURES	Basic	5E2(1)
60-05-0100	Automatic Network Management Controls	Basic	5E2(1)
60-05-0200	Manual Network Management Controls	Basic	5E1(2)1
60-05-0201	Code Controls	Basic	5E2(1)
60-05-0202	Trunk Group Controls (Toll)	Basic	5E1(2)1
60-05-0300	Network Management Surveillance Data	Basic	5E2(1)
60-05-0400	Centralized Network Management	Basic	5E1(2)1
60-05-0401	NM Audits and Alerts (Toll)	Basic	5E1(2)1
60-05-0401A	NM Audits and Alerts (Enhanced, Toll)	Basic	5E2(1)
60-05-0402	Message Administration (Toll)	Basic	5E1(2)1
60-05-0402A	Message Administration (Enhanced, Toll)	Basic	5E2(1)
60-05-0500	Backup Network Management Capabilities	Basic	5E2(1)
60-06-0000	BILLING		
60-06-0100	Toll CAMA Billing Through Automatic Message	Basic	5E1(2)1
	Accounting Collection System (AMACS)		
60-06-0110	CAMA Suspension	Basic	5E1(2)1
60-07-0000	800 Service - Originating Screening Office	Basic	5E2(2)
60-10-0000	ECHO CONTROL		
60-15-0000	Local Toll Synchronization	Basic	5E1(2)1
60-16-0000	Traffic Measurements (Toll)	Basic	5E1(2)1
60-17-0000	Plant Measurements (Toll)	Basic	5E1(2)1
60-18-0000	ADMINISTRATION		
96-5E-2697	Drop Fully Restricted Terminating Leg of a MWAY Call	Basic	5E10
96-TP-1009	I/O Message to Obtain SS7 Code Numbers	Basic	5E9(1)
97-5E-0015	50A CPS Compatibility	Basic	5E2(2)
97-5E-0022	BRI Cost Reductions - N+K Sparing of the PSU	Loaded	5E4
97-5E-0023	BRI Cost Reductions - DPIDBS	Loaded	5E4
97-5E-0027	128 Channel Protocol Handler	Loaded	5E4
97-5E-0035	CCS AM Real-Time Relief	Basic	5E4
97-5E-0037	Optional Equipping of ISLU Line Drawer Hardware	Loaded	5E4
97-5E-0041	5E4(1) to 5E4(2) Generic Transition	Loaded	5E4
97-5E-0043	Compatibility Test of Proton T and Proton C Data	Loaded	5E4
	Modules		

97-5E-0044	Compatibility Test of NT1 Terminal Adapter	Loaded	5E4
97-5E-0045	Compatibility Test Modular Data Module - Asynchronous (MDM-A)	Loaded	5E4
97-5E-0046	Compatibility Test Modular Data Module - Synchronous (MDM-S)	Loaded	5E4
97-5E-0047	Compatibility Test of Modular Data Module - Modem Pooling (MDM-MP)	Loaded	5E4
97-5E-0048	Compatibility Test of Asynchronous Terminal Adapter for AP	Loaded	5E4
97-5E-0049	Compatibility Test of ISDN VDS-1 (Voice/Data Station I)	Loaded	5E4
97-5E-0050	Compatibility Test of ISDN Voice/Data Station II (VDS-II)	Loaded	5E4
97-5E-0052	Compatibility Test of ISDN Integrated Display	Loaded	5E4
97-5E-0053	EMC Verification of ISDN Hardware	Loaded	5E4
97-5E-0054	5E3 to 5E4(2) Retrofit	Basic	5E4
97-5E-0056	MC68012 TM SMP	Basic	5E4
97-5E-0057	Compatibility Test of ISDN Attendant Console	Loaded	5E4
97-5E-0058	FCC Registration of Pre-5E5 Digital Interfaces of the 5ESS [®] Switch	Basic	5E4
97-5E-0059	Large Office Data Base Retrofit Improvements	Basic	5E4
97-5E-0060	SM Text Off of Primary Disk	Basic	5E4
97-5E-0061	BCD/IO Type	Basic	5E4
97-5E-0064	ODD Disk Resource Enhancements	Basic	5E4
97-5E-0065	Switch Module Office Dependent Data Memory Reductions	Basic	5E4
97-5E-0074	68020 SMP Conversion	Basic	5E4
97-5E-0075	SMP20	Basic	5E4
97-5E-0088	Interflow Cross Generic Compatibility	Loaded	5E6
97-5E-0108	ACD Terminal Support	Loaded	5E4
97-5E-0109	RC and DB to CMP - CMP Application	Basic	5E6
97-5E-0110	5E5 to 5E6 Generic Retrofit and 5E6 Updates	Basic	5E6
97-5E-0111	AMA Teleprocessing Performance Enhancements	Basic	5E6
97-5E-0123	Commercial ACD-AMA Recording for Agent Calls	Loaded	5E4
97-5E-0124	Output Message Reduction	Basic	5E6
97-5E-0409	ISDN PRI Access From Centrex	Loaded	5E7
97-5E-0434	Dial Through Attendant (DTA) Routing of Calls Based on Attendant's Line Class Code (LCC)	Basic	5E7
97-5E-0435	Customer-Originated Trace Transparency Feature	Basic	5E5
97-5E-0436	OSPS Utility Call Trace	Loaded	5E7
97-5E-0437	OSPS Growth Update	Loaded	5E7
97-5E-0438	Real-Time Improvements for AML	Basic	5E8
97-5E-0439	100 Functions per SM Product in BWMs	Basic	5E7
97-5E-1285	ECD Configuration System Standing	Basic	5E9(1)
97-5E-1286	Disk Reconfiguration Standing	Basic	5E9(1)
97-5E-1287	Disk Growth Standing	Basic	5E9(1)
97-5E-1288	Conversion to PRL5.0	Basic	5E9(1)
97-5E-1542	ECD Configuration System Standing	N/A	5E9(2)
97-5E-1543	Disk Growth Standing	N/A	5E9(2)
97-5E-1544	Disk Reconfiguration Standing	N/A	5E9(2)
97-5E-1545	TLWS Enhancements	Basic	5E9(1)
97-5E-1555	All IRN2 Ring	N/A	5E9(2)
97-5E-1614	ISDN Hardware on SM-2000	SM2000	5E10
97-5E-1625	5 Node Shelf for 5E CN1	N/A	5E9(2)
97-5E-2251	Disk Reconfiguration	N/A	5E10
97-5E-2252	ECD Configuration System	Basic	5E10
97-5E-2253	Disk Growth	N/A	5E10
97-5E-2298	On-Switch ECD Hardware Check for Retrofit	Basic	5E10
97-5E-2306	On-Switch ECD Audit	Basic	5E10
97-5E-2353	Software update capability for DATA	Basic	5E10
97-5E-2384	Redesigned Call Transfer Queuing Reduce Conference	Basic	5E10
97-5E-2487	Increase Number of Trunk Groups to 4000 Basic 5E11		
97-5E-2550	Base Relation (BREV)	SM2000	5E10
97-5E-2894	Cost Reduced LDSF for SM-2000	SM2000	5E12
97-5E-2895	Cost Reduced LDSF for SM	Basic	5E12
97-5E-2962	SFG and Network Management for VCDX	N/A	5E11
97-5E-3116	AIU Base/POTS	Basic	5E11
97-5E-3227	Switching Module Processor Unit - 5 (SMPU5)	SM2000	5E11
97-5E-3344	TSIU4 Version2	SM2000	5E11
97-5E-3451	SM/CMP Patch Space Compaction	SM2000	5E12
97-5E-3457	IS-634 A2 Interface	SM2000	5E13
97-5E-3541	LU2 on SM-2000	SM2000	5E10
97-5E-3671	CORE60MM with Integrated RAM	SM2000	5E12
97-5E-3846	Restrict Usage of ASP Triggers	N/A	5E11

97-5E-4169	MCTU3 on CM1	SM-2000	5E11
97-5E-4286	PH22 (PH20-16 Base)	N/A	5E14
97-5E-4271	VCDX SPARC5 Replacement		5E13
97-5E-4455	Program Update Interface Reduction	N/A	5E13
97-5E-7102	3B21 Emulator for VCDX	SM-2000	5E14
97-5E-7103	Enhanced DCTU Administration for MLT	N/A	5E14
97-5E-7428	Decouple PSU from SMP During GSM Initializations	N/A	5E15
97-5E-7677	ConnectVu Recent Change Links via High Level ECD	N/A	5E14
	RC/V		
97-CP-4246.K	SS7-PSU Link Enhancements	SM-2000	5E14
97-CP-4463	PSU SU Pump	N/A	5E13
97-CP-7525	PSU SS7 Signaling Link Monitor	N/A	5E16.1
97-CP-7822	Global Function Alarm (SS7-PSU Human Factors)	N/A	5E16.1
97-CP-7828	Recent Change Critical Indicators (SS7-PSU Human	N/A	5E15
	Factors)		
97-CP-8002	SS7 PSU Remove Routing from Host GSM (Dedicated	N/A	5E16.1 (FR1)
	Configuration)		
98-5E-0012M	Delay Treatment	Standard b	5E4
98-5E-0013	Customer Alerting - Delay Announcement	Standard b	5E4
98-5E-0014	Customer Alerting - Overload Announcement	Standard b	5E4
98-5E-0015	Customer Alerting - Emergency Announcement	Standard b	5E4
98-5E-0016	Fold Down	Loaded	5E4
98-5E-0016M	Fold Down	Loaded	5E4
98-5E-0018	DA Interflow (Incoming)	Loaded	5E4
98-5E-0019	Intraflow	Standard b	5E5
98-5E-0019M	Intraflow	Standard b	5E5
98-5E-0021	Queue Control	Loaded	5E4
98-5E-0021M	Queue Control	Loaded	5E4
98-5E-0022	Interflow	Standard b	5E5
98-5E-0022M	Interflow	Standard b	5E5
98-5E-0025	Administrative Equipment Capabilities	N/A	5E4
98-5E-0027	Administrative Measurements - Force Administration	Loaded	5E4
98-5E-0028	Administrative Measurements - Facility	Loaded	5E4
98-5E-0028M	Administrative Measurements - Traffic	Loaded	5E4
98-5E-0030	Administrative Measurements - Operator Performance	Loaded	5E4
98-5E-0031	Operator Position Assignments	Loaded	5E4
98-5E-0031M	Agent/Supervisor Assignments	Loaded	5E4
98-5E-0032	Position Status Display	Loaded	5E4
98-5E-0038	Service Assistance Capabilities	Loaded	5E4
98-5E-0038M	Service Assistance Capabilities	Loaded	5E4
98-5E-0043	Operator Position Monitoring	Loaded	5E4
98-5E-0043M	Agent Monitoring	Loaded	5E4
98-5E-0044	Residual Calls	Loaded	5E4
98-5E-0045	Access to Special Services Operators	Loaded	5E4
98-5E-0046	Access to Switched Network	Loaded	5E4
98-5E-0046M	Access to Switched Network	Loaded	5E4
98-5E-0047	Activate/Deactivate Position	Loaded	5E4
98-5E-0047M	Activate/Deactivate Position	Loaded	5E4
98-5E-0049	Automated Coin Toll Service (ACTS)	Standard b	5E4
98-5E-0050	Automatic Calling Number Identification	Standard b	5E4
98-5E-0051	Automated Operator Training	N/A	5E4
98-5E-0053	Basic Busy Line Verification (BLV)	Loaded	5E4
98-5E-0054	CAMA Transfer Service	Loaded	5E4
98-5E-0055	Call Hold (Incoming)	Loaded	5E4
98-5E-0055M	Call Hold (Incoming)	Loaded	5E4
98-5E-0056	Operator System Hold	Loaded	5E4
98-5E-0057	Call Origin Indication	Loaded	5E4
98-5E-0057M	Agent Alerting and Call Origin Identification	Loaded	5E4
98-5E-0058	Call Waiting Indication	Loaded	5E4
98-5E-0058M	Call Waiting Indication	Loaded	5E4
98-5E-0060	Cancel Previous Entry	Loaded	5E4
98-5E-0060M	Cancel Previous Entry	Loaded	5E4
98-5E-0061	Emergency Alert	Loaded	5E4
98-5E-0061M	Emergency Alert	Loaded	5E4
98-5E-0062	Enter Call Data into Memory	Loaded	5E4
98-5E-0064	Interposition Communication	Loaded	5E4
98-5E-0064M	Interposition Conference	Loaded	5E4
98-5E-0065	Interposition Transfer	Loaded	5E4
98-5E-0065M	Interposition Transfer	Loaded	5E4
98-5E-0066	Automated Multi-Leaf Bulletin Interface	Loaded	5E4
98-5E-0066M	Teleservices Agent Data Base Access	Standard	5E5

98-5E-0067	Operator Alerting and Call Type ID	Loaded	5E4
98-5E-0067M	Operator Alerting and Call Type ID	Loaded	5E4
98-5E-0068	Operator Number Identification	Loaded	5E4
98-5E-0069	Operator-Assisted Coin Toll Service	Loaded	5E4
98-5E-0070	Macro Keys	N/A	5E4
98-5E-0071	Position Release with Disconnect	Loaded	5E4
98-5E-0071M	Position Release with Disconnect	Loaded	5E4
98-5E-0072	Recall From Subscriber	Loaded	5E4
98-5E-0074	Ring Forward	Loaded	5E4
98-5E-0075	Ringback to Subscriber	Loaded	5E4
98-5E-0077	Split Forward/Split Back	Loaded	5E4
98-5E-0083	Automated Calling Card Service	Standard b	5E4
98-5E-0085	Billed Number Screening	Loaded	5E4
98-5E-0086	Centralized Charge Quotation Service	Loaded	5E4
98-5E-0087	Operator-Assisted Calling Card Service	Loaded	5E4
98-5E-0088	OECC - Auto Collect	Loaded	5E4
98-5E-0089	OECC - Non-Revenue (No AMA)	Loaded	5E4
98-5E-0090	OECC - Person Collect	Loaded	5E4
98-5E-0091	OECC - Person Paid	Loaded	5E4
98-5E-0092	OECC - Person Special Called	Loaded	5E4
98-5E-0093	OECC - Person Special Calling	Loaded	5E4
98-5E-0094	OECC - DDD (Direct Dialing Rate)	Loaded	5E4
98-5E-0095	OECC - Station Collect	Loaded	5E4
98-5E-0096	OECC - Station Paid	Loaded	5E4
98-5E-0097	OECC - Station Special Called	Loaded	5E4
98-5E-0098	OECC - Station Special Calling	Loaded	5E4
98-5E-0100	Originating Line Screening	Standard b	5E4
98-5E-0102	Automated Rate Quotation	Standard b	5E4
98-5E-0105	Subscriber Credit Entry	Loaded	5E4
98-5E-0106	Time and Charges Service - Subscriber Request	Loaded	5E4
98-5E-0109	Operator Trouble Reporting	Loaded	5E4
98-5E-0110	Plant Measurements	Standard b	5E4
98-5E-0110M	Administrative Measurements - Plant	Loaded	5E4
98-5E-0114	Operator-Entered Special Number - Bill to Third Number	Loaded	5E4
98-5E-0115	Cancel Call	Loaded	5E4
98-5E-0116	Record Message	Loaded	5E4
98-5E-0119	Operator System Signaling	Standard b	5E4
98-5E-0120	Carrier Identification	Standard b	5E4
98-5E-0123	Commercial ACD-AMA Recording for Agent Calls	Standard	5E6
98-5E-0125	Centralized Flexible Rating (CFR)	Loaded	5E4
98-5E-0127	System CAMA-ONI	Loaded	5E4
98-5E-0133	Operator Services AMA Recording	Standard b	5E4
98-5E-0132	Position Release	Loaded	5E4
98-5E-0136	Operator-Assisted Postpay Coin Toll Service	Loaded	5E4
98-5E-0138	Network Call Denial	Standard b	5E4
98-5E-0139	Real-Time Rating - External	Standard b	5E4
98-5E-0140	Operator-Assisted Hotel/Motel Service	Loaded	5E4
98-5E-0141	Release Forward Connection	Loaded	5E4
98-5E-0142	Release Back Connection	Loaded	5E4
98-5E-0143	Charges-and-Minutes Display	Loaded	5E4
98-5E-0144	Manual Outpulsing	Loaded	5E4
98-5E-0146	Two-Stage Outpulsing for International Calls	Standard b	5E4
98-5E-0150	Call Hold on a Loop	Loaded	5E4
98-5E-0152	DA Call Completion - Phase I	Loaded	5E6(2)
98-5E-0153	Multiple Data Base Access	Loaded	5E6
98-5E-0155	Cancel Timing	Loaded	5E4
98-5E-0157	Conference Connection	Loaded	5E4
98-5E-0158	Operator-Initiated Call Handoff	Loaded	5E4
98-5E-0164	Autoquote Service for Hotel/Motel	Loaded	5E4
98-5E-0167	Personalized Response System Interface for the BSTs	Loaded	5E4
98-5E-0168	BLV Scramble	Loaded	5E4
98-5E-0170	CAS I - Release 1	Standard b	5E5
98-5E-0178	Delay Calls - Charging	Loaded	5E4
98-5E-0180	Improved Third Number Acceptance	Loaded	5E6
98-5E-0183	Force Management System Interface	Loaded	5E4
98-5E-0185	Direct International Originations	Loaded	5E6
98-5E-0186	Inward Calling Card Validation	Standard b	5E4
98-5E-0188	Local ISLU for Data Link Support	Standard b	5E4
98-5E-0189	ISLU as a Position Controller	Loaded	5E4
98-5E-0191	Operator Trouble Report System Interface	Loaded	5E4

98-5E-0194	Sequence Call Changes	Standard b	5E4
98-5E-0197	Terminating Code Screening for Calling Card Calls	Standard b	5E4
98-5E-0200	Manual Ticket	Loaded	5E4
98-5E-0205	Switched-Access External Audio Response Unit Interface	Loaded	5E6
98-5E-0213	Interface		
98-5E-0213	LIDB Interface	Standard b	5E5
98-5E-0217	Fully Coded Addressing	Standard b	5E5
98-5E-0218	More Efficient Call Handling	Loaded	5E6
98-5E-0219	SAB - Phase I Call Handling	Standard	5E5
98-5E-0225	Exchange Alternate Billing Services	Standard b	5E5
98-5E-0227	Expanded Call Type Determination Capabilities	Standard b	5E5
98-5E-0229	Custom Information Display	Loaded	5E4
98-5E-0230M	Maximum Number of TM/TS Positions	Loaded	5E4
98-5E-0232	External Call Transfer from the BST	Loaded	5E4
98-5E-0232M	External Call Transfer	Loaded	5E4
98-5E-0239	Music on Hold for Incoming TM/TS Calls	Standard	5E6
98-5E-0240	Music on Queue Using Call Vectoring	Basic	5E6
98-5E-0243	Remote Agent Terminals	Loaded	5E4
98-5E-0247	Non-ISP Trunk Group Routing to VDT Position	Standard b	5E4
98-5E-0250	MIS Data Link	Loaded	5E4
98-5E-0251	CAS I - Release 2	Standard	5E5
98-5E-0265	Answer Supervision Control	Basic	5E6
98-5E-0267	Call Vectoring	Basic	5E6
98-5E-0273	Combined Services (Listing Services/T&A)	Loaded	5E6
98-5E-0274	Listing Services Presentation Protocol	Standard	5E6
98-5E-0275	CCI Switched-Access External ARU Interface	Standard	5E6
98-5E-0276	Expansion of Maximum Number Positions	Loaded	5E6
98-5E-0276M	Expansion of Maximum Number of TM/TS Positions	Standard	5E6
98-5E-0278	Automated Operator Trainer	N/A	5E4
98-5E-0285	Calling Party Number Delivery to ACD	Standard	5E6
98-5E-0298	Direct Agent Access	Standard	5E5
98-5E-0298M	Direct Agent Access	Standard	5E5
98-5E-0312	Customer Account Services - Release 3	Loaded	5E7
98-5E-0330	Terminating Code Screening - Release 3	Loaded	5E7
98-5E-0331	OSPS Interface to Voice Messaging Service	Loaded	5E7
98-5E-0336	Telemarketing/Teleservices MIS	Loaded	5E4
98-5E-0338	Agent Event Codes	Loaded	5E4
98-5E-0339	Custom Report Definition	Standard	5E5
98-5E-0339M	Custom Report Definition	Standard	5E5
98-5E-0340	Force Management System Interface from MIS	Standard	5E5
98-5E-0341	Definable MIS Headings	Standard	5E5
98-5E-0342	Wall Mounted Message Display Interface	Loaded	5E4
98-5E-0344	Force Management on the TM/TS Supervisory Workstation	Standard	5E5
98-5E-0345	Conference and Transfer on Outbound TM/TS Calls	Loaded	5E7
98-5E-0347	Intercept Service Using an External Information System - Phase I	Loaded	5E6(2)
98-5E-0350	Call Hold (Outgoing)	Loaded	5E4
98-5E-0351	Enhanced Incoming Call Alerting	Loaded	5E4
98-5E-0352	Access to ARS	Loaded	5E4
98-5E-0353	Enhanced Delay Treatment/Music on Queue	Standard	5E5
98-5E-0354	IBM® Listing Services Interface	Loaded	5E6(2)
98-5E-0355	Alternate Access to Operator Services/SDN Network	Loaded	5E7
98-5E-0356	Remote Access		
98-5E-0356	Combined Services Terminal	Standard	5E6
98-5E-0359	0+/0- Rate Differential	Loaded	5E4
98-5E-0362	891 Card Validation Using Bellcore-Defined Protocols - Release 2	Loaded	5E7
98-5E-0363	Commercial Credit Card Validation Using Bellcore-Defined Protocols	Loaded	5E7
98-5E-0365M	Agent Monitoring with Interrupt	Loaded	5E4
98-5E-0367	Directory Assistance (DA) Call Completion, Release 2	Standard b	5E9(1)
98-5E-0371	Enhanced Voice Path Control	Standard	5E6
98-5E-0376	Call Interaction Interface for Inbound Call Management	Standard	5E6
98-5E-0378	Automated Alternate Billing Services - Automated Position	Loaded	5E7
98-5E-0379	OSPS Feature Group B CIC Expansion	Loaded	5E8
98-5E-0380	OSPS Feature Group D CIC Expansion	Standard b	
98-5E-0381	10XXX Unblocking Fraud Prevention	Loaded	5E5
98-5E-0382	891 Card Validation Using Bellcore-Defined Protocols	Loaded	5E5
98-5E-0386	OSPS Precompliant Feature Group B CIC Expansion	Loaded	5E6

98-5E-0387	OSPS Interface to Voice Messaging Services for Automated Calls	Loaded	5E6
98-5E-0390	Enhanced Services Provider Credit Checking	Loaded	5E7
98-5E-0393	OSPS Recognition of Customer Provided Terminal	Loaded	5E9(1)
98-5E-0396	Carrier Specific Routing for International Card Calls	Loaded	5E7
98-5E-0397	Honor Credit Cards and Provide Operator Assistance for 900 Calls	Loaded	5E8
98-5E-0398	Alternate External Dialing	Loaded	5E5
98-5E-0399	Differentiation of Card Service Charges	Loaded	5E8
98-5E-0400	OSPS Interface to Voice Messaging Service - Release 3	Loaded	5E7
98-5E-0401	OSPS Interface to Voice Messaging Service - Release 4	Loaded	5E8
98-5E-0402	International Credit Card Validation - Customer-Defined	Loaded	5E8
98-5E-0403	Bill Segmentation		
98-5E-0404	Purchase Limit	Loaded	5E8
98-5E-0404	Inward Validation Identification	Loaded	5E8
98-5E-0405	Termination Code Screening - Release 3	Loaded	5E8
98-5E-0406	Enhance Cut-Through of Callers to an Operator for Cards	Loaded	5E8
98-5E-0407	Not Honored		
98-5E-0407	Customer-Defined Bill Segmentation - Sequence Dialing	Loaded	5E8
98-5E-0408	Switch Change for Automated Position	Loaded	5E7
98-5E-0409	Retrofit Skip (5E6 to 5E8) (OSPS)	Standard	5E8
98-5E-0411	DIOR Rate Quote and T&C	Loaded	5E8
98-5E-0412	Custom Toll and Assistance Branding	Loaded	5E5
98-5E-0419	Operator Administrative Processor Link Failure Alarm	Loaded	5E7
98-5E-0420	ANI Forwarding	Loaded	5E6
98-5E-0421	ANI II Short Digit Treatment	Loaded	5E6
98-5E-0422	Emergency Interrupt AMA	Loaded	5E6
98-5E-0423	Access Charge Recording for FGB Prepay Coin	Loaded	5E6
98-5E-0424	Called Number in LIDB Signaling Protocol	Loaded	5E6
98-5E-0425	Inclusion of 10+4 Cards in the Card Recognition Tables	Loaded	5E7
98-5E-0426	ISP Precompliant FGB CIC Expansion	Loaded	5E6
98-5E-0427	Automated Sequence Dialing Following Operator Release	Loaded	5E7
98-5E-0428	Intermediate Switching Point FGB CIC Expansion	Loaded	5E8
98-5E-0430	Improved Automated Call Selection	Loaded	5E7
98-5E-0431	Direct International Originations Country-to-Country	Loaded	5E6
98-5E-0441	Collect Blocking		
98-5E-0441	Originating Line Screening Code Expansion	Loaded	5E7
98-5E-0443	ICCV - Request for Call Duration and Charge	Standard a	5E9(1)
98-5E-0500	Card Volume Limit	Standard a	5E9(1)
98-5E-0503	Enhanced Limits	Standard a	5E9(1)
98-5E-0507	All Cards Fail	Standard a	5E9(1)
98-5E-0508	Non-English Announcement for Card Calls	Standard a	5E9(1)
98-5E-0511	Calling and Enhanced Called Number Card Geographic Restrictions	Standard a	5E9(1)
98-5E-0512	ICCV - Called Number Card Geographic Restrictions	Standard a	5E9(1)
98-5E-0515	OSPS Changes for Interchangeable NPA Codes	Standard a	5E9(1)
98-5E-1004	Overload Control for OSP	Standard b	5E4
98-5E-1004M	Overload Control for TM/T	Standard b	5E4
98-5E-1010	Master Control Center - OSPS Enhancements	Standard b	5E4
98-5E-1010M	MCC - TM/TS Enhancements	Standard b	5E4
98-5E-0518	Card Duration Limit	Standard a	5E9(1)
98-5E-1011	Remote Alarm Unit and Status Display	Standard b	5E4
98-5E-1011M	Remote Alarm Unit and Status Display	Standard b	5E4
98-5E-1013	Remote Maintenance Terminal	Standard b	5E4
98-5E-1013M	Remote Maintenance Terminal	Standard b	5E4
98-5E-1016	Video Display Terminal Maintenance	N/A	5E4
98-5E-1017	Basic Services Terminal Maintenance	N/A	5E4
98-5E-1017M	Agent Terminal Maintenance	N/A	5E4
98-5E-1025	Generic Retrofit	Standard b	5E4
98-5E-1027	Growth of OSPS Facilities	Standard b	5E4
98-5E-1028	PSM Growth	Loaded	5E4
98-5E-1050	Automatic Demand Transmission Testing	Standard b	5E4
98-5E-1050M	Automatic Demand Transmission Testing	Standard b	5E4
98-5E-1052	Remote Operator Service Centers	Loaded	5E4
98-5E-1052M	Remote Call Center	Loaded	5E4
98-5E-1288	OSPS 5E8 to 5E9 Retrofit	N/A	5E9(1)

98-5E-2014	Timed Event Codes for Outbound Calls	Basic	5E9(1)
98-5E-2029	OSPS Growth Update	N/A	5E9(1)
98-5E-2030	OSPS Utility Call Trace	N/A	5E9(1)
98-5E-2031	OSPS Interflow Cross Generic Compatibility	N/A	5E9(1)
98-5E-2098	OSPS 5E9(1) to 5E9(2) Retrofit	N/A	5E9(2)
98-5E-2099	OSPS Growth Update	N/A	5E9(2)
98-5E-2100	OSPS Utility Call Trace	N/A	5E9(2)
98-5E-2101	OSPS Interflow Cross Generic Compatibility	N/A	5E9(2)
98-5E-2522	OSPS 15-Digit International Direct Digital Dialing	N/A	5E10
Notes:			
a.	One loaded SM required for attached processor interface (API) link.		
b.	Operator position and interswitch interface SMs need to be loaded.		

10.1.3 5ESS[®] Switch Feature List (*continued*)

Table 10-3 5ESS[®] Switch Feature List (99-5E-0000 - 99-5E-0799)

FEATURE NUMBER	FEATURE TITLE	SM CONFIG	SOFTWARE RELEASE
99-5E-0000	ADDITIONAL 5ESS [®] SWITCH FEATURES		
99-5E-0005	Multimodule RSM (MMRSM) (formerly No.5B RSM)	Basic	5E2(2)
99-5E-0006	3B20D-2 Central Processor	Basic	5E1(1A)
99-5E-0008	DSU-UCC (Version 2)	Basic	5E1(2)2
99-5E-0009	DSU-UTD (Version 2)	Basic	5E1(2)2
99-5E-0010	DSU-UTG (Version 2)	Basic	5E1(2)1
99-5E-0011	LU2	Basic	5E1(2)1
99-5E-0012	Modular Metallic Service Unit (MMSU)	Basic	5E1(2)2
99-5E-0014	TSIU2 (Time Slot Interchange Unit - Model 2)	Basic	5E1(2)1
99-5E-0016	Directly Connected Test Unit (DCTU)	Basic	5E1(2)1
99-5E-0017	DEMERT Generic 2	Basic	5E1(1A)
99-5E-0018	UNIX [®] RTR Operating System Release 1 (formerly DMERT Generic 3)	Basic	5E2(2)
99-5E-0019	Fast Pump	Basic	5E1(2)1
99-5E-0022	MDII Messages	Basic	5E1(1)
99-5E-0023	MML Human-Machine Language Option	Basic	5E1(2)1
99-5E-0024	Multimodule Operation	Basic	5E1(2)1
99-5E-0025	RC/VFY From MCC Terminal Option	Basic	5E1(2)1
99-5E-0026	BRCS Compatibility with 5E1 Features (formerly 5E1 retest)	Basic	5E2(1)
99-5E-0027	Switching Module Processor Unit (SMPU)	Basic	5E1(1A)
99-5E-0028	AM Selection Initialization	Basic	5E1(1A)
99-5E-0031	Recent Change - Digit Analysis Data	Basic	5E1(1A)
99-5E-0032	Improved Dial Tone Delay Measurement	Basic	5E1(1A)
99-5E-0033	Routine Exercise of Line Unit Grids (In-Service)	Basic	5E1(1A)
99-5E-0034	Alarm on Exercise Failure	Basic	5E1(1A)
99-5E-0035	Automatic Restoration of Recent Change Data	Basic	5E1(1A)
99-5E-0041	Modular Features Customization (MFC) Capability	Basic	5E2(1)
99-5E-0042	Selective Incoming Overload Control (SILC)	Basic	5E2(1)
99-5E-0043	Recent Change and Verify Text Interface on SCC Channel	Basic	5E1(2)2
99-5E-0044	Open Circuit Test Line	Basic	5E1(2)1
99-5E-0045	Color MCC Terminal Option	Basic	5E1(1A)
99-5E-0046	Make Recent Change Data Permanent (Manual)	Basic	5E1(1)
99-5E-0047	Make Recent Change Data Permanent (Automatic)	Basic	5E1(2)1
99-5E-0050	Growth of Units in SM	Basic	5E1(2)2
99-5E-0051	Trunks on Single-Module RSM (EAS & Tandem Operation)	Basic	5E1(2)3
99-5E-0056	Monitoring of Recent Change Log Area (Single Module)	Basic	5E1(1A)
99-5E-0058	Automatic Restoration of Recent Change Data (Multimodule)	Basic	5E1(2)1
99-5E-0059	Monitoring of Recent Change Log Area (Multimodule)	Basic	5E1(2)1
99-5E-0060	Automatic Restoration of Recent Change Data (Multimodule) [Enhanced]	Basic	5E1(2)2
99-5E-0061	Memory Engineering - AM ODD	Basic	5E1(2)1
99-5E-0062	Memory Engineering - SM ODD	Basic	5E1(2)2
99-5E-0066	48 Message Switch Ports	Basic	5E1(2)2
99-5E-0071	Local Traffic Channel (Telesciences PDU-10 Compatibility)	Basic	5E1(2)3

99-5E-0071A	Local Traffic Channel/Division of Revenue Counts	Basic	5E2(1)
99-5E-0073	Frequency Selective Ringing - 100 V	Basic	5E1(2)3
99-5E-0075	Frequency Selective Ringing - SLC® 96 Carrier	Basic	5E1(2)3
99-5E-0077	Semi-Post Pay Coin	Basic	5E1(2)3
99-5E-0080	Super POTS (SPOTS) on Integrated SLC® 96 Carrier	Basic	5E1(2)3
99-5E-0081	9:1 Concentration Ratio for Integrated SLC® 96 Carrier	Basic	5E1(2)2
99-5E-0082	Billing Single-Module RSM During Stand-Alone	Basic	5E1(2)3
99-5E-0084	SLC® Carrier Nail-Up	Basic	5E4
99-5E-0090	Code Optimization (>200K BHC)	Basic	5E1(2)2
99-5E-0093	2-Mile Optically Remoted Module (ORM)	Basic	5E2(2)
99-5E-0100	Integrated Services Line Unit (ISLU) Base	Loaded	5E4
99-5E-0103	Time-Out on Tones and Announcements	Basic	5E1(2)1
99-5E-0104	Detection and Reporting of DTMF on DP Lines (to SCC)	Basic	5E1(2)1
99-5E-0105	Smart Set Interface	Basic	5E2(1)
99-5E-0106	Individual Billing Number for WATS	Basic	5E2(1)
99-5E-0107	Power Failure Transfer - Attendant	Basic	5E2(1)
99-5E-0111	Compatibility with Auto Number Announcer Circuit (ANAC)	Basic	5E1(2)1
99-5E-0116	SM Selective Initialization	Basic	5E1(2)1
99-5E-0126	Music on Hold	Basic	5E7
99-5E-0137	Stratum 2 Clock	Basic	5E2(2)
99-5E-0157	SM Growth Procedure	Basic	5E1(2)2
99-5E-0159	Software Error Detection Enhancements	Basic	5E1(2)2
99-5E-0160	HLSC Traffic Carrying Capacity Enhancement	Basic	5E2(1)
99-5E-0161	Generic Retrofit & Update Enhancement	Basic	5E1(2)2
99-5E-0162	SM ODD Engineering and Growth	Basic	5E1(2)2
99-5E-0164	Communications Link Enhancements	Basic	5E1(2)1
99-5E-0165	RLS 2 Diagnostic Environment	Basic	5E1(2)2
99-5E-0167	External Functional Monitor	Basic	5E1(2)1
99-5E-0170	Utility Call Trace	Basic	5E1(2)1
99-5E-0171	Measurement Generation Enhancement	Basic	5E1(2)2
99-5E-0173	Craft Admin. Module Intervention (AMI) & Power Switch Monitor	Basic	5E1(2)2
99-5E-0174	Control Interface Scanning Enhancements	Basic	5E1(2)1
99-5E-0180	Recent Change (RC) Terminal Enhancements	Basic	5E1(2)2
99-5E-0181T	Common Channel Signaling (CCS) Transport	Basic	5E2(2)
99-5E-0182T	Toll OA&M Package	Basic	5E2(2)
99-5E-0183T	Interexchange Carrier Billing	Basic	5E2(2)
99-5E-0187T	Carrier Interconnect (CI) - Toll	Basic	5E2(2)
99-5E-0188T	Network Call Denial	Basic	5E2(2)
99-5E-0201	Home Intercom/Single Line Variety Package	Basic	5E6
99-5E-0204	Optional Number of Digits on Incoming Trunks	Basic	5E1(2)3
99-5E-0205	Single Bay Switching Module (SM)	Basic	5E2(2)
99-5E-0211	AMA Teleprocessing for Single Module	Basic	5E1(1A)
99-5E-0212	Local AMA to Tape for Single Module	Basic	5E1(1A)
99-5E-0213	Integrated Services Line Unit - U-Interface (ISLU-U)	Loaded	5E4
99-5E-0214	Discontinuation of AMARC Support	Basic	5E2(1)
99-5E-0215	300K PBHC Capacity	Basic	5E2(2)
99-5E-0216	ISDN BASE	Loaded	5E4
99-5E-0217	Remote Integrated Services Line Unit (RISLU)	Loaded	5E4
99-5E-0218	BRCS Customization Phase I	Basic	5E2(1)
99-5E-0219	Expensive Route Warning Tone With ARS	Basic	5E2(1)
99-5E-0220	Facility Restriction Levels With ARS	Basic	5E2(1)
99-5E-0221	Manual and Time-of-Day Control for ARS	Basic	5E2(1)
99-5E-0222	Multiline Variety Package (MVP) Service	Basic	5E2(1)
99-5E-0223	Single-Digit Dialing	Basic	5E2(1)
99-5E-0226	SLIM Compatibility	Basic	5E1(2)3
99-5E-0227	Integrated SLC® 5 Carrier System - Mode 96 Compatibility	Basic	5E2(1)
99-5E-0228	Memory Expansion Unit in SM	Basic	5E1(2)2
99-5E-0229	AM Memory Expansion	Basic	5E2(2)
99-5E-0230	ODD Disk Access	Basic	5E2(1)
99-5E-0232	Attendant Call Transfer	Basic	5E2(1)
99-5E-0233	AUTOVON - Abbreviated Dialing	Standard	5E2(2)
99-5E-0234	AUTOVON - Hot-Line Service	Standard	5E3
99-5E-0235	AUTOVON - Route Code	Standard	5E2(2)
99-5E-0236	AUTOVON Direct Station Selection	Standard	5E2(2)
99-5E-0237	AUTOVON - MLPP	Standard	5E2(2)
99-5E-0238	AUTOVON - 4-Wire Line Service	Standard	5E3
99-5E-0239	AUTOVON - Polygrid Routing	Standard	5E3
99-5E-0240	AUTOVON - Answer Delay	Standard	5E3
99-5E-0241	AUTOVON Special Guard Timing	Standard	5E3
99-5E-0242	AUTOVON - AUTOVON Network Management	Standard	5E3

99-5E-0244	Two-Party ONI	Basic	5E1(2)3
99-5E-0245	Teradyne 4-Tel Compatibility	Basic	5E1(2)3
99-5E-0253	Integrated Services Line Unit - T-Interface (ISLU-T)	Loaded	5E4
99-5E-0254	Integrated Services Line Unit - Z-Interface (ISLU-Z)	Loaded	5E4
99-5E-0264	Deluxe Queueing (off-hook or on-hook queueing)	Basic	5E6
	Facilities		
99-5E-0265	Account Codes	Basic	5E3
99-5E-0266	On-/Off-Hook Queueing for Outgoing Trunks	Basic	5E3
99-5E-0269	ISDN X.25 LAN	Loaded	5E4
99-5E-0274	ISDN/CSDC Interworking for Data Calls	Loaded	5E4
99-5E-0277	Digital Carrier Line Unit	Basic	5E1
99-5E-0279	Line Side Announcement for RSM	Basic	5E2(1)
99-5E-0281	LU2 Grid with Secondary Protection	Basic	5E2(2)
99-5E-0285	Four-Wire Tie Trunk Access	Basic	5E2(2)
99-5E-0286	Precedence Network in Dialing (PNID)	Standard	5E2(2)
99-5E-0287	Main-Satellite AUTOVON Compatibility	Standard	5E2(2)
99-5E-0288	BRCS Adaptation to AUTOVON	Standard	5E2(2)
99-5E-0289	AUTOVON Console	Standard	5E2(2)
99-5E-0290	Recorded Announcement Function - Playback	Basic	5E4
99-5E-0291	BRCS TELCO Admin Support Capability (TASC)	Basic	5E2(2)
99-5E-0292	Facilities Administration and Control	Basic	5E3
99-5E-0293	Automatic Alternate Routing	Basic	5E3
99-5E-0294	Deluxe Queueing	Basic	5E3
99-5E-0295	Ringback Queueing	Basic	5E3
99-5E-0296	Priority Queueing	Basic	5E3
99-5E-0297	NUTS/LUTS	Basic	5E3
99-5E-0298	Facility Management (FM)	Basic	5E3
99-5E-0299	Palletized Equipment, Coding and Cable Assembly	Basic	5E2(2)
	(PECCA)		
99-5E-0301	DSN - Precedence Access Threshold (PAT)	Standard	5E3
99-5E-0302	Optically Remoted Module (ORM)	Basic	5E3
99-5E-0303	DSN - Multifunction Switch	Standard	5E3
99-5E-0304	MERLIN [®] Communication System/ 5ESS [®] Switch	Basic	5E2(1)
	Compatibility		
99-5E-0305	DSN - Community of Interest Precedence Treatment	Standard	5E3
99-5E-0306	DSN - 5E3 BRCS Adaptation to DSN	Standard	5E3
99-5E-0307	Multiple Entry Recent Change Interface Phase I	Basic	5E3
99-5E-0308	AMA Dual Stream Recording	Basic	5E2(2)
99-5E-0309	AMA Multi-Disk Partition	Basic	5E2(2)
99-5E-0310	AMA 56 kb/s Data Link	Basic	5E2(2)
99-5E-0311	Automated Office-to-Office Testing of Integrated SLC [®] 96	Basic	5E2(1)
	Carrier Lines		
99-5E-0312	Disk Independent Operation	Basic	5E3
99-5E-0313	Applications Processor - IOP Interface	Basic	5E3
99-5E-0314	SDN Network Access Point	Basic	5E3
99-5E-0315	Craft Passwords	Basic	5E2(2)
99-5E-0316	UNIX [®] System Availability	Basic	5E2(2)
99-5E-0317	Pre-5E4 BRCS Compatibility With ISDN	Loaded	5E4
99-5E-0318	ISDN Primary Rate Interface (PRI)	Loaded	5E4
99-5E-0319	ISDN DBS Multiple DN Buttons	Loaded	5E4
99-5E-0320	ISDN DBS Shared Call Appearances of a DN	Loaded	5E4
99-5E-0321	ISDN DBS Multiple Call Appearances	Loaded	5E4
99-5E-0322	ISDN DBS Feature Function Buttons	Loaded	5E4
99-5E-0323	ISDN DBS Hold	Loaded	5E4
99-5E-0324	ISDN DBS Transfer	Loaded	5E4
99-5E-0325	ISDN DBS Conference Calling	Loaded	5E4
99-5E-0326	ISDN DBS Call Forwarding	Loaded	5E4
99-5E-0327	ISDN DBS Call Pickup	Loaded	5E4
99-5E-0328	ISDN DBS Automatic Callback on Busy	Loaded	5E4
99-5E-0330	ISDN DBS Speed Calling	Loaded	5E4
99-5E-0331	ISDN DBS Manual Exclusion	Loaded	5E4
99-5E-0333	ISDN DBS Drop	Loaded	5E4
99-5E-0337	ISDN MBKS Executive Ringer Cutoff	Loaded	5E5
99-5E-0338	ISDN DBS Delayed and Abbreviated Ringing	Loaded	5E4
99-5E-0346	ISDN DBS Bridging	Loaded	5E4
99-5E-0349	ISDN DBS Intercom Alerting	Loaded	5E4
99-5E-0350	ISDN DBS Intercom Functions	Loaded	5E4
99-5E-0352	RISLU T-Interface	Loaded	5E4
99-5E-0353	RISLU U-Interface	Loaded	5E4
99-5E-0354	RISLU-Z Interface	Basic	5E4
99-5E-0355	ISDN Attendant Feature Package	Loaded	5E4
99-5E-0356	ISDN Attendant Call Hold	Loaded	5E4
99-5E-0357	ISDN Attendant Call Transfer	Loaded	5E4

99-5E-0358	ISDN Attendant Call Splitting	Loaded	5E4
99-5E-0359	ISDN Attendant Camp-On	Loaded	5E4
99-5E-0360	ISDN Attendant Direct Trunk Group Selection	Loaded	5E4
99-5E-0361	ISDN Attendant Position Busy	Loaded	5E4
99-5E-0362	ISDN Attendant Night Service	Loaded	5E4
99-5E-0363	ISDN Attendant Conference Calling	Loaded	5E4
99-5E-0364	ISDN Attendant Control of Facilities	Loaded	5E4
99-5E-0365	ISDN Attendant Selective Customer Control of Facilities	Loaded	5E4
99-5E-0366	Dial Access to ISDN Attendant	Loaded	5E4
99-5E-0367	ISDN Attendant Through Dialing	Loaded	5E4
99-5E-0368	Queueing for ISDN Attendants With Call Waiting Indication (Lamps)	Loaded	5E4
99-5E-0369	ISDN Attendant Trunk Queueing	Loaded	5E4
99-5E-0370	ISDN Attendant Power Failure Transfer (ISDN Communications Failure)	Loaded	5E4
99-5E-0371	Auto Dropback to ISDN Attendant (Serial Calls)	Loaded	5E4
99-5E-0372	ISDN Attendant Timed Reminder	Loaded	5E4
99-5E-0374	Emergency Access to ISDN Attendant	Loaded	5E4
99-5E-0375	ISDN Attendant Direct Station Selection/ Busy Lamp Field	Loaded	5E4
99-5E-0376	ISDN Attendant Trunk Identification	Loaded	5E4
99-5E-0377	ISDN Attendant Trunk Group Indicators	Loaded	5E4
99-5E-0378	ISDN Attendant Call-Through Tests (Physical Trunks)	Loaded	5E4
99-5E-0379	ISDN Attendant Busy Verification of Lines and Trunks	Loaded	5E4
99-5E-0380	ISDN Attendant Emergency Override	Loaded	5E4
99-5E-0381	ISDN Attendant Even Call Distribution (Uniform Call Distribution)	Loaded	5E4
99-5E-0382	ISDN Attendant Control of Voice Terminals	Loaded	5E4
99-5E-0383	ISDN Attendant Originating Permission Display (Class-of-Service Display)	Loaded	5E4
99-5E-0384	ISDN Attendant Incoming Call Identification	Loaded	5E4
99-5E-0385	ISDN Electronic Directory	Loaded	5E4
99-5E-0386	ISDN Electronic Directory - Automatic Call Setup (ED-ACS)	Loaded	5E4
99-5E-0387	ISDN Electronic Directory - Query Service (ED-QS)	Loaded	5E4
99-5E-0388	ISDN Electronic Directory - Station Display Data	Loaded	5E4
99-5E-0389	ISDN Basic Message Service	Loaded	5E4
99-5E-0391	ISDN Message Service - Message Data Base	Loaded	5E4
99-5E-0392	ISDN Message Service - Automatic Call History Display	Loaded	5E4
99-5E-0393	ISDN Message Service - Automatic Control of Message Waiting Indicator	Loaded	5E4
99-5E-0394	ISDN Message Service - Leave Word Calling	Loaded	5E4
99-5E-0395	ISDN Message Service - Direct Access to Message Data Base	Loaded	5E4
99-5E-0396	ISDN Message Service - Message Retrieval Display	Loaded	5E4
99-5E-0397	ISDN Message Service - Automatic Call Setup	Loaded	5E4
99-5E-0398	ISDN Message Service - Print Messages on Demand	Loaded	5E4
99-5E-0399	ISDN Basic Circuit-Switched Voice Services	Loaded	5E4
99-5E-0400	ISDN Basic Circuit-Switched Data	Loaded	5E4
99-5E-0401	ISDN Interswitch Data Transport	Loaded	5E4
99-5E-0402	Intrastwitch ICLID (Individual Calling Line Identification)	Basic	5E4
99-5E-0403	ISDN Basic D-Channel Packet Switching	Loaded	5E4
99-5E-0404	ISDN Special B-Channel Packet Switching (64kb Access)	Loaded	5E4
99-5E-0405	Gateway to Packet Switch for Access to PDNs	Loaded	5E4
99-5E-0406	X.25 PVCs (Permanent Virtual Circuits)	Loaded	5E4
99-5E-0407	X.25 CUGs (Closed User Groups)	Loaded	5E4
99-5E-0408	X.25 Recognized Private Operating Agency (RPOA) Selection	Loaded	5E4
99-5E-0409	X.25 InterExchange Carrier (IEC) Preselection	Loaded	5E4
99-5E-0410	Intercom Addressing for Packet Switching	Loaded	5E4
99-5E-0411	X.25 Hunt Groups	Loaded	5E4
99-5E-0412	X.25 Reverse Charge	Loaded	5E4
99-5E-0413	X.25 Reverse Charge Acceptance	Loaded	5E4
99-5E-0414	X.25 Fast Select	Loaded	5E4
99-5E-0415	X.25 Fast Select Acceptance	Loaded	5E4
99-5E-0416	X.25 Flow Control Parameter Negotiation	Loaded	5E4
99-5E-0417	X.25 Throughput Class Negotiation	Loaded	5E4
99-5E-0418	X.25 Incoming Calls Barred	Loaded	5E4
99-5E-0419	X.25 Outgoing Calls Barred	Loaded	5E4
99-5E-0420	X.25 One-Way Outgoing Logical Channel	Loaded	5E4
99-5E-0421	X.25 Transit Delay Selection and Indication	Loaded	5E4
99-5E-0423	ISDN Modem Pooling	Loaded	5E4
99-5E-0424	Data Service Screening	Loaded	5E4

99-5E-0425	Bit Rate Indication	Loaded	5E4
99-5E-0426	Data Format Agreement	Loaded	5E4
99-5E-0427	ISDN Customer Station Rearrangements Via MACSTAR®	Loaded	5E4
	I and MACSTAR® II Computer Program		
99-5E-0429	Packet-Switched Call Billing	Loaded	5E4
99-5E-0431	Class 4X Office - Intermediate Switch Point	Standard	5E4
99-5E-0433	Application Processor - Basic Rate Interface (BRI)	Loaded	5E4
99-5E-0434	Defense Switched Network Console	Loaded	5E4
99-5E-0436	Defense Switched Network - BRCS/ISDN Adaptation to DSN	Loaded	5E4
99-5E-0437	Deferred Line Unit Channel Maintenance	Basic	5E2(1)
99-5E-0438	Precutover Fabric Testing	Basic	5E2(1)
99-5E-0440	Analog Message Waiting Indicator	Basic	5E4
99-5E-0442	Flexible IOP Utilization	Basic	5E4
99-5E-0443	DSU2 Integrated Services Test Function (ISTF)	Basic ^a	5E4
99-5E-0447	Number of Calls on Queue - ISDN Attendant	Loaded	5E4
99-5E-0448	Total Number of Calls Handled Display Data for ISDN Attendants	Loaded	5E4
99-5E-0449	Aggregate Work Time/Number of Calls Handled for ISDN Attendants	Loaded	5E4
99-5E-0454	Recent Change Update to ODIN Forms Management System 7.0	Basic	5E4
99-5E-0457	Demand Continuity Check of Voice Path	Basic	5E3
99-5E-0458	Intercom Calling Restriction	Basic	5E4
99-5E-0459	ISDN Originating Priority Calling	Loaded	5E4
99-5E-0460	ISDN Initiated Priority Calling	Loaded	5E4
99-5E-0461	ISDN Priority Calling Incoming Only	Loaded	5E4
99-5E-0462	ISDN DBS Key System Coverage for Analog Lines	Loaded	5E4
99-5E-0463	ISDN DBS Terminal Management	Loaded	5E4
99-5E-0464	ISDN Attendant Console Terminal Management	Loaded	5E4
99-5E-0465	ISDN Attendant Interposition Transfer	Loaded	5E4
99-5E-0466	ISDN Attendant Information About Calls on Queue	Loaded	5E4
99-5E-0467	ISDN Attendant Traffic	Loaded	5E4
99-5E-0468	ISDN Directory Query Display	Loaded	5E4
99-5E-0469	ISDN Calling Name Display	Loaded	5E4
99-5E-0470	ISDN Time and Date Display	Loaded	5E4
99-5E-0471	Service Switching Point/800 Service	Basic	5E4
99-5E-0472	CCS Enhancement - Domain Controlled Routing	Basic	5E4
99-5E-0473	RMS-D3/ 5ESS® Switch Interface	Standard	5E4
99-5E-0474	TOPAS/5ESS® Switch Interface	Standard	5E4
99-5E-0475	MAC-OS Access of Batch Recent Change	Basic	5E4
99-5E-0477	ALLIANCE®* Teleconferencing Service Access	Basic	5E4
99-5E-0478	Initial U-BRI Layer 1 Performance Monitor	Loaded	5E4
99-5E-0479	Data Query Select - Trunk Reports	Basic	5E4
99-5E-0480	Leased Network 100-Second Scan	Basic	5E4
99-5E-0481	Distributed Manual Call Gap	Basic	5E4
99-5E-0482	Multiple DNs on MLHGs	Basic	5E3
99-5E-0483	Nonhunting DNs	Basic	5E2(2)
99-5E-0484	Outdial Lists	Basic	5E2(2)
99-5E-0485	Local and INWATS on Same MLHG	Basic	5E3
99-5E-0486	Queueing for Multiple Position Hunt Group	N/A	
99-5E-0487			
99-5E-0490	Call Forwarding Variable Activation Confirmation	Basic	5E3
99-5E-0492	0XX and 1XX Routing	Basic	5E3
99-5E-0494	Multiple IP Trunk Groups	Loaded	5E5
99-5E-0495	Q.931/CCS7 Interworking	Loaded	5E5
99-5E-0498	OS Support for Remote Centralized ISDN BRI Digital	Loaded	5E5
	Testing		
99-5E-0499	NonInvasive U-BRI LoopBack	Loaded	5E5
99-5E-0500	Inspect for ISDN Terminals	Loaded	5E4
99-5E-0501	Outgoing Calling Line Identification (OCLID) For ISDN Terminals	Loaded	5E4
99-5E-0502	Fully Coded Addressing	Standard	5E5
99-5E-0503	OSO AMA Recording	Standard	5E5
99-5E-0504	NM/Domain Selectivity	Basic	5E5
99-5E-0505	Leased Network 8-Hour Past MDR	Standard ^b	5E5
99-5E-0506	Leased Network MDR for Released Link Trunk	Standard ^b	5E5
99-5E-0507	5ESS® Switch - Stand-Alone Feature for Switching	Basic	5E5
	Modules (SMs/ORMs)		
99-5E-0508	TRCU Direct Fiber Transmission Interface	Basic	5E5

99-5E-0509	ISDN Automatic Customer Station Rearrangement	Loaded	5E5
99-5E-0510	ISDN Circuit-Switched Data Call Hunting BRI	Loaded	5E4
99-5E-0511	Basic Rate ISDN via Universal Digital Loop Carrier (UDLC)	Loaded	5E4
99-5E-0512	Individualized Dialing Plan (IDP) for ISDN	Loaded	5E4
99-5E-0513	Circuit-Switched Data Calls Terminal Group and Station Restriction for ISDN	Loaded	5E4
99-5E-0514	Circuit-Switched Data (CSD) Calls		
99-5E-0515	ORM Line Metallic Testing	Basic	5E4
99-5E-0517	Composite Lines Query	Basic	5E3
99-5E-0518	Interface to MFOS (Domestic)	Basic	5E4
99-5E-0519	CCS& Improved ISUP	Basic	5E4
99-5E-0520	BRCS Feature Grouping	Basic	5E4
99-5E-0521	Line Usage Measurements	Basic	5E4
99-5E-0522	BRI Trouble Notification	Loaded	5E4
99-5E-0523	Software Defined Network for AT&T-C	Standard	5E5
99-5E-0524	Special Access Phase 1	Standard	5E5
99-5E-0525	X.25 Gateway to Public Packet Switched Network (PPSN)	Loaded	5E5
99-5E-0526	LASS Automatic Recall	Basic	5E5
99-5E-0527	LASS Customer-Originated Trace	Basic	5E5
99-5E-0528	LASS - Individual Calling Line Identification	Basic	5E5
99-5E-0529	LASS Automatic Callback	Basic	5E5
99-5E-0530	InterModule Trunking	Basic	5E5
99-5E-0531	Line Time Slot Bridging	Basic	5E5
99-5E-0533	Advanced Services Platform	Basic	5E6
99-5E-0534	ISDN - Calling and Called Name Display for Forwarded Calls	Loaded	5E5
99-5E-0535	On-Demand B-Channel Packet Switching on the BRI	Loaded	5E5
99-5E-0536	Simultaneous Packet Switching on Multiple Channels of a BRI (B- and D-Channels)	Loaded	5E5
99-5E-0537	Selective Carrier Denial	Basic	5E5
99-5E-0538	ISDN - Multipoint U-BRI	Loaded	5E5
99-5E-0540	Remote Digital Testing	Loaded	5E5
99-5E-0543	Original Caller's Facility Restriction Level on an Attendant-Extended Call	Standard	5E5
99-5E-0544	Authorization Code Screening for Senderized PBXs and Station Group Designators	Standard	5E5
99-5E-0545	AMA Recording for Centralized Attendant Service/Release Link Service	Standard	5E5
99-5E-0548	Hunt Group Transfer for Circuit-Switched Data	Loaded	5E6
99-5E-0549	ETN Interworking in 5ESS® Switch Private Network Environment	Loaded	5E6
99-5E-0550	CPN/BN Transmittal in 5ESS® Switch Private Network Environment	Loaded	5E6
99-5E-0551	Call-by-Call Access from 5ESS® Switch in a Private Network to Public Network Services	Loaded	5E6
99-5E-0552	Queueing for Circuit-Switched Data MLHGs	Loaded	5E6
99-5E-0553	ETN on PRI Trunks, 5ESS® Switch to DPBX	Loaded	5E6
99-5E-0554	Toll OA&M Enhancement for AT&T-NOG	Standard	5E6
99-5E-0555	AT&T NOG CCS7 Network Interconnection	Standard	5E6
99-5E-0556	CCS7 Leased Network Interoffice Signaling	Standard	5E6
99-5E-0557	Leased Network Action Point Routing and Billing	Standard	5E6
99-5E-0558	Leased Network Action Point Screening	Standard	5E6
99-5E-0559	Leased Network Action Point Attendant	Standard	5E6
99-5E-0560	ISDN Access to Leased Network Features	Standard	5E6
99-5E-0561	Message Detail Recording on EA/CCS7/CCS7 NI/CAMA/ISDN Facilities	Standard	5E6
99-5E-0562	Customer Traffic Data on EA/CCS7/CCS7 NI/CAMA/ISDN Facilities	Standard	5E6
99-5E-0563	100-Second Scans (HSS) on EA/CCS7/CCS7 NI/CAMA/ISDN Facilities	Standard	5E6
99-5E-0564	Call Gap Enhancements	Basic	5E6
99-5E-0565	Trunk Reservation with Automatic Reservation Arrangement	Basic	5E6
99-5E-0566	FTS2000 Network Management Networks	Standard	5E6
99-5E-0567	Protocol Handler 3	Loaded	5E6
99-5E-0568	PRI Access to Selected IC Services Via DCO	Loaded	5E6
99-5E-0569	Intraswitch/Interswitch Optioning CPN/BN to Terminating	Loaded	5E6

	User		
99-5E-0585	X.25 Packet Switching Access on T1 Facilities, Including PRI	Loaded	5E6
99-5E-0586	X.75 Gateway to Public Data Networks	Loaded	5E6
99-5E-0587	E.164/X.121 Interworking Using Bellcore Escape Codes	Loaded	5E6
99-5E-0588	BRCS Supplementary Services for ISDN Circuit-Switched Data Calls	Loaded	5E6
99-5E-0589	Source Billing for Attendant Calls	Basic	5E6
99-5E-0590	Multiple Directory Numbers per Line with Distinctive Ringing Enhancements	Basic	5E6
99-5E-0591	Dual Telephone Coverage	Basic	5E6
99-5E-0592	LASS - Selective Call Rejection	Basic	5E6
99-5E-0593	LASS - Selective Call Acceptance	Basic	5E6
99-5E-0594	Call Associated CCS7 Network Interconnect	Basic	5E6
99-5E-0595	LASS Selective Call Forwarding	Basic	5E6
99-5E-0596	LASS Selective Distinctive Alert	Basic	5E6
99-5E-0597	LASS Screen List Editing	Basic	5E6
99-5E-0598	Enhanced 911 (E911)	Basic ^c	5E7
99-5E-0601	LASS Computer Access Restriction	Basic	5E6
99-5E-0603	User-Side PRI Implementation	Loaded	5E6
99-5E-0604	T1D1 Standard U-BRI for (R)ISLU	Loaded	5E6
99-5E-0606	DCLU Integrated Interface for DID PBX Channel Units on SLC [®] Carrier System with Fraud Control for all PBX DID Service	Standard	5E6
99-5E-0607	BRITE Channel Unit Maintenance (AMI/ANS [®])	Loaded	5E6
99-5E-0608	CMP-CP (350 K Metro Calls)	Basic	5E6
99-5E-0609	MSG CMP Base	Basic	5E6
99-5E-0610	CMP Growth in Generic 5E5	Basic	5E6
99-5E-0611	SCSI Bus Interface for 3B20D	Basic	5E6
99-5E-0613	Flexible Assignment of Service Feature Code	Basic	5E6
99-5E-0614	End-to-End Call Trace (EECT) - CCS7	Basic	5E5
99-5E-0616	Flexible Night Service/Attendant Call Forwarding	Basic	5E5
99-5E-0618	Coin Line AMA (CLAMA)	Basic	5E8
99-5E-0619	Backout Most Recent Official BWM	Basic	5E5
99-5E-0620	Decoupled ROM Initialization	Basic	5E5
99-5E-0621	Recent Change Performance Improvements	Basic	5E5
99-5E-0622	Switch-Based Protocol Monitoring	Loaded	5E5
99-5E-0623	Queue Monitor Feature for MLHG Queuing	Loaded	5E6
99-5E-0624	ISDN - Feature Button Inspect	Loaded	5E4
99-5E-0625	ISDN - BRI Dial-Up Test Line	Loaded	5E5
99-5E-0626	ISDN - DBS Secretarial Message Waiting Indicator	Loaded	5E4
	Control		
99-5E-0628	ISDN - DBS Display for Ringing Call Appearances Only	Loaded	5E4
99-5E-0629	Series Completion for ISDN Lines	Loaded	5E6
99-5E-0630	ISDN - Packet Switching Data Business Group Service	Loaded	5E5
99-5E-0631	Analog Shared Directory Number on all SM	Basic	5E5
	Configurations		
99-5E-0632	ISDN - Multipoint T-BRI	Loaded	5E5
99-5E-0633	Applications Processor Dual Telephone Coverage	Basic	5E4
99-5E-0634	Intercom Calling Restriction Billing of Overflow Calls	Basic	5E5
99-5E-0635	ISDN - DBS 2-Digit Intercom Dialing	Loaded	5E5
99-5E-0636	Disassociate Speed Calling from IDP	Basic	5E6
99-5E-0637	Flexible Assignment of Call Code	Basic	5E6
99-5E-0638	Large Terminal Growth	Basic	5E6
99-5E-0639	Multiple DNs Per Line with Distinctive Ringing	Basic	5E4
99-5E-0641	ORM/TRM Shared Resources	Basic	5E5
99-5E-0642	Flexible ANI Information Digit Assignment	Basic	5E6
99-5E-0643	7-Digit Outpulsing for V PATH	Basic	5E4
99-5E-0644	Allow Common Password for EDS and CMSS Functions	Loaded	5E6
99-5E-0645	ISDN Standard Billing Capability	Basic	5E6
99-5E-0646	ISDN Identification in AMA Records for ISDN	Basic	5E6
	Circuit-Switched Data Calls		
99-5E-0647	1980 X.25 DTE Support	Loaded	5E6
99-5E-0648	Modem Pool on a Multipoint BRI	Loaded	5E6
99-5E-0649	Customer-Initiated Verification of ISDN Directory Number	Loaded	5E6
99-5E-0650	X.25 Call Screening for Intra-LATA Packet	Loaded	5E6
99-5E-0651	Indication of a Full Protocol Error Record Log	Loaded	5E6
99-5E-0652	Timing Delay on Local Calls	Basic	5E6
99-5E-0653	ISDN DBS Automatic Exclusion	Loaded	5E7
99-5E-0654	LASS - AR/AC Dual Timer Queueing Activation	Basic	5E7
99-5E-0655	LASS - 2-Level Activation	Basic	5E7

99-5E-0656	LASS Screen List Editing Compliance with Bellcore	Basic	5E7
99-5E-0657	Process Message Data Block Message Storage	Basic	5E7
99-5E-0658	Inter-switch Voice Messaging Services	Basic	5E7
99-5E-0659	RTA Defensive Check Failure Message Redesign	Basic	5E7
99-5E-0660	Call Forwarding Inhibit Line Busy	Basic	5E7
99-5E-0661	Call Forwarding Inhibit Make Busy	Basic	5E7
99-5E-0662	ISLU/LU Load Administration Measurements	Basic	5E7
99-5E-0664	Enhancements to X.25 Packet Switching for Trusted DTE	Loaded	5E7
99-5E-0665	MDR to Customer Location Packet-Switched Data Calls	Loaded	5E6
	(ISDN Lines Only)		
99-5E-0666	Single PER Triggers for Protocol Monitoring	Basic	5E7
99-5E-0667	Remote Protocol Access	Basic	5E7
99-5E-0668	Complete Generic Utility Package for Protocol Handlers	Loaded	5E7
99-5E-0669	Memory Mining for the PH2	Basic	5E7
99-5E-0670	BWM Data Compression	Basic	5E7
99-5E-0671	BWM Performance Optimization	Basic	5E7
99-5E-0672	BWM Transmission Enhancements	Basic	5E7
99-5E-0673	CSCANS BWM Download Session Automation	Basic	5E7
99-5E-0674	CSCANS BWM Number Upload	Basic	5E7
99-5E-0675	Data Base Reorganization Enhancements	Basic	5E7
99-5E-0676	Operational Views for ODD and Memory Optimization	Basic	5E7
99-5E-0677	SMP23	Basic	5E7
99-5E-0678	Craft Interface Enhancement	Basic	5E7
99-5E-0679	5E7 Support for CNI Features	Basic	5E7
99-5E-0680	Disk ODD Backup Enhancement	Basic	5E7
99-5E-0681	CM Message Packetization	Basic	5E7
99-5E-0682	Software Release Retrofit (5E6 to 5E7), Software	Basic	5E7
	Release Update (5E7), and Large Terminal Growth (5E7)		
99-5E-0683	Retrofit Trunk Status Mapping	Basic	5E7
99-5E-0684	Remote Protocol Monitoring Access to ISDN Channels	Basic	5E7
99-5E-0685	Leased Network Service Selective Trunk Reservation	Standard	5E7
	(SSTR)		
99-5E-0686	CCS7 ISDN-UP Network Interconnect Phase 2	Loaded	5E7
99-5E-0687	Call Associated CCS7 Network Phase 2	Loaded	5E7
99-5E-0688	CCS7 ISDN User Part Enhancements	Loaded	5E7
99-5E-0689	Q.931/CCS7 ISDN-UP Interworking Enhancements	Loaded	5E7
99-5E-0690	Recent Change View Consolidation	Basic	5E7
99-5E-0691	Software/Hardware Decoupling	Basic	5E7
99-5E-0693	Global Recent Change for Lines	Basic	5E7
99-5E-0694	Circuit-Switched Trunk (CST) Calls	Basic	5E4
99-5E-0695	Incoming Trunk Service Evaluation	Basic	5E6
99-5E-0696	Limited Intragroup ICLID	Basic	5E4
99-5E-0697	Terminal Group/Station Restriction for ISUP Trunks	Basic	5E5
99-5E-0698	Precompliant FGB CIC Expansion	Basic	5E6
99-5E-0699	ANI Over Private Facilities	Basic	5E4
99-5E-0700	5ESS® Switch OSO AMA Recording for ANI Delivery	Basic	5E5
99-5E-0701	Enhanced INWATS-Type AMA	Basic	5E6
99-5E-0730	ANI6/ANI7 on a Trunk Group or SFG	Basic	5E7
99-5E-0731	Specifying a DAS on an OUTWATS SFG	Basic	5E7
99-5E-0732	Modified Calling Line Disconnect Procedure for Fraud	Basic	5E5
	Protection		
99-5E-0733	Call Forwarding Don't Answer Invocation After Call	Basic	5E7
	Waiting		
99-5E-0734	Single Recent Change for Intercept Line Assignment	Basic	5E7
99-5E-0735	Direct Interface to RNM	Basic	5E7
99-5E-0736	Support of Multiple ISDN Trunk Members on PH3	Basic	5E7
99-5E-0737	Optimization of System Initialization	Basic	5E7
99-5E-0738	Provide Shared DN Bridging on Conference Calls	Loaded	5E8
99-5E-0739	ISDN MBKS Pick Up Held Conference from Shared DN	Loaded	5E8
	Call Appearance		
99-5E-0740	Increase Shared Directory Number Group Size - Custom	Loaded	5E8
	BRI Version		
99-5E-0742	Additional ASP Capabilities	Basic	5E8
99-5E-0744	LASS - Bulk Calling Line ID (BCLID)	Basic C	5E8
99-5E-0745	Essential Service Protection for BRI	Loaded	5E8
99-5E-0746	Attendant Group Overload Warning	Loaded	5E8
99-5E-0747	Attendant Offered Load Statistics	Loaded	5E7
99-5E-0748	ISDN Attendant Remote Busy Verification	Loaded	5E8
99-5E-0749	Matching Loss Measurements	Basic	5E8
99-5E-0754	Local Change Prevention on X.25 DE	Loaded	5E7
99-5E-0755	Packet Trunk Interface Standardization	Loaded	5E8
99-5E-0759	5E6 to 5E8 Retrofit Skip	Basic	5E8

99-5E-0760	Automatic Calculation of REX Schedule	Basic	5E8
99-5E-0770	Broadcast Pump of Switching Modules	Basic	5E7
99-5E-0775	AM/CM Resynchronization	Basic	5E8
99-5E-0776	Delivery of TG Maintenance Busy Counts to RNMS	Basic	5E7
99-5E-0777	NM Data Collection for 2000 Trunk Groups	Basic	5E7
99-5E-0778	Retrofit Menu Page Enhancements	Basic	5E7
99-5E-0779	Fast Software Transition Tape Read	Basic	5E7
99-5E-0781	Expanded Range for Service Indicator Code	Basic	5E4
99-5E-0784	Tandem Access for Inter-LATA Sent-Paid Coin Calls	Basic	5E2(2)
99-5E-0788	1+ Blocking and 1+ Split Blocking	Basic	5E6
99-5E-0789	Calling Party Number Presentation	Basic	5E6
99-5E-0790	Unidentified Call Rejection	Basic	5E5
99-5E-0791	Removal of ISDN COT Agency Follow-Up Number	Loaded	5E6
99-5E-0792	Calling Line Supervision	Basic	5E7
99-5E-0793	Calling Party Disconnect Indication	Basic	5E5
99-5E-0794	Private Option for Last Incoming Number	Basic	5E6
99-5E-0795	Operator Line Verification Interaction with CFBL	Basic	5E6
99-5E-0796	AM-Based Protocol Monitoring Translator	Basic	5E7
99-5E-0797	ISDN Attendant Console - 20 Hundred Group Selector Buttons	Loaded	5E7
99-5E-0798	Contiguous Storage of Data on Tape	Basic	5E7
99-5E-0799	Remote Protocol Analysis by RMS-D3	Basic	5E7
Notes:			
a.	Available on basic SMs with the 5E8 software release (see 99-5E-0833).		
b.	Every 24 standard SMs require one loaded SM for data link interface.		
c.	For full feature functionality, requires one loaded SM for API link.		

10.1.4 5ESS® Switch Feature List (continued)

Table 10-4 5ESS® Switch Feature List (99-5E-0800 - 99-TP-1008)

FEATURE NUMBER	FEATURE TITLE	SM CONFIG	SOFTWARE RELEASE
99-5E-0800	METRO HUB	Loaded	5E6
99-5E-0801	Conditional Notification Class of Service	Loaded	5E8
99-5E-0802	Active Channel Selection for X.25 Call Delivery	Loaded	5E8
99-5E-0803	Subscription to Number of On-Demand B-Channels for Packet	Loaded	5E8
99-5E-0804	User Testing Capabilities	Loaded	5E8
99-5E-0805	ISDN Packet-Switched Data Business Group Enhancements Abbreviated Dialing and Abbreviated Number Delivery	Loaded	5E8
99-5E-0806	Standardized ISDN Packet Multiline Hunt Group	Loaded	5E8
99-5E-0807	Packet Trunk Enhancements	Loaded	5E8
99-5E-0808	Standardization of ISDN Basic Call Control for Circuit-Switched Voice and Data Calls	Loaded	5E8
99-5E-0809	Standardization of Terminal Initialization and Terminal Maintenance	Loaded	5E8
99-5E-0810	Bellcore Standardization of Stimulus Features	Loaded	5E8
99-5E-0811	Multiple Call Services for Terminal Portability	Loaded	5E8
99-5E-0812	OA&M Terminal Compatibility	Loaded	5E8
99-5E-0813	Flexible Calling	Loaded	5E8
99-5E-0814	Bellcore Standardization of Stimulus Signaling	Loaded	5E8
99-5E-0815	Hold Capability for CSD	Loaded	5E8
99-5E-0816	Bellcore Standardization of Display Capability	Loaded	5E8
99-5E-0817	Enhancements to Intraswitch Automatic Recall - ISDN for CSD	Loaded	5E8
99-5E-0818	ISDN Calling Number Identification Services	Loaded	5E8
99-5E-0819	ISDN AMA Compliance for ISDN Interworking	Loaded	5E8
99-5E-0820	ISDN BRI Access to 108-Type Test Line	Loaded	5E8
99-5E-0821	Channel/Terminal Configuration	Loaded	5E8
99-5E-0822	Additional Call Offering for CSD	Loaded	5E8
99-5E-0823	FGB CIC Expansion	Basic	5E8
99-5E-0824	Improved Input Message Update Capability	Basic	5E8
99-5E-0825	CCS7 ISDN User Part Enhancements for 5E8	Loaded	5E8
99-5E-0826	Transmitter Time-Out Measurements in 5-Minute NM Report	Basic	5E8

99-5E-0827	5ESS® Switch Trunk Group List Audit	Basic	5E8
99-5E-0829	Allow Craft to Set AMA Percent Full Alarm Levels	Basic	5E8
99-5E-0830	AMA Traffic Measurements per SM	Basic	5E8
99-5E-0831	Integrated Digital Carrier Unit	Standard	5E8
99-5E-0832	DFI-2 Performance Monitoring Enhancements	Basic	5E8
99-5E-0833	DSU2-ISTF Capability for SM	Basic	5E8
99-5E-0834	Analog Calling Name Display	Basic	5E8
99-5E-0835	Network Facility Access	Basic	5E8
99-5E-0836	International Direct Distance Dialed Calls	Basic	5E8
99-5E-0838	Simultaneous Trunk Conversion via Automatic Recent Change	Basic	5E8
99-5E-0839	LASS Validation/Screening During NPA Split	Basic	5E8
99-5E-1002	IDCU RT303 Industry Std Large RT Interface	Loaded	5E9(2)
99-5E-1010	AM Off-Line Boot Verification	N/A	5E9(1)
99-5E-1018	Recent Change of Protocol Timers and Parameters	Loaded	5E9(1)
99-5E-1053	Redefine Protocol Handler 2 Access Image (PH2A)	Loaded	5E9(1)
99-5E-1077	AMATRC Enhancements	Basic	5E9(1)
99-5E-1078	Multiple DS1 Facilities Controlled by a Single PRI	Loaded	5E9(1)
99-5E-1079	D-Channel		
99-5E-1087	PRI D-Channel Back Up	Loaded	5E9(1)
99-5E-1101	PRI Call-by-Call Service Selection for FX and Tie	Loaded	5E9(1)
	CNI Data Structure Documentation/ Modification of	N/A	5E9(1)
99-5E-1105	CNIDBOC		
	Call Waiting with Distinctive Tone and Distinctive Ringing	N/A	
	for Long Distance Calls		
99-5E-1106	Calling Identity Delivery on Call Waiting	N/A	
99-5E-1136	5ESS® Switch CCS7 Capacity Improvement - DLN 30	N/A	5E9(2)
99-5E-1140	Call Park	Basic	5E9(1)
99-5E-1144	Parallel Update Activation	N/A	5E10
99-5E-1148	ODD Conversion Tool "UNMKDSK"	N/A	5E9(1)
99-5E-1150	Advanced Services Platform Release 0.1B	Basic	5E9(1)
99-5E-1150A	SSP800 and ASP Interworkings	Basic	5E9(2)
99-5E-1154	Centrex PRI Enhancement	N/A	
99-5E-1156	CENTREX Network	SM-2000	5E9(2)
99-5E-1168	SETD Message Space Relief	Loaded	5E9(1)
99-5E-1174	Call Forwarding Don't Answer Return	N/A	
99-5E-1169	Automatic Callback Blocked to Private Number	N/A	
99-5E-1192	Compact Digital Exchange (CDX)	SM-2000	5E9(2)
99-5E-1198	Standard Service Profile Identifier (SPID)	Loaded	5E9(1)
99-5E-1202	Standardized CPE Status Control	Loaded	5E9(1)
99-5E-1203	Service Uniformity for Flexible Calling	Loaded	5E9(1)
99-5E-1205	Service Uniformity for Call Forwarding	Loaded	5E9(1)
99-5E-1207	Service Uniformity for Display	Loaded	5E9(1)
99-5E-1208	Service Uniformity for Additional Call Offering (Circuit Mode Only)	Loaded	5E9(1)
99-5E-1209	Service Uniformity for EKTS	Loaded	5E9(1)
99-5E-1211	Advanced Network Services (ANS) LASS-SCN/ Intelligent Peripheral Interworking	Loaded	5E10
99-5E-1221	National ISDN - BRI Verification (BRIV)	Loaded	5E10
99-5E-1227	5ESS® Switch Command Restriction Feature	N/A	5E9(1)
99-5E-1235	Directory Number Measurements (DNM) for EADAS (non-ISDN)	Basic	5E9(1)
99-5E-1239	Automatic Terminal Setup	Loaded	5E9(1)
99-5E-1241	ACD/BRCS Interworking	Loaded	5E9(1)
99-5E-1242	CMP Core Board Memory Expansion	N/A	5E9(1)
99-5E-1243	Improved DLN Overload Control Strategy	N/A	5E9(1)
99-5E-1244	Software Update (BWM) Process Automation	N/A	5E9(1)
99-5E-1245	5ESS® Switch Line Editing and History	N/A	5E9(1)
99-5E-1250	NI Phase 3 - NI MTP LATA Routing	Loaded	5E9(1)
99-5E-1252	Far Access Remote (FAR)	N/A	5E9(2)
99-5E-1257	CM2 PIC2 Microcode Performance Improvement	N/A	5E9(1)
99-5E-1258	Software Release Retrofit Downtime Reduction via AM	N/A	5E9(1)
99-5E-1262	CCITT E.164 Compliance with 15 Digits Off-Line Boot	N/A	5E10
99-5E-1272	Message Service System Call Forward	N/A	
99-5E-1274	ISDN Fast Transfer Option	N/A	
99-5E-1280	CNI/IMS Hardware and Software Inhibits	N/A	5E9(1)
99-5E-1281	DLN Quality Improvement - AP Panic Interface	N/A	5E9(1)
99-5E-1282	Critical Node Restore Phase 2	N/A	5E9(1)
99-5E-1283	CNI Core Enhancements	N/A	5E9(1)
99-5E-1288	5E8 to 5E9 Software Release Retrofit	N/A	5E9(1)
99-5E-1290	NI-1 Access to Series Completion	Loaded	5E9(1)

99-5E-1291	Inter-LATA Carriers Intra-LATA Capabilities for 5ESS TM and 1A ESS [®] Switches	SM-2000	5E10
99-5E-1302	Routing Based on Bearer Capability	Loaded	5E9(1)
99-5E-1310	Join Two Call Appearances on ISDN Attendant Console	N/A	
99-5E-1319	Feature Group D (FGD) Carrier Identification Code (CIC) Expansion	Basic	5E9(1)
99-5E-1323	5ESS [®] Switch Advanced Automated Circuit Pack Return Tag (Yellow Tag)	Loaded	5E9(1)
99-5E-1326	IDCU TR 303 Industry Standard Large RT Interface, Introduction Release - Customer Lab Environment	Loaded	5E9(1)
99-5E-1331	Testing of Audio and Visual Switch Alarms	Basic	5E9(1)
99-5E-1334	Automated Static ODD Audit	Basic	5E9(1)
99-5E-1335	Add AMA Error File and Office Record	Basic	5E9(1)
99-5E-1336	Fractional DS1 Switching via PRI Access	Loaded	5E9(1)
99-5E-1348	5ESS [®] Switch for AutoPLEX [®] System 1000 (AMPS)	Loaded	5E9(1)
99-5E-1349	Enhanced RISLU	Loaded	5E9(1)
99-5E-1376	Special Access Code (SAC) Call Type	N/A	
99-5E-1397	RCOS Apptext Forward Translation	N/A	5E9(1)
99-5E-1411	Standard AMA Recording for User-Originated B-Channel Packet Service	Loaded	5E9(1)
99-5E-1412	Higher Interswitch Data Throughput (19.2 kbps)	Loaded	5E9(1)
99-5E-1427	Digital Networking Unit - SONET	SM-2000	5E9(2)
99-5E-1430	IDCU TR 303 Industry Standard 96 Line RT Interface	Loaded	5E9(1)
99-5E-1433	Switching Module - 2000, Release 1	SM-2000	5E9(2)
99-5E-1445	Line Time Slot Bridging and Automatic Callback/Recall	N/A	
99-5E-1451	CNIS Intra-Group Only Delivery Optioning	SM-2000	5E9(2)
99-5E-1457	Suppressed Ringing	Basic	5E10
99-5E-1471	RC OS Apptext Forward Translation for 5E9(2)	N/A	5E9(2)
99-5E-1475	Quad Link Packet Switch	SM-2000	5E9(2)
99-5E-1485	RC Log Full Permanent Warning	SM-2000	5E12
99-5E-1511	ASP Network Element Services Signaling	Loaded	5E10
99-5E-1532	Service Announcement System	Loaded	5E9(2)
99-5E-1536	5E9(2) Software Transitions	N/A	5E9(2)
99-5E-1576	Originating Busy/No Answer Subsequent Event Detection	N/A	
99-5E-1576.A	ASP Busy/No Answer Subsequent Event Detection	Basic	5E10
99-5E-1583	Analog Trunk Interface on SM2000	SM-2000	5E10
99-5E-1584	GDSF on SM-2000	SM-2000	5E10
99-5E-1584.A	TTF/STF Functionality on GDSF on SM-2000	SM-2000	5E10
99-5E-1588	T1 Trunk Interface for SM-2000	SM-2000	5E9(2)
99-5E-1589	64 MB Memory Board on SM-2000	SM-2000	5E10
99-5E-1590	ISDN on SM-2000	SM-2000	5E10
99-5E-1591	HSM-2000 for Single/Multi-Module RSMs	SM-2000	5E10
99-5E-1600	Code Division Multiple Access (CDMA)	SM-2000	5E10
99-5E-1600.A	CDMA PH for ATM	SM-2000	5E10
99-5E-1602	Extended Switching Module - 2000	SM-2000	5E9(2)
99-5E-1610	Direct Inward Dialing (DID) Answer	N/A	
99-5E-1616	Very Compact Digital Exchange (VCDX)	Basic	5E9(2)
99-5E-1627	Forced Privacy on Interswitch Outgo	N/A	
99-5E-1628	5E10 Software Release Translation	N/A	5E10
99-5E-1637	Direct Connect Thru ISDN Attendant Control of Voice	N/A	
99-5E-2000	Terminals (DCACVT)		
99-5E-2202	Digital Audio Tape	N/A	5E9(2)
99-5E-2203	Calling Party Number (CPN) Delivery on E911 Calls	N/A	
99-5E-2204	BRCS Interworking with ASP OHD Trigger	Basic	5E9(2)
99-5E-2205	ASP Default Routing for TAT Triggers	Basic	5E9(2)
99-5E-2206	ASP Distinctive Ringing	Basic	5E9(2)
99-5E-2207	ASP Interworking with NISDN	Basic	5E9(2)
99-5E-2227	PINNACLE [®] ACD E911	Loaded	5E10
99-5E-2262	Analog and Time Division Multiple Access on SM-2000	SM-2000	5E9(2)
99-5E-2264	BRI Multipoint EOC	Loaded	5E11
99-5E-2268	CNAM for ISDN BRI for NI3	Loaded	5E10
99-5E-2269	BRI/PRI Surveillance - Layers 2/3	Loaded	5E11
99-5E-2270	NISDN-3 Call Forwarding Over Private Facilities (CFPF)	Basic	5E10
99-5E-2271	Logging of Clearing of Subnetwork Identifier	Loaded	5E10
99-5E-2273	Default Service Profile	Loaded	5E10
99-5E-2283	Non-Initializing Terminals	Loaded	5E10
99-5E-2285	IEC Preselect Indication Utility on X.75' Trunks	Loaded	5E10
99-5E-2295	ACD Vector Prompt Enhancement	Basic	5E10
99-5E-2299	Calling Name for ISDN PRI	Loaded	5E11
99-5E-2299	DCLU and IDCU TR-008 Mode 1 Interface Support of the SLC [®] 96-Compatible Dual Circuit Foreign Exchange (FX)	N/A	

	Plugs		
99-5E-2304	T1/E1 Termination on DLI of ORM Timing	Basic	5E10
99-5E-2304.A	T1/E1 Termination on DLI for VCDX	Loaded	5E10
99-5E-2320	ISDN Inspect	Loaded	5E11
99-5E-2326	AMA Long Duration Recording Enhancements	Basic	5E10
99-5E-2343	ASP BRCS/OHD Interworking Extensions	Basic	5E10
99-5E-2347	ASP LASS OHD Interworking	Basic	5E10
99-5E-2356	ISDN/PCS Interworking	Loaded	5E10
99-5E-2357	AIN 0.2 SSP Send to Outside Resource	Basic	5E10
99-5E-2371	Enhanced Professional Office	Basic	5E11
99-5E-2372	ASP Interworking with Custom ISDN Attendants	Basic	5E9(2)
99-5E-2378	SM-2000 Standalone Call Processing Circuit Usage	SM-2000	5E9(2)
99-5E-2401	RCOS Apptext Forward Translation (AFT)	Basic	5E10
99-5E-2404	Automatic Power Recovery	Basic	5E10
99-5E-2406	Recovery From Alternate Boot Disk	a	5E13
99-5E-2407	Remote Recovery and Backup from DAT	N/A	5E10
99-5E-2422	CORE60	SM-2000	5E10
99-5E-2444	TLWS Metallic Test Capacity on 5ESS® Switch	SM-2000	5E10
99-5E-2446	Information Services Gateway (ISG)	SM-2000	5E11
99-5E-2448	Feature Activation Counting and Reconciliation	N/A	5E8
99-5E-2457	Third Party Call Control	Loaded	5E10
99-5E-2466	TR-303 on DNU-S	SM-2000	5E12
99-5E-2467	CPN Billed on a PRI	Loaded	5E10
99-5E-2477	Additional ASP OHD Interactions with Account Code and	Basic	5E9(2)
	CNP/BN		
99-5E-2488	PRI Call-by-Call Service Selection for Hotel/Motel and	Loaded	5E11
	SCOCS		
99-5E-2525	AMPS Landline Cellular Option	SM-2000	5E9(2)
99-5E-2526	ASI PROXY Enhancements	N/A	5E11
99-5E-2533	Default Routing for 3/6/10 Digit Triggers	Basic	5E10
99-5E-2534	Distributed Power	N/A	5E10
99-5E-2536	Four-Wire FXO Line via DFI	Basic	5E11
99-5E-2540	Type 2A/2B Cellular Interconnection via SS7	N/A	5E11
99-5E-2551	Visual Call Pickup	N/A	5E15
99-5E-2563	ASP Interworking with SMDR	Basic	5E10
99-5E-2564	SMP23 Core Board with Dynamic Memory	N/A	5E10
99-5E-2567	Public Access Trunks/Release Link Trunks Interworking	N/A	5E8
99-5E-2594	On-Site Data Evolution	N/A	5E13
99-5E-2594.A	5E12 to 5E13 Network Based Retrofit (NBR)	N/A	5E13
99-5E-2597	Priority Calling Incoming Only for NI	Loaded	5E11
99-5E-2609	Automated SODD Audit Enhancement	Basic	5E10
99-5E-2609.A	Automated Static ODD Audit Enhancements	Basic	5E11
99-5E-2610	5ESS® VCDX Integration of SM-2000	SM-2000	5E10
99-5E-2610.A	Circular AMA Buffer for VCDX	SM-2000	5E10
99-5E-2627	CA Reservation for NI	Loaded	5E11
99-5E-2636	Combined Services Unit	Basic	5E10
99-5E-2651	ASP Call Routing Parameters	Basic	5E10
99-5E-2652	Forwarded Call - Call Screening	N/A	5E14
99-5E-2669	Call Forwarding Over Private Facilities/ Don't Answer	Basic	5E10
	(CFPF/DA)		
99-5E-2695	SAS on SM-2000	SM-2000	5E10
99-5E-2708	TCAP Improvements for a Switch Spanning Multiple	Basic	5E11
	LATAs		
99-5E-2709	MCTU3	N/A	5E10
99-5E-2725	AMA Capabilities for Type 1 Cellular Access	N/A	5E11
99-5E-2741	TRFC30-Section 143 Increase Maximum Collection Units	N/A	5E13
99-5E-2741.A	Allow All Command for TRFC30-Section 143	N/A	5E13
99-5E-2753	Parameter Downloading Modifications for VKTS	Loaded	5E11
99-5E-2758	Coin Phone Functionality on AIU	N/A	5E11
99-5E-2776	ACD/BRCS Interworking - II	Loaded	5E11
99-5E-2779	Central Office Building/Power Alarms Repeatability	Basic	5E10
99-5E-2780	IOP-PC/DFC Circuit Pack Enhancement	N/A	5E10
99-5E-2807	Increase ESCOs for 911	Basic	5E10
99-5E-2809	SAS Workstation	N/A	5E11
99-5E-2844	MLPP on SS7 - Stage 1	Basic	5E11
99-5E-2845	MLPP on SS7 - Stage 2	SM-2000	5E11
99-5E-2846	ASP Interworking with NISDN, CISDN and ISAT	Basic	5E10
99-5E-2848	ASP 3/6/10 Digit Pre-Query Screening	Basic	5E10
99-5E-2855	ISDN U-Interface on AIU	Basic	5E12
99-5E-2860	Mini DCS - CDMA on VCDX	SM-2000	5E11
99-5E-2864	Prohibit Routine Exercise (REX) on Basic Rate Interface	SM-2000	5E11
	(BRI)		

99-5E-2949	ASP Interworking with Circuit Switched Data	Basic	5E11
99-5E-2972	ODD/Text Compression	SM-2000	5E11
99-5E-2975	MIS SM Event Link on IDCU	SM-2000	5E11
99-5E-2988	CDMA Data Service - Circuit Mode	Loaded	5E12
99-5E-3003	Automatic Power Recovery - Phase 2	Basic	5E11
99-5E-3004	A/B Link and No Path Access Delay and Blockage	N/A	5E11
99-5E-3005	Increase of Printing Units of Section 144 for ROP	N/A	5E11
99-5E-3032	5ESS® Long Distance Platform Basic Call Processing	SM-2000	5E11
99-5E-3045	Redirected Number on PRI	Loaded	5E11
99-5E-3055	Parallel Pump on CI2	N/A	5E11
99-5E-3081	Extended Handoff with ATM Center Stage	SM-2000	5E11
99-5E-3082	Interswitch Soft Handoff	SM-2000	5E11
99-5E-3085	ASP Support on the VCDX Platform	Basic	5E11
99-5E-3114	SS7-PSU on SM-2000	SM-2000	5E11
99-5E-3114.B	Call/Circuit Monitor SS7-PSU	Basic	5E12
99-5E-3133	Multiple CIC Support for Long Distance Platform	Basic	5E11
99-5E-3151	ASP Enhancements to Provide Tollfree Services	Basic	5E11
99-5E-3152	ANA Recording-AIN Busy and Don't Answer	Basic	5E11
99-5E-3158	ASP Monitor for BRI and Multiline Hunt Group	SM-2000	5E15
99-5E-3183	Subsystem Number Capacity Increase	Basic	5E11
99-5E-3228	Global Messaging Server (GMS)	SM-2000	5E15
99-5E-3243	Trunk Group Expansion and OA&M Redefinition	SM-2000	5E11
99-5E-3260	AIN Toll Free Service - Phase 2	Basic	5E11
99-5E-3261	Two B-channel Transfer (TBCT) on PRI	a	5E13
99-5E-3270	Line Blocking Enhancements - Phase 2	Basic	5E11
99-5E-3270.A	Line Blocking Enhancements - Phase 1	Basic	5E11
99-5E-3338	Internally Bridged Dual Service -Package 1	a	5E12
99-5E-3341	E9-1-1 on VCDX	Basic	5E12
99-5E-3359	PHV3 Downloadable Protocol Handler for Voice	Basic	5E11
99-5E-3360	CDMA Mobile Loopback Testing	Basic	5E11
99-5E-3379	Long Distance Platform Data Capabilities	Basic	5E11
99-5E-3395	Switch Based TDMA Vocoders	a	5E12
99-5E-3397	TNM Interface on VCDX	N/A	5E13
99-5E-3404	Transmission Rate Converter Unit 3 (TRCU3)	a	5E12
99-5E-3411	PSU Capacity Expansion	SM-2000	5E12
99-5E-3412	Protocol Handler for Voice 4 (PVH4)	Loaded	5E12
99-5E-3421	Virtual Private Network for Long Distance Platform	Basic	5E11
99-5E-3426	Multiple Rate Center Support	Basic	5E11
99-5E-3438	Feature Deployment via ASM	N/A	5E13
99-5E-3474	CDMA Enhanced Variable Rate Coding (EVRC)	SM-2000	5E11
99-5E-3474.A	PHV Traffic Measurements Expansion	N/A	5E13
99-5E-3483	Enhanced UNIX® Tools on AM	Basic	5E11
99-5E-3484	Decoupling of AM/CM for CM Only Init	Basic	5E12
99-5E-3486	Selective Broadcast Pump	Basic	5E12
99-5E-3487	STS-1 Echo Cancellation	a	5E13
99-5E-3489	Selective Manual RC Output Priority	Basic	5E12
99-5E-3520	Automated SPID Download (Auto SPID)	Basic	5E11
99-5E-3529	ASP Originating Busy/No Answer Office Triggers with	Basic	5E11
99-5E-3553	Extended Ringing		
99-5E-3541	Wireless Trunks on DNU/S	SM-2000	5E13
99-5E-3559	LU2 on SM-2000	Basic	5E11
99-5E-3560	DS1 Echo Cancellation	Basic	5E11
99-5E-3561	Expansion Access Interface Unit (EAIU)	Loaded	5E12
99-5E-3569	Integrated Metallic Testing for AIU	Loaded	5E12
99-5E-3576	AIN Announcement ID Expansion	Basic	5E12
99-5E-3579	TDMA Data Services - Circuit Mode	Loaded	5E14
99-5E-3599	5ESS® DCS Nailup Expansion	a	5E13
99-5E-3614	Network Busy Event for Next Event List	a	5E13
99-5E-3620	AIN Send to Outside Resource (Remote)	Basic	5E11
99-5E-3620.A	STOR Remote Traffic Measurements	Basic	5E12
99-5E-3673	ICLID ENhancement for MLHG	N/A	
99-5E-3675	Long Distance AMA Enhancement	Basic	5E11
99-5E-3692	Conversion of 3B20D Based AM to 3B21D	Basic	5E11
99-5E-3706	Number Portability - LRN Measurements	Basic	5E12
99-5E-3730	Number Portability - NPA-NXX Growth	Basic	5E12
99-5E-3735	SM-2000 Two Fully Loaded DNU-S	Basic	5E11
99-5E-3739	Internally Bridged Dual Service - Package 2	a	5E12
99-5E-3760	Inhibiting Originating Busy/No Answer Office Trigger	Basic	5E11
99-5E-3761	Call Screening for Originating Busy/No Answer Office	Basic	5E11
99-5E-3777	Triggers		
	Automatic ISDN Line Assignment (ALA)	Basic	5E11

99-5E-3780	Data Only PRI Capability	Basic	5E11
99-5E-3782	Multi-Vendor Intra Network Trunks	a	5E12
99-5E-3784	Real Time Call Detail	Loaded	5E12
99-5E-3796	National ISDN Call Park	a	a
99-5E-3825	5E12 Software Transitions and AFT Feature	SM-2000	5E12
99-5E-3837	Local Number Portability on Long Distance Platform	a	5E12
99-5E-3847	DMT ADSL Application Pack for <i>AnyMedia™</i> AIU	a	5E13
99-5E-3850.V	Distinctive Remote Module	SM-2000	5E14
99-5E-3874	Non-pump Protocol Handler Software Update	Basic	5E11
99-5E-3886	Selective NPA Deletion for ASP Multiple Rate Center Support	Basic	5E11
99-5E-3887	Bellcore Cause Codes and Location Values	a	5E13
99-5E-3900	Delete Warning Display for Essential Services	a	5E12
99-5E-3900.A	Delete Inhibit Display for Selected Lines and Trunks	a	5E13
99-5E-3928	Secondary Network Dial Tone	Basic	5E11
99-5E-3928.A	Secondary Network Dial Tone - Phase 2	Basic	5E12
99-5E-3939	5ESS® Switch Long Distance Platform Version 4 Multiple ANI	Basic	5E12
99-5E-3945	GETS High Probability of Completion (HPC)	a	5E13
99-5E-3954	Ability to Stop RST	Basic	5E12
99-5E-3968	Route International Calls by Country Code	Basic	5E11
99-5E-3970	Carrier Routing/Call Processing by Facility Presence	Basic	5E11
99-5E-3974	Two Simultaneous Voice Calls on BRI	Basic	5E11
99-5E-3987	Persistent Transitions Enhancement	a	5E12
99-5E-3993	5ESS® Switch 0 LDP ANI Table Screening Index	Basic	5E11
99-5E-4001	Telephone Status Monitor and Select	Loaded	5E12
99-5E-4018	Handle Date and Time Transition to Year 2000	Basic	5E12
99-5E-4029	Call Forwarding on Trunks	SM-2000	5E11
99-5E-4035	Subscribed Originating Busy/No Answer Triggers	Basic	5E12
99-5E-4036	Number Portability - 5 Minute Peg Counts	SM-2000	5E12
99-5E-4046	Modified Redirecting Number Origination on BRI	Basic	5E11
99-5E-4050	IDCU Recovery Enhancements	Basic	5E11
99-5E-4076	CDMA-Data Services □ Packet Mode	SM-2000	5E15
99-5E-4085	VCDX Additional Serial Ports	Basic	5E12
99-5E-4088	CDMA 6-Way Soft Handoff	Loaded	5E12
99-5E-4093	Improve RC Verify	N/A	5E13
99-5E-4095	Recent Change Front-End to ASM	a	5E13
99-5E-4108	Software Transitions + AFT Standing Feature for 5E13	a	5E13
99-5E-4119	Trunk Trigger for Toll MF	Basic	5E12
99-5E-4132	ASP Terminating Busy/No Answer Triggers and Subsequent Event Detection	N/A	5E14
99-5E-4141	SMP23 CDM Processor Memory Expansion	Basic	5E11
99-5E-4148	Enhanced ECD Audit	Basic	5E12
99-5E-4149	VER:OFC for BRI Data Calls	Loaded	5E12
99-5E-4151	DNU-S Support for Byte-Synchronous DS1	SM-2000	5E13
99-5E-4155	DS1 Loopback for TR303 on DNU-S	a	a
99-5E-4184	Internally Bridged dual Service - Package 3	a	5E12 5E13
99-5E-4187	Routing Enhancements	a	5E13
99-5E-4187.A	Routing Enhancement: Final Routing Trigger	N/A	5E14
99-5E-4191	Port by Port Control of Metallic Access Pack Diagnostics	Basic	5E12
99-5E-4208	Dialed Number Identification Service	Loaded	5E12
99-5E-4208.A	Transport of Original Dialed Number	SM-2000	5E13
99-5E-4209	RSM on DNU-S	a	5E13
99-5E-4217	Dual ESA on VCDX	a	5E12
99-5E-4219	ANI NPA-NXX Expansion	Basic	5E12
99-5E-4221	3/6 Digit ANI Matching	Standard	5E12
99-5E-4288	Optical Extended Control and Data Unit (OXU)	SM-2000	5E15
99-5E-4237	Administrative Services Module (ASM) Base	a	5E13
99-5E-4238	MTP Restart & Processor Outage Procedure	N/A	5E14
99-5E-4244	Simplified Custom ISDN Attendant	Loaded	5E12
99-5E-4245	Automatic Trunk Test Scheduler (ATTS)	Basic	5E11
99-5E-4256	Immediate Start Announcement Interface for <i>PINNACLE®</i>	Loaded, SM-2000	5E13
99-5E-4267	ACD Trunk Group Hunt Sequence Enhancements	Standard	5E13

99-5E-4268	LDIT Best Fit Search	a	5E13
99-5E-4269	FG-D Cut-Through Trigger	a	5E13
99-5E-4275	CALEA Capability □ Core	N/A	5E14
99-5E-4284	Verify Office Capability for Long Distance Platform	N/A	5E14
99-5E-4299	Information Digit Screening	a	5E13
99-5E-4300	400 Hz Carrier Tone	a	5E13
99-5E-4301	FG-D Inband Multistage Over Two-Way Trunks	a	5E13
99-5E-4306	Faster PH Pump During Retrofit	a	5E13
99-5E-4307	Direct Access Links (DALs)	Loaded	5E12
99-5E-4311	MINT Expansion Package A	Basic, SM-2000	5E13
99-5E-4340	Increase 5ESS® TRFC30 Buffer Size	N/A	5E14
99-5E-4340.A	INCREASE TRFC 30 BUFFER SIZE	N/A	5E14
99-5E-4360	SS7 Inter-Module Trunk on VCDX	Loaded	5E12
99-5E-4373	PRI D-Channel Capacity Expansion for SM2000	SM-2000	5E13
99-5E-4375	AMPS in Building AMPS/PRI Interworking	SM-2000	5E15
99-5E-4377	Global Recent Change Interaction with LASS Automatic Recall	SM-2000	5E12
99-5E-4381	Access Code Option for SUSTWC	N/A	5E11
99-5E-4387	RTCD Expansion Package A	Loaded	5E13
99-5E-4400	Tandem Call over ISUP Trunk	N/A	5E13
99-5E-4413	Voice Frequency Data Enhancement	Loaded	5E12
99-5E-4421	BALANCE	a	5E12
99-5E-4424	DNU-S VT/Group Number	SM-2000	5E13
99-5E-4425	DNU-S Path Trace	a	5E13
99-5E-4429	7-Digit DN Handling at IXC Switch	a	5E12
99-5E-4432	Wireless Number Portability	a	5E12
99-5E-4441	13 kbps QCELP on PHV3	Loaded	5E12
99-5E-4473	Broad Band Backplane for AnyMedia™ AIU	a	5E12
99-5E-4474	ADSL on AIU (DMT)	a	5E12
99-5E-4482	AMA Recording for Unbundled & Resold Local Switching	N/A	5E13
99-5E-4484	FGD Interface to E911	Basic	5E12
99-5E-4489	Packet Pipe Enhancements	SM-2000	5E13
99-5E-4491	IS-41 Inter-System Handoff	SM-2000	5E14
99-5E-4498	Local Trunk Billing Enhancements	N/A	5E12
99-5E-4504	CDMA DTMF Tone Generation Programmability	SM-2000	5E13
99-5E-4520	Incoming/Outgoing SM Usage Counts	N/A	5E13
99-5E-4528.A	ANI Table Index	Standard	5E13
99-5E-4539	Recent Change Capacity Improvements	a	5E13
99-5E-4553	PSU Reliability Enhancements	SM-2000	5E14
99-5E-4553.A	PSU Reliability Enhancements	N/A	5E14
99-5E-4572	Flexible Alerting	N/A	5E13
99-5E-4572.A	Measurements for Flexible Alerting	N/A	5E13
99-5E-4582	AIN LDP Support of High Speed Data	Standard, Loaded,	5E13
99-5E-4596	Multiplex Access Interface Unit (XAIU)	Basic, SM-2000	5E14
99-5E-4603	DSN Enhanced Network Management Control	SM-2000	5E12
99-5E-4605	Talking Call Waiting	Basic	5E13
99-5E-4620	Calling Name Presentation (CNAP)	Standard, Loaded,	5E13
99-5E-4621.A	E911 Call Error Detection and Alarm	Basic, SM-2000	5E13
99-5E-4632	FGD Cut-Through Enhancement	N/A	5E12
99-5E-4634	DSN Centralized Attendant	a	5E12
99-5E-4651	CDMA IS-53A Preferred Language (PL)	a	5E13
99-5E-4657	5E Acceptance of a 1A Wink NPD and ANI for 911 Routed Calls	Basic	5E12
99-5E-4673	Set Global DSN BIT and Test DSN for VCDX	Standard	5E12
99-5E-4684	Originating Switch Calling Name	SM-2000	5E13
99-5E-4687	Release Link Trunk-Toll	N/A	5E14
99-5E-4694	System Integration and Testing of ADSL onAnyMedia™	a	5E12
99-5E-4707	Access Interface Unit (AIU)		
	Base ASM Software for RSD Functionality on 5E12 □	SM-2000	5E12
99-5E-4717	Phase I		
99-5E-4718	Traffic Reports for Modular Metallic Service Unit	N/A	5E13
99-5E-4719	Output Messages for Metallic Path Setup Failures	N/A	5E13
99-5E-4720	Identification of MA Port Assignments	N/A	5E13
	Flexible Assignment of DCTU/PMU Ports to MMSU Shelves	N/A	5E14

99-5E-4727	City Code Routing on International Calls	SM-2000	5E12
99-5E-4728	Base ASM for RSD Deployment - Phase II	N/A	5E13
99-5E-4732	Tandem to Tandem E911	a	5E12
99-5E-4740	ASP STOR Interworking with Originating Busy Line No	N/A	5E13
	Answer with Extended Ringing		
99-5E-4745	Number Portability □ Nonconditional Trigger for DID	N/A	5E12
	Trunks		
99-5E-4757	Support for an High Speed Billing Interface	N/A	5E13
99-5E-4759	ISUP Intra-Module Trunk Groups on VCDX	N/A	5E13
99-5E-4759.A	ISUP Intra Module Loop Around Trunks for EXM-2000,	N/A	5E13
	CDX, and SM-2000		
99-5E-4769	Integration of Vendor BITS Stratum 3 Clock Source with	SM-2000	5E13
	EXM-2000, DRM-2000, and VCDX		
99-5E-4776	Software Transitions + AFT Standing Feature for 5E14	N/A	5E14
99-5E-4779	CDMA High Speed Packet Switched Data (HSPD)	SM-2000	5E15
	Services		
99-5E-4784	Generic Digits Parameter	a	5E12
99-5E-4801	TDMA Discontinued Transmission (DTX) with Comfort	SM-2000	5E13
99-5E-4864	ADSI Acknowledgment Timer Optional Value	SM-2000	5E12
99-5E-4868	Pay Phone Compensation for Toll Free Calls	a	5E13
99-5E-4907	CALEA Core TCP/IP Suite Functionality	N/A	5E14
99-5E-4908	CALEA Core TCP/IP DSL Access Via X.25/X.75	N/A	5E14
99-5E-4918	CMP Memory Expansion	N/A	5E13
99-5E-4920	5E Support for CALEA - Phase III	N/A	5E14
99-5E-4923	MDR/CW/CF Interaction Enhancement (FAX Ring)	N/A	5E14
99-5E-4978	CDMA Upward Negotiation Capability	SM-2000	5E12
99-5E-4979	Plan R - A5 Interface	SM-2000	5E14
99-5E-4980	ICLID on 40Wire Subscriber Line - DNU-S	a	5E13
99-5E-7000	Increase Data Limits for Selected Traffic Sections	N/A	5E14
99-5E-7002	866, 855 Toll Free Service	N/A	5E13
99-5E-7005	PHV with REX	SM-2000	5E13
99-5E-7011	MultiService Module	a	5E13
99-5E-7020	Support of 15 Digit International DN and 14 Digit National	N/A	5E15
99-5E-7021	64 Kbps X.75□/X.75 Trunk Groups	Loaded, SM-2000	5E14
99-5E-7035	Secured Feature Activation	N/A	5E15
99-5E-7082	Usage Sensitive Call Forwarding (USCF)	N/A	5E15
99-5E-7085	Release with Cause Value 1 for Vacant Codes	N/A	5E14
99-5E-7087	Multiline Hunt Group (MLHG) Capacity Expansion	N/A	5E15
99-5E-7089	Canadian 15 D IDDD	N/A	5E14
99-5E-7112	Worldcom TRAF30 Report Modification	N/A	5E14
99-5E-7116	Dial Code Activated Terminal Make Busy for MLHG	N/A	5E15
99-5E-7115	ASP-Mid-Call Events	N/A	5E14
99-5E-7118	AR/AC Destination Point Code	a	5E13
99-5E-7121	Call Forward Don't Answer - Customer Controlled Ring	Basic	5E13
	Enhancements		
99-5E-7124	NPA to NPD Translation Table for E911 Calls	N/A	5E13
99-5E-7127	Proxy Database Phase I	N/A	5E15
99-5E-7128	MSC Interface for GEO Location	SM-2000	5E15
99-5E-7130	Three Way Calling Enhancements	N/A	5E15
99-5E-7131	Increase Buffer for 5ESS® 30 Minute Traffic Report	N/A	5E14
99-5E-7133	TCP/IP Interface for Traffic Data	N/A	5E14
99-5E-7150	UCR Measurements of the TRFC30	N/A	5E15
99-5E-7158	Office to Office Testing	N/A	5E13
99-5E-7168	NP-DID PBX Query Enhancement 5E15 Roll Forward	N/A	5E14
99-5E-7172	ASP Timeout Alarm	N/A	5E15
99-5E-7178	LTSB Interworking With Home Intercom	N/A	5E15
99-5E-7183	ECHO Cancellation for CDMA for FMC	N/A	5E15
99-5E-7189	DF2 Supporting SS7 Links to Landline Signaling Point	SM-2000	5E13
99-5E-7210	1000 Block Number Pooling Using Number Portability	N/A	5E14
	Feature		
99-5E-7207	3G-1X Voice Services Feature	N/A	5E15
99-5E-7213	ISUP Intra-Module Loop Around Trunks for LDP on 5ESS®	SM-2000	5E13
	Switch		
99-5E-7242	LD CIC in Terminating Tandem	Basic, SM-2000	5E14
99-5E-7245	AIU Per-Line Impedance	N/A	5E14
99-5E-7247	Announcement on Detection of NPA Splits (ADNPAS)	SM-2000	5E14
99-5E-7250	5E14 3B21D Disk Configuration	N/A	5E14
99-5E-7256	Renaissance □ SM to SM-2000 Conversion	N/A	5E13
99-5E-7268	ISDN TBCT Notification to controller	N/A	5E13.1

99-5E-7284	Easy Access to Voice Mail (EAVM)	N/A	5E15
99-5E-7285	IDDD City Code Routing Enhancement	Loaded, SM-2000	5E14
99-5E-7290	IS-53A Preferred Language Phase 1 Enhancement	N/A	5E15
99-5E-7301	Port PCTFI from International to NAR	SM-2000	5E15
99-5E-7302	ASP Toll Free Service Interaction with Flexible ANI	N/A	5E14
	Features		
99-5E-7303	Semi-Integrated No Test Trunk Box	Standard, SM-2000	5E15
99-5E-7304	NP-Append BAF Mod 164 w/Chargeable Account Number	Basic	5E14
	to CNA		
99-5E-7321	GETS Egress Queueing and Office Queueing	Standard, Loaded, Basic, SM-2000	5E15
99-5E-7326	ASM/PDS Communication	N/A	5E14
99-5E-7332	PD Summary Alarms on ASM	N/A	5E14
99-5E-7336	Recent Change Translation Protection for Highly Critical Elements	N/A	5E14
99-5E-7345	Access Interface Unit □ Hardened Expansion (HEAIU)	SM-2000	5E12
99-5E-7346	Switch Based Direct Access Link (DAL)	N/A	5E15
99-5E-7356	Software Transitions + AFT Standing Feature for 5E15	N/A	5E15
99-5E-7370	Customer Recent Change Input for Critical Translation	N/A	5E15
99-5E-7381	Type 1/2A/2B CMC ID Enhancement	N/A	5E14
99-5E-7382	AutoPLEX [®] Facility Identifier (AFAC id) Value Increment	N/A	5E14
99-5E-7382.A	AutoPLEX [®] Facility Identifier (Phase 2)	N/A	5E15
99-5E-7390	Digital Audio Level Control w/TDMA Vocoders in the Switch	SM-2000	5E13.1
99-5E-7390.A	Digital Audio Level Control with TDMA Vocoders in the Switch	N/A	5E14
99-5E-7393	RTD Multiple Billing Record	N/A	5E15
99-5E-7395.A	TSI Nail-up of Consecutive DS0s for DNU-S	N/A	5E13.1
99-5E-7404	ASP AMA Recording for Abandoned STOR Connections	N/A	5E14
99-5E-7404	ASP AMA Recording for Abandoned STOR Connections	N/A	5E14
99-5E-7412	Vocoder Hunting Enhancements	SM-2000, Classic	5E15
99-5E-7420	Handoff to Third Party	N/A	5E13.1
99-5E-7423	Flexent [™] A2 Interface Data Rate Enhancements	N/A	5E13.1
99-5E-7427	Inhibit Delete on Route Indices	N/A	5E13
99-5E-7431	PBX Calling ID	N/A	5E14
99-5E-7447	Call Waiting Tone Enhancement for Forwarded Call -Call Screening	N/A	5E14
99-5E-7452	Support for Preferred Terrestrial Circuit in IOS Environment	N/A	5E16.1
99-5E-7453	IOS V3.1 □ Support for All Circuits	N/A	5E15
99-5E-7463	One-Way Audio Detection Tool	N/A	5E14
99-5E-7463.A	One-Way Audio Detection Tool Phase II	N/A	5E15
99-5E-7469	Connecting Prepaid Card Platform (PPC) to the 5ESS [®]	N/A	5E14
	Network Edge		
99-5E-7473	Rate Area Increase	N/A	5E15
99-5E-7475	DAS Increase	N/A	5E15
99-5E-7486	CNA CC720 Modification	N/A	5E14
99-5E-7489	Stop DMQ Message for SMS	N/A	5E14
99-5E-7495	Audible Calling Name on *69 (Automatic Callback)	Standard, Loaded, Basic and SM-2000	5E14
99-5E-7500	AMA Module 104 Direction Indicator Support	Standard	5E14
99-5E-7502	Per Use TWC with Call Transfer	N/A	5E15
99-5E-7512	Forward Traffic Channel DTMF for CDMA EVRC	SM-2000	5E15
99-5E-7533	Flexible DNIS	N/A	5E14
99-5E-7537	PHV5	N/A	5E16.1
99-5E-7537.A	PHV5 Shadow Feature	N/A	5E16.1 (FR1)
99-5E-7537.B	CDMA 3G-1X High Speed Data on PHV5	N/A	5E16.1 (FR1)
99-5E-7555.B	PDS OAM&P Interface via OLM/ASM	N/A	5E15
99-5E-7555.D	CCS Maintenance Tools for BICC	N/A	5E15
99-5E-7564	High Availability ASM	N/A	5E15
99-5E-7567	Originating AR/AC Destination Point Code	N/A	5E14
99-5E-7568	ASP Extended TSTRC Timer	Standard, Loaded, Basic, SM-2000	5E15
99-5E-7571	XAIU Broadband	SM-2000	5E15
99-5E-7577	TTY/TDD for TDMA	N/A	5E15
99-5E-7578	ASP CDP Trigger on PRI Trunks	Loaded	5E15
99-5E-7582	UUCP Support on AM	N/A	5E15
99-5E-7588	ASP TAT for Trunk Groups	N/A	5E15
99-5E-7590	Reroute-on-Release (ROR)	N/A	5E15
99-5E-7598	Usage Sensitive Six-Way Calling (USSWC)	Standard, Loaded,	5E15

99-5E-7604	Talking Call Waiting-Interlata Call Enhancements	Basic, SM-2000	
99-5E-7607	Remote Feature Control (RFC)	N/A	5E14
99-5E-7612	Schedule Generic Backup Procedure	N/A	5E15
99-5E-7618	Advanced Services Platform Unrestricted FCD Trigger	N/A	5E15
99-5E-7623	LASS Dialed-Digits Extraction Capability	N/A	5E15
99-5E-7655	RTCD Recording of ASP Modules	Standard, Loaded,	5E15
99-5E-7657	Allow MTB Connection and TAP100 on the EAIU	Basic, SM-2000	
99-5E-7673	CNI Conversion to SS7 in Wireless Environment	SM-2000	5E14
99-5E-7682	EAIU with Emergency Standalone Capability	N/A	5E15
99-5E-7686	On-Hook Data Transmission Without Power Ring	N/A	5E15
99-5E-7693	High Water Mark (PO Percentages) in Traffic Report of	N/A	5E15
	5ESS®		
99-5E-7712	Delete Constructed Features via Audit Tool	N/A	5E15
99-5E-7716	ISUP Mobile-Mobile Looparound Trunks	N/A	5E15
99-5E-7727	XAIU Medium Traffic Configuration Option 2	N/A	5E15
99-5E-7728	Talking Call Waiting (TCW) With CIDCW	N/A	5E15
99-5E-7741	FRPH and IFRPH on PH22	N/A	5E16.1 (FR1)
99-5E-7763	ISUP Inter-DCS and Inter-MSC Trunks	SM-2000	5E15
99-5E-7776	Signaling Only GSM for 5E DCS	N/A	5E15
99-5E-7780	Trunk Group Register Expansion	N/A	5E15
99-5E-7781	Non-Restrictive ANI Over Private Facilities	N/A	5E14
99-5E-7787	Furnish AMA Recording for Abandoned STOR	N/A	5E15
	Connections		
99-5E-7796	Distinct Reliable SM (DRM)	SM-2000	5E15
99-5E-7797	Double Packet Switch Unit (Dual PSU) Packet Bus	N/A	5E16.1
99-5E-7800	Carrier Compare for VPN	N/A	5E15
99-5E-7804	TCP/IP for SCCS/NFM	N/A	5E15
99-5E-7807	Dynamic Allocation Of Vocoders On PHV5	N/A	5E16.1 (FR1)
99-5E-7825	AIN Ping Ring in a Forward_Call SCP Response Message	N/A	5E15
99-5E-7831	FCCS Enhancement	N/A	5E16.1
99-5E-7851	Increased Disk Space for Billing	N/A	5E15
99-5E-7854	Packet Pipe (PP) Engineering Enhancements	SM-2000	5E15
99-5E-7872	G.168-2000 Compliance and Acoustic Echo Cancellation	N/A	5E16.1 (FR1)
	On PHV5		
99-5E-7877.A	Software and Data Management	SM-2000	5E15
99-5E-7878	Code Conversion Expansion for N11 Services	N/A	5E15
99-5E-7885.A	Craft I/O	N/A	5E15
99-5E-7886.A	External Interface Infrastructure Expansion for ASM	N/A	5E15
99-5E-7890	Expanded Virtual Terminal Access	N/A	5E15
99-5E-7895	MCC Login Protection	N/A	5E15
99-5E-7942	Cause Value Mapping	N/A	5E15
99-5E-7951	RC Security Feature	N/A	5E15
99-5E-7980	Add Input and Output Messages to the One Way Audio	N/A	5E15
	Tool		
99-5E-7984	AMA Tandem Billing	N/A	5E15
99-5E-7995	Mobile To Land Test Call On Selected Trunks	N/A	5E16.1
99-5E-7999	NPA Split Enhancements	SM-2000	5E15
99-5E-8007	Use of NPA E911 Default Routed Calls	N/A	5E15
99-5E-8010	PLS3.0 Transition to PSAX	N/A	5E15
99-5E-8012	PSU Community Address Expansion	N/A	5E15
99-5E-8018	PLS3.0 Call Processing for Transitioning to PSAX	N/A	5E15
99-5E-8019	Retest TM/CCS (7555.C) in the PSAX Environment	SM-2000	5E15
99-5E-8020	Retest Commercial Features (7646) in the PSAX	N/A	5E15
	Environment		
99-5E-8022	CSI Default Handling for LD Platform	N/A	5E15
99-5E-8175	Network Identifier (NID) Expansion on 5ESS	N/A	5E16.1
99-CP-2314	MTP Node Restart	Basic	5E11
99-CP-2316	SLS Code Expansion	Basic	5E11
99-CP-2345	SS7-PSU for 5ESS® Switch VCDX	Basic	5E11
99-CP-2354	Call Waiting Deluxe - Phase 1	Basic	5E10
99-CP-2354.A	Call Waiting Deluxe - Phase 2	Basic	5E10
99-CP-2530	Spontaneous Usage Sensitive Three Way Calling	Basic	5E10
99-CP-2677	Support up to 800 NXXs/NOCs	Basic	5E11
99-CP-2821	TCAP Message Tandem	Basic	5E11
99-CP-3042	Toll-Free Treatment for NPA 888	Basic	5E10
99-CP-3053	ISUP Message Loop Detection	Basic	5E11
99-CP-3072	Improved Signaling Test Procedures	N/A	5E11
99-CP-3169.A	Number Portability - NRA Method	Basic	5E11
99-CP-3441	Screening Enhancements to Outside Calling Area Alerting	Basic	5E11
99-CP-3587	Deny Automatic Callback on IntraLATA PIC Call	Basic	5E11

99-CP-3587.A	Deny Automatic Callback on IntraLATA PIC Call - per CIC Control	Basic	5E11
99-CP-3667	Number Portability - AMA Billing	Basic	5E11
99-CP-3749	Repeat Dial Interworking with ASP Originating Busy Triggers	Basic	5E11
99-CP-3818	Number Portability - AMA Access Billing	Basic	5E11
99-CP-3888	Non-Conditional 10-Digit Trigger for LRN	Basic	5E11
99-CP-3921	Non-Obtrusive Link Interface (LI) Pump	a	5E13
99-CP-4031	Alternate Local Service Provider (LSP) Routing	a	5E12
99-CP-4246	SS7/PSU Architectural Enhancements	Standard, Loaded, Basic, SM-2000	5E15
99-CP-4246.B	SS7/PSU Maintenance Reliability Enhancements	a	5E13
99-CP-4246.E	SS7/PSU MTP and SCCP Route Verification Tests	a	5E13
99-CP-4322	NP-Service Provider Portability AMA Enhancements	a	5E12
99-CP-4346	NP-Verify Office for LRNs	N/A	5E14
99-CP-4369	Deny International Call Transfer for CENTREX	a	5E13
99-CP-4388.A	NP-Service Provider Portability AMA Enhancements	Loaded	5E12
99-CP-4477	Package II-Phase 1 Operator and Billing Assistance for Unbundled Local Switching	a	5E12
99-CP-4543	Wireless 911	a	5E12
99-CP-4574	PINNACLE® Third Party Call Control Enhancements 1	N/A	5E13
99-CP-4590	NP - Test Query for LRNs	a	5E12
99-CP-4748	Primary rate Interface (PRI) B-Channel Negotiation	N/A	5E14
99-CP-4826	Feature		
99-CP-4847	Number Portability □ Cause Code 26 Error Suppression	SM-2000	5E12
99-CP-4916	Toll Free Calling Enhancement for Flexible ANI	N/A	5E13
99-CP-7974	SS7-PSU Conversion	N/A	5E15
99-TP-1002	SS7 PSU Plant and 24-Hour Measurements	N/A	5E16.1 (FR1)
99-TP-1004	Distinctive MDNL Ringback with Call	N/A	
99-TP-1006	Unlimited Size for Simulated Facilities Group	Basic	5E9(1)
99-TP-1008	Announcement as Error Treatment for LASS	Basic	5E9(1)
	Account Code - Toll Diversion to Attendant	Basic	5E9(1)
Notes:			
a. SM configuration information to be updated when available.			

10.2 FEATURE DEFINITIONS

10.2.1 RESIDENCE AND BUSINESS CUSTOMER FEATURES - 01-00-0000

01-01-0000 RESIDENCE FEATURES

01-01-0100 FOUR- AND EIGHT-PARTY LINE

A 4- or 8-party line is a line arranged to serve up to four or up to eight main stations. Identification of each party is not automatic and ringing selectivity is dependent upon central office ringing arrangements in accordance with the multiparty ringing feature (20-09-0000).

Reverting calls between 4- and 8-party customers sharing the same line are treated in accordance with the reverting call service feature (20-10-0000).

01-02-0000 FEATURES COMMON TO RESIDENCE AND BUSINESS

01-02-0100 INDIVIDUAL LINE

An individual line is a line arranged to serve only one main station although additional stations may be connected to the line as extensions of the main station. Individual lines provide telephone service to residence and business customers. The system is capable of automatically identifying the directory number assigned to a line, based upon the originating appearance to the system. Service-related features such as manual originating, dial pulse dialing, or dual tone multifrequency (DTMF) dialing assigned to individual lines may vary from line to line within a central office.

01-02-0200 TWO-PARTY LINE

A 2-party line is a line arranged to serve two main stations. Automatic identification of each party and individual ringing capabilities are provided. A 2-party line may be used to provide telephone service to residence and business customers. Service-related features may vary between parties sharing a 2-party line.

Reverting calls between 2-party customers sharing the same line are treated in accordance with the reverting call service feature (20-10-0000).

01-02-0300 AUTOMATIC ORIGINATING FEATURES**01-02-0301 MANUAL LINE SERVICE**

Manual line service is a service-related feature that automatically asks for operator assistance upon detection of an origination. Since all originations from lines with this service are routed to an operator, no dial tone is returned to the subscriber. This feature does not affect termination to a line.

01-02-0302 DIRECT CONNECT

Direct connect is a feature that provides automatic placement of a call to a preselected directory number upon detection of an origination. No dialing is required by the calling party to complete the call. The service may be used for intraoffice or interoffice calls. This feature does not affect termination to the line.

01-02-0303 DIRECT CONNECT FOR TWO-PARTY

Direct connect for two-party allows the direct connect feature to be assigned to the tip or ring party of a two-party line. This feature also permits a single customer having one central office loop to have two main stations (one the ring party, the other the tip party) where one main station has normal originating characteristics and the other has direct connect service.

01-02-0400 FREE TERMINATING LINE SERVICE

With this feature, calls from a class of lines (for example, intraoffice), or from specified trunks to a line designated as a free terminating line are not billed. Intraoffice calls should be screened by the system to prevent charging of calls to lines with this feature. Interoffice calls completed to free terminating lines may require, depending upon the incoming trunk class, that answer supervision not be returned to the originating office.

Calls to the "official lines" of an operating company are examples of lines which may require free terminating line service.

01-02-0500 DENIED TERMINATING LINE SERVICE

Denied terminating service is a feature whereby the system denies call completions to a line.

01-02-0550 DENIED ORIGINATING LINE SERVICE

Denied originating service is a feature whereby the system denies originations from a line.

01-02-0600 TOLL RESTRICTED LINE SERVICE

Toll restricted line service is a feature that restricts the completion of originating calls to a limited area only. More than one limited area of toll restriction may be provided for a central office.

01-02-0700 CODE RESTRICTION

Code restriction is a feature which blocks call completion to customer-specified codes (NPA, NNX). In its

basic form, the customer specifies 3-digit codes (NPAs or home-NPA NNXs) to the operating telephone company. Calls to these codes are denied. Another form of this service blocks calls on the basis of 6-digit customer specified codes (NPA-NNX).

10.2.2 HUNTING FEATURES - 01-02-0800

01-02-0801 SERIES COMPLETION SERVICE

Series completion is a feature whereby calls to a busy line are routed to another specified telephone number in the same switching office. More than two lines may be linked to form a series completion list.

Each member of a series completion list has a unique telephone number. A series completion list should not be limited to sequential numbers. Calls attempted to a busy line within a series completion list should hunt for an idle line by advancing to the next number in the list until either an idle line is found or all lines are found busy. The originating call should be completed to the first line found idle in the series completion list.

Busy tone shall be returned only when all hunted lines are found busy.

This feature is not applicable for 2-, 4-, and 8-party lines.

01-02-0802 MULTILINE HUNT SERVICE

Multiline hunt service is a feature whereby calls to a busy line are routed to other specified lines without assigning a telephone number to each line. A telephone number must be assigned to the first line of a group of sequentially ordered lines that form an multiline hunt group (MLHG). Telephone numbers may be assigned to other lines within an MLHG and thus provide subgroups of lines to be hunted.

With multiline hunting service, when the line associated with the dialed number is found busy, the system hunts only the lines sequentially following the line associated with the dialed number. The call is completed to the first line found idle. Busy tone is returned only when all remaining lines in the hunt group are found busy.

01-02-0803 CIRCLE HUNTING

With this feature, the system tests all lines for busy within the MLHG, regardless of the point of entry into the group, before returning busy tone. The hunt starts at the line terminal associated with the dialed number and continues to the last line in the MLHG, and then to the first line until the remaining lines in the MLHG are tested.

01-02-0805 UNIFORM CALL DISTRIBUTION

Uniform call distribution is a hunting arrangement that provides uniform terminating call distribution to members of an MLHG.

01-02-0806 STOP HUNT KEY

The stop hunt feature is available to customers who have the multiline hunt service. A key at the customer's premises connected to the central office through a wire pair is associated by the switching system with a given line of the MLHG. Customer activation of the key stops the hunt at the line associated with the key.

01-02-0807 QUEUING FOR LINES

This feature provides for queuing calls to hunt groups when all lines are busy. The customer can specify the length of the queue, that is, the number of calls that can be held waiting if the queue has reached its capacity, then new incoming calls will receive busy treatment. The calls on the queue will receive an audible ring, or optional delay announcements can be provided. Calls are removed from the queue and completed on a first-in, first-out basis.

01-02-0808 DELAY ANNOUNCEMENT FOR QUEUED CALLS ON HUNT GROUP

This feature provides a customer-generated automatic announcement for MLHGs with queuing capability. After a call has been queued for a customer-specified interval, a single non-barge-in announcement is optionally returned to the calling party announcing additional delays.

01-02-0809 MAKE-BUSY KEY

This feature provides a method for making a group of lines to appear busy to incoming calls. The feature is activated by operation of dedicated keys at the customer's premises which inhibits the search for an idle line, and the incoming call is given busy treatment.

01-02-0900 DIAL PULSE DIALING

Dial pulse dialing is a feature that permits a customer to send pulsed dc address signals to the switching system. After line seizure, the system alerts the customer by dial tone that it is ready to receive the dialed address information. Dialed digits interpretation is provided by the system in accordance with the call processing feature arrangements for the central office. The system will ignore dual tone multifrequency (01-02-1000) address signals from lines only provided with the dial pulse dialing feature.

01-02-1000 DUAL TONE MULTIFREQUENCY (DTMF) DIALING

The DTMF dialing is a feature that permits a customer to send DTMF address signals to the switching system. After line seizure, the system alerts the customer by dial tone that it is ready to receive the dialed address information. Dialed digit interpretation is provided by the system in accordance with the call processing feature arrangements for the central office. Lines provided with the DTMF dialing feature are also permitted to use dial pulse dialing.

01-02-1100 ABBREVIATED DIALING FEATURES**01-02-1101 SPEED CALLING**

Speed calling is a feature that allows a customer to specify a speed calling list containing DNs (directory numbers), each associated with a unique abbreviated dialing code. On reception of a valid abbreviated dialing code from a line arranged with this feature, the system attempts to complete the call to the associated DN.

The speed calling feature is available to individual lines, 2-party lines, and individual members (some or all) of an MLHG. Speed calling lists assigned to individual lines may be shared by other lines.

The DNs in a speed calling list can be placed in the list by direct input from the customer (01-02-1102) or by service order.

01-02-1101A SPEED CALLING (FOR BRCS)

A customer may specify a speed calling list containing DNs which are associated with a unique abbreviated dialing code. When a line with this feature sends a valid abbreviated dialing code, the system attempts to complete the call to the associated DN. The speed calling feature is available to individual lines, 2-party lines, and individual members (some or all) of an MLHG. Speed calling lists assigned to individual lines may be shared by other lines. List sizes available are 6-, 8-, and 30-code lists. The DNs in a speed calling list can be placed in the list by direct input from the customer (01-02-1102A) or by service order.

Speed calling in the BRCS-I package provides the ability to store digit sequences of up to 32 characters in length. Thus, it is possible to store a call forwarding sequence plus a DN in the speed calling list. In addition to the basic speed calling list sizes of 6, 8, and 30, the operating telephone company may define the list size in blocks of ten. Therefore, the following sizes are available: 6, 8, 10, 20, 30,...80. The access codes may be up to two digits in length.

01-02-1102 CUSTOMER-CHANGEABLE SPEED CALLING

Customer-changeable speed calling is a feature that provides the services described for the speed calling feature (01-02-1101) and permits initial entry and changing of a speed calling list by direct input from the associated customer's line.

After updating a customer change to a speed calling list, the system alerts the customer that the change has been accepted.

01-02-1102A CUSTOMER-CHANGEABLE SPEED CALLING (FOR BRCS)

The option for initial entry and alteration of a speed calling list by direct input from the associated customer's line is called customer-changeable speed calling. After a change has been made to the speed calling list, the system alerts the customer that the change has been accepted.

Customer-changeable speed calling in BRCS-I allows for the call list size and access codes to be defined by the operating telephone company. A customer may null an entry in the speed call list.

01-02-1200 CALL WAITING FEATURES**01-02-1201 CALL WAITING**

Call waiting is a feature whereby a line in the talking state is alerted by a call waiting tone when another call is attempting to complete to that line. The call waiting tone is only audible to the line with the call waiting feature activated. Audible ringing is returned to the originating line. The service also provides a hold feature that is activated by a switchhook flash. Consecutive flashes allow the subscribing customer to alternately talk to the original and the new calling party. If the subscribing customer hangs up while one party is on hold, he/she is automatically rung back, and upon answer is connected to the held party.

01-02-1201A CALL WAITING (FOR BRCS)

Call waiting for BRCS is equivalent to call waiting (01-02-1201) and, in addition, is compatible with the remaining BRCS features.

01-02-1202 CALL WAITING ORIGINATING

Call waiting originating service essentially allows the customer to assign call waiting (terminating) service to a called party for the duration of a call. For example, when a line with this feature calls a busy line in the terminal group, the caller hears audible ring instead of busy tone while the called party hears call waiting tone. The called party could then flash to put the current call on hold and answer the calling party. If the called party hangs up, the station will ring and upon answer is connected to the calling party. This service is restricted to intraoffice calls.

01-02-1203 DIAL CALL WAITING

This feature allows a customer to give call waiting treatment to a called line. Dial call waiting differs from call waiting originating in that the dial call waiting subscriber must dial an activation code followed by the called number in order to give call waiting service to the terminating line for the duration of a call. This service is restricted to intraterminal group calls.

01-02-1204 CANCEL CALL WAITING

This feature allows the customer with call waiting (terminating) service to inhibit the operation of call waiting for one call. The customer dials the cancel call waiting code, obtains recall dial tone, and places a call normally. During this time, call waiting service will be inactive so that anyone calling the call waiting customer will receive the normal busy treatment, and no call waiting tones will interrupt the customer's call.

01-02-1300 THREE-WAY CALLING SERVICE FEATURES

01-02-1301 THREE-WAY CALLING

Three-way calling allows a station in the talking state to add a third party to the call without operator assistance. To add a third party to the call, the three-way calling customer flashes the switchhook once to place the other party on hold, receives recall dial tone, dials the third party's telephone number, and then flashes the switchhook again to establish the three-way connection. The second switchhook flash may occur any time after the completion of dialing.

After the three-way connection has been established, the customer with the service activated may disconnect the last party added by a single switchhook flash, or by disconnecting. Should either of the other two parties hang up while the service-activating customer remains off-hook, the three-way call is returned to a 2-party connection between the remaining parties.

01-02-1301A THREE-WAY CALLING (FOR BRCS)

This feature is equivalent to three-way calling (01-02-1301) and, in addition, is compatible with the remaining BRCS features.

01-02-1302 CALL TRANSFER INDIVIDUAL - ALL CALLS

The "call transfer individual - all calls" feature allows a station user to transfer any established call to another station. The station user makes this transfer by hanging up after invoking the three-way calling feature. Thus, this feature is a modification of three-way calling, since hanging up on an established three-way call does not result in all three parties being disconnected.

01-02-1302A CALL TRANSFER OUTSIDE

This feature allows a station user to transfer an external call outside the centrex group through dial 9, off network (10-digit) CCSA, or WATS facility.

01-02-1400 CALL FORWARDING FEATURES**01-02-1401 CALL FORWARDING**

Call forwarding allows calls attempting to terminate to a line to be redirected to another customer-specified line served by the same office or by another office. The customer must activate and deactivate the forwarding function and specify the desired terminating DN during each activation procedure. Calls that are forwarded cause a short (about 0.5 sec.) ring on the forwarding line (base station) as a reminder that the service is active.

If the call from the calling party to the forwarding line is chargeable, the calling party is billed for that part of the call. If the forwarded leg of the call is chargeable, the forwarding line is billed for that portion of the call.

01-02-1401A CALL FORWARDING VARIABLE (FOR BRCS)

This feature is equivalent to call forwarding, 01-02-1401 and, in addition, is compatible with the BRCS features.

01-02-1402 REMOTE CALL FORWARDING

With the remote call forwarding (RCF) feature, all calls to a telephone number are always forwarded to a remote DN. This service is similar to call forwarding service with the following exceptions:

- ☐ Forwarding is always activated and not controlled by the customer.
- ☐ No local office terminal is associated with the dialed number from which forwarding occurs, but a logical port is required.
- ☐ The customer can specify a maximum number (<99) of simultaneous RCF calls.

01-02-1404 CALL FORWARDING - BUSY LINE

This feature permits calls attempting to terminate to a busy line to be redirected to another customer-specified line. Billing for this feature is handled in the same manner as for call forwarding variable.

01-02-1407 CALL FORWARDING - DON'T ANSWER - ALL CALLS - VARIABLE TIMING

This feature allows calls terminating to an idle station to ring that station a specified number of seconds, and if the call is not answered, to route it to another station in the same or another switching system. The operating telephone company decides the length of the "don't answer" time period (that is, the specified number of seconds that the station will ring before the call is routed to another station).

01-02-1408 CALL FORWARDING OVER PRIVATE FACILITIES

This feature is applicable to customers with call forwarding and dial access to private facilities. Normally, during the activation of call forwarding, the desired rerouting directory number is specified during the activation procedure and the calls are placed and rerouted over the DDD network. If the customer has private outgoing facilities, such as FX lines, WATS, CCSA, etc., and has dial access to these facilities, this feature permits the customer to use the private facilities during the call forwarding activation process.

01-02-1409 REMOTE ACTIVATION OF CALL FORWARDING

This feature provides the means to remotely activate/deactivate call forwarding by using access codes. Remote access service provides the features of a home/business telephone from any DTMF telephone to a remote location. This feature uses an announcement system to provide interactive voice message prompting, which allows the customer to verify the forward-to number. This eliminates the need for a successful completion of a courtesy call.

The service provider can allow remote access from remote stations within the customer group, within the local 5ESS[®] switch, and/or from a remote switch by selecting the appropriate options.

01-02-1600 INTERNATIONAL DIRECT DISTANCE DIALING (IDDD)**01-02-1601 IDDD VIA TRAFFIC SERVICE POSITION SYSTEM (TSPS)**

This feature provides for routing and customer charging of IDDD calls through TSPS. The arrangement provides for direct dialing of station-to-station calls without operator assistance (except for calling party identification where required) for individual, 2-, 4-, and 8-party, and other customer line types. The arrangement also provides for coin calls and special toll calls (for example, person-to-person calls), and calls where the domestic operator can ask for, in advance, overseas operator assistance.

As with other TSPS calls, IDDD calls routed through TSPS are billed through TSPS and require automatic number identification (ANI). The calling number must be forwarded to TSPS via operator number identification (ONI) when it cannot be done with ANI.

01-02-1700 FLAT-RATE CHARGE SERVICE

Flat-rate charge service is a feature that, for a fixed monthly charge, permits an unlimited number of completed calls from a local noncoin line to a group of specific destinations. The group of destinations is referred to as a flat-rate area and is usually located within a geographic boundary surrounding the central office. Two or more flat-rate areas may be specified for a central office with some destinations assigned to more than one flat-rate area. No charge recording is required for completed calls to destinations within the originator's flat-rate area.

01-02-1800 MESSAGE-RATE CHARGE SERVICE

Message-rate charge service is a feature that, for a fixed monthly charge, allocates a fixed number of message units to a customer from a local originating line to a group of destination codes. Additional charges to the fixed monthly charge are billed for the message units exceeding the monthly allotment. The group of destination codes is referred to as a message-rate area and may include single message unit and multmessage unit destination codes. The number of message units assigned to each destination code within a message-rate area is available to the system. A message-rate area may include several destination codes from the home numbering plan area (HNPA) and selected destination codes from up to eight foreign numbering plan areas (FNPAs).

A minimum of 16 rate treatment classifications are available for message-rate line service. A rate treatment classification may include the number of message units to be charged and the duration of the initial charge period, the number of message units to be charged and the duration of the overtime period, or a combination of both. In addition, a rate treatment classification may specify whether or not timing of the call is required.

Message-rate service is available to individual and 2-party line customers.

The system provides both detailed message billing and bulk message billing information. Detailed message billing information includes the calling number, the called number, time of answer, time of disconnect, and message-rate treatment for each call. Bulk message billing information includes the calling number, the time of answer, and message-rate treatment for each call.

01-02-1900 CUSTOMER PREMISES MESSAGE REGISTERS

This feature provides the capability to operate remotely a customer premises message register to visually display the accumulated number of message units expended on calls from certain lines.

Customer premises message registers are not used for customer billing. Each message rate call must be recorded for billing purposes on the billing recording medium used by the switching system.

The customer can have the capability to reset the message-rate register.

This feature does not apply to toll calls routed to an operator for completion.

01-02-2000 PRIVATE FACILITY INTERFACES

01-02-2001 FOREIGN EXCHANGE LINES

A foreign exchange (FX) line is a line which terminates in a distant central office different from the one which would normally provide service to the customer. The customer pays monthly mileage charges for the distance between the normal serving office and the distant (foreign) exchange office to be served from. A customer originating a call on the FX line essentially draws dial tone from, and dials into the distant exchange, and all calls are billed as if dialed from that distant central office.

01-02-2002 800 SERVICE (INWATS)

The 800 service feature is a terminating-only service that allows a subscriber to receive message calls originating within specified service areas, with the call charges billed to the called party instead of the calling party. The service is provided to one or more dedicated access lines.

The 800 service billing information and appropriate service measurements are registered by the AMA recording arrangement serving the terminating exchange. When the billing arrangement used by the switching system is through connection to a CAMA (centralized automatic message accounting) office (feature 55-01-0300), the 800 service billing information is recorded on auxiliary equipment separate from the CAMA billing arrangement.

01-02-2003 EIGHT-HUNDRED (800) SERVICE - SIMULATED FACILITY GROUP (SFG)

This feature is a variation of the 800 service (INWATS) feature already available in the 5E1(2)1 software release. The number of simultaneous 800 service calls is not restricted by the physical size of a dedicated trunk group, as it is in the basic 800 service feature. Instead, the number of calls is restricted by a simulated facility group, where the software keeps track of the number of simultaneous calls.

01-02-2004 OUTWATS

Outward wide area telecommunication service (WATS) is provided over one or more dedicated access lines to the serving central office. The service allows customers to make calls to a certain zone(s) or band(s) on a direct dialing basis for a flat monthly charge or for a charge based on accumulated usage. Outward WATS lines can dial station-to-station calls directly to points within the selected band(s) or zone(s), or to reach a WATS operator for assistance.

01-02-2005 OUTWATS - SFG

This feature differs from the basic OUTWATS feature. The OUTWATS - SFG is not provided by a dedicated line group, as the basic OUTWATS feature is. Instead, the OUTWATS - SFG traffic shares a line group with other outgoing traffic. The restriction on the number of simultaneous OUTWATS calls is achieved by an SFG, where the software keeps track of the number of simultaneous calls. Attempts that overflow the SFG size are routed to reorder.

01-02-2006 DIAL ACCESS TO PRIVATE FACILITIES

The customer may choose to terminate private facilities at the central office, and have access to the facilities (for example, FX trunk) by dialing a unique access code per facility or facility group. Thus, the customer may go off-hook, dial the appropriate access code, optionally obtain a second dial tone, and then dial the call as though directly connected to the selected facility. The private facility may be accessed on a cut-through or senderized basis. In cut-through operation, the local switching system must seize the private facility upon recognizing the access code and pass or repeat customer-dialed digits. In senderized operation, the local switching system collects customer-dialed digits, then seizes the appropriate private facility and outputs the dialed digits.

01-02-2500 AUTOMATIC CALLBACK

With this feature, the customer can hang up after reaching a busy station and then dial a call-back activation code to initiate the automatic call-back process. As soon as the called party goes on-hook, the customer will receive a distinctive ringing pattern (intraswitch only) to indicate that the desired line is available.

01-02-2600 CONFERENCE CALLING - 6-WAY STATION CONTROLLED

A station subscribing to this service may sequentially call up to a maximum of five other parties and add them together to form a 6-way call. After dialing the access code, the procedure that the subscribing party follows consists of calling a party, consulting privately, and flashing the switchhook to add the party to the multiparty connection. After flashing to add a party to the group, a further flash by the subscriber provides new dial tone. The subscriber can then dial the next party and repeat the process for a maximum of five parties. The parties that have been added may confer while the initiator is completing the setup. (A 6-port conference circuit is a hardware requirement for this feature.)

01-02-2700 CALL HOLD

Call hold allows a station user to put any in-progress call on hold by flashing the switchhook and then dialing a hold code. This frees the line to originate another call. Only one call per station line may be held at a time. The call on hold cannot be added to the other call, but the original connection can be retrieved by flashing the switchhook. If the station user disconnects when there is a party on hold, the user will automatically be rung back and upon answer be reconnected to the held party.

01-02-2800 CALL PICKUP FEATURES

01-02-2801 CALL PICKUP

Call pickup enables a station to answer a call to another station in the defined pickup group. This is accomplished by dialing a pickup access code while the called station is being rung. If more than one station in the group is being rung, the station which has been ringing longest will be picked up first.

01-02-2802 DIRECTED CALL PICKUP

Directed call pickup permits a user to dial a code and a station number and pick up a call which has been answered or is ringing at another station. The rung telephone must permit directed pickup. If a user tries to pick up a station that has already been answered, barge-in alert tone is provided, and a three-way call is established. Directed call pickup differs from call pickup in that there are no defined pickup groups.

01-02-2803 DIRECTED CALL PICKUP WITHOUT BARGE-IN

This feature is identical to directed call pickup except that a three-way call will not be established if the call had been answered by the called station. The party dialing the pickup code will be routed to reorder.

01-02-2900 CUSTOMER-DIALED ACCOUNT RECORDING (CDAR)

This feature allows a customer to add an account number to his own AMA record for customer allocation of charges on billable outward calls.

The customer specifies the fixed number of digits of the account code. In order to enter an account code, the customer begins the call with a special activation code followed by the account code and the desired DN. The monthly bill lists the called party plus the dialed account code; therefore, the customer can prorate his telephone bill to the appropriate accounts.

01-02-3000 DISTINCTIVE RINGING TONE ORIGINATING/TERMINATING

This feature provides distinctive ringing cycles or distinctive call waiting tones based upon whether the incoming call is intragroup or intergroup.

01-02-3300 RADIO PAGING

Radio paging access allows dial access to customer-provided radio paging equipment by an attendant, tie trunk, and station users. The attendant or station users may then selectively tone alert or voice page individuals carrying pocket radio receivers or other devices.

10.2.3 SMALL BUSINESS (CENTREX) CUSTOMER FEATURES - 02-00-0000

Small business customer features are primarily distinguished from features common to residence and business customers by the fact that they are usually only available to lines which have the business group line feature. Since the lines are members of a unique customer group, many features may be applied which have no meaning outside a customer group.

02-01-0000 LINE FEATURES**02-01-0100 BUSINESS GROUP LINE**

A business group line provides capabilities similar to an individual line, but is classed as a member of a group of business lines belonging to a single customer. Group identification is necessary for the following reasons:

- (A) Calls between group members are accomplished through a special dialing plan that is shared by the group.
- (B) Calls between group members through the special dialing plan can be billed differently from POTS

calls.

- (C) Private facilities can be shared by group members.
- (D) Features can apply to calls only incoming to the group, only within the group, only outgoing from the group, or any combination of the three.
- (E) Calls between group members through the special dialing plan have special traffic measurements.
- (F) Calls incoming to the group or outgoing from the group through DDD have special traffic measurements.

02-01-0200 GROUP NUMBERING PLAN

Business group lines share a common group numbering plan. This numbering plan allows:

- (A) Intercom dialing on a 1- to 7-digit basis
- (B) Access to an attendant through the digit '0'
- (C) Access to private facilities through a 1- to 7-digit code
- (D) Redefinition of feature access codes from standard POTS codes
- (E) Overriding this special dialing plan by dialing an access code (the digit '9' usually) to gain access to the standard DDD numbering plan.

02-01-0201 CRITICAL INTERDIGITAL TIMING FOR DIALING PLAN

This feature allows for the use of conflicting and/or variable length codes in a business customer group dialing plan. For example, both 323 and 3236 can be assigned as station extensions in the same business customer group. If an ambiguity exists, a "#" can be used as an end-of-dialing code to truncate the interdigital timing.

02-01-0300 INTERCOM DIALING

Intercom dialing is provided in conjunction with the special dialing plan (described in the group numbering plan feature) to permit lines with the business group line feature to place calls to one another on a 1- to 7-digit basis. Calls placed in this fashion may not be subject to the DDD billing used in the local area, but instead use one of two other billing arrangements. The first method offers no billing for intraterminal group intercom calls. The second method extends the free calls to intraoffice intercom calls. Access to the attendant through the digit "0" is inherent to the intercom dialing feature.

02-01-0400 SEMIRESTRICTED (ORIGINATING AND TERMINATING)

This feature provides the ability to restrict a business customer group line (centrex group for example) from originating any calls outside the group and/or receiving any calls from outside the group. Calls over private facilities are not restricted by this feature provided the private facilities are within the terminal group. Therefore, a semirestricted line may call other stations within the group and use any private facilities that are otherwise accessible by that group. Restricted calls are routed to reorder, a specified DN, or an intercept announcement. Calls incoming to the station from outside the group through DDD may be restricted by the semirestricted terminating feature. Again, calls incoming through private facilities are not denied by this feature if the facilities are within the terminal group. Incoming calls that are denied are routed to their appropriate error treatment. Incoming and outgoing calls must go to the attendant.

02-01-0500 FULLY RESTRICTED (ORIGINATING AND TERMINATING)

The fully restricted line feature, in addition to performing the semirestricted functions defined previously, also blocks calls from stations to the attendant and/or calls from the attendant to stations.

02-01-0600 TOLL DIVERSION TO ATTENDANT

Toll diversion to attendant performs the restriction functions of the toll diversion, toll restricted line service, and code restriction features of the 5E1(1) software release, but in addition, routes blocked calls to a station within the group (for example, the attendant). (For reference, the toll diversion/restricted and code restriction features provide reorder, announcement, and battery reversal as blocking treatment options.)

02-01-0700 CUSTOMER ACCESS TREATMENT CODE RESTRICTIONS

The customer access treatment (CAT) code restrictions feature allows the creation of subgroups within the business customer group to provide additional restriction or access functions. Codes which are part of the group numbering plan may be denied or made accessible to subgroups of stations by assigning to each station within the group a customer access treatment category. Each CAT category defines which private facility groups and features can be accessed. For example, stations are restricted from a particular private facility if the CAT category of the stations does not allow access. Since a business group is allowed up to 32 CAT categories, flexible control of the facilities is possible. The CAT categories are associated with dialing plan codes which access private facilities and also codes associated with features that are assigned to the business group rather than to individual stations within the group.

02-01-0800 TRUNK ANSWER ANY STATION

Trunk answer any station permits an individual at any business group station to answer an incoming call to the listed DN when the attendant is not on duty to answer the call. This feature allows any of the business group stations to dial a code in order to be connected to the incoming call. In order to make individuals aware that a call has come in which needs to be answered, this feature is used in conjunction with night service and audible alarms or lights. For example, trunk answer any station is applicable in the situation where a night security guard must be alerted through an alarm or light that an incoming call has come in to the attendant position while the attendant is not present. The guard may then answer the call from any business group station.

02-01-0900 AUTHORIZATION CODES

Authorization codes dialed by the caller grant the caller privileges associated with the authorization codes rather than those associated with the station from which the call is being made. Therefore, the station can be very restrictive in terms of its calling privileges, but with the use of authorization codes, different station users can have different calling privileges. Authorization codes can be employed with various features (for example, automatic route selection) to allow the customer to define a set of dialing capabilities and to restrict the use of these capabilities to authorized personnel.

02-01-1000 CALL WAITING INCOMING ONLY

Call waiting incoming only modifies call waiting (01-02-1201) so that the business customer group line only receives call waiting treatment on calls coming into the group from the outside network. Intragroup calls and calls terminating from private facilities receive busy treatment as if the called line had no call waiting feature.

02-01-1100 CALL FORWARDING SERVICES

02-01-1101 CALL FORWARDING - INCOMING ONLY

Call forwarding - incoming only modifies call forwarding service (01-02-1401) so that the activated call forwarding function applies only to calls originating from outside the terminal group. Intragroup terminations, as well as terminations from private facilities, result in busy treatment when the line is off-hook, and ringing when the line is busy (just as if the called line had no call forwarding).

02-01-1102 CALL FORWARDING - WITHIN GROUP ONLY

Call forwarding - within group only modifies call forwarding (01-02-1401) so that it restricts the DN dialed during the activation procedure to intragroup extension numbers. Dialing a DN associated with the outside network results in reorder treatment.

02-01-1103 CALL FORWARDING - BUSY LINE - INCOMING ONLY

Call forwarding - busy line - incoming only is a modification of the call forwarding - busy line feature in that only incoming calls to the specified DN are forwarded on busy. If intragroup calls attempt to terminate to the busy line, they receive busy treatment.

02-01-1104 CALL FORWARDING - DON'T ANSWER - INCOMING ONLY

This modification of the call forwarding - don't answer features provides that only calls incoming to the business customer group through DDD will be forwarded if not answered after a customer-specified number of rings. Intragroup calls will continue to ring the idle line.

02-01-1200 SPECIAL INTERCEPT ANNOUNCEMENTS

A unique intercept announcement can be provided to each business customer group. The following unique intercept announcements are applicable on calls:

- ☐ Originated by business group members through the special dialing plan but to codes which are undefined
- ☐ Restricted from terminating to a group member or restricted from being originated by a group member due to various restriction arrangements such as fully restricted service, semirestricted service, code/toll restriction/diversion, CAT code screening, etc.

02-01-1300 CALL TRANSFER SERVICES**02-01-1301 ADD-ON - CONSULTATION HOLD - INCOMING ONLY**

Add-on - consultation hold - incoming only is a terminal group variation of three-way calling. Add-on is three-way calling restricted to incoming calls to the group. If the call does not meet this criteria, the switchhook flashes of three-way calling are ignored by the system.

As in three-way calling, this add-on feature allows consultation hold. The incoming call prior to the third party add-on is retained in hold, and private consultation between the called and third party is in effect. A switchhook flash by the called party removes the consultation hold and enables the three-way connection.

02-01-1303 CALL TRANSFER ATTENDANT

A station user connected to an incoming call can call the attendant to transfer the call to another station line. The station user can accomplish this by either flashing the switchhook or flashing the switchhook and dialing "0".

02-01-1304 CALL TRANSFER - INTERNAL ONLY

As a terminal group option, this feature provides the capabilities of the "add-on consultation hold incoming only" (02-01-1301) feature, but the ability to add and transfer calls outside the group is denied.

02-01-1305 CALL TRANSFER - INDIVIDUAL - INCOMING ONLY

The call transfer - individual - incoming only is a variation of the add-on feature. If the called party hangs up on a three-way call which was the result of an incoming call, the incoming call is transferred to the third party instead of all parties being disconnected.

02-02-0000 PRIVATE FACILITY TRUNK FEATURES**02-02-0100 TIE TRUNK FEATURES**

The tie trunk features are based on the following definition. The tie trunk is sometimes referred to as a tieline. A tieline connects two business customer groups. The business customer groups may have a central office based service or they may be served by customer premises equipment. Typically, all of the customer groups are branches of the same corporation.

02-02-0101 TIELINE (TRUNK) ACCESS

A tieline is dial accessed. The attendant may seize the line directly and dial digits into the line. Dial access by stations and/or the attendant may be provided by cut-through or senderized access to the tieline as provided by the dial access to private facilities feature. Digits dialed after the access code are received by the distant customer equipment. This equipment treats the digits as if they were originally dialed by another station terminated at that distant location. Dial pulse and DTMF (touch-tone) dialing are allowed over the tieline. Such a tieline which permits dialing, is called a dial repeating tieline. Digits received over the tieline are subject to normal origination treatment, just as business customer group lines. Tielines may be equipped for flash repeating capabilities between the two switches. Additionally, tielines may prohibit dialing. Tielines that prohibit dialing are called automatic tielines; for once seized, they automatically terminate to a predesignated station in the distant office (for example, the attendant).

02-02-0102 TANDEM TIE TRUNK (TIELINE) DIALING

Tandem tieline (trunk) dialing may apply to a business which has several business customer groups served by different switches and interconnected by dial repeating tielines. This feature capability is provided by the switch serving the customer group which has tielines to two or more different locations. This feature permits calls incoming to the customer group from a distant switch to dial digits which are access digits for another tieline. Tandem tieline dialing returns second dial tone to the distant switch and receives further digits which are tandemmed through this office to a second distant office selected by an access code dialed by the customer in the first distant office. This tandemming process may be repeated again for the next office based on the digits dialed by the originating party, and the originating capabilities assigned to the tieline in each office.

02-02-0103 DIAL TRANSFER TO TANDEM TIELINE

This feature assures that the call transfer feature is compatible with tielines. If the consultation hold feature is invoked and dial tone is obtained, a station which normally has access to tielines may dial a call through the tieline, and after using the three-way calling feature transfer the original call over the tieline.

02-02-0300 AUTOMATIC ROUTE SELECTION (ARS)

The automatic route selection (ARS) feature is also known as flexible route selection (FRS). The ARS feature directs outgoing business customer calls to the customer's most preferred available route. The customer may preselect a sequence of up to four private routes for each code point in the direct distance dialing (DDD) network for which a charge applies. The types of private routes include FX, common control switching arrangement (CCSA), full-time wide area telephone service (WATS), and measured-time WATS. Under certain conditions, tielines used for off-network dialing may be included as a possible route. If no private routes are available, the option of completing calls using standard DDD routing and charging is provided. If the service is provided for a PBX, a special access line to the PBX extends the ARS feature to the customer premises equipment.

02-02-0400 DELUXE ARS

Deluxe automatic route selection extends the choice of private routes for each NPA/NNX from four to ten. In addition, stations accessing the deluxe automatic route selection feature can be given one of eight special classes of service which determine how many of the maximum number of routes for the dialed NPA/NNX will be examined before the call is blocked. In addition, this service allows the routing patterns to

change as a function of time of day or customer control.

02-02-0500 SIMULATED FACILITY GROUPS FOR IN AND OUT CALLS (NO INTERCOM)

A terminal group of business customers may require the capability to restrict the number of simultaneous calls terminating to the group from the DDD network and the number of simultaneous calls originated by the group to the DDD network. This feature enables the simultaneous number of calls of each type to be restricted separately to customer-specified quantities of each type. This restriction is accomplished by SFGs. Calls coming into the group or going out from the group over private facilities (FX, WATS, tielines, etc.) are not restricted by this feature, but are independently limited by the number of private facilities acquired by the customer.

02-02-0600 CCSA ACCESS

A customer that has subscribed to a CCSA service has essentially subscribed to a facility which provides access to the CCSA network. These facilities, or access lines, provide the capability for the customer's stations to gain access to the CCSA network, and/or to receive calls from the CCSA network. Access to the network may be accomplished in two ways. First, access may be through the attendant when the access line is restricted to attendant access. Second, access may be by the station on a dial-up basis through the dial access to private facility feature. The station user dials the access digits (usually the single digit "8"), and after an optional second dial tone, completes dialing per the CCSA numbering plan. (The operating telephone company may opt for the second dial tone at assignment time.) Digits from calls coming in from the CCSA network are interpreted as station extensions of the business customer group according to the customer group dialing plan.

02-02-0700 ENHANCED PRIVATE SWITCHED COMMUNICATION SERVICE (EPSCS) ACCESS

The local switching system must provide for the ability to terminate access lines to the EPSCS switch for those customers subscribing to EPSCS. These access lines provide station and/or attendant origination capabilities and network call completion capabilities. The customer group stations dial the EPSCS access code and gain cut-through access to the EPSCS facilities through the dial access to private facilities feature. Second dial tone is provided from the distant EPSCS switch and the remaining dialed digits are passed or repeated through the local office to the EPSCS switch. Calls terminating from the EPSCS switch require the local office to recognize a seizure of the access line and collect digits and interpret them through the customer group dialing plan.

02-02-0900 ACCESS TO ETS TRUNKS

A customer group served by a local switch may desire access to the electronic tandem switch (ETS) service which it has subscribed to at a distant switch. The access is provided via cut-through tielines with dial repeating capability. A station or the attendant in the local customer group dials the ETS access code to be cut through to the tieline connecting to the ETS switch. The distant ETS switch provides further dial tone and digit collection according to the ETS dialing plan and features assigned to the tieline. Calls terminating to the customer group from the ETS through the tieline require the local switching system to recognize seizure and perform digit collection and interpretation through the customer group dialing plan.

02-02-1000 MESSAGE DETAIL RECORDING OF PRIVATE FACILITY CALLS VIA REVENUE ACCOUNTING OFFICE

A customer may want to perform cost accounting or analysis of his/her private facility outgoing calling patterns. Message detail recording of private facility calls through revenue accounting office offers this service by providing per-call records for a customer's private facilities; namely, WATS facilities (by band), FX lines, tielines, and tandem tielines. Thus, the local switching system must make automatic message accounting (AMA) records (local or teleprocessed) per outgoing call on the private facilities which are selected by the customer for this service.

02-03-0000 ATTENDANT FEATURES

02-03-0100 ATTENDANT ACCESS TO CODE CALLING

This feature is provided in the 5ESS[®] switch as a subset of feature 03-04-0100, code calling, and is provided when that feature is provided.

This feature allows a centrex attendant and tie trunks to page a called party by a coded system. An access code is dialed, followed by a 2- or 3-digit calling code of the called party using either dial pulse or DTMF. After all digits are collected, they are outpulsed by means of a dial pulse transmitter through the dial pulse repeating circuit to the code calling circuit. The dial pulse repeating circuit is classed as an outgoing tie trunk. The code calling circuit then operates an audible sounding or visual device. Upon recognition of a visual or audible signal, the party being paged may respond from any centrex station by dialing an answering code and will be connected to the attendant or tieline that originated the call. The code calling equipment will be released when the call is answered.

02-03-0200 NON-DATA-LINK ATTENDANT CONSOLE (50B CONSOLE)

A business customer group may designate a particular station within the group as an attendant station. This attendant station may assist the other stations in the business customer group in making calls and may be designated to receive calls to the listed directory number (LDN) for the entire business customer group. Business group stations may access the attendant by dialing the digit "0" (if so defined in their individualized dialing plan). The attendant may be provided with a special telephone called a console, which will speed call completion and aid in the identification of calls terminating to the attendant. The console may be used to segregate the loop terminations from the central office in order for the attendant to distinguish different types of terminating calls. For example, dial "0" calls may terminate separately from LDN calls, or there may be several LDNs. The console will usually have keys with lights and audible indicators to alert the attendant that calls are terminating. Private facilities may be terminated at the attendant console (that is, line terminations only, such as INWATS). If the console functions are entirely provided by customer premises gear, the console is of the non-data-link type. (Other features listed may be associated with loops associated with the attendant, but they are provided as if the attendant position is the same as any other station.)

02-03-0300 ATTENDANT CONFERENCE

Attendance conference allows an attendant to connect a maximum of five parties (not including the attendant) to a conference facility in order that they may converse. The parties are added one at a time to the common connection through the attendant. (A 6-port conference circuit is a requirement for this feature.)

02-03-0400 ATTENDANT CAMP-ON (NON-DATA-LINK CONSOLE)

This service feature allows the attendant to transfer calls incoming to a non-data-link console to a busy station. This type of transfer is called "camp-on." When the attendant uses the camp-on feature in transferring a call to a busy station, the busy station receives a tone (indication of camp-on) each time the attendant attempts a completion. The call being transferred is held and receives audible ringing while waiting for the busy station to answer. The called customer can answer the call by either flashing or hanging up and being rung back.

02-03-0500 NIGHT SERVICE

Night service routes calls which are normally directed to the attendant to preselected station lines within the customer group. This is useful when the regular consoles (50B) are not attended. Routing is available to one or more preselected numbers.

02-03-0600 ATTENDANT ID ON INCOMING CALLS

Attendant identification of incoming calls allows an attendant at a 50B console position to identify visually the type of service or trunk group associated with a call directed to the attendant. This feature is also called "incoming call identification."

02-03-0700 ATTENDANT CONTROL OF FACILITIES

Attendant control of facilities permits an exchange to restrict dial access by all stations to tielines, FX lines, and WATS lines on any dialed code by operating a key or dialing a code. A maximum of 32 groups of facilities are allowed. When control is activated, calls to these restricted facilities will be routed to the attendant, a DN, given reorder, or given an announcement.

02-03-0800 DIAL THROUGH ATTENDANT

Dial through attendant allows a station user to complete the dialing after the attendant selects the facility. The station user may complete the dialing on calls other than station-to-station calls.

02-03-1000 TRUNK GROUP BUSY LAMPS

The trunk group busy lamps feature indicates on a private facility group basis when the facility group is entirely in use. The feature is applicable when private facilities are provided with access on a dial-up or ARS basis. The switching system activates a light on the customer premises to indicate when all trunks are busy in a private facility group. There is one lamp per private facility group.

02-03-1100 ATTENDANT DIRECT STATION SELECTION

An attendant with a non-data-link 50B electronic console can place calls to stations in the business customer group by simply depressing a nonlocking pushbutton key associated with the desired station line. A separate busy lamp field option provides a visual indication of the busy or idle condition of the stations through a lamp associated with each pushbutton key.

02-03-1200A MULTIPOSITION HUNT

This feature provides the ability to distribute calls over a group of console positions, each of which can handle several different types of calls (for example, dial "0", LDN). Each position has dedicated terminals for receiving the different types of incoming calls. This feature allows only one call at a time to ring on a console.

02-03-1300 CALL WAITING LAMPS FOR ATTENDANT

This feature permits the customer to specify the level of delayed attendant traffic at which the "CALLS WAITING" lamp on the attendant consoles will be turned on.

10.2.4 LARGE BUSINESS (CENTREX-ESSX TYPE) CUSTOMER FEATURES - 03-00-0000**03-01-0000 SYSTEM FEATURES****03-01-0100 UNIFORM NUMBERING**

The ETS uniform numbering plan allows each on-network ETS station to be reached from any other on-network station through a unique 7-digit number. An on-network station is defined to be any station terminated at an ETS, main, satellite, or tributary location. The on-network dialing plan is of the form RNX-XXXX, where the first three digits identify the customer location and R and N have values between two and nine inclusive. The value of "X" can be any digit and XXXX identifies the individual ETS station at the specified customer location. The on-network dialing plan is in effect only after access to the ETS network is achieved.

Off-network locations are identified through the 10-digit address (NPA-NXX-XXXX). On-network stations can reach an off-network location by dialing the required 10-digit number after access to the ETS network.

03-01-0200 TRAVELING CLASS MARKS (TCM)

When two switching systems providing private network service to a single customer are interconnected

over private facilities, the two switches may pass more than just called number information over the private trunk. The additional information, a TCM, is conveyed from the originating switch and through 1 or 2 digits per call advises the terminating switch of the class of the call. This allows the terminating office to provide unique routing privileges based on the call class.

03-01-0500 CENTREX COMPLEX

This feature provides the ability to associate multiple business customer groups in a single switch with a single common "complex." All business groups within the complex share intercom dialing privileges, yet they may have separate private facility groups or separate dialing plans. Also, transfer capabilities between group members within the complex may be inhibited. This feature finds principle application in airport environments where each airline has its own business group but wishes to have intercom dialing capabilities to all stations in the airport.

03-01-0600 MAIN - SATELLITE SERVICE

If a business customer receives business group service at two or more distinct switching machines or customer premises equipment in the same geographic area, but wishes to obtain the same service which would be received if the customer were served by a single switch, then main-satellite operation can be provided to accomplish this. In main-satellite operation, one of the business customer's serving switches is designated as the "main" switch, and all attendant services are provided from this location. The other serving switches are designated as "satellites," and all attendant functions are at the main location. The main location is the only location to have an LDN, and all DID calls are completed through the main. All the serving switches are interconnected through tie trunks for intercom dialing between locations. A separate tie trunk group is used for attendant completed calls, DID calls, and dial "0" calls to the attendant. Switches which serve as satellites must be able to route all attendant service to the main location. The switch for the main location must be able to recognize calls from tie trunks and ask for attendant assistance. These come as switchhook flashes over the special tie trunk groups.

03-01-0600B ATTENDANT RECALL FROM SATELLITE

A station at a remote location (a satellite) without an attendant, but with the attendant transfer feature, may transfer a call by flashing the attendant recall from satellite feature. The remote station may transfer an incoming call, by flashing the switchhook to generate a recall to the main location attendant, who can then accomplish the transfer for the remote station.

03-01-0600C SATELLITE ATTENDANT TRANSFER

This feature provides the same service as the call transfer attendant feature to satellite locations having no attendant. Satellite attendant transfer service can be provided over both tie trunk facilities and FX facilities for routing calls to an attendant at the main location.

03-01-0600E TRUNK DIAL TRANSFER

(This feature is a subset of the feature, "Main-Satellite Service 03-01-0600.") This feature provides the ability to give call transfer individual to tie trunks.

03-01-0700 CENTRALIZED ATTENDANT SERVICE (CAS)

The CAS may be viewed as a variation of main satellite service. With both services, a customer receives business group service as though a line were served by a single switch. However, the customer actually has a number of switches (PBXs, CTX, ESSX) providing service to geographically dispersed customer locations. With both services, there is a centralized attendant. The CAS feature allows each of the geographically separate switching systems to have separate LDNs (listed directory numbers) and direct inward dialing (DID) independently. The main satellite service allows only the main location to provide LDN service, and DID service (for both main and satellite locations). Also, CAS provides for release link trunks between locations, where main satellite service does not. The release link trunks are regular tie trunks that also have the capability of providing release link service. The release link trunks can be considered as

providing short holding time connections for attendant calls from satellite locations to the main location. The release link trunk service minimizes the number of regular tie trunks required between each satellite and the main location for attendant calls completed to a satellite line or trunk.

03-01-0800 RELEASE LINK SERVICE (RLT)

The RLTs are regular tie trunks with the capability of providing release link service. The RLTs may be considered as providing short holding time connections for attendant calls from branch locations to the main location. The RLT service minimizes the number of regular tie trunks required between each branch and the main location for attendant calls completed to a satellite line or trunk. The RLTs may be used in the main satellite service or in conjunction with the CAS feature. The CAS feature may be viewed as a variant of main satellite service. With both services, a customer receives business group service as though a line were served by a single switch. However, the customer actually has a number of switches (PBXs, CTX, ESSX) providing service to geographically dispersed customer locations. In main satellite service and CAS there is a centralized attendant. However, CAS allows each of the geographically separate switching systems to have separate LDNs and DID independently. The main satellite service allows only the main location to provide LDN service, and DID service (for both the main and satellite locations). The CAS feature also provides for RLTs between locations. The main satellite service does not.

03-01-1000 PRIVATE SWITCHED NETWORKS

Private switched networks permit customers to establish communications between two or more stations at locations served by either a PBX or centrex service through private facilities. The CCSA, TTTN, EPSCS, and ETS are examples of PSNs (private-switched networks). In general, these networks have a numbering plan that is different from the public network numbering plan for private locations. The private facilities may also be used to optionally handle calls destined for the public network.

Users in PSNs are located at PBX/centrex locations which are interconnected with private facilities. The users usually have access to both the private and public networks by dialing the appropriate access code. For example, the digit "9" may be used to access the public network, and the digit "8" may be used for the private network. Once the access code to the private network has been dialed, the user can reach any unrestricted location on the network by dialing successive access codes followed by an extension, or by dialing a unique 7-digit number, depending on the particular PSN service.

The 5ESS[®] switch provides the following PSN services:

- ☐ CCSA switching (03-01-1020)
- ☐ ETN switching (03-01-1030).

03-01-1020 COMMON CONTROL SWITCHING ARRANGEMENT (CCSA) SWITCHING CAPABILITY

The CCSA service is a method of interconnecting various business locations of large customers by means of a common control switching arrangement and dedicated facilities. It is primarily a package service offering which uses special hardware (CCSA trunks, access lines, switching systems, etc.) to complete calls on a special switching network. A uniform numbering plan is used with CCSA service which allows stations that are members of the CCSA network (on-network) to be reached by dialing a 7-digit number (NNX-XXXX). Stations that are not part of the CCSA network (off-network) are reached by dialing a 10-digit code (NPA + NNX + XXXX). The NNX code is assigned for CCSA switching purposes and has no relationship to the central office codes that are assigned for regular message network service. For example, the digit "8" is often used as the PSN access code for stations served by the CCSA network. A typical private network station user would dial 8, plus the 7- or 10-digit called station number to access another station on the CCSA network.

Directly terminated CCSA stations (direct access) are not required to dial an access code. A service arrangement which allows the interconnection of the CCSA network to regular message network facilities is provided. When a 10-digit address is dialed, the call is routed through the CCSA network to either an local

off-network access line (LONAL) or to an off-network access line (ONAL) group used as the entry point to the message network. Upon reaching the appropriate LONAL or ONAL, the call enters the regular message network over which it completes to the desired off-network station. Using the LONAL arrangement, calls can be completed to the same office, the local calling area, the DDD network, or WATS lines. With the ONAL arrangement, calls can be completed to foreign central offices using FX or tie trunks on a 1-way outgoing basis from the CCSA switching office. Direct access stations, served by a central office which is also serving as a CCSA switch, do not require physical access lines to enter the CCSA switching control network; however, a restriction on the number of simultaneous originating and terminating customer group CCSA calls may be implemented for tariff purposes. This restriction is achieved by assigning the theoretical access line group to an SFG. The SFGs are also used instead of the actual trunk hardware to provide LONAL and WATS.

The 5ESS[®] switch provides the following CCSA services:

- ☐ Account codes (99-5E-0265)
- ☐ Automatic alternate routing (99-5E-0293)
- ☐ Automatic calling station identification
- ☐ Deluxe ARS (02-02-0400)
- ☐ Message Detail Recording (03-03-0700)
- ☐ Uniform numbering (03-01-0100)
- ☐ Senderized intertandem trunks.

03-01-1030 ELECTRONIC TANDEM NETWORK (ETN) SWITCHING

The ETN features can be used as business features for specified customer group (PBX, CENTREX, ESSX-1, etc.) environments, or multiple ETS nodes can be interconnected to form an ETN. In the ETN configuration, features similar to those provided by EPSCS are provided to the customer, with the exception of equivalent 4-wire switching and meet-me conferencing. A subset EPSCS CNCC (customer network control center) features are available with the ETS customer administration and control feature.

The 5ESS[®] switch provides the following ETN services:

- ☐ Account codes (99-5E-0265)
- ☐ Authorization codes (02-01-0900)
- ☐ Automatic alternate routing (99-5E-0293)
- ☐ Automatic circuit assurance (03-03-0500)
- ☐ Customer-pollled traffic data (03-03-0600)
- ☐ Deluxe ARS (02-02-0400)
- ☐ Deluxe queuing (99-5E-0294)
- ☐ DTMF outpulsing (04-07-0000)
- ☐ Facility administration and control (99-5E-0292) (subset of facility management 99-5E-0298)
- ☐ Message detail recording (03-03-0700)

- ☐ Senderized intertandem trunks
- ☐ Traffic data to customer (03-03-0400)
- ☐ Traveling class marks (03-01-0200)
- ☐ Uniform numbering (03-01-0100).

03-02-0000 ATTENDANT FEATURES

03-02-0500 ATTENDANT CALL THROUGH TESTS ON TIE TRUNKS

This feature permits analog attendant call through testing of specific circuits in a customer's private network [electronic tandem network (ETN), tie trunk network (TTN), foreign exchanges (FXs), or tielines (TLs)].

This feature permits the attendant to select a specific trunk within a trunk group, and place a call over that trunk to verify that the trunk is in working order.

Testing is only performed from an attendant class of service line.

03-02-0900 MESSAGE SERVICE

Message service is provided to business customer groups. Message service attendant stations within the customer group can be equipped with CRT displays. Intragroup calls terminating to message service attendant stations will have information regarding the terminating call displayed on the CRT. This information may be the calling station's DN, or if the call was forwarded within the group, an indication of the type of forwarding, the originally dialed DN, and the name of the party from which the call was forwarded. For calls incoming to the customer group, an indication that the call originated outside the group will be displayed. The CRT display is controlled by customer premises equipment (CPE) which is directly connected to the local switching system in order to obtain the terminating call information except for the name of the party which is provided by the CPE. This feature requires the applications processor (AP), customer message service system.

03-03-0000 ADMINISTRATIVE FEATURES

03-03-0100 CUSTOMER STATION REARRANGEMENTS (CSR) VIA RMAS

The customer station rearrangements feature allows business customers with access to RMAS to make changes affecting their telephone service from an on-premises terminal. The customer has the ability to interact with the 5ESS[®] switch and change DNs, class of service, and features associated with particular lines. Stations can be activated or deactivated. This ability replaces the service order activity for many business station changes. The 5ESS[®] switch provides this feature only through the RMAS.

03-03-0200 CUSTOMER CONTROL

Customer control of a customer's private facilities is provided through terminal access to their private database. The customer has the ability to perform the following functions:

- ☐ Modify authorization code assignments
- ☐ Change automatic route selection routing patterns
- ☐ Modify network classes of service associated with ETS
- ☐ Activate/deactivate queuing on private facilities.

A special interface is required between the application processor on the customer's premises and the local

switching system. Alternatively, the customer control functions may be initiated on a customer dial-up basis to an application processor residing at the local switch.

Note that this feature is provided by the 5ESS[®] switch as a part of feature 99-5E-0292, facility administration and control.

03-03-0300 SELECTIVE CONTROL OF FACILITIES (SCOF)

This feature allows the customer "to make-busy" the private facilities through key control, and thereby deny all originating access. The key can be applied to physical or simulated facilities on a trunk-group basis.

03-03-0400 TRAFFIC DATA TO CUSTOMER LOCATION

The customer may obtain traffic data through a terminal display (printer) at the customer's location. At times preselected by the customer, the local switching system will provide selected traffic measurements relating to the customer's private facilities. Measurements are available on a cumulative, peak, or time coincident basis. This feature requires the applications processor feature, traffic data system.

03-03-0500 AUTOMATIC CIRCUIT ASSURANCE

This feature provides a list of facilities which have had very short holding time traffic, or very long holding time traffic over a specified time interval as part of the traffic data printout. Also included is the ability to provide non-usage trunk scan (NUTS) reports and locked-up trunk scan (LUTS) reports. This enables the customer to locate potential troubles in the private facilities. This feature requires the applications processor feature, automatic circuit assurance.

03-03-0600 CUSTOMER-POLLED TRAFFIC DATA

This feature provides the customer with the ability to obtain a presorted set of traffic measurements relating to the customer's private facilities. These traffic measurements are provided in response to the customer terminal. Measurements are available on a cumulative, peak, or time coincident basis. The customer may interactively select the specific set of measurements provided.

03-03-0700 MESSAGE DETAIL RECORDING ON CUSTOMER PREMISES

This feature provides the customer with call detail information on DDD calls and private facility calls. It supplies a customer with detailed call records in real time through a dedicated data link. Private network customers can obtain records on individual station, attendant, and tie trunk calls. The record may be used by the customer for cost allocation and private network management and is provided in addition to the monthly billing information. The capability is provided to store these call records on a tape unit, or to process the information to produce a wide range of call detail reports. These reports can be obtained by the customer on an interactive basis. This feature requires an applications processor, equipped with the ACP advanced station message detail reporting feature.

03-03-0800 WATS ADMINISTRATION DATA

The WATS administration data feature provides a unique identification number for each individual "trunk" in a WATS SFG and records the number on the AMA tape. The number will be used to provide per-trunk usage data to customers. The feature applies to both INWATS and OUTWATS SFG.

03-04-0000 OTHER FEATURES

03-04-0100 CODE CALLING

Code calling allows attendants and station users to dial an access code and a 2- or 3-digit called party code to activate signaling devices (bell, gongs, horns, etc.). The called party can be connected to the calling party by dialing an answering code from any station within the customer group which has appropriate access treatment.

03-04-0300 LOUDSPEAKER PAGING

This feature allows dial access to customer-owned loudspeaker paging equipment. (Answer back option available as in code calling).

03-04-0400 RECORDED TELEPHONE DICTATION

This feature permits access to and control of customer-owned dictating equipment by station users within the customer group.

10.2.5 EXTENDED BUSINESS FEATURE INTERFACES - 04-00-0000**04-01-0100 PBX LINE - FEATURES**

The PBX lines are eligible for the following services when provided:

- (A) Free Terminating Line Service (01-02-0400)
- (B) Denied Originating or Terminating Service (01-02-0500)
- (C) Bill to Another Number in the Same Switching Office (55-03-0400)
- (D) Toll Restricted Line Service (01-02-0600)
- (E) Multiline Hunt Service (01-02-0802)
- (F) Make-Busy Key (01-02-0809)
- (G) Stop-Hunt Key (01-02-0806).

04-02-0000 DIRECT INWARD DIALING (DID)

The DID feature allows an incoming toll or DDD call (not FX or WATS) to reach a specific PBX station line without attendant assistance. With DID, the central office seizes a DID trunk and outpulses the station line number to the PBX. If the called station line is idle, and not restricted from receiving terminating calls, the PBX alerts the called station and returns audible ringing on the incoming connection. If the called station's line is busy, the PBX returns busy tone. If the called station is restricted from receiving terminating calls, the incoming call is routed to an announcement, reorder tone, or to the attendant by the PBX.

04-04-0000 TOLL DIVERSION

This feature permits a PBX to deny, to some of its lines, the completion of station-dialed calls beyond a limited area. The exclusion may encompass all toll calls or calls to customer-specified 3-digit codes. When the local exchange receives, on a line with toll diversion, a called number to a restricted area, it returns to the PBX a toll diversion signal (battery reversal). On detection of the reverse battery signal, the PBX blocks or allows the call depending on the originating line.

04-05-0000 HOTEL/MOTEL CALLS ROUTE TO TSPS

This feature provides the capability to route outgoing hotel/motel guest-line noncoin toll calls to a TSPS and promptly receives an automatically computed record of the call charges. Hotel/motel guest-line calls can be routed from the serving central office to the TSPS over a combined trunk group. In such cases, calls from hotel/motels are identified by the information digit '6' on the ANI signal sent to TSPS.

04-06-0000 OUTWARD CALLING FEATURES (OCF) FOR PBX VIA ARS

This customer feature allows a PBX (a customer premises switch) to take advantage of business group features relating to outgoing private facilities. Instead of terminating outgoing private facilities directly onto

the PBX, the customer may instead terminate the outgoing facilities at the central office. The PBX is connected to the central office with special lines from which these outgoing private facilities may be accessed. Access to the private facilities is through features like ARS or deluxe ARS. The PBX customer may therefore have his stations dial the outgoing private facility access code, have the PBX seize the special lines to the central office, have the central office, (1) recognize the PBX seizure on these special lines, (2) return dial tone directly to the PBX station, (3) collect the digits associated with the called number, and (4) route the call over the appropriate private facility based on the particular outward calling features selected. The capability of the outward calling features extends sophisticated central office routing and control functions to a PBX which may not be able to provide such features.

04-07-0000 DTMF OUTPULSING TO PBX

With this feature, the central office uses DTMF (instead of dial pulse) address signaling to the PBX on DID calls (see feature 04-02-0000).

10.2.6 COIN AND CHARGE-A-CALL FEATURES - 10-00-0000

10-01-0000 COIN LINE - COIN-FIRST

Coin-first coin service is a feature that requires deposit of a coin(s) before dial tone is returned and a call can be initiated. Deposit of the local initial rate and the station off-hook closes a conducting path from the ring terminal at the central office to ground at the coin station. The central office responds to this origination signal by returning dial tone.

10-02-0000 COIN LINE - DIAL-TONE-FIRST

Dial-tone-first coin service is a feature that provides dial tone without an initial coin deposit. On coin paid local calls, the deposit of initial rate must be made prior to the completion of dialing. The central office tests for the initial rate by connecting negative battery to the tip conductor. All other calls may be dialed without a coin deposit. Positive battery is connected to the ring conductor on calls to operator systems when the latter are in a coin deposit monitoring state.

10-03-0000 COIN COLLECT AND RETURN SIGNALING

Coins are collected or returned by the application of coin collect or coin return battery by the central office. Coins are collected at the end of all sent-paid charged calls and just prior to the end of the initial period on calls that go into overtime. The return of coins on free calls can be optionally made initially or upon disconnect. Coin deposits are returned at disconnect on calls that cannot be completed./ If the central office cannot collect or return coins, a stuck coin trouble record is made identifying the station. An option is provided for using coin collect and return signals of opposite polarities.

10-04-0000 COIN WITH OR WITHOUT LOCAL OVERTIME CHARGING

Coin service with local overtime charging provides timed initial and overtime periods. Coins are collected shortly before the end of each charging period. At the end of each period, an overtime coin test is made by applying the appropriate polarity to the tip conductor. If a coin is present, timing for the next period commences. If no coin is present, an announcement is returned to instruct the customer to make an overtime deposit. Another coin test is performed after the announcement, and, if no coin is present, the call is terminated.

Coin service without local overtime charging permits unlimited conversation time on local calls at no charge beyond the initial coin deposit.

10-05-0000 COIN DISTANCE DIALING WITH TSPS

This feature permits the handling of customer-dialed toll calls from coin stations. A TSPS operator (or the automated coin toll service equipment at TSPS) is connected and monitor the initial deposit, to notify the customer at the end of the initial period, and to monitor overtime deposits. The TSPS operator also

provides assistance on "0+", 7-, and 10-digit special toll calls (collect, credit card, person-to-person, etc.). The TSPS signals the central office to collect and return coins and to ring back the coin station on these types of calls.

10-08-0000 EXPANDED INBAND SIGNALING

The expanded inband signaling (EIS) arrangement is used by TSPS on coin calls. With this arrangement, an on-hook wink is used by the local office to connect an MF receiver and prepare to receive the inband signal. The inband signal (MF tone transmission) indicates operator-attached, operator-released, coin-collect, coin-return, ringback or combined coin-collect operator-released.

In addition, this feature provides red box fraud prevention capability on specially equipped sets served from dial-tone-first lines by blocking the transmission of coin deposit tones fraudulently simulated by the user. The operator-released signal enables the DTMF pad, thus allowing end-to-end DTMF signaling.

10-09-0000 IMPROVED PUBLIC TELEPHONE SERVICE

10-09-0001 LOCAL RATE FLEXIBILITY

Local rate flexibility provides the capability for local office processing of single and multmessage unit (MMU) coin calls without routing them to TSPS or to an operator. It provides for independent and variable initial and overtime rates and timing of coin calls. The initial and overtime rates and timing of MMU calls can be changed.

10-10-0000 CHARGE-A-CALL (COINLESS PUBLIC TELEPHONE SERVICE)

Charge-a-call permits the customer to make INWATS, directory assistance, 0- and 0+ non-sent-paid calls (credit card, third number, collect) with no coin deposits from a special public phone which has no coin handling capabilities. Charge-a-call calls are routed to TSPS and identified by the ANI information digit '7.'

10-11-0000 STUCK COIN ADMINISTRATION

Stuck coin administration permits the operating company to periodically print out the DN of coin lines with stuck coins at a repair service bureau or automatic line insulation test teletypewriter.

10-12-0000 INBAND SIGNALING

Inband signaling is used by TSPS and cordboards on trunks handling coin calls. With this signaling method, an on-hook wink from TSPS asks the local office to connect an MF receiver and prepare to receive an inband signal. The inband signal (MF tone) asks the local office coin-collect, coin-return or ringback actions on the coin station. This feature supersedes coin zone dialing and multiwink signaling.

15-00-0000 PUBLIC SAFETY FEATURES

15-01-0000 BASIC EMERGENCY SERVICE (911)

The basic 911 emergency service feature provides a 3-digit universal telephone number (911) which gives the public a direct access to an emergency service bureau, usually without charge to the calling subscriber. The emergency service is 1-way only, terminating to the service bureau. The emergency service bureau is usually located within a police department, although in some communities it is located in a fire department or in an independent agency serving as a communications center. No more than one emergency service bureau may be served from a given 5ESS[®] switch.

When the originating line and the emergency service bureau are served by the same switching system, the bureau has the capability of holding and disconnecting the connection, monitoring the supervisory state, and ringing back the originating station.

When the local switching system is in an area with E911 (expanded emergency service), served through a tandem switch, the emergency call is advanced to the tandem switch with calling line automatic number

identification (ANI).

15-03-0000 TRACING OF TERMINATING CALLS

This feature provides identification of the calling number on intraoffice calls, or of the incoming trunk on incoming calls, for calls terminating to a specified DN. When this feature is activated, the originating DN or incoming trunk number, terminating DN, time, and date are printed out for each call to the specified line.

15-04-0000 OUTGOING CALL TRACING

This feature allows the tracing of nuisance calls to a specified DN suspected of originating from a given local office. The tracing is activated upon entering the specified DN. A printout of the originating DN, outgoing trunk number or terminating number, and the time and date are generated for every call to the specified DN.

15-05-0000 TANDEM CALL TRACE

This feature identifies an incoming trunk of a tandem call to a specified office DN.

The feature is activated by entering the specified distant office DN for tandem call trace. A printout of the incoming and outgoing trunk numbers, time and date, is generated for every call to the specified DN.

15-06-0000 TRACE OF A CALL IN PROGRESS

This feature identifies the originating DN or incoming trunk for a call in progress. The feature is activated by authorized personnel that includes the specific terminating DN or trunk involved in the call.

15-07-0000 GROUP ALERTING

This feature provides simultaneous live and/or recorded announcements to a selected group of lines.

An origination from a line of a selected group causes it to be simultaneously connected to a specific group of lines on the same switching system.

10.2.7 MISCELLANEOUS LOCAL SYSTEM FEATURES - 20-00-0000

20-01-0000 LOOP RANGE FEATURES

20-01-0100 COMPATIBILITY WITH 1300-OHM LOOPS

This customer route resistance design plan provides for a maximum conductor loop resistance of at least 1300 ohms for customer lines. This feature is included in feature 20-01-0300.

20-01-0300 COMPATIBILITY WITH 1500-OHM LOOPS

This customer route design plan provides for a maximum conductor loop resistance of at least 1500 ohms (outside plant) for customer lines.

20-01-0410 COMPATIBILITY WITH EXTERNAL PER-LINE RANGE EXTENSION DEVICES

This feature applies to the arrangement whereby voice frequency gain, equalization, and signaling enhancement for subscriber lines exceeding 1500 ohms conductor loop (outside plant) resistance are obtained by wiring to range extension equipment installed on frames external to the switching system.

20-01-0600 COMPATIBILITY WITH DIAL LONG LINE CIRCUITS

Dial long line circuits are circuits that are used to extend the range of customer loops. The range is extended by repeating supervision and dial pulses from the customer to the central office and by repeating ringing from the central office to the customer. A variety of dial long line circuits may be required dependent

upon their capabilities to provide necessary service features and for meeting transmission and range requirements associated with these services.

20-02-0000 PAIR GAIN INTERFACES

20-02-0100 INTEGRATED PAIR GAIN INTERFACES

A pair gain system (PGS) is a device used to reduce the quantity of outside plant facilities needed to serve telephone customers in a class 5 office by multiplexing and/or concentrating N lines onto some smaller number of n facilities. It is composed of three subsystems: (1) terminal equipment located in the serving class 5 office, (2) a remote terminal located outside the serving office, and (3) outside plant facilities interconnecting the first two subsystems. An integrated PGS is a PGS whose central office (CO) equipment terminates on the switching machine in either individual analog (for an analog CO) or multiplexed digital (for a digital CO) from only those n channels that can be in simultaneous use. The central office control for an integrated pair gain system is partially or totally merged with the control for the CO. The PGS and CO designs should allow lines on the pair gain system to meet all standard requirements for lines served directly from the CO.

20-02-0200 COMPATIBILITY WITH CONVENTIONAL (NONINTEGRATED) PAIR GAIN SYSTEMS

A PGS is a device used to reduce the quantity of outside plant facilities needed to serve telephone customers in a class 5 office by multiplexing and/or concentrating N lines onto some smaller number of facilities. It is composed of three subsystems: (1) terminal equipment located in the serving class 5 office, (2) a remote terminal located outside of the serving office, and (3) outside plant facilities interconnecting the first two subsystems. A universal PGS is a PGS whose central office equipment expands the outside plant facilities back to N analog line appearances independently of the class 5 switching system used.

20-03-0000 LINE SIGNALING

20-03-0100 LOOP-START LINE

In a loop-start line arrangement, the central office supplies battery between the ring and the tip conductors. The central office detects a loop closure from the customer station as a seizure, after which it provides dial tone on the tip and ring conductors as a start dial signal.

20-03-0200 GROUND-START LINE

In a ground-start line arrangement, the central office provides battery through a ground detector to the ring conductor and leaves the tip conductor open. The customer station or PBX seizes the line by applying a ground to the ring conductor. The central office responds by returning ground on the tip conductor and dial tone across the tip and ring as start-dial signals. Upon detecting the tip ground from the central office, the customer station or PBX removes ground from the ring side and changes to loop closure for the off-hook state. Alerting the customer or PBX is done by connecting 20-Hz ringing to the ring conductor and ground to the tip conductor.

20-03-0300 LINE - SLEEVE LEAD CONTROL

Line sleeve lead control is a feature that, by means of a third wire, permits operation of a device in an equipment unit external to the switching system but directly associated with the line. The system is capable of identifying any line equipped with a sleeve lead and provides the functional operation of the sleeve lead in accordance with the application of the device associated with that line and/or detect a change of state of the sleeve lead.

20-04-0000 EMERGENCY RINGBACK

Emergency ringback is a feature associated with basic 911 emergency service that is used to recall a customer's station immediately following a disconnect from the caller and at the request of an emergency bureau. The request for emergency recall is transmitted from the emergency bureau as a unique signal to

the central office. The recall signal applied to a customer line from the central office is either 20-Hz ringing, receiver off-hook tone, or steady high tone depending upon the line class of service and the supervisory state of the line.

Emergency ringback signaling to an on-hook individual or coin line is 20-Hz ringing. On-hook party lines are rung only when the party is identified. Ringback signaling to an off-hook non-PBX or coin line is a receiver off-hook tone except when carrier facilities are used. In this case, high tone is returned. Ringback signaling to an off-hook PBX line is 20-Hz ringing.

20-05-0000 TWO-DIGIT TRANSLATION ON INCOMING TRUNKS

Two-digit translation on incoming trunks is a system-related feature that provides for address signaling from incoming trunks where one digit of a 3-digit address is suppressed by the originating office. An office arranged with this feature is capable of determining the valid 3-digit address from the digit(s) received and routing the call to its intended destination.

An example of this feature is a 411 (directory assistance) call where a step-by-step office would suppress the first digit and only send the second and third (11) digits of the intended address. The receiving office recognizes the received address as a valid 411 address and route the call to a directory assistance operator.

20-06-0000 ANNOUNCEMENTS

20-06-0100 RECORDED ANNOUNCEMENT SERVICE (LOCAL)

Recorded announcement service is a system-related feature that provides a verbal announcement to originating lines which have voluntarily requested access to a recorded announcement (time, weather, etc.) or have been routed to an intercept announcement for calls that cannot be completed as dialed.

Calls routed to an announcement in response to a voluntary customer request require charge treatment. Calls routed to an intercept announcement are not charged to a customer. Therefore, answer supervision is not returned to the originating office for interoffice calls routed to an intercept announcement.

20-06-0500 SPECIAL INFORMATION TONES

The SITs (special information tones) are machine-detectable tone sequences that precede announcements given to uncompleted calls. The SITs permit the automated analysis of call disposition.

20-07-0000 RINGING

Ringing is a system-related feature that provides a continuous ringing source of 20-Hz so that a called line may receive ringing signals with a minimum of delay. Each cycle of ringing consists of a nominal 6-second time period (a 2-second ringing period followed by a 4-second silent period for noncoded ringing).

The 20-Hz ringing current, as an independent ringing source, is only applicable to individual, 2-party, coin, or PBX lines. Special ringing facilities are required for 4- and 8-party ringing. A central office requires either AC-DC and/or superimposed ringing capabilities for ringing party line stations.

The AC-DC ringing consists of the 20-Hz AC ringing current accompanied by a negative DC voltage which is usually furnished by the central office.

Superimposed ringing is similar to AC-DC ringing except that it consists of the 20-Hz AC ringing current accompanied by either a positive or negative DC voltage.

20-07-0100 INDIVIDUAL LINE RINGING

Individual line ringing requires the application of an AC-DC ringing signal to activate a ringer bridged across the line within the telephone set. Under certain conditions, coded ringing signals can be used.

20-07-0200 TWO-PARTY LINE RINGING

Two-party line ringing normally requires the application of an AC-DC ringing signal to activate a ringer from either the ring side of the line to ground within the telephone set for party 1 or the tip side of the line to ground for party 2. This method of ringing is referred to as 2-party full selective ringing. Under certain conditions, coded ringing signals can be used.

20-08-0000 MULTIPARTY RINGING

Multiparty ringing is a system-related feature that provides each party of a 4- or 8-party line with a unique ringing alert signal or coded ringing. A central office requires either AC-DC and/or superimposed ringing capabilities for ringing party line stations.

The system provides optional ringing methods that include fully selective ringing, semiselective ringing, and coded ringing. Fully selective ringing provides for ringing each station without ringing any other station sharing the line. A common ringing code should be used for all parties. Semiselective ringing provides for the simultaneous ringing of no more than two stations with a unique ringing code for each of the two stations. Coded ringing provides for the simultaneous ringing of no more than four stations with a unique ringing code for each station.

Fully selective or semiselective ringing is required for 4-party lines. Semiselective ringing is required for 8-party lines. Eight-party coded ringing is not required for new switching systems.

20-09-0000 AUDIBLE RINGING TONE

Audible ringing is a system-related feature that provides a ringing tone to inform calling customers that the called destination is being alerted. It is desirable to apply the signal as soon as possible upon connecting to the called line.

The audible ring tone signal is applied in a manner that does not permit an electrical voice connection between the calling and called lines before answer.

20-10-0000 REVERTING CALL SERVICE

Reverting call service is a service-related feature that permits a 2-, 4-, or 8-party line customer to complete a call to another party sharing the same line. A call between two customers sharing a party line is referred to as a reverting call. This feature is required if 2-, 4-, or 8-party service is provided (features 01-01-0100 and 01-02-0200).

20-11-0000 BRIDGE LIFTERS

Bridge lifters are devices that electrically or physically isolate bridged telephone pairs at the central office to reduce the transmission losses they produce. Saturable inductors, relays, and semiconductor devices are sometimes used as bridge lifters. A hypothetical example of a bridge lifter application might be a 2-party line bridged at the central office. If only one party is off-hook, the on-hook party is bridged through an inductor that isolates the on-hook loop at voice frequencies yet allows DC access. For this application, 20-Hz ringing signals should pass through the bridge lifter device. This example may not be applicable to all 2-party lines.

20-13-0000 PREVENTION OF SERVICE REQUESTS BY INDUCED VOLTAGES

A system-related feature that prevents service request appearances caused by induced voltages on ground-start lines can be provided by means of an auxiliary line circuit. This type of circuit may be applied to loop-start lines or as a ground-start to loop-start converter. It is only required on a per-line basis where induced voltages would cause the system to misinterpret saturation of a current sensitive device by induced AC voltage as a (off-hook) seizure.

20-14-0000 CLASS OF SERVICE

Class of service is a feature that permits the system to identify service requirements for lines and intersystem facilities. Each line and intersystem facility terminating in a central office requires individual treatment based upon its electrical characteristics, privileges, restrictions, call processing features, charge treatment, routing, screening, etc. The information used to define these attributes is referred to as class-of-service information.

20-16-0000 NAILED-UP SPECIAL SERVICES AND MESSAGE TRUNKS

This feature provides an option by which a private line special service or interoffice trunk uses a dedicated path through a switching machine from one transmission facility to another. Such possibilities arise when a service is either a switched type or a nonswitched type which must traverse an office enroute to its terminating switch or customer equipment. A service so implemented is referred to as nailed-up through the switch because the transmission path is guaranteed, and signaling information is not subjected to normal call-processing functions. The path through the switching machine may be a more economical or convenient alternative than making the required trunk-to-trunk, trunk-to-line, or line-to-line connections by equipment external to the switch. The OA&M for this feature is based on existing switched services capabilities and will therefore require additional activity to administer and test special service circuits. This feature also allows the *SLC*[®] carrier nail-up feature (99-5E-0084).

20-18-0000 SUBSCRIBER LOOP ECHO RETURN CONTROL

This feature provides for limiting echo return from subscriber loops under software control. This feature is applicable to 4-wire class 5 (digital) switching systems.

20-19-0000 NONSEGREGATED T1 SPECIAL SERVICES

This feature provides the ability to accept T-carrier facilities containing a mixture of special service and message channels, directly onto the switch and to perform the channel separation within the switch. The switch then routes the individual channel information to the appropriate transmission facilities. The feature is an alternative to performing these functions with channel banks or other similar equipment external to the switch.

20-20-0000 AUTOMATIC NUMBER IDENTIFICATION (ANI)

This feature causes the local switching system to outpulse the calling customer's station identity to a CAMA, TSPS, or other office requiring calling number information.

20-21-0000 SOFTWARE-CONTROLLED CONNECTION LOSS

To assure transmission stability in conformance with the network transmission requirements, interoffice calls may require the insertion of one of several loss values (including zero loss) depending on the connection type and the interfacing facility (for example, toll connecting, direct interlocal; analog, digital). Usually these losses are fixed and traditionally provided on analog facilities externally to the switching system. However, when a port can be used for two or more connection types requiring different losses (for example, toll connect and intertoll), the system is able to insert the appropriate loss.

This feature provides for the insertion, when required, of any of several possible loss levels at the loop port side or trunk port side of connections. The determination of each loss level is under software control and is a function of the transmission loss requirements for the connection.

20-22-0000 SYNCHRONIZATION TO INCOMING DS1 FACILITIES

With the hierarchical synchronization plan used in the Bell Operating Companies, a switching system derives its clock rate from an accurate frequency signal arriving from another office. With this feature, the switching system obtains the primary or backup reference signal for synchronization of its clock from the DS1 signals of designated digital facilities.

20-24-0000 INTER-LATA-CARRIER/INTERNATIONAL-CARRIER INTERCONNECTION (CI)

This feature offers the inter-LATA carriers (ICs) equal access to intra-LATA carriers using a trunk type interface. With this feature, the 5ESS[®] switch can function as a local equal access end office (EAEO) or as an access tandem (AT) office. The interface allows uniform nationwide access codes, single dial tone operation, calling number identification, short dialing sequences, improved transmission and maintenance, and provides answer supervision to ICs. Provision is made for message detail recording, network management (including a selective incoming overload control capability) and traffic measurements by the intra-LATA carrier, as well as other required operations support system interfaces. This feature is applicable to local and access tandem offices. For more information, refer to IL82-01-202.

20-24-0200 FEATURE GROUP A

Feature group A provides interconnection to carriers as a line appearance on local switches (called feature group A serving offices). Feature group A calls are those which terminate or originate at designated feature group A lines serving a carrier. The feature group A line is virtually indistinguishable from any other line served by the switch. The only substantial difference is that AMA records are generated for all calls terminating or originating at the feature group A line. The address digits of the called line are sent directly to the carrier by the customer using dual-tone, multifrequency signaling. The feature group A serving office may or may not provide other forms of interconnection, independent of the provision of feature group A.

20-24-0300 FEATURE GROUP B

Feature group B provides interconnection to carriers as a trunk appearance on certain local switches. Originating calls are dialed as 950-1XXX, where the XXX identifies the carrier. These originating calls may be routed directly from the serving switch to the carrier or through a tandem switch. In any case, an AMA record is generated on all carrier answered calls. The address digits of the called line are sent directly to the carrier by the customer, using dual-tone, multifrequency signaling. Terminating calls are also AMA recorded and may be routed directly to the switch serving the called line or through a tandem switch.

10.2.8 INTEROFFICE FEATURES - 25-00-0000

25-01-0000 INTEROFFICE ADDRESS SIGNALING

25-01-0200 REVERTIVE PULSING

Revertive pulsing is the method of interoffice signaling originating with the panel systems and continued with the No. 1 Crossbar. Revertive pulses are generated at the terminating end of the trunk, and the transmitting office counts the pulses and transmits the start and stop signals to the terminating office. The pulse code employed is not strictly a base 10 code. The conversion of the digits sent or received to conform with the originating panel signaling is provided. Pulsing rates of 22 pulses per second (PPS) to 32 PPS are provided, and three state DC signals are provided.

25-01-0300 DIAL PULSING

Dial pulsing is a feature that provides the capability of transmitting and receiving DC address signals between offices.

Dial pulse address signals are sent as trains of on-hook pulses with the number of pulses in the trains corresponding to the digit of the address. The trains of digit pulses are separated by longer off-hook intervals called interdigital times. The time interval from the start of one on-hook pulse to the start of the next on-hook pulse in the same digit is the pulse period. The reciprocal of this period is the pulsing speed, and it is expressed as pulses per second. The on-hook pulse duration is called the break time, and the off-hook remainder of the period is called the make time. The break time, expressed as a percent of the period, is a characteristic or measure of the dial pulsing called percent break.

For reception of dial pulse addresses, the system recognizes dial pulse signals at a nominal rate of 10 pulses per second.

A dial pulse sending circuit outputs at the nominal rate of 10 pulses per second and 60 percent break. The interdigital time is at least 600 ms.

25-01-0400 MULTIFREQUENCY PULSING

Multifrequency pulsing is a feature that provides the capability of transmitting AC address signals between offices. Each address digit is transmitted as a pulsed pair of frequencies (from a set of six). Pulses are transmitted at a rate of about 7 pulses per second.

25-02-0000 ADDRESS PULSING CONTROL

25-02-0100 IMMEDIATE START

Immediate start is a feature that provides intersystem address signaling between the SPC system and a system that transmits and/or receives address signals without special address control signals. For the reception of digits from offices requiring immediate start, the system is prepared to recognize the first dial pulse promptly after the connect signal is received. For transmission of address information to an office requiring immediate start, the system delays outputting after sending the connect signal to assure that the distant office is ready.

It is desirable that the transmitting office verifies that battery and ground are of the proper polarity at the time of seizure. Failure to detect the proper condition results in a retry of the call and a failure recorded.

25-02-0200 WINK-START

Wink-start is a feature that provides control for address signaling between systems arranged with wink-start as a special address control signal. The wink-start signal is applicable to specified incoming, outgoing, and two-way trunks and is used to inform the calling office that the called office is prepared to receive address signals.

A wink-start signal consists of a brief off-hook. If the calling office receives an off-hook signal of more than the expected wink duration on a two-way trunk, the signal is interpreted as a glare condition. (A glare condition is the result of nearly simultaneous seizures of a two-way trunk at both ends.)

For wink-start operation, the transmitting office tests for the detection of the brief off-hook as a signaling integrity check.

25-02-0300 DELAY DIAL

Delay dial is a feature that provides control for address signaling between systems arranged with delay dial as a special address control signal. The delay dial signal is applicable to specified incoming, outgoing, and two-way trunks and is used to inform the calling office that the called office is not prepared to receive address signals.

The delay dial state is an off-hook signal, and the start-dial signal is a change of state from off-hook to on-hook. The called office may have a delay dial trunk in the delay dial state (off-hook) prior to receiving a connect signal or it may place the trunk in the delay dial state upon reception of a connect signal.

For delay dial operation, the originating system detects the on-hook to off-hook transition of the delay dial signal shortly after sending the connect signal. Receipt of the on-hook to off-hook and back to on-hook condition is an indication of signaling integrity.

25-02-0400 STOP-GO

Stop-go is a feature that provides control of intersystem address signaling between a local switching system and an intertoll trunk that is arranged for stop-go signaling.

Stop-go operation is similar to delay dial except that the delay dial signal is sent during interdigital time after one or more digits have already been sent on an immediate start basis. The off-hook transition constitutes

a stop pulsing signal and the transition back to on-hook is the go signal. This operation is only required where a local switching system is establishing a call over a toll connecting trunk through an intertoll step-by-step system to a common control system that does not have immediate start capability or in certain tandem tie trunk networks. Dial pulsing is always used.

In the toll connecting application, the stop signal is generated first by the intertoll step-by-step system when it is about to seize a trunk to the called office. This stop signal is then extended by an overlapping delay dial signal from the called office until it is ready to receive dial pulses. The local switching system is capable of detecting the stop dial signal during interdigital time. After detecting the go signal, the local switching system resumes outpulsing of the address digits. The local switching system is not required to generate stop-go signals.

25-03-0000 CALL STATE SUPERVISORY SIGNALING

25-03-0100 LOOP SIGNALING ARRANGEMENTS

Signaling arrangements where DC supervisory, address, and control signals are superimposed on the same conductors that are used for transmission are referred to as loop signaling arrangements. The following are supervisory states which are required for various loop signaling arrangements.

25-03-0101 REVERSE BATTERY (RB)

The trunk circuit at one end of a variety of loop signaling trunks applies battery and ground through suitable resistances to the tip and ring conductors. One polarity on the tip and ring leads is used for the on-hook state, and the reverse is used for the off-hook state. The trunk circuit at one end of a variety of loop signaling trunks provides supervisory signaling by means of loop signaling states. On a loop signaling trunk, the on-hook state is an open (infinite resistance) across tip and ring. The off-hook state is a relatively low resistance across tip and ring.

25-03-0102 HIGH LOW

The trunk circuit at one end of a variety of loop signaling trunks provides supervisory signaling by changing the impedance it applies across the tip and ring conductors. A high-low trunk indicates the on-hook state by a high resistance across tip and ring. The off-hook state is a relatively low resistance across the tip and ring.

25-03-0200 E AND M LEAD INTERFACES

The E and M lead trunks make use of separate leads for signaling. Either E and M leads or E, M, SG, and SB leads are used. Ground and open states are used for off-hook and on-hook, respectively, on the E lead for signaling from the trunk facility to a trunk circuit. Battery and ground or battery and open states are used for off-hook and on-hook, respectively, on the M lead for signaling from a trunk circuit to the trunk facility. The SG and SB leads may be used to supply the signaling ground and battery when a looped conductor arrangement is desired.

25-04-0000 INTRAOFFICE CONNECTING ARRANGEMENTS

An intraoffice connecting arrangement is required to establish a connection between two customers served by the same switching system.

25-05-0000 INCOMING INTEROFFICE TRUNKS

25-05-0100 LOCAL - RB SUPERVISION, MF OR DP

A local incoming trunk with loop supervision is used to complete a call from a distant local office to a customer served by the home office. The home office uses reverse battery supervision toward the distant office. Either dial pulsing or MF signaling may be used.

25-05-0200 LOCAL - E AND M LEAD SUPERVISION, MF OR DP

A local incoming trunk with E and M lead supervision is used to complete a call from a distant local office to a customer served by the home office. Supervision is handled over the E and M leads. Dial pulsing is received on the E lead, and MF signaling is received over the transmission leads.

25-05-0300 TANDEM - RB SUPERVISION, MF OR DP

A tandem incoming trunk with loop supervision is used to complete a call from a distant local office to a customer served by the home office or to another distant office. Reverse battery supervision is used toward the originating distant office.

25-05-0400 TANDEM - E AND M LEAD SUPERVISION, MF OR DP

A tandem incoming trunk with E and M lead supervision is used to complete a call from a distant office to a customer served by the home office or to another distant office. Supervision is handled over the E and M leads. Dial pulsing is received on the E lead, and MF signaling is received over the transmission leads.

25-05-0500 IMMEDIATE START - RB SUPERVISION, DP

An immediate start incoming trunk with loop supervision is used to complete a call from a distant step-by-step office to a customer served by the home office or to another distant office. Immediate dial operation is used with the incoming dial pulsing being either loop or battery and ground pulsing. Reverse battery supervision is used toward the originating distant office.

25-05-0600 IMMEDIATE START - E AND M LEAD SUPERVISION, DP

This immediate start incoming trunk is similar to the immediate start incoming trunk with loop supervision, except that E and M lead supervision is used. Incoming dial pulsing is on the E lead.

25-05-0700 TANDEM COMPLETING TOLL

Incoming toll completing trunks are used to complete calls from a toll office to a customer served by the home office. Supervision and address signaling are handled as described previously for the loop and E and M lead local incoming trunks.

25-05-0900 SWITCHBOARD OR DESK**25-05-0901 TOLL SWITCHING, DISTANT BUILDING**

A variety of trunks are used to complete toll calls from 3CL switchboards in distant buildings to customers served by the office. Supervision may be high-low, reverse battery, or by E and M leads. Address signaling is by either dial pulsing or MF signaling. Coin control signals are handled by inband MF signals. Rering is controlled either by wink or inband MF signals.

25-05-0903 VERIFICATION

Verification service is a feature which permits operators to establish a connection to a customer line to verify a busy condition. Operator access for verification is provided over dedicated facilities and special verification trunks which interconnect class 5 offices and operator systems. In the class 5 office, the verification access is obtained via incoming "no-test" trunks and associated facilities. The facilities may connect directly to a manual switchboard or to a switched verification network accessed by remote operator systems (for example, TSPS). The trunks may use reverse battery loop or E&M lead supervision, with MF or dial pulse signaling.

25-05-0905 LOCAL TEST DESK OR CABINET ACCESS

Test trunks are used to establish test connections from a local test desk or cabinet to a customer line through the local switching system. These connections are required for testing, maintenance, and busy

verification. Access to both busy (no test) and idle (regular test) lines is required.

25-06-0000 OUTGOING INTEROFFICE TRUNKS

Outgoing interoffice trunks are used to handle calls between two local offices or from a local office to a toll office (tandem access toll trunks).

25-06-0100 LOOP SUPERVISION, MF OR DP

Outgoing loop trunks use loop or high-low supervision toward the distant office. Reverse battery supervision is returned from the distant office. Address signaling is by either dial pulsing or MF signaling.

25-06-0200 E AND M LEAD SUPERVISION, MF OR DP

Outgoing trunks may use E and M lead supervision. Address signaling may be by MF signaling over the transmission leads or dial pulsing on the M lead.

25-06-0300 DIRECTORY ASSISTANCE

Directory assistance trunks are used to complete calls to operators when the customer has dialed the directory assistance number. These types of trunks may use reverse battery loop supervision or E and M lead supervision, and they may be used to or from centralized locations in distant buildings.

25-06-0500 SWITCHBOARD OR DESK

25-06-0501 SWITCHBOARD

Trunks may be provided to a 3CL switchboard in the same or in a distant building when a customer dials a "0" call for operator assistance. A class-of-service tone to identify the customer's class of service may be used. Either reverse battery, high-low, or E and M lead supervision may be used to a distant building. Only loop supervision is used within the same building.

25-06-0502 TRAFFIC SERVICE POSITION SYSTEM (TSPS)

Trunks to a traffic service position in a TSPS No. 1 System are provided for "0", "0+", and "1+" calls. Both coin and noncoin stations may be served. High-low reverse battery, or E and M lead supervision is used. Address signaling is by MF signaling. Address signaling is followed by ANI. Multiwink, expanded inband and inband coin control and ringback signals are used. After address signaling, the connection can be released only after TSPS returns on-hook supervision.

25-06-0503 REPAIR SERVICE BUREAU ACCESS

This access provides a routing arrangement by which a customer dialing 611 or a designated 7-digit number is connected to a repair service bureau for the purpose of reporting trouble. Repair service trunks to operator switchboards are no longer required.

25-06-0504 ACCESS TO LOCAL TEST DESK

Outgoing test trunks are provided to complete calls to a local test desk or other test equipment for test and maintenance purposes. These are used by switch personnel at the customer's station.

25-06-0505 CENTRALIZED INTERCEPT

Intercept trunks are used to complete calls to an operator or an announcement machine when the called number has been disconnected, has been changed, or is out of order.

25-07-0000 TWO-WAY TRUNKS

25-07-0100 INTEROFFICE (MF AND DP)

Two-way trunks may be used to provide the combined functions of the incoming and outgoing trunks already described. The E and M lead supervision is used.

25-07-0300 SWITCHBOARD AND DESK

Two-way trunks may be used to provide the combined functions of the 1-way trunks already described. Both loop supervision and E and M lead supervision are used.

25-08-0000 OUTGOING CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA) TRUNKS

When message billing is provided through a distant CAMA office (feature 55-01-0300), dedicated CAMA trunks are used for the completion of DDD calls through the CAMA office. On CAMA calls, the calling number is outpulsed through ANI, or when necessary (for example, multiparty calls) identified by ONI. A TSPS No. 1 system may be used for the CAMA function, in which case TSPS trunks instead of CAMA trunks are used for completing DDD calls.

25-09-0000 DIRECT PORTS TO PULSE CODE MODULATION (PCM) FACILITIES

Direct ports to PCM facilities provides for a direct connection from a switching network to a PCM digital terminal. A digital switching system having this feature avoids the conversion from one digital signal to another.

25-09-0100 DIRECT PORTS TO DS1 FACILITIES

Direct ports to DS1 facilities provide for a direct connection from a switching network to a DS1 digital terminal.

10.2.9 CALL PROCESSING FEATURES - 30-00-0000

30-01-0100 AUTOMATIC INTERNAL OVERLOAD CONTROL

Automatic internal overload control is a feature which provides automatically activated controls aimed at safeguarding the switching system efficiency and maximizing call completion to all lines during periods when the offered load significantly exceeds system capacity.

30-01-0200 ESSENTIAL SERVICE PROTECTION

The essential service protection (ESP) feature is aimed at assuring that a small number of lines designated by the operating company as "essential" receive priority originating service during periods of extreme overloads. Service to other lines must be equitably distributed when ESP is activated. The ESP feature must be manually enabled and disabled. ESP is automatically activated, if previously enabled, when the system detects that service has been significantly degraded.

30-02-0000 CUSTOMER LINE CHECKS

30-02-0100 POWER CROSS TEST

This test is made during a customer origination and termination to ensure that no power crosses exist on the loop.

30-02-0200 RINGING CONTINUITY TEST

This test is performed during a customer termination to ensure that no open circuit exists on a loop.

30-03-0000 NUMBERING PLAN

The numbering plan is a feature that utilizes destination code numbering to provide a uniform method for identifying a main station in accordance with the North American Numbering Plan (Notes on the Network, Section 2). A destination code consists of a 3-digit numbering plan area (NPA) code, a 3-digit central office

code, and a 4-digit station number. A destination code is also referred to as a national number. All 10 digits or, more commonly, the last 7 digits of a destination code are referred to as a directory number or telephone number.

30-04-0000 DIRECT DISTANCE DIALING (DDD)

The DDD feature permits eligible customers to place calls without operator assistance by dialing a set of digits in accordance with the numbering plan (30-03-0000).

30-05-0000 PERMANENT SIGNAL

Permanent signal is a feature that tests for the reception of digits after dial tone has been returned to an originating line. If no digits are received within a limited time after the start of dial tone to the calling line, the line is considered to be in a permanent signal state (off-hook) and permanent signal treatment is applied. Permanent signal timing is recommended as 16 to 24 seconds, but longer intervals may be required for some applications.

Permanent signal treatment consists of a sequence of steps including an announcement followed by receiver-off-hook tone to attempt to clear the condition.

30-06-0000 DIGIT INTERPRETATION

Digit interpretation is a feature that provides for the recognition of the end of customer dialing and the recognition of dialed digits as prefixes, central office codes, NPA codes, and other types of dialed information. The digit interpretation rules applicable to a local switching system are office dependent in accordance with the feature arrangements provided.

30-07-0000 DIGIT INTERPRETATION TIMING

30-07-0100 PARTIAL DIAL

Partial dial timing is activated after each digit is received unless the system has determined that dialing is complete, critical interdigit timing is activated, or dialing is invalid. The partial dial timing interval is recommended to be 16 to 24 seconds. Certain applications may require longer time intervals. A timeout after this interval indicates that the customer has partially dialed the number of digits required to complete the call, and the call should be given partial dial treatment. Partial dial treatment consists of a series of steps including an announcement followed by receiver-off-hook tone.

30-07-0200 CRITICAL INTERDIGIT TIMING

Critical interdigit timing is activated when the digits received could provide sufficient information to complete a call, but the possibility of receiving additional valid digits exists. For example, after the seventh digit of a 10-digit station call has been received, the system might assume that no digit will follow. However, one option allows a short period of time for the customer to continue dialing the eighth digit of a 10-digit call. This period of time is a critical interdigit timing interval and is approximately 4 seconds in duration. A time-out after the critical interdigit timing interval is treated as a completed dialing condition.

30-07-0300 END OF DIAL

This feature allows the system to determine that dialing is complete and then process the call with a minimum of delay. It is desirable to avoid the use of timing whenever possible, as this delays call completion and is a potential source of wrong numbers (for example, if the customer pauses too long between the seventh and eighth digits of a 10-digit call). A customer alternative to timing is the use of the "#" key on the touch-tone (or equivalent) set to indicate the intended end of dialing. The system is capable of interpreting the # signal from a touch-tone (or equivalent) set to be the end of dial signal except for the valid use of the "#" symbol as a prefix digit.

30-08-0000 SCREENING

Screening is a feature that determines the eligibility of a customer to complete a call as dialed based upon class-of-service information associated with the line. Prior to routing a call as dialed, the system screens the call and denies completion of all calls that are found to be ineligible due to class-of-service restrictions.

30-09-0000 ROUTING

Routing is a feature that determines the terminating line or trunk group based upon an analysis of the digits received, call history, and screening of a line where required.

30-10-0000 ALTERNATE ROUTING

Alternate routing is a feature that provides for routing a call to an alternate trunk group if no trunks are available in the primary trunk group.

The system attempts to route a call to the trunk group assigned as the primary trunk group. If no trunk is available in that trunk group, the system should attempt to route the call in a predetermined sequence over each alternate trunk group assigned for the destination code requested.

30-12-0000 SUBSCRIBER DIRECTORY NUMBER DIALING FEATURES

These features relate to the subscriber dialing practices for local and toll calls in a given NPA. In the definitions under this feature set, the symbol "X" denotes any dialed decimal digit (0 through 9), "N" denotes digits 2 through 8, and "P" denotes digits 0 or 1.

The first 3 digits of a 7-digit address or digits 4 through 6 of a 10-digit address are the central office (CO) code. The first 3 digits of a 10-digit address are the NPA code.

The NPA codes are of the format NPX (excluding N11 codes). The CO codes are preferably of the format NNX (which are distinguishable from NPA codes). However, some NPAs have exhausted all NNX formats for CO codes and had to resort to using CO codes of the NPX format, thus giving rise to code ambiguities. Code ambiguities can be resolved by a prefix or a critical (4 seconds) interdigital time-out after the seventh digit, depending on the switching environment.

Subscriber dialing practices are usually uniform for a given NPA, and are governed by the constraints or capabilities of the exchanges in the NPA (common control or non-common control), and whether or not NPX formats are used for CO exchanges in the NPA.

30-12-0100 PREFIX '1' FOR TOLL CALLS

A prefix "1" is used for 7- and 10-digit toll calls. This feature is used in NPAs with step-by-step (SXS) exchanges (which use the "1" prefix to route toll calls to a serving CAMA exchange to allow automated billing). For the sake of dialing uniformity within the NPA, this practice is also used on common control offices (whatever their billing arrangements).

If an NPA with this dialing arrangement exhausts the NNX format and uses NPX formats for some CO codes, then a toll call with ambiguous NPX on its first 3 digits must use critical interdigital timing after the seventh digit to resolve the ambiguity and decide whether the dialed address is 7 or 10 digits long.

Following are the valid call addresses for this feature:

- ☐ NPA does not have ambiguous CO codes.
- ☐ Local: NNX-XXXX
- ☐ 7-digit toll: 1+NNX-XXXX
- ☐ 10-digit toll: 1+NPX-NXX-XXXX
- ☐ NPA has ambiguous CO codes.

- ☐ Local: NXX-XXXX
- ☐ Toll: first 3 digits after prefix unambiguous.
- ☐ 7-digits: 1+NXX-XXXX
- ☐ 10-digits: 1+NPX-NXX-XXXX

- ☐ Toll: first 3 digits after prefix ambiguous.
- ☐ 7-digit: 1+NPX-XXXX+(T > 4sec.)
- ☐ 10-digit: 1+NPX-NXX-XXXX (no critical time-out occurred after seventh digit)

30-12-0200 PREFIX '1' FOR 10-DIGIT CALLS

With this feature, a "1" prefix indicates that 10 digits follow ("1" plus 7 digits receive partial dial treatment). This feature is used in NPAs where all exchanges are common control, and ambiguous NPX codes are in use (or planned to be used) for CO codes.

Codes allowed for this feature are as follow:

- ☐ NXX-XXXX (local or toll)
- ☐ 1+NPX-NXX-XXXX.

30-12-0300 NO PREFIX REQUIRED FOR 7- OR 10-DIGIT CALLS

This feature does not require a prefix for 7- or 10-digit customer-dialed calls. It is adopted in NPAs where all exchanges are common control and there are no ambiguous CO codes in the NPA.

Features 30-12-0301 and 30-12-0302 are two variants of this feature.

30-12-0301 PREFIX '1' ALLOWED ON 10-DIGIT CALLS ONLY

1+NNX-XXXX calls are routed as dialing errors.

1+NPX-XXXX calls receive partial dial time-out after the seventh digit.

Allowed codes are as follow:

- ☐ NNX-XXXX
- ☐ NPX-NXX-XXXX
- ☐ 1+NPX-NXX-XXXX.

30-12-0302 PREFIX '1' ALLOWED ON 7- OR 10-DIGIT CALLS

With this feature, the prefix "1" is not required, but is permitted, on any 7- or 10-digit call (including 7-digit calls within the same exchange).

Allowed codes are as follow:

- ☐ NNX-XXXX

- ☐ NPX-NXX-XXXX
- ☐ 1+NNX-XXXX
- ☐ 1+NPX-NXX-XXXX.

30-13-0000 FOREIGN AREA TRANSLATION (6-DIGIT TRANSLATION)

Foreign area translation is a feature that provides selective routing for 10-digit calls based upon the requested FNPA code and office code. This translation is only required for FNPAs which can be accessed by more than one route.

30-14-0000 OPERATOR ASSISTANCE - DIAL '0'

Operator assistance in response to dialing a single digit '0' is a feature that routes a call directly to an operator for assistance. The operator facility may be TSPS or a cordboard, depending on feature arrangements of the CO.

30-15-0000 SPECIAL TOLL CALLS - DIAL '0' PLUS SEVEN OR TEN DIGITS

Special toll calls are characterized by operator handling of a '0' plus 7- or 10-digit toll call. Upon recognition of a special toll call, and when dialing is determined to be complete with a valid destination code, the call is routed to a TSPS. The 7 or 10 digits received are outpulsed to the TSPS.

30-16-0000 SERVICE CODES

30-16-0100 SERVICE CODES N11

Service codes N11 is a feature that provides simplified dialing in order to complete calls to frequently called service facilities.

Service codes are of the form N11, where N is any decimal digit 2 through 9. When the system receives a valid service code, as specified by the operating company, dialing shall be considered complete, and the call should be routed to the trunk group associated with the service requested. Although all service codes are not universally applied in all COs, the normal application of service codes is as follows:

- ☐ Local information - 411
- ☐ Repair - 611
- ☐ Business office - 811
- ☐ Emergency - 911.

30-16-0100A SERVICE CODES N11 (ENHANCED)

This feature provides the same service as 30-16-0100, with enhancements.

30-17-0000 DIRECTORY ASSISTANCE

Directory assistance codes is a feature that routes calls to a local or FNPA directory assistance operator based upon the digits received. The option of charging for directory assistance calls is provided.

Directory assistance codes may vary in different areas. However, the system is capable of interpreting and routing any one, a subset of all, or all of the following codes to a directory assistance facility.

- ☐ 411

- ☐ 1-411
- ☐ 555-1212
- ☐ 1-555-1212
- ☐ NPA-555-1212D (NPA = 3-digit NPA code)
- ☐ 1-NPA-555-1212D (NPA = 3-digit NPA code).

30-18-0000 CUSTOM CALLING SERVICE ACCESS CODES

Custom calling service access codes is a feature that permits the system to provide custom calling services to the customer with a standardized set of 2-digit codes following a service access code prefix * or 11.

30-19-0000 INTERSYSTEM ADDRESS OUTPUTSING (MF AND DP)

Intersystem outputsing is a feature that provides the forwarding of MF or DP address information from a local switching system to a distant office. The system should provide the following minimum capabilities (customer-dialed prefixes are not normally outputsing).

30-19-0100 OUTPUTSING TWO THROUGH TEN DIGITS MF AND DP

Outputsing the dialed number received (from 2 through 10 digits).

NOTE: Offices arranged for IDDD feature(s) may require up to 13-digit outputsing. Other features such as CAMA and TSPS may require additional outputsing such as ANI or ONI digits.

30-19-0200 DELETE DIGITS (UP TO SEVEN)

Outputsing the dialed number with the first 1 to 7 digits suppressed.

30-19-0300 PREFIX DIGITS (UP TO THREE)

Outputsing the dialed number received with 1, 2, or 3 digits prefixed.

It is desirable that the system be capable of suppressing from 1 to 7 digits from the dialed number received, prefix 1, 2, or 3 digits, and then outputsing the resultant address information.

30-19-0400 OUTPUTSING SEVEN DIGITS FOR VALID SERVICE CODES

Outputsing a specified 7-digit number based upon receipt of a valid service code.

Provision should be made for specifying the number of digits to be suppressed, prefixed, or both based upon each interoffice destination code.

30-20-0000 RECEPTION OF OUTPUTSING FROM OTHER SYSTEMS (MF AND DP)

The reception of outputsing from other systems is a feature that permits the accumulation of MF or DP address information in order to locally terminate a call. The number of digits required for each application is dependent upon the local office trunk group arrangements, the distant office outputsing characteristics, and local office destination code assignments. **30-21-0000 INTERCEPT ROUTING FOR CALLS TO BLANK, CHANGED, DISCONNECTED, OR UNASSIGNED DIRECTORY NUMBERS**

Intercept routing for calls to blank, changed, disconnected, or unassigned directory numbers is a feature that permits the system to alert calling customers (local or intersystem) to the reason why a call cannot be completed as dialed. In addition, where applicable, it is desirable that the calling customer be provided with the correct information required to complete the call without operator assistance. No charge is made for

calls routed to intercept.

One or more of the following (30-21-0100 through 30-21-0300) intercept treatments is provided for this type of call.

30-21-0100 ANNOUNCEMENT - LOCAL OR REMOTE

Route the call to an announcement which may be provided locally or remotely.

30-21-0200 OPERATOR

Route the call to a local or remotely located operator.

30-21-0300 REMOTE INTERCEPT SYSTEM (AIS)

Route the call to a remote intercept system such as Automatic Intercept System (AIS).

30-23-0000 REMOTE SWITCHING UNIT (RSU)

This feature entails the capability of having a switching unit located remotely from the basic system but connected to it by a control message and data link. The remote unit performs a minimum of switching services (for example, process intra-RSU calls) in case of a link outage.

30-23-0200 HOSTING SINGLE-MODULE RSM UNITS

The single-module RSM is a 5ESS[®] switch switching module remoted on digital transmission facilities from a host switching module. A host switching module is a local switching module that can host one to five RSMs (in addition to lines and trunks) up to the capacity of the host switching module. In normal operation, customers served by the single-module RSM are offered any or all of the features available to the customers connected directly to the host. During RSM stand-alone operation, most custom calling features are available. Those requiring a host facility, such as a global digital services unit (for example, conferencing), will not be provided in stand-alone.

30-25-0000 TIMED RELEASE DISCONNECT

An originating office causes a timed release disconnect (TRD) if the calling party fails to disconnect within 10 to 12 seconds after the called party has gone on-hook. The TRD timing is only applied after the minimum chargeable duration has elapsed. The TRD timing is not performed by the local office on calls routed to operator systems.

30-26-0000 TANDEM CAPABILITY

The tandem office feature provides the local switching system with the capability to serve as a tandem or local/tandem office. The tandem office is an intermediate switching center primarily used to switch trunks between local or tandem offices and other local or tandem offices. Each local office in an area may have trunks to one or more tandem offices, but each tandem office does not necessarily have trunks to every central office in the area. In many cases, local offices are connected with each other by direct trunks that do not go through a tandem office.

Tandem switching is a means of making economical use of trunks and switching equipment, where otherwise many small separate groups of trunks would be required to interconnect different offices in the same general area.

30-26-0100 LIMITED LOCAL TANDEM SWITCHING

This feature provides only the capability for interconnecting an originating local office to a terminating local office.

30-26-0200 LOCAL INTERTANDEM SWITCHING

This feature provides, in addition to the capabilities of feature 30-26-0100, the capability to interconnect local tandem offices and to connect the local office with another tandem office.

10.2.10 SYSTEM MAINTENANCE FEATURES - 35-00-0000

35-01-0000 TROUBLE DETECTION

Trouble detection is the process of determining that a trouble exists. Trouble detection capabilities are intended to detect all actual and potential hardware and software troubles so that the impact on service is minimized consistent with the reliability and service objectives.

35-01-0100 HARDWARE REDUNDANCY

Major system hardware is duplicated and/or arranged in such a manner that a failure in a major system function is detected rapidly, the cause of failure identified and, if required, the system provides for the automatic substitution of a spare standby unit or bypass. With hardware redundancy, failure of a single hardware unit does not cause a major loss of system call processing.

35-01-0200 HARDWARE CHECKS

Redundantly encoded and checked programs and data and self-checking (and correcting) hardware is employed, where necessary, to assure that hardware failures do not cause the mutilation of calls in progress before a failure is detected. The fault detection facilities permit automatic corrective actions to be taken rapidly to maximize the system's ability to respond to real time inputs or to provide adequate output information and reduce or eliminate the mutilation of calls being handled.

35-01-0300 SOFTWARE CHECKS

Various trouble detection strategies are employed by the 5ESS[®] switch to minimize the effect of troubles on system performance. The software trouble detection strategies include, in decreasing order of preference, continuous automatic tests, per-operation and per-call automatic tests, periodic automatic tests, semiautomatic tests, and manual routine tests.

35-01-0310 CONTINUOUS AUTOMATIC TESTS

Continuous tests detect troubles such as continuous data transmission errors and monitor equipment power and active and standby equipment. Two types of continuous tests, audits and sanity tests, are described as follows.

35-01-0311 AUDITS PROGRAMS

Audit programs are provided to detect and correct data errors caused by software or hardware troubles before they can propagate and lead to system outages or significant degradation of service. These programs run on a routine basis interleaved with normal call processing. They continuously check various data and programs for correctness and internal consistency. They provide a record of detected errors and switching system corrective actions.

35-01-0312 SANITY TESTS

Basic checks are continuously made to ensure that the call processing program modules are cycling in proper sequence and on a timely basis.

35-01-0320 PER-CALL AND PER-OPERATION TROUBLE DETECTION TESTS

Tests are performed on a per-call or a per-operation basis to detect troubles such as call processing database troubles, call processing resource availability, ineffective attempts, cut-off calls, network path end-to-end integrity, assurance of customer privacy of communication, and tip and ring polarity reversals.

35-01-0321 CALL PROCESSING DATABASE TROUBLES DETECTION

This test detects troubles in the call processing database resulting from syntactically correct but functionally incorrect entries.

35-01-0322 CALL PROCESSING RESOURCE AVAILABILITY TEST

These tests detect the lack of currently available call processing resources.

35-01-0323 INEFFECTIVE ATTEMPT DETECTION

These tests automatically detect ineffective attempts which are any valid bids for service which do not complete or outpulse, as appropriate, in the normal manner.

35-01-0324 CUT-OFF CALL TROUBLE DETECTION

These tests detect any stable or transient calls that are cut off as a result of switching system troubles.

35-01-0325 NETWORK PATH INTEGRITY END-TO-END TEST

These tests check the end-to-end integrity (continuity) of paths set up through the switching system network fabric. These tests may include an audible frequency transmission test such as 1000 Hz at a known level.

35-01-0326 ASSURANCE OF CUSTOMER PRIVACY OF COMMUNICATIONS TEST

This test checks for connections with other unwanted switching system network paths whenever a path associated with a call is established.

35-01-0327 TIP AND RING POLARITY CHECK TEST

This test detects tip and ring reversals in the switching system network, if such reversals cause misinterpretation of external signals.

35-01-0330 PERIODIC AUTOMATIC TEST

Periodic automatic tests are performed on standby units of a duplicated unit pair operating in an active-standby state, on all units in a nonduplex redundancy scheme, and on server groups such as transmitters and receivers.

35-01-0340 SEMIAUTOMATIC TROUBLE DETECTION TESTS

Any individual automatic trouble detection test can be requested on demand from an equipment frame location and the local and remote maintenance center, and the results presented at the location or center from which the request was made.

35-01-0350 MANUAL TESTS

The use of manual tests is limited to testing that requires manual assistance or intervention by the nature of the test, such as testing of the person/machine interface.

35-01-0360 INHIBIT OF TROUBLE DETECTION

This feature allows the system to inhibit trouble detection strategies in order to increase call processing capacity during overload or to provide limited service rather than no service at all. A periodic automatic reminder of all active trouble detection inhibits may be provided.

35-02-0000 SERVICE RECOVERY

Service recovery capabilities are intended to recover the switching system from detected troubles, both

internal and external, in order to protect service with minimal impact on customers. Service recovery includes automatic reconfiguration of major functional units such as processors, memories, and buses in order to obtain a working configuration.

Service recovery strategies protect stable calls first and transient calls second. Automatic service recovery strategies are preferred to manual strategies.

35-02-0100 FAULT RECOVERY PROGRAMS

Fault recovery programs detect and locate faulty hardware units and reconfigure the system with a minimum degradation of call processing.

35-02-0200 INITIALIZATIONS

When software troubles or multiple hardware faults cause a severe degradation of call processing capability, varying levels of predefined system hardware and software initializations are capable of restoring both hardware and software to a known operating state. The levels of system recovery initializations provide for escalating steps of initializations, with each step encompassing more software and more hardware to clear the system of faulty states that have eluded the previous step. The final step initializes all software and all applicable hardware.

35-02-0300 AUTOMATIC SERVICE RECOVERY

Service recovery is normally automatic, except at the highest level of switching system initializations. Automatic service recovery provides for call completion without customer knowledge of trouble and special treatment for calls that cannot be completed.

35-02-0310 AUTOMATIC TREATMENT OF ERRORS

An error is a detectable trouble condition that cannot be reproduced at will by the system or by external means. An error can sometimes be reproduced by repetitive testing. Errors are monitored such that equipment experiencing system correctable errors is not removed from service unless an excessive error rate occurs.

35-02-0320 AUTOMATIC TREATMENT OF FAULTS

A fault is a detectable trouble condition that can be reproduced at will by the switching system or by external means. Equipment experiencing fault conditions is removed from service as soon as the fault is detected unless system operation could be severely degraded.

35-02-0330 EQUIPMENT SELECTION PROCEDURES

Automatic equipment selection procedures insure that calls encountering a trouble have a reasonably high probability of completion on subsequent customer or switching system retries (for example, random selection of server group circuits).

35-02-0340 OUT-OF-SERVICE LIMIT FOR SERVER GROUP EQUIPMENT

This feature limits the number of server group circuits or units which can be automatically placed in an out-of-service state. Such safeguards are necessary to insure that faulty trouble detection equipment does not result in a large proportion of good equipment being removed from service.

35-02-0400 MANUAL SERVICE RECOVERY

Manually initiated switching system initializations and reconfigurations supplement the automatic capabilities.

35-03-0000 TROUBLE NOTIFICATION

Trouble notification alerts the switch personnel to the existence and severity of any switching system troubles. Alarms indicate conditions which have immediate or potential impact on switching system operation and performance and require action on the part of the switch personnel to restore normal operation or prevent degradation of performance. Trouble notifications enable the switch personnel to determine the nature of the trouble as well as the equipment in which the trouble is located before leaving the work center where the notification is received.

35-03-0100 THREE-LEVEL ALARM STRUCTURE

Alarm conditions are separated by decreasing severity into three levels: Critical, Major, and Minor.

35-03-0200 AUDIBLE ALARMS

Distinctive audible tones in the office are used to report critical, major, and minor alarm conditions.

35-03-0300 VISUAL ALARM INDICATORS

Visual alarm indicators report the proper alarm level (critical, major, and minor) for alarm conditions.

35-03-0400 OUTPUT MESSAGES

In addition to audible and visual alarms, output messages report alarmed maintenance information to the switch personnel. Trouble messages contain sufficient text so as to be easily understood and used by the switch personnel with the aid of an output manual and without additional conversion, translation, or analysis. Output messages include threshold alarm messages, hourly status messages, and demand status messages.

35-03-0500 TROUBLE STATUS INDICATORS

Trouble status indicators in the office include (1) system status indicators which display the status of the major units of equipment of the system as well as any active troubles and main programs inhibited for any reason, (2) state of health indicators which do not necessarily denote trouble but report such conditions as system load, program cycle rates, program controls in effect, and active queues, and (3) other visual indicators such as aisle pilots.

35-03-0600 OFFICE ALARM SUBSYSTEM

An office alarm subsystem, together with the local and remote maintenance center displays, provide alarm information for system troubles.

35-04-0000 TROUBLE VERIFICATION

Trouble verification is necessary (1) prior to automatic trouble notification, (2) prior to initiation of repair to determine the continuing existence of the trouble, and (3) after repair to determine that the trouble has cleared. The switching system provides a trouble notification prior to verification for those trouble symptoms (for example, maintenance interrupts) that are indicative of potential hazards to the health of a large portion of the system. If possible, the switching system provides internal thresholding for certain classes of troubles that are not reported on a per-incident basis in order to avoid premature service recovery actions and trouble notification.

35-05-0000 TROUBLE ISOLATION

Trouble isolation takes place after a trouble has been detected and verified and service recovery and protection has taken place. It is intended to isolate a trouble to a minimum number of replaceable elements without affecting service.

35-05-0100 TROUBLE LOCATION PROCEDURE

A trouble location procedure provides a list of replaceable elements arranged in the order of the elements

probability of causing the trouble. The switching system output may (1) be a list of replaceable elements, (2) be used in conjunction with an on-line support system, or (3) be used in conjunction with switching system documentation.

35-05-0200 DIAGNOSTICS

These programs are provided to identify the failing element in a faulty unit down to a relatively few number of replaceable units. After a suspected failed part or parts have been replaced, diagnostic programs are manually requested to verify that the trouble has been cleared. For those cases where the standard trouble location procedure fails, a raw data report for diagnostic test failures provides further information for trouble isolation purposes. Complete, partial, and repetitive tests can be manually initiated.

35-05-0300 ERROR ANALYSIS

As described previously, the system distinguishes between faults and errors. Statistics on errors are kept and analyzed periodically and the results printed out. When errors exceed a threshold, which is manually adjustable, the faulty equipment is automatically placed out of service and a report generated.

35-06-0000 REPAIR

Repair begins after the trouble has been isolated to the defective replaceable element. Normally, the switching system will automatically place an equipment unit or circuit that has the trouble in an out-of-service state. Manually initiated requests are provided to ensure that the equipment is out-of-service prior to repair. In some instances, it may be necessary to remove power prior to repair because of potential hazards to the switching system or to the switch personnel. Physical repair involves replacement of a unit based on the results of a trouble location procedure or other means and with the aid of minimal test equipment. Equipment is clearly marked to quickly identify units to be replaced. As the final step in the repair process, equipment is automatically restored to the active or standby state if all verification tests pass. If desired, the equipment can be manually forced into the active state.

35-07-0000 MAINTENANCE PERSON - SWITCHING SYSTEM INTERFACE

35-07-0100 MASTER CONTROL CENTER (MCC)

The local maintenance control center provides an interface to the switch personnel in order to monitor the overall switching system status and performance and manually control the switching system maintenance functions.

35-07-0200 SWITCHING SYSTEM CONTROL AND DISPLAY INTERFACE

The local maintenance center includes a control and display interface such as a lamp and key panel or a CRT providing manual control and displaying the service and maintenance status of the overall switching system, as well as the major equipment units. The control and display interface includes emergency action controls, switching system reconfiguration and initialization capability, central processor and memory test controls, switching system configuration and status displays, state of health indicators, summary status indicators, and recovery status indicators.

35-07-0210 ALARM RELEASE

Operation of the alarm release control in the office or from the remote maintenance center silences the audible alarm and extinguishes the visual alarm indicator so as not to mask any subsequent alarms. Release of the alarm indicator does not affect the associated status display which provides a continuous trouble indication until the trouble indication is cleared.

35-07-0220 ALARMS TRANSFER

In the alarms transferred mode, local audible and visual alarms appear at the office for a short period of time (spurt alarms) and self-terminate without extinguishing the local or remote status displays.

35-07-0300 SWITCHING SYSTEM MAINTENANCE I/O DEVICES

Also provided at the MCC are one or more alphanumeric devices such as a teletypewriter or CRT-keyboard terminal which receive output messages and allow the switch personnel to input messages as required to maintain the switching system.

35-07-0400 EXTENDED MAINTENANCE CENTER (BELTLINE)

Jacks on equipment frames are provided so that a portable I/O device may be connected to the system.

35-08-0000 REMOTE MAINTENANCE CENTER

This feature provides interfaces permitting full remote maintenance capabilities excluding activities that require physical action on equipment, such as circuit pack replacement. At the remote maintenance center, the switch personnel have the alarms, status information, and control capability to monitor switching system performance and the ability to perform system reconfiguration and initialization, when necessary.

35-08-0200 SWITCHING CONTROL CENTER SYSTEM (SCCS) SYNCHRONOUS INTERFACE

This feature permits the implementation of the remote maintenance center feature (35-08-0000) by means of a synchronous interface to an SCCS. This SCCS interface consists of two data links, one of which is a backup, which provide the means to transmit (1) configuration and control data and (2) maintenance and administrative messages between the SPCS and the SCCS. These data links are governed by the BX.25 protocol. The telemetry data and the maintenance and administrative data are transported on different virtual circuits supported by the protocol.

35-09-0000 MAINTENANCE MEASUREMENTS

Maintenance measurements provide data to evaluate equipment performance, to evaluate the impact of troubles on customer service, and to calculate the performance index. Maintenance measurements are divided into categories including base, maintenance service, and performance measurements.

10.2.11 TRUNK, LINE, AND SPECIAL SERVICE CIRCUIT TEST FEATURES - 40-00-0000**40-00-1000 TRUNK MAINTENANCE**

Means are provided to detect faulty incoming and outgoing trunks and service circuits, automatically and manually, to protect service from faulty trunks, to allow verification of a fault, and to allow isolation.

40-00-1200 TRUNK AND LINE CONTROL AND DISPLAY INTERFACE

A test position is provided to permit central office maintenance personnel to maintain trunks, lines, special service circuits, and switching machine service circuits (such as DP transmitters, MF receivers, etc.). This interface together with the Trunk and Line Maintenance I/O Interface is referred to as the trunk and line work station (TLWS).

40-00-1300 TRUNK AND LINE MAINTENANCE I/O INTERFACE

A trunk and line maintenance I/O interface is provided to permit the switch personnel to enter input messages concerning trunks and to receive appropriate output messages.

40-00-1300A TRUNK AND LINE MAINTENANCE I/O INTERFACE (ENHANCED)

This feature provides enhancements to the basic feature 40-00-1300.

40-00-1400 SUPPLEMENTARY TRUNK AND LINE WORK STATIONS

In larger offices, additional test positions can be added to the system to provide additional trunk test facilities. These positions provide the same set of features as provided at the trunk and line work station.

These work stations need not be physically close to the MCC.

10.2.12 TRUNK TEST FEATURES AT THE TRUNK AND LINE WORK STATION (TLWS) - 40-01-0000

40-01-0100 DIAGNOSTIC TESTS

Outgoing trunks are checked by placing program-initiated and controlled test calls to test lines in the distant office and detecting the response signals received over the trunk. Incoming trunks can be tested for the ability to change state under manually-initiated or system-controlled processes. Test results are reported on the appropriate TTY channel, and when a failure results, trouble data is sufficient to isolate faulty components.

The 5ESS[®] switch should provide diagnostic data results which indicate the results of each failing test performed by a diagnostic program. It is possible to run a diagnostic test several times on a specified trunk or service circuit through a single test request. Means are provided to allow a diagnostic test of an outgoing trunk to a specified type of far-end operational test line (synchronous or nonsynchronous) or a permanent busy, instead of the normal diagnostic test.

40-01-0200 OUTPULSING TESTS

The outpulsing test is a feature that provides the means to place a call and talk or listen over a specified outgoing trunk. It is possible to specify the digits to be outpulsed over the trunk, and the supervision returned over the trunk can be displayed at the test position.

40-01-0300 MAKE-BUSY/MAKE IDLE CONTROL

The make-busy/make idle control feature provides the ability to make a specific trunk maintenance busy or idle by manual request.

40-01-0400 DC VOLTMETER

It is possible to connect a DC voltmeter circuit to a trunk under test and to place the trunk circuit in a state where the tip and ring conductors of the facility are presented to the voltmeter. Voltage, resistance and capacitance measurement capability is thereby provided.

10.2.13 TRANSMISSION MEASUREMENTS - 40-01-0500

40-01-0501 BASIC TRANSMISSION MEASUREMENTS

With this feature, it is possible to send a tone and measure the received tone level and frequency so as to make possible two-way determination of the standard transmission parameters affecting voice communications: loss (level), C-message noise, C-notch noise, gain-slope, and return loss. It is also possible to apply an AC open, an AC short, or a balance termination. (Reference: Bell System Technical Reference PUB 41009, Transmission Parameters Affecting Voiceband Data Transmission-Measuring Techniques.)

40-01-0600 SUPERVISORY TESTS

Upon request, the 5ESS[®] switch displays the status of incoming supervision on trunks and allows control of the state of outgoing supervision.

40-01-0700 TRUNK CIRCUIT DIAGNOSTICS

The 5ESS[®] switch provides trunk diagnosis results in response to manual requests.

40-01-0800 MONITOR

The capability to monitor a line or trunk that is service busy is provided.

40-01-0900 TALK

The capability is provided to set up a talk and listen connection to a specific idle trunk without outputting digits or altering supervision. Switch personnel with the same capability at the far end of the trunk can talk and listen over the facility on a prearranged basis.

40-01-1100 TEST SET CONNECTIONS

It is possible to connect portable transmission and signaling test equipment to trunks at the test position.

10.2.14 REMOTE TRUNK AND LINE MAINTENANCE - 40-02-0000

40-02-0100 REMOTE TRUNK MAINTENANCE

This feature provides the capability for receiving and executing trunk test access requests from remote work stations. These requests include supervisory, outputting and transmission tests, removal and restoral of trunk from/to service, and setting up monitoring and talking connections.

The local maintenance control center provides an interface to the switch personnel in order to monitor the overall switching system status and performance and manually control the switching system maintenance functions.

40-02-0101 CENTRALIZED TRUNK TEST UNIT (CTTU) INTERFACE

The test position for remote trunk testing is the CTTU. The CTTU controls transmission, DC, supervisory and dial pulsing tests. The interface between a CTTU and the 5ESS[®] switch is a 1200-baud, full duplex, synchronous data link using X.25 protocol. Primary access to this interface is through the DDD network rather than the data network. Security for the DDD interface is provided by an initial security exchange between the 5ESS[®] switch and the CTTU.

40-02-0200 REMOTE OFFICE TEST LINE (ROTL)

The ROTL allows two-way transmission tests to be made automatically on trunks outgoing from the office containing the ROTL. These tests are capable of being initiated from a remote location. Also allowed is interrogation of trunk or trunk group maintenance busy status from a remote location. The ROTL is also capable of operating with the centralized automatic reporting on trunks (CAROT) system or with a processor controlled capability (or equivalent) which permits locally initiated semiautomatic ROTL tests.

40-02-0300 REMOTE LINE MAINTENANCE

This feature enables switch personnel at a remote location, via a connection to an incoming test trunk, to access lines and verify status, and perform basic tests such as resistance, leakage and current measurements, ringing, and coin control signals.

40-02-0301 INTERFACES TO LOCAL TEST DESK AND RELATED SYSTEMS

A test trunk is provided for compatibility between the 5ESS[®] switch and existing maintenance systems such as the No. 14 local test desk, the No. 16 local test desk, the line status verifier (LSV), the automatic line verifier (ALV), mechanized loop test (MLT) system, detection of unauthorized equipment (DUE) hardware, and the switched access remote test system (SARTS) phantom connector.

The switch provides a means for establishing a metallic connection between a line to be tested and any of the previously external maintenance systems. These systems are equipped for testing through a standard test trunk circuit which uses sleeve lead signaling.

40-02-0302 INTEGRATED MECHANIZED LOOP TEST SYSTEM NO. 2 (MLT-II) INTERFACE

Remote testing of loops requires an interface to the switch and the MLT-II, or its equivalent.

The integrated interface between MLT-II and the switch will be a 1200-baud, full duplex, synchronous data link using X.25 protocol. Access will be through either a private line or the DDD network, and security for the DDD connection will be ensured by an initiation protocol between the MLT-II controller and the switch.

40-03-0000 LOCAL OFFICE TEST LINES

Test lines are provided for testing lines and incoming trunks from connecting offices. The transmission test lines listed in this section may also be used for toll applications but would then be accessed by a 10X code.

40-03-0100 100-TYPE TEST LINE

A 100-type test line provides a local office with equipment that first applies a precise (1004 Hz at 1 mW) tone for a timed period, then a balanced termination for transmission level and noise measurements. Line and trunk access is provided to the 100-type test line.

40-03-0200 101-TYPE TEST LINE

A 101-type test line provides a communication line to the service position.

40-03-0300 102-TYPE TEST LINE

A 102-type test line applies a precise (1004 Hz at 1 mW) tone for approximately 9 seconds on, 1 second off, in a repetitive sequence.

40-03-0500 105-TYPE TEST LINE

A 105-type test line, with responder, provides for automatic two-way loss and noise measurements, plus gain slope, return loss, and noise in the presence of tone on trunks requiring transmission testing.

40-03-0600 SYNCHRONOUS TEST LINE

A synchronous test line provides diagnostic tests of incoming trunk equipment. A total of six supervisory pulses are returned followed by a tone signal.

40-03-0700 NONSYNCHRONOUS TEST LINE

A nonsynchronous test line tests incoming trunk equipment. Supervisory pulses are repeated until disconnection takes place.

40-03-0800 PERMANENT BUSY TEST LINE

A permanent busy test line returns a permanent busy signal.

40-04-0000 COIN STATION TEST LINE ACCESS

This feature allows switch personnel at a coin telephone station to obtain dialed access through an outgoing test trunk to a coin station test line and command it through dialed codes to test, without other assistance, line resistance, line leakage, and coin control signals.

40-05-0000 STATION RINGER TOUCH-TONE TEST LINE

This feature provides the means for an installer at the customer premises to test the touch-tone pad, if equipped, and ringer equipment on the station set. In addition, this feature verifies the directory number line assignment and identifies the set as tip party or ring party/individual.

40-08-0000 AUTOMATIC PROGRESSION TRUNK AND SERVICE CIRCUIT TESTING

Automatic progression trunk and service circuit testing are performed during specified periods and have no detrimental effect on call processing or other system tasks. Trunks are automatically and sequentially tested through connections to the appropriate operational test lines in the connecting offices or, if no test lines are available and the trunk is an outgoing loop supervised trunk, by a continuity and polarity test. The operational capabilities of transmitters and receivers can be verified. Tone generation circuits can be tested for the presence of tone and interruption rate where appropriate. Faulty circuits can be removed from service and a trouble report generated. Safeguards are provided to limit the number of circuits that can be automatically removed from service.

40-09-0000 LINE INSULATION TESTS

The line insulation test (LIT) is a test feature which detects lines with electrical leakage from tip or ring to battery or ground, or leakage between tip and ring. These functions may be performed on a routinely scheduled basis (ALIT), as well as on a demand basis (DLIT). Demand tests may be requested on a specific line, a range of lines, or all lines in an switching module (SM). Routinely scheduled tests will test all lines in the office. (ALIT and DLIT tests do not test 4-party fully-selective and 8-party lines.) It is possible to specify pass/fail thresholds for the test and to restrict ALIT from automatically testing specific lines. The primary use of the ALIT is preventive loop and line cable maintenance. The trend in the results obtained from frequent checking for line faults aids in detecting gradual cable deterioration. The results of the ALIT test are available both locally (in the office) and on the ALIT channel, also known as the RSB TTY channel. This channel carries other data such as per-call test failures in addition to ALIT test results.

40-10-0000 SYSTEM LINE INSULATION TEST

A system line insulation test checks for low loop resistance before applying ringing to a line. Failure of this test results in a report of the failing line.

40-11-0000 TEST INCOMING TRUNKS IN TANDEM OR LOCAL STATE

The system provides the ability to place incoming trunks in the local or tandem state on incoming calls to 100-, 102-, and 105-type test lines. The choice of state is based on the directory number received from the originating office.

40-12-0000 AUTOMATIC RETEST (TREATMENT) OF PERMANENT SIGNALS

40-12-0100 LINES

Lines which are not cleared during initial permanent signal treatment (30-05-0000) are recorded in a list. The system automatically returns lines from this list to service after the permanent signal condition has cleared. The capability is provided to output this list at the request of switch personnel.

40-12-0200 TRUNKS (FALSE SEIZURES)

Trunks causing incoming seizure with no subsequent signaling are removed from service, monitored for supervision, and restored to service when the seizure is removed.

40-17-0000 MANUAL TESTING

40-17-0100 MANUAL TEST OF LINE

This feature provides switch personnel at a trunk and line work station (TLWS), or another local test position, interfacing with the switching system with line maintenance capabilities such as: to remove lines from service, to restore lines to service, to verify the status of lines, and with access to lines for basic test capabilities (resistance, leakage and current measurements, ringing and coin control signals).

40-17-0200 MANUAL TEST OF TRUNKS

This feature provides switch personnel at a TLWS, or another local test position, interfacing with the

switching system with trunk maintenance capabilities such as: to remove trunks from service, to restore trunks to service, to verify trunk states, and with access to trunks for basic test capabilities (resistance, leakage and current measurements, supervisory tests, VF parameter measurements).

40-19-0000 TREATMENT OF TRUNKS WITH MACHINE-DETECTED INTEROFFICE IRREGULARITIES (MDII)

40-18-0100 REMOVAL FROM SERVICE OF TRUNKS WITH MACHINE-DETECTED INTEROFFICE IRREGULARITIES

When this feature is activated, a trunk on which an unexpected stop dial signal or a stop dial time-out occurred is held off-hook and kept out of service. A manual input message identifies such trunks (40-00-1300). For service protection, the number of trunks withheld from service are limited. Trunk service activation is by a manual input command. This feature assists in the location of wiring transpositions external to the switching system.

40-18-0200 SELECTIVE SUPPRESSION OF MDII MESSAGES

This feature permits, when activated, suppression of MDII reports associated with ineffective call attempts due to trunk signaling errors, based on the MDII type and the trunk group.

40-18-0500 CALL IRREGULARITIES DUE TO TRUNK FAILURES

40-18-0501 DETECTION, REPORTING, AUTOMATIC DIAGNOSTIC, AND TRUNK REMOVAL SAFEGUARDS

The system provides the following for call irregularities due to trunk failure:

- ☐ Call attempts that use a trunk and fail to complete are detected, reported, and counted. (Calls are completed over other trunks if a failure persists.)
- ☐ The information reported includes all equipment involved in the connection, type of failure, and address information. A retry is provided, where required, to meet blocking objectives.
- ☐ Diagnostic tests of suspected units are automatically initiated.

40-18-0502 TRUNK ERROR ANALYSIS

The system will provide error analysis of call irregularities due to trunk failure. Maintenance error counts will be kept for a limited number of trunks. If the error rate is too high on a trunk or service circuit, it will be reported to the maintenance switch personnel. (Outgoing trunks can also be automatically removed from service.) Outgoing trunks with a high error rate are automatically tested through connections to appropriate operational test lines in connecting offices. Safeguards will prevent automatic removal of excessive trunks from any trunk group.

40-18-0600 IDENTIFICATION OF TIP-RING REVERSALS ASSOCIATED WITH SPURIOUS ANSWER SIGNALS

On demand, the system provides a report that identifies the loop supervision outgoing trunk on which an anomalous supervisory state (false answer) is detected during outpulsing on multifrequency signaling trunks. This capability is applied to help locate a probable external source of the malfunction.

40-19-0000 DEMAND LISTING OF TRUNK NUMBERS OF A SPECIFIED TRUNK GROUP

Upon request, the system provides a listing of all trunk assignments associated with the trunk group specified.

40-20-0000 PRINT THE TRUNK-OUT-OF-SERVICE (TOS) LIST

Upon request, all trunks on the TOS list are outputted based upon the sequential assignment of trunk groupings.

40-22-0000 TRUNK GROUP - REMOVE FROM SERVICE (MAKE-BUSY)

Upon request, the system places all idle (not traffic busy) trunks in a specified trunk group in the out-of-service locked out manual, or out-of-service disabled manual state requested. Traffic-busy trunks are camped on, and as they become idle are also placed in the requested state.

40-23-0000 TRUNK GROUP - RESTORE TO SERVICE (MAKE IDLE)

Upon request, the 5ESS[®] switch provides the ability to restore to service all trunks in a specified trunk group removed from service.

40-24-0000 TRANSMISSION TESTING OF TRUNK GROUPS

Upon TTY or TLWS request, all trunks of a specified trunk group are transmission tested.

40-27-0000 LINE ACCESS TO TLWS

The system provides switch personnel with the ability to dial from a line directly to a talk/monitor telephone at the work station. In the test state, all normal line tests are available.

40-28-0000 MULTIPLE TRUNK TEST CAPABILITY

The system provides the software capability to conduct tests on an engineered number of trunks in parallel.

40-29-0000 TRUNK-TO-TRUNK TEST CONNECTION

This feature provides a capability for establishing and disconnecting stable connections between trunks and service or test circuits, in response to manual requests, for the purpose of special tests. Active paths are automatically disconnected after a 1-hour period.

40-32-0000 CARRIER GROUP ALARM (CGA)

The system provides the capability of detecting a CGA, and upon detection of this alarm, all associated trunks are automatically placed in an out-of-service, facility failure state so the trunks look busy to subsequent customer call attempts.

40-32-0000A CARRIER GROUP ALARM (CGA) (ENHANCED)

This feature provides enhancements to feature number 40-32-0000.

45-00-0000 ADMINISTRATIVE FEATURES

45-01-0000 DATABASE MANAGEMENT - MEMORY ALTERATION

45-01-0100 ASSIGNMENTS

Assignment is the association of logical identifiers (in the areas of line/telephone numbers, trunks, and hardware) to physical units of equipment (circuits and ports) and the provision of feature permissions.

45-01-0200 RECENT CHANGE AND VERIFY

Recent change provides a means to update (that is, insert into, modify and delete from) the 5ESS[®] switch database. Verify allows for retrieval of view tuples from the database for verification of its contents.

45-01-0300 INITIALIZATION AND GROWTH

The office data assembler (ODA) is a data generation process providing initialization of both the data model and the contents of the database. The 5ESS[®] switch also supports a mechanism for adding the data necessary for the growth of physical equipment (for example, line units, memory and circuit packs, switching modules) on the switch through recent change. In addition, the database and the memory spectrum can be grown.

45-01-0400 OFFICE RECORDS VERIFICATION

This feature provides a means for obtaining office records of the database for some recent change views and performs limited ad hoc requests for data in the database.

45-01-0500 MEMORY BACKUP AND RECOVERY

The 5ESS[®] switch provides for back-up of the database manually or automatically and for recovering the database in the event of an initialization of the switch. The database on each processor of the switch is backed up onto the disk at user request (manual) or on a scheduled (automatic) basis. In between backups, the database updates are logged on a disk file to be reapplied during recovery in the case of database mutilation or system initialization.

45-01-0600 PROGRAM ALTERATION

An efficient means of altering the system program is available. The system program includes all executable programs including: main memory resident as well as any paged, overlaid, and swapped programs; any microprocessor programs stored in writable memory; and any special purpose data that is not recent changeable.

45-01-0700 INTERFACE TO CENTRALIZED DATABASE MANAGEMENT CENTER

The Remote Memory Administration System (RMAS) provides a mechanism in the 5ESS[®] switch for centralized database management from operations support centers external to the switching system.

45-01-0701 RMAS INTERFACE

The 5ESS[®] switch database management function includes those operations required to ensure that the information stored in the 5ESS[®] switch database accurately represents the office parameters and also the individual customer services provided by the switching system. This involves generating and transmitting messages to the 5ESS[®] switch to update or query the contents of its database and also for restoring the database in the event it is destroyed. The operations centers responsible for these tasks are the Remote Memory Administration Center (RMAC) and the Switching Control Center System (SCCS).

The RMAS acts as a focal point between the centers and the 5ESS[®] switch entities that they serve, providing interfaces to the switching systems and also mechanized aids to support 5ESS[®] switch database management activities. Functionally, RMAS transmits database update information to the switching system and queries the switching system for current database information. The switching system responds to RMAS messages, indicating whether they are accepted or rejected and also provides any database information appropriate for a query message. The RMAS administers its internal files and controls the interface dialogue based on its interpretation of 5ESS[®] switch responses.

45-01-0800 DIRECT TERMINAL INTERFACE FOR DATA CHANGE AND VERIFY

This feature provides the capability to efficiently perform data change and verify functions locally, without assistance from external operations support systems.

10.2.15 DATABASE INTEGRITY AND SECURITY - 45-01-0900

45-01-0910 DATABASE INTEGRITY

Three levels of consistency checking are provided by recent change to protect the integrity of the database when inserts, modifications, and deletions are performed. The first level of error checking provides range checking for each attribute. The second level provides intraform error checks of attributes on the form. The third level checks the form for consistency with the data in the database.

45-01-0920 DATABASE SECURITY

A set of protection measures is provided to prevent unauthorized access to the database to protect against disclosure, alteration, or obliteration of its contents.

45-03-0000 DELAYED ACTIVATION RECENT CHANGE (BATCH RECENT CHANGE)

This feature provides the capability for validity checking and storing recent changes in a latent state for later activation. First- and second-level error checks are performed on entry of the recent changes. The stored recent changes can be activated on demand or by a time release mechanism and canceled, if desired. Third-level error checking of the stored recent changes checks for consistency with the database at the time of activation. The delayed activation recent change also provides clerk summaries for recent changes completed and errors which occurred.

45-05-0000 TELETYPEWRITER (TTY) INPUT/OUTPUT (I/O)

The TTY I/O feature is provided by a cathode ray tube (CRT) keyboard terminal optionally complemented by a hard-copy receive-only printer (ROP).

45-06-0000 AUTOMATIC TRAFFIC MEASUREMENTS

The system accumulates peg counts and usage data on lines, groups of lines, trunks, groups of trunks, service circuits, groups of service circuits, and call processing registers. Peg count and usage data (100-second rate for trunks; 10-second rate for servers with average holding times less than 90 seconds) are automatically output through locally or remotely located devices for the periods consisting of each quarter hour, half hour, and total day. Not all data is printed for each period.

45-06-0100 TYPES OF MEASUREMENTS

45-06-0101 EVENT MEASUREMENTS

Event measurements provide an accumulation of the number of times a specific machine action occurs.

45-06-0102 USAGE MEASUREMENTS

Usage is the duration of a specified condition, normally the busy condition of a server. (A server is a system component that performs operations required for the processing of a call.) It is collected, summed, and accumulated over time intervals which are specified for the type of server.

10.2.16 MEASUREMENT APPLICATIONS - 45-06-0200

45-06-0201 OFFICE TOTALS (BASIC)

Office total measurements provide a picture of the system as a total environment (primarily using type and number of call activities performed) and an indication of system quality in terms of number and type of incompleting activities.

45-06-0201A OFFICE TOTALS (ENHANCED)

This feature enhances the capabilities of the 5ESS[®] switch provided by feature 45-06-0201.

45-06-0202 COMPONENT MEASURES

Standard measurements are provided for each traffic-sensitive system component. A traffic-sensitive

component is a group of servers that provide less than 100 percent switched capacity, that is, a group of servers for which, when all are in use, the probability of another request for use exists. The term "component" includes hardware and, if appropriate, software server groups. The measurements are provided on a per-group basis and reflect the sum of the individual servers in the group.

45-06-0203 NETWORK MEASURES

A system network is a set of common paths used to interconnect various system components required for call processing. The paths are formed by the use of switched link chains, which has the effect of providing wide access using limited servers. The term "network" applies to both space division and time division systems. The network measures are event measures (for example, terminating calls) or usage measures (for example, service circuits usage) that relate to the performance of the network.

45-06-0205 VALIDITY MEASURES

To allow the system data user to judge the reliability of data provided by the system; measurements of data collection efficiency are provided.

45-06-0206 DIVISION OF REVENUE MEASURES

Division of revenue requires that point-to-point traffic measurements, which include call holding times and toll calling volumes, be provided.

45-07-0000 SERVICE MEASUREMENTS

45-07-0100 CUSTOMER ACCESS SERVICE MEASUREMENTS

The measurements provided by this feature are initially very similar to those described for feature 45-06-0000, automatic traffic measurement, and outputted as feature 45-09-0000, traffic measurement output.

45-07-0200 PLANT SERVICE MEASUREMENTS

The measurements provided for this feature are initially very similar to those described for feature 35-09-0000, maintenance measurements, and outputted as feature 35-09-0000, remote maintenance center.

45-07-0200A PLANT SERVICE MEASUREMENTS (MORE)

This feature provides plant service measurements in addition to those provided by feature 45-07-0200.

45-09-0000 TRAFFIC MEASUREMENT OUTPUT

The system provides for an interface with EADAS or equivalent for the output of all accumulated traffic measurements except the quarter-hour traffic measurements which are output on a maintenance or administrative channel.

45-09-0100 ENGINEERING AND ADMINISTRATION DATA ACQUISITION SYSTEM (EADAS) INTERFACE

The system provides an interface to the EADAS. Data transmitted over the data link interface is collected and summarized by EADAS. Network management control signals can be transmitted to the local switching system.

45-10-0000 NETWORK ADMINISTRATION WORK GROUP (NAC) I/O CHANNEL

45-10-0100 NAC VERIFICATION OF TRANSLATION DATA

This feature enables the NAC to verify the switching system translation area of the database through a

direct access I/O channel. Access to this channel may be obtained through an SCCS work station terminal or a dedicated I/O terminal at the NAC. The switching system limits queries on this channel to translation functions relevant to the NAC.

45-10-0200 SYSTEM STATUS INFORMATION RETRIEVAL

This feature enables the NAC to utilize the I/O channel to:

- ☐ Query the switching system for office performance (for example, processor overload) and control status information
- ☐ Receive the previous information automatically on occurrence of status changes
- ☐ Change the control status for essential service protection (ESP).

45-10-0300 TRAFFIC DATA QUERY CAPABILITY

This feature enables the NAC to query the switching system for selected traffic data measurements as a backup to normal data collection and critical network management controls.

45-11-0000 VERIFICATION OF TRAFFIC SCHEDULES

The system, upon request, produces an output of the traffic report from the previous collection interval.

45-13-0000 SERVICE EVALUATION INTERFACE

45-13-0100 SERVICE EVALUATION

The system provides dial line service evaluation. The basic objective is to obtain customer-dialed call data which are then used to provide both quality assessment of the network service delivered to the customer and to direct quality control activities. These measurements reflect the following.

- ☐ How effectively the local and toll dial switching systems complete customer calls. This performance is measured as the percentage of call failures due to equipment blockages and failures and the speed of call advancement measured in terms of average seconds.
- ☐ The effective use of the equipment by the customer. This is measured as the percentage of customer-caused irregularities.

45-13-0200 NO. 2 SERVICE EVALUATION SYSTEM (SES) INTERFACE

The 5ESS[®] switch - No. 2 SES interface is a direct processor-to-processor arrangement which provides the ability to control the sample size of certain call strata and enables enhanced detection of completed calls for which no answer supervision is returned (with significant revenue recovery implications). The 5ESS[®] switch - No. 2 SES interface is not concerned with the transmission quality feature.

45-15-0000 BLACK BOX FRAUD PROTECTION

This capability is provided to detect (a) the absence of supervisory conditions at the called party, once ringing is tripped to avoid charging the calling party, and (b) the called party giving two off-hook signals, both of which are less than the minimum chargeable duration interval. The switch then interrupts the talk path.

45-16-0000 SIGNALING IRREGULARITIES (BLUE BOX FRAUD DETECTION)

This capability is provided to detect changes in supervision on an established connection to an outgoing trunk and the presence of MF digits on the talk path. Should 4 or more MF digits be detected or supervision

continues to change for longer than 5 minutes, the call will be terminated.

45-18-0000 NETWORK MANAGEMENT (NM)

Network management is a set of real-time procedures aimed at optimizing network performance when the network is under stress due to adverse conditions. Network management provides and operates control and surveillance features that aid in maintaining the network's integrity and security during overloads and failures.

Unlike internal switching system overload controls, which modify the internal call processing functions under overload to maximize the efficiency of the switching system, network management controls are aimed at modifying and optimizing the flow of traffic in the entire network.

45-18-0200 MANUAL NETWORK MANAGEMENT CONTROLS

Manual network management controls supplement and augment automatic network management controls. Manual controls also provide more flexibility in coping with situations that require human judgment. Manual controls, such as reroutes, can be expansive in nature. Alternatively, they are protective by canceling or blocking traffic that cannot be completed. Manual controls can be activated and deactivated at NMCs (network management centers) through the system which supports the operation of the NMC or through an on-site NM capability.

45-18-0201 CODE CONTROLS

Manual code controls limit traffic to destination codes. Code controls are most effective for controlling focused overload, a condition characterized by a surge of traffic from many parts of the network to a single office or destination code.

Call gapping regulates the maximum rate at which calls are released towards a destination code.

45-18-0202 TRUNK GROUP CONTROLS

Manual trunk group controls are of two types: protective and expansive. Protective controls can be used to inhibit the spread of congestion in the network by restricting normal trunk group access and overflow. Protective trunk group controls include trunk group cancel and skip controls.

Expansive controls are used to exploit routing beyond the normal in-chain routes, when in-chain routes are busy or have failed, and there exists idle capacity in out-of-chain routes. The control which accomplishes this is called a reroute control.

45-18-0202A TRUNK GROUP CONTROLS (ENHANCED)

The following measurement counters are kept regarding manual trunk group controls:

- ☐ The number of calls to which the SKIP trunk group control was applied
- ☐ The number of calls to which either the cancel to or cancel from trunk group control was applied
- ☐ The number of calls per trunk group control identifier to which the reroute trunk group control was applied
- ☐ The total number of calls to which the reroute trunk group control was applied
- ☐ The number of calls per trunk group control identifier to which the reroute trunk group control was applied, but for which no idle through route was found
- ☐ The total number of calls to which the reroute trunk group control was applied, but for which no idle through route was found.

45-18-0300 NETWORK MANAGEMENT SURVEILLANCE DATA

To support the function of an network management center (NMC), an Operations System (OS), processes network management surveillance data from switching systems within its area of coverage. These data are collected on a regularly scheduled basis.

Every 30 seconds a discrete request message is sent to the local switching system, which responds with a set of discrete (on/off) indicators that show the current state of switching problems and network management controls. Every 5 minutes a data request message is sent to the local switching system, which responds with register readings and on/off flags that describe switching and trunk group performance, switching problems, and results of network management control actions during the most recent 5-minute interval.

45-18-0400 CENTRALIZED NETWORK MANAGEMENT

It is necessary to provide network managers with real-time network surveillance data and manual controls. Network managers in NMCs are expected to intervene in problems for which automatic solutions would be excessively expensive and in problems requiring human judgment.

The functions of the NMC are supported by a computer-based system called Engineering and Administrative Data Acquisition System/Network Management (EADAS/NM). The system collects data in near real time from toll and local offices in a large geographical area, such as a state or metropolitan area. From one EADAS/NM-supported NMC, network managers can monitor and control several hundred switching offices. Local switching systems are connected to the EADAS/NM system through an intermediate computer-based traffic data collection system such as the No. 1A EADAS.

45-18-0401 NM AUDITS AND ALERTS

The EADAS/NM audits and alerts feature communicates to the NMC OS (EADAS/NM), through an intermediate data collection system (No. 1A EADAS), information that is not needed on a regularly scheduled basis.

The switching system maintains lists of trunk group reference and trunk group control status data that the NMC must be able to audit.

Upon receipt of an audit request message, the local switching system sends complete contents of the requested list, either manual trunk group controls or reference data.

45-18-0401A NM AUDITS AND ALERTS (ENHANCED)

This feature enhances the capabilities provided by feature 45-18-0401. It handles command messages from the on-site capability or the NMC and has the necessary changes to handle manual code controls, automatic controls, and carrier interconnect reference data.

Audits may be requested by personnel in the NMC. The EADAS/NM system may issue an audit request for certain information about a switching system to update its own data base. Finally, the EADAS/NM will issue a specific audit request whenever it has received a message-alerting discrete from the switching system.

Message alerting discretely are on/off flags that are received on a regular basis (every 30 seconds or 5 minutes). These alerts indicate that some change (for example, trunk group changes, code control changes, routing changes) has occurred at the switching system. The alerts serve to stimulate EADAS/NM to issue an audit request to get the details of the change. The alerts are turned off after transmitting an audit message to EADAS/NM.

Most audit information may be obtained in one of two forms. One form asks for the full set of information (demand audit), and the other form asks only for the changes since the last request for change information (change audit). The only change audit provided includes TG reference data changes.

45-18-0402 MESSAGE ADMINISTRATION

The message administration feature comprises the functional interactions which take place between the local switching system and the NMC.

The interactions with the NMC OS (EADAS/NM) can take place via an intermediate traffic data collection system (No. 1A EADAS).

45-18-0402A MESSAGE ADMINISTRATION (ENHANCED)

The message administration feature processes the messages used to communicate between the switching system and the EADAS/NM (via EADAS) or the on-site capability. The switching system never transmits messages to EADAS/NM until a request for a message has been received. However, the switching system anticipates some requests (see surveillance data feature) by buffering information for regularly scheduled 5-minute and 30-second requests sufficiently in advance so as to be available when the request is received. Other requests include audit requests and command activation/deactivation requests that are received by the switching machine on an as-needed basis.

All requests received by the switching system result in a response which includes data if the request was an audit, and/or indication as to success or failure of the switching system's ability to comply with the request. The messages that pass between the switching system and EADAS/NM are distinguished on the basis of timing and priority. The priorities from highest to lowest are: discretes (every 30 seconds), control messages (as needed), 5-minute data and flags (every 5 minutes), and audit messages (as needed). Audit messages indicating focused overload, a large number of calls destined for one or a few lines at the same time, are considered the same priority as control messages.

45-18-0403 EADAS/NM INTERFACE

The NM features provide the EADAS/NM interface through the EADAS traffic data collection system. The functions of the NMC are supported by a computer-based system called EADAS/NM. The system collects data in near real time from toll and local offices in a large geographical area, such as a state or metropolitan area. From one EADAS/NM-supported NMC, network managers can monitor and control many switching offices simultaneously. Local switching systems interface with the EADAS/NM system through an intermediate computer-based traffic data collection system such as EADAS (45-09-0100).

45-18-0500 ON-SITE NETWORK MANAGEMENT CAPABILITIES

For backup in the event of a loss of contact with the OS which supports the NMC, the local switching office provides the capability to accept critical network management messages on input/output channels not connected to the NMC OS. These backup channels include maintenance and/or administrative channels which are usually accessible from the SCCS and/or the NAC. The local switching system will respond to network management control messages and audit requests on the backup channel. Personnel at the NMC will communicate by voice with personnel in work centers which have access to backup channels.

Additionally, the 5ESS[®] switch provides the ability to:

- (1) Retrieve 5-minutes NM surveillance data
- (2) Display 30-second NM discrete information
- (3) Handle miscellaneous NM related messages.

This feature provides the primary access to all the 5E2(1) NM features for applications where EADAS/NM is not available.

More specifically, the on-site NM capability permits a network manager to:

- (1) Install or remove all types of manual controls

- (2) Specify automatic control parameters
- (3) Retrieve NM interest data
- (4) Administer the 5E2(1) NM capabilities.

Many new input and output messages are associated with the on-site NM capability.

45-19-0000 TRUNKS OUT-OF-SERVICE FOR DATA CHANGES

Trunks are removed from service before trunk data changes are made to avoid possible adverse effects on calls.

10.2.17 CUTOVER AND GROWTH FEATURES - 50-00-0000

50-01-0000 ON-LINE GROWTH PROCEDURES AND TESTS

The system provides the capability of adding, changing or removing equipment to an existing operational system with no degradation of system service. This requirement applies to major functional equipment, peripheral equipment, and minor functional equipment. Test facilities are also provided during the previous operations.

50-02-0000 AUTOMATIC BOARD-TO-BOARD TESTING

Board-to-board testing is performed prior to the transfer of a number of customer lines from one telephone switching office (or offices) to another. There are two distinct applications for this feature. The first application is office cutovers where one office is replacing another office (or offices). The second is an area transfer between two offices.

Board-to-board testing ensures that the connections of transferred lines to the new office are correct with respect to the existing connections of these lines to the old office (or offices).

Automatic board-to-board testing utilizes the program capabilities of the system in order to perform board-to-board testing in an automatic manner with minimal disturbance to the customer lines either in the idle or busy state.

50-02-0000A AUTOMATIC BOARD-TO-BOARD TESTING (ENHANCED)

This feature enhances the capabilities provided by feature 50-02-0000. It permits testing of transferred lines from offices which have only a no-test trunk as a means of test access.

10.2.18 BILLING AND COMPTROLLERS FEATURES - 55-00-0000

55-01-0000 AUTOMATIC MESSAGE ACCOUNTING (AMA)

The AMA feature provides billing information concerning the control, collection, and recording of calls charged and other pertinent information as a record for the call billing process. The AMA feature has the major subsets local AMA (LAMA), centralized AMA (CAMA), and AMA Teleprocessing which are described in the following paragraphs.

Except for CAMA (Feature No. 55-01-0300), all other AMA systems must register or transmit the billing information in a standard format.

55-01-0100 LOCAL AUTOMATIC MESSAGE ACCOUNTING (LAMA)

The LAMA feature provides control, collection and local recording of billing information and other pertinent information on magnetic tape. Specific billing details such as calling customer's telephone number, called customer's telephone number, time of answer, elapsed time, and billing class of service should be detected

and recorded accurately for individual and 2-party lines. The 5ESS[®] switch billing formats for local AMA to tape are identical to the feature AMA teleprocessing, 55-01-0400, and not to the standards which most service providers think of when referring to LAMA. In particular, the information is formatted and stored on disk at the time it is generated, and copied to tape at a later time. If something should happen to the tape, the information can be recopied to another tape, provided the original disk space has not yet been used for newer data.

55-01-0300 CONNECTION TO CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA) OFFICES

The CAMA feature is provided by a distant switching system for the control, collection, and recording of billing information and other pertinent information for class 5 offices. The interface between the switching system and the CAMA system requires dedicated trunks and trunk groups. The switching system outpulses all called number digits and the calling line directory number digits of lines arranged for automatic number identification (ANI). Calls routed to the CAMA system from lines that are not arranged for ANI are referred to as calls requiring operator number identification (ONI).

The ANI type calls require unique identification which is outpulsed from the local switching system. Calls routed to the CAMA facility which encounter ANI failures within the local switching system prior to outpulsing also are provided unique identification.

55-01-0400 AMA TELEPROCESSING

With this feature, the switching system forwards call billing information, over a data link, to a centralized AMA data collection system. The collection system, in turn, interfaces with an revenue accounting office (RAO) which processes the billing information. As in feature 55-01-0100, if something should happen to the data after it has been teleprocessed, the information can be retransmitted, provided the original disk space has not yet been used for newer data.

55-02-0000 AMA RECORDING FOR SPECIAL STUDIES

Distinguishing marks are provided in the AMA records of calls involved in each of the following types of special studies.

55-02-0200 COMPLAINT OBSERVING

Complaint observing is used for customers who question their message rate bills. Lines marked for complaint observing have complete AMA details recorded for all AMA attempts and completions, and the AMA records are uniquely marked.

55-02-0300 TRAFFIC SAMPLING

Traffic sampling is normally used for coin and CCSA lines for division of revenue and billing and usage reports. Lines marked for traffic sampling have complete AMA details recorded on all normal AMA records, and the records are uniquely marked.

55-02-0400 SUBSCRIBER LINE USAGE

Customer line usage studies are used to determine measured service tariffs and to determine tariff effects. Lines marked for study have detailed AMA records produced for all attempts and completions, whether or not the calls would ordinarily be AMA calls, and the records are uniquely marked. Furthermore, records produced for free calls carry an additional distinguishing mark.

55-03-0000 BILLING SERVICES

Dependent upon the AMA feature arrangements of a local switching system, the following are typical billing services which should be provided.

55-03-0100 CLASS OF SERVICE - BILLING

The class of service, or charge class, controls a call's charging and billing treatment. Each line should be assigned a class of service, except that a line may not be assigned to a class of service corresponding to a service not offered by the office. Typical classes of service are as follows:

- (A) Flat rate (01-02-1800)
- (B) Message rate (several classes) (01-02-1900)
- (C) Coin service (10-01-0000 through 10-02-0000)
- (D) OUTWATS billing (01-02-2004)
- (E) INWATS billing (01-02-2002).

55-03-0200 AMA DETAILED RECORD ON TIMED AND UNTIMED MESSAGE UNIT (MU) CALLS

This feature provides the ability to record, when required by changeable office data parameters, the called number and/or message billing index on message-rate calls.

55-03-0300 CALLING AREA ASSIGNMENTS

Allowable calling areas should be defined for the various service classes to which customer lines may be assigned. These areas are flat-rate, message-rate, local coin, and OUTWATS areas. In addition, toll calls should be recognizable. This also applies to IDDD calls if IDDD capability is provided.

55-03-0500 DIRECTORY ASSISTANCE CHARGING

Dependent upon AMA billing arrangements of the local switching system, the capability of charging for directory assistance calls is provided.

55-03-0600 FREE CALLS

Subscriber calls originating at a local office to certain destinations generate billing records which prevent charging (free calls). Examples of possible free calls are calls to service codes (for example, 411, 555). Calls to NPA directory assistance bureaus (NPA-555-XXX) do not require special AMA records; they are currently not billed because of RAO screening of the called number. Other calls, such as calls to assistance operators (0, 0+) are billed on the basis of records generated in other systems (TSPS), and no billing record is generated at the originating local office. Calls to lines in the same office with free terminating class of service should either not generate a billing record or be appropriately identified so as to preclude billing. Provisions should be made to construct AMA records for free calls, when required; these records should be uniquely marked.

55-06-0000 VERIFICATION OF BILLING NUMBER ASSIGNMENTS

This feature provides the capability to verify through a TTY input message single or multiple assignments of billing numbers to directory numbers or terminal numbers.

55-07-0000 BILLING RECORDS OF WATS CALLS

The AMA records furnish complete and detailed information on WATS calls, for example, WATS band number, calling number, etc.

55-08-0000 AMA REEL MOUNTING PROTECTION AND AUTOMATIC POSITIONING

The AMA check programs prevent improper mounting of reels and eliminate the possibility of improper positioning of the beginning-of-tape mark by the switch personnel. The mark will be positioned

automatically after a new reel of tape has been mounted on the AMA transport.

10.2.19 TOLL FEATURES - 60-00-0000

Toll offices are the switching entities in the long distance trunking network through which any direct distance dialing (DDD) telephone may be reached if a direct trunk is unavailable. The toll office features that are defined herein apply to an office used for class 4 toll center (Class 4C) operation. A class 4C type of operation is defined in the "Notes on the Network."

COMBINED OFFICE

A single switching system which is capable of providing more than one of the fundamental switching functions (local, tandem, toll) is called a combined office. These offices are denoted by local/toll, local/tandem, toll/tandem, and local/toll/tandem as appropriate. On a given call, such an office may serve either one or two of these functions. If two functions are served, one must be the local function.

60-01-0000 DOMESTIC TOLL OFFICE TRUNKS

Trunk names differ to some degree among various standard references.

The nomenclature and two letter codes, by traffic use, utilized herein are known as *Common Language*® codes.

The trunks discussed herein are known by the same names regardless of whether they appear on a system that performs only the toll office function or other class of office functions (local or tandem) as well. In the following paragraphs, the assigned codes by traffic use are shown in parentheses. A few of the trunks discussed in this section do not yet have *Common Language*® codes assigned to them.

Trunks that may appear on a toll switching system depending on specific features provided in the office include:

- ☐ Toll connecting
- ☐ DDD access (DD)
- ☐ Centralized automatic message accounting (CA)
- ☐ Traffic Service Position System (SP)
- ☐ Toll completing (TC)
- ☐ 2-Way operator office (OO)
- ☐ 2-Way toll connecting (not coded).

Intertoll

- ☐ Primary intertoll (IT)
- ☐ Emergency access (not coded)
- ☐ Regular access (not coded)
- ☐ TSPS verification (not coded).

Secondary intertoll

- ☐ Toll tandem (TT)
- ☐ Operator assistance (OA) and leave word (LW)
- ☐ Residual (not coded)
- ☐ Delayed call (DC).

Auxiliary service

- ☐ Rate and route (RR)
- ☐ Rate-quote (not coded)
- ☐ Directory assistance (IN) (DA)
- ☐ Time (TI) and weather (WE).

Special service trunks

- ☐ Direct inward dialing (DI)
- ☐ INWATS (WI).

Miscellaneous trunks

- ☐ CAMA - operator (CP)
- ☐ Data processing systems (not coded)
- ☐ Trouble reporting (not coded).

60-01-0100 TOLL CONNECTING TRUNKS

Toll connecting trunks are trunks between a local office (class 5 office) and a toll office (class 4, 3, 2, or 1). The trunks may be 1-way local to toll, or 1-way toll to local, or two-way.

60-01-0101 DDD ACCESS TRUNKS

The DDD access trunks are 1-way trunks from a class 5 office to a toll office carrying noncoin toll traffic. The recording and timing of the call is done at the class 5 office and operator assistance is never required.

60-01-0102 CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA) TRUNKS

The CAMA trunks are 1-way trunks from a class 5 office to a toll office carrying noncoin toll traffic. The recording and timing of the call are done at the toll office. The ANI feature is normally used for the identification of the directory number of the calling party. Certain kinds of calls, such as those from a multiparty line or those encountering an ANI failure in the class 5 office, require identification by a CAMA operator at the toll office who obtains the directory number verbally [operator number identification (ONI)]. A CAMA trunk may serve a local office unequipped with ANI in which case ONI applies on all calls.

60-01-0103 TRAFFIC SERVICE POSITION SYSTEM (TSPS) TRUNKS

The Traffic Service Position System (TSPS) trunks are 1-way trunks extending from a class 5 office to a TSPS No. 1 and then to a toll office. These trunks carry dial assistance, special toll, coin, and noncoin traffic. The toll office is an outlet to the DDD network for long-haul calls and also for short-haul calls to a

class 5 office in the same toll center area. The TSPS does the call rating and charge recording functions. The TSPS operator collects coins, redirects the call (if necessary), initiates charge timing, and does other necessary operator functions.

In some sparsely populated locations, a TSPS, instead of the toll office, serves as the CAMA office. The 1+ noncoin traffic may be combined with special toll traffic or may be handled on a separate trunk group. When handled on a separate trunk group, the trunks at the toll office are identical to (SP) trunks and are so coded.

60-01-0104 TOLL COMPLETING (TC) TRUNKS

Toll completing trunks are one-way outgoing trunks from a toll office to a class 5 office. In some literature they are called toll switching trunks, and in other literature they are called tributary trunks.

60-01-0106 TWO-WAY TOLL CONNECTING TRUNKS (NOT CODED)

Most toll connecting trunks today are 1-way; either incoming to the toll office (DDD access) or outgoing from the toll office (toll completing). Two-way toll connecting trunks combine DDD access and toll completing trunk functions. Long-haul, two-way toll connecting trunks are known as end office toll (EOT) trunks.

60-01-0200 INTERTOLL TRUNKS

In addition to the trunks that connect any class 1 through class 4 toll office with any other class 1 through class 4 toll office, the term intertoll has recently been extended to cover other types of trunks such as emergency access trunk, TSPS verification trunk, and regular access trunk since their transmission characteristics are identical to intertoll.

60-01-0201 PRIMARY INTERTOLL (IT) TRUNKS

A primary intertoll trunk is a trunk that connects any class 1 through class 4 toll office with any other class 1 through class 4 toll office.

60-01-0203 REGULAR ACCESS TRUNKS

Operators are sometimes given direct access to primary intertoll trunks on a routine basis in some earlier types of Bell System toll switching offices. Some independent companies with more recent types of switching offices continue this practice. Therefore, the receiving toll office cannot tell whether the incoming call is operator-originated or switching office-originated when such trunks are served. The 5ESS[®] switch includes this as part of the secondary intertoll capability.

60-01-0204 TSPS VERIFICATION TRUNKS

A TSPS verification trunk is a 1-way trunk from a TSPS to a toll office. It has been classified by transmission engineering as an intertoll trunk. The verification classification and specification differs from the classification and specification for a similar trunk - delayed call trunk which is limited to the secondary intertoll category. The verification trunk is used by a TSPS operator to reach, through the toll office, either a toll connecting or an intertoll trunk dedicated for verification service. Over these dedicated trunks, a TSPS operator can verify the busy or idle status of a called line in a prearranged selection of nearby or distant class 5 office.

60-01-0300 SECONDARY INTERTOLL TRUNKS

Transmission literature categorizes trunks from the toll switch to their associated switchboard and trunks from an associated toll switchboard (or TSPS No. 1) to the toll switch as secondary intertoll since their transmission characteristics are similar to intertoll trunks but not identical in every respect. Secondary intertoll trunks are subdivided as discussed in the following sections.

60-01-0301 TOLL TANDEM (TT) TRUNKS

Toll tandem trunks are trunks from a switchboard to a toll office and are used for originating outward traffic and for the completion of assistance and leave-word traffic where a TSPS is not available. Residual traffic received from TSPS operators is also completed by switchboard operators through toll tandem trunks.

60-01-0302 OPERATOR ASSISTANCE (OA) AND LEAVE-WORD (LW) TRUNKS

Trunks in this category connect a toll office to an assistance operator or to a leave-word operator at a cord switchboard. Both types of operators are reached only by operators at their own toll center or by operators at some distant toll center. These leave-word and assistance operators assist other operators, at switchboards or at TSPS, who may be at a distant location or in the same area, in such functions as verification of line busy, completion of calls to mobile or marine stations, and the completion of calls originated earlier by a customer in the toll center where the leave-word operator is located. Leave-word and assistance operators may advance the call through the toll office using toll tandem trunks or they may use toll switching trunks or operator-office trunks directly to a class 5 office.

"Operator assistance" and "leave-word" trunks also exist between a toll system and a TSPS No. 1 and are used when this traffic is handled by a TSPS operator. Operator assistance and leave-word trunks associated with a TSPS are joined at the TSPS through their respective trunk circuits to the equivalent of toll tandem trunks. These trunks are used by a TSPS operator to complete "operator assistance" and "leave-word" traffic through the toll office. A TSPS operator unlike a cord switchboard operator does not have direct access to toll switching trunks or to operator-office trunks.

60-01-0303 RESIDUAL TRUNKS

The TSPS operators handle most types of calls without the assistance of another operator. The category of calls that the TSPS operator is not equipped to handle are called "residual calls," and these are advanced by the TSPS operator through the associated toll office to an operator at a 3CL switchboard called the special operator service traffic (SOST) board or equivalent. This operator then advances the call (via a toll tandem trunk) as appropriate. Marine, mobile, and conference calls are typical. A subset of these calls are handled with TSPS continuing support through special wink signals.

60-01-0304 DELAYED CALL (DC) TRUNKS

A TSPS operator uses a "delayed call" trunk to reach both the calling and called parties by setting up two separate connections through the toll office. The called and calling parties are joined at the TSPS through the delayed call trunk circuit which has two trunk appearances on the toll office. The toll office treats the delayed call trunk as two separate and distinct incoming trunks.

60-01-0400 AUXILIARY SERVICE TRUNKS

Some trunks associated with a toll switching office are not used to advance a call to another office. These include (1) rate and route trunks, (2) rate quote trunks, (3) directory assistance trunks, and (4) time and weather trunks.

60-01-0401 RATE AND ROUTE TRUNKS

Rate and route trunks are 1-way trunks from a toll office to operators at cord switchboards or desks. Originating operators place calls to these operators to obtain dialing instructions (area code, etc.) and charging rates for operator-assisted calls to infrequently called localities. After obtaining the needed information, the originating operator releases the connection to these special operators and then places the outgoing call in a normal manner.

60-01-0403 DIRECTORY ASSISTANCE TRUNKS (IN) (DA)

These are 1-way trunks between a toll office and a No. 5 ACD (automatic call distribution) system through which directory assistance operators are reached. The code (DA) is assigned to trunks used for local

directory assistance traffic (dial code 411) at this time, but it will shortly be assigned to both toll and local trunks. There may be either one group of trunks or two groups of trunks; one (IN) for toll assistance and one (DA) for local assistance when these latter calls are routed to the toll office to reach the ACD.

60-01-0500 SPECIAL SERVICE TRUNKS

60-01-0501 DIRECT INWARD DIALING (DID)

The DID feature permits dialing a DDD call directly to the PBX extension. This reduces the number of attendants and positions that a large business customer has to provide to handle incoming calls.

The DID trunks to PBXs directly from toll offices give load relief to class 5 offices with large PBX customers. The DID terminating calls are handled by the toll office as though completion is to a SXS local office. Dial pulse is the only type of pulsing used to all PBXs, whether of the SXS type, crossbar type, or *ESSTM* type although studies of touch-tone pulsing are underway for some applications.

60-01-0600 MISCELLANEOUS TRUNKS

This category comprises trunks provided for traffic administration, plant maintenance and administrative purposes, or trunks that do not fall within other specified categories.

60-01-0601 CAMA-OPERATOR TRUNKS

The CAMA operator trunks are required at a toll office to connect to an operator on CAMA-billed calls requiring ONI of the calling number. The *5ESS[®]* switch provides this capability via TSPS access. Two concurrent connection paths are required between the local/toll office and the operator position. One path is to be used for talking (requesting and providing the calling number), and the other for signaling (MF outpulsing the calling number) to the local/toll office for CAMA recording.

60-02-0000 CALL PROCESSING FEATURES

60-02-0100 TRUNK-TO-TRUNK TEST CONNECTIONS

This is the capability of setting up or disconnecting stable connections between various trunks and service or test circuits either in response to manual requests (made through teletypewriters) or as a part of the switching function. These connections should meet the established Bell System toll transmission requirements.

60-02-0200 3-DIGIT TRANSLATION

Three-digit translation in conjunction with an address length count for the complete thousand "XXX" combinations. Included would be the translation of (a) 200 "0/1XX" terminating toll center (TTC) codes, operator codes, etc., (b) 800 "NXX" central office and other special purpose codes, and (c) 800 "NXX" area codes. Refer to Section 2 of the "Notes on the Network."

60-02-0201 0/1XX TERMINATING TOLL CENTER AND OPERATOR CODES

This is the ability to translate the two hundred 3-digit codes of the form 0/1XX made available to operators or generated by the system for certain toll calls to modify routing or call-handling logic. Examples of these codes are terminating toll center and operator codes and machine-generated codes used for routing such calls as inward wide area telephone service (WATS) and international calls.

60-02-0202 NXX CENTRAL OFFICE AND SPECIAL PURPOSE CODES

This is the ability to translate the eight hundred NXX codes comprising central office codes, special purpose codes such as 555 for toll directory assistance and 844 for time, and service codes such as 411 and 911.

60-02-0203 NXX AREA CODES

This is the ability to translate the area codes which are currently of the form N 0/1X but are to be expanded to the form NXX by the turn of the century.

The entire United States and Canada, certain Caribbean Islands, and part of Mexico have been divided geographically into NPAs (number plan areas) and assigned NPA codes. In addition, a few NPA codes have been assigned for special purposes such as 800 for inward WATS and are known as SACs (special area codes). These NPA codes, commonly referred to as area codes, are presently of the form N 0/1X. It is estimated that by 1995 all currently unused N 0/1X numbers will have been assigned. The present plan calls for then adopting the NXX form for area codes.

60-02-0300 6-DIGIT TRANSLATION

This is the ability to make a 6-digit translation for NPAs in conjunction with an address length count. This is required when an foreign NPA (FNPA) can be reached by more than one route. There are also situations where 6-digit translation applies to a central office code and subsequent digits as well as to toll center codes and subsequent digits.

60-02-0400 DIGIT DELETION

This is the ability to delete a number of digits before outpulsing them to the next office.

60-02-0500 DIGIT PREFIXING

This is the ability to prefix 1 to 6 digits to the incoming address starting from the most significant digit position of the incoming code format. Prefixed digits consist of decimal values only, and the maximum length of the outgoing code format is 14 digits for national calls.

60-02-0600 CODE CONVERSION

This is the ability to substitute for some or all of the routing digits received. This feature provides flexibility of meeting numbering plan requirements by furnishing routing digits for certain systems in the network. For example, an established step-by-step train may require routing digits which differ from those provided by the 7-digit numbering plan. This is a combination of digit deletion and digit prefixing since the conversion is limited to leading digits.

60-02-0700 ROUTE ADVANCE LOGIC

This is the ability to determine the alternative routing choices based on the received digits and incoming trunk information. The route advance logic provides for at least seven alternative routes where each route may have alternative choices of trunk subgroups. The route advance logic is expandable.

60-02-0800 INTERNATIONAL DIRECT DISTANCE DIALING (IDDD) VIA FUNCTION

The IDDD - through function provides for an appropriate trunk-to-trunk connection after the translation of the "011XXX" digits which are received during the first stage of pulsing on IDDD calls. After transmission of the 011XXX digits, there is no delay in readiness to detect a delay dial from a gateway office ahead.

60-02-0900 CAPABILITY FOR SATELLITE CONNECTIONS

Long-haul trunks may, in certain circumstances, be derived in part from satellite transmission facilities. When this is done, echo control arrangements, either split suppressors or split cancelers, must be provided at each trunk end or at an alternative location closer to the end of the connection.

Furthermore, when conventional MF, delay dial signaling is used on a satellite trunk, normal "pumping" protection must be modified to compensate for the added round trip propagation of a short off-hook transient around a circuitous trunk transmission path between two switches. With conventional MF signaling, whether wink or delay dial, trunk guard time should be extended to fall in the range of 1050 to 1250 ms. With CCIS, no special timing adjustments are required. It is assumed that not more than one

satellite in synchronous orbit will be used for one trunk.

60-02-1000 RECORDED ANNOUNCEMENT SERVICE (TOLL)

Recorded announcement service provides various verbal announcements for connection to incoming trunks whenever appropriate conditions are encountered. An incoming trunk is connected to an announcement channel whenever vacant code, partial dial, equipment busy, blockage, or disaster conditions are encountered. The messages are structured to explain the condition to the customer and cause a change in subsequent attempts as applicable. Calls routed to these announcements return answer supervision to the originating office. Announcements are provided on a non-barge-in basis.

60-02-1200 VACANT CODE SCREENING

This is the capability to establish a connection to an announcement trunk at the operating companies option for all unassigned numbering plan area and central office codes.

60-02-1300 TRUNK CLASS SCREENING

This is the capability to restrict incoming trunk groups from certain dialing patterns.

60-02-1400 CAMA UNAUTHORIZED CODE SCREENING

This is the capability to restrict incoming CAMA trunk groups from certain dialing patterns.

60-02-1500 CAMA FOR ADJACENT NPAs

The toll system provides the capability of handling calls by CAMA from the CAMA home numbering plan area (HNPA) plus up to four adjacent NPAs.

60-03-0000 TOLL SIGNALING

60-03-0100 CCS TRUNK SIGNALING

This feature employs data links, distinct from the voice paths, to transfer information between signal transfer points (STPs) in the toll network. This information consists of supervisory and address signals, as well as supplementary information for customer services and network features.

60-03-0200 INTEROFFICE TRUNK SIGNALING (TOLL)

Signaling between toll exchanges is essentially the same as between local exchanges. Additional signals associated with operator systems are used on toll exchanges. They are ring forward, an on-hook wink used by an operator system to recall an operator in the forward direction, and double ring forward used by TSPS No. 1 to signal a cordboard that the originating station has disconnected. Dual tone multifrequency signals and coin signals are not used between toll exchanges.

60-04-0000 LINE AND TRUNK TEST FEATURES

60-04-0100 TEST LINES

60-04-0102 103-TYPE TEST LINE

This provides for overall tests of the supervisory and signaling features of conventional intertoll trunks.

60-04-0103 104-TYPE TEST LINE

This provides a test termination for two-way loss measurements and 1-way noise checking. The termination can be used to test trunks outgoing from offices equipped with manual testboards or with certain automatic equipment.

60-04-0200 MULTIPLE TRUNK TEST CAPABILITY

Switch personnel at TLWSs (trunk and line work stations) and CTTUs (centralized trunk test units) can perform tests simultaneously on several trunks.

60-04-0500 SELECTION OF TRANSMISSION TEST LEVELS (TLP2, TLP3)

For trunks which can operate in either a local or toll mode, the switch recognizes both local and toll test line calls and adjusts trunk circuit loss appropriately.

60-04-0600 FX LINES FOR ROTL IN TOLL AND TANDEM OFFICES

This feature provides for CAROT access to ROTL in toll and tandem offices not assigned an office code. Access to the toll ROTL is provided through a ground-start line originating at a nearby central office. This line is assigned a directory number in the central office, and this number is used by CAROT to access the toll ROTL. The line is converted to a T1 channel by a D4 channel bank in the central office. The T1 line terminates on a digital line and trunk unit (DLTU) at the toll switch, where the channel is a dedicated ROTL access port.

60-04-0700 TWO-WAY TRUNK MAINTENANCE

A trunk out-of-service state, designated as the lockout state, is provided for two-way trunks. In this state, outgoing calls are blocked, but incoming calls are accepted. A second state, which blocks calls in both directions is provided and designated as the desirable state.

60-04-0800 QUICK 'GO OR NO-GO' TRUNK TEST

The system should provide an automatic, quick "go or no-go" type trunk test. This test can be similar to the voice path assurance test used for CCIS trunks or the signaling lead integrity test used for non-CCIS trunks.

60-04-0900 VOICE PATH ASSURANCE (VPA) TEST

This feature allows the 5ESS[®] switch to perform voice path assurance tests for CCS trunks. This test ensures the integrity of the voice path since the signaling path and voice path are separate on CCS trunks.

60-05-0000 NETWORK MANAGEMENT FEATURES

Network management is a set of real-time procedures aimed at optimizing network performance when the network is under stress due to adverse conditions. Network management provides and operates control and surveillance features that aid in maintaining the network's integrity and security during overloads and failures.

Unlike internal switching system overload controls, which modify the internal call processing functions under overload to maximize the efficiency of the switching system, network management controls are aimed at modifying and optimizing the flow of traffic in the entire network.

60-05-0100 AUTOMATIC NETWORK MANAGEMENT CONTROLS

Automatic network management controls respond dynamically to switching office and trunk group congestion and failures.

60-05-0200 MANUAL NETWORK MANAGEMENT CONTROLS

Manual network management controls supplement and augment automatic network management controls. Manual controls also provide more flexibility in coping with situations that require human judgment. Manual controls, such as reroutes, can be expansive in nature. Alternatively, they are protective by canceling or blocking traffic that cannot be completed. Manual controls can be activated and deactivated at NMCs (network management centers) through the system which supports the operation of the NMC or through an

on-site NM capability.

60-05-0201 CODE CONTROLS

Manual code controls limit traffic to destination codes. Code controls are most effective for controlling focused overload, a condition characterized by a surge of traffic from many parts of the network to a single office or destination code.

Call gapping regulates the maximum rate at which calls are released towards a destination code.

60-05-0202 TRUNK GROUP CONTROLS [TOLL]

Manual trunk group controls are of two types: protective and expansive. Protective controls can be used to inhibit the spread of congestion in the network by restricting normal trunk group access and overflow. Protective trunk group controls include trunk group cancel and skip controls.

Expansive controls are used to exploit routing beyond the normal in-chain routes, when in-chain routes are busy or have failed, and there exists idle capacity in out-of-chain routes. The control which accomplishes this is called a reroute control.

60-05-0300 NETWORK MANAGEMENT SURVEILLANCE DATA

To support the function of a network management center (NMC), an Operations System (OS), processes network management surveillance data from switching systems within its area of coverage. These data are collected on a regularly scheduled basis.

Every 30 seconds a discrete request message is sent to the local switching system, which responds with a set of discrete (on/off) indicators that show the current state of switching problems and network management controls. Every 5 minutes a data request message is sent to the local switching system, which responds with register readings and on/off flags that describe switching and trunk group performance, switching problems, and results of network management control actions during the most recent 5-minute interval.

60-05-0400 CENTRALIZED NETWORK MANAGEMENT

It is necessary to provide network managers with real-time network surveillance data and manual controls. Network managers in NMCs are expected to intervene in problems for which automatic solutions would be excessively expensive and in problems requiring human judgment.

The functions of the NMC are supported by a computer-based system called Engineering and Administrative Data Acquisition System/Network Management (EADAS/NM). The system collects data in near real time from toll and local offices in a large geographical area, such as a state or metropolitan area. From one EADAS/NM-supported NMC, network managers can monitor and control several hundred switching offices. Local switching systems are connected to the EADAS/NM system through an intermediate computer-based traffic data collection system such as the No. 1A EADAS.

60-05-0401 NM AUDITS AND ALERTS (TOLL)

The EADAS/NM audits and alerts feature communicates to the NMC OS (EADAS/NM), through an intermediate data collection system (No. 1A EADAS), information that is not needed on a regularly scheduled basis.

The switching system maintains lists of trunk group reference and trunk group control status data that the NMC must be able to audit.

Upon receipt of an audit request message, the local switching system sends complete contents of the requested list, either manual trunk group controls or reference data.

60-05-0401A NM AUDITS AND ALERTS (ENHANCED, TOLL)

This feature enhances the capabilities provided by feature 45-18-0401A. It handles command messages from the on-site capability or the NMC and has the necessary changes to handle manual code controls, automatic controls, and carrier interconnect reference data.

Audits may be requested by personnel in the NMC. The EADAS/NM system may issue an audit request for certain information about a switching system to update its own data base. Finally, the EADAS/NM will issue a specific audit request whenever it has received a message-alerting discrete from the switching system.

Message alerting discrettes are on/off flags that are received on a regular basis (every 30 seconds or 5 minutes). These alerts indicate that some change (for example, trunk group changes, code control changes, routing changes) has occurred at the switching system. The alerts serve to stimulate EADAS/NM to issue an audit request to get the details of the change. The alerts are turned off after transmitting an audit message to EADAS/NM.

Most audit information may be obtained in one of two forms. One form asks for the full set of information (demand audit), and the other form asks only for the changes since the last request for change information (change audit). The only change audit provided includes TG reference data changes.

60-05-0402 MESSAGE ADMINISTRATION (TOLL)

The message administration feature comprises the functional interactions which take place between the local switching system and the NMC.

The interactions with the NMC OS (EADAS/NM) can take place via an intermediate traffic data collection system (No. 1A EADAS).

60-05-0402A MESSAGE ADMINISTRATION (ENHANCED, TOLL)

The message administration feature processes the messages used to communicate between the switching system and the EADAS/NM (via EADAS) or the on-site capability. The switching system never transmits messages to EADAS/NM until a request for a message has been received. However, the switching system anticipates some requests (see surveillance data feature) by buffering information for regularly scheduled 5-minute and 30-second requests sufficiently in advance so as to be available when the request is received. Other requests include audit requests and command activation/deactivation requests that are received by the switching machine on an as-needed basis.

All requests received by the switching system result in a response which includes data if the request was an audit, and/or indication as to success or failure of the switching system's ability to comply with the request. The messages that pass between the switching system and EADAS/NM are distinguished on the basis of timing and priority. The priorities from highest to lowest are: discrettes (every 30 seconds), control messages (as needed), 5-minute data and flags (every 5 minutes), and audit messages (as needed). Audit messages indicating focused overload, a large number of calls destined for one or a few lines at the same time, are considered the same priority as control messages.

60-05-0500 BACKUP NETWORK MANAGEMENT CAPABILITIES

For backup in the event of a loss of contact with the OS which supports the NMC, the local switching office provides the capability to accept critical network management messages on input/output channels not connected to the NMC OS. These backup channels include maintenance and/or administrative channels which are usually accessible from the SCCS and/or the NAC. The local switching system will respond to network management control messages and audit requests on the backup channel. Personnel at the NMC will communicate by voice with personnel in work centers which have access to backup channels. Additionally, the 5ESS[®] switch provides the ability to:

- ☐ Retrieve 5-minutes NM surveillance data
- ☐ Display 30-second NM discrete information

- ☐ Handle miscellaneous NM related messages.

This feature provides the primary access to all the 5E2(1) NM features for applications where EADAS/NM is not available.

More specifically, the on-site NM capability permits a network manager to:

- ☐ Install or remove all types of manual controls
- ☐ Specify automatic control parameters
- ☐ Retrieve NM interest data
- ☐ Administer the 5E2(1) NM capabilities.

Many new input and output messages are associated with the on-site NM capability.

10.2.20 BILLING FEATURES - 60-06-0000 - 96-TP-1009

60-06-0100 TOLL CAMA BILLING THROUGH AUTOMATIC MESSAGE ACCOUNTING COLLECTION SYSTEM (AMACS)

This feature provides for toll billing from class 5 central offices on an ANI and ONI basis. The CAMA billing information is registered by the AMA recording arrangement serving the exchange (feature 55-01-0000). This recording arrangement must be other than feature 55-01-0300. CAMA currently interfaces with all billing systems supported on the 5ESS[®] switch.

60-06-0110 CAMA SUSPENSION

This feature permits operators handling CAMA-ONI calls to vacate their positions during emergency conditions without causing service interruption. The CAMA suspension can only be initiated at the MCC, and a minor alarm will be given when suspension is in effect. The CAMA calls affected by suspension are not billed. Appropriate audible and visual signals are provided. Safeguards are provided so that trouble conditions cannot falsely cause the CAMA suspension to be put into effect.

60-07-0000 800 SERVICE - ORIGINATING SCREENING OFFICE

This feature allows a toll office to access a remote database after a 3-digit "800" translation and determine, (a) whether or not a specific 800 Service (INWATS) call can be completed, and (b) if it can be completed, a DDD number to which the call can be forwarded. The CCIS direct signaling messages are used to communicate between the OSO and a remote database.

60-10-0000 ECHO CONTROL

60-15-0000 LOCAL TOLL SYNCHRONIZATION

Local toll synchronization assures that a class 4/5 time division switch adequately conforms to the network synchronization objectives.

60-16-0000 TRAFFIC MEASUREMENTS (TOLL)

A local/toll office requires traffic measurements supplementary to those required by a local exchange system. These additional measurements fall into four categories: (1) additional office totals, (2) division of revenue measurements, (3) network management measurements, and (4) measurements related to CAMA operation.

60-17-0000 PLANT MEASUREMENTS (TOLL)

Requirements for registration, strategy, measurement accuracy, and integrity are the same as for local switching systems. Additional base, service, and performance measurements are required to provide separation between local and toll functions of the switching system.

96-5E-2697 ABILITY TO DROP FULLY RESTRICTED TERMINATING LEG OF A MWAY CALL

When a Multi-way user tries to form a Multi-Way call (for example, 3-way calling, or 6-way Conference) (by flashing, dialing a DN, and flashing again) with an outside the Terminal Group calling party and a fully restricted terminating station within the same terminal group, the Multi-way user should be connected to the calling party and the fully restricted terminating station should be dropped, at the time the multi-way controller makes the second flash.

The feature applies to the following Multi-way feature attempts by the Multi-way controller. These features in general allow the controller to form a multi-way calling involving an outside the Terminal group party and a fully restricted terminating party.

- ☐ Add-On Consultation Hold - Incoming Only
- ☐ 3-Way Calling
- ☐ 6-way Conference Calling (only for the first added leg).

For 6-way conference, the feature will only apply for the first added party to the conference; it does not apply to a subsequent added party to the conference.

The feature applies to analog (including shared analog) stations. The feature does not apply to ISDN stations.

ISDN stations can press the DROP button to disconnect the Fully Restricted terminal and press the Call Appearance button to connect to the held party.

96-TP-1009 I/O MESSAGE TO OBTAIN SS7 CODE NUMBERS

This feature, introduced in 5E9(1), is used as a maintenance tool to aid in resolving problems occurring on Signaling System 7 trunks only. This feature provides a means to query the system database to determine trunk group(s) through an input message number associated with a Destination Point Code (DPC). Also, given a trunk group number, a trunk group number and members or OPC and circuit identification code(s) as an input message, this feature outputs the TG number, TG member number, DPC, CIC, and OPC for every TG member. For more information see the 235-600-700, *Input Message Manual*, and the 235-600-750, *Output Message Manual*.

10.2.21 MISCELLANEOUS FEATURES - 97-5E-0015 - 97-CP-4463

97-5E-0015 50A CUSTOMER PREMISES SYSTEMS COMPATIBILITY

This feature allows the 5ESS[®] switch to serve a business customer equipped with an old 50A customer premises system non-data-link attendant console.

97-5E-0022 BRI COST REDUCTIONS ☐ N+K SPARING OF THE PSU

This method of protocol handler (PH) sparing significantly reduces the cost of the PSU by using n active and k standby PHs (where k is 1 per shelf), rather than 8 active and 8 standby PHs on the PSU.

97-5E-0023 BRI COST REDUCTIONS ☐ DPIDBs (DIRECTLY CONNECTED PIDBs)

This feature allows terminating PIDBs directly on the PSU instead of having PIDBs nailed up through the

TSIU to the PSU. This will save peripheral time slots on the TSIU and provide an economical approach for ISLU applications with higher number of digital subscribers.

This feature includes development of an LSI chip for PIDB skew compensation, firmware and diagnostic software.

97-5E-0027 128-CHANNEL PROTOCOL HANDLER

This feature provides for the termination of 128 ISDN channels on each protocol handler through the use of VLSI devices.

97-5E-0035 CCS AM REAL-TIME RELIEF

This feature removes all per-call common channel signaling (CCS) message processing from the AM and restores the CCS office capacity to the non-CCS level in CM2 or CM2C equipped offices. It introduces software release 2 of the common network interface (CNI) ring architecture and uses its new direct link node (DLN) to do the per-call CCS message processing and relieve AM real time. The message flow takes place from the SM to the DLN through CM2 or CM2C. Since use of the DLN is optional, CCS message processing in the AM for non-DLN CNIs will continue to be provided. The feature will support all CCS-related features, including the existing OSO/INWATS, network call denial, CCIS6 and CCS7 ISUP trunk signaling, and OSPS related CCS queries for centralized flexible rating, calling card service, and customer account services.

97-5E-0037 OPTIONAL EQUIPPING OF ISLU LINE DRAWER HARDWARE

A blank ISLU line drawer (which contains no PWB backplanes, connectors, or cabling) reduces the cost to installations that do not anticipate the need for a full 512-line ISLU. To achieve the proper airflow for cooling, a drawer position may not be left empty. Instead, a low-cost blank drawer consisting of only a bare molded plastic frame is provided. Applications which expect growth to more than 384 lines should not order blank drawers. These applications receive a full set of functional drawers at first. If an application with blank drawers encountered unexpected growth, functional drawers can be ordered and installed in the field.

97-5E-0041 5E4(1) TO 5E4(2) SOFTWARE RELEASE TRANSITION

This feature is required for the limited amount of live offices that have the 5E4(1) software release. This feature does not provide for the preservation of stable calls or RC/CORC evolution to the 5E4(2) software release. This feature is necessary to limit the amount of down time that live offices requiring a transition from the 5E4(1) to 5E4(2) would otherwise encounter using load dead from tape procedures.

97-5E-0043 COMPATIBILITY TEST OF PROTON T AND PROTON C DATA MODULES

System test the following CPE provided for use with ISDN:

Proton T and Proton C Data Modules

The proton T connects a 3274 terminal to a BRI; the proton C connects a BRI to a 3270 cluster controller. These two pieces of CPE must be tested together.

97-5E-0044 COMPATIBILITY TEST OF NT1 TERMINAL ADAPTER

System test the following CPE provided for compatibility with ISDN:

NT1 Terminal Adapter

97-5E-0045 COMPATIBILITY TEST ASYNCHRONOUS MODULAR DATA MODULE

System test the following CPE provided for compatibility with ISDN:

Asynchronous Modular Data Module

97-5E-0046 COMPATIBILITY TEST OF SYNCHRONOUS MODULAR DATA MODULE

System test the following CPE for compatibility with ISDN:

Synchronous Modular Data Module

97-5E-0047 COMPATIBILITY TEST OF MODEM POOLING MODULAR DATA MODULE

System test the following CPE provided for compatibility with ISDN:

Modem Pooling Modular Data Module

97-5E-0048 COMPATIBILITY TEST OF ASYNCHRONOUS TERMINAL ADAPTER FOR AP

System test the following CPE provided for compatibility with ISDN:

Asynchronous Terminal Adapter for AP

97-5E-0049 COMPATIBILITY TEST OF ISDN VOICE/DATA STATION I

System test the following CPE provided for compatibility with ISDN:

ISDN Voice/Data Station I

97-5E-0050 COMPATIBILITY TEST OF ISDN VOICE/DATA STATION II

System test the following CPE provided for compatibility with ISDN:

ISDN Voice/Data Station II

97-5E-0052 COMPATIBILITY TEST OF ISDN INTEGRATED DISPLAY

System test the following CPE provided for compatibility with ISDN:

ISDN Integrated Display Terminal

97-5E-0053 EMC VERIFICATION OF ISDN HARDWARE

This feature provides for the EMC testing and verification of the 5ESS[®] switch central office hardware developed for ISDN related services. It requires compliance with FCC rules part 15J as they apply to electromagnetic radiation.

97-5E-0054 5E3 TO 5E4(2) SOFTWARE RELEASE RETROFIT

This feature provides the retrofit procedures from the 5E3 software release to the 5E4(2) software release. This work includes writing the entire list of procedures to retrofit the office from an "old" software release to a "new" software release, writing planning requirements for a timely retrofit and writing procedures for backout and recovery, if trouble arises during the actual retrofit. Also included is advance preparation of the switch (for example, ensuring adequate memory is available), system evaluation, to ensure the operating condition of the switch, software development needed for the procedures (recent change work for on-site evolution and office dependent data work for off-site evolution) and actual implementation of the retrofit. Lastly, it also includes writing software tools to assist in the retrofit procedures.

97-5E-0056 MC68012[™] SMP

The MC68012[™] conversion is a physical change out of a live MC69.00 - based SM to a MC68012[™] - based SM, while preserving the call processing capability of the SM. The MC68012[™] enables the SMP1 memory address spectrum to be expanded from the present 16 MB up to 32 MB, depending upon whether 2 MB or 4 MB memory boards are used.

97-5E-0057 COMPATIBILITY TEST OF ISDN ATTENDANT CONSOLE

System test the following CPE provided for compatibility with ISDN:

ISDN Attendant Console

97-5E-0058 FCC REGISTRATION OF PRE-5E5 DIGITAL INTERFACES OF THE 5ESS[®] SWITCH

This feature requires each digital interface between 5ESS[®] switch customer equipment (CE) and service provider facilities to be registered with the FCC under Part 68 of FCC regulations. The reason for registration is as follows. At each interface with service provider facilities, CE must comply with the Part 68 rules, which are intended to prevent harm to the public network, for example, through hazardous voltage or excessive signal power. Compliance is demonstrated by carrying out and documenting extensive tests, submitting an application to the FCC, and receiving a registration number. The registration number must be supplied to the service provider when connection is made to the public network.

The digital interfaces to be registered are:

- (1) The standard 1.544 Mb/s T1 trunk interface.
- (2) The T1 interface at the host SM towards a RISLU.
- (3) The T1 interface at RISLU towards the host SM.
- (4) The ISDN primary rate interface (PRI).
- (5) The T1 interface at the DCLU towards a SLC[®] carrier remote terminal.
- (6) The T1 interface between an RSM and a host SM.

97-5E-0059 LARGE OFFICE DATABASE RETROFIT IMPROVEMENTS

The large office database retrofit feature will develop a disk RC process to reapply accumulated RC/CORCs during the retrofit interval to the office dependent data (ODD) files before the initialization of the new software release. The same disk RC process will also be used to reapply RC/CORCs that were accumulated during the large terminal growth period before the reinitialization with the ODD files that has been grown with a large amount of trunks or lines.

97-5E-0060 SM TEXT OFF OF PRIMARY DISK

This feature will move the SM text off of the primary disk pair to another disk pair.

97-5E-0061 BCD/IO TYPE

This feature provides the ability to define digit attributes in ODD relations as domains with an I/O type of binary coded decimal.

97-5E-0064 ODD DISK RESOURCE ENHANCEMENTS

This feature separates the redundant from the partitioned data in the SM ODD. This will allow only one copy of SM redundant data to be stored on disk. In addition, SM ODDs will be allowed to be kept on more than one disk pair.

97-5E-0065 SWITCH MODULE OFFICE DEPENDENT DATA MEMORY REDUCTIONS

This feature will reduce ODD space by (1) reduction of actual tuple size and (2) reduction of key range.

97-5E-0074 68020 SMP CONVERSION

The 68020 SMP conversion is a procedure for physical (and database) changeout of a live 69.00-based SM to a 68020-based SM, while preserving the call processing capability of the SM.

97-5E-0075 SMP20

A 68020-based, 32-bit SMP is provided with this feature. This processor provides the following resource enhancements:

- ☐ Additional real-time capacity, for applications including export, OSPS, and domestic ISDN
- ☐ SM memory addressability beyond 16 MB
- ☐ Increased number of user stacks, from 256 to 512 for OSPS applications
- ☐ Duplex bootstrap for increased reliability
- ☐ New unit configuration to support future retrofits.

Furthermore, the 68020 SMP is consistent with a larger evolutionary trend - the evolution toward a distributed call processing architecture, with even more functionality moving from the AM to the SM, including inter-processor communication (IPC).

97-5E-0088 INTERFLOW CROSS SOFTWARE RELEASE COMPATIBILITY

Interflow Cross Software Release Compatibility provides for the bridging of software releases 5E5 and 5E6 in an interflow network. This feature allows a switch on software release 5E5 to interflow from/to a switch on software release 5E6. New 5E6 features affecting interflowed calls cannot be activated until both switches are on software release 5E6.

This feature allows a graceful retrofit of interflow switch complexes.

97-5E-0108 ACD TERMINAL SUPPORT

This feature provides for the lab testing of the 5ESS[®] switch ACD with one outside vendor's agent terminal which meets the OSPS-BST interface.

97-5E-0109 RC AND DB TO CMP - CMP APPLICATION

This feature provides improved recent change performance to the 5ESS[®] switch in the form of increased throughput and decreased response time. This is made possible by moving certain recent change and database manager functionality to the CMP (communications module processor). This feature also reduces AM memory by 3-4 megabytes.

97-5E-0110 5E5 TO 5E6 SOFTWARE RELEASE RETROFIT AND 5E6 UPDATES

This feature provides the capability of performing a software release transition from the 5E5 to the 5E6 software release. It also includes the capability of performing 5E6 software release updates. The following items are provided by this feature:

- ☐ Documentation and testing procedures to perform the 5E5 to 5E6 software release retrofit and the 5E6 software release update.
- ☐ FOA and lab trials for the software release retrofit and the software release update.
- ☐ Off-line conversion of switch databases such as ODD and ECD
- ☐ Reapplication of database changes while the database was undergoing off-site conversion

- ☐ Integration of retrofit functionalities provided by 5E6 software release features such as CMP.

97-5E-0111 AMA TELEPROCESSING PERFORMANCE ENHANCEMENTS

This feature reduces the AM real time usage of AMA teleprocessing to within its busy hour real time allocation of 13 percent, while maintaining a transmission link occupancy of greater than 70 percent. This enables the 5ESS[®] switch to sustain a rated call capacity of 350 K metro calls per busy hour.

97-5E-0123 COMMERCIAL ACD-AMA RECORDING FOR AGENT CALLS

This feature allows the 5ESS[®] switch to create AMA records for commercial ACD calls. This includes outgoing calls from commercial ACD positions and incoming commercial ACD calls.

Outgoing Calls: This feature creates AMA records for ACD agent originated calls to stations external to the ACD. This includes calls originated without a back party, as well as conferences and transfers of incoming calls to stations external to the ACD. These calls are recorded utilizing loop around trunks and a billing number that the OTC assigns to the commercial ACD customer.

Incoming Calls: This feature creates terminating access AMA records for calls delivered to the ACD from an inter-LATA or international carrier. These records allow the OTC to collect access charges on the calls. This feature also performs INWATS specific call processing for INWATS calls which must be billed at the terminating CO. This includes band restriction, band overflow, and AMA record generation.

97-5E-0124 OUTPUT MESSAGE REDUCTION

This feature remaps the 5ESS[®] switch output messages into a new message class structure and provides read-only printer (ROP) message volume reduction. The reclassification is based on the functionality and type of messages.

Three types of general messages have been identified:

- ☐ Operational
- ☐ Debugging
- ☐ Responses to queries.

Each functional group may contain all three types of messages; therefore, all three messages classes are provided for each functional group. The reclassification allows the office personnel to control the messages that are printed at the ROP.

The ROP message volume reduction is accomplished by changing the way audits, system integrity, recent change, and terminal maintenance print messages. Audits will print only the first audit in an event. System integrity only prints the stimulus of the stack frame dumps. Recent change changes the default setting of printing the one line complete message to be logging and provides a user query message that identifies the terminals that are performing recent change activities. Terminal maintenance generates a summary message of all the per call test failure (PCTF) messages that are generated in the switch.

In addition to the summary work that is being done, the size of the day log file (/log/HMlog) is increased. The OP:LOG message is used to dump messages (instead of the DUMP:DAYLOG message) from the day log file. This allows the user to do keyword searches on the day log file.

97-5E-0409 ISDN PRI ACCESS FROM CENTREX

This feature provides ISDN access from local exchange carrier (LEC) centrex locations to leased network customers through customer dedicated PRI trunk groups.

This feature supports the following ISDN specific features:

- ☐ CPN to the network
- ☐ CPN/BN to terminating user
- ☐ Per call service selection
- ☐ Switched 64-kbs clear and restricted data channel
- ☐ Forced authorization code entry
- ☐ Permanent B-channel packet transport.

97-5E-0434 DIAL THROUGH ATTENDANT (DTA) ROUTING OF CALLS BASED ON ATTENDANT'S LINE CLASS CODE (LCC)

The dial through attendant (DTA) feature allows a subscriber to complete the dialing after the attendant selects the facility. The subscriber may complete the dialing on other than station-to-station calls.

The DTA feature is used to provide access to certain facilities (for example, DDD, private facilities, CCSA network) when the requesting station does not have access to or has trouble reaching those facilities. The requesting station dials the attendant and places a verbal request to the attendant for access to a given facility. The attendant then flashes the switchhook (START key) to place the requesting party on hold and receives dial tone. The attendant now dials the appropriate access code for the requested facility. After the attendant dials the appropriate access code and if the requested facility is available, local dial tone is returned to the attendant. The attendant now goes on-hook (RELEASE key), and the dial tone is transferred to the requesting station. The requesting station must be in the same terminal group as the attendant in order for the requester to complete dialing of the call. If the requesting station is not in the same terminal group as the attendant, or is a private facility, both the requesting station and the attendant station are idled, and the DTA feature is aborted.

97-5E-0435 CUSTOMER-ORIGINATED TRACE TRANSPARENCY FEATURE

This feature allows the telephone company personnel to operate the COT feature in one of two modes; dedicated and nondedicated. Dedicated operation requires the OTC personnel to install a dedicated output channel known as TTY45 before the switch will allow the COT feature to be activated. Dedicated operation provides a buffer for the TTY45 channel. If the channel goes out of service, the buffer stores COT messages until it is full before shutting off the feature. Nondedicated operation does not require installation of TTY45 and only sends COT messages to the output channels specified on the CLASSDEF form in the ECD database for the COT feature. The nondedicated version will not deactivate COT if an output channel is not specified on the CLASSDEF form. Instead, COT messages are dropped if nothing is specified on the CLASSDEF form.

The COT transparency feature increases the COT buffer size to 300, thereby reducing the incidents of turning off the COT feature. This is independent of the mode of operation.

The COT buffer is not used with the nondedicated version. Rather, in this mode, the buffer associated with the CSOP is used. The COT feature will not be turned off when the CSOP gets full.

97-5E-0436 OSPS UTILITY CALL TRACE

This feature provides dumps of dynamic OSPS data relations, such as the call record and the data associated with a loop at an operator position.

97-5E-0437 OSPS GROWTH UPDATE

This feature provides the procedures for adding new OSPS features. These procedures specify the sequence of recent changes required to add the data for the features. Growth provides for adding, and degrowth provides for removing the OSPS features while maintaining reliability and availability of the office.

97-5E-0438 REAL-TIME IMPROVEMENTS FOR AUTOMATIC MAINTENANCE LIMIT

This feature proposes a new scheme for the existing automatic maintenance limit (AML) feature to alleviate the AM real-time problem. The proposed feature finds a trade-off between AM real-time and AM memory. Thus, by using an additional 50K of AM memory, the existing AML real-time performance can be dramatically improved. The proposed feature will save a large amount of AM real-time which is a very critical resource in a large office environment.

97-5E-0439 ONE HUNDRED FUNCTIONS PER SM PRODUCT IN SOFTWARE UPDATES

This feature increases the number of functions within an SM product that can be updated in a single software update from 50 to 100.

97-5E-1285 EQUIPMENT CONFIGURATION DATA (ECD) CONFIGURATION SYSTEM STANDING FEATURE

This feature creates customized ECD database scripts for new-start 5ESS[®] switch offices. It is executed on a support processor under the guidance of ODA personnel.

97-5E-1286 DISK RECONFIGURATION STANDING FEATURE

This is an end customer feature that allows 5ESS[®] switch personnel to change from the current disk configuration to another configuration. This feature relies on procedures, tools, and switch resident code to perform this function.

97-5E-1287 DISK GROWTH STANDING FEATURE

Disk growth is a customer feature consisting of procedures and tools that allow the user to add disks onto an existing 5ESS[®] switch. It includes physical and functional growth elements.

97-5E-1288 CONVERSION TO PRL 5.0

This feature converts the embedded base of population rules from population rule language (PRL) 4.0 to PRL 5.0.

97-5E-1542 EQUIPMENT CONFIGURATION DATA (ECD) CONFIGURATION SYSTEM STANDING FEATURE

This feature creates customized ECD database scripts for new start 5ESS[®] switch offices. It is executed on a support processor under the guidance of ODA personnel.

This ECD customization is a deliverable that is impacted by routine changes to the ECD equipage required by normal software release development. For each software release this feature must be significantly modified and tested.

97-5E-1543 DISK GROWTH STANDING FEATURE

Disk Growth and disk conversion are end customer standing features consisting of procedures and tools to allow the customer to grow, degrow, and convert disk configurations from 340MB SMD to SCSI (322 MB and 600 MB) and 322 MB SCSI to 600 MB SCSI.

These features require re-testing on each software release to insure the functionality of the Disk

Growth/Disk Conversion tools.

97-5E-1544 DISK RECONFIGURATION STANDING FEATURE

This is an end customer feature that allows 5ESS® switch personnel to change the current disk configuration to another (for example, 340A -> 340B). This feature consists of procedures, tools and switch resident code to perform this function.

Disk reconfiguration is a feature that is impacted by growth of the 5ESS® switch software and regular changes to the allocation of disk resources during the development of each software release. For each software release, this feature must be modified and retested.

97-5E-1545 TRUNK AND LINE WORK STATION (TLWS) ENHANCEMENTS

The TLWS Enhancement feature enhances the TLWS error reporting such that error messages produced during TLWS interactive test sessions present sufficient information so that the tester knows what went wrong and, if not a software problem, can resolve the error. Also, clearly defined function information of the source where the error message was generated will be provided to help TLWS software developers quickly track down software problems.

The TLWS Enhancement capability allows the TLWS interactive testing to be available from shell input and graphics terminal devices. Output from the TLWS will be available also through shell and graphics terminal devices.

The TLWS enhancement capability improves the consistency of TLWS display interface by utilizing a state machine display manager. All display calls from TLWS will pass through this display manager. This manager will check the incoming display request with the current TLWS status and update the TLWS display accordingly.

The TLWS enhancement capability provides consistent results when the user chooses to execute either a poke which provides the functionality of several other pokes, or the individual pokes themselves.

The TLWS enhancement capability improves the response time to poke request in some instances by removing the time-consuming tasks of exchanging ownership of the port between different controlling Port Under Test (PUT) processes.

The TLWS Enhancement capability will provide all the existing features of the current 5ESS® switch software release (5E8) and will provide the following enhancements (in the following, whenever a command poke number is given, its functionality also holds for the associated input message. Whenever screen output is given, its functionality also holds for the associated output message):

- ☐ Allows TLWS interactive testing on TTY devices, graphics terminal devices and OS input channels.
- ☐ Allows the user to print TLWS error messages to the ROP.
- ☐ Provides new pokes to allow the user to set defaults for DSL digital loopback testing.
- ☐ Provides all TLWS interactive test position activity summary on a 5ESS® switch display screen (page).
- ☐ Provides clearly defined (function and line number) error messages when error(s) occur during a TLWS interactive test session.
- ☐ Allows removal and restoral of either the whole DSL or a specific channel of the DSL on both 9200 and 5400 pages.
- ☐ Provides an information display when a long duration poke is completed.
- ☐ Provides ISTF equipment number and PH equipment number for both B and D channels during an

interactive digital loopback test.

- ☐ Provides DCTUPOINT (DCTU port number) information on every metallic test that is requested from the user.
- ☐ Allows the user to reseize a port by using 4800 poke even if there is testing in progress. An executing test will be torn down when the 4800 poke is entered.
- ☐ Provides a smoother testing environment. The ownership of the port under test in a TLWS session will be seamless across all tests starting from the seizure of the port until the release of the port.
- ☐ Provides the same results when the execution of a poke implies the execution of other poke(s) under its hierarchy. The user has the choice of using a single poke or the implied sequence of pokes, and the TLWS will provide the same results in both cases.

97-5E-1555 ALL IRN2 RING

The all IRN2 Ring feature adds a new backplane technology to the CNI ring for 5ESS® switches. Due to its reduction in the overall number of boards required to support the CNI Ring, it enables some new ring configurations, and most significantly, increases the number of link pair terminations from 5 to 19 pairs.

When combined with the other feature offerings under the CCS7 Capacity Improvements - DLN30 feature, significant CCS7 capacity increases are realized.

Also included with the purchase of this RTU package is the software to support the following features:

- ☐ All IRN2 Ring - 97-5E-1555
- ☐ 5 Node Shelf for 5E CNI - 97-5E-1625
- ☐ Improved Message Capacity - 97-5E-2491

This feature requires the purchase of the new DLN30, with the All IRN2 CNI Ring. It is recommended that new offices, and smaller offices, utilize the 5 Node Shelf Option.

97-5E-1614 ISDN HARDWARE ON THE 5ESS® SWITCH

This feature includes the ISLU2, PSU2/PI2/PH4, and IDCU on the SM-2000 for the 5E10 software release.

The ISLU2 feature is a 5ESS® switch line unit which supports digital (U) and (T) interfaces on the SM and SM-2000. The ISLU2 line packs do not fit in the ISLU shelf but are functionally equivalent to the ISLU line packs. The hardware for the ISLU2 includes a wide line shelf and wide common shelf. Other required unit hardware includes a wide fan unit and a wide "blank" air plenum.

The ISLU2 also supports enhanced sparing digital (U) 2-wire line circuits initiated by exchange technician. Digital T line circuits cannot be spared. Four circuits can be actively spared per unit.

There are 8 separate line circuits per U and T line pack. Each line circuit can be assigned to a customer separately. Failures on a single line can be isolated and spared independently of the other line circuits within the pack. The exchange technician will be able to perform operations both on a pack level affecting all 8 assigned lines or individual circuits affecting just one line circuit.

An ISLU2 can physically terminate up to 1024 digital (U or T) interfaces. Traffic and blocking considerations must be engineered and will limit the maximum physical configuration. Preliminary engineering studies indicate that the practical maximum for U.S. calling patterns is approximately 768 line circuits per ISLU2 unit.

The 5E10 software release introduces a packet switching unit for SMs and SM-2000s called the PSU2. This unit uses a packet interface (PI2) that produces significantly higher packet throughput (800 packets per second versus 210 packets per second). Code Division Multiple Access (CDMA) also uses an improved protocol handler called the PH4 for its applications.

CDMA provides packet switching on the SM-2000 and loaded SMs using the PSU2/PI2/PH4 combination. The ability to use a PH4 in the PSU on SMs is also supported.

- ☐ The PH4 increases the total throughput capacity from 160 packets per second to 215 packets per second. This performance increase is accomplished by removing the 4 MB Dual Dynamic RAM (DDRAM) module from the circuit pack and by increasing the size of the Static RAM (SRAM) module from .75 MB to 3 MB. The new memory spectrum defined by this change would be partitioned with 1 MB AP Local SRAM, 1 MB IOP Local SRAM, and 1 MB Shared SRAM.
- ☐ The PSU2/PI2 is a high throughput packet switching unit that supports either a 10 or 100 MB packet bus. The units higher throughput achieves 800 bidirectional packets per second (400 packets per second, each direction) as compared to 210 bidirectional packets per second for the PSU/PI.

This feature also provides the ability to groom DS0s between the TR-008, TR-303, and PUB43801 interfaces on the SM-2000. The TR-008 Interface provides POTS and other switched services through SLC[®] 96 carrier systems, SLC[®] Series 5 carrier systems Feature Package B, and the SLC[®] 2000 Access System. The PUB43801 Interface allows the routing of non-switched and non-locally switched services towards D4/D5 channel banks or towards DACS I, II, or IV. The TR-303 96 Line RT Interface provides POTS and other switched services, and ISDN capabilities to customers terminating on SLC[®] Series 5 carrier systems FP303 RTs. The TR-303 Large RT Interface provides the same functions as the TR-303 96 Line RT, but expands the number of allowed lines on the interface from 96 to 2048.

97-5E-1625 5 NODE SHELF FOR 5E CNI

The 5 Node Shelf for 5E CNI feature builds on the introduction of the new IRN2 technology to the CNI ring for the 5ESS[®] switch. Due to the reduction of boards, a new configuration for the bottom shelf is allowed that contains five nodes, namely: a Ring Peripheral Controller Node, 3 link nodes, and a Direct Link Node. In addition, the upper two shelves can be configured with 8 Link Nodes each, allowing the total of 19 link pairs on the CNI Ring.

When combined with the other feature offerings under the CCS7 Capacity Improvements - DLN30 feature, significant CCS7 capacity increases are realized.

Also included with the purchase of this RTU package is the software to support the following features:

- ☐ All IRN2 Ring - 97-5E-1555
- ☐ 5 Node Shelf for 5E CNI - 97-5E-1625
- ☐ Improved Message Capacity - 97-5E-2491.

Because of the introduction of the IRN2 technology, the number of signaling links terminating in an office increases from 5 pairs to 19 pairs.

This feature requires the purchase of the new DLN30, with the All IRN2 CNI Ring. It is recommended that new offices, and smaller offices, utilize the 5 Node Shelf Option.

97-5E-2251 DISK RECONFIGURATION STANDING

This is an end customer feature that allows 5ESS[®] switch personnel to change the current disk configuration to another (for example, 63 -> 66). This feature consists of procedures, tools and switch

resident code to perform this function.

Disk reconfiguration is a feature that is impacted by growth of the 5ESS® switch software and regular changes to the allocation of disk resources during the development of each software release.

97-5E-2252 ECD CONFIGURATION SYSTEM STANDING

This feature creates customized ECD database scripts for new start 5ESS® switch offices. It is executed on a support processor under the guidance of ODA personnel.

This ECD customization is impacted by routine changes to the ECD equipage required by normal software release development. For each software release, this feature must be significantly modified and tested.

97-5E-2253 DISK GROWTH STANDING

Disk Growth and disk conversion are end customer standing features consisting of procedures and tools to allow the customer to grow, degrow, and convert disk configurations from 340MB SMD to SCSI (322 MB, 600 MB, and 1 GB), 322 MB SCSI to 600 MB, and 600 MB SCSI to 1GB SCSI.

These features require retesting for each software release to insure the functionality of the Disk Growth/Disk Conversion tools.

97-5E-2298 ON-SWITCH HARDWARE CHECK FOR RETROFIT

The hardware checking mechanism verifies that any required, release specific hardware (for the target release) is in the proper state (operational, special growth, etc.) prior to a retrofit. Any failed checks will be output to a file containing "retrofit critical errors."

This on-switch hardware checking mechanism for retrofit is necessary to eliminate the preliminary dump.

Currently, this function (hardware checking) is performed through a combination of ODA x-checks, ECD evolution and some ODA Project Consultant specific checking done at the preliminary dump time.

97-5E-2306 ON-SWITCH ECD VERIFICATION

The On-Switch ECD Audit allows switch owners to verify the integrity of their ECD database. The audit is invoked either through an input message or a scheduling mechanism. It is recommended that the audit be run regularly as part of routine switch maintenance to identify and correct any ECD database errors. The audit must be run prior to the final database dump for a retrofit and the ECD database must be error free. Each audit execution produces a summary message and a detailed log of individual error conditions.

Some of the main events for the On-Switch ECD Audit are as follows:

- ☐ Scheduling: Schedule automatic execution of the Audit for routine maintenance. (SCHED:ECDAUD)
- ☐ Running: Manual or Automatic execution of the audit. (EXC:ECDAUD)
- ☐ Stopping: Input of the stop command aborts execution of a currently running audit. (STOP:ECDAUD)
- ☐ Inhibiting: Input of the inhibit command keeps the scheduled audit from running and also prevents manual execution of the audit until the allow command is entered. (INH:ECDAUD)
- ☐ Allowing: Input of the allow command lets the scheduled audit run and also allows manual execution of the audit after it has been previously inhibited. (ALW:ECDAUD)
- ☐ Checking Audit Status: Input of the status command shows the current status of a running audit or the status of the last execution of the audit. (OP:ECDAUD).

97-5E-2353 SOFTWARE UPDATE FOR DATA

This feature allows new ODD relations and new attributes to be introduced as part of a Software Update (SU). The feature only uses the spare spaces reserved and "holes" in the relation (for example without changing the existing data structures).

With this capability, more features can be delivered through software update packages, which implies shorter delivery interval.

This feature provides a more flexible software update mechanism to deliver customer requested features which in turn will allow customers to provide their subscribers with new features more quickly and with less impact on customers' Switch operation.

97-5E-2384 REDESIGN OF CALL TRANSFER WITH QUEUEING TO REDUCE CONFERENCE CIRCUIT USAGE

In the current 5ESS[®] switch design, after a party transfers a call, and the call is subsequently queued before terminating to the transferred-to party, a conference circuit is needed by the call until it is removed. For some applications (as ACD/BRCS) which have the potential for many transferred queued calls, the usage of conference circuits will be very high. The feature, which results in the modification of the multi-way code, keeps the conference circuit from being needed for the transfer-queueing case.

97-5E-2487 INCREASE THE NUMBER OF TRUNK GROUPS TO 4000

This feature increases the maximum number of trunk groups carrying voice traffic that are presently allowed in a 5ESS[®] Switch from 2000 to 4000. This feature can not be used with any EDAS type OSS as it will disrupt Traffic 30 Measurements. Only non EDAS type OSSs that have been modified to handle 4000 trunk group measurements will work with this feature. For a description see: "EDAS Interface", 235-070-100, *Traffic and Plant Measurements Descriptions*. The feature increases the number of groups into which trunks can be partitioned. All existing features that are presently supported with respect to voice trunks will remain intact. Features such as measurements and those that specify trunk groups by number will support this feature. In addition, audit and trunk synchronization provided by the keep-alive functionality will keep SM/CMP trunk status in synch and recover stuck busy trunk status within the existing time constraints.

97-5E-2550 BASE RELATION EVOLUTION (BREV)

The Base Relation Evolution feature evolves 5ESS[®] switch Office Dependent Data (ODD) base relations from one software release to another software release. Base Relation Evolution eliminates the need to recover ODA input forms, evolve the input forms, and then map the input forms to base relations to upgrade the ODD.

97-5E-2678 PIDB GROWTH CONTROL FEATURE

The PIDB Growth Control feature allows the service provider to grow the IDCUC hardware to meet specific needs that maximize the capability of a TR-303 RDT. By providing a means to grow the PIDB level in two TSS increments for each IDCUC on a SM, the service provider has complete flexibility in managing the IDLC application in a cost effective manner. This is accomplished by simply growing in the minimum hardware required for the specific needs and deferring costs associated with growth until the need exists.

With the Large RDT interface for the 5ESS[®] switch, the customer benefits from a "pay as you grow" approach in configuring Large RDTs in the central office. Thus, assignment of PIDBs in two (2) Time Slot Sets help to alleviate concerns with underutilization of hardware in their IDLC applications.

The assignment of dual PIDBs to the IDCUC is done on an existing hardware growth Recent Change/Verify view. The initial PIDB level is provided when the customer purchases the basic IDCUC configuration. Essentially, these 4 PIDBs correspond to a PIDB level of four for this IDCUC. Each IDCUC on a given SM will have a unique PIDB level assigned to allow for maximum flexibility in growing in TR-303 Large RDTs.

The initial PIDB level of four allows the customer to assign up to four (4) active PIDBs to that IDCU. A smaller number of PIDBs can still be made active for this IDCU depending on the CCS the customer engineers for the set of lines served by this IDCU. To this point, the functionality that the customer is accustomed to has not changed.

In order to provide additional CCS for the higher number of lines served by TR-303 applications, the customer must now contact the regional Lucent representative to obtain a password to activate an additional set of PIDBs for a given IDCU. A total of four PIDB groups can be assigned for a total of 16 PIDBs per IDCU.

The password is entered on the Recent Change/Verify view to activate the new PIDB group and allow the PIDBs to be "active" for the unit.

The end user should not see any change in feature operation due to the PIDB Growth Control feature on lines served on the Large RDT interface.

The functionality of growing the PIDB hardware is secured. The Lucent Account Representative must be consulted in order to obtain the necessary password to allow the PIDBs needed to provide additional CCS to be grown on the IDCU.

97-5E-2894 TECHNOLOGY UPGRADED LOCAL DIGITAL SERVICES FUNCTION (LDSF) FOR SM-2000

The LDSF for SM-2000 feature introduces a single hardware platform using a new UN590 circuit board and a resident software image for the local digital services functions. The feature includes tone generation, tone decoding, and signaling on both the switch module (SM) and the SM-2000.

97-5E-2895 TECHNOLOGY UPGRADED LOCAL DIGITAL SERVICES FUNCTION (LDSF) FOR SM The Cost Reduced LDSF for SM feature introduces a single hardware platform (circuit board) and resident software image for the local digital services functions including tone generation, tone decoding and signaling on both the switch module (SM) and the SM-2000. Advantages of this new TN1890 circuit board are reduced cost and increased processing power.

97-5E-2962 SIMULATED FACILITY GROUPS (SFG) AND NETWORK MANAGEMENT (NM) FOR VCDX

This feature moves SFG functionality from the AM/CMP to the SM in order to support locally hunted SFG screening. Moving the SFG code to the SM also increases the reliability of the VCDX Switch. The Packet Business Groups (PBG)s are supported from the CMPKP. In addition, for the first time Automatic Route Selection (ARS), Private Facility Access (PFA), and Modular Queueing for Trunks, and Modular Queueing for SFGs are supported. These features, as well as SFGs, are supported for VCDX SMs as well as VCDX SM-2000 SMs. In addition, SFG capabilities developed for SM-2000 are provided for VCDX with the SM configuration.

By migrating the routing functionality to the SM (from AM/CMP), the workstation is not in the critical path for call processing. The feature also turns on NM for VCDX offices with an SM-2000. In the offices, the standard NM controls and 5-minute measurements are active. Since the functionality is copied to the SM, it also supports local trunk groups.

97-5E-3116 ACCESS INTERFACE UNIT (AIU) BASE/POTS

The AIU Core/POTS feature provides an access interface unit with POTS functionality. This requires the development of a new AIU unit, including COMDAC, ring generator, and a per line CODEC line card (Z interface) that serves up to 32 customers. The AIU equipped with all Z interface cards can support a maximum of 640 lines per unit/shelf. This feature also lays the groundwork to make the AIU expandable to provide accesses such as GDX, U, T, and trunk interfaces.

97-5E-3227 SWITCHING MODULE PROCESSOR UNIT - MODEL 5

The Switching Module Processor Unit - Model 5 (SMPU5) implements the same functionality as the SMPU4 (SM-2000). The SMPU5 (SM2005) development consists of three basic pieces: a new backplane which integrates DSC3 functions into the unit; a new combined power and display control (PCD) pack; and APC board. None of these changes affect any of the TSI, its interfaces, or the SU IO interfaces with the SMP.

The SMPU5 is capable of supporting all SM-2000 configurations supported by SMPU4, and in particular VCDX. The difference between SMPU4 and SMPU5 is that equipment locations change for most boards. SMPU5 uses a single, combined power/control and display board per side; there are 6 DSC3 slots in SMPU5; and there are only 2 memory slots, per side, in SMPU5.

The two memory slots provide for sufficient memory growth given the currently available 32 Mbyte and 64 Mbyte memory boards. With a 128M CORE60MM. board and two 64M memory boards, a total of 256 Mbytes could be equipped in the SMPU5. SMPU5 does not support CORE40.

97-5E-3344 TIME SLOT INTERCHANGE UNIT 4 VERSION 2 (TSIU4-2)

This feature provides the same functionality as the TSIU4, but in a different configuration that is a technology upgrade.

For TSIU4 Version 2, the top shelf is divided down the middle into two service groups. The left group is SG0 and the right group is SG1. The bottom shelf contains the power converter and TSICOM packs stacked vertically on the left hand side. The lower set is SG0, and the upper set is SG1. The right hand side of the bottom shelf contains the TSIS packs, with SG0 on the left and SG1 on the right of the center stiffing plate.

The top shelf contains 8 inch high circuit packs, while the bottom shelf contains 8 inch high TSICOM and power packs and 16 inch high TSIS circuit packs.

The TSIU4 Version 2 provides exactly the same functionality as the TSIU4 in a different unit configuration. TSIU4-2 is still a two shelf duplex unit, but uses two separate backplanes in place of a single, triple-high backplane. The upper shelf is a standard 8 inch high by 13 inch deep 132-type housing, and contains one Power Converter and up to six XDX circuit packs per service group.

The lower shelf is a double high 500-type housing containing two Power Converters and two TSICOM packs (UM74C) stacked vertically on the left hand side of the unit, as viewed from the front. The lower pair is in service group 0, the upper pair in service group 1. The right side of the shelf contains up to 10 TSIS packs per service group, with service group 0 to the left and service group 1 to the right of the center stiffing plate. All four Power Converters will always be equipped for all configurations, and no PIB paddle boards are required.

A minimally equipped Version 2 TSIU4 service group contains:

- ☐ One 410AA and one 486AA Power Converter
- ☐ TSICOM (UM74C)
- ☐ One TSIS (KLUI)
- ☐ One XDX (UN553)
- ☐ Two CBT paddle boards
- ☐ One CTSNS paddle board.

97-5E-3451 SM/CMP PATCH SPACE COMPACTION

This feature compacts fragmented patch space memory into a large continuous patch space thus allowing room for customer requested features to be loaded. Service providers can provide subscribers with new features more quickly and with less impact on the switch operation. No change has been made to existing software update procedures; if a feature fails to load because of insufficient patch space, a new command is issued to compact patch space and make room for the feature.

97-5E-3457 IS-634 A2 INTERFACE

The IS-634 A2 Interface allows service providers to choose any base station that complies with the IS-634 standard.

Terrestrial circuits for voice paths from the 5ESS[®] Switch to the base stations are known as IS-634 A2 Interface trunks. They are given trunk group and member numbers, which are known at the 5ESS[®] Switch and the ECP. These are 56K/64K trunks with 24 or 30 channel (DS0) digital facilities (DS1) in which each channel is a PCM voice trunk. All signaling for controlling calls on these trunks is done out of band using the ECP/DCS message set. The speech handlers reside at the base stations. Even though the vocoder resides in the base station, echo cancellers will be turned on for IS-634 A2 Interface Trunk calls, in case of a handoff to a non-A2 Trunk. From the 5ESS[®] perspective, while these calls have an air interface of CDMA, the digital interface is a PCM trunk much like a cell site trunk.

A new trunk class of service of A2 Trunks was added to handle the connections to these base stations. The trunk group and member of this new trunk type are used in CDMA messages where normally speech handler information is transmitted. This leads to some confusion as to whether IS-634 A2 Interface is a CDMA feature of a CDMA "Service" and what exactly is a CDMA call. For the purpose of the IS-634 A2 Interface feature the following definitions apply. From the ECP perspective, the call is a CDMA call because it is a CDMA air interface. From the 5ESS[®] Switch perspective, the air interface is PCM trunk circuits. The IS-634 A2 Interface feature is not dependent on the CDMA feature. Initially, CDMA is the only air interface supported by the IS-634 A interface. Since, it does not make a difference to the 5ESS[®] DSC what the air interface is, we want to remove any relationship between the IS-634 A2 Interface feature and CDMA.

No support is required from the 5ESS[®]-DCS to support soft handoffs since soft handoffs are supported by the base station. The 5ESS[®]-DCS will continue to support hard handoffs between Lucent cells and non-Lucent cells.

97-5E-3541 LINE UNIT 2 (LU2) ON THE SM-2000

The LU2 on the SM-2000 feature allows existing customers with LU2 to upgrade their office with SM-2000 technology. Prior to SM-2000 each switching module supported a maximum of eight LU2s. However, with the introduction of this feature/option each SM-2000 has the capability to support up to 42 LU2s (when equipped).

97-5E-3846 RESTRICT USAGE OF ASP TRIGGERS

This feature allows the RBOC and independent service providers to purchase ASP components individually (such as, Local Number Portability) without being required to purchase the entire ASP Release 0.1B platform.

NOTE: In a 5ESS[®] Switch that has already unlocked ASP R0.1B Functionality (SFID 126), SFID 254 is automatically unlocked when the software update is applied that includes the Restricted Usage of ASP Triggers Feature.

This feature allows for greater flexibility in selecting and offering the ASP functionality on a per platform basis (feature lock 254) as well as per trigger basis (feature lock 255, 256, and 257). This feature allows for a new ASP customer to purchase all the ASP 0.1B triggers (Unrestricted ASP - Feature ID 254), or to separately purchase an ASP trigger group. An ASP trigger group can be purchased and unlocked without purchasing and unlocking any or all of the other groups of ASP triggers. The following list defines each ASP trigger grouping and the controlling feature lock ID:

- ☐ ASP Subscribed Originating Triggers (Feature ID 255):
 - ☐ Off Hook Delay
 - ☐ Off Hook Immediate
 - ☐ Feature Code Dialing
 - ☐ Custom Dialing Plan
 - ☐ Trunk Seizure Trunk (Private EAMF)
 - ☐ Shared Inter-Office Trunk (SIT) - options 1, 3, 4
 - ☐ B-Channel Setup PRI (Primary Rate Interface)
- ☐ ASP Dialing Plan Triggers (Feature ID 256):
 - ☐ 3/6/10-digit
 - ☐ N11
 - ☐ Shared Inter-Office Trunk (SIT) - option 2
- ☐ ASP Termination Attempt Triggers (Feature ID 257)

The other ASP triggers, not noted in the above groups, are secured under existing secure feature locks and are not altered by this feature nor secured by this feature. These ASP triggers continue to be secured under their individual secure locks and are not affected by the presence and state of the new feature locks introduced by this feature. When a call is made and encounters a "restricted" trigger, the ASP query is blocked and the call fails. End user services are not able to utilize the ASP triggers unless they are unlocked.

97-5E-3955 SU DOWNLOAD ENHANCEMENT

This feature changes the handling of file replacements during the download process. It reduces the size of the software update (SU) that is downloaded to the switch. There is also a reduction in the size of the SU that is saved in the Back Out Last Official (BOLO) directory during the Make Official process. This results in a reduction of the disk space used to store the SU.

This feature uses a new process that determines the differences between the new download file and the previous version. These differences are saved to a delta file and shipped in the SU, instead of shipping the entire compressed download file, which was done previously. This process produces a new download file during the verify process using the delta file and the previous version of the file residing on the switch. Since the delta file is only a fraction of the size of the whole file, the size of the SU is greatly reduced and download times are significantly reduced.

97-5E-4169 MCTU3 ON CM1

The MCTU3 on CM1 supports use of the MCTU3 SM hardware in offices that have the CM1. The original MCTU3 works only in offices with the CM Model 2 (CM2) which has a higher messaging capacity than the CM1. This feature throttles message traffic being sent by the MCTU3 to the CM to match the messaging capacity of the CM1, but only in offices equipped with the CM1. In offices equipped with the CM2, message traffic will not be throttled.

This feature also introduces a new version of the MCTU3 core board (SB20CORE) and the software

changes required to support the new core board.

97-5E-4271 VCDX SPARC5 REPLACEMENT

This feature provides a replacement workstation for the SPARCstation 5 used as the administrative workstation in the VCDX. The *Sun*TM Ultra 60 or another newer *Sun*TM workstation would be used as the replacement.

The VCDX Sparc5 Replacement feature enables the newest workstation technology to be deployed as the administrative workstation for the VCDX.

97-5E-4286 PH22 (PH20-16 BASE)

This feature provides the base PH22 hardware and software upon which other features can be built. It provides the PH20 core with 16MBs of DRAM and 5MBs of SRAM. The PH22 is a replacement for the PH3 and PH6.

97-5E-4455 PROGRAM UPDATE INTERFACE REDUCTION

This feature reduces the number of methods the customers must learn in order to use the various methods of installing software using the software update process. This feature runs under the control of Program Update, which performs all work operations and sends back any failure notifications through the ROP.

This feature benefits the customer in the following ways:

- (1) It decreases the time RC/V is inhibited
- (2) It allows the non-system impacting PREPARE action to be done during the day, thereby reducing the installation time during the regular installation period. This in and of itself does not reduce the overall time to install the SU.
- (3) It decreases the TIME-OF-INSTABILITY. This is the time from when the first update is made active to the time the last update is made active on the system. As a result, this decreases the risk of problems that may occur between dependent products.
- (4) it reduces the number of user interfaces the customer must choose from to install SU Packages.

This feature also reduces the number of user interface/display (MCC) pages. The 1960 and 1940 display page interfaces have been replaced with the 1990 display page. This feature will also change what gets executed by the input commands used for installation. The input commands will execute the new SU installation mechanism which is responsible for the 1990 display page.

97-5E-4475 INCREASE SWITCH ODD CAPACITY IN 5E12

This feature increases the Office Dependent Data (ODD) switch capacity for such requirements as local number portability and support for multiple local carriers.

97-5E-4535 DEFENSE SWITCHED NETWORK (DSN) NETWORK MANAGEMENT CONTROL

The DSN Network Management Control feature adds three network management capabilities to a VCDX using the SM-2000 switch. It is applicable only to a switch type of VCDX using the SM-2000, where the global office parameter GLDSNOPT indicates the office is a DSN switch (i.e., GLDSNOPT=Y).

The three network management capabilities are:

- (1) Destination code cancellation
- (2) DSN network management measurements

- (3) DSN network management monitoring.

97-5E-7102 3B21 EMULATOR FOR VCDX

This feature provides an emulator software upgrade from 3B20 to 3B21 Emulator for the 5ESS® Switch Very Compact Digital Switch (VCDX). This emulator supports an increase in memory from 64 MB to 256 MB. The feature also provides remote recovery/backup from tape (RRBUFT) functionality. This feature also adds functionality to support the integration of the Solaris/emulator updates into the retrofit procedures, and introduces a disk-based retrofit scenario to reduce the processing time on the night-of-retrofit.

This feature supports current *Sun*™ hardware platforms, which includes Sparc5 and Netra-T 1120.

97-5E-7103 Enhanced DCTU Administration for MLT

This feature enhances the messages on the interface between the 5ESS® switch and the Mechanized Loop Test system (MLT) to support a feature on the MLT system. (That feature provides the MLT administrator with the ability to get information on the busy/idle status of in-service DCTU ports, on the service status of Metallic Access (MA) packs, on the service status of MTBs, and on the service status of GDX compensators. The feature also gives the administrator the ability to select the specific DCTU port to be used in a test request, and to control the IS/OOS service status of PMUs in the DCTUs.

97-5E-7428 DECOUPLE PSU FROM SMP DURING GSM INITIALIZATIONS

This feature reduces the effect that GSM initialization events have on signaling downtime. Signaling links and the CMT (CCS Message Transport) path between a GSM and each NGSM will remain operational throughout a GSM selective initialization. Signaling links will remain operational for as long as possible during a GSM full initialization or during generic retrofit of an office. CMT path connectivity downtime between a GSM and each NGSM will be minimized during a GSM full initialization or during generic retrofit of an office only when a second TMH (TRANSFER MH) path is provisioned. After recovery from a GSM initialization event, normal GSM operation resumes.

Also provided is the ability to provision a second TMH path between a GSM and a given NGSM. This adds a layer of reliability, as one of the TRANSFER MHs may become unavailable, and the remaining path will handle all CCS message traffic between the GSM and NGSM.

Finally, terminations of CCS signaling links on DFI/DNU-S facilities (called signaling data links or SDLs) no longer must reside on the GSM. These SDLs may reside on any SM-2000 or non-SM-2000 with loaded/signaling configurations in the office, with nailed-up timeslot connections to signaling PHs on the GSM.

The SS7-PSU Architectural Enhancements feature (and included features) is planned to be available for the 5E15 and later software releases.

97-5E-7677 CONNECTVU RECENT CHANGE LINKS VIA HIGH LEVEL ECD RC/V

This feature adds new high-level ECD pages to streamline the installation of the ConnectVu Operations System.

97-CP-4463 PSU SU PUMP

This feature enables customers with a VCDX platform and those with EXM PSU2 signaling to install function updates to the signaling Protocol Handler application processor images during the SU APPLY stage for PSU2-based PH units without removing the PH from service. As a result, the SU SOAK section PMPPERF remove and restore functionality does not need to be executed for these PH units, providing an overall reduction in the time required for the SU installation when these peripherals are equipped.

97-CP-7525 PSU SS7 SIGNALING LINK MONITOR

The PSU SS7 Signaling Link Monitor feature (97-CP-7525) provides the SS7 link monitoring tool to report (in near real time) SS7 MTP and SCCP signaling management messages being transmitted/received over GSM link(s). The tool also reports informative indicators regarding GSM link failure/restoral.

This OA&M capability provides parity with the CNI signaling link monitoring tool MON:SLK.

The PSU SS7 Signaling Link Monitor feature is planned to be available for the 5E16.1 and later software releases.

97-CP-7822 GLOBAL FUNCTION ALARM (SS7-PSU HUMAN FACTORS)

The Global Function Alarm (SS7-PSU Human Factors) feature (97-CP-7822) establishes a new MCC SSA 106 indicator that displays the status of Global Functions (GLB FUNC). This new 106 GLB FUNC indicator replaces the current BLDG INH indicator. (Functions formerly pointed to by the BLDG INH SSA will be moved into the 105 BLDG/PWR indicator.)

The 106 GLB FUNC indicator alerts technicians to access and view the new MCC 106 - Global Functionality page to display the summary status of Global Functions. In the 5E16 Software Release, the Global Function pertains to signaling on the PSU SS7 Platform, i.e., Signaling Gateway Summary. (Future Releases may include the following; Billing Summary, Real-Time Call Detail Summary, and/or Echo Cancellation Summary.)

Additionally, the technician can access the new MCC 165 - Signaling Gateway Summary page to display the status of up to 16 Global Switch Modules (GSM).

The Global Function Alarm (SS7-PSU Human Factors) feature is planned to be available for the 5E16.1 and later software releases.

97-CP-7828 RECENT CHANGE CRITICAL INDICATORS (SS7-PSU HUMAN FACTORS)

This feature provides protection against the accidental and/or erroneous update or removal of data that has been identified as critical to the Signaling System 7 Packet Switching Unit (SS7 PSU) signaling on the 5ESS[®] switch.

This feature provides additional protection against user errors in customer specified Recent Change (RC) views. The layer of protection is for all instances of a particular view.

97-CP-8002 SS7 PSU REMOVE ROUTING FROM HOST GSM (DEDICATED CONFIGURATION)

The SS7 PSU Remove Routing from Host GSM (Dedicated Configuration) feature (97-CP-8002) removes the unnecessary data (which includes routing information) on a dedicated or host GSM.

With the introduction of the Dedicated Global Switching Module (GSM) (also referred to as the Host GSM), data (which includes routing data) has been populated in the GSM just as other SM data is entered. This has created a problem because access to this routing data causes large amounts of unnecessary traffic on the GSM. This in turn has caused some instances of real-time problems in the GSM.

This feature would modify certain Recent Change views which are used to populate the data required to assign a SM as the dedicated GSM. Those changes would prohibit adding certain data to that SM once it has been identified as the Dedicated GSM. They would also prohibit assigning data in other recent changeable tables used in the SM provisioning process.

The SS7 PSU Remove Routing from Host GSM (Dedicated Configuration) feature is planned to be available for the 5E16.1 (FR1) and later software releases.

10.2.22 OSPS FEATURES - 98-5E-0002 - 98-5E-2101

98-5E-0002 AUTOMATED ANNOUNCEMENTS FOR DA

This feature provides directory assistance announcements as part of an OSPS directory assistance application. An external directory assistance system provides the directory listing.

98-5E-0003 DELAYED CALLS

This feature allows calls for which completions are attempted at a time later than the original request by a subscriber. The operator attempts to establish the back connection (calling number) and the forward connection (called number). If both connections can be established, the OSPS connects them.

98-5E-0005 DEMAND CALLS

Demand Calls are calls on which completion is attempted immediately on being requested by a subscriber. For these calls, OSPS establishes the forward connection to the called number and connects calling and called parties. The called number may be dialed by the customer or by the operator; the operator provides collect, person-to-person, special billing, or other services. The operator can then release from the call.

98-5E-0006 INCOMING (INWARD) CALLS

This feature allows operator-dialed calls from a distant operator system to be connected to the OSPS. For example, the OSPS operator may assist the distant operator by:

- ☐ Providing busy line verification or emergency interrupt
- ☐ Completing calls that have experienced difficulties or that cannot be dialed directly.

98-5E-0008 SPECIAL SERVICE CALLS

This feature allows calls from subscribers and operators that terminate at special service operator positions selected according to various call parameters. Special service AMA records are written if the operator enters a special service code.

98-5E-0010 AUTOMATIC CALL DISTRIBUTION (ACD)

This feature automatically distributes calls to operator positions according to the call parameters. A call is distributed to the operator who has been idle longest in the appropriate operator team.

98-5E-0010M AUTOMATIC CALL DISTRIBUTION

The automatic call distribution (ACD) feature automatically distributes calls to agent positions according to specified call parameters. A call is distributed to the appropriate agent serving team and within that serving team to the agent who has been idle longest.

When a call requiring agent handling reaches the ACD, the dialed digits and incoming trunk group are analyzed to determine the call type. The 5ESS[®] switch software then sends a routing message to the powerful ACD software alerting it to begin ACD call procedures. The ACD searches for an available agent in a serving team that is assigned to serve the calls' type. If an agent is available, the ACD distributes the call to the agent. If there is more than one agent available, the ACD selects the statistically most idle agent to handle the call. If there is no agent available in the appropriate serving team, the ACD places the call in queue and triggers an audible indication to the caller that the call is waiting for service.

The ACD provides equitable allocation of workload by distributing calls to agents who have been available for the longest period of time. The queuing capability provides the flexibility in directing designated calls to a specific answering team. Also, the random flow of calls is averaged out by holding callers in queue until the traffic load lightens. The queue reduces the total number of agents needed to handle peak traffic loads by holding calls until they can be distributed evenly. Using automatic call distribution with queue capabilities helps to ensure that the call center will handle the call volume in a productive and efficient manner while providing prompt, attentive customer service.

98-5E-0011 CALL QUEUING

This feature queues incoming calls from trunks, other OSPS operators, and distant operators if no operator is immediately available. The specific queue a call enters depends on various call parameters and the queue structure established by the telephone administration. Calls are distributed to operator positions from queues according to operator service classifications and speed of service objectives on an order-of-arrival basis within the queue (first-in, first-out).

98-5E-0011M CALL QUEUING

The call queuing feature ensures that calls arriving at the automatic call distributor (ACD) are entered into queues if no agent is immediately available. The specific queue into which a call is entered depends upon the service requested (as determined by incoming trunk group and/or dialed digits) and the queue structure established by the call center administrator. A queue is defined as a grouping of call types that are to be served by the same agent serving team or automated process. The ACD provides for up to 128 queues and 128 teams.

Calls are distributed to agent positions using delayed ratio queuing. Calls in queue are served on an order of arrival basis (first-in, first-out).

The queuing process has the following capabilities:

- ☐ One call type can enter only one queue, but one queue can contain more than one call type.
- ☐ Any number of queues can be served by a single team.

A sophisticated delayed ratio queuing algorithm is used to determine the distribution of the calls once the call is placed in queue. The call is matched to the statistically most idle operator assigned to the call type. This type of distribution allows the call center administrator to place different types of calls with different service objectives in the same team. The 5ESS[®] switch automatic call distributor/Management Information System (ACD/MIS) along with other switch capabilities can be used to distribute calls to specialized groups of agents, while taking measurements for management purposes.

The major benefit of this type of distribution is that large team efficiencies can be maintained while still providing for priority calls that require a high rate of answer. Serving priority calls in this manner does not mean that lower priority calls are not served (or starved) but rather that delayed ratio queuing will strive to handle the lower priority calls at the lower service objective rate set by the call center administrator.

98-5E-0012 CUSTOMER ALERTING - AUDIBLE RING

This feature provides audible ringing to assure the caller that the call is active when a call cannot be routed immediately to an operator and must be queued for service.

98-5E-0012M DELAY TREATMENT

The delay treatment feature provides various types of alerting to the calling party when a call cannot be routed immediately to an agent and must be queued for service. The type of alerting provided is based on customer-defined expected delay thresholds. Any announcements provided during the alerting are also customer-defined. This allows the customer to change thresholds and announcements based on office conditions. Announcements and thresholds are specified on a queue basis.

If the expected delay of a call is less than the first threshold, the call will be queued and will receive audible ring. If the expected delay of a call is between the first and second thresholds, the call will be queued and an announcement will be played. If the expected delay of a call is between the second and third thresholds, the call will be queued and a different announcement can be played. If the expected delay of a call is greater than the third threshold, the call will receive a different announcement and then be disconnected.

This type of delay treatment allows the customer the flexibility to specify different types of delay treatment for different types of calls. Additionally, the delay treatment provided a particular call (announcement, ringing, reorder) can vary based on the expected amount of delay the call will experience.

This feature was formerly documented in features 98-5E-0012, 98-5E-0013, 98-5E-0014, and 98-5E-0015.

98-5E-0013 CUSTOMER ALERTING - DELAY ANNOUNCEMENT

This feature provides an announcement to all newly arriving calls to a given queue when the expected delay of the queue exceeds an administration specified first-level threshold (specified separately for each queue). The call is still queued.

98-5E-0014 CUSTOMER ALERTING - OVERLOAD ANNOUNCEMENT

This feature provides an announcement to all newly arriving calls to a given queue when the expected delay of the queue exceeds an administration specified second-level threshold (specified separately for each queue). The call is still queued.

98-5E-0015 CUSTOMER ALERTING - EMERGENCY ANNOUNCEMENT

This feature provides an announcement to all newly arriving calls to a given queue that an overload condition exists when the expected delay of the queue exceeds an administration specified third-level threshold (specified separately for each queue). The call is canceled.

98-5E-0016 FOLD DOWN

This feature provides an administrative procedure for an orderly restriction of traffic to a smaller number of operator positions during periods of low traffic. This procedure provides automatic reconfiguration of the assignments of call queues to serving teams.

98-5E-0016M FOLD DOWN

The fold down feature provides an administrative procedure [performed at the Management Information Center (MIS)] for an orderly restriction of traffic to a smaller number of agent positions during periods of low traffic. This feature ensures that calls in progress and incoming calls are not lost during the fold down procedure. An administrator can fold down a position by allowing the agent to complete the in-progress call while inhibiting the routing of any additional calls to that agent.

When an agent logs out of the ACD and the position is unoccupied, no more calls are distributed to that position. Additionally, the call center administrator may reconfigure the queuing structure of the ACD (either manually or automatically by time-of-day and day-of-week) to consolidate agents into a smaller number of serving teams.

The ability to implement fold down changes through the MIS ensures that these changes can be made quickly and efficiently.

98-5E-0018 DA INTERFLOW (INCOMING)

This feature allows the OSPS to accept traffic rerouted from a distant directory assistance system.

98-5E-0019 INTRAFLOW

This feature provides the customer with a flexible and powerful way of increasing the number of operators able to handle a call. It allows an OSPS administrator to designate for each call queue a single principal serving team and up to 8 supporting serving teams with associated outflow thresholds. Each serving team has a threshold indicating the maximum percentage of the team that can be handling calls from its

supporting queues simultaneously. A queue intraflows traffic from its principal serving team to a supporting team when the delay of the oldest call on queue exceeds the delay outflow for the supporting team. The supporting serving team accepts the call as long as doing so would not violate the team's supporting queue call percentage threshold.

Similarly, a server will serve calls from its supporting queues, subject to the existing delay ratio queuing strategy, only when there are no other available servers on its team and there are no calls in any of its principal queues. The same team threshold and outflow threshold are checked before a server can accept a call from one of its supporting queues.

This feature provides for the handling of certain types of calls by alternate server groups. The OSPS queuing strategy provides for 128 serving teams that may handle specific, single call types, several specific call types, or all call types. When incoming calls encounter lengthy call queues at the principal serving team, they may be diverted to a supporting serving team that has been designated to handle that type of call.

The customer has effective control over intraflow. Assignments of primary and secondary serving teams to call queues are stored as office data and are recent changeable.

Intraflow allows the customer to increase the number of available operators for a given queue to gain large team efficiency, thereby minimizing queuing delay and increasing operator occupancy. Intraflow also allows toll and assistance (T&A) customers to establish restricted traffic positions for training purposes when used in conjunction with the expanded call type determination capabilities feature (98-5E-0227). Intraflow can also be used to establish preferred traffic routing patterns among serving teams.

98-5E-0019M INTRAFLOW

This feature provides the customer with a flexible and powerful way of increasing the number of agents able to handle a call. Intraflow allows a call center manager to designate a single principal serving team and up to 8 supporting serving teams for each call queue. Each supporting team has an outflow threshold specified, which is the length of time a call must be queued before the call can intraflow to that supporting team. Each supporting team has an inflow threshold specified, which is the maximum percentage of the team that can be handling calls from its supporting queues simultaneously. A queue intraflows traffic from the principal serving team to a supporting team if:

- ☐ There are no idle agents on the principal team
- ☐ The delay of the oldest call on queue exceeds the outflow threshold for the supporting team
- ☐ The inflow threshold for the supporting team is not exceeded.

Intraflow allows a customer to establish specialized serving teams for call handling without losing large team efficiency, thereby minimizing queuing delay and increasing agent occupancy. When an incoming call encounters a lengthy delay at the principal serving team, the call may be diverted to a supporting serving team that has been designated to handle that type of call. Through the Management Information System (MIS), the customer has effective control over intraflow through the inflow and outflow thresholds, and can tailor the feature for their specific application.

98-5E-0021 QUEUE CONTROL

This feature alerts administrative personnel to queuing delays that exceed designated thresholds and, through use of input messages, can modify automatic call distribution (ACD) control parameters to achieve the desired grade-of-service or performance objectives.

98-5E-0021M QUEUE CONTROL

This feature allows administrative personnel to be alerted to queuing delays that exceed customer

designated thresholds and, through the Management Information System (MIS), to modify automatic call distributor (ACD) parameters in order to relieve the problem. The administrator has the capability to specify the level of delay that callers are expected to experience. Examples of administrative capabilities include:

- ☐ Specification of the announcements to be heard by delayed callers for each queue
- ☐ The ability to develop a schedule which will automatically assign agents to teams and queues to teams based on time of day and day of week
- ☐ The ability to modify the previous schedule, at any time, to change assignments
- ☐ Definition of call waiting indicator thresholds and announcement delay thresholds.

This feature allows the call center manager the flexibility to, at any time, modify ACD parameters and assignments to run the call center efficiently and effectively.

98-5E-0022 INTERFLOW

This feature provides for scheduled or permanent close down of one, some, or all operator serving teams at an OSPS. Activation and deactivation of interflow is specified by time of day and day of week, and the serving team.

For T&A calls, operator voice and data connections between the OSPS on which the call originally arrived and the OSPS providing the operator services are provided over dedicated digital facilities. Call completion, charging, final routing and other switch functions are carried out by the OSPS on which the call originally arrived; only service provided by the operator is handled by the receiving OSPS. The T&A calls not requiring an operator, such as fully automated coin or calling card calls, are handled entirely by the OSPS on which the call originally arrived.

The directory assistance (DA) calls assigned to closed teams are rerouted over analog or digital facilities to other operator systems for call handling. These facilities can be switched or dedicated as chosen by the switch owner. On calls that are rerouted, the switch administrator can specify that the OSPS translates the received dialed digits based on incoming trunk group and received dialed digits. The translation process allows insertion and deletion of digits. Therefore, the administrator can specify the outputting of the dialed digits received, outputting of different digits than those received, or outputting of digits when no dialed digits were received.

Interflow allows the operating companies to close teams during low traffic periods and have the calls served at another location where the benefits of large team sizes can be realized. Also, interflow allows concentration of specialized operator traffic, such as language assistance, in specialized teams at a single location.

98-5E-0022M INTERFLOW

This feature provides customers the ability to reroute incoming calls to any destination outside the switch. Dedicated or switched network facilities can be used to reroute the calls. Interflow is activated on a queue basis. When invoked, calls for a queue will be rerouted to the interflow destination. Interflow can be activated and deactivated on a demand or scheduled (time of day and day of week) basis through the Management Information System (MIS).

This feature allows an end-user to close call centers during low traffic periods and have the calls served at another location where the benefits of large team sizes can be realized. Also, during periods of high traffic volume, this feature allows an end-user to overflow a portion of a call center's traffic to another call center where the calls can be better served.

98-5E-0025 ADMINISTRATIVE EQUIPMENT CAPABILITIES

This feature provides administrative personnel at each operator office with an administrative processor, one or more administrative video display terminals, and an administrative printer. Each terminal provides force administration functions through selectable status and performance displays and input messages providing queue control, operator position assignment, and demand printout capabilities.

The printer provides administrative reports on a scheduled and demand basis. This equipment cannot handle calls.

98-5E-0027 ADMINISTRATIVE MEASUREMENTS - FORCE ADMINISTRATION

This feature provides force administration measurements to administrative terminals and printers on a demand and scheduled basis. These measurements characterize OSPS call traffic, ACD call queue performance, and operator serving team performance.

98-5E-0028 ADMINISTRATIVE MEASUREMENTS - FACILITY

This feature incorporates traffic and plant measurements that provide facility peg and usage counts for OSPS traffic into existing 5ESS[®] switch traffic and plant reports. The reports are distributed on a demand and scheduled basis to 5ESS[®] switch operational support systems, as appropriate.

98-5E-0028M ADMINISTRATIVE MEASUREMENTS - TRAFFIC

This feature allows traffic measurements providing facility peg and usage counts due to automatic call distributor/Management Information System (ACD/MIS) traffic to be incorporated into existing 5ESS[®] switch traffic reports, which are distributed on a demand and scheduled basis to 5ESS[®] switch operational support systems as appropriate. These reports describe how the system is processing calls.

The traffic measurements include: processor performance, peg counts by call type, peg counts, overflow, and usage for hardware units.

98-5E-0030 ADMINISTRATIVE MEASUREMENTS - OPERATOR PERFORMANCE

This feature provides individual operator performance measurements on a scheduled daily basis and on a demand interim basis. These measurements include call handling volume, number of calls handled, average call handling time, and number and duration of work periods, all on a per serving team basis.

98-5E-0031 OPERATOR POSITION ASSIGNMENTS

This feature assigns operators to serving teams by operator ID. This feature also assigns positions to operate as monitor positions. This is accomplished by messages entered at administrative or recent change terminals.

98-5E-0031M AGENT/SUPERVISOR ASSIGNMENTS

This feature allows an administrator to assign each agent/supervisor a login identification (ID) and password. This feature also allows the assignment of capabilities and restrictions to login IDs through the Management Information System (MIS).

Agents are assigned to serving teams based on the login ID, and calls are routed to the agent based on login ID, not position. An agent's ability to establish a conference, transfer, and dial externally is also based on the login ID. Additionally, a supervisor's ID can be given monitor permissions.

This capability allows the administrator to establish call handling capabilities on an individual agent/supervisor basis and to maintain those capabilities independent of the position at which the agent/supervisor is handling calls. Statistical reports on call handling activity are also provided on an agent basis rather than a position basis.

Some of the benefits that this assignment method provides are as follow:

- ☐ Agents can change serving teams by logging in with a different login ID. The agents do not have to physically move to a position assigned to that team.
- ☐ An agent's call handling capabilities are assigned to that agent regardless of the position.
- ☐ Since statistics are reported on an agent basis, an agent can sit in several different positions, and valid statistics are still reported.

98-5E-0032 POSITION STATUS DISPLAY

This feature allows administrative personnel in an operator office to select a display on the administrative terminal that shows the status of operator positions in that office. When selected, this display can be periodically updated at a rate which provides satisfactory response to status changes.

98-5E-0038 SERVICE ASSISTANCE CAPABILITIES

This feature enables an operator position used by a service assistant to provide assistance on calls. When alerted to an operator request for assistance, a service assistant can accept transfer of a call from, or conference with, the operator for further handling. Any operator position can be assigned to operate as a service assistance position.

98-5E-0038M SERVICE ASSISTANT CAPABILITIES

This feature provides agents single keystroke access to a service assistant on difficult calls, for example, when an agent is unable to satisfy a customer's request.

This feature allows the call center administrator the ability to define service assistant logins IDs (identifications), queues, and serving teams. By logging in with a service assistant ID, an agent/supervisor is assigned to a service assistant team which can be used to provide assistance to other agents on difficult calls. When alerted to an agent request for assistance, a service assistant may accept transfer or conference of the call from the agent for further handling. Any agent ID can be used as a service assistant ID through assignment to a service assistant serving team.

A service assistant can receive calls from, and transfer calls to, any agent on the automatic call distributor (ACD) who belongs to the same customer. When receiving a call, the service assistant also receives ID of the agent requesting assistance and the call information.

This feature allows the customer to assign, monitor, and control service assistant capabilities by identifying specific service assistant IDs and assigning those IDs to service assistant serving teams. Agents then have single keystroke access to a service assistant, making the request for assistance simple and efficient.

98-5E-0043 OPERATOR POSITION MONITORING

This feature allows OSPS managers to bridge onto an operator position that may or may not be handling a call. The manager can hear all connected parties and receives the same switch-directed display and tones as the operator. Monitoring may be undetected (not discernible by the observed operator) or detected (signaled to the observed operator) at the option of the end customer. Any operator position can be assigned to operate as a monitor position; operator IDs are granted or denied permission by messages entered at the administrative terminal or recent change terminal. Optional printing of the monitored call's details is also provided.

98-5E-0043M AGENT MONITORING

This feature provides call center supervision the ability to bridge onto an agent connection. The agent may or may not be handling a call. The supervisor can hear all connected parties and receive the same switch provided displays and tones as the agent. Monitoring may be undetected (not discernible by the observed agent) or detected (signaled to the observed agent), at the option of the telephone company. Any agent

position can be assigned to operate as a monitor position through means of a message entered at the Management Information System (MIS). This feature provides an administrator with the capability to assign an identification (ID) to each supervisor and to restrict monitoring and other supervisor activities by ID. Supervisor IDs are granted or denied permissions by messages entered at the MIS.

The 5ESS[®] switch automatic call distributor (ACD)/MIS provides the capabilities to:

- ☐ Monitor any position handling any type of call
- ☐ Provide an optional indication to the agent that monitoring is taking place (at telephone company option)
- ☐ Deliver to the monitoring supervisor all displays and tones sent from the switch to the agent
- ☐ Access agent statistical data
- ☐ Optionally interrupt supervisor (98-5E-0365M).

This feature allows management to collect and review actual agent performance data. This can be helpful to management while creating performance review documentation or agent training plans.

98-5E-0044 RESIDUAL CALLS

This feature allows OSPS operators to access special operator service traffic (SOST) operators in distant manual offices to provide handling of residual calls, such as mobile or marine calls. An OSPS operator accesses the SOST operator by dialing a designated residual operator code. Billing and control are the responsibility of the distant operator system. This feature provides the following capabilities:

- ☐ Transmission of a single ring-forward signal from the OSPS to recall the SOST operator as necessary
- ☐ Transmission of a double ring-forward signal to indicate calling party on-hook to the SOST operator
- ☐ Detection of a ringback signal generated by the SOST operator to recall an OSPS operator
- ☐ Optional generation of a special services AMA record (not to be used for billing the caller).

This feature does not provide the ability to receive coin control signals from an SOST operator. On residual calls requiring coin control, the originating OSPS operator must maintain voice contact with the SOST operator and receive the coin control information verbally. This feature does not provide any capability for an OSPS operator to serve as a terminating residual operator (for example, SOST).

98-5E-0045 ACCESS TO SPECIAL SERVICES OPERATORS

This feature allows operators to access operators in special services teams in the same OSPS.

98-5E-0046 ACCESS TO SWITCHED NETWORK

This feature allows an OSPS operator to place a call into the switched network by dialing either a directory number or a special operator-dialed code.

98-5E-0046M ACCESS TO SWITCHED NETWORK

The access to switched network feature allows an automatic call distributor (ACD) agent with the appropriate permissions the ability to place a call into the switched network by dialing a directory number.

Through the Management Information System (MIS), the call center manager can allow, or disallow, the placing of long distance calls by the members of a serving team. (In this case, long distance means calls

which are routed to an interexchange carrier.) Additionally, the call center manager can allow an agent the following types of dialing permissions:

- ☐ Unrestricted - The agent can place calls anywhere in the network.
- ☐ Restricted - The agent can place calls to directory numbers contained on a list of up to 20 numbers.
- ☐ Denied - The agent cannot place any calls into the switched network.

These agent dialing restrictions are overridden by the serving team long distance dialing restriction.

This feature allows a call center manager the ability to give each individual agent the necessary outbound dialing permissions while providing the call center manager with a means to control how those capabilities are used.

98-5E-0047 ACTIVATE/DEACTIVATE POSITION

This feature enables operators to indicate that a console is available for call processing (activate or logon) or that no new incoming calls should be routed to the console (deactivate or logoff). A sequence of keystrokes, which include the operator identity, is used for activation. Deactivation occurs when a basic services terminal (BST) or video display terminal (VDT) operator unplugs the headset.

98-5E-0047M ACTIVATE/DEACTIVATE POSITION

This feature allows agents to indicate that a position is available for calls (activate or logon) through a sequence of keystrokes which includes the agent identification (ID). Agents can indicate that a position is not available for calls via a keystroke (make-busy or logout).

Through the use of this feature, no ACD calls are delivered to unattended or unavailable positions.

98-5E-0049 AUTOMATED COIN TOLL SERVICE (ACTS)

This feature allows customers using coin stations to satisfy coin deposit requests without operator assistance. This feature:

- (1) Automatically calculates the amount due
- (2) Announces the amount due to the caller
- (3) Detects deposits
- (4) Totals the amount deposited
- (5) Either allows the call to proceed if the deposit is satisfied or routes the call to an operator if the deposit is not satisfied
- (6) Performs all of the coin signaling described in the Operator-Assisted Coin Toll Service feature.

98-5E-0050 AUTOMATIC CALLING NUMBER IDENTIFICATION

This feature provides automatic identification of the calling station, usually for billing purposes.

98-5E-0051 AUTOMATED OPERATOR TRAINING

This feature provides an interface between a video display terminal (VDT) and an Automated Operator Trainer. The trainer is connected to the VDT by cabling from the trainer's interface port to the VDT's trainer port. The interface is bidirectional for both voice and data.

98-5E-0053 BASIC BUSY LINE VERIFICATION (BLV)

This feature allows an operator to complete a connection to a busy line to determine the off-hook/on-hook status of the line and if a conversation exists on the line. This service depends on a BLV network being present in other switching systems in the network. An operator may begin verification on request of a subscriber or distant operator. The conversation on the verified line is unintelligible to the operator. This feature allows an operator to interrupt a call in case of an emergency. An intrusion tone is provided just before the operator interrupt. The ability to charge for the service provided by this feature is also included.

98-5E-0054 CAMA TRANSFER SERVICE

This feature allows non-operator-assisted calls to be routed to the OSPS from a CAMA office for operator number identification. The operator obtains the calling number from the customer and enters it into the OSPS which then releases the call from the operator position. The calling number is transmitted to a CAMA office over a dedicated trunk and the call is released by the OSPS.

98-5E-0055 CALL HOLD (INCOMING)

This feature allows an operator to place an incoming DA call on hold. While a call is on hold, the operator can use the position to consult with another operator or supervisor (using the Interposition Communication feature) or make an outside call (using the Access to Switched Network feature). The OSPS indicates the presence of the held call to the operator. The held call can be released (floated) or transferred from the operator position after the operator reconnects the voice path to the subscriber.

98-5E-0055M CALL HOLD (INCOMING)

This feature allows an agent to place an incoming call on hold. While a call is on hold, the agent has full use of the position to consult with another agent or supervisor or to make an outside call.

98-5E-0056 OPERATOR SYSTEM HOLD

This feature controls call disconnect of T&A calls in cooperation with a local office. Following a calling party on-hook, a call is disconnected at the local office only after an on-hook signal is given by the OSPS. This feature permits ringback to the calling party (following an on-hook) for a time-and-charges quotation, in order to request coin deposits from a party at a coin station or in emergency situations.

98-5E-0057 CALL ORIGIN INDICATION

This feature automatically identifies the call origin on position seizure. For DA calls, up to ten characters can be displayed. These characters can be user specified or can be any portion of the digits received. For T&A calls, the display is based on fixed characteristics applicable to toll and assistance calls.

98-5E-0057M AGENT ALERTING AND CALL ORIGIN IDENTIFICATION

This feature presents an audible tone and a 10-character alphanumeric display to the agent when a call is delivered to the position. The content of the display is specified by the customer based on dialed digits and/or incoming trunk group.

This feature reduces agent work time by automatically delivering the call to the agent, with no keying action required by the agent to answer the call. Additional work time savings are realized since, through the use of the display, the agent does not have to ask time consuming questions of the caller about the nature of the call. The use of the displayed information also allows an agent to offer more personalized service by, for example, varying greetings based on the service being requested.

Feature 98-5E-0067 has been included in this feature.

98-5E-0058 CALL WAITING INDICATION

This feature indicates to all members of a serving team when the waiting time of a call in any queue for that

team exceeds a preset threshold. The indication is turned off whenever the waiting time falls under a second preset threshold.

98-5E-0058M CALL WAITING INDICATION

This feature indicates to all members of a serving team when the waiting time of any call in a queue for that team exceeds a customer-specified threshold. The indication is turned off whenever the waiting time for all queues served by the team falls under a second customer-specified threshold.

This feature allows the customer the flexibility to define required system service level objectives and to communicate to the agents how well the system is currently meeting those objectives.

98-5E-0060 CANCEL PREVIOUS ENTRY

This feature allows an operator to delete previously entered digits.

98-5E-0060M CANCEL PREVIOUS ENTRY

This feature allows an agent to delete previously entered digits.

98-5E-0061 EMERGENCY ALERT

This feature allows an operator to indicate and notify administrative personnel of an emergency call (that is, bomb threat) with a single key action. The operator identification is printed when the key is used. For toll and assistance calls, additional call details are printed when the call is released from the position. Optionally, for DA calls, an automatic conference with an administration-specified call queue can be invoked.

98-5E-0061M EMERGENCY ALERT

This feature provides a single keystroke method of flagging calls of special interest to the end-user, for example, a very important customer or a bomb threat. Notification that the agent has selected this key is provided via the Management Information System (MIS). Also, as a customer option specified on a per queue basis, an automatic conference with a service assistant is initiated.

This feature allows an agent to quickly notify a supervisor and optionally obtain assistance on calls of special interest to a customer.

98-5E-0062 ENTER CALL DATA INTO MEMORY

This feature allows an operator to enter data relating to a call into the OSPS memory through a keying action.

98-5E-0064 INTERPOSITION COMMUNICATION

This feature allows an operator to request voice communication with an operator in another team in the OSPS, with a particular operator or position, or with a supervisor. The request is entered by a keying action. The requested operator or supervisor is seized, if available, or camped on if not available. Call data (including operator ID) at the time of conference are displayed to the requested operator when seized.

98-5E-0064M INTERPOSITION CONFERENCE

This feature allows agents to conference a call currently at their position with a specific agent, with an agent on a specific serving team, or with a supervisor. The call conference includes the sending of the requesting agent identification (ID), display information, and call data. The call center administrator can specify whether an agent is allowed to conference calls and if an agent is allowed to conference calls with parties outside of the automatic call distributor (ACD).

If the agent has requested conference with a specific agent/supervisor and that agent/supervisor is busy

with a call, the conference will claim the position, and the conference will be initiated when the current call is completed. Once a conference has been established, either agent can release from the call and become available to handle another call.

To conference with a service assistant, the agent selects the appropriate key(s). The calling/called party may be placed on hold during the agent's conversation with the service assistant. If necessary, the agent can transfer the call to the service assistant for handling. The service assistant is able to conference with or transfer the call to another service assistant, agent, or serving team.

This feature allows the agent an easy, flexible way to establish a conference call when the agent cannot provide the appropriate level of customer service to the caller. Use of this feature allows a call center to provide quality customer service efficiently.

98-5E-0065 INTERPOSITION TRANSFER

This feature allows an operator to request that a call currently at his/her position be transferred to an operator in another serving team, a particular operator or position, or a supervisor's position. The call transfer includes the transfer of call data (including operator ID) and displays.

98-5E-0065M INTERPOSITION TRANSFER

This feature allows agents to transfer a call currently at their position to another agent, to a serving team, or to a supervisor. The call transfer includes the transfer of the transferring agent identification (ID), display information, and call data. The call center administrator can specify whether an agent is allowed to transfer calls, and if an agent is allowed to transfer calls outside of the automatic call distributor (ACD).

Once the agent has entered a valid transfer request, the agent is released from the call and is available to handle another call. If the agent has requested transfer to a specific agent/supervisor and that agent/supervisor is busy with a call, the transfer will claim the position and be delivered to the position when the current call is completed.

To transfer a call to a service assistant, the agent selects the appropriate keys. The service assistant is able to consult with or transfer the call to another service assistant, agent, or serving team.

This feature allows the agent an easy, flexible way to transfer a call when the agent cannot provide the appropriate level of customer service to the caller. Use of this feature allows a call center to provide quality customer service efficiently.

98-5E-0066 AUTOMATED MULTILEAF BULLETIN INTERFACE

This feature provides an interface to an on-line database, for example, reference database. Using the VDT, an OSPA operator can display pages of information used to complete calls or to answer customer inquiries. This information might include dialing codes, inward operator route codes, emergency numbers, telephone company business office numbers, etc.

The operator can flip back to the call handling screen from the AMLB screen (25 rows by 80 columns). A set of 18 programmable function keys are made available to the AMLB database computer.

98-5E-0066M TELESERVICES AGENT DATABASE ACCESS

The teleservices agent database access feature provides a standard X.25 packet-switched interface that allows telemarketing/teleservices (TM/TS) agents access to external database systems.

The TM/TS agents can access databases through an agent communication terminal (ACT) set and attached data terminal. The agent can establish a packet-switched data call to any database accessible to that agent through packet-switching from the 5ESS[®] switch. Only one data call may be established at a time. Database access capability for agents is assigned on a per position basis and can be further controlled through the use of database logins and passwords.

This feature allows agents to access a variety of databases via packet-switching, thus eliminating the need for a separate data network.

98-5E-0067 OPERATOR ALERTING AND CALL TYPE ID

This feature presents an audible tone and display to the operator when a call is delivered to the position.

For directory assistance (DA) calls, up to ten characters can be displayed. These characters can be specified by the telephone company administration based on incoming trunk group or can be any portion of the digits received.

For toll and assistance (T&A) calls, the display includes the calling and called numbers, if available, the dialed prefix (0-, 0+, or 1+), the type of station (coin, non-coin, hotel), and the type seizure (that is, inward, recall).

This feature reduces operator work time by automatically delivering the call to the operator, with no keying action required by the operator to answer the call. Additional work time savings are realized since, through the use of the display, the operator does not have to ask time consuming questions of the caller about the nature of the call. The use of the displayed information also allows an operator to offer more personalized service by, for example, varying greetings based on the service being requested.

98-5E-0068 OPERATOR NUMBER IDENTIFICATION

This feature allows an operator to obtain the billing number of the calling station verbally and enter it into the OSPS. This feature is used when automatic calling number identification is not available or ANI (automatic number identification) fails.

98-5E-0069 OPERATOR-ASSISTED COIN TOLL SERVICE

This feature permits an OSPS domestic toll and assistance operator to request, return, and collect coin deposits on calls from coin telephones. The OSPS provides inband, expanded inband, and multiwink coin-control signaling. Inband signaling provides coin return, coin collect, and ringback signals to coin telephones. Expanded inband and multiwink signaling provide the same signals that inband signaling provides, plus DTMF pad and totalizer control (that is, operator-attached and operator-released) signals. Expanded inband signaling also provides a combined coin-collect/operator-released signal to minimize voice path interruptions. When a sent-paid call originates from a coin telephone, the OSPS determines and identifies the type of coin station, rates the call, and attaches an OSPS operator to the call. The OSPS displays the initial period charge or overtime charge to the operator who requests the deposit. When possible, the system counts the coins as they are deposited. When the deposit has been satisfied, the operator releases the call, enabling completion of the call.

98-5E-0070 MACRO KEYS

This feature allows alphanumeric (A-Z, a-z, 0-9) and punctuation characters to be assigned to each of the four macro keys. If, for example, a frequently used 10-digit forward number were assigned to a macro key, the operator would press the FWD # key, a macro key, and the ENTER key to input the forward number, resulting in a savings of nine keystrokes.

Macro key sequences are programmed locally at the VDT, and a programmed sequence remains stored until the VDT is powered off or position reset occurs.

98-5E-0071 POSITION RELEASE WITH DISCONNECT

This feature allows an operator to release the position from a DA call terminating at an operator position. Release of the position causes the call to be disconnected.

98-5E-0071M POSITION RELEASE WITH DISCONNECT

This feature allows the agent to release the position from a call with one keystroke. Release of the position causes the call to be disconnected, and the agent is immediately available for another call.

This feature saves agent keying action and reduces delay between calls, thereby making the handling of the call more efficient.

98-5E-0072 RECALL FROM SUBSCRIBER

This feature allows the subscriber to recall an OSPS operator for certain classes of operator-assisted calls by flashing the switchhook. The operator recalled is not necessarily the operator who originally assisted on the call.

98-5E-0074 RING FORWARD

This feature allows an operator (using a ring forward signal) to recall a distant operator to an established inward call originally set up through the distant operator's office.

98-5E-0075 RINGBACK TO SUBSCRIBER

This feature allows an originating operator to initiate a ringback signal to cause ringing to be applied to an originating subscriber's line.

98-5E-0077 SPLIT FORWARD/SPLIT BACK

This feature allows an operator to split off (separate) and reconnect the voice paths of either the called or calling subscriber on any call on which that operator is bridged. The operator can then communicate privately with one subscriber while the "split" party is on "hold."

98-5E-0083 AUTOMATED CALLING CARD SERVICE

This feature allows subscribers with dual tone multifrequency (DTMF) signaling to enter a calling card number or a personal identification number into the system without operator assistance. The billing information is validated by an automatic calling card service query to a billing validation database for each call attempt. The calling card number is retained by OSPS for subsequent call attempts (sequence calls) if the calling party presses the "#" key either before the called party answers or after the on-hook of the called party at the end of the call.

98-5E-0085 BILLED NUMBER SCREENING

This feature allows the OSPS to query a BVA (billing validation application) database to see if collect and bill-to-third-number billing are denied to a directory number designated to receive billing for a call. On call attempts with restricted billing, the operator is notified of the restriction so that alternate billing for the call may be arranged with the requesting customer.

98-5E-0086 CENTRALIZED CHARGE QUOTATION SERVICE

This feature allows the OSPS to direct time and charges quotations from calls originating at specified line numbers to a centralized administration system (for example, HOBIS or HOBIC).

98-5E-0087 OPERATOR-ASSISTED CALLING CARD SERVICE

This feature provides assistance to a subscriber that makes a calling card call but does not choose to enter the billing information or does not have DTMF signaling. The operator enters the billing information (calling card number). The calling card number is validated by the same automatic procedure as for Automated Calling Card Service. Appropriate operator displays are provided to indicate valid and invalid numbers.

98-5E-0088 OECC - AUTOMATIC COLLECT

This feature allows an operator to assign a collect class of charge to calls to certain numbers, without the

need to obtain verification from the called station. (Examples of automatic collect calls are Enterprise and 800 service calls.)

98-5E-0089 OECC - NON-REVENUE (NO AMA)

This feature allows an OSPS operator to indicate that a call is to be made with no charge to the caller. (Examples of such calls might be calls to the telephone company business office or emergency calls.)

98-5E-0090 OECC - PERSON-COLLECT

This feature allows an OSPS operator to indicate that a call is to be charged to the called party at a person-to-person rate, as requested by the parties to the call.

98-5E-0091 OECC - PERSON-PAID

This feature allows an OSPS operator to indicate that a call is to be charged to the calling party at a person-to-person rate, as requested by the caller.

98-5E-0092 OECC - PERSON SPECIAL CALLED

This feature allows an OSPS operator to indicate that a call is to be charged at a person-to-person rate and billed to a third number, or a credit card number applicable to an operator-assisted calling card service call, as requested by the called party. This billing number is provided by the called party and is entered into the OSPS by the operator.

98-5E-0093 OECC - PERSON SPECIAL CALLING

This feature allows an OSPS operator to indicate that a call is to be charged at a person-to-person rate and billed to a third number, or a credit card number applicable to an operator-assisted calling card service call, as requested by the calling party. This billing number is provided by the calling party and is entered into the OSPS by the operator.

98-5E-0094 OECC - DDD (DIRECT DIALING RATE)

This feature allows an OSPS operator to indicate that a call is to be billed at the direct dial rate. Typically, calls on which a caller has encountered difficulty in completing directly are charged in this manner.

98-5E-0095 OECC - STATION-COLLECT

This feature allows an OSPS operator to indicate that a call is to be billed to the called party at a station-to-station rate, as requested by the parties to the call.

98-5E-0096 OECC - STATION-PAID

This feature allows an OSPS operator to indicate that a call is to be billed to the calling party at a station-to-station rate. This class of charge is typically used for coin calls, for station-to-station calls on which time and charges service is requested, or when the caller is unable, or does not wish, to dial the called number and requests operator assistance.

98-5E-0097 OECC - STATION SPECIAL CALLED

This feature allows an OSPS operator to indicate that a call is to be charged at a station-to-station rate and billed to third number, or a credit card number applicable to an operator-assisted calling card service call, as requested by the called party. This billing number is provided by the called party and is entered into the OSPS by the operator.

98-5E-0098 OECC - STATION SPECIAL CALLING

This feature allows an OSPS operator to indicate that a call is to be charged at a station-to-station rate and

billed to a third number, or a credit card number applicable to an operator-assisted calling card service call, as requested by the calling party. This billing number is provided by the calling party and is entered into the OSPS by the operator.

98-5E-0100 ORIGINATING LINE SCREENING

This feature allows the OSPS to accept or deny classes of charge and/or display text to the operator based on the originating station identification. Screened calls can be identified by trunk group, ANI information digits, or ANI search techniques. Screening is accomplished through internal data rather than by accessing an external database.

98-5E-0102 AUTOMATED RATE QUOTATION

This feature allows an operator to obtain the charging rate for an operator-assisted or direct-dialed call placed from a calling line, if requested by a calling, called, or third party. The OSPS obtains the rates from the Real-Time Rating System (RTRS) external database. The operator uses keying actions, including the desired class of charge, to request the rate. The rate returned and displayed to the operator for quotation to the customer is the rate that applies at the moment the inquiry is received by the rating database or the rate that will apply at a future time (within one week of the current time) specified by the operator.

98-5E-0105 SUBSCRIBER CREDIT ENTRY

This feature allows a charge-recording entry specifying the number of occurrences of calls by a calling party with poor transmission, accidental cutoff, etc. The credit entry is created as the result of an operator's keying action.

98-5E-0106 TIME AND CHARGES SERVICE - SUBSCRIBER REQUEST

This feature is a service where an operator or clerk provides a verbal quote of the elapsed time and associated charges for a call. The operator performs a keying action to record the request. At the conclusion of the call or on a flash, the OSPS automatically notifies an operator (not necessarily the original operator) of the time and charges for the call. The operator reports the time and charges to the calling, called, or third party, as requested.

98-5E-0109 OPERATOR TROUBLE REPORTING

This feature handles trouble-code entry by the operator and call information provided by the OSPS. This feature provides the means for an operator to report a trouble condition in the network to maintenance personnel. Operators generate these reports at their positions whenever difficulties in handling calls are encountered or reported by customers. The operator trouble reports (OTRs) are used by maintenance for monitoring network performance, measuring customer satisfaction, and locating network troubles. These trouble reports are printed out on designated printers and sent to standard trouble reporting operating support systems.

98-5E-0110 PLANT MEASUREMENTS

This feature makes measurements available on maintenance terminals according to schedule or demand messages. The plant measurements include counts of OSPS trunks and service circuits out of service for maintenance reasons; down-time of operator positions; counts of network blockage; and alarm indications.

98-5E-0110M ADMINISTRATIVE MEASUREMENTS - PLANT

This feature allows plant measurements providing equipment peg and usage counts due to automatic call distributor/Management Information System (ACD/MIS) traffic to be incorporated into existing 5ESS[®] switch plant reports which are distributed on a demand and scheduled basis to 5ESS[®] switch operational support systems as appropriate. These reports describe how the system is processing calls.

The plant measurements include: counts of ACD/MIS trunks, lines, and service circuits out of service for

maintenance reasons, down time of agent positions, counts of network blockage, and alarm indications.

98-5E-0114 OPERATOR-ENTERED SPECIAL NUMBER - BILL TO THIRD NUMBER

This feature allows an operator to enter a 10-digit special billing number to be billed for the call being handled. This special billing number is provided by one of the parties to the call and is neither the called or calling number for the call.

98-5E-0115 CANCEL CALL

This feature allows an operator to release the forward connection on a call without affecting the back connection. Billing for the call is also canceled, although AMA records for statistical purposes only may be made. Billing data related to the calling party (for example, calling card number) are retained when cancel call is invoked.

98-5E-0116 RECORD MESSAGE

This feature allows an operator to release the forward connection on a call without affecting the back connection, at the same time creating an AMA record that will result in billing for the completed call. This feature permits an operator to place a second or subsequent call for the calling party without requiring him/her to go on-hook between calls. Billing data related to the calling party (for example, calling card number) is retained when record message is invoked.

98-5E-0119 OPERATOR SYSTEM SIGNALING

This feature allows the OSPS to accept calls from equal-access end offices using modified TSPS signaling and nonconforming end offices using traditional TSPS signaling. This feature also allows OSPS to outpulse calls in any of the following signaling formats: Feature Group C, direct-connect Feature Group D, CCS6 (Common Channel Signaling System 6), ECIS6 (Embedded CCS6), and CCS7 (Common Channel Signaling 7). Any 10-digit pseudo-ANI number, identifying the OSPS office, can be included when using direct-connect Feature Group D signaling on a conference connection, such as for third number verification.

98-5E-0120 CARRIER IDENTIFICATION

This feature allows the OSPS to determine (via digit analysis, trunk group data, and/or signaling from a local office) whether a call should be transported by an intraexchange carrier or interexchange carrier. This information is displayed to the operator on position seizure or after an operator enters a forward or back number. This feature is for United States domestic applications.

98-5E-0123 COMMERCIAL ACD-AMA RECORDING FOR AGENT CALLS

This feature allows the 5ESS[®] switch to create AMA records for commercial ACD calls. The records include outgoing calls from commercial ACD positions, incoming commercial ACD calls, and commercial ACD calls rerouted to another switch.

For outgoing calls, this feature creates AMA records for ACD agent originated calls to stations external to the ACD. The records include calls originated without a back party, as well as conferences and transfers of incoming calls to stations external to the ACD. These calls are recorded using a billing number that the service provider assigns to the commercial ACD customer.

For incoming calls, this feature creates terminating access AMA records for calls delivered to the ACD from an inter-LATA or international carrier. These records allow the service provider to collect access charges on the calls. This feature also performs INWATS specific call processing for INWATS calls that must be billed at the terminating CO. The call processing includes band restriction, band overflow, and AMA record generation.

For rerouted calls, this feature ensures that AMA records are made for any commercial ACD calls that are

rerouted over public facilities using call vectoring.

98-5E-0125 CENTRALIZED FLEXIBLE RATING (CFR)

This feature is required for completing real-time rated calls over a communications network. It provides the mechanism for issuing a rating query to, and receiving a reply from, a communications network database external to OSPS. The reply to the rating query provides OSPS with the charges due for the call.

98-5E-0127 SYSTEM CAMA-ONI

This feature allows a local office to send nonoperator-assisted calls to the OSPS when an operator must obtain the back number from the calling customer. The operator obtains the calling number and enters it into the OSPS, and then the call is released. The OSPS records the billing information for these calls. These calls can be routed to the OSPS on dedicated CAMA trunks or combined on operator trunks with operator-assisted traffic.

98-5E-0132 POSITION RELEASE

This feature allows an operator to release the position from a T&A call. For calls with a trunk connection to a called party, such as a 0+ demand call, an operator can release from the call before called party answer without causing disconnect of the trunk connection. For calls terminating at an operator position, such as an inquiry for dialing information, release of the position causes the call to be disconnected.

98-5E-0133 OPERATOR SERVICES AMA RECORDING

This feature provides changes in AMA recording necessary to format and generate AMA records associated with OSPS T&A calls.

The 5ESS[®] switch features a single-entry call charge recording system that provides for the collection of charging data during the progress of a call, transfer of this data to the switch AMA system, assembly of the data into a standard format, and temporary storage of data on the 5ESS[®] switch disks. AMA tracer records, traffic count records, and AMA sampling are also provided.

For operator-assisted calls, the computed call duration contained in the AMA record does not include operator interrupt time.

98-5E-0136 OPERATOR ASSISTED POSTPAY COIN SERVICE

This feature alerts the operator at seizure that the call originates at a postpay station or to listen for a tone identifying it as a postpay station. Postpay coin stations collect all coins deposited in them and the operator cannot return coins; therefore, the operator does not request a deposit for the initial period until the called station or party answers.

98-5E-0138 NETWORK CALL DENIAL

This feature prevents a subscriber from completing calls if a database query indicates that the subscriber is not a customer in good standing. For each call, a query is sent over the common channel signaling network to an NCD network control point to determine if the billing number is valid. If the billing number is not valid, the call is blocked and appropriate operator displays or customer announcements are given. Inward NCD validation for directory numbers and calling cards, similar to the Inward Calling Card Validation feature, is also provided.

98-5E-0139 REAL-TIME RATING - EXTERNAL

This feature provides the mechanism for issuing a rating query to, and receiving a reply from, a rating database external to the OSPS for calls requiring real-time rating. The reply to the rating query provides the OSPS with the charges due and timing information for the call. This feature applies to calls (for example, coin, hotel/motel, and time and charges) for which charges must be determined and reported to customers

in real time.

98-5E-0140 OPERATOR-ASSISTED HOTEL/MOTEL SERVICE

This feature allows the OSPS to identify a call, based on signaling or screening data, that originates on a hotel/motel line. The operator verbally requests the room number of the originating party, enters the data into the OSPS, and then releases the position. The autoquote service for hotel/motel feature or centralized charge quotation service (voice quote) feature provides a charge quotation at the end of the call.

98-5E-0141 RELEASE FORWARD CONNECTION

This feature allows an operator to release the forward connection on a call without affecting the back connection or AMA recording.

98-5E-0142 RELEASE BACK CONNECTION

This feature allows an operator to release the back connection on a delayed call without affecting the forward connection or AMA recording.

98-5E-0143 CHARGES-AND-MINUTES DISPLAY

This feature displays the charges and elapsed time associated with a real-time rated call.

98-5E-0144 MANUAL OUTPULSING

This feature allows an operator to initiate outpulsing of a directory number by a single keying action.

98-5E-0146 TWO-STAGE OUTPULSING FOR INTERNATIONAL CALLS

This feature provides for those international calls that require outpulsing to be performed in the international direct distance dialing (IDDD) format with two stages of outpulsing. The first stage establishes a connection to the appropriate domestic gateway switch. The second stage includes the country code and national number in the specified country. The operator specifies outpulsing in the IDDD format by using the international forward number or international route number key.

98-5E-0150 CALL HOLD ON A LOOP

This feature allows an operator to place a toll and assistance call on hold and later reaccess it without disturbing the connections. When the operator is not connected to the call, the supervision status of the call is displayed at the operator's position. Up to three calls can be on hold at one time. If both the calling and called connections are off-hook and unsplit, and a valid class of charge is available, the call is automatically timed. A held call can be released from the position by the operator reaccessing it, then releasing the position (using the position release feature).

98-5E-0152 DIRECTORY ASSISTANCE CALL COMPLETION - PHASE I

The directory assistance call completion - phase I feature provides a directory assistance user with the option of completing both intra-LATA and inter-LATA calls to the retrieved directory number. Alternatively, an operator may key into the terminal to indicate call completion is desired. The OSPS uses existing T&A capabilities to screen, charge, and route the completion. The call to the retrieved directory number is completed through the OSPS switch. The OSPS retains call supervisory control and provides charge recording for the call. This feature assumes automatic number identification (ANI) is available on DA calls.

98-5E-0153 MULTIPLE DATABASE ACCESS

This feature provides a standard X.25 packet-switched interface that allows access to multiple external database systems. Operators using combined services terminals can access up to 15 databases and can have up to 6 simultaneous sessions active at one time. The toll and assistance (T&A) operators using VDTs (video display terminals) can also access up to 15 databases and can have 2 sessions active at the

same time. The data screens associated with each session can be individually requested and displayed on the operator's terminal. Database access capabilities for operators are assigned on a serving team and Operator Service Center (OSC) basis.

This feature allows operators to access a variety of databases from a single terminal. Some of the databases may be for listing services while others contain toll and assistance information, such as emergency telephone numbers and operator routes. The operators can alternate between active sessions without having to log on or off, thereby providing improved and timely customer service.

98-5E-0155 CANCEL TIMING

This feature allows an operator to restart timing on an established call by means of a keying action without any change in the call connections.

98-5E-0157 CONFERENCE CONNECTION

This feature provides operators with a third connection on a loop, in addition to back and forward connections, which may be used for advancing calls. When established, this connection is conferenced with other connections on the loop, and supervision is displayed to the operator. When the conference connection is external to the switch, it is connected to the operator and at most, one other party on the loop. When the conference connection is internal, it may be connected to all parties on the loop. The ability to release an established conference connection is also provided.

98-5E-0158 OPERATOR-INITIATED CALL HAND OFF

This feature permits a call to be released from the operator position and be connected through the 5ESS[®] switch to a distant operator system (for example, TSPS). Signaling from the OSPS simulates a call dialed directly to the remote system from the caller to the distant system to establish the call. As part of the feature, through-signaling and supervision to the originating local office is provided to the distant operator system by the intermediate switching point (Class 4X Office) feature of the 5ESS[®] switch.

98-5E-0164 AUTOQUOTE SERVICE FOR HOTEL/MOTEL

This feature allows the OSPS to send charge quotations directly over switched connections to remote printers located on the hotel/motel or other customer premises. The charge quotations are also sent to either a hotel billing information system (HOBIS) minicomputer or the record printers in a telephone company's hotel billing information center (HOBIC). The charge quotations are sent to the customer's printer directly after call completion. This feature also allows maintenance personnel to establish connections with the remote printers and send test messages to the printers.

98-5E-0167 PERSONALIZED RESPONSE SYSTEM INTERFACE FOR THE BST

This feature provides an interface from the BST to a personalized response system such as the PRS[®] manufactured by Golden Enterprises, Inc. The personalized response system allows the operator to record a phrase (typically in the operator's own voice) for playback to customers.

98-5E-0168 BUSY LINE VERIFY (BLV) SCRAMBLER

The scrambler circuit for the BLV feature (98-5E-0053) is developed separately and may be used to make conversation on the verified line unintelligible to the operator. An operator may override the scrambler when making an emergency interrupt in order to enter the conversation on the line.

98-5E-0170 CUSTOMER ACCOUNT SERVICES (CAS) I - RELEASE 1

This feature provides recognition, validation, and AMA recording of phone calling cards in the Telecommunication Standardization Sector (TSS) standard format. Entry of the card number in an abbreviated format is also supported. These cards are validated in the CAS database using CCIS6/DCIS6 (common channel interoffice signaling system No. 6/destination common channel interoffice signaling No.

6) signaling. Both automated calling card service and operator handling are provided. Inward validation of the cards is also supported. Fourteen-digit cards continue to be handled and can be validated in the billing validation application (BVA) or, with feature 98-5E-0225, in line information database (LIDB).

The OSPS data is used to check contractual agreements when using a phone calling card on a local exchange carrier (LEC) call and a LEC card.

This feature allows TSS format cards to be accepted and automatically validated by the telephone company, provided a common channel signaling link connection to the CAS database is available.

98-5E-0178 DELAYED CALLS - CHARGING

This feature allows delayed calls to be released from the operator position and call timing started when both parties are connected and appropriate charging information has been entered by the operator.

98-5E-0180 IMPROVED THIRD NUMBER ACCEPTANCE (ITNA)

This feature automatically determines whether verbal acceptance is required on calls billed to a third number by the calling party (back third number). The following types of treatment can be selected based on the originating station type, incoming trunk group, carrier, and originating line number:

- ☐ Verbal acceptance is required, and the third number is automatically outpulsed at all times of day.
- ☐ Verbal acceptance is required, but the third number is automatically outpulsed only at selected times of day. At other times, the operator is notified and can take appropriate action based on local practices.
- ☐ Verbal acceptance is never required. The operator is notified of this, and no outpulsing to the third party occurs.

This feature saves operator work time and helps reduce fraud on bill-to-third-number calls.

98-5E-0183 FORCE MANAGEMENT SYSTEM INTERFACE

This feature allows the OSPS administrative processor (OAP) to act as a pollable data terminal whereby designated data files stored in its hard disk can be accessed on a polling basis by a user-supplied force management system (FMS) and transferred to the FMS through the FMSI protocol. This feature allows the operations support system (OSS) to obtain traffic, force, and service measurements to forecast operator staffing needs by polling the OSPS system.

98-5E-0185 DIRECT INTERNATIONAL ORIGINATIONS

This feature allows the OSPS to provide service for callers in foreign countries who have direct access to interexchange operators in the United States. The OSPS operators can complete calls to selected NPAs (numbering plan areas), NPA-NXXs, and country codes. To reach an operator, the customer either dials an access code or picks up the receiver at a designated station. Either the station equipment or local office signals the appropriate codes to reach the United States operator. When the called party hangs up after an operator-handled calling card call, callers with dual tone multifrequency (DTMF) signaling capability from countries providing appropriate signal quality can place sequence calls billed to the same card number without operator intervention.

This feature allows the telephone company to provide quality telephone service to overseas customers, such as those traveling and working abroad. The customers can reach an English-speaking operator, use billing methods accepted by the United States telephone company, pay at established rates, and be connected in a timely manner.

98-5E-0186 INWARD CALLING CARD VALIDATION

This feature allows the OSPS to receive inward calls from operator systems that do not have access to a

calling card validation database to validate calling cards. For automated service, the distant operator dials a special inward operator code that tells the OSPS what type of signaling will be used (DTMF or MF). After collecting the calling card number, the OSPS sends a query to the appropriate database. An automated response informs the originating operator of the card's status. If the distant operator cannot dial DTMF or MF digits, the inward code dialed by the distant operator causes the call to be connected to an OSPS operator. The OSPS operator enters the card number and verbally relays the result of the validation to the distant operator.

98-5E-0188 LOCAL ISLU FOR DATA LINK SUPPORT

This feature establishes an integrated services line unit connected with the link adapter unit as a supported configuration to terminate OSPS data links in a switching office.

98-5E-0189 INTEGRATED SERVICES LINE UNIT AS A POSITION CONTROLLER

This feature allows OSPS operator terminals to be connected through an ISLU. The feature applies to all operator types.

98-5E-0191 OPERATOR TROUBLE REPORT SYSTEM INTERFACE

This feature provides for the transmission of operator trouble reports (OTRs), automatic number identification (ANI) failure messages, and other automated trouble reports to network operator trouble information system (NOTIS) and network service center system (NSCS) or equivalent systems. The NOTIS and NSCS are computer-based systems that perform trouble analysis for the network.

98-5E-0194 SEQUENCE CALL CHANGES

This feature is provided to allow or not to allow, as a telephone company option, automated calling card sequence calls to 700, 800, and 900 numbers and to directory assistance and 611.

98-5E-0197 TERMINATING CODE SCREENING

This feature allows screening of calling card billing, blocking of collect billing, and/or display of text to the operator on calls to selected countries and domestic NPAs and NXXs. Automated calls may be routed to an operator or given reorder. On operator-assisted calls, a display is given to the operator indicating that TCS applies. Coin, noncoin, and hotel/motel calling card calls can be independently screened.

98-5E-0200 MANUAL TICKET

This feature allows an operator to designate a call as requiring a paper printout, but still allows the operator to float the call. The OSPS records the call timing along with other call data, plus billing instructions entered by the operator. Upon call termination, the OSPS sends this data to a printer designated in office data. Certain toll and assistance calls cannot be automatically rated and/or billed, thus requiring a manual billing procedure.

98-5E-0205 SWITCHED-ACCESS EXTERNAL ARU INTERFACE

This feature permits connection of the calling party to automated listing service announcements generated by a vendor-supplied ARU external to the 5ESS[®] switch. These announcements are generated under the control of an external information system (EIS).

This feature provides the flexibility for listing services to use announcements stored on the internal Operator Services Position System (OSPS) announcement unit (feature 98-5E-0002) or announcements generated by an external ARU. The choice of internal or external announcements can be made on a per call basis by the EIS vendor. When external announcements are used, announcement changes can be made by the telephone company without affecting the OSPS. Existing external ARUs can be used when installing a new OSPS system, provided they conform to the OSPS/EIS interface specifications. Although an open interface for EIS vendors is used, certification testing and/or vendor-specific modifications may be

necessary for particular EIS vendors.

98-5E-0213 LINE INFORMATION DATABASE (LIDB) INTERFACE

This feature provides the message formats and equipment interface for Operator Services Position System (OSPS) to communicate with the LIDB. The LIDB interface uses Bell Communications Research SS7 (signaling system 7) common channel signaling transaction capability protocols for the purpose of transmitting messages and receiving responses at appropriate times during call processing.

This feature, when used in conjunction with feature 98-5E-0225, allows telephone companies to control fraud by automatically accessing LIDB databases to validate 14-digit calling cards [10-digit card number plus personal identification number (PIN)] and for billed number screening of collect and third-number calls. The common channel signaling link used for LIDB queries can be shared with other SS7 signaling applications in the office, such as call setup signaling and 800 database queries.

98-5E-0217 FULLY CODED ADDRESSING (FCA)

This feature allows FCA protocol for OSPS calls.

The FCA provides a common channel signaling (CCS) single-stage protocol for routing international outbound calls in a simple and uniform format. The FCA protocol includes sufficient routing and addressing information in a single CCS message to route international calls to the appropriate international switching center (ISC). It eliminates multistage multifrequency signaling for outbound international calls which saves switch resources and reduces the time needed to handle the calls. This allows for consolidation of trunking and signaling protocols and better utilization of the CCS network.

98-5E-0218 MORE EFFICIENT CALL HANDLING (MECH)

This feature divides the operator handling for person and collect calls between two operators. The first operator enters the class of charge for the call and may enter the name of the person desired and/or the name of the calling party. This operator releases. The OSPS (Operator Services Position System) system outpulses and connects the call to another operator if the called party answers. The second operator obtains the requested party or billing authorization and connects the calling and called parties. If the call is unanswered, no second operator is connected, and the call is disconnected when the calling party hangs up.

The MECH feature offers operator work time savings on person and collect calls by more efficiently handling these calls while maintaining quality customer service. Operator work time is saved because no operator is connected during outpulsing and ringing/busy, and no second operator is connected on unanswered calls.

98-5E-0219 SUB-ACCOUNT BILLING (SAB) - PHASE I

This feature offers the ability to provide telephone customers a detailed breakdown on their monthly statements. Customers are allowed 10,000 subaccount numbers per station number, ranging from 0 to 9999, which they can assign as they choose. Customers first dial 0 + the called number. Upon receipt of a prompt, they key "1ZX", where Z is the code for subaccount billing and X is the 1 to 4 digit subaccount number. No operator assistance is provided.

When used with a compatible billing system, this feature offers a revenue-producing customer service option for the telephone companies. It allows business customers to partition their telephone charges as they choose without having to register these partitions with the telephone company in advance.

98-5E-0225 EXCHANGE ALTERNATE BILLING SERVICES CALL HANDLING

This feature provides call handling of calling card, collect, and bill-to-third-number calls based on responses to queries sent to the line information database (LIDB) over an SS7 network using the LIDB interface feature. To provide billed number screening and calling card validation in a mixed BVA/LIDB environment,

the OSPS supports bimodal access to the billing validation application (BVA) and LIDB based on the NPA-NXX of the called number for collect calls, the third number for bill-to-third-number calls, the card number for line number based calling cards, and the RAO-0/1XX for RAO-based calling cards.

98-5E-0227 EXPANDED CALL TYPE DETERMINATION CAPABILITIES

This feature provides the telephone company with additional ability to control the functions provided by the various toll and assistance (T&A) operator teams by increasing the parameters that can be used to control the routing of T&A calls to operators. The added parameters are the call destination, the incoming trunk group number, whether the call originates at a coin station, and, when feature 98-5E-0022 is used, the identity of the sending Operator Services Position System (OSPS).

98-5E-0229 CUSTOM INFORMATION DISPLAY

This feature displays a customized information display message on the OSPS VDT based on incoming trunk group number. This message can be used to alert the OSPS operator to provide a special greeting, treatment, or call-handling restrictions when dealing with these calls. The displayed message text can be up to 116 characters long and is displayed at initial and recall position seizures. The system administrator specifies, through recent change, the message content and the trunk groups associated with each message.

98-5E-0230M MAXIMUM NUMBER OF TM/TS POSITIONS

This feature sets the maximum number of agent positions allowed on a switch to 1000 and the maximum number of positions on a single SM to 100. The actual number supported by a given system depends on engineering based upon traffic.

98-5E-0232 EXTERNAL CALL TRANSFER FROM THE BST

This feature allows an operator at an OSPS BST terminal to transfer a calling party to a party external to the system. No billing is done.

98-5E-0232M EXTERNAL CALL TRANSFER

This feature allows a TM/TS agent to transfer a calling party to a party external to the system. At the telephone company's option, calls that are transferred to a party external to the system may be billed to the call center.

This feature allows a call center to offer improved customer service. When an agent receives a call that the call center cannot handle, this feature allows the agent to transfer the call to the appropriate location/department, instead of asking the caller to redial.

98-5E-0239 MUSIC ON HOLD FOR INCOMING TM/TS CALLS

When an incoming call is placed on hold by an agent, the call is routed to an audio source which provides music or other audio output. This audio source can be located in either the central office or on customer premises. This feature is assigned on a serving team basis and the audio source is specified on a serving team basis.

By playing music or announcements to a caller on hold, the caller is reassured that their call has not been disconnected, thus reducing the number of callers who disconnect while on hold. A TM/TS customer can also use this feature to inform callers of additional services and products by playing advertisements.

98-5E-0240 MUSIC ON QUEUE USING CALL VECTORING

This feature provides additional flexibility to the call center administrator in specifying the music and/or other audio treatment that calls will receive while in queue. Within a call vector, the administrator will be able to specify the announcement(s) and/or music that should be played for a call that has been placed in

queue as a result of a vector step.

By playing music to a calling party on queue, the calling party is reassured that their call has not been disconnected. This reduces the number of abandoned calls.

98-5E-0243 REMOTE AGENT TERMINALS

This feature provides two enhancements which will allow TM/TS agent terminals to be provided in a location that is distant from the ISLU or RISLU. One enhancement is the ability to use a U-interface to connect to the agent terminal. The other enhancement is the ability to use commercial power for the BST. The commercial power is external to the BST.

98-5E-0247 NON-INTERMEDIATE SWITCHING POINT TRUNK GROUP ROUTING TO VDT POSITIONS

This feature allows an Operator Services Position System (OSPS) owner to use VDT positions as operator terminals for calls that arrive on nonoperator trunk groups. The call queue can be determined based on either the incoming trunk group number or the digits received.

This feature allows integrated services digital network (ISDN) access to an external database from the operator's terminal, which can be used to offer a variety of services.

98-5E-0250 MIS DATA LINK

This feature sends ACD queue and agent information to the MIS data links. These messages provide complete detail on calls as they enter the system and are delivered to agents. Also, these messages provide details on the call activities and performance of the agents. This information is the basis for the MIS capabilities of the 5ESS[®] switch ACD/MIS.

With this data sent to the MIS, the MIS can provide statistics on how well calls are being handled and how well agents are performing. These statistics allow a call center manager to run the call center efficiently.

This feature was formerly documented in feature candidates 98-5E-0250 and 98-5E-0264.

98-5E-0251 CUSTOMER ACCOUNT SERVICES (CAS) I - RELEASE 2

This feature provides recognition and automatic message accounting (AMA) recording of commercial credit cards in ISO and/or ANSI[®] standard format and all telecommunications cards in the TSS standard format. Telecommunications cards can be validated in the CAS database using common channel interoffice signaling system No. 6/destination common channel interoffice signaling No. 6 (CCIS6/DCIS6) signaling or manually validated by an operator. Commercial cards must be manually validated. All card numbers can be keyed by the customer in response to the automated calling card service prompt or given to an operator. Calls requiring manual validation are routed to an operator after card recognition. Fourteen-digit cards are assumed to be the current telecommunications cards and can be validated in the BVA or, with feature 98-5E-0225, in the line information database (LIDB). TSS format cards continue to be handled as in CAS - release 1.

This feature allows a telephone company to accept TSS standard telecommunications cards and commercial cards. The card numbers can be entered by the caller in response to automated calling card service protocol or given verbally to an operator.

98-5E-0265 ANSWER SUPERVISION CONTROL

This feature gives the teleservices administrator the ability to control the point at which answer supervision is returned for calls that are processed using call vectors. This ability is provided by allowing the administrator to specify, as steps in a call vector, call processing actions that explicitly or implicitly give answer supervision.

For example, an administrator might specify that the first step in a call vector is to give audible ring for a

certain duration and the second step is either an explicit command to return answer supervision or some other command that implicitly gives answer supervision (such as connecting the call to a recorded announcement).

This feature can be used, for example, to reduce INWATS charges to a TM/TS customer. When queuing delays exist, giving a call audible ring for a period of time before playing an announcement reduces the billed time. Therefore, the cost of that call to the TM/TS customer is reduced.

98-5E-0267 CALL VECTORING

This feature gives the Teleservices administrator the power to program a series of call handling steps that an incoming teleservices call will follow before it is routed to an agent. The series of steps is referred to as a call vector. Call vectors are accessed based on dialed digits and/or trunk group. One or more dialed digit/trunk group permutations can be assigned to a single vector. These assignments are controlled by the Teleservices administrator.

Each step in a vector contains a command. Some commands are conditionally executed based on parameters such as time of day, day of the week, or queue length. The selection and ordering of commands as well as the specification of conditions for conditional commands are under the control of the teleservices administrator. The actions that are provided by call vectoring commands include the following:

- ☐ Place call in queue
- ☐ Branch on queue or team status
- ☐ Place call in queue (transfer call from one queue to another)
- ☐ Branch to another vector
- ☐ Return answer supervision
- ☐ Connect call to an announcement
- ☐ Go to another step in the vector
- ☐ Delay vector processing for a specified number of seconds with silence, music or audible ring
- ☐ Forced busy
- ☐ Reroute call to a directory number over public or private networks
- ☐ Forced disconnect
- ☐ Stop vector processing for this call.

This feature gives the TM/TS customer a high degree of flexibility in the treatment of a call prior to delivering the call to an agent. Call treatment can be varied in response to system status (queue length, delay, time of day, etc.) by specifying the appropriate conditional steps. The ability to customize call treatments and to vary the treatment automatically in response to changes in system status provides a mechanism for maximizing the efficiency of handling calls.

98-5E-0273 COMBINED SERVICES (LISTING SERVICES/TOLL AND ASSISTANCE)

This feature allows operators at combined services terminals to serve all call types that enter the OSPS (Operator Services Position System), currently listing services and toll and assistance, on a per call basis. The telephone company administrator can control or modify the traffic types served by each operator team using OSPS automatic call distribution features.

This feature relies on multiple database access (98-5E-0153) to provide interactive access to both listing services (LS) and toll and assistance (T&A) databases. It uses the external information system (EIS) interface provided by the switched-access external audio response unit interface feature (98-5E-0205) to provide listing services.

Combined services allows telephone companies to optimize their operator work force and training.

98-5E-0274 LISTING SERVICES PRESENTATION PROTOCOL

The listing services presentation protocol feature provides efficient communication between vendor-supplied listing services databases and OSPS CSTs. The protocol for this communication meets an interface negotiated between Lucent and Computer Console Incorporated (CCI). It includes the specification of templates for various listing service displays and keying sequences that are stored locally in the CST. Response time is minimized by the database sending the appropriate template designation to the CST at the start of a session. This design permits the details of the display and keying sequences for that session to be sent with minimal information.

This feature is required for the OSPS CST to interface with the CCI EIS gateway. It allows information provided by CCI databases that may support multiple services, such as directory assistance, customer name and address, and zip code provision, to be displayed on the OSPS terminal.

Use of this interface with the CCI databases allows OSPS customers to offer revenue producing operator services in an efficient, flexible manner.

98-5E-0275 COMPUTER CONSOLE INCORPORATED SWITCHED-ACCESS EXTERNAL AUDIO RESPONSE UNIT INTERFACE

The CCI switched-access external ARU interface provides the OSPS support for an upgraded Lucent/CCI interface to a CCI EIS gateway and to an associated CCI-supplied external ARU. This provides the CCI-specific modifications required for the switched-access external ARU interface feature (98-5E-0205).

This feature permits the calling party to be connected to automated listing services announcements provided by a CCI-supplied ARU. This allows the caller to hear announcements for directory assistance and other listing services that may be offered by CCI, such as customer name and address, and zip code provision.

98-5E-0276 EXPANSION OF MAXIMUM NUMBER OF OSPS POSITIONS

This feature increases the number of positions that can be connected to an OSPS position switching module and to a 5ESS[®] switch. The OSPS positions can be any combination of listing services and toll and assistance (T&A) terminals. The actual number supported by a given system depends on services provided, traffic engineering, and work times. This feature allows consolidation of multiple operator systems onto one OSPS and allows an OSPS to meet future growth demands.

98-5E-0276M EXPANSION OF MAXIMUM NUMBER OF TM/TS POSITIONS

This feature increases the number of agent positions allowed on a 5ESS[®] switch to 4000 and on a single position switching module to 200. The actual number supported by a given system depends on engineering based upon traffic, work times, and services provided.

This feature provides flexibility for both the large and small TM/TS applications. While large users can consolidate their operations on a single switch, several small customers can be served by a single switch, thus accommodating future growth demands for a variety of TM/TS customers.

98-5E-0278 AUTOMATED OPERATOR TRAINER

The automated operator trainer is a separately orderable, nontraffic-engineered piece of equipment. The trainer is a microprocessor-controlled call simulator that presents training lessons and simulates calls on

the OSPS VDT. The trainer controls the displays on the VDT and provides audio through the trainee's headset, based on instructions read from the optical disk contained inside the trainer. Customer voices and some call progress tones are stored as PCM-encoded data on the optical disk. Other call progress tones are generated directly by the trainer. An internal printer capable of printing 40 columns wide and an external printer port are provided with the trainer. The portable trainer supports one trainee at a time and is directly connected to the VDT trainer port through a cable.

98-5E-0285 CALLING PARTY NUMBER DELIVERY TO ACD

This feature delivers the calling party number (CPN) from CCS7 trunks to the 5ESS® switch ACD/Management Information System (MIS). Via the MIS, the call center administrator can specify whether the CPN is to be delivered to the MIS, the agent's terminal, or both. The CPN will be delivered to the ACD when it is present in the CCS7 initial address message and when the presentation indicator is set to "presentation allowed."

98-5E-0298 DIRECT AGENT ACCESS

This feature allows an agent to be reached directly by an external party dialing a phone number associated with that agent. The call center manager can assign a directory number to an individual agent. The agent can give this number to customers who wish to call the agent directly. If the agent receives an agent-direct call while handling an ACD call, the agent-direct call will camp-on the agent's position. The agent can place the agent-direct call on hold, then conference with a third party, join both parties for a three-way conversation, and transfer the call to the third party. The MIS reports statistics for this feature such as number of agent-direct calls received and average talk time.

This feature allows call centers to offer more personalized service to customers. For example, a customer may initially reach an agent through the ACD to place an order. Then, to modify or check on that order, the customer can call that agent directly, thus giving the customer a single point of contact for that order.

98-5E-0312 CUSTOMER ACCOUNT SERVICES - RELEASE 3

This feature provides the following capabilities:

- ☐ Card validation using common channel signaling 7 (CCS7) transaction capabilities application part (TCAP) protocol.

This protocol can be used for both telecommunications cards in the TSS standard format (89 cards) and for commercial credit cards in ISO and/or ANSI® standard format. Automated validation is provided for both automated and operator-handled calls. Automated validation is also provided for operator-handled inward validation requests and for automated inward validation requests for 89 cards.

- ☐ Automation of international credit card validation (ICCV) for non-CAS 89 cards using ICCV standardization sector (SS7) TCAP signaling.

This protocol can be used to validate TSS non-CAS 89 cards which are issued by a foreign administration in a foreign partner's database.

- ☐ Specification of the signaling protocol, query time-out threshold, query time-out action (allow/delay), and translation type on a card vendor basis.

This allows the telephone company to select any OSPS-supported validation protocols for 89 cards and ISO and/or ANSI® commercial cards, even when the card numbers reside in various databases (both domestic and international) with differing timing and network characteristics.

- ☐ Prompt for personal identification number (PIN).

This provides efficient handling for both automated and operator-handled calls when callers enter a

fixed-length card number but do not enter the required PIN.

- ☐ Terminating code screening (TCS) override.

This enhances customer service by allowing card holders to selectively or completely override TCS restrictions. (See feature 98-5E-0197). The OSPS bypasses TCS checks when such override is specified in an CAS TCAP reply.

- ☐ Application of Luhn algorithm check.

This check reduces the number of queries that would result in an invalid card reply, thereby reducing the query load on the network and databases. It also enhances security for cards that must be manually validated by an operator.

- ☐ Support of customer-defined bill segmentation.

This provides AMA recording of a 2-digit customer defined bill segmentation (CDBS) code (same as subaccount number) when the code is received in an CAS TCAP reply from the card validation database.

The CAS release 3 feature adds to the card validation protocols supported by the OSPS for the validation of telecommunications cards. In addition, commercial credit cards can be automatically validated using the CAS TCAP protocol. These protocols allow both automated and operator-handled card calls to be processed more efficiently, thus improving operator productivity and overall customer service. Card recognition and AMA recording are provided by the CAS release 1 and CAS release 2 features.

98-5E-0330 TERMINATING CODE SCREENING - RELEASE 2

This feature expands the terminating code screening (TCS) feature (98-5E-0197) by providing the following capabilities:

- ☐ Screening for calling card calls is based on the originating NPA, terminating code (country code, NPA, and/or NPA-NXX), and originating station class (public, hotel, or non-hotel/non-public). Only the terminating code and originating station class are used in TCS.
- ☐ Restrictions for collect calls are based on both the originating NPA and terminating code. Only the terminating codes are used in TCS.
- ☐ Text for operator displays is selected on the basis of both the originating NPA and terminating code. Only the terminating code is used in TCS.
- ☐ The number of available TCS screening codes is increased from 32 to 128.

The first three capabilities allow the telephone company to have different calling card and collect terminating screening treatment and unique operator displays for the various originating NPAs served by an OSPS. The fourth capability increases the number of displays that can be used for informing operators of billing restrictions and/or special procedures for fraud prevention, traffic problems, etc.

98-5E-0331 OSPS INTERFACE TO VOICE MESSAGING SERVICE

This feature allows OSPS calls to be transferred to a voice messaging service or other enhanced service provider. On automated calling card service and subaccount billing feature calls, the caller can transfer to the voice messaging service (VMS) provider by entering the "#" followed by a service code and access code at any time that a sequence call would be allowed. On operator-handled calls, the operator can transfer the caller by specifying the service code and the access code, after first canceling or billing the current call. For both automated and operator-handled calls, the OSPS routes the call to a 10-digit number

derived from the access code. After connecting to the service provider, the OSPS uses DTMF signaling to send the calling number, called number, billing type, and billing number for the previous call. The billing type can be card, third number, paid, or it can be unspecified.

This feature allows telephone companies to gain revenue from enhanced service providers by transferring calls to them. It also benefits callers by allowing them to transfer to a voice messaging service or other service when their calls are busy or unanswered without having to hang up and re-enter the billing information and the number they were attempting to reach.

98-5E-0336 TELEMARKETING/TELESERVICES MIS

This feature provides a state-of-the-art MIS for use with the TM/TS offering. A personal computer (PC) based supervisory workstation uses color graphics and text to provide both real-time displays and historical reports. These reports and displays contain the information required to run a call center efficiently, such as agent, queue, team, and system status; service level; individual agent performance and utilization; current staffing levels; and the calls abandoned/answered profile. The MIS also provides a user-friendly interface for administering the call center efficiently.

The following benefits are provided by the MIS:

- ☐ The MIS provides both real-time and historical reports.
- ☐ By using color and graphics to highlight important statistics, the manager can easily and quickly absorb salient information.
- ☐ This information, coupled with the ability to change call distribution parameters quickly through the MIS, allows the system to be reconfigured in real time.

The user friendly interface provided by the MIS permits less time to be spent analyzing reports and configuring the system, thereby leaving more time for the manager to manage agents.

98-5E-0338 AGENT EVENT CODES

This feature allows an agent to enter a 1- to 4-digit event code via the agent terminal in response to an administratively defined event. The agent event codes can be used to gather real-time information on a variety of topics such as the effectiveness of various types of advertising, different types of billing problems, or various agent activities. These event codes are then tabulated and reported on at the MIS.

An example of this is the situation where agents are taking orders for a product. The agents ask each caller how the caller heard about the product, and the appropriate event code is entered based on the customer's response (that is, TV ad, radio ad, word of mouth). Tabulation of these codes at the MIS can then be used to help determine the effectiveness of various types of advertising.

98-5E-0339 CUSTOM REPORT DEFINITION

This feature allows the TM/TS customer to define reports that are supersets/subsets of existing reports. New screens are provided which list possible fields that can be selected when defining customized reports. Separate custom reports can be specified for agent related data and incoming call related data. The customer can also define the column headings and specify whether or not the reports are to be scheduled or manually requested.

This feature allows the customer to receive information that is most relevant to their specific needs in a format that is most convenient to them. This feature also provides the customer the flexibility to change these reports to match changing needs.

98-5E-0340 FORCE MANAGEMENT SYSTEM INTERFACE FROM MIS

This feature provides a software release interface to a force management system external to the ACD/MIS,

such as the force management system manufactured by the Affinotec Corporation.

This feature allows necessary data to be passed automatically to the force management system, eliminating the need to manually transfer the data.

98-5E-0341 DEFINABLE MIS HEADINGS

This feature allows the TM/TS service provider to define a unique report heading and supervisor login screen message. For example, the name of their ACD service offering can be placed on reports and login screens.

This allows the switch owner customization and "ownership" of the ACD/MIS product.

98-5E-0342 WALL MOUNTED MESSAGE DISPLAY INTERFACE

This feature provides a software release interface from the MIS to a wall mounted message display, such as the model 202 LA InfoEXPRESS sign manufactured by Labelle Industries. This wall-mounted display can then be used to display the number of calls waiting, the longest call waiting time, and average call waiting time for selected queues and serving teams. This display can also be used to display a customer specified message.

This feature allows a customer to notify agents and supervisors of call queue and serving team status information even when the agents/supervisors are not at their positions/workstations.

98-5E-0344 FORCE MANAGEMENT ON THE TM/TS SUPERVISORY WORKSTATION

This feature stores data required by force management systems in a standard format on the supervisory workstation. This data can then be accessed by a force management system which is resident on the supervisory workstation, such as the NAMES10 force management system.

This feature allows the customer the ability to readily use the supervisory workstation to run a PC-based force management system, thereby eliminating the need for a separate force management system.

98-5E-0345 CONFERENCE AND TRANSFER ON OUTBOUND TM/TS CALLS (ACD/MIS)

This feature allows a TM/TS agent to conference an outbound call with another party and to transfer or handoff an outbound call to another party. The keying actions used to conference/transfer an outbound call are consistent with the keying actions used to conference/transfer and inbound call. This feature provides the same conference and transfer functionalities for outbound calls that are provided for inbound calls, allowing agents greater flexibility in handling outbound calls.

98-5E-0347 INTERCEPT SERVICE USING AN EXTERNAL INFORMATION SYSTEM (EIS) - PHASE I

The first phase of the intercept service using an external information system (EIS) feature is the basic intercept service that provides information concerning the status of the number dialed by a calling customer when the number is a nonworking number. The terminating local office determines that a called number is to be intercepted and forwards the call with the called number and intercept class (vacant, changed, or special) to the OSPS. The call is routed to an OSPS operator if the terminating local office does not forward the called number to the OSPS. An operator is attached to obtain the called number information. The OSPS sends the called number and intercept class to an EIS, which searches the intercept database and requests the OSPS to transfer to an external audio response unit (ARU) or to an operator. An external ARU can provide automated customized announcements (without the capability to make an AMA record in the OSPS, however) as well as automated split referral announcements. The call may be routed to an OSPS operator instead of an announcement if the referral number is not available or if the split referral is not provided by an external ARU.

98-5E-0350 CALL HOLD (OUTGOING)

This feature allows an agent to place an outgoing call on hold. If an incoming call is already at the position, the agent can toggle between the calls with either party on hold. The agent can place both parties on hold at the same time or remove both parties from hold for a conference.

98-5E-0351 ENHANCED INCOMING CALL ALERTING

This feature provides the ability for an agent to select a mode of operation that provides enhanced audible alerting on call arrival. When the agent terminal is in this mode, an alerting tone can be heard when the agent is not wearing a headset. The enhanced alerting tone is accompanied by visual alerting. When in this mode of operation, the voice path connection is delayed until the agent depresses an answer key.

This feature provides more flexibility to administrators in operating their call centers.

98-5E-0352 ACCESS TO AUTOMATIC ROUTE SELECTION

This feature allows outbound calls from an agent position to access the ARS capabilities of the 5ESS[®] switch. Outbound calls are routed to loop-around trunk groups to provide ARS through feature 04-06-0000, Outward Calling Features for PBX.

98-5E-0353 ENHANCED DELAY TREATMENT/MUSIC ON QUEUE

This feature provides the ability to:

- ☐ Play multiple announcements per queued call
- ☐ Play music to a queued call
- ☐ Remotely record announcements.

Using expected delay thresholds specified on a queue basis, calls can receive a variety of delay treatments. Audible ring, announcements interspersed with music and/or silence, and reorder are possible delay treatments which the customer can combine in any order in segments of fixed length (where a segment is a 24-second long subset of a particular delay treatment.) The delay treatment can be further customized to permit the caller to hear up to 9 segments which are repeated until an agent becomes available, or to hear up to 7 segments once before routing the call to silence or audible ring.

An administrator with the appropriate password can call into the announcement machine and, using a touch-tone telephone, remotely change and record the announcements.

When long queuing delays before answer occur, the ability to play multiple announcements per call reassures the caller that their call will be answered, thus reducing the number of abandoned calls. By playing music to a calling party on queue, the calling party is reassured that their call has not been disconnected, which also reduces the number of abandoned calls. Remote recording of announcements allows the call center manager the flexibility to change delay announcements in response to changes in traffic and staffing levels.

98-5E-0354 IBM[®] LISTING SERVICES INTERFACE

This feature provides the switch support for a call processing data link (CPDL) interface to an IBM[®] listing services database (LSDB) gateway and an associated interface to an external audio response unit (ARU). The CPDL interface includes expanded/new messages (transmitted between the OSPS and the gateway) which allow provision of external ARU announcements defined by the customer (for example, a BOC) for a variety of listing services [directory assistance (DA), yellow pages, customer name and address (CNA), and other LSDB services].

98-5E-0355 ALTERNATE ACCESS TO OPERATOR SERVICES/SOFTWARE DEFINED NETWORK - NETWORK REMOTE ACCESS

This feature allows the OTC to route incoming calls to the OSPS over nonoperator trunks and allows card calls to be routed to a private network from telephones not included in that network.

To use alternate access to OSPS, the caller dials a number that results in the call being routed to the OSPS using MF feature group C signaling over trunks dedicated to this type of access. This called number signaled must be of the form SSC-XXX-NPAX, where NPA is the numbering plan area where the call originates. The call can be signaled with or without automatic number identification (ANI) digits. Operator signaling such as operator hold, coin control, etc., is not supported. The OSPS receives the call and determines the type of treatment to be given, alternate access to operator services (AATOS) or software defined network (SDN) - network remote access (NRA), based on the SSC-XXX signaled.

The AATOS calls always use the access described in the previous paragraph. The OSPS first prompts the caller to enter the number they are calling. Callers with DTMF capability can enter a North American Numbering Plan (NANP) or international number. The OSPS then prompts the caller to enter a card number. Calls that time out or dial zero are sent to an operator position. The operator can enter the called number and establish collect, card, or third number billing. The call is routed over the public switched network and OSPS creates the billing record.

The SDN NRA callers can reach an OSPS directly using 0- or 0+ dialing or by using the alternate access described previously. When alternate access is used, the OSPS first prompts the caller to enter the number they are calling. Callers with DTMF capability can enter private network numbers as well as NANP and international numbers. The OSPS then prompts the caller to enter a card number. Callers dialing 0+ receive standard automated calling card service. Callers who dial 0-, or who time out or dial zero during an automated protocol, are sent to an operator position. The operator can enter an NANP or international called number. The SDN NRA calls must be billed to a card and are routed over a private network to the routing number returned in response to the card validation query. The call is routed to an SDN action control point (ACP) using ISDN user part (ISUP) signaling that includes information needed for billing. The ACP writes the billing record and, therefore, the OSPS does not create a billing record.

Both AATOS card callers and SDN - NRA callers at DTMF stations can make automated sequence calls, thus reducing the number of digits needed to place the call.

The AATOS portion of this feature allows a carrier to provide alternate access to their operator system from phones that are not presubscribed to that carrier, even when 10XXX dialing is not supported. The caller could dial a unique 800 number, for example, and could then be routed by the carrier to the OSPS. The SDN NRA portion of the feature provides card billing for private network callers and supports automated sequence calling for those callers.

98-5E-0356 COMBINED SERVICES TERMINAL

The combined services terminal (CST) feature uses a PC based workstation to perform the OSPS terminal functions. The CST provides the following:

- ☐ Functionality equivalent to that of the OSPS video display terminal (VDT).
- ☐ A hardware/firmware platform that allows full flexibility for the multiple database access (98-5E-0153), combined services (98-5E-0273), and listing services presentation protocol (98-5E-0274) features.
- ☐ A color display monitor with selectable color sets.
- ☐ Macro keys that retain their programming when the CST is powered off or the position is reset.
- ☐ Maintenance functions equivalent to those provided by the VDT maintenance feature (98-5E-1016).

The CST can be used for both OSPS T&A and listing services calls. When used with the combined services feature (98-5E-0273), the CST allows an operating company to serve both types of calls from the same terminal. These calls can be intermixed (one call listing services, next call T&A, etc.) or can be of one

type (for example, all listing services) for a given interval. The CST also allows future designs to include T&A functionality for listing services features (for example, call completion).

Other advantages include reduced floor space, large team efficiencies, and capital expense savings which the customer may realize by using one PC terminal for the T&A and listing services functions.

98-5E-0359 0-/0+ RATE DIFFERENTIAL

The 0+/0- rate differential feature allows an operator to change a call from 0- to 0+. This is useful, for example, when a caller encounters difficulty dialing 0+ and the rates for 0+ and 0- calls are different.

98-5E-0362 891 CARD VALIDATION USING BELLCORE DEFINED PROTOCOLS - RELEASE 2

This feature provides validation of North American telecommunications cards in the TSS standard format, also known as 891 cards. Validation is provided using the Bellcore signaling system 7 (SS7) common channel signaling transaction capability protocols and a choice of type 1 or type 2 LIDB query formats.

Release 1 of this feature (98-5E-0382) is required to provide the basic validation protocol. Release 2 adds the following capabilities to that feature:

- ☐ Type 2 queries, in addition to the type 1 queries provided in release 1.
- ☐ Variable PIN length, when type 2 query is used.
- ☐ Operator-handled inward validation of 891 cards, using either type 1 or type 2 queries.
- ☐ Query measurements for LIDB validation of 891 cards separate from those for 14-digit cards.

Release 2 of this feature allows LECs to validate 891 cards using either the type 1 or type 2 query format. It adds to the card validation protocols supported by the OSPS for the validation of telecommunications cards. These protocols allow both automated and operator-handled card calls to be processed efficiently.

Release 3 of the customer account services feature (98-5E-0312) is required to provide customer specification of the signaling protocol, query timeout threshold, query timeout action (allow/deny), and translation type on a card vendor basis. This allows the LEC to select any OSPS-supported validation protocols even when the card numbers reside in various databases with differing timing and network characteristics.

98-5E-0363 COMMERCIAL CREDIT CARD VALIDATION USING BELLCORE DEFINED PROTOCOLS

The commercial credit card validation using Bellcore defined protocols feature provides validation of commercial credit cards in the ISO and/or *ANSI*[®] standard format. Validation is provided using the Bell Communications Research signaling system 7 (SS7) common channel signaling transaction capability protocols and a choice of the type 1 or type 2 line information database (LIDB) query formats.

This feature includes:

- ☐ Personal identification numbers (PINs) in addition to the card number PINs can be variable length when the type 2 query is used.
- ☐ Operator-handled inward validation of commercial credit cards using either type 1 or type 2 queries
- ☐ Customer-specification, on a card issuer basis, of the translation type to be included in the validation query
- ☐ Query measurements combined with those for LIDB validation of 891 cards but separate from those for 14-digit cards.

Release 3 of the customer account services feature is required to provide recognition and AMA recording of commercial credit cards and customer specification of the signaling protocol and translation type. The cards to be recognized can be defined by the telephone company. Recognized card numbers can be keyed by the customer in response to the automated calling card service prompt or given verbally to an operator. Sequence calls can be made on either an automated or operator-handled basis.

Release 2 of the 891 card validation using Bellcore defined protocols feature (98-5E-0362) is required to provide the validation protocols and the measurements.

The commercial credit card service feature gives local exchange carrier (LEC) and other telephone companies the ability to validate commercial credit cards using either the type 1 or type 2 query formats. These protocols allow both automated and operator-handled commercial credit card calls to be processed efficiently.

98-5E-0365M AGENT MONITORING WITH INTERRUPT

This feature allows a TM/TS supervisor using the agent position monitoring feature (98-5E-0043M) to interrupt the monitored conversation (for example, to correct erroneous information from the operator). When this feature is activated, all monitoring sessions are initiated with a two-way voice path to the monitoring supervisor. If a supervisor does not want background noise or conversation from the supervisor to be heard on the monitored conversation, the supervisor can use the mute key to mute the supervisor's voice path. This feature is activated on an office-wide basis through recent change/verify.

98-5E-0367 DIRECTORY ASSISTANCE CALL COMPLETION, RELEASE 2

The Directory Assistance Call Completion - Release 2 (DACC - R2) feature provides the ability for a Listing Services (LS) operator at a Combined Services Terminal (CST) to enter charging information to apply to the subsequent DACC call. Until such time as the Flexible Charging for Listing Services feature is developed, any alternate billing information entered shall apply only to the DACC call; the LS function would be billed as sent paid only.

The abilities added for a CST-equipped LS operator by DACC - R2 are as follows:

- ☐ Enter the calling party (back) number in case of ANI Failure or ONI
- ☐ Enter a charging type
- ☐ Enter an Alternate Billing Service (ABS) number, either a card number or a third number
- ☐ Indicate that DACC is desired with same (sent paid) or different billing.

For a Basic Services Terminal - Listing Services Database (BST-LSDB)

- ☐ Enter the calling party (back) number in case of ANI Failure or ONI.

98-5E-0371 ENHANCED VOICE PATH CONTROL

Enhanced voice path control adds to the voice path control features, provided by feature 98-5E-0077, the ability to mute the back (calling) party. When in the muted state, the back party can hear any announcements, call progress tones, other parties connected to the call, and the operator, but the back party cannot be heard by any of the other parties. An operator using a VDT or a CST can place the back party in a muted state and remove them from that state.

The enhanced voice path control feature can be used to control fraud by preventing the back party from passing a message while still allowing the back party to hear the progress of the call. The back party is

automatically muted under certain circumstances by the MECH feature (98-5E-0218). An operator can mute the back party with or without the MECH feature.

98-5E-0376 CALL INTERACTION INTERFACE FOR INBOUND CALL MANAGEMENT

The call interaction interface for inbound call management feature is an enhancement to the call vectoring feature that allows an announcement to be played to the caller and caller-entered touch-tone digits to be collected. These digits can then be used to route the call to a particular step within the call vector, or to a different call vector. Multidigit entries will also be sent to the MIS in an event message.

This feature allows a TM/TS customer to have a single telephone number for callers, and provide different treatment for calls based on caller-entered digits. For example, a call center may have one telephone number and, based on the digit(s) entered by a caller, place catalog order calls in one queue or vector, order inquiry calls in a different queue or vector, and billing inquiry calls could be routed to a different ACD.

98-5E-0378 AUTOMATED ALTERNATE BILLING SERVICES - AUTOMATED POSITION

This feature provides full automation of collect, third number and calling card calls; it also partially automates the handling of person-to-person calls. This feature allows a calling party making a 0+ call to enter a call-type identifier by using speech and/or DTMF input or a billing number using DTMF input in response to a prompt. Recognized spoken call-type phrases include "credit card", "calling card", "collect", "third number", "person", and "operator". Acceptable dialed calling party inputs include credit card and calling card account numbers, 4-digit personal identification numbers (PINs), and 2-digit call-type codes in the format 1X. Administrators may also specify that 10-digit telephone numbers be interpreted as third number billing numbers at the initial prompt. The prompting announcements may be interrupted by customer speech or DTMF dialing. An adjunct processor collects the digits or speech, recognizes the sounds using automated speech recognition (ASR), gives announcements, and records calling party speech. This processor interfaces with OSPS using existing operator terminal protocol to validate billing information and process the call.

Card and PIN processing is similar to that provided by the automated calling card service. This feature processes the caller-entered third numbers and call-type codes. If the calling party does not respond with DTMF or speech input within a timeout interval, OSPS provides an instructional prompting announcement specifying how to request particular call-types.

If a collect or third number request is identified, the OSPS may (under customer control by billing type) prompt the calling party to speak his/her name and record the subsequent sounds. The call is outpulsed and, at answer, the billed party is prompted for acceptance of the charges with the recorded name of the calling party included in the prompt. The OSPS uses ASR to determine whether the billed party said "yes", accepting the call, or "no", refusing the call, or "operator," requesting assistance on the call. The DTMF equivalents are also available for these responses.

By using this automated feature the customer can save significant amounts of operator work time. The feature also provides a new way of automating features in the OSPS by providing service control in an adjunct processor. This allows for quicker introduction of new features to the marketplace.

98-5E-0379 OSPS FEATURE GROUP B CARRIER IDENTIFICATION CODE EXPANSION

This feature allows an OSPS to interface with feature group B (FGB) carriers when FGB CIC codes are 4 digits in length. Carrier identification codes are used within signaling sequences and in customer interfaces to indicate the desired carrier for a call. Callers dial 950-XXXX for FGB access, where XXXX is a 4-digit CIC. Initially CICs were 3 digits in length. However, to accommodate the expected number of carriers, Bellcore requested expansion of the FGB CICs to 4 digits.

This feature provides the following OSPS capabilities for FGB carriers with 4-digit carrier codes:

- ☐ Routing calls using normal carrier data
- ☐ Operator specification of the carrier both by name and number
- ☐ Operator transfer of FGB calls to an external operator system
- ☐ Automatic message accounting (AMA) records and manual tickets that include the 4-digit CIC.
- ☐ Separate administration of FGB and FGD CICs.

The FGB carrier identification code expansion feature (99-5E-0823) and the intermediate switching point FGB carrier identification feature (98-5E-0248) are required to provide the basic switch capability to identify, route, and signal FGB carrier calls with 4-digit CIC codes. This feature allows OSPS owners to properly interface with FGB carriers when the FGB carrier codes have been expanded to 4 digits.

98-5E-0380 OSPS FEATURE GROUP D (FGD) CARRIER IDENTIFICATION CODE (CIC) EXPANSION

The OSPS Feature Group D Carrier Identification Code (CIC) expansion feature allows an OSPS to interface with carriers using a feature group D interface when CIC codes are 4 digits in length. It also allows an OSPS to distinguish a feature group D carrier from a feature group B carrier that uses the same 4-digit carrier code.

The CICs are used within signaling sequences and in customer interfaces to indicate the desired carrier for a call. Feature group D carriers are identified by data associated with the incoming trunk group or by operator entry of the carrier name or CIC. Initially CICs were 3 digits in length, but Bellcore requested expansion to 4 digits to accommodate the expected increase in the number of carriers.

This feature allows OSPS owners to properly interface with feature group D carriers when the carrier codes are 4 digits in length and during the transition from 3 to 4-digit codes.

Callers do not subscribe to the OSPS FGD feature and their keying actions at the OSPS are not impacted by it. The OSPS determines the carrier for a call in the same manner as it is currently done. The only way a caller can explicitly request a different CIC is by asking the operator to change the carrier.

On any toll and assistance call handled by an operator, the carrier for the call is displayed on the Video Display Terminal (VDT)/Combined Services Terminal (CST). This feature modifies the operator interface in two ways:

- ☐ An FGD CIC will be displayed as a 4 digit number
- ☐ The operator will have to enter all 4 digits of a CIC.

98-5E-0381 10XXX UNBLOCKING FRAUD PREVENTION

This feature provides additional fraud protection on calls from public telephones to the OSPS by modifying the call screening process. When 10XXX access is provided from public telephones to an OSPS in an interexchange carrier (IC) network, this traffic is identified to the IC OSPS through ANI (i)i digits provided in the trunk signaling from the intermediate switching point (ISP) or end office. When it receives (i)i digits (0)6 and (0)7 on a call, the OSPS checks to see if the calling number is in its internal screening tables. If the number is in the tables, it is given treatment consistent with that dictated with being in the table. If the number is not in these screening tables, it is classified as "non IC presubscribed" and given the treatment provided by this feature. The feature applies to 10XXX calls dialed 0+, 0-, or 1+ arriving on both dedicated and nondedicated trunk groups when screening data matches are not made.

Once the OSPS determines that this feature is applicable to a call, it controls the billing options. For example, it can allow credit-card and third-number while denying sent-paid billing. If the call requires

operator handling, the operator receives a text screen message indicating the special call situation.

This feature helps an IC eliminate charging calls to potentially uncollectible billing numbers. It allows the IC to identify calls from coin and hotel phones presubscribed to another carrier and prevent sent-paid billing to those phones.

98-5E-0382 891 CARD VALIDATION USING BELLCORE DEFINED PROTOCOLS

This feature provides validation of 891 cards [North American telecommunications cards in the TSS standard format which Bellcore calls alternate credit card number (ACCN) cards]. The feature uses signaling system 7 (SS7) common channel signaling transaction capability protocols with the calling card query - type 1 query format to provide validation. The feature adds to the card validation protocols supported by OSPS for validating telecommunications cards. These protocols allow both automated and operator-handled card calls to be processed efficiently.

The OSPS owner defines which cards are recognized. Recognized card numbers are either keyed by the customer in response to the automated calling card service prompt or given verbally to an operator. The feature accommodates both automated and operator-handled sequence calls.

Two other features are required for this feature to function fully. Customer Account Services - Release 2 (98-5E-0251) is required to provide card recognition and AMA recording of the 891 cards, (LIDB) Interface feature (98-5E-0213) is required to provide the basic SS7 LIDB protocols and equipment interface.

98-5E-0386 OSPS PRECOMPLIANT FEATURE GROUP B (FGB) CARRIER IDENTIFICATION CODE (CIC) EXPANSION

Carrier identification codes (CICs) are used within signaling sequences and in customer interfaces to indicate the desired carrier for a call. Callers dial 950-XXXX for FGB access, where XXXX is a 4-digit CIC. Initially CICs were 3 digits and callers dialed 950-0XXX or 950-1XXX. Bellcore requested expansion to 4 digits to accommodate the expected number of carriers. This special feature allows an OSPS to interface with FGB carriers when CIC codes are 4 digits in length. It provides a temporary solution that allows the OSPS to route, using line translations, 950-ZXXX calls, where Z is any digit from 2 through 9. Operators can enter a 4-digit carrier as part of the 950-ZXXX number entered, but cannot specify the carrier by name. Any billing records generated for these calls include the 4-digit CIC. Call handling of 950-0XXX and 950-1XXX calls is unchanged. This feature allows OSPS owners to interface with FGB carriers when the carrier codes have been expanded to 4 digits and during the transition from 3 to 4-digit codes.

Two other features are required for this feature to function properly: Precompliant FGB CIC Expansion (99-5E-0698) and Intermediate Switching Point Precompliant FGB CIC Expansion (98-5E-0426) for the basic capabilities to identify, route, and signal FGB carrier calls with 4-digit CIC codes.

98-5E-0387 OSPS INTERFACE TO VOICE MESSAGING SERVICE (VMS) FOR AUTOMATED CALLS

This feature allows callers on certain automated OSPS calls to transfer to an external enhanced services complex (ESC) to obtain voice messaging or other enhanced services. (Voice messaging services take messages from callers and later delivers the messages to caller-specified parties.) On calls that accept the "#" tone for sequence dialing, a caller can request transfer by pressing "#" on the telephone keypad, followed by a short VMS service code (to select the feature) and a short access code (to select a particular ESC). Depending on the type of call, a caller can request transfer while awaiting answer and/or during the timed release disconnect (TRD) interval following a completed call.

The feature does not allow operators to transfer callers to a VMS, but callers on completed operator-handled, card-billed calls can transfer during the TRD interval by following the same procedure used when transferring on automated calls. Once the transfer request is received, the OSPS splits off the caller's voice path, outpulses to the ESC specified by the access code, sends call-related data to the ESC

using in-band dual-tone multifrequency (DTMF) signaling, and then connects the caller to the ESC. The caller can then interact with the ESC for service. After the ESC disconnects, callers can press "#" to request OSPS sequence call treatment.

This feature benefits OSPS owners, callers, and enhanced service providers (ESPs). The OSPS owners benefit from revenues gained by transferring callers to enhanced service providers. At the same time, ESPs benefit from the increase in traffic to their facilities. Callers benefit from the convenience afforded by the feature: they do not have to hang up to transfer to the ESP, and once connected, they do not have to re-enter the billing number, called number, and other call information.

98-5E-0390 ENHANCED SERVICES PROVIDER CREDIT CHECKING

The enhanced service provider (ESP) credit checking feature provides the capability for the OSPS to prevent calls it transfers to ESPs from being billed to cards that are not allowed for charging ESP services. With this feature, the OSPS can determine when to exclude a caller's card number from the call data sent to an enhanced services complex (ESC) when transfer to an ESC occurs using the OSPS voice messaging service (VMS) interface feature.

The ESP credit checking feature allows the OSPS to process an ESP denial indicator when it is present in the reply to a customer account services (CAS) card validation query. When the denial indicator is not present, the call is transferred with the card number as the billing number. When the denial indicator is present, the call is still transferred but OSPS excludes the billing number from the data sent to the ESC.

98-5E-0393 OSPS RECOGNITION OF CUSTOMER PROVIDED TERMINAL

This feature enables service providers with a listing service database and a 5ESS® switch OSPS to provide combined services from IBM® Programmable Operator Subsystem (POS) workstations. Combined services capabilities allow an operator to serve any type of OSPS call:

- ☐ Directory assistance
- ☐ Listing services
- ☐ Toll & assistance
- ☐ Intercept.

Although this feature contains some switch software modifications, this feature truly takes the form of a POS upgrade package consisting of personal computer hardware and software.

The feature provides operator services managers more flexibility as to how they deploy their operator work force. This flexibility translates into cost savings through higher work team efficiency and lower facilities usage through night closeout.

Without the upgrade package that this feature makes possible, the POS consists of a platform that connects to the Listing Services database through a token-ring LAN connection. The POS software is a customized application designed to interact with the Listing Services database. With this configuration, the operator must also be equipped with a second terminal primarily to provide the operator a voice connection with the caller. This second terminal, the OSPS Basic Services Terminal, is connected to OSPS and provides the operator a limited set of call processing functions. In these two terminal configurations, the operator can only provide directory assistance, listing services, or intercept.

This feature's upgrade package consists of an Intelligent Peripheral Interface Board, two headset extension cables, the OSPS combined services terminal application software, and a keyboard with expanded call processing functions. An upgraded POS is a single terminal that provides an LAN interface to the Listing Services database and an ISDN connection to OSPS that provides an interface to OSPS call processing, packet-switched access to other databases, and a voice connection to the caller.

This feature modifies 5ESS[®] switch software to support the Combined Services POS. Upon terminal initialization, the IBM[®] POS identifies itself to OSPS switch software, which recognizes it as a unique terminal type. So notified, OSPS call processing can then properly handle calls distributed to Combined Services POS workstations.

98-5E-0396 CARRIER SPECIFIC ROUTING FOR INTERNATIONAL CARD CALLS

The carrier specific routing feature provides carrier selection for calls to an international country that are charged to a credit card issued in that country. The carrier, or administration, selected is determined by the issuer of the card. The carrier can be designated as either the mandatory carrier or the preferred carrier.

The selected carrier is included in the Common Channel Signaling System 7 (CCS7) message used to route the call to the international gateway.

This capability allows OSPS owners to negotiate with foreign card issuers/administrations for carrier selection schemes that favor the foreign administration. The OSPS owner is then in a position to negotiate for calls from the foreign administration that favor the carrier designated by the OSPS owner.

98-5E-0397 HONOR CREDIT CARDS AND PROVIDE OPERATOR ASSISTANCE FOR 900 CALLS

This feature allows 900 services to be charged to selected telephone and commercial credit cards and allows operator assistance for 900 service calls.

Billing information, including the card number and/or calling line number, is included in the outgoing CCS7 signaling message. This allows the billing record to be made at the network entity that has the charging information for the 900 service provided.

The 900 service calls may only be billed to a card given by the calling party or to the calling line. To reduce fraud the following billing options are blocked: collect, third number, person and charging to a calling number obtained verbally by an operator. Because the OSPS is not the billing point for these 900 calls, 900 services cannot be charged to a coin or automated charge quotation service (ACQS) station.

The 900 services are designed to meet the needs of business customers with innovative, high volume inward calling applications. This feature allows both the telephone company and the 900 service provider to realize additional revenues because it provides access to these 900 services for additional customers.

98-5E-0398 ALTERNATE EXTERNAL DIALING

This feature allows an agent to dial, or transfer to an external number without having to enter "#9" before the phone number. This reduces the number of keystrokes required and increases agent efficiency on these calls. When dialing or transferring to a queue while this feature is activated, the agent enters "#5" before the queue number. The feature is activated on an office-wide basis using recent change/verify.

98-5E-0399 DIFFERENTIATION OF CARD SERVICE CHARGES

This feature in OSPS supports telephone companies that charge different service charges on card calls based on card vendor and issuer. The vendor/issuer of the card is determined from the OSPS card recognition table.

On card calls, this feature allows operators to provide time and charges and rate quotes that include the different card service charges. On rate quotes, it also allows for the display of the rates for a card specified by the telephone company (a comparison card) in addition to the rate for the card the caller requested.

The card vendor/issuer, as defined in the card recognition table, is included in the T&C and rate quotation queries sent to the Real Time Rating System (RTRS). If a comparison card was specified by the telephone

company, that card's vendor/issuer is also included in the rate quotation queries. The RTRS can include this card type information in its determination of the appropriate rates for the call.

For this feature to work correctly, the corresponding capability must be available in the telephone company's RTRS.

When used with the corresponding capability in the RTRS and the billing center, this feature provides a telephone company with the ability to charge different rates for calls billed to different types of cards and provides the option to promote the use of a particular type of card based on price.

98-5E-0400 OSPS INTERFACE TO VOICE MESSAGING SERVICE - RELEASE 3

The OSPS interface to voice messaging service (VMS) - release 3 builds on the OSPS interface to VMS - release 2 feature. Release 2 allows callers on both automated and operator-handled OSPS calls to transfer to external enhanced services complexes (ESCs) to obtain voice messaging or other enhanced services.

Release 3 gives announcements to callers on busy or unanswered automated calls that have been routed forward from the OSPS on Common Channel Signaling 7 (CCS7) trunks and that accept the "#" tone for sequence dialing. The announcements prompt the callers to transfer to a VMS to leave a message and tell the callers how to transfer. The OSPS examines backward CCS7 messages to determine whether the called number is busy or ringing. If signaling messages indicate the number is busy, the announcement prompt is applied immediately. If signaling messages indicate the number is ringing, the OSPS applies the prompt if the called party has not answered after a telephone company defined period of time.

The announcement prompts provided by release 3 are expected to increase the number of transfers to ESCs, thereby increasing overall revenues and caller convenience.

The series of OSPS VMS interface features benefits telephone companies, callers, and enhanced service providers (ESPs). Telephone companies benefit from revenues gained by transferring callers to enhanced service providers. At the same time, ESPs benefit from the increase in traffic to their facilities. Callers benefit from the convenience afforded by the feature, that is, they do not have to hang up to transfer to the ESP, and once connected, they do not have to re-enter the billing number, called number, and other call information.

98-5E-0401 OSPS INTERFACE TO VOICE MESSAGING SERVICE - RELEASE 4

This feature builds on the earlier OSPS VMS interface releases. Those releases allow callers on both operator-handled and automated OSPS calls to transfer to external enhanced services complexes (RSCs) to obtain voice messaging or other enhanced services.

Release 4 of the VMS interface adds two new capabilities:

- ☐ Improved Call Data Transfer: In addition to supporting in-band dual-tone multifrequency (DTMF) signaling to transfer call data to ESCs (as in previous releases of the VMS interface), release 4 also supports CCS7 signaling of this data, allowing for faster transfer times.
- ☐ Additional Call Data Available to Enhanced Services Complexes: Call disposition information is transmitted to the ESC. This data indicates the state of the original call (busy, ringing, or indeterminate) prior to transfer to the ESC.

Release 4 reduces network transfer times, thereby decreasing operating costs. It also allows service providers to vary their services depending on the ringing or busy state of the call.

The series of OSPS VMS interface features benefits telephone companies, callers, and enhanced service providers (ESPs). The LECs benefit from revenues gained by transferring callers to enhanced service providers. At the same time, ESPs benefit from the convenience afforded by the feature: they do not have

to hang up to transfer to the ESP, and once connected, they do not have to re-enter the billing number, called number, and other call information.

98-5E-0402 INTERNATIONAL CREDIT CARD VALIDATION - CUSTOMER-DEFINED BILL SEGMENTATION

This feature records, in the billing record for the call, a subaccount number received in response to an ICCV card validation query. The feature provides the same capabilities for release 3 (98-5E-0312) and exchange alternate billing services call handling (98-5E-0225) features, except that this feature interacts with ICCV validation queries.

When a cardholder subscribes to this service, multiple personal identification numbers (PINs) are assigned to a card in the card validation database and each PIN maps to a unique subaccount number. The caller specifies the appropriate PIN when using the card. When the foreign partner's database includes a subaccount number in the response to an ICCV card validation query, the OSPS includes that subaccount number in the AMA record for the call.

When a distant operator uses OSPS inward service to validate a card that subscribes to this service, the subaccount number is included in the automated response or displayed to the OSPS operator for operator-handled service.

98-5E-0403 PURCHASE LIMIT

This feature enables a card validated in the customer account services (CAS) database to have an established dollar threshold for card usage. The purchase limit capability can be optioned in the CAS database to function three different ways within the OSPS.

- ☐ Discount the call in progress and do not allow any future calls when the threshold has been reached.
- ☐ Allow the current call but do not allow any future calls when the threshold has been reached.
- ☐ Allow the call but the card database operations support system should notify the customer of record that the threshold has been exceeded.

Based on the response from the real-time rating system (RTRS), the OSPS determines if a call can be established and when a call should be torn down if optioned for disconnect when the balance is depleted. The OSPS passes both intermediate and end-of-call rate information back to the card data base in order to maintain the account accuracy. To maintain balance accuracy, calls are not permitted if they cannot be automatically rated.

The purchase limit capability provides a card subscriber or issuer with a method to control and identify the amount of expenditure that can be accrued against a specific card. Customers may tailor the capability to meet their specific needs - from very restrictive to using the capability as a simple budgeting tool.

98-5E-0404 INWARD VALIDATION IDENTIFICATION

This feature enables an OSPS switch owner to send an indicator in a customer account services (CAS) common channel signaling system 7 (CCS7) transaction capabilities application part (TCAP) signaling query identifying that the card validation request was generated in response to an inward request.

When the inward validation (IVI) parameter is included in the validation request, the database includes that information in its determination of whether to allow or deny the card. Cards optioned with services that cannot be provided through inward validation may or may not be denied. The IVI parameter also allows the database to return an "allow" or "deny" reply without extraneous information that cannot be used by the

inward operator.

98-5E-0405 TERMINATION CODE SCREENING - RELEASE 3

This feature expands the termination code screening - release 2 feature (98-5E-0330) by providing the following functions:

- ☐ Blocking third number calls based on the originating NPA/originating station calls/terminating code combination.
- ☐ Requiring manual outpulsing on collect calls based on the originating NPA/originating station calls/terminating code combination.

The first function allows selected third number calls to be prevented based on the originating NPA, originating station class (public, hotel/motel, or other), and terminating code (NPA, NPA-NXX, or country code.)

The second function requires the operator to outpulse selected collect calls manually based on originating NPA, originating station class, and terminating code. This is useful if, for example, there is a problem with collect calls being placed to coin stations in foreign countries. By forcing the operator to outpulse manually, the LEC can reinforce any TCS information on the screen. This information may instruct the operator to identify coin stations by looking for a particular pattern in the called number or to listen for particular tones or clicks.

The feature can be used by LECs to help reduce fraud on third-number and collect calls.

98-5E-0406 ENHANCE CUT-THROUGH OF CALLERS TO AN OPERATOR FOR CARDS NOT HONORED

This feature enables an OSPS switch owner to customize the error handling when callers attempt to use cards that are not accepted either because a billing agreement was not reached (reciprocity) or because they fail the card recognition process (not accepted).

This capability affects the handling of automated calls and applies to all card types. However, 14-digit cards can only fail the reciprocity check. After the first failure, the caller is given the choice of requesting an operator or re-entering a card number. After the second failure, the LEC can select either rerouting to an operator or disconnect after an announcement.

The CAS release 1 feature (98-5E-0170) is required to provide the card recognition and billing agreement checks.

This feature enhances the interaction for customers who enter cards that are not honored, thereby reducing the number of calls abandoned because of customer confusion. Without this feature, reciprocity and card recognition failures result in the caller either being routed to an operator or disconnected following an announcement.

98-5E-0407 CUSTOMER DEFINED BILL SEGMENTATION - SEQUENCE DIALING

This feature provides card callers who subscribe to customer defined bill segmentation (CDBS) service the option to change their CDBS code on sequence calls.

Customer defined bill segmentation, also known as subaccount recording, is a form of billing that allows a caller to associate the charge for the call with a specific subaccount number. Cards subscribed to this service have multiple valid personal identification numbers (PINs) assigned. The card validation database

returns the 2-digit subaccount number assigned to the PIN used.

This feature gives the customer the ability to change the PIN, and thus the subaccount number, or to retain the current PIN on each automated sequence call. By eliminating the need to hang up and dial again to change the CDBS code, the feature enhances customer service and reduces LEC costs.

98-5E-0408 SWITCH CHANGE FOR AUTOMATED POSITION

The automated operator position (AOP) feature utilizes automatic speech recognition (ASR) technology for the automation of operator-handled toll and assistance calls. The AOP provides ASR call type determination and DTMF identification of call type and entry of billing numbers. This feature also prompts for and records the calling party's name for playback to the billed party on collect and third number calls. The initial offering of AOP includes the ability to recognize "yes" and "no" as spoken responses to the billing acceptance prompt. It also recognizes "operator" as a spoken request for assistance on the initial phase of collect calls. The AOP initially introduces sufficient ASR technology to provide significant savings/functionality for the LEC while providing a platform for the ready introduction of improved technology with broader capabilities and greater operational accuracy.

This feature supports calls handled by automated positions. The OSPS feature 98-5E-0378, Automated Alternate Billing Services - Automated Position, is necessary for this feature to function correctly. It allows an OSPS to automate 60 percent to 75 percent of all OSPS traffic of collect, person and bill-to-third calls. The feature provides:

- ☐ A new position type for automated positions. This allows automated positions to be uniquely identified without restricting the operator identifications that can be assigned to them. The remaining functions of this feature apply to positions identified with this position type.
- ☐ Recording of a special automated message accounting (AMA) module for calls handled by automated positions. This AMA module indicates how the billing option, billing number, and billed party response were provided to the OSPS. It can be used for special billing or special studies.
- ☐ Identification of calling party flash to automated positions. A unique message is sent to an automated position when the calling party flashes. This permits the automated position to recognize the flash as a request for an operator.
- ☐ Prevention of automatic outpulsing for calls at automated positions. This gives the automated position more flexibility in sequencing its actions and allows name recording and confirmation announcements to complete before outpulsing calls.
- ☐ Response to plug out messages from an automated position. When such a message is received, any active call is canceled and released from the position. This allows the automated position to recover if there is a problem with the position and frees the calling party's line.
- ☐ Automatic release of the incoming trunk when a calling party hangs up while being served by an automated position. This assures that the calling party's telephone is available for emergency calls upon calling party disconnect. It also minimizes holding time on the calling party's line.

This feature provides identification in the AMA record of calls handled by automated positions, allows robust handling by the automated position of several call and error conditions, and prevents the calling party's line from being tied up in case of automated position failures.

98-5E-0409 RETROFIT SKIP (5E6 TO 5E8) (OSPS)

The OSPS 5E6 to 5E8 software release retrofit skip feature provides for the direct retrofit of the 5ESS[®] switch OSPS application from the 5E6 to the 5E8 software release by skipping the 5E7 software release. Retrofit skip provides the transition functionality required to preserve feature operability between the

different software releases during the retrofit interval. In particular, this feature provides for retrofit skip of existing OSPS features including OSPS interflow. Transition support of OSPS-specific system interfaces is also included.

This feature provides flexibility and administrative savings for customers by allowing them to load the 5E8 software release while operating on the 5E6 release, if the 5E7 software release is not needed for other reasons. This feature is consistent with and builds on the general 5ESS[®] switch software release retrofit and retrofit skip procedures and functionality.

98-5E-0411 DIRECT INTERNATIONAL ORIGINATIONS - RATE QUOTE AND TIME & CHARGES

This feature provides OSPS operators with the ability to provide rate quotes for direct international originations (DIOR) calls. It also includes the ability to provide time and charges (T&C) quotations on calls billed to the caller's card. The rate quote capability provided by feature 98-5E-0102 (rate quote) and the T&C capability provided by feature 98-5E-0106 (time and charges service - subscriber request) are extended to include DIOR calls provided by feature 98-5E-0185.

This feature saves operator work time by eliminating the need to do a manual look-up of the rates when providing DIOR rate quotations and adds the T&C capability to DIOR calls.

98-5E-0412 CUSTOM TOLL AND ASSISTANCE BRANDING

This feature allows OSPS owners to brand the front-end of 0+ calls with one of two interruptible announcements. One is treated as a "tone only" announcement, the other as a "tone plus prompt" announcement. Any phrases currently recorded in the digital service unit model 2 - recorded announcement facility (DSU2-RAF) can be used to make up the announcements. For example, the "tone only" announcement can be "Bong, Audible Logo" and the "tone plus announcement" version can be "Bong, Audible Logo. Please dial your card number or zero for an operator now," provided the desired audible logo phrase has been recorded.

The calls of one designated carrier receive the branded announcements. Calls of other carriers receive the standard, nonbranded automated calling card service "tone" and "tone plus prompt" announcements. This feature does not differentiate between LEC carriers. If the LEC carrier is designated to receive branded announcements, all LEC carriers, including independents, receive the same announcements. The choice between the branded "tone only" and "tone plus prompt" announcements is made on the same basis as the standard "tone only" and "tone plus prompt" announcements used in the automated calling card service feature.

This feature allows a LEC to provide front-end branding on calls carried by a designated carrier.

98-5E-0419 OPERATOR ADMINISTRATIVE PROCESSOR (OAP) LINK FAILURE ALARM

This feature provides an alarmed output message whenever an OAP link is manually or automatically removed from service. Master control center (MCC) display page information indicates that the link is now out-of-service. The feature provides standard out-of-service treatment for OAP links. Without this feature, an unalarmed out-of-service message is printed at the read-only printer (ROP).

98-5E-0420 ANI FORWARDING

This feature provides the calling number in outgoing common channel signaling, SS7 signaling. It is included in the calling party number parameter in the initial address message (IAM). Currently the ANI received by OSPS in multifrequency (MF) signaling is the calling number's billing number but is not necessarily the true calling number (calling station set number). If an operator enters the calling number, that calling number is not included in outgoing CCS7 signaling because of ANI failure, operator number identification (ONI), or because the operator initiated the call.

This feature allows a LEC to forward the calling number in outgoing CCS7 messages from an OSPS and allows terminating offices to use the calling number for features such as calling number delivery. Without

this feature the calling number is not included in the outgoing CCS7 signaling.

98-5E-0421 ANI II SHORT-TERM DIGIT TREATMENT

This feature provides a short-term solution to ensure correct call handling and billing of IC calls delivered with ANI information digits of 52, 61, and 93. These II digits identify outward wide area telephone service (OUTWATS), cellular, and software-defined network (SDN) calls, respectively. The feature provides the following for an IC-owned OSPS:

- ☐ For ANI II of 52: "Normal" call handling treatment and a unique value in Table 12 of resulting AMA records.
- ☐ For ANI II of 61: "Normal" call handling treatment.
- ☐ For ANI II of 93: "Normal" call handling treatment and a unique value in Table 12 of resulting AMA records.

98-5E-0422 EMERGENCY INTERRUPT AMA

This feature eliminates the recording of operator interrupt time for emergency interrupt calls. Zeros are recorded in AMA Table 19 for emergency interrupt calls, replacing the emergency interrupt length recorded without this feature. The feature eliminates a conflict in some billing systems that cannot accept elapsed time, Table 19, on calls which are marked "not answered", as is the case for emergency interrupt.

98-5E-0423 ACCESS CHARGE RECORDING FOR FEATURE GROUP B PREPAY COIN

This feature provides access charge records at the OSPS on feature group B calls from prepay coin telephones. An access charge record with structure code 00625, call type code 134, replaces the 012XX record currently written. Feature group B calls are dialed 950-XXXX, where XXXX identifies the carrier. They are not normally routed to OSPS. However, some local offices route these calls to OSPS with their other coin traffic because they are not capable of separating them from the other calls originating at coin telephones. The OSPS separates the feature group B calls from the regular operator traffic and routes them on to the identified carrier. The feature writes an access charge record for the feature group B calls that originate from prepay coin telephones, thereby allowing the local exchange carrier to bill the appropriate interexchange carrier for the access.

98-5E-0424 CALLED NUMBER IN LINE INFORMATION DATABASE (LIDB) SIGNALING PROTOCOL

This feature provides the switch owner with an option to send the called number as part of the information in an LIDB card validation query. With this capability activated, the called number is included in a LIDB card validation query whenever the called number is available and LIDB is the selected signaling type. This capability expands the LIDB interface provided by feature 98-5E-0213. Agreements that may be reached between switch owners and card issuers in the emerging card marketplace may require that the called number be sent in a card validation query. The presence of the called number in the query allows the issuer of the card to offer card-related services to their card holders that are based on the forward number.

98-5E-0425 INCLUSION OF 10+4 CARDS IN THE CARD RECOGNITION TABLES

This feature allows a switch owner to take advantage of the flexibility of the OSPS card recognition tables to customize how 14-digit cards are validated. This capability augments the card recognition capabilities provided by feature 98-5E-0312. By taking advantage of the flexibility of the card recognition tables, a switch owner can enter the card issuer in the table (first 3 to 6 digits of the card number) and specify the type of signaling to be used for validation. Issues such as fraud assumption can be addressed by specifying whether to allow or deny attempts when indeterminate replies occur for that issuer's cards. Signaling timeout values can be adjusted per issuer to allow for timing variability between networks. Time and charges can be denied if the rates for that issuer's cards differ from those of other cards.

A switch owner can use this capability to validate 14-digit cards issued by interexchange carriers in a manner different than the traditional 14-digit cards issued by the local exchange carriers. For example, the 14-digit Bellcore standard card issuer identification (CIID) cards can be validated similar to 891 cards, thereby offering services consistently across the CIID and 891 cards and allowing a smooth transition between these card types.

98-5E-0426 INTERMEDIATE SWITCHING POINT PRECOMPLIANT FEATURE GROUP B (FGB) CARRIER IDENTIFICATION CODE (CIC) EXPANSION

Carrier identification codes (CICs) are used within signaling sequences and in customer interfaces to indicate the desired carrier for a call. Callers dial 950-XXXX for FGB access, where XXXX is a 4-digit CIC. Initially CICs were 3 digits in length, and callers dialed 950-0XXX or 950-1XXX. Bellcore requested expansion to 4 digits to accommodate the expected number of carriers.

This feature provides a temporary solution that allows access tandem offices with ISP capabilities to route, using line translations, operator system calls of the form 950-ZXXX, where Z is any digit from 2 through 9. Any billing records generated for these calls contain the 4-digit CIC. Handling of 950-0XXX and 950-1XXX calls is unchanged.

The precompliant FGB CIC expansion feature (99-5E-0698) is required to provide the basic switch capabilities to identify, route, and signal FGB carrier calls with 4-digit CIC codes. If the switch has OSPS capabilities, the OSPS precompliant FGB CIC expansion feature (98-5E-0386) is also required.

98-5E-0427 AUTOMATED SEQUENCE DIALING FOLLOWING OPERATOR RELEASE

This feature allows callers served by an operator or automated position to place sequence calls while awaiting answer. This feature is available on station card-billed calls released from the position prior to outpulsing of the call. The service is the same as is available to callers on initial automated calling card calls. The caller can initiate a sequence call while awaiting answer by entering a "#" using dual-tone multifrequency (DTMF) input. The acceptable entries following the "#" depend on the features active at the time (for example, automated calling card service, OSPS interface to voice messaging service). By reducing the number of times a caller has to hang up and reinitiate a call, this feature enhances customer satisfaction and saves LEC resources.

98-5E-0428 INTERMEDIATE SWITCHING POINT FEATURE GROUP B CARRIER IDENTIFICATION CODE EXPANSION

This feature allows access tandem offices with ISP capabilities to route, via normal carrier data, operator system calls of the form 950-XXXX and provides separate administration of feature group B (FGB) and feature group D (FGD) CICs. Any billing records generated for these calls contain the 4-digit CIC. This feature supersedes the ISP precompliant FGB CIC expansion feature (98-5E-0426), which provided a temporary solution for handling feature group B traffic with 4-digit CICs.

The CICs are used within signaling sequences and in customer interfaces to indicate the desired carrier for a call. Callers dial 950-XXXX for feature group B access, where XXXX is a 4-digit CIC. Initially CICs were 3 digits in length. However, to accommodate the expected number of carriers, Bellcore requested expansion of the FGB CICs to 4-digits.

The FGB CIC expansion feature is required to provide the basic switch capability to identify, route, and signal FGB carrier calls with 4-digit CIC codes. If the switch has OSPS capabilities, the OSPS FGB CIC expansion feature (98-5E-0379) is also required.

98-5E-0430 IMPROVED AUTOMATED CALL SELECTION

Improved automated call selection enhances the LEC's ability to select the calls to be handled by automated positions. This feature allows the telephone company administration (TCA) to specify whether any calls in the office should receive automated position treatment. In addition, the TCA specifies by trunk group whether any calls arriving on that trunk group should receive automated position treatment. If

automated treatment is specified for the office, the TCA also specifies whether 1-stage or 2-stage protocol is to be used for 0+ calls. One-stage protocol means that 0+ calls designated for automated position handling are routed to an automated position at initial seizure. Two stage protocol means that 0+ calls are given automated calling card service (feature 98-5E-0083) initially; then if the caller does not enter a card number, calls designated for automated position handling are routed to an automated position to handle card or other types of billing.

When calls are designated for automated position treatment, they are routed to the automatic call distributor (ACD) provided by feature 98-5E-0010. The TCA can use any of the call parameters provided by the ACD feature and the expanded call type determination (98-5E-0227) feature to route the call to an automated position or operator team. This feature adds the capability to associate both an automated position team and an operator team with any set of the ACD parameters for which automated position treatment is desired. For other ACD parameter combinations only an operator team is specified. Calls from lines designated for operator handling in the originating line screening or special treatment tables are never treated as automated position calls and always use the operator team. The OSPS also uses the operator team for situations encountered during automated calling card service that require routing to an operator. Otherwise, calls arriving on operator trunk groups that are designated for automated position treatment and that have the ACD parameters associated with an automated position team use the automated position team. Other calls use the operator team.

This feature allows the LEC to specify the call types and trunk groups to receive automated position treatment, while retaining the ability to route calls to operators from those same trunk groups. It also provides the capability to select one or two stage protocol and to easily activate and deactivate automated position handling. Without this feature, calls designated for operator handling can be routed to a team that contains automated positions, but all calls with the same values of the ACD parameters are routed to this team at any time during the initial seizure that operator-handling is specified. Exceptional cases cannot be routed to an operator instead of to an automated position.

98-5E-0431 DIRECT INTERNATIONAL ORIGINATIONS - COUNTRY-TO-COUNTRY COLLECT BLOCKING

This feature allows the LEC to automatically block collect billing on transit calls. It is an enhancement to the direct international originations feature (98-5E-0185), which allows the OSPS to provide service for callers in foreign countries who have direct access to interexchange operators in the United States. Transit calls occur when these calls are completed to foreign countries.

When this feature is active, the collect class of charge is not allowed on direct international originations calls whenever the forward number is to an international destination (not in the North American Numbering Plan). This blocking applies uniformly to calls originating from any foreign country and terminating in any foreign country. It is not selective based on originating country code or destination country code.

98-5E-0441 ORIGINATING LINE SCREENING CODE EXPANSION

This feature allows the OSPS to accept or deny classes of charge and/or display text to the operator based on the originating station identification. Screened calls can be identified by trunk group, ANI information digits, or ANI search techniques. Screening is accomplished through internal data rather than by accessing an external database.

Originating line screening (OLS) allows billing options to be restricted for OSPS-handled calls originating from specific calling lines or groups of calling lines. The billing options that can be restricted are: paid (including direct distant dialing), card billing by the back (calling) party, card billing by the forward (called) party, third number billing by the back party, third number billing by the forward party (effective with the 5E6 software release), collect, and automatic collect. The OLS also allows lines to be identified for special treatment. These lines can be identified as coin, noncoin public, nonautomatic charge quotation service (ACQS) hotel, as requiring operator rather than automated handling, and as requiring special treatment specified by a recent-changeable display to the operator. In addition, by using the subaccount billing feature (98-5E-0219), lines can be restricted from using subaccount billing service.

98-5E-0443 INTERNATIONAL CREDIT CARD VALIDATION (ICCV) - REQUEST FOR CALL DURATION AND CHARGE

The International Credit Card Validation - Request for Call Duration and Charge (ICCV-CDC) feature enables the OSPS to provide information on the disposition, duration, and charge for calls billed to cards issued by ICCV partners.

The card must be validated using ICCV signaling protocol. The OSPS is notified in the initial query response from the foreign card database that a call disposition message (CDM) is requested. The OSPS then sends the CDM at the end of the call. The CDM includes the card number and whether the call was successfully completed. If it was completed, the CDM also includes information about the type of call (station/person, automated/operator-handled, home country/third country/domestic), the call start time in Greenwich Mean Time (GMT), and the call duration. For calls that are not to the home country of card issuer, the charge for the call in standard drawing rights units is also included. Home country calls are calls that terminate in the card issuing administration's country and are ultimately rated by that administration.

This feature allows foreign card issuing administrations, such as a Post Telephone and Telegraph (PTT), to monitor revenue streams and card usage. It also enhances the relationship between the switch owner and foreign card issuing administrations and fosters partnering agreements that provide for a broader use of foreign cards within the domestic marketplace and domestic cards in the international marketplace.

98-5E-0500 CARD VOLUME LIMIT

The Card Volume Limit feature provides the ability to control the number of calls charged to a card.

Card holders can subscribe to an enforced or non-enforced volume limit card. Non-enforced means that the limit can be exceeded and calls can still be charged to the card. The subscriber may be notified based on information at the card database, but is not notified by the OSPS. Enforced means that if the limit has been reached, no further calls can be charged to the card.

This feature is one of a family of features that allow card holders to limit or monitor the usage of their cards.

The user holds a card that is subscribed to a volume limit. The feature does not change how the user initiates a call, which may be automated or operator-handled.

If a caller uses a card with an enforced volume limit and the balance in the card database is depleted, the database informs the OSPS by means of an insufficient balance reply and the billing is denied. If the call is operator-handled, the operator is given an appropriate display and can inform the caller of the problem. If the call is automated, the caller receives an appropriate denial announcement and can hold for an operator or can hang up.

98-5E-0503 ENHANCED LIMITS

The Enhanced Limits feature provides enhancements to the Card Volume Limit feature, Card Duration Limit feature and Purchase Limit feature. It consists of the following separate capabilities:

- ☐ The multiple calls in progress capability
- ☐ The single call in progress enforcement capability.

The multiple calls in progress capability allows multiple calls charged to a card with purchase and/or duration limits to proceed simultaneously. The card database records charges against the card and maintains an accurate balance for the card even when these multiple calls proceed simultaneously. In contrast to the Basic Purchase and Duration Limit features, the card database does not allocate the entire balance to any one call when the multiple calls in progress capability applies. Instead, each call is allocated a portion of the purchase limit and/or duration limit balance to begin with. The OSPS requests additional balance from the card database if the call has not terminated before the initial balance granted by the card

database is about to be consumed. If the additional balance is successfully granted by the card database, the OSPS allows the call to continue for the additional period and may make additional requests before that period expires.

The single call in progress capability allows a card subscriber to specify that only a single call be allowed at a time, and that other concurrent calls that attempt to charge to this card be disallowed. This limit capability may be subscribed to in conjunction with one of the other limits or by itself. A card with the single call in progress capability but no other limit is referred to as a single limit card. The card database is the primary agent for enforcing that multiple calls are not allowed for a card that allows only a single call in progress. This is because the card database authorizes all charge attempts and it is the only central point that has knowledge of all charge attempts. The OSPS informs the card database, by means of Call Disposition Messages (CDMs), of the disposition of calls that are allowed to proceed by the card database. When the call ends, the OSPS sends an "End CDM" to the card database, which can then allow another call to charge to the card.

The enhanced limits feature allows multiple people to share a card that has a purchase and/or duration limit. The feature also assists in fraud prevention by allowing cards to be restricted to only one call in progress at a time. Without the feature, only one call at a time can be charged to a card with a purchase and/or duration limit and multiple simultaneous calls are allowed for calls charged to cards without these limits.

This feature only applies to balance affecting calls validated in the phone calling card database using the cards validation protocol. A call is balance affecting if it can affect one or more of the purchase, duration, or volume balances in the card database and the OSPS can report updates for these balances to the card database.

98-5E-0507 ALL CARDS FAIL (ACF)

All Cards Fail is a fraud control feature for card calling. It is designed to control trial and error determination of a valid card account number and personal identification number (PIN).

This feature complements the All Pins Fail (APF) functionality.

98-5E-0508 NON-ENGLISH ANNOUNCEMENTS FOR CARD CALLS

The Non-English Announcements for Card Calls feature provides announcements on card calls in other languages besides English. This is an announcement feature for customer specific card calls. It is not available on *ALLIANCE*[®] calls and other inward validated card calls.

This feature allows the card issuer to specify the language in which announcements will be given. English is the default and is always available.

All card billed calls are given announcements in the specified language. The number of languages for which announcements can be provided is limited by the capacity of the customer-controlled announcement unit.

The card holder may specify a different language if it is supported by the long distance carrier. This preference is stored in the database and returned to OSPS with the response to a card query. The OSPS plays all subsequent announcements in the card holder's chosen language.

This feature enhances the relationship between the switch owner and the card issuing administration by permitting announcements in the language preferred by that issuer. The card holder has the added flexibility to override the card issuer's chosen language with one of their own.

The switch owner specifies the language identified by the card issuer in the OSPS card tables and the language identified by the card holder in the database.

The switch owner also assures that acceptable announcement phrases are available on their standard or

custom announcement units. Use of the chosen phrases can be controlled by recent change.

This feature may be limited to calls billed to cards by the long distance carrier. These may be on-net and off-net 89C cards or 10+4 cards issued by an LEC. The number of languages announcements can be provided in is currently limited by the capacity in the customer controlled announcement units.

98-5E-0511 CALLING AND ENHANCED CALLED NUMBER CARD GEOGRAPHIC RESTRICTIONS

The Calling and Enhanced Called Number Card Geographic Restrictions feature provides the ability to restrict callers from originating card calls from specific telephone stations as well as completing card calls to specific called numbers. This feature applies to both automated and operator handled calls.

Call completion denial, based upon the called number was introduced in Customer Account Service Release 1.

A limited version of call completion denial, based upon the calling number, was introduced in the Calling and Called Number Card Restrictions - Early Release feature. An enhancement to the caller and operator interface was provided to specify the reason for call denial.

This feature provides the ability for a caller to reach an operator during the automated portion of a call. The AMA recording and traffic counts have been modified to include two counts:

- ☐ National or international *called* number restrictions
- ☐ National or international *calling* number restrictions.

With this feature, a caller placing an automated card call may be denied call completion due to a restriction on either the calling or the called number. The caller is given an announcement explaining the reason for the denial, followed by dialing instructions on how to reach an operator. This feature does not change how a caller initiates an automated card call.

For operator handled calls, an operator can assist the caller based upon displays at the operator terminal. The displays explain whether the reason for call denial is due to restrictions on the calling or the called number.

98-5E-0512 INTERNATIONAL CALLING CARD VALIDATION (ICCV) - CALLED NUMBER GEOGRAPHIC RESTRICTIONS

The International Calling Card Validation - Called Number Geographic Restrictions feature provides the ability to restrict locations that can be called using a card validated with ICCV signaling. It allows the international administration to apply geographic restrictions based on the called number on calls that originate on a domestic OSPS and is billed to a card issued by the Post Telephone and Telegraph Administration (PTT). This feature applies to automated calls, operator-handled calls, and inward validation calls.

This feature enhances the relationship between the switch owner and foreign card issuing administrations and fosters partnering agreements that provide for a broader use of foreign cards within the domestic marketplace and domestic cards in the international marketplace.

This feature does not change how the caller initiates an automated card call. When this feature is active, call completion may be denied due to a restriction on the called number. The caller is given an announcement explaining the call cannot be billed to the entered card number, followed by dialing instructions on how to reach an operator.

For operator handled calls an operator can assist the caller based on displays at the operator terminal. A display explaining the reason for call denial - the card number is not allowed with the forward number - is provided.

The announcements, operator display, AMA billing and traffic report provided by this feature are consistent with the called number geographic restrictions portion of Calling and Enhanced Called Card Geographic Restrictions feature.

98-5E-0515 OSPS CHANGES FOR INTERCHANGEABLE NPA CODES

This feature conforms to the Bellcore recommendation that the format of the Numbering Plan Area (NPA) codes be changed from N0/1X to N[0-9]X in order to increase the supply of NPA codes. The introduction of Interchangeable (INPAs) effects the dialing procedures.

In some areas, the state commission requires that 0+ and 1+ 7-digit dialing be allowed in addition to the 0+ and 1+ 10-digit dialing. In order to accommodate this, the OSPS provides a dialing option parameter on a per-trunk-group basis that indicates the number of digits that a customer is required to dial on a call.

On a 0+ call from an Equal Access End Office (EAEO), the service provider can allow either a 3- and 10-digit dialing option or a 3- 7- and 10-digit dialing option for numbers in the NANP format which are associated with an NPA. On a 0+ call from a Non-Conforming End Office (NCEO), the service provider continues to allow 3-, 7-, and 10-digit dialing.

The end-office performs most of the checks on the number of digits dialed. There are cases however, such as Alternate Access to Operator Services (AATOS) calls, Software Defined Network - Network Remote Access (SDN-NRA) calls, Direct International Originations (DIOR) calls, sequence calls, and calls from NCEO, where the end-office does not perform the checks on the forward number. The OSPS performs those checks. The dialing option selected by the service provider does not affect the AATOS, SDN-NRA, and DIOR, initial and sequence calls. However, the non-AATOS, non-SDN-NRA, and non-DIOR automated sequence calls [Plain Old Sequence (POS) calls] are affected. The OSPS determines whether the number of digits dialed on the POS calls are consistent with the dialing option selected by the service provider.

If the service provider allows 3-, 7-, and 10-digit dialing on 0+ calls, the OSPS follows the existing treatment for forward number acceptance on POS calls if the number is a 10-digit number in the NANP format, a nongeographic number, or a number in the international numbering format. If the forward number is not a 10-digit number in the NANP format, a non-geographic number, or a number in the international numbering format, the OSPS either reprompts the caller to enter a number, plays an announcement and disconnects the caller, or disconnects the caller, depending on the number of prompts already given and the caller's response to those prompts.

The intermediate Switching Point (ISP)/OSPS INPA Code feature allows the ISP/OSPS to reorganize the NPA codes in the new format and handle the call properly.

98-5E-0518 CARD DURATION LIMIT

Duration Limit (DL) feature is used very much like the Purchase Limit (PL) feature (98-5E-0403) introduced in software release 5E8. This feature is one of a family of features that allow card holders to limit or monitor the usage of their cards. Subscribers use the length of time expended on calls to control the card usage. Rather than explicitly indicating the dollar amount the card holder may spend (PL), the length of time is used. In addition, DL will utilize the enforcement levels established by PL to determine the length of the call. Unlike PL, DL calls can last as long as desired with the Enforced without disconnect (EWOD) and Non-Enforced (NE) enforcement levels which differs from the 48 hour maximum associated with PL calls. However, the caller is disconnected in the same manner as a PL subscriber when the allowed duration is expended on calls with the Enforced with disconnect (EWD) enforcement level. Once a card holder subscribing to EWD or EWOD expends the available balance in the card database, future calls will be denied; however, for EWOD the current call is not affected. Card holders subscribing to NE should never have a call denied as a result of a depleted balance in the card database. The DL feature performs the same function as PL for NE subscribers, a record keeping function as to how much of the particular limit has been expended. The record of the expenditure is performed in the card database as a result of individual or periodic update(s) provided by the OSPS.

98-5E-1004 OVERLOAD CONTROL FOR OSPS

This feature promptly detects and properly controls an overload condition (the state of the system where the load offered to it exceeds the system capacity) to guarantee that the performance of the system is not degraded. The OSPS calls are subject to the same overload controls as the rest of the switch. The OSPS also automatically reduces the number of calls routed to an overloaded PSM.

98-5E-1004M OVERLOAD CONTROL FOR TM/TS

This feature promptly detects and properly controls an overload condition (the state of the system where the load offered to it exceeds the system capacity) to guarantee that the performance of the system is not degraded. The automatic call distributor/Management Information System (ACD/MIS) calls are subject to the same overload controls as the rest of the switch. During overload conditions, the ACD/MIS automatically reduces the number of calls routed to an overloaded position switching module.

This feature provides an automatic, graceful manner of overload control to prevent serious degradation of system performance.

98-5E-1010 MASTER CONTROL CENTER - OSPS ENHANCEMENTS

This feature is the central maintenance work station and serves as the primary communication path with the switch personnel. The 5ESS[®] switch master control center is expanded to support the maintenance of the OSPS units. This expansion includes:

- ☐ Input commands and output messages in either Program Documentation Standards (PDS) or Man-Machine Language (MML) format specified in the Bell System MML, PUB 54100 (the choice of format being consistent with the format used by the host switch)
- ☐ Visual display pages that indicate the status of each OSPS hardware unit
- ☐ Menu commands on the display pages
- ☐ System status indicators.

98-5E-1010M MASTER CONTROL CENTER - TM/TS ENHANCEMENTS

The master control center is the central maintenance work station and serves as the primary communication path with maintenance personnel. This feature expands the master control center capabilities to support the maintenance of the ACD/MIS units. This expansion includes:

- ☐ Input commands and output messages
- ☐ Visual display pages that indicate the status of event and recent change/verify links
- ☐ Menu commands on the display pages
- ☐ System status indicators.

This feature integrates the ACD/MIS maintenance functions with that of the rest of the switch without any special hardware being required.

98-5E-1011 REMOTE ALARM UNIT AND STATUS DISPLAY

This feature provides sounding and display of alarms at a remote site and reporting of alarm status to the hosting switch module. Scan points are available for 30 office-definable environmental conditions, as well as for fire and fire alarm trouble. Alarms are divided into three categories: minor, major, and critical.

98-5E-1011M REMOTE ALARM UNIT AND STATUS DISPLAY

This feature provides sounding and display of alarms at a remote site and reporting of alarm status to the hosting switch module. Scan points are available for 30 office-definable environmental conditions, as well as for fire and fire alarm trouble. Alarms are divided into three categories: minor, major, and critical. This provides the flexibility to maintain the equipment either at the remote site or at the hosting switch.

98-5E-1013 REMOTE MAINTENANCE TERMINAL

This feature provides the ability to control and monitor the system from a location away from the master control center. A remote maintenance terminal is provided on an optional basis at each geographical location equipped with remote operator positions to support diagnostics, initializations, manual reconfiguration, and other maintenance functions. All input commands and output messages conform to either the Program Documentation Standards (PDS) or Man-Machine Language (MML) syntax; the choice of format is consistent with the format used by the host switch.

98-5E-1013M REMOTE MAINTENANCE TERMINAL

This feature provides the ability to control and monitor the system from a location away from the master control center (MCC). A remote maintenance terminal can be provided at a location remote from the MCC to support diagnostics, initializations, manual reconfiguration, and other maintenance functions. Visual display pages, input commands, and output messages are provided.

98-5E-1016 VIDEO DISPLAY TERMINAL MAINTENANCE

This feature provides the ability to test the data paths between the 5ESS[®] switch and each VDT and test the VDT itself. These features include VDT diagnostics, the display of test patterns on the video display screen, and the support of a maintenance session at the VDT to provide access to test programs.

98-5E-1017 BASIC SERVICES TERMINAL MAINTENANCE

This feature provides the ability to diagnose the unit locally. This feature includes BST local diagnostics and the support of a local maintenance session at the BST to provide access to test programs.

98-5E-1017M AGENT TERMINAL MAINTENANCE

This feature provides the ability to diagnose the unit on site. This feature includes local diagnostics and the support of a local maintenance session at the terminal.

98-5E-1025 SOFTWARE RELEASE RETROFIT

This feature supports the procedure for upgrading a system to a new software release issue. software release retrofit features include system evaluation, database evolution, system configuration, loading and verification of the new software release, cutover to the new software release, acceptance testing, and backout with recovery in case of trouble.

98-5E-1027 OSPS GROWTH OF FACILITIES

This feature permits the installation of switching modules with the operator services feature, operator positions, terminal adaptors, administrative terminals, administrative printers, and DAS/C links while the 5ESS[®] switch is actively processing calls. It provides the ability to:

- ☐ Run complete diagnostics on any unit in the growth state
- ☐ Request and monitor initialization of any hardware unit in the growth state.

98-5E-1028 PSM GROWTH

This feature extends the OSPS growth procedures to include growth of the position switching module (PSM).

98-5E-1050 AUTOMATIC DEMAND TRANSMISSION TESTING

This feature determines if the voice path is operating within acceptable specifications. To execute these tests, the system connects the position voice path to the TTF (transmission testing facility) and applies a "loop-around" termination to the remote end of the voice path. The TTF generates tones which are transmitted to the position and looped back to the TTF. The TTF measures the tone and reports the results to the TTF terminal that requested the test. The TTF measurements indicate to the switch personnel whether the voice path passed or failed the transmission test.

98-5E-1050M AUTOMATIC DEMAND TRANSMISSION TESTING

This feature determines whether the voice path to the agent position is operating within acceptable specifications. An automatic test is requested either at the SCCS, Remote Maintenance Center (RMC), centralized trunk test unit (CTTU), or remote maintenance terminal.

This feature enables the voice path to be tested remotely without the use of external transmission measuring equipment.

98-5E-1052 REMOTE OPERATOR SERVICE CENTERS

This feature provides the ability to locate operator service centers remotely hundreds of miles from the host switch. Data and voice communication to the operator-position-controller unit is performed over digital carrier facilities. Spare digital facilities can be equipped to provide redundancy in case of failures.

98-5E-1052M REMOTE CALL CENTER

The remote call center feature provides the ability to locate call centers remotely from the host switch. Data and voice communication to the agent position controller is performed over extended superframe digital carrier facilities. Spare digital facilities can be equipped to provide redundancy in case of failures.

Depending on the type of facilities used, the agent can be remoted to over 1000 miles from the host. The distance that can be achieved depends on two factors. The round trip delay for the data connection between the agent and the host switch should be a maximum of 18 milliseconds. To avoid echo problems, the round trip delay for the connection between the agent and farthest customer should be a maximum of 60 milliseconds, unless additional echo control is provided.

The ability to remote call centers from the host allows a switch owner to provide automatic call distributor (ACD) service over a large geographic area from a single switch. Additionally, a telemarketing/teleservices (TM/TS) customer with multiple call centers distributed over a large geographical area can utilize a single ACD for call distribution.

98-5E-1288 OSPS 5E8 TO 5E9 RETROFIT

The OSPS Software Release Retrofit feature builds on the 99-5E-1288, 5ESS[®] Switch 5E8 to 5E9(1) Software Release Retrofit feature. It provides the software and procedures to transition from the 5E8 Software Release to the 5E9(1) Software Release, and 5E9(1) Large Terminal Growth for offices whose applications include OSPS.

98-5E-2014 TIMED EVENT CODES FOR OUTBOUND CALLS

This feature allows the call center to keep track in near real time of the number of times certain events happen and the length of time spent in an event code. This feature allows the agent to use event codes for no call at the position, inbound calls, outbound calls, and internal calls.

98-5E-2029 OSPS GROWTH UPDATE

This feature specifies the sequence of recent changes required to add the data for the new OSPS features.

98-5E-2030 OSPS UTILITY CALL TRACE

This standing feature provides the changes to Utility Call Trace required to support new OSPS features.

The OSPS Utility Call Trace provides dumps of dynamic OSPS data relations, such as the call record and the data associated with a loop at an operator position. This tool is used as a debugging aid.

98-5E-2031 OSPS INTERFLOW CROSS SOFTWARE RELEASE COMPATIBILITY

Interflow Cross Software Release Compatibility provides for the bridging of software releases for Toll and Assistance (T&A) calls in an interflow network. It allows a switch on one software release to handle interflowed T&A calls from/to a switch on another software release.

Features in a new software release affected by interflow should not be activated until all switches in an interflow complex have been upgraded to the new software release and any required hardware/firmware has been installed or upgraded.

This feature allows a graceful retrofit of switch complexes that use the interflow feature (98-5E-0022) for T&A calls.

98-5E-2098 OSPS 5E9(1) to 5E9(2) RETROFIT

This feature provides the software and procedures to transition from the 5E9(1) Software Release to the 5E9(2) Software Release, and 5E9(2) Large Terminal Growth for offices whose applications include OSPS.

The software evolves operator/serving team data that changed during the double logging interval thus minimizing the time OSPS operators are not available during the retrofit event.

98-5E-2099 OSPS GROWTH UPDATE

This feature specifies the sequence of recent changes required to add the data for the new OSPS features.

98-5E-2100 OSPS UTILITY CALL TRACE

This feature provides the changes to Utility Call Trace required to support new OSPS features.

It provides dumps of dynamic OSPS data relations, such as, the call record and the data associated with a loop at an operator position. This tool is used as a debugging aid.

98-5E-2101 OSPS INTERFLOW CROSS SOFTWARE RELEASE COMPATIBILITY

This feature provides for the bridging of software releases for Toll and Assistance (T&A) calls in an interflow network. It allows a switch on one software release to handle interflowed T&A calls from/to a switch on another software release.

Features in a new software release affected by interflow should not be activated until all switches in an interflow complex have been upgraded to the new software release and any required hardware/firmware has been installed or upgraded.

This feature allows a graceful retrofit of switch complexes that use the interflow feature (98-5E-0022) for T&A calls.

10.2.23 5ESS[®] SWITCH FEATURES 99-5E-0000 - 99-5E-0093

99-5E-0005 MULTIMODULE REMOTE SWITCH MODULE (MMRSM)

The multimodule RSM consists of one to four RSMs interconnected and in communication with one another

and the host 5ESS[®] switch over digital facilities. The multimodule RSM has the same basic characteristics as the single-module RSM. Termination of trunks to other exchanges is permitted. The links between modules permit calls within the multimodule RSM to be completed without routing them through the host. These links also permit message communication between modules during stand-alone operation (stand-alone call processing is an optional feature). During normal operation when the modules are linked with the host, these messages are routed through the message switch. Other optional features available are stand-alone billing, remote alarm and status panel, and remote clock unit.

99-5E-0006 3B20D-2 CENTRAL PROCESSOR

The 3B20D-2 processor is an evolution of the 3B20 processor. A higher level of integration is obtained using LSI to reduce the number of circuit packs, and space reduction is obtained by using a physically smaller disk drive.

99-5E-0008 DSU-UCC (VERSION 2)

The version 2 universal conference circuit, TN841, provides five conference circuits per pack. (The first version had two conference circuits per pack.)

99-5E-0009 DSU-UTD (VERSION 2)

The version 2 universal tone decoder provides four decoders per pack. (The first version provided two decoders per pack.)

99-5E-0010 DSU-UTG (VERSION 2)

The version 2 universal tone generator converts EPROM to ROM. Operational software is not affected. This circuit contains the new pack TN892.

99-5E-0011 LU2 (LINE UNIT MODEL 2)

The LU2 has improved reliability over its predecessor. It has 32 lines per failure group, and contains a microprocessor-controlled, high-level service circuit, resulting in real-time improvement.

99-5E-0012 MODULAR METALLIC SERVICE UNIT (MMSU)

The MMSU provides MSU circuit functions through hardware redesigned to be more space efficient and growable to accommodate various size offices. The MMSU can serve approximately 2.5 times the number of lines as the present MSU. This reduces the number of units required for a large office and shortens the metallic test interconnection bus (MTIB). Higher efficiency is realized through reduced cabling requirements, smaller power converters, and a new GDX compensator circuit.

99-5E-0014 TSIU2 (TIME SLOT INTERCHANGE UNIT - MODEL 2)

Using LSI, this unit contains single circuit board designs for the control interface, data interface, and duplex link interface.

99-5E-0016 DIRECTLY CONNECTED TEST UNIT

This hardware element permits integrated measurements (DC and low-frequency AC) on metallic lines and trunks, including pay stations.

99-5E-0017 DMERT SOFTWARE RELEASE 2

This feature provides an enhanced DMERT, containing such items as fault recovery improvements based on PFI, improved switch personnel performance, overload and recovery, and disk performance improvements.

99-5E-0018 UNIX[®] System RTR RELEASE 1 OPERATING SYSTEM (FORMERLY DMERT SOFTWARE

RELEASE 3)

The *UNIX*® System RTR release 1 operating system provides an enhanced DMERT, that includes changes which improve the maintainability of the administrative module, increase the effectiveness of recovery operations, increase the speed of communications with other systems, and facilitate growth and retrofit procedures. It contains such items as improved disk community reliability, memory cost reduction, and improved software update verification.

99-5E-0019 FAST PUMP

This feature provides the mechanism to pump individual modules in under 40 seconds.

99-5E-0022 MDII MESSAGES

The system will output an machine-detected interoffice irregularity (MDII) message whenever a trunk call failure occurs.

99-5E-0023 MML HUMAN-MACHINE LANGUAGE OPTION

This option provides an interface language which conforms to the world standard language.

99-5E-0024 MULTIMODULE OPERATION

This provides for an office with up to 30 switching modules and a 130 K BHC capacity.

99-5E-0025 RECENT CHANGE AND VERIFY FROM MCC TERMINAL

This feature provides recent change capabilities at the MCC terminal in the office. It eliminates the need for a separate channel and terminal for stand-alone recent change in the central office.

99-5E-0026 BRCS COMPATIBILITY WITH 5E1 FEATURES (FORMERLY 5E1 RETEST)

A significant set of the previously existing 5E1 features are made compatible with centrex service. Since centrex service is implemented in 5E2(1) with terminal groups and individual dialing plan, most 5E1 features must be made compatible with these and other new 5E2(1) features. The list of 5E1 features which must be compatible follows:

- ☐ Speed calling (includes storage of IDP numbers and SC-6 & SC-30)
- ☐ Customer-changeable speed calling
- ☐ Call waiting
- ☐ 3-Way calling
- ☐ Call forwarding variable
- ☐ FX lines.

99-5E-0027 SWITCHING MODULE PROCESSOR UNIT (SMPU)

This unit is a redesign of the original interface module processor, to incorporate a more powerful microprocessor (*MOTOROLA*® *MC68000*™). It offers increased memory and speed.

99-5E-0028 AM SELECTIVE INITIALIZATION

A selective initialization in the AM recovers the AM from faulty conditions in hardware and/or software without disrupting POTS calls already in the talking state. It retains temporary recent changes which have

not been made official.

99-5E-0031 RECENT CHANGE - DIGIT ANALYSIS DATA

The scope of the office data which can be recent changed is expanded to include routing and charging data.

99-5E-0032 IMPROVED DIAL TONE DELAY MEASUREMENT

The dial tone delay measurement is made more complete by now including the codes when customers abandon before receiving dial tone.

99-5E-0033 ROUTINE EXERCISE OF LINE UNIT GRIDS (IN SERVICE)

The ability is provided to test routinely the line unit concentration circuitry without removing it from service or interfering with calls in progress.

99-5E-0034 ALARM ON EXERCISE FAILURE

Provision is made to generate a maintenance alarm whenever a failure is detected during the routine exercise of line unit concentration circuitry.

99-5E-0035 AUTOMATIC RESTORATION OF RECENT CHANGE DATA

In addition to increasing the reliability and shortening the recovery time, this feature keeps the AM and SM ODDs intact during an initialization.

99-5E-0041 MODULAR FEATURE CUSTOMIZATION (MFC)

This feature provides a new innovative method for providing business and residence custom services (BRCS) features to the end-user. This method changes the way features are supplied and the procedures of operating companies in feature provisioning. The ongoing objectives of the MFC methodology are to:

- ☐ Unbundle features which were previously provided in interdependent packages
- ☐ Remove restrictions which allowed features to be assigned only to limited classes of lines so that eventually features can be assigned to any line and to trunks where possible
- ☐ Add customer control functions to all features so that customers may dial codes to activate, deactivate, and change numerical parameters associated with features
- ☐ Allow all features to be usage billed
- ☐ Develop features from component capabilities where the capabilities have options that can be selected by OC personnel to construct specific new features
- ☐ Allow more flexible interactions between constructed features.

99-5E-0042 SELECTIVE INCOMING OVERLOAD CONTROL (SILC)

This control prevents the spread of traffic congestion from inter-LATA carrier (IC) networks into the switching system of the local network. This control limits the maximum percentage of processing IC incoming calls. The percentage of traffic controlled will be fixed for all offices. Two percentages will be implemented, one for MC1 and another for MC2. The MC1 congestion level is equivalent to DOC MC2.

99-5E-0043 RECENT CHANGE AND VERIFY TEXT INTERFACE ON SCC CHANNEL

This feature eliminates the need for a separate I/O channel between the office and the SCCS for recent change and verify. It provides recent change and verify capabilities which are not menu-driven and which

do not require a terminal with cursor control.

99-5E-0044 OPEN CIRCUIT TEST LINE

This feature automates removal of battery from the customer loop by providing a test call for this purpose. After the switch personnel dials, the system returns a 5-second tone burst followed by 30 seconds of open circuit (both values are defaults and office settable). The test call is useful when testing a line for shorts or crosses, sectionalizing resistive faults, or verifying a repair.

99-5E-0045 COLOR MCC TERMINAL OPTION

This feature allows the option of colored display on the MCC terminal and all other local terminals. The use of color allows a more effective human-machine interface to be developed.

99-5E-0046 MAKE RECENT CHANGE DATA PERMANENT (MANUAL)

This feature allows recent change data to be made permanent (that is, backed up on the system disk image) under manual control. The frequency of backup is determined by each individual office. If the system has an initialization, all recent changes entered into the system since the last database backup will be removed. These recent changes must be reentered manually (until feature 99-5E-0035 is available).

99-5E-0047 MAKE RECENT CHANGE DATA PERMANENT (AUTOMATIC)

This feature allows Recent Change (RC) data to be made permanent by automatically invoking database backup. The backups can also be run manually, thus allowing the office to control when the backup occurs.

99-5E-0050 GROWTH OF UNITS IN SM

This feature allows the addition or deletion of an LU, LU2, TU, LDSU, GDSU, MSU, DCLU, and/or a DCTU to a switching module (including host SM and remote SM).

99-5E-0051 TRUNKS ON SINGLE-MODULE RSM (EAS & TANDEM OPERATION)

This feature allows trunks on the single-module RSM. The EAS trunks would run between the single-module RSM and other end offices. Tandem operation implies that calls can come in on a trunk and leave on a trunk. The outgoing trunk could go to a higher class office, an operator, etc.

99-5E-0056 MONITORING OF RECENT CHANGE LOG AREA (SINGLE MODULE)

This feature monitors the number of recent changes that are kept in the recent change log area. It helps ensure fast recovery (in less than an hour) of the recent changes in the event of a system initialization by printing out a warning message when the number of recent changes is near or has reached a system threshold (for 1 hour estimated recovery time). The switch personnel perform a backup as soon as possible. Recent changes and customer-originated recent changes can still be entered into the system after the warning limit is reached and will be logged, but recent change recovery in the event of a system initialization will take longer.

99-5E-0058 AUTOMATIC RESTORATION OF RECENT CHANGE DATA (MULTIMODULE)

Recent changes entered in the system between database backups are saved automatically in the recent change log area on disk. Restoration of recent changes is performed automatically by a more reliable recovery method. The new recovery method allows each processor to be reinitialized independently. This will significantly reduce the chance of a total system failure. Additional reliability is built into each SM by keeping the ODD intact during an initialization. No restoration of recent changes on the SM is necessary unless the ODD area is mutilated. The restoration of recent changes is done on a per-processor basis. For the AM, automatic restoration of the recent changes is done during each DMERT Level 2 Initialization or as described previously. The decoupled initialization of the 5ESS[®] switch not only adds reliability to the system, but also reduces significantly the time needed to restore recent changes. Please note that all

automatic operations can be overridden by manual operations.

99-5E-0059 MONITORING OF RECENT CHANGE LOG AREA (MULTIMODULE)

Recent changes are logged on a disk file between backups of the ODD. This provides for the reapplication of these recent changes during an initialization of the system. The number of recent changes logged is monitored to ensure a fast system recovery (on the order of 15 seconds) in the AM. A warning message is output when the number of recent changes logged is within a system threshold which guarantees the recovery time. Noncustomer-originated recent changes are automatically blocked when the threshold is reached to ensure data consistency in the distributed database. When a recent change must be entered in an emergency situation, the logging of the recent change can be inhibited to allow the action to be taken.

99-5E-0060 AUTOMATIC RESTORATION OF RECENT CHANGE DATA (MULTIMODULE) (ENHANCED)

This feature is an enhancement over feature 99-5E-0058 which increases the reliability and shortens the length of AM recovery. With feature 99-5E-0058, the AM ODD is restored from the ODD disk image in a DMERT level 2 (or previously described) initialization. This new feature will keep the AM ODD intact during an AM initialization unless bad data is detected in the ODD.

99-5E-0061 MEMORY ENGINEERING - AM ODD

This feature allows the memory required in the office administrative module to be sized according to the needs of that office. Memory can be added later if the office dependent data needs increase; however, a DMERT level 4 initialization will be necessary.

99-5E-0062 MEMORY ENGINEERING - SM ODD

This feature allows the engineering of the amount of memory needed for the office dependent data which is stored in the switching module. This allows, for instance, more memory to be located in an RSM than in a host office switching module.

99-5E-0066 48 MESSAGE SWITCH PORTS

The number of ports of the message switch are increased from 32 to 48. This increases the number of RSMs supported by the 5ESS[®] switch from (number of host office SMs) + (number of RSM SMs) = 32, to (number of host office SMs) + (number of RSM SMs) = 48. Note that the number of host office SMs remains at 30.

99-5E-0071 LOCAL TRAFFIC CHANNEL (TELESCIENCES PDU-10 COMPATIBILITY)

The local traffic channel provides a separate output medium for traffic reports to those telephone companies that do not have access to the Engineering and Administrative Data Acquisition System. This separate traffic channel is 1-way outgoing to a local TTY or to a traffic data collection system, such as the Telesciences PDU10 traffic data collection unit that works with the AUTRAX central polling and processing system. Initially, the current 30-minute traffic report (with the trunk group report section expanded to all trunk groups) is output on the channel.

99-5E-0071A LOCAL TRAFFIC CHANNEL/DIVISION OF REVENUE COUNTS

When the local traffic channel is equipped in an office, division of revenue counts are provided. These division of revenue counts are the same traffic information data that are sent to EADAS. The counts are output in human-readable form via the local traffic channel. The information is output on an hourly and on a daily basis corresponding to the EADAS report schedule.

99-5E-0073 FREQUENCY SELECTIVE RINGING - 100 V

Many independent telephone companies use frequency selective ringing for alerting individual customers

on a multiparty line. Each station set is tuned to ring at the particular frequency assigned to that customer. Three series of five frequencies are used for frequency selective ringing. They are harmonic, decimonic, and synchrononic. These frequencies are selectable on an office basis. Because of the environment the 5ESS[®] switch is placed in, the series will be selectable on an SM basis. This provides the ability for a single module RSM to use a different frequency series than its host in those situations where the single module RSM replaces a rural office separate from the host office. Rather than replace station sets when a customer is moved from a multiparty line to a single-party line, the existing station sets are retained, and the line is assigned the ringing frequency necessary to ring those station sets. This feature provides the ability to deliver the required frequency selective ringing at 100 V rms.

99-5E-0075 FREQUENCY SELECTIVE RINGING - SLC[®] 96 CARRIER

Many independent telephone companies use frequency selective ringing as an alternative to 20-Hz ringing for alerting customers. Each station set is tuned to ring at the particular frequencies which are used for frequency selective ringing. They are harmonic, decimonic, and synchrononic. These frequencies are selectable on an office basis. Because the SLC[®] 96 carrier will be used in environments where frequency selective ringing is in use, frequency selective ringing will be capable of using a frequency series different from the series used at the host office. This provides the ability for a SLC[®] 96 carrier to use a different frequency series than its host in those situations where the SLC[®] 96 carrier replaces, or augments, a rural office separate from the host office. Rather than replace station sets when a customer is moved from a multiparty line to a single-party line, the existing station sets are retained and the line is assigned the ringing frequency necessary to ring those station sets. This feature provides the ability to deliver the required frequency selective ringing on the SLC[®] 96 carrier.

99-5E-0077 SEMI-POSTPAY COIN

With semi-postpay coin stations, coin deposit is the last stage of call completion. Semi-postpay coin stations have no ability to return coins should the call not be completed or the called party not answer. These coin stations are loop-start and receive treatment identical to that for a customer line up to cut-through. If the call is not being routed to an operator, battery reversal is applied to the coin station at cut-through, disabling the transmitter. Upon coin deposit, the coin station autonomously enables the transmitter. If the call is being routed to an operator, interfaces lack coin control functions for toll calls. Since it is economically unattractive for independent telephone companies to replace these coin stations, the 5ESS[®] switch must offer semi-postpay coin treatment. This feature provides that capability.

99-5E-0080 SUPER POTS (SPOTS) ON INTEGRATED SLC[®] 96 CARRIER

The 5ESS[®] switch database supports a super POTS (SPOTS) channel unit connected at the SLC[®] 96 carrier remote terminal. The loop-start and ground-start signaling interface will be provided.

99-5E-0081 9:1 CONCENTRATION RATIO FOR INTEGRATED SLC[®] 96 CARRIER

The 9:1 concentration DCLU uses two PIDBs/64 time slots. The configuration is growable to four PIDBs/128 time slots. The 9:1 DCLU is attractive for small offices where low CCS/line is typical. This DCLU terminates six remote terminals either all mode I, or mode II, or a mixture of mode I and mode II.

99-5E-0082 BILLING SINGLE-MODULE RSM DURING STAND-ALONE

The stand-alone billing feature allows the single-module RSM to store billing information while operating in stand-alone. The information is stored in semiconductor memory and is transmitted to the host when linked call processing resumes. Billing during stand-alone would be an operating company option with the default being no stand-alone billing. The amount of billing information which could be stored would be engineerable by the operating company based on the amount of semiconductor memory they are willing to supply at the single-module RSM.

99-5E-0084 SLC[®] CARRIER NAIL-UP

The nail-up feature provides the ability to establish and tear down connections between any two nonswitched special services ports on the 5ESS[®] switch. A nailed-up connection is a semipermanent transmission path from one DS0 port to another DS0 port on the switch. Service requirements dictate that this transmission path be guaranteed and the signaling information not subjected to normal call processing treatment. The nail-up connection is provided between any two ports from a digital line and trunk unit, a trunk unit, or a digital carrier line unit. This feature extends the nail-up feature (20-16-0000) to include integrated SLC[®] carrier terminations in connections. Due to a signaling incompatibility, robbed bit connections between the DCLU or DLTU cannot be nailed-up except by using non-signaling channel units.

99-5E-0090 CODE OPTIMIZATION (>200 K BHC)

This feature raises the number of busy-hour calls that the 5ESS[®] switch can handle to an excess of 200 K. (This call level does not require the network resources module of feature 99-5E-0002.)

99-5E-0093 2-MILE OPTICALLY REMOTED MODULE (ORM)

An ORM is one of a family of remote switch designs for the 5ESS[®] switch.

The 2-mile ORM is connected to the host through duplicated multimode optical transmission cable. A host switching module is not required. The maximum distance between the ORM and the host 5ESS[®] switch is nominally two miles.

10.2.24 5ESS[®] SWITCH FEATURES 99-5E-0100 - 99-5E-0188T

99-5E-0100 INTEGRATED SERVICES LINE UNIT (ISLU) BASE

This feature is a base for development of integrated services line unit applications. The 5E3 software release ISLU terminates T-BRIs for domestic applications. In an integrated services digital network switching module, the ISLU terminates basic rate interfaces (BRIs). This provides a base which may be used in the future for Z-lines (analog) and U-BRIs.

Note that with the 5E3 software release, the ISLU base feature is only used to support the operator services features.

99-5E-0103 TIME-OUT ON TONES AND ANNOUNCEMENTS

This feature allows for the removal of a caller from a connection to a tone (for example, reorder) or announcement after a predetermined interval. The intervals may be changed via recent change.

99-5E-0104 DETECTION AND REPORTING OF DTMF ON DP LINES (TO SCC)

Ordinarily, a line marked dial pulse only will not recognize origination attempts by DTMF equipped station sets; the DTMF is ignored by the digit receiver and the customer can never break dial tone. (However, DP is allowed on lines marked DTMF.)

This feature allows, under manual control, DTMF operation on DP-only lines, and further allows the generation of an output message alerting the switch personnel to this erroneous operation. [The error may be due to a database mix-up, or unauthorized (that is, not paid for) usage of DTMF signaling.]

99-5E-0105 SMART SET INTERFACE

This feature provides a customer with a "smart" station set which can generate a flash in response to depressing a button, and a set which can store CO codes and flash requests and associate them with unique keys on the station set. Using such a station set, the customer could depress a single unique button while on a call, and the set would generate a flash, pause, and then dial (in DTMF or dial pulse) the code to put a call on hold. The customer would then hear dial tone from the CO. Another button could store a flash generation and a call pickup code.

This set is programmable by the customer and compatible with existing CO signaling requirements for feature control.

Using this type of set provides the illusion that the set has some type of "electronic" interface with the CO, since depression of a single key would accomplish multiple functions. Actually, the set is simply a repertory dialer that can store in its repertory flash requests, and then generate flashes to the CO.

99-5E-0106 INDIVIDUAL BILLING NUMBER FOR WATS

This feature provides standard billing number format for all OUTWATS calls and eliminates certain errors that can occur on an attendant handled OUTWATS calls.

99-5E-0107 POWER FAILURE TRANSFER - ATTENDANT

This feature provides for the routing of calls to a centrex/ESSX-1 attendant to a preassigned directory number during a commercial power failure at the customer's location.

99-5E-0111 COMPATIBILITY WITH AUTOMATIC NUMBER ANNOUNCER CIRCUIT (ANAC)

This feature allows the switch to make a connection (via a trunk) to an auxiliary circuit which reads the ANI information and then "verbalizes" the calling DN to the switch personnel making the test call.

99-5E-0116 SM SELECTIVE INITIALIZATION

An SM selective initialization is restricted to a single SM and covers the initialization and recovery action required to bring the SM to a known and sane state, while maintaining stable calls in the SM.

99-5E-0126 MUSIC ON HOLD

This feature optionally provides customers with an ability to provide music to parties placed on hold as a result of three-way calling, call transfer, call hold, call waiting, attendant camp-on, etc. This feature is provided to terminal group members and the audio source is provisioned on a terminal group basis.

Music can be provided from the service provider or from the customer premises. Providing the music source is the responsibility of the service provider if the music source is located at the switching office. Otherwise, the customer is responsible for keeping the connection and music source in service.

99-5E-0137 STRATUM 2 CLOCK

This feature provides a more flexible synchronization system than previously available. The clock may derive its synchronization from up to eight sources through digital or analog references in a master/slave configuration. If synchronized to one of these references, the office will run at the stability of the source. If synchronization with the master source is lost, then the clock must have stability high enough to meet network requirements on its own. A stratum 2 stability option is available with this clock in order to meet export and toll synchronization requirements. A stratum 3 stability option is available to meet local requirements.

99-5E-0157 SM GROWTH PROCEDURE

This feature provides a growth procedure for adding an SM to an existing medium size 5ESS[®] switch office. Included are message switch growth, time multiplex switch growth, and NCT link growth. Switching module growth conversion from single-module to multimodule is not included.

99-5E-0159 SOFTWARE ERROR DETECTION ENHANCEMENTS

This feature provides improvements to software recovery in the areas of performance, error detection, and I/O.

99-5E-0160 HLSC TRAFFIC CARRYING CAPACITY ENHANCEMENTS

This feature will look ahead when scheduling short jobs and time-out ringing in overload. This will increase the traffic carrying capacity of the HLSCs and allow some offices to be engineered with less than six HLSCs per line unit.

99-5E-0161 SOFTWARE RELEASE RETROFIT AND UPDATE ENHANCEMENTS

Software release retrofit allows new software releases to be pumped into the off-line side of switching modules. Software release update uses the 5ESS[®] switch interface to install and make official program updates. Menu pages simplify the functions, and lessen the likelihood of on-site procedural errors.

99-5E-0162 SM ODD ENGINEERING AND GROWTH

This feature provides memory engineering for the SM office dependent data (ODD) and supplies a new ODD when SMs are added to an operational office.

99-5E-0164 COMMUNICATION LINK ENHANCEMENTS

This feature provides enhanced communications link fault recovery including full use of message interface bus cross coupling, optimization for time slot switching and AM (administrative module) hair pinning, AM system strategy to unit fault resolution, and soft switch of communication link.

99-5E-0165 RLS 2 DIAGNOSTIC ENVIRONMENT

This feature provides extended diagnostic capabilities for the 5E1(2)2 software release that build upon the 5E1(2)1 multimodule diagnostic environment. The extended diagnostic environment includes additional TSI initialization, support of enhanced PIDB diagnostics, DCLU diagnostics, modular MSU diagnostics, MTB diagnostics, MIB diagnostics, and routine exercise of RLI, RAU, DCLU (common board), LU2, DSU, modular MSU, and MTB circuitry.

99-5E-0167 EXTERNAL FUNCTIONAL MONITOR

This feature provides for a system sanity verification through an external monitor. Included in this capability are test for dial tone and certain levels of call completion capability.

99-5E-0170 UTILITY CALL TRACE

This feature provides the ability to output hardware and software data structures involved with an in-progress call.

99-5E-0171 MEASUREMENT GENERATION ENHANCEMENT

While the administrative services (AS) subsystem reports the measurement counts that must be done (in general) by other subsystems, the measurement generation feature serves to track the individual counts needed.

99-5E-0173 ADMINISTRATIVE MODULE INTERVENTION (AMI) AND POWER SWITCH MONITOR

This feature provides for a power switch monitor for AM controlled units, unit mounted status lamp administration (excluding IM), and switch personnel use of AMI to reset the MCU, to force/clear an MCU, enable/disable the sanity timer, and perform a soft MCU switch and force during software release update.

99-5E-0174 CONTROL INTERFACE SCANNING ENHANCEMENTS

This feature provides centralized CI scanning/driver in PC for enhanced processing of service requests from digital facility interface circuits.

99-5E-0180 RECENT CHANGE TERMINAL ENHANCEMENTS

This feature provides enhanced menu and form displays for recent change and verify. The enhancements include office identifier on all menu pages, terminal identifier on all hardcopy outputs, recent change help pages, color recent change, and menu reorganization.

99-5E-0181T COMMON CHANNEL SIGNALING (CCS) TRANSPORT

This feature will provide the ability to connect the 5ESS[®] switch to the 2STP signaling network. The same ring that is being developed for use in the 2STP will be used. The ring provides the basis for CCIS6, ECIS, DCIS, or CCS7 transport. Initially only direct signaling applications will be supported.

99-5E-0182T TOLL OA&M PACKAGE

This package includes recent change and verify (RC/V) enhancements and measurement enhancements. The RC/V enhancements include allowing updates of trunk groups and trunk members without doing a delete and insert. The measurement enhancements include additional plant measurements and associated reporting capabilities, including a new hourly plant report.

99-5E-0183T INTEREXCHANGE CARRIER BILLING

This package of billing features will allow for the addition and upgrading of billing capabilities to allow a 5ESS[®] switch to better fit into the interexchange carrier network in the post-divestiture environment.

99-5E-0187T CARRIER INTERCONNECT (CI) - TOLL

This feature will allow the 5ESS[®] switch to accept the new EAS (equal access signaling). The EAS defines the new signaling protocol that interexchange carrier toll machines must use to meet the standard EAS interface provided by the RBOCs. The capabilities provided by the new interface must be made compatible (fully interworked) with existing procedures, such that existing features are preserved. The EAS feature also provides new measurements, new NM controls, etc. With this feature, the toll application of the 5ESS[®] switch will be consistent with the modified final judgement.

99-5E-0188T NETWORK CALL DENIAL

This feature will allow the 5ESS[®] switch to interrupt call processing for all calls that arrive on specified trunks. A query will be sent to the database in parallel with call processing. Upon a receipt of a deny response from the data base, the original call is killed, and the originator is routed to a new announcement. Under normal conditions, response is not expected for nondelinquent customers.

10.2.25 5ESS[®] SWITCH FEATURES 99-5E-0201 - 99-5E-0299

99-5E-0201 HOME INTERCOM/SINGLE LINE VARIETY PACKAGE

The home intercom calling feature allows residences having two stations or more on a single working analog (non-BRI) line to receive intercom-like service.

The customer initiates a home intercom call by going off-hook and dialing his or her own directory number from that telephone. The customer receives busy tone. When the customer goes on-hook, the office applies distinctive ringing to all extensions of that line.

When an extension is taken off-hook, the extensions connected to that DN have a talking path established until all extensions are placed back on-hook. This means that any two extensions can continue a conversation if other extensions go on-hook.

The single line variety package (SVP) enhances the home intercom feature by providing:

- ☐ Intercom Code Dialing - Allows for dialing fewer than seven digits
- ☐ Selective Intercom Dialing - Provides four distinctive ringing patterns, each associated with a different

dialing code

- ☐ Selective Call Transfer - Provides for transferring a call with an outside party to another extension on the line
- ☐ Dialable Hold - Provides for putting a call with an outside party on hold, and picking it up from the same or another extension on the line.

99-5E-0204 OPTIONAL NUMBER OF DIGITS ON INCOMING TRUNKS

This feature was previously called direct connect trunk group digits. It can be divided into two parts: (a) no digits (direct connect) and (b) n (n > 0) digits.

With part (a), the 5ESS[®] switch allows an operating company to route the call to a predetermined number when a particular incoming trunk is seized. The 5ESS[®] switch will then outpulse that number to another office or complete the call to a trunk (for example, 411 trunk).

Part (b) of this feature is an extension of the 30-02-0000 feature. It allows an operating company to option an incoming trunk to receive a predetermined number of digits (for example, one digit, two digits, etc.) and route the call (after necessary translation to a desired number) to higher class offices or to another trunk (for example, 411, 911, 611 services) on the same 5ESS[®] switch.

This feature is needed to make the 5ESS[®] switch compatible with step-by-step offices and CDOs which absorb certain number of digits when they route the call to other offices (for example, 5ESS[®] switch). Without this feature, the far-end, step-by-step offices or CDOs will have to modify and/or add equipment to interface with the 5ESS[®] switch.

99-5E-0205 SINGLE BAY SWITCHING MODULE (SM)

This feature consolidates the equipment for a digital trunk only switching module (access tandem and local/toll) from two bays to one bay. Presently, two digital line trunk units are housed in one line and trunk peripheral bay, and the switching module processor unit, the time slot interchange unit, and a local digital services unit are housed in one switching module controller bay. The feature provides housing of all of the previously described equipment in a single bay resulting in a floor space savings of one bay.

99-5E-0211 AMA TELEPROCESSING FOR SINGLE-MODULE

This feature is identical to the feature AMA teleprocessing, 55-01-0400. It is repeated here to properly identify this feature as available in the 5E1(1A) software release. The development for AMA teleprocessing was done against 5E1(2)1 software release and then added to 5E1(1A) software release.

99-5E-0212 LOCAL AMA TO TAPE FOR SINGLE-MODULE

This feature is identical to the feature local AMA to tape, 55-01-0100A. It is repeated here to properly identify this feature as available in the 5E1(1A) software release. The development for local AMA to tape was done against 5E1(2)1 software release and then added to 5E1(1A) software release.

99-5E-0213 INTEGRATED SERVICES LINE UNIT - U INTERFACE

The ISLU - U is an ISDN 2-wire, BRI interface providing the basic 2B+D access utilizing an echo-canceled hybrid technology appropriate for all carrier serving area (CSA) non-loaded loops. If bridge taps exist, the range is reduced.

99-5E-0214 DISCONTINUATION OF AMARC SUPPORT

This feature allows for the discontinuation of support for the AMARC billing option in the 5E2 software release. This means that for local billing, all offices using the 5E2 software release must use either the

AMA teleprocessing (55-01-0400) feature or the local AMA to tape (55-01-0100A) feature.

99-5E-0215 300 K BHC CAPACITY

This feature provides for improving the calling capacity of the 5ESS[®] switch to 300 K PBHC. This will be achieved through code optimization in the AM.

99-5E-0216 ISDN BASE

This feature is a base for development of ISDN applications. The ISDN base provides the basic 2B + D access method recommended by TSS. The initial offering supports signaling and permanent virtual circuits on the 16 kb/s D-channel, and circuit-switching of voice and data on the two 64 kb/s B-channels.

The ISDN base provides the hardware/firmware and software needed in the switching module to support implementation of ISDN application features in the 5ESS[®] switch. This hardware consists of a packet switching unit (PSU) (interface between switching module processor (SMP) and customer's D-channel) and a packet interface (PI) (replacing the channel interface). The software includes the initialization, maintenance and control functions to support the PSU as well as handling packetized messages between PSU and SMP.

This feature supports all CO/CPE signaling as out-of-band signaling over the ISDN D-channel. This signaling is accomplished through ISDN layer 3 messages, which are provided by specific ISDN application features.

NOTE: In the 5ESS[®] switch 5E3 software release, ISDN base is used only to support Operator Services features.

99-5E-0217 REMOTE INTEGRATED SERVICES LINE UNIT (RISLU)

The RISLU is a remote vehicle to provide analog and digital services. Its major component, the integrated services line unit (ISLU), is the core unit upon which all application specific developments will evolve.

The RISLU provides all the 5ESS[®] switch features to remote subscribers. This augments the 5ESS[®] switch by offering a remote version of the CO equipment. The unit provides up to 496 analog line terminations, or up to 316 U-interface Phase 1 BRIs.

99-5E-0218 BRCS CUSTOMIZATION PHASE I

A telephone company will be able to modify a preconstructed feature so that a customer will be able to activate, deactivate, and modify a certain parameter that may be associated with that preconstructed feature. The modification of that preconstructed feature results in a new customized feature created by the telephone company which can be assigned to lines just like any preconstructed feature. The telephone company can choose to provide one of a number of different ways of activating and deactivating features and independently choose to provide the customer the ability to change individual parameters.

99-5E-0219 EXPENSIVE ROUTE WARNING TONE WITH ARS

This ARS feature provides an optional warning tone to indicate when a more expensive route is being used. The customer will predesignate which routes are to be considered expensive.

99-5E-0220 FACILITY RESTRICTION LEVELS WITH ARS

An FRL is a number that defines the calling privileges associated with a line. The FRL is assigned on a per-line basis. Each outgoing route within a routing pattern is also assigned an FRL to identify the minimum level of privilege needed to access the facility. The line must have an FRL greater than or equal to that of the facility to be used.

99-5E-0221 MANUAL AND TIME-OF-DAY CONTROL FOR ARS

The automatic route selection feature provides the optional ability to change the routing pattern by dialing a code followed by a parameter indicating which routing pattern group is to be in effect. The time-of-day feature provides a method for automatically changing the same parameter according to a prespecified schedule, given that a station has the ability to make manual changes.

The manual and time-of-day control of ARS feature is provided to an ARS customer who specifies a control line (or lines) which will have the ability to make the manual changes. Then that control line is given the time-of-day feature so that the ARS routing pattern changes can be made automatically.

This feature provides abilities similar to the 1/1A *ESS*TM switch feature ETS facility administration and control with respect to the ARS feature. The ETS feature, however, is controlled via a terminal, while this feature is controlled through dialed code from a predesignated station.

99-5E-0222 MULTILINE VARIETY PACKAGE (MVP) SERVICE

The MVP service provides for a packaged group of services to be made available to noncentrex lines. This basic package of services includes the following:

- ☐ Three-way calling
- ☐ Call transfer
- ☐ Call hold
- ☐ Intercom dialing using speed call 6.

Also at a minimum, the following optional services can be provided to MVP lines:

- ☐ Distinctive ringing/call waiting tones
- ☐ Call forwarding busy line
- ☐ Call forwarding don't answer
- ☐ Call waiting
- ☐ Call forwarding variable
- ☐ Speed call 30.

It is desirable to additionally provide dial access to private facilities, especially to WATS facilities.

99-5E-0223 SINGLE-DIGIT DIALING

This feature permits station users to reach any of a preselected group of stations or other internal facilities by dialing single-digit codes. This feature precludes the assignment of a 1-digit speed calling list to the same line.

99-5E-0226 SLIM COMPATIBILITY

The Subscriber Loop Interface Module (SLIM) provides an interface between the *SLC*[®] 96 carrier remote terminal and the digital carrier line unit (DCLU). The SLIM is used in place of an office repeater bay (ORB), since it performs the standard ORB functions of powering the T1 digital lines and allowing maintenance on them. In addition to performing normal ORB functions, the SLIM does some alarm processing, provides an alarm interface, and handles switching of the protection T1 lines that runs between the SLIM and the remote terminal.

99-5E-0227 INTEGRATED SLC[®] SERIES 5 CARRIER SYSTEM - MODE 96 COMPATIBILITY

This feature provides an integrated interface for a new version of the remote terminal. The integrated SLC[®] series 5 carrier system - mode 96 compatibility feature provides the new digital loop carrier remote terminal. This system uses state-of-the-art technology and is compatible with the SLC[®] 96 carrier system. This feature supports POTS and SPOTS services.

99-5E-0228 MEMORY EXPANSION UNIT IN SM

By the addition of another shelf, the memory expansion unit allows the SM to grow from a physical limitation of 5 MB (using the TN28 board) to a physical limitation of 8 MB (using the TN28).

99-5E-0229 AM MEMORY EXPANSION

This will increase the AM main memory spectrum, subject to certain constraints, from 16 MB to 32 MB.

99-5E-0230 ODD DISK ACCESS

This feature allows office data which is used for recent change to be stored on the disk to save AM memory. This data is brought into memory when alteration is required and restored to the disk after the change is made.

99-5E-0232 ATTENDANT CALL TRANSFER

An attendant's usual three-way calling involves automatic three-way calling (all parties are connected at the completion of dialing). With this feature, the attendant may flash and dial a code prior to dialing the third leg of the three-way call and inhibit the automatic connection of all the parties. This allows private consultation between the attendant and the third leg of the call.

99-5E-0233 AUTOVON - ABBREVIATED DIALING

This class of service enables the subscriber to use 2-digit keying (NX) ending with the "A" or "#" key. With this feature, the switch can store 15 manuals of 80 numbers each. A precedence code and route code prefix may also be dialed, thus the total address available could be: P, 1X, NX, A.

99-5E-0234 AUTOVON - HOT-LINE SERVICE

This service is for selected subscribers and provides the capability of automatically establishing a predesignated connection the moment the calling subscriber's line goes to the off-hook state. There is a designated primary and secondary subscriber for each pair of off-hook subscribers, who talk only to each other. The route code digits "5" and "6" are for route protection against unauthorized access to HOT-LINE subscribers and are generated by the switch for HOT-LINE service.

99-5E-0235 AUTOVON - ROUTE CODE

(This feature is also known as the route control prefix.) The subscriber keys in 1X which is an indication of service treatment, grade of trunk to use for a call, protection of HOTLINE calls, and calls to other networks. The "1" is deleted and the "X" is outpulsed. The digits "5" and "6" are for route protection against unauthorized access to HOTLINE service and are generated by the switch for HOTLINE service.

99-5E-0236 DIRECT STATION SELECTION

This feature allows the initiation of a call over a dedicated DSN/AUTOVON access line to any of 12 preprogrammed subscriber numbers by pressing only one button on the 12- or 16-button touch-tone set.

99-5E-0237 AUTOVON - MLPP

The switch will accommodate four levels of precedence over routine with preemption when required. Precedence levels, designated zero (highest) through four (routine) will be provided. Preemption will

automatically disconnect an established connection for reuse of part of the connection by a higher precedence call when no idle circuit is available.

99-5E-0238 AUTOVON - 4-WIRE LINE SERVICE

This feature allows 4-wire E&M trunks to receive line type services. The AUTOVON network provides service to 4-wire telephone sets through the 4-wire E&M trunk interface at the serving tandem or class 4/5 office.

99-5E-0239 AUTOVON - POLYGRID ROUTING

Polygrid routing is used in an AUTOVON network of interconnected switching centers composing a grid such that a large percentage of the switching centers must be destroyed before the network is disrupted. Each of the switching centers within the polygrid network will be required to be programmable to route traffic through a primary route and up to nine alternate routes. Different route hunting procedures will be required for precedence and routine traffic.

99-5E-0240 AUTOVON - ANSWER DELAY

When an AUTOVON switch is establishing a call to certain types of PBXs, it is possible that the PBX equipment may transmit a momentary off-hook back to the switching center before the called party answers. This feature would allow the switch to ignore the momentary off-hook and wait for the actual answer supervision.

99-5E-0241 AUTOVON - SPECIAL GUARD TIMING

This feature is for use with circuits which operate on facilities with round trip propagation time of 40 ms or more between an AUTOVON 5ESS[®] switch and some type of automatic switching equipment. Its function is to extend the interval that a 5ESS[®] switch will wait to receive an on-hook from the distant switch after it has transmitted an on-hook toward that switch.

99-5E-0242 AUTOVON - AUTOVON NETWORK MANAGEMENT

This feature provides additional switch center status and control features. These include features which are applicable to a polygrid network. The features are as follows:

- ☐ Directionalization
- ☐ Directional reservation of equipment
- ☐ Alternate route control
- ☐ Skip route control
- ☐ Destination code control
- ☐ Line load control.

99-5E-0244 TWO-PARTY ONI

This feature will allow an office to have an option to select operator number identification (ONI) or automatic number identification (ANI) for 2-party customers at the time of office data assembly. There is no administrative control through recent change.

99-5E-0245 TERADYNE 4TEL[®] COMPATIBILITY

The Teradyne 4TEL[®] Automated Subscriber Loop Test System is a fully automated system consisting of three components:

- ☐ A service area computer (SAC)
- ☐ Central office line testers (COLTS)
- ☐ CRT terminals.

The SAC connects to the COLTS by 300-baud direct or dial-up data lines. When a person at a CRT types in a directory number of a loop to be tested, the SAC sends a test request to the appropriate COLT. The COLT then requests test access from the switch (for the 5ESS[®] switch application, this would be over a no-test trunk interface of the SN-107).

If given test access, the COLT performs the test plus sends the results to the SAC. The 4TEL[®] system may be operated in a routine (ALIT-like) mode, under control of the SAC. The COLT makes AC and DC current and voltage measurements to locate earth faults, battery contacts, shorts, opens, foreign voltage, etc.

99-5E-0253 INTEGRATED SERVICES LINE UNIT - T INTERFACE (ISLU-T)

The T-interface is the standard 4-wire digital customer interface for a BRI. The T-interface provides the basic ISDN 2B+D access over a range of up to 1,000 meters. The wiring for the T-interface must be protected, that is, inside a building or grounded conduit.

99-5E-0254 INTEGRATED SERVICES LINE UNIT - Z INTERFACE

The ISLU-Z Interface provides an efficient termination for domestic analog lines (for example, POTS, coin lines, party lines etc.) which normally terminate on the analog-concentrated line unit. The ISLU-Z Interface serves high-CCS analog lines in an economical way because it does not require deloading of the line unit. It provides concentration ratios of 1:1 to 8:1. ISLU-Z Interface features a per-line CODEC, digital concentration, single line packaging, and automatic sparing for failed line cards.

99-5E-0264 DELUXE QUEUEING (OFF-HOOK OR ON-HOOK QUEUEING) FACILITIES

Deluxe queuing allows a user to queue for an outgoing facility via an off-hook or on-hook (ringback) queue. The outgoing facility can be a trunk group or a simulated facility group (SFG). Access to the outgoing facility can be via Automatic Route Selection (ARS) or Private Facilities Access. Access to the on-hook queue is requested via a dialed code when the required facility is busy. The caller is rung back when the facility becomes idle.

Deluxe queuing allows for putting outgoing calls in a queue for completion when an outgoing facility becomes available. By selecting the appropriate options, the following services are provided:

- ☐ Off-Hook Queuing (features 99-5E-0264 and 99-5E-0266)
- ☐ On-Hook (Ringback) Queuing (feature 99-5E-0295)
- ☐ Priority Queuing (feature 99-5E-0296)

NOTE: Post-Queue Routing is an additional feature option available for Automatic Route Selection - Deluxe users. This feature option allows the call another chance at routing after the call has timed out in the queue and/or if the call overflows the queue.

99-5E-0265 ACCOUNT CODES

This feature permits a customer to add an account number to an AMA record for customer allocation of telecommunications charges. The customer specifies the number of digits in the account code. To enter an account code, the customer begins the call with a special access code followed by the account code, and finally the called directory number. The monthly bill will list the called party number and the dialed account

code. This allows the customer to allocate the telecommunications charges to the appropriate accounts. Options available to the account code customer include a preset routing access code, restriction of directly-dialed AMA charged calls, activation/deactivation change, and account code length change.

99-5E-0266 ON/OFF-HOOK QUEUING FOR OUTGOING TRUNKS

This feature allows on-hook queuing for outgoing trunks if they are busy. The station is notified with a distinctive ring when the trunk is available. With off-hook queuing, the customer may remain off-hook, and the call will be completed when the trunk is available. Note that this feature is provided as a part of the deluxe queuing feature (99-5E-0294) with the 5ESS[®] switch.

99-5E-0269 ISDN X.25 LOCAL AREA NETWORK (LAN)

A LAN is implemented by X.25 packet switching over a 16 kb/s D-channel on a BRI. Access for individual subscribers is through the standard 2B + D format. Packet-switched data and signaling is carried on the 16 kb/s D-channel. Computer access will be available using one or more BRIs carrying statistically multiplexed packet data on the 64 kb/s B-channel. The X.25 CUGs (closed user groups), X.25 intercom dialing, and X.25 hunt groups control access to the LAN.

99-5E-0274 ISDN/CSDC INTERWORKING FOR DATA CALLS

This feature allows ISDN subscribers to access CSDC I subscribers (56 kb/s) served by other switches. This includes conversion of signaling from A/B bits on CSDC I trunks to ISDN compatible signaling, and vice versa. The 5ESS[®] switch rate-adapts the digital data from the 56 kb/s CSDC data format to the 64 kb/s ISDN B-channel. This feature also provides the 108-type test line loopback for incoming test calls over digital trunks. This feature does not provide alternate voice/data, nor does it provide simultaneous voice data; this is a "data only" feature.

99-5E-0277 DIGITAL CARRIER LINE UNIT

This feature provides a digital bit stream and maintenance interface for the integrated SLC[®] 96 carrier systems operating in either the mode 1 or mode 2 configuration. All system maintenance and troubleshooting functions performed by the central office terminal of the universal SLC[®] 96 carrier system are preserved in the DCLU.

99-5E-0279 LINE SIDE ANNOUNCEMENTS FOR RSM

To provide a stand-alone announcement from an RSM, an analog trunk unit supporting a 13A recorded announcement unit is currently used. This feature provides the ability to supply the stand-alone announcement using a commercially available recorded announcement machine terminating on the RSM line unit. This allows time slot sharing of the recorded announcement machine with other line appearances on the same RSM.

99-5E-0281 LU2 GRID WITH SECONDARY PROTECTION

This feature provides compatibility with carbon block protection at serving main distribution frames (MDFs). It incorporates secondary protection on the LU2 half-grid circuit pack, thus eliminating the need for gas tube protection at the MDF (or optionally the line interface cabinet).

99-5E-0285 AUTOVON - FOUR-WIRE TIE TRUNK ACCESS

This feature provides access between a PBX and an AUTOVON switch using 4-wire E&M trunks. Signaling capability is added to support immediate diversion network inward dialing and precedence network in dialing.

99-5E-0286 PRECEDENCE NETWORK IN-DIALING (PNID)

The PNID feature provides the basic AUTOVON interface capability for routine and precedence calls

between a BRCS (centrex) customer and the AUTOVON network. Unique treatment is required for originating and terminating precedence calls via preemptible trunks due to the AUTOVON precedence hierarchy. Originating and terminating routine calls do not require unique treatment and are completed through either preemptible or nonpreemptible trunks. The PNID feature allows alternate routing for incoming AUTOVON precedence calls that are directed to another switching system.

99-5E-0287 MAIN-SATELLITE AUTOVON COMPATIBILITY

The main-satellite AUTOVON compatibility (MASC) feature provides two AUTOVON precedence call forwarding options for completing incoming AUTOVON precedence calls that are directed to customer stations served by another switching system. These two options are immediate diversion network in-dialing service and precedence network in-dialing service.

The term "main-satellite" is used to denote the relationship between the 5ESS[®] switch providing the AUTOVON interface feature package and any other switching system to which incoming AUTOVON precedence calls may be routed by the 5ESS[®] switch through either tie trunks or the message telecommunications network. In this "main-satellite" arrangement, the 5ESS[®] switch providing the AUTOVON interface feature package is referred to as the "main" switching system. Any other switching system to which incoming AUTOVON precedence calls may be routed through the 5ESS[®] switch is referred to as a "satellite" switching system. The 5ESS[®] switch serves as the "main" switching system for AUTOVON calls to a "satellite" switching system.

99-5E-0288 BRCS ADAPTATION TO AUTOVON

This feature adapts portions of the BRCS II feature package, for example, call forwarding and call waiting, to operate in the DSN environment. The effort includes providing for interaction between unique DSN requirements, such as precedence and preemption, and the BRCS features.

99-5E-0289 AUTOVON CONSOLE

The AUTOVON console will provide the attendant with the ability to process incoming precedence calls that have not been automatically completed by the switch, including (1) precedence call forwarding don't answer calls, and (2) precedence call forwarding busy calls. In addition, incoming call identification of (1) AUTOVON incoming calls to directory number, and (2) AUTOVON precedence calls waiting will be provided.

The console will allow the attendant to originate precedence and routine calls. Preemption can be done by the 5ESS[®] switch automatically.

99-5E-0290 RECORDED ANNOUNCEMENT FUNCTION - PLAYBACK

The Recorded Announcement-Playback feature uses 64 kb/s speech encoding for variable length, variable content announcement. It is realized in hardware with the DSU2 pack in tandem with one to three EPROM memory array pack(s) capable of 250 seconds of storage capacity each, updatable through firmware. The OSPA (DA) recorded announcement function is built upon this base.

99-5E-0291 BRCS SERVICE PROVIDER ADMIN SUPPORT CAPABILITY (TASC)

This provides specialized report detailing on the contents of the ODD. With this capability, a user can obtain categorized, selected data on the BRCS features available in the switch. Three reports are provided, which cover lines, trunks, and individualized dialing plans. Such information will be valuable for maintenance, office administration, engineering, and marketing activities for a variety of purposes. Examples of such use are as follow:

- ☐ Office administration can use the TASC reports to verify initial or subsequent provisioning of BRCS features.

- ☐ Maintenance switch personnel can use these reports to trace problems to a common feature or line characteristic.
- ☐ Engineering can use these reports in planning assignments for new, large customers, and major modifications to existing assignments.
- ☐ Marketing can use these reports as a source for feature penetration data.

99-5E-0292 FACILITIES ADMINISTRATION AND CONTROL (FAC)

The FAC feature gives the customer some administrative control over certain telephone company assignable features. These features include the following:

- ☐ Account codes
- ☐ Authorization codes
- ☐ Queues
- ☐ Automatic alternate routing (AAR)
- ☐ Automatic route selection (ARS)
- ☐ Facility restriction level (FRL)
- ☐ Alternate FRLs.

Note that this feature is provided as part of the facility management feature (99-5E-0298). This feature requires the applications processor feature, facilities management system.

99-5E-0293 AUTOMATIC ALTERNATE ROUTING

On-network ETS calls are routed similar to ARS-deluxe routing. Access is gained to the ETS network by dialing the required 1- to 3-digit access code. Then the originating station dials the destination digits of the terminating on-network station. An AAR pattern is selected, and the route list is examined for an idle route. Route list entries include access tie trunks, tie trunks, and intertandem tie trunks. If an idle route with the proper FRL is found, the call is completed. If no idle route with the proper FRL is found, the on-network call can be optionally routed through off-network facilities by means of ARS deluxe routing patterns. On-network calls can be optionally routed to reorder or, if queuing is available, the primary route in the route list can be queued.

99-5E-0294 DELUXE QUEUING

Queuing is available in the ETS network as an option for route list routine overflow. In the event that all network facilities are busy, the call is automatically placed in a queue for the first route in the AAR route list. Queuing is provided as off-hook or ringback. If off-hook queuing is provided, the originating station is connected to an announcement or music until an idle facility is available. If ringback queuing is provided, a station must go on-hook within 5 seconds of the tone. After 5 seconds, the call is routed to reorder tone. If disconnect is completed within 5 seconds, the call is placed on the queue, and the caller is rung back when an idle facility is found.

The ETS facilities that can be assigned queuing include intertandem tie trunks and access tie trunks for on-network directed calls, and simulated OUTWATS and FX trunks for off-network directed calls. A priority queue is established as part of the service protection algorithm to prevent inefficient use of the network. Calls incoming to an ETS node through intertandem or tie trunks will receive priority treatment. Individual stations marked as such will also be eligible to make use of priority queue treatment. Queuing privileges are based on originating terminals (that is, ETS lines and trunks), and calls initiated from stations that do

not have queue privileges are routed to overflow treatment if no idle facility is available.

99-5E-0295 RINGBACK QUEUING

Queuing is available as an option for route list routine overflow. When ringback queuing is provided, a station must go on-hook within a preselected time following the queuing confirmation tone. After time-out, the call is routed to reorder. If disconnect is completed prior to time-out, the call is placed on the queue, and the caller is rung back when an idle facility is found. Note that this feature is part of the deluxe queuing feature (99-5E-0294) in the 5ESS[®] switch.

99-5E-0296 PRIORITY QUEUING

Queuing is available as an option for route list routine overflow. With this feature, a customer is assigned a queue priority level that is used to establish precedence for facilities when immediate access is unobtainable. Note that this feature is a part of the deluxe queuing feature (99-5E-0294) in the 5ESS[®] switch.

99-5E-0297 NON-USAGE TRUNKS AND LOCKED-UP TRUNKS (NUTS/LUTS)

With this feature, the nonusage trunk scan provides a list of individual customer trunks which have not been found traffic busy during the previous timing interval. Also, the locked-up trunk scan provides a list of trunks marked busy for maintenance purposes during the previous timing interval. Note that with the 5ESS[®] switch, this feature is provided as a part of the automatic circuit assurance feature (03-03-0500).

99-5E-0298 FACILITY MANAGEMENT (FM)

The Facility Management (FM) feature provides a customer with administration and control of the facilities dedicated to the customer's private use. A set of telephone company provided features enables the customer to more efficiently use and administer large numbers of WATS lines, FX lines, and private facilities. The FM feature also gives the customer control over facility administration and control, message detail recording (MDR), selection of traffic measurements groups, as well as the administration and control of automatic circuit assurance parameters. The FM feature is provided through an interactive terminal on the customer's premises.

99-5E-0299 PALLETIZED EQUIPMENT, CODING AND CABLE ASSEMBLY (PECCA)

The PECCA is an optional 5ESS[®] switch system level packaging arrangement whereby cooling energy savings may be realized by independent cooling of the 5ESS[®] switch equipment and room air. This packaging arrangement allows the equipment to operate under extended wideband environmental control irrespective of the surrounding room environment. The PECCA packaging arrangement consists of mounting 5ESS[®] switch cabinets on a hollow pallet. The pallet serves the dual purpose of an air inlet plenum and cable rack. Cooling air is applied to this plenum, is forced up through the cabinets and then returned via a combination hot air duct and power cable rack to the cooler.

10.2.26 5ESS[®] SWITCH FEATURES 99-5E-0301 - 99-5E-0399

99-5E-0301 DSN - PRECEDENCE ACCESS THRESHOLD (PAT)

The precedence access threshold (PAT) provides a software means to set the limit on the number of simultaneous calls permitted at each specific precedence level and calling area combination. This feature allows five progressively wider calling areas and five precedence levels to be intermixed. The threshold counts can be variable. These counts can be established both locally and remotely.

99-5E-0302 OPTICALLY INTEGRATED REMOTE MODULE (ORM)

An ORM is one of the family of remote switch designs for the 5ESS[®] switch.

The ORM allows the use of standard DS3 transmission equipment, which could employ either single-mode or multimode optical fiber cabling, duplication, or protection switching of the fiber link and extensive multiplexing over each fiber. No host switching module is required. The CM2 or CM2C is required. The ORM can be located up to 100 miles from the host 5ESS[®] switch.

99-5E-0303 DSN - MULTIFUNCTION SWITCH

The DSN multifunction switch performs both the function of an end office and an AUTOVON tandem switch. The end office is a dial central office that serves a military base and the tandem performs the functions of the AUTOVON tandem feature (99-5E-0233 through -0236 and -0238 through -0242). This feature incorporates both of these switch functions into one physical switch. The adaptation of BRCS to the DSN environment is included in this feature.

99-5E-0304 MERLIN[®] COMMUNICATIONS SYSTEM/5ESS[®] SWITCH COMPATIBILITY

This feature specifies that the 5ESS[®] switch BRCS features (specifically listed as follows) when used with the MERLIN[®] communication system will function normally.

- ☐ Call forwarding
- ☐ Terminal group/station restriction
- ☐ Individualized dialing plan
- ☐ Distinctive ringing
- ☐ Multiway calling
- ☐ Call waiting
- ☐ Call pickup
- ☐ Private facility access
- ☐ Automatic route selection.

99-5E-0305 DSN - COMMUNITY OF INTEREST PRECEDENCE TREATMENT

The community of interest precedence treatment limits the authorized precedence of a station according to the switching center code or area code dialed. The station line may be service-treatment marked to indicate one of two conditions. The first condition authorizes the station to exercise a precedence level higher than the level normally authorized. The second condition prevents the station from using a higher precedence for calling in the communities of interest.

99-5E-0306 DSN - 5E3 BRCS ADAPTATION TO DSN

This feature adapts portions of the BRCS IV features to operate in the DSN environment. The effort includes providing for interaction between unique DSN requirements, such as precedence and preemption, and the DSN requested BRCS features.

99-5E-0307 MULTIPLE ENTRY RECENT CHANGE INTERFACE PHASE I

This feature enables the centralization of the interexchange carrier 5ESS[®] switch machine administration. The multiple entry recent change interface phase I feature includes a BX.25 9.6 kb/s interface, improvements to recent change, and improvements to office records.

99-5E-0308 AMA DUAL STREAM RECORDING

This feature provides for directing AMA data records to two separate disk partition groups. Each partition group can be independently redirected to a tape or teleprocessing port. Separation can be on a per SM basis.

99-5E-0309 AMA MULTIDISK PARTITION

This feature extends the amount of storage available for AMA data by allowing additional disk pairs to contain AMA data partitions. The size of each partition is selectable by the office.

99-5E-0310 AMA 56 KB/S DATA LINK

This feature provides for a synchronous 56 kb/s data link to the *BILLDATS*[®] collector. It uses the same BX.25 protocol as the other AMA data links.

99-5E-0311 AUTOMATED OFFICE-TO-OFFICE TESTING OF INTEGRATED SLC[®] 96 CARRIER LINES

Automated office-to-office testing of integrated SLC[®] 96 carrier lines will provide automated verification of wiring continuity and office dependent data for lines being transferred from an existing SLC[®] carrier system to a 5ESS[®] switch integrated SLC[®] carrier system. This capability, referred to as integrated SLC[®] carrier OTO, is applicable for the testing of both mode I and mode II integrated SLC[®] carrier lines.

99-5E-0312 DISK INDEPENDENT OPERATION

This feature gives the 5ESS[®] switch the ability to maintain call processing during duplex system disk hardware failures. Under disk independent operation, disk file controllers and disks can be verified and, if needed, the disk can be restored from tape. The administrative module can be restored to normal service without affecting stable calls.

99-5E-0313 APPLICATIONS PROCESSOR (AP) - IOP INTERFACE

The AP is a separate minicomputer (or microcomputer system) which is connected to the 5ESS[®] switch by a dedicated, 9.6 kb/s, synchronous data link, to support a set of interactive features. The AP may be connected by a single data link, multiple data links, or active/standby data link pairs, at the customer's option.

In the 5E3 software release, the AP will communicate with the 5ESS[®] switch through a data link connected to the AM via the input/output processor (IOP). The AP will support the following features:

- ☐ Facility management
- ☐ Message detail recording
- ☐ Traffic data to customer location
- ☐ Facility administration and control
- ☐ Automatic circuit assurance.

99-5E-0314 SDN NETWORK ACCESS POINT

This feature allows interexchange carrier SDN calls to originate on a 5ESS[®] switch and be passed to a 4ESS[™] switch providing the SDN service. The interface between the switches is a dedicated group of CAMA trunks, used to pass the originating ANI.

99-5E-0315 PASSWORDS

On a per terminal basis, controlled by the ECD, selected terminals will require a valid login name and

password to be entered before the PDS/MML commands or POKES may be entered.

These logins are global to the switch rather than local to a terminal.

99-5E-0316 UNIX[®] SYSTEM OPERATING SYSTEM AVAILABILITY

This feature provides:

- (1) Access to the UNIX[®] System environment on the 3B20D.
- (2) On-line manual pages of the UNIX[®] System commands.
- (3) New UNIX[®] System commands to provide nonroot logins and spooled output to the receive-only-printer (ROP).

99-5E-0317 PRE-5E4 BRCS COMPATIBILITY WITH ISDN

The BRCS compatibility with ISDN feature ensures that many of the existing BRCS features and services will function with supported ISDN station sets in such a fashion that users shall experience equivalent, similar or expanded circuit-switched voice service by subscribing to these ISDN BRCS features and services. Specifically, the following pre-5E4 software release modular capabilities are made compatible: automatic callback-calling, account codes, automatic route selection I & II, authorization codes, call forwarding, distinctive ringing, individualized dialing plan, multiline hunting additions and attendant services, multiway, private facility access, message detail recording, call pickup, precedence & preemption, terminal group/station restriction, and time of day. In addition, this feature ensures that these features function properly when invoked by feature buttons.

99-5E-0318 ISDN PRI LOOP

The PRI access capability of ISDN supports digital interface to DPBXs on a primary rate carrier (PRC) (1.544 Mb/s for domestic). It supports twenty-three 64 kb/s B-channels plus one 64 kb/s D-channel on a domestic PRC facility. This interface supports both ISDN PBXs and host computers.

99-5E-0319 ISDN DIGITAL BUSINESS SERVICE (DBS) MULTIPLE DN BUTTONS

A user has access to more than one directory number (DN) on the ISDN Multibutton Key System set. The DN selection is controlled by buttons; indicator lights show the status of the DN (idle, call one hold, call in progress, etc.).

99-5E-0320 ISDN DBS SHARED CALL APPEARANCES OF A DN

Several ISDN DBS station sets can share one or more call appearances for a particular DN. Originating and terminating events on one station set will affect all stations sharing that call appearance for a particular DN. The shared DNs can have multiple call appearances; multiple calls can exist on different call appearances of a DN. One station sharing the DN can have a call active on that shared DN.

99-5E-0321 ISDN DBS MULTIPLE CALL APPEARANCES

An ISDN DBS set can have more than one DN button assigned to the same DN. Incoming calls for the same DN are handled in much the same way as call waiting; if the first "call appearance" button is busy, the 5ESS[®] switch attempts to complete the call to the second "call appearance." In a similar way, a call can be originated on the second "call appearance" while there is a call on hold on the first "call appearance."

99-5E-0322 ISDN DBS FEATURE FUNCTION BUTTONS

A variety of "soft" (assignable) buttons which activate features are provided on the ISDN DBS set. Indicator lights show the activation/deactivation status of the features. The number of function buttons provided is

dependent on the ISDN DBS set design. Features which can be activated by dialing activation codes can be assigned to a button on the ISDN DBS station set. The following are some of the features which can be assigned to feature buttons:

- ☐ ISDN DBS CALL FORWARDING
- ☐ ISDN DBS CALL PICKUP
- ☐ ISDN DBS AUTOMATIC CALLBACK ON BUSY
- ☐ ISDN DBS SPEED CALLING
- ☐ ISDN DBS MANUAL EXCLUSION.

99-5E-0323 ISDN DBS HOLD

The ISDN DBS set user can place a call on hold by pressing the "hold" function button. The indicator for that call appearance on all ISDN DBS sets having that call appearance will indicate that the call is on hold. Any ISDN DBS set with the call appearance for the call on hold can pick up the call by pressing the call appearance button.

99-5E-0324 ISDN DBS TRANSFER

Using implicit transferring procedures, a call can be transferred to another DN in the customer group by pressing the transfer button on the ISDN DBS set, dialing the DN, and pressing the transfer button again. For explicit transfer, the hold button is pressed, a DN dialed, and the transfer button pressed followed by the held call appearance.

99-5E-0325 ISDN DBS CONFERENCE CALLING

The ISDN DBS set user can set up a conference call using implicit conferencing procedures by pressing the "conference" button, and dialing the DN of the party to be added to the conference. The conference call can include members of the customer group and parties outside the group. Up to 6 parties can conference. For explicit conference, the hold button is pressed, a DN dialed, and the conference button pressed followed by the held call appearance.

99-5E-0326 ISDN DBS CALL FORWARDING

The ISDN DBS set user activates "call forwarding" functions by pressing a "call forwarding" button and dialing the number to which calls are to be forwarded. Buttons can be programmed to activate different variations of call forwarding, such as "forward all calls," "forward when busy," etc. Call forwarding is deactivated by pressing the same button a second time.

99-5E-0327 ISDN DBS CALL PICKUP

The ISDN DBS set user can pick up a call directed to another station within the customer group by pressing the "call pick up" button.

99-5E-0328 ISDN DBS AUTOMATIC CALLBACK ON BUSY

The ISDN DBS set user activates this feature by pressing the "automatic callback" button when a busy number is dialed. When the busy station becomes idle, the originating ISDN DBS set is alerted with a distinctive ring, and the call is placed when the originating user goes off-hook.

99-5E-0330 ISDN DBS SPEED CALLING

The ISDN DBS set user can dial a preassigned number by pressing a "speed calling" feature button. This feature will operate with transfer, conference calling, and call forwarding.

99-5E-0331 ISDN DBS MANUAL EXCLUSION

An ISDN DBS set user can inhibit other stations from picking up a call on hold or bridging onto a call which is active at the station with manual exclusion. Manual exclusion can also be activated while two members of the key-system group are bridged onto the call. At this point the station which is bridged onto the call (not the station requesting manual exclusion) will be dropped from the call. All terminals which share the call appearances for a DN are defined to make up a key-system group.

99-5E-0333 ISDN DBS DROP

Pressing this button drops the last party added to a conference call. For a 2-party call, pressing this button disconnects the ISDN DBS station set from the call.

99-5E-0337 ISDN MBKS EXECUTIVE RINGER CUTOFF

This feature allows an MBKS user, by pressing a feature button, to turn ringing on and off for all calls except keyset intercom (ICOM) calls. This feature is normally used where coverage is provided by shared DN call appearances on a coverage person's keyset. The feature button will be lighted to indicate to the user that ringing has been silenced. This feature cannot be activated with a dialed code; a feature button must be assigned.

99-5E-0338 ISDN DBS DELAYED AND ABBREVIATED RINGING

An (executive's) ISDN DBS set rings for a predetermined interval before ringing a designated (secretary's) ISDN DBS set. This provides for secretarial coverage of executive station sets.

99-5E-0346 ISDN DBS BRIDGING

The ISDN DBS set user can bridge onto a currently active call by pressing the active shared call appearance button on the ISDN DBS Set and going off-hook. This establishes a three-way call. This is different from standard "three-way conference calling" in that the third party initiates the bridge to the active call. This bridging is inhibited if the "manual exclusion" feature is activated at an ISDN DBS set engaged in the active call.

99-5E-0349 ISDN DBS INTERCOM ALERTING

A distinctive ring and/or visual indicator alerts the ISDN DBS set user that they are receiving an intercom call.

99-5E-0350 ISDN DBS INTERCOM FUNCTIONS

The station set provides priority conversations between two members of the INTERCOM GROUP (for example, executive and secretary) by the user pressing the INTERCOM feature button.

99-5E-0352 RISLU T-INTERFACE

The RISLU T-interface is an ISDN 4-wire, BRI providing the basic ISDN 2B+D access (T-interface) terminating on the RISLU. The wiring for the RISLU T-interface must be protected; that is, inside a building or tunnel. This feature provides the same services as the ISLU-T (99-5E-0253). An alarm/control panel is not provided for RISLU site.

99-5E-0353 RISLU U-INTERFACE

The RISLU U-interface is an ISDN 2-wire, BRI providing the basic 2B+D access (U-interface) terminating on the RISLU. This feature provides the same services as the ISLU-U (99-5E-0213). Metallic testing is supported only if total metallic loop is less than 3000 ohms (host SM to CPE). An alarm/control panel is not provided for RISLU site.

99-5E-0354 RISLU-Z INTERFACE

This feature provides the Z-interface terminating on the RISLU. The RISLU-Z interface serves high hundred call seconds analog lines in an economical way because it does not require deloading of the line unit. It provides concentration ratios of 1:1 to 8:1. The RISLU-Z interface features a per-line coder/decoder, digital concentration, single line packaging, and automatic sparing for failed line cards. The Z-interface is applicable to POTS calls only.

99-5E-0355 ISDN ATTENDANT FEATURE PACKAGE

This feature package supports attendant functions for customer groups on a standard BRI interface using an ISDN attendant console. The ISDN attendant can pick up, answer, hold, transfer, and monitor the status of lines in a group. The ISDN attendant can also set up multiway voice conferences. The 5ESS[®] switch also allows an attendant to have higher priority for accessing WATS and other types of trunks.

99-5E-0356 ISDN ATTENDANT CALL HOLD

An ISDN attendant can hold a call in progress so that the attendant can originate another call, answer a call, or pick up a call on hold. Timed reminder is activated when the call is placed on hold by the attendant.

99-5E-0357 ISDN ATTENDANT CALL TRANSFER

An ISDN attendant can transfer a call to another directory number or another attendant position.

99-5E-0358 ISDN ATTENDANT CALL SPLITTING

An ISDN attendant can consult privately with the called party without the calling party hearing. The attendant can alternate conversation between the called and calling party before completing (or terminating) the call.

99-5E-0359 ISDN ATTENDANT CAMP-ON

An ISDN attendant can cause a call directed to a busy analog directory number to wait for the busy station to become free. The ISDN attendant can release from the connection if the attendant so desires. A "call waiting" indication is given to alert the busy party that a call is waiting. When the busy station becomes idle, it is automatically alerted, and connected to the calling party without attendant intervention. While waiting, the caller (and the attendant) can be connected to silence, tone, audible ringing, or announcement. The "timed reminder" feature can be initiated when camp-on is activated. Calls to the ISDN attendant from within the group and from outside the group can be camped-on to a busy station.

99-5E-0360 ISDN ATTENDANT DIRECT TRUNK GROUP SELECTION

An ISDN attendant can select an idle trunk for an outgoing call by pressing a single button on the console.

99-5E-0361 ISDN ATTENDANT POSITION BUSY

The ISDN attendant position can be made busy by the ISDN attendant. When the position is made busy in a single position arrangement, new calls to the position receive busy treatment. In a multiple-position arrangement, new calls are directed to a different console position. When a position is in a "position busy" state, the ISDN attendant can serve calls on hold, calls alerting the console, and calls on a timed reminder; the attendant can also originate calls. The attendant can remove the position busy condition at any time.

99-5E-0362 ISDN ATTENDANT NIGHT SERVICE

Night service routes calls directed to the ISDN attendant to a different station. This feature is activated and deactivated from a designated ISDN attendant console. The user can select one of the following options for night service routing:

- ☐ **Fixed Routing** : Calls are routed from the major listed directory number to a preselected night station. Routing is controlled by the operating company, and can be changed by a service order.
- ☐ **Trunk Answer From Any Station** : Calls activate a night ring or other indicator at all stations in the group. Calls can be answered at any station by dialing an access code for the call pickup feature.
- ☐ **Flexible Routing** : The ISDN attendant uses call forwarding - variable to arrange routing.

Trunk queuing and automatic callback are automatically canceled when night service is activated. When night service is activated, the attendant can originate calls.

99-5E-0363 ISDN ATTENDANT CONFERENCE CALLING

An ISDN attendant can set up conference calls which includes any combination of extensions or trunks on the internal conference bridge. The attendant can drop off from a conference call that the attendant originated. The maximum number of parties on the conference call is limited to the capacity of the multiport conference circuit.

99-5E-0364 ISDN ATTENDANT CONTROL OF FACILITIES

An ISDN attendant can restrict dial access to the facilities (lines and trunks). Subsequent calls to the restricted facilities are routed to the attendant, to a recorded announcement, or to intercept treatment as desired by the customer. The ISDN attendant can activate and deactivate the access restrictions.

99-5E-0365 ISDN ATTENDANT SELECTIVE CUSTOMER CONTROL OF FACILITIES

An ISDN attendant can deny access to a trunk or simulated facility group. All calls, including attendant-originated calls, are denied access to the facility when this feature is activated. Calls to restricted facilities are routed as specified by the customer.

99-5E-0366 DIAL ACCESS TO ISDN ATTENDANT

Station users within the customer group can reach the attendant by dialing.

99-5E-0367 ISDN ATTENDANT THROUGH DIALING

An ISDN attendant can access an outgoing facility for a calling party within the group which has restrictions or difficulty in placing an outgoing call.

99-5E-0368 QUEUING FOR ISDN ATTENDANTS WITH CALL WAITING INDICATION

Calls are queued for ISDN attendants which are designated to receive a particular call type, as determined by the incoming call identification feature. Queues are served on a "first-come, first-served" basis. An indicator is lighted to alert the attendant that a call is waiting.

99-5E-0369 ISDN ATTENDANT TRUNK QUEUING

Trunk queuing is used when all trunks in a trunk group or facility are busy. An ISDN attendant can request that the switch reserve a trunk in a trunk group or facility and call the attendant when one becomes available. The ISDN attendant has the ability to cancel the request. Trunk queuing is automatically canceled when the ISDN attendant activates night service or position busy.

99-5E-0370 ISDN ATTENDANT POWER FAILURE TRANSFER

Calls destined for an ISDN attendant are routed to a preassigned directory number during an ISDN communications failure at the customer's location or loss of power to the attendant console.

99-5E-0371 AUTO DROPBACK TO ISDN ATTENDANT (SERIAL CALLS)

This feature (also referred to as "serial calling") enables the same ISDN attendant to complete a call from an incoming trunk to two or more stations in succession without requiring the calling party to redial the ISDN attendant. When the attendant is recalled, the called party can disconnect, and the calling party can give further instructions for the next call. This feature provides a time and cost savings for a long-distance caller because the biggest time-segment cost occurs at the beginning of a call. Serial calling can be used by callers within the group that desires to place a series of calls over an outgoing trunk.

99-5E-0372 ISDN ATTENDANT TIMED REMINDER

A timer is started when a call is camped-on, when the called party has not answered after a transfer, or when a call is on hold. When the timer expires, the ISDN attendant is alerted and can pick up the call to talk to the calling party. The length of the timer is specified by the customer.

99-5E-0374 EMERGENCY ACCESS TO ISDN ATTENDANT

A station user with emergency access can dial an emergency access code to gain immediate access to the ISDN attendant.

99-5E-0375 ISDN ATTENDANT DIRECT STATION SELECTION/BUSY LAMP FIELD

An ISDN attendant can select and access a station through a single keystroke within a single 100's group, without having to dial the station number. The feature also includes the busy lamp field (BLF) hundreds group select, and range shift keys.

The hundreds group select, and range shift keys are used to select the 100 DNs displayed by the BLF. They are also used to select the 100 DN range for the direct station select.

Up to 3200 DNs can be monitored in 32 sets of 100 contiguous DNs starting at 00. The DNs can be POTS, MLHG, ISDN shared DN or MCA DN. The DN may not be multiposition hunt or ISDN attendant DN.

99-5E-0376 ISDN ATTENDANT TRUNK IDENTIFICATION

The trunk group and member number of the incoming or outgoing trunk in use is displayed at the request of the ISDN attendant.

99-5E-0377 ISDN ATTENDANT TRUNK GROUP INDICATIONS

An ISDN attendant can monitor the level of traffic on a minimum of 12 customer-selected trunk groups. The customer can select two thresholds of traffic per trunk group and the 5ESS[®] switch will notify the ISDN attendant if those thresholds are exceeded. The 5ESS[®] switch will also notify the ISDN attendant when the traffic levels drop under the thresholds.

99-5E-0378 ISDN ATTENDANT CALL-THROUGH TESTS

An ISDN attendant can set up a test call over a selected physical trunk in a trunk group to determine if the trunk is working properly.

99-5E-0379 ISDN ATTENDANT BUSY VERIFICATION OF LINES AND TRUNKS

This feature allows an ISDN attendant to determine whether or not a line or trunk that is in the same customer group is busy or idle. If the line or trunk is busy, the ISDN attendant can bridge on to the connection in order to (1) converse with the parties, or (2) determine if the line or trunk is truly busy or if there is a problem with it. The ISDN attendant can override (disconnect) the talking parties.

99-5E-0380 ISDN ATTENDANT EMERGENCY OVERRIDE

An ISDN attendant can complete incoming calls to stations with terminating restrictions. It also allows the ISDN attendant to complete calls to stations with call forwarding activated, that have a series completion or

multiline hunt arrangement, or that are busy from the setting of the make-busy key.

99-5E-0381 ISDN ATTENDANT EVEN CALL DISTRIBUTION

Calls are distributed uniformly to multiple ISDN attendant positions. When calls are waiting to be answered and the ISDN attendant is busy, alerting is only applied to the ISDN attendant when the attendant becomes idle.

99-5E-0382 ISDN ATTENDANT CONTROL OF VOICE TERMINALS

Calls destined for a line or group of lines are routed to the ISDN attendant for handling. For example, in a hospital, DID calls to a patient room after visiting hours are routed to the ISDN attendant after the attendant activates this feature, or after the 5ESS[®] switch automatically activates this feature.

99-5E-0383 ISDN ATTENDANT ORIGINATING PERMISSION DISPLAY

This feature identifies the originating permissions of lines which have been routed to the ISDN attendant. This feature is also known as "class-of-service display."

99-5E-0384 ISDN ATTENDANT INCOMING CALL IDENTIFICATION

An ISDN attendant can identify the type of facility that an incoming call to the attendant was routed over.

99-5E-0385 ISDN ELECTRONIC DIRECTORY

The ISDN electronic directory is a user-defined, on-line directory database which is accessible from ISDN station sets and ISDN data terminals within the customer group. Users search and retrieve data entries by entering single or multiple keys. This feature interacts with other ISDN features such as message service. This feature requires the applications processor feature, electronic directory services.

Customer administration of the electronic directory database is provided.

99-5E-0386 ISDN ELECTRONIC DIRECTORY - AUTOMATIC CALL SETUP

A customer subscribing to electronic directory query service (ED-QS) can elect the ED-ACS feature. A request for automatic call setup based upon information obtained through the ED-QS feature is allowed. Also, with this feature automatic call setup to parties external to the customer group is allowed. This feature requires the applications processor feature, electronic directory services.

99-5E-0387 ISDN ELECTRONIC DIRECTORY - QUERY SERVICE

The user can query a directory for call and personal information on a per customer group basis. Each directory furnishes such attributes as person's name, telephone number, location, organization, position, etc., as provided by the customer. This feature requires the applications processor feature, electronic directory services.

99-5E-0388 ISDN ELECTRONIC DIRECTORY - STATION DISPLAY DATA

Within a customer group, the called party can display the calling party's name and directory number. This feature requires the applications processor feature, electronic directory services.

99-5E-0389 ISDN BASIC MESSAGE SERVICE

This service provides basic personalized message service for customer groups. Calls to a message service client are redirected through call forwarding. Call forwarding options include:

- ☐ Call forward busy line (CFBL)
- ☐ Call forward don't answer (CFDA)

- ☐ Call forward variable (CFV).

To provide the personalized call coverage, message service attendants will be equipped with ISDN station sets which will display call information on calls directed to the message service center. The 5ESS[®] switch makes the following information available for display:

- ☐ Call type (direct call, CFBL, CFDA, or CFV)
- ☐ Originating party DN (if available)
- ☐ Called party DN.

The message service attendant records the messages manually, and activates a visual or audible message waiting indicator (MWI) at the message service client's station set. The message service attendant deactivates the MWI when messages for a client are delivered. A client can deactivate the MWI from his/her station set.

99-5E-0391 ISDN MESSAGE SERVICE - MESSAGE DATABASE

A message database is available to the message service attendant on the application processor. This database stores customer organizational data, client status data, and standard "canned" messages. Messages received by the message service attendant for the client are also stored in the database for later retrieval. Client status information is provided at the client's discretion. This feature requires the applications processor feature, customer message service system.

Customer administration of the message database is provided.

99-5E-0392 ISDN MESSAGE SERVICE - AUTOMATIC CALL HISTORY DISPLAY

Call information, client status information, and messages are displayed to the message service attendant automatically when the message service client calls from his/her station set to receive messages. For forwarded calls, the call information, client's status information, and a message entry template are displayed. This feature requires the applications processor feature, customer message service system.

99-5E-0393 ISDN MESSAGE SERVICE - AUTOMATIC CONTROL OF MESSAGE WAITING INDICATOR

The MWI at the message service client's station set is activated automatically when a message is recorded in the message database. The MWI is deactivated automatically when the messages are retrieved. This feature requires the applications processor feature, customer message service system.

99-5E-0394 ISDN MESSAGE SERVICE - LEAVE WORD CALLING

A message service client can leave a predefined, "canned" message for another client within the same business customer and served by the same switch of message service without assistance from a message service attendant. When the message is stored, the MWI on the called station is activated automatically.

The leave word calling messages can be retrieved like other messages. This service is restricted to users within the same customer group and the same switch. This feature requires the applications processor feature, customer message service system.

99-5E-0395 ISDN MESSAGE SERVICE - DIRECT ACCESS TO MESSAGE DATABASE

The message service client can update his/her status information, leave messages for incoming calls, and retrieve messages by directly logging onto the application processor (AP) without assistance from the message service attendant. A video display terminal with a standard keyboard is required for this feature. This feature requires the applications processor feature, customer message service system.

99-5E-0396 ISDN MESSAGE SERVICE - MESSAGE RETRIEVAL DISPLAY

The message retrieval display (MRD) feature provides the ISDN station user with the capability to directly retrieve his/her message service center messages or leave word calling messages independent of an existing voice and/or data connection. This feature requires the applications processor, customer message service system.

99-5E-0397 ISDN MESSAGE SERVICE - AUTOMATIC CALL SETUP

Message service clients with the message retrieval display feature or direct access to message database feature, can set up a call automatically to the DN being displayed during the retrieval session. This feature requires the applications processor feature, customer message service system.

99-5E-0398 ISDN MESSAGE SERVICE - PRINT MESSAGES ON DEMAND

A message service client (analog and/or ISDN) can request a printout of messages at a predetermined printer without assistance from a message service attendant. This feature requires the applications processor feature, customer message service system.

99-5E-0399 ISDN BASIC CIRCUIT-SWITCHED VOICE SERVICES

The 5ESS[®] switch supports circuit-switched voice calls over the 64 kb/s B-channels of the BRI. Two calls can be in progress simultaneously on the two B-channels of one BRI. This feature provides standard calling services to the ISDN subscriber. This feature allows an ISDN customer to make interoffice and intraoffice circuit-switched voice calls over the 64 kb/s B-channel to ISDN and non-ISDN customers, including operator services. This feature requires the applications processor feature, customer message service system.

10.2.27 5ESS[®] SWITCH FEATURES 99-5E-0400 - 99-5E-0499**99-5E-0400 ISDN BASIC CIRCUIT-SWITCHED DATA**

The 5ESS[®] switch supports intraswitch circuit-switched data calls over the 64 kb/s B-channel. Two calls can be in progress simultaneously on the two B-channels of one BRI. This feature requires the applications processor feature, customer message service system.

99-5E-0401 ISDN INTERSWITCH DATA TRANSPORT

Circuit-switched data calls between the 5ESS[®] switch and RSMs, and between the 5ESS[®] switch and other switches, are carried on a clear data channel at data rates up to 64 kb/s. The CCS signaling is required for the 64 kb/s clear channel; without CCS, the maximum rate is 56 kb/s.

Data is transmitted between the 5ESS[®] switch host switching module and RSM, and between two 5ESS[®] switches, at rates up to 64 kb/s. Transport between the host and SM is limited to one data rate; between two 5ESS[®] switches, any combination of data rates is allowed. For transport between a 5ESS[®] switch and other switches (1A ESSTM and ESSTM), the maximum data rate is 56 kb/s. The 64 kb/s data can be transmitted in a restricted or unrestricted TSS standard format.

99-5E-0402 INTRASWITCH INDIVIDUAL CALLING LINE IDENTIFICATION

The ICLID feature provides calling party data on calls originated from both analog and digital lines on the same 5ESS[®] switch for ISDN subscribers and ISDN attendants. The ICLID feature consists of two main functions:

- ☐ Calling Number Delivery - Transmitting data on an incoming call from the originating line to the terminating station set. A called customer receives the DN of the calling party and the date and time of the call at various stages during a BRI call. The DN received includes all digits necessary to call back

the originating party. The station set displays or stores the data for later retrieval.

- Directory Number Privacy - Preventing delivery of the DN to the terminating station set. The originating user can prevent the 5ESS[®] switch from transmitting the originating DN to the terminating station. There are two types of service, "all-call" and "per-call" DN privacy. In "all-call DN privacy," the DN is not sent unless the user precedes the call with an activation code or presses a feature activation button.

The ICLID feature data interacts with other features to display additional calling party information, such as name and organization from the ISDN electronic directory.

99-5E-0403 ISDN BASIC D-CHANNEL PACKET SWITCHING

The 5ESS[®] switch appears to the D-channel of a BRI as a data circuit-terminating equipment (DCE) side of the 1984 version of X.25. This includes Layer 3 X.25 functions.

The X.25 virtual circuit call services give 5ESS[®] switch ISDN users the ability to originate and receive X.25 data calls, over the 16 kb/s D-channel. Multiple data calls can be active simultaneously on a single D-channel. The full X.25 interface, including D-, M-, and Q-bit usage, is implemented.

The DTEs using the D-channel for X.25 packet switching will be allowed up to 16 logical channels.

NOTE: Packet switching can be provisioned through service order on a D-channel or on one of the B-channels of a DSL, but not both.

99-5E-0404 ISDN SPECIAL B-CHANNEL PACKET SWITCHING

The X.25 packet switching services are provided over the 64 kb/s B-channel, using Layer 2 LAPB protocol. This 64 kb/s access provides packet switching service access to a host computer. With this access method, many user sessions with the host computer can be multiplexed.

This access is implemented by nailing up the 64 kb/s link on a B-channel to the PSU. This access must be presubscribed by the ISDN user through a service order. Up to 128 logical channels are allowed for packet switching on each B-channel.

NOTE: Packet switching can be provisioned through service order on a D-channel or on one of the B-channels of a BRI, but not both.

99-5E-0405 GATEWAY TO PACKET SWITCH FOR ACCESS TO PDNS

The ISDN subscribers have access to a public data network (PDN) via standardized data link access from a 5ESS[®] switch to a 1PSS.

99-5E-0406 X.25 PERMANENT VIRTUAL CIRCUITS

Packet switching can be implemented over a dedicated logical channel without the need for call setup or clearing. The PVC (permanent virtual circuit) is established by a service order.

99-5E-0407 X.25 CLOSED USER GROUPS

The ISDN subscribers can establish "subnetworks" within which the members of the closed user group can communicate. Communication with users who are external to the CUG is not permitted. The CUGs are established by service order. A user can belong to multiple CUGs.

99-5E-0408 X.25 RECOGNIZED PRIVATE OPERATING AGENCY

The ISDN subscriber can specify an inter-LATA carrier on a per-call basis. Route selection based on the RPOA is part of the routing capability.

Both the basic and extended formats of the RPOA feature are included. The basic feature allows one RPOA transit network to be specified. In the extended format, one or more RPOA transit networks can be specified. The RPOA selection is made from the 1PSS switch.

99-5E-0409 X.25 INTEREXCHANGE CARRIER

The ISDN subscriber can preselect, by service order, a default inter-LATA carrier for packet-switched data calls. All inter-LATA calls for which the RPOA selection facility is not requested will be placed through the preselected carrier. Route selection based on the preselected IEC is part of the routing capability. The interexchange carrier selection is made from the 1PSS switch.

99-5E-0410 INTERCOM ADDRESSING FOR PACKET SWITCHING

The ISDN subscriber can set up packet switching data calls to other users on the same 5ESS[®] switch without using a full 10-digit address. A user can subscribe to 4-digit or 7-digit dialing, or both. If 4-digit intercom dialing is selected, the user can address other customers on the 5ESS[®] switch whose addresses begin with the same service region and service area (SRSA) using only a 4-digit end point address. The 7-digit intercom dialing works similarly, except in this case, only the SR must be the same.

99-5E-0411 X.25 HUNT GROUPS

This feature allows a grouping of access lines such that an incoming packet-switched data call to the hunt group will be completed if there is an available logical channel on any of the access lines within the hunt group. A hunt group is established by service order. Members of a hunt group can be distributed among the ISDN switching modules within a 5ESS[®] switch, but the hunt group cannot span switches. A BRI within a hunt group can have its own address (individual line addressing) and can accept calls independent of the hunt group.

99-5E-0412 X.25 REVERSE CHARGE

The ISDN subscriber can, on a per-call basis, assign billing charges to the called DTE rather than the calling DTE. Terminating customer must have X.25 Reverse Charge Acceptance for the call to complete.

99-5E-0413 X.25 REVERSE CHARGE ACCEPTANCE

In order for the "X.25 Reverse Charge" calls to be completed, the destination line must subscribe to X.25 reverse charge acceptance; otherwise, the call requesting reverse charging is refused.

99-5E-0414 X.25 FAST SELECT

A sending DTE can forward 128 bytes of data along with call setup and clearing packets. Terminating customer must have X.25 fast select acceptance for the call to complete.

99-5E-0415 X.25 FAST SELECT ACCEPTANCE

Incoming packets from a sending DTE that uses the fast select feature can be transmitted to a destination DTE which has subscribed to the X.25 fast select acceptance feature. If fast select acceptance has not been subscribed, the incoming packets are not delivered to the destination DTE.

99-5E-0416 X.25 FLOW CONTROL PARAMETER NEGOTIATION

The data window size and the maximum packet size is negotiated automatically during an X.25 data call. This can be presubscribed by service order, or it can be established on a per-call basis.

99-5E-0417 X.25 THROUGHPUT CLASS NEGOTIATION

The DTEs can negotiate the throughput class for an X.25 data call. This feature can be presubscribed by service order or established on a per-call basis.

99-5E-0418 X.25 INCOMING CALLS BARRED

A DTE can be prohibited from receiving incoming calls. This feature is activated by service order.

99-5E-0419 X.25 OUTGOING CALLS BARRED

A DTE can be prohibited from originating an outgoing virtual call. This feature is activated by service order.

99-5E-0420 X.25 ONE-WAY OUTGOING LOGICAL CHANNEL

The ISDN subscriber can specify some number of their logical channels to be used only for calls that they originate. This feature is activated by service order.

99-5E-0421 X.25 TRANSIT DELAY SELECTION AND INDICATION

The DTE can specify an acceptable transit delay on a per-call basis, for a virtual call.

99-5E-0423 ISDN MODEM POOLING

The ISDN modem pooling connects an ISDN subscriber's data terminal equipment (DTE) to another DTE which is on an analog facility. The ISDN subscriber can make (and receive) data calls to (and from) non-ISDN destinations (such as local time-sharing and other public data network services), without requiring the subscriber to use a modem and an analog line for access.

The connection is established by routing the call through a member of a modem pool to perform data conversions. The modem pool is connected to the switch through the BRI D-channel (for the X.25 packet-switched portion of the path connection) and through analog lines (for the circuit-switched analog portion of the call connection). The switch provides X.25 level 3 transport of data between the BRI customer's ISDN terminal adapter and the modem pool terminal adapter, over the 16 kb/s D-channel. The connection between the modem pool and the analog customer is provided by a circuit-switched analog connection.

The modem pool can be installed and maintained as part of the central office, or the customer can maintain the modem pool on the customer's premises.

99-5E-0424 DATA SERVICE SCREENING

This feature would allow the switch administrator the ability to assign types of permitted data services (for example, packet-switched or circuit-switched) to DNs for ease of administration and engineering the office. These service permissions are checked prior to the setting up of a data call. The ability to assign types of permitted data services should be provided through recent change and the customer station rearrangement capabilities.

99-5E-0425 BIT RATE INDICATION

This feature allows the network and user to exchange information to determine a transmission speed that the network can support. The switch will determine if network equipment allows the call to be completed at the requested mode and rate. However, there is no rate negotiation done by the network. In the case of a call that cannot be completed as per the requested mode and rate, the switch will clear the call. The switch will not provide any rate adaptation as this functionality will be provided by terminal adapters.

99-5E-0426 DATA FORMAT AGREEMENT

This feature will allow the network to carry information between the users to determine the data format for data communication. Changes have been proposed to the Q.931 messages to support this feature. Prior to the approval of these proposed changes by the standard bodies, the switch will support the standard cause elements in the RELease COMplete message for this feature. Additionally, the switch will support the lower layer compatibility information element. This will provide a means by which the user may verify end-to-end

compatibility.

99-5E-0427 ISDN CUSTOMER STATION REARRANGEMENT (CSR) VIA *MACSTAR*® I AND *MACSTAR*® II COMPUTER PROGRAM

The manual CSR capabilities are expanded to include customer control over the ISDN features. Inputs by the CSR user result in recent change/verify actions being performed by the switch. The RC/V capabilities that need to be extended to ISDN features are as follow:

- ☐ Move DNs
- ☐ Enable/disable service
- ☐ Feature verification
- ☐ Assign/remove features
- ☐ Change/display data
- ☐ Display feature definitions
- ☐ Activate/deactivate features
- ☐ Station verification.

This feature supports the CSR functions both through the *MACSTAR*® I and RMAS implementation, and through the *MACSTAR*® II stand-alone implementation.

99-5E-0429 PACKET-SWITCHED CALL BILLING

Billing measurement collection and record generation processes are provided to allow OTC billing of packet-switched calls on the B-channel and D-channel. The *5ESS*® switch will do all the billing for X.25 packet-switched calls originated on the *5ESS*® switch.

99-5E-0431 CLASS 4X OFFICE - INTERMEDIATE SWITCH POINT

This feature allows operator calls to be routed through a *5ESS*® switch serving as an intermediate switching point (ISP) to an operator system not integrated with the switch. The feature would typically be used by a BOC access tandem switch to route inter-LATA operator calls to an operator system. On operator-assisted calls, the connection between the calling party and the operator must be under control of the operator system. Thorough supervision allows multiwink and inband control signals to bypass from the operator system to the local office. When the *5ESS*® switch is equipped with the OSPS feature to serve all or a portion of the incoming operator traffic, the portion of the traffic to be served can be split off, based on trunk group identification, signaling, dialed digits, ANI identification, and/or ANI search, and sent to OSPS operators. The remaining traffic continues to be routed to the appropriate external operator system(s).

99-5E-0433 APPLICATION PROCESSOR (AP) - BRI INTERFACE

The AP is a separate computer system which is connected to the *5ESS*® switch by a dedicated data link, to support a set of interactive features. The AP may be connected by a single data link or multiple data links, at the customer's option.

In the 5E4 software release, the AP will communicate with the *5ESS*® switch through a BRI. The BRI terminates on an SM, to provide better AM real-time performance.

Data communication between the *5ESS*® switch and the AP is carried on the 16 kb/s D-channel. An ISDN terminal adapter (TA) is required to adapt the 165 kb/s D-channel to 9.6 kb/s synchronous data format at

the AP.

In addition to the features supported by the AP in the 5E3 software release, the AP will support the following features in the 5E4 software release:

- ☐ Electronic directory service
- ☐ Message service system.

This feature includes software to perform the conversion of an AP from the IOP interface to the BRI interface.

99-5E-0434 DEFENSE SWITCHED NETWORK CONSOLE

The ISDN console will be used as the DSN console and will display additional information to the DSN attendant, for example, the priority of the incoming call to the attendant and DSN class-of-service restrictions.

99-5E-0436 DEFENSE SWITCHED NETWORK - BRCS/ISDN ADAPTATION TO DSN

This feature adapts the BRCS and ISDN feature packages to be compatible in the DSN environment. The effort includes providing for the interaction between the unique DSN requirements, such as the differences in the handling of voice calls versus data calls and precedence and preemption in the DSN environment.

99-5E-0437 DEFERRED LINE UNIT CHANNEL MAINTENANCE

This feature allows the switch personnel to place out-of-service channel units in a "deferred maintenance" state. With this feature, one or two channel units in a line unit can be out-of-service and the "system normal" indicator can remain on. This enhancement avoids the masking of higher-priority problems and allows the OTC to reduce maintenance costs.

99-5E-0438 PRECUTOVER FABRIC TESTING

This feature provides a mechanism to test the grid hardware while the switch is in the precutover state. Specifically, it provides the ability to test the first and second stage crosspoints and the scan cutoff switches.

99-5E-0440 ANALOG MESSAGE WAITING INDICATOR

This feature allows the 5ESS[®] switch to activate/deactivate a message waiting indicator lamp on an analog station set that is equipped with compatible analog station set hardware.

99-5E-0442 FLEXIBLE IOP UTILIZATION

Current administration of the IOP is such that each peripheral device is assigned to a unique IOP slot on a software release basis. If a given office has no need for a given device, its slot is wasted in that office. This feature will provide flexibility in ECD administration so that IOP slots can be used as they are needed in a given office. With this feature, the number of offices requiring a third IOP is reduced.

99-5E-0443 DSU2 INTEGRATED SERVICES TEST FUNCTION (ISTF)

This feature provides a 5ESS[®] switch peripheral unit for ISDN that supports transmission testing of interoffice digital trunks and BRIs. The ISTF provides the trunk maintenance interface with other 5ESS[®] switches, and with 1A ESSTM switch CSDC and ESSTM switch circuit-switched digital networks.

99-5E-0447 NUMBER OF CALLS ON QUEUE - ISDN ATTENDANT

An attendant can display the number of calls on queue for each ISDN call identification type. The attendant

can display all the ICI queues by repeating the request until all the ICIs have been displayed.

99-5E-0448 TOTAL NUMBER OF CALLS HANDLED DISPLAY DATA FOR ISDN ATTENDANTS

A supervisory attendant, or a designated attendant, can display traffic data about attendants in the ISDN attendant group. This information includes the total number of calls served, the average time on queue for served calls, the total number of calls on queue that were abandoned before being served, the average time on queue for calls that were abandoned before being served, and the time that the longest call was on queue.

99-5E-0449 AGGREGATE WORK TIME/NUMBER OF CALLS HANDLED FOR ISDN ATTENDANTS

This feature allows a supervisor, or attendant, to display data about an attendant position. The data includes number of calls handled, length of time the console was active, and the total time spent handling calls.

99-5E-0454 RECENT CHANGE UPDATE TO ODIN FORMS MANAGEMENT SYSTEM 7.0

The ODIN forms management system 7.0 is a new release of the screen formatting program that recent change uses. The ODIN forms management system 7.0 provides the software mechanism that RC software optioning development will use in order to deny access to certain fields and views that should not be accessible to the switch personnel because of the software configuration of the switch.

99-5E-0457 DEMAND CONTINUITY CHECK OF VOICE PATH

This feature allows the switch personnel to make a continuity check of the voice path for 4-wire CCIS analog trunks. The voice path assurance transceiver used for the tests contains the logic functions and timing for performing go/no-go tests.

99-5E-0458 INTERCOM CALLING RESTRICTION

The intercom calling restriction feature counts and limits the number of intercom (both intraterminal group and interterminal group) calls that can be in progress at any one time within a business customer group.

99-5E-0459 ISDN ORIGINATING PRIORITY CALLING

The ISDN originating priority calling feature provides an ISDN equivalent of call waiting originating (01-02-1202).

This feature is assigned at subscription to a particular station set. All calls originated from this station set will be priority calls.

99-5E-0460 ISDN INITIATED PRIORITY CALLING

The ISDN initiated priority calling feature provides an ISDN equivalent of dial call waiting (01-02-1203).

With initiated priority calling, a station initiates a priority call by one of two methods:

- ☐ By originating, dialing an access code for initiated priority calling, then dialing the digits of the called party.
- ☐ By originating, pressing a priority calling feature button, then dialing the digits of the called party.

99-5E-0461 ISDN PRIORITY CALLING INCOMING ONLY

The ISDN priority calling incoming only feature provides an ISDN equivalent of call waiting incoming only (02-01-1000).

With this feature, calls outside the centrex group can terminate to a priority call appearance. Termination to priority appearances will indicate the normal interterminal group alerting pattern as opposed to a priority alerting pattern. Calls only go to priority appearances if all normal appearances are busy. Interterminal group alerting requires the IBC distinctive ringing feature (99-5E-0317).

99-5E-0462 ISDN DBS KEY SYSTEM COVERAGE FOR ANALOG LINES

This feature allows an analog station set the capability to share calls with the ISDN station set.

99-5E-0463 ISDN DBS TERMINAL MANAGEMENT

This feature provides a management function for the ISDN terminal, therefore most of this feature is transparent to the user. However, five capabilities which are provided do impact the user:

- ☐ Call appearance preference:
- ☐ Idle call appearance preference - When a user goes off-hook, a call appearance which is currently idle is automatically selected, and the user receives dial tone.
- ☐ Ringing call appearance preference - When a user goes off-hook, the call appearance which was alerting first is automatically selected, and the user is connected to the calling party.
- ☐ Automatic hold/drop preference - The network automatically determines how to handle a call active on one call appearance when the user shifts to another appearance. Two types of treatment are provided:
 - ☐ Auto-drop treatment
 - ☐ Auto-hold treatment.
- ☐ Adjunct control - The switch automatically turns on the speakerphone at the station set, if appropriate for particular feature.
- ☐ Call appearance selection for implicit conference and transfer - An idle appearance is automatically selected for the implicit conference and transfer features.
- ☐ Button management - Allow the user to have "generic" buttons that can be used for features or call appearances.

99-5E-0464 ISDN ATTENDANT CONSOLE TERMINAL MANAGEMENT (ACTM)

The ACTM feature provides management services for the attendant console. The ACTM feature is not a feature that an attendant uses as part of their responsibilities. Rather it is a feature provided by the switch to support the attendant console.

The basic services provided by ACTM are as follow:

- ☐ Button management - The switch maintains information about the button configuration of the console. For example, a console could have ten buttons. For one console the switch could configure these ten buttons to be six call appearances and 4 feature buttons. For another console, these ten buttons could be eight call appearances and two feature buttons.
- ☐ Call appearance selection - The switch selects a call appearance on the console for incoming calls and for certain attendant-originated calls (for example, originations through direct trunk group selection, direct station selection, etc.).
- ☐ DN management - A maximum of eight LDNs (listed directory numbers) can be assigned to an attendant group. The switch does not support shared call appearances for attendant positions. Each attendant is capable of having a unique DN, other than the LDN, for purposes of attendant-to-attendant

calls.

- ☐ Lamp management - Lamp management is responsible for controlling console lamps associated with features.
- ☐ Display management - Many of the attendant features utilize a console display.
- ☐ Tones management - The switch informs the console to alert the attendant to one of four specific events. The console is responsible for generating corresponding tones. Note that these are not inband call processing tones generated by the switch. The four alerting tones arranged in priority of importance are:
 - ☐ Emergency - informs the attendant that an emergency call is waiting.
 - ☐ Timed reminder - informs the attendant that a timed reminder for a held call or an unanswered transferred call has expired.
 - ☐ Calls waiting - informs the attendant that calls are in queue waiting to be answered.
 - ☐ Alerting - informs the attendant that a call is alerting the console.

99-5E-0465 ISDN ATTENDANT INTERPOSITION TRANSFER

This feature allows an attendant to transfer a call to or call a specific attendant in the attendant group. An attendant can transfer a call or originate a call to another attendant position by dialing the DN of the desired attendant. This DN is different from the LDN of the attendant group. Each attendant position may have a unique DN assigned to it. When a call is made to this DN, the switch will only offer the call to the specified attendant and will not provide any hunting (or queuing) if the attendant is busy on that DN.

99-5E-0466 ISDN ATTENDANT INFORMATION ABOUT CALLS ON QUEUE

The switch provides the following counts for each ISDN call identification (ICI) for which the customer has subscribed. These counts are available only to a master attendant position for display at the console and through CTRAF reporting mechanisms.

- ☐ Total number of calls that have been served.
- ☐ Total number of calls on queue that were abandoned before being served.
- ☐ The longest time a call has been on queue before being served.
- ☐ The longest time a call has been on queue before being abandoned.
- ☐ Queue usage - can be used to derive average time on queue for served calls and average time on queue for calls that abandoned before being served.

99-5E-0467 ISDN ATTENDANT TRAFFIC

The switch provides the following counts for each attendant console position. These counts are available only to a designated attendant (master position) for display at the console and through CTRAF reporting mechanisms.

- ☐ Number of calls handled by the position
- ☐ Time, in minutes, of how long the position has been active
- ☐ The total work time for the position.

The CTRAF reports these counts periodically (30 minutes). This information can be obtained by the master position for each attendant position in the attendant group. The master position must make repeated requests for this data to sequence through all of the data for attendants in the attendant group.

These counts are zeroed by the switch when an attendant activates a position. The counts apply only to calls offered to the position, not including time waiting in a central office queue or calls abandoned before connection to an attendant call appearance. These counts are not part of the standard traffic reporting mechanism of the switch (for example, hourly reports).

99-5E-0468 ISDN DIRECTORY QUERY DISPLAY (DQD)

The DQD feature is an option of electronic directory service (EDS) available to ISDN station users and ISDN attendants within the same business group. This feature provides the user with the capability to query the EDS database for a directory number independent of a voice and/or data connection. This feature requires the applications processor feature, electronic directory service.

99-5E-0469 ISDN CALLING NAME DISPLAY (CND)

The CND feature will provide the following display data: calling DN, ICI, call appearance identification, and calling name (name for intrabusiness group calls only). The CND feature is equivalent to ICLID (individual calling line identification) plus calling name for intrabusiness calls. For incoming calls (DID originated outside the business group), "INCOMING CALL" will be displayed.

99-5E-0470 ISDN TIME AND DATE DISPLAY

The 5ESS[®] switch provides the time and date to the ISDN station set. Time and date is a subscribable feature for ISDN attendants and ISDN station set users. This feature requires the applications processor feature, electronic directory service.

99-5E-0471 SERVICE SWITCHING POINT (SSP)/800 SERVICE

The SSP enables 5ESS[®] switch equal access end offices (EAEOs) and access tandem (AT) offices to interface with telephone company databases, using common channel signaling system 7 (CCS7) and transaction capabilities (TC) protocols, to implement telephone company number services. The 800 service is the number service provided as part of this capability.

A special code, 800, indicates that the call requires special treatment. Once an 800 call reaches an SSP, the SSP sends a TC message to the telephone company database, a service control point (SCP). Screening is performed at the SCP and a reply message returned to the SSP containing information to be used in processing the call. The call may be routed either to an inter-LATA carrier (IC) or within the telephone company.

99-5E-0472 CCS ENHANCEMENTS - DOMAIN CONTROLLED ROUTING

This feature provides enhancement to CCS trunk signaling feature 60-03-0100. The enhancement covers domain controlled routing for CCS (ISUP, CCIS6) calls, that is, depending on the service, the same dialed digits could be interpreted differently for the purpose of routing. This feature supports the following domain assignments:

- (1) POTS (1-79)
- (2) SPECIAL SERVICES (80-99)
- INTERNATIONAL OUTBOUND (81)
- CSDC (82)
- DIRECT EGRESS VOICE (89)
- DIRECT EGRESS DATA (90)
- 64 kb CLEAR (91)
- 64 kb RESTRICTED (92)

DIRECT EGRESS VOICE< CCS7 PREFERRED (97)
 DIRECT EGRESS DATA< CCS7 PREFERRED (90).

The domain controlled routing can be derived from one of two sources in the 5ESS[®] switch. One source is the translation data, namely, digit analysis selectors. The other source is the CCS initial address message where the routing category yields the domain information. This feature is designed to support *ALLIANCE*[®] teleconferencing services for exempt non-POTS domains from NM code controls and reroute controls.

99-5E-0473 RMS-D3/5ESS[®] SWITCH INTERFACE

The RMS-D3 is a test device developed for supporting the testing and maintenance of digital- and analog-switched circuits. The testing of switched circuits via RMS-D3 will be controlled by TOPAS.

The 5ESS[®] switch hardware interface to RMS-D3 will consist of a control link (BX.25 level 3) and a T1 interface. The commands from RMS-D3 as well as responses transmitted by the 5ESS[®] switch will utilize the control link. The T1 interface provides access to the RMS-D3 test ports.

The 5ESS[®] switch will provide the following capabilities for RMS-D3:

- ☐ Route 104, 105, 109, and 606 calls to RMS-D3 ports. (Note that the 109 and 606 test lines do not exist in the 5ESS[®] switch.)
- ☐ Route 101 test position calls to RMS-D3 ports and reroute them to TLWS if these ports are busy.
- ☐ Ability to originate test calls from RMS-D3 - test call with outpulsing or without outpulsing, signaling test access with outpulsing or without outpulsing, monitor connection, split talk access, and out-tandem connection.
- ☐ Mapping of trunk groups and test position numbers, RMS-D3 TATs (test access trunks) and test position numbers, TOPAS test position number and status (attended/unattended).
- ☐ Ability to reconfigure TATs to meet testing needs during any given time.

99-5E-0474 TOPAS/5ESS[®] SWITCH INTERFACE

The Testing, Operations, Provisioning and Administration System (TOPAS) is an operation support system that provides centralized trunk maintenance and administration for trunks terminating on 5ESS[®] switches.

The TOPAS/5ESS[®] switch capabilities include the following:

- ☐ Provide pre-service testing, trouble sectionalization, and repair verification through RMS-D3.
- ☐ Maintain a current status of all the trunks on the 5ESS[®] switch through trunk state change reports from the 5ESS[®] switch as well as through periodic audits of the 5ESS[®] switch.
- ☐ Funnel facility failure reports from the 5ESS[®] switch to Facility Administrative Surveillance System.

The 5ESS[®] switch hardware interface to TOPAS is through a control link (BX.25 Level 4).

99-5E-0475 MAC-OS ACCESS OF BATCH RECENT CHANGE

This feature provides capabilities for MAC-OS that would allow MAC-OS to access text recent change capability through a session layer interface. The capability components include:

- ☐ **Batch Mode RC Input:** The 5ESS[®] switch provides text batch recent change for MAC-OS. The switch will report back all level 1 (syntax) and level 2 (consistency) errors immediately.

- ☐ **Batch History RC Display:** The 5ESS[®] switch allows MAC-OS to query for level 3 errors and batch recent change status.
- ☐ **Trunk Reports:** The 5ESS[®] switch allows the MAC-OS to query for trunk reports. However, these reports are only output at the local office ROP.

99-5E-0477 ALLIANCE[®] TELECONFERENCING SERVICES ACCESS

The ALLIANCE[®] teleconferencing services feature is an existing, tariffed public network service that currently uses a TSPS office for access. This feature allows a 5ESS[®] switch OSPS switch to perform the TSPS functions of collecting the caller's billing number and performing certain nonoperator screening. The current 0+700+45Y+XXXX ALLIANCE[®] teleconferencing services dialing plan is retained. The caller information is forwarded to a network office in a common channel signaling system No. 7 ISDN user part (CCS7 ISDNUP) initial address message (IAM). The call proceeds to a 4ESS[™] switch and eventually is completed at a network services complex which determines final call handling.

99-5E-0478 INITIAL U-BRI LAYER 1 PERFORMANCE MONITOR

The 5E4(1) ISDN sites will all have very limited numbers of BRIs. Thus, the minimum proposal is the creation of a new input message that requests the current error count for a specific BRI. The output message would identify the requested BRI line equipment number and the error count. An off-line process (in SCCS or personal computer) would hold historic information and track fluctuations of the error counts.

All error counts in the office should be zeroed once per day, preferably in the early morning (for example, 2:00 a.m. or 2:30 a.m.).

To minimize traffic on the SCC and primary maintenance channels, the input and output messages should be supported over a secondary TTY channel. The ALIT channel would be the best choice.

99-5E-0479 DATABASE QUERY SELECT - TRUNK REPORTS

This feature provides non-key query for trunk data. This feature can be accessed by a local/remote VDU terminal.

The 5ESS[®] switch provides a non-key query system by which it is possible to retrieve information from the office database by matching a set of attributes given in the query request. For example, it is possible to request a list of all trunk groups in a route which have the far-exchange as the glare controlling end.

The request is RC form driven only and is initiated as an administrative task. The query will be supported from each of the following RC Forms:

- ☐ 52021 Trunk Group Record
- ☐ 5204 Trunk Features and Assignments Record
- ☐ 5303 Route Index Expansion Record
- ☐ 53003 Local Digital Interpretation Record.

This feature also has enhancements to forms 5204 and 5303 (addition of clcigrd field) and form 5303 (return RTI, given trunk group member and code).

99-5E-0480 LEASED NETWORK 100-SECOND SCAN

This feature scans customer dedicated trunk groups every 100 seconds, counts the number of busy trunks in these trunk groups and then sends this information over the AP 5E4 software release interface to an OS

system. This feature is provided in support of the 5ESS[®] switch EPSCS service and the Customer Service Administration and Control Center (CSACC).

99-5E-0481 DISTRIBUTED MANUAL CALL GAPPING (MCG)

The MCG is an network management (NM) code control that regulates the rate at which calls for a specified set of dialed digits or destination codes are forwarded from the switch. This feature decouples the matching function (matching of dialed digits with digits in the control list) from the route request and allows the function to be performed either in the AM or in the SM.

99-5E-0482 MULTIPLE DNs ON MULTILINE HUNT GROUPS

This feature permits the assignment of an unlimited number of DNs to a single MLHG terminal. This allows a customer to change the listed DN for a service, while retaining the old DN for those who might still use it.

99-5E-0483 NONHUNTING DNs

Nonhunting DNs can receive direct calls and do not hunt if the DN is busy. However, the nonhunt DN is hunted when a hunting DN is called.

99-5E-0484 OUTDIAL LISTS

Outdial lists are lines associated with an MLHG and the same subscriber, but are not part of the hunting series. Outdial list lines are assigned to an MLHG to share common data, thereby conserving DNs. The assignment of DNs is only required if these lines are to receive terminating calls.

99-5E-0485 LOCAL AND INWATS ON SAME MLHG

This feature allows the subscriber to receive both local and 800 Service calls on the same MLHG. Band hunting determines the billing treatment that each call receives. Volume control limits the number of calls that can be in progress at any given time.

99-5E-0486 QUEUEING FOR MULTIPLE POSITION HUNT

This feature, Queuing for Lines (also referred to as Queuing for MLHG), provides the queuing service for incoming calls to MLHGs or trunk groups. In addition, Call Waiting Lamps, and Delay Announcements are also provided.

99-5E-0490 CALL FORWARDING VARIABLE ACTIVATION CONFIRMATION

This feature is a preconstructed feature that operates like the 1A ESSTM switch CFV as follows:

- ☐ If the remote station answers, CFV is activated.
- ☐ If the remote station does not answer, the user can activate CFV by redialing the remote directory number (DN) within 2 minutes.
- ☐ System attempts to establish a call to the remote station.
- ☐ System returns confirmation tone.
- ☐ System returns recall dial tone.
- ☐ User dials CFV activation code.
- ☐ User dials remote station DN.

If the user dials a different DN within the 2-minute time-out period, reorder is returned.

99-5E-0492 0XX AND 1XX ROUTING

This feature allows the assignment of 0/1XX as "pseudo NXX codes" for the routing of 800 Service (INWATS) calls, rather than a regular 10-digit DDD number. Such assignments can save central office codes and also protect against access by the local or toll network.

99-5E-0494 MULTIPLE IP TRUNK GROUPS

This feature will enable termination of multiple IP trunk groups on a single 5ESS[®] switch capable of handling the internal protocol (IP) packet switching protocol. Within a network comprised of packet switching switches (that is, the 5ESS[®] switch, 1PSS switch, DATAKIT[®] virtual circuit switch), the X.25 packets from the DTE/DCE interfaces and/or the X.75/X.75 packets from the STE/STE interfaces will be carried as IP packets to support virtual circuits and permanent virtual circuits. This feature will also support tandeming of IP packets. In case of a trunk group failure, the IP tandeming capability is used to provide alternate routing for new virtual circuits and permanent virtual circuits between two endpoints of the network. With a trunk group failure, this feature supports the IP reconnect recovery procedures to maintain the existing virtual circuits and permanent virtual circuits, transparently to the external interface, without the loss of any packets.

99-5E-0495 Q.931/CCS7 INTERWORKING

This feature supports interswitch ISDN calls over the CCS7 network. It involves a complete mapping of messages, information elements, and call states between Q.931 (PRI and BRI) and CCS7 ISDN user part to support the basic call setup and clearing supported by the 5E4 software release primary rate interface (PRI). This includes the following:

- ☐ Message-associated UUI (not on BRI)
- ☐ Per call service selection
- ☐ Station ID.

99-5E-0498 OS SUPPORT FOR REMOTE CENTRALIZED ISDN BRI DIGITAL TESTING

This feature provides testing of digital subscriber loops through an OS. The test facility should perform the following:

- ☐ Request that the switch run a series of digital tests (for example, loopbacks) on the BRI to sectionalize the hardware failure and return the results to the OS.
- ☐ Request that the switch run a series of digital tests on the BRI to verify that operation is within performance requirements and return the results to the OS.

99-5E-0499 NONINVASIVE U-BRI LOOPBACK

This feature provides the ability to perform a digital loopback test on the B-channel(s) of a BRI while still allowing customer originations and terminations. In addition, a digital loopback test may be performed on the D-channel of a BRI while still allowing customer terminations. Therefore, a digital test may be interrupted by a service request, minimizing the interference of digital testing procedures with customer service. The loopback is controlled by the network over the N-channel which lies outside the 2B+D user channels. Either B-channel can be looped back without taking the D-channel out of service.

For circuit-switched services, the loopback test is automatically halted and service restored if the call cannot be set up otherwise. This allows the performance of individual channels to be measured without disrupting service to the user. If on-demand packet-switched services are available on the B-channel, the loopback test is automatically halted and service restored any time a B-channel under test is established for packet switching using a Q.931 setup message over the D-channel. This is also the case any time a B-channel under test is reestablished for circuit switching using a Q.931 disconnect message over the D-channel. The test can be interrupted in this way only at the time of channel establishment, and not during X.25 call setup procedures. For service-provisioned packet-switched services on the B-channel, the user is not able to interrupt the loopback test since there is no appropriate out-of-band signaling associated with the services. In all cases however, the network may override the user's capability to interrupt a loopback test if so desired.

10.2.28 5ESS[®] SWITCH FEATURES 99-5E-0500 - 99-5E-0598

99-5E-0500 INSPECT FOR ISDN TERMINALS

The inspect feature is used to retrieve and display call related information about any call appearance that has a call associated with it. This could be the active call, a call on hold, or an alerting call. The data that can be displayed includes: call appearance identification, called or calling DN, ISDN call identifier (ICI) call type, and called or calling party name. If the user performing the inspect is an attendant, the originating permissions are also displayed.

99-5E-0501 OUTGOING CALLED LINE IDENTIFICATION (OCLID) FOR ISDN TERMINALS

The OCLID is a feature that provides a user who is originating a call with information about the called party and the facility or destination. Facility and call destination information is provided through the ICI call types. The OCLID information that is provided is: call appearance identification, called DN, and ICI. If an attendant is originating the call, the switch also provides the originating permissions of the called party. It is desirable that the called DN that is sent by the switch, be in a form such that the calling party can dial the called DN that is displayed on the terminal, to reach the called party. The OCLID feature will be billed only on a flat rate basis.

99-5E-0502 FULLY CODED ADDRESSING

The 5E2(2) software release provides the capability for the 5ESS[®] switch to serve as an inter LATA carrier point of presence (POP), receiving inter LATA domestic (DDD) and international (IDDD) calls from a subtending local exchange company (LEC), via the equal access - multifrequency (EA-MF) signaling protocol. This feature allows the POP to receive the IDDD multistage EA-MF sequences, generate an AMA record to charge the caller, and output a single stage of routing digits to an international switching center through CCIS6/CCS7 trunk signaling.

99-5E-0503 OSO AMA RECORDING

The 5ESS[®] switch can serve as an OSO for INWATS (800-service) calls. This feature allows the OSO to generate the INWATS per-call AMA records. The new AMA record format will include the calling number, the dialed "800" number, and the routing number returned from the INWATS database. The call is subsequently routed as a DDD call.

99-5E-0504 NM/DOMAIN SELECTIVITY

The NM/domain selectivity feature, with the shared network use of the 5ESS[®] switch, (for example, DCTN, EPSCS, POTS, etc.) and with overlapping numbering plans, allows the 5ESS[®] switch uses domain selection to provide proper call treatment. However, NM controls (for example, call gapping control and reroute control) are currently deficient in controlling these different types of traffic. This feature is needed for making the NM controls domain selective. For example, the call gapping control would then permit the control of codes in a specified domain. Since NM controls are accessible through the on-site capability and EADAS capability enhancements to these interfaces are also required.

99-5E-0505 LEASED NETWORK 8-HOUR PAST MDR

Every 8 hours, this feature will scan MDR fields to identify which calls have been in progress for more than 8 hours. The calls that have been in progress for more than 8 hours will have an intermediate MDR record generated. This feature aids in the identification of problem facilities and network abuse.

99-5E-0506 LEASED NETWORK MDR FOR RELEASED LINK TRUNK

This feature provides message detail recording records for calls handled by a centralized attendant. One MDR record is written for the initial call to the attendant, and a second record is written for the transferred call. The originating directory number in both records must be the directory number of the caller to the attendant as opposed to the current arrangement which would have the attendant's directory number as the originator for the second MDR.

99-5E-0507 5ESS[®] SWITCH - STAND-ALONE FEATURE FOR SWITCHING MODULES

This feature provides SMs the capability to continue processing local (intramodule) calls when the SMs are isolated from the rest of the 5ESS[®] switch. An SM in this instance, refers to any switching module capable of call processing, with NCT links that terminate directly on the CM; that is, the SM has direct access between the 512 time slots in the SM and the corresponding CM NCT ports, independent of the intervening transmission media. Included in this definition are host SMs, local SMs, and ORMs. The SMs that have ISDN capabilities are also included. However, specialized SMs, such as the OSPS PSM are not included.

The stand-alone feature consists of the following capabilities:

- ☐ **Basic Stand-Alone Capability**
- ☐ Stand-Alone Emergency Number Access: Provision for routing up to ten emergency numbers to local directory numbers or route indices. The local directory numbers are associated with local POTS/ISDN lines or local multiline hunt groups, and route indices are associated with local trunk groups.
- ☐ **Enhanced Stand-Alone Capabilities**
- ☐ Stand-Alone Call Processing: Provision of the basic capability, automatic transitions into and out of the stand-alone mode, and call routing capabilities for calls terminating to specific lines or trunks. This includes all hunted ports. Also, provision for maintaining all stable intramodule, intermodule, and interswitch calls during transitions.
- ☐ Stand-Alone Billing: Provision for engineerable storage of billing data. This engineerable storage would be random access memory and its upper bound will be determined by the addressable memory of the SM processor.
- ☐ Stand-Alone Announcement: Provision for a stand-alone announcement capability either on the line or trunk side.

All the capabilities listed previously are customer selectable options. The stand-alone billing and announcement capabilities are not allowed without the stand-alone call processing capability.

In general, most call processing features offered on the SM during linked mode will continue to be available in the stand-alone mode, provided the stand-alone call processing option is purchased and installed. Features that require shared resources from other SMs and/or AM intervention will not operate in the stand-alone mode. If neither the emergency access nor the call processing capability of the stand-alone feature is purchased and installed, all originating calls are routed to reorder when the SM becomes isolated from the host switch.

99-5E-0508 TRANSMISSION RATE CONVERTER UNIT DIRECT FIBER INTERFACE

This feature provides a transmission interface between the 5ESS[®] switch and an ORM. The interface achieves significant savings over the standard DS3 interface, and provides a point-to-point connection of ORMs to the CM of the 5ESS[®] switch using the TRCU configured to drive the optical fiber. Configured this way, the TRCU converts the 32 Mb/s NCT rate to a 45 Mb/s DS3 rate, and multiplexes the two DS3 channels (odd and even time slots from one physical CM) onto a single 90 Mb/s channel. The output of this channel can drive a single-mode fiber link (without repeaters) in excess of thirty miles, depending on the characteristics of the fiber and the specific driver pack used.

99-5E-0509 ISDN AUTOMATIC CUSTOMER STATION REARRANGEMENT

The ISDN automatic customer station rearrangement feature allows end-users to relocate their terminal equipment and associated directory number, assign features, change group memberships and restrictions, and install new service without the need for a service order. This feature provides the following functions:

- ☐ Directory number swap for physical station moves
- ☐ The ability to perform the previous function using dialed message exchange with prompting
- ☐ The ability to generate reports for the purpose of inventory control
- ☐ The ability to generate reports to update electronic directory databases
- ☐ Security to protect against illegal moves.

99-5E-0510 ISDN CIRCUIT-SWITCHED DATA CALL HUNTING FOR BRI

This feature will provide hunting for circuit-switched data calls on BRIs. Typically, in a circuit-switched implementation of multiple BRIs access to a host, this feature should provide the end-user the ability to dial a single number to access a port on the host. This feature should have the capability to hunt on individual BRIs for circuit-switched ISDN data calls.

99-5E-0511 BASIC RATE ISDN VIA UNIVERSAL DIGITAL LOOP CARRIER (UDLC)

This feature provides ISDN services through a D4 or D5 channel bank, or through a central office terminal to a SLC[®] carrier remote terminal. This extends the range from approximately 5 miles to the T1 carrier limit. These configurations are also known as UDLC arrangements.

99-5E-0512 INDIVIDUALIZED DIALING PLAN (IDP) FOR ISDN CIRCUIT-SWITCHED DATA CALLS

The IDP modular feature provides the following features for ISDN CSD calls:

- ☐ Speed calling
- ☐ Customer-changeable speed calling
- ☐ Group numbering plan
- ☐ Critical interdigit timing for dialing plan
- ☐ Intercom dialing
- ☐ Customer access treatment code restrictions
- ☐ Single digit dialing.

NOTE: In a data-only application, the customer premises equipment may not have the required functionality for monitoring the editing sequence for the customer-changeable speed calling list.

The editing process involves a human interface, in which the switch provides the required inband tones and announcements as the person goes through the editing sequence.

99-5E-0513 TERMINAL GROUP AND STATION RESTRICTION FOR ISDN CSD (CIRCUIT SWITCHED DATA) CALLS

The TGSR modular feature allows the creation of the following features for ISDN SCD calls:

- ☐ Business group directory number
- ☐ Unrestricted (originating and terminating)
- ☐ Semirestricted (originating and terminating)
- ☐ Fully restricted (originating and terminating)
- ☐ Special intercept announcements.

A terminal group (TG) is a grouping of two or more terminals that provide restriction on screening capabilities for certain features or interactions. The station restriction (SR) provides a means to restrict calls based on the membership of the terminal in a TG. The following are the definitions of the individual features covered under TGSR:

- ☐ **Business Group Directory Number:** This feature provides for the identification of a DN as a member of a group of DNs belonging to a terminal group. This grouping allows the DNs to share a common dialing plan, private facilities, traffic measurements, and some restriction options (on a per-station basis) on various combinations of incoming and outgoing calls of different types.
- ☐ **Unrestricted (Originating and Terminating):** This feature provides for the identification of a line as unrestricted. This feature is basically the absence of originating/terminating restriction. The terminal does not utilize the SR capability.
- ☐ **Semirestricted (Originating and Terminating):** This feature provides for the identification of a line as semirestricted. Semirestricted lines can make calls to and receive calls from lines in the same terminal group, including calls over private facilities (if within the terminal group), including the attendant. Restricted calls are given reorder, an announcement, or rerouted to another DN.
- ☐ **Fully Restricted (Origination and Termination):** Fully restricted lines can make calls to and receive calls from lines in the same terminal group, including calls over private facilities (if within the terminal group). Calls to and from the attendant are prohibited. Restricted calls are given reorder, an announcement, or rerouted to another DN.
- ☐ **Special Intercept Announcements:** These announcements are unique to each customer group, and are given when attempts are made to use undefined dialing codes or to make a call which conflicts with some originating or terminating restrictions.

99-5E-0514 ORM METALLIC TESTING

This feature provides the ability to measure resistance, capacitance, and voltage of lines served through an ORM without the requirement for a metallic connect to the host site or to external (to the 5ESS[®] switch) measurement equipment. A DCTU and an MSU must be resident in the ORM for this feature.

99-5E-0515 COMPOSITE LINES QUERY

This feature facilitates the administration of lines data by allowing the switch personnel to obtain categorized, selected data on non-BRCS lines from the database. A recent change view (similar to View 1.6) enables the switch personnel to input a range of attribute values. A report is then printed of all the

telephone numbers that satisfy the set.

99-5E-0517 INTERFACE TO MFOS (DOMESTIC)

The Multifunctional Operations Support System (MFOS) is a new OS that will require lab-to-lab testing with the current 5ESS[®] switch/OS interfaces. The MFOS will provide database administration, switch maintenance, billing, and traffic reports. The MFOS interface will not require a new, separate data link. This interface will terminate the existing physical data links from the 5ESS[®] switch 3B20 IOP for the OSs RMAS, EADAS, SCCS, and AMA TPS at the MFOS system. The MFOS emulates all these various OSs; as far as the 5ESS[®] switch is concerned, these data links still interface directly with their respective OSs. The MFOS lab-to-lab testing will be similar to the testing that we plan for RMAS, EADAS, SCCS, and AMA TPS.

99-5E-0518 CCS7 IMPROVED ISUP

Improved ISUP is a feature that will meet the requirements in TR-317 of Bellcore. The TR-317 describes Bellcore recommendations for the procedures required for the establishment and release of call connections using the SS7 protocol. (This protocol is also known as ISUP.)

99-5E-0519 BRCS FEATURE GROUPING

This feature provides the ability to group features and parameter data together and then assign this group to a group of terminals, directory numbers (DN), and multiline hunt groups (MLHGs).

99-5E-0520 LINE USAGE MEASUREMENTS

Line usage measurements provide a section of the 30-minute traffic report that displays total attempts (terminating), blockage counts, and traffic usage in hundred call seconds on a per-line basis for up to 640 lines in up to 20 concentrators, and up to 128 individually-specified lines.

99-5E-0521 BASIC RATE INTERFACE TROUBLE NOTIFICATION

This feature provides protection and isolation of BRI faults at layer 3. This feature addresses the problem of protocol fault occurring that would not be detected by customer premises equipment (CPE) testing or by testing by the switch, but nevertheless denies service to the customer. The fault occurs because of a protocol mismatch between the switch and the CPE.

99-5E-0523 SOFTWARE DEFINED NETWORK

This feature is similar to the software defined network (SDN) implemented on the 4ESS[™] switch (phase 1 and part of phase 3). The SDN capability provides virtual private networks on the public switched network. The SDN uses the PSN to offer customer specific databases and private network type features, as well as PSN features like IDDD. The SDN will also provide customers with flexibility in customer accounting and network performance surveillance. They may reconfigure SDN, make changes to meet their needs, and provide limits to network resources (for example, limit the number of calls at one time to a particular location). The CCS7 TCAP is used to access an SDN database such as the NCP which has software to define and characterize the network. Example function of the database are determining if the originating station has permission to place the call and determining the status of resources.

The SDN is composed of the following set of features:

- ☐ Uniform numbering/dialing plan
- ☐ Originating/terminating screening
- ☐ Interconnect to private networks
- ☐ Support of separate routing domain

- ☐ Receipt of SDN traffic from NAP
- ☐ Network number calling
- ☐ AMA record construction
- ☐ Hand off/assist capability
- ☐ Authorization codes
- ☐ Tones and announcements
- ☐ Network management
- ☐ Test calls
- ☐ EPSCS/SDN interworking
- ☐ Satellite avoidance
- ☐ 9.6 kb/s analog
- ☐ On-net 56 kb/s end-to-end
- ☐ Expanded access to *ACCUNET*[®] digital service 56 kb/s
- ☐ Teleconferencing
- ☐ Location dependent blocking
- ☐ Network indialing.

99-5E-0524 SPECIAL ACCESS PHASE 1

This feature provides the toll *5ESS*[®] switch with limited direct connect voice and voice-grade transmission capabilities. For phase 1, only one billing number will be assigned to each direct connect PBX customer; and, the identification of the originating stations is not required. In addition, the feature will not support SDN customers, nor other private network customers.

The feature allows a certain class of PBXs to be connected directly to the DLTUs of the toll switch. This includes PBXs with the following types of supervision:

- ☐ Loop-start
- ☐ Loop reverse-battery
- ☐ Ground start
- ☐ 4W E&M or 2W E&M
- ☐ Standard DS1 interface and E&M.

Four services can be offered to the special access customers that are connected directly to the toll switch. They are originating WATS and *MEGACOM*[®] telecommunications service, and terminating 800 and *MEGACOM*[®] 800 telecommunications services.

99-5E-0525 X.75' GATEWAY TO PUBLIC PACKET SWITCHED NETWORK (PPSN)

This feature specifies the protocol used and the capabilities provided to allow an ISDN 5ESS[®] switch owned by a BOC to connect with a PPSN also owned by the same BOC. Both switches must reside in the same LATA. With this feature, end-users of X.25 packet switching on the 5ESS[®] switch are allowed to reach any endpoint accessible from the PPSN. Each 5ESS[®] switch can access the PPSN either by directly supporting an X.75' interface to it, or through an international protocol trunk group to another 5ESS[®] switch that has an X.75' interface.

The following are limitations of this feature:

- ☐ Each interface consists of a single X.75' trunk group
- ☐ No alternate routing - if an X.75' trunk group fails, the switches and end-users served by that trunk group would be isolated from the PPSN. Any 5ESS[®] switch tandeming through IP to an X.75' interface residing on another 5ESS[®] switch knows only of the existence of that one interface.
- ☐ An X.75' interface cannot be used to interconnect switches within an ISDN. It can only be used to connect an ISDN 5ESS[®] switch to a PPSN switch in the same LATA.
- ☐ Incoming X.75' calls can only terminate in the IP connected ISDN. They will never leave through another X.75' interface.

99-5E-0526 LASS AUTOMATIC RECALL

Automatic recall enables the invoking terminal to automatically place a call to the directory number of the last outgoing call.

If the call cannot complete immediately (due to the called address being busy), the automatic recall feature camps-on to the called party (that is, it monitors the busy/idle status of the called party). When both the calling party at the calling terminal and the called party are found to be idle, the calling terminal is given automatic recall ringback alerting. If the ringback is answered, a call is automatically placed to the called party. For interswitch operation, this feature requires CCS7 connectivity between the offices. The CCS7 connectivity includes ISUP call setup and the capabilities offered by transaction capabilities application part (TCAP) signaling.

99-5E-0527 LASS CUSTOMER-ORIGINATED TRACE

The LASS customer originated trace feature provides the terminating party with the capability of requesting an automatic trace of the last call received. The trace includes the calling line directory number (CLDN), along with the time and date of the call. This information is transmitted through an AM IOP channel to a designated agency, such as the telephone company or law enforcement agency. The customer can call the agency after first activating the trace to determine any appropriate further action. For interswitch service, this feature requires CCS7 connectivity between the offices.

This feature is available to residential and business customers. This feature will also operate in an ISDN/BRCS environment on the 5ESS[®] switch.

99-5E-0528 LASS - INDIVIDUAL CALLING LINE IDENTIFICATION (ICLID)

The ICLID feature consists of the following two features:

- ☐ **Calling Number Delivery:** Transmits data on an incoming call to the terminating station set.
- ☐ **Directory Number Privacy:** Prevents delivery of the directory number to the terminating station set.

Calling number delivery delivers the calling party's directory number:

- ☐ By a 5ESS® switch as a central office or as a tandem
- ☐ On voice calls
- ☐ From analog lines, BRIs, PRIs, or CCS7 trunks
- ☐ To analog lines, BRIs, PRIs, or to CCS7 trunks.

The called customer receives the following:

- ☐ **ISDN BRI**
- ☐ Call appearance ID
- ☐ Calling DN
- ☐ Date and time of the call
- ☐ Call type.
- ☐ **Analog Line**
- ☐ Calling DN
- ☐ Date and time of call.
- ☐ **ISDN PRI**
- ☐ Calling DN
- ☐ Privacy, only if PBX-to-PBX or PBX-to-CO.

The station set or PBX controls what is displayed.

The DN privacy feature lets an analog line or BRI caller prevent the terminating switch from sending the customer's DN to the terminating customer. There are three types of service:

- ☐ All-call
- ☐ Per-call
- ☐ No DN.

The first two types are requested through service order. The third type is the default.

Both features can be billed either flat rate, usage sensitive, or a combination of both. Because of the usage sensitive billing option, the user can deactivate number delivery and reactivate it through an access code or ISDN feature button.

A PBX is responsible for offering a DN privacy feature to its own lines. To allow a calling DN to be private, the PBX must have the DN presentation indicator set to "restricted." The switch will assume that all calling DNs received from the PRI without the privacy indicator set are public. On the terminating side, the switch has the option to send a private DN to a PRI.

99-5E-0529 LASS AUTOMATIC CALLBACK

Automatic callback enables the invoking terminal to automatically place a call to the directory number of the

last incoming call.

If the call cannot complete immediately (due to the called address being busy), the automatic callback feature camps-on to the called party (that is, it monitors the busy/idle status of the called party). When both the calling party at the calling terminal and the called party are found to be idle, the calling terminal is given automatic callback ringback alerting. If the ringback is answered, a call is automatically placed to the called party. For interswitch operation, the feature requires CCS7 connectivity between the offices. The CCS7 connectivity includes ISUP call setup and the capabilities offered by TCAP signaling.

99-5E-0530 INTERMODULE TRUNKING

The intermodule trunking feature provides trunking between:

- ☐ MMRSM and MMRSM
- ☐ ORM and ORM
- ☐ MMRSM and ORM
- ☐ MMRSM and SM
- ☐ ORM and SM.

The modules connected by intermodule trunks must be connected to the same 5ESS[®] switch.

Traffic can be routed between the modules using the intermodule trunks as the primary route with the overflow to the links to the host switch, or with the links to the host as the primary route and the overflow to the intermodule trunks. An important application of this is to provide the ability to place calls between the modules in the event the host-to-remote link is severed. Additional alternate routes can be specified with the capability to tandem switch calls between the MMRSMs and/or ORMs.

When existing offices are replaced by MMRSMs or ORMs hosted from the same 5ESS[®] switch, then the existing trunks between the offices can be used to carry traffic by providing the intermodule trunking feature.

99-5E-0531 LINE TIME SLOT BRIDGING

This feature provides an off-premises extension to a single directory number and bridging of two separate directory numbers in two separate locations, with barge-in capabilities, for customers served by the same 5ESS[®] switch.

Where a direct connection to an SM or MMRSM, or where a SLC[®] carrier system is being employed, this feature can be provided by physically bridging the lines on the main distributing frame. The LTSB on the 5ESS[®] switch provides a software solution when the integrated SLC[®] carrier system is used and physical line bridging is not possible due to the lack of a line appearance on the main distributing frame.

The OTCs can offer to the customers one of the following options:

- ☐ **Off-Premises Extension:** The two locations have the same DN and an incoming call rings at both locations. A terminated call can be answered from both locations and going off-hook at one location will cause the ring to stop at the other.

This option is only available for analog lines. With ISDN, each extension must have its own primary DN that is unique to that station.

- ☐ **Two Bridged Lines:** The two lines have different DNs and an incoming call to one DN only rings at the called DN.

This is a software solution for bridging of two-party lines.

99-5E-0533 ADVANCED SERVICES PLATFORM

The advanced services platform (ASP) feature provides a platform of service-independent capabilities at a 5ESS[®] switch which allow it to interact with an external network element [an service control point (SCP)] via CCS7 transaction capabilities application part (TCAP) messages to determine the appropriate call handling treatment. The SCP exercises "executive level" control over the call, whereas the switching system retains "on-site" responsibilities including the ability to carry out many of the normal autonomous call processing actions. The new ASP functionalities of the 5ESS[®] switch are:

- ☐ The ability to recognize new trigger events (that is, off-hook delay/immediate, routing, digit analysis) and launch an appropriate ASP query message to an SCP
- ☐ The ability to route over private or public facilities (and to do the corresponding AMA recording)
- ☐ The ability to play announcements and to collect digits
- ☐ The ability to install automatic call gapping controls for ASP calls
- ☐ The ability to send termination notification for a call, when the originator of the ASP call disconnects.

All of these capabilities are based on instructions received from an SCP.

The 5ESS[®] switch has also been modified to allow ASP calls to interwork with many of the existing switch features (most notably the BRCS and ISDN features). Interworkings, both pre-query and post-query are defined. A pre-query example is when individualized dialing plan analysis leads to a query to an SCP. A post-query example is when an ASP call encounters a BRCS feature, such as call waiting terminating. Access to these ASP capabilities is available both to BRCS and non-BRCS (POTS and PBX) customers as well as to ISDN customers. It should be noted that ASP call processing can only be initiated on ISDN calls identified as "voice."

The ASP capabilities are offered in two office configurations:

- ☐ Service switching point (SSP)
- ☐ Network access point (NAP).

The SSP is described in the previous paragraph. The NAP can recognize trigger events, like an SSP, but rather than launch a query to an SCP, it uses feature group D (FGD) (EA/MF) or CCS7 signaling to route the call to an SSP which in turn conducts the dialogue with the SCP. The ASP platform provides a complete package of capabilities, not only call processing related but testing, administration and maintenance capabilities as well.

99-5E-0534 CALLING AND CALLED NAME DISPLAY FOR FORWARDED CALLS

This feature provides both calling and called names display at a forwarded-to station with ISDN electronic directory service. Calling and called names are displayed for calls forwarded with call forwarding variable, call forwarding don't answer, and call forwarding busy line. This feature requires an applications processor.

99-5E-0535 ON-DEMAND B-CHANNEL PACKET SWITCHING ON THE BRI

This feature allows the B-channels on a BRI to be used to support voice, circuit switching, or packet switching on a dynamic basis. One possible application of this feature is for users that occasionally require higher performance X.25 packet switching service (for example, lower transmission delays, or higher throughput) than achievable on a D-channel. Another possible application of this feature is an office where

each BRI is likely to have both voice and data (X.25 packet switching terminal) station sets. The requirements of each X.25 packet terminal will be such that D-channel packet switching will not be adequate to serve the needs of some of the users. For ease of administration, the service provider may elect to provision all BRIs with on-demand X.25 packet switching service on the B-channel.

99-5E-0536 SIMULTANEOUS PACKET SWITCHING ON MULTIPLE CHANNELS OF BASIC RATE INTERFACE (B AND D)

This feature allows multiple channels on a BRI to be used for X.25 packet switching service on a permanent connection basis. This feature allows any combination of the two B-channels and the D-channel to be used for permanent X.25 packet switching service. This feature is intended to support a BRI access to host computers which is constrained in the 5E4 software release to X.25 packet switching service on a single B channel of a BRI. This feature provides an extension of the MLHG feature. It allows two B channel members of a MLHG that are used for X.25 packet switching service on a permanent connection basis to be on the same BRI. The MLHG could consist of only two B-channel members, both being on the same BRI.

99-5E-0537 SELECTIVE CARRIER DENIAL (SCD)

This feature provides the ability for a local office to selectively inhibit certain calls normally handled by a carrier from lines designated as non-paying subscribers by the particular inter-LATA carrier that will handle the call. Calls that are inhibited will route to a tone or announcement, as specified by the local operating company. The SCD feature provides screening based on the originating line for up to 30 carriers defined in each central office. Screening can be assigned to an individual line independently from other lines. Centrex denial is performed on a per-line basis, not a group basis. Inhibiting or blocking calls from screened lines to one carrier is independent of SCD screening for other carriers. Calls from non-paying subscribers to inter LATA and international carriers may be screened.

Recent change is used to assign and remove SCD on a line for a specific carrier or group of carriers. Minimal office records additions are made, including flagging lines that have SCD assigned (but not which carriers), showing the SCD index assigned to each carrier, and listing the lines screened in the office and the carriers for which they are screened separately from the regular lines record.

99-5E-0538 MULTIPOINT U-BRI

This feature provides support for connecting a maximum of eight users, belonging to the same customer, to a single basic rate interface (BRI). The feature makes it possible to alert one or more of the users connected to the same BRI. (Only with a key-system will more than one user be alerted per call.)

The users share the two B-channels for circuit or packet mode services and the D-channel for signaling and additional packet data services (a maximum of eight permanent D-channel links may be used for X.25 packet mode services).

A user is a logical entity uniquely identified by a primary directory number (PDN) and associated with one or more User Service Order Profiles (USOP). A USOP contains information such as:

- ☐ Teleservices such as voice and facsimile,
- ☐ Teleservice characteristics or BRCS features and call appearances, that are associated DNs, and BRI.

A user may have a maximum of four terminals, however a maximum of eight terminals are supported on a BRI.

For the 5E5 software release, this feature allows only one terminal (single capability or integrated capability) to be associated with a USOP.

A service order is required whenever a terminal is to be added or removed from the interface.

This feature allows a User on a multipoint interface to have the following features and capabilities:

- ☐ Noninitializing terminal
- ☐ Fully initializing terminal (FIT)
- ☐ ISDN/BRCS
- ☐ Multibutton/key-system services (for FIT only)
- ☐ Circuit-switched services
- ☐ Permanent X.25 packet services
- ☐ Automatic and nonautomatic TEI CPE terminals
- ☐ Terminal management terminals (for FIT only)
- ☐ Nonterminal management terminals.

99-5E-0540 REMOTE DIGITAL TESTING VIA SCCS

This feature remotes switch capabilities for digital testing (that is, TST:DSL) through the SCCS to provide a consolidated testing operation. A multiwindow PC allows access to LMOS as well as SCCS digital testing of the 5ESS[®] switch.

99-5E-0543 ORIGINAL CALLER'S FACILITY RESTRICTION LEVEL ON AN ATTENDANT-EXTENDED CALL

This feature permits one of the two options to be selected per release link trunk. Under the default option, the attendant's facility restriction level (FRL) is used on an attendant-extended call. Under the second option, the original caller's FRL is used on an attendant extended call instead of the FRL associated with the attendant access facility. Under the second option, the screening of the call being extended by an attendant is based on the FRL of the caller. Under the second option the message detail (MDR) produced as a result of the call includes the caller's FRL and not that of the attendant.

99-5E-0544 AUTHORIZATION CODE SCREENING FOR SENDERIZED PBXs AND STATION GROUP DESIGNATORS

This feature extends authorization code capabilities to callers who are served by a senderized PBX, centrex, or use attendant services. The calling restrictions from these systems are determined by the FRL and the feature set assigned the originating access facility; or by a traveling class mark sent to the network switch by a PBX or centrex to identify the FRL of a calling station.

99-5E-0545 AMA RECORDING FOR CENTRALIZED ATTENDANT SERVICE AND/OR RELEASE LINK SERVICE

This feature provides AMA records for calls assisted and/or transferred by an attendant in a leased network. This feature, when optioned, requires that two AMA records with the same call type code be written for transferred calls. The first record records the original call to the attendant. The second record records the transferred call, specifying the assisted caller as the originator and indicating that an attendant assisted the call.

99-5E-0548 CALL FORWARDING/HUNT GROUP TRANSFER FOR CIRCUIT-SWITCHED DATA

This feature extends call forwarding don't answer (CFDA) and call forwarding busy line (CFBL) to circuit-switched data (CSD) calls. These call forwarding features are available for both individual ISDN lines and MLHGs.

This feature also allows circuit-switched data (CSD) calls to a CSD MLHG to be forwarded to a second CSD MLHG. This feature is assignable to the entire CSD MLHG by assigning ISDN CSD CFV to the main DN in the CSD MLHG. When activated, all new CSD calls to the CSD MLHG are forwarded to a second CSD MLHG, provided the forward-to DN is the main DN of the second CSD MLHG.

This feature can be activated by using the remote activation of call forwarding (RACF) feature. The RACF feature provides the means to activate/deactivate CSD MLHG call forwarding by using access codes from a dual tone multifrequency telephone.

99-5E-0549 ETN INTERWORKING IN 5ESS[®] SWITCH PRIVATE NETWORK ENVIRONMENT

This feature extends the 5ESS[®] switch provision of ETN capabilities over the PRI to a private network environment (for example, network of PBXs) between two 5ESS[®] switches, System 75/85 PBXs or any ISDN PBX that meets the 5ESS[®] switch interface, provided they are ETN nodes (99-5E-0553). These capabilities include:

- ☐ End-to-end ISDN connectivity indicator (EEICI)
- ☐ Satellite hop counter (SHC)
- ☐ Automatic route selection (ARS) and related features
- ☐ Other ETN features:
 - ☐ Message detail recording (MDR)
 - ☐ Facilities management (FM)
 - ☐ Traffic data system (TDS)

This feature also allows the sharing of different services over the same T1 line (for example, some B-channels carry ETN voice/data, while some other B-channels carry other voice/data services.) This applies to connections between ETN nodes only.

99-5E-0550 CPN/BN TRANSMITTAL IN 5ESS[®] SWITCH PRIVATE NETWORK ENVIRONMENT

The 5ESS[®] switch has the capability to provide the calling party number (CPN) of the originator to the public network or to another PBX on a per trunk group basis for all calls. The CPN information element in the Q.931 SETUP message is used to transmit the CPN. The privacy indicator of the originator is passed in the CPN so that the calling party can indicate whether their CPN can be delivered to the called party.

The 5ESS[®] switch PBX customer can subscribe to delivery of the CPN or billing number (BN) on all calls from the public network. The 5ESS[®] switch PBX may specify which number, CPN or BN, is preferred or only that CPN or BN is to be delivered. The 5ESS[®] switch PBX can also receive the CPN from another PBX. The CPN or BN is transmitted in the CPN of the Q.931 SETUP message from the public network or from another PBX. The privacy indicator in the CPN is honored by the 5ESS[®] switch PBX.

99-5E-0551 CALL BY CALL ACCESS FROM 5ESS[®] SWITCH IN A PRIVATE NETWORK TO PUBLIC NETWORK SERVICES

For a call to be placed to an interexchange carrier from a private network 5ESS[®] switch, signaling information must traverse two paths:

- ☐ From the user to the 5ESS[®] switch PBX

- ☐ From the 5ESS[®] switch PBX to the interexchange carrier network.

The first path can be a user on either a BRI terminal, or a non-ISDN terminal. By service provisioning, the 5ESS[®] switch is able to identify the IC service request by analyzing the dialed digit stream. With this information, the 5ESS[®] switch PBX can then generate the appropriate network-specific facilities information element (identifying the requested service) and send this information element over a PRI to the interexchange carrier, completing the second path. Similar procedures are also followed to access a 5ESS[®] switch local exchange carrier service.

The network services to which a 5ESS[®] switch PBX is able to subscribe to includes:

- ☐ Software Defined Networks
- ☐ MEGACOM[®] telecommunications services
- ☐ MEGACOM[®] 800 telecommunications services
- ☐ Switched Digital Services
- ☐ International Long Distance Service
- ☐ International Inbound 800
- ☐ DIAL-IT[®] NOVA.

The local exchange carrier services available include:

- ☐ OUTWATS
- ☐ INWATS
- ☐ Operator
- ☐ Presubscribed common carrier operator.

99-5E-0552 QUEUING FOR CIRCUIT-SWITCHED DATA MULTILINE HUNT GROUPS

Circuit-switched data calls to data MLHGs are queued when all members are busy. For CSD calls that remain within the ISDN network, appropriate indication is sent to the calling party to indicate that the CSD call has been queued. Only calls to terminating data members of data MLHGs are queued.

The calling party is informed that the call has been queued if there is ISDN signaling end-to-end. Data calls through T1 trunks (inband signaling) are queued but the caller is not notified.

Queuing for CSD calls that terminate on a trunk hunt group is not included in the scope of this feature. Voice band (modem) CSD calls are also not included within the scope of this feature.

99-5E-0553 ELECTRONIC TANDEM NETWORKING ON PRI TRUNKS: 5ESS[®] SWITCH TO DPBX

This feature allows PRI trunks to provide ETN trunking between a 5ESS[®] switch (either CO or PBX) node and one or more digital private branch exchange (DPBX) (either 5ESS[®] switch or non-5ESS[®] switch) nodes in an ETN. This feature does not change the already implemented ETN service for non-PRI trunks, but it partially expands its availability to ISDN PRI users and to data traffic (circuit-switched voice and circuit-switched data). A set of B-channels on the PRI can be marked as ETN trunks, by service order on a dedicated basis, or shared through a call-by-call service capability. Calls originating on the ETN and

arriving at the 5ESS[®] switch through a PRI have the following existing features available:

- ☐ Automatic route selection
- ☐ Automatic alternate routing
- ☐ Uniform numbering plan
- ☐ Traveling class marks
- ☐ Time-of-day for ARS.

Two new features have been added for ETN calls on a PRI:

- ☐ Satellite hop count
- ☐ End-to-end ISDN connectivity indicator.

The satellite hop count feature dynamically keeps a count of satellite hops during routing and lets the customer define satellite hop limits and options for route selections. The end-to-end connectivity feature allows the customer to specify the option to require end-office to end-office PRI connectivity, in the selection of routes. In addition, expensive route warning tones (ERWT) are provided for circuit-switched voice traffic over a PRI.

The information and controls available to system administrators using the station message detail recording to customer premises, traffic data to customer location, automatic circuit assurance, and facilities management features also apply to PRI facilities. For this information, the existing voice measurements are used; no new data measurements are added to separate voice and data.

Note that ETN and electronic tandem switching (ETS) are used synonymously.

99-5E-0554 TOLL OA&M ENHANCEMENT

This feature enhances the 5ESS[®] switch operations, administration, and maintenance capabilities and makes the 5ESS[®] switch more compliant with network operations plans and needs. These capabilities include enhancements of recent change, circuit provisioning, circuit testing, and overall switch maintenance.

99-5E-0555 NSD CCS7 NETWORK INTERCONNECTION

The CCS7 network interconnection feature provides an out-of-band signaling interface between the Local Exchange Carriers' End Office or Access Tandem and NSD Leased Networks and provides Integrated Services Digital Network - User Part capabilities.

This feature provides the protocol, billing, screening, and OA&M functions necessary to support CCS7 trunk signaling across this network interface.

99-5E-0556 CCS7 LEASED NETWORK INTEROFFICE SIGNALING

The leased network interoffice signaling feature provides end-to-end out-of-band signaling to a leased network. This feature permits the operation of leased network features with CCS7 signaling between leased network switching nodes. This feature also allows ARS to take advantage of and interwork with CCS facilities.

This feature also provides the capability to do CCS7 crankback. It permits a switch node, which cannot complete a call, to crank back the call to the originating switch. When an originating 5ESS[®] switch encounters a cranked back call, the call is rerouted to the next route in the ARS list.

99-5E-0557 LEASED NETWORK ACTION POINT ROUTING AND BILLING

This feature provides for enhancements in the routing and billing of calls in leased networks. This 5ESS[®] switch feature interacts with a network database to determine the appropriate call handling needed for leased network calls.

The access to the leased network services that this feature covers includes:

- ☐ Single-line telephone sets
- ☐ Multiline key telephone systems
- ☐ PBXs
- ☐ Centrexes
- ☐ Central offices with feature group D access
- ☐ T1 digital terminating equipment
- ☐ ISDN primary rate interface
- ☐ ISDN basic rate interface
- ☐ CCS7 ISUP
- ☐ Dedicated CAMA
- ☐ Interfaces to other networks.

The class of service for a call is determined by the network database from ANI, authorization code, traveling class mark, or trunk group. The network database can then impose time of day, day of week, and day of year restrictions, implemented on a per station, per location, and per authorization code basis.

The network database translates data associated with access to the leased network to determine how the call shall be routed. Routing data is provided to the 5ESS[®] switching system, including the method of routing the call and egress destination number. It is possible to route the call on-net, utilizing the capabilities of the 5ESS[®] switch ARS feature, off-net using the public switched network, or off-net using another leased (or private) network.

It is also possible for each intra-network 5ESS[®] switching node to signal using encrypted CCS7 signaling. Internetwork signaling supports multifrequency, dual tone multifrequency, and dial pulse signaling for the purpose of receiving and sending digits between networks at network interconnection points.

This feature allows the leased network customer to have AMA recording performed. These AMA records are generated by the switching system under the direction of the database system. The database system specifies the billing number to the 5ESS[®] switching system, while the 5ESS[®] switching system generates the AMA record after providing other AMA related data such as call origination and disconnect times.

99-5E-0558 LEASED NETWORK ACTION POINT SCREENING

Call screening comprises a set of capabilities that determines a call's eligibility to be completed as dialed, based on class of service information with the user, the station, or the trunk group for leased networks. The representative access to the leased network services includes:

- ☐ Single-line telephone sets

- ☐ Multiline key telephone systems
- ☐ PBXs
- ☐ Centrex services
- ☐ Central offices with feature group D access
- ☐ T1 digital terminating equipment
- ☐ ISDN primary rate interface
- ☐ ISDN basic rate interface
- ☐ CCS7 ISUP
- ☐ Dedicated CAMA
- ☐ Interfaces to other networks.

Class of service is determined by the network database from ANI, authorization code, traveling class marks, or trunk group. The network database can impose time of day, day of week, and day of year restrictions, implemented on a per station, per location, and per authorization code basis.

The network database contains data associated with determining a call's eligibility. The database alerts the caller on originating on- and off-network calls if identification cannot be made by other means for billing and class of service purposes, or when override capabilities are possible.

Override capabilities are made available to the caller by dialing a predetermined code along with the destination number, identifying to the network database that authorization code screening is required. The caller is prompted for an authorization code when it is not provided in the dialing sequence.

Repeated attempts that are closely spaced in time from one or more locations using the same or different invalid authorizations codes, or other identifiable patterns, may represent an attempt to perpetrate fraud. These cases are reported as possible fraud attempts.

It is possible for the caller to enter an authorization code from any station device that is an acceptable call origination device. An attendant may enter the authorization code for the caller and the call shall proceed as if the caller had entered the authorization code.

99-5E-0559 LEASED NETWORK ACTION POINT ATTENDANT

This feature provides for enhancements in the capabilities provided by the 5ESS[®] switch to an attendant system in leased networks.

The following services are provided by leased network attendants:

- ☐ The attendant has the capability to set up conferences and connect all conferees
- ☐ An attendant is able to verify authorization codes given verbally by callers from off-network and on-network locations
- ☐ The attendant has the capability to initiate:
 - ☐ Reports of a stolen or lost authorization code
 - ☐ Credit adjustments for completed calls to wrong numbers, interruption of calls or unsatisfactory transmission.

The attendant services are provided on a stand-alone system. The interface between the call processing 5ESS® switch and the attendant system are release link and tie link trunks. Release link trunks link the two systems for purposes of call completion setup by the attendant or assisting customers on matters requiring short holding times. The release link trunk is released whenever the attendant leaves the call.

Caller access to teleconferencing attendants, or attendants providing services requiring long holding times, is accomplished with a tie link trunk interface between the attendant and the 5ESS® switch.

When a caller accesses an attendant by means of a release link trunk interface, transfer to a second attendant is accomplished by means of a tie link trunk between the attendant and the 5ESS® switch. The release link trunk is released whenever the first attendant leaves the call.

When an attendant is extending a call through the 5ESS® switch for a caller, the call data associated with the caller is used in place of the call data of the attendant.

Teleconference calls are extended by means of a stand alone bridge interfacing to a leased network 5ESS® switch. These calls appear to the switching system as if the bridge were the accessing station.

Attendant entry of the authorization code by means of a release link trunk is treated and recorded as if the caller entered the authorization code.

The leased network attendant interacts with an external system (other than the switching system) for the purposes of initiating credit adjustments and reports of stolen or lost authorization codes. The credit adjustments are linked with the AMA records of the leased network customer by the stand alone billing system.

99-5E-0560 ISDN ACCESS TO LEASED NETWORK FEATURES

This feature provides access to the functionality and features of the leased networks for the ISDN PRI and BRI interfaces. This includes serving arrangements that allow a leased network customer access through CCS7 network interconnect on dedicated trunks. Access to the following capabilities are provided on the 5ESS® switch:

- ☐ **Uniform Number Plan/Automatic Route Selection (UNP/ARS):** This capability allows ISDN access to the BRCS UNP/ARS feature. This feature enables the 5ESS® switch to meet the leased network numbering plan and routing requirements.
- ☐ **Authorization Codes:** This capability allows leased network customers with ISDN access functionality to have authorization code screening. Authorization code screening applies to data as well as to voice.
- ☐ **Calling Party Number (CPN) to Network:** The CPN to network capability allows the CPN for a station to be available at the 5ESS® switch.
- ☐ **CPN/Billing Number (BN) to Terminating User:** This capability allows the 5ESS® switch to deliver CPN/BN to a terminating user over the ISDN interface.

Operations, administration, and maintenance capabilities to support this feature are provided (for example, provisioning, billing data, MDRs) for circuit-switched voice and data and for CPN/BN delivery. The out-of-service/return-to-service (OOS/RTS) messages for BRI and PRI facilities are sent to TOPAS. The OOS/RTS data are collected on all leased network trunks and sent to the Test Operations Provisioning Administrative System (TOPAS).

This feature includes the recent change work needed to provide for these new capabilities.

99-5E-0561 MESSAGE DETAIL RECORDING ON EA/CCS7/CCS7 NI/CAMA/ISDN FACILITIES

This feature enhances the 5ESS[®] switch message detail recording (MDR) capabilities to meet the needs of the leased networks. These capabilities include:

- ☐ The capability to provide MDR records for calls processed by a leased network action control point (ACP). In particular, the authorization code, facility restriction level, call event code fields, etc., are determined in part or entirely from information in CCS7 TCAP and Q.931 messages.
- ☐ The MDR records are supplied for calls that are originated on trunk facilities with the following forms of signaling:
 - ☐ ISDN BRI
 - ☐ ISDN PRI
 - ☐ Equal access MF
 - ☐ CAMA
 - ☐ CCS7
 - ☐ Signaling network interconnect.

As a consequence of out-of-band trunk signaling, the values of certain fields, such as answer time, are modified.

- ☐ A new call event code value is provided for the purpose of fraud detection on calls where there are repeated attempts to collect a valid authorization code and the caller abandons before one is collected.
- ☐ New call event codes are provided to support the crankback capability to be provided by the leased network interoffice signaling feature.

99-5E-0562 CUSTOMER TRAFFIC DATA ON EA/CCS7/CCS7 NI/CAMA/ISDN FACILITIES

This feature allows the following CTRF data to be collected on all switched private trunk groups by leased network 5ESS[®] switches and sent to the leased networks-OS through the ISDN applications processor interface.

- ☐ Peg Counts
- ☐ Usage Counts
- ☐ Overflow Counts
- ☐ Non-used trunks/locked-up trunks (NUTS/LUTS) scans
- ☐ Short holding time/long holding time (SHT/LHT) reports.

Peg, usage, and overflow counts are also collected for basic rate interfaces as is currently done for analog MLHGs.

This data is provided in a way consistent with current switch capabilities as specified in 235-900-303, 5ESS[®] *Switch Application Processor Interface Specification*, 5E4 Software Release, Issue 1.00, August 1986, and supports facilities with the following forms of signaling:

- ☐ ISDN PRI

- ☐ ISDN BRI
- ☐ Equal access MF
- ☐ CAMA
- ☐ CCS7
- ☐ Signaling network interconnect.

99-5E-0563 100-SECOND SCANS ON EA/CCS7/CCS7 NI/CAMA/ISDN FACILITIES

This feature allows hundred-second scan (HSS) data to be collected on all switched private trunk groups and multiline hunt groups by leased network 5ESS[®] switches and sent to the leased network OS through the API. The HSS data is provided in a way consistent with current switch capabilities and supports facilities with the following forms of signaling:

- ☐ ISDN primary rate interface
- ☐ ISDN basic rate interface
- ☐ Equal access MF
- ☐ CAMA
- ☐ CCS7
- ☐ Signaling network interconnect.

99-5E-0564 CALL GAP ENHANCEMENTS

This feature increases the call gap table from the present 16 entries to 35. This feature allows the network manager through an on-site message, through RNMS, or in the future, NetMinder, to specify more granular call gap interval than possible before (note, however, that all gap intervals are not available through every OS interface). The call gap interval refers to the time interval used to compute rate of release of calls for a given destination, when the call gap control is in effect in the switch.

99-5E-0565 TRUNK RESERVATION WITH AUTOMATIC RESERVATION ARRANGEMENT

Trunk reservation is an automatic trunk group control which is applied when a trunk group congestion is detected on a call by call basis. The purpose of the control is to give preference to specific types of traffic; direct routed over alternate routed. The call by call congestion detection is made by examining the number of idle trunks in the trunk group before the trunk hunt. If the number of idle trunks falls under one of two threshold levels (reservation levels), a skip or cancel control action is taken depending on the control parameters set by the network manager.

The automatic reservation arrangement (ARA) part of the feature allows for the dynamic adjustment of the reservation levels so that the fewest circuits are left idle.

99-5E-0566 FTS2000 NETWORK MANAGEMENT

This feature ensures that existing network management controls function properly in the FTS2000 leased network environment. This includes ensuring that the existing network management functions are called during call setup. This feature also provides a mechanism to exempt critical user calls from restrictive network management control.

99-5E-0567 PROTOCOL HANDLER 3

This feature provides more memory and increases throughput of the current protocol handler (PH2) by upgrading the two processors on the circuit pack. Memory is increased from the current 1 MB on the PH2 to 4 MB on the PH3. Increased throughput (packets per second), as well as reduced packet delay, is also achieved with the PH3. The new PH3 circuit pack can co-exist with PH2's in the same packet switch unit (PSU).

99-5E-0568 PRI ACCESS TO SELECTED IC SERVICES VIA DCO

This feature allows an LEC to provide an access and transport capability by which DPBX subscribers can gain access to a wide range of services offered by IECs (inter-exchange carriers) via switched access rather than direct connect (via the 5ESS[®] switch DCO using a PRI, and from CO to IECs using CCS7 network interconnect). The access arrangement between the 5ESS[®] switch DCO and DPBX can be either dedicated PRI channels, shared through call-by-call service selection capability, or as part of a simulated facilities group. The following services are listed as services which could be identified as part of an SFG for a user desiring access.

- ☐ Software Defined Network
- ☐ 800 Service
- ☐ Wide Area Telecommunications Service.

99-5E-0569 INTRASWITCH/INTERSWITCH OPTIONING CPN/BN TO TERMINATING USER

The terminating PRI user or BRI user may desire delivery of the calling party number (CPN) or billing number (BN) on an exclusive or preferred basis on every-call for circuit-switched voice/data calls. If available, the CO sends the appropriate number to the PRI or BRI interface. The TSS standard layer 3 (Q.931) message, SETUP, is used to transport CPN/BN on the PRI or BRI facility. End-to-end signaling connectivity through the network, for interswitch transport, is accomplished by interworking the Q.931 access protocol with the CCS7 network protocol.

The CPN is the number provided by the customer premises equipment (CPE) in the calling party number of the SETUP message for PRIs and is the number provided by the switch or by the originating CPE for BRIs. The BN is a billing number stored at a local switch and provided to a terminating user when desired. The terminating customer may choose, at service provisioning, to subscribe to either of two service alternatives:

- ☐ CPN or BN is desired on all calls
- ☐ Neither CPN nor BN is desired on any incoming calls.

In case (1), the desired service allows for one of four options:

- ☐ CPN is preferred
- ☐ BN is preferred
- ☐ CPN only
- ☐ BN only.

The implication with the preferred options is that when the preferred option is not available but the other is, then the other will be delivered.

99-5E-0585 X.25 PACKET SWITCHING ACCESS ON T1 FACILITIES, INCLUDING PRI

This feature allows individual DS0 channels on a T1 facility to be configured on a subscription basis for

X.25 packet-switched data access. Up to 24 channels of a T1 facility can be configured for packet switching. Any remaining channels on the T1 facility can be used for other digital services available on the 5ESS[®] switch; for example, PRI or circuit switched connections to a digital PBX. The number of channels chosen to carry the X.25 traffic can also be changed by subscription. The packet-switched DS0 channels on the T1 are not aggregated but remain channelized.

99-5E-0586 X.75 GATEWAY TO PUBLIC DATA NETWORKS

An X.75 gateway must be used by X.25 packet switching users within a BOC LATA to end points outside the LATA boundaries or to end points in non-BOC networks, even when these non-BOC networks reside in the physical LATA boundary. This feature provides an X.75 gateway on the 5ESS[®] switch for inter-LATA and inter-network traffic to and from the BOC packet switching users.

This feature supports multiple X.75 gateways from a 5ESS[®] switch. Only one X.75 gateway to an IEC/PDN is supported. The X.75 to and from X.75' transiting is supported, enabling traffic to/from the PPSN to transit through the 5ESS[®] switch IP connected ISDN subnetwork.

The TSS short term recommendations for E.164/X.121 interworking are supported.

99-5E-0587 E.164/X.121 INTERWORKING USING BELLCORE ESCAPE CODES

This feature provides the ability to interwork the numbering plan of ISDN (E.164) with the numbering plan of a public packet switching network (PPSN) (X.121) in accordance with TSS and Bellcore recommendations for short-term interworking. This interworking occurs at X.25 access, at X.75', and at X.75 STE interfaces. The format and structure of numbers in E.164 and X.121 recommendations are different and therefore this feature provides a mechanism for interworking DTE's conforming to the E.164 numbering plan with DTEs conforming to the X.121 numbering plan.

99-5E-0588 BRCS SUPPLEMENTARY SERVICES FOR ISDN CIRCUIT-SWITCHED DATA CALLS

This feature ensures that certain BRCS supplementary services which were originally developed for circuit-switched voice calls will apply to circuit-switched data calls as well. Following are the BRCS supplementary services in this feature:

- ☐ **Automatic Route Selection (ARS):** The ARS feature automatically routes outgoing calls to the customer's most preferred available route, from a route list which can contain up to sixteen private routes. The route list to be used (that is, the active pattern group) can be controlled via time of day (TOD), dialed access code, or facilities management. The ARS currently exists for ISDN circuit-switched voice calls. This feature extends the ARS capability to ISDN circuit-switched data (CSD) calls, and allows the user to specify a distinct set of route lists for CSD calls.
- ☐ **Private Facility Access (PFA):** The PFA feature allows customers to have dial access to various types of public (OUTWATS) and private switching arrangements.

Private facilities consist of all the various customer owned or leased tie lines (some times referred to as tie trunks) that act as an alternative to the public network for routing calls. Access arrangements may be constructed as needed through the modular communications capabilities feature construction process, which provides dialing, routing, and billing flexibility to the customer.

This feature is comparable to the subset of existing voice PFA features which are applicable to CSD calls. The facilities used for access are senderized and non-senderized digital trunks.

- ☐ **Account Code:** The account code feature for circuit-switched data calls allows a user to add an account number to the AMA and MDR records. Account codes are passive codes, since no analysis is done on the contents of the code by the switch. On a per-call basis, the customer determines which account code should be associated with which call. The switch does not monitor whether the correct account codes are being used. The user can input any account code provided it is of the correct length

and contains only dialable characters accepted by the switch. This feature will extend the use of the account code feature with circuit-switched data calls.

- **Authorization Codes:** When dialed by the caller, authorization codes for circuit-switched data calls grant the caller privileges associated with the authorization codes rather than the station from which the calls are being made. Therefore, the station can only allow a subset of the assigned features without an authorization code, but with the use of an authorization code, a station user can have expanded calling privileges. For example, authorization codes can be employed with ARS to allow the customer to define a set of dialing capabilities and to restrict the use of these capabilities to authorized personnel. This feature extends the use of the authorization code feature to include circuit-switched data calls in addition to circuit-switched voice calls. This feature allows the user to define CSD authorization code groups in addition to CSV authorization code groups. Thus, the user can have authorization codes for CSD calls, for CSV calls, or for both CSD and CSV calls, under one authorization code feature.
- **Message Detail Recording (MDR):** This feature extends the capabilities and options provided by the 5E4 MDR to customer location feature for ISDN lines by allowing the customer to receive reports and data for circuit-switched data calls. The switch transports pertinent information over the applications processor interface. The call detail information is available on a per-DN basis. This feature distinguishes between CSV (circuit-switched voice) calls and circuit-switched data (CSD) calls, and the customer is able to ask for separate reports for CSV and CSD calls. Message detail recording for circuit-switched data calls and circuit-switched voice calls are both handled by the same feature.
- **Individual Calling Line Identification (ICLID):** This feature, also known as calling number display, consists of two main features; calling number delivery, and directory number privacy. The network uses the calling number delivery capability to send incoming call-related data to the terminating station. The terminating station can turn the sending of ICLID data from the terminating switch on or off. The directory number privacy capability enables an originating customer to inhibit calling number delivery to a terminating station on an all-call or a per-call basis. This feature extends the use of ICLID with circuit-switched data calls in addition to circuit-switched voice calls.

Some possible technical considerations to apply to this feature include insuring end-to-end digital connectivity and checking for compatibility between bearer capabilities (56 kb/s, restricted 64 kb/s, 64 kb/s clear channel). The data feature is associated with the bearer capability associated with a call.

This feature set is based on similarity with voice service and competitive offerings.

99-5E-0589 SOURCE BILLING FOR ATTENDANT CALLS

The source billing for attendant calls (SBAC) feature causes the attendant's billing directory number (BDN) to be replaced with the source party's BDN in all AMA records and MDR records which result from the attendant extending a call. The source party and attendant must belong to the same terminal group, and the source party must be one of four allowable types.

The SBAC feature only affects calls to an attendant that are extended and ultimately result in an AMA/MDR entry. For these calls, SBAC in no way alters the call handling sequence of the attendant. If for any reason the call is not completed (for example, destination party is busy) no AMA/MDR record is made. Charges which result from the centrex attendant extending a call are billed to the source party's BDN rather than the attendant's BDN. In the customer's AMA/MDR record there is an indication that the attendant handled the call.

The attendant's BDN is replaced with the originating party's BDN in all resulting AMA records. In the AMA records, the service feature field (Table 12) defines the special services associated with the call. Therefore, "06 = centrex attendant" is recorded in this field to indicate that an attendant handled the call but was not billed for it.

This feature replaces the attendant's BDN with the source party's BDN for calls extended by an attendant

that result in MDR records. The feature interaction code field within the MDR record should indicate that the SBAC feature affected the contents of the MDR record. Therefore, the value "01:attendant source billing" is recorded in the field.

NOTE: This feature is equivalent to feature 03-2-0030.

99-5E-0590 MULTIPLE DIRECTORY NUMBERS PER LINE WITH DISTINCTIVE RINGING ENHANCEMENTS

Multiple DNs (directory numbers) share the same line, so that a residential or business subscriber can receive calls dialed to separate DNs without installing additional lines. Possible applications for this feature include home businesses or families with teenagers, and business customers with an MLHG or series completion group.

This feature enhances the basic MDNL feature as follows:

- ☐ Enhancement to the CFV option allows the subscriber to perform customer originated recent changes to indicate the desired MDNL CFV option at the time CFV is activated. The MDNL CFV options are as follows:
- ☐ Forward master only
- ☐ Forward all DNs to the same "forward to" DN (remote station)
- ☐ Forward only the dependent DNs to the same "forward to" DN (remote station).
- ☐ Only one MDNL CFV option can be active at one time; therefore, there is never more than one forward to DN specified at a time.
- ☐ Provides MDNL to lines organized in a regular, circular, or uniform call distribution MLHG arrangement. The distinctive ringing pattern based on the original dialed DN is carried forward to the hunted member and the appropriate ringing pattern is applied when the call is completed. The MDNL CFV options are not available for MLHG.
- ☐ Provide MDNL service on lines in a series completion group. The ringing pattern of the original dialed DN is carried forward and applied at the terminating station set after a call has been series completed. The MDNL CFV options are not available for Series Completion Groups.
- ☐ The basic MDNL feature can still be purchased (that is, the basic and enhanced versions of MDNL are separate features).

99-5E-0591 DUAL TELEPHONE COVERAGE

The dual telephone coverage (DTC) feature is an extension of the 5E4 message service system (MSS) feature. The DTC feature provides the ability for users to be served by multiple message services (maximum of four) with either an message waiting indicator (MWI) for each service or a 5ESS[®] switch integrated MWI where the activation/deactivation of the single MWI by multiple services is controlled by the 5ESS[®] switch. In addition, the DTC feature provides new preconstructed call forwarding features for call forwarding features that may currently be constructed using MFC (modular feature construction). These new call forwarding features provide the ability to forward calls that originate internal to a customers terminal group to a specific message center that may be different from a message center that services calls originating external to a customer's terminal group.

The DTC feature users selectively forward calls arriving at their station sets to multiple message service centers based on the origination source of the call and the condition encountered at the called station/line. Currently, the switch limits the user to one MSS feature. With DTC, the user may subscribe to multiple message services. In addition, since an MWI is provided as an integral part of MSS, an MWI may be

offered on either an integrated basis (multiple services use a single MWI) or an individual basis (each service uses a separate MWI). For integrated MWI service, the switch must keep track of the message waiting status of all services, and must guarantee that the MWI is inactive only when no messages are waiting on all services.

99-5E-0592 LASS - SELECTIVE CALL REJECTION

The selective call rejection (SCR) feature allows a residential or business customer to reject calls from identity attributes which are on the customer's SCR rejection list. Only 7- and 10-digit DNs are allowed as identity attributes for residential customers. Business customers are allowed to enter 1- to 7-digit extension numbers in addition to 7- and 10-digit DNs as identity attributes providing the customer has extension dialing. These identity attributes can be entered directly (dialed in) by the SCR customer or entered as the last call to alert the SCR customer. Alerting is defined as either ringing or applying call waiting tone to a terminating station. The structure of the list and methods for updating the rejection list contents are described in the LASS Screen List Editing Feature.

Call attempts to the SCR customer from parties specified on the SCR rejection list are prevented from terminating to the customer, and are instead routed to an announcement that informs the caller that their call is not presently being accepted by the called party. When the calling party receives this rejection announcement, the SCR customer receives no indication of the call attempt. Calls from parties not specified on the SCR rejection list terminate normally.

Only analog voice and ISDN circuit-switched voice calls are screened by SCR. The SCR is available for both analog and ISDN stations.

There is only one screening list per DN number used for SCR.

99-5E-0593 LASS - SELECTIVE CALL ACCEPTANCE

The selective call acceptance (SCA) feature allows residential and business users to restrict which incoming voice calls are allowed to terminate, based on the identity attribute of the calling party.

Identifiers (identity attributes) for calling parties may be 7- or 10-digit DNs or 1 to 7-digit extension numbers for users with extension dialing.

Users create an SCA screening list of identity attributes, making use of the screen list editing (SLE) capability. For all terminating calls, the identity attribute of the calling party is obtained and compared to entries on the screening list. Only calls from parties identified on the screening list are allowed to terminate.

Calls from parties not specified on the SCA screening list may be rerouted to an appropriate announcement or may be forwarded to an alternate DN depending on the user's selection at activation time. The SCA subscriber in this case will not receive any alerting.

Only analog voice and ISDN circuit-switched voice calls are screened by SCA. The SCA is available for both analog and ISDN stations.

There is only one screening list per DN used for SCA.

99-5E-0594 CALL ASSOCIATED CCS7 NETWORK INTERCONNECT

For calls originating from ISDN and non-ISDN customer premises equipment, the call associated CCS7 network interconnect feature provides a CCS7 ISDN user part interface between LECs (local exchange carriers) and interexchange carriers for inter-LATA/international call setup and call associated services. This feature covers the capabilities needed for a 5ESS[®] switch in an LEC network functioning as either an end office or access tandem office.

This feature provides the protocol, billing, screening, and OA&M capabilities necessary to support an equal access version of ISDN user part, functionally equivalent to equal access multifrequency signaling for

non-ISDN customers (alignment with Bellcore TR-TSY-00394, with some exceptions).

In addition, basic call setup using ISDN user part between an end office and access tandem office acting as a service switching point (SSP) is provided for 800 service and advanced services platform (ASP). This feature aligns with TR-TSY-000533 and a subset of Bellcore TA-TSY-000877, providing an ISDN user part functional equivalent to that available in EAS-MF signaling.

99-5E-0595 LASS SELECTIVE CALL FORWARDING

The LASS selective call forwarding (SCF) feature allows a residential or business customer to preselect which calls will be forwarded based on the identity attribute of the calling party. Only 7- and 10-digit DNs are allowed as identity attributes for residential customers. The 1- to 7-digit extension numbers in addition to 7- and 10-digit DNs are allowed as identity attributes for business customers provided they have extension dialing.

The basis of SCF is that a customer can create a screening list unique to SCF. This list contains the identity attributes of each calling party whose calls should be forwarded. For all terminating calls, the identity attribute of the calling party is obtained and is compared to the SCF screening list. If the calling party identity attribute is specified on the list, the call is forwarded. A ping ring indication is given to the idle telephone number associated with the SCF user. The SCF user may inhibit the ping ring through a service order. If the identity attribute of the calling party cannot be obtained or is not on the screening list, the call is not forwarded and regular terminating treatment applies. If the terminating call is an ISDN data call, the call is not screened.

Only analog voice and ISDN circuit-switched voice calls are screened by SCF. The SCF is available for both analog and ISDN stations.

There is only one screening list per DN used for SCF.

99-5E-0596 LASS SELECTIVE DISTINCTIVE ALERT

The selective distinctive alert (SDA) feature allows a residential or business customer to pre-select which calls are provided distinctive alerting treatment based on the identity attributes of the calling parties. Only 7- and 10-digit DNs are allowed as identity attributes for residential customers. Business customers are allowed to enter 1- to 7-digit extension numbers in addition to the 7- and 10-digit DNs as identity attributes (provided the customer has extension dialing). These identity attributes can be entered directly (dialed in) by the SDA customer or entered as the last call to alert the SDA customer. Alerting is defined as either ringing or applying call waiting tone to a terminating station. The structure of the list and methods for updating screening list contents are described in the screening list editing feature.

The basis of SDA is that a customer can create a screening list, which contains the identity attribute of each calling party whose calls should be distinctively alerted. For all terminating calls, the identity attribute of the calling party is obtained and compared to the SDA screening list. If the calling party identity attribute is specified in the SDA list, the called party is distinctively alerted. If the calling party identity attribute is not specified in the screening list, the call proceeds with standard terminating treatment.

Only analog voice and ISDN circuit-switched voice calls are screened by SDA. The SDA feature is available for both analog and ISDN stations.

There is only one screening list per DN used for SDA.

The SDA feature by itself provides only the distinctive ringing capability. In order for the analog customer to be provided with distinctive call waiting tone, the SDA customer must be busy without another call already waiting, and either the call waiting terminating or the call waiting incoming only feature must apply for or during the call.

99-5E-0597 LASS SCREEN LIST EDITING

The screen list editing (SLE) feature allows users to create and modify lists of telephone numbers associated with a directory number. These numbers are used to identify calling parties. Calls from a listed number are given special treatment by SLE "client" features. Each feature has its own associated screening list.

The following client features are available:

- ☐ Selective call acceptance (SCA)
- ☐ Selective call forwarding (SCF)
- ☐ Selective call rejection (SCR)
- ☐ Selective distinctive alert (SDA)
- ☐ Computer access restriction (CAR).

The SLE feature interactively guides users in editing screening lists. A set of interactive recorded announcements are used for analog stations and ISDN stations without display capability.

Display messages are provided in addition to announcements for ISDN stations with display capability. Users access the SLE session by dialing a single access code. All editing commands (for example, add/delete list entries) are available within the session. Users may also turn features on or off within the session.

List entries may be either 7- or 10-digit DNs or 1- to 7-digit extension numbers (for users with extension dialing). In addition, the DN of the last calling party can be transferred to a list. If the calling party used the DN privacy feature, the added entry is considered private and is not voiced back or displayed to the user.

All additions to screening lists are validated to ensure that calls are correctly screened, for example, unassigned numbers are not allowed on lists. For numbers not assigned at the user's switch, a CCS7 TCAP query is made of the switch where the number is assigned. This query asks for the following information:

- ☐ DN-match (part of the DN-line-service-type-mapping parameter)
- ☐ Line type (part of the DN-line-service-type-mapping parameter)
- ☐ Originating restrictions.

Screen list editing can be made generally available to all users in an office or can be available to users that subscribe to it. The SLE feature is available for the 5ESS[®] switch for both analog and ISDN stations. Both residential and business customers may have client features assigned.

99-5E-0598 Enhanced E911 (E911)

Enhanced 911 (E911) is an emergency calling service that routes "911" calls to emergency attendant positions selected on the basis of the caller's ANI. To provide prompt service, the attendants retrieve the callers' address and other related information from a remote database. Based on the geographic location of a caller, the appropriate emergency assistance assigned to that region is dispatched by the attendant.

The E911 feature utilizes the existing setup and hardware including the support of existing public service answering points (PSAPs). The E911 service adjunct (ESA) is used to provide the 5ESS[®] switch with the routing information which corresponds to each caller's ANI. The 5ESS[®] switch E911 application utilizes either CAMA or CCS7 trunks. The 5ESS[®] switch E911 can serve lines homed on the switch and act as an E911 tandem for lines homed on subtending end offices which serve many communities over a large area.

This is the first step toward network (N) 911.

10.2.29 5ESS® SWITCH FEATURES 99-5E-0601 - 99-5E-0699

99-5E-0601 LASS COMPUTER ACCESS RESTRICTION (SELECTIVE CALL ACCEPTANCE FOR COMPUTER SECURITY)

The LASS computer access restriction (CAR) feature is a variation of the selective call acceptance feature that controls computer access. This feature enables a customer to create a screening list of identity attributes using the screening list editing (SLE) feature and to accept a voice version of data calls only from a calling party whose identity attribute has been put on the screening list. This permits residential and business customers to restrict the calling parties who are allowed access to the computer. If the identity attribute is not on the screening list, the call is rerouted to announcement, or forwarded to an alternate DN, depending on the user's selection at activation time. The CAR subscriber in this case does not receive any alerting.

The CAR subscribers who choose the forwarding option can:

- (1) Forward nonaccepted calls to another computer for back-up purpose
- (2) Forward nonaccepted calls to an attendant that has a calling number display feature so an illegal incoming call's DN can be identified
- (3) Chain several DNs (lists) together to form a larger CAR screening list.

Only analog voice and ISDN circuit-switched voice calls are screened by CAR. The CAR is available for both analog and ISDN stations. The CAR and the LASS selective call acceptance feature are mutually exclusive. Only one of two can be assigned to a DN.

99-5E-0603 USER-SIDE PRI IMPLEMENTATION

The user-side PRI implements the "user" side of the PRI protocol, which allows PRIs to be supported in public (private trunks to provide access to public facilities) and private networks. The PRIs can be configured between two 5ESS® switches (CO to PBX or PBX to PBX), a 5ESS® switch and an IEC, and a 5ESS® switch and an ISDN PBX (this configuration is supported by the 5E4 software release PRI, which implemented the network side of the PRI protocol). The role (network/user) of the PRI is database defined on a per D-channel basis. This feature enhances the current 5ESS® switch inter-switch service offerings by providing 64 kbps end-to-end connectivity and a means to pass the calling party number and MA-UUI to the terminating party. The PRI allows the 5ESS® switch PBX customers switched access to public network services and facilities. There are no supplementary services provided by this capability.

99-5E-0604 T1D1 STANDARD U-BRI FOR (R)ISLU

The T1D1 (also known as ANSI®) standard U-BRI is a basic rate BRI which performs functions similar to the present U-BRI, but with a transmission format compatible with the T1D1 U-interface standard. This requires a new (R)ISLU U-BRI line card, a new NT1, changes to (R)ISLU resident software, and changes to SMP software. The T1D1 standard U-BRI complies with the requirements specified in ANSI® document number T1.601-1988, approved 09/88. The T1D1 standard differs from the present format in several areas: operations channel format, layer-1 performance monitoring, line coding, frame format, timing recovery, and signal filtering. This format allows potentially greater transmission range and has greater hardware complexity when compared with the present U-BRI.

99-5E-0606 DCLU INTEGRATED INTERFACE FOR DID PBX CHANNEL UNITS ON SLC® CARRIER SYSTEM WITH FRAUD CONTROL FOR ALL PBX DID SERVICE

This feature allows SLC® carrier systems integrated through the DCLU to terminate PBX direct inward

dialing (DID) channel units. The DID channel unit uses loop reverse battery signaling over one-way DID trunks, and supports either dial pulse or multifrequency outpulsing with either immediate, wink-start, or delay dial handling. It also provides fraud control by blocking the forward talk path until answer supervision is received by the switch for billing initiation. If answer is not received within a recent change controllable time, an AMA study record is created to help detect problems.

99-5E-0607 BRITE CHANNEL UNIT MAINTENANCE (AMI and/or ANSI[®])

This feature enhances the ISLU ISDN maintenance plan in applications where D4 SLC[®] 96, SLC[®] Series 5 basic rate interface transmission extension (BRITE), or D5 channel units are used to extend the range of the ISLU U-DSL. The BRITE maintenance plan includes the following capabilities:

- ☐ Manual CU loopbacks (to sectionalize CU faults)
- ☐ Manual access to performance monitoring counts (without history)
- ☐ Automatic/manual line card/first CU mismatch testing.

Maintenance capabilities are provided without the knowledge of the outside plant configuration in the 5ESS[®] switch.

99-5E-0608 CMP CALL PROCESSING (350 K METRO CALLS)

This feature is based on the hardware and software provided by 99-5E-0609 (CMP Base). By moving the call processing software to the communications module processor (CMP), the METRO call capacity is being increased to 350 K rated busy-hour calls.

99-5E-0609 COMMUNICATION MODULE PROCESSOR (CMP) BASE

This feature provides a common hardware and software base for off-loading the AM-resident functionality through installation of the CMP. The CMP is a 2-board computer consisting of a core board and a memory board that resides in the message switch frame.

99-5E-0610 COMMUNICATION MODULE PROCESSOR (CMP) GROWTH IN 5E5

This feature allows the communication module processor (CMP) to be grown and diagnosed prior to the 5E5 to 5E6 software release retrofit and to be pumped off-line and verified during the retrofit.

99-5E-0611 SCSI BUS INTERFACE FOR 3B20D

This feature enhances the input/output capabilities of the 3B20D AM through the addition of the small computer systems interface (SCSI) bus peripheral architecture. This feature provides expanded storage capacity by allowing more disks per cabinet and more disks. The 3B20D uses the industry standard SCSI disk drives giving the OTCs expanded storage capacities and increased reliability.

99-5E-0613 FLEXIBLE ASSIGNMENT OF SERVICE FEATURE CODE

This feature provides OTCs with the ability to control the recording of a service feature code (SFC) value (800-999) in the AMA record through the translation input (ODA and RC) based on the service provided to the end-user.

The type of service provided to the end-user can be determined by either the line class code (LCC) for the originating service and/or the terminating DN for an outgoing or incoming call. Therefore, the service feature code is determined right after the digit analysis and screening is complete for circuit-switched services. The OTCs can assign an OTC defined SFC value at the time the LCC is assigned to a group of lines or assign an SFC value to a group of DNs.

99-5E-0614 END-TO-END CALL TRACE (EECT)

This feature is a CCS7-based enhancement to tracing of terminating calls and to tandem call trace. A calling number received through CCS7 signaling is printed in the trace printout in addition to the trunk group and member number of the incoming trunk. Calls arriving with end-to-end CCS7 signaling are immediately traced to the calling number instead of having to be backtracked office-by-office and having to depend on multiple calls being placed by the same caller.

99-5E-0616 FLEXIBLE NIGHT SERVICE/ATTENDANT CALL FORWARDING

Night service routes calls normally directed to the attendant group to a different location (night location, also known as a night directory number). Routing may be provided in one of the following ways:

- ☐ Fixed - All calls to all listed directory numbers (LDNs) served by multiple position hunt (MUPH) or ISDN Attendant (ISAT) groups are routed to a preselected (at subscription time) night directory number and the activation/deactivation of it is done from a designated console only.
- ☐ Trunk answer from any station - All calls to all LDNs served by MUPH or ISAT groups activate a night bell or other indicator so that calls may be answered at any station by dialing an answer access code for the call pickup feature.
- ☐ Flexible - The attendant call forwarding feature is used to selectively route all calls to an LDN served by a MUPH or ISAT group to a different customer changeable night directory number and the activation/deactivation of it can be done from any console in the MUPH or ISAT group. Flexible and fixed night service can be assigned concurrently to the same MUPH or ISAT group and both features can be used by attendants. The flexible night service feature, when activated, will take precedence over the fixed night service activation.

Attendant call forwarding allows attendants to activate/deactivate call forwarding for any LDN within the MUPH or ISAT group (that is, flexible night service) and for any extension or station with call forwarding variable assigned that can be controlled from the attendant console.

99-5E-0618 COIN LINE AMA (CLAMA)

This feature creates an existing standard detailed AMA record at the originating end office for each coin telephone originated, answered, chargeable call that is sent paid and processed at the end office (local timed, local untimed and zone). The CLAMA record is an existing AMA record format and does not include coin collected information (call code 25 for coin zone calls and call code 41 for local timed and local untimed calls).

An operator system cannot be accessed during the calls. There is no flash recall operator system access for a coin, sent-paid call unless the original call was operator handled. There is no change in the existing processing of these calls other than the recording of an AMA record in the local switch.

Billing the owners of nonsmart coin telephones for sent paid calls requires the correlation of AMA records from all switches that may control charging of such calls. The originating end office CLAMA records have to be combined with records at the LEC operator services switch for detail billing since CLAMA records do not contain any coin collected information. When CLAMA records are combined with AMA information from all associated operator services, detailed billing data exists for all chargeable sent-paid calls from all nonsmart telephones processed at the end office.

Currently this capability is partially achievable through traffic sampling per coin line. The CLAMA feature provides the capability to ask for these records per office instead of per line which alleviates administrative complexity. The temporary nature of traffic sampling is not always sufficient.

99-5E-0619 BACKOUT MOST RECENT OFFICIAL SOFTWARE UPDATE

This feature allows the office technician to back-out the last software update that has been made official, returning the software release to the software update level prior to applying that software update.

99-5E-0620 DECOUPLED ROM INITIALIZATION

This feature divides the ROM code in the SM ROM into a less complex and decoupled ROM program that is responsible for pumping a larger, more complex program (virtually the present-day ROM program) into RAM. The program in RAM is then responsible for pumping the remaining majority of the SM image, as well as having the other responsibilities that used to be in ROM. With only hardware-related code in ROM, the vast majority of retrofits should be accomplished without ROM changes. In most cases only hardware upgrades would require accompanying ROM changes.

The benefits of this feature are realized on software release retrofits when retrofitting from the 5E5 or later software releases.

99-5E-0621 RECENT CHANGE PERFORMANCE IMPROVEMENTS

This feature provides improved response time and throughput for recent changes applied to the 5ESS[®] switch as follows:

- ☐ Improvement in the throughput of service orders for two concurrent users.
- ☐ Reduction in recent change real time in both the administrative module and the switching module.
- ☐ Reduction in the response time for a single stream.

99-5E-0622 SWITCHED-BASED PROTOCOL MONITORING

This feature provides controlled access to protocol information transmitted on an ISDN interface. This information, in the form of layer 2 frames (as with existing commercial protocol analyzers), is available for technician inspection. This feature also collects information concerning protocol abnormalities that may occur on the BRI or PRI. This information is retrievable.

The following protocols are incorporated into this feature:

- ☐ Q.931 level 3 on the BRI and PRI,
- ☐ X.75' and X.25 level 3 and LAPB and LAPD level 2 on the BRI.

99-5E-0623 QUEUE MONITOR FEATURE FOR MLHG QUEUING

The queue monitor feature provides real-time measurements for one to eight MLHGs. Measurements include usage, overflow, and abandon counts for the queue.

The queue monitor feature is assigned to an ISDN terminal (type A, B, C, D, or attendant console) with feature buttons assigned to monitor queues. Each feature button is activated corresponds to one MLHG. If the CPE has a display module, when the feature button is activated, real-time queue measurements are displayed.

When the number of calls exceeds a customer-specified queue threshold, a feature button lamp lights on the queue monitor console. The queue monitor console interfaces the switch through the BRI.

99-5E-0624 ISDN - FEATURE BUTTON INSPECT

The feature button inspect feature provides service providers and end-users who have display terminals with a method of determining the features and call appearances that are assigned to the buttons on a terminal. Inspecting a button is a two-step procedure:

- (1) The inspect feature button is depressed
- (2) The feature or call appearance button to be inspected is pressed.

The button number and/or feature assigned are displayed.

99-5E-0625 BRI DIAL-UP TEST LINE

This feature permits the technician, from an ISDN station set, to dial a special directory number to access a test facility in the central office. The technician can then use the keypad to enter tests to be run on either of the B-channels. The keypad interface supports a subset of the TST:DSL input command parameters. Results of the tests are printed as text on the station set's display and returned as pass/fail tones on the B-channel. The results of these tests can be used to verify proper operation of the BRI, as well as isolate faults on the BRI.

99-5E-0626 ISDN - DBS SECRETARIAL MESSAGE WAITING INDICATOR CONTROL

The secretarial message waiting indicator control feature provides the capability for a secretary to activate audible or visible message waiting indicators at a principal's ISDN keyset or analog telephone set. This feature is intended to be used for principals who choose to have call coverage provided by a secretary, rather than by a message service attendant or voice message system, although it could be used in combination with those forms of coverage. Unlike message waiting indicator activation by centralized message systems, which can cover all stations in a customer group, secretarial message waiting indicator control is limited to the stations for whom a secretary provides primary or backup coverage. Secretarial coverage may be provided in two ways: by shared directory number appearances of the principals' DNS, and by call forwarding to DNS that are shared by one or more secretaries. This feature relies on the use of an applications processor. The secretary will use the leave-word-calling feature to activate/deactivate the principal's MWI.

99-5E-0628 ISDN - DBS DISPLAY FOR RINGING CALL APPEARANCES ONLY

The display for ringing call appearances only feature activates displays on a digital business services (DBS) set only for ringing call appearances. This eliminates displays that a call coverage person (usually a secretary) has no need for and no desire to see. The feature is intended for applications where keysets have large numbers of secondary call appearances to provide shared backup coverage among a group of secretaries, and where abbreviated and delayed ringing is used.

When a secretary's set has secondary call appearances providing backup coverage for other secretaries, ringing does not normally occur immediately for those call appearances, so the secretary is not alerted to look at the terminal. When, however, the secretary is responding to ringing for a call that is within the secretary's assigned answering responsibilities, a display associated with one of the backup call appearances may overwrite the desired display. If, for example, four cooperating secretaries, having approximately equal numbers of DNS to cover, were supplied with full sets of backup call appearances for each other, three quarters of the displays appearing on each set would be extraneous during normal work times.

When abbreviated ringing is assigned to a principal, and delayed ringing is assigned to the call appearance of the principal's DN on the secretary's set, there is no need for a display to appear for the secretary until the principal has declined to answer and ringing has started for the secretary. The delayed appearance of the secretary's display also gives the principal total privacy regarding the source of calls that the principal answers promptly.

99-5E-0629 SERIES COMPLETION FOR ISDN LINES

This feature provides the series completion feature capability currently available for analog to ISDN lines. Series completion allows DNS to be grouped in a prearranged ordered list. The switch will make up to 16 attempts to series complete. However, more than sixteen DNS may constitute a series completion group.

When a call is completed to a busy DN with series completion, hunting is done through the ordered list until an idle DN is encountered or the call has made 16 attempts to series complete. The DNs in the series completion chain do not have to be sequential.

99-5E-0630 PACKET-SWITCHED DATA BUSINESS GROUP SERVICE

This feature enables the service provider to set up and administer intra-switch PBGs (packet business groups), and to distinguish between intragroup and intergroup X.25 packet data calls (virtual calls as well as PVCs) on the AMA record for appropriate billing treatment.

For X.25 virtual calls, the determination of intragroup or intergroup is based on a comparison of the PBG numbers associated with the calling and called DNs. Each X.25 termination can be assigned to a PBG by associating a PBG number with the X.25 packet DN. An entire MLHG can be assigned to a PBG by associating a PBG number with the MLHG DN (that is, the hunt DN). Similarly, an entire modem pool group (MPG) can be assigned to a PBG by associating a PBG number with the MPG hunt DN. A given X.25 termination can be a member of at most one PBG.

For X.25 PVCs, the determination of intragroup or intergroup will be based on the value of a boolean attribute that is provisioned during the PVC setup.

99-5E-0631 ANALOG SHARED DN ON ALL SM CONFIGURATIONS

This feature allows analog lines that share directory numbers with ISDN DBS sets to be assigned to switching modules that do not contain ISDN software.

99-5E-0632 MULTIPOINT T-BRI

This feature provides support of multiple users, and their associated terminals, on one (or more) T-BRI(s) using the existing ISLU T-card(s). The users on a single T-BRI share the two B-channels for digital voice or data and the D-channel for signaling and packet data services. An extended passive bus, a branched passive bus, and a short passive bus configuration are supported with up to two terminals per BRI.

The signaling, call processing, and maintenance is consistent with that provided for multipoint U-BRIs.

99-5E-0633 APPLICATIONS PROCESSOR DUAL TELEPHONE COVERAGE

The applications processor (AP) dual telephone coverage (DTC) feature is a capability that is available through the 5ESS[®] switch applications processor in conjunction with the 5ESS[®] switch. This feature allows subscribers of the Message Service System feature to have incoming telephone calls redirected between CMSS and one other answer point or message service that uses the SMSI interface, based upon a characteristic of the call itself, such as internal vs. external. Presently the switch allows only one service to be the coverage point for all types of incoming calls. The AP DTC allows two message services to be offered and integrated in a single AP, with only one API link required to the switch. This feature requires the AP features, CMSS and SMSI, which are contained in the advanced communications package, versions 3 and 4, for use on the applications processor.

99-5E-0634 INTERCOM CALLING RESTRICTION BILLING OF OVERFLOW CALLS

This feature provides the ability to establish an ICR simulated facility group (SFG) where SFG overflow calls are allowed to complete, but an AMA billing record per overflow call is made. The generation of AMA records for all overflow calls is an option on a per ICR SFG basis. This feature is an enhancement of the intercom calling restriction feature (99-5E-0458).

99-5E-0635 DBS 2-DIGIT INTERCOM DIALING

This feature augments an existing 5E4 feature, DBS intercom functions (99-5E-0350), to provide 2-digit, as well as 1-digit keyset intercom dialing.

99-5E-0636 DISASSOCIATE SPEED CALLING FROM INDIVIDUALIZED DIALING HC PLAN

The individualized dialing plan (IDP)/speed calling (SC) split disassociates SC features from IDP features which are currently provided through the individualized dialing (ID) modular feature type. A new SC modular feature type is created along with the means to assign and administer SC features independently from IDP features. The current ID modular feature type becomes a new IDP modular feature type. The IDPs continue to be assigned on a group basis while SC features are assigned individually without regard for the IDP assignment. The SC features do not have any IDP attributes included in their definitions, nor do the IDP features have any SC attributes in their definitions. Currently, only one ID feature can be assigned to a given line. The splitting of these features allows one IDP feature and up to two SC features to be assigned to a line. Any or all of the following may be assigned:

- ☐ An IDP, /IDP, or/IDP1
- ☐ 1 digit SC, /SC1 or /SC1C (changeable)
- ☐ 2 digit SC, /SC2 or /SC2C (changeable)

In addition, when adding a speed calling service (for example, two digit speed calling) to a line that already has another version of speed calling (for example, one digit speed calling), the currently assigned SC feature does not have to be manually deleted, which in the past would have resulted in a loss of the original (one digit) speed call list. With this feature, the list is retained. The speed call list is also retained if an update of the speed calling feature (for example, /SC1) is made on a line where another version of the same speed calling feature (for example, /SC1C) exists.

99-5E-0637 FLEXIBLE ASSIGNMENT OF CALL CODE

This feature provides the OTCs with the ability to control the recording of the call code of an AMA record through the translation input (ODA and RC) based on the service provided to the end-user.

The flexible assignment of call code feature provides a similar capability as described for the "Flexible Assignment of Service Feature Code" feature (99-5E-0613). It focuses on the determination of service based on the line class code of the originating service and/or terminating DNs for circuit-switched services. The OTCs are able to assign an OTC defined call code to a specific service.

99-5E-0638 5E6 LARGE TERMINAL GROWTH

This feature provides the ability for the 5ESS[®] switch to generate office data that can be directly merged, off-site through ODA processing, with the existing 5ESS[®] switch office database. It provides the ability to dump the existing 5ESS[®] switch database, reload through retrofit the newly merged database, and reapply the database changes made while the database was off-site being merged.

99-5E-0639 MULTIPLE DIRECTORY NUMBERS PER LINE WITH DISTINCTIVE RINGING

This feature provides customers the benefit of up to four directory numbers (DN) on one line, each with a unique (distinctive) ringing pattern, without additional line terminations or additional equipment. (An unlimited number of DNs can be assigned to a line; however, only four distinctive ringing patterns can be provided.) One DN is designated the "master DN" and receives regular ringing. Additional DNs assigned to the same LEN are called "dependent DNs" and receive distinctive ringing (up to the limit of three). If the customer also subscribes to Call Waiting, distinctive call waiting tones, corresponding in cadence to the distinctive ringing patterns, will be provided for each additional DN.

Customers subscribing to the MDNL feature have access to all custom calling BRCS and LASS features. However, regardless of the number of DNs a line has, it can only have one set of custom calling features, applicable to all DNs.

99-5E-0641 ORM/TRM SHARED RESOURCES

This feature allows the sharing of the alarm status circuit (ASC), directly connected test unit (DCTU), and modular metallic service unit (MMSU) among collocated ORM/TRMs. Up to 12 collocated ORM/TRMs can share the same ASC, DCTU, and MMSU depending on their equipage.

99-5E-0642 FLEXIBLE ANI INFORMATION DIGIT ASSIGNMENT

The flexible ANI information digit (II) assignment feature permits the OTC to assign ANI information digits through recent change to:

- ☐ Originating line class of service translations
- ☐ Certain IC-provided (inter-LATA) services that can be identified through a specific ANI pair assignment. Known inter-LATA services that may have flexible ANI pairs are OUTWATS and SDN. Flexible ANI pairs are assignable to inter-LATA services using SFGS or dedicated access facilities.

Flexible assignment applies only to two digit ANI information digits, which are used by inter-LATA carriers, international carriers, and operator services systems. Flexible ANI pairs are transmitted by both equal access MF signaling and CCS.

99-5E-0643 7-DIGIT OUTPUTSING FOR V PATH

This feature allows the 5ESS[®] switch (EAE0/NAP) to optionally outpulse a 7-digit called number to an AT/ACP, rather than always outpulsing the called number as ten digits by prefixing an NPA. V PATH is NYNEX's offering of a private virtual network, based on SDN.

The 5ESS[®] switch EAE0/NAP must be able to provide 7-digit outpulsing for 7-digit (for example, on-net V PATH) calls, while still providing ten digit outpulsing for other calls (for example, POTS or off-net V PATH calls) carried over the same shared trunk group to the AT/ACP. Existing outpulsing arrangements for carrier interconnect must not be affected, that is, for each route some switch personnel action must be taken to cause a change from 10- to 7-digit outpulsing. Seven-digit outpulsing to an AT/ACP will be performed on a per route index basis.

This feature allows 7-digit dialed calls to be outpulsed to an AT/ACP as seven digits; calls dialed as ten digits will continue to be outpulsed as ten digits. Seven-digit outpulsing may thus also be thought of as "outpulsing as dialed".

The 5ESS[®] switch (EAE0/NAP) will have to route the seven digit on-net V PATH call when it is placed by the following types of users:

- ☐ Users that are part of an individualized dialing plan (IDP) (BRCS users).
- ☐ Users that have key telephone systems or individual station sets.
- ☐ Users that are served by a PBX.

Access to V PATH for the users listed is assumed to already be provided on the 5ESS[®] switch.

99-5E-0644 ALLOW COMMON PASSWORD FOR EDS AND CMSS FUNCTIONS

To perform directory query display (DQD) from an ISDN station set, the user must specify the business customer password. The CMSS uses an individual password for performing message retrieval display (MRD) from an ISDN set. The feature allows the user the option of using a single password if both EDS and CMSS features are subscribed. This is available only from a users default station set.

99-5E-0645 ISDN STANDARD BILLING CAPABILITY

This feature provides the 5ESS[®] switch the ability to record Bellcore standard ISDN billing information in the AMA record. The extended Bellcore AMA format (EBAF) is used for this feature.

The ISDN data calls append modules differently than voice calls. For CSV calls, it is possible that no module is appended. For CSD calls, module 70 or 71 must be appended. These are controlled by office options.

Whether or not to record 70 or 71 is not optional, but is based on the signaling supplemental service being used.

Office-Option		CSD Calls Sig/Sup Used	Treatment
yes	yes	yes	Voice Record + 70
yes	no	no	Voice Record + 71
no	yes	yes	CSDC Record + 70
no	no	no	CSDC Record + 71

Office-Option		CSV Calls Sig/Sup Used	Treatment
yes	yes	yes	Voice + 70
yes	no	no	Voice + 71
no	yes	yes	Voice + 70
no	no	no	Voice only, no module

99-5E-0646 ISDN IDENTIFICATION IN AMA RECORDS FOR ISDN CIRCUIT-SWITCHED DATA CALLS

This feature provides the 5ESS[®] switch the ability to record Bellcore standard ISDN billing information in the AMA record for ISDN circuit-switched data calls. The ability to use voice call codes/structure codes is provided as an office option.

This feature is a subset of the ISDN Standard Billing Capability feature (99-5E-0645).

99-5E-0647 1980 X.25 DTE SUPPORT

The 1980 X.25 DTE support feature is a subscription option available on a per-user basis. Subscription to this feature for a user means that the network will prevent the 1984 X.25 network-to-user signaling on a virtual circuit associated with that user that is not included in the 1980 version of X.25. Therefore, virtual circuit communication is allowed between two DTEs that conform to either the 1980 or 1984 versions of X.25. However, under certain circumstances, virtual calls may be cleared or reset, and permanent virtual circuits reset, and some fields discarded if a capability defined in the 1984 but not in the 1980 version of X.25 is used by the 1984 DTE. In this case, cause and diagnostic information is provided to both end-users associated with the virtual circuit.

99-5E-0648 MODEM POOL ON A MULTIPOINT BRI

Each member of a Modem Pool group has two line appearances on the switch: an analog line with a modem, and a BRI with a terminal adaptor. This feature allows the TA to be connected to a Multipoint BRI (MBRI). In particular, several TAs can share a BRI.

Since the terminal adaptor used for multipoint modem pool is in a packet MLHG, the terminal adaptor must follow the FIT (fully initialized terminal) protocol procedures.

99-5E-0649 CUSTOMER INITIATED VERIFICATION OF ISDN DIRECTORY NUMBER

This feature provides the ability for an end customer (or installer) to verify the directory number assigned to a given ISDN line. The end customer asks the switch to provide the DN for the line. For display terminals, the response is the digits of the DN displayed on the CPE display.

The ability to display the function (DN or feature) associated with any switch managed button appearance on the CPE is provided as part of the BRI test line feature. In addition, the ability to use the BRI test line through a provisionable/billable option for each terminal is also provided.

The implementation of the feature can take several forms, and is likely to be impacted by its relation to similar customer initiated requirements (for example, loopback tests).

99-5E-0650 X.25 CALL SCREENING FOR INTRA-LATA PACKET

This feature enables the 5ESS[®] switch to screen the called address of packet mode calls, even when the RPOA (recognized private operating agency) facility is present, to determine the intra-LATA/inter-LATA status of the packet mode call. If the call is intra-LATA, the 5ESS[®] switch then determines whether intra-LATA competition is permitted as follows:

- ☐ The 5ESS[®] switch must clear an intra-LATA X.25 call that contains the RPOA facility if intra-LATA competition is not permitted.
- ☐ The 5ESS[®] switch must route the intra-LATA call to the IEC if intra-LATA competition is permitted.

A recent changeable office parameter is used to indicate the permissibility of intra-LATA competition by IECs.

99-5E-0651 INDICATION OF A FULL PROTOCOL ERROR RECORD LOG

With this feature, the switch monitors the available capacity of the protocol error record (PER) log in each SM, and sends an indicator prior to the log being filled.

99-5E-0652 TIMING DELAY ON LOCAL CALLS

This service allows the ability to specify [(via recent change (RC))] when prefixes rather than timing delays should be used in digit analysis when conflicting codes (that is, interchangeable NXX/NPAs) are possible in certain 5ESS[®] switch central offices. The ability to specify whether prefixes or timing delays should be used is allowed on a per code (that is, NXX or NPA) basis. This eliminates post dialing delays that occur after dialing local 7-digit DNs (with no prefix) when an interchangeable NXX/NPA configuration is possible in a dialing plan area.

99-5E-0653 ISDN DBS AUTOMATIC EXCLUSION

Automatic exclusion provides the capability, assignable by recent change, for an ISDN keyset user to automatically prevent other users who share the same directory number from bridging onto an active call or retrieving a call that has been put on hold. If a user wishes to allow bridging or hold retrieval on a per call basis, they may do so by pressing the privacy feature button. This feature is the inverse of another feature, ISDN DBS manual exclusion, which normally allows bridging and hold retrieval, unless they are prevented on a per-call basis by pressing the privacy feature button. The two features are mutually exclusive for each DN on a terminal.

99-5E-0654 LASS - AR/AC DUAL TIMER QUEUING ACTIVATION

With the 5E5 software release, LASS automatic recall/automatic callback (AR/AC) features treat a reactivation attempt from a single DN to a previously called DN as an initial activation attempt. This approach requires only a single timer at the originating switch and a single timer at the terminating switch. Reactivations result in the previous activation being torn down and a new activation attempt which results in the loss of the user's queue position. The operation specified by Bellcore uses a dual timer approach, allowing reactivation attempts to maintain the end user's queue position.

This feature uses two timers at both the originating and terminating switches, for a total of four timers. Two of the timers, one at each end, keep track of the feature duration time. The other two timers, again, one at each end, limit the amount of time an activation attempt can remain at the same position in the called line queue. This operation allows the customer to reactivate without losing queue position.

This feature also includes the ability to specify the reinitiate scanning timer threshold, N, as an OTC specified parameter. The suggested value for N is 5 minutes. This parameter will be highly desirable when the dual timer is implemented. The 5E5 software release has a hard coded value of 10 seconds.

Other capabilities provided by this feature are as follows:

- ☐ Announcements for activations towards CFV routes callers that activate AR/AC towards lines with CFV active, selective call forwarding, selective call acceptance with forwarding, or computer access restrictions with forwarding active, to a call forwarding denial announcement. Without this feature, the 5ESS[®] switch provides short-term denial consisting of reorder.
- ☐ AR/AC reactivations provide an AMA recording of activations and reactivations separately. If a reactivation is initiated by a subscriber, an AMA billing record is created.
- ☐ AR/AC concurrent activation limit and line queue size limit provides a concurrent activation limit of at least 30 per line feature.
- ☐ AR/AC activation towards a MLHG with queuing having either an idle member, or an empty queue position are considered idle.

99-5E-0655 LASS 2-LEVEL ACTIVATION

This feature is designed to work in conjunction with the LASS auto callback and COT features. The end-user activates the desired feature. The switch responds with an interruptible announcement providing the user with information concerning the feature and how to continue with the feature activation. If the end-user wants to proceed with the activation, the announced instruction should be followed with the appropriate action (for example, dial an additional digit to continue), and the switch will proceed with normal feature activation.

99-5E-0656 LASS SCREENING LIST EDITING COMPLIANCE

This feature provides for alignment of the user interface for LASS screen list editing with Bellcore requirements. (See feature 99-5E-0597.)

Alignment involves changes to wording of some announcements, introduction of additional announcements, and changes in what commands are accepted at particular points in the interface.

This feature also adds the capability to RC ISDN displays associated with the LASS features.

99-5E-0657 PROCESS MESSAGE DATA BLOCK (PMDB) MESSAGE STORAGE

This feature consists of a new OS message buffer, a process message data block (PMDB) which is used by all SM terminal processes for the storage of incoming and outgoing messages. The PMDB replaces the stack and the call buildup data block (CBDB) for storing messages. Outgoing messages will be built in the PMDB and incoming messages will be received in the PMDB. The terminal process will allocate and deallocate PMDBs as needed throughout the establishment and teardown of a full call. The PMDB is automatically allocated for a terminal process when the terminal process gets a process stack, and released when the stack is released.

99-5E-0658 INTERSWITCH VOICE MESSAGING SERVICES

This feature allows voice messaging (VM) service providers the ability to offer voice messaging on an interswitch basis. Intraswitch VM is currently available on the 5ESS[®] switch through the 5E4(2) message service system (MSS) feature. The MSS feature provides the switch with the ability to send feature control signals between itself and an adjunct, using the applications processor interface (API). For interswitch VM, the key is to be able to transmit the API feature control signals between switches. The CCS7 network is used to transmit these signals. Call-related messages require the switch to support parts of the CCS7

interswitch call forwarding standard. Other messages require submission and support of new CCS7 TCAP messages.

99-5E-0659 RTA DEFENSIVE CHECK FAILURE MESSAGE REDESIGN

This feature provides the redesign of the RTA subsystem mechanism of reporting error information (RTA DCF messages) such that the customer using the output message and official customer documentation shall be able to effectively analyze the output.

99-5E-0660 CALL FORWARDING BUSY LINE - INHIBIT LINE BUSY

The call forwarding busy line - inhibit line busy (CFBL-ILB) feature applies to individual analog lines that provide an individual make busy key and are allowed to be assigned the CFBL feature. This feature also applies to regular, circular, and UCD voice service multiline hunt groups (MLHGs) that provide a group make busy key or group make busy feature button and are allowed to be assigned the CFBL feature.

The CFBL-ILB feature is a call forwarding parameter of the CFBL feature that is assigned through a service order. It will inhibit the CFBL feature when an individual analog line's individual make busy feature button is deactivated and the corresponding MLHG is busy. When call forwarding busy line is inhibited, calls are routed to busy or overflow tone. The type of tone is determined by the call forwarding inhibit overflow (OVFCFI) parameter of the CFBL feature. When the individual/group make busy key or group make busy feature button is activated, normal CFBL treatment is allowed.

99-5E-0661 CALL FORWARDING BUSY LINE - INHIBIT MAKE BUSY

The call forwarding busy line - inhibit make busy (CFBL-IMB) feature applies to individual analog lines that provide an individual make busy key and are allowed to be assigned the CFBL feature. This feature also applies to regular, circular, and UCD voice service multiline hunt groups (MLHGs) that provide a group make busy key or group make busy feature button and are allowed to be assigned the CFBL feature.

The CFBL-IMB feature is a call forwarding parameter of the CFBL feature that can be assigned through a service order. It will inhibit the CFBL feature when an individual analog line is made busy through an individual make busy key, or an MLHG is made busy through a group make busy key or group make busy feature button. When call forwarding busy line is inhibited, calls are routed to busy or overflow tone. The type of tone is determined by the call forwarding inhibit overflow (OVFCFI) parameter of the CFBL feature. When the individual/group make busy key or group make busy feature button is deactivated and the line/MLHG is busy, normal CFBL treatment is allowed.

99-5E-0662 ISLU/LU LOAD ADMINISTRATION MEASUREMENTS

This feature provides traffic usage measurements for each operational line unit (LU) switch group and each operational integrated services line unit (ISLU) line group controller as specified by the OTC personnel. The usage counts are based on a 100-second scan and will be reported as part of the 30-minute traffic report.

These measurements allow the OTC personnel to perform effective load administration of the LUs and ISLUs.

99-5E-0664 ENHANCEMENTS TO X.25 PACKET SWITCHING FOR TRUSTED DTE

This feature makes three changes to the X.25 packet switching capability that can be used when the DTE accessing the capability is trusted; that is, when the DTE is considered to be part of the network and not CPE. The feature allows the X.25 access line to be provisioned for:

- ☐ Use of the calling directory number (passed in the call packet) in the AMA record, rather than a provisioned number
- ☐ Use of a DTE generated call identifier for all *DATAKIT*[®] virtual circuit switch to *5ESS*[®] switch packet originating calls, rather than requiring the *5ESS*[®] switch to generate the identifier. For packet call

identification and billing, the identifier is passed from the DTE to the 5ESS[®] switch in an X.25 call packet as a defined facility behind a defined marker.

- ☐ Ability to disable DN screening; it is assumed that the calling DTE has already performed the screening required by standards.

99-5E-0665 MESSAGE DETAIL RECORDING (MDR) TO CUSTOMER LOCATION (CL) PACKET-SWITCHED DATA CALLS (ISDN LINES ONLY)

This feature supplies call data reports to the customer for packet-switched data calls. The data calls must either originate, terminate, or both on a DTE using a BRI. This feature supplies MDR records for the packet-switched data calls on B- and D-channels. The MDR records for packet calls are provided for each qualified DN. After the MDR record is formatted, the data is sent to the customer by way of the AP. The MDR records are shipped in realtime using BX.25 data links between the 5ESS[®] switch and the AP.

The following additional MDR records are provided by this feature:

- ☐ Virtual calls
- ☐ Permanent modem pooling
- ☐ Private mode pooling
- ☐ Public modem pooling
- ☐ Long duration virtual calls
- ☐ Long duration private modem pooling
- ☐ Long duration public modem pooling.

This feature is an extension of the existing MDR to CL capabilities that provide MDR records for circuit-switched voice and data calls.

99-5E-0666 SINGLE PER TRIGGERS FOR PROTOCOL MONITORING

This feature allows the switch personnel to specify a single abnormal protocol condition (that is PER code) as a trigger for protocol monitoring.

The value added benefit of this feature is the ability to capture the protocol exchange information surrounding a given (that is specific) abnormal condition as perceived internally by the switch. In the case where a specific protocol error is occurring, as evidenced by the generation of a certain PER by the switch, the switch personnel can then invoke a protocol monitoring session using that particular PER as the trigger condition, thereby controlling the actual collection of data related to an occurrence of that error.

99-5E-0667 REMOTE PROTOCOL ACCESS

This feature provides the service provider the capability to nonintrusively (that is, without interrupting service to the customers) access the ISDN interfaces from a Customer Service Center (CSC) to monitor the protocol exchanges between the 5ESS[®] switch and the customer premises equipment (CPE). This feature also provides an interface to a protocol analyzer at the CSC. The ISDN interfaces are the BRI and PRI and the protocol exchanges are the TSS OSI Reference Model LAPB/LAPD frames, Q.931 messages, and X.25 packets. The BRI B-channel packet data or D-channel packet data can be monitored. Up to two channels can be monitored simultaneously on a BRI or PRI. Additionally, this feature supports the monitoring of other protocols such as CCS7, IP, X.75, and X.75'. The CSC is a work center that provides the maintenance for all the ISDN troubles reported and is located at a centralized remote location.

Whenever an ISDN trouble is reported to the CSC, the switch personnel at the CSC shall send an input message to the originating switch (the switch connected to the complaining customer) to a protocol monitoring session. The monitored data shall be either switched or carried over the dedicated facilities to the switch connected to the CSC and subsequently directed over the output facilities to the CSC. The output facilities may be either a pair of BRI or a pair of PRI interfaces or both. To terminate the monitoring session, the switch personnel at the CSC send an input message to the originating switch.

99-5E-0668 COMPLETE GENERIC UTILITY PACKAGE FOR PROTOCOL HANDLERS

This feature provides complete generic utility functionality for protocol handler 3 (PH3) and PH22 processors consistent with what is currently provided for the switching module. Specifically, this includes the 'COPY:UT, IF:UT, and WHEN:UT' capabilities [see the 235-600-700, *Input Message Manual* (formerly IM-5D000-01)].

99-5E-0669 MEMORY MINING FOR THE PH2

The PH2 supports two types of software images, the access and the gateway image. The access image handles all channel types except X.75 and X.75 prime channel groups. The gateway image supports only the X.75 and X.75 prime channel groups. By redefining the channel groups that the PH2 images can support and functionalities the images can support, code can be removed from the various images that is not used. For example, have the gateway image support X.75, X.75', and IP. The IP code for supporting IP trunks can be removed from the access image. Parts of the X.25 software can be pulled from the gateway image since it is not all used in the gateway image.

In terms of memory mining, by allocating data structures in the gateway image by means of practical channel usage limitations instead of theoretical limitations, BSS memory can be obtained.

99-5E-0670 SOFTWARE UPDATE DATA COMPRESSION

This feature provides the switch with the ability to expand compressed broadcast warning messages (software updates) by use of a process that executes after a software update has been transmitted to the switch and before it is applied.

99-5E-0671 SOFTWARE UPDATE PERFORMANCE OPTIMIZATION

This feature optimizes program update code to reduce the real time used by subroutine calls and disk input/output. This feature provides a significant performance improvement (relative to the previous software release) in software update application time for software update of comparable size and type.

99-5E-0672 SOFTWARE UPDATE TRANSMISSION ENHANCEMENTS

This feature updates documentation so that it reflects the alternative software update transmission mechanisms available to the customer, including use of BX.25 packet transmission over a permanent virtual circuit.

99-5E-0673 CSCANS SOFTWARE UPDATE DOWNLOAD SESSION AUTOMATION

This feature updates the current 5ESS[®] switch SCANS interface to provide a single use password scheme instead of the current use of process ID (PID) as a password. This eliminates the need for the manual remote start command that creates a process for each software update download session. This allows automation of the CSCANS download process. This is part of the changes needed for the CSCANS III interface.

99-5E-0674 CSCANS SOFTWARE UPDATE NUMBER UPLOAD

This feature updates the current 5ESS[®] switch SCANS interface to provide an upload of the number of the latest official software update made official (from the 5ESS[®] switch to CSCANS). This allows automation of the CSCANS history record for each switch and simplifies the determination of whether additional software

updates need to be downloaded. This is one of the changes required for the CSCANS III interface.

99-5E-0675 DATABASE REORGANIZATION ENHANCEMENTS

This feature incorporates a new hashing algorithm and a new overflow strategy into the database manager. This feature also provides an enhanced ACCED tool to detect database corruption (REVIEW, SCAN), to correct database corruption (OVERWRITE, DESTROY), and to run database reorganization (REORG, HASHSUM).

99-5E-0676 OPERATIONAL VIEWS FOR ODD AND MEMORY OPTIMIZATION

This feature provides the capability to decouple the application program's view of the ODD from its physical storage in memory/disk. Application programs include call processing, RC/V, and other operational software. This feature focuses on static protected ODDs and does not impact dynamic or unprotected ODD.

The operational views feature significantly reduces the ODD memory requirements and decreases the amount of time required to access call processing critical relations stored in the static ODDs.

99-5E-0677 SMP23

This feature is required to port the hardware and software of the SMP23 from the 5EE4.2 to the 5E7 software release. This feature consists of the following:

- ☐ Hardware - integration and regression testing of the two new circuit pack designs of the SMP23.
- ☐ Software - Porting of all SMP23 related software changes for 5EE4.2 into 5E7.

This involves a significant amount of regression testing of existing features.

99-5E-0678 PERSONNEL INTERFACE ENHANCEMENT

This feature enhances the 5ESS[®] switch control display (C/D) capabilities by increasing the maximum number of configured C/D terminals from 8 to 16.

99-5E-0679 5E7 SUPPORT FOR CNI<5> FEATURES

The 5ESS[®] switch is a user of the following CNI<5> features. It is expected that most of the message transfer part (MTP) and signaling connection and control part (SCCP) signaling functions for these features will be provided by the CNI. Support functions such as recent change and verification user interface, and OSS interfaces for some of the following features may be required:

- ☐ Increased maximum number of linksets and populated clusters
- ☐ Message trap for outgoing messages
- ☐ Enhanced DLN
- ☐ Version numbers for improved retrofit reliability
- ☐ Expansion of small network IDs
- ☐ Enhanced small network routing.

99-5E-0680 DISK ODD BACKUP ENHANCEMENT

This feature changes the ODD backup procedure for disk resident AM relations. Currently, three disk partitions are used: one for the active copy and the other two alternate between being the backup copy and the scratch copy. With this feature, the ODD backup procedure is enhanced to eliminate the use of one of the partitions. This requires inhibiting recent change while writing backup tapes from the active partition.

99-5E-0681 CM MESSAGE PACKETIZATION

As a means of delivering large interprocessor and intraprocessor message types (that is, OSDS message types greater than 252 bytes in size) with the 5E7 software release features and requirements, CM-implemented message packetization is recommended. With this feature, interprocessor OSDS messages greater than 252 bytes in size are packetized by the CM subsystem, with the message packets placed in the outgoing/XMIT message queue. The messages are limited to no more than three packets per message (maximum of 756 bytes), although message sizes greater than 350 bytes are not expected for the 5E7 software release. The MCB sizes will also be increased from 300 bytes to 350 bytes or more to accommodate the larger overall message sizes and to deliver large intraprocessor messages.

At the destination processor, arriving OSDS message/packets are screened for unique packet message type/process ID. If the OSDS message is a packetized message, it is placed in a special packet buffer, where it waits for the remainder of the message (or until an audit removes it). The packet buffer requires two data structures, a 6-kb table of head cells and a 15 kb to 25 kb (128 kb in the CMP) packet buffer pool. Upon reception of the entire set of packets associated with a single message, the CM subsystem will reassemble the message and deliver it through existing OSDS implementation.

99-5E-0682 SOFTWARE RELEASE RETROFIT (5E6 TO 5E7), SOFTWARE RELEASE UPDATE (5E7), AND LARGE TERMINAL GROWTH (5E7)

This feature provides the software, procedures, and tools to transition from the 5E6 software release to the 5E7 software release, update the 5E7 software release, and perform 5E7 large terminal growth.

99-5E-0683 RETROFIT TRUNK STATUS MAPPING

This feature provides the ability to map out-of-service (OOS) trunk status across a generic retrofit selective initialization (GRSI) of an SM during a software release retrofit, software release update, or large terminal growth.

This feature also automates the effort required to take trunks OOS on the new software release.

99-5E-0684 REMOTE PROTOCOL MONITORING ACCESS TO ISDN CHANNELS

This feature provides a split test capability for the primary rate interface (PRI) only.

The split test access feature allows the protocol analyzer, at the remote location, to be placed in effect between the ISDN capable CPE and the 5ESS[®] switch to which the CPE connects. The split test access capability permits the protocol analyzer to actively participate in the following protocol exchanges:

- ☐ Protocol exchanges with CPE:

The protocol analyzer can interact with the CPE as if it were the 5ESS[®] switch.

- ☐ Protocol exchanges with the 5ESS[®] switch:

The protocol analyzer can interact with the 5ESS[®] switch as if it were an ISDN capable CPE.

The split test access feature is useful during preservice service validation as well as in response to a customer service complaint.

This feature will facilitate the maintenance of ISDN facilities in the private leased networks like FTS2000,

customer network option (CNO), and software defined network (SDN).

99-5E-0685 LEASED NETWORK SERVICE SELECTIVE TRUNK RESERVATION (SSTR)

This feature allows the switch to reserve up to 15 trunks in each leased network inter-machine trunk group for critical users. A turning on/off mechanism based on node-to-node blocking is provided by the Remote Network Management Center (RNMC) for this feature to minimize the negative effects for the lower priority traffic. The SSTR is applied only to the first-routed trunk group in a route list. Also, queuing is used in egress trunk groups.

The network management data collected by the 5ESS[®] switches shall be made available to the Network Control Center (NCC) staff to monitor and control the leased network. The following data is provided to the SSTR:

- ☐ Five-minute node-to-node data - attempt peg count and overflow count
- ☐ Five-minute office data - count of critical user originating calls, total critical user call load and count of critical user calls blocked, and count of calls affected by SSTR.
- ☐ 30-second discretely - flags indicating SSTR is turned on, SSTR is triggered, office-wide SSTR inhibit override is on, SSTR control is changed from on-site, and node-to-node data transmission sequence is changed from on-site.
- ☐ In addition to the previous network data, the 5ESS[®] switch will also collect the 30-minute node-to-node data, attempt peg count, usage count, and overflow count.

99-5E-0686 CCS7 ISDN-UP NETWORK INTERCONNECT PHASE 2

This feature provides a CCS7 ISDN-UP interface between the local exchange carriers and the interexchange carriers. The interface supports internetwork and international call setup and call-associated services. Network interconnect phase 2 extends the ISDN-UP phase 1 capabilities (provided in 5E6), extends ISDN to LEC switched access customers and provides capabilities in line with national and international signaling protocols.

The following signaling capabilities for a toll switching system are included in this feature:

- ☐ ISDN-UP NI basic call control upgrades
- ☐ Internetwork message and parameter screening
- ☐ Call progress message handling including cause location recording
- ☐ Carrier selection parameter screening.
- ☐ Q.931 information element transport and user-to-user signaling
- ☐ Internetwork screening for the access transport parameter (ATP) and the user-to-user information (UII) parameter.

99-5E-0687 CALL ASSOCIATED CCS7 NETWORK INTERCONNECT PHASE 2

The initial offering of CCS7 network interconnect (NI) supports basic and limited ISDN call setup through an interexchange carrier using CCS7 ISDN-UP signaling. The CCS 7 NI phase 2 feature includes the protocol and procedural infrastructure required to support the following items:

- ☐ ISDN-UP protocol upgrade for basic call setup

- ☐ Call progress message
- ☐ Confusion message
- ☐ Carrier selection presubscription and parameter passing
- ☐ Access charge recording of CPN
- ☐ Cause indicators parameter location value recording
- ☐ Passing of unrecognized parameters
- ☐ Calling party identification
- ☐ Q.931 information element transport enhancements
- ☐ UUS transport enhancements.

99-5E-0688 CCS7 ISDN USER PART ENHANCEMENTS

This feature enhances signaling capabilities, extend ISDN services and features, and provide new capabilities in line with signaling protocol standards. This includes requirements for network signaling, switching system call processing, and operations, administration, and maintenance, as follows:

- ☐ Generation of confusion message
- ☐ Excessive ISDN call delay notification
- ☐ Mapping of ACM to CPG
- ☐ Passing of unrecognized parameters and values
- ☐ Unsuccessful call setup procedures
- ☐ Completion of transmission path enhancements
- ☐ Fast-connect
- ☐ Q.931 information element transport
- ☐ OA&M enhancements
- ☐ Call progress message
- ☐ UUS transport enhancements.

99-5E-0689 Q.931/CCS7 ISDN-UP INTERWORKING ENHANCEMENTS

This feature provides the logical mapping of signaling information between the Q.931 ISDN access protocol and the SS7 ISDN-UP network transport control protocol. This includes the complete mapping of the messages, information elements/parameters and corresponding fields between these protocols for the establishment and clearing of basic circuit-switched calls. This feature also provides for the mapping of signaling information necessary to support a number of supplementary services, accessed by ISDN CPE through either a Q.931 PRI or a Q.931 BRI. The enhancements provided are as follows:

- ☐ Basic call setup enhancements

- ☐ User-to-user signaling
- ☐ Q.931 information element transport
- ☐ Unsuccessful call setup procedures
- ☐ Excessive call delay setup procedures
- ☐ Fast-connect.

99-5E-0690 RECENT CHANGE VIEW CONSOLIDATION

This feature consolidates multiple recent change views having duplicate view attributes with differing view keys into one RC view having optional keys.

99-5E-0691 SOFTWARE/HARDWARE DECOUPLING

This feature allows the creation of a single source/single object release of the *UNIX*® System RTR operating system which will be able to execute on any of the following 3B20D hardware platforms:

- ☐ 3B20D - standard memory
- ☐ 3B20D - extended main memory (EMM)
- ☐ 3B20D - very large main memory (VLMM).

A single source is achieved by modifying the release 6 version of the source along with microcode changes to be able to handle the differences in hardware.

99-5E-0693 GLOBAL RECENT CHANGE FOR LINES

This feature allows the OTC personnel to query the database for all lines that match specified query criteria and then update one or more attributes for the selected set of lines. This feature accomplishes global RC of a possibly large set of lines with as few as one or two user actions. The user is allowed to specify a release time and date for the database update job to run.

The query criteria are specified through an enhanced version of the A.2 multiple line query administrative view for general analog, ISDN, and packet line attributes. The changeable attributes are a limited subset of nonkey attributes found on the 1.6 composite line, 1.8 BRCS assignment, 23.2 DSL, and 23.8 DSL/BRCS assignment recent change views.

99-5E-0694 CIRCUIT-SWITCHED TRUNK (CST) CALLS

This feature provides call routing from end-users to enhanced service providers (ESPs) based on the dialed number. The CST service is provided by designating certain 5ESS® switch offices as CST tandem switches which provide a one-way trunk-side interface to ESPs. The CST tandems allow ESPs to receive calls from end-users served by the equal access end offices (EAEOs) and provides to the ESPs the dialed digits and optionally, the ANI information associated with the call.

Upon CST call originations, the CST tandem performs digit analysis on the dialed digits received from the EAEO and based on the results of the translations, routes the call to the appropriate ESP.

99-5E-0695 INCOMING TRUNK SERVICE EVALUATION (LOCAL)

This feature collects completion performance data on calls from inter-LATA carrier (IC) points of presence

(POP) where they enter the local exchange network, either at an access tandem (AT) or an equal access end office (EAEO). The data collected are used for the quality assessment of network service and directing quality control activities. The data are delivered to and analyzed by the No. 2 Service Evaluation System (SES).

The intent is to evaluate the completion performance of the office's subtending networks. Calls arriving over trunks connected to an IC are eligible for service evaluation. This includes trunks that use per-trunk multifrequency signaling as well as common channel signaling, but excludes operator, CAMA, and test calls. The sample of calls evaluated for a given trunk group is proportional to the traffic over that trunk group.

99-5E-0696 LIMITED INTRAGROUP ICLID

This feature is an existing terminating switch feature that limits ISDN and analog ICLID displays of calling DN to a business customer to calls that originate and terminate within the same business group based on a terminal group ID. If the call originator is POTS or does not belong to the terminator's terminal group, the calling DN will not be displayed but will be marked as private. Similarly, if the terminator is POTS or does not belong to a terminal group, the calling DN to that terminator will not be displayed but will be marked as private.

99-5E-0697 TERMINAL GROUP/STATION RESTRICTION FOR ISUP TRUNKS

This feature provides a multilocation business group arrangement without requiring CCS7 protocol changes. The concept of a business group (terminal group) is extended to allow members to be served by multiple switches. With this arrangement, parties with station restriction (for example, fully-restricted originating, fully-restricted terminating) can make and receive calls from other parties in the same multilocation business group even if the other parties are served by different switches. Station restrictions are still enforced for calls involving outside parties.

The BRCS and LASS features which utilize TGSR information function as though all parties were in the same business group. For example, call forwarding within-group-only, which requires that the forward-to party selected be in the users terminal group, allows parties to be selected who are in the same multilocation business group but served by other switches.

99-5E-0698 PRECOMPLIANT FEATURE GROUP B CARRIER IDENTIFICATION CODE EXPANSION

The carrier identification codes (CICs) are used in both dialing plans and signaling sequences to indicate the designated interexchange carrier for a call. Both feature group B (FGB) and feature group D (FGD) signaling require the use of these codes. Currently, FGB CICs are three digits long and provide an available 1000 codes. This feature is an interim solution for FGB CIC expansion and provides a minimum set of FGB capabilities as follows:

- ☐ Routing of 950-ZXXX (Z = 2-9, X = 0-9) to a trunk group to either an interexchange carrier or access tandem
- ☐ Generation of an FGB originating AMA record containing a 4-digit CIC.

Precompliant FGB CIC expansion utilizes 4-digit CICs. The assignment of 4-digit FGB CICs begins with 2XXX. All new and current 3-digit CICs are processed as they are currently.

99-5E-0699 AUTOMATIC NUMBER IDENTIFICATION OVER PRIVATE FACILITIES

This feature allows ANI, similar to the FGD format, to be outpulsed over dedicated, private, multifrequency trunking facilities to the private network. A private facility access code (PFAC) or ARS routes calls to the private facilities. The dialed number can be variable in length, not to exceed the private facility access limit (which is currently 15 digits). Outpulsed information is the ANI II digits, the 10-digit public billing number ANI followed by the dialed number.

10.2.30 5ESS[®] SWITCH FEATURES 99-5E-0700 - 99-5E-0799

99-5E-0700 5ESS[®] SWITCH OSO AMA RECORDING FOR ANI DELIVERY

This feature affects the way that AMA billing is done for certain types of OSO/INWATS calls. The feature lets an OSO record the sending of ANI digits when the terminating switch requires the OSO to pass ANI or when the terminating switch sends an indication to the OSOs that ANI has been delivered. Previously, there was no way for the OSO to record the fact that ANI digits were delivered. This feature only affects toll OSOs and is generally expected to be used when the terminating station is an ISDN PRI.

99-5E-0701 ENHANCED INWATS-TYPE AMA

This feature extends the usage of INWATS type AMA records. Previous features, the INWATS feature and the INWATS-type billing on outgoing DID trunk groups feature, provide the capability of obtaining INWATS-type AMA records on selected lines or trunk groups terminating on a 5ESS[®] switch. The EITA feature provides purchasing service providers with the additional capability of assigning alternate service feature code (ASFC) values in the range of 800-999 to INWATS simulated facilities groups (SFGs) in order to identify types of calls which can then receive special billing treatment.

A service feature code is an enumeration that defines special services associated with a call. The standard service feature code for INWATS calls, 008, is written into the service feature field of the AMA record for INWATS calls. Service providers which purchase the EITA special feature will have the ability to assign to any INWATS SFG, through recent change, an ASFC in the 800-999 range. Calls which terminate to these lines will have the ASFC written into the service feature field of the AMA record in place of the standard code in order to distinguish this type of call at the revenue accounting office (RAO). These calls can then be billed to the called party in ways that are different from INWATS, thus giving additional income opportunities to the service providers.

99-5E-0730 ANI6/ANI7 ON A TRUNK GROUP OR SIMULATED FACILITY GROUP

This feature provides the ability, based on the originating trunk group or simulated facility group, to optionally outpulse one of the following before the billing DN for call terminations to a CAMA, TSPS, local toll connect (LTOLLCON), or interexchange carrier (IEC) trunk class of service (that is, calls to operator systems):

- ☐ For ANI7, an ANI I-digit of "7" (or ANI II-digits of "07")
- ☐ For ANI6, an ANI I-digit of "6" (or ANI II-digits of "06").

These ANI digits indicate the requirements for special screening for calls originated by hotel/motel, cellular, OUTWATS, and PBX customers. This feature alleviates the substantial costs of "loop-around trunks" and special FX trunks otherwise required.

99-5E-0731 SPECIFYING A DAS ON AN SFG

This feature provides the capability of routing OUTWATS dial access calls through a different LDIT than the originating lines LDIT by specifying the specific DAS on an OUTWATS SFG. Currently, the 5ESS[®] switch allows changing the screening index on an OUTWATS SFG, but not on the LDIT.

99-5E-0732 MODIFIED CALLING LINE DISCONNECT PROCEDURE FOR FRAUD PROTECTION

This feature allows the 5ESS[®] switch to provide permanent signal treatment to a calling line when it remains off-hook and the called party line has gone on-hook. Following the expiration of the delay disconnect timer, the switch applies permanent signal treatment to the calling line. This forces the line to return to the on-hook state before a subsequent off-hook can be recognized as a new call origination.

99-5E-0733 CALL FORWARDING DON'T ANSWER INVOCATION AFTER CALL WAITING

This feature provides analog customers with an interaction between call forwarding don't answer and call waiting that did not exist previously. Subscribers with the new CFDA/CW operation can receive a call waiting tone, put their current call on hold and answer the call, or not answer the call and let CFDA call processing forward the call to a preselected directory number (DN). This interaction is limited to certain analog lines. It does not occur on LTSB, AUTOVON, or analog lines shared with ISDN DNs.

This feature is applicable to customers who subscribe to a CFDA feature and either have a terminating call waiting (CWT) feature or receive a call waiting originating or dial call waiting (CWO or DCW) from another party. No new features are required for this operation. The CFDA/CW feature provides analog users with functionality which is very similar to the ISDN CFDA interaction with flexible call offering. In addition, it provides a direct interface with voice messaging systems.

99-5E-0734 SINGLE RECENT CHANGE FOR INTERCEPT LINE ASSIGNMENT

This feature allows the LEC switch personnel to assign the office equipment number of an intercept line to a new line with a single RC operation. Prior to this feature, two separate recent changes were needed to accomplish this task. This feature covers both analog and ISDN lines.

99-5E-0735 DIRECT INTERFACE TO RNMS

Currently, the 5ESS[®] switch sends network management data to EADAS, which then sends that data on to EADAS/NM. The size of the 5ESS[®] switch systems which are deployed and the manner in which they are deployed in the network may make it more economical to develop a direct interface from the 5ESS[®] switch to EADAS/NM, or to a follow-on system, so that network management data can bypass EADAS. If the 5ESS[®] switch is deployed as a point of presence (POP) switch, there may be significant economic advantage (in terms of savings in access charges) in providing access network management through a direct interface from the 5ESS[®] switch to regional network operations centers.

With the 5E6 software release, the protocol handlers (PHs) (both the PH2 and PH3) support only one X.75', X.75, or internal protocol (IP) trunk member per PH. These three channel groups are referred to as "gateway channels." This feature provides the PH3 with the capability to support multiple gateway channels of the same type.

99-5E-0736 SUPPORT OF MULTIPLE ISDN TRUNK MEMBERS ON PH3

Prior to the 5E7 software release, the PH3 supports only one X.75', X.75, or internal protocol (IP) trunk group member per PH. Since the PH3 has a much greater capacity than the PH2, the PH3 is expanded to support multiple trunk group members of the same service class (that is, X.75, X.75', and IP). This makes the PH3 a much more cost effective component. It also means that one PH3 can replace several PH2s. A given PH3 supports members of different trunk groups as long as they are the same service class.

99-5E-0737 OPTIMIZATION OF SYSTEM INITIALIZATION

After an outage, switch restoration must occur in minimal time so that call processing and revenue generation can resume. This feature reduces the time it takes to pump SMs by using idle processor time during the pump to begin validating what was pumped (hashsum checks). It further reduces the time it takes to pump several SMs by pumping one SM while another is finishing up its hashsum checks. This feature should reduce the full office pump and initialization time up to 30 percent.

99-5E-0738 PROVIDE SHARED DN BRIDGING ONTO CONFERENCE CALLS

This feature allows users having shared call appearances of a directory number to bridge onto a conference call that was established at another terminal with an appearance of the same directory number. The number of users who can bridge onto the conference call is subject to the constraint that the number of

conferees plus bridgers cannot exceed 6.

99-5E-0739 ISDN MBKS PICK UP HELD CONFERENCE FROM SHARED DN CALL APPEARANCE

This feature allows a conference call to be set up at one ISDN station, put on hold there, and retrieved at another station that shares the same DN. For example, a school principal asks a secretary to set up a conference call with two or more other parties and then notify the principal when the call is ready to be picked up. The feature applies where both the principal and secretary have ISDN keysets containing call appearances of the same DN. The feature also applies where only the secretary has an ISDN keyset and the principal has an analog set sharing a DN with the secretary. This feature, which in effect transfers control of the conference call from the secretary to the principal, is closely related to 99-5E-0738 which allows a second person with a shared DN to bridge on and join into a conference call already established by a first person with an appearance of the same DN.

99-5E-0740 INCREASE DIRECTORY NUMBER GROUP SIZE - CUSTOM BRI VERSION

This feature increases the number of stations sharing a directory number from the current limit of 8 to 32. Only one of the stations may be an analog station; the remaining stations must be ISDN stations.

99-5E-0742 ADDITIONAL ASP CAPABILITIES

Advanced services platform (ASP) was offered in 5E6 as a set of service-independent network functions and interworking capabilities which optimize the ability of the service control point (SCP) to offer new features and services. This feature builds on the 5E6 offering, providing additional capabilities that allow support of a greater variety of services. The service-independent capabilities to be included in this set are as follow:

- ☐ Non-subscribed partial and full dialed number triggers (DNTs) allow ASP calls to be triggered at service switching points (SSPs) based on the analysis of dialed numbers or SCP returned routing numbers. When a call encounters a DNT, call processing is temporarily suspended to allow a provide-instructions-query to be launched to an SCP. When routing or announcement information is returned to the SSP by the SCP, call processing at the SSP resumes.

The LEC can designate the entire string or a particular leading portion (including as a minimum NPA, NXX, and NPA+NXX) of North American numbering plan (NANP) dialed numbers or 3-digit - N11 - dialed numbers as triggers for ASP call processing.

As an enhancement to ASP, DNTs can also be associated with terminal equipment. This allows the LEC to provision triggers for line subscribers without resorting to administratively expensive double-numbering schemes.

- ☐ Serial triggering capability can occur when the routing number provided by the SCP in a response to a query encounters another trigger at the SSP. The Serial triggering capability allows up to 3 triggers to be encountered serially on a call at an SSP before the call is routed. This capability accommodates interworking of multiple ASP-provided services on a single call.
- ☐ Enhanced feature interactions include improvements of existing feature interactions, elimination of restrictions for certain features, and new feature interaction capabilities. Examples of such feature interactions are ASP capabilities interworking with multiway calling (MWC) and coin calls.
- ☐ Enhanced call termination notification (TN) enables multiple TN inquiries by the SCP to be honored per ASP call. Additionally, TN is returned for ASP calls transferred or conferenced by the analog or ISDN MWC feature. The TN is also returned for ASP calls picked up by remote-hold retrieve on shared DN ISDN terminals.
- ☐ AMA service feature identification - The 5E6 ASP offering supports a limited AMA recording capability with regards to the service feature identification field. This is a 3-digit value returned by the SCP to the SSP in a connect response, if AMA billing is being used for the call. The 5E6 offering records only 2

digits of the 3-digit code in the AMA record for the ASP call. This enhancement allows the recording of the full 3-digit service feature identifier in the AMA record, exactly as received in the CCS7 TCAP response.

- ☐ Announcement enhancements - both the number of announcements that can be stored in the switch, and the number of announcements allowed per call are increased. This provides the LECs greater flexibility in providing interactive dialing services.
- ☐ Other enhancements include: ignoring unsupported TCAP parameters, increase in the number of ACG controls, new/realigned ASP measurements, SCP control of ANI used in signaling, and true OST in the query message.

99-5E-0744 LASS - BULK CALLING LINE ID

This feature provides call-related information on incoming calls for BRCS/centrex, multiline-hunt group (MLHG) and PBX customers. BCLID provides data-only for calls from outside the BRCS/centrex, from MLHG or PBX. PBX customers must either have DID capability or be part of an MLHG. The BCLID information includes the calling and called party directory numbers, the time the call was received, the calling line's multistatus indicator (indication whether the true calling party DN is identified), and the called line's busy/idle status.

For interoffice calls, BCLID requires use of CCS so that calling party information can be provided by the originating switch.

Information is transmitted from the terminating switch to the user's CPE shortly after each call is received. Such CPE, which may include computer terminals, minicomputers, magnetic tape devices or related equipment, translates and provides display or storage of transmitted BCLID data. Data is transmitted to the CPE over a dedicated data channel which supports asynchronous transmission. The transmission does not affect completion of any calls.

The data channel is an application processor interface (API) link that may terminate directly to an applications processor (AP), a CPE which accepts the API protocol or the API link may terminate to a 3A-translator which converts the API messages into 1A ESSTM switch equivalent (asynchronous, ASCII) BCLID output.

The BCLID feature can optionally provide the intra-group recording for BRCS/centrex and/or date (day and month).

99-5E-0745 ESSENTIAL SERVICE PROTECTION FOR BRI

Essential service protection (ESP) as provided in 5E1 to analog lines (feature 30-01-0200) is provided to ISDN basic rate subscribers. This feature ensures that a small number of essential ISDN subscribers receive priority originating service during periods of extreme overload for both voice and circuit-switched data bearer services. This feature also changes the priority of handling primary rate originations to trunk origination priority, thus giving primary rate originations a 2:1 preference over basic rate and analog line originations.

99-5E-0746 ATTENDANT GROUP OVERLOAD WARNING

The ISDN attendant group overload warning feature provides two indicators, one which lights when a specified queue fill threshold is exceeded, and the other which lights when the queue is completely full. A distribute point is closed when the queue is full permitting a remote alarm to be activated. This feature is intended for use by group administrators, but can be assigned to any attendant. An additional indicator is provided for DSN applications which lights when a precedence call is waiting in the queue. This indicator may be provided to any attendant handling precedence calls.

99-5E-0747 ATTENDANT OFFERED LOAD STATISTICS

This feature enhances the ISDN attendant number of calls on queue feature by adding queue overflow counts to the carried load and queue abandon counts. The statistics are provided by the switch on an attendant group basis, and displayed on the ISDN console display. Statistics are available on a 30-minute or daily basis as a customer option. This feature is intended for use by group administrators, but can be assigned to any attendant.

99-5E-0748 ISDN ATTENDANT REMOTE BUSY VERIFICATION

This feature extends ISDN attendant busy verification to users on other 5ESS[®] switches. A group of switches may provide ISDN attendant (ISAT) service to one or more customer groups. The 5ESS[®] switches in the network allow each ISDN attendant group to serve only their clients. With this feature, busy verify access to clients on remote switches is provided using dedicated ISAT busy verify trunks in the same terminal group as the ISDN attendant group. Clients on other 5ESS[®] switches must be in the same terminal group as the ISAT busy verify trunks which terminate on the remote switch. The remote clients will be verifiable if other conditions, identical to the conditions for a directory number to be verifiable on the attendant's home switch as implemented in software release 5E4, are met. Other aspects of the remote busy verify feature are similar to the intraswitch feature. The feature provides busy verify warning tone. The ISDN attendant is only allowed to remain on the connection for 30 seconds. The ISAT busy verify trunks are conventional (non-SS7) analog or digital trunks which are identified to the switch by a distinctive class of service. An ISAT busy verify trunk is similar to a no-test trunk, but is only accessible from an ISDN attendant console.

99-5E-0749 MATCHING LOSS MEASUREMENTS

This feature adds seven matching loss measurements to the 30-minute traffic report. These seven matching loss measurements include ☐ incoming matching loss, tandem matching loss, incoming first failure to match, intra-office matching loss, outgoing matching loss, originating matching loss, and terminating matching loss measurements.

Matching loss occurs when a call fails to find a path through the system's network on the final attempt. Losses due to resource failure (such as HLSC failure) are excluded from this count. Losses can occur due to any of the following reasons: unavailability of concentrator path, unavailability of PIDB time slots to an ISLU, unavailability of PIDB time slots to a DCLU, unavailability of time slots in the TSI-TMS-TSI path, unavailability of time slots on RSM umbilicals, and unavailability of ICL (inter-communication links) channels.

99-5E-0754 LOCAL CHARGE PREVENTION ON X.25 DTE

This feature prevents packet calls that must be paid for by the local data terminal equipment (DTE). It is supported through the X.25 facility called "local charging prevention" as specified by TSS and the Bellcore Technical Reference TR-TSY-000846. Local charging prevention is an optional user facility for virtual calls. This user facility, when subscribed to, authorizes the data circuit-terminating equipment (DCE) to prevent the establishment of virtual calls which the packet subscriber must pay for.

99-5E-0755 PACKET TRUNK INTERFACE STANDARDIZATION

This feature closely aligns the 5ESS[®] switch's implementation of X.75 and X.75' packet trunk groups with requirements in Bellcore TR 268, TR 301, and TR 448. The following capabilities are supported:

- ☐ Multiple X.75' packet trunk groups on a single 5ESS[®] switch
- ☐ Multiple X.75 packet trunk groups from a single 5ESS[®] switch to the same interexchange carrier
- ☐ Packet calls that enter through an X.75' packet trunk group on a 5ESS[®] switch and exit through

another X.75' packet trunk group on the same 5ESS[®] switch or a different 5ESS[®] switch

- ☐ Alternately route packet-switched virtual calls to a secondary trunk group (X.75, X.75', or internal protocol) if the primary trunk group (X.75 or X.75') is unavailable
- ☐ The following X.75' protocol elements:
 - ☐ Identification of the specific X.75 packet trunk which transports a packet-switched virtual call
 - ☐ Identification of the subnetwork (group of switches connected by internal protocol) that cleared the packet call
 - ☐ Transportation of a protocol conversion from another subnetwork.
 - ☐ The X.75 protocol element that carries an identification for an interexchange carrier selection.

99-5E-0759 5E6 TO 5E8 RETROFIT SKIP

This feature provides the ability to directly retrofit from 5E6 to 5E8 software release without going through the intermediate 5E7 software release. The feature includes the ODD and ECD off-site evolution, RC and CORC on-site evolution, retrofit procedures, tools, and other related software, etc. This retrofit skip transitions the 5E6 basic, standard, and loaded SMs to the SM configurations being defined by the 5E8 software release.

99-5E-0760 AUTOMATIC CALCULATION OF REX SCHEDULE

A routine exercise schedule should be calculated at the generation of the office ODD, based on the equipage of each SM. This feature allows automatic implementation of the REX scheduling rules to produce a schedule with maximum test capability and minimum resource contention.

99-5E-0770 BROADCAST PUMP OF SWITCHING MODULES

This feature modifies the normal (as opposed to the backup) pump algorithms to allow common data to be pumped in parallel to each switching module. Consequently, this feature reduces the office recovery, office retrofit, office update, and large terminal growth times. This feature reduces the 5E7 software release pump time by up to 55 percent for office recovery and 65 percent for software release retrofits depending upon the number and configuration of the switching modules. Remote switching modules will continue to be pumped serially.

99-5E-0775 AM/CM RE-SYNCHRONIZATION

This feature provides the ability to reestablish normal AM-CM operations without a CM hardware initialization, after memory clearing AM initializations or CM isolation. This is accomplished by reconstructing AM data (peripheral control data and inhibit status) from CM or SM comparable data. Since providing this feature for CM1 offices would require firmware changes, this feature is only provided for CM2 and CM2C offices.

99-5E-0776 DELIVERY OF TG MAINTENANCE BUSY COUNTS TO RNMS

This feature allows network managers to get a more accurate view of the traffic load on a trunk group (TG) by reporting the number of trunks per trunk group that are maintenance busy (that is, out of service). The feature allows a maintenance busy count to be collected for each TG scheduled for five-minute network management data collection. Since the maintenance busy count should be taken at the end of the 5-minute

interval, the switch now sends these counts as an additional count per TG for every TG scheduled for data collection.

99-5E-0777 NM DATA COLLECTION FOR 2000 TRUNK GROUPS

This feature increases the number of trunk groups for which network management (NM) data can be collected from the current number of 250 trunk groups to 2000. The data corresponds to Package 17, trunk group measurements. To save space, Package 18, trunk group flags, is unlinked from the trunk group schedule. Only trunk groups affected by automatic controls during the previous interval are reported in package 18. This information is reported as part of the 5-minute report to the NM report.

99-5E-0778 RETROFIT MENU PAGE ENHANCEMENTS

This feature provides automatic configuration of the retrofit menu page for tape loading during the software release retrofit, update, and large terminal growth processes. It also provides improved checking during the tape loading process to help prevent tape loading errors.

99-5E-0779 FAST SOFTWARE TRANSITION TAPE READ

This feature provides a significant performance improvement for tape reads used in the software release retrofit, update, and large terminal growth processes. The performance improvement varies depending on tape drive equipage. Users should expect a performance improvement of at least 20 percent.

99-5E-0781 EXPANDED RANGE FOR SERVICE INDICATOR CODE (SIC)

This feature expands the range of service indicator codes that the 5ESS[®] switch receives in the INWATS success message. Currently, the 5ESS[®] switch performs an OSO role for 800 traffic. The ASN elements, that is, the 4ESS[™] switch and the INWATS database (IDB) NCP, use an expanded SIC field contained in the INWATS success message. The 5ESS[®] switch receives the expanded SIC field and populates the associated AMA records with the expanded SIC field values. The current 5ESS[®] switch capability allows an SIC field range of 16 values. The expanded SIC field range is 64 values.

With this feature, the ASN converts to the expanded SIC field in the INWATS success message. All 5ESS[®] switches serving as Toll or OSPS switches within the ASN must support the expanded range of the SIC field.

99-5E-0784 TANDEM ACCESS FOR INTER-LATA SENT-PAID COIN CALLS

This feature provides a modified equal access (EA) signaling protocol for sent-paid coin calls. This new protocol, modified equal access (MEA) signaling, can be specified on dedicated trunks used for sent-paid coin traffic between the following:

- ☐ End office and a carrier
- ☐ End office and an access tandem (AT)
- ☐ AT and a carrier.

The MEA signaling includes the XXX of the destination carrier in the first stage of outpulsing, allowing coin calls to multiple ICs/INCs to be routed over a shared (coin) trunk group from an equal access end office (EAEO) to an AT. The TAISP feature also supports the MEA signaling when used on direct trunking between an EAEO and an IC/INC, and also when used on trunking connections through an AT.

This feature does not eliminate or replace any existing forms of signaling arrangements. Operator systems signaling as well as equal access signaling without the enhancement provided by this feature will continue to be supported.

99-5E-0788 1+ BLOCKING AND 1+ SPLIT BLOCKING

This feature provides a capability to allow credit card, collect, or third-party billing inter-LATA calls using alternate carriers from lines presubscribed to a particular carrier while blocking nonoperator (1+) calls. This feature provides an option to either block all nonoperator inter-LATA calls or only those calls from an alternate carrier. Intra-LATA calls are not affected by this feature.

Full 1+ blocking functionality will be assigned if all nonoperator inter-LATA calls are to be blocked. Split 1+ blocking functionality will be assigned if inter-LATA calls using a presubscribed carrier need not be blocked while blocking inter-LATA nonoperator calls from an alternate carrier. Blocked calls will be routed to tones and/or an announcement at the Telephone Company's option.

99-5E-0789 CALLING PARTY NUMBER PRESENTATION

This feature enhances the existing DN privacy features by modifying the existing per-call privacy and all-call privacy features. This feature allows greater levels of granularity when assigning privacy to lines.

The CPNP feature provides six basic changes to the existing DN privacy features. These are as follow:

- ☐ Changes the existing all-call privacy precedence list and the per-call privacy toggle precedence list.
- ☐ Modifies the all-call privacy indicator to explicitly mark lines as "PUBLIC", "PRIVATE", and "NOT_SET".
- ☐ Expands the use of per-call privacy to lines with service classes of coin, charge-a-call, 2-party, and hotel/motel.
- ☐ Provides a new privacy indicator for all-call and per-call privacy on a screening index basis.
- ☐ Allows or blocks access to per-call privacy to a group of lines by screening index.
- ☐ Provides an uninterruptible announcement when the per-call privacy toggle access code is dialed and access is denied.

99-5E-0790 UNIDENTIFIED CALL REJECTION

This feature provides the called party with the ability to reject calls if the calling number has been marked as private. Calls which are rejected by UCR are provided with an uninterruptible announcement (for example, 13A), and the called party is not alerted.

99-5E-0791 REMOVAL OF ISDN CUSTOMER-ORIGINATED TRACE AGENCY FOLLOW-UP NUMBER

This feature eliminates the requirement that an agency follow-up number be specified by the service provider when provisioning customer originated trace (COT).

The default ISDN display message given to users when they invoke COT will be modified so that a follow-up number is not displayed if none has been specified.

99-5E-0792 CALLING LINE SIDE SUPERVISION

This feature allows the 5ESS® switch to provide battery reversal to an intelligent CPE device indicating that the called party answered (went off-hook). The battery is left in this reversed state until a subsequent on-hook is detected. Once a called party on-hook is detected the switch will reverse the battery again (returning the battery to normal) to the CPE indicating that the called party has disconnected from the call.

This battery reversal assumes that the calling party is still off-hook. Battery reversals can take place any number of times during the call.

Intelligent CPE devices will be able to detect the battery reversals and will use this information to better understand the called party status during the call. This feature will have no effect on normal POTS phones and does not apply to calls made to destinations that do not return answer supervision or disconnect indication to the switch. Some examples of intelligent CPE devices are customer-owned, coin-operated telephones, mass calling devices, and intelligent PBXs.

99-5E-0793 CALLING PARTY DISCONNECT INDICATION

This feature provides an indication to the called party as soon as the called party's switch recognizes the calling party has disconnected. The indication that the switch will give is a short open interval, that is, removal of central office battery. This indication is followed by the existing 10-12 second disconnect timing followed by the appropriate disconnect treatment. This disconnect treatment is usually dial tone, except for manual and direct connect lines which receive permanent signal treatment (reorder or announcement).

The particular application of interest is automatic equipment which handles incoming calls (for example, an answering machine or a key system). The existing indication that the calling party has finished is an open interval followed by dial tone, normally given to the line after 10 to 12 seconds delay. The immediate open interval allows the automatic equipment to react sooner, thereby decreasing wasted occupancy of the line.

99-5E-0794 PRIVATE OPTION FOR LAST INCOMING NUMBER

This feature ensures that the calling party number is not revealed and is treated as private by:

- ☐ LASS automatic callback
- ☐ LASS automatic recall
- ☐ LASS screen list editing.

The number is treated as private by these features even if the calling party had not marked the number as private.

99-5E-0795 OPERATOR LINE VERIFICATION INTERACTION WITH CALL FORWARDING BUSY LINE

This feature allows an operator to verify the busy/idle status of a line that has CFBL active on it. The feature allows an operator to override the CFBL feature and interrupt (barge-in) the busy line with CFBL active in an emergency situation.

99-5E-0796 AM BASED PROTOCOL MONITORING TRANSLATOR

This feature provides a translator tool based in the AM for protocol monitoring. Currently, protocol monitoring data is dumped in hexadecimal. This tool takes this data and translates it into a user readable format.

99-5E-0797 ISDN ATTENDANT CONSOLE - 20 HUNDRED GROUP SELECTOR BUTTONS

This feature increases the number of hundred group selector (HGS) buttons supported by the 5ESS[®] switch from 8 to 20. The HGS buttons are part of the ISDN attendant console's direct station selector, and each allows the attendant to monitor the busy/idle status of a specific block of 100 directory numbers (that is, DNs NXX-X00 through NXX-XX99).

99-5E-0798 CONTIGUOUS STORAGE OF DATA ON TAPE

A file system partition on disk may contain unused blocks and used blocks. Current backup procedures copy both the used and unused blocks on to tape.

This feature enables only the used portions of a disk file to be stored on tape. This is made possible by adding the ,SKP option to the COPY:BKDISK command. When the partitions are restored, the data blocks are put back in their original positions on the disk.

The time to retransfer SM ODD from disk to tape is reduced by approximately 50 percent. Benefits to AM text, AM ODD, and SM text are approximately 10 percent.

99-5E-0799 REMOTE PROTOCOL ANALYSIS BY RMS-D3

This feature is a test device that provides digital testing, echo canceler testing, trunk testing, and special service circuit testing capabilities on the 5ESS[®] switch.

This feature allows the RMS-D3 to access the B and D channels of a PRI to perform both monitoring and split access testing.

The 5ESS[®] switch receives commands from the RMS-D3 and provides the digital capabilities to conduct monitoring and split access testing of B or D channels of a PRI, such as: monitoring on digital channel, split test access on digital channel, and digital seize without outpulsing.

10.2.31 5ESS[®] SWITCH FEATURES 99-5E-0800 - 99-5E-0839

99-5E-0800 METRO HUB

This feature allows PRI trunks to be assigned to centrex business groups (terminal groups) and applies the limited intragroup ICLID (LIGI) feature to calls terminating to these trunks. With this feature a terminal group may contain a mixture of ISDN lines, analog lines and certain other trunks including the PRI trunks.

99-5E-0801 CONDITIONAL NOTIFICATION CLASS OF SERVICE

This feature enhances the 5E5 on demand B-channel packet feature (99-5E-0535) according to requirements in Bellcore TR 268 and is relevant only if the switch offers the packet call over an on-demand B-channel or a D-channel.

For on-demand B-channel calls, the switch attempts to offer the call to an on-demand B-channel connected to the packet handler. If there is no such B-channel available, the switch attempts to find an idle on-demand B-channel. If found, the switch notifies the user through Q.931 signaling procedures that there is an incoming packet call. (The method of notification to the end-user is CPE dependent). If the user wants to accept the call, the switch connects the B-channel to the packet handler and offers the call. If no idle on-demand B-channel can be found, the switch clears the packet call.

To receive D-channel calls, the called terminal must have identified itself to the switch as available for D-channel packet data calls. If that identification has taken place, the switch delivers the packet data call. If that identification has not taken place, the switch notifies the user through Q.931 signaling procedures that there is an incoming packet call. If the user wants to accept the call, and the terminal properly identifies itself to the switch, the switch offers the call.

The AMA recording for on-demand B-channel packet calls is carried out according to requirements in Bellcore TR 862.

99-5E-0802 ACTIVE CHANNEL SELECTION FOR X.25 CALL DELIVERY

This feature is based on requirements in Bellcore TR 268 and allows the user to subscribe to a single DN for all packet services. Prior to this feature, the user needed a DN for packet on the D-channel and another DN for packet on the B-channel. With the active channel selection for X.25 call delivery feature, additional

criteria besides the called address are used to identify the channel (B or D) on which the packet call should be delivered. These additional criteria are:

- ☐ Throughput class indication of D-channel parameter - allows the customer to tell the switch when to offer a packet call on their D-channel and when to offer a packet call on their B-channel. If the throughput for the call is less than or equal to this parameter, the call is offered on the B-channel. If the throughput is greater than the parameter, the call is offered on the D-channel.
- ☐ If the throughput for the call is less than or equal to this parameter, the call is offered on the D-channel. If the throughput is greater than the parameter, the call is offered on the B-channel.

99-5E-0803 SUBSCRIPTION TO NUMBER OF ON-DEMAND B-CHANNELS FOR PACKET

This feature is based on requirements in Bellcore TR 268 and allows the user to subscribe to 0, 1, or 2 on-demand B-channels for packet data. The value selected applies to both the incoming and outgoing direction (for example, if the user selects a value of 2, both B-channels can be accessed for incoming and/or outgoing packet data).

99-5E-0804 USER TESTING CAPABILITIES

This feature is based on requirements in Bellcore TR 301 and TR 846 and allows the user to test either the B- or D- channel by placing a call to that user's own DN.

99-5E-0805 ISDN PACKET-SWITCHED DATA BUSINESS GROUP (PBG) ENHANCEMENTS, ABBREVIATED DIALING, AND ABBREVIATED NUMBER DELIVERY

This feature provides the following three services which are defined according to requirements in Bellcore TR 849, TR 850, and TR 860, respectively.

The packet-switched data business group (PBG) service enables the local exchange carrier (LEC) to construct and administer up to 100 intraswitch PBGs. The LEC may assign to each PBG the following items which once assigned apply to all members of that particular PBG:

- ☐ Group Identifier - identifies the group and each member in the PBG
- ☐ Simulated Facility Group for Packet Switched Calls - limits the switch resources used by the PBG
- ☐ Billing Telephone Number - identifies the PBG and appears in the Bellcore compliant AMA records
- ☐ AMA Flag - indicates whether AMA records are generated for intra-PBG calls
- ☐ Abbreviated Dialing - indicates whether or not the PBG subscribes to this service
- ☐ Abbreviated Number Delivery - indicates whether or not the PBG subscribes to this service.

The abbreviated dialing service allows members of the PBG to originate calls using a subset of the called user's number (anywhere from 1 to 6 digits). If both abbreviated dialing and abbreviated number delivery are assigned to the PBG, the called user receives an abbreviated number of the calling party for intra-PBG calls.

For calls from members of the PBG, the LEC has the option to bill according to AMA recording requirements in Bellcore TR 862, TR 849, and TR 850.

99-5E-0806 STANDARDIZED ISDN PACKET MULTILINE HUNT GROUP (MLHG)

This feature provides an ISDN packet-mode multiline hunt group that more closely aligns with Bellcore description of a packet-mode multiline hunt group in TR 859. An MLHG can be made up of different channel types (for example, Member 1 could be a B-channel, Member 2 could be a D-channel, and Member 3 could be an XAT). This feature provides:

- ☐ Linear Hunting - A call starts hunting with the member number associated with the dialed DN and ends hunting with the last member of the hunt group.
- ☐ Uniformly Distributed Hunting - Calls are evenly distributed among members of the hunt group.
- ☐ Members of the hunt group with the option to subscribe to on-demand B-channel packet switching.
- ☐ The capability to provision nonhunt DN's to members of the hunt group.
- ☐ The capability to add/delete members to/from a hunt group.
- ☐ The capability to activate and deactivate members of a hunt group.
- ☐ Members of the hunt group with the option to subscribe to packet features on both the B- and D-channels.
- ☐ A busy limit parameter for members of the hunt group. This parameter determines the number of calls a member can have active at one time.

99-5E-0807 PACKET TRUNK ENHANCEMENTS

This feature improves the current X.75 and X.75' packet trunk interfaces following requirements in Bellcore TR 301. The following enhancements are supported:

- ☐ The network user identification (NUI) is handled over an X.75 or X.75' interface. The NUI allows a packet user to charge the packet-switched virtual call to an authorized credit card number specified in the NUI.
- ☐ Closed user group screening is carried out over an X.75 interface. This screening provides a means of controlling both incoming and outgoing X.75 packet traffic.
- ☐ If the switch receives an X.75 or X.75' packet call whose call identification (code that uniquely identifies this call for a 24 hour period) is all zeroes, a unique call identifier is substituted into the protocol before the call is passed on.
- ☐ The logical channels for X.75' interfaces are assigned as is currently done for X.75 interfaces (for example, a range to incoming packet calls and a range to outgoing packet calls).
- ☐ The feature retains the local exchange carrier (LEC) option that allows the pre-1988 packet features to go either before or after the appropriate marker in the protocol. However the default for this option is changed from "before" to "after."
- ☐ When provisioning new X.75' packet trunk groups, the default values for the various X.75' packet features (for example, packet size indication, window size indication) are now set to "on."
- ☐ The feature provides the LEC with the option to decide on a per X.75 interface basis whether to:
- ☐ Delete or retain the recognized private operating agency (RPOA) piece of the protocol before sending the call over another X.75 trunk (the RPOA specifies the interexchange carrier to be used for the call)
- ☐ Accept or clear an incoming X.75 packet call when the RPOA is included in the protocol.

The feature provides the LEC with the option to designate the transit network identification (TNI) parameter as "shared" or "unique" on a per X.75 basis. (The TNI identifies the networks that have acted as tandem networks for the call). For incoming X.75 calls that have duplicate TNIs in the protocol, and the "shared" option has been chosen, the LEC needs to verify that this TNI is allowed to be duplicated before sending the call on; if duplication is not allowed, the call is cleared. If the "unique" option has been chosen, no special screening is necessary. This feature also includes the following enhancements:

- ☐ Multiple X.75' interfaces per 5ESS[®] switch
- ☐ Multiple X.75' interfaces to a single Public Packet Switched Network
- ☐ Multiple X.75 interfaces to a single Inter-Exchange Carrier
- ☐ X.75' to X.75' Permanent Virtual Circuit and transit switching
- ☐ Alternate routing for X.75 and X.75' packet calls
- ☐ Intra-LATA Competition screening on X.75
- ☐ Pseudo DNIC not longer allowed

The AMA recording is aligned with requirements in Bellcore TR 862 and TR 301 when the network user identification is present and an indication to reverse charge is either:

- ☐ Not present
- ☐ Present but is not accepted
- ☐ Present and is accepted.

In addition, the AMA recording that is carried out at the X.75 packet trunk interface is altered according to requirements in Bellcore TR 862. The X.75 interface identifier is now recorded for all X.75 calls and the LEC may now provision on an X.75 interface basis what packet segment size will be used for AMA recording.

99-5E-0808 STANDARDIZATION OF ISDN BASIC CALL CONTROL FOR CIRCUIT-SWITCHED VOICE AND DATA CALLS

This feature lets the local exchange carriers achieve terminal compatibility as defined by Bellcore TR 268. Terminal compatibility allows an ISDN terminal to be ported between different vendor switches that support the standard ISDN basic call control capability. To support terminal compatibility, this feature standardizes the signaling content and procedures that are used for a basic call origination and termination (for example, call setup messages).

99-5E-0809 STANDARDIZATION OF TERMINAL INITIALIZATION AND TERMINAL MAINTENANCE

This feature follows the protocol described in Bellcore TR 847 and allows 1 to 8 standard terminals per interface to each identify itself to the switch and be associated with a set of services which its end-user has subscribed to.

99-5E-0810 BELLCORE STANDARDIZATION OF STIMULUS FEATURES

This feature alters the signaling that supports the following features based on requirements in Bellcore TR 861 and TR 847. Since this feature set is based on features offered for custom ISDN, only those features whose definition has changed are defined here. The others carry references to the custom ISDN definition which applies as follows:

- ☐ Call Forwarding Variable (circuit-switched voice and data) - (01-02-1401/01-02-1401A)
- ☐ Call Forwarding in a Group (circuit-switched voice and data) - (02-01-1102)
- ☐ Call Forwarding Incoming Only (circuit-switched voice and data) - (02-01-1101)
- ☐ Call Forwarding Busy Line (circuit-switched voice and data) - (01-02-1404)
- ☐ Call Forwarding Busy Line Incoming Only (circuit-switched voice and data) - (02-01-1103)
- ☐ Call Forwarding Don't Answer (circuit-switched voice and data) - (01-02-1407)
- ☐ Call Forwarding Don't Answer Incoming Only (circuit-switched voice and data) - (02-01-1104)
- ☐ Remote Call Forwarding (circuit-switched voice) - (01-02-1402)
- ☐ Remote Access to Call Forwarding (circuit-switched voice) - (01-02-1409)
- ☐ Call Pickup Originating (circuit-switched voice) - (01-02-2801)
- ☐ Call Pickup Terminating (circuit-switched voice) - (01-02-2801)
- ☐ Directed Call Pickup with Barge-In (circuit-switched voice) - (01-02-2802)
- ☐ Directed Call Pickup without Barge-In (originating) (circuit-switched voice) - (01-02-2803)
- ☐ Trunk Answer from Any Station (circuit-switched voice) - (02-01-0800)
- ☐ Code Calling (circuit-switched voice) - (03-04-0100)
- ☐ Loudspeaker Paging (circuit-switched voice) - (03-04-0300)
- ☐ ISDN Attendant Busy Verify ISDN Line (terminating)(circuit-switched voice) - (99-5E-0379)
- ☐ ISDN Attendant Emergency Override ISDN Line (terminating)(circuit-switched voice) - (99-5E-0380)
- ☐ Block Directed Call Pickup Without Barge-In (terminating)
- ☐ Automatic Recall (circuit-switched voice) - This feature is similar to the LASS automatic recall feature (99-5E-0526) except that once the far end is idle, the user of automatic recall is notified via Q.931 signaling procedures independently of the busy/idle status of the line. (The method of notification to the end-user is CPE dependent).
- ☐ Automatic Recall (circuit-switched data) - This feature works similarly to the automatic recall for circuit-switched voice and enables the ISDN user to place a call to the DN of the last party called by the user. (If only automatic recall for circuit-switched data is subscribed to, the user can only recall intraswitch circuit-switched data calls.) If the call cannot be completed because the DN is busy, the user camps-on to that DN. Once that DN becomes idle, the switch notifies the end user through Q.931 signaling procedures whether the user is busy or idle, and the user may choose to be connected to that DN or not.
- ☐ Customer Originated Trace (COT) - (99-5E-0527)
- ☐ Individual Calling Line Identification (ICLID) - (99-5E-0528)
- ☐ Automatic Callback (AC) - (99-5E-0529)
- ☐ Selective Call Rejection (SCR) - (99-5E-0592)

- ☐ Selective Call Acceptance (SCA) - (99-5E-0593)
- ☐ Selective Call Forwarding (SCF) - (99-5E-0595)
- ☐ Selective Distinctive Alert (SDA) - (99-5E-0596)
- ☐ Computer Access Restriction (CAR) - (99-5E-0601)
- ☐ Screen List Editing (SLE) - (99-5E-0656)
- ☐ Linear Hunting (circuit-switched voice and data) - (01-02-0802)
- ☐ Circular Hunting (circuit-switched voice and data) - (01-02-0803)
- ☐ Uniform Hunting (circuit-switched voice and data) - (01-02-0805)
- ☐ Stop Hunt (circuit-switched voice and data) - (01-02-0806)
- ☐ Make Busy (Group, Member (01-02-0809), Random (97-5E-0419)) - (circuit-switched voice and data)
- ☐ Nonhunt (circuit-switched voice and data) - (99-5E-0483)
- ☐ Queuing Monitor (circuit-switched voice and data) - (99-5E-0623)
- ☐ Delay Announcement for Queued Calls on Hunt Group (circuit-switched voice) - (01-02-0808)
- ☐ Message Waiting Indicators (circuit-switched voice) - (99-5E-0440)
- ☐ Call Coverage (circuit-switched voice)
- ☐ User Message Waiting Indication Deactivation (circuit-switched voice) - (03-02-0900)
- ☐ Queuing for Lines (circuit-switched voice and data) - (01-02-0807)
- ☐ Queuing for Lines with Call Waiting Lamps (circuit-switched voice and data) - (99-5E-0368)
- ☐ Queuing for Lines with Delay Announcements (circuit-switched voice)- (01-02-0808)
- ☐ Queuing for Uniform Call Distribution Data Hunt Groups (circuit-switched voice and data) - (99-5E-0522)
- ☐ Critical Interdigit Timing (circuit-switched voice) - (30-07-0200)
- ☐ Group Numbering Plan (circuit-switched voice) - (02-01-0200)
- ☐ Attendant Control of Facilities (circuit-switched voice) - (99-5E-0364)
- ☐ Customer Access Treatment Code Restrictions (circuit-switched voice) - (02-01-0700)
- ☐ Intercom Dialing (circuit-switched voice) - (02-01-0300)
- ☐ Dial Access to Private Facilities (circuit-switched voice) - (01-02-2006)
- ☐ Access to Attendant (circuit-switched voice)
- ☐ Redefinition of Access Codes (circuit-switched voice)
- ☐ Overriding Special Dialing Plan (circuit-switched voice)
- ☐ Business Group Line (circuit-switched voice and data) - (02-01-0100)

- ☐ Unrestricted Originating and Terminating (circuit-switched voice and data)
- ☐ Semirestricted Originating and Terminating (circuit-switched voice and data) - (02-01-0400)
- ☐ Fully Restricted Originating and Terminating (circuit-switched voice and data) - (02-01-0500)
- ☐ Centrex Complex (circuit-switched voice and data) - (03-01-0500)
- ☐ Special Intercept Announcement (circuit-switched voice) - (02-01-1200)
- ☐ Speed Calling (circuit-switched voice and data) - (01-02-1101A)
- ☐ Customer Changeable Speed Calling (circuit-switched voice and data)- (01-02-1102/01-02-1102A)
- ☐ Code Restriction (circuit-switched voice) - (01-02-0700)
- ☐ Message Detail Recording (circuit-switched voice and data) - (03-03-0700)

99-5E-0811 MULTIPLE CALL SERVICES FOR TERMINAL PORTABILITY

This feature alters the signaling that supports the following features according to requirements in Bellcore TR 205. The following feature definitions are the same as those associated with the custom ISDN feature set despite the signaling change. Therefore, only the following reference to the custom ISDN definition is provided:

- ☐ Multiple DNs (99-5E-0319)
- ☐ Shared Call Appearances of a DN (99-5E-0320)
- ☐ Bridging (99-5E-0346)
- ☐ Delayed and Abbreviated Ringing (99-5E-0338)
- ☐ Bridging Call Exclusion (99-5E-0331)
- ☐ Hold (99-5E-0323)
- ☐ Intercom Calling (Automatic Intercom, 1-Digit Intercom, and 2-Digit Intercom [99-5E-0635])

In addition, multiple call services for terminal portability provides the following new features according to the signaling requirements in Bellcore TR 205:

- ☐ Call Appearance Call Handling Electronic Key Telephone Service (99-5E-0321)
- ☐ Electronic Key Telephone Service (*EKTSTM*) Subfeatures
- ☐ Basic *EKTSTM* - A terminal is restricted to only one call appearance of a DN, but the call appearance may be shared by other terminals. A basic *EKTSTM* terminal may have multiple DNs.
- ☐ Notification of Bridging - When a user in an *EKTSTM* group bridges on to a call, the terminals that are active on that call are notified via Q.931 signaling procedures. (The method of notification to the end-user is CPE dependent).
- ☐ Notification for Call Exclusion - When a user in an *EKTSTM* group enables or disables privacy for a call, all terminals that are part of that *EKTSTM* group are notified through Q.931 signaling procedures. (The method of notification to the end-user is CPE dependent).

- ☐ Additional Call Offering for Voice - The ISDN user is notified via Q.931 signaling procedures that there is a circuit-switched voice call waiting to be answered. (The method of notification to the end-user is CPE dependent). Upon receipt of that notification, the user can choose to answer the incoming call or not.
- ☐ Additional Call Offering for Data - The ISDN user is notified via Q.931 signaling procedures that there is a circuit-switched data call waiting to be answered. (The method of notification to the end-user is CPE dependent). Upon receipt of that notification, the user can choose to answer the incoming call or not.
- ☐ Call Hold for Data - The ISDN user can place a circuit switched data call on hold and subsequently retrieve the call.

99-5E-0812 OA&M FOR TERMINAL COMPATIBILITY

This feature extends the existing 5ESS[®] switch OA&M capabilities (through 5E7) to standard interfaces. Most OA&M capabilities that are currently supported for custom interfaces are available for standard interfaces with the exception of some maintenance functions (for example, digital loop backs at customer premises equipment and access to the basic rate interface test line). These functions cannot be accomplished using the protocol specified in the Bellcore ISDN TRs. In addition, this feature adds new 5ESS[®] switch OA&M capabilities (for example, detection of incorrect connections of a standard terminal on a custom interface or the detection of a custom terminal on a standard interface).

99-5E-0813 FLEXIBLE CALLING

This feature alters the signaling that supports the conference, transfer, and drop features based on requirements in Bellcore TR 858 and TR 847. These features' definitions are substantially the same as the custom ISDN feature definitions. The feature number identifies the custom ISDN feature and definition:

- ☐ Conference Features - With National ISDN-1, the end-user must select a new call appearance before adding an additional party to the call and presses the conference button once instead of twice. For example, to perform a three-way call, the user places a call, presses the conference button, presses a second call appearance (which places the first call on hold), makes a second call, and presses the call appearance associated with the first call which joins all parties.
- ☐ Three-Way Calling (01-02-1301/01-02-1301A)
- ☐ Six-Way Calling (01-02-2600)
- ☐ Add-On Consultation Hold Only (01-02-1301/01-02-1301A)
- ☐ Bridging from ISDN Call Pickup

Transfer Features - With National ISDN-1, the end-user must select a new call appearance before adding an additional party to the call. For example, to perform a transfer, the user presses the transfer button which will place the existing call on hold, selects another call appearance, makes a call to the intended transferred to party, and presses the transfer button again which will transfer the existing call.

- ☐ Call Transfer Individual All Calls (01-02-1302)
- ☐ Call Transfer Internal Only (02-01-1304)
- ☐ Call Transfer Outside (01-02-1302A)
- ☐ Call Transfer Individual Incoming Only (02-01-1305)

- ☐ Call Transfer Attendant (02-01-1303)
- ☐ Drop (99-5E-0333).

99-5E-0814 BELLCORE STANDARDIZATION OF STIMULUS SIGNALING

This feature changes the signaling which is used between the switch and a "dumb terminal" (that is, one that does not track the order of messages sent to or received from the switch) according to requirements in Bellcore TR 847. The areas affected include signaling procedures where:

- ☐ ISDN features are available by dialing an access code
- ☐ ISDN features are accessed by pressing a feature button
- ☐ Additional information is supplied to the switch beyond the access code or feature button (for example, providing a forward-to DN).

99-5E-0815 HOLD CAPABILITY FOR CSD

This feature is based on requirements in Bellcore TR 856 and allows an ISDN user on a standard BRI to place an in-progress circuit-switched data call on hold. The user can subsequently retrieve this call.

99-5E-0816 BELLCORE STANDARDIZATION OF DISPLAY CAPABILITY

This feature alters the protocol and message formats used to display call-related information to the end-user for a basic circuit-switched voice and data call. The protocol and message formats follow requirements in Bellcore TA 865.

- ☐ Individual calling line identification display information for a basic call termination (circuit-switched voice and data) includes the following call-related information for the end-user:
 - ☐ Call appearance identification [applies only to those with call appearance call handling electronic key telephone service (99-5E-0321)]
 - ☐ Calling DN
 - ☐ Date and time of call
 - ☐ Identification of whether the call is an external incoming or internal incoming call.

Outgoing called line identification display information for a basic call origination (circuit-switched voice only) includes the following call related information for the end-user:

- ☐ Call appearance identification [applies only to those with call appearance call handling electronic key telephone service (99-5E-0321)]
- ☐ Called DN
- ☐ Identification of whether the call is an external outgoing or internal outgoing call

Redirecting number and redirecting reason display information for a basic call termination (circuit-switched voice and data) includes the following call-related information for the end-user:

- ☐ Calling DN

- ☐ Original called DN (original redirecting or forwarding DN)
- ☐ Original redirecting reason (call forwarding all, call forwarding busy, call forwarding no reply, or call pickup).

This feature also includes the DN privacy feature but it causes no changes to the custom ISDN feature (99-5E-0528).

99-5E-0817 ENHANCEMENTS TO INTRASWITCH AUTOMATIC RECALL - ISDN FOR CSD

This feature works similar to automatic recall for voice (99-5E-0526) and follows requirements in Bellcore TR 855. This feature lets the ISDN user place a call to the DN of the last party called by the user. (If only automatic recall for circuit-switched data is subscribed to, the user can only recall intraswitch circuit-switched data calls.) If the call cannot be completed because the DN is busy, the user may camp-on to that DN. Once that DN becomes idle, the switch notifies the end-user through Q.931 signaling procedures whether the user is busy or idle and the user may be connected to that DN. (The method of notification to the end-user is CPE dependent). For example, a user can camp-on to obtain a computer port when all the ports are busy.

The local exchange carrier has the option to provide detailed AMA recording of the activation and resolution (reasons automatic recall no longer remains in effect) information associated with automatic recall for circuit-switched data. The AMA recording is performed according to AMA recording requirements in Bellcore TR 855 and TR 862 whenever the activation results in a billable call.

99-5E-0818 ISDN CALLING NUMBER IDENTIFICATION SERVICES (I-CNIS)

This feature is based on requirements in Bellcore TR 860. This service offers all the functionality of the 5E6 calling party number/billing number transmittal in 5ESS[®] switch private network environment feature (99-5E-0550). In addition, the following new features are provided for both circuit-switched voice and data calls:

- ☐ Calling Party Subaddress (CgPS) Transfer and Delivery:

With this feature, the CgPS, which is another way of identifying the calling party, is transported from the calling party to the called party for both intraswitch and interswitch calls, an enhancement to the 5E6 calling number delivery feature.

- ☐ Redirecting Number Delivery:

For calls that have been forwarded to the called party, this feature delivers the first forwarding number and the associated reason for forwarding (for example, call forwarding busy) to the called party provided this user has subscribed to this feature. In the case of sequential forwardings, the last forwarding number and the associated reason for forwarding will be delivered in addition to the first forwarding number and the associated reason for forwarding.

Separate daily AMA records are created for circuit-switched voice and data calls regarding the delivery of the calling party's number. There is a daily AMA record created at the terminating side of the call for the successful delivery of the calling party's number and an AMA record created for the unsuccessful delivery of the calling party's number.

99-5E-0819 ISDN AMA COMPLIANCE FOR ISDN INTERWORKING

This feature enhances the current AMA recording that is done in interworking situations [that is, an ISDN

originated call encounters non-ISDN signaling in the network (for example, terminating to a non-ISDN terminal)]. These situations are identified for both intraswitch and interswitch calls and recorded in the AMA record according to requirements in Bellcore TR 862.

99-5E-0820 ISDN BASIC RATE INTERFACE ACCESS TO A 108-TYPE TEST LINE

This feature is based on requirements in Bellcore TA 892 and allows local exchange carrier maintenance personnel to dial up this special test line from a customer's site which causes the line to be put in a "looped back" mode. Once the connection is made between the terminal (most likely a special test set) and the test line, the terminal may start testing in whatever manner is appropriate (for example, send a particular bit pattern to the test line which is looped back to the test set so the maintenance personnel can determine the integrity of the data transmitted). Upon completion of the testing, the terminal can disconnect from the test line according to normal disconnect procedures.

99-5E-0821 CHANNEL/TERMINAL CONFIGURATION

This feature enhances the channel and terminal configurations provided in previous software releases according to requirements in Bellcore TR 268. The channel/terminal configuration feature allows the local exchange carrier to tariff one half of a standard BRI in addition to the entire BRI. The ISDN customers with a single terminal can be restricted to one B-channel. The ISDN customers with two or more terminals can be restricted to one B-channel through an "associated group." Two "associated groups" are permitted per BRI. On this B-channel, customers are allowed terminals having circuit-switched voice, circuit-switched data, on-demand B-channel packet data, permanent B-channel packet data, or any combination of the four services.

99-5E-0822 ADDITIONAL CALL OFFERING FOR CSD

This feature is based on requirements in Bellcore TR 857. This feature notifies the ISDN user through Q.931 signaling procedures that there is a circuit switched data call waiting for that user; the call cannot be delivered due to the unavailability of a B-channel. (The method of notification to the end-user is CPE dependent). The user can answer the incoming call. If the user does not answer the call, regular terminating treatment applies. The number of concurrent waiting calls for which the user will be notified is limited by a subscription parameter. The end-user can subscribe to receive up to 16 concurrent waiting calls.

99-5E-0823 FEATURE GROUP B CARRIER IDENTIFICATION CODE (CIC) EXPANSION

Carrier Identification Codes (CICs) are used in dialing plans, administrative reports, and within signaling sequences to indicate the desired interexchange carrier (IXC) for a call. Both feature group B (FGB) and feature group D (FGD) access require the use of these codes. Currently, CICs for both FGB and FGD are administered together and are 3 digits long, which provides an available 1,000 codes. This feature eliminates the linkage between FGB CICs and FGD CICs, and expands only the feature group B CICs from 3-digit codes to 4 digits. The current feature group B dialing plans are modified as follows:

- ☐ Current dialing plan: 950-0/1XXX (X = 0-9)
- ☐ New dialing plan: 950-XXXX (X = 0-9).

99-5E-0824 IMPROVED INPUT MESSAGE UPDATE CAPABILITY

This feature reduces the need for initializations (CFT INITs) in software updates by storing the 5ESS[®] switch input message database (HMidb) in shared memory segments, as opposed to all relevant applications linking it as a shared library as was done previously. With the shared memory segment approach, a new HMidb can be installed, and all relevant applications can be brought up using the new HMidb without performing a CFT INIT.

99-5E-0825 CCS7 ISDN USER PART ENHANCEMENTS FOR 5E8

This feature brings the 5E7 feature, CCS7 ISDN user part enhancement (99-5E-0xxx) into conformance with the Bellcore TR-TSY-000444 (Technical Reference for Switching System Requirements supporting ISDN Access Using the ISDN User-Part.) The basic functionality of the CCS7 ISDN-UP enhancements for 5E8 includes changes for the:

- ☐ Completion of the transmission path
- ☐ Coding of 3.1 kHz audio calls
- ☐ Operation, administration and maintenance capabilities.

The protocol and procedures for the items listed previously have been modified in this 5E8 feature to align with Bellcore standards. One example of a change in requirements is that under certain circumstances, for a circuit switch data call, TR-TSY-000444 requires a delay of the completion of the transmission path in both directions until the answer message or call progress message is received.

99-5E-0826 TRANSMITTER TIMEOUT MEASUREMENTS IN 5-MINUTE NM REPORT

This feature provides counts of multifrequency signaling transmitter timeouts (TTO) (that is, start signal timeouts). Specifically, counts of the number of TTOs occurring over a given trunk group and in the entire office are available in the 5-minute network management report.

99-5E-0827 5ESS[®] SWITCH TRUNK GROUP LIST AUDIT

This feature provides a list for all trunk groups (TG) by trunk group number (TGN) and associated far-end CLLI code as used in the 5ESS[®] switch database. The 5ESS[®] switch issues a 30-second discrete to indicate that the TGN and/or CLLI code assignments have changed in the switch's database due to TG additions or deletions. The network traffic management operation system (NTM OS) user is able to activate this audit manually or set up the NTM OS to activate an audit automatically in response to the switch discrete described previously.

The trunk group list audit feature encompasses the TG list demand audit and the TG change list audit. The TG list demand audit provides a list of all the TGs and associated far-end CLLI code currently assigned in the 5ESS[®] switch database. The TG list change audit provides a list of only those TGs and associated far-end CLLI code that have been changed, added, or deleted from the 5ESS[®] switch database since the last audit.

99-5E-0829 ALLOW PERSONNEL TO SET AMA PERCENT FULL ALARM LEVELS

This feature prevents loss of AMA data by allowing LEC personnel to determine and set the occupancy levels of primary AMA mass storage that trigger minor, major, and critical switch alarms. In previous software releases, minor, major, and critical alarms were generated when the AMA disk occupancy level reached 70 percent, 90 percent, and 100 percent, respectively. These alarm levels were not under LEC control. Through this feature, LEC personnel can use recent change to set each alarm level at any desired value from 0 percent to 100 percent in increments of 1 percent. This is of great value in offices where, with the fixed alarm levels of 70 percent, 90 percent, and 100 percent, LEC personnel cannot always respond quickly enough to an alarm to prevent the loss of AMA data caused by AMA mass storage reaching 100 percent occupancy. With this feature the LEC can set the alarm levels for a particular office so that more time is available for corrective action, and no AMA data are lost.

99-5E-0830 AMA TRAFFIC MEASUREMENTS PER SM

This feature offers the capability to accurately engineer both the AMA disk partition and SM stand-alone billing memory. It provides a measurement of the AMA memory needs for each SM in the office on the 30-minute traffic report. Hence, LEC personnel are able to determine the AMA memory needs of the disk partition based on these measurements.

99-5E-0831 INTEGRATED DIGITAL CARRIER UNIT (IDCU)

The integrated digital carrier unit (IDCU) is an interface unit on the 5ESS[®] switch switching module (SM) that provides integrated access to digital loop carrier (DLC) systems. In addition to terminating TR 008 systems, the IDCU supports TR 303 integrated DLC (IDLC) systems.

PUB 43801 interfaces are also supported, to allow the hair-pinning of nonswitched and nonlocally switched special services on IDCU and their routing towards D4/D5 Channel Banks or towards DACS (I, II or IV). The initial offering of the unit provides the first phase of a TR 303 implementation on the 5ESS[®] switch.

The TR 008 interface on the IDCU provides POTS and other switched services (SPOTS, coin, multi-party, frequency selective ringing, direct inward dial) via SLC[®] 96 carrier system (modes I and II), SLC[®] series 5 carrier system feature package B, (integrated modes I and II, with and without the specials services option), SLC[®] series 5 carrier system FP303 (TR 008 modes I and II) or gamma (TR 008 modes I and II) remote terminals (RTs). Fiber-to-the-home (FTTH) phase 1, 1.5 and 2 are supported on SLC[®] series 5 carrier system and gamma RTs. In addition, nonswitched and non-locally switched services may be nailed-up through the SM, or hair-pinned through IDCU. The N x DS0 services such as digital data service (DDS) with secondary channel error correction (SCEC), or services supported on program CUs (PG5, PG7.5 and PG15) can be hair-pinned on IDCU. ISDN service provided with BRITE channel units can be hair-pinned on IDCU and routed to D4 banks equipped with BRITE channel units. No modifications are required in the existing TR 008 digital loop carrier systems for existing services.

The TR 303 interface on the IDCU provides POTS, and other switched services (for example, SPOTS, coin, multiparty, frequency selective ringing, direct inward dial), and ISDN capabilities to customers terminating on SLC[®] series 5 carrier system FP303 RTs or on gamma RTs operating in FP303 mode. In addition, nonswitched and nonlocally switched services terminating on SLC[®] series 5 carrier system RTs may be nailed up through the SM, or hair-pinned on IDCU. FTTH phase 1, 1.5 and 2 are supported. FTTH phase 2 supports additional OA&M functions such as display of fiber lines on MCC and utility call trace screens, testing, sectionalization, and alarms.

The information transported over the 2-wire loop from the customer's premises is multiplexed onto a DS1 facility at the RT and transported to the IDCU. Each switched service, with the exception of a U-digital subscriber line (U-DSL), occupies a single time slot. A U-DSL uses a quarter of a time slot for the D-channel and it may utilize a time slot for each B-channel. In addition to customer information, time slots on the DS1 facility transport the time-slot management channel (TMC) and the embedded operations channel (EOC).

To provide better utilization of the DS1 facilities between the RT and the IDCU, time slots on the DS1 facilities are dynamically assigned. With dynamic assignment, an available time slot is assigned to a customer when a call (incoming or outgoing) is initiated. Available time slots are those not already occupied by a call in-progress, and those that are not permanently or semipermanently assigned (for the duration of subscription). Time slots are permanently assigned to the TMC (active/backup) and the EOC (active/backup). Time slots are semipermanently assigned to D-channels and to provisioned B-channels. Up to four D-channels may be multiplexed into a single time slot using time division multiplexing. A time slot is also semipermanently assigned to nonswitched or nonlocally switched services nailed-up through the switch or hair-pinned through the IDCU. The use of dynamic time slot assignment allows for concentration at the RT. The IDCU allows full-access concentration: any channel on the RT can be assigned to any available DS0 on any of the active DS1s connecting the RT to the IDCU.

The call processing signaling between the RT and the IDCU is transported in the TMC and in-band (via

robbed bit signaling). The DS0 24 on the first DS1 (the primary DS1) on each RT is used to transport the TMC. A backup TMC is on DS0 24 of any RT vendor-selected DS1 between the RT and the IDCU, except the primary DS1 and the protection DS1. The backup TMC for the FP303 RT is on DS1 number 3.

An embedded operations channel (EOC) is used to transport operations, administration, maintenance, and provisioning messages between the IDCU and the RT. The DS0 12 on the first DS1 (the primary DS1) on each RT is used to transport the EOC. A backup EOC is on DS0 12 of any RT vendor-selected DS1 between the RT and the IDCU, except the primary DS1 and the protection DS1. The backup EOC for FP303 RT is on DS1 number 3.

An ESF/ndl data link is used to convey alarms and to control protection switching between the IDCU and the RT. B8ZS clear channel capability is supported. The ZBTSl clear channel capability is supported only in hardware.

The interface described in PUB 43801 (Fs and ESF) is supported to allow the routing of nonswitched and nonlocally switched services on IDCU towards D4/D5 channel banks or towards DACS I, II or IV. The B8ZS clear channel capability option is available. The ZBTSl is supported only in hardware. Any DS0 time slot on a PUB 43801 (D4) DS1 facility can be cross-connected (hair-pinned) to any other time slot on any other DS1 facility on IDCU. Cross-connections of n x DS0 services (such as DDS with SCEC) are also supported. This provides cost effective nonswitched and nonlocally switched services on DLCs integrated with IDCU, without causing any degradation in service for locally switched services. Time slots on PUB 43801 interfaces can also be nailed-up on the 5ESS[®] switch SM. Time slots on PUB 43801 facilities terminated on IDCU cannot be switched in real time.

The OA&M capabilities for IDCU are based on those of DCLU. Like DCLU, AC/DC metallic testing of lines is available using either a metallic bypass pair between the switch and RDT or by using a remote measurement unit (RMU) collocated with the RDT. Based on needs expressed by customers, operations capabilities for IDCU are being enhanced over those of DCLU. Sophisticated DS1 performance monitoring is provided, and per-line traffic studies are available. The OA&M capabilities for IDCU U-DSLs are similar to those of integrated services line unit (ISLU) U-DSLs. They include performance monitoring reports and alerts, digital tests (for example, loopbacks at the ISDN channel unit and NT1), and access to NT1 status information such as the power state.

The messages and procedures specified in TR 008 are used to control operations signaling between an IDCU and an RDT that employs this interface.

99-5E-0832 DFI-2 PERFORMANCE MONITORING ENHANCEMENTS

This feature enhances performance monitoring (PM) reporting for the digital facility interface-2 (DFI-2), providing additional error counts and reporting capabilities, new history reports, and customer definable thresholds for the error counts. The LEC can receive the reports both in an automatic manner when these thresholds are exceeded and the error counts are generated and on an on-demand basis. It makes DFI-2 PM as consistent as possible with T1M1.3 and Bellcore requirements without hardware/firmware changes.

99-5E-0833 DSU2-ISTF CAPABILITY FOR BASIC AND STANDARD SM

This feature implements the 99-5E-0443 DSU2 integrated services test function (ISTF) package for fully loaded switch modules in basic and standard switch modules. The package supports incoming and outgoing 108 type digital trunk testing via the TLWS, automatic trunk surveillance, input/output messages, and test lines. The feature improves productivity of T1 trunk maintenance over POTS methods.

Network wide ISDN and circuit switched data connectivity is supported for trunk facilities through offices where ISDN is not yet deployed. This feature makes digital loopback testing available in non-ISDN offices. In addition, in offices where ISDN is deployed, ISDN test equipment can be relocated to a standard or basic SM. This would result in a minimum of 31 additional peripheral interface channels being made available for

billed traffic in the ISDN SM. These test channels could be relocated to any switch module selected by the operating company.

Sectionalization for impairments in POTS connections reported by FAX and modem users will be more productive. These impairments include all problems found by C-notched noise or modem based bit error rate testing (BERT) as well as impairments these two methods cannot detect.

99-5E-0834 ANALOG CALLING NAME DISPLAY

This feature is a terminating line option for analog lines on the 1A ESSTM switch and the 5ESS[®] switch. The analog calling name display (CNAM) feature is directly tied to the ICLID feature. A customer may subscribe to ICLID, CNAM, or both ICLID and CNAM with the appropriate information, calling party number, calling party name, or calling party number and name, respectively, delivered to her/his CPE.

The ability to provide a calling party's name to the analog customer's CPE requires a method of storing the names of callers in a database with the appropriate interface mechanisms to query this database. The queries from the switch and the responses from the database will use the transaction capability application part (TCAP) of the CCS7 protocol.

99-5E-0835 NETWORK FACILITIES ACCESS (NFA)

This feature provides NYNEX with the ability to connect their intelligent peripheral (IP) / service node (SN) to subscribers on the 5ESS[®] switch. NYNEX intends to use the SN/IP to support various proprietary services for which they have completed human factors testing and market research.

The NFA feature functions in 2 modes: implicit and explicit. In the implicit mode, the SN/IP is silently directly connected onto the subscribers phone at every origination. In this mode, the SN/IP may be utilized to provide information to the subscriber upon origination of a call, or the SN/IP may be silent and wait for explicit invocation.

In explicit mode, the subscriber dials an access code to communicate directly with the SN/IP while the 5ESS[®] switch continues to pass along incoming digits and provide dial pulse to touch tone conversion if necessary. In this mode, the SN/IP may be utilized to provide auto dialing (transfer) functions for the subscriber by assigning a multi-way feature to the outgoing trunk connection to the SN/IP.

99-5E-0836 INTERNATIONAL DIRECT DISTANCE DIALED CALLS

This feature allows IDDD calls to be routed using SFGs. Currently, IDDD calls can either be routed over private or public facilities. However, SFG throttling is not available for IDDD calls as it is for other call types. This feature would allow IDDD calls to be limited by SFGs just as normal traffic is. Any screening and code restrictions would have to be built in translations for business customers not allowed access to IDDD dialing.

99-5E-0838 SIMULTANEOUS TRUNK CONVERSION VIA AUTOMATIC RECENT CHANGE

This feature provides an automatic trunk conversion process using switch databases in conjunction with a positive identification of the trunk path to be converted. This process will provide efficient and accurate conversion of per-trunk signaling (PTS) trunks to common channel signaling system 7 (CCS7) trunks along with relevant information pertaining to the conversion between the switches.

Currently this conversion function is performed manually. For the 5ESS[®] switch, simultaneous trunk conversion through automatic recent change (STAR) remote functions are performed by a library program. But the library programs currently do not have the ability to detect incoming STAR test calls. With this feature, it will automatically extend CCS7 trunk conversion support from the 5ESS[®] switch to each of the switch types.

99-5E-0839 LASS VALIDATION/SCREENING DURING NPA SPLIT

This feature gives the service provider an option to have LASS automatic callback, automatic recall, and screen list editing validate DN's based on 7 digits only when the NPA of the DN in the TCAP query is involved in an NPA split. It also, allows the service provider an option to have LASS screening features perform screening based on 7 digits rather than 10 digits only when the NPA of the DN in the ISUP message is involved in an NPA split.

This feature is expected to be used during an NPA split, when the service provider is not certain which NPA (the old or the new) will be sent in the TCAP messages seeking DN validation and/or the ISUP messages being screened.

10.2.32 5ESS® SWITCH FEATURES 99-5E-1002 - 99-5E-1087

99-5E-1002 TR-303 INDUSTRY STANDARD LARGE RT INTERFACE, PRODUCT RELEASE

This feature provides the Product Release of the TR-303 Industry Standard Large RT Interface. The IDCU Large TR-303 Interface Product Release is tested with products which are designed to the 5ESS® switch's implementation of TR-303 is described in the 235-900-308, *Integrated Digital Carrier Unit TR-TSY-000303 Interface Specification*. The TR-303 options implemented with the IDCU are identified and the implementation detail needed to build the interface (matched to Bellcore Issue 2 of TR-303), are included in the TR-303 Interface Specifications document. Issue 3 of that document describes the TR-303 ASN.1 message set implemented with IDCU. Other vendor's Large RTs built to the TR-303 interface specification are also supported with IDCU.

All of the IDCU hardware is common between the 5E8, 5E9(1), and 5E9(2) TR-303 Interfaces. The IDCUs which support TR-303 RTs are deployed on loaded SMs. A Packet Switch Unit (PSU) is also needed to terminate the TR-303 TMCs and EOCs.

99-5E-1010 AM OFF-LINE BOOT VERIFICATION

This feature tests the bootstrap capabilities of the off-line 3B20D processor while the active side is operating normally. The purpose of this step is to verify the ability to boot the current processor and disk configuration. It can also be used for retrofit and software updates.

99-5E-1018 RECENT CHANGE OF PROTOCOL TIMERS AND PARAMETERS

This feature provides the ability modify protocol timers and parameters through recent change. This capability also adds the benefit of range and cross checks that are performed on these variables. This feature decreases Common Channel Signaling down time since an initialization of the Common Network Interconnect (CNI) Ring is no longer required for updating these values in main memory.

This feature allows the customer more flexibility in configuring and changing link set, combined link set timers, and office protocol parameters. This feature provides the needed versatility for offices with mixed transmission facilities such as land and satellite. Since these timers and parameters are changeable through recent change, there is no longer a need to initialize the CNI Ring to update these values in main memory. It also improves reliability by eliminating the error prone ASCII Network File that is not under recent change. This will save the Customer unwanted down time.

99-5E-1053 REDEFINE PROTOCOL HANDLER 2 ACCESS IMAGE (PH2A) FEATURE CONTENT

This feature redefines the content of the PH2 Access Image (PH2A) to support only ISDN Voice and Circuit-Switched Data (CSD); packet-switching is no longer supported on the PH2A. The customer may choose to use PH2 for low signaling rate, circuit-switched applications, while a PH3 may be used for high signaling rates, and packet-switched applications. The PH2 can also support the Gateway function, which supports interswitch as well as inter-SM applications. As a result of the PH2 redefinition, only 4 channels can be assigned for inter-SM nail-ups (PH Channel 0, 4, 8, or 12) The X.75/X.75', and IP trunks are still supported on the PH2A.

99-5E-1077 AMA TRACE (AMATRC) ENHANCEMENTS

This is a secured feature that offers a number of enhancements to the AMATRC feature. These enhancements include:

- ☐ The ability to activate multiple Directory Numbers (DNs) in AMATRC ☐ currently a maximum of five DN can be active.
- ☐ An input message (that is, audit) which queries the switch for a listing of all DNs AMATRC is currently tracing.
- ☐ The DN should be compared to the AMA record's Terminating DN, Originating DN, or both. The Originating DN is the default value. A flag is used to select a terminating DN or both the Originating and Terminating DN.
- ☐ Tracing the Originating and/or Terminating DNs for Packet-Switched AMA records.
- ☐ The input of a hexadecimal representation of the AMA record preceding the formatted AMA record.
- ☐ The ability to direct AMATRC output to a switch-based log file.

99-5E-1078 MULTIPLE DS1 FACILITIES CONTROLLED BY A SINGLE PRI D-CHANNEL

This feature allows a D-channel to control B-channels on a different DS1 facility than the one it resides on. This capability provides service flexibility and additional capacity by allowing a PRI D-channel to control a maximum of 479 B-channels on 20 DS1 facilities. The B-channels controlled by the single D-channel are selected at subscription time to match the customer's traffic requirements. All facilities controlled by a D-channel must reside in the same SM as the D-channel. This feature can only be provisioned on a National PRI.

99-5E-1079 PRI D-CHANNEL BACK UP

This feature allows the provisioning of a D-channel as a secondary (back up) to another D-channel on a National PRI. The feature includes monitoring capability for both D-channels and, in case of failure of the active channel, provides automatic switching from the active D-channel to the stand by channel with no loss of service. With the active and stand by channels residing on different DS1 facilities, this capability is designed to enhance service reliability when multiple DS1 facilities are controlled by a single D-channel. It also provides alert messages whenever the D-channels change service status. A maximum of 478 B-channels can be supported with D-channel stand by.

99-5E-1087 PRI CALL-BY-CALL SERVICE SELECTION FOR FOREIGN EXCHANGE (FX) AND TIE

This feature provides call-by-call access to FX and tie trunks on calls originating/terminating to CPE (typically an ISDN PBX) that are connected to the 5ESS[®] switch by PRI trunks.

10.2.33 5ESS[®] SWITCH FEATURES 99-5E-1101 - 99-5E-1198**99-5E-1101 COMMON NETWORK INTERFACE (CNI) DATA STRUCTURE DOCUMENTATION/MODIFICATION OF CNIDBOC**

This feature provides our customer documentation that describes the CNI data structures that are supported by Recent Change and the CNIDBOC tool. The document performs the same function that the Translation Data Manual does for the 5ESS[®] switch Office Dependent Data. This document aids in quicker resolutions for CNI data field problems.

99-5E-1105 CALL WAITING WITH DISTINCTIVE TONE AND DISTINCTIVE RINGING FOR LONG DISTANCE CALLS

The Call Waiting with Distinctive Tones and Distinctive Ringing for Long Distance Calls feature enhances previous call waiting and ringing operation to allow for a distinctive call waiting tone or a distinctive ringing pattern for long distance calls.

This feature is secured and cannot be enabled until the purchaser has made the necessary arrangements with Lucent Technologies.

NOTE: Screening Enhancement to Outside Calling Area Alerting (OCAA) feature (99-CP-3441) is an enhancement to Call Waiting with Distinctive Tones and Distinctive Ringing for Long Distance Calls (99-5E-1105), and replaced 99-5E-1105 beginning with the 5E10 software release.

99-5E-1106 CALLING IDENTITY DELIVERY ON CALL WAITING

The Caller ID with Call Waiting (CIDCW) feature enhances the caller ID and the calling name analog (CNAM) display features. Caller ID and CNAM provide the subscriber with the name and/or number of the calling party while the telephone is on-hook and ringing. When a call is in progress, the CIDCW feature displays the name and number of the caller after first sending a call waiting tone.

The CIDCW feature provides local area signaling services (LASS) calling name/number display to off-hook analog lines receiving an incoming call. When the subscriber receives a call waiting tone, caller ID data including name and number is displayed on the subscriber's customer premise equipment (CPE). The subscriber may then ignore the waiting call or flash to answer it.

CIDCW is a secured special feature (SFID=133) not accessible to the service provider until a right-to-use (RTU) fee has been paid to Lucent Technologies.

99-5E-1136 CCS7 CAPACITY IMPROVEMENTS - DLN30

The CCS Capacity Improvements - DLN30 feature provides support for higher CCS7 capacity on the Domestic 5ESS[®] switch for new ship 5E9(2) offices and optionally for retrofit 5E9(2) offices. This feature will upgrade the DLN by replacing the DLN-AP (Direct Link Node - Application Processor) board with an AP-30 board and the DLN's SSI (Small Scale Integration) ring interface with an IRN2 (Integrated Ring Node 2) ring interface. In addition, this feature increases the maximum number of CCS7 link nodes from 5 pairs to 19 pairs in DLN configuration.

The introduction of SM-2000 and QLPS will result in increased CCS related OSDS message traffic to a single SM. Switches in the NSD network and tandem switches in the RBOC networks also expected to have increasing percentages of the CCS7 traffic. To address these increases, this feature increases the available CCS7 capacity allowing higher call capacity for these switches.

As a result of these enhancements CCS7 call capacity will increase to over 750K calls per hour. This feature also provides memory growth from 2 MB on the existing DLN-AP to 16 MB on the DLN-AP30, which will significantly increase the total amount of trunk-related data which can be stored and used in the DLN30.

Also included with the purchase of this RTU package is the software to support the following features:

- ☐ All IRN2 Ring - 97-5E-1555 [5E9(2)],
- ☐ 5 Node Shelf for 5E CNI - 97-5E-1625 [5E9(2)],
- ☐ Improved Message Capacity - 97-5E-2491 [5E9(2)].

This feature package significantly improves CCS7 message capacity and throughput on the 5ESS[®] switch. It has its largest benefit for customers with a large number of trunks. Because of the introduction of the IRN2 technology, the number of signaling links terminating in an office goes from 5 pairs to 19 pairs.

99-5E-1140 CALL PARK

The Call Park service includes Basic Call Park, Directed Call Park, Retrieve, Answer Back, Ring Back and Attendant Call Park.

Call Park supports both Custom ISDN lines and analog CENTREX lines. The Call Park service has several feature capabilities defined as follows:

- ☐ Basic Call Park - Basic Call Park allows a station user active on a call to park a call against the user's own DN such that the call may be retrieved and answered by any station within the same terminal (CENTREX) group.
- ☐ Directed Call Park - Directed Call Park allows station users to park a call against their own DN, or direct the call to be parked against another directory number in the terminal (CENTREX) group.
- ☐ Answer Back - Answer Back of a parked call allows a call to be answered back from any station set (DN) within the terminal group by the user going off-hook, receiving dial tone, and entering an answer back access code or pressing an answer back feature button, receiving confirmation tone followed by recall dial tone, and then dialing the DN the call is parked against.
- ☐ Retrieve - Retrieve is the process of answering a call which is parked against your own DN (similar to retrieval of a call on analog Hard Hold).
- ☐ Ring back After Time-out - If Ring back After Time-out applies, then a call will be parked for only a specified period of time before being rung back at the parking station.
- ☐ Attendant Call Park - This allows Call Park to be assigned and used by 50B and ISAT Attendant consoles.

99-5E-1144 PARALLEL UPDATE ACTIVATION

This feature provides a more flexible software update mechanism to apply or back out a software update. It allows a software update to be preapplied, then activate all AM, SM, CMP, and non-pumpable peripherals (for example, DMA type peripherals: PI, SM-2000 MH) changes in time as is feasible. Once applied the user could also deactivate the software update within a very short period of time. Thus, a software update can be alternately activated and deactivated quickly.

The application of the software update is separated into two parts. The first part, the "preapply", creates all the disk files necessary to do the update to all affected products and copy functions into targeted process memory, without actually activating the changes. The second part, the "activation", activates the changes in all affected products. The ability to do a line by line activation of the software update and to activate the changes to products in a specified order is preserved. Making a software update official will remain a distinct operation.

Backing out of a software update is also split into two parts. The first part is the "deactivation" of the changes without removing the update files and most of the memory updates. The second part is the "removal" of the preapply, for example, the deletion of all the disk files and any other needed cleanup.

99-5E-1148 ODD CONVERSION TOOL "UNMKDSK"

This feature makes use of the UNMKDSK tool which allows off-site TEXT/ODD/ECD generation processes (for example ODA) the ability to directly read and process the 5ESS[®] switch back-up tape. The UNMKDSK tool reduces the time required to generate ODD for an office that is being replaced, or for an office in which a remote switch module has been rehomed.

99-5E-1150 ADVANCED SERVICES PLATFORM (ASP) RELEASE 0.1B

The ASP provides true service (that is, independent central office switch and interworking capabilities based on industry standard AIN 0.1 requirements). The ASP gives the service provider the ability to create, deploy, and customize services based on unique market opportunities. Enhancements for the 5E9(1) software release include the following:

- ☐ Terminating attempt triggers
- ☐ Display capabilities for analog and digital CPE
- ☐ Monitor capability for the SCP
- ☐ Trigger activation/deactivation
- ☐ BRCS interworking for off-hook delay triggers
- ☐ AIN release 0.1 SSP/SCP.

99-5E-1150.A SSP800 AND ASP INTERWORKINGS

The SSP800 and Advanced Services Platform (ASP) Interworking feature allows ASP calls to transition to SSP/800 calls as directed by a Service Control Point (SCP). When a call is involved in an ASP transaction, the SCP Database may return an Analyze_Route or Forward_Call with a Carrier ID parameter indicating a LEC/PSEUDO carrier and a routing number. If digit analysis determines that it is a Number Services Code (an SSP/800 number), then the SSP/800 feature is invoked.

When a transition from ASP to SSP/800 occurs, the ASP feature continues to provide billing and Termination Notification as normal for any previous ASP leg. The SSP/800 feature operates as normal in that it queries the SSP/800 SCP and provide routing, billing, and termination notification as directed by that SCP. Except for some specific cases, the ASP and SSP800 features continue to operate independently.

99-5E-1154 CENTREX PRI ENHANCEMENT

The Private Facility Access feature provides a private PRI communication link between customer locations served by different central offices or PBXs. This feature can be divided into two categories: outgoing to a PRI tie trunk and incoming from a PRI tie trunk. The PRI tie trunk access can originate from a station in the terminal group, attendant, or incoming tie trunks. The PRI tie trunk access is activated via dialed access codes. Access codes can range from one to five digits. Dial access by stations and/or the attendant is provided by the Individual Dialing Plan feature, "Dial Access to Private Facilities".

When a business has several centrex terminal groups located in multiple switches which are interconnected by PRI tie trunks, the subscriber may request the tandem tie trunk dialing feature in order to create a Tandem Tie Trunk Network. The tandem tie trunk dialing feature is activated via dialed access codes. All digits collected by the originating line are manipulated and outpulsed by the originating office to the tandem switch. The tandem switch receives and manipulates the digits, and routes the call to a remote switch. The call may terminate at the remote switch or the tandeming process may again be repeated, based on the digits dialed by the originating party and the capabilities assigned to the PRI tie trunks in each office.

The Automatic Route Select feature allows flexible routing of calls over the first available (non-busy) PRI trunk. Routing is transparent to the end-user since routing preference is provisioned via recent change. The ARS feature can be automatic or activated via an access code, depending upon the ARS capabilities assigned to the lines and PRI trunks in the office. When the centrex PRI Enhancement feature is on, ARS is invoked for all incoming calls over a call-by-call PRI regardless of the network specific facility value in the SETUP message.

The Individual Dialing Plan feature provides a common group numbering plan for all lines, trunks and PRI trunks within the same centrex terminal group. An incoming call over a PRI trunk can have one to fifteen

digits, which are then manipulated by the group numbering plan. Either the call is routed to the terminating line or the digits are outpulsed over an outgoing trunk. This feature allows intercom dialing, access to an attendant, attendant control of facilities, and dial access to private facilities between multiple switches linked by a PRI trunk.

The Speed Calling feature allows a customer to specify a speed calling list containing dialing sequences, each of which is associated with a unique speed calling code. When the switch receives an incoming call with a valid speed calling code that was sent over a PRI which has been assigned this feature, the system attempts to complete the call to the dialing sequences in the speed calling list. The Speed Calling feature provides the ability to store dialing sequences of up to 32 characters in length.

99-5E-1156 CENTREX NETWORK

The CENTREX Network feature functions as an area-wide CENTREX. It extends a 5ESS[®] switch CENTREX or terminal group and its intraswitch functionalities across a set of switches by using Signaling System 7 (SS7) signaling messages to transmit Business Group (BG) data between switches. This extension cannot cross LATA boundaries.

The CN feature provides for station-to-station intercom dialing across switches within a single LATA; one listed DN for attendant assistance (CENTREX attendant's DN) even if the attendant is located on a different switch than the user; direct inward dialing (DID) to a particular business group station; and direct outward dialing (DOD) from a business group station with station identification on outgoing calls. CN expands the notion of a single switch CENTREX to be definable on a set of switches. Thus, a business customer consisting of many geographical locations can define one CENTREX for all its business group locations on a CENTREX Network.

The CENTREX Network is made up of three interrelated features:

- ☐ CENTREX Network (CN) (the basic feature)
- ☐ CN-Special (CN-S), (only for the federal government)
- ☐ CN-InterSwitch Voice Messaging (CN-ISVM)

designed for, and contracted by, the federal government. CN-ISVM provides for a centralized Message Service System (MSS) for CN MBG customers. Each is secured and thus requires use of a password for activation.

CN is operational in both a digital and an analog environment. It requires Common Channel Signaling (CCS).

Existing operations systems need modifications to support the CN feature. Provisioning systems need to support assignment of the new switch parameters, Group Identifiers (GIs) and Incoming Call Identifiers (ICIs). In addition, traffic data systems need to support the additional traffic engineering counts provided in the 30-minute traffic report.

The ISDN attendant (ISAT) console is provisioned per existing procedures on the custom Basic Rate Interface (BRI), and user terminals are provisioned on either custom or standard BRIs per existing procedures.

CN Features

CN provides the following features interswitch, as well as maintaining their intraswitch operation:

- ☐ MBG Special Study Groups Measurements
- ☐ Call Forwarding (CF) Screening

- ☐ Call Waiting (CW) Screening
- ☐ Distinctive Ringing (DR)
- ☐ Call Pickup (CPU) Screening
- ☐ Three-Way Call (3-Way) Screening
- ☐ Call Transfer (XFER) Screening
- ☐ Blank Number/Intercept Treatment
- ☐ ISDN Attendant (ISAT) Features:
- ☐ Source Billing for ISAT Assisted Calls (SBAC)
- ☐ Interswitch ISAT camp-on
- ☐ Display at the ISAT of business group members' station restrictions for on-net calls (including display indication of a member being toll restricted)

NOTE: The term "screening" refers to checking a calling station's terminal group restrictions against the called terminal's group restrictions when deciding whether to allow successful call completion.

CN-S Features CN-S is solely for the federal government and provides the following features:

- ☐ Display of off-net trunk type originating onto the CN-S network
- ☐ Queueing based on off-net trunk type originating onto the CN-S network
- ☐ Overflow MC Route Index (RTI) used to throttle CN-S calls that overflow the dedicated CN-S ISUP7 trunks under Simulated Facilities Group (SFG) control.
- ☐ Routing of a call as an MBG call, not a PP call. If a PP feature is assigned to a terminal and a call is made using intercom dialing then the call is an MBG call, not a PP call. But, if the caller dials a PP access code + intercom digits, the call will be a PP call.

NOTE: Without the CN-S feature, MBGE's, which have the PP feature assigned, use intercom dialing for PP calls only. Such terminals are not able to dial a MBG calls.

- ☐ PP display only format option for calls terminating to an ISAT that is assigned a PP feature

CN-ISVM Features

CN-ISVM provides BCID screening at the Message Service Center (MSC) for interswitch and intraswitch MBG calls directed to the Voice Messaging System (VMS).

Voice messaging service calls are screened based on a Business Customer Identifier (BCID), as opposed to Terminal Group (TG) restriction screening. The BCID value assigned to the trunk originated MBG call must match the BCID associated with the Multiline Hunt Group (MLHG) which terminates the call.

CN-ISVM integrates the InterSwitch Voice Messaging (ISVM) feature with the CN feature to provide the following for a "Deluxe" MSC:

- ☐ A screening MSC for all MBG members, including the MBG members located on "far" switches (those switches not being served directly by the VMS)
- ☐ Ability to determine internal call type for ISVM far switch customers of the MBG (Internal callers that

are forwarded to the VMS will have their information displayed at the VMS even if marked private.)

99-5E-1168 SET DESTINATION (SETD) MESSAGE SPACE RELIEF

Prior to the 5E9(1) software release, all ISDN channel specific provisioning data is transported to the PH through the same MGL2SETD message, causing it to reach its size limit. This feature recommends using a specific message for each type of ISDN channel specific provisioning data. The specific message will only have to transport the provisioning data specific to that type of channel, and thus, eliminate any concern about the current MGL2SETD message reaching its size limit.

99-5E-1169 AUTOMATIC CALLBACK BLOCKED TO PRIVATE NUMBER

Automatic Callback (AC) is a Local Area Signaling Services (LASS) feature. The AC feature allows the user to call back the number of the last call that alerted the user.

The AC Block to Private Number feature allows a switch to block attempts to invoke AC towards a private number by routing the customer to a switch-changeable rejection announcement. This feature is a special feature and is secured. It requires a special purchase and a password for usage.

The AC Block to Private Number feature was developed so that customers can comply with requests by the regulatory commission to block the use of AC to return calls to private numbers.

99-5E-1174 CALL FORWARDING DON'T ANSWER RETURN

The Call Forwarding Don't Answer Return to Queue for Automatic Call Distributor (ACD)/BRCS feature forwards a call that was not answered by an ACD agent. The call is removed from the ACD queue and offered to an ACD agent. If the ACD agent does not answer the call, then the call is forwarded back to the head (that is, the top or the first slot) of the same ACD queue.

99-5E-1192 5ESS[®] SWITCH COMPACT DIGITAL SWITCH (CDX)

The 5ESS[®] switch CDX introduces a new hardware element, the Communications Module 2 Compact (CM2C), serving as the core of this new configuration. The CM2C provides the same switching capabilities as the CM2 (5ESS[®] switch), but supports a reduced number (2) of local SMs (LSM, HSM, ORM, or SM-2000).

The CM2C serves two major functions: as the switching fabric between SMs, and as the provider of switching functions, such as conference circuit allocation and routing.

99-5E-1198 STANDARD SERVICE PROFILE IDENTIFIER (SPID)

This feature supports Bellcore SPID. The SPID is used at the time of initialization to determine an ISDN terminal profile. The SPID is variable in length depending upon the assignment scheme defined by the service provider. The number is generated during the provisioning process. This feature applies to both Custom and National ISDN users.

10.2.34 5ESS[®] SWITCH FEATURES 99-5E-1202 - 99-5E-1291

99-5E-1202 STANDARDIZED CPE STATUS CONTROL

This feature provides manual and automatic Service State Control for ISDN terminals on a BRI. With this feature, maintenance personnel can electively remove and restore service for individual terminals. When the switch detects excessive errors on a terminal, it automatically removes the terminal from service.

99-5E-1203 SERVICE UNIFORMITY FOR FLEXIBLE CALLING

This feature modifies the NISDN-1 version of the Flexible Calling feature offered in software release 5E8 to

provide service uniformity compliance for the following services:

- ☐ Conference Calling (3 and 6 port)
- ☐ Consultation Hold
- ☐ Call Transfer All Calls (Explicit and Implicit)
- ☐ Drop Last Call on Conference
- ☐ AMA Module Population.

99-5E-1205 SERVICE UNIFORMITY FOR CALL FORWARDING

This feature modifies the NISDN-1 version of the 5ESS[®] switch Call Forwarding feature to provide service uniformity for the following services:

- ☐ Call Forwarding Variable (CFV)
- ☐ Call Forwarding Interface Busy (CFIB), also known as Call Forwarding Busy Line (CFBL)
- ☐ Call Forwarding Don't Answer (CFDA).

All equivalent Bellcore TR 853 default parameter values are available.

NOTE: Both CSV and CSD calls may be forwarded.

99-5E-1207 SERVICE UNIFORMITY FOR DISPLAY

This feature modifies the NISDN-1 version of the 5ESS[®] switch capability to provide NI-2 service uniformity compliance by supporting standard display text for all of the NI-2 features for which service uniformity is implemented.

99-5E-1208 SERVICE UNIFORMITY FOR ADDITIONAL CALL OFFERING (CIRCUIT MODE ONLY)

This feature modifies the NISDN-1 version Additional Call Offering feature to provide service uniformity compliance for the following services:

- ☐ Additional Call Offering - Unrestricted (ACO-U)
- ☐ Intra-Terminal Group only ☐ This option allows an ACO-U subscriber to indicate that only calls originated from within the terminal group will be allowed as waiting calls.
- ☐ Incoming-to-Terminal Group only ☐ This option allows an ACO-U subscriber to indicate that only calls originating from outside the terminal group will be allowed as waiting calls.
- ☐ Both of the options apply to Circuit-Switched Voice (CSV) and Circuit-Switched Data (CSD) calls.
- ☐ Notification Busy Limit (NBL) ☐ Limits the total number of originating and terminating waiting calls for a terminal.

99-5E-1209 SERVICE UNIFORMITY FOR ELECTRONIC KEY TELEPHONE SERVICE (EKTSTM)

This feature modifies the NISDN-1 version Electronic Key Telephone Service to provide service uniformity compliance for the following services:

- ☐ Multiple Directory Numbers per Terminal

- ☐ Multiple Directory Number Appearances
- ☐ Hold/Retrieve
- ☐ Bridging
- ☐ DN-Bridging
- ☐ Intercom Calling
- ☐ Membership in a Multiline Hunt Group
- ☐ Abbreviated and Delayed Ringing
- ☐ Bridged Call Exclusion
- ☐ Call Appearance Call Handling
- ☐ Analog Member in *EKTSTM* Group (only as the lead member).

99-5E-1211 ANS LASS-SCN INTELLIGENT PERIPHERAL INTERWORKING

This feature allows intelligent CPE, acting as an intermediary and in cooperation with SCP program logic, to provide actual originator's calling number for call legs initiated by the CPE. This calling party number information can then be used by service logic and features at the terminating end of the call. For example, a caller ID service at the terminating CPE would display the calling party number of the true originator of the call rather than the CPN of the intermediary CPE.

An example of intelligent CPE that can use this capability is a Radio Port Control Unit (RPCU), which can serve as an intermediary between mobile (wireless) phone users and the public switched telephone network. Calls initiated by mobile phone users are received at the RPCU and are converted there to the ISDN signaling for call setup over National ISDN BRI lines into the wireline telephone network. Rather than providing the calling party information associated with the RPCU itself, this feature allows the RPCU to provide the CPN information of the true (mobile) originator, and, with the cooperation of the SCP logic, have that CPN used as the true calling party number for the call.

Other CPEs, such as intelligent peripherals and service circuit nodes (SCN), can be used as intermediaries to provide services to the originating or terminating parties on a call. Calls that are destined for a given party may be routed to intermediary CPE for add-on services (for example, to announce the name of the calling party to the terminating party and provide options for handling the call). When the intermediary CPE completes the call to the terminating party, the true originator's calling party number information can be provided by using the capacities of this feature. This allows (LASS) features assigned to the terminating line to work as if the call had come directly from the true originator.

The role of this Advanced Network Services (ANS) LASS-Intelligent Peripheral Interworking feature in the preceding scenarios is to save a CPE-provided calling party number that either fails CPN screening at the 5ESS[®] switch or is not screened at all. When an off-hook delay (OHD) trigger is encountered, insert this calling party number into a new ANS parameter [Generic Address List (GAL)] for inclusion in an "INFO COLLECTED" query message to an SCP. Prior to this feature, a CPE provided calling number that failed screening or was not screened would be discarded and would not be included in the message to the SCP.

This feature does not change how the calling party is determined and populated in the "INFO COLLECTED" query.

Service logic at the SCP can be programmed to insert the calling party number from the GAL parameter into the "Calling Party ID" parameter that is returned to the switch in the response to the query (using the Analyze Route message). Upon receiving the response message, the 5ESS[®] switch sets the calling party

number for the call based on the "Calling Party ID" received from the SCP. This number then becomes the actual calling party number for the call as the call proceeds through the network, and is the number used for caller identification display to the terminating party.

For further details on this feature, the GAL parameter and interactions with other features such as privacy, see the 235-190-126, *Advanced Services Platform Feature Descriptions*.

99-5E-1221 NATIONAL ISDN-BRI VERIFICATION (BRIV)

The BRIV feature provides the capability to identify the Office Equipment connected to a Standard ISDN BRI access line. BRIV provides the installation and maintenance personnel of a Telephone Company the ability to retrieve the Office Equipment (OE) number (which identifies the termination of the ISDN interface in use) from the customer premises. When a test call is placed to BRIV, the OE number that identifies the termination of the ISDN interface from where the test call originated is displayed. The BRIV feature is accessed by dialing an access code from an ISDN terminal connected to a Standard ISDN BRI access line provisioned for Circuit-Switched access (voice or data). The length of the access code to be dialed can either be three or seven digits and is recent changeable.

The same 3-digit and 7-digit access codes can be used to access both BRIV and Custom BRITL. The 5ESS[®] switch connects a user terminal to either BRIV or Custom BRITL based on the type of interface (namely, Standard or Custom) associated with the terminal. However, different provisioned access codes can be used by the Telephone Company to access either BRIV or Custom BRITL. (Custom BRITL is the BRITL that can be accessed from Pre-Standard DSL or Custom ISDN interface.)

99-5E-1227 5ESS[®] SWITCH COMMAND RESTRICTION FEATURE

This feature restricts access to 5ESS[®] switch input commands and their associated command pokes, based on "authority classes". Each authority class has a set of commands associated with it which represent the command set that users may access.

Authority classes are assigned to logins and to terminals. Access to commands, and the associated pokes, not found in the authority class are denied. These attempts to access restricted commands are logged in a command log file. This feature allows the switch owner to control access to potentially damaging commands.

99-5E-1235 DIRECTORY NUMBER MEASUREMENTS (DNM) FOR EADAS

The Directory Number Measurements for EADAS (Engineering and Administrative Data Acquisition System) feature allows the study of the traffic on individual subscriber lines. It measures the line usage and peg counts for individual DNs associated with analog lines terminating on the Integrated Digital Carrier Unit (IDCU), Digital Carrier Line Unit (DCLU), Line Unit (LU), or Integrated Services Line Unit (ISLU) of the 5ESS[®] switch.

Seven new measurements (one usage count and six peg counts) are taken in this feature and reported in the 30 Minute Traffic Report (TRF30). For each office, a maximum of 250 DNs can be studied at a time. The 250 DNs may be on the same SM or across multiple SMs.

The seven counts and their definitions are listed:

- ☐ Originating calls
- ☐ Originating blockages
- ☐ Terminating calls
- ☐ Terminating blockages
- ☐ Terminating calls to busy

- ☐ Terminating calls to ring with no answer
- ☐ Usage.

99-5E-1239 AUTOMATIC TERMINAL SETUP

The ATS feature downloads certain parameters which are essential for terminal operation on a National ISDN (Standard) BRI. A terminal can ask for a parameter download after initialization or after it has been notified by the switch that a service order change has been completed. Parameters which are downloaded include:

- ☐ Directory Numbers (DNs)
- ☐ Bearer capabilities per DN
- ☐ Call reference busy limit per call type
- ☐ Directory number appearances
- ☐ The CACH *EKTS*TM Call Appearance (CA) map per DN
- ☐ The intercom call appearance map per intercom group
- ☐ The Feature Activator (FA)/Feature Indicator (FI) map
- ☐ FA/FI Service Descriptions
- ☐ Activator Keywords.
- ☐ Originating DN flag*.

The feature allows a user to connect any CPE that is designed to National ISDN standards and receive access to services provided by National ISDN.

99-5E-1241 ACD/BRCS INTERWORKING

This feature provides the end-users with the ability to use both Automatic Call Distribution (ACD) capabilities and ISDN BRCS capabilities from the same ISDN station set over a Basic Rate Interface (BRI).

Incoming ACD calls which are to be directed to the most idle agent serving a particular team would receive virtually the same treatment that they did prior to this feature. This includes ACD originating treatment, Call Vectoring, Queuing, and Delay treatment.

The ACD/BRCS Interworking will enhance these current OSPS ACD based features by allowing BRCS features to be used on outgoing and incoming non-ACD calls when an agent is not logged into an ACD team.

99-5E-1244 SOFTWARE UPDATE (BWM) PROCESS AUTOMATION

This feature provides for further automation of the software update process, for both application and administration. It provides support for CSCANS queries of software update administration related information and CSCANS to invoke software update commands.

Input messages provided by this feature also allow non-CSCANS users access to this information and these commands through the normal terminal. This feature provides a health check mechanism to easily determine if the state of the switch is such that software updates should be automatically downloaded, scheduled, or applied.

99-5E-1242 COMMUNICATION MODULE PROCESSOR (CMP) CORE BOARD MEMORY EXPANSION

This feature enables the CMP core Memory to be expanded from 4MB to 16 MB. This expansion offers the later option of a switch capacity improvement by moving "high runner" call processing software to the 1MB static RAM, and by moving dynamic ODD to the 16MB core board (faster processing areas).

99-5E-1243 DIRECT LINK NODE (DLN) OVERLOAD CONTROL

This feature provides an overload Control Strategy for the DLN taking into account its impact on CCS Network as follows:

- ☐ Based upon incoming message occupancy and outgoing message occupancy on the DLN-AP/NP, DLN buffer occupancy and the overload status of Switching Module (SM)/CMP/PIC
- ☐ Incorporates Network Congestion Control and Message Throttling to reduce the incoming message load at congestion level.
- ☐ Reduces outgoing message load by originating less number of CCS calls under overload.
- ☐ Communicates the overload status of SM/CMP/PIC to DLN.

99-5E-1245 5ESS® SWITCH INPUT MESSAGE EDITING AND HISTORY FEATURE

This feature provides the ability to edit input commands and provides a mechanism for recalling previously executed commands. A history buffer containing 200 commands is maintained in order that operating company personnel may retrieve, edit, append, and re-execute those commands at a later time. A "help" command is provided with this editing feature to provide assistance to users. This feature is designed for use by switch personnel using the MCC, SCC, STLWS, and RC/V terminals on the 5ESS® switch.

99-5E-1250 NETWORK INTERCONNECT (NI) PHASE 3 - NI MESSAGE TRANSFER POINT (MTP) LATA ROUTING

This feature is a solution that uses more than one point code assigned to a single Inter-exchange Carrier's (IEC's) toll switch office for inter-LATA routing. This feature will provide the capability to associate different point codes with different LATAs, allowing circuit or call associated Common Channel Signaling System 7 (CCS7) messages to be routed through the Signaling Point of Interface (SPOI) in each LATA. An SPOI is a legal and logical separation point where an LEC's signaling link meets an IEC's signaling link.

99-5E-1252 FAR ACCESS REMOTE (FAR)

This feature enhances the loss insertion capabilities of the 5ESS® switch and provides additional flexibility in loss control. (Loss is inserted by the switch to control echo in voice connections.) This feature would enable Remote Switching Modules to be located at greater distances from the host Switching Module. FAR gives the operating company enough flexibility to ensure quality voice services to its customers, while allowing networking options (backhauling on fiber pipelines, alternate routing for survivability, etc.). This flexibility is provided to the switch personnel through Recent Change. The remotes can now be placed up to a distance of 600 miles from the host switch.

This feature is available as a software update to the 5E9(2) software release.

99-5E-1257 COMMUNICATIONS MODULE 2 (CM2) PIC2 MICROCODE PERFORMANCE IMPROVEMENT

The purpose of this feature is to increase the performance of the CM2 PIC2 microcode in order to meet and exceed the messaging requirements of the 5ESS® switch.

99-5E-1258 SOFTWARE RELEASE RETROFIT DOWNTIME REDUCTION VIA AM OFFLINE

This feature builds upon the AM Offline Boot Verification feature to permit a "soft-switch" transition to a newly loaded (booted) software release (following an AM Offline Boot), thus reducing downtime incurred during a software release retrofit. The feature also will reduce the risk for Software Update application and recovery from Disk Independent Operation (DIOP).

This feature in conjunction with the feature titled "AM Offline Boot Verification" will significantly minimize risk of an unsuccessful transition to the new software.

99-5E-1262 TSS COMPLIANCE WITH 15 DIGITS

Currently, the international number plan supported by Lucent Switching Products are for 12-digit International Direct Digit Dialing (IDDD). TSS Recommendations have suggested that the international number length be increased to 15 digits from 12 digits. The recommendation has been put forward that this capability exist in all switching vehicles for use by December 31, 1996. Therefore, the international number digit length is increasing from 12 to 15 on the 1A ESSTM, 2B ESSTM, 4ESSTM and 5ESS[®] switches.

NOTE: No changes are planned at *Time T* for the North American Numbering Plan for World Zone 1. It will maintain a 1-digit CC and a 10-digit NSN.

The International Direct Distance Dialing 15-Digit Expansion Feature (IDDD15) ensures that the switches accommodate international numbers of up to 15 digits in dialing plans, AMA records, administration, signaling formats (including Signaling System 7, Multifrequency, and Q.931), and features which currently support international numbers.

99-5E-1272 MESSAGE SERVICE SYSTEM CALL FORWARDING

The Message Service System Call Forwarding Interaction (MSSCFI) feature allows all lines with a Call Forwarding feature assigned to forward incoming calls to message service centers (MSCs) without having to be provisioned for the Message Service System (MSS) feature by the 5ESS[®] switch owner. The MSSCFI feature provides an option for MSS clients to change message service providers and have their Message Waiting Indicator (MWI) controlled by the new provider. These clients must be provisioned with the public business customer identification (BCID). Without this option, the switch owner must provision the client for MWI whenever the client's message service provider changes. Clients who do not require this option must be provisioned with the private BCID. If the private BCID client changes message service providers, the switch owner must reprovision the client's MWI for the new message service provider.

99-5E-1274 ISDN FAST TRANSFER OPTION

This feature allows a user to transfer a call before ringing is heard on the transferred-to party call. This process speeds up the transfer process and allows a busy user to move on to another task. The ISDN Fast Transfer operation applies to all ISDN Transfer features if ISDN Fast Transfer is assigned to the switching module.

99-5E-1280 CNI/INTERPROCESS MESSAGE SWITCH (IMS) HARDWARE AND SOFTWARE INHIBIT

This feature provides CNI offices with the ability to inhibit escalation triggers from within the CNI/IMS software, without having to inhibit all AM software escalation triggers. This allows maintenance personnel a greater degree of control over manual recovery situations. The addition of CNI/IMS hardware and software further reduces the potential for long switch-attributable CCS outages.

99-5E-1281 DLN QUALITY IMPROVEMENTS - AP PANIC INTERFACE

This feature consists of adding a new DLN AP interface for collecting and formatting AP and NP data in the event of a DLN fault. Data that was previously unavailable for help in debugging is now available. The enhancements to the Direct Link Node (DLN) follow:

- ☐ Application 3B Interface Changes ☐ The Application 3B Interface Changes are designed to both

simplify and optimize the transactions necessary between CNI and the 5ESS[®] switch application node transactions. This new interface also simplifies and standardizes internal CNI interfaces by using a smaller set of Operating System Traps (OST) to communicate with the application.

- Auto Data Collection (AP Panic Interface) □ A new Direct Link Node (DLN) Attached Processor (AP) interface for collecting and formatting AP and Node Processor (NP) data in the event of a DLN fault has been added.
- Field DLN Tools □ The Field DLN Tool provides the functionality of GRASP for the CNI ring (RGRASP) to enhance the field's ability for diagnosing and correction of problems. It allows breakpoints and memory reads/writes to be performed on any CCS7 link node or DLN.

99-5E-1282 CRITICAL NODE RESTORE PHASE 2

This feature will provide rapid recovery from duplex and simplex failures of any nodes on the CNI ring by allowing nodes to be unconditionally restored. It consists of enhancements to an earlier Critical Node Restore feature which improved the recovery from duplex DLN failures.

The addition of Critical Node Restore Phase 2 further reduces the duration of any CCS outages due to node software faults.

99-5E-1283 CNI CORE ENHANCEMENTS

The following features are included in the CNI Core Enhancement:

- CNIDBOC Enhancement Phase I □ This feature provides to the user of the CNI Database Operations Consolidator (CNIDBOC) tool an added capability to determine the directory to which a batched reviewed file can be placed. If a directory is not specified by the user, the current default directory is used.
- Local Exchange Carrier (LEC) Forced Link Node Remove □ This feature provides the 5ESS[®] switch with the capability to manually, either locally or remotely, remove an active Link Node from service regardless of the LN type.
- Local Exchange Carrier (LEC) Forced Link Node Restart □ This feature provides the 5ESS[®] switch with the capability to manually, through an input 334message, restart any active Link Node regardless of the type [that is, SS7 LN or a DLN, with the exception of the Ring Peripheral Controller (RPC) nodes]. This feature provides a remote or on-site capability to reinitialize a link node without having to repump the link node with text and data .
- Performance Measurements □ This feature provides the 5ESS[®] switch with the capability to collect and report measurements for processor real time and buffer utilization which apply only to the Signaling System 7 link node for all interfaces. These measurements will be used by the Local Exchange Carrier companies for Common Channel Signaling planning, design, engineering, and performance.
- Processor Outage □ This feature provides the 5ESS[®] switch an improved and more efficient method of recovery from a processor outage. The former method, "break the link", required a substantial amount of recovery time to realign the link, irrespective of whether the processor outage is a short or long duration. This feature avoids "break the link" and provides for recovery from a processor outage condition based on the duration of the actual processor outage.

99-5E-1288 5E8 TO 5E9(1) RETROFIT

This feature allows the customer to retrofit from 5E8 to 5E9(1) software release. It includes the Office Dependant Data (ODD) and Equipment Configuration Database (ECD) off-site evolution, Recent Change

(RC) and Customer Originated Recent Change (CORC) on-site evolution, retrofit procedures, tools, and other related software.

99-5E-1290 SERIES COMPLETION FOR NATIONAL ISDN

This feature allows Series Completion on a National ISDN line. Series Completion is a type of hunting in which DNs are grouped into a prearranged ordered list.

99-5E-1291 ICLATA FOR THE 5ESS[®] SWITCH AND 1A ESSTM SWITCHES

The Intra-LATA PIC feature allows the Local Exchange Carriers (LECs) to offer their residential and business customers the choice of selecting an Intra-LATA Toll carrier.

This feature allows a customer to presubscribe to an Intra-LATA Toll Carrier (PIC2) which handles all Intra-LATA Toll traffic (7-digit or 10-digit calls with or without a "1/0" prefix), but which may or may not be the same as the Presubscribed Inter-LATA Carrier (PIC). If a subscriber wishes to place an Intra-LATA Toll call using a carrier other than the PIC2, a 10XXX (or 101XXXX) prefix must be dialed. A customer has the choice to designate the Local Exchange Carrier as their PIC2.

If a customer does not prescribe to an Intra-LATA carrier, the default carrier will be the LEC. Inter-LATA and international calls are unaffected by this feature.

The Intra-LATA PIC feature was previously known as Intra-LATA Carrier Equal Access (ICLATA) or simply, Full 2-PIC.

10.2.35 5ESS[®] SWITCH FEATURES 99-5E-1302 - 99-5E-1397

99-5E-1302 ROUTING BASED ON BEARER CAPABILITY

This feature provides flexible routing for "speech" and "3.1 kHz audio" calls. Currently, the 5ESS[®] switch routes "speech" and "3.1 kHz audio" calls in the same manner. The TR-TSY-000448, ISDN Routing and Digit Analysis, requires that "speech" and "3.1 kHz audio" bearer capability be routed differently. The "3.1 kHz audio" calls equate roughly to voice and data (facsimiles, modems, and so on), where it is important to maintain absolute integrity of the bit stream. No speech treatments such as Time Assignment Speech Interpolation (TASI) and Low Bit Rate Voice (LBRV) encoding should be applied to a "3.1 kHz audio" call. A call with the bearer capability of "3.1 kHz audio" should only be routed out of a switch over the following types of trunks:

- ☐ MF speech trunks
- ☐ ISUP speech trunks
- ☐ ISUP 56K data trunks
- ☐ ISUP R64K data trunks
- ☐ ISUP 64C data trunks.

Speech calls continue to be routed out of a switch over the same facilities currently used.

99-5E-1310 JOIN TWO CALL APPEARANCES ON ISDN ATTENDANT CONSOLE

This feature allows the ISDN attendant to join an active and a held call together while the attendant is active on the call. The attendant may remain on the call, or may transfer the call, leaving the two calls joined but removed from the attendant console. Neither of the two call appearances to be joined can be active in a three-way or N-way call.

99-5E-1319 FEATURE GROUP D (FGD) CARRIER IDENTIFICATION CODE EXPANSION

This feature will expand the Feature Group D Carrier Identification Code (CIC) from the current 3 digits (XXX) to 4 digits (XXXX) in the dialing, administration, and signaling format for FGD and in all other external interfaces and feature interactions. In order to accommodate a more orderly evolution, the Carrier Access Code (CAC) in the FGD dialing plan will be expanded from 5 to 7 digits. The expansion of the FGD CIC from 3 to 4 digits will modify the current FGD dialing plan when dialing overrides a presubscribed carrier. The current and new dialing plans are as follow:

Current Dialing Plan 10XXX	New Dialing Plan 101XXXX

99-5E-1323 5ESS® SWITCH ADVANCED AUTOMATED CIRCUIT PACK RETURN TAG (YELLOW TAG)

This feature allows the 5ESS® switch to print a completed circuit pack return tag to the Receive-Only Printer (ROP) or Trunk and Line Work station (TLWS) printer. This electronic tag can then be attached to the faulty circuit pack and sent to the factory for repair. This feature ensures that the information about the office and the circuit pack fault is correct and readable. This should minimize the No Trouble Found (NTF) circuit packs.

99-5E-1326 INTEGRATED DIGITAL CARRIER UNIT (IDCU) TR-303 INDUSTRY STANDARD LARGE RT INTERFACE, INTRODUCTORY RELEASE - CUSTOMER LAB EVALUATION

This feature supports testing for TR-303 Large Line Size RTs in a customer lab evaluation environment. It should not be evaluated in an office that supports tariffed customers. Document 235-900-308 describes its implementation through the IDCU.

99-5E-1331 TESTING OF AUDIO AND VISUAL SWITCH ALARMS

This feature allows switch personnel to light alarm lamps and activate audible alarm devices using a new input command, TST:ALM,LVL=level. The command triggers the alarm audibles and visuals in the office and at the Switching Control Center (SCC), allowing the switch personnel to verify that the indicators and devices are functional.

99-5E-1334 AUTOMATED STATIC ODD AUDIT

This feature allows the customer to maintain a clean database by replacing the existing switch-resident ODD Population Rule Audit with a much more comprehensive version. This new audit is automatically generated from the PRL5 database population rule source files and ensures the completeness and accuracy of the audit.

Given the office's SM, CMP, AM, and disk memory usage in the current release, this feature also forecasts the amount of SM memory required to load a subsequent software release.

The three modes of audit execution are as follow:

- ☐ **Universal Audit** The universal audit validates the entire ODD with respect to the entire set of population rules. It executes in an infinite loop, starting and suspending itself according to a customer determined schedule. A single cycle through the full audit may take several days. Each time this cyclic audit resumes execution, it begins where the previous execution suspended.
- ☐ **Incremental Audit** The incremental audit automatically executes each time the BKUP:ODD command is successfully run. It validates all database transactions (both Recent Change and Customer Originated Recent Change) since the last time BKUP:ODD command was used.
- ☐ **Entity Audit** The customer can ask for immediate execution of the audit. Such an inquiry typically limits the scope of an audit to a particular processor and relation, or to a particular database entity (for example, a line, a multiline hunt group, a trunk group, a multiline hunt group member or a trunk member).

Each time the audit is executed, it produces the following; 1) a summary message indicating how many errors were found, and 2) a detailed log of individual error conditions. This log is directed into a file where it can be decoded and dumped by the user.

The high runner error conditions are documented by very high quality error messages. Other error conditions are documented by mechanically generated error messages.

99-5E-1335 ADD AMA ERROR FILE AND OFFICE ALARM

This capability applies to events where, for a billable call, the switch fails to provide an AMA record for downstream processing, either because no record was formatted or because a formatted record was lost before being written to disk. For such cases, the following are provided:

- ☐ A minor alarm
- ☐ Notification through an output message, which is logged in a switch-based log file, accompanied by available diagnostic information.

99-5E-1336 FRACTIONAL DS1 SWITCHING VIA PRI

This feature allows a user to have bandwidth allocated on a call-by-call basis using the Bellcore TR1268 National PRI for originating and terminating access. This bandwidth is allocated in multiples of 64 kbps and has a range from 128 kbps (2 DS0 channels) up to 1536 kbps (24 DS0 channels). This feature is also called Nx64 switching and is available on the SM (loaded). The PRI access and termination requires a loaded SM. The ISUP7 wideband capable trunk groups can reside on a basic, standard, or loaded SM. Inter-switch connectivity is done with ISUP7 trunk groups. Connections between 5ESS[®] switches can be made with ISUP7 or National PRI trunk groups. Billing records can be generated on a per call usage sensitive basis. This allows the user to be billed only for the bandwidth they use.

99-5E-1348 5ESS[®] SWITCH FOR AutoPLEX[®] SYSTEM 1000

For the cellular telephone application, the 5ESS[®] switch will serve as the Digital Cellular Switch (DCS) in the AutoPLEX[®] System 1000. This section briefly describes the architecture of the AutoPLEX[®] System 1000. A more detailed description is given in the 401-612-000, AutoPLEX[®] Cellular Telecommunication System 1000 System Description (With Call Processing/Database Nodes).

The AutoPLEX[®] System 1000 is composed of three main elements: (1) the Executive Cellular Processor (ECP), (2) the Digital Cellular Switch (DCS), and (3) Cell Sites.

Executive Cellular Processor

The ECP controls the cell sites and the Mobile Station (MS) parts of a call. In addition, the ECP informs the DCS to make the trunk-to-trunk connections for all calls. This includes the ECP determining and providing to the DCS, the trunk or trunk group for the following types of calls:

- ☐ Originating on a mobile station, and terminating to a mobile station, a PSTN, VMS, Inter-DCS, Inter-MS, or an IS.41 Inter-Vendor (IV) trunk.
- ☐ Incoming on a PSTN, VMS, Inter-DCS, Inter-MS, or an IS.41 IV trunk, and terminating to a MS, PSTN, VMS, Inter-DCS, Inter-MS, or an IV trunk.
- ☐ Hand off and Hand backs. (IS.41 IV traffic is specific to Hand offs and Hand backs only.)

A CNI-Ring is the basis for the ECP architecture. Nodes of the ring provide the interfaces or connections to

the several cell sites and to the DCS. Some nodes perform call processing activities relating to the Mobile Station/Cell Site connections.

Cell Sites (CS)

When a call is made that involves a mobile station, the mobile station is connected to a cell site over a radio link. The ECP determines which frequency band (and time slot) is to be used. The ECP also determines which trunk between the cell site and the 5ESS[®] switch is to be used for that leg of the call.

Digital Cellular Switch (DCS)

The DCS performs those call processing functions that connect the mobile station to "land line trunks", to other mobile station trunks, or to trunks which connect to another DCS. A DCS to DCS connection can be via Inter-DCS or IS.41 Inter-Vendor (IV) trunks. Except for an incoming call over a PSTN or Inter-DCS trunk, the DCS connects trunks based on information from the ECP. The land line trunks connect to the Public Switched Telephone Network(s), and can be MF or CCS trunks. The DCS and the ECP communicate over links between their CNI-rings. Trunks between the cell sites and the SMs of the 5ESS[®] switch, carry the voice (and data, if any) for the mobile station part of the call. Trunks between SMs and the other leg of the call (PSTN trunk or another AutoPLEX[®] type trunk) carry the voice (and data, if any) for the other leg of the call.

Call Scenario

The following briefly describes how a basic call involving a mobile station is processed by the ECP/DCS:

- (1) A mobile station subscriber wishes to make a call and goes off hook. The station set transmission is received by a nearby cell site.
- (2) The cell site/ECP determines which channel (frequency/time slot) the mobile station should use.
- (3) The ECP determines which cell site trunk to the 5ESS[®] switch to use and sends this to the 5ESS[®] switch (which receives it through the CNI-ring/DLN).
- (4) The DLN finds the SM the cell site trunk is connected to and sends a message to this SM.
- (5) Call processing proceeds "as usual" with the SM as the originating SM, the CMP determining the terminating SM with the outgoing trunk and the TMS time slot to use.

Because mobile stations are mobile, they move out of the range of one cell site and into a different cell site. To maintain continuity of service, the mobile station leg of the call has to be transferred from cell site to cell site. To do this, the ECP notifies the DCS/5ESS[®] switch of which cell site trunk to transfer the mobile station leg of the call to. The 5ESS[®] switch performs the transfer; one of the types of transfer is similar to that of a 3-way call. In the parlance of the cellular call, this is called a hand off.

From the 5ESS[®] switch point of view, calls in this application involve more interprocess and interswitch messages than in other 5ESS[®] switch applications. This is because the ECP controls the mobile station leg of the call and communicates with the DCS/5ESS[®] switch through the CNI-rings. In addition, due to the mobility of the cellular subscribers, there may be several hand offs per call, each involving ECP-DCS messages as well as the intra-5ESS[®] switch messages associated with a 3-way call.

The large message load the 5ESS[®] switch must process acting as the DCS is a concern. The required call load is 108 call attempts/hour for a call mix of 65% MS -> PSTN, 30% PSTN -> MS, 5% MS -> MS with 2.5 handoffs/ call attempt. With this call mix, the 5ESS[®] switch components that may have capacity problems are the CMP and the MSCU/PIC.

The CMP customarily allocates 40% of real time for call processing. For the AMPS application and the

previous call mix, the estimated call load at 40% occupancy is about 100K/hr. The 40% occupancy limit can easily be increased to 50% without impacting any other performance criteria (particularly OA&M).

The MSCU/PIC processes about 100 messages per average call for the previously mentioned mix.

Availability

This is a secured feature and is available with the 5E9(1) and later software releases. Because this is a secured feature it will not be enabled until the purchaser has made the necessary arrangements. Information on feature enabling is provided upon ordering. Please contact your Lucent Account Representative for ordering information and Right-to-Use (RTU) fee associated with this feature.

99-5E-1349 ENHANCED REMOTE INTEGRATED SERVICES LINE UNIT (RISLU)

This feature provides additional OA&M support for the Universal RISLU. To support these functions, additional OA&M capabilities have been provided. These include:

- ☐ Metallic Testing
- ☐ Environmental/Systems Alarms
- ☐ Dynamic Load Sharing.

A conversion routine to change a Universal RISLU into an Enhanced RISLU is provided.

99-5E-1376 SPECIAL ACCESS CODE (SAC) CALL TYPE

This feature allows assignment of a Special Access Code (SAC) call type and SAC OWNER to each of two or more conflicting dial codes defined in the office. This allows use of certain currently assigned office codes as SAC calls when those codes are allocated as Numbering Plan Areas (NPAs).

When an NPA code matches a local office code, digit analysis cannot determine from the first three digits whether it's an NPA and full NANP DN will be dialed or it's an office code and NANP DN without the NPA will be dialed. Normally, this is resolved by defining the three digit code as CALL TYPE of CONFLICT in the LDIT (RC/V view 9.3), enabling Timing Delay on All Calls (TDAC), and by requiring a prefix to determine the digit string length and doesn't have to do critical interdigit timing between the seventh and eighth digits. If TDAC is not activated, the switch does critical interdigit timing after each set of collected digits which constitutes a possible valid number (for example, between digits 7 and 8) until an unambiguous number is received.

This resolves most "normal" conflict situations; however, the Circuit Switched Trunk (CST) feature requires that a SAC be assigned to some codes in conflict. Once a code is defined as a CONFLICT, RC/V does not allow an entry in the TYP CI CALL field on screen one of view 9.3. Instead, the data needed to resolve the conflict must be defined on screen two (Conflict Resolution Entries Table). The SAC Call Types for Codes in Conflict special feature allows 5ESS[®] switch translations that defines a code with a Call Type of CONFLICT on RC/V 9.3 to resolve the conflict on screen two with a TYP CI CALL value of "SAC" and a SAC OWNER. The new SAC OWNER field will hold the Carrier Identification Code (CIC) used to route to the target switch.

99-5E-1397 RECENT CHANGE OPERATIONS SYSTEM (RCOS) APPTTEXT FORWARD TRANSLATION (AFT)

The AFT feature provides an Apptext software translation mechanism that allows the service provider to retrofit the 5ESS[®] switch with the current software release while the supporting RC OS remains on the previous software release. For example, a 5ESS[®] switch could be retrofit from 5E8 to 5E9, while the supporting MARCH system remains on the software supporting the 5E8 software releases. The Apptext translation mechanism of the AFT feature is based on the RC evolution process used during 5ESS[®] switch

retrofits. The AFT translator converts Apptext commands generated in the format of a preceding software release into the format of the current 5ESS[®] switch software release. (The feature was named the "Recent Change OS Downward Compatibility" in 5E8.)

NOTE: The AFT feature is intended as a convenience feature of short duration. The feature is to be used for short periods of time between the availability of the 5ESS[®] switch 5E9 software release and the availability of OSs that support 5E9. It may be used to allow the software update of an OS to be accomplished on a schedule separate from the 5ESS[®] switch operating company deployment schedule. This flexibility, though, is intended only for the early retrofits.

10.2.36 5ESS[®] SWITCH FEATURES 99-5E-1411- 99-5E-2988

99-5E-1411 STANDARD AMA RECORDING FOR USER-ORIGINATED B-CHANNEL PACKET

This feature enables the service provider to charge for B-Channels on a usage-sensitive basis in NISDN-2. The AMA records for the B-Channel packet service is generated only if the user subscribes to the "No notification" service option.

99-5E-1412 HIGHER INTERSWITCH DATA THROUGHPUT (19.2KBPS)

This feature offers an end-user higher data throughput by providing larger packet window sizes and throughput data. The X.25 packet users will have the ability to ask for window sizes in a range from one to seven. This feature also allows X.75/X.75' packet trunks to ask for window sizes in a range from one to seven, and throughput classes in a range from 75 to 19,200 bps.

99-5E-1427 DIGITAL NETWORK UNIT - SONET (DNU-S)

The Digital Networking Unit - SONET (DNU-S) is a new peripheral unit in the Switching Module - 2000 (SM-2000). It is a high capacity digital trunk termination vehicle which can support up to 8064 trunks via a new SONET STS-1 interface.

The DNU-S interface to the SM-2000 Time Slot Interchanger (TSI) is via new optical Peripheral Control and Timing (PCT) links. These links are 65.536 Mb/s and replace the Peripheral Interface Data Block (PIDB) and Peripheral Interface Control Block (PICB) interfaces currently used by SM peripherals.

The DNU-S interface to the network is through electrical STS-1 (STSX-1) links. This interface is a standard SONET interface and as such will be compatible with transmission equipment that supports the STS-1 interface, including the Digital Access and Cross Connect System IV - 2000 (DACS-2000) and the Dual Digital Multiplexer - 2000 (DDM-2000).

The DNU-S, as a 5ESS[®] switch peripheral, provides complete Operations, Administration, and Maintenance (OA&M), and Provisioning functionality. This includes capabilities such as Recent Change/Verify (RC/V), Performance Monitoring, Call Trace, Alarming, etc.

Initially, the DNU-S is capable of supporting 12 STSX-1 high speed trunk interfaces, each STSX-1 can support 672 DS0s.

99-5E-1430 INTEGRATED DIGITAL CARRIER UNIT (IDCU) TR-303 INDUSTRY STANDARD 96 LINE RT INTERFACE

This feature provides the product release of the TR-303 Industry Standard 96 Line RT Interface implements the IDCU with the SLC[®] Series 5 Carrier System RT equipped with FP303. The 5ESS[®] switch's implementation of TR-303 is described in the 235-900-308, *5ESS[®] Switch Integrated Digital Carrier Unit TR-TSY-000303 Interface Specification*.

99-5E-1433 SWITCHING-MODULE 2000 (SM-2000) RELEASE 1

The major component of the 5ESS[®] switch is the Switching Module 2000 (SM-2000) Release 1. Architecturally identical to the SM, the SM-2000 greatly expands the bandwidth available in the switch while providing additional processing power and memory capacity needed for its effective utilization. The following are the SM-2000 major components:

- An extensive Time Slot Interchanger (TSI), which is growable to 30 times larger than that of the SM. This enables enhanced support of the large scale applications of wideband data switching, as well as continued support of narrowband services.

Growth is in response to total bandwidth demand in increments of 3092 peripheral terminations (DSOs). Also, the fabric is configurable, providing additional network capacity toward the periphery of the switch or toward the internal network, as required. This flexibility permits a tailoring of bandwidth capacity.

The internal network side of the TSI is served by expanded Network Control and Timing (NCT2) links. These NCT2 links grow with the TSI in increments of 1024 network terminations (DSOs).

The new TSI fabric also supports concatenated time slots (that is, NxDSO switching) like the existing TSI, but, the larger size is intended to support greater penetration of wideband services.

- The sophisticated switching fabric of the SM-2000 is supported by a higher capacity Switching Module Processor (SMP). Based on the *MOTOROLA*[®] MC68040[™] microprocessor, the CORE40 has a significant increase in call processing capacity than the previous processor. This means that the SM-2000 can support over 20,000 lines and their associated trunks.

The CORE40 complex also includes the Message Handler (MH), a separate processor responsible for all interprocessor messages for the SM-2000. Coupled with an expanded message channel on the NCT2 links of 832 kilobits per second (Kbps), the MH comprises the SM-2000 portion of an enhanced message switching architecture.

- A larger Network Control and Timing (NCT2) link which can be added incrementally to an individual SM-2000 and is fully compatible with the existing Communications Module (CM) and NCT links on SMs. An SM-2000 will be able to coexist on a switch with local and remote SMs.

The SM-2000 also supports a new peripheral unit, the Digital Networking Unit - SONET (DNU-S) (99-5E-1427), which provides an STSX-1 trunk interface. The DNU-S interface to the TSI is an optical bus, the Peripheral Control and Timing link (PCT).

99-5E-1445 LINE TIME SLOT BRIDGING AND AUTOMATIC CALLBACK/AUTOMATIC RECALL

The Line Time Slot Bridging (LTSB) feature allows for either:

- Two independent analog lines associated with a single DN (LTSB-1 DN)
- Two independent analog lines with separate DNs associated with each other (LTSB-2 DN).

In either case, the lines must be served by the same switch. The LTSB can be used to provide an off-premises extension. It also supports conversion from Universal to Integrated SLC[®] Carrier as well as cable transfers.

NOTE: Internally Bridged Dual Service Package 1 (99-5E-3338), Internally Bridged Dual Service Package 2 (99-5E-3739), and Internally Bridged Dual Service Package 3 (99-5E-4184) are LTSB feature interaction modifications designed to enhance the current 5ESS[®] Switch LTSB feature by allowing more features to be assigned to and used on 1-DN LTSB lines.

Automatic Callback and Automatic Recall are LASS features.

- ☐ Automatic Callback allows the user to call back the number of the last call to have alerted the user.
- ☐ Automatic Recall allows the user to recall the number of the last call made.

The LTSB and AC/AR Compatibility feature allows access to both AC and AR from LTSB lines with 1 DN (off-premises extensions). Access from a line is provided either by assigning AC or AR to the line or by offering AC or AR on a generally-available basis for the entire switch.

The two LTSB lines will be treated independently regarding activations of AC or AR. This feature does not allow access to AC or AR from LTSB lines with 2 DNs (two bridged lines), either via subscription or when these features are made generally available. This feature does not affect the interaction of any other features with Line Time Slot Bridging. This feature allows access to both AC and AR as described in this feature document, and also allows access from LTSB lines with 1 DN as described in 235-190-103 Business and Residential Feature Descriptions document.

99-5E-1451 CNIS INTRA-GROUP ONLY DELIVERY OPTIONING

The CNIS Intra-group Only Delivery Optioning (CNIGI) feature provides the ability to restrict for members of a terminal group Calling Party Number (CPN) delivery, Redirecting Number (RN) delivery, delivery of Calling Party Subaddress (CPS), and provision of ICLID displays to intra-group calls. CNIGI has no effect on delivery of information to non-terminal group parties (for example residential).

CNIGI is not a separate assignable feature; it allows existing features (for example ICLID, CPN/BND) to restrict delivery of information to intra-group calls. Whether or not the CNIGI restriction applies depends on the settings of the CNIS Intra-group Only Delivery (CNIGI) option for the office, business group and individual line/PRI trunk. CNIGI applies to all members of the terminal group, including National ISDN BRI/PRI, Custom BRI/PRI, and analog lines.

The possible settings of the CNIGI option are as follows:

- ☐ No Restrictions (default for office) - no change in number delivery
The phrase "no change in number delivery" means that the calling and/or forwarding number(s) are delivered to the line/PRI for both inter-group and intra-group calls if an active number delivery feature (for example, ICLID, CPN/BND) indicates to do so.
- ☐ Intra-group Only - no delivery of calling and/or forwarding number(s) for inter-group calls. When a calling/forwarding number is not delivered because of this setting of the CNIGI option, this is known as application of CNIGI restrictions.
- ☐ Null (not valid for office option, default for group and line) - consult next level up.

If a call to a member of a terminal group is an inter-group call, the following logic is used to determine whether CNIGI display/delivery restrictions on a calling/forwarding number apply:

- ☐ Check line/PRI CNIGI option
- ☐ If set to *No restrictions*, then there is no change in number delivery
- ☐ If set to *Intra-group only*, then there is apply CNIGI restrictions
- ☐ If set to *Null*, then there is proceed to next step.

Check terminal group CNIGI option

- ☐ If set to *No restrictions*, then there is no change in number delivery

- ☐ If set to *Intra-group only*, then there is apply CNIGI restrictions
- ☐ If set to *Null*, then there is proceed to next step.

Check office CNIGI option

- ☐ If set to *No restrictions*, then there is no change in number delivery
- ☐ If set to *Intra-group only*, then apply CNIGI restrictions.

When CNIGI restrictions apply:

- ☐ The ISDN display of the Calling Number or Redirecting Number will have "Incoming call" (National BRI) or "INCOMING CALL" (Custom BRI) in place of the actual number.
- ☐ For analog displays, a string of ten "1"s will be delivered in place of the calling number.
- ☐ The Calling Party Number Information Element will be delivered to an ISDN terminal with no calling party number and with an indication of private. There will be no delivery of Calling Party Subaddress.
- ☐ The Redirecting Number Information Element(s) will be delivered to a National ISDN terminal with no forwarding number(s) and with an indication of private.
- ☐ The Calling Party Number Information Element will be delivered to a PRI with no calling party number and with an indication of private. There will be no delivery of Calling Party Subaddress (unless unconditional delivery is specified).

99-5E-1457 SUPPRESSED RINGING

Suppressed Ringing is a basic transport service applied to utility meter reading/controlling services. It uses an Open Network Architecture (ONA) to activate/deactivate Audible Ringing/Power Ringing even though signals are sent and a connection is set up from CPE to CPE. The feature provides access to meter-reading equipment connected to a customer loop without disturbing (alerting) the customer.

The Suppressed Ringing feature involves creating a Utility Telemetry Trunk (UTT) which uses standard switch fabric to perform a no-ring access to a residence or business line. This access is a cut-through connection and is not affected by features assigned to the line such as Call Forwarding. An existing Class of Service called LATA-CONNECT is modified to create a Utility Telemetry Trunk and does not use the Metallic Path of the No Test Trunk circuits of the switch as do other meter reading implementations.

The advantages of this approach are as follows:

- ☐ Substantially faster call set up/tear down time by using standard switch fabric
- ☐ Elimination of contention with switch test programs
- ☐ Telemetry data (traffic) transparency to the switch
- ☐ Provision of a connection technology that, in principle, could be used in future ISDN applications.

The feature allows a utility or other service provider access to an end user's line for telemetry data purposes. The end user's line is not alerted. The Utility Controller connects to the Central Office Service Unit (COSU) through dial-up or private lines. The COSU connects to the switch through a new class of service trunks identified as a Utility Telemetry Trunk (UTT). There may be multiple UTTs, configured as trunk groups, connected between the COSU and multiple switches. The specific number of trunks and

trunk groups is engineered for each office.

The switch is connected to the Telemetry Interface Unit (TIU) on the end user's premises using a standard local loop. The Utility Controller communicates to the COSU the directory number of the end user meter to be read. The COSU then places a call to the TIU on the end user's premises without ringing the line.

The UTT utilizes standard analog or digital E & M trunking. One COSU can be connected to several offices to more efficiently utilize resources. However, this feature does not access meters on ISDN BRI/PRI lines of the end user's side of DID PBX lines.

99-5E-1471 RC OS APPTTEXT FORWARD TRANSLATION FOR 5E9(2)

This feature provides an Apptext software translation mechanism that allows the service provider to retrofit the 5ESS[®] switch with the current software release while the supporting Recent Change (RC) OS remains on the previous software release. For example, a 5ESS[®] switch could be retrofit from 5E9(1) to 5E9(2), while the supporting MARCH system remains on the software supporting the 5E9(1) software releases. The Apptext translation mechanism of the AFT feature is based on the RC evolution process used during 5ESS[®] switch retrofits. The AFT translator converts Apptext commands generated in the format of a preceding software release into the format of the current 5ESS[®] switch software release.

NOTE: The AFT feature is intended as a convenience feature of short duration. The feature is to be used for short periods of time between the availability of the 5ESS[®] switch 5E9(2) software release and the availability of OSs that support 5E9(2). It may be used to allow the software update of an OS to be accomplished on a schedule separate from the 5ESS[®] switch operating company deployment schedule. This flexibility, though, is intended only for the early retrofits.

99-5E-1475 QUAD LINK PACKET SWITCH (QLPS)

The Quad Link Packet Switch (QLPS), supports the higher message traffic of the SM-2000 and the 5ESS[®] switch.

The QLPS is essentially a high speed tandem message switch designed to support the increased message traffic from the SM-2000 and its Message Handler (MH) due to the higher volume of calls. The QLPS communicates with the existing 5ESS[®] switch Message Switch (MSGs) through a QLPS Gateway Processor (QGP). The MSGs will support the SM and SM-2000 without QLPS, but to effectively use the higher call capacity of the SM-2000, the eventual addition of the QLPS is recommended.

The QLPS has two significant impacts:

- ☐ The QLPS enables the evolution towards a capacity increase of the 5ESS[®] switch to one million completed POTS calls per hour.
- ☐ It allows the 5ESS[®] switch to handle the increased message traffic generated by the message-intensive distributed intelligence architecture of the Advanced Intelligent Network.

The QLPS network is an overlay network which provides high bandwidth/low latency message transport between an SM-2000 and other SM-2000s, and between an SM-2000 and SMs, the AM, CMP, FPC, and DLN through the MSGs Peripheral Interface Controller (PIC). The QLPS network increases OSDS message bandwidth from 48 Kbps to 832 Kbps.

The QLPS network is composed of the following elements:

- ☐ **Quad Link Packet Switch (QLPS)** ☐ The QLPS is the hub of a star network. Its purpose is to assemble frames (encapsulate the actual OSDS/CCS messages) received from network endpoints, verify basic frame integrity, determine the destination, and store those frames until delivery to the destination can be accomplished.

- **QLPS Gateway Processor (QGP)** □ The QGP is a MSGS subdevice, which provides access to/from an MSCU and the QLPS called a QLPS Gateway Link (QGL). The QGP provides QLPS with an interface to the existing 5ESS[®] switch messaging foundation. Messages received at the QGP can be transmitted to the AM, CMP, DLN, FPC, SMs, or into the QLPS network addressed for an SM-2000. If the CMPU is equipped with a QGP (optional with the 5E9(2) software release), the QGPs reside on the left half of the shelf while the CMP resides on the right half of the shelf. Both can contain 0, 1, or 2 QGPs per MSGS side. Depending on the QGP configuration there may be 0, 4, or 2 QGLs per QGP. If there are 4 QLPSs and 4 QGPs, then each QGP has 2 equipped QGLs. That is, one to each QLPS in the network. Each QGP on a MSGS side serves 1 QLPS network. For example:

QGP 0-0, 1-0 and QLPS 0-0, 1-0 serve network 0

QGP 0-1, 1-1 and QLPS 0-1, 1-1 serve network 1.

If there are 4 QLPSs and 2 QGPs, then each QGP has 4 equipped QGLs. That is, one to each QLPS in both networks. Each QGP on a MSGS side serves both QLPS networks. For example:

QGP 0-0/1-0 and QLPS 0-0, 1-0 serve network 0

QGP 0-0/1-0 and QLPS 0-1, 1-1 serve network 1.

- **Message Handler (MH)** □ The MH provides access from the SM-2000 SMP to the QLPS network. The connection between the MH and QLPS is through a nail-up pipe through the TMS/TSI.

99-5E-1485 RC LOG FULL PERMANENT WARNING

This feature displays a continuous alarm on Miscellaneous alarm page 116 of the MCC when an "RC Log Full" condition exists. The new alarm display occurs along with the existing "RC log 85% Full Warning" message output message and accompanying audible Major alarm. Although the Major alarm can be cleared, the new Miscellaneous alarm display remains until an ODD backup is performed, serving as a reminder to service provider personnel.

99-5E-1511 NETWORK ELEMENT SERVICES SIGNALING (NESS)

The Network Element Services Signaling feature provides a generic data transport mechanism between ISDN CPE (that is, the SCN) and SCPs. The 5ESS[®] switch, acting as an AIN 0.2 SSP, does protocol translation and limited processing of data it receives through "envelopes" from either network element. The CPE and SCP agree on the format and contents of the envelope. The SSP does not examine the envelope contents.

This generic transport feature is a new component of ANS Advanced Services Platform (ASP) Release 0.1B.

This transport occurs independent of any call being processed by the SSP. Two new ASN.1-encoded operations are introduced by this feature. The ISDN CPE uses common element procedures as specified in TR-NWT-000864 to communicate with the SSP. The SCP uses the AIN 0.2 SS7 TCAP protocol.

SSP capabilities required for this service are as follows:

- Ability to encode/decode a new operation code within the Facility interface exchange of the REGISTER message
- Ability to provide a new ASP "originating" trigger for NESS
- Ability to administer CUG-like address screening on a hunt group basis
- Ability to decode/Encode TCAP messages with the new operation code

- ☐ Ability to provide a flag indicating whether SCP-initiated messages are provided to ISDN CPE.

This feature supports only unidirectional messages between the network elements. A query/response mechanism is not supported by the SSP, although ANS applications themselves may correlate messages at the application level. For example, the SCN and SCP may encode their own correlation IDs within the envelopes that they transmit.

99-5E-1532 SERVICE ANNOUNCEMENT SYSTEM (SAS)

SAS is a announcement system platform offering greater storage capacity, an interface for allowing on-line announcement updates by the customers and a base for enhanced feature offerings. SAS will be developed in two phases. The objective of phase 1 is to produce a high capacity announcement system that provides both Recorded Announcement Facility (RAF) transparency and an improved platform on which to accommodate new capabilities.

99-5E-1536 5E9(2) SOFTWARE RELEASE SOFTWARE TRANSITIONS

This feature provides the software, procedures, and tools to transition from the 5E9(1) Software Release to the 5E9(2) Software Release, update point loads on 5E9(2), and 5E9(2) Large Terminal Growth. It provides the following:

- ☐ Documentation and testing procedures to perform the Software Release Retrofit.
- ☐ Documentation and testing procedures to perform the Software Release Update.
- ☐ Documentation and testing procedures to perform the Large Terminal Growth.
- ☐ Software maintenance to carry existing capabilities such as Recent Change and CORC reapplication, SM off-line pump, AM off-line boot, and saving stable two port circuit-switched calls.
- ☐ Evolution of switch databases such as ODD (test only), ECD, and CNI data (if necessary) specific to Software Release Retrofit and/or Large Terminal Growth.

99-5E-1576 ORIGINATING BUSY/NO ANSWER SUBSEQUENT EVENT DETECTION

This feature allows the service control point (SCP) to redirect calls that encounter busy or no answer conditions. When the SCP sends a Routing message to the service switching point (SSP), the SCP can include an additional message component that instructs the SSP to notify the SCP if the call encounters certain events. Upon notification, the SCP can instruct the switch to redirect the call to another destination, play the calling party an interactive or final announcement, or allow the caller to continue to hear audible and alert the far party or be allowed to hear busy, whatever the case may be. The SCP indicates its interest in events by sending next event list (NEL) information to the SSP in a Request component, that accompanies the Routing component, in a conversation package.

In addition to the called party busy and no answer events, the SCP can also request the SSP monitor for:

- ☐ Answer
- ☐ Termination seized

99-5E-1576.A ASP BUSY/NO ANSWER SUBSEQUENT EVENT DETECTION

The Busy/NoAnswer Subsequent Event Detection feature provides incremental functionality to the Advanced Services Platform (ASP) Release 0.1B Software. This feature is part of the initial release of the AIN 0.2 Software defined by Bellcore.

AIN Release 0.1 protocol provides the SCP with the ability to specify one or more routes (for example Carrier/DN or Route Index) which the switch is to use to complete the call. The SCP-supplied routing information is hierarchical in that an Alternate Routing process is used to attempt each route in turn until an idle facility is found over which the call can complete. Once the SCP has supplied the switch with routing data, however, its involvement in the call is over. If the switch cannot find an idle route from the set of routes supplied, the call will complete to reorder. Additionally, if the call is completed over an idle route, and the terminating station is busy or rings without being answered, there is no way for Alternate routing or nothing the SCP can do to redirect the call.

This feature allows the SCP to continue its involvement on a call by specifying that it is interested in being notified if certain call processing events occur while the switch is completing the call. A Request component which contains a Next Event List (NEL) is sent to the SSP with the Routing Component. The NEL indicates the events in which the SCP is interested. The events which the SCP can indicate to the switch are as follows:

- ☐ O_Term_Seized - a Notification
- ☐ O_Called_Party_Busy - a Request
- ☐ O_No_Answer - a Request
- ☐ O_Answer - a Notification

When the SCP includes a Request component, including a NEL indicating the events which it is interested in, the switch will maintain the TCAP transaction with the SCP, and inform the SCP when the condition(s) occur(s). If an indicated event occurred and is a Notification event, the SSP informs the SCP that the event occurred, and continues processing the call. No SCP response is expected when the SSP notifies the SCP that the event has occurred. If an indicated event occurred and is a Request event, the SSP informs the SCP that the event occurred, and the SCP can then return additional routing instructions to the switch, or can play a final or interactive announcement. In this case, an SCP response is expected when the SSP informs the SCP that the event (busy or no answer) has occurred.

For further details on this feature see the 235-190-126, *Advanced Services Platform Feature Descriptions*.

99-5E-1583 ANALOG TRUNK INTERFACE ON THE SM-2000 SWITCH

This feature provides analog trunking capabilities on the SM-2000. A full complement of analog trunk capabilities is provided on the SM-2000 including the 13A Announcement interface, and trunk testing capabilities.

99-5E-1584 GLOBAL DIGITAL SERVICE FUNCTIONS ON THE 5ESS[®] SWITCH

The Global Digital Service Function (GDSF) unit is a single unit that replaces the GDSU, TTF, and ISTF found on the SM. The GDSF can be assigned on the SM-2000 or an SM, and is based on the DSC3 technology already in place on the SM-2000. This feature includes 3- and 6-port conference circuit functionality on the GDSF. The feature 99-5E-1584.A will provide the Transmission Test Facility (TTF) circuits and Integrated Services Test Function (ISTF) circuits functionality.

99-5E-1584.A GLOBAL DIGITAL SERVICE FUNCTIONS ON THE 5ESS[®] SWITCH

This feature adds the Transmission Test Facility (TTF) circuits and Integrated Services Test Function (ISTF) circuits functionality to the GDSF, introduced by feature 99-5E-1584.

99-5E-1588 DIGITAL LINE AND TRUNK UNIT - MODEL 2 (DLTU2)

The Digital Line and Trunk Unit - model 2 (DLTU2) can be provisioned on a SM-2000 to provide a direct interface between T1-carrier and the 5ESS[®] switch to support interoffice trunking. Each SM-2000 may be

equipped with a maximum of six fully loaded DLTU2s. Each DLTU2 has the capacity to terminate 20 T1-spans. The DLTU2 is a 1-shelf unit having positions for 10 DFI2 circuit packs (2 circuits per pack). Each DFI2 circuit is allocated 24 time slots per circuit, one per voice channel. A fully loaded DLTU2 consists of 10 DFI2 boards and is allocated 8 Time Slot Sets (TSSs).

The DLTU2 is mounted in the Line Trunk Peripheral (LTP) cabinet and functions as the system interface for T1 carrier lines that operate at 1.544 MHz and carries 48 digital trunks.

99-5E-1589 64 MB MEMORY BOARD FOR SM-2000

The 64 MB Memory Board feature provides additional Dynamic Random Access Memory (DRAM) for SM-2000. With this feature, the SM-2000 dynamic memory spectrum of 128 MB, is expended to 256 MB for the 5E10 and later software releases. In addition, this feature provides memory mixing allowing SM-2000 to be simultaneously equipped with 32 (TN1685) and 64 (TN1806) MB memory boards.

This feature only affects the SM-2000 development.

99-5E-1590 INTEGRATED SERVICES DIGITAL NETWORK ON SM-2000

This feature supports all operational capabilities associated with the Integrated Services Digital Network (ISDN) feature set on the SM-2000. Full ISDN functionality including BRI, PRI, and Packet support will be provided. All Custom and National ISDN feature offerings will be available on the SM-2000. This includes the wideband switching capabilities provided by the Fractional DS1 Switching through PRI Access feature (99-5E-1336). This feature is an enhancement to the Fractional DS1/ISDN feature made available in the 5E9(1) software release. Per the "ISDN on SM-2000" feature (99-5E-1590), Fractional DS1/ISDN will also be supported on the SM-2000 in the 5E10 software release. Additional development, however, is needed so that calls can be switched between a SM and an SM-2000.

99-5E-1591 HOST SWITCHING MODULE - 2000 (HSM-2000)

This feature provides the ability to use the SM-2000 as a host switching module. Current host SMs provide the termination of up to 5 remoted switching modules. The HSM-2000 can support up to 30 subtending SMs.

99-5E-1600 CODE DIVISION MULTIPLE ACCESS (CDMA)

This feature permits wireless service providers (initially cellular service providers but also personal communications service (PCS) providers also) to use the 5ESS[®] switch DCS for the *AutoPLEX*[®] System 1000 in new, existing, or overlay networks. With this feature, the 5ESS[®] switch offers the "fabric" to interconnect customers who use existing analog cellular phones or emerging digital CDMA handsets. This feature also enables the wireless provider to connect their customers to the Public Switched Telephone Network (PSTN), as well as other network switching offices resulting in seamless service.

Code Division Multiple Access, a digital-radio to phone/handset interface, achieves at least a TEN fold capacity increase over existing analog systems. With more efficient usage of the frequency spectrum, wireless providers can fulfill the access demand for service especially during high usage periods, such as rush-hour. CDMA also offers end-users: (1) the voice clarity only obtainable from digital transmission, and (2) secured communications only achievable through spread-spectrum. CDMA is accepted by the Cellular Telephone Industry Association (CTIA).

There are three network elements required for the CDMA feature: *AutoPLEX*[®] System 1000 Cell Site (CS), *AutoPLEX*[®] System 1000 Executive Cellular Processor (ECP) Complex, and the 5ESS[®] switch functioning as a Digital Cellular Switch (DCS). The DCS provides the switching fabric, the voice trunking to the cells, and the connectivity to the PSTN. This feature will add the capability to support CDMA mobile calls on the 5ESS[®] Switch DCS.

CDMA describes a system to divide the radio frequency spectrum between the cell site radios and the

mobile station radios using spread-spectrum technology. The radio signals associated with a call are spread across a broad frequency spectrum (1.25 MHz) using a unique code for each signal. Multiple signals are carried by the single carrier using different codes.

The voice and signaling in the CDMA system are digital from the mobile station to the DCS. Voice is also packetized, to save on bandwidth. The CDMA feature adds the necessary hardware and software to terminate packetized voice connections (packet pipes) from the cell site to the 5ESS[®] switch DCS, the software to allow call processing to use the packetized connections, and the maintenance software to monitor and service the packetized connections.

99-5E-1600.A CDMA PROTOCOL HANDLER FOR ATM (PHA)

This feature provides an interface between two Packet Switching Units by way of a SONET/ATM link. This Protocol Handler for Asynchronous Transfer Mode (PHA) is designed to be upward compatible to the expected ATM fabric.

This development is predicated on a PH designed for the purpose of point to point connectivity between PSUs in a switching office. The direct connect utilizes bandwidth consistent with the expected rates of ATM fabrics. This feature includes circuit pack design, associated software, and necessary engineering rules for the new circuit pack which is resident in a PSU PH slot with an optical interface attached to the PSU backplane. The circuit pack design consists of three primary components: a 100Mb/s PSU packet bus interface, a SONET/ATM interface and a control processor complex based on a 68040 design. The software includes message routing, diagnostics, maintenance, initialization, and administrative services work. Maintenance software and engineering rules support active-standby operation of the PHA channels and the active-active operation of the PHA boards in the PSU.

The first application to use the PHA is the CDMA AMPS project. For a CDMA service provider, this feature allows a Frame Relay PH in one PSU to communicate with a Protocol Handler for Voice (PHV) in another PSU. This capability allows for a greater percentage of the handoffs to be soft handoffs. Soft handoffs require less MSC real time and, therefore, enable the MSC to have a greater capacity. Also, soft handoffs provide the best quality voice connections to the end users.

99-5E-1602 EXTENDED SWITCH MODULE-2000 (EXM-2000)

The Extended Switch Module 2000 (EXM-2000) feature provides the ability to optically remote an SM-2000 through Transmission Rate Conversion Unit Model 2 (TRCU2) equipment. The EXM-2000 will support the same functionality and operations as the local SM-2000. In addition, stand-a-lone call processing (99-5E-2378) is supported.

99-5E-1610 DIRECT INWARD DIALING (DID) ANSWER

This feature allows a 5ESS[®] switch configured as a private branch exchange/customer premise equipment (PBX/CPE) to return answer supervision over incoming DID trunks for these calls:

- ☐ DID calls routed to an announcement on the PBX. This includes calls routed to number invalid, not in service or not assigned recordings.
- ☐ DID calls routed to an outgoing trunk. This includes all calls routed back to the public switched telephone network (PSTN) or other PBXs. Answer supervision is provided after a fixed 15-second delay from the time the DID call was routed to another trunk unless real answer has already been received and relayed. Answer supervision is provided even when the call ultimately terminates to a ringing, announcement or busy/reorder tone.
- ☐ DID calls receiving a dial prompt and expecting additional in-band signaling from the caller.
- ☐ DID calls routed to a line that is marked as a free termination.

99-5E-1616 VERY COMPACT DIGITAL EXCHANGE (VCDX)

The Very Compact Digital Exchange (VCDX) enhances the Lucent product line offering competitive switching products in line sizes from small to large. With this product, Lucent addresses the needs of service providers in the very small switch market segment (100 to 1500 Lines). The 5ESS[®] switch VCDX is built on the 5ESS[®] switch platform. Most of the features supported by the 5ESS[®] switch are supported by the VCDX switch. The VCDX switch meets market requirements for a highly reliable, very small switch, at a competitive price.

The underlying philosophy of the VCDX switch is to provide call processing capabilities with the same reliability and quality as the 5ESS[®] switch.

The VCDX switch uses only one SM and a simplex administrative workstation (AW). The AW provides the AM/CM/CMP functionality. All call processing software runs on the SM (that is, it does not rely on the AM/CM/CMP) and therefore is not dependent on the simplex AW.

The initial release of the VCDX switch is intended to meet the needs of:

- ☐ Subscribers needing POTS only service
- ☐ Subscribers needing more enhanced services, such as BRCS and ISDN.

The VCDX switch can provide some of the features that growing rural areas are looking for, such as work at home features that are available with BRCS and ISDN. Additionally, remote line capabilities are available using SLC[®]-5, SLC[®]-6, SLC[®]-96, and RISLU.

For more information on the 5ESS[®] Switch Very Compact Digital Exchange (VCDX), refer to the 235-120-110, *Very Compact Digital Exchange Reference Guide*, and the 235-120-120, *Very Compact Digital Exchange User's Guide*.

99-5E-1627 FORCED PRIVACY ON INTERSWITCH OUTGOING CALLS

This feature prevents the calling party number (CPN) leaving a 5ESS[®] switch over Common Channel Signaling 7 (CCS7) trunks from being displayed at a far-end (terminating) office. Subscribers at the far-end office receive a display of "PRIVATE NUMBER" on their display handsets.

This feature is secured (SFID 27) and requires that necessary arrangements be made between the service provider and Lucent Technologies. These arrangements include paying a right-to-use (RTU) fee before Lucent Technologies provides enabling information.

99-5E-1628 5E10 SOFTWARE TRANSITIONS

This feature provides the software, procedures, tools, and any other related software for 5E9(1) or 5E9(2) to 5E10 Software Release Retrofit, 5E10 Software Release Update, and 5E10 Large Terminal Growth (LTG).

For retrofits to 5E10 and for 5E10 LTG, this feature includes ODD and ECD off-site evolution, CNI database evolution, RC and CORC on-site evolution, RC and CORC reapplication, AM off-line boot, SM off-line pump, and saving stable two-port circuit-switched calls.

99-5E-1637 DIRECT CONNECT THRU ISDN ATTENDANT CONTROL OF VOICE TERMINALS (DCACVT)

This special feature provides the ability for an ISDN Attendant Console to assign an Attendant Control of Voice Terminals restriction level to an analog line that will force originations from the analog line to connect immediately to a prespecified directory number without the user dialing any digits. This is similar to the Hotline capability that can be assigned via Recent Change. The primary difference is that the ISDN

Attendant can control the restriction level of the analog line and, therefore decides whether or not the line will have Direct Connect. The DCACVT Special Feature only applies to Analog lines with the ACVT feature. ISDN and Shared Analog lines are not supported by this special feature.

The DCACVT Special Feature adds two new ACVT Restriction Levels as follows:

- ☐ ODCTRES - Originating Direct Connect, Terminating Restricted to Attendant Class of Service.
- ☐ ODCTNRES - Originating Direct Connect, Terminating Not Restricted.

99-5E-2000 DIGITAL AUDIO TAPE (DAT)

The digital audio tape (DAT) feature is introduced with the 5E9(2) software release for 3B21D and *Sun*TM based processors. The DAT supports the 5ESS[®] Switch, 5ESS[®] Switch Compact Digital Exchange (CDX), and the 5ESS[®] Switch Very Compact Digital Exchange (VCDX) offices and is available with all new office ships.

NOTE: The DAT is not supported on the 3B20D processors.

The DAT provides a minimum storage capacity of 1.3 GB/60 meters and supports the same functions currently supported by the SCSI 9-track tape drives.

The RTR currently supports a maximum of 6 tape drives: four SCSI 9-track tape drives and two DAT. The tape drives can be any combination SCSI 9-track tape drives and DAT. The DAT can coexist with the SCSI 9-track tape drives. Existing SCSI 9-track tape drive hardware is supported with the DAT drives, but conversion from SCSI 9-track tape drives to DAT is not supported in 5E9(2).

99-5E-2202 CALLING PARTY NUMBER (CPN) DELIVERY ON E911 CALLS

This feature specifies that either the billing directory number (DN) or the calling party DN be used for the E911 Service Adjunct (ESA) query, PSAP display and Automatic Location Identification (ALI) look-up on a per office basis.

The CPN Delivery on E911 Calls secured feature is a secured feature with an SFID of 116. The E911 feature (SFID=61) must be available and active before this feature can be turned on.

99-5E-2203 BRCS INTERWORKING WITH ASP OHD TRIGGER

The BRCS/OHD Interworking feature provides the service provider with the ability to assign selected Business and Residential Custom Services (BRCS) features and an Advanced Services Platform (ASP) OffHook Delay (OHD) trigger to the same line. This feature provides additional functionality to the Release 0.1B as provided in the 5E9(1) software release. It is also instrumental to the ASP National ISDN Interworking and ASP ISAT Interworking features being implemented concurrently. This provides the ability to assign an OHD trigger to a National ISDN station, and a National ISDN with *EKTS*TM station. It does not provide the ability to assign an OHD to an ISAT line. The BRCS/OHD Interworking of feature allows co-assignment of an OHD feature and the BRCS features listed under an analog line (using the RO or ROD1 protocol) or a NISDN line (using the ROD1 protocol).

As implemented previously in the 5E9(1) software release, ASP Rel 0.1B prohibits assigning BRCS features and an OHD trigger to the same line. This feature lifts this restriction for the following BRCS features for analog and NISDN lines:

- ☐ Call Forwarding Variable and Variable Feature Button, Busy Line (BL) and BL Feature Button, Don't Answer (DA) and DA Feature Button, and Remote Access to Call Forwarding.
- ☐ Call Waiting Terminating (applies only to analog)

- ☐ Cancel Call Waiting (applies only to analog)
- ☐ Multiway Calling (specifically, Call Hold (Soft Hold), Call Transfer, 3-Way Calling and 6-Way Calling)

99-5E-2204 ASP DEFAULT ROUTING

In the 5E9(1) Advanced Services Platform (ASP) Release 0.1B capabilities, when a call to a 5ESS[®] switch ASP line hits a Termination Attempt Trigger (TAT), a query to the SCP is initiated (Termination_Attempt). If the TAT query fails, the SSP terminates the call with a Reorder Tone or a No Circuits Available (NCA) announcement.

This feature will allow the SSP to examine the TAT RC data following a TAT query failure, and determine on a per subscriber basis whether to apply fault treatment or deliver the call to the ASP line. Calls will be delivered based on the service application and any associated SSP TAT subscription parameters for that DN.

Additional characteristics of this feature are the following:

- ☐ This feature provides for a default routing option for TAT queries only. Default routing can occur due to failures such as:
 - ☐ T1 timer expires
 - ☐ TAT blocked by ACG
 - ☐ TAT blocked due to either software/hardware (CNI ring or SS7 links down)
 - ☐ Invalid response to TAT (unexpected message, unexpected message sequence)
 - ☐ When SCP application or protocol errors occur such as a garbled TAT
- ☐ This feature provides additional flexibility in building services that make use of the TAT query.
- ☐ Billing for calls that are default routed to the ASP line reverts to POTS billing.
- ☐ This feature can be provisioned on a per-line basis as TATs are now provisioned.

99-5E-2205 ASP DISTINCTIVE RINGING

The ASP Distinctive Ringing/Call Waiting feature provides for the inclusion of distinctive alerting parameters in the SCP routing responses to the Service Switching Point (SSP). The distinctive alerting parameters allows the SCP to dictate the alerting pattern or the call waiting tones that are used. The feature is provided for calls that originate from and terminate to the SSP. The switch-based distinctive alerting feature does not need to be assigned to the terminating line to receive ASP distinctive alerting. However, only stations that subscribe to switch based call waiting can receive ASP distinctive call waiting tones.

Distinctive alerting information may be received from the SCP in the following messages:

- ☐ Analyze_Route (SCP response message for an origination trigger)
- ☐ Forward_Call (SCP response message for a terminating trigger)
- ☐ Authorize_Termination (SCP response message for a terminating trigger)

This feature provides additional flexibility in building services that make use of the distinctive ringing

patterns. This feature does not need to be provisioned at the SSP. This feature is available on analog, National ISDN, and Custom ISDN lines.

99-5E-2206 ASP INTERWORKING WITH NISDN

This feature allows an administrator to provision National ISDN lines with ASP 0.1B Off Hook Delay Triggers, Public Office Dialing Plan (PODP) Feature Code Triggers, Customized Dialing Plan (CDP) Triggers, and Terminating Attempt Triggers. Switch owners can allow NISDN users to subscribe to another service that makes use of the subscribed triggers mentioned previously.

Exceptions to this interworking are as follow:

- ☐ SCP-provided Display Information will not be supported
- ☐ SCP Activation/De-Activation of triggers for Shared DN will not be supported.

99-5E-2207 5E10 *PINNACLE*® ACD E911

This feature allows E911 calls to be delivered over a Basic Rate Interface (BRI) to an ISDN Public Safety Answering Point (PSAP) position using *PINNACLE*® ACD call handling capabilities. Included among these call handling capabilities are:

- ☐ Call queuing with announcements - puts incoming calls in a first-in-first-out queue and plays an announcement when all call-takers are unavailable.
- ☐ Intraflow - routes the call to another serving team in the ACD when all call-takers are busy.
- ☐ Interflow - routes the call to another ACD when all call-takers are busy.
- ☐ Call vectoring with conditional routing - routes calls based upon current conditions within the ACD following customer defined parameters.

In addition to the call handling capabilities, this feature allows the end user access to the *PINNACLE*® Management Information System (MIS). The *PINNACLE*® MIS provides real-time call status displays, historical reports, and system administration capabilities.

99-5E-2227 ANALOG AND TIME DIVISION MULTIPLE ACCESS (TDMA) ON SM-2000

This feature permits wireless service providers [initially cellular service providers but possibly personal communications service (PCS) providers also] to use the 5ESS® switch in new, existing, or overlay networks. With this feature, the 5ESS® switch offers the "fabric" to interconnect customers who use existing analog cellular phones or emerging digital TDMA handsets. With this feature, wireless providers will enjoy deploying a central office quality switch, with the highest capacity and best-in-class reliability and performance, to better service customers.

For a description of Analog and Time Division Multiple Access, see feature 99-5E-1348.

With this feature, the service provide can replace existing private branch exchanges in their wireless networks with higher capacity and better reliability central office switches.

The Analog and Time Division Multiple Access on the SM-2000 feature requires the base office and SS7 software.

The Analog and Time Division Multiple Access on the SM-2000 feature requires hardware that Lucent offers as part of the 5E9(2) software release. The feature utilizes the Common Network Interface (CNI) ring, administrative module (AM) with the 3B21D processor, the communication module (CM), and the

switching modules (SMs) with the global digital service unit (GDSU) and digital line and trunk unit (DLTU).

99-5E-2262 BRI MULTIPOINT EOC

The multipoint embedded operations channel (MP-EOC) is an operations interface which builds upon the point-to-point embedded operations channel (PP-EOC). The MP-EOC provides operations capabilities additional to the PP-EOC for sending operations messages between the ISDN switch and network element line units.

99-5E-2264 CALLING NAME (CNAM) FOR ISDN BRI FOR NATIONAL ISDN PHASE 3 (NI-3)

ISDN Calling Name Delivery (I-CNAM) provides calling party name information on terminations to National and Custom ISDN BRIs subscribed to the feature and equipped with a display. The name information is retrieved from the Line Identification Database (LIDB) using SS7 signaling, and will be up to fifteen characters, a private indication, or an unavailable indication.

ISDN Calling Name Delivery is closely related to the Analog Calling Name Display Feature (99-5E-0834). The ISDN service extends the capabilities provided by that feature to ISDN interfaces.

If the ISDN customer that subscribes to Calling Name Delivery is also a member of a customer group [that is, Basic Business Group (BBG)], the customer may also subscribe to the Electronic Directory Service (EDS) Calling Name Display (CND) feature (99-5E-0469) to be able to have "Personal Names" delivered for intra-group calls. The names will be retrieved from an Applications Processor adjunct to the 5ESS[®] switch.

On a BRI, the name information is coded with other display information (that is, calling party number) in the Display Text Information Element (IE). The name information is sent to the CPE in a SETUP message or in a subsequent INFOrmation message.

99-5E-2268 BRI/PRI SURVEILLANCE - LAYERS 2/3

This feature describes a set of the protocol maintenance capabilities at layer 2 and 3 that the ISDN switch is required to provide for BRI and PRI. Compliance is required for: Layer 2 transmission performance monitoring and logging (layer 2/3 packet, layer 2/3 signaling, TEI assignment, and retrieval selection).

99-5E-2269 NATIONAL ISDN-3 (NI-3) CALL FORWARDING OVER PRIVATE FACILITIES (NI-3 CFPF)

National ISDN-3 Call Forwarding over Private Facilities (NI-3 CFPF) allows a call of the Circuit Switched Voice (CSV) Call Type (CT) to be forwarded to an on or off-network remote DN over the private/public facilities indicated during the activation in a National ISDN-3 environment from NI-3 compatible Customer Premises Equipment (CPE). The NI-3 CFPF feature can be used for forwarding over private facilities or public facilities, but forwarding over private facilities is only applicable for subscribers who possess a Private Facilities Access (PFA) feature or Automatic Route Selection (ARS) feature. When the NI-3 CFPF subscriber possesses private outgoing facilities [such as Foreign Exchange (FX) lines, Wide Area Telephone Service (WATS), Common Control Switching Arrangement (CCSA), or senderized tie trunk facilities], and has PFA dial access or ARS access to these facilities, CFPF will permit the subscriber to use the private facilities during the Call Forwarding activation process. For the NI-3 version of the feature, the subscriber may enter the CFPF activation code or feature button, followed by the PFA access code (or feature button) or ARS access code (or feature button), followed by the desired remote DN. Depending on the CFPF preconstructed feature's activation type (ACTYP), a "courtesy" call to the remote station may be set up, yet the call's completion is not required for activation. Billing of forwarded calls occurs as in normal call forwarding, however, there are no DDD charges associated with the forwarded leg when only private facilities are used.

The NI-3 CFPF feature, like the current 5ESS[®] switch CFPF feature, must remain compatible within Electronic Tandem Switching (ETS) networks. This service allows 5ESS[®] switch ETS main business customer stations to have all terminating calls automatically forwarded to another ETS on-network or

off-network remote station.

The enhancements to the existing 5ESS[®] switch ISDN CFPF for this feature are required to meet Bellcore ISDN CF requirements as defined in Technical Reference (TR) 853 per the Bellcore definition of National ISDN-2 End-User Service Uniformity defined in Special Report 2120. As such, these enhancements are intended to be evolved from the 5E9(1) software release NI-2 version of ISDN Call Forwarding. The detailed feature interaction requirements for this feature are evolved from the 5E5 Call Forwarding Over Private Facilities (CFPF) feature for analog and custom ISDN lines.

This feature requires one (1) new preconstructed feature on the 5ESS[®] switch, which is required so that all of the equivalent Bellcore TR 853 default parameter values are available without requiring Business and Residence Custom Services (BRCS) Modular Feature Construction (MFC). In addition, the pre-5E10 CFPF preconstructed features are also supported. The NI-3 CFPF feature supports the work needed to make these features compatible on a standard BRI in NI-3. These features are the following:

- ☐ /CFIPF - Call Forwarding Over Private Facilities for NI-3 (new feature for NI-3)
- ☐ /CFPF - Call Forwarding Over Private Facilities (first available in the 5E5 software release).
- ☐ /CFPFFB - Call Forwarding Over Private Facilities Feature Button (first available in the 5E6 software release).

All of these features allow activation through Dialed Code or Feature Button.

This is a special feature available in the 5E10 software release. However, it is available for the 5E9(1) and 5E9(2) software releases through software updates.

99-5E-2270 LOGGING OF CLEARING SUBNETWORK IDENTIFIER

The Clearing Subnetwork Identification (CSI) utility is an X.75' utility carried in Clear Requests packets and is used to identify the subnetwork responsible for abnormally clearing an X.25 Virtual Call. This utility does on a subnetwork basis what the TSS Clearing Network Identification Code (CNIC) utility does on a network basis.

This feature provides enhancements to both the generation of the CSI utility by the 5ESS[®] switch and the logging of calls that are abnormally cleared.

This feature provides two subfeatures as follows: Support of inserting the CSI utility into a Clear Request packet transported across an X.75' interface for every occurrence of a call being abnormally cleared.

Currently, the 5ESS[®] switch only generates a CSI utility in the X.75' Clear Request packet for two specific conditions:

- ☐ An IP Reconnect Failure
- ☐ An X.75'/X.75 or X.25 Unconditional Removal of the trunk or line.

This feature generates the CSI utility for insertion into the Clear Request packet for an X.75' trunk whenever the 5ESS[®] switch abnormally clears a virtual call.

The Protocol Error Record (PER) reporting mechanism is updated to provide the called and calling addresses when they are available and the CSI value (the subnetwork which initiated the clear). This information is provided for both PERs that are queried by switch personnel on-demand and are included in the midnight report.

The 5ESS[®] switch currently logs all protocol abnormalities with PERs. This includes calls that are cleared

by the switch because of a protocol error and also the switch receiving Clear Request packets with a Cause Code other than "DTE Originated" and a Diagnostic Code of other than "No Additional Information".

This feature will add additional information to the PER output with the Called and Calling addresses of the call and the CSI value (this may be the 5ESS[®] switch CSI value, if the 5ESS[®] switch is abnormally clearing a call, or the CSI value received in a Clear Request packet on a X.75' trunk).

Until ubiquitous deployment is achieved, the CSI utility transmission must continue to be inhibited on a per trunk member basis in order to prevent the CSI from being sent to a facility that does not support it.

99-5E-2271 DEFAULT SERVICE PROFILE

The Default Service Profile feature provides a method of provisioning a minimum set of services on a Standard ISDN BRI interface to serve terminals which do not associate themselves with any other service profile on the interface. Dial tone and the minimum set of services can be provided to terminals on a DSL with no DN and no services assigned. Dial tone and the minimum set of services can be provided to terminals which cannot associate themselves with any of the subscribed services on an interface with services assigned.

The feature extends to Standard BRIs the ability to define one or more "Default Service Profiles" in the switch. Each Default Service Profile can be configured to enable Circuit Switched Voice originations to any selected set of the following services - BRIV, 108 Test Line, 611 (Repair Service Bureau), 811 (Business Office), and 911 (Emergency). Each DSL can be individually associated with a specific "Default Service Profile" whether or not DNs and other subscribed services are assigned to that DSL.

The Default Service Profile is to be used by telephone companies as one of many forms of provisioning an ISDN line with service. The minimum level of service will be useful to maintenance personnel dispatched to the customer premises as well as to end users who try to use a DSL or a terminal which is not setup for full service.

NOTE: This feature is an ISDN feature. ISDN service must be implemented on the switch. This feature is based upon the ability of the Standard ISDN interface to provide Non-initializing Terminals (NITs) with circuit-switched voice service on the interface. That capability, "Non-initializing Terminals" (99-5E-2273), must be available on the interface.

99-5E-2273 NON-INITIALIZING TERMINALS

This feature adds to the current level of support for Non-Initializing Terminals (NITs) on a Standard ISDN interface. Before the 5E10 software release, NITs were only supported for Packet-mode calls. This feature adds support for Circuit-mode calls, and adds the capability of using a NIT with a Permanent Virtual Circuit.

A NIT is simpler than a Fully-Initializing Terminal (FIT), both in its construction and its use. From the user's perspective, a NIT only has to be programmed with the terminal's directory number. (For FITs, there is a good deal more information that the terminal must "know" before it can be used. This information must either be manually programmed into the set, or else provided from the switch through the Automatic Terminal Setup feature.) A NIT also has more limited capabilities than a FIT, in that it cannot have any feature buttons. Therefore, any feature requiring the use of feature buttons, such as Conference or Transfer, shall be unavailable to a NIT.

For Circuit-mode calls (that is, voice bearer capability), or for non-PVC Packet-mode calls, the user does not need to know anything more than what DN the terminal needs to know to be able to accept incoming calls. (If all calls are to be outgoing, then the NIT would not need to know even the DN associated with the interface.) Thus, the user shall be able to attach the NIT to the interface and immediately begin making calls.

This simplified mode of operation is facilitated in the switch by the existence of a "Default" directory number (DN) provisioned for the interface. A Default DN can be established for both Circuit and Packet call types, at the operating company's discretion.

This feature also provides an additional capability for a FIT which does not successfully initialize, for example, if the user did not program the SPID correctly. The terminal is allowed to make calls based on the Default DN that is used for NITs - to the switch, a FIT which has not initialized appears the same as a NIT. The terminal must be designed to operate in this mode, however, and none of the terminal's feature buttons will operate. This may be confusing to a user expecting full service, but they would be receiving enough service to call the telephone company to determine why they were not receiving the expected level of service.

Users who wish to use a NIT with a Permanent Virtual Circuit (PVC) must know more technical information about their terminal. Use of a NIT with a PVC requires that the user and the operating company agree on the Terminal Endpoint Identifier (TEI) that the user's NIT will use. The TEI becomes the means for the NIT to identify itself to the switch, allowing the switch to connect the terminal to the proper PVC. This TEI will be either built into the terminal by the manufacturer, or else programmed into the set by the user (this depends on the terminal design). In either case, the user must understand what this number is, and communicate it to the operating company at the time the PVC service is subscribed. This may mean that the user must purchase the terminal some time in advance of the time service is actually subscribed. The switch shall only provision this TEI as part of the user's subscription options when a PVC is subscribed, so this complexity does not apply when other Packet or Circuit services are being provisioned.

The advantages this feature provides are as follow:

- ☐ A NIT is easier to install than a FIT - the user needs to know little information about the interface they are using, and so there is very little information that has to be programmed into the terminal. This should assist non-technical users to access ISDN capabilities.
- ☐ NITs are expected to be less expensive to both produce and purchase, stimulating ISDN usage.
- ☐ Meets NI-3 requirements, as negotiated with Bellcore and the RBHCs.

99-5E-2283 INTER-EXCHANGE CARRIER PRESELECT INDICATION UTILITY OVER X.75' TRUNKS

The Inter-exchange Carrier Preselect Indication (ICPI) is a utility specified by Bellcore for Bell Operating Company packet mode networks. It is used to pass an indication on an X.75/X.75' packet trunk that the end-user (originating DTE/CPE) has subscribed to Inter-exchange Carrier Preselect. The ICPI utility is generated by packet switch nodes that have insufficient routing information to decide if an Inter-exchange Carrier is required to complete a call.

This feature allows operating companies to connect packet devices to 5ESS[®] switch through X.75' interface that do not have logic necessary to route calls and need to forward user's Preselected Inter-exchange Carrier through ICPI utility.

99-5E-2285 VECTOR PROMPT ENHANCEMENT

ISDN call center service, provided by the *PINNACLE*[®] ACD is used for sophisticated call handling applications. These applications often involve a parallel data application for order entry or information retrieval. To provide the maximum efficiency of call center operation, it is highly desirable to automate and link these processes as much as possible.

Often it is costly for customers to modify their existing data applications to accept data messages from a switch interface. As an alternative, data could be delivered to the telephone set display of the ISDN-equipped agents, who would then use the information displayed to perform the required data functions of information retrieval and data entry. What is unavailable is a means of delivering the data collected by the *PINNACLE*[®] EPIC prompt steps to the agent telephone displays. This feature will provide that capability.

99-5E-2295 CALLING NAME FOR PRI

The CNAM for ISDN PRI feature (CNAM-P) consists of three components as follows:

- (1) **Privacy of Calling Name (PCN)** - which allows an originating CPE to signal on a per-call basis the "presentation status" (such as public or private) for their calling name.

Both flat rate and usage sensitive billing options will be provided for PCN.

- (2) **Calling Name Delivery (CNAM)** - which provides name information (either name characters, a private indication, or an unavailable indication) to a subscribed terminating interface (PRI) at the time of call setup.

Both flat rate and usage sensitive billing options will be provided for CNAM Delivery on an ISDN PRI.

- (3) **Electronic Directory Service Calling Name Display (EDS CND)** for intra-business group calls.

Flat Rate billing only will be available for EDS CND.

PCN, CNAM, and EDS CND are provided for both Custom ISDN and National ISDN PRIs. All three capabilities apply to circuit switched voice, circuit switched data, and switched fractional-DS1 calls; but are **not** applicable to packet switched data calls.

99-5E-2299 DCLU AND IDCUI TR-008 MODE 1 INTERFACE SUPPORT OF THE SLC[®] 96-COMPATIBLE DUAL CIRCUIT FOREIGN EXCHANGE (FX) PLUGS

This feature allows the 5ESS[®] switch to terminate, provision and maintain SLC[®]-96-compatible dual circuit (FX) plugs.

This feature offers two major benefits for systems that currently use dual circuit FX plugs:

- ☐ It provides greater access capacity for TR-008 mode 1 remote terminals and facilities.
- ☐ Universal TR-008 mode 1 systems that utilize dual circuit FX plugs will not have to be reconfigured to single circuit FX plugs when these systems are converted to integrated access on the 5ESS[®] switch.

This is a secured feature (SFID=144) requiring that necessary arrangements be made between the service provider and Lucent Technologies. These arrangements include paying a right-to-use (RTU) fee before Lucent Technologies provides enabling information.

99-5E-2304 T1/E1 TERMINATION ON DLI OF ORM FOR TIMING

This feature provides the capability of terminating a T1/E1 from a Building Integrated Timing Supply (BITS) source on the DLI. The ORM is equipped with an internal Stratum 4 clock. During stand-a-lone mode, the internal clock loses its timing from the umbilical and enters into the free running mode. In free running mode, the stratum 4 clock on the ORM is not stable and accurate enough to prevent digital facilities in an ORM from experiencing excessive frame slips. The introduction of a timing source based on the BITS solves this stand-a-lone timing problem by providing continuity of service on these facilities since the BITS provides an internal Stratum 3 (or better) clock at the ORM site.

99-5E-2304.A T1/E1 TERMINATION ON DLI FOR VCDX

This feature provides the capability of terminating a T1/E1 from a Building Integrated Timing Supply (BITS) source on the Direct Link Interface (DLI) circuit. The VCDX product is currently equipped with a Clock Synchronization Circuit (CSC), TN1838, which provides an internal Stratum 4 clock and interface to a external BITS source which can provide an internal Stratum 3 (or better) clock. The CSC is no longer required for VCDX applications and is replaced with the DLI circuit on the TN1077F circuit pack.

99-5E-2320 ISDN INSPECT

ISDN Inspect feature consists of three inspect operations: Feature Button Inspect, Idle Call Appearance Inspect, and Non-Idle Call Appearance Inspect:

- ☐ Feature Button Inspect -- displays the service description associated with a feature button selected by the user.
- ☐ Idle Call Appearance Inspect -- displays the directory number or intercom group information associated with the call appearance selected by the user. The directory number is the directory number programmed into the terminal, the directory number associated with a call appearance on a CACH *EKTSTM* terminal, or the default directory number for the interface.
- ☐ Non-Idle Call Appearance Inspect -- on an active, held, or offered call, displays the other party's directory number (if known and not private) if the user is subscribed to Calling Number Delivery. (If the user is not subscribed to Calling Number Delivery, then only the status of the call is displayed, that is, 'connected' for an active call.) If the user has Calling Name Display active, the calling party's name is displayed for calls terminating to the ISDN user (if known and not private). If the non-idle call appearance being inspected is on a conference call, the display indicates that this is a conference call, and does not display the other parties' (for example, conferees) directory numbers and names.

Both flat rate and usage sensitive billing options are provided for ISDN Inspect.

Inspecting a feature button on the terminal is a two step process. The user first selects the inspect feature button and then selects any feature button (including the inspect feature button). The service description associated with the feature button is then displayed to the user.

99-5E-2326 AMA LONG DURATION RECORDING ENHANCEMENTS

This feature revises AMA recording for long duration connections to meet requirements in Bellcore TR-NWT-000508, Issue 3. Two types of Bellcore AMA Format (BAF) records will be made for long duration connections. The first record is generated at the first scheduled record generation time after the elapsed time of the call exceeds 1440 minutes (24 hours).

The second type of record is called a continuation record. It is generated at each scheduled record generation time and at call disconnect, provided a first record has been generated for the call. The elapsed time and carrier elapsed times reported are the same as the time since the previous record was generated for the call (duration time corrections are not applied). Module 022 (long duration module) will be appended to all continuation records.

The schedule record generation time is the time of day when the switch produces the long duration records. This time will be recent changeable on an office basis. The default time is 00:00 (midnight).

99-5E-2343 ADVANCED SERVICES PLATFORM BRCS/OHD INTERWORKING EXTENSIONS

The ASP BRCS/OHD Interworking Extensions feature provides the additional capabilities to complete the Residential and Small Business feature interactions. The additional interactions with the Business and Residential Custom Services (BRCS) features include the following:

- ☐ Call Pickup - Basic
- ☐ Message Service System
- ☐ Multiple DNs per Line (MDNL) with Distinctive Ringing
- ☐ Denied Origination and Termination

- ☐ Direct Connect (Manual/Hot Line)
- ☐ Home Intercom and Single Line Variety Package
- ☐ Speed Calling (for home; not associated with Individual Dialing Plan)
- ☐ Series Completion Hunting.

99-5E-2347 ASP LASS/OHD INTERWORKING

The LASS/OHD Interworking feature provides the ability for selected LASS features and an ASP OffHook Delay (OHD) trigger to be assigned to the same line. This feature provides additional functionality to the ASP Release 0.1B as provided in the 5E9(1) software release by allowing the following LASS features to be assigned to a line which also has an OHD trigger assigned:

- ☐ Analog Calling Name Delivery (CNAM)
- ☐ Automatic Callback
- ☐ Customer Originated Trace (COT)
- ☐ Automatic Recall (Repeat Dialing)
- ☐ Individual Calling Line Identification (ICLID) for Analog and National ISDN, including both Calling Number Delivery (CND) and Directory Number Privacy (DNP) and Per-Call Privacy (PCP)
- ☐ Screen List Editing
- ☐ Selective Call Rejection (also known as, Call Screening)
- ☐ Selective Call Forwarding (SCF)
- ☐ Selective Call Acceptance (SCA)
- ☐ Selective Distinctive Alerting (SDA)
- ☐ Computer Access Restriction (CAR)
- ☐ Unidentified Call Rejection (UCR).

99-5E-2356 ISDN/PERSONAL COMMUNICATIONS SERVICES (PCS) INTERWORKING

ISDN/PCS Interworking allows National ISDN (NI-3) BRI lines on an Advanced Intelligent Network (AIN) capable 5ESS[®] switch the ability to interface with radio equipment [Radio Port Control Units (RPCU) and/or Intelligent Base Stations (IBS)] to provide four basic capabilities fundamental to a Personal Communications Services (PCS) user, as well as several vertical services [for example, Call Waiting, 3-Way Calling, Calling Number Delivery.] A PCS user can be described as a user with a wireless handset who is associated with a registration area which is managed by an Access Manager (AM) located in a Service Control Point (SCP) or in an RPCU. The initial offering of PCS supports PCS users traveling at low to moderate speeds, for example, walking or traveling in a vehicle in an area restricted by local limits. High-speed vehicular travel is not supported.

The four basic capabilities provided by 5E10 ISDN/PCS Interworking include the ability for a PCS user to:

- ☐ Register with the network
- ☐ Originate calls into the network

- ☐ Receive calls from the network
- ☐ Move from one RPCU to another without any loss of call [Automatic Link Transfer (ALT)] (the 5E10 software release supports intra-switch ALT only)

ISDN/PCS Interworking is a Personal Communications Services offering based on an ISDN interface between the LEC switch and radio controllers operated by a PCS provider. When mature, PCS will be a set of capabilities that will provide three types of mobility: terminal mobility, personal mobility, and service mobility. Terminal mobility is the ability of a terminal, such as a wireless handset, to access telecommunications services from different locations while in motion, and the ability of the network to locate, identify and authenticate that terminal. Personal mobility is the ability for users to access telecommunications services at any terminal or handset on, for example, the basis of a personal phone number. That is, a user may be reached any time, anywhere either on a land line phone or a wireless phone through a personal telephone number. Service mobility is the ability for users to access the vertical features provided by today's land line network from their wireless phone.

99-5E-2357 AIN 0.2 SEND TO OUTSIDE RESOURCE (LOCAL)

This feature provides the ability for a 5ESS[®] switch, acting as a Service Switching Point (SSP), to process an external Send_to_Resource Message. This message allows an SSP to send AIN Calls to an external Intelligent Peripheral under the control of the Service Control Point (SCP). The SCP may instruct the IP to connect to a particular resource (for example, announcements, text to speech, voice recognition circuits) and then return the result of the call to the SCP for further processing. The interface between the SSP and the IP is a Primary Rate Interface (PRI) connection. This feature only provides the interface to an IP which is local to an SSP (directly connected). This feature is delivered as a 5E10 software update.

99-5E-2371 ENHANCED PROFESSIONAL OFFICE

The Professional Office feature extends the capabilities of the *PINNACLE*[®] ACD/MIS to other BRCS users, not just those who are part of a call center. This service offers the following capabilities:

- ☐ Provides status of BRCS Professional Office Positions to management.
- ☐ Provides the ability to track and report detailed, company-specific information gathered by individual staff during phone usage through the use of event codes.
- ☐ Allows staff to access detailed, personal reports concerning phone use and to use Professional Office capabilities in supporting client billing.

99-5E-2372 ASP INTERWORKING WITH CUSTOM ISDN ATTENDANTS

This feature supports the interworking of the 5ESS[®] switch release 0.1B ASP capabilities with the ISDN Attendant (ISAT). The interactions between ASP and ISAT defined by this feature consist primarily of the following:

- ☐ Allowing the subscribed Originating ASP Triggers to be assigned to DN's on ISAT BRI terminals. The two allowed ASP originating triggers on ISAT are the Public Office Dialing Plan Feature Code (PODP FC) trigger and the Customized Dialing Plan (CDP) trigger.
- ☐ Allowing subscribed Terminating ASP Triggers to be assigned to DN's on ISAT BRI terminals. The ASP terminating trigger is the Termination Attempt Trigger (TAT).
- ☐ Allowing ASP interactions with ISAT switch-based features.
- ☐ Allowing ISAT calls to hit 3/6/10/N11 triggers and TATs within the same SSP.

There are a number of ASP and ISAT interworkings that are not supported in this feature. The capabilities that are **not** supported are the following:

- ☐ The ASP Off-Hook Immediate (OHI) triggers on ISAT lines.
- ☐ The ASP Off-Hook Delay (OHD) triggers on ISAT lines.
- ☐ The ASP Monitor capability on ISAT.
- ☐ ISAT Feature button access to ASP triggers.
- ☐ ISAT display information provided by the SCP.

99-5E-2378 SM-2000 STANDALONE CALL PROCESSING

This feature gives the Switching Module - 2000 (SM-2000) and Extended Switching Module - 2000 (EXM-2000) the ability to continue processing calls even when they are isolated from the rest of the 5ESS® switch. All ports on an SM-2000 can reach all other ports on that SM-2000.

99-5E-2401 RC OS APPTTEXT FORWARD TRANSLATION FOR 5E10

This feature provides an Apptext software translation mechanism that allows the service provider to retrofit the 5ESS® switch with the current software release while the supporting Recent Change (RC) OS remains on the previous software release. For example, a 5ESS® switch could be retrofitted to the 5E10 software release from the 5E9(2) software release, while the supporting Recent Change OS remains on the software supporting the 5E9(2) software releases. As Retrofit Skip from the 5E9(1) software release to the 5E10 software release is supported, the AFT feature supports OS translation from the 5E9(1) software release to the 5E10 software release also. The Apptext translation mechanism of the AFT feature is based on the RC evolution process used during 5ESS® switch retrofits. The AFT translator converts Apptext commands generated in the format of a preceding software release into the format of the current 5ESS® switch software release.

NOTE: The AFT feature is intended as a convenience feature of short duration. The feature is to be used for short periods of time between the availability of the 5ESS® switch 5E10 software release and the availability of OSs that support 5E10. It allows the software update of an OS to be accomplished on a schedule separate from the 5ESS® switch operating company deployment schedule. This flexibility, though, is intended only for the early retrofits.

99-5E-2404 AUTOMATIC POWER RECOVERY - PHASE 1

The Automatic Power Recovery (APR) feature improves the recovery of the 5ESS® switch or its entities on a power outage caused by unreliable AC power or a power outage. It is no longer necessary to dispatch a technician to the remote site (from the SCC) to recover it. The feature provides three distinct deliverables (two external and one internal):

- ☐ Phase 1 APR hardware (external)
- ☐ Complete list of 5ESS® hardware identifying APR/non-APR hardware (output from the test effort for this feature, provided to SE/Product Management as input for future planning).

The GPDF, 3B21D, CM2c, CM2, ISLU2, SMP core (MCTSI, DLI, NLI), the LU3 (APR enabled through backplane option), and the LDSU are the hardware entities that will be delivered with the 5E10 software release with APR (for example, Phase 1 APR hardware). APR requires that after the site (transmission elements are not included) has lost and then regained power, the site must be restored to service automatically (except for those circuits taken OOS manually by the exchange technician). Any other

hardware entities (that is, CNI) may need manual intervention for complete restoral.

This feature also provides automatic recovery for short duration transient power losses, possibly due to exchange technician errors. This feature is expected to work with existing customer supplied battery plants that utilize a load or battery disconnect to protect the plant.

99-5E-2406 RECOVERY FROM ALTERNATE BOOT DISK

This feature provides the capability to recover a 5ESS[®] switch from a remote monitoring site, such as the switching control center (SCC), from a disk other than the primary and secondary boot disks. Presently, the 5ESS[®] switch has MHDs 14 and 15 designated as software backup disks, and the system can be recovered using these disks. However, technicians must be sent to the site and physically manipulate the hardware (change the ID plugs of the disk drive or use thumb switches) before the system can boot.

This feature allows technicians at the SCC to recover the office from the emergency action interface (EAI) page, without requiring a technician to be on site and without any hardware manipulation. The ABDs can be spread over the available small computer systems interface (SCSI) buses for hardware reliability, and can be configured under either DFC-0 or DFC-1. Customers accrue substantial savings in time and money with this feature by administering the recovery from a disk entirely from the remote SCC. Additionally, this feature enhances the inherent reliability of the 5ESS[®] switch by providing the ability for customers to have two software backup disks that could be used as alternate boot disks (MHDs 14 and 15) without having to manipulate the hardware.

99-5E-2407 REMOTE RECOVERY AND BACKUP FROM DAT TAPE

This 5ESS[®] switch feature provides our customers (the service providers) with the capability to recover and backup a 5ESS[®] switch equipped with one or more DAT tape drives, from a REMOTE monitoring station such as the SCC.

Recovery and Backup of a 5ESS[®] switch are two OA&M procedures critical to maintaining the high standards of reliability that the 5ESS[®] switch is associated with. Recovery procedures recover a part or the whole switch from any outage office text and database situation (with the exclusion of power failure). Backup procedures allow the periodic backing up of the office text and database on to tapes which are stored until they are needed for recovery procedures.

To date, these procedures must be performed on-site and require that switch personnel be present on site to administer the equipment and the switch personnel dependent procedures. With this feature, switch personnel no longer have to travel to the site to perform either of these procedures. In addition, no on-site manipulation of hardware will be required. Backup procedures are almost always performed at off-peak hours, generally midnight to 6:00 a.m. By making it possible to administer and control these procedures from the SCC, our customers can accrue substantial benefits in time and money.

99-5E-2422 SWITCH MODULE PROCESSOR 60 (CORE60)

This feature provides an enhanced processor platform for supporting a processor speed up of a factor of over 1.5 times the capability of the SM-2000 release 1 processor, CORE40. With this enhancement, the SM-2000, using the CORE60, will be capable of supporting larger terminations than those supported by SM-2000 in software release 1, and also support features that are processor real time intensive.

99-5E-2444 TRUNK AND LINE WORKSTATION (TLWS) METALLIC TEST CAPABILITY ON 5ESS[®] SWITCH

This feature provides metallic (electrical) testing through the Trunk and Line Work Station (TLWS) interface for offices which have no DCTU. The metallic testing provided by this feature is through a display page on the TLWS terminal separate from the page which accesses metallic testing provided by the Directly Connected Test Unit (DCTU). A switch with both this feature and DCTU based testing will allow access to either of the metallic testing pages selected by the user.

99-5E-2446 INFORMATION SERVICES GATEWAY

The Information Services Gateway feature allows service providers to offer cellular customers access to various information services by dialing a single cellular feature code (for example, *INFO) from a mobile phone. A voice mail storage system provides the mobile station with a voice menu from which the subscriber dials the number for the desired information (such as, weather, sports, traffic, etc.). For example, a mobile station might gain access to weather information by entering a "1", sports information by entering a "2", and traffic information by entering a "3". The voice mail storage system translates the entered digit or digits into the telephone number of the corresponding information service and transmits this information back to the *AutoPLEX*® system. The *AutoPLEX*® system then disconnects the mobile station from the voice mail system and establishes an outgoing call to the selected information service.

This *5ESS*® switch feature provides three specific functions. First, the feature collects the dial tone multi-frequency (DTMF) digits from the voice mail system corresponding to the telephone number of the information service provider. Second, this feature disconnects the channel to the voice mail system. Finally, this feature sends the collected DTMF digits to the Executive Call Processor/Access Manager for further analysis.

The Information Service Gateway feature increases cellular/wireless usage, thereby, increasing revenue for the service providers.

NOTE: The Information Services Gateway feature operates with the wireless/*AutoPLEX*® System 1000 application of the *5ESS*® switch. Therefore, at least one of the wireless/*AutoPLEX*® System 1000 features (such as Frequency, Time, or Code Division Multiple access, or the Access Manager Communications Package) is needed.

This feature is available as a software update (SU) to the 5E10 and the 5E9(2) software releases. This feature is also available with the 5E11 and later software releases.

99-5E-2448 FEATURE ACTIVATION COUNTING AND RECONCILIATION

The Feature Activation Counting and Reconciliation (FACR) feature enables the customers to monitor feature usage in their *5ESS*® switch, and it also enables billing of customers for assigned software features.

The FACR feature is being deployed in Releases. Release 1 counts a subset of the existing feature packages listed in Switching Flash 93-038, dated October 1, 1993. Upon acquisition, Release 1 may be used immediately. Future releases will count all feature packages, and they will replace the current Feature Billing Verification process.

The FACR feature consists of three main components:

- ☐ **5ESS® Switch Audit** ☐ checks billable NSEP feature packages to determine whether they are assigned. The audit may be run on demand or it may be scheduled to be run on a routine basis. Once executed, the audit begins processing each SM-2000 in the office. Upon completion, the audit creates a data file containing the feature package assignment counts. This file is retrievable by the PC user for output in a report format. There are no feature dependencies for this audit.
- ☐ **RSCANS Communication Package** ☐ enables file transfer between the *5ESS*® switch and the PC using the retrieval software (either the customers' or the Billing Center's).
- ☐ **PC Retrieval Software** ☐ enables the PC user to retrieve the feature package data files and to generate feature package assignment reports.

The FACR feature requires the following PC hardware and software:

- ☐ IBM® compatible 386 computer
- ☐ 200 MB or greater hard drive
- ☐ HAYES® compatible modem (up to 9,600 baud)
- ☐ MICROSOFT® WINDOWS™ 3.1
- ☐ MICROSOFT® EXCEL.

99-5E-2457 THIRD PARTY CALL CONTROL

The Third Party Call Control feature allows the 5ESS® switch to receive call control information from an external host computer through the Application Interface Unit and perform call-processing functions, such as host call routing, host-requested call redirection, host call transfer, host conference, and host outbound dial. ACD/BRCS agent telephone equipment must be an Custom ISDN Type B or Type D or equivalent terminal.

The *host call route* feature allows the host to specify a destination for an ACD call that is receiving call vectoring treatment. The destinations are directory number, queue number, vector ID or an agent ID.

The *host call redirection* feature redirects an ACD call that is alerting at an ACD agent position if the agent does not answer. The call is redirected to any directory number, queue number, or an agent based on the information passed by the Application Interface Unit.

The *host call transfer* feature allows automatic transfer of an active call to a held call at an agent position.

The *host conference call* feature allows automatic conferencing of an active call and a held call at an agent position.

The *host outbound dial* feature automates dialing and improves an agent's efficiency.

99-5E-2466 TR303 INTERFACE ON DNU-S

This feature assigns a TR303 remote digital terminal (RDT) to digital signal level 1 (DS1) facilities terminating on a digital network unit (DNU) synchronous optical network (SONET) (DNU-S) (contained with an EC-1). The 5ESS® switch provides the equivalent capabilities and services for TR303 RDTs on a DNU-S as for those on an IDCU with the exception of DS1 maintenance capabilities (PLS and Loopbacks) and Hairpins.

This feature terminates both analog and ISDN SONET trunks and lines (up to 30,000 lines - maximum allowed on the SM-2000).

99-5E-2467 CALLING PARTY NUMBER (CPN) BILLED ON A PRIMARY RATE INTERFACE

This feature enables the Calling Party Number (CPN), which is received in the signaling protocol, to be used as an originating number in the AMA record for calls incoming on a primary rate interface (PRI). The feature also includes sending the calling party number out to the network as a charging number on CCS7 trunks or as ANI digits on Equal Access Multi-Frequency (EAMF) trunks.

The existing 5ESS® Switch functionality bills calls from a PBX to a single billing number that is assigned to the PRI trunk group to that PBX. The feature is used when the PBX owner must bill originating PRI calls to the calling party number. The feature design does not affect the choice of CPN or BN sent to an E911 Public Safety Answering Point (which is controlled by a separate parameter).

99-5E-2477 ADDITIONAL ASP OHD INTERACTIONS WITH ACCOUNT CODE AND CPN/BN

This feature provides the ability for selected Business and Residence Custom Services (BRCS) features and an Off-Hook Delay (OHD) trigger to be assigned to the same line. Prior to this feature, these features were not assignable to the same lines that had OHD triggers assigned. Appropriate feature interactions between these BRCS features and the OHD triggers are also defined as part of this feature.

The specific BRCS features which will be assignable along with OHD triggers are as follow:

- ☐ Account Codes
- ☐ MultiLine Hunt Groups
- ☐ Calling Party Number/Billing Number (CPN/BN)
- ☐ Redirecting Number Delivery (RND).

Note that this feature does not alter any restrictions on the types of lines/terminals that can be assigned the BRCS features noted previously. It provides for co-assignment of these selected BRCS features with OHD triggers on analog and National ISDN lines where only mutually exclusive assignment was possible before.

This feature provides additional capabilities to the Advanced Services Platform (ASP) Release 0.1B as provided in the 5ESS[®] switch 5E9(1) software release.

With respect to this feature, Recent Change support for assignment of BRCS features to a line along with an OHD trigger is limited to the additional interacting BRCS features. The active/inactive status of the OHD trigger is not considered in deciding whether or not to allow a BRCS feature to be assigned.

- ☐ MultiLine Hunt Groups MultiLine Hunt Groups (MLHG) are used to provide terminating service capabilities although it is also possible to originate calls from members. There is no interaction with OHD triggers other than the ability to assign them to the same lines as the additional interacting BRCS features.

An Off-Hook Delay Trigger may be provisioned on a line that is a member of a Multiline Hunt Group (MLHG).

- ☐ Calling Party Number/Billing Number (CPN/BN) An Off-Hook Delay Trigger subscriber may also subscribe to the ISDN Calling Number Identification Services (I-CNIS) feature.

Recent Change (RC) allows CPN/BN to be assigned to analog lines if SHRD DN = "All" on RC view 12.52.

The I-CNIS feature was known as the Calling Party Number/Billing Number (CPN/BN) feature prior to 5E8.

- ☐ Account Code Modular Feature An Off-Hook Delay Trigger subscriber may also subscribe to the Account Code Modular Feature.

When an access code or feature button is used to access the Account Code Modular Feature, that code will initially be processed by the 5ESS[®] switch in the normal manner (for example, without regard to the OHD trigger). If and when an actual call is placed as a result of the Account Code feature access, then the OHD trigger will be processed.

Dialing of only the Account Code access code from an OHD subscriber line will not result in an OHD trigger query, whether it is the initial leg of a call or a leg of a multiway call.

- ☐ Redirecting Number Delivery Redirecting Number Delivery (RND) is a companion feature to the CPN/BN and allows a Redirecting Number to be passed to the ISDN customer premises equipment (CPE). This feature is used in cases where a call is redirected before terminating to ISDN CPE (which

is likely to be the case for the calls sent to the SCN for services).

Support for co-assignment of the RND and OHD will only be provided for National ISDN BRI. Co-assignment for Custom ISDN is not provided. The RND is not typically used on analog lines although it can be assigned to analog lines if it is shared.

99-5E-2488 PRI CALL-BY-CALL SERVICE SELECTION FOR HOTEL/MOTEL AND SCOCs

This feature provides call-by-call access over an ISDN PRI to two services that were previously accessible over dedicated trunks: Hotel/Motel (HM) service and Selected Class of Call Screening (SCOCs) service. By including a properly coded value in the call Q.931 SETUP message sent over a PRI to the 5ESS[®] switch, a PBX can ask for either Hotel/Motel service or SCOCs service for a call. ISDN PRI B-channels are selected on a per-call basis, and the available B-channels can be shared by Hotel/Motel service, SCOCs service, and by other call-by-call services such as OUTWATS, SDS, SDN, and access to FX and Tie,

Hotel/Motel service enables calls from a PBX at a hotel or motel to be handled by an operator service system (OSS), so that detailed billing information, such as the calling party's room number, can be obtained for calls originating at guest rooms. Calls identified by the PBX as HM calls are routed from the 5ESS[®] switch to the OSS, and the corresponding ANI or ANI II digits are signaled on the trunk to the OSS. After the call is completed, billing information for the call is forwarded to the originating hotel or motel.

SCOCs service, which also routes calls to an OSS, typically is applied to calls originating from patients' rooms at hospitals, dormitory rooms at universities, and designated phones for inmates at prisons. Calls from locations such as these may require additional screening to determine billing restrictions and special measures for fraud prevention. As for HM calls, the SCOCs ANI digits or ANI II digits are provided to the OSS by the 5ESS[®] switch.

As with other call-by-call services, the number of simultaneous calls can be limited using simulated facilities groups (SFGs). This feature introduces two enhancements to existing SFG functionality. The first enhancement allows HM and SCOCs SFGs to be assigned according to bearer capability. With this extension, the allocation of B-channels to calls can be further delimited for calls requiring a particular bearer capability. By appropriate provisioning of the HM and SCOCs SFGs, SFGs can support multiple bearer capabilities, and SFGs can be selected such that the available SFG that supports the least number of SFGs is selected for a call. SFG overflow provisioning allows designated SFGs to carry traffic that exceeds the limits imposed by the primary SFG. The second SFG enhancement is to introduce a parameter to specify a SCOCs service identifier. This parameter allows the assignment of separate SFGs for different classes of SCOCs service.

This feature uses a billing number that is assignable per SFG.

This feature provides for the assignment of AMA service feature code to designate either "with tax" or "without tax" for HM calls, on a per-PRI trunk group basis.

99-5E-2525 AMPS LANDLINE CELLULAR OPTION (LCO)

The Landline Cellular Option allows a service provider the ability to switch both wireless and landline traffic on a single 5ESS[®] switch. The wireless traffic may consist of Frequency Division Multiple Access (also known as analog cellular) or either of the new digital cellular schemes, Time Division Multiple Access or Code Division Multiple Access. The landline traffic may consist of Local, Toll, Business and Residential Custom Services, Local Area Signaling Service, ISDN, etc.

With the Landline Cellular Option, service providers reduce their initial cost by deploying a single (versus separate) switches for both landline and wireless traffic. With a single switch, service providers also reduce maintenance costs as well as the amount of floor space required.

The Landline Cellular Option maintains separate operations for the wireless and landline traffic. Therefore, cellular and landline features continue to operate as they do today.

The Landline Cellular Option uses digital trunks, either MF or ISUP, to bridge the landline and cellular traffic. Depending on the type of landline and cellular traffic, additional switching equipment may be necessary.

Lucent will introduce the Landline Cellular Option in conjunction with the Frequency, Time, and Code Division Multiple Access features of the 5ESS[®] switch scheduled for the 5E9(1), 5E9(2), and 5E10 software releases.

99-5E-2526 ADVANCED SERVICES INTERFACE (ASI) PROXY ENHANCEMENTS

ASI-PROXY is a switched based capability which allows connectivity to a Service Circuit Node (SCN) or Intelligent Peripheral (IP) for the purpose of providing automated call handling for (non-ISDN) subscribers. The 5ESS[®] switch resident ASI capability does not provide the automated call handling by itself. The SCN/IP provides the switch with the sequences of instructions for call handling, call extension and feature access. Remote Access to ASI allows remote access to automated call handling, call extension and feature access.

The feature provides the following enhancements to ASI-PROXY:

- ☐ Additional Stringing of Digits support
- ☐ SCN/IP Implicit connections after dropback to dial tone
- ☐ Extended Dial Pulse (DP) to Dual Tone Multifrequency (DTMF) conversion.

The following is a description of each of these three items:

Additional Stringing of Digits Support:

Existing 5ESS[®] switch (ASI-PROXY) functionality already accepts "Stringing of Digits" dialing by an SCN/IP for several features, for example, Call Forwarding Variable (Call fwd activation + forward-to-DN), and Account Codes (Account Access Code + Account Code + DN).

This ASI-PROXY Enhancement feature expands the set of features for which Stringing of Digits dialing by an SCN/IP is supported by ASI-PROXY. The following list represents this expanded set of features:

- ☐ Cancel Call Waiting (CCW): CCW activation code plus the DN being called, in order to block call waiting tone from interrupting the call once it is completed.
- ☐ Dial Call Waiting (DCW): DCW activation code plus the DN being called, in order to cause call waiting treatment to be given for this call when terminating to a line within the same terminal group as the caller's line.
- ☐ Authorization (ATH) Code: ATH Code Access Code plus ATH Code plus added digits (for example, a DN), in order that a call or feature activation requiring an Authorization Code can be completely dialed by the SCN/IP.
- ☐ CLASS Per Call Privacy options: any of the four per call privacy access codes plus the DN being called, in order that the Calling Party's number and or name will not be displayed to the called party when the call is completed.

Stringing Of Digits (SOD) support refers to the 5ESS[®] switch (ASI-PROXY) capability that permits an Intelligent Peripheral (IP) or Service Circuit Node (SCN) to string together both a feature code and another set of digits related to that feature code. For example, a call forwarding activation code plus a forward-to telephone number, and send the entire combined digit string into the switch to be sequentially processed.

SCN/IP Implicit Connections after Dropback to Dial Tone:

If Implicit Mode of ASI-PROXY is activated for a subscriber, then this part of the ASI-PROXY Enhancement feature provides additional support for the ASI-PROXY capability to attempt SCN/IP Implicit connections after the completion of feature activations/deactivations and dropback to dial tone. This support is provided with respect to the following specific features:

☐ Call Forwarding features

The following call forwarding features are examples of preconstructed features where dial tone is provided after the completion of feature activation or deactivation, or both. (When dial tone is provided in these cases, this Enhancement feature will attempt SCN/IP Implicit Mode connections):

- ☐ Call Forward Variable (/CFV)
- ☐ Call Forwarding Variable 1A ESSTM Switch Transparency (/CFV1A)
- ☐ Call Forwarding Incoming Only (/CFIO)
- ☐ Call Forwarding Variable IntraTerminal Group (/CFVITG)
- ☐ Call Forwarding In (within) A Group (/CFIAG)
- ☐ Call Forwarding over Private Facilities (/CFPF)

Speed Calling (for list management): A new SCN/IP Implicit connection will be attempted after a Customer Changeable Speed Calling list has been updated and dial tone has been returned to the user.

Automatic CallBack Calling (ACBC): (Also referred to as "Ring Again".) A new SCN/IP Implicit connection will be attempted after activation or deactivation of the ACBC feature is completed and dial tone has been returned to the user.

Extended Dial Pulse to DTMF Conversion Enhancement: The ASI-PROXY Enhancement feature provides for Dial Pulse to DTMF conversion for IP "assisted" calls where the SCN/IP dials a complete subportion of the digits for a call (for example, just the feature access code) and the subscriber provides the remainder of the digits needed to complete a call. This support is provided with respect to the following specific features:

- ☐ Call Forwarding
- ☐ Cancel Call Waiting
- ☐ Dial Call Waiting
- ☐ Per Call Privacy
- ☐ Authorization Code feature
- ☐ Account Code feature
- ☐ Message Detail Recording (MDR)
- ☐ Advanced Services Platform (ASP) trigger features [for example, Custom Dialing Plan (CDP), Feature Code Dialing (FCD), 3/6/10 digit triggers, and Terminating Attempt Triggers (TATs)].

99-5E-2533 ASP DEFAULT ROUTING FOR 3/6/10 DIGIT TRIGGERS (PHASE 1)

This feature allows the SSP to provide default routing to the dialed number for 3/6/10 digit triggers when

the trigger is encountered and the query fails. This capability may be administered on a per trigger basis for each trigger defined in the Office Dialing Plan.

Default Routing is supported for the following conditions:

- ☐ The T1 Timer expires on initial query (INFO_ANALYZED Message).
- ☐ The 3/6/10 Digit Trigger is blocked by ACG Network Management.
- ☐ The 3/6/10 Digit Trigger is blocked because of switch hardware/software (CNI Ring or SS7 link outages).
- ☐ The SSP receives an invalid response to the INFO_ANALYZED Message.
- ☐ The SSP receives an application or protocol error message in response to the INFO_ANALYZED Message.

After a recognized response is received for the INFO_ANALYZED Message (an ANALYZE_ROUTE, CONTINUE, DISCONNECT, or SEND_TO_RESOURCE message), default routing will no longer apply.

Call routing options for the conditions listed previously, based on subscriber data, include the following:

- ☐ Route the call to a ReOrder Tone. For ACG blocked calls, route the call to ReOrder or to a No Circuits Available (NCA) announcement.
- ☐ On a per 3/6/10 digit trigger basis, route the call to either the dialed DN or to a single office-wide 13A announcement.

This feature applies to the AIN Release 0.1 protocol only. Default routing for the Release 0 Dialed Number Triggers (DNTs) is not provided.

99-5E-2534 DISTRIBUTED POWER

The distributed power feature is a special feature that provides the option of allowing the A and B bus voltages to be at any value, balanced or unbalanced, within the 5ESS[®] switch design limits, without issuing an alarm or causing a malfunction in the switch. This results in a distributed power arrangement and improves network reliability. Multiple, small capacity power plants add diversity and redundancy to the 5ESS[®] switch power architecture and eliminates the single point failure present in the bulk power plant arrangement. Power plant sizing is done automatically. As the switch capacity grows, so does the plant capacity, eliminating any oversizing of the battery plant.

With the use of distributed power, plants are located adjacent to PDF frames reducing the amount of cable required for these circuits.

This feature eliminates the engineering and estimation for a customer who is making a determination of what size bulk power feed power plant to install to cover present and future requirements for the office. When the switch is installed, only the power required for the equipment is installed. As the switch grows, power will grow. This makes it possible to include the power plant hardware as part of the switch hardware when ordering the switching equipment.

99-5E-2536 FOUR-WIRE FXO LINE VIA DFI

This feature allows the service provider to provision FX service (ground-start and loop-start) on a digital port of the Digital Facility Interface (DFI). The "Four Wire Subscriber Features on DNU-S" feature allows the same FX service to be provisioned on a Digital Networking Unit - SONET (DNU-S). A requirement of this feature is that the switch must support both the digital equivalent of ground start and loop start signaling to the DFI and DNU-S. The switch should act as the Foreign Exchange Office (FXO) and send

the same signaling and supervision signals as an FXO.

99-5E-2540 TYPE 2A/2B CELLULAR INTERCONNECTION VIA SS7

The Type 2A/2B Cellular Interconnection Via SS7 feature allows automatic message accounting (AMA) recording capabilities to include type 2B multifrequency (MF) trunks and Signaling System 7 (SS7) versions of both type 2A and type 2B trunks on a 5ESS[®] switch.

This feature is an enhancement to the existing secured feature "AMA Capabilities for Type 2A Cellular Interconnections."

99-5E-2551 VISUAL CALL PICKUP

This feature allows ISDN users with call pickup feature buttons to have their terminal notified whenever there are calls ringing in their pickup groups/queues that they are allowed to pickup. Once the terminal is notified, the pickup feature button lamp starts flashing at the ISDN station. The ISDN station user can then press the feature button or dial the access code to pickup the call. Once a call is picked up, the original called station for that call stops ringing.

When there are no calls ringing in the call pickup group/queue another de-notification is sent to the ISDN stations to turn the feature button lamp off.

The call pickup notifications will only be sent to the ISDN terminals (Custom and National) in the pickup group. No visual notification is sent to analog stations. However, visual notifications will be sent to ISDN stations for calls ringing on any other terminal (analog or ISDN), and visually notified calls can be picked up by any other terminals (analog or ISDN) within the pickup group.

Since an ISDN station can have up to 4 pickup feature buttons, up to 4 notification options may be assigned, one for each pickup group/queue that the station may pick up from. That is notification messages to turn the feature button lamp on or off will be on a per pickup group/queue basis.

The VCP feature applies to a Call Pickup Originating feature that has a Call Pickup Queue associated with it. The VCP feature does not apply to Directed Call Pickup with/without Barge-In features.

99-5E-2563 ASP INTERWORKING WITH STATION MESSAGE DETAIL RECORDING (SMDR)

This feature allows the population of AIN specific data onto SMDR records. The AIN data is included in an SCP Routing message.

Currently (if this secured feature is not unlocked), the AIN data that affects the fields in an SMDR record is as follows:

- ☐ An originator, assigned the MDR feature, that dials a Custom Dialing Plan (CDP) or Feature Code dialing (FCD) trigger records:
 - ☐ The CalledPartyID in the SMDR Called Number field
 - ☐ The selected carrier, if the call used public routing, in the SMDR Carrier ID field
 - ☐ The selected trunk group, if the call used private routing, in the Outgoing Facility field
 - ☐ The identity of the call as ASP in the Feature Interaction Code field
- ☐ The originator assigned the MDR feature, dials a Specific_Digit_String trigger which records the information as CDP or FCD (the Feature Interaction Code field does not identify the call as ASP)
- ☐ The originator dials a DN that is assigned both TAT functionality and the MDR feature; the same information as CDP or FCD is recorded, if the SCP Routing message is a Forward_Call.

When this secured feature is unlocked, MDR subscribers encountering CDP, FCD, or Termination Attempt triggers generate SMDR records that contain the following new information, provided it is included in the SCP Routing message:

- ☐ Business Customer ID
- ☐ Authorization Code
- ☐ Account Code
- ☐ Access Code
- ☐ A new Calling Party Number.

99-5E-2564 SMP23 CORE BOARD REDESIGN

The maximum memory available without a Memory Expansion Unit (MEU) in the SMP12/SMP23 is 20MB. This core board is required for those SMs in the field that will retrofit to the 5E10 software release but on which an MEU cannot be added. This feature introduces a processor core board for SMP12/SMP23 units that provides 32MB dynamic RAM on board. This removes the need to add memory boards as software release memory size expands. This feature will be made available for the 5E9(1) and 5E9(2) software releases through a software update.

99-5E-2567 PUBLIC ACCESS TRUNKS/RELEASE LINK TRUNKS (PAT/RLT) INTERWORKING

The Public Access Trunks/Release Link Trunks (PAT/RLT) Interworking feature (99-5E-2567) provides the Leased Network switch the ability to insert a pseudo-ANI in the NCP query for the call extended by the Leased Network attendant. The attendant must be on an RLT and the call must access the Leased Network switch through a CCS7 Query PAT.

This feature also enables the Leased Network switch to provide the originating caller's true-ANI in the AMA and MDR records, if they are generated for the calls.

99-5E-2594 On-Site Data Evolution

Most new features for the 5ESS[®] Switch require new static data, which in turn require changes to the ODD of the field office receiving the new features. Previously, service providers changed the structure of their ODDs by sending a copy to an Office Data Administration (ODA)/Base Relation Evolution (BREV) processing center. This off-switch evolution process consumed time and was expensive.

The On-Site Data Evolution feature uses the processing power of an adjunct ASM processor to evolve the ODD and the ECD before retrofitting to a new software release.

The advantages this feature provides include:

- ☐ **Reduce Impact to Service:** the interval for data evolution is shortened and the number of RCs and CORCs that must be reapplied is kept to a minimum.
- ☐ **Reduce ODA Scheduling Concerns:** removes the constraint of scheduling an ODA slot and allows the customer to evolve their data based on their Lucent support schedule.
- ☐ **Provide 1A ESSTM Switch Equivalency:** the 5ESS[®] Switch acquires functionality similar to the 1A ESSTM Switch process.
- ☐ **Provide Parity with Competition:** allows customers to evolve and install databases in one night.

- ☐ **Reduce OA&M Costs:** database dumps to tapes are eliminated, thereby removing the need for sending/receiving ODD/ECD tapes.

99-5E-2594.A 5E12 TO 5E13 NETWORK BASED RETROFIT (NBR)

The purpose of this feature is to set up the process for Network Based Retrofit (NBR). This feature utilizes the Administrative Services Module (ASM) for electronic file transfer. The NBR tools are sent from Lucent to ASM. The ODD/ECD is sent from the 5ESS[®] Switch to Lucent via the ASM for evolving to the new software release format. The Recent Change (RC) logfile is sent from the 5ESS[®] Switch to Lucent via the ASM for OFFRCR processing. Generic text and evolved data are then sent from Lucent to the ASM before the retrofit. On the night of the retrofit, the text and evolved data are sent from the ASM to the 5ESS[®] Switch. The advantages to this process include:

Reduce Impact to Service: The previous retrofit process requires longer RC and CORC reapplication time in order to provide end-user service in the same state as prior to the retrofit. With the NBR process, the reapplication time is reduced.

Reduce OA&M Costs: While service providers must still purchase the release dependent software, the service providers should enjoy cost savings from a shorter and less restricted operation. With this feature, a person is no longer required to be physically on site for the data base dump to tape or to load the tapes to the 5ESS[®] Switch. Additionally, tape delivery is eliminated.

File Transfer via Network: The text, ODD/ECD, RC logfile and NBR tools will be electronically sent via the network.

99-5E-2597 PRIORITY CALLING FOR NI

This feature allows calls (from outside a user's terminal group) terminating to a terminal with call appearances reserved for originations and priority terminations to receive priority treatment. If there are no non-reserved call appearances available for termination, the call may be offered on a call appearance reserved for terminations only. If there are no non-reserved call appearances or termination only reserved call appearances available, the call may be offered on a call appearance reserved for originations and priority incoming terminations. This feature is often used with the Distinctive Ringing Incoming Calls feature to provide distinctive alerting as well as reserved call appearance terminations. Also see the Call Appearances Reservation for NI feature.

Call Appearance Reservation for NI and Priority Calling for NI may be used in a business environment to facilitate secretarial coverage. In the situation where a secretary's primary job is to answer calls, most call appearances might be reserved for terminations only or originations and priority incoming terminations. By subscribing to originations and priority terminations, the secretary ensures that customer calls (calls from outside the terminal group) are given precedence over internal calls.

This feature requires an *EKTSTM* terminal.

99-5E-2609 AUTOMATED STATIC ODD AUDIT ENHANCEMENT

This feature is an enhancement to the 5E9(1) Automated Static ODD Audit, feature number 99-5E-1334. As in the original feature, it provides a tool by which the service provider can audit and detect errors in its Static Office Dependent Data (SODD). By correcting the errors, the service provider will be able to maintain an error-free database, allowing better line services to its customers and smoother retrofits.

The major enhancements added to this version of the feature are as follows:

- ☐ More coverage - this feature covers all static relations in the database, while the original feature audits 149 relations.

- ☐ Improved error reporting - More input messages or input parameters have been implemented, adding user-friendliness.

As in the original version, there are three modes of audit execution.

- ☐ **Full Audit** ☐ The Full Audit validates all static relations in the service provider's database. It executes in an infinite loop, starting and suspending itself according to a schedule established by the service provider's (telephone company) personnel. A single cycle through the full audit may take several weeks to complete. Each time this cyclic audit resumes execution, it picks up where the previous execution suspended.
- ☐ **Incremental Audit** ☐ The Incremental Audit automatically executes after each successful BKUP:ODD (Backup of Office Dependent Data). It validates all database transactions [Recent Changes and Customer Originated Recent Changes (CORCs)] since the backup of the ODD. The audit executes only after the whole backup is completed.
- ☐ **Entity Audit** ☐ The service provider personnel can ask for immediate execution of the audit on the following specific entities:
 - ☐ One TN (Telephone Number)
 - ☐ One OE (Office Equipment) number
 - ☐ One MLHG (Multiline Hunt Group)
 - ☐ One MLHG (Multiline Hunt Group) member
 - ☐ One Trunk Member
 - ☐ One Trunk Group
 - ☐ One Relation on a particular processor
 - ☐ All relations on a particular processor.

Each audit execution produces a summary message indicating how many errors were found. Additionally, each audit execution produces a detailed log of individual error conditions. Input messages are provided to read and print this detailed error log.

99-5E-2609.A AUTOMATED STATIC ODD AUDIT ENHANCEMENTS

The ASODD (Automatic Static Office Dependent Data) audit is an executable product created from PRL code. The SODD audit is only available in NAR market. It is used to check the integrity of switch static ODD's.

As of 5E11 release, the SODD audit has been restructured. In 5E10, the customer found using the SODD audit to be impractical due to the amount of time required for the audit to complete. In 5E11 it was scaled back to include only a subset of relations. Also in 5E11, Boot Critical and BRCS audits were introduced. After a successful field trial, the customer requested that the entire SODD audit be broken down to manageable sub-audits, which can be invoked any time and should complete in a reasonable time frame. So in 5E12, a set of sub-audits have been created.

99-5E-2610 5ESS® SWITCH VCDX INTEGRATION OF SM-2000

This feature allows the support of SM-2000 on 5ESS® Switch VCDX. The VCDX switch with an SM-2000 can support up to 10,000 lines whereas the VCDX switch with SM can only support 1,500 lines. This

development provides a cost reduced switching office with a single SM-2000 VCDX office to fill the market segment with small office needs and low cost objectives. This is a logical extension to the VCDX switch with an SM developed for the 5E9(2) software release.

Since the VCDX with SM-2000 supports a large number of lines, some features and capabilities, which were not supported in the initial release of VCDX with SM, will be supported. The following features are supported with the VCDX/SM-2000 development:

- ☐ In the 5E11 software release, Network Management (NM) control functionality will be copied to the SM-2000 in order to allow local control of SM operation at all times. This capability will be provided to VCDX/SM-2000 only.
- ☐ In the 5E11 software release, SFG functionality will be copied to SM to support locally hunted SFG screening. This capability will be supported on VCDX/SM and VCDX/SM-2000 configurations.

Circular AMA buffer feature that tracks AMA pointers until the SM's Stand Alone Billing (SABM) area AMA data is copied to the workstation shared Data Segment (SDS) and written to disk from SDS. This feature protects AMA data in the SDS if a problem develops in the workstation that needs a 54 boot. This feature is provided to VCDX/SM and VCDX/SM-2000.

99-5E-2610.A CIRCULAR AMA BUFFER IN SM

When in the stand alone mode, the VCDX switch stores AMA data in the Switching Module's (SM) Stand Alone Billing Memory (SABM) area. The standalone mode may be triggered by a number of reasons, for example, Workstation or *Ethernet*[®] is down. When the standalone mode is cleared, the workstation polls the AMA data from SM's SABM area and writes it to disk. If for any reason the process is interrupted before the SDS AMA data is completely written to disk, the AMA data in the SDS could be lost.

With the circular AMA buffer feature, the SABM area will not be updated until this whole sequence is completed (for example, SABM -> SDS -> Disk). If for any reason the process is interrupted, the AMA data in the SM's SABM area can be retrieved again.

The Circular AMA buffer feature keeps a copy of data that goes to the SDS in the SABM area and clears that area once the corresponding data in the SDS is written to disk.

This feature protects AMA data in the SDS if a problem develops in the workstation that needs a 54 boot. This feature is provided to VCDX/SM and VCDX/SM-2000.

99-5E-2627 CALL APPEARANCE RESERVATION FOR NI

This feature, available with both Basic and Call Appearance Call Handling (CACH) *EKTS*[™], allows one or more call appearances (for example, subaddresses) of a DN assigned to an *EKTS*[™] group to be reserved for one of the following categories of calls: (1) originations only, (2) termination only, or (3) originations and priority incoming terminations. A DN may have call appearances reserved in more than one of the categories.

This feature is also part of the Virtual *EKTS*[™] (VKTS) offering.

Call Appearance Reservation for NI and Priority Calling for NI may be used in a business environment to facilitate secretarial coverage.

99-5E-2636 COMBINED SERVICES UNIT (CSU)

The Combined Services Unit (CSU) feature (99-5E-2636) applies only to the SM (not the SM-2000) and is targeted for the 5E10 software release.

This development is dependent on GDSF (99-5E-1584) and SLIM2 (99-5E-2444) features that are planned

for the 5E10 software release.

The CSU combines the DLTU2, MMSU, DSU2 into one shelf and is targeted for smaller sites such as the VCDX/SM configurations, small CDX offices, and CDX and 5ESS® switch RSMs.

The new CSU unit will be compatible with existing DLTU2, DSU2-RAF2 and GDSU units in the same office and in the same SM or in different SMs. The MMSU in the repackaged version will have only one service group, thereby making it incompatible with the standard MMSU which has two service groups. Therefore, if office growth to conventional configurations necessitates greater metallic services, the standard MMSU will need to be provided and the MMSU portion of the repackaged shelf will be de-grown.

99-5E-2651 ADVANCED SERVICES PLATFORM (ASP) CALL ROUTING PARAMETERS

This feature provides additional information for the Advanced Services Platform Query and Response. Specifically, 2 response message, Analyze_Route and Forward_Call have added additional parameters. These parameters are as follows:

- ☐ Carrier Usage to Analyze_Route and Forward_Call responses
- ☐ Redirecting Party ID to Forward_Call response
- ☐ Redirection Information to Analyze_Route and Forward_Call response.

The redirecting parameters are being added to provide additional call history information. The carrier usage parameter provides greater flexibility in routing Inter-LATA calls. These parameters may be used for any ASP based service. In addition, these parameters are needed for GR-2801, Personal Communications Services.

99-5E-2652 FORWARDED CALL - CALL SCREENING

The Forwarded Call - Call Screening (FCCS) feature allows analog subscribers to monitor the most recently forwarded call without the calling party's knowledge and to intercept the call if desired. This functionality is similar to that provided by a Telephone Answering Device (TAD).

This feature is primarily intended for calls forwarded to a Voice Messaging System and is thus available for calls forwarded by the Call Forwarding Don't Answer (CFDA), Call Forwarding Don't Answer after Call Waiting (CFDA/CW) and Call Forwarding Busy Line (CFBL) features. The FCCS subscriber is provided alerting when a call is eligible for screening. Activation/deactivation access codes are provided.

99-5E-2669 CALL FORWARDING OVER PRIVATE FACILITIES/DON'T ANSWER (CFPF/DA)

The Call Forwarding Over Private Facilities/Don't Answer (CFPF/DA) feature provides the ability to construct a CFPF feature so that calls terminating to analog, custom or National ISDN lines may call forward over dedicated private facilities in the case of a "Don't Answer" condition. This feature allows CFPF when the Forwarding Condition (FWDCOND) feature option is set to "IDLE".

This feature allows forwarding calls to private facilities through the Automatic Route Selection (ARS) and Private Facility Access (PFA) feature to eliminate Local Measured Service (LMS) charges for the call forwarded legs [for example, to a Voice Messaging System (VMS)].

99-5E-2695 SERVICE ANNOUNCEMENT SYSTEM (SAS) ON SM-2000

DSU2-SAS is an announcement system platform offering greater storage capacity, increased channel capacity (for dial through announcements), an interface for allowing on-line announcement updates by the customers, or a base for enhanced feature offerings.

This feature produces a high capacity announcement system that provides both Recorded Announcement Facility (DSU2-RAF) transparency and an improved platform on which to accommodate new capabilities.

99-5E-2708 TCAP IMPROVEMENTS FOR A SWITCH SPANNING MULTIPLE LATAS

The feature permits lines, trunk groups, or groups of lines to be assigned a LATA NUMBER different from the default LATA NUMBER associated with the office. Prior to this feature, LASS and CNAM TCAP queries from any line or ISDN PRI trunk group resulted in queries to the STP which corresponded to the LATA NUMBER from the Office Options Form (item 56). Prior to this feature, SSP 800 and ASP calls from any line resulted in queries to the database that included the LATA NUMBER from the Office Options Form (item 56). Such calls received over trunks were allowed to designate another LATA NUMBER based on the Trunk Group Form (FAR END LATA or LATA NBR, item 116, RC/V View 5.1 field 89). With this feature, the customer can associate a LATA NUMBER with a LASS or CNAM subscriber (line or ISDN PRI trunk group). This LATA number will be used to select the appropriate signaling link based on the STP for LASS and CNAM services, or be used to populate the SSP 800 or ASP TCAP query to the SCP.

For ISDN PRI trunk groups the existing FAR END LATA number field (note this field is sometimes called the LATA NBR field) on the Trunk Group view will be used, as this is already used to populate a specific LATA NUMBER in SSP 800 or ASP TCAP queries for trunk originated calls.

The translator for lines that most closely resembles the Trunk Group is the Line Class Code (LCC) Form (RC/V View 4.1). In processing a TCAP query, this Form derives the DAS and Screening Index just as the Trunk Group Form does. In this way, the LATA associated with the subscriber can be used during TCAP query processing in determining the Destination Point Code (DPC) for the query. The DPC corresponds to the appropriate STP for the TCAP query. For 800 SSP or ASP calls, the LATA associated with the line (default is the office LATA) shall be used in the formulation of the TCAP query.

NOTE: Using the LCC Form means that normal line/DN assignment procedures would be unaffected by this feature.

99-5E-2709 MODULAR CONTROLLER/TIME SLOT INTERCHANGE UNIT, MODEL 3 (MCTU3)

The Modular Controller/Time Slot Interchange Unit, Model 3 (MCTU3) provides a cost reduction for the SM hardware. The cost reduction is obtained by combining several circuit packs into one and reducing the MCTU2 from two shelves to one. The MCTU3 requires a different shelf/backplane, a different core board (SB20CORE), and a combined power control and display pack. The existing TSIU3 together with the DIs, CIs or the CI2s and peripherals are used. All SM configurations, including LSM, RSM, ORM for 5ESS[®] switch and 5ESS[®] switch CDX, are supported. The MCTU3 feature is particularly beneficial to the 5ESS[®] switch VCDX because the SB20CORE board contains most of the hardware to support the *Ethernet*[®] interface. A paddle board located on the backplane of the MCTU3 provides the physical interface to the *Ethernet*[®] interface and handles the CPI message interface between the workstation and the SB20CORE.

The MCTU3 hardware is being designed to have minimal impact on the existing software base. Run time checks will be used to distinguish between processor types (SMP12, SMP23, SMP20, MCTU3) thereby allowing a single image for all SMs. The call processing capacity of the MCTU3 is 20% more than the SMP20 Data Cache.

99-5E-2725 TYPE 1 WIRELESS SERVICE PROVIDERS AMA RECORDING

This feature generates AMA records for the purpose of providing billing information concerning the Wireless Service Provider (WSP) and the time the WSP is connected to the local exchange carrier's network through a Type 1 interconnection (Multifrequency trunk). These records do not replace but are in addition to any currently generated AMA records. A description of how both originating calls to a WSP (outgoing from LEC to Wireless Switch) and terminating calls from a WSP (incoming from wireless to Local Exchange Carrier switch) are handled by the Local Exchange Carrier (LEC) switch at a Type 1 interface as follows:

- ☐ Originating/Outgoing calls to a WSP:

Outgoing calls from the LEC switched network to the WSP are handled through the Type 1 interconnection using Multifrequency (MF) trunk signaling to identify the called wireless customer station number without manual or operator assistance. When utilizing the Type 1 interconnection, the WSP is responsible for handling calls to the NXX, or blocks of numbers assigned to the WSP.

☐ Terminating/Incoming calls from a WSP:

Incoming calls are handled through the Type 1 interconnection using MF trunk signaling protocols. However, with special software, generally referred to by Bellcore as Trunk with Line Treatment (TWLT), the LEC switch is able to process and record the calls as if they are from an ordinary line side connection. With this Type 1 interconnection, the Wireless Service Provider (WSP) Wireless Switching Center (WSC) can establish connections through the LEC network to valid office codes (NXXs) within the LEC local network, LEC Directory Assistance, LEC operator assistance, or services provided by ICs, INCs and other wireless services providers or local exchange carriers. In addition, via FGB/FGD switched access services, an IC can be selected on each interexchange call by transmitting the proper IC identification code (for example, 10XXX or 101XXXX). If desired, presubscription to a specific IC can be made by the WSP on each trunk group. Then the LEC EO will route interexchange calls from the WSP to the presubscribed IC, unless a different IC identification is transmitted prior to the called customer address digits.

99-5E-2741 TRFC30-SECTION 143 INCREASE MAXIMUM COLLECTION UNITS

This feature enhances Section 143 (IRT) of the 30-minute Traffic Measurement Report (TRFC30) to increase the maximum number of remote digital terminals (RT) on the integrated digital carrier unit (IDCU) that can be studied simultaneously. Either 800 individual RTs or all RTs on 25 IDCUs (total of 775) may be studied at one time.

99-5E-2741.A ALLOW ALL COMMAND FOR TRFC30-SECTION 143

This feature enhances section 143 of the TRFC30 traffic measurements report. It allows the service provider to collect traffic data on all (but not more than 800) Digital Loop Carrier Remote Terminals (RTs) by executing one command. Previously, data collection was allowed only on the individual RT or IDCU basis, which was a time-consuming task, especially during retrofit.

99-5E-2753 PARAMETER DOWNLOADING MODIFICATIONS FOR VKTS

The purpose of this feature is to minimize the number of steps the user or installer must take to establish service. The most simple installation requires the user to plug the CPE into the interface, and then program the SPID into the CPE. After the initialization and download procedures are complete, the user may immediately originate and receive voice, circuit-switched data and packet data calls.

This feature allows a terminal to ask for a parameter download after initialization of layer 3, after it has been notified by the switch that a service order change has been completed, or any other time during the life of the service when the user or repair switch personnel deems necessary. Parameters which are downloaded after NI-2 and prior to this feature include Directory Numbers (DNs), the bearer capabilities per DN, the call reference busy limit per call type, DN appearance IDs, the CACH EKTSTM Call Appearance (CA) map per DN, the intercom call appearance map per intercom group, the Feature Activator (FA)/Feature Indicator (FI) map, and FA/FI service descriptions.

In addition to these parameters, Parameter Downloading Modifications for VKTS feature downloads the following parameters:

- ☐ Originating DN Flag, which indicates the DN that is used for originating calls from a CACH EKTSTM terminal. Originating DN is the "primary DN" or MLHG "group DN", if there is no "primary DN" assigned.
- ☐ Activator Keywords for those FA/FI that are to be downloaded.

- ☐ Call Appearance (CA) Reservation information for Basic as well as CACH *EKTS*TM that allows one or more call appearances of a DN to be reserved for one of the three defined reservation statuses or it's not present.

ISDN CPE built according to this feature are required. Terminals built to NI-2 are already in the field. In order to avoid adversely affecting the operation of these existing terminals, a new type of terminal built for this feature is needed.

99-5E-2758 COIN PHONE FUNCTIONALITY ON ANALOG INTERFACE UNIT

The Coin Phone Functionality On Analog Interface Unit feature provides an interface for analog coin phones through an analog interface unit. A new coin application circuit pack that supports up to 16 coin lines and provides an interface to the 5ESS[®] switch is installed in the Analog Interface Unit.

99-5E-2776 ACD/BRCS INTERWORKING II

The trend in today's Automatic Call Distributor (ACD) marketplace is for smaller and specialized agent groups which require more switch based resource capacity. This feature does the following:

It increases the switch capacity for the following switch resources:

- ☐ Serving Teams (128 -> 999)
- ☐ Queues (128 -> 999)
- ☐ Call Classes (511 -> 2,048)
- ☐ Vectors (1,024 -> 2,048)
- ☐ ACD DNs (256 -> 2,048)
- ☐ Display Indices (276 -> 2,047)
- ☐ Queue Slots (5,000 -> 40,000)
- ☐ Position IDs (4,095 -> 9,999)
- ☐ Agent IDs (8,999 -> 32,767)
- ☐ Destination DNs (256 -> 2,048)

It decouples ACD/BRCS from OSPS to avoid forcing changes on OSPS that is not wanted or needed. This decoupling improves the maintainability and quality of both the OSPS and ACD products by preventing changes to one product from inadvertently breaking the other product. A new class for the new Recent Change and Verify (RC/V) views is created which makes it easier and more logical to find the RC/V views needed to administer ACD/BRCS. New RC/V views are created for administering ACD resources which were previously administered using common views.

- ☐ It creates the ability for a centrex customer to define multiple ACD groups and provide security between the groups through use of a new attribute called "ACDGROUP". This enables the ACD customer on both the switch and Management Information System (MIS) to define separate clients within a Terminal Group and is sometimes defined as client partitioning.

This feature requires coordinated changes between the switch, the *PINNACLE*[®] Application Interface Unit, and the *PINNACLE*[®] Management Information System (MIS). In order for the feature to operate, the

changes to the Application Interface Unit and MIS software must be installed prior to the installation of the 5E11 software release on the 5ESS[®] switch.

This feature expands the current capacity of the 5ESS[®] switch ACD resources by nearly a factor of eight. This meets the known and anticipated capacity needs of all of our customer base.

This feature also adds the ability to partition a single terminal group into multiple ACD customers.

Benefits to the End User

This feature allows the end user to have access to all the ACD resources needed without impacting any other customers co-resident on the switch. Each customer can customize the call center to meet individual needs. The split of ACD/BRCS from OSPS also increases the reliability of both the ACD/BRCS and OSPS products.

Benefits to the Service Provider (telephone company)

This feature provides the Service Provider with the ability to market *PINNACLE*[®] ACD aggressively to all its customer because of the increased capacity. It also enables the provider greater flexibility in reselling services from a service provider owned MIS through the introduction of ACDGROUP. The split with OSPS leads to simplified provisioning for ACD/BRCS through the introduction of a new class of views specifically targeted for the *PINNACLE*[®] ACD needs.

99-5E-2779 CENTRAL OFFICE BUILDING/POWER ALARMS REPEATABILITY

The Central Office Building/Power Alarms Repeatability Special feature is being deployed on the 5ESS[®] switch in a software update for the 5E9(1) and 5E9(2) 5ESS[®] switch software releases and in the Beginning Managed Introduction of 5E10 software release.

This feature allows the customer to designate certain office-assignable building/power and miscellaneous alarms as repeating. Once activated, these alarms would repeat every 15 minutes until the stimulus for the alarm is cleared or the alarm is inhibited.

The status and assignment of building/power alarms are summarized in MCC display page 105/106. The status and assignment of miscellaneous alarms are summarized in page 119. Currently, only some hard-coded (that is, not office-assignable) alarms such as Fire and Central Office Battery Discharge are configured to repeat. The remaining hard-coded alarms and the office-assignable alarms are not configured to repeat.

The CHG:ALM input message permits assigning an alarm level and a nine character alarm label to office-assignable Central Office building/power and miscellaneous scan points. This message is modified to include an additional optional parameter (REPEAT=X, where X is Y or N) to designate an alarm as either non-repeating or repeating at 15 minute intervals.

By default, the repeatability is set to non-repeating for each office-assignable Central Office building/power and miscellaneous scan point. When an alarm is set to repeating, a "+" is shown next to the alarm level in the indicator corresponding to that scan point on MCC display pages 105/106 or 119. The absence of a "+" means the alarm is non-repeating.

This feature applies only to the office-assignable building/power scan point (BPSC) alarms 02-27 on display page 105/106 and miscellaneous (MISC) alarms 00-47 on display page 119. Alarms which currently have fixed assignments, including those which already repeat, are not impacted by this feature.

This feature provides repeatability only to Central Office alarms. It does not provide repeatability for building/power alarms or miscellaneous alarms at remote SM (RSM, ORM, TRM) or RISLU sites.

The alarm repeat rate is fixed at 15 minutes. There is no provision to set this rate at a different frequency.

99-5E-2780 INPUT OUTPUT PROCESSOR - PERIPHERAL CONTROLLER/DISK FILE CONTROLLER (IOP-PC/DFC) CIRCUIT PACK ENHANCEMENT

The input output processor - peripheral controller/disk file controller (IOP-PC/DFC) feature is a technology upgrade for the 3B21D processor. The *UNIX*® System RTR system multi-purpose peripheral controller (MPC) provides a common hardware platform and technology upgrade for the following PCs:

- ☐ TN983 and TN83B
- ☐ TN74B
- ☐ TN75C and TN1839
- ☐ TN82 and TN82B
- ☐ UN33D

The board codes assigned for the MPC hardware are UN582 when configured as the TN82, TN82B, TN75C, TN1839 and UN583 when configured as the TN983 or TN83B. The Scanner/Signal distributor board is replaced by the UN933.

The DFC3 feature eliminates obsolescent components from the hardware design. The DFC3 feature is totally transparent to the 3B21D computer SCSI subsystem interface. The circuit pack code for the new DFC controller pack replacing the TN2116 and the UN373 is UN580. The new SCSI HA circuit pack plugs into the TN2116 slot in the basic and growth backplanes. This feature is for a 3B21D only.

99-5E-2807 INCREASE ESCOs FOR 911

The Emergency Service Central Office (ESCO) number is used to identify the originating office of the 911 caller. An ESCO may be assigned to trunk groups and to the dialing plans for local lines.

An Emergency Service Central Office number is assignable to trunks which can originate 911 calls and to the dialing plan for lines. ESCO translation data determines whether selective routing will be done for that originator. If selective routing is not assigned or if it fails in some manner, a default ESN associated with the ESCO is used. In addition, the ESCO translation data provides a *Numbering Plan Digit (NPD)* which is part of the ANI provided to the PSAP equipment and maps to the NPA of the 911 originating call on the E911 switch. If the switch serves multiple NPAs, the dialing plan or trunk supporting that NPA should have a ESCO which yields a unique NPD. In the case when ANI information about the originator is not available to the E911 switch, the ESCO is signaled to the PSAP to provide some information about the originating location.

99-5E-2809 SERVICE ANNOUNCEMENT SYSTEM (SAS) WORKSTATION

The Service Announcement System (SAS) has been developed to provide announcements for 5ESS® switch applications. In conjunction with the announcement system, a workstation (SAS Workstation) is being developed that allows service providers to modify SAS announcements.

The SAS Workstation has the following functionalities:

- ☐ Record announcements on the workstation
- ☐ Install announcements from audio tape
- ☐ Edit audio characteristics of the announcements
- ☐ Playback announcements to verify correctness
- ☐ Write SAS Flash Memory cards

- ☐ Maintain a database of what announcements are in what office.

99-5E-2844 MLPP ON SS7 - STAGE 1

The MLPP on SS7 - Stage 1 feature provides the 5ESS[®] Switch with the ability to utilize the Multi-Level Precedence and Preemption (MLPP) feature on Signaling System Number 7 (SS7) trunks, using the SS7 ISDN User Part protocol and procedures in ANSI[®] T1.113-1988.

The MLPP on SS7 - Stage 1 feature addresses the issue of using SS7 facilities for:

- ☐ Transmitting a precedence level of a call
- ☐ Release and reservation for immediate reseizure of a trunk reserved for reuse (preempt for reuse)

MLPP users may have analog or Custom ISDN terminals. MLPP may be invoked by dialed code from either type of terminal and by feature button from Custom ISDN terminals.

99-5E-2845 MLPP ON SS7 - STAGE 2

The MLPP on SS7 - Stage 2 feature is an enhancement to the MLPP on SS7 - Stage 1 feature which requires the MLPP on SS7 - Stage 1 feature to be enabled on the switch. The MLPP on SS7 - Stage 1 feature provides the 5ESS[®] switch the ability to utilize the Multi-Level Precedence and Preemption (MLPP) feature on Signaling System Number 7 (SS7) trunks, using the SS7 ISDN User Part protocol and procedures in ANSI[®] T1.113-1988. The MLPP on SS7 - Stage 2 feature adds support for MLPP on SS7 trunks using the SS7 ISDN User Part protocol and procedures in ANSI[®] T1.619-1992 and ANSI[®] T1.619a-1994a, along with interworking between the Stage 1 and Stage 2 protocols. The MLPP on SS7 features addresses the issue of using SS7 facilities listed as follows:

- ☐ Transmitting a precedence level of a call information on the precedence level of a call is carried in the SS7 ISUP Initial Address Message (IAM) when a call is transmitted over an SS7 trunk.
- ☐ Route Code carried in the IAM message. Route Control digits may also be carried in the IAM message.
- ☐ Preemption of an SS7 trunk which in turn involves:
 - ☐ Release and reservation for immediate reseizure of a trunk reserved for reuse (preempt for reuse).
- ☐ Release of a trunk not reserved for reuse (preempt to clear). Information on this preemption is transmitted in the SS7 ISUP Release (REL) message sent over the trunk(s) being preempted.

99-5E-2846 ASP INTERWORKING WITH CUSTOM ISDN

This feature expands the current release 0.1 Advanced Services Platform (ASP) interworkings to include Custom ISDN (CISDN) terminals and features. Currently, the ASP Release 0.1 call processing software interacts with Custom ISDN services by allowing CISDN originated calls to encounter Termination Attempt Triggers (TATs) and office wide triggers like 3/6/10 and N11. However, release 0.1 ASP subscribed triggers are not currently available for CISDN and the Termination Attempt Trigger cannot be assigned to a CISDN terminal. CISDN can have release 0.0 triggers assigned but NOT release 0.1 triggers. This feature will expand the interactions between ASP and CISDN by allowing CISDN terminals to have access to additional ASP capabilities in release 0.1. Also, this feature will provide necessary feature interactions between the switched-based CISDN features and the ASP release 0.1 trigger operations.

This feature applies for the 5ESS[®] switch implementation of CISDN Basic Rate Interface (BRI) and AIN 0.1. The interactions between ASP and CISDN defined by this feature consists primarily of the following:

- ☐ Allowing the subscribed Originating ASP Release 0.1 Triggers to be assigned to DNs on CISDN terminals. The ASP originating triggers include the following:
- ☐ Customized Dialing Plan (CDP) Trigger
- ☐ Feature Code Dialing (FCD) Trigger. This trigger is also called the Public Office Dialing Plan Feature Code (PODP FC) trigger.
- ☐ Allowing the subscribed Terminating ASP Triggers to be assigned to DNs on CISDN terminals. The ASP terminating trigger is the Termination Attempt Trigger (TAT).
- ☐ Allowing ASP interactions of the previously mentioned triggers with CISDN switched-based features. In other words, everything on CISDN in terms of feature interactions with ASP should work the same as they do for analog.

99-5E-2848 ASP 3/6/10 PRE-QUERY SCREENING

This enhancement to existing Advanced Services Platform (ASP) functionality invokes the screening function when a 3/6/10 Digit Trigger is encountered as the first trigger on a call in the office. This feature allows blocking to be provided to invalid classes of service (that is, inmates, etc.). Screening either indicates that no special treatment is provided, in which case the ASP Query is sent as normal, or that special handling is required, in which case the Query is not sent, and the call is routed to the destination identified by screening (that is, final announcement, to an operator position, etc).

This feature applies to calls originating from Analog and ISDN lines, PRIs, and Private Facility trunks. For these call types, when a 3/6/10 digit trigger is encountered as the first trigger on the call, the Screening Relation (10.10) is read using the Screening Index (SI) of the originating facility, the Prefix (none, 0+, 1+), and the Code Index (CI) derived from translation of the dialed number. Note that the dialed or derived carrier is not used in screening the 3/6/10 digit trigger.

If the Screening Relation read yields "REGL," or if a Route Index is present but is the same as the Route Index derived from translation of the dialed number, or if no tuple exists in the relation for the SI/Prefix/CI combination, the call progresses as an ASP call and the Query is sent. Otherwise, the call is not an ASP call, and is routed through the Route Index or Office Code specified by the Screening Relation (10.10). No 3/6/10 Query is sent in this case.

This pre-Query screening is not performed for other types of originating triggers, and is not performed for subsequent 3/6/10 digit triggers encountered as serial triggers. It applies to triggers which specify either the AIN Release 0 or AIN Release 0.1 protocol.

99-5E-2855 ISDN U-INTERFACE ON AUXILIARY INTERFACE UNIT

This feature provides an interface for ISDN U-Interface lines on the auxiliary interface unit. The unit replaces the ISLU2 in markets where these lines types are required. A new application board is added to the Auxiliary Interface Unit that provides an interface for ISDN U-Interface lines.

Benefits to the service provider include reduced floor space, lower power consumption as well as simplified office engineering, maintenance and installation.

99-5E-2860 MINI DCS - CDMA ON VCDX

This feature permits service providers [cellular service providers and Personal Communications Service (PCS) providers] to use the Very Compact Digital Exchange version of the 5ESS[®] Switch in networks that require Analog [also known as, Frequency Division Multiple Access (FDMA)], Time Division Multiple

Access (TDMA), or Code Division Multiple Access (CDMA). The VCDX switch provides a cost effective solution to introduce or upgrade wireless service in rural or low penetration areas. Furthermore, the VCDX also provides a cost effective way to service isolated high traffic areas, such as roamer traffic on interstate highways.

With this feature, the VCDX switch provides the switching fabric and trunk interfaces to interconnect FDMA/TDMA/CDMA cell sites. Furthermore, the VCDX Switch enables the service provider to connect the FDMA/TDMA/CDMA cell sites with the Public Switched Telephone Network (PSTN), as well as other network switching offices resulting in seamless wireless service to subscribers. Finally, with this feature, service providers will enjoy deploying a compact central office quality switch to better service their customers.

The Analog/TDMA/CDMA on the VCDX (Mini DCS) feature operates with the wireless/*AutoPLEX*[®] System 1000 application of the *5ESS*[®] Switch. Therefore, at least one of the wireless/*AutoPLEX*[®] System 1000 features (such as Frequency, Time, or Code Division Multiple access, or the Access Manager Communications Package) is needed.

99-5E-2864 PROHIBIT ROUTINE EXERCISE (REX) ON BASIC RATE INTERFACE (BRI)

The Prohibit Routine Exercise (REX) on Basic Rate Interface (BRI) feature provides the ability to control the testing of ISDN lines by the Routine Exerciser. REX can be enabled or disabled on an office basis or a per-DSL basis. This feature is secured (SFID 267 controls REX on specific BRIs and 266 controls REX on the entire office) and requires that a right-to-use (RTU) fee be paid to Lucent Technologies before enabling information is provided.

99-5E-2949 ASP INTERWORKING WITH CIRCUIT-SWITCHED DATA

The ASP Interworking with Circuit-Switched Data feature provides end users with the ability to place circuit-switched data calls and encounter ASP triggers which will invoke AIN-based services.

The operational user is any calling party with CPE capable of placing a circuit-switch data call who either has an assigned ASP subscribed trigger, or who places a call to a number which has an DNT or TAT assigned, thus invoking an AIN based service.

Under normal circumstances, the caller places a CSD call and encountered an ASP trigger. A query is launched into the network, and a reply is received from the SCP which instructs the switch how to proceed with the call.

Under abnormal circumstances, the user places a CSD call and encountered a trigger which is marked as voice only. Depending upon the type of trigger encountered, the call may be killed, or may continue by ignoring the trigger.

For more information regarding this feature please refer to the 235-190-126, *ASP Release 0.1B Feature Descriptions*.

99-5E-2972 ODD/TEXT COMPRESSION

The ODD/Text Compression feature significantly improves the SM pump time component to fully pump and initialize the SM-2000 so that it is close to 5 minutes.

99-5E-2975 MIS EVENT LINK ON IDCU

With the 5E10 software release, the MIS SM Event Link is supportable from an ISLU, RISLU or a TR303 IDCU which supports DSLs. This feature is made available to the 5E9(1) and 5E9(2) software releases through software updates. This feature allows the *5ESS*[®] switch to support the MIS SM Event Link required for each ISDN Switching Module which supports ACD/BRCS agents. ACD/BRCS requires that each SM serving ACD/BRCS positions must have a BRI defined for the MIS Event Link. Before the introduction of this feature, this link could only be provisioned for an ISLU or RISLU. Since ACD/BRCS positions can be

provisioned for an ISLU, RISLU, or IDCU with a TR303 remote terminal configuration, this feature is necessary to allow ACD/BRCS to be fully functional on SMs which are equipped with IDCUs and are equipped with neither an ISLU nor a RISLU.

This feature creates a new Recent Change and Verify (RC/V) view which is used to provision the MIS Event Link. This view supports the provisioning of this link for either an ISLU, RISLU, or IDCU with a TR303 remote terminal configuration.

99-5E-2988 CDMA DATA SERVICE - CIRCUIT MODE

The Code Division Multiple Access (CDMA) Data Service feature is a secured feature that uses CDMA technology to provide circuit-mode (voice band) data to the Public Switched Telephone Network (PSTN). This feature enables a mobile subscriber to communicate with the existing asynchronous modems (service option 4) and group-3 facsimile machines (service option 5) in the PSTN.

The typical mobile station configuration consists of a data terminal, such as a laptop computer, connected through an RS-232 cable to a CDMA mobile device conforming to EIA/TIA/IS-99, the circuit-mode data standard. This mobile device presents an interface to the data terminal that is an extension of a standard AT modem interface for asynchronous data service. For group-3 facsimile service, the mobile device presents an interface that is an extension of the class 2 PC fax standard interface to a fax modem.

CDMA Data Service provides soft handoffs that eliminate breaks in contact between the terminal and the network, giving higher system capacity. This feature is used by wireless subscribers for wireless access from devices such as laptop computers and portable fax machines. Users must connect these devices to a CDMA terminal, which provides the CDMA air interface.

CDMA Data Services requires the base CDMA feature. They also require some additional trunk connections plus an external inter-working function (IWF), which provides modem tones into the PSTN.

10.2.37 5ESS[®] SWITCH FEATURES 99-5E-3003- 99-5E-3993

99-5E-3003 AUTOMATIC POWER RECOVERY - PHASE 2

The Automatic Power Recovery (APR) features improve the recovery of the 5ESS[®] switch or its entities on a power outage caused by unreliable AC power or a power outage. In addition to extended AC power outages, these features also provide automatic recovery for short duration, transient power losses, possibly due to exchange technician errors. Phase I (99-5E-2404) consisted of APR for the AM, CM and SM core. This phase (99-5E-3003) includes all SM peripherals (both host and remote) for APR providing the complete coverage of all hardware units. However, it will not support automatic power recovery of LU1 or LU2, since power startup for these units requires manually removing fuses to prevent circuit pack damage.

Once system power is restored, manual on-site intervention is not required to physically charge capacitors, enable power start circuit packs, start FASTECH converters, or re-initialize software. This feature is significant to the large offices that are being considered for the domestic market, where a power outage is of major concern.

99-5E-3004 A/B LINK AND NO PATH BLOCKAGE

This feature allows the service provider to measure the blockage at the A-Link, B-Link, and Path level at the Line Unit. These measurements are used to determine/correct the concentration ratio of the switch Line Units and to identify/fix the blockage problem.

The following three measurements are provided:

- (1) No Idle A-Links (A-Links are blocked/not available)
- (2) No Idle B-Links (B-Links are blocked/not available)

- (3) No Path (A-Link and B-Link are idle/available, but no match exists).

From the service provider perspective, when subscribers report the dial tone delay to the telephone company, the switch personnel looks for causes such as blockage in the LU concentrators and tries to either change the concentration ratio or balance the load differently. The added measurements assist the switch personnel or network engineer to easily identify the blockage problems and correct them.

This is a secured feature.

99-5E-3005 INCREASE OF PRINTING UNITS OF SECTION 144 FOR ROP

This feature enhances Section 144 of the 5ESS® Switch Traffic 30-minute report. The enhancement provides:

- (1) An increase of the maximum printing units for ROP output of Section 144 of the traffic report from 6 units to 20 units. Currently, six records may be printed for the ROP. To ensure a more accurate analysis of data, an increase to twenty records with flexibility to distinguish ten high and ten low, all twenty high, or all twenty low count values is required.
- (2) A new count referred to "Originating and Terminating Blockage".

The Originating and Terminating Blockage Measurement is provided on a Line Unit Switch Group (LU-SG) basis for each call that is blocked.

From the service provider perspective, the switch personnel and network engineers have more useful data on a regular basis to better balance the load on Line Unit-Switch Groups (LU-SG) of the 5ESS® switch.

This is a secured feature.

99-5E-3032 LONG DISTANCE PLATFORM BASIC CALL PROCESSING

The Long Distance Platform Basic Call Processing feature consists of the capabilities being offered as the first offering of toll services on the 5ESS® Switch Long Distance Platform, one of these capabilities being the new switch-based ANI Table. Other capabilities that are part of the ANI Table feature include feature processing as indicated by fields in the ANI Table, call processing for incoming Special Called Part Number (SCPN) calls (that is, incoming 800 calls, incoming operator calls), routing and AMA support for toll calls, and TOD/DOW (Automatic Route Selection) routing for toll calls.

The ANI Table itself contains caller specific information. A caller's record in the ANI Table is keyed by the caller's ANI. The initial entries per caller that are allowed in the ANI Table are for Network Call Denial, Account Codes, SCP Trigger, DAS (Digit Analysis Selector), and Fixed Carrier.

99-5E-3045 REDIRECTED NUMBER (RN) ON PRI

The RN on PRI feature is being provided for a 5ESS® switch Central Office (CO) with PRIs serving intelligent CPE. This CPE is able to make use of redirection information for further call processing decisions for the call.

This feature is a terminating feature. It only affects circuit-switched voice or circuit-switched data calls terminating to an outgoing PRI B-channel trunk group.

This feature allows the service provider to provision the source of the redirection information delivered on outgoing calls to a PRI B-channel trunk group.

The current 5ESS® switch implementation (without this feature) of the outgoing PRI SETUP message allows for delivery of redirection information to the terminating equipment. Without this feature, an incoming

SS7 ISUP trunk call that terminates to a PRI B-channel trunk group has its PRI RN IE(s) populated from the SS7 ISUP IAM's Access Transport Parameter (ATP). [Such ATP information is regarded as Message Associated User-to-User information (MAUUI) within the switch.] Also, without this feature, calls redirected to a PRI from a line on the same switch as the PRI do not cause RN IE(s) to be populated in the outgoing PRI SETUP message.

When a PRI B-channel trunk group is subscribed to this feature, an incoming SS7 ISUP trunk call that terminates to such a trunk group has the PRI RN IE(s) populated from the SS7 ISUP OCN, RN, and RI parameters of the incoming SS7 ISUP IAM, not from the ATP. Furthermore, this feature populates the RN IE(s) for calls redirected from lines on the same switch as the terminating PRI.

When a PRI B-channel trunk group is subscribed to this feature, the MAUUI is discarded for calls that terminate to such a trunk group. This is the result of an implementation decision. For such a trunk group, the following IEs are not populated in the outgoing PRI SETUP message due to the discarding of MAUUI: Connected Number, User-to-User Information, Low-level Compatibility, and Codeset 7 information. Redirection information received from a PRI is currently treated by the 5ESS[®] switch as MAUUI. This being the case, redirection information [RN IE(s)] received from an originating PRI on the same 5ESS[®] switch or on a different 5ESS[®] switch when sent to a terminating PRI B-channel trunk group with this feature subscribed, would not be available.

99-5E-3055 PARALLEL PUMP ON CI2

This feature significantly improves the SM peripheral pump time component to fully pump and initialize the SM-2000 or the SM. The CI2 (UN71C) pack has a broadcast capability to allow rights to multiple peripherals at the same time. It also has the added benefit of a faster scanning time that speeds up call processing.

In order to get this benefit for existing CIs, our customers need to change to the CI2 pack and change the CLI for those CIs to get the benefit. This benefit applies to SM-2000 and SMs.

99-5E-3081 EXTENDED SOFT HAND-OFF

The "Extended Soft Hand-off" feature offers the service provider the means to interconnect packet switching units through an asynchronous transfer mode switch by reusing the "protocol handlers for ATM (PHA)." Since superior voice quality without "pops" or "clicks" during handoffs will differentiate your wireless service, this exclusive feature enriches your service by extending the area or number of CDMA cells where a subscriber enjoys soft hand-offs.

To use the Extended Soft Hand-off feature, the service provider needs (1) an ATM switch and (2) the protocol handlers for ATM (PHA) to terminate the ATM link on the packet switching unit of the 5ESS[®] switch. If the service providers currently use PHAs to directly interconnect PSUs through point-to-point connections, the service providers may elect to reuse or redeploy PHAs to terminate the ATM link and reduce the number of PHAs the service providers must purchase.

99-5E-3082 INTERSWITCH SOFT HAND-OFF

The Interswitch Soft Hand-Off feature allows service providers to offer the same quality and grade of service between large areas (for example, cities, BTAs, or MTAs) that they provide in smaller areas. This feature creates seamless CDMA service to interconnect soft hand-off areas served by different 5ESS[®] switches. The subscriber does not experience any pops or clicks as the switch hands off the call between cells served by the switches.

The service provider can interconnect packet switching units of different 5ESS[®] switches, either through a direct point-to-point or an ATM center stage connection. This enlarges the soft hand-off area.

The Interswitch Soft Hand-Off feature serves as a prerequisite to the larger Inter-Mobile Switching Center Soft Hand-Off feature that interconnects AutoPLEX[®] System 1000s and offers larger contiguous soft

hand-off areas spanning the multiple systems.

99-5E-3085 ASP SUPPORT ON VCDX PLATFORM

This feature provides full support of the Advanced Services Platform (ASP) Release 0.1 platform (99-5E-1150) on the Very Compact Digital Exchange (VCDX). With this feature the customer will be able to use the VCDX with all of the ASP 0.1 capabilities provided by the ASP platform as well as the numerous ASP adder features that build upon the ASP 0.1 platform. Benefits of this feature include provisions for increased line capacity from 100 to 1500. In conjunction with the SM-2000 based VCDX the line capacity can be increased to more than 10,000 lines. The feature requires an interface capability to the SS7 signaling network.

99-5E-3114 SS7-PSU ON SM/EXM-2000

The introduction of switch module (SM)-based Signaling System 7 (SS7) signaling on the SM-2000/EXM-2000 allows basic subscriber features and services that require SS7 signaling to continue intra-module operation if the SM-2000/EXM-2000 loses communication with the host and goes in to stand-alone operation. The SS7-PSU on SM/EXM-2000 feature has signaling links that terminate on PH3 hardware on the packet switch unit (PSU). Stand-alone processing is then achieved by adding an SS7 PSU to either an SM-2000 or EXM-2000 and terminating SS7 signaling links to it.

This feature provides the SM-based SS7 message transfer part (MTP) and signaling connection control part (SCCP) signaling platform (SS7-PSU) on the SM-2000 and EXM-2000 switching modules in the 5ESS[®] switch. It also allows both the (AM-based) CNI and (SM-based) SS7-PSU signaling platforms to co-exist in the same host office.

Those SMs equipped with an SS7 PSU and terminating SS7 signaling links are designated as global switching modules (GSM). All SS7 signaling on the GSM is handled by its associated SS7 PSU.

99-5E-3114.B CALL/CIRCUIT MONITOR SS7-PSU

This feature provides protocol monitoring options and capabilities for the monitoring and maintenance of SS7 signaling based network services. It applies to PSU SS7 and adds to capabilities available for Common Network Interface (CNI). Service providers can perform traps on SS7 calls for the duration of the call, analyze SS7 problems, and receive monitoring results in English text rather than in the hexadecimal format previously used.

With this feature, the customer has the ability to monitor inbound and outbound Transaction Capabilities Application Part (TCAP) queries based on called/calling party information found in the query's Signaling Connection Control Part (SCCP) header. This enhancement provides the customer with the ability to specify whether the matching called/calling party information is found in either the SCCP header or TCAP data part of the TCAP query message.

Since calling party information is optional in the SCCP header (the 5ESS[®] implementation does not provide it) but required in the TCAP data part of the query, this enhancement provides the customer with the ability to specify a specific called/calling party (to be found in the TCAP data part) and then begin protocol monitoring. As an example, the customer can monitor a specific subscriber calling an 800 number rather than having to monitor all subscribers calling the 800 number to find information on one specific subscriber.

The TCAP data part is limited to TCAP queries originated by the switch and thus outbound to the SS7 network. The capability to monitor inbound TCAP queries based on called/calling party information in the TCAP data part is not provided.

In addition, the customer has the ability to monitor inbound and outbound ISDN User Part (ISUP) messages relating to a particular call based on called/calling party information.

99-5E-3133 MULTIPLE CIC SUPPORT FOR LONG DISTANCE PLATFORM

The Multiple CIC Support for Long Distance Platform feature supports calls from up to 20 different carriers identified by a combination of the automatic number identification (ANI) table and the carrier ID code (CIC). If the CIC of an incoming call is listed in the ANI table, the ANI table determines call handling treatment. If the CIC is not listed in the ANI table, a special CIC table is used for determining call treatment.

99-5E-3151 AIN TOLL FREE SERVICE - PHASE 1

The AIN Toll Free Service features (Phase 1) is available with the 5E10 and later software releases. This feature provides an AIN based Tollfree Service utilizing the Advance Services Platform (ASP) Tollfree capacity. The AIN Tollfree feature allows any number to be marked as a tollfree number, thereby eliminating the restriction of using numbers such as 800, 888, or 877. The capacities of the AIN Tollfree feature are intended to provide Tollfree Services under AIN that are as transparent as possible to those currently provided today through the Intelligent Network SSP800 feature.

Please refer to the "AIN Toll Free Phase 1" section of the 235-190-126, *ASP Feature Description*, for further information.

This is a secured feature.

99-5E-3152 AMA RECORDING - AIN BUSY AND DON'T ANSWER

This feature provides AMA recording for ASP calls when the call is unanswered (Answer Supervision is not received before the caller abandons) or the call completes to a busy station (whether on the same switch or on another switch as represented by an ISUP RELEase message indicating a User Busy condition).

Normally (with the exception of Carrier Access Recording), ASP calls which are unanswered or complete to busy do not generate an AMA record. Unanswered calls may be recorded based on special studies or office-based unanswered call recording. No current provision exists for recording busy calls.

The feature includes a Recent Changeable Office parameter on RC View 8.1 which enables or disables the recording of busy or unanswered ASP calls.

This feature causes pending AMA records to be made only for call legs under ASP control (the "access record" for the leg prior to hitting a 3/6/10 trigger or a Termination Attempt Trigger is not affected), and only applies on legs for which an AMAslpID parameter is received causing a Structure 220 or 221 record to be made. It does not apply in "default AMA" situations when an AMAslpID is not received.

99-5E-3158 ASP MONITOR FORBRI AND MULTILINE HUNT GROUP

This feature provides the following new capabilities:

- ☐ Allows the Monitor target to be either a National or Custom ISDN BRI.
- ☐ Allows the Monitor target to be a MultiLine Hunt Group.

MLHGs are identified in the Monitor_For_Change message by specifying a Hunt DN in the CalledPartyID parameter, or by specifying its group number in the FacilityGID parameter.

Only REG, CIRC, and UCD MLHGs are supported by Monitor. ISAT and MUPH MLHGs will not be supported.

- ☐ Determines the busy/idle status with regard to terminating features (Call Waiting Terminating, Additional Call Offering, or Series Completion) for both Analog and ISDN targets. (Note that this is a change from previous practice for Analog lines, and a TFOS is provided to control whether existing practices will be continued in the office or whether new treatment, taking terminating features into account, will be provided.

99-5E-3183 SUBSYSTEM NUMBER CAPACITY INCREASE (SSNCI)

The SSNCI feature removes the restriction on the 5ESS[®] switch for processing SCCP messages with a remote subsystem number outside the range currently supported. Without this feature, the switch supports SSNs from 1-7 and 232-255 for a total of 31 subsystems (SSN value of 0 is not valid). When the switch receives an SCCP message initiated by another node, both the local and remote subsystems are contained in the message. The local subsystem is used to specify the application to process the SCCP message. The response to this message is sent to the destination node and include the remote SSN so the remote node can identify the application to process the message. This feature allows remote subsystem numbers to range from 1 to 255. The subsystem monitoring functions currently supported on the switch do not apply to remote subsystems outside the currently supported SSN range.

99-5E-3195 LDSU OFF-LINE PUMP DURING RETROFIT

The Local Digital Service Unit (LDSU) Off-Line Pump feature provides the ability to off-line pump the LDSUs in the SMs without incurring office downtime for the pump during retrofit. During the boot that occurs as a part of retrofit, the office is down until one or more SMs are up and able to complete call processing for analog lines. Bellcore's 1997 GR-512-CORE outage requirements state that planned office outages during retrofit should not exceed 30 seconds. This feature will off-line pump the LDSUs in the SM preceding the switch of the SMs to the new release. The initialization of the LDSUs will then be done in parallel with other downtime activity during the retrofit initialization. This will result in substantial reduction of the downtime in offices that have Classic SMs, and will help limit downtime to within the 30 second limit.

99-5E-3228 GLOBAL MESSAGING SERVER (GMS)

This feature provides redesigned and condensed Communications Module functions into a single-frame configuration for the maximum (23 SM-2000s) office size. The GMS includes the following components:

- ☐ Single board Message Switch
- ☐ Single board Network Clock and TMS Controller
- ☐ Single board TMS foundation including QLPS
- ☐ Single board TMS expansion
- ☐ Single frame CM for a full-sized CM2 equivalent
- ☐ Oscillator board.

99-5E-3243 DCS TRUNK GROUP EXPANSION AND OA&M REDEFINITION

This feature allows the wireless service provider greater use of the resources of the 5ESS[®] switch. When deployed in conjunction with the *AutoPLEX*[®] System 1000 ECP feature, the wireless service provider is able to increase the number of 5ESS[®] switch trunks designated as wireless trunks, and obtain additional OA&M capabilities.

This feature supports the two stage increase in the number of wireless trunk groups being implemented on the *AutoPLEX*[®] System 1000. The first stage raises the number of wireless trunk groups from 256 to 999. The second stage increases the number of wireless trunk groups to 2000.

Additional OA&M capabilities are:

- ☐ Accept conditional and unconditional trunk remove from the *AutoPLEX*[®] ECP and report to the ECP if remove fails.
- ☐ Report trunk group alarms to the ECP whenever an alarm is set or cleared.

- ☐ Handle trunk group status from ECP. The reply message includes the number of out of service members, the total number of members, the highest assignable numbered member, and the alarm status.

99-5E-3260 AIN TOLL FREE SERVICE - PHASE 2

The Advanced Intelligent Network (AIN) Toll Free Service feature (Phase 1 and Phase 2) provides "tollfree" services based upon the AIN architecture. This feature allows for end user and IXC transparency between the existing SSP/800 feature and AIN-based tollfree services using either the existing 800 code or new codes such as 888 designated for tollfree services.

The following are provided by this feature.

- ☐ Automatic Call Gap (ACG) List Size Increase. Increases the size of each ASP ACG list to 256 entries for a total of 512 entries.
- ☐ Measurements are made for the following: Announcement Number Unavailable, Total Completed ASP Calls, Total SCP Overload List Overflow, and Total SMS-Initiated List Overflow.
- ☐ The following ASP Tollfree specific counts are provided on a new 5-minute package: Total ASP Tollfree Call Attempts, Total Completed ASP Tollfree Calls, Total ASP Tollfree Calls Blocked by SCP Overload Controls, and Total ASP Tollfree Calls Blocked by SMS-Initiated Controls.

99-5E-3261 TWO B-CHANNEL TRANSFER (TBCT) ON PRI

The Two B-Channel Transfer feature allows two calls over an ISDN primary rate interface (PRI) between two end-users and a controller to be transferred so that the two end-users are connected to each other, and the two B-channels on the ISDN PRI the controller are released. The controller, which is a PBX or other intelligent peripheral, interfaces to a 5ESS[®] switch over an ISDN primary rate interface (PRI). The end users, who may be voice or data users, may be interfaced over analog or digital lines or trunks to the 5ESS[®] switch. The end users may also be interfaced to other switches in the network, which are interfaced to the 5ESS[®] switch over inter-switch trunks.

99-5E-3270.A LINE BLOCKING ENHANCEMENTS - PHASE I

This feature is used to override the Calling Party Number (CPN) Presentation Restriction to a Voice Messaging System (VMS) and deliver the call to the VMS for both direct and forwarded calls. This feature only applies to VMS that is used for ISVM. CPN Presentation Restriction is ignored on a switch for all ISVM Service Providers.

99-5E-3270 LINE BLOCKING ENHANCEMENTS - PHASE II

This feature is the same as Phase I except it overrides the CPN Presentation Restriction to a VMS, thus allowing the delivery of the CPN to the VMS. Phase II of the feature is assignable to a Message Service Center (MSC) on a Multi-Line Hunt Group (MLHG) basis.

99-5E-3338 INTERNALLY BRIDGED DUAL SERVICE - PACKAGE 1

This feature provides feature interaction modifications as an enhancement to the current 5ESS[®] switch Line Time Slot Bridging (LTSB) feature. The enhancement allows the following features to be assigned to and used on one Directory Number (DN) LTSB lines. These features do not modify two DN LTSB service.

- ☐ Multiline Hunt Group - including Regular, Circular, and Uniform Call Distribution (UCD) hunt types only
- ☐ Series Completion

- ☐ Call Forwarding Busy Line (CFBL) - all analog CFBL subfeatures
- ☐ Call Forwarding Don't Answer (CFDA) - all analog CFDA subfeatures
- ☐ Message Waiting Indication (MWI)
- ☐ Incoming Calling Line ID (ICLID) - all Line ID subfeatures
- ☐ Calling Name Display (CND)
- ☐ Directory Number Privacy (DNP) - per call privacy only

In addition, this feature does not change the current originating class of service requirements for LTSB lines. The switch allows LTSB service only on lines with an INDIV originating class of service. This feature does add to the allowed terminating classes for LTSB lines (INDIV or AGING). Terminating classes of MLHG and INWATS are now allowed. The INWATS class can be applicable to an LTSB MLHG member or a non-MLHG LTSB line.

99-5E-3341 E9-1-1 on VCDX

This feature allows the 5ESS[®] Switch Very Compact Digital Exchange (VCDX) to operate as an E9-1-1 serving office by providing most of the E9-1-1 services/capabilities available on the 5ESS[®] switch. Enhanced 9-1-1 routing and transfer features are supported as well as both analog ISDN Public Safety Answering Points (PSAP).

The VCDX does not, however, support Automatic Call Distribution (ACD) PSAPs.

99-5E-3359 PHV3 - DOWNLOADABLE PROTOCOL HANDLER FOR VOICE

This feature provides a Protocol Handler for Voice (PHV) to be downloaded during the PHV initialization. This will give the customer the ability to configure the PHV3 algorithm type (8K or 13K), and to change the algorithm type during the initialization to accommodate CDMA vocoder usage changes. A major benefit to the customer is the elimination of costs as a result of replacing PHVs whenever vocoder algorithms are changed.

99-5E-3360 CDMA MOBILE LOOPBACK TEST

The mobile loopback test provides the service provider a tool to evaluate the CDMA mobile equipment and the quality of the air interface. The test is initiated by dialing a test number from the a CDMA mobile. The mobile originated test can be performed by a point-of-sale clerk or other technician to verify a mobile is operational, or used by RF engineers to assess RF coverage.

The switch sends a known data stream to the mobile and compares it with the received data stream. Test results are presented to the mobile user and the Technician Interface terminal at the AutoPLEX[®] ECP.

99-5E-3379 LONG DISTANCE PLATFORM DATA CAPABILITIES

The Long Distance Platform Data Capabilities feature adds the "bearer capability" field to the AMA records generated by long distance platform data calls. The following data calls are supported:

- ☐ 56Kbit/s
- ☐ 64Kbits/s
- ☐ 384Kbit/s
- ☐ 1472Kbit/s

- ☐ 1536Kbit/s
- ☐ Multi-rate

99-5E-3395 SWITCH-BASED TDMA VOCODERS

This feature supports the Time Division Multiple Access (TDMA) vocoder relocation capability being added to the *AutoPLEX*® system. Switch-Based TDMA Vocoders provides the TDMA vocoders from the switch instead of the cell site. TDMA vocoder relocation is available to TDMA wireless service providers using Series II cell sites equipped with enhanced digital radio units (EDRU).

Switch-Based TDMA Vocoders is a software feature which makes use of the packet switching capabilities of the 5ESS® switch. Switch-Based TDMA Vocoders creates "packet pipes" of one DS0 in size which connect the packet switching unit 2 (PSU2) of the 5ESS® switch to the EDRU of the cell site. Each packet pipe carries three voice channels. The TDMA voice packets are delivered to vocoders located within the PSU2. The vocoders will support either the ACELP or VSELP vocoding algorithms used for TDMA service.

Centralizing the vocoders provides several benefits to TDMA wireless service provider. The benefits include: facility savings between the switch and cell site because of carrying voice packets for three radio channels per DS0, fewer vocoder circuits because of the efficiency of a single large vocoder pool at the switch, and the improvement of voice quality during handoffs because of uninterrupted semi-soft handoffs on the network side.

Activation of this feature is dependent on the activation of the AMPS feature (99-5E-1348).

This feature requires that the packet switch unit be equipped in the 5ESS® switch. This unit is traffic engineered, based on the traffic characteristics of the TDMA cell sites.

99-5E-3397 TNM INTERFACE ON VCDX

This feature provides the ability to support the 5ESS® Switch VCDX from the Network Fault Management (NFM) Operations Support System, formerly TNM. NFM provides facilities to control and maintain switches from a centralized remote location using a Switching Control Center (SCC) datalink. Limited remote monitor and control capabilities were previously provided through the TLWS (Trunk Line Workstation), available on VCDX. TNM provides the additional Emergency Action Interface (EAI), Read Only Printer (ROP), and Processor Recovery Messages (PRMs) which are not available from TLWS.

99-5E-3404 TRANSMISSION RATE CONVERTER UNIT 3 (TRCU3)

This feature provides increased bandwidth performance to ORMs/EXMs. It also provides a new transmission rate converter unit (TRCU3), which requires the development of two new circuit packs for terminating the network control and timing links (NCT and NCT2). The new TRCU3 directly interfaces with NCT and NCT2 links for rate conversion to STS-1, SONET. The TRCU3 multiplexes signals up to OC-3/OC12. The design achieves a four-fold increase in bandwidth performance over the TRCU2 unit it replaces for the EXM and a two-fold improvement for the ORM.

The TRCU3 consists of a DDM-2000 shelf equipped with the following DDM-2000 boards: one system controller, one overhead controller, two timing generator systems, two OC-3/OC-12 optical line interface units, and the new NCT/NCT2 packs equipped in the DS3 function pack slot.

The new TRCU3 boards will be equipped as follows:

- ☐ NCT2 circuit pack terminating one NCT2 link per board for EXM-2000
- ☐ NCT circuit pack terminating one NCT link per board for ORM

99-5E-3411 PSU CAPACITY EXPANSION

The PSU Capacity Expansion feature increases the number of time slots between the SM-2000 TSIU and each packet switch unit (PSU) shelf from 128 to 768. This is accomplished with a new data fanout circuit board called the data fanout with peripheral control and timing (DF2) board.

This feature benefits the wireless service provider by increasing the traffic capacity of the PSU2 and at the same time reducing the equipage requirements for both PSU2 and SM-2000 units.

99-5E-3412 PROTOCOL HANDLER FOR VOICE 4 (PHV4)

The Protocol Handler for Voice 4 (PHV4) provides 32 speech vocoders per circuit board, double the capacity of the PHV3. Like the PHV3, the PHV4 is a downloadable platform that supports multiple vocoding algorithms, even for multiple air interface standards.

By deploying the PHV4 in combination with PSU2 units equipped with the PSU Capacity Expansion feature (99-5E-3411), the traffic capacity of the PSU2 is more than triple the capacity of the 5E10 PSU2 configurations. This means a savings of PSU2 units deployed and SM-2000s deployed.

It is possible to mix PHV1, PVH2, PHV3, and PHV4 circuit packs in the same PSU2 unit.

Activation of this feature is dependent on the activation of the AMPS and CDMA features (SFID 130, and SFID 221, respectively).

99-5E-3421 VIRTUAL PRIVATE NETWORK FOR LONG DISTANCE PLATFORM

This feature allows business subscribers to make long distance calls by what appears to be their own private network. The call may enter the virtual private network (VPN) by either public network access trunks or by network access trunks that are dedicated to VPN access.

VPN networks are used as a method of providing a private network to a business customer without actually having dedicated facilities to each of their locations. The basic calling scenarios that are supported by a VPN network are:

- ☐ On-net, call made to party that is part of same VPN.
- ☐ Off-net, call made to a party that is not part of the VPN.
- ☐ Off-net overflow, call originated as on-net but VPN trunks are not available, so call is routed as a public call.

The 5ESS[®] Switch implementation utilizes the power of network- wide CENTREX functions to determine the originating station's restriction and the A-I-Net[®] to determine the routing for the call. The on-net caller dials an extension and the call is routed to the toll service provider over VPN designated trunks from an end- office. The business customer is connected to the end-office over PBX, CENTREX, BRI or analog line.

Authorization and account code processing is allowed for on-net calling. The SCP translates extension into the forward number and sends the routing information for the call.

For Remote Access calls, an 8XX number is dialed to access the toll switch. The switch prompts the caller to enter an authorization code. The authorization code is entered by the caller and the SCP performs validation. The switch then asks the caller to enter the forward number.

For Virtual Office Connection calls, the ANI is recognized and authorization code is not required. Otherwise the procedure is the same as Remote Access.

99-5E-3426 MULTIPLE RATE CENTER SUPPORT

This feature ID 190 controls the Advanced Services Platform (ASP) enhancements to Multiple Rate Center Support. Which provides a new field on RC/V View 9.35. This field affects the selection of the Digit Analysis Selector (DAS) used for post query processing of ASP calls detected through any type of ASP trigger. Any valid DAS can be entered on this new RC/V View 9.35 field if SFID 190 is unlocked. All ASP triggers can utilize this RC/V View 9.35 DAS.

For further information on this feature, refer to 235-190-126, *Advanced Services Platform* Release 0.1B (RO.1 protocol), issue 4.0, section 3.8.5, ASP Enhancement to Multi Rate Center Support.

99-5E-3438 FEATURE DEPLOYMENT VIA THE ADMINISTRATIVE SERVICES MODULE (ASM)

Feature Deployment via the Administrative Services Module (ASM) provides the ability to enhance the methods for distributing software updates to the 5ESS[®] switch. Currently, most Regional Bell Operating Companies (RBOCs) use Customer Service Computer Access Network System (CSCANS) and have encountered a bottleneck when distributing software updates to a large number of switches. This feature allows an RBOC CSCANS to rapidly distribute features and software updates from CSCANS to multiple ASMs over the RBOC's private network. Additionally, this feature allows Software Change Administration and Notification System (SCANS) to send features or software updates directly to a switch owner's ASM.

This feature depends on an ASM that:

- ☐ communicates with a 5ESS[®] switch using a high speed interface
- ☐ supports a range of standard, open interfaces

99-5E-3474 CDMA ENHANCED VARIABLE RATE CODING (EVRC)

Available as a software update for 5E11 and later, the CDMA EVRC (Enhanced VARIABLE Rate Coding) feature defines an enhanced 8 kbps vocoding algorithm adopted for CDMA voice services. The EVRC algorithm provides voice quality comparable to the present 13 kbps CDMA vocoding algorithm. The EVRC provides the ability to maintain the voice quality provided by the 13 kbps algorithm but captures the spectrum and facility efficiencies of an 8 kbps coder. The EVRC algorithm can be deployed in the same office and onto the same PSU2 as the other CDMA algorithms.

99-5E-3474.A PHV TRAFFIC MEASUREMENTS EXPANSION

The PHV Measurement Enhancement feature provides enhancements to the SH Report and a new section of 30-minute traffic report to provide vocoder usage information. Note that the name SH Report has been changed to ECPSRVT report. The enhancement to the ECPSRVT provides a new field to indicate vocoder type for voice calls and a multiplex option with service provided (Async, Fax, IP, and CDPD) for data calls.

Specifically, this feature enhances traffic measurements by:

- ☐ Supporting the PSU channel measurements - IFRPH is a PH image dedicated to terminate the ISDN Frame Relay protocols and communicates to the SM. The previously existing measurements for FRPH (section FRPH) are used to evaluate the IFRPH as well. Existing section supported 22 pipes (channels), but IFRPH needed 32 channels (the number of time slots on IFRPH). To achieve compatibility, this section was renamed to be a general PSU channel section - and the new name is PSUCHAN (packet switch unit channel measurements).
- ☐ Updating existing measurements for new equipment introduced by CDMA data services.
- ☐ PSU/Service type combinations allowed for the ECPSRVT report collection are updatable via RC/V views for all CMDA and TDMA_VIS applications. In an initial office, the ECPSRVT section is allowed for collection and all service types in all PSUs are marked as selected.

For PSU/Service type combinations grown in later, the service types is marked as not selected.

An input message is provided to inhibit or allow measurement collection for the ECPSRVT section.

The PSU/Service type combinations allowed for ROP printing are updatable via RC/V views for all CMDA and TDMA_VIS applications. By default, the ECPSRVT section is allowed for ROP printing and no PSU/Service type combinations are selected for ROP printing. An input message must be provided to allow or inhibit the section for ROP printing.

Note that when the ECPSRVT section is allowed for collection, measurements are collected for those PSU/Service type combinations marked as selected and also when the ECPSRVT section is allowed for ROP printing, the measurements are printed for those PSU/Service type combinations marked as selected for both measurement collection and ROP printing.

- ☐ Adding a new section (VOCODER) of the 30-minute traffic report is provided for the usage of different vocoder types. The following counts are pegged:
 - ☐ Vocoder Usage (USAGE)
 - ☐ Number of overflows (OVFL)

This report is provided only for the CDMA and TDMA voice. All the necessary I/O messages are provided for activating and deactivating, and obtaining the collection status of the Vocoder Usage TRFC30 measurements.

- ☐ Adding a new section (FRBC) of the TRFC30 report buffer to support Frame Relay Bearer Channel (FRBC) Measurements: The number of incoming seizures for the FRBC, and the number of outgoing attempts for the FRBC.

FRBCs provide DFI to IFRPH connectivity and are considered to be physical facilities. They are used for both AMPS and non-AMPS applications. Access to the FRBC measurements will be restricted to offices that have FRBCs.

99-5E-3483 ENHANCED *UNIX*[®] System TOOLS ON AM

This feature is intended to minimize the manual manipulation of data required on the AM by providing the tools which give enhanced data-handling capabilities presently found on other *UNIX*[®] systems. Three additional commands are made available with this feature: pg, lf, and vi.

99-5E-3484 DECOUPLING OF AM/CM FOR CM ONLY INIT

This feature provides a communications module (CM)-only initialization to use in the manual recovery of the 5ESS[®] switch. This includes emergency action interface (EAI) and input message control capabilities as well as recovery from the failure of the CM to initialize.

99-5E-3486 SELECTIVE BROADCAST PUMP

The Selective Broadcast Pump feature enhances the existing broadcast pump feature by allowing the service provider to selectively initialize (broadcast pump) switch modules on a 5ESS[®] switch. In addition to initialization by SM type as done previously, this new feature allows initialization by SM configuration and/or selectively by multiple SM numbers or ranges.

Supported switch module types include:

- ☐ local switch modules (LSM)
- ☐ host switch modules (HSM)

- ☐ remote switch modules (RSM)
- ☐ optical remote modules (ORM)
- ☐ two-mile optical remote module (TRM)

Supported SM configurations include: BASIC, STANDARD, LOADED, SIGNALING, SM-2000 and/or CNFG000, CNFG001, CNFG002, CNFG003 and CNFG2K00.

99-5E-3487 STS-ECHO CANCELLATION

This feature provides the maintenance and application code to control an external echo canceller terminating an STS-1 interface. This feature also provides the ability to add/delete echo cancellation on a per call basis.

Long distance networks are susceptible to echo generation due to the long transmission medium distance and impedance characteristics. Calls traversing multiple switching points generate more electrical echo than those traversing few points, as well as calls that require satellite or radio transmission. This echo is evident to the end user and translates to poor quality for the service provider. In order for the service provider to provide quality transmission to their customers, they need to implement echo cancellation technology in their network. In introducing Digital Network Unit - SONET interface (DNU-S), the need exists to echo cancel at STS-N rates without demuxing down to digital signal level 1 (DS1) (1.544 Mbps) rates. The Neptune II platform is the next generation signaling platform, when integrated with the 5ESS[®] switch, it provides echo cancellation for three STS-1 interfaces and echo cancellation for 2,016 DS0s.

99-5E-3489 SELECTIVE MANUAL RC OUTPUT PRIORITY

The Selective Manual RC Output Priority feature allows the service provider to change the system priority for TTY terminal input/output messages. MML input commands initiated and resulting output will be handled at a higher priority while the change remains in effect. The priority change can be specified from 5 to 360 minutes with 360 minutes as the default.

99-5E-3520 AUTOMATED SPID DOWNLOAD (AUTO SPID)

The Automated SPID Download feature simplifies the ISDN installation process by automatically sending ISDN provisioning information to ISDN terminal equipment. This information is then used by the ISDN terminal to initialize the equipment and provide network access to the subscriber. The automatic exchange of provisioning information such as directory numbers, bearer capability and service profile identifiers (SPID) between the 5ESS[®] switch and customer premise equipment (CPE) frees the subscriber from having to program network details into their ISDN equipment.

Fully-initializing terminals (FIT) must be used to receive the ISDN provisioning information from the switch.

99-5E-3529 ASP ORIGINATING BUSY/NO ANSWER OFFICE TRIGGERS WITH EXTENDED RINGING

This feature will enhance the 5ESS[®] Switch ASP offering by adding Originating Busy and NoAnswer triggers, along with an Extended Ringing capability. This feature allows Service Providers to offer enhanced services to their end customers through providing calling parties with additional options upon encountering a busy or unanswered call condition.

Extended Ringing allows the called party's line to continue to receive ringing after the O_No_Answer trigger has been hit and the SSP is playing an announcement (Send_To_Resource) to the calling party. Extended Ringing also allows the calling party to be connected to the called party if the called party answers while the SSP is playing an announcement to the calling party.

99-5E-3541 VERIFY THE SM-2000 IS COMPATIBLE WITH LU2 SOFTWARE

This feature will be used to verify that the SM-2000 is compatible with the LU2 hardware and software. Prior to installing this feature the following sequence may be used to verify compatibility.

- ☐ Test the LU2 with the SM-2000 to identify incompatibilities
- ☐ Resolve the incompatibilities via HW/SW corrections
- ☐ Retest to ensure 100% compatibility and total operation.

99-5E-3553 WIRELESS TRUNKS ON DNUS

This feature provides the 5ESS[®] switch DCS with the capability to use DNUS as a trunk interface for the AutoPLEX[®] System 1000 and per call control of the external echo cancellers for DNUS. Per call control provides the ability to disable/enable the external echo canceller per call from the 5ESS[®] switch DCS. Per call control requires an Ethernet[®] connection from the 5ESS[®] switch DCS to the external echo canceller. Without per call control, a Graphical User Interface (GUI) at the external echo canceller manually disables/enables the external echo canceller.

Some wireless trunks should never be echo cancelled and should not be provisioned with an echo canceller. Other wireless trunks require echo cancellation. For those wireless trunks that require echo cancellation, all calls currently handled on those trunks can be echo cancelled. All voice calls can currently be echo cancelled and for asynchronous data and fax calls, the modem on the call will send tones to disable the echo canceller. Until ISDN data calls or calls with a data bearer capability are handled on a wireless trunk, per call control of the external echo canceller is not necessary during call processing.

Terminal maintenance uses per call control to turn off echo cancellation during test calls. If Wireless Trunks on DNUS does not have per call control of the external echo canceller, that is, no Ethernet[®] connection to the external echo canceller, then the external echo canceller should be manually disabled before running operational tests. Some operational tests on a trunk may fail as a result of external equipment. An enabled external echo canceller can result in these tests failing.

99-5E-3559 DS1 ECHO CANCELLATION

The DS1 Echo Cancellation feature provides the 5ESS[®] switch long distance platform (LDP) with an integrated DS1 echo cancellation and signaling unit (ECSU) that is physically integrated into the switch modules (SM). A control feature allows the echo cancellation to be enabled or disabled on a per-call basis. The feature allows echo cancellation to be turned off for data calls.

99-5E-3560 EXPANSION ACCESS INTERFACE UNITY (EAIU)

This feature provides the capability of providing more Access Interface Unit (AIU) on a 5ESS[®] switch's SM-2000. This is accomplished by providing a new Comdac (RCOMDAC) for the AIU so it can interface with a 5ESS[®] switch using DS1 facilities provided by the DNU-S or DLTU2. The EAIU utilizes all AIU application packs, both existing and those still to be developed.

99-5E-3561 INTEGRATED METALLIC TESTING FOR AIU

This feature provides an Integrated Metallic Test circuit pack and associated software for the Expansion Access Interface Unit (EAIU).

99-5E-3569 AIN ANNOUNCEMENT ID EXPANSION

This feature will expand the maximum number of recorded announcement IDs from 255 to 65535.

99-5E-3576 TDMA DATA SERVICES ☐ CIRCUIT MODE

The TDMA (Time Division Multiple Access) Circuit Data Services feature is a secured feature (SFID 286)

that provides TDMA mobile users access to existing asynchronous modems and Group-3 fax machines in the PSTN (Public Switched Telephone Network). Users must connect the devices such as laptop computers and portable fax machines to a TDMA terminal that provides the TDMA air interface. TDMA voice circuits cannot carry voice band modem tones, so this feature allows for the TDMA air interface to carry the data in a digital form to an interworking function that generates the modem tones for communication through the PSTN.

99-5E-3599 5ESS® DCS NAILUP EXPANSION

This feature allows the service provider to assign up to 9999 DSCs and to assign DSC numbers in any naming order. For example, DSC number 1 through 150 and 2003 through 2020 may be assigned.

99-5E-3614 ASP NETWORK BUSY EVENT AND ENHANCED ALTERNATE CARRIER ROUTING

This feature provides two enhancements to the existing ASP functionality:

- (1) The Enhanced Alternate Carrier Routing capacity enhances the existing ASP Alternate Routing function. It allows a RElease message received from a forward switch with appropriate cause value to be detected as network busy. This causes the SSP to invoke alternate routing by abandoning any further attempts with the current routing parameter and shipping to the next carrier or trunk group parameter.
- (2) ASP Network Busy Event capability allows the service control point (SCP) to be notified when a call it has instructed the service switching point (SSP) to route, encounters a network busy condition either at the SSP or in another switch in the network, after exhausting all routes available per the SCP's instructions. The SCP can then provide additional instructions to the SSP.

99-5E-3620 AIN SEND TO OUTSIDE RESOURCE (REMOTE)

AIN Send to Outside Resource (STOR) - Remote enhances the STOR-Local feature by allowing a connection to an Intelligent Peripheral (IP) located on a remote switch, connected by Signaling System #7 (SS7) trunks. STOR-Local can only connect AIN calls to an IP residing on the same switch where the AIN query initiated. Working together, STOR-Remote and STOR-Local features implement functions at the SSP of handling AIN 0.2 Send_To_Resource message described in the following Bellcore documents:

- (1) Advanced Intelligent Network (AIN) 0.2 Switching Systems Generic Requirements, GR-1298-CORE.
- (2) Advanced Intelligent Network (AIN) 0.2 Switch - Intelligent Peripheral Interface (IPI) Generic Requirements, GR-1129-CORE.

99-5E-3620.A STOR REMOTE TRAFFIC MEASUREMENTS

The 99-5E-3620.A STOR Remote Traffic Measurements feature enhances traffic measurements by distinguishing LOCAL from REMOTE messages and adds REMOTE specific counts.

99-5E-3621 PRI-B CHANNEL AVAILABILITY SIGNALING PROCEDURES

This feature provides a new maintenance capability on the National ISDN Primary Rate Interface (PRI). With this maintenance capability, either end (network or subscriber side) of the PRI can notify the far end when the status of an individual B-channel is changed (for example, the B-channel has been taken out-of-service or is ready to be brought into service).

B-channel maintenance procedures are significantly improved by making the network switch aware of far end status, and by allowing the network switch to communicate status to the far end. With this feature, both the central office and the subscriber can avoid call attempts on channels that are out-of-service at the far end.

99-5E-3671 CORE60MM WITH INTEGRATED RAM

The CORE60MM with Integrated RAM feature improves processor performance of the SM-2000® switch modules. CORE60MM provides multiple memory configurations of either 64MB or 128MB of CORE random access memory (RAM). Either of two new circuit packs - the UN594 or the UN588 - is provided by this feature.

99-5E-3673 ICLID ENHANCEMENT FOR MLHG

The ICLID Enhancement for MLHG feature (99-5E-3673) sends a "group" directory number (DN) rather than an individual directory number from an analog multi-line hunt group (MLHG) to a called party who is subscribed to Incoming Calling Line Identification (ICLID). This is a secured feature (SFID 192) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-3675 LONG DISTANCE AMA ENHANCEMENT

This feature adds fields to the originating toll AMA recordings:

- ☐ terminating trunk group
- ☐ interexchange/originating line information (II/OLI) digits
- ☐ II digits for equal access multi-frequency (EAMF)
- ☐ OLI digits for common signaling signal 7 (CCS7)

99-5E-3692 CONVERSION OF 3B20D BASED AM TO 3B21D BASED AM - VERSION 2

This feature provides customers with the ability to convert an existing 3B20D Administrative Module (AM) to the 3B21D AM supported by the 5E11.1 software update. The conversion provides a seamless migration including disk partitioning information, disk office data, port configuration, and other office dependent information onto the 3B21D AM.

The conversion is accomplished without interrupting service by using hardware cabling to overlay the 3B21D Control Unit (CU) 1 with the 3B20D CU1. When the 3B20D CU 1 is switched from CU 0 to CU 1, the office is essentially running off the new 3B21D Administrative Module.

99-5E-3706 NUMBER PORTABILITY - LRN MEASUREMENTS

This feature enhances the Number Portability - Basic LRN feature (99-CP-3169.A) by providing additional measurement capabilities. The Basic LRN Feature provides measurements for the number of calls encountering a number portability (NP) trigger that results in a service control point (SCP) query. The additional measurements provide peg counts for the number of NP query failures, the number of calls to ported numbers and the NP data inconsistencies. Measurements are also collected at the terminating switch for NP unallocated number calls and NP data inconsistencies. A new Traffic-30 measurements section provide the NP measurements. The additional measurements are compliant with the Illinois Generic Requirements for Number Portability.

99-5E-3730 NUMBER PORTABILITY - NPA-NXX GROWTH

The Number Portability - NPA-NXX Growth feature increases the number of allowed NPA-NXX codes on a 5ESS® switch from 250 to 8000. NXX codes in multiple numbering plan areas (NPA) are now allowed.

For example, on a given 5ESS® switch, the same office code (or NXX) can exist in two different area codes (or NPA); that is, lines for the same office code are supported in both area codes.

99-5E-3735 TWO FULL DNU-S ON SM-2000

The Two Fully Loaded DNU-S on SM-2000 feature is increasing the number of STSX-1 interfaces supported on a single SM-2000 from 18 to 24 (or from 3 Data Groups on 1.5 DNU-S units to 4 Data Groups on 2.0 DNU-S units.) As a result of increasing the number of STSX-1 interfaces supported per SM-2000, the maximum number of DNU-S trunks also increases to 16,128.

99-5E-3739 INTERNALLY BRIDGED DUAL SERVICE - PACKAGE 2

This feature provides feature interaction modifications as an enhancement to the current 5ESS[®] switch Line Time Slot Bridging (LTSB) feature. The enhancement allows the features, which are listed below, to be assigned to and used on one Directory Number (DN) LTSB lines. These features do not modify a two DN LTSB service.

- ☐ Distinctive Ringing (DR) - all DR subfeatures except priority and preemption
- ☐ Terminal Group Station Restriction (TGSR) - all TGSR subfeatures
- ☐ Private Facilities Access (PFA) - all PFA subfeatures except queuing
- ☐ Caller ID on Call Waiting
- ☐ Individualized Dialing Plan (IDP) - all IDP subfeatures
- ☐ Customer Originated Trace (COT) - line feature only, LTSB line can access and use generally available version
- ☐ Message Detail Recording - all MDR subfeatures
- ☐ Dial Call Waiting
- ☐ Call Waiting Originating

In addition, this feature does not change the current originating class of service requirements for LTSB lines. The switch allows LTSB service only on lines with an INDIV originating class of service.

99-5E-3760 INHIBITING ORIGINATING BUSY/NO ANSWER OFFICE TRIGGERS

This feature provides Service Providers with a mechanism that prevents particular lines on the 5ESS[®] Switch from encountering the office wide Originating Busy and No Answer triggers. This enables the Service Providers to identify telephone customers that do not wish to receive an AIN service, and for those customers, prevent their calls from encountering the office based Busy and No Answer triggers. By preventing these calls from triggering, the Service Provider has less data to maintain in their application logic, and the Service Providers have less non-revenue generating SS7 queries launched.

This feature may inhibit the AIN Originating Busy/No Answer Triggers based on the following criteria:

- ☐ Individual lines
- ☐ Originator's Screen Index
- ☐ Groups of lines using Global Recent Change.

99-5E-3761 CALL SCREENING FOR ORIGINATING BUSY/NO ANSWER OFFICE TRIGGER WITH EXTENDED RINGING

This feature screens the number of calls that launch a Busy or No Answer query from office-based triggers. A list of criteria created by the customer is used to screen the calls. The criteria could include the following:

- ☐ Out-of-LATA calls based on digit string call type
- ☐ Carrier transporting the call
- ☐ Digit string.

When an inbound call is received it is compared against a list and if it met the list criteria it would be prevented from launching Busy or No Answer queries.

99-5E-3777 ISDN AUTOMATED LINE ASSIGNMENT

The ISDN Automated Line Assignment feature allows the 5ESS[®] Switch to choose an integrated channel number and path (DPIDB/PIDB time slot) to the protocol handler (PH) so that mismatches between an ISDN line termination, PH and path to the PH cannot occur. The feature assigns the packet channel, quarter time slot for D-channel and full time slots for B-channel packet automatically.

The feature can be turned on in an office. Once it is turned on, the switch will automatically select packet channels for an ISDN line, such as ISDN Channel Numbers (ISCNs) when the application is created or updated on the Digital Subscriber Line (DSL) Assignment.

The switch will automatically select an available ISCN for the D-channel (D ISCN) when the ISDN service is created. If X.25 packet service is created at the same time, the switch will also automatically select the B-channel ISCN(s).

99-5E-3780 DATA ONLY PRI CAPABILITY

This feature allows the switch operator to limit the calls coming into the switch via a PRI to only data calls, by subscription. If the PRI is provisioned to originate data calls only, an attempt to originate a voice call will be blocked and an appropriate ISDN message will be sent back to the originating equipment clearing the call. For the purposes of this feature only 56 kbps or 64 kbps digital data is considered to be data. A call with a Bearer Capability of voice or 3.1 kHz audio will be considered voice and will be denied origination on a data-only PRI.

99-5E-3782 MULTI-VENDOR INTRA-NETWORK TRUNKS (MINT)

The MINT feature provides new signaling and routing capabilities to allow long distance platform calls to traverse toll networks over Multi-Vendor Intra-Network Trunks (MINTs). This feature helps the carrier make more efficient use of the network resources based on known daily or hourly traffic patterns. Additionally, this feature allows a service provider to segregate or partition customers into different dialing plans that can be used throughout the service provider's network. Three separate MINT signaling formats (Alpha, Beta, and Gamma) are provided to allow 5ESS[®] LDP switches to be compatible with other vendor switches.

MINT signaling, allowed on SS7 and MF trunks, consists of network-specific parameters. For SS7 MINTs, this includes queuing, satellite, Terminating Network Selection Code (T-NSC), Originating Network Selection Code (ONSC), and route search limit information stored in a Network-Specific Initial Address Message (IAM) parameter. For MF MINTs, queuing, satellite, and T-NSC information is prepended to the CdPN.

Other routing capabilities provided by this feature to enhance existing LDP routing include Reroute Queuing, Reroute-On-Release, and Time Dependent Routing. The Reroute Queuing capability allows queuing of a call on a Standard Intra-Network Trunk (STINT) or MINT when a route is not available out of the 5ESS[®] LDP switch. After a brief silent queuing period, if the queued trunk has not become available, the route chain is searched a second time for an available trunk.

The Reroute-On-Release capability allows the 5ESS[®] LDP switch to attempt to reroute a call, based on certain specific cause values, when a release message is received on an LDP trunk.

The Time Dependent Routing capability allows the service provider to change the routing of a call based on time of day and/or day of week.

99-5E-3784/99-5E-3784.B REAL TIME CALL DETAIL FOR THE 5ESS® LONG DISTANCE PLATFORM

See feature 99-5E-4387 RTCD Expansion A.

99-5E-3796 NATIONAL ISDN CALL PARK

This feature allows the subscriber to interrupt voice on an active call without the call being cleared. The call gets parked against the subscriber's Directory Number (DN) or another DN in the subscriber's terminal group. The subscriber who parked the call (or another party) can then retrieve the call from the same terminal or from a different terminal in the same terminal group.

NI Call Park consists of the following capabilities:

- ☐ Call Park - parks calls against any DN in a subscriber group, including their own.
- ☐ Call Retrieve - reestablishes communications with calls parked against any DN in a subscriber group, including their own.
- ☐ Call Park Timed Recall - alerts the parking party and reestablishes the call between the parking party and the parked party if the parked call is not established within a specified time interval.
- ☐ Call Park Reroute - reroutes parked party to an attendant defined for a terminal group if a ring-back call does not get answered after 30 seconds, or if ring-back does not occur after 3 attempts.

This feature is only available on the National ISDN Basic Rate, but the feature interfaces with analog users and custom BRI users. (Feature 99-5E-1140 provides Analog and Custom ISDN Call Park operation.) The platforms are compatible. Non-NI users may retrieve calls parked by NI users and NI users may retrieve calls parked by non-NI users provided they are in the same terminal group and have the Call Park feature assigned.

NI Call Park applies only to circuit-switched voice calls (for example, speech or 3.1 -kHz audio) on a Basic Rate Interface (BRI).

99-5E-3825 5E12 SOFTWARE TRANSITIONS AND AFT FEATURE

The 5E12 Software Transitions and AFT Feature includes two types of retrofits:

- ☐ Standard SG retrofit
- ☐ VCDX retrofit

The feature can be described as performing three functions:

- ☐ Standard retrofit (including AFT feature)
- ☐ Large terminal growth
- ☐ Software release update

The Apptext Forward Translator (AFT) function provides a Recent Change/Verify (RC/V) text interface software translation mechanism that allows the service provider to continue RC/V operating system (OS) operations after the retrofit of a 5ESS® switch to a new software release. Thus the switch owner is not required to install the RC/V OS on the new software release before retrofitting the switch.

99-5E-3837 LOCAL NUMBER PORTABILITY ON LONG DISTANCE PLATFORM

This feature provides support of local number portability (LNP) on the long distance platform (LDP). This involves allowing LNP queries and routing based on the resulting location routing number (LRN) in the toll network, rather than relying on the incumbent network to perform this LNP processing for toll calls.

99-5E-3847 DMT ADSL APPLICATION PACK FOR *AnyMedia*® AIU

Asymmetric Digital Subscriber Line (ADSL) Network Services provide the ability to handle many times more data bandwidth over existing copper loop equipment, which avoids tying up the telephone network with long-duration modem calls and provides more efficient transport of data traffic. It allows subscribers to send and receive data on their analog telephone line without interfering with their voice telephone service.

ADSL provides subscribers with high-speed data access to Internet Service Providers (ISPs) or to corporate networks through the use of Discrete Multi-Tone (DMT) encoding by putting data traffic on the local loop at frequencies above the voice band. ADSL automatically adapts to the quality of the line. Depending on line quality, downstream rates (from the network to the subscriber) are typically between 1 and 6 Mbps. Upstream rates (from the end user to the network) are typically between 100 kbps and 640 kbps. Data transmission is via Asynchronous Transfer Mode (ATM).

At the subscriber's site, a splitter/combiner isolates the existing Plain Old Telephone Service (POTS) signals from the high frequency data signals on the line. An ADSL Transceiver Unit - Remote (ATU-R), which connects to a Personal Computer (PC), performs the modulation/demodulation, the ATM formatting, and the signal conversion needed to send the data signal across the line at frequencies above the voice signal.

ADSL Network Services on the 5ESS® switch includes two features:

- ☐ The ADSL On The AIU (DMT) feature (99-5E-3847) provides the 5ESS® switch support for ADSL Application Packs (APs) on the Access Interface Unit (AIU).
- ☐ The Broadband Backplane For *AnyMedia*® AIU feature (99-5E-4473) allows ADSL APs in the AIU to exchange information with the ATM Feeder Multiplexer (AFM) over an ATM link.

99-5E-3850.V DISTINCTIVE REMOTE MODULE

This feature provides the customer additional capability, that of operating an SM that is remoted without expensive umbilicals at distances of up to 2000 miles. The Distinctive Remote Module (DRM) coexists with other 5ESS® Switch remoted switch modules (those remoted using the TRCU2 or TRCU3, RSMs or ORMs). The functions and capacity of the existing 5ESS® Switch are not impacted or modified by the introduction of this feature.

At the DRM module itself, all line-to-line calls are intra-switch, in the conventional sense. All outgoing calls from DRM to other network elements, including the host, must be carried on inter-switch trunks.

99-5E-3874 NON-PUMP PROTOCOL HANDLER SOFTWARE UPDATE

This feature improves the method used to update the software of the Protocol Handler for Voice (PHV) and the Protocol Handler for ATM (PHA). This new update technique eliminates the need for a "hot spare" of these packs for software update purposes.

This feature updates the PHA and PHV protocol handlers during the Software Update APPLY stage. The PHA and PHV protocol handler images are updated in all PHAs or PHVs simultaneously during the APPLY, realizing significant efficiency over the current method. The Software Update SOAK stage UPD:PMPPERF command is no longer needed to remove and restore these units, and the requirement for equipped hot spare units is eliminated.

99-5E-3886 SELECTIVE NPA DELETION FOR ASP MULTIPLE RATE CENTER SUPPORT

This feature changes the way in which the decision is made as to whether an NPA should be deleted from a post-query number for ASP calls. Prior to the introduction of this feature, a global office parameter, Inhibit NPA Deletion, controls that decision for both SSP-800 and ASP calls. This feature would cause a different treatment only for ASP calls by adding the possibility of two passes through digit analysis, with each of 7 or 10 digits, to try to get successful digit analysis when the needed number of digits is not known.

99-5E-3887 BELLCORE CAUSE CODES AND LOCATION VALUES

This feature provides Bellcore-defined information values in standard Q.931 messages on the PRI and BRI, under selected circumstances. The information values, called cause codes and location values, indicate the reason for selected actions by the switch, and the location at which that action or reason was initiated.

99-5E-3900 DELETE WARNING DISPLAY FOR ESSENTIAL SERVICES

This feature is used to send an error message whenever Recent Change (RC) is invoked to delete a line or trunk that is provisioned as an Essential Services line or trunk. The telco must first change the line or trunk from being Essential Services before deletion occurs.

This feature would require RC mapping code that would check the status of the EL field on Views 1.6 (for analog lines) and 23.2 (for DSLs), or the CAMA PSAP field on View 5.1 (for trunks), before RC allows the deletion to occur or be blocked. If the deletion is blocked, then an error message is sent indicating which field the crosscheck failed.

This feature is capable of displaying a unique "delete warning" on specific lines and trunks as designated by the local telco administration.

99-5E-3900.A INHIBIT DELETE DISPLAY FOR SELECTED LINES AND TRUNKS

This feature provides protection against the accidental and/or erroneous removal of lines, trunks, or DSLs that the operating company desires to protect, such as subscribers whose business depends solely on telecommunication services. Inhibit Delete Display for Selected Lines and Trunks extends the protection provided by feature 99-53-3900, Essential Lines Service and E911, to other non-critical lines and trunks so that key business customers will not be adversely affected by loss of service. The end user must make updates in Recent Change BEFORE a customer designated critical line, trunk, or DSL can be deleted. The Inhibit Delete feature is provided on a per trunk member basis.

99-5E-3928 SECONDARY NETWORK DIALTONE

This feature provides a dialtone similar to the land line dialtone to mobiles using CDMA handsets. This enhances custom calling features including; Call Waiting, Cancel Call Waiting, Call Forwarding, Caller ID, Three-Way Calling, and other custom features where land line customers receive a second dial tone during the activation process.

Activation of this feature is dependent on the activation of the AMPS and CDMA features.

99-5E-3928.A SECONDARY NETWORK DIAL TONE □ PHASE 2

This feature provides a landline-like second dial tone to mobile users of Code Division Multiplex Access (CDMA) handsets. Phase 2 supports the following customer features:

- ☐ Cancel Call Waiting
- ☐ Calling Number Identification
- ☐ Limited Call Transfer
- ☐ Three-Way Calling

This capability is for custom calling and other customer features where network customers receive a second dial tone during the activation process. Activation of this feature is dependent on the activation of the Advanced Mobile Phone Service (AMPS) and CDMA features (Special Feature IDs 130 and 221) and is transparent to the wireless subscriber.

99-5E-3939 5ESS[®] SWITCH LONG DISTANCE PLATFORM VERSION 4 MULTIPLE ANI

This feature provides the ability to handle customers connecting to up to 8 different Inter-LATA carriers (having specialized routing) through a long distance platform switch.

It enhances both the 99-5E-3127 5ESS[®] Switch Long Distance Platform Basic Call Processing feature and the 99-5E-3032 5ESS[®] Switch Long Distance Platform ANI Table Processing feature.

99-5E-3945 GETS High Probability of Completion (HPC)

This feature provides the functionality required for implementing the Government Emergency Telephone System (GETS) High Probability of Completion (HPC) service for government agents during national emergencies.

The operational user is expected to be a government authorized GETS user placing a call during a period of local, regional, or national emergency. With working knowledge of how to place a GETS call, the user dials the GETS access number. The user will be aware of what actions to expect, such as long delays and multiple announcements/tones due to queuing, and the need to authenticate and provide the true destination address.

Typical processing for an HPC call, after origination in a local exchange carrier (LEC) end office, is for the call to be routed to one of three IECs (AT&T, MCI, or Sprint). Within the IXC network, the caller is prompted for an authorization code and destination address. Once the caller is authenticated, the IXC routes the call to the LEC serving the true destination, and that LEC completes the call. At this time, all HPC calls complete through an IXC, even when the call completes to a destination within the originating LATA.

The High Probability of Call Completion feature provides the following capabilities:

(1) Detection of HPC calls

- ☐ Allows for the definition of digit strings in switch translations as HPC numbers.
- ☐ Allows for detection of calls to these HPC numbers when placed from analog and ISDN lines, private facility trunks, ISDN PRIs, and when received over incoming public trunks using intra-LATA signaling.

(2) ISUP trunk signaling and measurements

- ☐ Allows the switch to recognize an HPC call when the incoming Initial Address Message (IAM) Calling Party's Category (CPC) value is set to the NS/EP value.
- ☐ Allows the switch to set the IAM CPC to the NS/EP value for outgoing calls.
- ☐ Provides a new office option to control the IAM priority value for outgoing IAMs.
- ☐ Provides a set of HPC specific traffic measurements.

(3) Exemption from network traffic management controls

- ☐ Allows calls identified as HPC to be exempt from certain traffic management controls which

otherwise apply to "normal" POTS calls. This allows HPC calls to continue routing attempts instead of being redirected or blocked.

(4) HPC trunk queuing

- ☐ Allows for HPC trunks queues to be assigned to public network trunks.
- ☐ Allows only calls identified as HPC to queue for an idle trunk (non-HPC calls are not allowed to queue).

99-5E-3954 ABILITY TO STOP RST:TRK, TKGMN

This feature provides the ability to stop the RST:TRK task. The task (process) associated with the trunk(s) indicated in the original command determines if the command can be halted with any data updates corrected so as to revert the trunk(s) to the pre-restored state.

In most cases, this is expected to involve only restoration of the previous trunk port states. There will be some instances where the process executing the RST command will be unable to reconstruct the original state of the indicated trunks.

99-5E-3968 ROUTE INTERNATIONAL CALLS BY COUNTRY CODE

This feature provides the ability to use the Routing Call and populate the carrier codes as part of the outgoing message to the next switch. Routing will then be based on the Carrier Code.

99-5E-3970 CARRIER ROUTING/CALL PROCESSING BY FACILITY PRESENCE

This feature allows long distance facilities owners, who enter into wholesale arrangements with other long distance service providers, to determine which calls are to be carried on-net (facility owner's network) or off-net (inter-exchange carrier network). The 5ESS[®] Switch routes calls on-net in instances where wholesale agreement exists, and routes calls off-net in instances where there is no agreement.

99-5E-3974 TWO SIMULTANEOUS VOICE CALLS ON BRI

This feature permits a single National or Custom ISDN terminal, identified at the switch by a Terminal Endpoint Identifier (TEI), to have two simultaneous Circuit Switched Voice (CSV) calls active at the same time. A CSV call is any call signaled with a bearer capability of either "speech" or "3.1 kHz audio". A basic assumption for this feature is that there is a single intelligence, either human or machine, that is controlling both B-channels. Thus, the feature is not a replacement for a multipoint configuration, but adds to the capability of a single-point BRI.

Examples of the applicability of this feature are:

- ☐ A single user could have a voice ("speech") call in progress and at the same time place a 3.1 kHz audio, that is, modem or Group III Fax) call.
- ☐ A single terminal device could support two active voice calls, such as two analog phones attached to an ISDN terminal adapter.
- ☐ A single BRI could be used to provide two independent B- channels to a Key System controller, using the same DN and the same services for whatever user devices were attached to the controller.

99-5E-3987 PERSISTENT TRANSACTIONS ENHANCEMENT

This feature allows an additional, restricted transactions to be open during an existing and open persistent

transactions within the same call portion of the switch. This feature provides additional flexibility for the ASP Originating Busy/No Answer Subsequent Event Detection feature and additional triggering capabilities for the ASP Originating Busy/No Answer Triggers with Extended Ringing feature. It provides additional capabilities for triggers encountered and honored during a pending event or trigger.

99-5E-3993 5ESS® SWITCH LDP ANI TABLE SCREENING INDEX

This feature allows the service provider to specify a screening index value in the automatic number identification (ANI) table.

The feature also adds a screening index value to the LDP carrier table.

10.2.38 5ESS® SWITCH FEATURES 99-5E-4001- 99-TP-1621

99-5E-4001 TELEPHONE STATUS MONITOR AND SELECT (TSMS)

This secured feature allows a user with an Integrated Services Digital Network (ISDN) telephone (secretary) to monitor the status of other ISDN and analog telephones (managers) using a single feature button for each telephone being monitored. Multiple telephones may be monitored by a single telephone, but each requires a separate Telephone Status Monitor and Select (TSMS) indicator on the monitoring telephone. The purpose of this feature is to monitor telephone status instead of individual call appearances.

Regardless of the number of ISDN call appearances or directory numbers assigned to a monitored telephone, a single TSMS indicator on the monitoring telephone responds to the status indications from any call appearance on the monitored telephone in accordance with the following table:

Status Indicator Functions	
Status (Monitored telephone)	Indicator (Monitoring telephone)
Idle	Off
Ringing	Flashing
Busy or Held	Steady
Ringing with Busy and/or Held	Wink

This feature allows a secretary or administrative assistant to know the status of the monitored telephone and to answer any incoming calls regardless of the status of the monitored telephone. An alert ring may be optionally provisioned to provide an audible indication of incoming calls. Using the transfer feature in conjunction with the speed dial capability of the TSMS feature button, the monitoring party may transfer calls, pick up calls, or dial the monitored party.

99-5E-4018 HANDLE DATE AND TIME TRANSITION TO YEAR 2000

This feature allows the 5ESS® to process date and time related functions correctly for the year 2000 and beyond. A 100-year window is created that allows the user to continue to use the standard 2-digit year format. This 100-year window has a range from 1970 to 2069. Therefore, the year 00 is interpreted as 2000.

99-5E-4029 CALL FORWARDING ON TRUNKS

The Call Forwarding On Trunks feature provides the capability to forward calls if all trunks in the trunk group are busy or out of service, instead of giving the caller a busy signal. Using the Next Route Index, the service provider can reroute the call to an alternate trunk group or to another Directory Number (DN).

99-5E-4035 SUBSCRIBED ORIGINATING BUSY/NO ANSWER TRIGGERS

This feature allows service providers to provision the Originating Busy/No Answer Office Triggers on a per line basis. With this feature service providers are able to create services that require the detection of a busy or no answer condition. This capability is available on an office-wide basis with the Originating Busy/No Answer Office Triggers. The Subscribed ASP Originating Busy/No Answer Triggers feature allows service providers to specifically provision the triggers against the subscriber's line and allows the service providers

to limit the service to only those callers that have subscribed to the service.

This feature builds on the advanced services platform (ASP) Originating Busy and No/Answer Office Triggers with Extended Ringing feature, and thus requires that feature to be purchased.

99-5E-4036 NUMBER PORTABILITY - 5 MINUTE PEG COUNTS

This feature -Number Portability - 5 Minute Peg Counts - enhances the Number Portability - Basic LRN feature (99-CP-3169.A) by providing measurements on a five-minute basis. The following 5 minute peg counts are provided for surveillance purposes:

- ☐ Count of the number of local number portability (LNP) queries launched;
- ☐ Count of the number of LNP query responses containing a local reference number (LRN);
- ☐ Count of the number of LNP query failures;
- ☐ Count of the number of ISUP REL messages with a cause of "mis-routed call to a ported number (ANSI[®] 26);"
- ☐ Count of all calls encountering an unallocated number on this switch after LNP processing was performed;
- ☐ Count of all calls encountering an unallocated number when the switch's own LRN has been detected after LNP processing;
- ☐ Count of the number of non-queried NP calls;
- ☐ Count of the number of NP calls entering on a CCS7 trunk and exiting on a CCS7 trunk (CCS7 tandem);
- ☐ Count of the number of NP calls blocked because of a manual call gap;
- ☐ Count of the number of NP calls blocked because of a SCP overload automatic call gap (ACG); and
- ☐ Count of the number of NP calls blocked because of a service management system (SMS) initiated ACG control.

99-5E-4046 MODIFIED REDIRECTING NUMBER ORIGINATION TO PRI

This feature is a modification to feature 99-5E-3045 Redirecting Number (RN) on PRI. This feature makes it easier to bill the entity that forwarded a number to the intelligent peripheral. The feature offers two options:

- ☐ Provide the ability to use the Redirecting Number as the Billing Number. The Last Redirecting Number or the Original Called Number can be used.
- ☐ Provide the ability to use the Redirecting Number in the originating setup message as the Redirecting Number for calls terminating on the same switch or other switches connected via SS7 as specified by Bellcore.

99-5E-4050 IDCU RECOVERY ENHANCEMENTS

This feature shortens the time interval for recovery from a duplex failure of the Integrated Digital Carrier Unit (IDCU). When ports that terminate to a TR008 Remote Digital Terminal (RDT) are taken out of service due to a maintenance action involving TR008 shelves/banks, IDCU Facilities (IFACs) or IDCU service groups, a fast removal procedure is employed on the ports involved. This procedure enables them to be brought back in service faster when the shelves/banks, IFACs or IDCU service groups become

available. This fast removal procedure is denoted by a port status of "IS ISOL" (in service but isolated) shown in the OP STATUS output message for that port. The result of employing this fast removal procedure is much faster restoral of service to the ports involved for TR008 Mode I and Mode II RDTs. The exact speedup depends upon the configuration of the RDTs and type of ports involved.

99-5E-4076 CDMA DATA SERVICES □ PACKET MODE

CDMA packet-mode data service provides a subscriber having the appropriate mobile station configuration the ability to transmit bursts of data over a packet network via the CDMA air interface. It provides the infrastructure for mobile users with lap-top computers or other data devices to access various data applications, such as E-mail, field service automation, file transfer, and fleet dispath. These applications may reside on existing or customer designed data networks. The CDMA packet-mode data services are bi-directional and apply to both cellular and PCS systems.

The initial release of CDMA packet-mode data services supports Service Option 7 and 4103 which uses Rate Set 1 (9.6Kbps) and Service Option 15 which uses Rate Set 2 (14.4KBPS).

99-5E-4085 VCDX ADDITIONAL SERIAL PORTS

This feature provides additional ports for Recent Change and Verify (RCV) and Supplemental Trunk Line Workstation (STLWS) terminals for the increased OA&M activity on the 5ESS[®] switch VCDX. The number of serial ports available is increased from 6 to 14, which allows for more technician's input. This increase also lets the service provider assign services more quickly.

99-5E-4088 CDMA 6-WAY SOFT HANDOFF

This feature expands the number of allowed code division multiple access (CDMA) soft handoff call paths available to a call from the current three paths to a maximum of six active call paths. The CDMA Six-Way Soft Handoff feature provides improved call quality in certain situations where CDMA mobiles are moving through difficult coverage areas that require frequent add and drop of CDMA sectors serving a particular CDMA subscriber.

99-5E-4093 IMPROVE RC VERIFY

This feature provides additional functionality to the existing RC/V Text interface. The feature allows the user of the RC/V Text interface to perform a projection operation on a given Recent Change view. The output of this projection is provided in name-value format to the user. For example, the user is now able to verify a specific item of information, such as LLC, CLASS features, BRCS features on a line (the value for a specific field on an RC view).

This feature is intended to provide very small, initial feature that begins to allow expedient and flexible access to 5ESS[®] Switch switching data. This feature does not change the existing functionality of the RC/V Text interface and therefore will not impact current OS operations. It only provides additional functionality to the RC/V Text interface.

99-5E-4095 RECENT CHANGE FRONT END TO THE ASM

This feature provides administrative module (AM) real-time relief and Recent Change (RC) throughput increase by providing three popular RC applications on the administrative services module (ASM). These applications are:

- ☐ RC text interface (APPTXT)
- ☐ RC menu interface (APPRC)
- ☐ RCOS interface (RCmacntl)

A portion of the RC processing for each of these three applications is done on the ASM. This provides increased RC throughput and response time for users of these interfaces on the ASM. To benefit from these improvements, RC users must use these applications on the ASM. The present versions of these applications are still available on the AM, however they will not take advantage of the improvements offered by the ASM version of these applications.

99-5E-4108 SOFTWARE TRANSITIONS + AFT STANDING FEATURE FOR 5E13

The Apptext Forward Translator (AFT) feature provides a recent change/verify text interface software translation mechanism that allows the service provider to retrofit the 5ESS[®] switch to the new software release while the supporting recent change (RC) operating system (OS) remains on the previous software release. For example, a 5ESS[®] switch may retrofit from 5E12 to 5E13, while the supporting OS remains on the software supporting the 5E12 release.

The Apptext translation mechanism of the DC/AFT feature is based on the RC evolution process used during 5ESS[®] switch retrofits. The DC/AFT feature converts RC/V text interface commands generated in the format of an earlier 5ESS[®] switch software release into the format of a later software release. The translator is intended for use on a temporary basis after a retrofit and prior to updating the applicable OS software. Most RC/V views supported by remote memory administration system (RMAS) and non-Lucent Technologies RC OSs are supported by AFT. Lucent Technologies expects the service provider to minimize the time between a retrofit and OS software update to the greatest degree practical.

The software release retrofit feature provides the retrofit software, tools, and procedural documentation for the following types of software transitions in operational 5ESS[®] switch offices:

- ☐ 5E12 to 5E13 software release retrofit
- ☐ 5E13 software release update
- ☐ 5E13 large terminal growth (LTG)
- ☐ 5E12 to 5E13 VCDX software release retrofit
- ☐ 5E13 VCDX software release update

The 5E12 to 5E13 software release retrofit and 5E12 to 5E13 VCDX software release retrofit provides the ability to replace the resident 5E12 software release text, equipment configuration database (ECD), and office dependent data (ODD) in an operational office with 5E13 software release text, ECD and ODD.

The 5E13 software release update and 5E13 VCDX software release update provides the ability to replace the resident 5E13 software release text in an operational office with the "new" 5E13 software release text that the office will transition to. ODD changes are not allowed during this transition; the application of load-specific ECD keystroke files is allowed.

The large terminal growth procedure (LTG) provides the ability to add large quantities of lines and trunks to an operational 5ESS[®] switch. LTG allows the bulk loading of new, non-operational, pre-cut office data. It can use either manually input data or existing switch owner database information to generate office data that is merged, using office data administration (ODA) processing, with the existing 5ESS[®] switch ODD. No text and ECD changes are allowed during an LTG.

All software release transition performs with the following objectives:

- ☐ Minimize the time interval when call processing functionalities are suspended
- ☐ Maintain adequate reliability by minimizing the probability of a system outage during the retrofit interval.

The 5E13 software release retrofit capability provides the tools and procedural documentation for backing out from any stage up to committing the MHDS of a software release transition. In the case of retrofit, this will backout to the previous software release. In the case of software release update, this will backout to the previous software release load. For LTG, this will backout to the ODD which was in place at the beginning of the LTG process.

The 5E13 database retrofit capability provides the necessary functions to transition the 5ESS® switch database transparently across a software release retrofit from 5E12 to 5E13. This applies to both the traditional and VCDX versions of the switch. For a 5E13 LTG, this capability provides the necessary functions to transition the 5ESS® switch database transparently while remaining on that software release.

99-5E-4119 TRUNK TRIGGER FOR TOLL MF

This feature allows the Trunk Trigger for Toll to be placed on multi-frequency (MF) trunks.

99-5E-4132 ASP TERMINATING BUSY/NO ANSWER TRIGGERS AND SUBSEQUENT EVENT DETECTION

Functionality for this feature is controlled by two feature locks: Secured Feature IDs 507 □ ASP Terminating Busy/NoAnswer Triggers and Subsequent Event Detection and 508 □ ASP Display on Basic Rate Interface.

SFID 507 enhances the 5ESS® Switch with following functionality:

- **Terminating Busy and No Answer Subscribed Triggers** Provides the ability to assign the following subscribed triggers to terminating DN's and to have a call encounter them upon termination when the appropriate condition is detected:

T_Busy (TDP)

T_No_Answer (TDP)

- **Terminating Subsequent Event Detection Next Event Lists (NELs)** Provides the ability for the SCP to return a NEL and to indicate the following events when sending an Authorize_Termination or Offer_Call message to complete the call to the terminating DN:

Term_Resource_Available [an Event Detection Point Notification (EDP-N)]

T_Busy [an Event Detection Point Request (EDP-R)]

T_Answer (an EDP-N)

T_No_Answer (an EDP-R)

NOTE: The T_Busy EDP-R is only allowed in a Request component which accompanies an Auth_Term message, not when accompanying an Offer_Call message.

- **Offer_Call functionality** The Offer_Call message allows the call to be delivered to the busy line following the T_Busy EDP or TDP. Offer_Call is used whenever the T_Busy EDP or TDP is encountered and the line has some form of call waiting feature assigned.

For analog lines with call waiting assigned, the Offer_Call response allows the call to proceed and encounter switch-based call waiting.

For ISDN lines, the line would need to have the Additional Call Offering feature assigned for the Offer_Call response to alert the ISDN line.

Offer_Call also provides interworking with Caller ID on Call Waiting.

The Offer_Call message also supports the display text parameter allowing the displaying of display text on analog CPE's.

SFID 508 enhances the 5ESS[®] Switch with following functionality:

- ☐ Supports DisplayText parameter in the Authorize_Termination message for Custom and National ISDN Basic Rate Interface (BRI) CPE's.
- ☐ Supports DisplayText parameter in the Offer_Call message for Custom and National ISDN Basic Rate Interface (BRI) CPE's.

NOTE: SFID 507 is required to support the Offer_Call message.

Both of the new locks associated with this feature require that AIN 0.1B (SFID 126) be already unlocked; the two new locks may be unlocked independently of each other.

99-5E-4141 SMP23CDM PROCESSOR MEMORY EXPANSION

This feature converts the SMP23CDM processor to allow an extension of its maximum memory equipage from 32MB to 52MB. The feature will expand the processor's capability through the addition of 4MB Memory Boards (TN2012) that are plugged into the on-board processor memory upgrade slots. Changes to the processor's hardware and the SM software will be used to access the additional memory. The memory conversion presently applies only to the SMP23CDM.

99-5E-4148 ENHANCED ECD AUDIT

The Enhanced ECD Audit feature is an enhancement to the existing On-switch ECD Verification (97-5E-2306) feature. The existing On-switch ECD Verification feature allows successful evolution and retrofit of the equipment configuration database (ECD). The Enhanced ECD Audit provides a CNI audit to check for invalid CNI configurations. There are no changes in how the ECD Audit is invoked.

99-5E-4149 VFY:OFC FOR BRI DATA CALLS

This feature allows a technician to check the routing of an ISDN circuit-switched data or packet-switched data call from the central office without the need to send a technician to the subscriber site. This saves the cost of the subscriber visit, and allows quicker resolution of the problem. The existing VFY:OFC capability already in the switch is enhanced by allowing verification of routing for only basic circuit-switched data and packet-switched data calls. No features are being supported [e.g., Closed User Groups, Automatic Route Selection (ARS), Auto ARS, Individualized Dialing Plan (IDP), Intercom, etc.].

VFY:OFC for BRI Data Calls allows a technician to verify the routing translations for ISDN circuit-switched data calls and packet calls. At the maintenance control center (MCC) terminal, the technician types an input message that identifies the origin of a call (either a directory number, trunk group and member, or multiline hunt group and member) and the intended destination of the call (another directory number). The switch produces output on the same terminal that tells the technician what routing data was found for the emulated call from the originating party to the terminating party, with respect to the switch.

This feature relies on existing maintenance terminals, and does not require any additional hardware beyond what is normally present in the central office.

99-5E-4151 DNU-S SUPPORT FOR BYTE-SYNCHRONOUS DS1 MAPPING TO VT1.5

This feature enables the DNU-S to support EC-1 facility interfaces that have been provisioned to support a byte synchronous mapping of VT1.5 payloads.

The DNU-S hardware was originally developed (5E10) to support VT1.5 byte-synchronous payloads. However, software support (provisioning and monitoring) was not provided in 5E10. The SONET VT Path Overhead Byte (V5) contains the VT Signal Label. Previously, asynchronous DS1 mapping (0x010) was supported by the DNU-S. Byte synchronous mapping requires support for the 0X100 signal label value by the DNU-S.

99-5E-4155 DS1 LOOPBACK FOR TR303

This feature provides the ability to support DS1 Far End Loop Process (FELP) capability on the TR303 interface to the DNU-S. This feature performs in the same way that the DS1 FELP operates on the Integrated Digital Carrier Unit (IDCU) TR303 interface.

99-5E-4184 INTERNALLY BRIDGED DUAL SERVICE - PACKAGE 3

This feature provides the ability to assign additional features on lines which are provisioned with line time slot bridging (LTSB). These additional features include:

- ☐ Account Codes
- ☐ Authorization Codes
- ☐ Automatic Route Selection (ARS)
- ☐ Call Waiting Deluxe (CWD)
- ☐ Direct Connect
- ☐ Access to Trunk Queuing
- ☐ Time of Day (TOD)
- ☐ Advanced Services Interface (ASI) Proxy
- ☐ Bulk Calling Line ID (BCLID)

99-5E-4187 ROUTE LIST FOR LONG DISTANCE

This feature provides an increase in the route index list up to 16 route indexes (RTIs), and expands the number of RTIs up to 16,382 per switch. In addition, the route index list (RC View 10.40) gives the network administrators increased flexibility in the sequence in which trunk groups are searched. It allows up to 16 route choices for a single call, or 48 routes when used with the Advanced Services Platform. This feature can also be used in conjunction with the Time Dependent Routing feature.

99-5E-4187.A ROUTING ENHANCEMENT: FINAL ROUTE TRIGGER

The Final Route Trigger capability adds the option to query an AIN Service Control Point (SCP) when a route index chain or list is exhausted. The service provider can then control subsequent treatment of the call through logic at the SCP. The SCP then returns a new routing number, private route, etc., or simply direct the switch to tear down the call.

A new AIN trigger called "Final Route Trigger" (FR Trigger) has been created to accomplish this. The FR Trigger is associated with the route (RTI) using Recent Change/Verify. The FR Trigger will create a "networkBusy" TCAP message to query the SCP when the very last route index that can be attempted is unavailable.

99-5E-4191 PORT BY PORT CONTROL OF METALLIC ACCESS PACK DIAGNOSTICS

This feature provides port by port diagnostics and control of the circuitry on the metallic access (MA) packs.

Each port serves a metallic test bus (MTB). Diagnostic routines are partitioned to associate faults with the specific ports that are affected by the faults. When faults are found, the entire MA pack is designated faulty, but only those ports which are affected by the faults are made unavailable for use by the metallic access network. Ports that are functional continue to be used. This strategy is followed for diagnostics triggered by routine testing (REX) and for diagnostics triggered by manual requests using input commands. An MCC display page shows the individual status of the ports on the MA pack and shows information about the MTB connections associated with each port.

99-5E-4208 DIALED NUMBER IDENTIFICATION SERVICE (DNIS)

This feature provides the capability to deliver the dialed number to a PBX that uses the "*" symbol as a delimiter. For 5E12, this feature will only provide the translated called party number (DN) from the terminating switch to the PBX. This feature provides the ability to construct and deliver a sequence of digits to a special PBX from the 5ESS[®] switch. The sequence of digits includes the following:

- ☐ *ANI*DN* - where ANI plus called number are present
- ☐ **DN* - when ANI is not available
- ☐ *ANI** - when called number is not available
- ☐ *** - when neither ANI or called number is available.

99-5E-4208.A TRANSPORT OF ORIGINAL DIALED NUMBER

The new functionality that 99-5E-4208.A adds to 4208 is the ability to store the original dialed digits at the originating switch and transport this information in the CCS7 Generic Address Parameter (GAP) with Type of Address = "00000000" to the terminating switch. The GAP with Type of Address = "00000000" will contain a maximum of 10 dialed digits. The original dialed digits will be stored in the GAP for NS800 trigger and AIN Toll-Free calls.

99-5E-4209 RSM on DNU-S

This feature provides the capability to assign a Remote Switching Module (RSM) to DS1 facilities terminating on a DNU-S.

This feature enables the host ends of the RSM interface to be terminated on the DNU-S while the remote ends of the interface are still terminated on the Digital Line and Trunk Unit 2 (DLTU2). This feature only applies to DNU-Ss that use the STS facility interface (SFI).

99-5E-4217 DUAL ESA FOR E911 ON VCDX

This feature adds the Dual Enhanced 911 Service Adjunct (ESA) capability for E911 on the Very Compact Digital Exchange (VCDX) platform, permitting a single 5ESS[®] switch to interface to two ESAs for selective routing service. This feature improves the reliability of E911 service by allowing the use of a second pair of E911 Applications Processor Interfaces (AP) to link to a backup or secondary ESA. If communication with the primary ESA fails, the 5ESS[®] VCDX switch will attempt to communicate with the secondary ESA via the second AP link pair. This prevents a failure with a single ESA (or its AP link pair) from interrupting E911 selective routing.

99-5E-4219 ANI-NPA NXX EXPANSION

This feature increases the size of the NPA-NXX table from 14,000 to 64,000. The table is stored on all SMS and is used to point to the SM containing the ANI table to be used for a given NPA-NXX number.

The ten digit ANI tables can be divided among different SMS.

99-5E-4221 3/6 DIGIT ANI MATCHING

This feature allows partial matching of an automatic number identification (ANI) number to an entry in the ANI table. A search is done that attempts to match all 10 digits and the LDP CARRIER field. If this combination is not found, the following sequence of searches is initiated to determine the ANI number.

- ☐ A search is performed on the first 6 digits of the NPA-NXX fields, with the line set to "ANY", and matching the call's LDP CARRIER.
- ☐ A search is performed on the first 6 digits of the NPA-NXX fields, with the line set to "ANY", and the LDP CARRIER set to "10004".
- ☐ A search is performed on the first 3 digits of the NPA fields, with the NXX fields set to "000", the line set to "0", and matching the call's LDP CARRIER.
- ☐ A search is performed on the first three digits of the NPA fields, with the NXX fields set to "000", the line set to "000", and the LDP CARRIER set to "10004".

99-5E-4237 ADMINISTRATIVE SERVICES MODULE (ASM) BASE

This feature provides the basic administrative services module (ASM) platform. The ASM is a commercial hardware platform attached to the AM through a high-speed interface [Dual Serial Channel Computer Interconnect (DCI)]. The ASM Base supports multiple applications that provide operations, administration, and maintenance (OA&M) enhancements in the 5ESS[®] switch environment. It supports a wide variety of commercially available software and hardware for network access (for example, UUCP, and FTP with TCP/IP). In order for the ASM applications to function, the ASM Base feature is required.

99-5E-4238 MTP RESTART & PROCESSOR OUTAGE PROCEDURE

This feature provides the following functionality: Message Transfer Part (MTP) Node Restart procedure, Short Term Processor Outage procedure, MTP User Part Unavailable (UPU) procedure, and SCCP (Signaling Connection Control Part) Remote Subsystem Status Number (SSN) procedure.

The MTP Node Restart procedure provides protection for the node, whose MTP is restarting, and the network by giving the restarting node time to activate sufficient signaling links and to exchange enough routing data with the network before user traffic is restarted to avoid message loss and mis-sequencing. Two Signaling Network Management messages, TRW (Traffic Restart Waiting) and TRA (Traffic Restart Allowed), are used in conjunction with MTP Level 3 timers T25, T28, and T29 and other Network Management messages to control the procedure. The 5ESS[®] Switch for the North American Region (NAR) supports only the Adjacent MTP Node Restart ANS[®] procedure at this time. Controls are provided to allow or disable the feature. This is a Secured Feature.

The Short Term Processor Outage procedure reduces the amount of time required to recover from a processor outage state. When a processor outage occurs, the MTP Level 3 timer T1 (500-1200 ms) is used to determine the severity of the outage. If the outage clears prior to T1 expiration, the outage is considered to be sufficiently short enough that service may be immediately resumed, no changeover occurs, and any in-progress changeovers are aborted. Also no MTP Node Restart procedure is initiated. Messages in the transmit and re-transmit buffers are preserved and transmitted when the outage clears. However, if timer T1 does expire, new traffic should be delivered to an alternate route. When the outage does clear, any buffered messages associated with the failed link are considered to be too old to be useful and must be discarded. Controls are provided to allow or disable the feature, which is defaulted as "allowed".

The MTP User Part Unavailable procedure provides for when the MTP is unable to distribute a received message to a local user because that user is unavailable, (for example: no ISUP trunks defined, SCCP is currently unavailable). The MTP sends a User Part Unavailable (UPU) message to the MTP at the originating signaling point. The detailed information whether the User is unequipped or unavailable for management reasons is contained in the UPU message. No controls are provided to allow or disable the

feature.

The SCCP Remote SSN Status procedure is dependent on the MTP User Part Unavailable procedure. This procedure provides for management of remote SCCP statuses (the status of the SCCP "process" at a remote signaling point). When a message is sent to a signaling point whose SCCP is unavailable, the MTP at that signaling point will return a UPU message. When that message is received by the local MTP, it will provide a MTP-STATUS indication to the local SCCP with an indication of the unavailable user (the remote SCCP). When a MTP-STATUS is received indicating the remote SCCP is unavailable, all subsystems at that signaling point must be marked as prohibited (as is done when the signaling point itself becomes unavailable). In addition, the status of the remote SCCP is also marked as prohibited. A Subsystem Status Test (SST) must then be initiated for the concerned SSN=1 (Sub System Number), and all SSTs for other prohibited subsystems at that signaling point must be stopped. If the remote SCCP is still unavailable, a UPU will be returned. If a SST for SSN=1 is received, then a SSA (Sub System Allowed) for SSN=1 is returned and existing procedures for the handling of subsystems after a signaling point recovery should be followed. If a SSA(SSN=1) is received, then the remote SCCP is marked as allowed and all subsystems at that signaling point are also marked as allowed. Controls are provided to allow or disable the feature.

99-5E-4244 SIMPLIFIED CUSTOM ISDN ATTENDANT

This feature provides the ability to support ISDN Attendant (ISAT) features on a Type D terminal; for example, a Lucent 8500 series terminal.

The list of existing attendant features supported by Simplified ISAT are the following:

- ☐ Provisioning of Type D Terminals as an ISDN Attendant
- ☐ Basic Custom ISDN-Compatible Terminal Initialization
- ☐ Terminal Initialization in an On-Hook State
- ☐ Automatic Call Appearance Selection
- ☐ Attendant Busy Verification of DNS
- ☐ Attendant Busy Verification of Trunks
- ☐ Attendant Call Forwarding
- ☐ Attendant Call through Test
- ☐ Attendant Control of Facilities
- ☐ Attendant Control of Voice Terminals (ACVT)
- ☐ Attendant Direct Trunk Group Selection
- ☐ Attendant Emergency Override
- ☐ Attendant Timed Reminder for Call Hold (with Timed Reminder Ring)
- ☐ Attendant Timed Reminder for Call Transfer (with Timed Reminder Ring)
- ☐ Automatic Camp-On with the Manual Exclude Option
- ☐ Call Hold
- ☐ Dial Through Attendant ("Through Dialing")
- ☐ Display Aggregate Work Time

- ☐ Display Total Calls Handled Information
- ☐ Fixed Night Service
- ☐ Flexible Night Service
- ☐ Inspect
- ☐ ISAT Queuing:
 - ☐ Calls Waiting Lamps (Call Waiting and Warning Lamps)
 - ☐ Calls Waiting Tone
 - ☐ Display Calls in Queue
 - ☐ Emergency Tone
- ☐ Manual Bridging
- ☐ Manual Camp-On
- ☐ Selective Customer Control of Facilities
- ☐ Serial Calling ("Auto Dropback to Attendant")
- ☐ Six-Way Conference Calling
- ☐ Three-Way Conference Calling
- ☐ Trunk Identification
- ☐ Trunk Group Indicators
- ☐ Two-Way Call Splitting

NOTE: All of the features currently supported by the ISAT Attendant console will be supported for simplified ISAT except the following:

- ☐ Direct Station Select/Busy Lamp Field (DSS/BLF)
- ☐ One-Way Call Splitting
- ☐ Centralized Attendant Service/Release Link Trunk (CAS/RLT) Service

99-5E-4245 AUTOMATIC TRUNK TEST SCHEDULER (ATTS)

The automatic trunk test scheduler (ATTS) provides a means of scheduling automatic execution of specific types of operational tests on outgoing trunks and logging the individual test results on the AM disk for retrieval at a later time. Test scheduling is done with Recent Change using normal maintenance channels such as the trunk line and work station (TLWS). Up to 20 independently scheduled tests can run concurrently on specified trunk groups. This feature was developed for a non-*AutoPLEX*® 5ESS® switch.

99-5E-4256 IMMEDIATE START ANNOUNCEMENT INTERFACE FOR *PINNACLE*® ACD

This feature provides an interface that supports an immediate start announcement capability for the existing ACD/BRCS call vectoring feature. The interface is transparent to the existing provisioning for the

call vectoring announce and prompt steps and supports the existing EPIC (Enhanced Prompting for Incoming Digits) Enhancement feature (allowing the collected digits to be displayed on the agents telephone set).

This interface supports connectivity to the 17A Announcement Unit, which supports up to 165 unique announcements. Each unit can handle up to 24 callers listening to announcements at one time. They can all listen to the same announcement, or different announcements, or any combination.

99-5E-4267 TRUNK GROUP HUNT SEQUENCE ENHANCEMENTS

This feature adds two new types of trunk hunting to the 5ESS[®] Switch Long Distance Platform (LDP):

- ☐ Hunt for Least Idle trunk within a trunk group (LIDL)
- ☐ Hunt for the Most Idle trunk within a trunk group (MIDL).

99-5E-4268 LDIT BEST-FIT SEARCH

This feature improves the troubleshooting capability of the long distance platform (LDP) and local service providers by finding the routing information after entering a full or partial string of dialed digits. Previously, locating a specific record required a user to pull up an Local Digit Interpreter Table (LDIT) and enter a complete string of dialed digits that had to match the database exactly. If no match was found, an error message was returned.

This feature provides a search mechanism that allows the technician to specify a "best-fit search" and enter a full or partial string of digits. This enhancement completes a full search for the specified digit string. If a match is not found, it returns a list of up to 10 entries of valid digits to search.

99-5E-4269 FG-D CUT-THROUGH TRIGGER

This feature provides the ability to send a query to the service control point (SCP), which in turn collects information on FG-D cut-through calls to the long distance platform.

99-5E-4275 CALEA CAPABILITY ☐ CORE

This feature provides compliance to the Communications Assistance for Law Enforcement Act (CALEA) of 1994 for 5ESS[®] Switches providing service to wireline subscribers.

The CALEA Act requires that a telecommunications service provider be able to support lawful surveillance of the traffic in its network. CALEA requires that two levels of surveillance be supported:

- ☐ Level I: Provides call progress data for all of the subject's calls and call progress data for all calls redirected by the subject. Call content is not provided. This level is intended to satisfy Pen Register as well as Trap and Trace court orders.
- ☐ Level II: Provides call progress data and all call content. It is equivalent to Level I plus call content. This is intended to satisfy a Title III court order which specifically authorizes the surveillance of call content for the subject's calls and for all calls redirected by the subject.

This functionality is provided for both circuit-switched and packet-switched calls in accordance with standard J-STD-025, produced by the Telecommunications Industry Association (TIA) TR45.2 subcommittee.

99-5E-4284 VERIFY OFFICE CAPABILITY FOR LONG DISTANCE PLATFORM

This feature allows verifying office routing translations used in long distance call processing. The technician types the appropriate input command at the maintenance terminal, and the switch generates an output

message containing the routing information as if this were an actual call being routed through the switch.

If there is an SCP Query that would be generated for this verify request, the trigger number and the trigger type will be printed without executing the actual query.

99-5E-4299 INFORMATION DIGIT SCREENING

This feature adds the ability to process a call based on an incoming trunk group and the two information digits (that is, II digits) in EAMF signaling. It adds a boolean type field (II bit) to the ANI Table, Default ANI Table (RC/V8.51), LDP Carrier Table, and Default LDP Carrier Table (RC/V8.52). If call processing finds a match from one of these tables, and if this field is on in that matched tuple, call processing will look in the II Digit Table to get processing information.

99-5E-4288 OPTICAL EXTENDED CONTROL AND DATA UNIT (OXU)

This feature provides the Optically remotored Extended Control and Data Unit (OXU). It allows the customer to migrate certain SM peripheral units (those supported today by SM-2000 plus, only for US, DCLU and DLTU1) to an SM-2000 in an office, without requiring peripheral location changes, and to remove the peripherals' former MCTUs. The customer can move or re-route the SM PIDBs and PICBs from the MCTU backplane to the OXU, which has optical links back to the SM-2000.

NOTE: This feature does not introduce a conversion procedure. The various steps that need to be followed (moving peripherals from one SM to another, etc.) can be found in other existing procedures. This includes moving line and trunk assignments from the units, degrowth of the equipment, and growth using the PICBs and PIDBs from the OXU. The OXU consists of a duplicated, single-shelf unit that provides PICBs and PIDBs. The OXU data TSI Links (TSILINKs) from the TSI and Control links from the Application Controller for OXU (APCO) are both optical (optical PCTs in the case of the TSILINKs). These optical links enable the SM-2000 to be located up to 2000 cable feet away from the SM peripherals being migrated. The current electrical XCDCL2 and TSI links are limited to 28 cable feet.

99-5E-4300 400 Hz Carrier Tone

This feature provides a steady, 400 Hz signal (known as Carrier Tone) in the voice path for communicating with end customers. This tone lets the Customer Premise Equipment (CPE) know that it has reached an Inter-Exchange Carrier (IEC) and that additional digits will be needed.

The feature provides flexibility to the existing switch functionality by allowing the tones and announcements to be programmed for various long distance call scenarios. The 400 Hz Carrier Tone is primarily for 5ESS[®] Toll Switch (the Long Distance Platform) and will work on all Switch Module hardware platforms.

99-5E-4301 FG-D INBAND MULTISTAGE OVER TWO-WAY TRUNKS

Inter-exchange carriers (IXCs) offer business customers direct dedicated access to network switches. This is provided in three ways:

- (1) using a direct access line (DAL) trunk class
- (2) using FG-D inband multistage outpulsing
- (3) using a primary rate interface (PRI)

This feature allows the 5ESS[®] switch to offer the Feature Group D (FG-D) inband multistage outpulsing.

Dedicated trunks are generally two-way trunks between a private branch exchange (PBX) and a toll switch. In the case of FG-D inband multistage outpulsing, the 5ESS[®] switch only offers this option over one-way trunks. This feature allows the 5ESS[®] switch to offer FG-D inband multistage outpulsing over a two-way

trunk.

99-5E-4306 FASTER PH PUMP DURING RETROFIT

This feature improves protocol handler (PH) pump speeds during switching module (SM) initializations and PH diagnostics and restores. Previously, all PHs were pumped at the same slow speed even though some PH hardware types pump faster than others. This feature removes these delays for those PH types which pump faster.

A group of PH types (PH3, PH4, PH6, PH22) are constrained by the firmware which limits the speed that the PH can process pump frames. This feature makes firmware improvements in RAM software. Thus, this design employs a 'little boot' (Phase 2)/'big boot' (Phase 3) strategy similar to that presently used in the SM.

In addition, this feature expands the use of the error_lead in the PH. For this feature, the error_lead will be used as a positive acknowledgment from the PHs to the SM (that is, handshake) during the PH initialization.

99-5E-4307 DIRECT ACCESS LINKS (DALs)

A Direct Access Link (DAL) trunk group connects a private facility PBX trunk group to a toll switch. This secured feature allows a DAL trunk group to encounter an ASP trigger. When the DAL feature is enabled on the 5ESS[®] switch, every call that originates on a member of the DAL trunk group launches an ASP query.

For further information, consult the *Advanced Services Platform* (235-190-126).

99-5E-4311 MINT EXPANSION PACKAGE A

The MINT Expansion Package will work in conjunction with the initial MINT Processing feature to enhance the 5ESS[®] Long Distance Platform (LDP) Switch's ability to serve as a toll switch in a multi-vendor environment.

The MINT Expansion Package provides a larger range for the T-NSC parameter (0-63) for Beta Trunk Groups.

The MINT Expansion capability extends the functionality developed by the MINT Feature for the LDP Switch. The MINT Expansion capability includes:

- ☐ Backward SS7 Message Enhancements
- ☐ Expanded MINT Signaling Format - BETA
- ☐ DAL Egress Functionality
- ☐ Expanded Reroute on Release Ingress Facilities
- ☐ Modified Cause Value for PRI Private Facility Terminations

99-5E-4340 INCREASE 5ESS[®] SWITCH TRFC30 BUFFER SIZE

This feature increases the traffic measurements buffer for TRFC30 traffic reports from 75,000 bytes to 384 kB and the corresponding protocol requirements associated with the data transferred. In addition, this feature extends space available for newly created sections from 255 to 65,535. It is recommended that the service provider support higher data link speeds to at least 9.6 kbps data in order to transfer the requested data within the required polling window. As the amount of data increases the existing 2400 bps data interface will be insufficient in most cases to handle the throughput. Finally, this feature creates a "platform" for creating sections capable of collecting much more data, but doesn't change the existing TRFC30

section □ the same amount of data will be collected. Only section 222 (DLINE) has been expanded to whole buffer space.

99-5E-4340.A INCREASE TRFC 30 BUFFER SIZE

This feature allows the customer to send up to 384 kB of data from the exchange to the external OS over the BX.25 link. This feature is an extension to feature 99-5E-4340 which has increased the overall traffic measurements buffer size to 384kB.

99-5E-4360 SS7 INTER-MODULE TRUNK ON VCDX

This feature provides the ability to support SS7 Loop-Around Trunks on a single-SM switch. Signaling messages for Intermodule Trunks (IMTs) do not leave the switch but are intercepted and sent back to appropriate destinations in the software for processing as if coming from the external SS7 message network. This feature supports both the end-office and long distance applications on the 5ESS[®] switch VCDX equipped with SM-2000.

99-5E-4373 PRI D-CHANNEL CAPACITY EXPANSION FOR SM-2000

The PRI D-Channel Capacity Expansion for SM-2000 feature expands the capacity of the SM-2000 to terminate Primary Rate Interface D-channels. The previous limit of 127 PRI D-channels was imposed by software. This feature removes the software limit and the total number of D-channels is now constrained only by hardware limits. Hardware limits that can affect the number of PRI D-channels provisioned on a 5ESS[®] SM-2000 are:

- Number of PSU shelves provisioned and number of PIDB timeslots per shelf. PRI D-channels are only supported across PIDB connections to a PSU shelf. Several types of hardware exist that terminate PIDB connections to a PSU shelf. Depending on hardware equipage, the limitation can be from 31 to 127 PIDB timeslots per PSU shelf. If all 5 PSU shelves are provisioned, the theoretical limitation will be from 155 to 635 PRI D-channels per SM-2000.
- Number of PSU shelves and PHs provisioned on a PSU shelf. A PH can terminate a maximum of 32 PRI D-channels. The theoretical limitation on number of PH channels is 2560.
- Number of DS1s terminated on the 5ESS[®] SM-2000. Theoretical limitation on DS1s is 792.

With hardware available in the 5E12 time frame, the maximum theoretical limit for D-channels on a single SM-2000 is 635 based on PDIB timeslot limits. Normal engineering considerations make this theoretical limit unlikely, and a reasonable planning number is approximately 400 D-channels per module.

The feature applies to both Custom ISDN and National ISDN PRIs.

99-5E-4375 AMPS IN BUILDING AMPS/PRI INTERWORKING

This feature provides the ability to connect customer premises equipment (CPE), such as a PBX or other equipment compatible with ISDN PRI/PRA specification, directly to the AutoPLEX[®] Mobile Switching Center (MSC) for both voice and data. The PRI/PRA interface trunks are used for general call processing including routing calls directly from mobile subscribers to CPE and CPE to mobile subscribers without going through the PSTN. In general, the PRI/PRA trunks function the same way as the PSTN trunks function for call routing.

99-5E-4377 GLOBAL RECENT CHANGE INTERACTION WITH LASS AUTOMATIC RECALL

The Global Recent Change Interaction with LASS AR feature is an enhancement to the Global Recent Change feature and includes the ability to find all lines on the switch that have the LASS AR (Automatic Recall). A new parameter is added to list all lines that are (or are not) allowed to use the LASS AR feature.

The Global Recent Change Interaction with LASS AR feature is a secured feature (SFID 305) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-4381 ACCESS CODE OPTION FOR SUSTWC

The switch will provide recall dial tone after the initial flash and provide recall dial tone again after the access code is dialed, if the Access Code Option for SUSTWC is turned on via the 8.31 Feature Option RC View, and an access code is defined on RC View 9.2 as indicated:

- ☐ CALL TYPE
- ☐ FEATURE
- ☐ TYP CI CALL
- ☐ NONCI
- ☐ FEATURE
- ☐ /MWUS3WC
- ☐ ACTION
- ☐ US3WC

After dialing the access code the customer can then dial as they normally would. However, if the switch does not receive an access code after the initial flash, but receives any other digits, then the switch will provide re-order treatment. Upon a subsequent flash, the switch will reconnect the subscriber to the soft-held party. Or upon disconnect, if ring-back is applicable, ring-back the soft-held party to the subscriber. The Access Code Option (678) also has interactions with the existing Billing Option for SUSTWC, feature number 99-5E-3910, Office Optioned Feature System ID 664.

99-5E-4387 RTCD EXPANSION PACKAGE A

This feature extends the capabilities of 5ESS[®] switch feature Real Time Call Detail for Long Distance Platform (99-5E-3784) by providing the following:

- ☐ recording of RTCD records for calls originating on extended digital subscriber loop hotel/motel (EDSLHM) trunks
- ☐ recording of network information (for example, terminating switch) not otherwise available at the recording office
- ☐ permitting the service provider the option of generating additional records to capture information from service control point (SCP) transaction(s)
- ☐ simplifying the correlation of all RTCD records generated for any given call, regardless of what office produced each record or how many records per call are generated at a specific office
- ☐ expanding the set of measurements and I/O messages

99-5E-4400 TANDEM CALL OVER ISUP TRUNK

This feature provides the enhanced SS7 signaling procedures to interconnect incoming ISUP calls to outbound Integrated Services User Part (ISUP) or outbound Multi-Frequency (MF) trunks, but does not provide full ISUP tandem functionality. Full tandem functionality would pass all ISUP parameters through the MSC in addition to other functions. Previously, the *AutoPLEX*[®] System 1000 supported incoming ISUP calls for local terminations and outgoing ISUP calls for local originations, but blocked tandem calls.

With the Tandem Over ISUP feature, the 5ESS[®] Switch DCS will see two calls, an incoming ISUP call and an outgoing ISUP or MF call. For this feature, the 5ESS[®] Switch DCS is enhanced to send to the ECP and receive from the ECP the following additional ISUP parameters, but a subsequent feature is needed if all ISUP parameters are to be passed through the MSC:

- ☐ Hop Counter
- ☐ Carrier Identification Code
- ☐ Carrier Selection
- ☐ Transit Network Selection

99-5E-4413 VOICE FREQUENCY DATA ENHANCEMENT

This feature enhances the Timeslot Management Channel (TMC) message set to contain additional ITU Q.931 standard messages that allows 64Kb clear channel use of a DS0 once a call is set up. These new messages will be used to transition between robbed bit mode and clear channel mode for each individual call. Assigned on a switch-wide basis, this feature depends on the Remote Digital Terminal (RDT) to identify itself as a supporting Voice Frequency Data Enhancement (VFDE). The new messaging scheme provides interoperability with the RDTs that do not support these new messages. This feature applies to all 5ESS[®] TR-303 switch implementations. When activated, this feature applies to all analog calls to and from single party Plain Old Telephone Service (POTS) lines, Wide Area Telephone Service (WATS) lines, and Ground Start Private Branch Exchange (PBX) lines. The operation of this feature is transparent to the end-user, and does not change the operation of any end-user features (e.g., 3-Way Calling, Call Waiting, etc.).

With this feature active, due to the additional Timeslot Management Channel (TMC) messaging, there will be increases in dial tone delay, post dial delay, and cut through delay.

99-5E-4421 BALANCE

This feature simplifies load balancing by identifying subscribers that are causing blockage and Hundred Call Seconds (CCS) calls to internet service providers. Balance provides data for blocked call identification on analog line units LU1, LU2, and LU3.

Functionally, this feature provides the switch administrator with a new measurement that supplements existing Traffic 30 measurements. It offers more accuracy, speed, and simplicity than the existing traffic measurement reports for usage and blockage.

99-5E-4424 DNU-S VTTM/GROUP NUMBER

This feature splits the Digital Networking Unit - Synchronous Optical Network (SONET) (DNU-S) virtual tributary numbering scheme from one sequential number to two numbers (VTTM group and member). The old VTTM=1-28 sequential scheme maps directly onto the new scheme of VTG=1-7 and VTM=1-4. This changes technician's input/output (I/O) messages, maintenance control center (MCC) pages, recent change/verify (RC/V), and office data administration (ODA) representations of the VTTM. The old sequential VTTM numbering pattern will no longer be supported as of 5E13 BMI.

99-5E-4425 DNU-S PATH TRACE

The Synchronous Transport Signal (STS) Path Trace feature provides the ability to provision a 64-byte message transmission and expected reception strings and to monitor receive strings for end-to-end verification on the STS-1 path, utilizing the path trace (J1) byte in the SONET path overhead.

This feature provides the capability of on-demand reporting of a mismatch between the expected and

received path trace value for each STS-1 facility in the office.

The switch stores the expected and received values of the path trace string in a buffer. It detects a mismatch whenever the expected and received path trace values do not agree. When a technician requests a report with an input message, the expected value and the received value of the path trace are dumped along with a "match" or "no match" result.

Monitoring of the path trace byte is not possible whenever the path trace byte is unavailable due to a failure condition of the facility (i.e., AIS, LOP, etc.).

Path trace is optional for each new STS-1 facility that is grown onto a DNU-S.

The Three Fully Loaded DNU-S on an SM-2000 feature increases the trunk capacity of the SM-2000 beyond the current limit on an SM-2000 by using three fully equipped DNU-S for a total of 24,192 trunks.

99-5E-4429 7-DIGIT DN HANDLING AT IXC SWITCH

This feature provides additional options for establishing the called numbering plan area (NPA) for calls that arrive at a toll switch with a 7-digit destination number. On a trunk group basis, this feature allows the prefixing of the NPA associated with either the incoming trunk group or the NPA signaled with an ANI or calling party number to the 7-digit called party number.

99-5E-4432 WIRELESS NUMBER PORTABILITY

This feature allows the 5ESS[®] switch, acting as a digital cellular switch (DCS), to support wireless local number portability. It allows the mobile user to move from one service provider or location to another and keep their original directory number (DN).

This feature provides service provider portability. Service provider portability is defined as the ability to retain the same telephone number when a subscriber changes service provider. To change between the wireline service provider and the wireless service provider is considered service provider portability.

99-5E-4441 13kbps QCELP ON PHV3

This feature integrates the CDMA vocoding algorithm, 13kbps QCELP, on the PHV3.

99-5E-4473 BROADBAND BACKPLANE FOR *AnyMedia*[®] ACCESS INTERFACE UNIT (AIU)

This feature adds a high speed broadband backplane to the access interface unit (AIU). This permits asymmetric digital subscriber line application packs (ADSL APS) in the AIU to exchange information with the asynchronous transfer mode (ATM) feeder multiplexer (AFM) over an ATM link supporting ATM Adaptation Layer 5 (AAL5) protocol.

The ADSL AP provides the line termination for the ADSL subscriber. The AP receives the signals, splits off the plain old telephone service (POTS) portion of the bandwidth, and routes that POTS part to a normal POTS AP in the AIU. The broadband portion of the bandwidth is passed along the broadband backplane to the AFM, which multiplexes in onto a digital signal (Level 3) link to an ATM network.

The 5ESS[®] switch does not directly control or maintain the AFM and ADSL APs. This functionality is provided by the element manager using simple network management protocol.

99-5E-4475 INCREASE SWITCH ODD CAPACITY IN 5E12

This feature increases the Office Dependent Data (ODD) switch capacity for such requirements as local number portability and support for multiple local carriers.

99-5E-4482 AMA RECORDING FOR UNBUNDLED & RESOLD LOCAL SWITCHING

This feature provides additional billing information for resale and unbundled lines. The additional billing

information includes records or modules for all originations and terminations to a Resale or Unbundled (RU) line. (Note: Resale lines are separate and distinct from Unbundled lines and only combined for simplicity. Where the treatment for each type is different these differences will be noted.) Each line is identified by a line attribute (resale, unbundled, or native) and office parameters control the originating and terminating recording of AMA for each type of line.

The AMA call records are created for both local and toll calls. Intra-switch calls from one RU facility to another RU facility generate one billing record on a call. If both RU AMA originating recording and RU AMA terminating recording conditions are met, the originating record should override the terminating record for the forced AMA recording. This feature creates (2) new call type code AMA records for originating and terminating records (Call Type Code 126 Originating and Call Type Code 128 Terminating) from an RU line if a billing record is not called for. To these new or existing records, the feature will potentially append (3) modules (125 - Timing and (1 or 2) 338 - LSPI). At this time no specific identification of the Local Service Provider involved on a call is provided.

NOTE: 125 Module only for unbundled lines as unbundled service group member. If originating and terminating party are both unbundled users, only one Timing module 125 for the originating is appended to the AMA record.

99-5E-4484 FGD INTERFACE TO E911

This feature modifies the feature group D (FGD) interface to the E911 feature. In conjunction with Wireless E911, this feature allows the 5ESS[®] E911 serving switch to output the wireless 911 caller's 10-digit mobile directory number (MDN) and the 10-digit pseudo automatic number identification (pANI) together to the enhanced centralized automatic message accounting (CAMA) public safety answering point (PSAP) handling the wireless 911 call. The pANI is not available for any wireline calls.

99-5E-4489 PACKET PIPE ENHANCEMENTS

This feature supports the *AutoPLEX*[®] Packet Pipe Engineering Optimization (FID 2281) and Packet Pipe 16 (FID 3125) features.

The Packet Pipe Engineering Optimization feature maximizes the overall utilization of the packet pipes in the mixed service MSC. Currently, for a 5ESS[®] digital cellular switch (DCS) that supports mixed services (8K, 13k, EVRC, and Circuit Switched Date), the packet pipes are engineered based on 13K traffic resulting in the overengineering of packet pipes. This feature optimizes the utilization of the packet pipes for a mixed service 5ESS[®] DCS, which eliminates the overengineering of packet pipes. To optimize the PP utilization, this feature assigns different PP capacity loading factors to different types of calls for both PP engineering and PP utilization algorithms.

The Packet Pipe 16 feature increases the packet pipe size from 8DSOs to 16 DSOs, which enables the packet pipe size to be of variable lengths (from 1DSO to 16 DSOs). This enhancement of packet pipe size provides the flexibility and efficiency of usage of the T1 line.

99-5E-4491 IS-41 INTER-SYSTEM HANDOFF

IS-41 Inter-System Handoff allows handoffs between MSCs of like and different vendors for TDMA circuit mode data calls. This approach uses Intersystem Link Protocol (ISLP) trunks to connect MSCs and MSCs of different vendors.

This feature requires a new PHV image, an ISLP PH, and a new trunk group (TG) type, i.e., the ISLP trunk type). The ISLP PH is to terminate the ISLP trunk.

99-5E-4498 LOCAL TRUNK BILLING ENHANCEMENTS

This feature provides additional trunk-group billing information for local exchange carriers (LEC), which is appended to interoffice call records. This set of billing options is necessary to record calls from one network to another network in order to identify calls where mutual compensation is owed. The additional trunk

information on the automatic message accounting (AMA) recording will assist the compensation settlement. Trunk information is provided for both incoming and outgoing trunks in case both are provided for the AMA record produced for a leg of a call.

99-5E-4504 CDMA DTMF TONE GENERATION PROGRAMMABILITY

Dual Tone Multi-Frequency (DTMF) tones are generated by the speech handlers in the 5ESS® Digital Cellular Switch (DCS) for the mobile station's (MS) burst DTMF message. This feature provides the ability to specify the on-length and off-length of the DTMF tones via Recent Change/Verify. When this feature is activated, the 5ESS® overrides the on-length and off-length values received in the burst DTMF message and uses the service provider's values.

99-5E-4513 VIRTUAL PRIVATE NETWORK (VPN) EXPANSION PACKAGE A

This feature activates the Centrex network (CN) feature on long distance platform (LDP) (VPN) switches and tests the CN operation with VPN.

The VPN switch receives multiswitch business group (MBG) information from the originating end office. After originating a VPN-MBG call at the VPN switch, the switch continues the call as an MBG (CN) call to the terminating switch.

Virtual private network multiswitch business group (VPN-MBG) calls between business group lines directly connected to LDP VPN switches convey the business group identify and station restrictions of the end stations involved between connected originating and terminating VPN switches. This allows interswitch VPN-MBG calls to complete to restricted phones as intragroup calls. These calls would normally received terminating switch release treatment without identification of the call originator as being in the same business group as the terminator. This feature allows different options of Centrex/business and residential customer services (BRCS) features to operate for the terminating line.

Full Centrex Network (CN) feature capacities are available on these VPN-MBG calls.

99-5E-4520 INCOMING/OUTGOING SM COUNT

This feature adds two measurements to the Traffic 30 Report; Section 12 and Trunk Group Usage. The feature enables the customer to separately track incoming and outgoing traffic usage and to verify monthly facility charges from the local exchange carrier (LEC).

99-5E-4528.A ANI TABLE INDEX

This feature provides an efficient storage of automatic number identification (ANI) entries on an SM and minimizes the amount of SMs needed for ANI storage per office. The feature also breaks the existing relations into a header part (containing key fields and an index to the data table) and a data part. This allows an administrator to easily group a set of ANIs together using a single index, and to change how calls are handled for a specific group of ANIs by changing only one entry in the long distance platform (LDP) index table.

This feature also provides utilities to help administer ANI tables on both a per-SM and per-office basis. In addition, it provides a mechanism to process 6 Million ANI entries.

99-5E-4539 RECENT CHANGE CAPACITY IMPROVEMENTS

Recent Change Capacity Improvements feature enhances the through-put capacity of recent change operations on the switch. It maintains the existing interfaces to RC functionality while increasing performance.

This feature provides for improvements in total switch RC transaction through-put and average RC transaction response time. Invocation of the feature is automatic with the invocation of recent change transactions incorporating the involved improvements.

99-5E-4553 PSU RELIABILITY ENHANCEMENTS

This feature introduces two new/modified PSU functionalities, PSU critical unit fault recovery, and Common-Channel signaling (CCS) Protocol Handler softswitch. A "Critical PSU" undergoes modified fault recovery when PSU/PH faults persist, which can escalate to SM initialization recovery actions in the event of multiple failures within the PSU. This option would be used by a customer that feels the PSU provides the primary service in that Switching Module. The "PSU Critical Unit" feature has to be allowed by updating Recent Change.

This feature provides CCS PH softswitch capabilities. CCS softswitch allows recommended routine exercises (REX) for all provisioned PSU equipment and makes packet handler (PH) restorals for all PH images ACTIVE by default. CCS PH softswitch is a part of the release, it does not have to be allowed as does the "PSU Critical Unit."

99-5E-4553.A PSU RELIABILITY ENHANCEMENTS

This feature provides soft switches for all Protocol Handler (PH) applications. ("Soft" means that the switch is not disturbing to customers, subscribers, or external equipment.) In addition, this feature provides REX for all PSU equipment that is provisioned as recommended and makes PH restorals ACTIVE by default.

99-5E-4572 FLEXIBLE ALERTING

This feature allows a pre-defined set of directory numbers (DNs) to be grouped into a flexible-alerting (FA) group. Each FA group is identified by a single pilot DN. An incoming call destined to the pilot DN will cause all the DNs in the group to be alerted simultaneously. (Calls incoming to any member of the flexible alerting group other than the pilot DN will not cause other members of the group to be alerted.) When the call is answered on a DN in the group, the network completes the call to the answered DN and abandons the alerting of the other DNs. The DNs grouped together (referred to as an FA group) can consist of any combination of wireless and/or wireline DNs.

99-5E-4572.A MEASUREMENTS FOR FLEXIBLE ALERTING

This feature is an enhancement to feature 99-5E-4572 (Flexible Alerting). The Measurements for Flexible Alerting feature updates Section 12 on the TRFC30 report with a new peg counter that indicates flexible alerting (FA) call attempts (FAOUT). This allows a distinction between regular call attempts and FA call attempts. As a result, office operators can analyze large amounts of possible unanswered call attempts, since most FA call attempts will not be answered.

99-5E-4582 AIN LDP SUPPORT OF HIGH SPEED DATA

This feature supports High speed data calls (>64kbps) that require a query to the SCP and have the BearerCapability parameter in the Info_Analyze or Info_Collected query populated with b64kbps. For High Speed DAL and VPN type calls, the BearerCapability field will also be set to b64kbps. Previously, if a high speed data call came into the 5ESS[®] and either a dialed number trigger (DNT) or its TRG NBR entry in the ANI or carrier table indicated that a query should be sent to the SCP, this indication is ignored and call proceeded as if no DNT or TRG NBR were present. (AIN does not officially support high speed data calls). The only valid BearerCapability parameter values were:

- ☐ Speech
- ☐ f31kHzaudio
- ☐ b56kbps
- ☐ b64kbps

If call screening is being done on the SCP, this may lead to high speed data calls being handled differently

than voice calls. For example, if international calls for a given ANI are being blocked via the SCP, then voice calls which query the SCP would be blocked but high speed data calls would not be blocked since the SCP query is ignored.

99-5E-4596 MULTIPLEX ACCESS INTERFACE UNIT (XAIU)

The XIAU is an updated AIU cabinet design that uses fiber links to connect the AIU to the host SM. The XAIU uses PCT and Message Handler resources, rather than PIDB/PICB resources in order to provide line services such as ADSL, ISDN, POTS, and COIN. This is accomplished in an updated cabinet design that houses a Fiber Common Data circuit pack (FCD) that allows the termination of the fiber link at the AIU cabinet and a slightly modified COMDAC (DAC100) pack. The time slots are then fanned out to the AIU shelves over cables. The cables are pre-installed at the factory and there is no cabinet wiring required post ship.

The XAIU supports most of the CCS configurations that were previously available with the AIU. The XAIU is fully compatible with all of the line circuit packs that are available on the AIU, including LPZ100C (POTS), LPC 100 (coin), LPU 116 (ISDN), and LPA400 (ADSL).

The XAIU is fully NEBS tested and is only applicable to the SM-2000 and EXM applications. The unit is not supported on RSMs.

99-5E-4603 DSN ENHANCED NETWORK MANAGEMENT CONTROL

This feature allows the switch, when operating as a defense switch network (DSN) office type, access to network management controls that were previously unique to non-DSNs. These network management controls provide various combinations of automatic versus manual, and restrictive versus expansive controls.

The network management controls are as follows:

- ☐ An automatic control is preassigned by network management personnel and is activated by the switching element upon exceeding prespecified, adjustable conditions. A manual control is activated by personnel (either on-site or at a remote network management work center), in response to data from switching offices.
- ☐ A restrictive control results in either call cancellation or non-availability of a trunk group for the call. This preserves the health of the network while the call is restored to proper operation. An expansive control results in availability of additional network resources (e.g., trunk routes) which help circumvent network congestion and promote call completion.
- ☐ Pre-hunt controls are applied after a trunk group is chosen and before the hunt for an idle member starts. Post-hunt controls are applied after the trunk group failed to locate an idle member and before alternate route treatment is applied.

The following controls that were previously not available for DSNs are also made accessible:

- ☐ Automatic Congestion Control (ACC)
- ☐ Trunk Reservation (TR)
- ☐ Cancel To (CANT)
- ☐ Cancel From (CANF)
- ☐ SKIP
- ☐ Reroute (RR)

These controls are enhanced to account for the DNS's Multilevel Precedence and Preemption feature in the following manner:

- ☐ Calls affecting by the controls: ACC will not apply to precedence calls above ROUTINE, and CANT and CANF will not apply to FLASH and FLASH OVERRIDE calls.
- ☐ Interaction with preemption: Network management controls apply during the friendly hunt (both pre- and post-hunt), and do not apply if doing a preemptive hunt on that trunk group.

99-5E-4605 TALKING CALL WAITING

This feature provides the subscriber with a Call Waiting tone followed by the spoken name of the caller when the subscriber is busy on a stable call and a second call comes in. The spoken name is provided by an external Intelligent Peripheral (IP). Interactions with Caller ID on Call Waiting (CIDCW) and Call Waiting Deluxe (CWD) are supported.

The voice the Talking Call Waiting (TCW) subscriber (party A) hears for call waited calls is referred to as **TCW Treatment**. The TCW treatment will be provided by the IP and will be transparent to the switch. The TCW treatment will usually be a beep followed by the spoken name of the waiting party (e.g., *beep* John Jones). For TCW subscriber with CIDCW active, it is assumed that the TCW treatment will not have the beep, it will have the spoken name only (the CIDCW feature will already have provided the beep).

The IP is connected to the 5ESS[®] via either BRIs or a PRI. The DNS associated with the BRIs or PRI must have the calling name features provisioned on them, namely, 99-5E-2264 for BRI, and 99-5E-2295 for PRI.

99-5E-4620 CALLING NAME PRESENTATION (CNAP)

The Calling Name Presentation (CNAP) feature allows the 5ESS[®] switch, acting as a DCS, to support CNAP.

The CNAP feature displays the name of the calling party (up to 20 characters) on display compliant mobiles operating in the digital mode.

When CNAP is active and an incoming call arrives for the subscriber, the calling party name is sent to the mobile for display during the first ringing cycle. If the calling party has CNAP active and the calling name is not available, an "Unavailable Name" indication is displayed to the called party.

The CNAP feature works in conjunction with the Calling Name Restriction (CNAR) feature. The CNAR feature provides privacy for those who do not want their name displayed. If the calling party has CNAR invoked and the called party has CNAP, an indication of "Private Name" is displayed to the called party.

99-5E-4621.A E911 CALL ERROR DETECTION AND ALARM

This feature helps to reduce E911 outage duration. When the E911 error occurs, alarms and information associated with the error are provided so that the emergency services personnel are able to fix the problem with E911 service quickly. This improves E911 service due to less downtime. This feature can also detect non-911 dialed emergency calls when the call type is marked as an emergency call.

This feature is intended to detect errors, in certain instances, when E911 calls are not being completed and to send an alarm to alert the service provider. Lucent does not warrant that this feature will in all instances detect errors and send an alarm when E911 calls are not being completed.

99-5E-4632 FGD CUT-THROUGH ENHANCEMENT

This feature allows the provisioner to specify on a carrier id basis, that the FGD Cut-through Call is to be

switched to the carrier for the carrier to collect the digits. The switch will use the RTI/CDI specified for the carrier to route the call to the designated carrier.

The FGD Cut-Through Enhancement requires that a new Tandem Cut Through Call Indicator be added to the LDP Carrier table (RC/V 10.3) as well as a Cut-Through RTI and Cut-Through CDI. This secured feature allows a FGD Cut-Through Call to be switched to another carrier without first collecting digits for the call.

99-5E-4634 DSN CENTRALIZED ATTENDANT

The DSN Centralized Attendant feature provides the 5ESS[®] switch with the ability to extend the existing Dial-through-Attendant (DTA) feature that currently functions only if the customer line is located on the same switch as the ISDN attendant (ISAT). The existing DTA feature allows the ISAT to give a caller access to an outgoing facility [by the attendant using the Private Facility Access (PFA) feature].

This feature extends the ability of the 5ESS[®] switch to use this functionality over MLPP on SS7 trunks, thereby allowing a cluster of switches to provide this service using an ISAT physically located at one of the switches.

99-5E-4651 CDMA IS-53A PREFERRED LANGUAGE (PL)

For Phase 1 of the IS-53A Preferred Language feature, a mobile subscriber may receive a 5ESS[®] Switch DCS provided recorded announcement in the preferred language of their choice. Upon receipt of a message from the ECP requesting an announcement to be played to the mobile, the 5ESS[®] Switch DCS will examine the optional preferred language parameter and determine whether this language is currently defined on the 5ESS[®] Switch DCS. If so, the 5ESS[®] Switch DCS will play the recorded announcement in the requested language. If the language requested is not defined on the 5ESS[®] Switch DCS, the announcement will be played in the default language which is defined on the DCS by the service provider.

Currently, approximately 61 languages are defined, with the possibility of defining up to 255 different languages. For Phase 1, the 5ESS[®] Switch DCS will only support 4 languages. The four languages are limited to English, French, Mandarin, and Cantonese. Only Service Announcement Services (SAS) equipment will be supported for this feature. No support for RAF, 13A, 16A (for example) announcement equipment will be provided. In addition, the customer will be responsible for recording their own announcements. They can accomplish this in one of two ways:

- ☐ by purchasing a SAS workstation and recording/digitizing the SAS flash cards by themselves,
- ☐ by sending Lucent their prerecorded announcements on some sort of medium (tape, for example) and Lucent will digitize the announcements onto the SAS flash cards for an additional fee.

Current 13A, 16A customers who choose not to implement the Preferred Language feature will not be impacted.

99-5E-4657 5ESS[®] SWITCH ACCEPTANCE OF A 1A ESSTM SWITCH WINK NPD AND ANI FOR 911 ROUTED CALLS

This feature allows the 5ESS[®] switch to respond to a seizure with a wink, and accept a numbering plan digit (NPD) and automatic number identification (ANI), then route the call to a centralized automated message accounting (CAMA) public safety answering point (PSAP). (The before-mentioned seizure, wink, NPD, and ANI is the normal signaling of a CAMA PSAP.) This feature allows the 5ESS[®] switch to replace a 1A ESSTM switch that has a non-supported 1A ESSTM inter-switch hand off, where one 1A ESSTM switch defines a CAMA PSAP and the other 1A ESSTM switch signals like CAMA PSAP and completes the call to its own CAMA PSAP. This feature allows the 5ESS[®] switch to replace the second 1A ESSTM switch.

99-5E-4673 SET GLOBAL DSN BIT AND TEST DSN FOR VCDX

This feature allows an SM-2000 VCDX to be provisioned as a DSN office, and allows verification of DSN functionality on a loaded SM-2000 VCDX. This feature provides the following MLPP/DSN features:

- ☐ Precedence access threshold (PAT)
- ☐ Individual dialing plan to support Multilevel Precedence and Preemption (MLPP) feature
- ☐ Routing to access lines and PBX trunks (assuming MLPP feature assigned)
- ☐ Speed calling/abbreviated dialing to make MLPP calls
- ☐ Authorization and account code dialing using MLPP feature
- ☐ MLPP screening - map precedence levels, route code values, and destinations to desired treatment for specified classes of users (use screening index)
- ☐ Dual homing - support a PBX homed to two different DSN offices
- ☐ DSN AMA - precedence level recorded
- ☐ DSN MDR - precedence level recorded
- ☐ Tones and announcements - PAT limitation, blocked precedence, unauthorized precedence, preemption tone, blocked preemption
- ☐ MLPP feature on 2-wire lines, 4-wire lines, custom ISDN lines, 4-wire E&M trunks
- ☐ Community of interest (COI) - groupings of MLPP users for purposes of screening MLPP calls with regard to allowed precedence levels and calling areas
- ☐ Support for MLHGs with the MLPP feature assigned (analog and custom ISDN) - queuing and preemption interactions
- ☐ Hot line service
- ☐ Support for MLPP feature on trunks, including interswitch trunks and PBX trunks (TIERNID, TIEPNID, VONPNID, VONRNID, NONRCD, EORNID, EOPNID, SATPID, SATINID) - precedence level signaling, friendly and preemptive hunting, preemption
- ☐ Support for MLPP on PRI and MLPP on SS7 trunks
- ☐ Support for ISDN attendant (ISAT) interactions with MLPP - MLPP queuing, MLPP displays, in addition to non-DSN ISAT feature (e.g., busy verify, attendant recall, etc.)
- ☐ Allows ODA to configure a VCDX SM-2000 switch as a DSN office

It also provides MLPP versions of the following features:

- ☐ Call forwarding
- ☐ Call pickup
- ☐ Multiway calling, including call hold, transfer, conference calling
- ☐ Distinctive ringing
- ☐ Custom ISDN features - shared DN, multiple call appearance, displays, distinctive ringing, feature button origination

- ☐ DSN measurements
- ☐ Recent change support for all of the features listed

This feature does not provide the following features on VCDX DSN offices:

- ☐ POLYGRID routing
- ☐ DSN network management

99-5E-4684 ORIGINATING SWITCH CALLING NAME

The originating switch calling name feature modifies the existing Calling Name features to allow an originating 5ESS[®] switch to provide a calling party name for each call origination and deliver this name to the terminating party. The name is obtained either from switch-based data or through a Calling Name TCAP query to a calling name data base (for which a calling number is available). If the call is interswitch, the name will be sent in the Generic Name parameter in the IAM, along with an indication of whether the name is "Presentation allowed" or "Presentation restricted." A calling name can also be received in a SETUP message from an originating PRI.

At the terminating switch, when the calling name is received (in the Generic Name parameter), it will be delivered to the terminating party, assuming that the terminating party subscribes to the Calling Name Delivery and the name is indicated as "Presentation allowed." If the Generic Name parameter is received without a calling name or no Generic Name parameter is received, and if the switch is provisioned to do CNAM TCAP queries, then the terminating switch will attempt to retrieve the calling name through a CNAM TCAP query.

99-5E-4687 RELEASE LINK TRUNK-TOLL

The Release Link Trunk-Toll feature allows toll service providers to use elements of the generic Release To Pivot (RTP) procedure to provide release link ISUP trunks between a 5ESS[®] switch originating toll office and an operator system site. SS7 release link signaling using RTP permits the originating toll switch to release the trunk to the operator system switch (on a directory assistance call completion request) and reroute the call using information obtained from the operator system. This allows directory assistance call completion calls to use non-dedicated SS7 trunks.

The Release Link for Toll Office feature also offers a release link directory assistance call completion service as specified by Nortel[™] for the TOPS switch (Nortel's operator services switch), which uses non-standard signaling over dedicated SS7 trunks to the TOPS operator.

99-5E-4694 SYSTEM INTEGRATION AND TESTING OF ADSL ON AnyMedia[®] AIU SOLUTION

This feature provides the residential or small business customer with high-speed data access to an internet service provider or corporate network through the use of asymmetric digital subscriber line (ADSL) technology. ADSL offers the opportunity to get 10 to 100 times the data bandwidth over most of the existing copper loop plant, and avoids tying up the telephone network with long holding time modem calls. By using frequency multiplexing, ADSL puts upstream and downstream data channels on the local loop at frequencies above the voice band and automatically adapts to the quality of the line.

99-5E-4707 BASE ASM SOFTWARE FOR RAPID SOFTWARE DELIVERY (RSD) FUNCTIONALITY IN 5E12 ☐ PHASE 1

This feature deploys the Administrative Services Module (ASM) Base feature (99-5E-4237) as a 5E12 software update. This feature should be deployed in connection with 99-5E-4728.

99-5E-4717 TRAFFIC REPORTS FOR MODULAR METALLIC SERVICE UNIT

This feature provides the ability of the service provider to request and obtain traffic data on MMSU units. The information can be used for MMSU engineering and MMSU configuration on the switch. In addition, on the basis of this measurement, the switch staff will be able to identify the resources blocking testing paths. This information is needed to identify and apply the optimal MMSU configuration.

99-5E-4718 OUTPUT MESSAGES FOR METALLIC PATH SETUP FAILURES

This feature provides a set of output messages which report failures in the setup of metallic paths for metallic testing of lines and trunks. Metallic testing is executed via the Trunk and Line Workstation (TLWS) at the switch, via switch-based routine testing (Automatic Line Insulation Test [ALIT] or Subscriber Line and Instrument Measurement [SLIM]), and via requests from external operations systems such as Mechanized Loop Test system (MLT). When metallic tests are executed, the first step is to set up a path between the test equipment (electrical measuring device) and the line to be tested. This path is set up using the Modular Metallic Service Unit (MMSU), Metallic Access (MA) Packs within the MMSU, the Metallic Test Buses (MTBs) from the MA Packs to the equipment to be connected, and the Metallic Test Interconnect Busses (MTIBs).

The setup of the connections to be used for testing may not succeed. Three important categories of causes are: Resource Blockage, Software Blockage, and Failure. Resource Blockage occurs when a piece of hardware that is needed to set up a metallic path is unavailable. Software Blockage occurs when an attempt to read a relation fails or when other unexpected data or software problems prevent the metallic path from being set up. Failure occurs when a diode protocol test fails or when a power cross test fails. With this feature, when the path setup does not succeed, an output message will be provided to note the occurrence and to indicate the cause, and to indicate what equipment was being used.

The Service Provider technicians can enable or disable this new output message type. Moreover, they can selectively enable or disable whether the output message is produced for certain categories of causes. Such selective enabling and disabling is provided by a new allow input command type and a new inhibit input command type.

99-5E-4719 IDENTIFICATION OF MA PORT ASSIGNMENTS

This feature provides an easy-to-use method of accessing and displaying the provisioned assignment data for individual Metallic Test Buses (MTBs) on Metallic Access (MA) Packs. The feature provides complete identification of the terminations of both ends of the MTB: the MA pack port identification and the "far end" termination(s) of that MTB. When the MTB is serving Remote Terminals (RTs) in a Digital Loop Carrier System, this feature provides an additional display of information on all RTs assigned to that MTB. This feature provides a summary display of "far end" information for all of the ports on an MA pack.

99-5E-4720 FLEXIBLE ASSIGNMENT OF DCTU/PMU PORTS TO MMSU SHELVES

This feature allows a service provider to configure a switch such that each Directly Connected Test Unit (DCTU)/Precision Measurement Unit (PMU) Port is concurrently connected to metallic test buses (MTBs) on all half-shelves of an Modular Metallic Service Unit (MMSU) service group. (There may be up to four such half-shelves consisting of one basic shelf and three growth shelves.) When attached anywhere on the same MMSU half-shelf, a DCTU/PMU Port and a Line Under Test (LUT) MTB can be connected without the use of an MTIB. They require only a simple MTB-Junctor-MTB connection. When not attached to the same MMSU half-shelf, a DCTU/PMU Port and the LUT MTB must connect by the use of MTIBs. This results in an MTB-Junctor-MTIB-Junctor-MTB metallic path.

Prior to this feature, each DCTU/PMU Port could be connected to only one MTB on one MMSU Half-Shelf. As a consequence, a simple MTB-Junctor-MTB connection could only be made between the DCTU/PMU Port and the MTB to a LUT on that one MMSU half-shelf. Connections between this DCTU/PMU Port and the MTBs to the lines attached to any other MMSU half-shelf required the use of interconnecting MTIBs. Because of the limited number of MTIBs, the lack of available MTIBs could cause blocking for metallic testing requiring MTB-MTIB-MTB interconnection. Therefore, this feature increases, by a factor of four, the likelihood that a single DCTU/PMU Port will be able to connect to a desired line by use of a simple

MTB-Junctor-MTB connection. Reciprocally, the likelihood that an MTB-Junctor-MTIB-Junctor-MTB connection will be necessary is reduced by a factor of four. Consequently, the cumulative MTIB usage will be reduced, so that when an MTIB is needed to complete a connection, it is less likely to be blocked because of full utilization.

This improves the metallic testing access in such a way that simultaneous metallic tests are less likely to be blocked by MTIB shortages.

99-5E-4727 CITY CODE ROUTING ON INTERNATIONAL CALLS

The City Codes Routing on International Calls feature allows long distance providers to route international calls using the city code in addition to the country code. The customers will be able to realize tremendous savings by selecting the lowest cost carrier to the specific city within the country.

99-5E-4728 BASE ASM FOR RSD DEPLOYMENT - PHASE II

This feature provides a PCI connection between the 3B21 processor and the Administrative Services Module (ASM) processor. The feature supports a commercial server (the SunTM Netra[®] t-1120, which implements the ASM.

This feature also includes the ASM Base that is needed to support the AMADNS Billing Interface. The interface will increase the speed of the transfer of billing records to the billing center using FTP over TCP/IP.

99-5E-4732 Tandem to Tandem E911

The Tandem to Tandem E911 feature provides the ability to transfer information that is pertinent to an E911 call or to a direct dialed PSAP call from one E911 tandem switch to another E911 tandem switch via SS7 signaling.

The transfers covered by this feature include:

- ☐ emergency calls that originated in a wireline network
- ☐ direct (anonymous) calls that originated in a wireline network
- ☐ emergency calls that originated in a wireless network
- ☐ direct (anonymous) calls that originated in a wireless network.

NOTE: The term "transfer" when applied to E911 call handling usually means that a 3-way conference is formed; the first PSAP may then choose to drop off the call after verifying that the caller and the second PSAP are connected.

This feature also applies to call forwarding of emergency or direct dialed calls from an ISDN PSAP on one E911 tandem switch to a DN on a second E911 tandem switch.

99-5E-4740 ASP Send to Outside Resource (STOR) Interworking with Originating Busy Line No Answer (BLNA) with Extended Ringing

This feature, which interacts with Feature 99-5E-3529, *ASP Busy/No Answer Office Triggers with Extended Ringing*, STOR (local), and STOR (remote), allows the called party to continue to receive ringing after the O_No_Answer trigger has been hit and the Service Switching Point (SSP) is playing an announcement (Sent_To_Resource) from a local or Remote IP to the calling party. Extended Ringing also allows the calling party to be connected to the called party if the called party answers while the SSP is playing the announcement to the calling party. In other words, Extended Ringing allows the "called leg" of an AIN call to remain "up" while the "originating leg" of the call is involved with a Send_To_Resource interaction at the SSP.

99-5E-4745 NUMBER PORTABILITY □ NONCONDITIONAL TRIGGER FOR DID TRUNKS

The Number Portability - Non-Conditional 10 Digit Trigger for Location Routing Number (NCDT) feature (99-CP-3888) cannot be assigned to DNs associated with direct inward dialing (DID) PBXs (terminating class of service RTTC_RI).

The Number Portability - Non-Conditional Trigger for DID (NCDT-DID) feature removes this limitation by allowing the assignment of NCDT to DNs with a terminating class of service of RTTC_RI. The NCDT-DID feature is also provisionable on lines with the RTTC_TINWATS terminating class of service.

The Number Portability - Nonconditional 10-Digit Trigger for DID Trunks feature, SFID 304, enhances the functionality provided by the Number Portability - Nonconditional 10-Digit Trigger for LRN feature and now allows the use of the nonconditional trigger with PBX DNs. This means that when a trigger, provisioned on an NPA-NXX-XXXX basis, is activated, the NP query is made, regardless of whether or not the line is being served by the switch. Due to limitations of the Number Portability - Nonconditional 10-Digit Trigger for LRN feature, DNs with a terminating class of service populated with RTTC_RI cannot have the nonconditional trigger assigned to it. This is the general class of service of DNs associated with a route index that is, also, used for Direct Inward Dialing (DID). The Number Portability - Nonconditional 10-Digit Trigger for DID Trunks feature removes this limitation. This feature allows for the terminating class of services of RTTC_RI and RTTC_TINWATS. The switching point (SP) using this new assignment capability needs to be aware that no software checks will be made to ensure that the assignment is only for DID PBX DNs. This feature is dependent on the Number Portability - Basic LRN feature, 99-CP-3169A, SFID 174.

99-5E-4757 SUPPORT FOR AN HIGH SPEED BILLING INTERFACE

The existing Automatic Message Accounting TeleProcessing System (AMATPS) uses BX.25 protocol over a 56 or 9.6 kilobit per second link that is attached to the Administrative Module (AM). This feature uses a new data link for Automatic Message Accounting (AMA). The new data link, moved off the AM, downloads the data much faster using increased bandwidth and a more efficient protocol.

- There is no change in the way AMA data is created in the SMs and sent to the AM disks for storage. The change is in the teleprocessing interface.
- This feature provides a new type of link with larger bandwidth, a 10 Mb *Ethernet*® link, and moves the link from the AM to the Administrative Services Module (ASM).
- Uses AMA Data Networking System (AMADNS) protocol, which is a new Bellcore standard, GR-1343-CORE.
- With this feature, the data can be receiver-requested from the Host Collector as it has been or the data can be sender-initiated.
- If receiver-requested, transmission time takes minutes instead of hours.
- If sender-initiated is assigned and the timers to initiate file transfer are set accordingly, the data can be available in near real-time (to the Host Collector).

99-5E-4759 ISUP INTRA-MODULE TRUNK GROUPS ON VCDX

This feature implements "ISUP Intra-Module Loop Around Trunks" for use with the Local and Wireless applications on the 5ESS® Switch VCDX SM-2000.

This feature is used when the service provider wishes to support both the Local and the Wireless applications and when the service provider wishes that interapplication calls be kept within a single switching module.

This feature provides for ISUP Intra-Module Loop Around Trunks, which are necessary for simultaneously providing both local and wireless applications when only one SM is present. "ISUP Intra-Module Loop Around Trunk" refers to the ability to have loop around ISUP trunks on a 5ESS® Switch within a single switching module. An existing feature refers to loop around trunks as "InterModule Trunks" (IMT). The "ISUP Intra-Module Loop Around Trunks" will also be called IMTs even though only one switching module is involved.

99-5E-4759.A ISUP INTRA MODULE LOOP AROUND TRUNKS FOR EXM-2000, CDX, AND SM-2000

This feature extends the functionality of feature 99-5E-4759, providing for ISUP Intra-Module Loop Around Trunks on 5ESS® Switch SM-2000, 5ESS® Switch EXM, 5ESS® Switch CDX SM-2000, and 5ESS® Switch CDX EXM, which are necessary for simultaneously providing both local and wireless applications when only one SM is present. "ISUP Intra-Module Loop Around Trunk" refers to the ability to have loop around ISUP trunks on a 5ESS® Switch within a single switching module. An existing feature refers to loop around trunks as "InterModule Trunks" (IMT). The "ISUP Intra-Module Loop Around Trunks" will also be called IMTs even though only one switching module is involved.

ISUP Intra-Module Loop Around Trunks are voice-bearing trunks that are physically looped out and then back into a switching module. The routing of voice channels on these trunks is coordinated by the use of ISUP signaling. Signaling messages for InterModule Trunks do not leave the switch, but instead are intercepted and sent back to appropriate destinations in the software for processing as if they came from the external SS7 message network. The message transport mechanism in the 5ESS® Switch is implemented using the CNI Ring. This signaling mechanism must support the new ISUP Intra-Module Loop Around Trunks.

99-5E-4769 INTEGRATION OF VENDOR STRATUM 3 BITS TIMING SOURCE

This feature provides the customer the assurance of a robust timing source, and the ability to respond promptly to incidents of failure in the external timing and synchronization system. The feature also provides the enhanced capability of the TSICOM with the introduction of a new oscillator capable of stratum 3 free-run operation (4.6 ppm and 7 Hz at 1.544 Mhz accuracy). The existing clock capability of the current UM74C is stratum 4, with this enhancement, provides an overall assurance, that when the BITS box duplex fails, the 5ESS® network element will operate with stratum 3 free-run.

99-5E-4776 SOFTWARE TRANSITIONS + AFT STANDING FEATURE FOR 5E14

The 5E14 Software Transitions feature provides the software and procedures to perform software release retrofits, large terminal growths, and software release updates.

The Apptext Forward Translator (AFT) feature provides a Recent Change/Verify text interface software translation mechanism that allows the service provider to continue sending recent changes to the 5ESS® Switch following retrofit, even though the supporting RC OS remains on the previous software release. The APPTXT translation mechanism of the DC/AFT feature is based on the RC evolution process used during 5ESS® switch retrofits. The DC/AFT feature converts RC/V text interface commands generated in the format of an earlier 5ESS® Switch software release into the format of a later software release.

99-5E-4779 CDMA HIGH SPEED PACKET SWITCHED DATA (HSPD) SERVICES

This feature provides a subscriber with the ability to transmit bursts of data up to the raw speed of 153.6 Kbps over a packet data network via the CDMA air interface. Prior to this feature, CDMA data services were limited to speeds of 9.6 Kbps or 14.4 Kbps. The HSPD feature allows mobile users with laptop computers or other data services, conforming to the TIA/EIA/IS-707-A1 standard, to access various data applications such as Internet Access, Database Access, E-mail or file transfer at higher speed. The HSPD services are bi-directional and apply to both cellular and PCS systems.

99-5E-4784 GENERIC DIGITS PARAMETER (GDP)

This feature implements the generic digits parameter (GDP) for the ISUP IAM to carry the information related to the call/sector information. This includes interworking with appropriate ECP messages. GDP makes the Lucent MSC compliant with current standards for Enhanced E911.

99-5E-4801 TDMA DISCONTINUED TRANSMISSION (DTX) WITH COMFORT

The TDMA-VIS DTX/CNI feature allows the DTX/CNI compatible mobiles, being served on a Digital Traffic Channel (DTC), to turn off their transmitters when a Voice Activity Detection (VAD) detects that the subscriber is not speaking. This allows mobile stations to save battery power and reduce uplink co-channel interference at neighbor cells.

The DTX/CNI feature uses TDMA ACELP algorithms and is not a secured feature by the 5ESS[®] Switch DCS. This feature is available in 5E13 Software Update and later software releases.

99-5E-4864 ADSI ACKNOWLEDGEMENT TIMER OPTIONAL VALUE

This feature modifies the Switch-to-CPE Analog Off-Hook FSK Data Interface feature (99-5E-1580) to allow the service provider to extend the length of the acknowledgment (ACK) timer T1. The T1 is 5ESS[®] switch timer that waits for a response from the customer premises equipment (CPE) after sending a subscriber alerting signal (SAS) or CPE alerting signal (CAS).

To use the extended value for ACK timer T1, the service provider must activate the ADSI Acknowledgment Timer Optional Value feature. This feature has two levels of activation:

- ☐ Secure feature view 8.22 to activate the feature.
- ☐ View 8.31 to indicate whether the extended value of ACK timer T1 applies to the entire switch, or only certain SMS.

If the feature is activated on view 8.22 but not on view 8.31, all SMS use the default value of 160 ms for the timer.

When the Analog Display Services Interface (ADSI) Acknowledgment Timer Optional Value feature is not active, ACK timer T1 runs for the default value of 160 ms with no options.

When Secure Feature 327 is activated via view 8.22 and view 8.31 is used to specify the use of this feature, ACK timer T1 has a value of 250 ms.

99-5E-4868 PAY PHONE COMPENSATION FOR TOLL FREE CALLS

The Pay Phone Compensation for Toll-Free Calls feature gives service providers the capability to identify a toll-free call made from a pay phone and the type of pay phone originating the toll-free call following scp queries that translated the toll-free number into a POTS number. The Toll-Free Calling Enhancement for Flexible ANI feature (99-CP-4847) is also included with the same Secured Feature Identification (SFID). This feature provides the ability to restrict or allow forwarding of original flexible ANI Information Digits (II) following Service Control Point (SCP) queries on a per-carrier basis for non-translated toll-free calls. These features help service providers support pay phone compensation and flexible ANI II screening as mandated by the Federal Communications Commission (FCC). These features apply to SSP800 toll-free calls only; they do not apply to AIN toll-free calls.

99-5E-4907 CALEA CORE TCP/IP SUITE FUNCTIONALITY

The CALEA Core TCP/IP Suite Functionality feature allows users to access TCP/IP Suite functionality on a Protocol Handler (ISDNPH:PH3/PH4) and on the Switching Module Processor (SMP) in all types of SM and SM-2000 configurations. The CALEA feature is the first application of the TCP/IP platform on the ISDNPH and the SMP. The core TCP/IP protocol suite initially includes the Transmission Control Protocol (TCP), the Internet Protocol Version 4 (IPv4), and the Internet Control Message Protocol (ICMP). The users utilize

these network capabilities via socket primitives. Sockets is a widely used form of application program interfaces to IP network services. There are several "flavors" of sockets. The flavor chosen for emulation in the 5ESS® Switch environment is the 4.4BSD version.

All IP entities, whether a host or router, route IP datagrams. In order to route IP datagrams, the IP entity must consult an Internet routing table (commonly referred to as an IP routing table). This IP routing table stores information about possible destinations for IP datagrams and how IP can reach those destinations. For the initial implementation of the TCP/IP platform, static routing and very minimal dynamic routing are supported. The static routing is administered via RC/V. The individual IP routing entries are also affected by the state of the interface, both the physical and link layer. If the link and physical layer are not up, then the routing table is updated to indicate that the specific route is not currently usable for IP routing. IP datagrams may be routed to/from the following external physical interfaces: X.25 BRI; X.25 Access over T1 (XAT); X.75 trunks; and X.75' trunks. The link layer interface is LAPB for all of the physical interface types. Security is handled by assuming that X.25 PVCs and X.75/X.75' PVCs will transport the TCP/IP messages to/from the Law Enforcement Agency. It is assumed that using the X.25 packet network will provide sufficient internal security of the 5ESS® from the traditional security concerns of TCP/IP. Audits and System Integrity are also provided. On SM selective initialization, the TCP/IP socket interface remains and no data lost. On SM full initialization, the TCP/IP socket interface is established within 6 minutes.

99-5E-4908 CALEA CORE TCP/IP DSL ACCESS VIA X.25/X.75

The Core TCP/IP Access via X.25/X.75 feature allows a Core TCP/IP Platform application on the 5ESS® Switch to interface with a remote host over a BRI or T1, using LAPB as the Layer 2 protocol and X.25 or X.75 as the Layer 3 protocol. For the X.25 interface, the 5ESS® Switch acts as the Data Circuit Terminating Equipment (DCE) while the remote host acts as the Data Terminal Equipment (DTE). Permanent Virtual Circuits (PVCs) are utilized; Switched Virtual Circuits (SVCs) are not required.

The CALEA feature is be the first application to use the Core TCP/IP DSL Access via X.25/X.75 feature. The CALEA application requires the use of TCP/IP/X.25 over BRI, TCP/IP/X.25 over T1 (i.e. TCP/IP over XAT), and TCP/IP/X.75 over T1 to transport Call Data Content (CDC) messages and packet call content (PDC) messages from the 5ESS® Switch to Law Enforcement Agency Monitoring Stations. With the CALEA feature, CDC messages are generated in the subject's Switching Module while packet call content is monitored and copied in the subject's Protocol Handler (PH). These messages are encapsulated into TCP/IP messages and sent to a delivery PH by the Core TCP/IP Suite Functionality For CALEA feature. In the delivery PH, the TCP/IP messages must be encapsulated into X.25 or X.75 messages, as determined by provisioning, and transported over the X.25 PVC, XAT PVC, or X.75 PVC to the designated Law Enforcement Agency via this feature. For the BRI interface, PVCs may be assigned to either of the B-channels. For B-channels, the dedicated interface must support a provisionable signaling rate of either 56 kbps or 64 kbps.

99-5E-4918 CMP MEMORY EXPANSION

This feature will add a second TN1396 auxiliary memory board to the Communications Module Processor (CMP) in 5E13. Note that this actually means two TN1369s since the CMP is duplex. Due to the growth of the CMP ODD in 5E14, the previous CMP circuit packs would not be sufficient to hold the larger ODD. The memory has been increased for the UODD from 2M to 4M in the 5E14 generic, and NRODD from 14M to 28 M in the 5E14 generic.

The impact of growing in the new memory board in the CMP requires that the existence of the TN1369 board be known during the CMP initialization at INIT level 52, (before the INIT level 54, text and ODD is pumped) so that the TN1369 can be initialized.

99-5E-4920 5E SUPPORT FOR CALEA-PHASE III

This feature provides the 5ESS® Switch DCS with the TSI bridging capability for monitoring a subject's circuit switched voice (CSV) call content which is sent over a 5E trunk, call content channel (CCC) or circuit mode data to an external hardware delivery facility. The CCC interface is used to carry the subject and the

non-subject call content via the bridge in the speech-path. The delivery facility delivers the call contents to the monitoring agency.

99-5E-4923 MDR/CW/CF INTERACTION ENHANCEMENT (FAX RING)

This feature allows subscribers with both the multi-distinctive ringing (MDR) feature and the call waiting terminating (CWT) feature to better manage their incoming calls. MDR subscribers with two directory numbers (DNs) often associate a FAX line with one of the DNs. When an incoming call is made to that FAX line DN subscribers do not want to have any call waiting tones applied for the duration of that call. The call waiting tone will interfere with the FAX transmission and can cause the call to disconnect. The previous switch operation for MDR and CWT did not allow an option to suppress call waiting tones based on the called DN. This feature allows the switch to suppress call waiting for incoming calls based on the DN that was called. The subscriber can designate either the master or dependent(s) DN such that when there is an active call to that DN, the switch will not apply any call waiting tone treatment even though CWT is assigned to the subscriber.

In addition, MDR subscribers with FAX line service on one of the DNs often subscribe to a voice mail service as well. In order to prevent FAX calls from being forwarded, via call forwarding busy line (CFBL) and call forwarding don't answer (CFDA) to the voice mail system, this feature provides an option to restrict either the master DN or all dependent DNs from being forwarded via CFBL or CFDA.

99-5E-4978 CDMA UPWARD NEGOTIATION CAPABILITY

This feature allows a mobile switching center (MSC) to offer 13K service in response to an 8K or enhanced variable rate coding (EVRC) request from a dual mode mobile unit (8K/13K or EVRC/13K) when the MSC cannot allocate an 8K or EVRC vocoder.

The MSC's offer of a service option other than the one requested by the mobile unit is called service negotiation (SN). An MSC's offer of 13K service in response to an 8K or EVRC service request by a mobile unit is called upward service option negotiation (USON).

This is a CDMA-only feature, applicable to voice calls only.

99-5E-4979 PLAN R - A5 INTERFACE

A5 Interface feature is part of the IS634 compliant which allows other vendor's CDMA base stations to connect to a Lucent *AutoPLEX*® MSC for circuit data calls. This feature allows transmission of data octet stream with the following four service options: async 9.6, fax 9.6, async, 14.4 or fax 14.4 using ISLP (Inter System Link Protocol) protocol between the IS634 BS and MSC. It also provides intra-MSC intra-DCS S-type hard handoff for A5 interface (may between two IS634 BS or between IS634 BS and Lucent Cell).

This feature provides the allocation/deallocation of the A5 interface and call processing support of A5 interface carrying ISLP frames. The feature is similar to the *AutoPLEX*® Circuit Data Service except the circuit services uses a packet pipe interface between 5EDCS and the Lucent Cell whereas the IS634 A5 Circuit Data service uses an A5 ISLP interface between 5EDCS and IS634 BS. It also provides S-type hard handoff functionality. The handoff request (SWPATH) only involves connecting the existing IFRPH/IWF interface to one of the following interface:

- ☐ A new A5 interface when the MS is handing off to a IS634 BS.
- ☐ A new packet pipe interface when the MS is handing off to a Lucent Cell.

The IFRPH to IWF interface remains intact throughout the life of the call including handoff.

99-5E-4980 ICLID ON 4-WIRE SUBSCRIBER LINE -- DNU-S

The Four Wire Subscriber Features on DNU-S feature allows the same FX service to be provisioned on a

Digital Networking Unit □ SONET (DNU-S). The switch must support both the digital equivalent of ground start and loop start signaling to the DFI and DNU-S. The switch acts as the Foreign Exchange Office (FXO) and sends the same signaling and supervision signals as an FXO. To provision this, the switch allows a service class of 4WINDV to support additional INSTRSIG values of loop (LOOP) and ground (GRND) on the 1.6 and 28.2 Recent Change Line views. The switch continues to allow values of WINK, WNKDT, and DIALTONE (using standard A bit signaling). The 4WINDV line class of service applies to standard and loaded SMs only for Classic SMs as well as SM-2000 SM.

NOTE: ICLID on 4-wire subscriber lines will also work on a DLTU.

99-5E-7000 INCREASE DATA LIMITS FOR SELECTED TRAFFIC SECTIONS

This feature extends the collection limits of several selected sections of collected data from 32,000 Bytes to 390,016 Bytes while using the total space available within TRFC30 buffer. This feature will be dependent on 99-5E-4340 and shall not be installed without it.

The following section numbers can be candidates for expansion:

- SECTION 12 TG - Trunk Group
- SECTION 68 PSPH - ISDN Packet Switch Protocol Handler
- SECTION 77 DSL - Digital Subscriber Line
- SECTION 90 LINE - Per Line Measurements
- SECTION 139 IPIDB - Integrated Digital Carrier Unit PIDB
- SECTION 141 ILINE - Integrated Digital Carrier Unit LINES
- SECTION 143 IRT - Integrated Digital Carrier Unit RT
- SECTION 144 SG - Switch Group
- SECTION 145 LGC - Line Group Controller
- SECTION 217 AIULN - AIU Line
- SECTION 218 AIULC - AIU Line Card

RC/V views 13.7, 13.8, and 13.9 have been altered to provide for the administration of these sections. In addition, 13.4 has been modified to include SM number and LU number as the key and RC/V view 13.6 has been updated to allow selection of 24 study groups.

99-5E-7002 866, 855 TOLL FREE SERVICE

This feature enables the service provider's switch to process 866, 855, 844, 833, or 822 Service Access Codes (SACs) for toll-free services. No new provisioning is provided by this feature but the service provider must ensure that other nodes in the network will accept the new SAC code (that is, Signaling Transfer Points (STPs), Service Control Points (SCPs), switches, etc.).

When a number using the new toll free SAC is assigned, the switch will collect the digits, recognize the new SAC, use the new SAC to generate a SCP database query, recognize the responses (may include the new SAC), and route the call. In addition, the SAC may be outpulsed from a switch that is not an Service Switching Point (SSP). The SAC must be recognized and screened regardless of whether the subscriber dials the new SAC, the new SAC is returned from a database query, or the new SAC is inpulsed.

99-5E-7005 PHV WITH REX

This feature provides the ability to run Routine Exercise (REX) on active PHVs with or without a spare PHV circuit pack on the shelf. The feature will run diagnostics on a maximum of 6 PHVs for each REX pass.

The PHVs are REXed sequentially. First, the non-PHV types (PHAs) are removed and diagnosed followed by the PHV types. If a removal is unsuccessful, REX will leave the PHV in its original state (ACTIVE-IN-SERVICE) and will attempt to remove and diagnose the next PHV. If the PHV (channel group) is busy on a call, a campon (2 minutes) is done. For example, if shelf 0 has 1 PHV, shelf 1 has 6 PHVs, and shelf 2 has 3 PHVs, the PHV on shelf 0 is REXed first, followed by 5 PHVs on shelf 2. Then the REX session is ended because the maximum number of PHVs have been tested. When the next REX session starts, it picks up from where it left off and 6 PHVs are tested.

99-5E-7011 MULTISERVICE MODULE

The MSM feature incorporates the Remote Access Business Unit's (RABU) PortMaster 4 (PM4) functionality into the 5ESS[®] switch, providing Internet access through the switch. This feature enables the switch to become a bridge between voice and data networks, efficiently moving voice traffic and voice-related services over networks designed for data.

This feature supports any service on any port, at any time, automatically. When a switched call comes in on a single phone number or hunt group on any of its ports, the system intelligently determines the type of call [i.e., Integrated Services Digital Network (ISDN), ISDN data-over-voice, K56flex, or V.90 modem] and switches service on that port to accommodate the call. This capability enables the provider to always have the optimal network configuration as traffic patterns change throughout the day (from heavy ISDN use during the day to heavy modem access in the evening).

The MSM feature provides higher port density in a standard seven foot rack, resulting into greater revenue potential per square foot of floor space. It also delivers greater performance even under full load. The feature distributes multiprocessors for each slot enabling each card to make independent routing and forwarding decisions. As cards are added, processing power and service capacity are added.

With the MSM feature, service providers can offer Internet telephony, voice telephony over asynchronous transfer mode (ATM), ATM switching, Internet protocol routing, high-speed Internet access, xDSL, or modem pooling. For more detailed information regarding the MSM feature, refer to the Web site at <http://www.livingston.com>.

99-5E-7020 SUPPORT OF 15 DIGIT INTERNATIONAL DN AND 14 DIGIT NATIONAL

This feature enables the *AutoPLEX*[®] system to fully supports international directory numbers of 15 digits in length, and NSNs of 14 digits in length. For outgoing National Significant Number (NSN) calls, the *AutoPLEX*[®] system must support the ITU-T maximum of 15 digits, including the ability to perform digit analysis, routing, billing, signaling, etc. For incoming calls, the *AutoPLEX*[®] system must support the ITU-T maximum of 14 digits, including the ability to perform data base queries, billing, etc.

99-5E-7021 64 KBPS X.75□/X.75

This feature allows the ISDN X.75□/X.75 datarate to be either 56 kbps or 64 kbps. Historically, the superframe (SF) was used for the DS1 signal. When the SF is used, the 8th bits of the 6th and the 12th frames of each superframe were robbed to be used for loop-testing/signaling purpose. For correctly transmitting data, all the 8th bits were not used for data transmission. The data rate was 56 kbps. In order to achieve 64 kbps, the extended superframe (ESF) DS1 signal is implemented via the B8ZS signal, which provides the clear-channel.

In RC/V5.1, the attribute was set to 56 kbps for X.75 (Inter-LATA)/X.75□ (Intra-LATA) ISDN trunk groups. To comply with the X.75 and GR-301-Core, 64 kbps is allowed for the datarate attribute in RC/V5.1 for both X.75 and X.75□ trunk groups.

99-5E-7035 Secured Feature Activation

This feature provides an efficient and easy to use procedure to speed-up the secured feature application process in cases when a customer buys a feature for all of their switches. The procedure activates the secured feature with a common password.

Two new fields are added to RC/V view 8.22: MAP Z, which is for the company ID, and COPASSWD, which is the generated password. The company ID is determined by the customer and updated using the Office Data Base Editor (ODBE). When a customer wants to activate a secured feature ID (SFID) that they have purchased for all their switches, the MAP Z value is used. The Regional Engineer executes secured feature activation (SFAC) and requests the values for MAP X, MAP Y, MAP Z, and the SFID that is being activated. SFAC generates a password that is valid for all switches. The customer is then responsible for distributing the generated password to their switches.

99-5E-7082 USAGE SENSITIVE CALL FORWARDING (USCF)

The Usage Sensitive Call Forwarding (USCF) feature (99-5E-7082) allows customers to activate and deactivate the Business and Residence Custom Services (BRCS) Call Forwarding Variable (CFV) feature when needed. Customers can therefore use the CFV feature without the need of subscribing in advance.

Each time a customer uses the USCF feature to activate or deactivate (after previously being active) the CFV feature, an AMA record is generated. These AMA records allow service providers to produce billing based on feature usage, providing a much more flexible and user-friendly access to the CFV feature. This versatility to custom-design service offerings and billing adds another dimension to both marketing and strategic plans.

The USCF feature is a secured feature and a right-to-use fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-7085 RELEASE WITH CAUSE VALUE 1 FOR VACANT CODES

The Release with Cause Code Value 1 (ANSI[®]) for Vacant Number feature (99-5E-7085) is a modification of procedures currently used by the 5ESS[®] switch when a voice call is made to a vacant (unallocated) number. This feature changes which end office switch provides error treatment (from terminating to originating) when a voice call is made to a vacant (unallocated) number. This is not a secured feature.

This feature has a recent changeable option that activates/deactivates it on an office-wide basis. When the feature is activated, the terminating office sends a RELEASE message containing Cause Code 1 (ANSI[®]) to the originating office (subject to certain conditions). When the feature is deactivated, any procedures introduced by this feature will no longer apply.

When the Release with Cause Code Value 1 for Vacant Number feature is activated for a terminating end office, it allows that office to send a RELEASE message containing Cause Code 1 (ANSI[®]) (instead of connecting the calling party to blank number treatment) when all of these conditions apply:

- (1) The call is originated from:
 - (a) an analog line, or
 - (b) an ISDN line with a bearer capability of voice, speech, or 3.1 KHz audio.
- (2) The path between the originating and terminating end offices is 100% ISUP.
- (3) Location Routing Number (LRN) routing is used and the NP - Cause Code 26 (ANSI[®]) Suppression feature is on.

The RELEASE message is sent back toward the originating end office, intermediate offices simply pass the RELEASE message along, and when the RELEASE message is received at the originating end office, that

office provides error treatment (usually a connection to a tone or an announcement provided by the switch or an Automatic Intercept System [AIS]). For an ISDN voice caller, the RELEASE message is not passed to the CPE at that point. Normal procedures for releasing the CPE over the ISDN interface apply when the ISDN voice caller disconnects or the tone or announcement times out.

If, as a result of this feature, the terminating end office switch determines that it should send a RELEASE message containing ANS[®] Cause Code 1, the switch ignores other tone and announcement indicators that are set to Y.

There are no changes as a result of this feature to existing terminating end office error treatment procedures for:

- ☐ voice calls whose path from the terminating end office to the originating end office is non-ISUP or where interworking has occurred (not ISUP all the way),
- ☐ LRN calls that use Cause Code 26 (ANS[®]) procedures,
- ☐ and ISDN data calls.

The sending of a RELEASE message containing ANS[®] Cause Code 1 is the current procedure for ISDN data calls because tone and announcement do not apply to data calls. This feature only changes the procedures for analog and ISDN voice calls.

CAUTION: This feature is used in Canada's public switched telephone network only. It should not be used in the United States, where industry agreements and transparency issues preclude offices from releasing voice calls with Cause Code 1 (ANS[®]).

99-5E-7087 MULTILINE HUNT GROUP (MLHG) CAPACITY EXPANSION

The Multiline Hunt Group (MLHG) Capacity Expansion feature (99-5E-7087) expands the number of MLHGs allowed per office from 2000 to 8191. This includes CDX and VCDX offices. This limit of 8191 applies regardless of the number or type of SMs associated with the office. The current limit of 2015 members per hunt group continues to apply.

The MLHG Capacity Expansion feature is a secured feature (SFID 351) and a right-to-use fee must be paid to Lucent Technologies before enabling information is provided.

The MLHG Capacity Expansion feature is included in the 5E15 and later software releases.

99-5E-7089 CANADIAN 15D IDDD

Canadian telephone companies may not use equal access signaling for outbound international calls (IDDD calls outside World Zone 1). Instead, outbound international calls (both operator-assisted and direct-dialed) are routed via an operator system or toll switch using "traditional" or Feature Group C signaling. Many Canadian customers use 5ESS[®] switches as tandems to the operator systems with outgoing SS7 signaling over traditional trunks for these outbound international calls.

The 15-Digit IDDD for Canada enhancement feature supports non-equal access SS7 signaling of outbound international calls in two ways:

- (1) It extends the number of digits in the ISUP IAM Called Party Number (CdPN) parameter from 15 to 18 to handle a 011+CC+NN digit string.
- (2) It allows a 5ESS[®] switch end office to code the Nature of Address field in the CdPN parameter of the ISUP IAM correctly for international calls that are signaled using traditional FG-C (TRAD) SS7. Note that for a tandem office, the Nature of Address received in the incoming IAM is used in the outgoing IAM.

This feature does not make any changes to the digit analysis mechanisms on the 5ESS[®] switch, specifically it does not alter the either the number of incoming digits, nor the number of conflict codes defined on in an Local Digit Interpreter Table (LDIT). This feature assumes that the 5ESS[®] switch uses the IDDD digit analysis table for the analysis of called international numbers.

99-5E-7090 DISTINCTIVE CALL FORWARDING ALERT

This feature provides recall dial tone on an off-hook analog or ISDN line to alert the customer that a call forwarding variable (CFV) type feature is active. The recall dial tone consists of 3 bursts of 100 milliseconds on and 100 milliseconds off followed by steady dial tone.

Distinctive call forwarding alert is provisioned on the Call Forwarding Feature Definition form via a default (line) parameter field with a Yes (Y) or No (N) option. All lines with a CFV feature that have this parameter set to Y receive a recall dial tone upon going off hook when the CFV feature is active. If the CFV feature is not active, the switch provides normal dial tone when the line goes off hook.

99-5E-7112 WORLDCOM TRAF30 REPORT MODIFICATION

This feature allows the Service Provider the flexibility to set the collection and reporting interval for TRFC 30 report. The reporting interval can be set to 30 minutes or 60 minutes. The feature also adds two new counters and an additional field with the trunk group name to Section 12 of the report. With the addition of Trunk Group name field on the report it is more readable to the administration, providing an easy way for identifying trunk groups not only by numbers, but also by the names. In addition, the two new counts that have been added to the report are INSVC and OOS.

99-5E-7115 ASP ☐ MID-CALL EVENTS

The new capabilities provided by this feature allow Service Providers to create new services with AIN (or ASP) features on the 5ESS[®] Switch. The End User (or caller, or subscriber) of a service will only be able to invoke, or use, these new capabilities if and/or when the Service Provider decides to incorporate these capabilities in their AIN applications.

The ASP MidCall events feature allows the SCP to continue its involvement in a call by specifying that it is interested in being notified if certain call events are encountered during the stable state of the call. MidCall events are sent to the SSP in the Next Event List in a Request component with the Routing Component when the SCP is requesting the switch to complete a call. When the SSP receives a NEL with MidCall events, the switch will maintain the TCAP transaction with the SCP, carry the open transaction into the stable talking state of the call, and inform the SCP when the requested event is encountered. MidCall events are Request type events. That is, the SCP has to be informed when the event has occurred, and the switch waits for further instructions.

The MidCall events that the SCP can indicate to the switch and are supported by this feature are:

- ☐ O_Disconnect_Called - a Request
- ☐ O_DTMF_Entered - a Request

99-5E-7116 - DIAL CODE ACTIVATED TERMINAL MAKE BUSY FOR MLHG

This feature allows Analog MLHG members to activate make busy huntkeys - Member Make Busy (MMB), Group Make Busy (GMB), Stop Hunt (SH) - by using two dial codes: one code for activation and one code for deactivation. The dial codes used may be part of the Office Dialing Plan (ODP) or an Individualized Dialing Plan (IDP). This feature only applies to Analog MLHG members (ltm_type = LTM_OTHER). The use of Dial Code Terminal Make Busy for MLHGs feature is controlled by SFID 555. MLGH members that have huntkeys assigned as scan points cannot assign this feature.

99-5E-7118 AR/AC DESTINATION POINT CODE

The Automatic Recall/Automatic Callback (AR/AC) Destination Point Code feature changes how the Terminating Scanning Response messages are routed via the Signaling System 7 (SS7) network. Previously, the transaction capabilities application part (TCAP) Terminating Scanning Idle Response and Terminating Scanning Timer Expired Response messages were global title routed to the originating switch. When this feature is enabled, the terminating switch routes the messages using point code routing. The end user sees no difference in functionality.

The AR/AC Destination Point Code feature enhances the AR/AC feature such that if Terminating Scanning is requested by the originating switch, the point code and subsystem number of the AR/AC originating switch (received in the AR/AC TCAP messages from the originating switch) are stored, along with the platform point code associated with the platform (e.g. GSM/PSU, CNI) through which the message was received. These point codes and subsystem number are used for Point Code routing of AR/AC TCAP messages sent to the originating AR/AC switch during the AR/AC Terminating Scanning session. Any subsequent Terminating Scanning Idle Response or Terminating Scanning Timer Expired Response messages are now point code routed instead of global title routed.

NOTE: Even if this feature is not enabled and Originating Scanning is requested, the TCAP Originating Scanning Busy/Idle Response messages sent from the far switch would be point code routed as previously done. This feature only modifies the Terminating Scanning procedures.

The TCAP messages impacted are the:

- ☐ Terminating Scanning Idle Response
- ☐ Terminating Scanning Timer Expired Response.

99-5E-7121 Call Forwarding Don't Answer-Ring Control

This feature allows the subscriber to change the number of rings allowed before forwarding unanswered incoming calls. Call Forward Don't Answer (CFDA) - Ring Control (CFDA-RC) changes the end-user interface for the CFDA feature so that the end-user is prompted to specify the number of rings (rather than number of seconds) before the call is forwarded to voice mail or other locations. The Ring Control feature allows the end-user an interface to convert the number of rings to a CFDA TIMEOUT value to be stored in Recent Change in seconds.

NOTE: The CFDA-RC feature only *approximates* the number of rings before forwarding by assuming the average ring cycle time is six seconds. The CFDA-RC feature does not keep a count of the actual number of rings before forwarding.

99-5E-7124 NPA TO NPD TRANSLATION TABLE FOR E911 CALLS

This feature provides the capability to translate a 3-digit Numbering Plan Area (NPA) to a 1-digit Numbering Plan Digit (NPD) based on the received NPA instead of on a Trunk Group basis. This enables full use of Signaling System 7 (SS7), which can carry multiple area codes (NPAs), to interface to 8-Digit Centralized Automatic Message Accounting (CAMA) Public Safety Answering Points (PSAP).

PSAPs that support 10-Digit (or more) signaling do not require the translation table since they do not require NPDs as part of their signaling. Those interfaces receive the NPA and are not limited to the 1-digit representation of the NPA (the NPD) as the 8-Digit CAMA PSAPs.

99-5E-7127 PROXY DATABASE PHASE I

This feature introduces the initial environment to support a full copy of the 5ESS[®] Static ODD on the ASM processor. This feature introduces solutions for ASM DBMS initialization, ASM DBMS fault recovery, ASM ☐ AM/CMP/SMS synchronization to be able to support the copy of the 5ESS[®] ODD.

This feature introduces solutions to support fast read access to RC views and solutions to support SQUAL, an SQL (-like) interface, on top of the ASM RC front end.

This Feature also provides solutions to store and access non-5ESS[®] data in a user defined ASM database.

99-5E-7128 MSC INTERFACE FOR GEO LOCATION

This feature implements in the MSC the following capabilities:

- ☐ To provide Geo Location support via Wireless Intelligent Network (WIN) triggers
- ☐ To receive from the LAP the Mobile Station Location (longitude, latitude, etc.) information and forward this information to the IS41 network elements (HLR, VLR, etc.) or to a SS7 network via trunk ISUP signaling messages.

With this feature, service providers have the signaling capability required to develop and offer many location-based services to their customers.

99-5E-7130 THREE WAY CALLING ENHANCEMENTS

This feature is an enhancement to the Secondary Network Dial Tone Feature. This enhancement is intended to make existing features that use a second stage of dialing, more like the equivalent basic wireline features. This is done by giving the mobile user more control during the second stage of dialing. To provide this, in addition to the end-of-dial function provided by the existing feature, this feature adds the following capabilities for the mobile user:

- ☐ When in the second stage of dialing, this feature provides the mobile user the ability to flash exit digit collection and return to the previous state. Flash during the second stage of dialing was previously ignored.
- ☐ When in the second stage of dialing, this feature provides the mobile user a cancel capability. If the user should make a mistake while dialing, the user can press the cancel key (if one has been provisioned by the service provider). Receipt of this key by the DCS, triggers the cancel function. The cancel function erases the digit collection buffer. The user may then begin dialing again. Cancel was previously not supported during the second stage of dialing.

This feature also gives the service provider the ability to provision in the ECPC, the following parameters associated with the second stage of dialing:

- ☐ Permanent Signal Time (Range: 1-30 seconds)
- ☐ Inter-Digit Time (Range: 1-30 seconds)
- ☐ Cancel Key (Range: NONE, *,#,0,1,2,3,4,5,6,7,8,9)
- ☐ End-of-Dial Key (Range: NONE, *,#,0,1,2,3,4,5,6,7,8,9)
- ☐ Number of Digits (Range: 1 - 32 digits)

A value of "NONE" means that no key is defined for the Cancel or End-of-Dial function, therefore that function cannot be triggered for the current call.

99-5E-7131 INCREASE BUFFER FOR 5ESS[®] 30 MINUTE TRAFFIC REPORT

This feature extends existing PSUCHAN section and allows for the selection of more than 80 PHs for collection within this section. The number of PHs will be limited by space available in TRFC30 buffer and RC/V selectivity mechanism. With the deployment of feature 99-5E-4340, the total space available for

TRFC30 report will be 384KBytes.

Depending on the number of channels present in the certain PH, the customer will be able to select up to:

- ☐ 190 fully equipped PHs with 64 channels
- ☐ 320 fully equipped PHs with 32 channels
- ☐ 320 fully equipped PHs with 22 channels

The values above refer to overall ability of TRFC30 to collect data for PSUCHAN section within the TRFC30 buffer and does not specify physical amount of channels or protocol handlers available within the office. Since the space available within TRFC30 buffer depends on the number of other sections already selected for collection the number of PHs may be lower than presented in the table above.

99-5E-7133 TCP/IP INTERFACE FOR TRAFFIC DATA

This feature introduces the TCP/IP interface to transfer network management and traffic measurements data to external destinations, (that is, external OSSs) via the ASM. This feature enables the transmission of the Network Management (NM) and Traffic Measurement (TRFM) data from the holding buffers located in the 3B21D AM module or the DRM through the ASM into an external destination.

99-5E-7150 UCR MEASUREMENTS OF THE TRFC30

This feature adds the following measurements to Section 76 of the TRFC30 to measure Unidentified Call Rejection (UCR):

- ☐ # of Successful Activations
- ☐ # of Unsuccessful Activations
- ☐ # of Successful Deactivations
- ☐ # of Unsuccessful Deactivations
- ☐ # of Calls Rejected due to UCR

99-5E-7158 OFFICE TO OFFICE TESTING

This feature changes the output of Office to Office Testing interface from supporting a TEN (analog) only to supporting a DEN (digital) trunk appearance as well. This is required for switching replacements. This feature is required when using an analog to digital converter in place of the Analog Trunk Unit SN102 during OTO testing. This is required because the Analog Trunk Unit (ATU) and associated packs have legacy issues.

99-5E-7168 NP - DID PBX QUERY ENHANCEMENT 5E15 ROLL FORWARD

The NP - DID PBX Query Enhancement feature provides an office option controlled by an OFID that when set prevents NP queries from being launched for portable DID PBX DN associated with a HRI. When this OFID is not set (default) the existing NP functionality is followed.

99-5E-7172 ASP TIMEOUT ALARM

This feature provides a major alarm when time outs exceed a particular threshold previously set by the switch owner via RC/V. The alarm generated is a major alarm visible in the SSA. The alarm is recorded in the Read Only Printer (ROP).

Both the timeout threshold and the time interval are settable via RC/V. The alarm is generated at the end of

the settable time interval when the ratio of the number of timed out queries divided by the number of total queries exceeds the customer settable threshold. The time interval value can be set from 5 minutes to 60 minutes in 5-minute increments. The threshold value range is between 1% to 100% of timeout queries.

99-5E-7178 LTSB INTERWORK WITH HOME INTERCOM

This feature allows either the lead or the non-lead line (for 1-DN LTSB) to invoke a Home Intercom/Single Line Variety Package service. This includes Home Intercom Basic, Intercom Code Dialing, Selective Intercom Dialing, Selective Call Transfer, and Dialable Hold

99-5E-7183 ECHO CANCELLATION FOR CDMA FOR FMC

The Echo Cancellation (EC) on PHV4 feature provides echo cancellation function for EVRC and 13Kbps vocoders on PHV4. This feature eliminates the need to equip external echo cancellers thus reducing the cost of CDMA system to the service providers. This feature will only be activated on PHV4s that support CDMA 13K and EVRC calls. It supports up to a 64ms echo path delay. It does not support tone disabling or acoustic echo control.

This feature also provides the service provider with the capability to set the value gain or loss of the PCM input and/or output of the vocoder on a per office basis for CDMA 13K and EVRC calls. The gain or loss of the PCM input and/or output is basically the volume level of the voice in a receive or send direction from the vocoder. The volume level can be provisioned in a range of +12db to -12db and is independent of Echo Cancellation being on or off.

99-5E-7189 DF2 SUPPORTING SS7 LINKS TO LANDLINE SIGNALING POINT

This feature provides Signaling System 7 (SS7) Links to Public Switched Telephone Network (PSTN) with DF2 supporting the PH3 (or the newer PH22) on VCDX, CDX, and 5ESS[®]. This feature now only requires the support of DF2 with SS7 link to PSTN (landline side) on VCDX, CDX, and 5ESS[®].

99-5E-7207 3G-1X VOICE SERVICES FEATURE

This feature is a new technology that significantly increases the voice CDMA capacity across the standard 1.25 MHz CDMA carrier. The 3G-1X Voice feature evolves from IS-95 and IS-95B Standards. The 3G-1X Voice feature uses the existing 1.22 MHz, also known as 1.25 MHz, spectrum to lower the cost by efficiently using the air interface. The 3G-1X Voice feature provides the radio technologies to ease the introduction of the higher rate CDMA data services.

This feature is intended to provide the *FlexentTM* *AutoPLEX[®]* customer with a way to evolve to the 3rd generation (3G) technology while protecting their investments already made in the 2nd generation (2G) systems.

99-5E-7210 1000 BLOCK NUMBER POOLING USING NUMBER PORTABILITY

This feature provides local exchange carriers (LEC) a provisioning method to use in a thousand block number pooling environment. It is available beginning with the 5E14FR3 and later software releases. The feature is a secured feature with SFID 530.

The feature provides LECs the switch-based tools to establish their telephone number database in a pooling environment. In a pooling environment where a NPA-NXX may be shared by as many as ten LECs, one of the LEC switches must be designated the "Code Holder" for the NPA-NXX (10,000 numbers). Other switches sharing the NPA-NXX are designated "Block Holders". The code holder switch may also be designated a block holder for one or more of the thousands blocks of the NPA-NXX. With SFID 530, a Service Provider (SP) can designate switches as code holders and/or block holders.

In a pooling environment, an SP can only assign numbers to subscribers from blocks it is allocated. SFID 530 provides a method for the SP to designate those blocks it may use for number assignment (RESERVED) and those blocks it may not use for assignment (PORTED OUT). SFID 530 also provides

methods for the SP to designate hundreds groups and individual DNs as RESERVED or PORTED OUT. Providing these designations at the hundreds group and individual DN level allows the SP to mark ported out hundreds groups or individual DNs. These lower level designations also help to establish correct error handling in a number portability environment.

SFID 530 thus provides the SP with methods to:

- ☐ Designate switches as code holders and/or block holders;
- ☐ Mark thousands blocks RESERVED or PORTED OUT;
- ☐ Mark hundreds groups RESERVED or PORTED OUT;
- ☐ Mark individual DNs RESERVED or PORTED OUT; and
- ☐ Allow switches to provide correct error handling in a NP and number-pooling environment.

99-5E-7213 ISUP INTRA-MODULE LOOP AROUND TRUNKS FOR LDP ON 5ESS® SWITCH

This feature provides for ISDN Services User Part (ISUP) Intra-Module Loop Around Trunks. These trunks are needed when two applications are used on the same 5ESS® Switch and when loop around trunking for circuits is to be performed within a single SM-2000. This feature provides this capability for loop-arounds between the Local application and the Long Distance Platform (LDP) application as established using ISUP signaling.

This feature is primarily to support switch configurations that have only one SM, but can be used with multiple SM configurations. The operation of this feature applies to either an SM or an SM-2000 processor. Primary documentation for this feature set is shown in document 235-190-120.

99-5E-7242 LD CIC IN TERMINATING TANDEM

The LD CIC in Terminating Tandem feature allows the 5ESS® Tandem Switch to control the population of a Carrier Identification Code (CIC) on the terminating portion of an Inter-LATA call. When a call is passed from an originating end office to an inter-exchange carrier there exists the capability for the end office to pass the CIC in the normal signaling, thus identifying the inter-exchange carrier that will be handling the call. Once the inter-exchange carrier has control of that call, that carrier strips the CIC from the signaling because it is no longer a needed piece of information (that carrier knows its own identify). On the terminating portion of the call, the CIC remains unpopulated as it terminates throughout the remainder of that call model. Since the terminating Telco cannot identify the inter-exchange carrier for that call, the billing is performed via a "hand shake" agreement between the inter-exchange carrier and the terminating Telco as to that monies are to be billed to one another.

With this feature, the terminating end office can identify who the inter-exchange carrier actually was so that appropriate/accurate billing can be performed in a more mechanical and efficient manner.

99-5E-7245 AIU PER-LINE IMPEDANCE

This feature allows the assignment of a higher on-hook impedance to POTS lines served by an AIU. This allows products based on Derived Channel Technology to operate with the AIU POTS lines. The higher impedance applied to a line, increases the power dissipation in the unit.

99-5E-7247 ANNOUNCEMENT ON DETECTION OF NPA SPLIT

This feature provides an enhancement to 5ESS® Switch offices which are undergoing an NPA Split within their dialing plans. During an NPA Split, a 3-6 month permissive period exists, during which time, customers can dial both the old DN and the new DN, when placing a call. When this feature is active,

during this permissive period, and appropriate data provisioned, a customer dialing the old DN is routed to an announcement that reminds them that as of some given date, the old DN will transition to a new NPA. After hearing the announcement, the customer is then connected to the called party. At the end of the permissive dialing of an NPA Split, use of the old DN will result in a connection to an announcement informing the customer that the new area code is required for completing the call. The call is terminated and the customer must hang up and dial the new DN to complete the call.

NOTE: This feature is restricted to use in offices with SM-2000 configurations.

99-5E-7250 5E14 3B21D DISK CONFIGURATION

This feature increases the disk configuration layout on the 3B21D in the 5E14 release to a "2010" disk layout (2 GB on first base pair and 1 GB for second base pair). In addition, this feature supports a 2 GB disk configuration layout on all optional disk drives.

99-5E-7256 Renaissance - SM to SM-2000 Conversion

This feature provides a conversion procedure to upgrade the older Switch Module processors in a host office with the more powerful SM-2000 processor. Typically, 3 to 5 original classic SM processors can be displaced by one SM-2000, substantially improving the economics and performance of the office.

99-5E-7268 TBCT NOTIFICATION TO CONTROLLER

As an enhancement to Feature 99-5E-3261 (Two B-Channel Transfer [TBCT] on PRI), this feature sends notification to the controller when the transferred call is cleared. A non-call associated NOTIFY message is used. When the Notification to Controller feature is active, the switch assigns a Call Tag to the TBCT call at the time of transfer. This Call Tag is unique at the PRI interface serving the controller. If the multiple PRI option is subscribed, the Call Tag is unique across the PRI serving group. The switch retains an association between the Call Tag, the transferred call, and the controller's interface throughout the duration of the transferred call.

The base TBCT feature, 99-5E-3621, passed the number of active and available transfers to the controller in the DISCONNECT message. When this feature, 99-5E-7268, is active on the PRI group, the DISCONNECT message will also include the Call Tag assigned to the transferred call. The switch sends a NOTIFY message to the controller, when the TBCT transferred call clears. The NOTIFY message contains two notifications. One notification contains the Call Tag value to alert the controller that the TBCT call associated with the Call Tag has cleared and a second notification provides the updated number of active and available transfers on that PRI group.

The Notification to Controller feature is provided on a per PRI GROUP basis.

NOTE: Notification to Controller can be subscribed only if TBCT is active.

99-5E-7284 EASY ACCESS TO VOICE MAIL (EAVM)

The Easy Access to Voice Mail (EAVM) feature (99-5E-7284) simplifies message retrieval for Message Service System (MSS) and Interswitch Voice Messaging (ISVM) subscribers. EAVM allows MSS/ISVM subscribers to retrieve messages at their home phone line by dialing an access code, instead of a 7- or 10-digit access number. The EAVM feature is available to residential analog and ISDN lines.

NOTE: This feature cannot be used to retrieve voice mailbox messages from a non-MSS/ISVM line (for example, a coin-operated line or a charge-a-call line) or a line other than the MSS/ISVM subscriber's own home phone line.

The EAVM feature is included in the 5E15 and later software releases.

For more information on the EAVM feature, see 235-190-104, *ISDN Feature Descriptions*.

99-5E-7285 IDDD CITY CODE ROUTING ENHANCEMENT

This feature allows the service provider to use "IDDD Country Access Code" Recent Change view (9.6) to define routing information for International calls (IDDD) based on Country Code only, or based on Country Code and a one-to-seven digit City Code.

99-5E-7290 IS-53A PREFERRED LANGUAGE PHASE 1 ENHANCEMENT

This feature enables the subscriber to provide the recorded announcements in any four languages. This feature builds upon the feature 99-5E-4651, which provides the recorded announcements in only four languages: "Mandarin, Cantonese, English, and French." As in feature 99-5E-4651, only announcements triggered by the origination mobile are eligible for preferred language announcements.

99-5E-7301 PORT PCTFI FROM INTERNATIONAL TO NAR

This feature provides a generic (proprietary) internal interface for both line and trunk side applications that must be terminated by the 5ESS[®] from a variety of peripheral unit types and applications.

The PCTFI uses the PCT link(s) from the SM-2000 TSI to directly terminate a variety of peripheral unit types and applications onto the 5ESS[®]. The 5ESS[®] supports this interface by creating a "virtual unit" (in software) at the TSI. The customer terminations supported on this interface will appear at the TSI, on the PCT link.

The SM-2000 supports OAM&P for the PCT Link (PCTFI) interface to the peripheral unit. OAM&P for the peripheral unit may, or may not be, supported by the SM-2000 and is application dependent.

99-5E-7302 ASP TOLL FREE SERVICE INTERACTION WITH FLEXIBLE ANI FEATURES

The Advanced Services Platform (ASP) Toll Free Service Interaction with Flexible ANI Features feature is a special feature (SFID 528) that provides the functionality required for Pay Phone Compensation for Toll Free Calls and Enhancements to the FlexANI feature (SFID 332). This feature allows to "derive and map FlexANI II digits" based on carrier and CPST value returned by SCP in its analyze Route or Forward Call response for AIN TF and NTF calls. AIN calls use DNTs as AIN TollFree triggers via an attribute on RC View 9.35.

This feature interacts with the following "Flex-ANI features" on the 5ESS[®] Switch:

- ☐ Flexible ANI Information Digits Assignment and Flexible ANI Enhancements (SFID 38, 142)
- ☐ TollFree Calling Enhancement for Flexible ANi and Pay Phone Compensation for TollFree Calls (SFID 332).

99-5E-7303 SEMI-INTEGRATED NO TEST TRUNK BOX

This Feature provides the capability to support the No-Test Test Trunk (NTT) without requiring the use of an Analog Trunk Unit (ATU) and its associated circuit pack (SN107).

An external signaling converter connects to the 5ESS[®] Switch via a T1 digital interface (for signaling, control, and voice path connections to the test trunks), and via Metallic Test Buses (MTBs) (for metallic test access, two MTBs are provided per test trunk). This provides the identical interface to the end-user that test trunks equipped on an ATU do and at a level of transparency so that Line Testing Operation System users won't notice any operational differences between analog based or T1-based test trunks.

The Signaling Converter converts analog signals on a NTT to digital signals on existing T1 Extended Super Frame (24 channel) facilities. These facilities terminate on 5ESS[®] Switch digital trunk units DLTU and DNU-S. The Signaling Converter also terminates up to 12 MTB pairs. Each MTB pair is be associated with one, and only one trunk.

Control of the trunks and MTB pairs is accomplished via the Signaling Converter Control Trunk (SCCT) within the T1. The SCCT is the lowest assignable DS0.

The command scheme is transmitted over the SCCT. For T1's, DS0s are numbered 1 through 24. DS0 channel 1 is the SCCT. DS0s numbered 2 through 13 carry digitized sleeve lead signals. A single T1 supports up to 12 NTTs.

This SCCT is defined as a one-way outgoing trunk type from the 5ESS[®]'s point of view. MF signaling is used on the SCCT to issue commands to the signaling converter hardware. The protocol used on the SCCT uses digit strings to convey commands. These digit strings also indicate to which trunk the command applies. Commands are issued by the switch over this control channel.

99-5E-7304 NP-APPEND BAF MOD 164 W/CHARGEABLE ACCOUNT NUMBER TO CNA RECORD

The NP - Append Mod 164 with Chargeable Account Number to CNA AMA Record feature (99-5E-7304) was developed in two separate phases. The implementation during both Phase 1 and Phase 2 uses a new Secure Feature ID SFID 346.

In phase 1 when the SFID is enabled, all CNA BAF AMA CC720 base records populate Table 13 and 14 of Structure Code 0625 using the following:

With OFID 719 inactive, the following will be recorded:

- ☐ Record the SS7 CHG or MF ANI if received.
- ☐ Record SS7 CPN if the SS7 CHG or MF ANI are not available and the SS7 CPN was received.
- ☐ Record the Trunk Group BN if the SS7 CHG or MF ANI and the SS7 CPN are not available and the Trunk Group BN was received.

With OFID 719 active, the following will be recorded:

- ☐ Record Trunk Group BN received.

In phase 2 the switch provides a recent changeable parameter on a trunk group basis, an option for recording of a Chargeable Account Number in an appended BAF Module 164 for CNA records. If the CNA Module 164 Option is set to YES on a trunk group, and all other conditions for recording a CNA record are met, then EBAF Module 164 is appended and populated as follows:

- ☐ Record the SS7 RN if the call has been forwarded two or more times and the RN is received.
- ☐ Record the SS7 OCN if the call has been forwarded once and the OCN is received and the RN is unavailable.
- ☐ Record the SS7 CPN if received and the SS7 RN and SS7 OCN are unavailable.
- ☐ Record the SS7 CHG or MF ANI if received and the SS7 RN, SS7 OCN, and SS7 CPN are unavailable.

If none of the SS7 parameters are received, then no module 164 will be appended to the CAN AMA SC 0625.

In Phase 2 when the SFID 346 is enabled the base CNA BAF AMA CC720 base records will populate tables 13 and 14 of Structure Code 0625 using the following:

With OFID 719 inactive, the following will be recorded:

- ☐ Record the SS7 CHG or MF ANI if received.
- ☐ Record the SS7 CPN if received and SS7 CHG or MF ANI are unavailable.

With OFID 719 active, the following will be recorded:

- ☐ Record Trunk Group BN if received.

99-5E-7321 GETS EGRESS QUEUEING AND OFFICE QUEUEING

This feature provides two enhancements to the GETS capabilities:

- ☐ GETS Office Queueing - This capability provides office-wide GETS queueing without having to specifically identify and provision individual trunk groups with GETS queues.
- ☐ GETS Egress Queueing - This capability provides GETS queue coverage, on an office-wide basis, for calls attempting to terminate to a private facility. It provides a better probability of completion to a GETS call which has fought its way across a congested or damaged network so that it does not necessarily die if the outgoing PF/PRI trunk group has no idle member.

The use of HPC Network Capabilities is restricted in the United States and U.S. Territories to National Security/Emergency Preparedness (NS/EP) users authorized by the Office of the Manager, National Communications Systems (OMNCS). Service provider deployment of these HPC Network Capabilities must be co-ordinated with the OMNCS at the following address:

Office of the Manager
National Communication System
Attn: GETS Program Office
701 South Courthouse Road
Arlington, VA, 22204-2198
email: gets@ncs.gov

99-5E-7326 ASM/PDS COMMUNICATION

This feature is the first step in consolidating maintenance features of the 5ESS[®] switch and the Packet Driver Solution within the 7R/ETM. This feature provides the initial infrastructure to consolidate management of these platforms. The first application that makes use of this infrastructure is consolidated alarm summary status reporting (See feature description 99-5E-7332). Later applications are planned that will further integrate alarm reporting and control capabilities for both systems and provide some alarm correlation capabilities.

99-5E-7332 PD SUMMARY ALARMS ON ASM

This feature allows the 5ESS[®] (ASM and 3B) to show the summary alarm status of the Packet Driver (PD): normal, critical, major, or minor alarm. When the PD experiences an alarm, an alarmed message is sent to the 5ESS[®] ROP (either ASM or 3B) which causes the network operation center operation system to light an indicator on a wall screen and on a technician console. The ASM Global Summary Page will display the summary alarm status of the 5ESS[®] and PD. The 3B ROP interface is for the PD application to interface with legacy OSS, which does not have TCP/IP interfaces.

99-5E-7336 RECENT CHANGE TRANSLATION PROTECTION FOR HIGHLY CRITICAL ELEMENTS

This feature provides protection against the accidental and/or erroneous update or removal of data that has been identified, by the operating companies during provisioning, as critical to the operation of the 5ESS[®] Switch.

The following set of Recent Change Views have been identified as needing new critical data indicator fields: Routing views 10.2, 10.3 and 10.4, Essential Service views 9.40 and 9.41, and Office Parameter views 8.1 and 8.49.

This critical data indicator field would be used to identify a view instance/field that, if updated incorrectly or deleted accidentally, could cause service interruption. The field is required and defaults to a value of 'N'. The customer will be responsible for indicating that updates to fields in a specific view instance may be service impacting by setting this field to 'Y'.

The CRIT IND field on view 10.2 is checked by the Digit Analysis views 9.2, 9.3, 9.5, 9.6, 9.9 and 9.15, and Routing views 10.10 and 10.25. These views contain a Route Index (RTI) field. When a Route Index is marked critical on view 10.2, RC will block the attempted update of the RTI field on the Digit Analysis views and the Routing views. Likewise, the customer will not be allowed to delete a view instance that contains a RTI that is defined as critical on view 10.2.

NOTE: Routing view 10.25 will become a verify only view in 5E14(1) and therefore will no longer be impacted by this feature.

99-5E-7345 ACCESS INTERFACE UNIT □ HARDENED EXPANSION (HEAIU)

This feature provides the same capability as 99-5E-3560, Expansion Access Interface Unit (EAIU), but packaged in a hardened case. The feature provides the capability of providing more Access Interface Unit (AIU) on a 5ESS® switch's SM-2000. This is accomplished by providing a new Comdac (RCOMDAC) for the AIU so it can interface with a 5ESS® switch using DS1 facilities provided by the DNU-S or DLTU2. The EAIU utilizes all AIU application packs, both existing and those still to be developed.

99-5E-7346 SWITCH BASED DIRECT ACCESS LINK (DAL)

This feature allows Direct Access Link (DAL) originated calls to be processed "on-switch", using Long Distance Platform (LDP) basic and ANI table call processing capabilities. This allows service providers the flexibility to produce DAL calls without interaction with the Service Control Point (SCP).

99-5E-7356 SOFTWARE TRANSITIONS + AFT STANDING FEATURE FOR 5E15

The AFT feature provides a Recent Change/Verify text interface software translation mechanism that allows the service provider to retrofit the 5ESS® Switch to the new software release while the supporting RC operating system (OS) remains on the previous software release. For example, a 5ESS® Switch may retrofit from 5E14 to 5E15, while the supporting OS remains on the software supporting the 5E14 release.

The 5E15 Software Transitions feature provides the software and procedures to perform software release retrofits, large terminal growths, and software release updates.

99-5E-7370 CUSTOMER RECENT CHANGE INPUT FOR CRITICAL TRANSLATION

This feature requires an additional critical data remark field for Recent Change Views 10.2, 10.3, 10.4, 9.40 and 9.41.

The critical data remark field allows the customer to input additional information in a comment field that clarifies the important nature of the data. The contents of the critical data remark field is displayed as part of a message sent to the Read Only Printer (ROP) when the critical data indicator field is changed from a value of "Y" to "N" or when the modification of critical data without updating the critical data indicator field results in an error. The critical data remark field along with the critical data indicator field is displayed on the Recent Change Terminal Screen when the warning message appears due to an attempt to change the critical data indicator field from a value of "Y" to "N".

Feature 99-5E-7370 sends the error message produced by feature 99-5E-7336 to the ROP. It displays the critical data remark field as part of a message sent to the ROP when the critical data indicator field is changed from "Y" to "N". It also displays the critical data remark field, along with the critical data indicator

field, on a separate screen when the critical data indicator field is changed from "Y" to "N".

99-5E-7381 TYPE 1/2A/2B CMC ID ENHANCEMENT

This feature operates under its own unique secure feature ID (and does not eliminate three existing features), and combines the capabilities of (1) Feature 99-5E-1081 (Type 2A for MF), (2) Feature 99-5E-2540 (Type 2A for SS7 and Type 2B for MF and SS7, and (3) Feature 99-5E-2725 (Type 1). Prior versions of these three features each only supported up to 60 CMC IDs, while the new feature supports up to 1,023 CMC IDs. Thus feature 99-5E-7381 supports:

- ☐ Type 1 Wireless Service Providers AMA Recording (via PF trunks) for up to 1,023 CMC IDs (introduced by 99-5E-2725, but limited to supporting only up to 60 CMC IDs in 99-5E-2725),
- ☐ Type 2A Cellular interconnection for MF trunks for up to 1,023 CMC IDs (introduced by 99-5E-1081, but limited to supporting only up to 60 CMC IDs in 99-5E-1081), and
- ☐ Type 2A and Type 2B Cellular interconnection for SS7 trunks and Type 2B Cellular interconnection for MF trunks for up to 1,023 CMC IDs, (all introduced by 99-5E-2540, but again limited to supporting only up to 60 CMC IDs).

The SFIDs for features 99-5E-1081 (SFID 128), 99-5E-2540 (SFID 160) and 99-5E-2725 (SFID 167) must be activated either prior to the SFID for feature 99-5E-7381, or at the same time as the SFID for feature 99-5E-7381. Purchasing feature 99-5E-7381 entitles the customer to activate the SFIDs for 99-5E-1081, 99-5E-2540 and 99-5E-2725. The SFID for feature 99-5E-7381 is 538.

99-5E-7382 *AutoPLEX*® FACILITY IDENTIFIER (AFAC ID) VALUE INCREMENT

This feature changes the range of the AFAC id value from 1 to 4080 through the RC/V interface.

RC/V view 20.24, "Digital Networking Unit Sonet Virtual Tributary (SM2000)," has been modified to extend the range of an AFAC ID of a DS1 on a DNU-S. Likewise, RC/V view 20.4, "Digital Line/Trunk Unit Pack Equipment: has been modified to extend the range of an AFAC ID of a DS1 on a DLTU. The previous range was 1 to 1023; now the range is 1 to 4080.

99-5E-7382.A *AutoPLEX*® FACILITY IDENTIFIER (PHASE 2)

The AFAC ID is a number used to distinguish DS1(s) associated with *AutoPLEX*® facilities (example: a DS1 to cell site) from DS1(s) associated with non-*AutoPLEX*® facilities (example: a DS1 to a PBX). If an alarm occurs on an *AutoPLEX*® DS1 facility, the DCS notifies the ECP with a message containing the AFAC ID. The ECP removes the facility and any associated trunks from its in-service list. The ECP displays the out-of-service status of the AFAC ID on an ECP MCC page.

Because the DCS can now support a large number of DS1s, the first phase of this feature, 99-5E-7382, expanded the AFAC ID value from the 1023 to 4080. The second phase of this feature, 99-5E-7382.A, expands the AFAC ID value from 4081 to 4500. Feature 99-5E-7382.A also provides a new I/O command to convert the AFAC ID to a FAC number and vice versa.

99-5E-7390 DIGITAL AUDIO LEVEL CONTROL W/TDMA VOCODERS IN THE SWITCH

This feature updates Recent Change view 8.56, to be more user friendly. View 8.56 is an existing view, which is used in wireless TDMA vocoder relocated offices, to update PHV echo canceler parameters. View 8.56 also allows a TDMA vocoder relocated customer to update digital audio level parameters for speech handler trunks on an office basis.

99-5E-7390.A DIGITAL AUDIO LEVEL CONTROL WITH TDMA VOCODERS IN THE SWITCH

This feature gives customers control over the digital audio parameter levels. The control can be accessed

by the customer using the Recent Change View 8.56.

99-5E-7393 RTCD MULTIPLE BILLING RECORD

This feature provides a count of the total number of records generated for a call, and provides a count indicating the relative sequence (e.g., 2 out of 5) of the record in the record stream. The counts are to be inserted into AMA Module 960 and into RTCD Table C.42 (the Correlation Parameter fields).

99-5E-7395.A TSI NAIL-UP OF CONSECUTIVE DS0S FOR DNU-S

The Time Slot Interchanger (TSI) Nail-up of Consecutive Digital Signal Level 0s (DS0s) for Digital Networking Unit-Synchronous Optical Network (DNU-S) feature (99-5E-7395) allows Intra-/Inter-Switch Module (SM) Dual-Digital Data Service (DDS) nail-ups between:

- ☐ a TR-303 on DNU-S line and a DNU-S trunk
- ☐ a TR-303 on DNU-S line and a Digital Line and Trunk Unit (DLTU/DLTU2) trunk

Dual-DDS nail-ups are nail-ups in which two time slots (DS0s) are used per end of the nail-up. One of the time slots is designated as the primary and the other time slot is designated as the secondary. The primary time slot carries data while the secondary time slot carries error correction information. The primary time slot must always precede the secondary time slot in any frame; therefore, frame integrity is essential. Double buffering is required to maintain frame integrity for Dual-DDS nail-ups.

Dual-DDS service is provided between TR303 lines hosted on a DNU-S and any digital trunks, assigned on consecutive OEs within the same Digital Signal Level 1 (DS1), terminated on any SM-2000 in the office. The trunk can be hosted by both DLTU/DLTU2 and DNU-S. Routing of Dual-DDS service is not allowed between a TR303 Remote Digital Terminal (RDT) hosted on a DNU-S and a TR303/TR08/PUB43801 facility on an Integrated Digital Carrier Unit (IDCU).

99-5E-7404 ASP AMA RECORDING FOR ABANDONED STOR CONNECTIONS

This feature supports the recording for the interactions between Intelligent Peripheral (IP) and caller for caller abandoned calls during STOR connection. This feature allows the switch to create an AMA record for calls that allow the caller to interact with an IP, but do not actually route calls.

99-5E-7412 VOCODER HUNTING ENHANCEMENTS

Service handler (vocoders and AMPS Data Trunks [ADTs]) are a limited pooled resource due to real time hunting limitations. This feature improves the hunting of the limited service handler resource for both TDMA VIS and CDMA service handlers. When a call comes in on a packet pipe, the switch looks for an idle service handler on the same PSU as the packet pipe. If there is no idle service handler of the service type needed (such as 8K, etc.), then routing will hunt other connected PSUs for an idle service handler. Due to real time limits, routing can only hunt a limited number of PSUs. For this reason, a call may fail to find an idle service handler, even though there may be idle service handlers of that type in the switch. A new relation has been created to indicate which PSUs are equipped with which service handler types. With this new relation, hunting will skip a PSU if there are no service handlers of that type equipped. This makes hunting more effective in finding an idle service handler of a specified type.

99-5E-7420 HANDOFF TO THIRD PARTY

The Handoff to Third party feature provides support for the ANSI-41 path minimization function that involves the Handoff to Third INVOKE and RETURN RESULT messages. The principle purpose of the Handoff to Third operation is to reduce the number of inter-MSC trunks used between the anchor MSC and target MSC. The 5ESS[®] switch supports inter-vendor trunk (IVT) S-type handoff.

99-5E-7423 FLEXENTTM A2 INTERFACE DATA RATE ENHANCEMENTS

This feature supports the 64 Kbps data rate on *Flexent*TM A2 trunk groups in addition to 56 Kbps.

99-5E-7427 INHIBIT DELETE ON ROUTE INDICES

This feature provides the ability to incorporate an additional level of security for lines terminating to a route index that are designated critical by the customer. Recent Change cross checks have been included to disallow deletions on lines secured by this feature. An error message will be returned to the user upon each invalid deletion attempt. The error message will contain corrective details for actually deleting the services.

This feature requires a check of the status of the INHIBIT DEL field on View 1.6 before allowing a deletion to occur. If the field is set to Y, the deletion will be blocked and an error message is sent indicating for which field the crosscheck failed. If the field is set to N, the deletion will continue.

99-5E-7431 PBX CALLING ID

This feature allows the use of the (existing) MAIN DN field on the Trunk Group RC view 5.1, previously used only for PRI originations, to also be used as the Calling Party Number (CPN) for originations from an associated Private Facility (MF/DTMF) Trunk Group. This CPN is used for delivery to Calling Number Delivery subscribers and for placing the Calling Party Number parameter in an outgoing SS7 trunk, and for all feature interactions where a Calling Party Number is used (e.g., ASP and LASS features). The existing PRI procedures for determining whether the Presentation of the CPN is Restricted or Allowed are used.

The PBX Calling ID feature can be enabled by a craft person using SFID 550 assigned to the feature. When the feature is enabled, the MAIN DN field on the Trunk Group view (5.1) can be populated for a Private Facility Trunk (PF, PFLASH, PFITT) group from which a call can be originated.

99-5E-7447 CALL WAITING TONE ENHANCEMENT FOR FORWARDED CALL-CALL SCREENING

The Call Waiting (CW) tone enhancement for Forwarded Call-Call Screening (FCCS) feature allows the FCCS subscriber to receive CW tones during the Monitor Phase when Call Waiting Terminating (CWT) is assigned to the line. The FCCS subscriber will have the option to ignore the CW tone or to answer the CW call via flash-hook. The flash-hook will put the monitored call on hold and allow the FCCS subscriber to talk to the call waited party. The FCCS subscriber will not be allowed to intercept the monitored call when a Call Waiting call has been offered to the subscriber.

99-5E-7452 SUPPORT FOR PREFERRED TERRESTRIAL CIRCUIT IN IOS ENVIRONMENT

When an A2 or A5 trunk is requested for call origination (ECPC request from DCS), the base station may request a specific trunk group (preferred trunk group). If this value is populated, the 5ESS[®] switch DCS attempts to allocate it first; if the trunk group and member requested is not available, the next attempt(s) are made using the ECP provided trunk group list.

The Support for Preferred Terrestrial Circuit in IOS Environment feature is planned to be available for the 5E16.1 and later software releases.

99-5E-7453 IOS V3.1 - SUPPORT FOR ALL CIRCUITS

This feature allows service providers to connect IS-634 compliant other vendor Base Stations (OVBS) to a Lucent MSC. A2 and A5 circuit management for OAM messages are carried out through an A1 interface between the MSC and the IS-634/CDG OVBS. Previously, each circuit management message only specified one circuit at a time, represented as the circuit identity code (CIC). The "All Circuits Support" feature is an Inter-Operability Standard (IOS) feature that modifies certain circuit-related messages between the IOS Base Station and the MSC. The "All Circuits" feature allows the block, unblock, and reset circuit messages to specify the following options:

- ☐ a range of circuits
- ☐ a bitmap specifying the affected circuits

- ☐ all circuits for a base station.

99-5E-7463 ONE-WAY AUDIO DETECTION TOOL

The feature helps to detect faulty PHV4 hardware used in the 5ESS[®] DCS for CDMA and TDMA applications using vocoders on the switch that may cause or contribute to connections that result in one-way audio. The tool, Built In Self-Test for the Vocoder (BIST), provides the customer with the ability to automatically test the vocoder for a faulty condition before the end customer calls to report a one-way audio failure.

This feature also introduces customer control of Acceptable Bit Error Rates (ABER) on speech handler trunk groups. The three parameters required for all digital tests run on AMPS or wireless trunks that are provisional by the user for Speech Handler tests are:

- ☐ duration of the test (1-3600 seconds)
- ☐ block size of the digital bit stream used in the test (1-64000)
- ☐ the acceptable BER (0-7) expressed as negative exponent (e.g., a value of 4 indicates an Acceptable Bit Error Ratio (ABER) is 10 to the - 4 or 1 error in 10000.)

When the software exercises the vocoder internal test, each SH trunk is briefly taken out of the pool of SH trunks that serve *AutoPLEX*[®] calls. The BIST routine takes around 1/2 second per trunk to execute, it is done on an SM basis so that on a given SM, the vocoders are selected and BIST executed one trunk at a time.

99-5E-7463.A ONE WAY AUDIO DETECTION TOOL PHASE II

This feature gives the customer a tool to simulate sending voice over a Speech Handler trunk. The new PVELBK test (PHV Voice Encoding Loopback Test) is similar to the existing 102-LB test. The PVELBK test sends the PCM tones to the PHV vocoder which encodes the signal into CDMA/TDMA packets which are looped back into the vocoder for decoding into PCM tones before being sent back to the GDSF/TTF for analysis. The test analyzes the results and gives a PASS, Marginal, or FAIL Assessment based on thresholds set in RC/V view 14.12.

99-5E-7469 CONNECTING PREPAID CARD PLATFORM (PPC) TO THE 5ESS[®] NETWORK EDGE

This feature is being provided on a 5ESS[®] Switch End Office with National ISDN PRIs serving a PBX or external platforms. When the new field provided on RC/V View 5.1 set to "N" (the default) for the PRI trunk group, calls terminating to that trunk group will behave the same way they always have, namely this feature is not activated and all SETUP messages do not contain the newly defined Informational Element for II/OLI information. When this field is set to "Y", and the II/OLI information is available and valid for this call, the outgoing SETUP message will include the new IE for II/OLI information.

99-5E-7473 RATE AREA INCREASE

This is a secured feature with a SFID of 561. This feature increases the range of RAX from 1-99 to 1-999. This enables the 5ESS[®] switch to service wider geographic areas and simplifies data administration by using one RAX per geographic served rate area. Additional RAX are needed to align 5ESS[®] translations with the served Rate Areas specified by state and local tariffs. These tariffs define the charges that apply to the codes dialed by each line. The RAX field is used in 5ESS[®] to identify digit analysis and screening tables associated with lines.

99-5E-7475 DAS INCREASE

This Feature increases the number of Digit Analysis Selectors in the Office Dependent Data (ODD) to a maximum of 254.

99-5E-7486 CNA CC720 MODIFICATION

This feature provides, on a per-switch basis, an option for recording a Carrier Identification Code (CIC) received in incoming signaling in Table 57 of the CNA AMA records. This option is a Secured Feature (SFID 533).

From a call processing perspective, only Equal Access (EA) MF or ISUP signaling is involved. For calls received over ISUP trunk groups the CIC code, if any, present in the Transit Network Selector (TNS) parameter of the IAM is passed to the AMA subsystem for inclusion in the CNA AMA record. For calls received over MR trunk groups, the CIC, if any, present in the first stage of EAMF signaling is passed to the AMA subsystem for inclusion in the CNA AMA record. It should be noted that this is likely to occur only for Equal Access (EA) signaled calls incoming over TTOLLCON trunks marked for CNA recording.

From an AMA perspective, if this new SFID is "active," and all other conditions for recording a CNA record are met (i.e., COND or UNCOND CNA OPTION along with SFID 180 "active" and a call is received over the incoming trunk group) then when a CNA CC720 record is generated the IC/INC Prefix (reference LSSGR Table 57) is populated with the received CIC for an incoming call. In this case, character 5 of table 57 is set to value 2 or 5 in accordance with existing procedures depending upon whether or not the CIC represents a FG-B or FG-D carrier. Calls received via non-equal access signaling will not contain a TNS parameter or XXXX code, so table 57 will be zero filled in these cases.

99-5E-7489 STOP DMQ MESSAGE FOR SMs

This feature provides a single input message (STP:DMQ,SM=sm#) that can stop all processes currently running or waiting on the SM specified. The present method is to issue a Stop (STP) command for every circuit on the DMQ.

99-5E-7495 AUDIBLE CALLING NAME ON *69 (AUTOMATIC CALLBACK)

The Audible Calling Name on *69 feature modifies the existing 2-Level Automatic Callback (AC) feature. When the Audible Calling Name on *69 feature is active and an end-user with access to 2-Level AC dials the 2-Level AC number or depresses the ISDN feature button for AC, the user will hear the name associated with the last incoming call, followed by the existing initial 2-Level AC announcement. The name will be provided by an Intelligent Peripheral (IP).

All 2-level AC invocations for which the last calling DN would be included in the initial DSU2-RAF/SAS announcement (i.e., does not apply when the DN is marked private or is not present) results in the switch initiating a call to the IP DN with the DN of the last incoming call (from the Incoming Line History Block) as the calling party number. This call is expected to result in a talk path being set up to an Intelligent Peripheral, which has a Calling Name feature assigned and which will speak the name (received in an incoming message from the switch over the BRI or PRI) associated with the DN of the last incoming call, and then immediately release the call. After the release is detected, 2-Level AC proceeds with the existing 2-Level initial announcement followed by existing 2-Level AC processing.

99-5E-7500 AMA MODULE 104 DIRECTION INDICATOR SUPPORT

This feature is an enhancement to Automatic Message Accounting (AMA) for cases where the Bellcore Trunk Identification Module (Module 104) is appended to existing AMA records. This feature adds a direction indicator to the information provided in Module 104 to indicate whether the trunk in question is incoming or outgoing. The enhancement that this feature provides is a simple incoming/outgoing direction indicator in the first character of the Trunk ID field (Table 244) of Module 104. A value of 1 indicates incoming trunk group; a value of 2 indicates outgoing trunk group. This feature is a Secured Feature (SFID 565) and is dependent on feature 99-5E-4498, Local Trunk Billing Enhancements (also a Secured Feature SFID 278).

99-5E-7502 PER USE TWC WITH CALL TRANSFER

This feature provides a limited transfer capability to users of the existing USTWC features when these features are provided by the Service Provider and are turned on for the end user. The existing USTWC capabilities are retained. Thus, the controller on a USTWC conference can still drop the last party added by doing a switch hook flash.

99-5E-7512 FORWARD TRAFFIC CHANNEL DTMF FOR CDMA EVRC

This feature exists in the Reverse Traffic Channel but not in the Forward Traffic Channel. In the case of the 13K vocoder, it is robust enough to support DTMF Tone Signaling BOTH in the Reverse Traffic Channel and in the Forward Traffic Channel. The ANS[®]/TIA/EIA-95-B standards support DTMF Tone Signaling both in the Forward Traffic Channel and in the Reverse Traffic Channel.

This feature implements DTMF Tone Signaling in using the CDMA Air-Interface with EVRC vocoders in the Forward Traffic Channel for Wireless Local Loop (WLL) and PCS subscribers.

99-5E-7533 FLEXIBLE DNIS

This feature enhances the Phase II DNIS (Dialed Number Identification Service) feature known as "Transport of Original Dialed Number" (Feature Number 99-5E-4208.A). The Flexible DNIS feature works with the AIN 0.1 protocol to expand AIN Toll-Free services. The feature allows the Long Distance Platform (LDP) switch to identify the contents of a AIN 0.1 Generic Address List (GAL) parameter value contained in an SCP TCAP response message as DNIS digits. These DNIS digits are then forwarded through the network and delivered to its associated Private Branch Exchange (PBX). The Flexible DNIS feature is not available for NS800 triggers and its associated AIN 0.0 protocol.

99-5E-7537 PHV5

PHV5 is a new downloadable vocoder board that will reduce the COGS and increases the capacity of CDMA 5ESS DCS system. PHV5 supports up to 64 voice channels and 32 low speed data channels simultaneously or it can support up to 64 high speed data channels. The PHV5 supports all the features that are currently supported on PHV4.

The PHV5 is planned to be available for the 5E16.1 and later software releases.

99-5E-7537.A PHV5 SHADOW FEATURE

The PHV5 Shadow feature (99-5E-7537.A) is a PHV5 enhancement per these existing features: One Way Audio Phase II (99-5E-7463.A) and 3G-Voice (99-5E-7207), Shut Off Phases for the Forward Dual Tone Multi-Frequency (FDTMF) feature (99-5E-7512) and the IS-634 A5 Interface (ISLP) feature (99-5E-4979).

The important thing to note about this feature is that Forward Dual-Tone Multi-Frequency (FDTMF) feature (99-5E-7512) is no longer supported. This feature was designed for Wireless Local Loop (WLL) and mobile subscribers, and was driven by the ECP on a per call basis. Forward DTMF was supported on both PHV3 and PHV4s with EVRC vocoders.

The **NON-SUPPORT** of FDTMF is handled as below for PHASE 1 of the feature:

- ☐ Phase I: (part of this feature) - A WARNING message will appear

WARNING: FDTMF NO LONGER SUPPORTED whenever the EVRC image, in field PHV4 EVRC IMAGE of Recent Change and Verify (RC/V) screen 8.75, is chosen, which includes FDTMF. If a call is attempted with FDTMF enable tone detection parameters set, the call will complete, but a FAIL_X message will generate with the following parameters:

- ☐ Type = CCAINVMSG=8, /* Invalid messages */

- ☐ Rsn = CCSFEATUREOFF=115, /* Requested Feature is not turned on */
- ☐ Rslt = CCNOCHANGE=4,

The PHV5 Shadow feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-5E-7537.B CDMA 3G-1X HIGH SPEED DATA ON PHV5

The CDMA 3G-1X High Speed Data on PHV5 feature (99-5E-7537.B) depends on the PHV5 base feature (99-5E-7537) which introduces the new PHV5 hardware.

The 3G-1X (3rd Generation) High Speed Packet Switched Data (3G-1X PD) services feature provides a subscriber with the ability to transmit bursts of data up to the raw speed of 153.6 Kbps over a packet data network via a 1.25 MHz CDMA air interface. Prior to this feature, CDMA data services were limited to speeds of 9.6Kbps or 14.4 Kbps. Currently this is supported on a PHV4 which supports 20 high speed packet data trunks with 10 bursts (forward and/or reverse). This feature allows the 3G-1X High Speed Packet data on a PHV5, supporting 20 high speed packet data trunks with 20 bursts (forward and/or reverse). In order to achieve the higher burst capability, the office must be engineered properly with the correct allocation of packet pipe timeslots and FRBC timeslots to support the traffic requirements.

The CDMA 3G-1X High Speed Data on PHV5 feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-5E-7555.B PDS OAM&P INTERFACE VIA OLM/ASM

The PDS OAM&P Interface Via OLM/ASM feature provides the PLS3.0 OAM&P interface.

99-5E-7555.D CCS MAINTENANCE TOOLS FOR BICC

This feature enhances the CCS maintenance work for VTOA to include:

- ☐ Incoming BICC Call Instance Code (CIC) query
- ☐ Outgoing demand BICC CIC query
- ☐ Outgoing periodic BICC CIC query
- ☐ Mechanism to send blocking/unblocking for BICC CICs
- ☐ Mechanism to send blocking/unblocking for BICC CICs
- ☐ End-to-end test calls
- ☐ IWG Loopback Test Call

This feature also adds the 108 test call facility using the TST:PATH command.

99-5E-7564 HIGH AVAILABILITY ASM

This feature increases the reliability of the ASM by providing a high availability ASM, which includes two processors: active and standby. The ASMs will be connected through multiple private network paths. Loss of one ASM or detection of other fault conditions triggers a switch to the other processor.

99-5E-7567 ORIGINATING AR/AC DESTINATION POINT CODE

The Originating AR/AC Destination Point Code feature modifies the Automatic Recall and Automatic Callback (AR/AC) features at the originating 5ESS[®] switch in an AR/AC session to send all AR/AC TCAP messages following the Initial Query message using Point Code routing. Without this feature, messages following the Initial Query TCAP message use Global Title Translation (GTT) routing (customers who are billed for SCP queries prefer Point Code routing over GTT routing, which may require an SCP query).

99-5E-7568 ASP EXTENDED TSTRC TIMER

This feature provides the following two capabilities:

- ☐ Change the maximum value of the TSTRC field on view 8.49 to a maximum of 300 minutes.
- ☐ Allow the addition of a new parameter, TSTRC, in the STR message. When the STR message contains a Destination Address parameter (indicating that an IPe connection is to be established) and when the TSTRC parameter is also present, then the TSTRC timer value used for the connection is that of the TSTRC parameter.

If the TSTRCTimer is not present in a STOR message, or if it is present and the feature is locked, then the value for the STR connection is used from the value of the TSTRC field on RCV 8.49.

If the TSTRCTimer is present, but its value is invalid, then the error is treated as a fatal unexpected data value error and reported to the SCP and the call is killed.

If a valid TSTRC parameter is included in an STR message which does not contain a DestinationAddress parameter, then it is ignored.

99-5E-7571 XAIU BROADBAND

This feature provides the XAIU the expanded capability to include broadband circuit packs -- the AFM pack and the ADSL packs in the application slots of the BAIU subrack.

With this feature, the type of signals each hardware component handles includes:

- ☐ Subscriber data - The XAIU handles ADSL data from a subscriber.
- ☐ Clock pulses- The BB XAIU does not change the timing or synchronization.
- ☐ Control messages - The XAIU handles ADSL control messages from a subscriber.

99-5E-7577 TTY/TDD FOR TDMA

This feature provides the modifications of the TDMA ACELP vocoder software to incorporate TTY/TDD algorithm. The ability to provide access to services for the hearing/speech impaired community is mandated by FCC rulings as well as by the Americans with Disability Act. This feature is a reliable mechanism for providing this access without great impact to the TDMA system.

This feature reduces the expected character error rate experienced by a TTY/TDD user from roughly 15% to effectively 0%, and therefore complies with both the FCC and the legislative mandates.

99-5E-7578 ASP CDP TRIGGER ON PRI TRUNKS

This secured Advanced Services Platform (ASP) feature is an enhancement to the ASP Subscribed Originating Line Triggers in feature 99-5E-3846. With this feature, ISDN Primary Rate Interface (PRI) trunk members, that are Individualized Dialing Plan (IDP) members, are allowed to encounter ASP Custom Dialing Plan (CDP) triggers.

The ASP CDP trigger is defined and detected on PRI trunks in the same manner as the CDP trigger is

defined and detected on lines and on Private Facility (PF) trunks. The Advanced Intelligent Network (AIN) Service Control Point (SCP) Transaction Capabilities Application Part (TCAP) query population and also the post-query call processing are not changed or impacted by this feature.

99-5E-7582 UUCP SUPPORT AM

The *UNIX*[®] to *UNIX*[®] Copy (UUCP) support on the AM feature implements a subset of the UUCP functionality on the *UNIX*[®]-RTR system running on the 3B21D computer. The UUCP support on the 3B21D is interoperable with UUCP running on a traditional *UNIX*[®] system such as SUN. The UUCP suite of tools provides commands that may be used to transfer files between two *UNIX*[®] systems and request remote systems to execute commands on their behalf. The possible uses for this feature are: Automatically sending files, such as SU packages, from a *UNIX*[®] system to the 3B21D or transmitting a request from a *UNIX*[®] system to the 3B21D to have routine administrative or bookkeeping commands executed. As part of the UUCP on the AM feature, the following commands are provided: uucp, uux, uuname, uustat/uulog, uucleanup, uuccheck and rmail.

99-5E-7588 ASP TAT FOR TRUNK GROUPS

This feature allows the 5ESS[®] switch to provide an ASP trigger for calls that terminate to designated Private Facility (PF), Primary Rate Interface (PRI), and PBXDID trunk groups. The feature provides incremental functionality to that provided in Advanced Services Platform 0.1B with the Terminating Attempt Trigger (TAT) which only provided the assignment of a trigger to Directory Numbers associated with equipped lines. This feature extends that same capability to private trunk groups with the new Terminating Trunk Group trigger (TGT). When a call is routed and encounters a trunk group on which the TGT is assigned, a Termination Attempt Query will be sent to the SCP, thereby enabling invocation of services on behalf of the PBX.

The feature also provides the ability to monitor for Network Busy, TBusy, T_NoAnswer, T_Answer, and Term_Resource_Available conditions under the following conditions:

- ☐ When an Authorize_Termination is received in response to the Termination_Attempt query for TGT triggers.
- ☐ When an OfferCall is received in response to a T_Busy message (in this case, T_Busy can not be monitored).

99-5E-7590 REROUTE-ON-RELEASE (ROR)

This feature is a capability that allows a call to be rerouted if unavailable routes are encountered in the call path. After a call arrives at a switch, the switch determines the outgoing route chain and searches for an available route up to the Route Search Limit. As part of existing switch functionality, all possible outgoing routes out of the downstream switch office (primary and SCP alternate routes) would be searched. If the switch is unable to locate an available route (at this downstream switch), the downstream switch sends a RELEase message (with Cause) to the upstream switch.

If the upstream switch receives a RELEase message, the Cause value is checked to determine if the "Reroute-on-Release" capability applies. That is, if the Cause value is "armed" (provisioned) for Reroute-on-Release. If the Cause value is "armed" for Reroute-on-Release, the upstream switch continues searching its route chain, where it left off, for another route. This occurs independently of the original routing method used on the call (for example, non-ASP, ASP routing).

99-5E-7598 USAGE SENSITIVE SIX-WAY CALLING (USSWC)

This feature allows end-users to make three- to six-party calls on a sporadic and spur-of-the-moment basis without requiring the line subscription to a Multiway feature. Users are billed for the service on a "per use" basis, also known as a usage sensitive basis. The customer using the USSWC feature perceives no

difference in the operation or functionality of service, from the way the flat-rate version of the Conference Calling Six-Way service works. Only the way in which it is invoiced by the service provider is different.

The USSWC feature is a secured feature and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-7604 TALKING CALL WAITING ☐ INTERLATA CALL ENHANCEMENTS

The Talking Call Waiting (TCW) ☐ InterLATA Call Enhancements (99-5E-7604) feature allows the following:

- ☐ InterLATA Intelligent Peripheral (IP) calls to be routed to an office wide carrier, ignoring the subscriber's Presubscribed InterLATA Carrier (PIC).
- ☐ InterLATA Toll IP calls to be routed via the Local Exchange Carrier ignoring the subscriber's Presubscribed InterLATA Toll Carrier (PTC). (Requires that ICLATA (SFID 149) also be turned on.)
- ☐ InterLATA IP calls to be routed via the Local Exchange Carrier (LEC), ignoring the subscriber's Presubscribed InterLATA Local Carrier (PLC). (Requires that Alternate Local Service Provider Route (SFID 269) also be turned on.)
- ☐ The option to suppress the billing record generation for all calls to the IP.
- ☐ The IP call, the TCW DN1 and TWC DN2 to be used as the billing DN.

The TCW ☐ InterLATA Call Enhancements feature is a secured feature (SFID 558) and a right-to-use fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-7607 REMOTE FEATURE CONTROL (RFC)

Remote Feature Control (RFC) for Call Forwarding is a 5ESS[®] switch DCS and *FlexentTM AutoPLEX[®]* IS-41 feature, which provides the mobile subscriber with the ability to activate/deactivate, features from a mobile or PSTN phone. This feature uses SAS announcements and will allow dial-through so the user can start dialing digits during (or after) the announcement. The 5ESS[®] switch DCS can break the announcement and begin collecting digits or continue the announcement and collect digits depending on new parameters received through messages from the ECP for this feature.

99-5E-7612 SCHEDULE GENERIC BACKUP PROCEDURE

The Schedule Generic Backup Procedure feature (99-5E-7612) provides customers with the ability to administer an automated system backup directly from a Maintenance Control Center (MCC), Supplementary Trunk Line Workstation (STLWS), or remotely from a Switching Control Center (SCC) using a craft input message interface.

The craft input message interface allows the customer to:

- ☐ Specify options for an automated system backup
- ☐ Schedule an automated system backup
- ☐ Output information about scheduled automated system backups
- ☐ Unschedule an automated system backup

This feature provides new processes on the AM to perform system backups. This feature is not associated with, and does not impact, the existing Generic Backup (GENBKUP) process.

The Schedule Generic Backup Procedure feature is planned to be available for the 5E15 Feature Release

4 (FR4) and later software releases.

99-5E-7618 ADVANCED SERVICES PLATFORM UNRESTRICTED FCD TRIGGER

This feature provides an "unrestricted" version of FCD triggers to end users. Unlike the existing FCD triggers, the unrestricted FCD triggers are not subscribed on a per line (or per PF trunk) basis. They are useful for providing "popular" AIN services where every line/PF-trunk is a potential user.

This feature allows every line/PF-trunk to access AIN services made possible by unrestricted FCD triggers. In addition, this feature provides capability of blocking all (unrestricted FCD) triggers or selected (unrestricted FCD) triggers by those users who do not want to access specific services by inadvertently dialing a trigger code.

99-5E-7623 LEAS DIALED-DIGITS EXTRACTION CAPABILITY

This feature provides Law Enforcement Agencies (LEAs), such as the FBI, the ability to receive the digits dialed by a subject when connected to another Telecommunications Service Provider (TSP's) service for processing and routing of a call origination. For example, when the subject dials an 800 number to access a long distance carrier, and then, after connecting to the long distance carrier, dials the telephone number that represents the ultimate destination of the call, the DCS extracts the digits dialed by the subject after cut-through to the TSP and sends them to the ECP, so that they can be sent to the LEA over the CDC in a Dialed Digit Extraction message.

99-5E-7655 RTCD RECORDING OF ASP MODULES

This feature is a billing feature that supports the recording of 15 modules that are comparable to the modules that can be appended to the AMA ASP records. The following modules can be appended to the RTCD record type 56 with this feature:

- ☐ 5021 ☐ Carrier Access Module
- ☐ 5023 ☐ WATS Module
- ☐ 5025 ☐ Circuit Release Module
- ☐ 5027 ☐ Business Customer ID Module
- ☐ 5029 ☐ Alternate Billing Number Module
- ☐ 5030 ☐ Translation Settable Module
- ☐ 5040 ☐ Digits Module
- ☐ 5070 ☐ ISDN Core Module
- ☐ 5071 ☐ ISDN Abbreviated Core Module
- ☐ 5104 ☐ Trunk Identification Module
- ☐ 5125 ☐ Interconnection Timing Module
- ☐ 5164 ☐ E.164/X.121 Number Module
- ☐ 5290 ☐ Resource Timing Module
- ☐ 5307 ☐ Line Number Module
- ☐ 5338 ☐ Service Provider Information Module

In addition, this feature will remove the capability to append the Originating ANI (Module 5803) to the RTCD record type 56. Module 5307 can be used as a replacement to Module 5803.

99-5E-7657 ALLOW MTB CONNECTION AND TAP100 ON THE EAIU

This feature provides a line testing configuration for (remote) EAIUs that supports the assignment of both a Metallic Test Bus (MTB) from the host Modular Metallic Service Unit (MMSU) to the EAIU and a Test Access Pack located in the EAIU. The TAP pack is used to serve all line testing requests from the Trunk and Line WorkStation (TLWS) interface and the MTB is used to serve all testing requests from external line testing equipment that use the No-Test-Trunk or the IMLT (Integrated MLT) interface. The combination of the Test Access Pack and an MTB is also supported when the TAP is assigned to a group of EAIUs in a daisy chained fashion; the MTB wiring must be daisy chained across the same group of EAIUs that are assigned to the Test Access Pack.

99-5E-7673 CNI CONVERSION TO SS7 IN WIRELESS ENVIRONMENT

This feature provides the capability for an existing DCS to use an SS7 PSU signaling platform instead of the CNI signaling platform to communicate with the ECP and PSTN. Although the SS7 PSU signaling platform may have been equipped before the introduction of this feature, it would only have supported PSTN trunking local to the Global SM to which it was provisioned. Now it is possible to transport messages in any switching module provisioned in the DCS to/from the Global SM. Thus, a single GSM can now replace CNI as the SS7 signaling interface on the DCS.

99-5E-7682 - EAIU WITH EMERGENCY STANDALONE CAPABILITY

This feature allows the EAIU to continue limited call processing if the primary communication links (T1s) to the host switch are severed for any reason. Call processing is limited to emergency numbers such as 911. Calls are limited to emergency numbers and line-to-line (within the AIUs in ESA mode serviced by the same BZ-RS). Other calls are routed to announcements. If the 5ESS[®] switch detects a failure in both primary links, the 5ESS[®] switch automatically switches into ESA. The EAIU automatically restores to normal operation when the first primary link restores to normal.

New hardware, the BZ-RS module, serves as a temporary host switch. A miscellaneous cabinet collocated with the EAIU contains the BZ-RS module. The first 2 T1s of each EAIU connects through the BZ-RS module. The BZ-RS module may have a T1 trunk facility to the Public Switched Telephone Network (PSTN) for 911 connectivity. The BZ-RS module contains the announcements for ESA operation.

The BZ-RS has a separate Element Manager (EM) system, which must be located on the host site.

99-5E-7686 - ON-HOOK DATA TRANSMISSION WITHOUT POWER RING

The On-Hook Data Transmission Without Power Ring feature (99-5E-7686) signals to loop transmission equipment, such as Digital Loop Carrier (DLC) systems, both integrated and universal, via an Open Switching Interval (OSI), that an on-hook transmission path to the analog customer's terminal should be established by the DLC. The switch generates the OSI prior to sending the FSK data. This only occurs when FSK data is being sent down the line when (1) the line is on-hook and (2) when the line is not going to be rung. For instance, the Calling Number Delivery feature sends FSK data to the CPE in on-hook mode but the line is rung prior to sending the FSK data, so the OSI is not needed.

The On-Hook Data Transmission Without Power Ring feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7693 HIGH WATER MARK (PO PERCENTAGES) IN TRAFFIC REPORT OF 5ESS[®]

This feature adds two new measurements to the TRFC30, SECTION 66 report:

- (1) The maximal AP Processor percent occupancy value that took place during the TRFC30 interval, (this occupancy will be scanned every 6 seconds), and

- (2) The time the maximal occupancy was noted.

99-5E-7712 - DELETE CONSTRUCTED FEATURES VIA AUDIT TOOL

This feature allows the user to remove unused Business and Residential Customer Services (BRCS) Constructed Features from RC views. Before deletion or removal, this feature first checks the BRCS constructed feature usage to ensure there is no possibility of deleting a feature that is assigned to a subscriber. It also prevents the customer from deleting preconstructed features (for example, /CFV). Do not run the audit tool during a system retrofit and do not assign constructed features while the audit tool is running.

99-5E-7716 ISUP Mobile-Mobile Looparound Trunks

This feature allows a service provider to use ISUP Mobile-Mobile Loop Around Trunks, intra-module as well as inter-module. Since the loop around trunk can originate and terminate on the same Switching Module (SM), this feature will work in a switch having only a single SM. It also allows the use of Mobile-to-Mobile loop around trunks at a remote switching module without the need for extensive intermodule trunking facilities.

99-5E-7727 XAIU MEDIUM TRAFFIC CONFIGURATION OPTION 2

This feature provides the associated development, documentation, and testing effort required for a 4 unit 6 TSGRP XAIU configuration.

99-5E-7728 TALKING CALL WAITING (TCW) WITH CIDCW

The Talking Call Waiting (TCW) With CIDCW feature (99-5E-7728) is a secured option on the existing Talking Call Waiting feature (99-5E-4605) that modifies the operation of TCW so that when CIDCW is assigned with TCW, in addition to the switch providing the SAS+CAS tones and the caller ID information to the subscriber's CPE via the CIDCW feature, the switch also briefly connects the TCW subscriber to an Intelligent Peripheral (IP) for an announcement which is expected to be the voiced name of the call waiting party.

Thus the subscriber receives the caller ID information of the waiting party in two ways. Both as a display on their Caller ID display where they can receive either the name, the DN or both the name and the DN of the waiting party (which of the three delivered is based upon provisioning on the subscriber's DN), or a text-to-speech voiced name of the waiting party.

The original TCW feature without this optional feature will attempt to provide the caller ID information via the CIDCW feature. If that is successful, that is all that is provided. If the switch recognizes that the CIDCW feature failed to deliver the caller ID information to the subscriber (that is, the subscriber's CPE failed to send the switch an acknowledgment to the SAS+CAS tones), then the switch would provide the TCW voiced name of the waiting party.

Thus without optional feature 99-5E-7728, the subscriber receives the caller ID information in only one way, and normally that would be by the CIDCW display. This optional feature is especially useful when the Caller ID display is built into the handset of the phone. The subscriber will determine the identity of the waiting party without taking the handset from their ear. But since many CIDCW CPE keep a list of DNs that have called, the list will also be available for later use.

This feature is a special feature (SFID 579). This feature is dependent on feature 99-5E-4605, SFID 331.

The Talking Call Waiting (TCW) With CIDCW feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7741 FRPH AND IFRPH ON PH22

The FRPH and IFRPH on PH22 feature (99-5E-7741) is a new frame relay protocol handler (FRPH) and ISDN frame relay protocol handler (IFRPH) which has the capability to reduce COGS and increase the capacity of the CDMA and TDMA PSU2 5ESS[®] Switch DCS. When used as an FRPH, the PH22 will be able to service up to 64 PPs of 1 DS0 size and supports up to 240 simultaneous (Rate Set 1) voice call legs 1. The PH22 circuit pack will support the existing FRPH functions of the base CDMA and TDMA VIS features.

The FRPH and IFRPH on PH22 feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-5E-7763 ISUP INTER-DCS AND INTER-MSC TRUNKS

This feature allows a service provider to use ISUP trunks between two Digital Cellular Switches (DCSs) on the same ECP (inter-DCS), and between DCSs on different ECPs Inter-Mobile Switching Center (inter-MSC). For NAR, the ISUP trunks in a 5ESS[®] DCS use ANSI[®] ISUP.

99-5E-7776 SIGNALING ONLY GSM FOR 5E DCS

This feature allows the wireless customer who uses PSU for SS7 signaling to choose a Maximally Reliable Configuration (MRC) for the Global SM. When MRC is chosen, non-signaling hardware is not allowed on the GSM. This reserves the GSM for signaling only, thereby isolating it from possible failures due to call processing functions. When the MRC is not chosen, the GSM can be used just like any other SM for call processing.

99-5E-7780 TRUNK GROUP REGISTER EXPANSION

This feature introduces the new section TGN of TRFC30 traffic measurements report. This new section consists of the same set of counters as section TG (sections 12 and 41). The difference between TG and TGN is in the counter precisions. The new section has the double precision counts. The advantage of TGN section is that it was developed in TDC architecture and the component selectivity for this section was introduced as well.

To avoid a problem with compatibility of 5ESS[®] switch with external OSSs, sections 12 and 41 are still supported. Which sections to take into collection are determined by the customer through the SFID activation/deactivation mechanism, however only one of them (TG or TGN) can be allowed for collection at a time.

99-5E-7781 NON-RESTRICTIVE ANI OVER PRIVATE FACILITIES

This feature allows service providers to provide the delivery of 10-digit ANI over a private facilities trunk without having to assign a Private Facilities (PF) or Automatic Route Selection (ARS) feature to their originating subscribers. The new feature removes the restriction that originating subscribers must access the private facilities via a PF or ARS feature. The feature uses the existing Automatic Number Identification (ANI) Over Private Facilities (PF) functionality (feature 99-5E-0699).

99-5E-7787 FURNISH AMA RECORDING FOR ABANDONED STOR CONNECTIONS

This feature creates an AMA record for calls that are abandoned before the Intelligent Peripheral (IP) operation completes and thus before a true call-related AMA record is made. The duration of the IP connection is measured and recorded in the Resource Timing Module 290, which may be appended to a 220 record for originating call model triggers, or a 221 record for terminating call model triggers. A Furnish_AMA Information component and other optional AMA information may be received from the SCP and included in the record.

99-5E-7796 DISTINCT RELIABLE SM (DRM)

This feature is a 5ESS[®] switch remote switching architecture module, based on the VCDX 5ESS[®] switch. It is connected to the 7R/ETM 5ESS[®] Switch *OneLink Manager*TM Administrative Services Module (ASM).

The DRM feature addresses that configuration of the network for which all voice and user data traffic at the remote is confined within the area near the remote switching equipment. DRMs may be deployed in the same manner as other remote SMS provided they do not share hardware with any other network elements, but can share administrative and maintenance functions and resources in order to minimize the cost to the customer. The DRM exists with existing 5ESS[®] switch modules such as SM-2000. The DRM is based on the VCDX, with numerous enhancements. Two of these enhancements are:

- ☐ the SUN workstation must be a Netra-t 1120,
- ☐ the operating system for it is Solaris 2.6.

99-5E-7797 DOUBLE PACKET SWITCH UNIT (DUAL PSU) PACKET BUS

The Double Packet Switch Unit (Dual PSU) Packet Bus feature (99-5E-7797) allows a second PSU to be installed in and supported by a single SM2K. Both PSUs on the SM2K must be PSU2s (mode/version 2). The logical distinction of second PSU2 allows their independent operation and accessibility through the same SM2K. The second PSU2 supports wireless CDMA (Code Division Multiple Access) or TDMA (Time Division Multiple Access) applications.

The Double PSU feature for CDMA, or TDMA, allows the second PSU2 referred to as PSU2(1) to be housed in the same bay as the first PSU2 referred to as PSU2(0) or in a separate bay. When housed in the same bay, the second PSU2 can be installed into the remaining empty shelves unused by the first PSU2. This configuration will significantly increase the call capacity as compared to the single PSU configuration.

When the second PSU2 is housed in a separate bay, up to the maximum increase in capacity can be attained since all five shelves are available to be grown into. It is important to note that the second bay can be located next to the first bay or cross aisle.

The Double Packet Switch Unit (Dual PSU) Packet Bus feature is planned to be available for the 5E16.1 and later software releases.

99-5E-7800 CARRIER COMPARE FOR VPN

This feature (OFID 980) allows "digit routing" whenever possible, thereby providing greater efficiency and flexibility in routing long distance calls. Prior to the introduction of this optioned feature, VPN processing required routing out of the switch using RC/V view 10.3, CARRIER ADMINISTRATION, following a SCP query response. Enabling OFID 980 allows the service provider to route a call using carrier compare functionality. Carrier compare functionality allows a call to be routed per digit analysis using the DAS and SCR fields of the LDP Carrier Table or LDP CARRID entry (provided a match with the carrier exists). Carrier compare routing is limited to trunks provisioned on a per carrier basis.

NOTE: The Carrier Compare for VPN feature only applies to PRI (EDSL and EDSLHM) trunk classes. All other existing VPN trunk classes currently execute carrier compare functionality.

99-5E-7804 TCP/IP FOR SCCS/NFM

The TCP/IP For SCCS/NFM feature (99-5E-7804) provides customers with a TCP/IP link for the SCCS channel off the ASM that could be used by the NFM to allow for faster retrieval of 5E fault and alarm data.

This feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7807 DYNAMIC ALLOCATION OF VOCODERS ON PHV5

The Dynamic Allocation of Vocoders on PHV5 feature (99-5E-7807) provides the capability of run-time selection of vocoder algorithms for CDMA vocoder pools. Formerly, service providers had to monitor vocoder usage and make manual adjustments to obtain the correct vocoding algorithms when changes

occur in the traffic pattern.

This feature is dependent on the PHV5 base feature (99-5E-7537) and new DSP algorithms.

The Dynamic Allocation of Vocoders on PHV5 feature introduces a new SH Channel (SHC) trunk group vocoder CEV13 type of service. A SHC trunk group member of CEV13 vocoder service type can service a 13 Kbps QCELP call or EVRC call.

The Dynamic Allocation of Vocoders on PHV5 feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-5E-7822 TCP/IP FOR SCCS/NFM

The TCP/IP For SCCS/NFM feature (99-5E-7804) provides customers with a TCP/IP link for the SCCS channel off the ASM that could be used by the NFM to allow for faster retrieval of 5E fault and alarm data.

This feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7825 AIN PING RING IN A FORWARD_CALL SCP RESPONSE MESSAGE

This feature provides a ping ring indicator in a Forward_Call message by using a new value of 068 in the PassiveLegTreatment parameter. When the Forward Call message is received with this value, it is an indication to ping ring the customer that detected the ASP terminating trigger. Ping ring is applied to both analog and ISDN ports in the same manner as the ping ring is applied via the CFV feature.

It is important to note that Ping Ring is not able to be supported simultaneously on the same call with distinctive ringing. The SCP needs to decide which type of ringing is appropriate to apply to the call and signal it accordingly via the PassiveLegTreatment parameter.

The AIN Ping Ring in a Forward_Call SCP Response Message feature is a secured feature (SFID 593) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-7831 FCCS ENHANCEMENT

The FCCS Enhancement feature allows a subscriber to monitor the most recently forwarded call without the calling party's knowledge and to intercept the call or allow the call to be answered by the Forward-to DN (assume VMS). This feature provides an answering machine equivalent service and maintains voice mail parity. The subscriber is then able to monitor and intercept calls that are forwarded by the Call Forwarding Don't Answer (CFDA) and the Call Forwarding Busy Line (CFBL) features.

The subscriber is able to toggle (activate/deactivate) the CS feature using a pre-defined CSTOG dial code if it is assigned to the line. Once the feature is activated by the subscriber, if the call is forwarded from the subscriber's line by CFDA or CFBL and is available for CS, the subscriber is provided with CS alerting. The CS subscriber is then able to initiate monitoring and interception. The subscriber can deactivate the CS feature at any time using the same pre-defined CSTOG dial code.

This feature provides a CS announcement to be heard (if available) when CS status is toggled by dialing the appropriate pre-defined dial code.

In addition the user is able to activate and deactivate Call Forwarding Don't Answer (CFDA) and Call Forwarding Busy Line (CFBL) using dial codes. The user is also able to specify through a dial code, the approximate number of times their phone should ring before the call is forwarded to the Voice-Mail System (VMS).

The FCCS Enhancement feature is planned to be available for the 5E16.1 and later software releases.

99-5E-7851 INCREASED DISK SPACE FOR BILLING

The Increased Disk Space for Billing feature (99-5E-7851) increases the ASM disk space for AMADNS for

large capacity configurations.

This feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7854 PACKET PIPE (PP) ENGINEERING ENHANCEMENTS

The Packet Pipe Engineering (PPE) Enhancements feature increases the number of call legs carried by a packet pipe. This feature is the result of a better understanding of the traffic carried over the PPs. This feature can be activated on an office wide basis. The PPE Enhancement feature is similar to the Packet Pipe Optimization feature in that service providers must examine their office engineering and make any necessary PP and PH4 adjustments before activating the feature to avoid potential overloading of FRPH. For the service providers who would like to gradually reengineer their PPs and FRPHs, a CTS settable ODB flag is provided to disable the PP RC/V provisioning checks. However, it is the responsibility of the service providers to re-engineer the PPs and FRPH to save facility costs and at the same time avoid overloading of FRPH. This feature is supported on FRPH based either on PH4 or PH22.

99-5E-7872 G.168-2000 COMPLIANCE AND ACOUSTIC ECHO CANCELLATION ON PHV5

The G.168-2000 Compliance and Acoustic Echo Cancellation On PHV5 feature (99-5E-7872) provides ITU-T Recommendation G.168-2000 Compliant Electrical Echo Cancellation and Acoustic Echo Cancellation on CDMA PHV5 vocoders. This feature can only be activated if the 5ESS[®] Switch has PHV5 and a CDMA only secured feature. The feature is designed to support a set of echo cancellation related features:

- ☐ Electric Echo Cancellation (EEC) - Electric echo is heard by the local user due to poor impedance at equipment interface points (hybrids) resulting in a portion of the transmitted signal being reflected back. The echo is cancelled on a PHV5 using ITU-T recommendation G.168-2000 Compliant Electrical Echo Cancellation (EEC). Although echo cancellation is used on PHV4, it is not compliant with the G.168-2000 standard.
- ☐ Acoustic Echo Cancellation (AEC) - Acoustic echo is produced when sound from a mobile's station speaker is acoustically fed into the mobile station microphone. The result is that the far-end user hears an echo.
- ☐ Automatic Gain Control (AGC) - This functionality boosts low level signals coming from the network to compensate for surrounding noise. It is also used to reduce very high speech signals.
- ☐ Noise Suppression (NS) - This functionality reduces the background noise found in the reverse link (mobile-to-land) mobile speech path environment by filtering it.
- ☐ Noise Compensation (NC) - This is the application of a gain to the forward-link speech path proportional to the noise level found in the reverse-link direction.

This feature also supports a maximum tail delay of 64 ms on each of the 64 channels. Tail delay is the round trip delay measured from the echo canceler to the landline hybrid and back to the echo canceler.

The Acoustic Echo Cancellation for PHV5 feature (AEC) is designed to adapt more quickly than the Echo Cancellation for PHV4 feature (EEC) for typical echo path impulse responses.

The G.168-2000 Compliance and Acoustic Echo Cancellation On PHV5 feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-5E-7877.A SOFTWARE AND DATA MANAGEMENT

The Software and Data Management feature (99-5E-7877.A) introduces the capability to install ASM SWD, ASM Terminal Server (iTouch), 5ESS BWM, and DRM BWM software updates from one integrated user interface on the ASM GUI. The GUI software update screen provides a complete system

(5ESS/DRMs/ASM) software version status display. The GUI software update screen provides a single SU installation interface for all the previously mentioned software updates. This software update installation interface provides a familiar look for a 5ESS user since it resembles that of the well established 5ESS SU installation page. This will ease the transition from installing SUs using the existing 5ESS mechanism to the new ASM SU screen mechanism. In addition to the SU reports available on the 5ESS and DRM ROP, output reports resulting from ASM initiated SU actions are logged to a SU log which can be viewed from the ASM GUI. Another advantage of the new ASM SU interface is in the efficiency improvements associated with installation of DRM SUs. With the ASM SU interface, a DRM BWM will be installed in parallel to all the DRMs associated with a ASM. Another efficiency improvement is related to system version consistency checking. With the ASM SU interface, consistency checks for the ASM, 5ESS and all associated DRMs can be performed from the GUI Software Update screen. The pass/fail results with a timestamp of when it last completed is displayed on that page as well. SU installation remote access from a customer OSS is supported via a new software update command line interface (CLI) which accepts MML formatted SU commands similar to the capability currently available on the 5ESS. This means that we can support the existing CSCANS-OWLS SU installation OSS interface that is used by the NAR RBOCs. SU installation automation is supported via a ASM GUI SU Scheduler screen which provides the capability to schedule the application of SUs for the ASM, 5ESS, DRMs from one user screen. The scheduled activity time will be automatically calculated for time zone differences across DRM sites managed by a ASM. This means that if a DRM SU is to be applied at 11:00 P.M., it would be scheduled for 11:00 P.M. local time for that DRM. This scheduling feature requires that the 5ESS SU Automation feature be enabled for the 5ESS and all DRMs managed by a ASM.

The Software and Data Management feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7878 CODE CONVERSION EXPANSION FOR N11 SERVICES

This feature supports the 711 code as a national number used by hearing-impaired people. The 711 code is typically translated into an 800 number. This feature opens up a new digit analysis Call Type for 711 and allows this new Call Type to perform digit analysis on the new Conversion Digits that are substituted for the 711 code. The following defines the functionality of this feature:

- ☐ The customer dials 711.
- ☐ The 711 code is defined in digit analysis as a new Call Type (RELAY).
- ☐ The RELAY Call Type is defined on the RC/V View 9.4 (Code Conversion).
- ☐ On View 9.4 the RELAY Call Type entry allows a new View 9.4 field (DIG ANA ON CONV TN) to be defined. This field identifies if the digits in the Conversion TN field should go through digit analysis or go to routing (the previous treatment applied to all supported N11 codes).
- ☐ If an 800 number is defined as the Conversion TN and the new field defines that digit analysis should be performed on the 800 number, the 800 number goes through digit analysis as if the customer dialed the 800 number.

99-5E-7885.A CRAFT I/O

The Craft I/O feature (99-5E-7885.A) provides user administration capability, improves the security, and enhances the alarm and log functions on the ASM GUI. The system administrator now has the full capability to administrate users from the GUI, and lock out a user immediately if needed. In ASM5.0, the technician is required to have the proper permissions in order to access the GUI. The permissions are divided into four categories: Maintenance, Administration, Software, and Provisioning. Each category is further divided into full, browse only, or none. Another improvement to the security is the session timeout feature. Each user is set to a terminal time out value, the user will be automatically logged out if there is no activity within the specified value. The GUI also supports user password aging that is based on the Solaris password aging. A new summary alarm table is provided on the GUI page. The alarm table shows the

summary of all alarms on the virtual switch, which includes 5ESS, ASM, and DRM. Both real-time and history log viewing have been improved. In addition to the ASM Orlog, the ASM performance log and error logs are been added on the GUI log viewing page. A new ASM security log was created to include all user login, log out, failed attempts, and user administration data.

The Craft I/O feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7886.A EXTERNAL INTERFACE INFRASTRUCTURE EXPANSION FOR ASM

The External Interface Infrastructure Expansion for ASM feature (99-5E-7886.A) introduces a TCP/IP interface to NTP or equivalent OSSs for the transport of MDIIs that are detected by the 5ESS or DRMs. It also changes the ASM Logging infrastructure so that all log types (for example, error logs and ROP logs) have the same user interface. The user interface is now enhanced to support pattern matching and sorting, thus allowing much greater analysis of the data. With the new infrastructure, the following logs have also been introduced:

- ☐ Software Update Log
- ☐ RCC Log
- ☐ Security Log

The External Interface Infrastructure Expansion for ASM feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7890 EXPANDED VIRTUAL TERMINAL ACCESS

The Expanded Virtual Terminal Access feature (99-5E-7890) expands the number of virtual terminals available via the ASM.

The Expanded Virtual Terminal Access feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7895 MCC LOGIN PROTECTION

The MCC Login Protection feature (99-5E-7895) provides login/password protection on the MTTY during normal system operations. A user must first log onto the MTTY with a login and password before they can enter any commands or perform any operations on the MTTY. Once a user successfully logs on, the user has the same capabilities on the MTTY as they currently have today.

The feature supports a maximum of 1023 user logins and passwords, to allow different users to have their own unique login and password. The user login and password for the MTTY is administered via the Command Restriction feature administrative commands as is done for the other terminals. Login administration is handled remotely from the SCCS. This administration includes resetting or changing passwords, modifying password aging duration, and turning the terminal timeout on and off.

This feature allows for a time-out screen lock.

The MCC Login Protection feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-7942 CAUSE VALUE MAPPING

This feature provides specific default cause values for the 5 BICC Release categories provisioned in an office through Recent Change. With this feature, an office has the flexibility of entering Recent Change cause values or simply using the default values of the 5 categories.

When this feature is implemented, customers have the option of mapping specific cause values, or retaining the default values (5 categories) already provisioned.

99-5E-7951 RC SECURITY FEATURE

This feature provides the following changes to Recent Change security:

- ☐ Permissions can be granted at the view level in addition to the class level.
- ☐ Recent Change permissions are assigned to Authority Management login ID's, Recent Change Security Groups, as well as to TTY's and ASM logins. The login ID's are verified to match existing Authority Management logins before creation of a permissions set for the ID as well as when a login ID is added to a Recent Change Security Group. Offices not using Authority Management are not able to take advantage of this part of the feature.
- ☐ MML commands allow login groups to be created and deleted, and AUTHORITY Management login ID's, TTY's and ASM logins to be added or deleted from login groups.
- ☐ The "set:rcaccess" permission command accepts decimal class and class.view numbers, comma or space separated, instead of bit-maps converted to octal or hexadecimal strings.
- ☐ The "set:rcaccess" permission command accepts "+" and "-" to add or delete classes and views without requiring specification of the entire permission set currently in force for the login or group.
- ☐ RC Verbose capability reports the user by Authority Management login ID in addition to TTY ID when appropriate.

99-5E-7980 ADD INPUT AND OUTPUT MESSAGES TO THE ONE WAY AUDIO TOOL

This feature is an enhancement to the existing One Way Audio feature. This feature provides the ability to verify that the One Way Audio feature is running through the command: OP:RPC,SM=a. This feature also enables the Service Provider the option of intercepting these actions based on knowledge of the results of Built in Self-Tests (BISTs) run via a new port status. The new port status given for trunks whose vocoders have failed the BIST are now listed for OP:LIST or OP:STATUS command as: OOS:MTCE FE BIST.

99-5E-7984 AMA TANDEM BILLING

This feature allows the flexibility to assign specific values to the routing indicator in the AMA record. It provides an option to record the routing indicator either according to the call path that is actually traveled or according to the provisioning of the trunk group. If this feature is not active, the value of the routing indicator is controlled solely by the call path.

This feature uses a new field on the incoming trunk group or the outgoing trunk group (view 5.1) to determine whether to populate the value of the routing indicator via the call path or the value placed in this new field.

99-5E-7995 MOBILE TO LAND TEST CALL ON SELECTED TRUNKS

The Mobile to Land Test Call On Selected Trunks feature (99-5E-7995) provides wireless service providers with an audible means to verify customer complaints of poor transmission such as echo, static, warble, etc., on calls that complete over a particular trunk from DCS (Digital Cellular Switch) to the PSTN (Public Switched Telephone Network). It provides wireless service providers with the capability to place a call over a specific trunk and talk over that connection to see if the conditions reported by a subscriber are also experienced by wireless service provider personnel over the part of the network that the wireless service provider has some control and maintenance responsibilities.

The Mobile to Land Test Call On Selected Trunks feature is planned to be available for the 5E16.1 and later software releases.

99-5E-7999 NPA SPLIT ENHANCEMENT

This feature is used in conjunction with the Announcement on Detection of NPA Split (ADNPAS) feature (99-5E-7247) to provide announcement on an Overlay in the office's dialing plan.

On Overlay, DN's where seven digit numbers encounter Number Portability processing (that is, LNP trigger populated or a ported in NXX) and have NPA SPLIT ANNC marked as "Y" on RC View 9.3 receive a message, such as, "The call you are making is a local ten digit call. Next time please dial the area code before the seven digit number you are calling. Your call will now be completed. This is a recording." (The NPA Split Enhancement feature allows for the modification of the existing ADNPAS feature announcement to not include a specified NPA field.) After an announcement is played, the call is routed to its final destination. This special announcement is generated every time a DN involved in an overlay is dialed by a customer.

Information on feature enabling will be provided upon ordering. Please contact your Lucent Technologies Network Systems Account Representative for ordering and pricing information. This feature is dependent on an existing Call Processing secured Special Feature, which is controlled by secured number 347.

99-5E-8007 USE OF NPA FOR E911 DEFAULT ROUTED CALLS

Currently, when a wireline E911 call is default routed at an E911 Tandem switch to an Enhanced Multi-frequency (MF) Centralized Automatic Message Accounting (CAMA) Public Safety Answering Point (PSAP) or Integrated Services Digital Network (ISDN) PSAP due to the caller's Automatic Number Identification (ANI) not being available (for example, not 10 digits), the digit string "000-911-0TTT" [where TTT represents the Emergency Service Central Office (ESCO)] is sent instead of the ANI. For a wireless E911 call, when the Mobile Directory Number (MDN) and/or Pseudo ANI (pANI) are not available, the "000-911-0TTT" digit string(s) is sent, instead of the ANI and/or pANI, to an Enhanced MF CAMA PSAP. For an ISDN PSAP, only one "000-911-0TTT" digit string is sent. This feature modifies the "000-911-0TTT" digit string by replacing the "000" digits of the string with the 3 digits from the HOME NPA field on Recent Change and Verify (RC/V) view 8.1, OFFICE PARAMETERS (MISCELLANEOUS). If the HOME NPA field is not populated, the existing "000-911-0TTT" digit string is used as is currently done.

Use of NPA for E911 Default Routed Calls is for 10/20 digit PSAP interfaces.

99-5E-8010 PLS3.0 TRANSITION TO PSAX

This feature develops the basic functionality needed to introduce the PSAX as the IWG in 7R/E PS 3.0n. The functionality includes the maintenance of the DNUS transport, the peripheral control that supports call processing, the implementation of the Sapphire protocol, and changes needed in the Audits, Recent Change & Verify, and Office Data.

99-5E-8012 PSU COMMUNITY ADDRESS EXPANSION

The PSU Community Address Expansion feature (99-5E-8012) allows more than 255 PSU communities in a wireless network to support soft handoff. This feature introduces a new sub-network concept that allows up to 254 PSU community addresses to be grouped together by a given sub-network number. A new piece of hardware is added which is called a Gateway PHA (GWPHA). Traffic destined for a different sub-network is sent to a Gateway PHA and the Gateway PHA routes the traffic to the appropriate PSU in the destination sub-network. This feature supports up to 4 PSU sub-networks (0, 1, 2, and 3).

For more detailed information, see 235-200-100, *FLEXENTTM/AUTOPLEX[®] Wireless Networks Applications OA&M Manual*.

The PSU Community Address Expansion feature is planned to be available for the 5E15 Feature Release 4 (FR4) and later software releases.

99-5E-8018 PLS3.0 CALL PROCESSING FOR TRANSITIONING TO PSAX

This feature provides for the use of Bearer Independent Call Control (BICC) signaling, is carried over the existing SS7 signaling network. The bearer connection, provided by 99-5E-8010, is provided by setting up a UNI 4.0 Switched Virtual Connection (SVC) using AAL1 for constant bit rate service. Interworking is supported between ISUP and MF signaling trunks and BICC. Trunk types emulated by BICC are limited to LTOLL or TTOLL trunk class.

99-5E-8019 RETEST TM/CCS (7555.C) IN THE PSAX ENVIRONMENT

This feature is part of the 7R/E PS Voice Telephony over ATM (VTOA) feature developed for the NAR market. It provides the functionality:

- ☐ CIC status administration,
- ☐ BICC signaling maintenance,
- ☐ BICC MDII reporting, and
- ☐ BICC call monitoring.

This functionality is needed to support the initial offering of VTOA.

99-5E-8020 - RETEST COMMERCIAL FEATURES (7646) IN THE PSAX ENVIRONMENT

This feature allows end users to place voice calls over ATM packet networks. The feature applies to public network inter-switch calls only and is transparent to the end user.

Calls originated from circuit line/trunks can be routed over an ATM packet network. Incoming ATM packet calls are allowed to encounter terminating feature(s). Incoming packet calls may terminate locally on the switch, or may be redirected to another switch as a result of a feature invocation (e.g., Call Forwarding, Call Transfer, and Terminating Access Trigger). Incoming ATM packet calls that are redirected to another switch by a feature may in some cases be allowed to complete over an ATM packet network (ATM-to-ATM routing) wherever possible, or may go over circuit trunks (ATM-to-circuit trunk routing).

99-5E-8022 CSI DEFAULT HANDLING FOR LD PLATFORM

This feature changes the default handling of the Carrier Selection Information (CSI) parameter. Currently, the switch treats no received CSI as "non-presubscribed." If the SFID for the feature is turned on, the switch treats a no received CSI as "presubscribed."

CSI Default Handling for LD Platform is a secured feature (SFID 597) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-5E-8175 NETWORK IDENTIFIER (NID) EXPANSION ON 5ESS

The Network Identifier (NID) Expansion on 5ESS feature (99-5E-8175) increases the NID capacity from 24 to 64. A signaling point is now capable of routing to 24 NIDs. NIDs are assigned in descending order beginning at 254 (1111 1110) for large networks and in ascending order beginning at 1 (0000 0001) for small networks. Routing on only the NID field of the destination point code in a message is also supported.

The Network Identifier (NID) Expansion on 5ESS feature is planned to be available for the 5E16.1 and later software releases.

99-CP-2314 MESSAGE TRANSFER PART (MTP) RESTART

The MTP Restart procedure enables the Message Transfer Part (MTP) at a signaling point that has just become available to bring sufficient signaling links into the available state to handle the expected traffic and to stabilize its routing before user traffic is restarted to the point. This procedure uses the Traffic Restart Allowed (TRA) and Traffic Restart Waiting (TRW) messages. The TRW message is an indication to the

receiving signaling point that user signaling traffic (for example, traffic from the users of the MTP, such as ISUP) should not be sent to the originator of the TRW until a TRA message is received from the same signaling point. A TRA is an indication to the receiving signaling point that user signaling traffic may be resumed to the originator of the message. The MTP Restart procedures may not only be performed at a restarting signaling point, but also at signaling points adjacent to the signaling point which is restarting.

Although the MTP Restart procedures described could apply to both a switch and a Signaling Transfer Point (STP), at the present time, the MTP restart procedures corresponding to a restarting signaling point are not needed at a restarting switch. Therefore, this feature does not deal with a restarting switch. Procedures are provided only for a switch adjacent to a STP which is restarting.

99-CP-2316 SIGNALING LINK SELECTION (SLS) EXPANSION TO 8 BIT

The value of the Signaling Link Selection (SLS) code determines the specific links and STPs used to route a message. With the SLS field size always being 8 bits in length, prior to this feature the three most significant bits were marked as spare and assumed to be zero. The five least significant bits, hence the 5 bit SLS code, were used in the outgoing link selection. With a 5 bit SLS code, each of the 32 SLS codes corresponded to one of 32 individual logical paths within a route set between two SPs. At an STP, however, only 16 SLS codes are available for assignment to link sets or combined link sets.

This feature allows for the expansion of the SLS code to its full 8 bits. Such expansion allows the maximum size of a B or D link set to be 16 links compared to the previous value of 8. (Expansion to a number greater than 16 is not currently possible since the signaling link code (SLC[®]) field, which is used in several network management messages, has only 4 bits.) The expansion also allows a more even traffic distribution on links in a (combined) link set, especially after link failures. For example, with a 5-bit SLS code, traffic load between links in a link set could differ in some cases by a factor of 2. With the 8-bit SLS code, traffic will differ by less than 25 per cent in all cases.

99-CP-2345 SS7-PSU FOR 5ESS[®] SWITCH VCDX

This feature provides SS7 capability for Very Compact Digital Exchange (VCDX) which allows feature capabilities such as interoffice LASS, 800 Number Services, and ISVM. The SS7 Signaling Links are provided through the Protocol Handlers PH3 located in the Packet Switch Unit (PSU), rather than through the CNI Ring used in larger 5ESS[®] switch applications. The PSU can also be used to provide ISDN and TR303 capabilities along with the SS7 capability. The only restriction is Protocol Handlers PH3 cannot be used to provide more than one feature capability (that is, ISDN and SS7 signaling on the same PH3).

The I/O interface is slightly different from the 5ESS[®] Switch and CDX switches for SS7 capability since these switches use the CNI Ring.

This feature also moves software currently located on the Administration Module (AM) and Communication Modular Processor (CMP) to the VCDX SM Processor to support the following protocols:

- ☐ Transaction Capabilities Application Part (TCAP)
- ☐ ISDN Services User Part (ISUP)
- ☐ CCS trunk routing and hunting
- ☐ CCS point code status.

99-CP-2354 CALL WAITING DELUXE - PHASE I

Call Waiting Deluxe (CWD) is a feature that allows a subscriber to manage the treatment applied to incoming calls while the telephone instrument is off-hook on a stable call. While on an existing call, CWD notifies the subscriber of an incoming call with the call waiting tone that the subscriber is accustomed to receiving. If the subscriber has a Caller Identity on Call Waiting (CIDCW), the data is transmitted

immediately following CWD alerting. After being notified of the incoming call, the subscriber may choose from several treatment options in order to manage the incoming call. The subscriber can choose to provide any of the following treatments to the incoming call:

- ☐ ANSWER
- ☐ SEND TO A BUSY ANNOUNCEMENT and DISCONNECT
- ☐ SEND TO A HOLD ANNOUNCEMENT and PUT ON HOLD (additional options are CONFERENCE ANSWER and DROP)
- ☐ FORWARD TO ANOTHER NUMBER
- ☐ CONFERENCE WITH THE EXISTING CALL (additional options include DROP FIRST and DROP LAST)
- ☐ DROP while the existing party is DISCONNECTED.

Call Waiting Deluxe (CWD) is defined in Bellcore TA-NWT-000416, Issue 2, April 1993.

99-CP-2354.A CALL WAITING DELUXE - PHASE 2

Call Waiting Deluxe (CWD) Phase 2 builds on CWD Phase 1 by providing several additional capabilities. The primary additions are as follows:

- ☐ Support for standard analog telephones that use dual tone multi-frequency (DTMF) tones
- ☐ Enhanced usage sensitive billing
- ☐ Complete traffic measurements
- ☐ Additional announcement default option
- ☐ Reminder announcement for call-waited call on hold.

NOTE: When Call Waiting Deluxe - Phase 2 feature becomes available, Phase 1 will no longer be offered. The combined feature will simply be known as the Call Waiting Deluxe feature.

This is a Secured/Restricted feature and requires CWD Phase 1.

99-CP-2530 SPONTANEOUS USAGE SENSITIVE THREE WAY CALLING

This feature provides a version of Usage-Sensitive Three-Way Calling (USTWC) that does not require a dial code. This feature option to Usage Sensitive Three-Way Calling is spontaneous and is available to both the calling and the called party.

The feature is intended for the casual user of three-way calling who does not make enough three-way calls to warrant a subscription to the Three-Way calling feature. The feature is restricted to residential and small business users since there is a restriction preventing USTWC from being assigned to a member of a Terminal Group (for example, CENTREX group).

The feature is available on both the 5ESS[®] switch and the 1A ESSTM switch.

This feature requires another feature, Usage Sensitive 3-Way Calling 99-5E-1230, for this feature to function properly.

99-CP-2677 SUPPORT FOR UP TO 800 NXXs/NOCs

This feature increases the number of NXXs/NOCs that can be supported on the 5ESS[®] switch from 250 to 800. Eight hundred is the total number of NXX values assignable within an NPA under the current North American Numbering Plan. There is no change in how the NXXs/NOCs are provisioned. The existing restriction requiring office codes to be defined within only one NPA on the switch remains in effect. In other words, the same NXX cannot be defined in different NPAs on a switch.

99-CP-2821 TCAP MESSAGE TANDEM

The TCAP Message Tandem for LASS/CLASS feature (99-5E-2821) allows a primary 5ESS[®] switch to send and receive transaction capabilities application part (TCAP) messages to and from a signal transfer point (STP) and to route the messages to the appropriate switch in a switch cluster.

When an NPA-NXX is distributed between two switches, this feature allows the STP to send all LASS AC/AR or ISUM TCAP queries for a given NPA-XXX to one switch which re-addresses the query to the correct destination. The feature allows STPs to continue processing 6 digit global title translations (GTT) when an NPA-NXX is distributed between two switches. This effectively minimizes administrative work, especially for small STPs that lack the memory and real-time processing to perform 10 digit GTTs.

99-CP-3042 TOLL FREE TREATMENT FOR NPA 888

This feature modifies operation of the 800 Number Service feature, called "Service Switching Point 800" in the 5ESS[®] Switch and 4ESSTM switches. In the 1A ESSTM switch, the functionality is provided by two features: "Service Switching Point" and "800 Number Service". This feature allows two new NPAs 888/877 to receive the treatment currently provided to the 800 SAC code. This feature is intended to provide the same level of "Toll-Free" service as that provided 800.

99-CP-3053 ISUP MESSAGE LOOP DETECTION

The ISUP Message Loop Detection feature provides for inclusion of an additional Integrated Services Digital Network User Part (ISUP) parameter to be signaled between switching offices through the Signaling System Number 7 (SS7) network. The new optional ISUP parameter is named Hop Counter and contains information that indicates the number of switches or hops this message has traversed. The Hop Counter parameter may be included in the Initial Address Message (IAM) at an intermediate switch and is initialized with a configurable number of allowed hops for this message. As the call progresses through the network, the hop count is decremented by one by the intermediate switch and, if the counter reaches zero, the SS7 message is rejected by the intermediate switch. The Hop Counter parameter is defined for only the IAM message.

The main impetus for this additional parameter is to stop an SS7 signaled call from entering an infinite loop in the signaling network. When a Hop Counter parameter is included in the message, the message terminates after a specified number of hops and the looping of the SS7 IAM is avoided.

99-CP-3072 IMPROVED SIGNALING LINK TEST PROCEDURES

The Improved Signaling Link Set Test (SLT) Feature provides enhancements to the SLT procedure currently used in the CNI product.

The signaling link functions, together with a signaling data link as bearer, provide a signaling link for reliable transfer of signaling messages between two directly connected "signaling points". The on-line signaling link test procedure involves communication between the two ends of the concerned signaling link. This procedure verifies the physical link assignments and can detect looped links and other irregularities in the operation of the link. This procedure is used when a signaling link is activated or restored. The signaling link becomes available only if the test is successful.

The first requirement clarifies that the test pattern sent in the second signaling link test message should be the same as that seen in the first signaling link test message. This allows the response to the first test message to be accepted as a response to the second test message, in effect allowing twice the time for a

response to the first signaling test message.

The second requirement clarifies that when the option to test available links periodically is on, the test should be performed even on links which are congested. In a case when a link is unintentionally looped-back to the same signaling point, it is very likely that congestion occurs on the link. This test then detects the loop-back.

99-CP-3169.A NUMBER PORTABILITY - NRA METHOD

Number Portability (NP) gives the end-user the ability to move from one switch to another and keep their original Directory Number (DN). There are 3 types of Number Portability: Service Portability, Service Provider Portability, and Geographic Portability.

- ☐ Service Portability - allows an end user to retain the DN after changing services (for example, POTS to ISDN).
- ☐ Service Provider Portability - allows an end user to retain the DN after changing service providers.
- ☐ Geographic Portability - allows an end user to retain the DN after changing physical locations. For example, the user may move and be serviced by a different switch, or a different rate center on the same switch.

99-CP-3441 SCREENING ENHANCEMENTS TO OCAA

Screening Enhancements for Outside Calling Area Alerting enhances the Long Distance Call Waiting Feature, 99-5E-1105, by providing distinctive call waiting tones and distinctive ringing to idle lines for long distance calls. The call waiting component of the feature applies only to analog lines; however, the distinctive ringing for idle lines applies to analog and ISDN BRI lines. This feature allows the following new capabilities to Long Distance Call Waiting:

- ☐ Apply SS7 Calling Party Number (CPN) screening treatment of incoming calls over IC class of service designated trunks.
- ☐ Allow a screening NPA+NXX local call table for each Digit Analysis Selector (DAS).
- ☐ Screen intra-switch calls based on the CPN and the DAS/NPA/NXX screening table.
- ☐ Use only Calling Party Number and remove Charge Party Number from being included in the decision on whether a call is long distance or local.
- ☐ Specify treatment of all calls when Calling Party Number information is not available/determinate.

Screening Enhancements to OCAA and Long Distance Call Waiting are packaged as one marketable item: "Enhanced Long Distance Call Waiting."

99-CP-3587 DENY AUTOMATIC CALLBACK ON INTRA-LATA PIC CALLS

The Deny Automatic Callback on Intra-LATA PIC Calls - Basic feature provides blocking of Automatic Callback (AC) for Intra-LATA toll calls that not carried by the LEC to private DNs (previous incoming call received with an indication of privacy). The user is blocked from accessing Automatic Callback and is also denied access over a long term.

99-CP-3587.A DENY AUTOMATIC CALLBACK ON INTRALATA PIC CALL - PER CIC CONTROL

The Deny Automatic Callback Calls on IntraLATA PIC Calls - Basic Feature, 99-CP-3587, provides blocking of Automatic Callback (AC) for IntraLATA toll calls that are not carried by the local exchange carrier (LEC) and are sent to private directory numbers (DN). The DN is private when the previous

incoming call is received with an indication of privacy.

NOTE: As of the 5E12 and later software releases, the "Deny Automatic Callback on IntraLATA PIC Calls" feature also applies to IntraLATA calls carried by the Presubscribed Local Carrier (PLC) that is non-LEC and gets provisioned by the Alternate Local Service Provider Routing (ALSPR) Feature, 99-CP-4031.

The Deny Automatic Callback on IntraLATA PIC Calls - Per CIC Control is a feature enhancement which replaces the Deny Automatic Callback on IntraLATA PIC Calls - Basic Feature.

This is a secured feature (SFID 201) and a right-to-use (RTU) fee must be paid to Lucent Technologies before enabling information is provided.

99-CP-3667 NUMBER PORTABILITY AMA BILLING

The Number Portability AMA Billing feature (99-CP-3667) provides billing functions for directory number (DN) portability within a service provider's rate center and also between two geographically different rate centers.

To provide AMA records for calls crossing a network boundary between two local service providers, a new connecting network access (CNA) record is produced by this feature. This new CNA option is provided on a per-trunk group basis or only for those calls resulting in a local number portability-service control point (LNP-SCP) database query.

99-CP-3749 REPEAT DIAL INTERWORKING WITH ASP ORIGINATING BUSY TRIGGER

This feature allows callers to invoke the LASS Automatic Recall (AR) feature after the caller dials a number that is busy.

By using the repeated dial feature, users are able to increase their calling efficiency by making greater use of the existing AR feature which monitors a busy line and notifies the caller when the call can be put through. By providing a simpler means to activate AR, usage of AR increases, thereby generating additional income. AR already includes the flexibility for billing on a per-use basis or on a subscribed basis.

Rather than having to remember when and how to use AR by remembering the activation code to dial, callers are simply asked if they want to make use of AR at the most appropriate time - when a call they are making reaches a busy line. If they decide to use AR, then the existing AR feature is invoked automatically for them, and they are advised to hang up and wait for notification when the call can be completed. The existing AR feature monitors the busy line, and rings back the caller when it is no longer busy. The caller picks up their phone in response to the ring back, and the call is put through.

This feature makes use of Advanced Intelligent Network (AIN) functionality to activate the AR feature on behalf of callers. Repeat Dial feature enhances the functionality provided by the "Originating Busy/NoAnswer Office Triggers with Extended Ringing" feature, 99-5E-3529. When 99-5E-3529 detects a user busy condition, the O_CalledPartyBusy query is sent to the SCP. The SCP may invoke the play and collect announcement to ask the caller if they want to use LASS AR. Based on the caller's response, the SCP may send the AIN Collect_Information message that asks LASS AR to be invoked. The Repeat Dialing functionality starts when the 5ESS[®] Switch receives the Collect_Information message.

This feature is targeted for service providers whose switches serve end user lines directly. Ultimately, this feature serves a broad spectrum of end users who will take advantage of a simpler interface to the AR feature in order to increase their calling efficiency.

Benefits to the End User include:

- ☐ Notification to the end user when AR can be effectively used.
- ☐ An easier end user interface to the existing AR feature.

- ☐ Increased calling efficiency through greater use of AR, leading to increased user productivity.

Benefits of this feature for Service Providers include:

- ☐ Increases usage of an existing switch-based feature which generates revenues on a per-use or subscription basis.
- ☐ Helps to prove in the investment in Advanced Services Platform (ASP) functionality.
- ☐ Sets the stage for the invocation of additional switch-based features using ASP.
- ☐ Helps service providers distinguish themselves from competitors.

99-CP-3818 NUMBER PORTABILITY - AMA ACCESS BILLING

The Number Portability - AMA Access Billing feature (99-CP-3818) accurately identifies a serving central office for carrier access usage billing. This allows correct usage charge computation for inter exchange carrier (IXC) or cellular mobile carrier (CMC) handled calls originating from or terminating to a ported directory number (DN).

This feature adds the local remote number (LRN) of the switch serving a ported DN to the originating and terminating IXC and CMC access records generated for calls from or to a ported DN. The billing systems can then correctly identify the serving switch and compute the distance to the central office with the ported DN.

For ported DNs served by a remote switching module (RSM), an LRN unique to the RSM may optionally be recorded to handle situations where an RSM is serving as a community dial office replacement and has a location different from the host switch.

99-CP-3888 NON-CONDITIONAL 10-DIGIT TRIGGER FOR LRN

This feature is an enhancements to the NP - Basic LRN feature 99-CP-3169.A.

This features allows the non-conditional 10-digit trigger to override the conditional nature of the NP trigger when the DN has a line provisioned on the switch. In this case, the NP query is made regardless of whether the line is being served by the switch or not.

This feature offers the following advantages:

- ☐ Pre-provisioning of customers.
- ☐ Marking customers that are porting out.

The pre-provisioning feature allows service providers the hardware and software associated with a new customer prior to porting into their switch. Since the customer has not actually ported, even though the line is equipped, the switch will continue to query the NP database for the correct serving switch. Once the subscriber ports, the NP database is updated and the response directs the call to their switch. The customer then removes the marking to minimize queries. This eliminates much time-critical provisioning for the new service provider.

The feature also allows service providers to mark customers that are porting out prior to their actual porting. During this interval, the old service provider queries the database and direct the call to their switch. Once the subscriber ports and the NP SCP is updated, the calls are directed to the new service provider. The old service provider can then remove the hardware and software at their leisure. This eliminates much time-critical provisioning for the old service provider.

99-CP-3921 NON-OBTRUSIVE LINK INTERFACE (LI) PUMP

Non-Obtrusive Link Interface (LI) Pump feature provides automatic loading of the SS7 link when loading updates into the common network interface (CNI).

This feature provides an automated method to update an integrated ring node 2 (IRN2) SS7 node to newer software without having to manually perform node removal and restoration. This feature also minimizes downtime of a signaling link during this upgrade, which lessens the impact on the SS7 network while applying upgrades.

99-CP-4031 ALTERNATE LOCAL SERVICE PROVIDER (LSP) ROUTING

This feature provides the ability for the switch, in a service resale or unbundled switch environment, to handle multiple alternate local service providers and customize the routing for each. Operator services, directory assistance, and local calls (non-intraLATA toll) receive customized routing. This feature is commonly referred to as ALSPR.

99-CP-4246 SS7-PSU ARCHITECTURAL ENHANCEMENTS

The SS7-PSU Architectural Enhancements feature (99-CP-4246) provides major architectural enhancements to CCS operation on a PSU platform:

- A non-global SM (NGSM) is defined. An NGSM represents an SM possessing TCAP clients or ISUP trunks that require the services of a PSU platform on a GSM. Prior to 5E15, NGSM clients and associated GSM functionality must reside on the same physical SM. The architectural enhancement associated with this feature allows TCAP/ISUP clients residing on *multiple* NGSMs to be served by a *single* GSM.
- A host GSM (HOST GSM) is defined. Such a GSM can support CCS clients on multiple NGSMs.
- The generalized concept CCS message transport (CMT) internal to the 5ESS[®] switch is introduced. This includes intra-GSM CMT, as well as inter-HOST GSM/NGSM transport.

While the complete feature became available in the 5E15 software release, the concept of NGSMs and CMT as applied to VCDX/ISLAND GSMs was introduced in the 5E14 software release.

Additional 99-CP-4246 SS7-PSU Architectural Enhancements features include:

- (1) **SS7-PSU MTP Routing Enhancements** □ Prior to the 5E15 Software Release, the full point code was used by Message Transfer Part (MTP) software in a Global SM signaling platform to route a message to its intended destination in the SS7 network. This is known as full point code routing.

The SS7-PSU MTP Routing Enhancements feature enhances the MTP software in the Signaling Gateway - SS7 signaling platform [formerly known as Global SM (GSM)] to support three new capabilities:

- (1) MTP Network Routing

MTP software routes a message based on the network identifier field of the destination point code.

- (2) MTP cluster routing and management

MTP software routes a message based on the network identifier and network cluster fields of the destination point code. This also includes support for reception of transfer cluster allowed/restricted/prohibited (TCA/TCR/TCP) messages and the associated update of dynamic routing status on provisioned normal and alternate routes to the affected destination.

(3) Alias Point Code Support

Normally the Signaling Gateway is known to the SS7 network by one unique point code address. With this feature, each Signaling Gateway in the office can be assigned up to 15 additional point codes known as alias point codes. These are logical point codes that allow one physical 5ESS[®] switch office to appear as multiple logical offices to the SS7 network with regard to ISUP trunking. TCAP and SCCP messages originated by the switch will continue to use the primary CNI or Signaling Gateway point code as is done currently.

- (2) **SS7-PSU Call Processing Supporting TCAP** ☐ Prior to the 5E15 Software Release, an SS7-PSU platform was capable of supporting the signaling needs of ISUP trunks and certain TCAP services local to a global SM (GSM). Examples where this was beneficial include the 5ESS[®] VCDX Switch and also 5ESS[®] switch remote switching modules (e.g., DRM-2000, EXM-2000).

In the 5E15 Software Release, feature 99-CP-4246 (SS7-PSU Architectural Enhancements) has defined an internal CCS message transport (CMT) architecture allowing (when provisioned) each SM in the office to send/receive messages to/from a Signaling Gateway - SS7 signaling platform [formerly known as a Global SM (GSM)].

Building upon the SS7-PSU Architectural Enhancements feature, SS7-PSU Call Processing Supporting TCAP enhances TCAP call processing software to send/receive messages through a Signaling Gateway platform for the following TCAP services:

- ☐ Local Area Signaling Services (LASS)
 - ☐ Number Service 800 (NS800)
 - ☐ Inter-Switch Voice Messaging (ISVM)
 - ☐ Analog Calling Name Display (CNAM)
 - ☐ Advanced Services Platform (ASP) 0.0 and 0.1
- (3) **Link/MTP Measurements for SS7-PSU** ☐ This feature is responsible for the modification and development of TRFC30 Reports for NAR customers with SM-based SS7 signaling on the PSU platform. These reports will provide the customer with data regarding the performance of the signaling link sets and the network as a whole.
- (4) **Wireless Support for SS7-PSU** ☐ This feature provides an SS7 PSU signaling interface in 5ESS[®] switch and CDX digital cellular switches. Wireless support of SS7 PSU:
- ☐ uses the GSM to provide SS7 communication with the Executive Cellular Processor (ECP) and Public Switched Telephone Network (PSTN)
 - ☐ throttles calls when CMT overload is detected.

For 5ESS[®] switch and CDX digital cellular switches on software releases prior to 5E15, the SS7 signaling interface to the ECP and PSTN is the CNI. In 5E15 new start offices, wireless support of SS7 PSU allows 5ESS[®] switch and CDX digital cellular switches to use PSU instead of the CNI as the SS7 signaling interface.

Internal CCS message transport (CMT) paths established between provisioned SMs and the GSM allow the SMs to communicate with the ECP and PSTN through the GSM. A single GSM can replace the CNI as the SS7 signaling interface. (While the SS7-PSU signaling platform can be equipped in software releases prior to 5E15, it only supports SS7 messages local to the GSM on

which it is provisioned, as in a VCDX switch).

- (5) **SS7-PSU Terminal Maintenance** □ Prior to the 5E15 Software Release, an SS7 PSU was capable of supporting the signaling needs of ISUP trunks and certain TCAP services local to a global SM (GSM).

In the 5E15 Software Release, the SS7 PSU Architectural Enhancements feature (99-CP-4246) has defined an internal CCS message transport (CMT) architecture allowing (when provisioned) each SM in the office to send/receive messages to/from a Signaling Gateway - SS7 signaling platform (formerly known as a Global SM).

Building upon feature 99-CP-4246, SS7-PSU Terminal Maintenance enhances SM terminal maintenance software to maintain ISUP trunks whose signaling is supported through a Signaling Gateway - SS7 signaling platform (formerly known as Global SM). These trunks may now terminate on any SM in the office rather than only local to the Signaling Gateway.

- (6) **SS7-PSU ISUP Support** □ Prior to the 5E15 Software Release, an SS7 PSU was capable of supporting the signaling needs of ISUP trunks and certain TCAP services local to a global SM (GSM). Examples where this was beneficial include the 5ESS® VCDX Switch and also 5ESS® switch remote switching modules (e.g., DRM-2000, EXM-2000).

In the 5E15 Software Release, the SS7 PSU Architectural Enhancements feature (99-CP-4246) has defined an internal CCS message transport (CMT) architecture allowing (when provisioned) each SM in the office to send/receive messages to/from a Signaling Gateway - SS7 signaling platform (formerly known as a Global SM).

Building upon feature 99-CP-4246, the SS7-PSU ISUP Support feature enhances ISUP call processing software on an SM to send/receive messages over an internal CMT path to/from a Signaling Gateway - SS7 platform. The customer can provision a trunk group member on any SM in the office through a Signaling Gateway as long as an internal CMT path is provisioned between the trunk member's SM and the Signaling Gateway platform.

- (7) **SS7-PSU INTER-MODULE TRUNKING (IMT)** □ Prior to 5E12, SS7 loop-around trunks, otherwise known as SS7 inter-module trunks (IMT), required the use of two switching modules and an active CNI platform in order to complete an ISUP call. In general, ISUP call processing would treat a call using an SS7 IMT like any other SS7 call attempt. The Initial Address Message (IAM) generated, however, would be intercepted by the CNI signaling platform and forwarded to appropriate destination SM for processing as if it came from the external SS7 message network. Thus, the CNI platform played an important role in the SS7 message flow regarding SS7 IMTs.

The requirement of two distinct SMs and the role of CNI, however, blocked the 5ESS® VCDX Switch from deploying SS7 loop-around trunks since it consisted of a single SM and used an Signaling Gateway (formerly known as Global SM) for signaling message transport. In a 5E12 software update, feature 99-5E-4360, *Single SM Loop Around Trunks* resolved this deficiency by introducing changes to support SS7 loop-around trunks on the VCDX switch when it was provisioned as a Global SM.

The SS7-PSU Intermodule/Intramodule Trunk Enhancements feature provides three capabilities on the 5ESS® switches:

- Support for single SS7 loop around trunks (SLT), otherwise known as SS7 intra-module trunks, on any SM in the office.
- Support for SS7 inter-module trunks (IMTs) that originate on one SM and terminate on a different SM in the same office. This feature creates a new message flow for handling SS7 inter-module trunks that is independent of any signaling platform (CNI or Signaling Gateway) provisioned in the office.

- ☐ Support for a new mechanism to monitor SS7 trunk maintenance (TM) messages being sent/received regarding one or more ISUP trunks. The ISUP trunks may be intra-module (SLT), inter-module (IMT), or CNI/SG-based inter-switch trunks.

99-CP-4246.B SS7-PSU MAINTENANCE/RELIABILITY ENHANCEMENTS

This feature provides several enhancements to the message transfer part (MTP) software in the Signaling System 7 (SS7) packing switching unit (PSU) and the global switching module (GSM) to achieve feature parity with the common network interface (CNI). These enhancements are as follows:

- ☐ Elimination of false link congestion
- ☐ Improved periodic signaling link test (SLT) procedure
- ☐ Signaling link (SL) failure/T19 timer support
- ☐ SLT procedure improvements
- ☐ NEN renumbering for CCS trunks

99-CP-4246.E SS7-PSU MTP AND SCCP ROUTE VERIFICATION TESTS

The Message Transfer Part (MTP) Routing Verification Test (MRVT) is used to verify MTP routing data between signaling points (SP) in an SS7 network and confirm all MTP routes between an initiating SP (the initiator) and a terminating SP (the terminator). Findings are reported back to the initiator.

The MRVT checks the accuracy and consistency of the administrable MTP routing data at all the SPs involved in routing between a given source and destination. Administrable routing data is static routing data that can be modified directly through a recent change mechanism.

The Signaling Connection Control Point (SCCP) Routing Verification Test (SRVT) is used to test the SCCP Global Title Translation (GTT) data for accuracy, completeness, and consistency in the SS7 network and to sectionalize any routing problems discovered in the network. The SRVT performs this testing by simulating the process involved in query/response transactions which take place between signaling points.

97-CP-4246.K SS7-PSU LINK ENHANCEMENTS

This feature provides capacity and routing enhancements for SS7 PSU signaling platform to achieve feature parity with capabilities offered on the CNI signaling platform. This feature adds this functionality:

- ☐ Signaling Link Selector (SLS) Code Expansion ☐ Allows the SS7 PSU load sharing procedures to support the 8 bit SLS code field and load share the traffic evenly across the available links.
- ☐ Increase Linkset Size to 16 Links ☐ Allows the SS7 PSU signaling platform to support up to 16 links per linkset.
- ☐ Label A/E/F Links ☐ Allows the labeling of links according to their link type.
- ☐ ISUP Message Handling in the PSU ☐ Allows MTP to respond with ISUP Release (REL) messages to fail incoming call set-up requests when it determines it cannot route the message to the appropriate SM.

99-CP-4322 NP-SERVICE PROVIDER PORTABILITY AMA ENHANCEMENTS

This feature provides the following set of automatic message accounting (AMA) enhancements to the

5ESS[®] implementation of local number portability (LNP):

- (1) Base: Attach an originating party LNP BAF module (MOD 720) to all AMA records generated for calls originating from (or forwarding from) ported destination numbers (DNs).
- (2) Incremental: Attach a terminating party LNP BAF module (MOD 720) to all terminating AMA records generated for calls terminating to "ported" DN's. Generate a new default flat rate AMA record using either Structure Code 001 or Structure Code 500 and a Call Code 721 "LNP DFR" for line originations and private facility trunk originations (that is, PBX trunk groups) when the called DN is "portable" and no other AMA record is being generated for the call.

99-CP-4346 NP-VERIFY OFFICE FOR LRNS

This feature enhances VFY:OFC capabilities to allow maintenance personnel to:

- ☐ Verify a port (DN/TG/MLHG/PORT) dialing or receiving specific digits (DIG) - VFY:OFC provides the non-ported outgoing routing information or terminating NOC (NPA-NXX) information, along with any NP-related information associated with the digits
 - ☐ If the number is served by this switch (and its Non-Conditional 10-Digit Trigger [NCDT] is not set), an indication that the switch serves this line, plus the associated NOC, will be output.
 - ☐ If the number is not served by this switch (or has a NCDT set), and an active LNP Trigger is associated with the dialed digits, an NP TCAP Query will be sent to the NP SCP associated with the LNP Trigger. The output, which is presented in several segments, will indicate in the last of the segments that the response was: 1) the original dialed number (not ported), 2) a new number (the LRN of a ported number) or 3) a query failure
- ☐ Verify routing of an arbitrary LRN by using the previously used LRN in the input message, but include a LRN parameter as input - VFY:OFC provides the same type of output as in the first item above, but uses the input LRN rather than query an NP SCP for the LRN.
- ☐ Verify routing of an SS7 trunk group (TG) receiving an LRN and PORTEDDN representing a ported number - VFY:OFC provides either the outgoing routing information (for non-Home LRNs) or NOC information (Home LRNs).
- ☐ Verify routing of an SS7 trunk group (TG) receiving an incoming called number representing an already-queried non-ported number - VFY:OFC provides the non-ported outgoing routing information or terminating NOC (NPA-NXX) information, along with any NP-related information associated with the digits.
- ☐ Verify a "PORTED NUMBER ROUTING ERROR" for a CCS7 trunk origination routing with an LRN in the DIG parameter and PORTEDDN parameter when the LRN is HOME_LRN=Y and the DN is not on the switch.
- ☐ Verify a "ROUTING ERROR UNASSIGNED DN, NO LRN" for a CCS7 trunk origination for an already queried call, that is routing with the dialed digits and that has no RTI associated with those digits post-Digit Analysis. (for example, There is a NOC associated with the dialed digits; but, the DN is not on the switch.

99-CP-4369 DENY INTERNATIONAL CALL TRANSFER FOR CENTREX

This feature enables the switch to prevent transfer of calls to all digit-screened parties for analog lines with a multiway feature that allows call transfer. It helps combat the problem of parties illegally bridging an extension telephone onto a line and selling the directory number as an access number for calls, usually to

international locations. When this feature is activated, the switch denies transfer if either one of the original legs or the added leg party is a digit-screened call that is either international or domestic.

The switch allows normal progression of the digit-screened call and merging of the calls to form a conference, even if one party is an international-type call. The switch denies the transfer only when the controller attempts to transfer the call by disconnecting. If the transfer is denied, the switch tears down the call connection between all three parties (controller, original party, and added leg party) so no call exists between any of the parties.

In addition, this feature allows the service provider to specify (through recent change/verify) the digits that are to be screened and used as the basis for denying the transfer attempt. The service provider provisions a list of codes/digits that are to be screened for this feature. Call processing reads the information from switch data to determine if the transfer should be allowed.

Both a line parameter and a terminal group parameter are available to override this new operation and allow the current transfer operation to continue.

99-CP-4388.A NP-SERVICE PROVIDER PORTABILITY AMA ENHANCEMENTS PACKAGE II - PHASE 1

This feature attaches an originating party local number portability (LNP) module to all terminating access records generated when the function is active. The LNP module contains the location routing number of the originating switch as received in the incoming Signaling System 7 jurisdiction information parameter (JIP). If no JIP is received, no LNP module is generated for the originating party. The information in the LNP module allows terminating networks that perform settlements for mutual compensation with an interconnected network to identify the serving originating network for exchange of automatic message accounting (AMA) billing records.

99-CP-4477 OPERATOR AND DIRECTORY ASSISTANCE BILLING FOR UNBUNDLED LOCAL SWITCHING

This feature provides AMA billing enhancements needed for the local unbundled and resale markets. It allows AMA bills for 0+/- and N11 to operator trunks (class of service FCTSPS).

This feature provides the capability for the incumbent local exchange carrier (ILEC) originating office to generate a valid AMA call type and structure code, as translated by the ILEC, for 0+/- and N11 local call. These calls are routed through operator services trunks using modified operator services signaling (MOSS). The AMA data generated is formatted in the Bellcore AMA Format (BAF).

Generation of this AMA call code data at the ILEC originating end office enables the ILEC to record 0+/- and N11 local calls to any operator services platform.

99-CP-4543 WIRELESS 911

This feature provides the capability for wireless 911 subscribers to have their locations estimated in accordance with FCC regulations. This enhancement to the E911 feature is based upon new information transmitted by the wireless provider, recognition of this new information, and database changes to utilize this data in determining the appropriate call delivery point.

99-CP-4574 PINNACLE® THIRD PARTY CALL CONTROL ENHANCEMENTS 1

This feature is an enhancement to 99-5E-2457, *Third Party Call Control*. Third Party Call Control Enhancements 1 provides access to the switch from a customer's host computer system to specify the following:

- ☐ Host-Requested Agent Log-in: request to log-in a specific agent onto a specific position.
- ☐ Host-Requested Agent Log-off: request to log-off a specific agent from a specific position.

- ☐ Host-Requested Agent Make Busy: request to place a specific agent in the made busy state on a specific position.
- ☐ Host-Requested Agent Ready: request to remove the made busy state for an agent on a specific position.
- ☐ Host-Requested Agent Closed: request to put a specific agent into the closed state on a specific position.

99-CP-4590 NP-TEST QUERY FOR LRNS

A new format has been added to the existing ASP R0.1 test query input message for this feature. For local number portability (LNP), a new message type (NPINFOANAL) is used, and the called party ID is included on the command line. Msgpart is not valid for NPINFOANAL. The called party ID is a 10-digit destination number (DN) that is used to populate the user ID, called party DN, and global title. The OP and CLR input commands do not support the new message type.

A new output message is provided to display the 10-digit local routing number (LRN) when an analyze route is received with a called party that is different than the called party sent in the query. If an analyze route is returned with the same called party, the DN is displayed along with the message, "DN NOT PORTED." Finally, if a Continue is received, the input DN is displayed. For all other responses, existing Advanced Services Platform (ASP) functionality and output messages will be used.

99-CP-4748 B-CHANNEL NEGOTIATION FEATURE

This feature is transparent to the end user, who is a called party whose telephone service is served by an ISDN PBX. When a call is received at the PBX or intelligent peripheral over a PRI, the network switch indicates in the SETUP message that the B-channel negotiation is allowed. If so desired, the PBX or intelligent peripheral can select a different B-channel than the one in the SETUP message from the switch, and include the new channel in a response to the switch. The switch sets up the call on the new channel.

In order to provision this feature, the switch's PRI must already be provisioned. For each PRI B-channel trunk group for which B-channel negotiation is to be activated, access the RC/V view 5.1, and set the new "BCHNEG" field to "YES."

99-CP-4826 NUMBER PORTABILITY ☐ CAUSE CODE 26 ERROR SUPPRESSION

The Number Portability (NP) feature (99-CP-3169.A) requires the switch to send a release (REL) message with ANSI[®] cause code 26 when a location routing number (LRN)-routed call routes to an unallocated directory number. The Number Portability ☐ Cause Code 26 Error Suppression feature provides an optional capability (Controlled via SFID) to disable the NP functions that send back REL ANSI[®] cause code 26 when a call with a home LRN is routed to an unallocated number. With this optional capability, the call receives unallocated number treatment and the switch does not send ANSI[®] cause code 26.

99-CP-4847 TOLL FREE CALLING ENHANCEMENT FOR FLEXIBLE ANI

This feature provides the mechanism to restrict or allow forwarding of original ANI II digits subsequent to Service Control Point (SCP) queries on a per carrier basis for non-translated SSP800 Toll Free calls. The 5ESS[®] Switch tandem/EO provides a "Default II Subscription" indication with a Yes or No (default) value on a per carrier basis (RC/V 10.3). After performing an SCP query for which the SCP has returned a carrier ID and a Toll Free number (non-translated Toll Free number), the switch will check the carrier "Default II Subscription" field. If N, the "Original II" digits are forwarded. If Y, the "Original II" digits are checked to determine which "Default II" value, if populated, to forward, otherwise, forward the "Original II" digits. The "Original II" to "Default II" mapping is recent changeable (RC/V 8.74).

The feature applies to both an Access Tandem or End Office. In the case of Access Tandem, (Access

Tandem does the SCP query), the Original II digits are the II digits received in the signaling message from the end office where the call originated. In the case of End Office (End Office does the SCP query), the Original II digits are the digits as determined by call processing.

This feature applies only when the Toll Free number is not translated to a POTS number by the SCP. The feature applies to SSP800 tollfree calls only.

99-CP-4916 SS7-PSU CONVERSION

The SS7-PSU Conversion feature enhances software in support of a procedure the office.

99-CP-7974 SS7 PSU PLANT AND 24-HOUR MEASUREMENTS

The SS7 PSU Plant and 24-Hour Measurements feature (99-CP-7974) introduces the new parts in PLNTHR and PLNT24 reports, which will provide the office total type data for the performance of all signaling links in the office.

This feature introduces the new part 36 in Plant hourly report (PLNTHR) and part 36 in 24-hour report PLNT24. These new parts will consist of the same set of following counters:

- (1) ACO - number of near-end and far-end automatic changeovers performed.
- (2) ERSEC - number of seconds signaling links are in error.
- (3) CRCER - number of cyclic redundancy check errors detected.
- (4) BYTRXMT - number of bytes being retransmitted.
- (5) OOSTIME - out-of-service duration.

The SS7 PSU Plant and 24-Hour Measurements feature is planned to be available for the 5E16.1 Feature Release 1 (FR1) and later software releases.

99-TP-1002 DISTINCTIVE MDNL RINGBACK WITH CALL

Multi-Distinctive Ringing (MDR) for Call Waited Calls [sometimes referred to as Multiple Directory Numbers Per-Line (MDNL) with Distinctive Ringback for Call Waited Calls] provides multi-distinctive ringing when a party call waits a MDR dependent directory number (DN) and the call waited party goes on-hook.

99-TP-1004 UNLIMITED SIZE FOR SIMULATED FACILITIES GROUPS

The 5ESS[®] switch previously permitted a maximum SFG size of 1984. This Transparency feature allows for an unlimited (infinite) size SFG for 5ESS[®] switch offices.

99-TP-1006 ANNOUNCEMENT AS ERROR TREATMENT FOR LASS ACCESS CODES

This feature provides routing of a user to an uninterruptible announcement when the user dials any valid LASS access code and usage is denied. Feature denial could be for any reason other than invalid access codes or Individual Dialing Plan (IDP), for example, Customer Access Treatment (CAT) or Dialing Plan Access (DPAT) restriction. A single announcement is provided regardless of which LASS feature access code the user dialed. The announcement is provided on a per-switch basis. Error announcement is provided if the feature is available on the switch. If the feature is not available, reorder tone is provided.

99-TP-1008 ACCOUNT CODES - TOLL DIVERSION TO ATTENDANT (DPAT)

With the introduction of the Account Codes - Toll Diversion to Attendant (DPAT) (99-TP-1008) transparency feature option, an Account Code overrides Toll Diversion to an Attendant.

Also, an Account Code access code that has an associated code followed by an ACCT, overrides Dialing Plan Access Treatment (DPAT) restrictions for the first associated code.

The following impacts user operation:

- ☐ Toll Diversion to an Attendant
- ☐ CAT Code Restriction.

There are two methods to restrict end users from directly dialing AMA charged calls: CAT codes for routing codes in the business dialing plan (IDP for the 5ESS[®] switch) and TOLD for calls that escape to the Office Dialing Plan (ODP), dial "9".

- ☐ TOLD Restriction

Escape to POTS codes, dial "9", are not restricted by CAT codes on the 1A ESSTM switch. To restrict the Centrex station from dialing toll charged dial "9" calls (for example, from a conference room), the Centrex station is given the TOLD feature. If a call from the Centrex station attempts an AMA charged dial "9" call without using the CDAR feature first, the call will be routed to an attendant. The attendant's decision whether to route or deny the call is based on the business practices for that company.

However, since account numbers are recorded and shown on billing records, the 1A ESSTM switch allows Customer Dialed Account Recording (CDAR) to supersede toll diversion on a per call basis. Entering the CDAR access code followed by an account number overrides the TOLD restriction, with or without the dial "9" associated with the CDAR access code as a preset routing code. If the caller enters the CDAR access code followed by the account number, the dial "9" access code and the address information, TOLD restriction is overridden and the call is allowed to continue. If the caller dials a CDAR access code with dial "9" as a preset routing access code, followed by the account number and the address information, TOLD restriction is overridden and the call is allowed to continue.

- ☐ CAT Code Restriction

Centrex stations can be restricted from accessing facilities such as ARS, WATS, etc., by CAT codes in the dialing plan for routing access codes used to access these facilities. The customer may associate a routing access code with a particular CDAR access code. When using the CDAR feature and the preset routing access code option, the customer does not dial the routing access code. Entering that CDAR access code overrides the CAT code restriction for the preset routing access code. One distinct CDAR access code is needed for each routing access code that the customer wants treated by this option. Only one routing access code can be associated with each CDAR access code. Entering a CDAR access code without an associated routing access code, followed by the routing access code, will not override the CAT code restriction for the routing access code.

Refer to the 235-190-103, *Business and Residence Feature Descriptions* for more information on this feature.

99-TP-1621 MULTI-DISTINCTIVE RINGING/MSG. SERVICE

The Multi-Distinctive Ringing and Message Service System (MSS) Interactions transparency provides the 5ESS[®] switch with the option to forward the master Directory Number (DN) as the forwarding party regardless of which DN was actually called. Without this option, when calls terminating to a line with Multi-Distinctive Ringing are forwarded, the 5ESS[®] switch provides the number of the DN that was called (master or dependent) as the forwarding party (to the Forward-to destination). As an Optioned Feature, this option is available on an SM or per office basis. An end-user with MSS and Multi-Distinctive Ringing will only need one mail box for the master DN and no mail boxes for the dependent DNs with this feature option.

GLOSSARY

The following acronyms, abbreviations, and terms are used in this manual.

AATOS

Alternate Access to Operator Services

ABS

Average Busy Season

ABSBH

Average Busy Season - Busy Hour

AC

Alternating Current

AC

Authorization Codes

AC

Automatic Callback

ACB

Automatic Callback-Calling

ACC

Alarm Conversion Circuit

ACCQS

Automatic Centralized Charge Quotation System

ACCS

Automated Calling Card Service

ACCT

Account Code

ACD

Automatic Call Distributor

ACP

Advanced Communications Package

ACQS

Automatic Charge Quotation System

ACSR

Automatic Customer Station Rearrangement

ACT

Agent Communication Terminal

ACTS

Automatic Coin Toll Service

ADSL

Asymmetric Digital Subscriber Line

AFT

Analog Facilities Terminal

AGC

Automatic Gain Control

AGTC

Audiographics Teleconference

AICLID

Analog Incoming Calling Line Identification

AIDB

Agent Information Data Base

AIN

Advanced Intelligent Network

AIS

Automatic Intercept System

AIU

Access Interface Unit

ALE

Automatic Line Evaluation

ALIT

Automatic Line Insulation Test

ALTA

Asynchronous Low-Speed Terminal Adapter

AM

Administrative Module

AMA

Automatic Message Accounting

AMARC

Automatic Message Accounting Recording Center

AMATPS

Automatic Message Accounting Teleprocessing System

AMI

Alternate Mark Inversion

AML

Automatic Maintenance Limit

AMLB

Automatic Message Leaf Bulletin

AMST

Administrative Module System Test

ANAC

Automatic Number Announcement Circuit

ANI	Automatic Number Identification
ANIF	Automatic Number Identification Failure
AOC	Announcement Only Channel
AP	Applications Processor/Automated Position
APC	Agent Position Controller
APF	All PINs Fail
APN	Action Point Numbering
APS	Automated Position System
APT	Automatic Progression Test
AQ	Autoquote
AR	Alternate Route
ARA	Automatic Reservation Adjustment
ARC	Alternate Route Cancellation
ARS	Automatic Route Selection
ARU	Audio Response Unit
AS	Administrative Services
ASC	Announcement Service Circuit
ASCII	American Standard Code for Information Interchange
ASM	Announcement System Manager
ASM	Administrative Services Module

ASP

Alarm Status Panel/Advanced Services Platform

ASU

Alarm Status Unit

AT

Access Tandem/Administrative Terminal

ATA

Automatic Task Administrator/Asynchronous Terminal Adapter

ATO

Address Complete Time Out

ATP

Announcement Terminal Process/All Test Passed

ATU

Analog Trunk Unit

AUTH

Authorization Code

AUTOVON

Automated Voice Network

AVMWI

Analog Visual Message Waiting Indicator

AWT

Average Work Time

BAIU

Broadband Access Interface Unit

BAF

Bellcore AMA Format

BCD

Binary Coded Decimal

BCLID

Bulk Calling Line Identification

BCP

Basic Communications Package

BER

Bit Error Rate

BHD

Busy Hour Determination

BIC

Bus Interface Controller

BITS

Building Integrated Timing Supply

BLF

Busy Lamp Field

BNS

Billed Number Screening

BRCS

Business and Residence Custom Services

BREV

Base Relation Evolution

BRI

Basic Rate Interface

BRITE

Basic Rate Interface Terminal Equipment

BRITL

Basic Rate Interface Test Line

BRIV

Basic Rate Interface Verification

BROOT

Backup ROOT

BST

Basic Services Terminal

BSTR

Bootstrapper

BVA

Billing Validation Application

CACD

Centrex Automatic Call Distributor

CAF

Circuit Reset Acknowledgement Failure

CAI

Address Incomplete Received

CALEA

Communications Assistance for Law Enforcement Act

CAMA

Centralized Automatic Message Accounting

CANF

Cancel From

CANT

Cancel To

CAPFIT

Capacity Fit

CAROT

Centralized Automatic Reporting on Trunks

CAS

Customer Account Services

CAT

Customer Access Treatment

CATP

Conditional All Tests Passed

CB

Control Bus

CBA-RA

Coin Box Accounting for Revenue Allocation

CBIC

Complimentary Bipolar Integrated Circuit

CBDB

Call Build Data Blocks

CBIC

Complementary Bipolar Integrated Circuit

CC

Common Control

CCIS6

Common Channel Interoffice Signaling No. 6

CCQS

Centralized Charge Quotation Service

CCS

Common Channel Signaling

CCSA

Common Control Switching Arrangement

CD

Common Data

CD-ROM

Compact Disk - Read-Only Memory

CDAL

Control and Diagnostic Access Link

CDAR

Customer Dialed Account Recording

CDFI

Communication Link Digital Facility Interface

CDI	Control and Data Interface
CDO	Community Dial Office
CDO	Community Dial Office
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CDX	Compact Digital Exchange
CFW	Call Forwarding
CG	Channel Group
CGA	Carrier Group Alarm
CGC	Circuit Group Congestion
CI	Carrier Interconnect
CIB	Control Interface Bus
CIDB	Control Interface Data Bus
CII	Circuit Initial Address Message Irregularity
CIICM	Call Interaction Interface for Inbound Call Management
CISDN	Custom ISDN
CKF	Continuity Check Failure
CLEI	Common Language Equipment Information
CLNK	Communication Link
CM	Communication Module

CMC

Cellular Mobile Carriers

CMCU

Communication Module Control Unit

CMP

Communication Module Processor

CMPC

Circuit Pack Microcode

CMPU

Communication Module Peripheral Unit

CMST

Communication Module System Test

CNAM

Calling Name

CNI

Common Network Interface

CO

Central Office

CODEC

Coder/Decoder

COER

Central Office Equipment Report

COI

Communities of Interest

CODAC

Common Data And Control Circuit

COPS

Cutover Preparation Services

CORC

Customer-Originated Recent Change

CORE40

Switching Module Processor 40

CORE60

Switching Module Processor 60

COSMOS

Computer System for Main Frame Operations

COT

Central Office Terminal

COT

Common Optical Termination

CPDL

Call Processing Data Link

CPE

Customer Premises Equipment

CPI

Central Processor Intervention

CPMC

Circuit Pack Microcode

CPN

Calling Party Number

CPS

Circuit Pack Schematic

CPU

Central Processing Unit

CRA

Call Record Assembler

CRAF

Coin Recorded Announcement Function

CRC

Cyclic Redundancy Code

CRF

Continuity Recheck Failure

CRO

Cancel Reroute Overflow

CRT

Cathode Ray Tube

CSC

Customer Service Center

CSCANS

Customer Service Computer Access Network System

CSD

Circuit Switched Data

CSDC

Circuit Switched Digital Capability

CSR

Customer Station Rearrangements

CSS

Cluster Support System

CSU

Combined Services Unit

CSTL

Coin Station Test Line

CTO

Continuity Time-Out

CTS

Control Time Slot

CTTU

Centralized Trunk Test Unit

CTX

Centrex

CUD

Central Update Database

CVN

Vacant National Number Received

CWT

Call Waiting

DA

Directory Assistance

DACS

Digital Access and Cross Connect System

DAS

Digit Analysis Selector

DAS/C

Directory Assistance System/Computer

DAT

Digital Audio Tape

DBA

Data Base Access

DBM

Data Base Management

DBMS

Data Base Management System

DBP

Data Base Preparation

DBS

Digital Business Services

DCC

Destination Code Cancellation

DCLU

Digital Carrier Line Unit

DCS

Digital Cellular Switch

DCTU

Directly Connected Test Unit

DDD

Direct Distance Dialing

DDL

Derived Data Link

DDSBS

Duplex Dual Serial Bus Selector

DEN

Digital Equipment Number

DESEP

Destination Separation

DF

Data Fanout

DFA

Digital Facility Access

DFC

Disk File Controller

DFI

Digital Facilities Interface

DFIH

Digital Facility Interface - Host End

DI

Data Interface

DID

Direct Inward Dialing

DII

Direct Intelligence Interface

DIOR

Direct International Originations

DIP

Dual In-Line Pin

DISC

Disconnect

DISP

Display and Privacy

DLI	Dual Link Interface
DLN	Direct Link Node
DLP	Decode Level Point
DLSO	Dial Line Service Observation
DLTU	Digital Line and Trunk Unit
DLTU-RH	Digital Line and Trunk Unit - Host End
DLTU-RR	Digital Line and Trunk Unit - Remote End
DM	Disconnected Mode
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
DMI	Dual Message Interface
DN	Directory Number
DOC	Dynamic Overload Control
DOPS	Digital Ordering and Planning System
DPAT	Dialing Plan Access Treatment
DPIDB	Directly Connected Peripheral Interface Data Bus
DR	Direct Route
DRM	Distinctive Remote Module
DRZ	Directionalization
DSC	Digital Service Circuit

DSCH

Dual Serial Channel

DSCP

Digital Service Circuit Port

DSL

Digital Subscriber Line

DSN

Defense Switched Network

DSP

Digital Signal Processor

DSS

Direct Station Select

DSU2

Digital Service Unit 2

DSX

Digital Signal Cross-Connect

DTA

Dial Through Announcement

DTF

Dial Tone First

DTMF

Dual Tone Multifrequency

DTT

Digital Transmission Terminal

DUP

Disk Unit Package

DUV

Data Under Voice

EA

Error Analysis

EADAS

Engineering and Administrative Data Acquisition System

EAEO

Equal Access End Office

EAI

Emergency Action Interface

EAS

Equal Access Signaling

EBAF

Extended Bellcore AMA Format

ECD

Equipment Configuration Data

ECIS

Embedded Common Channel Signaling

ECL

Event Control Link

ECMS

End Customer Management System

ED

Equipment Drawing

EDS

Electronic Directory Service

EDSL

Extended Digital Subscriber Line

EEPROM

Electrically Erasable Programmable Read-Only Memory

EIA

Electronics Industry Association

EIS

External Information System

ELI

Electrical Line Interface

ELP

Encode Level Point

ELS

Electronic Loop Segregation

EMF

Electromotive Force

ENLI

Electrical Network Link Interface

EOAS

External OTR Analysis System

EOC

Embedded Operations Channel

EPORTS

E-Port

EPROM

Erasable Programmable Read Only Memory

ES

Errored Seconds

ESAC

Engineering Support Assistance Center

ESCO

Emergency Service Central Office

ESF

Extended Super Frame

ESP

Essential Service Protection

ETFCC

Elapsed Time From Carrier Connect

ETN

Electronic Tandem Network

ETS

Electronic Tandem Switch

EVE

Extreme Value Engineering

EVHD

Extreme Value High Day

EX

Exercise

EXD

Extra Digits

EXM-2000

Extended Switch Module - 2000

FC

Feature Control

FCC

Federal Communications Commission

FCG

False Cross and Ground

FCMA

Frequency Division Multiple Access

FFA

First Factory Application

FIDB

Facilities Interface Data Bus

FIFO

First-In First-Out

FIT

Fully Initialized Terminal

FITTS

Factory and Installation Test Translation System

FIU

Facilities Interface Unit

FMC

Force Management Center

FOA

First Office Application

FPC

Foundation Peripheral Controller

FST

Factory System Testing

FULLS

Full Translations

FX

Foreign Exchange

GDSF

Global Digital Service Functions

GDSU

Global Digital Service Unit

GDX

Gated Diode Crosspoint

GIDB

Group Interface Data Bus

GMOS

Group Manager Operator Services

GMS

Global Messaging Server

GRASP

Generic Access Package

GSC

Group Signaling Congestion

GSM

Global Switching Module

HDFI

Host Digital Facility Interface

HDLC

High-Level Data Logic Control

HI	Home Intercom
HLSC	High-Level Service Circuit
HM	Human Machine Interface
HOBIC	Hotel Billing Information Center
HOBIS	Hotel Billing Information System
HSM	Host Switching Module
I/O	Input/Output
IAD	Incomplete Address Detected
IAM	Initial Address Message
IC	Interexchange Carrier
ICCV	International Credit Card Validation
ICI	Incoming Call Types
ICL	Inter-RSM Communication Link
ICLID	Incoming Calling Line Identification
ICM	ISDN Intercom
ID	Identification
IDCU	Integrated Digital Carrier Unit
IDDD	International Direct Distance Dialing
IDP	Individualized Dialing Plan
IEC	

Inter-Exchange Carrier

ILAS

ISDN Line Assignment System

IM

Input Manual

IMCS

Intelligent Micro Control Store

IMLT

Integrated Mechanized Loop Test System

IMS

Interprocessor Message Switch

IMT

Intermodule Trunking

INC

International Carrier

INDIT

Incoming Trunk Preliminary Digit Interpreter Table

INSEP

Incoming Separation Class

INWATS

Inward Wide Area Telecommunications Service

IOMI

Input/Output Microprocessor Interface

IOP

Input/Output Processor

IOTP

Interflow Originating Terminal Process

IP

Internal Protocol

IPIB

Intelligent Peripheral Interface Bus

IPTP

Interflow Position Terminal Process

IS

In-Service

ISAT

ISDN Attendant

ISC

Intelligent Serial Card

ISDN

Integrated Services Digital Network

ISLU

Integrated Services Line Unit

ISM

Inter-SM

ISMPT

Inter-SM Packet Transport

ISO

International Standards Organization

ISP

Intermediate Switch Point

ISPA

Integrated Services Port Administration

ISTF

Integrated Services Test Function

ISUP

ISDN Users Part

IT

Inter-Switch Transport

ITC

Installation Test Center

ITNA

Improved Third Number Acceptance

IU

Interface Unit

IUN

Interprocess Message Switch User Node

KDT

Keyboard Display Terminal

LA&M

Link Administration and Maintenance

LAMA

Local Automatic Message Accounting

LAN

Local Area Network

LAPB

Link Access Procedure B

LAPD

Link Access Procedure D

LASS

Local Area Signaling Services

LATA

Local Access and Transport Area

LAU

Link Adapter Unit

LC

Line Card

LCC

Line Class Code

LCEN

Line Card Equipment Number

LCR

Line Concentration Ratio

LDC

Long Duration Call

LDIT

Local Digit Interpreter Table

LDS

Local Digital Switch

LDSU

Local Digital Service Unit

LDSUF

Local Digital Service Unit Function

LEC

Local Exchange Carrier

LED

Light Emitting Diode

LEN

Line Equipment Number

LGC

Line Group Controller

LI

Link Interface

LID

Line Identification

LIDB

Local Interface Data Bus

LIT

Line Insulation Test

LLC

Line Load Control

LMOS

Loop Maintenance Operations System

LN

Leased Network

LS

Listing Services

LSPP

Listing Services Presentation Protocol

LTC

Local Test Cabinet

LTD

Local Test Desk

LTF

Loop Test Frame

LTMA

Lightwave Termination and Multiplex Assembly

LTP

Line Trunk Peripheral

LTS

Loop Testing System

LU

Line Unit

MA

Metallic Access

MAN

Metallic Access Network

MAS

Main Store

MASA

Main Store Array

MASC

Main Store Controller

MBI

Message Billing Index

MCA

Multiple Call Appearances

MCC

Master Control Center

MCCQS

Manual Centralized Charge Quotation System

MCG

Manual Call Gap

MCTSI

Module Controller and Time Slot Interchanger Unit

MCTU

Switching Module Processor and Time Slot Interchanger Unit

MDBA

Multiple Data Base Access

MDF

Main Distributing Frame

MDII

Machine Detected Interoffice Irregularities

MDR

Message Detail Recording

MEA

Modified Equal Access Signaling

MECCA

Mechanized Evaluation of Call Completion Anomalies

MECH

More Efficient Call Handling

MEU

Memory Expansion Unit

MF

Multifrequency

MFC

Modular Feature Customization

MIB

Message Interface Bus

MICU

Message Interface Control Unit

MIS

Management Information System

MLH

Multiline Hunt

MLHG

Multiline Hunt Group

MLSS

Machine Load and Service Summary

MLT

Mechanized Loop Testing

MMP

Module Message Processor

MMRSM

Multimodule Remote Switching Module

MMST

Multimodule System Test

MMSU

Modular Metallic Service Unit

MPLPC

Multipulse Protective Coding

MPSC

Multiprotocol Serial Controller

MPTA

Modem Pool Terminal Adapter

MQ

Modular Queuing

MR

Modification Request

MRA

Maintenance Request Administration

MS

Main Station

MSC

Mobile Switching Center

MSCU

Message Switch Control Unit

MSG

Message Switch

MSL

Mechanized Subscriber Line

MSPU

Message Switch Peripheral Unit

MSU

Metallic Service Unit

MTB

Metallic Test Bus

MTIB

Metallic Test Interface Bus

MTP

Monitor Terminal Process

MTS

Measured Time Service

MWI

Message Waiting Indicator

MWY

Multiway Calling

NAC

Network Administration Work Group

NAP

Network Access Point

NANP

North American Numbering Plan

NCD

Network Call Denial

NCLK

Network Clock

NCP

Network Control Point

NCT

Network Control and Timing

NCTE

Network Channel Terminating Equipment

NI-1

National ISDN-1

NISDN

National ISDN

NIT

Non-Initializing Terminal

NM

Network Management

NMC

Network Management Center

NOG

Network Operations Group

NPA

Numbering Plan Area

NRA

Network Remote Access

NSC

National Switching Congestion

NSEP

Network Switching Engineering Practices

NT

Network Termination

NTC

National Trunk Congestion

NTR

No Test Run

OAM

Once a Month

OAP

OSPS Administrative Processor

OCC

Other Common Carrier

ODA

Office Data Administration

ODBE

Office Data Base Editor

ODD

Office Dependent Data

ODIN

On Line Data Integrity System

OE

Originating Equipment

OFFNORM

Off Normal

OFFRCR

Off-Site Recent Change Reapplication

OID

Operator Identification

OM

Output Manual

ONI

Operator Number Identification

ONTC

Office Network and Timing Complex

ONTCCOM

ONTC Common

OOS

Out-of-Service

OPC

Operator Position Controller

ORB

Office Repeater Bay

ORM

Optically Integrated Remote Switching Module

OS

Operations System

OSC

Operator Service Center

OSDS

Operating System for Distributed Switching

OSDS-C

Operating System for Distributed Switching in the AM

OSDS-CMP

Operating System for Distributed Switching in the CMP

OSDS-M

Operating System for Distributed Switching in the SM

ISDS-P

Operating System for Packet Interface and Protocol Handlers

OSDS-SM

Operating System for the Switch Maintenance Software in the AM

OSO

Originating Screening Office

OSPS

Operator Services Position System

OTC

Operating Telephone Company

OTP

Originating Terminal Process

OTR

Operator Trouble Reports

OTRP

Operator Trouble Report Printer

OUTWATS

Outward Wide Area Telecommunications Service

PA

Program Application

PAD

Packet Assembler/Disassembler

PB

Packet Bus

PBX

Private Branch Exchange

PC

Peripheral Control/Personal Computer/Program Change

PCM

Pulse Code Modulation

PDS

Packet Driver Solutions

PDIT

Prefix/Feature Digit Interpreter Table

PFA

Private Facility Access

PG

Program Index

PH

Protocol Handler

PHDB

Protocol Handler Data Bus

PI

Packet Interface

PIB

Packet Interconnect Bus

PIC

Peripheral Interface Controller

PICB

Peripheral Interface Control Bus

PIDB

Peripheral Interface Data Bus

PIN

Positive Intrinsic Negative

PK

Supplementary Program Information

PLL

Phase Locked Loop

POTS

Plain Old Telephone Service

PPC

Pump Peripheral Controller

PPQ

Periodic Product Qualification

PPS

Packet Per Second

PPSN

Public Packet-Switched Network

PR

Program Listing

PRI

Primary Rate Interface

PRN

Pseudo-Random Number

PROM

Programmable Read-Only Memory

PSA

Port Status Administration

PSD

Packet Switched Data

PSM

Position Switching Module

PSMCP

Packet Switched Modem Call Processing

PSU

Packet Switch Unit

PSUCOM

Packet Switch Unit Common Controller

PTI

PIDB Transmission Interface

PTP

Position Terminal Process

PUO

Call Pickup Originating

PVC

Permanent Virtual Circuit

QLI

Quad Link Interface

RA

Rate Adapter

RAF

Recorded Announcement Function

RAI

Recorded Announcement Interface

RAM

Random Access Memory

RAO

Revenue Accounting Office

RAS

Remote Alarm Section

RAU

Remote Alarm Unit

RBOC

Regional Bell Operating Company

RC

Recent Change

RC/V

Recent Change/Verify

RC/VFY

Recent Change/Verify

RCAF

Remote Access to Call Forward

RCLK

Remote Clock

RCLKU

Remote Clock Unit

RCOS

Recent Change Operations System

RDFI

Remote Digital Facility Interface

REX

Routine Exerciser

RISLU

Remote Integrated Services Line Unit

RLI

Remote Link Interface

RMAS

Remote Memory Administration System

RMV

Remove From Service

RNR

Receiver Not Ready

ROH

Receiver Off-Hook

ROM

Read-Only Memory

ROP

Receive-Only Printer

ROTL

Remote Office Test Line

RP

Revertive Pulsing

RPCN

Ring Peripheral Controller Node

RR

Reroute

RSB

Repair Service Bureau

RSCANS

Reverse Software Change Administration and Notification System

RSM

Remote Switching Module

RSS

Remote Switching System

RST

Restore to Service

RT

Remote Terminal

RTA

Routing and Terminal Allocation

RTAC

Regional Technical Assistance Center

RTI

Route Index

RTR

Real-Time-Reliable

RTRS

Real-Time Rating System

RTTU

Remote Trunk Test Unit

SA

Service Assistant

SABM

Set Asynchronous Balance Mode

SAC

Scan Applique Circuit

SADA

Service After Delay Announcement

SAS

Service Announcement System

SC

Speed Calling

SCA

Selective Call Acceptance

SCANS

Software Change Administrative Notification System

SCCS

Switching Control Center System

SCCP

Switching Connection Control Point

SCE

Service Creation Environment

SCF

Selective Call Forwarding

SCN

Service Control Node

SCP

Service Control Point

SCR

Selective Call Rejection

SCSD

Scan and Signal Distribute

SCSI

Small Computer Systems Interface

SCU

Signal Conversion Unit/Switch Control Unit

SD

Schematic Drawing

SDA

Selective Distinctive Alerting

SDDF

Supplementary Digital Distributing Frame

SDFI

Subscriber Digital Facility Interface

SDLC

Synchronous Data Link Controller

SDN

Software Defined Network

SEC

Service Evaluation Center

SES

Spares Exchange Service

SFG

Simulated Facility Group

SFI

STSX-1 Facility Interface

SG

Service Group

SGROW

Special Grow

SHDN

Shared Directory Number

SI

System Integrity

SILC

Selective Incoming Overload Control

SIT

Special Information Tone

SLATTS

Selected Line and Trunk Translation System

SLEN

Subscriber Loop Equipment Number

SLG

Sub Line Group

SLIM

Subscriber Loop Interface Module

SLUS

Subscriber Line Usage Studies

SM

Switching Module

SMC

Switching Module Control

SMD

Storage Module Device

SMP

Switching Module Processor

SMPU

Switching Module Processor Unit

SMS

Service Management System

SMST

Switching Module System Test

SODD

Static Office Dependent Data

SONET

Synchronous Optical Network

SP

Signal Processor/Speech Processing

SPC

Stored Program Control

SPCS

Stored Program Control System

SPP

Single Process Purge

SPYDER-T

Synchronous/Asynchronous Protocol Data Formatter

SRA

Synchronous Rate Adapter

SRAM

Static Random Access Memory

SSP

Service Switching Point

SST

Short Supervisory Transition

SSU

Short Supervisory Unit

ST

Security Terminal

STA

Synchronous Terminal Adapter

STF

Some Tests Failed

STLWS

Supplementary Trunk and Line Work Station

STP

Signal Transfer Point

STPI

International Signal Transfer Point

SVC

Switched Virtual Circuit

SXS

Step by Step

T

Transmit

T&A

Toll and Assistance

TA

Terminal Adapter

TAC

Test Access Circuit

TAISP

Tandem Access for Inter-LATA Sent-Paid Coin Calls

TASC

Telco Administration Support Capability

TAT

Termination Attempt Trigger

TAU

Test Access Unit

TBCC

Test Bus Control Circuit

TBCU

Test Bus Control Unit

TCA

Telephone Company Administration

TCBH

Time-Consistent Busy Hour

TCM

Traveling Class Marks

TCSE

Terminating Code Screening Enhancements

TD

Tone Decoder

TDMA

Time Division Multiple Access

TEN

Terminal Equipment Number

TEO

Telephone Equipment Orders

TERA

Trunk Error Analysis

TG

Terminal Group

TG

Translation Guide

TGB

Trunk Group Busy

TGC

Trunk Group Control

TGSR

Terminal Group and Station Restriction

TGW

Trunk Group Warning

TIE

Time Interval Error

TIRM

Technical Information Resource Manager

TLP

Trouble Locating Procedure

TLWS

Trunk and Line Work Station

TM

Terminal Maintenance

TMC	Time Slot Management Channel
TMF	Terminal Management Function
TMS	Time Multiplexed Switch
TMSLNK	Time Multiplexed Switch Link
TMSU	Time Multiplexed Switch Unit
TNN	Trunk Network Number
TOD	Time-of-Day
TP	Terminal Process
TR	Trunk Reservation
TRCU	Transmission Rate Converter Unit
TRUMP	Trunk Maintenance Package
TSI	Time Slot Interchanger
TSI-S	Time Slot Interchanger for Subscriber Loop Carrier Applications
TSIU	Time Slot Interchange Unit
TSPS	Traffic Services Position System
TSS	Telecommunication Standardization Sector
TSS	Time Slot Set
TTF	Transmission Test Facility
TTL	Transistor-Transistor-Logic
TTP	Terminating Terminal Process

TTS

Transmission Test Set

TU

Trunk Unit

UCC

Universal Conference Circuit

USOC

Universal Service Order Code

USTWC

Usage Sensitive Threeway Calling

UTD

Universal Tone Decoder

UTG

Universal Tone Generator

UTX

Universal Tone Transceiver

VCA

Vacant Code

VCDX

Very Compact Digital Exchange

VDT

Video Display Terminal

VFY

Verify

VIRGOS

Video Interactive Regional Ordering Specification

VLSI

Very Large Scale Integration

VMSI

Voice Messaging Service Interface

VPA

Voice Path Assurance

VSA

Voice Switched Attenuator

WATS

Wide Area Telecommunications Service

XAT

X.25 Packet-Switching Access on T1 Facilities

XO

Extended Office

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