FEATURE DOCUMENT
COMMON CHANNEL INTEROFFICE SIGNALING FEATURE
LOCAL AND TOLL
2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

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INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This document provides information for using the Common Channel Interoffice Signaling (CCIS) feature with the No. 1/1A Electronic Switching Systems (ESSs). The CCIS feature provides for the exchange of information between processor-equipped switching systems and data bases over a

network of signaling data links between offices in both the toll and local network.

REASON FOR REISSUE

1.02 This document is reissued to include coverage of Local CCIS, direct signaling, related CCIS Inward Wide Area Telephone Service (800 Service) features (Originating Screening Office [OSO] and Busy/Idle Status Indicators [BISI]), CCIS network management, and software carrier group alarm. Since this reissue is a general revision which involves conversion to the standard 18-part format, no arrows have been used to denote significant changes.

FEATURE AVAILABILITY

1.03 The Toll CCIS feature is initially available for the No. 1 ESS with the 1E5 generic program and for the No. 1A ESS with the 1AE5 generic program. The Local CCIS feature is initially available for the No. 1 ESS with the 1E7 generic program and for the No. 1A ESS with the 1AE7 generic program.

1.04 Toll CCIS signaling link overload controls and the use of common language location information (CLLI) with translation integrity check are initially available with the 1E6/1AE6 generic programs.

1.05 Direct signaling, CCIS network management, 800 Service OSO, and software carrier group alarm capabilities are initially available in the 1E7/1AE7 generic programs. Details of CCIS network management operation can be found in reference A(64) in Part 18. Details of 800 Service OSO can be found in reference A(8) in Part 18.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The ***CCIS*** feature provides for exchanging information between processor-equipped switching systems over a network of signaling data links between offices in both the toll and local network. All signaling data, including the supervisory and address signals necessary to control ordinary call setup and take-down, special service related signals, network management signals, etc, are exchanged by these systems over the signaling links.

BACKGROUND

2.02 The CCIS feature utilizes a data link (DL) network separate and distinct from the direct distance dialing (DDD) voice network to transmit signaling, supervisory, and administrative information between switching offices. The CCIS feature provides the ability to set up originating, terminating, and tandem interoffice calls by connecting CCIS trunks to lines or other trunks. The connected trunks may be either the CCIS or conventional type. Local CCIS provides line-to-CCIS trunk and CCIS trunk-to-line connections as well as CCIS trunk-to-trunk connections in local offices. Toll CCIS provides CCIS trunk to either CCIS or conventional signaling (per trunk signaling [PTS]) trunk connections in toll offices.

2.03 The simplest and most direct form of CCIS would utilize a signaling link between the processors of a pair of CCIS-equipped switching offices having interconnecting trunks. This is referred to as associated signaling. Since, in most instances, this method would result in very light loading of the signaling links, nonassociated signaling is extensively used; and, in fact, it is the only method currently used with No. 1/1A ESS offices for trunk related signaling. With nonassociated signaling, the signaling information is routed via signal transfer points (STPs) that concentrate the signaling for a large number of trunk groups into a few signaling paths. In addition to nonassociated signaling used for trunk related messages, CCIS uses another form of signaling called direct signaling. This form of signaling is used for sending nontrunk-related messages between nodes in the CCIS network. Direct signaling is used by features such as INWATS OSO and BISI for transmitting messages between switching offices and INWATS data bases. The STPs serve as signal message switching centers, sorting and redirecting the signal messages from incoming to outgoing signal links.

2.04 All portions of the signaling network are sufficiently redundant and diversified to ensure signaling availability. For intertoll switching, the nation is divided into ten signaling regions corresponding to the existing regions of the DDD switching hierarchy. Each region has a pair of regional STPs, and where the signaling traffic warrants it, one or more additional pairs of STPs called area STPs. Figure 1 shows the signal links and trunks between two regions. All CCIS-equipped switching offices concentrate the signaling traffic for all of their CCIS trunks onto a few well-loaded links to one or more STP pairs. Every CCIS switching office is connected via A links to the primary STP serving it.

(Type A links are always provided in redundant pairs—duplicated links to each of two STPs of a pair.) Type C links connect each STP to its mate. If a CCIS switching office is connected to more than one STP pair (eg, for high usage reasons), then E links provide the connections to the STP pairs in addition to the primary STP pair. Type D links connect the area STPs to the regional STPs. Type B links provide connections between STP pairs of the same level, ie, connections from an area STP pair to another STP pair and connections from a regional STP pair to another regional STP pair.

2.05 The following examples, using Fig. 1, illustrate how the signaling links and STPs are involved in setting up calls. An intraregional Toll CCIS attempt for trunk group TG3 from switching office TO8 is sent over link A81 to STP RI-1, where

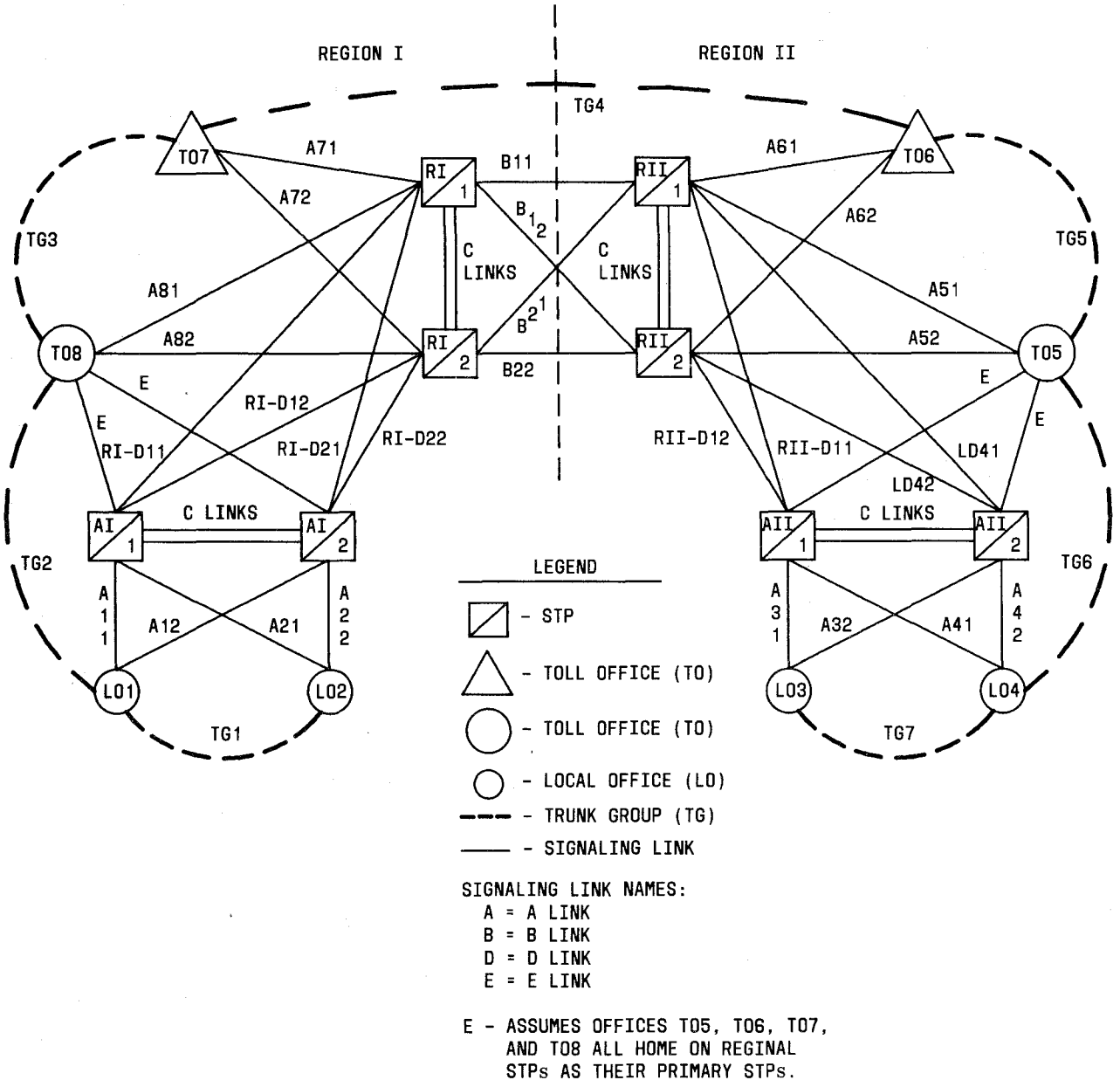


Fig. 1—CCIS Network Topology

it is translated and then forwarded over link A71 to TO7. (Alternately, A82, STP RI-2, and A72 could have been used.) Interregional CCIS calls normally require two STPs—one in each region. An interregional CCIS attempt for trunk group TG4 and TO7 may use link A71, STP RI-1, B11, STP RII-1, and link A61 to TO6. Numerous alternate paths are also available using STP RI-2, RII-2, and the other B links. Type C links provide additional paths which are used when there are STP or link failures.

2.06 An interlocal CCIS attempt from switching office LO1 to LO2 is sent over link A11 to STP AI-1, where it is translated and then forwarded over link A21 to LO2. (Alternately, A12, STP AI-2, and A22 could have been used.) An interregional CCIS call from one area network to another requires the use of the toll network. A call attempt from LO1 to LO4 is sent over A11 to STP AI-1, where the call information is translated and then forwarded over link D11 to STP RI-1. There the information is forwarded over link B11 to STP RII-1, where it is again translated and sent over link RII-D21 to the distant metropolitan STP AII-2 and finally over link LA42 to the distant switching office LO4. (There are many alternate paths. One might be A12, STP AI-2, RI-22, STP RI-2, B22, STP RII-2, RII-D12, STP AII-1, and finally, A41.) If the C links are considered, a total of 256 possible paths exist. (Type C links are used only during link failure.)

2.07 No. 1/1A ESS can utilize either the 2400 DL or peripheral unit controller/data link (PUC/DL) for its DLs. A block diagram of the No. 1/1A ESS CCIS signaling subsystem appears in Fig. 2. The DL controller can be either the terminal access controller (TAC) or the peripheral unit controller (PUC) with the related terminal being the data terminal (DTRM) or the line interface unit (LIU), respectively. The controller enables the processor to access the various signaling links by providing an interface between the processor and the terminals. It also performs certain maintenance functions.

2.08 Each A link connecting a No. 1/1A ESS with an STP consists of a signaling terminal, a modem (data set), and a duplicated voice frequency link (VFL). The signaling terminals store both outgo-

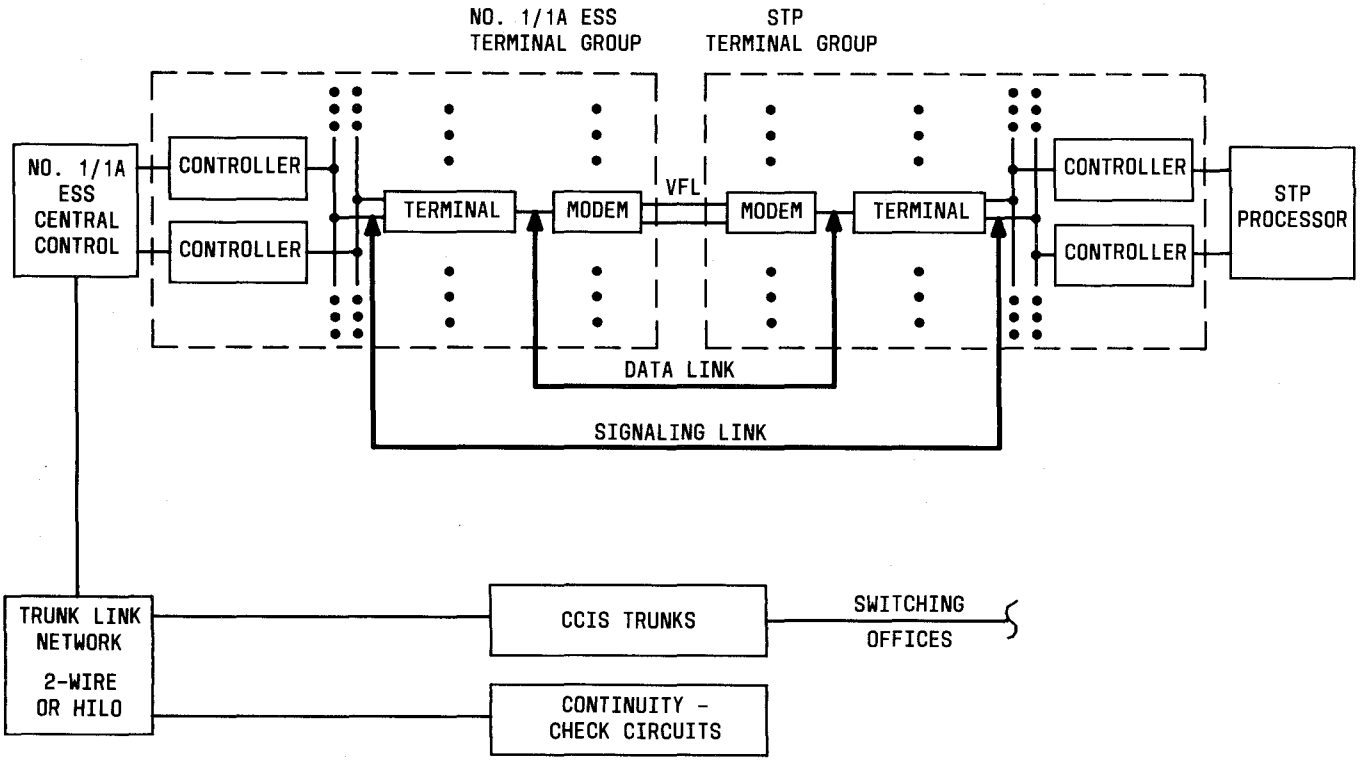


Fig. 2—No. 1/1A ESS CCIS Signaling Subsystem—Block Diagram

ing messages awaiting transmission and incoming messages awaiting processing. The terminals also perform error detection and correction through redundant coding and retransmission of signaling messages found to be in error. Each modem forms a digital to analog interface between the terminal and the VFL. The VFL is a conventional 4-wire message grade synchronous transmission facility (type 3002 channel) and is operated full duplex; ie, signaling occurs in both directions simultaneously.

2.09 Because the signaling for many trunks is sent over the same link pair (approximately 2250 trunks per pair of A links), all trunk related signaling messages include a label identifying the trunk for the signals being sent. The STPs use this label to determine the outgoing link on which the received signaling message is to be forwarded. Direct signaling messages are also sent on the same A link pairs as the trunk related messages. Links must be engineered to account for both the trunk related and the direct signaling traffic on the links.

2.10 A load-sharing configuration is established between the A links and the two STPs. In the event of a link failure, all signaling can be routed over the mate link to the other STP.

2.11 Each signaling message is made up of one or more basic words or signal units (SUs). Signal units consist of 28 bits—20 information bits plus 8 check bits used for error detection. A message that contains only a single SU is designated a lone signal unit (LSU). A message that is made up of several SUs is called a multiunit message (MUM). The first SU of a MUM, the initial signal unit (ISU), indicates that this is a MUM and also indicates the number of subsequent signal units (SSUs) that comprises the remainder of the MUM.

2.12 Signal units are always transmitted in blocks of 12. Whenever no message is in the transmit queue, a synchronization signal unit (SYU) is transmitted. The 12th SU of every block always contains an acknowledgment control unit (ACU). The ACU acknowledges to the far end of the DL that a previously transmitted block has been received. The ACU contains an indication of which units of the block were received in error (if any). The far end retrieves and retransmits the particular messages that contained the SUs in error.

2.13 The CCIS messages are divided into the following four major classes.

(a) ***Signaling System Control Messages:*** These are messages that pertain specifically to the individual signaling link over which they are being carried. Examples include the acknowledgment control unit and the synchronization unit, previously described, and the changeover unit (COV) that is used in the process of changing over to the mate load-sharing link whenever a failure occurs.

(b) ***Telephone Messages:*** These are messages that relate to the setup and take-down of telephone calls. Examples include the initial address message (IAM) which contains the trunk identifying label and call routing information, the address complete signal (ADC) which is sent in the backward direction indicating that all address signals required for routing the call to the called party have been received, and the answer (ANC) signal which is also sent in the backward direction indicating that the called party has answered and that charging can commence.

(c) ***Management Messages:*** These messages are divided into the following subgroups:

(1) ***Signaling Network Management:*** The function of these signals is to ensure the availability of the CCIS network itself. Examples include the transfer restricted (TFR) and transfer prohibited (TFP) signals used during link failures.

(2) ***Network Maintenance:*** These signals are used to maintain the trunk network. An example of this type of message is the trunk query (TQU) message that can be used by the switching office to determine the state of a particular trunk at the distant end.

(3) ***Network Management:*** These messages are used to manage the DDD network. Examples include the dynamic overload control (DOC) messages used to cut back the amount of traffic sent to a trunk under overload conditions.

(d) ***Trunk Related Messages:*** These messages verify proper translation through the signaling network on behalf of a particular trunk. They are used, for example, by the translation integrity test procedures.

2.14 A complete list of CCIS network signals that are processed by the No. 1/1A ESS appears in Table A. Expanded definitions of these signals appear in Part 17, GLOSSARY.

2.15 The foregoing presented a brief tutorial exposition of the CCIS network; for more detailed information see references A(1) through A(5) in Part 18.

TABLE A

CCIS MESSAGES PROCESSED BY NO. 1/1A ESS OFFICES

SIGNALING MESSAGES PROCESSED BY CCIS SOFTWARE		TYPE OF MESSAGE	ASSOCIATED SOFTWARE FUNCTION
ADC	Address Complete-Charge	Telephone Signals	Call Processing Trunk Maintenance
ADI	Address Incomplete		
ANC	Answer-Charge		
BLO	Blocking		
CB1	Clear Back 1		
CB2	Clear Back 2		
CB3	Clear Back 3		
CFL	Call Failure		
CLF	Clear Forward		
COF	Confusion		
COT	Continuity		
FOT	Forward Transfer		
IAM	Initial Address Message		
ID	Identifier		
MRF	Message Refusal		
NSC	National Switching Congestion		
NTC	National Trunk Congestion		
RA1	Reanswer 1		
RA2	Reanswer 2		
RA3	Reanswer 3		
RCT	Recycle Timer		
RLG	Release Guard		
RST	Trunk Reset		
SPR	Signaling Problem		
SSB	Subscriber Busy		
SSD	Second Start Dial		
UBL	Unblocking		
UQL	Unequipped Label		
VNN	Vacant National Number		
BD3	Broadcast DOC 3	Network Management Signals	Network Management
RD3	Remove DOC 3		
DOC 0	Dynamic Overload Control Level 0		
DOC 1	Dynamic Overload Control Level 1		
DOC 2	Dynamic Overload Control Level 2		
DOC 3	Dynamic Overload Control Level 3		
GSC	Group Signaling Congestion		
PSC	Processor Signaling Congestion		

TABLE A (Contd)

CCIS MESSAGES PROCESSED BY NO. 1/1A ESS OFFICES

SIGNALING MESSAGES PROCESSED BY CCIS SOFTWARE		TYPE OF MESSAGE	ASSOCIATED SOFTWARE FUNCTION
COV	Changeover	Signaling System Control Signals	Link Security
ELT	Emergency Load Transfer		
LTA	Load Transfer Acknowledge		
LTR	Load Transfer		
MCA	Manual Changeover Acknowledge		
MCO	Manual Changeover		
MVT	Manual VFL Transfer		
PRN	Processor Notification		
TSV	Test Standby VFL		
VLF	VFL Test, Failed		
VLP	VFL Test, Passed		
ESU	End of Status Update	Signaling Network Management Signals	Link Security
RAB	Request All Bands Status		
RPB	Request Particular Band Status		
TFA	Transfer Allowed		
TFP	Transfer Prohibit		
TFR	Transfer Restricted		
RBR	Reset Band Reply	Network Maintenance Signals	Audits/Trunk Query
RSB	Reset Band		
TQR	Trunk Query Reply		
TQU	Trunk Query		
TTR	Test Translation	Special Signals	Translation Integrity Check Direct Signaling Translation Test
DTT	Data Test Translation		
RTT	Reply to Test	Direct Signaling	Direct Signaling Translation Test
SIGNALING MESSAGES PROCESSED BY THE DATA TERMINALS			
ACU	Acknowledgment Control Unit		
PRO	Processor Outage		
SYU	Synchronization Signal Unit		

DESCRIPTION

3. USER OPERATION

CUSTOMER

3.01 The basic Local and Toll CCIS features are essentially invisible to the customer. However, as CCIS becomes widely deployed, a noticeable decrease in call setup time for customer-dialed calls will occur. The basic CCIS features also provide a basis upon which new and enhanced customer services can be built. Enhanced INWATS services, which utilize the CCIS signaling capabilities, are an example of such services. References A(8) through A(10) in Part 18 provide a detailed description of these services.

TELEPHONE COMPANY

A. No. 1/1A ESS CCIS Signaling Subsystem

3.02 A No. 1/1A ESS CCIS office would typically be equipped with a signaling subsystem consisting of either a 2400 DL or a PUC/DL. It is also possible to use both types of signaling subsystems in the same office. The 2400 DL subsystem is dedicated to the CCIS application. However, the PUC/DL subsystem can be shared between CCIS and other applications such as the Remote Switching System (RSS), Electronic Tandem Switching (ETS), and Centrex Station Rearrangements (CSR) features.

3.03 The 2400 DL comprises a basic terminal frame and up to two supplementary frames. The basic frame can house up to eight DTRMs and eight modems plus terminal access controllers (TACs). The two supplementary TAC-DTRM frames (2400 DL), when fully equipped, contain eight DTRMs (four per supplementary frame), eight modems, and associated power converters.

3.04 The PUC/DL comprises a single frame containing duplicated PUC controllers and LIUs. The modems are mounted on a separate frame, the data communication control frame, along with the data interface units and voice frequency link access (VFLA) circuits. The number of LIUs which can be supported on a single PUC/DL frame varies with application. One PUC/DL frame will support up to six CCIS LIUs.

3.05 Two VFLs are associated with each modem in both signaling subsystems. One VFLA circuit per VFL provides switched access to the VFL from test panels located in the switching office (or remoted to a switching control center) (Fig. 3).

3.06 The controller and terminal use the existing peripheral bus system for communication with the ESS processor (Fig. 4). The peripheral bus length to a 2400 DL frame is restricted to 165 feet and to a PUC/DL frame is restricted to 450 feet. The CCIS

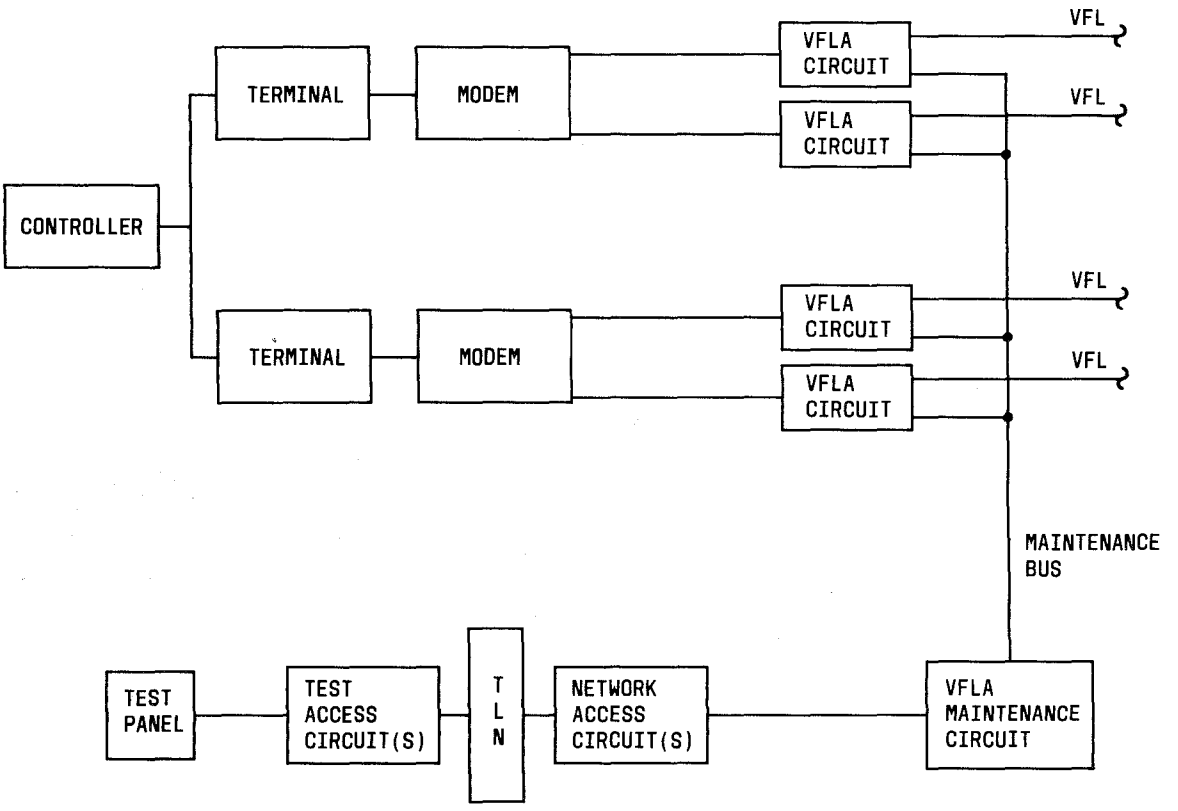


Fig. 3—VFL Access—Test Position Arrangement

terminal communicates with the central control (CC) in much the same manner as ESS scanners. Orders from the CC are sent over the peripheral unit address bus to the controller. Answer data from the controller is received over the scanner answer bus to the CC. A modification to the scan answer bus (Peripheral Unit Parity [PUP] feature) is required when the PUC/DL is added to a No. 1/1A ESS.

3.07 The 2400 DL and PUC/DL signaling subsystems are described in greater detail in references A(6) and A(7) in Part 18.

B. CCIS Trunks

3.08 Trunk circuits used by the CCIS feature can be either 2- or 4-wire type. The 2-wire trunks can be connected to a 2-wire (ferreed or remreed) trunk link network (TLN). The 4-wire trunks can be connected to a HILO TLN. Existing 2- and 4-wire trunk circuits are used for CCIS. Table B lists the circuits which can be used for CCIS. No new message trunk circuits or trunk frames are required for CCIS.

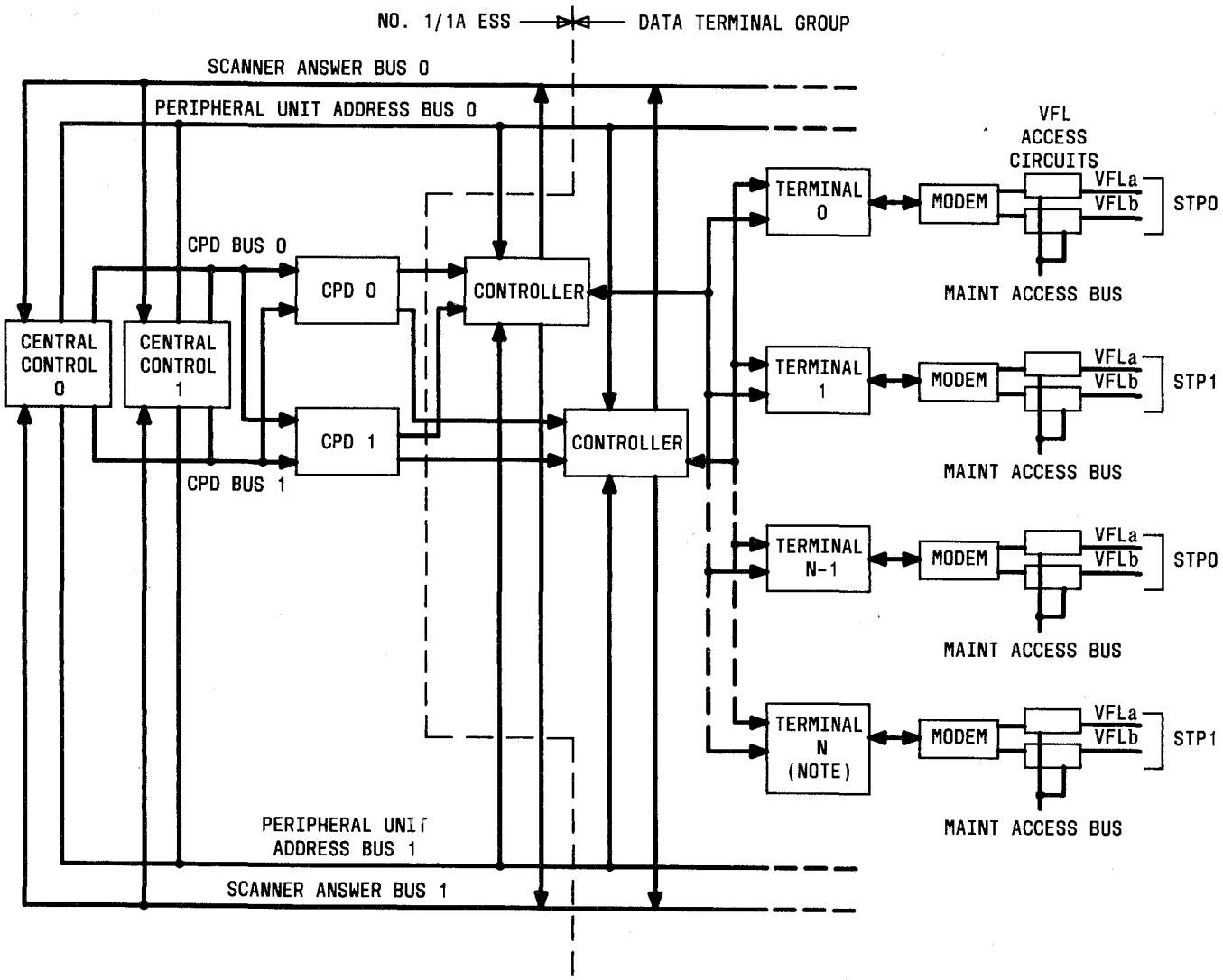


Fig. 4—No. 1/1A ESS CCIS Configuration

TABLE B

CCIS TRUNK CIRCUITS

SD-1A	TRUNK ORDER CODE(S)	TPI												SPI			TYPE
		NONINTERTOLL						INTERTOLL									
		SCAN 0			SCAN 1			SCAN 0			SCAN 1						
		OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	2-WIRE CIRCUITS
163-02	04905	26	26	26	15	25	25										
	04902*	26	26	26	15	25	25										
	049G2†	26	26	26	15	25	25										Miscellaneous, 2-way, 2-wire facility
	04911	26	26	26													
163-05	04909	26	26	26													Miscellaneous, 2-way, 2-wire facility
	04912	26	26	26													
236-02	02109‡	26	26	26				44	44	44							
	02110‡	26	26	26				44	44	44							
	02105	26	26	26	15	25	25	44	44	44	47	45	45				
	021T5	26	26	26	15	25	25	44	44	44	47	45	45				
	021E5	26	26	26	15	25	25	44	44	44	47	45	45				
	02106	26	26	26	15	25	25	44	44	44	47	45	45				
	021T6	26	26	26	15	25	25	44	44	44	47	45	45				
	021E6	26	26	26	15	25	25	44	44	44	47	45	45				
	02100¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021T1¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021E1¶	26	26	26	15	25	25	44	44	44	47	45	45				Miscellaneous, 2-way, 4-wire facility
	02104¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021T4¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021E4¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021G0¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021T2¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021E2¶	26	26	26	15	25	25	44	44	44	47	45	45				
	02103¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021T3¶	26	26	26	15	25	25	44	44	44	47	45	45				
	021E3¶	26	26	26	15	25	25	44	44	44	47	45	45				

TABLE B (Contd)

CCIS TRUNK CIRCUITS

SD-1A	TRUNK ORDER CODE(S)	TPI												SPI			TYPE
		NONINTERTOLL						INTERTOLL									
		SCAN 0			SCAN 1			SCAN 0			SCAN 1						
		OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	2-WIRE CIRCUITS
236-05	02111‡	26	26	26				44	44	44							
	02112‡	26	26	26				44	44	44							
	02107	26	26	26	15	25	25	44	44	44	47	45	45				
	021T7	26	26	26	15	25	25	44	44	44	47	45	45				Miscellaneous, 2-way, 4-wire facility
	021E7	26	26	26	15	25	25	44	44	44	47	45	45				
	02108	26	26	26	15	25	25	44	44	44	47	45	45				
	021T8	26	26	26	15	25	25	44	44	44	47	45	45				
	021E8	26	26	26	15	25	25	44	44	44	47	45	45				
237-02	02213‡	26	26	26				44	44	44							
	02214‡	26	26	26				44	44	44							
	02207	26	26	26	15	25	25	44	44	44	47	45	45				
	022T7	26	26	26	15	25	25	44	44	44	47	45	45				
	022E7	26	26	26	15	25	25	44	44	44	47	45	45				
	02208	26	26	26	15	25	25	44	44	44	47	45	45				
	022T8	26	26	26	15	25	25	44	44	44	47	45	45				
	022E8	26	26	26	15	25	25	44	44	44	47	45	45				Miscellaneous 2-way, 4-wire facility
	02202¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022T3¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022E3¶	26	26	26	15	25	25	44	44	44	47	45	45				
	02282¶	26	26	26	15	25	25	44	44	44	47	45	45				
	02204¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022T4¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022E4¶	26	26	26	15	25	25	44	44	44	47	45	45				

TABLE B (Contd)

CCIS TRUNK CIRCUITS

SD-1A	TRUNK ORDER CODE(S)	TPI												SPI			TYPE
		NONINTERTOLL						INTERTOLL									
		SCAN 0			SCAN 1			SCAN 0			SCAN 1						
		OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	2-WIRE CIRCUITS
237-02 (Contd)	022G2¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022T5¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022E5¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022R2¶	26	26	26	15	25	25	44	44	44	47	45	45				Miscellaneous, 2-way, 4-wire facility
	02206¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022T6¶	26	26	26	15	25	25	44	44	44	47	45	45				
	022E6¶	26	26	26	15	25	25	44	44	44	47	45	45				
237-05	02215‡	26	26	26				44	44	44							
	02216‡	26	26	26				44	44	44							
	02210	26	26	26	15	25	25	44	44	44	47	45	45				
	022T0	26	26	26	15	25	25	44	44	44	47	45	45				
	022E0	26	26	26	15	25	25	44	44	44	47	45	45				Miscellaneous, 2-way, 4-wire facility.
	02211	26	26	26	15	25	25	44	44	44	47	45	45				
	022T1	26	26	26	15	25	25	44	44	44	47	45	45				
	022E1	26	26	26	15	25	25	44	44	44	47	45	45				
165-02	00200													7			
	00205													7			
	00270													7			Universal, outgoing, 2-wire facility.
165-05	00206													7			
	00208													7			

CCIS TRUNK CIRCUITS

SD-1A	TRUNK ORDER CODE(S)	TPI												SPI			TYPE
		NONINTERTOLL						INTERTOLL									
		SCAN 0			SCAN 1			SCAN 0			SCAN 1						
		OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	2-WIRE CIRCUITS
166-02	00405														4		
	00410														4		Universal, incoming, 2-wire facility.
166-05	00406														4		
	16100														4		
252-02	00700													7	4	12	
	007C0													7	4	12	
	007V0													7	4	12	Universal, 2-way, 2-wire facility.
252-05	00702													7	4	12	
	00703													7	4	12	
	00704													7	4	12	
266-02	02500														4		
	05100§														4		
	02518¶														4		Universal, incoming, 2-wire facility.
266-05	02501														4		
	05101§														4		
361-01	11100¶													36	32	34	
361-02	11102													36	32	34	Universal, 2-way, 2-wire facility, HILO
	11103													36	32	34	
362-01	11200¶													36	32	34	
	11201¶													36	32	34	
362-02	11202													36	32	34	Universal, 2-way, 4-wire facility, HILO.
	11203																

TABLE B (Contd)

CCIS TRUNK CIRCUITS

SD-1A	TRUNK ORDER CODE(S)	TPI												SPI			TYPE
		NONINTERTOLL						INTERTOLL									
		SCAN 0			SCAN 1			SCAN 0			SCAN 1						
		OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	OGT	INC	2 WY	2-WIRE CIRCUITS
367-01	11700¶														32		Universal, incoming, 2-wire facility, HILO.
367-02	11701														32		
368-01	11800¶														32		Universal, incoming, 4-wire facility, HILO.
368-02	11801														32		
373-01	12300¶													36			Univesal, outgoing, 2-wire facility, HILO.
373-02	12301													36			
374-01	12400¶													36			Universal, outgoing, 4-wire facility, HILO.
374-02	12401													36			
SD-3C329	17100 (NON-FX)													7	12	12	Universal, 2-wire facility, incoming outgoing, 2-way DCT.

* Without Type II Interface and Tie-Line Cut Through

† With Type II Interface

‡ Only scan point 0 is assigned and wired for these TOCs

§ Same circuit as TOC 02500 and TOC 02501 except that Hold Off-Hook feature is required

¶ Manufacture discontinued but can still be converted for use by Local and/or Toll CCIS

3.09 Trunk group (TG) types, which are currently supported in No. 1/1A ESS as CCIS TGs, include interlocal (TG types 1 and 2); DDD access (ie, toll connecting and toll completing including HILO intraprocessor TGs) and intertoll (TG type 10); and tandem (TG type 15). The CCIS tandem TGs must be arranged for standard 3-, 7-, or 10-digit addressing. Abbreviated addressing (eg, 6-digit addressing) is not used on CCIS tandem TGs. However, abbreviated addressing (ie, 4- or 5-digit addressing) will continue to be used on interlocal TGs when they utilize CCIS signaling. Local CCIS must be loaded in an office to support CCIS signaling on interlocal and tandem TGs and to handle toll connecting traffic (ie, traffic at the local office end of a TG type 10 TG). Toll CCIS must be loaded in an office to support CCIS signaling on intertoll TGs and at the toll office end of toll connecting TGs.

3.10 Trunk group types not currently supported in No. 1/1A as CCIS TGs include the following: VSS (TG type 3); centrex, including FX lines, tie trunks, private network trunks, etc (TG type 6); AIOD (TG type 6); AUTOVON (TG type 7); CAMA ONI (TG type 8); CAMA ANI (TG type 9); secondary intertoll (TG type 10); and E911 Tandem (TG type 15).

C. Continuity Checks (CCKs)

3.11 Unlike inband single-frequency/multifrequency (SF/MF) signaling, CCIS does not pass signals for call routing over the voice channel. Thus, trunk failures cannot be detected by loss of supervision. To determine that the voice path continuity and transmission level are acceptable, CCKs are required during call setup.

3.12 A CCK consists of passing a tone (or tones) between switching offices as each link of the call is connected. In No. 1/1A ESS offices, this tone is provided and detected by continuity-check circuits (CCTs). Different circuits are used for checking CCIS trunks on the 2-wire and HILO 4-wire No. 1/1A ESS networks. These circuits are SD-1A436 for 2-wire networks and SD-1A453 for HILO 4-wire networks.

3.13 Diagnostic-test circuits are also required to test the CCTs. These are SD-1A451 for testing the 2-wire circuits and SD-1A454 for testing the HILO 4-wire circuits.

D. CCIS Software

General

3.14 The CCIS feature is offered as optionally loaded feature groups in No. 1/1A ESS. Each feature group comprises one or more feature packages. There is a common CCIS software package that is required for both Local and Toll CCIS. There are also additional packages required for Local and/or Toll CCIS offices. These include the Local and Toll CCIS packages. They also include CCIS 2-wire and CCIS HILO network packages as well as 2400 DL and PUC/DL DL packages. The INWATS OSO feature is also included in the Local and Toll CCIS feature groups. See reference A(8) in Part 18 for a description of the INWATS OSO feature. A No. 1/1A ESS local/toll office should load the common, local, and toll CCIS packages as well as the appropriate network package(s) and appropriate DL packages. Refer to Part 11 for further details. The appropriate group of feature packages provides the following functions.

(a) ***Call processing*** processes CCIS DL telephone messages and interacts with local or toll call processing programs.

(b) ***Direct signaling*** provides a mechanism for processing nontrunk-related messages which are exchanged with any node (eg, switching office, feature processor, or data base) in the CCIS network.

(c) ***Link security*** controls automatic maintenance activity on the DLs (link recovery) and supports manual DL configuration control and maintains signaling network status for routing of DL messages.

(d) ***Audits, trunk query, translation integrity check, and direct signaling translation test*** are contained in a single group. Audits initializes and validates CCIS call store memory. Trunk query validates CCIS trunk states via interoffice status checks using the CCIS DL. Translation integrity check is a signaling check which verifies the routing data for routing banded messages in the CCIS network between the two switching offices terminating a common CCIS trunk. Direct signaling translation test is a signaling check which verifies the routing data for routing direct signaling messages between nodes in the CCIS network.

(e) ***Network management*** provides automatically activated TG controls on CCIS TGs af-

fected by congestion in the CCIS signaling or DDD networks.

(f) ***Signaling link maintenance*** provides automatic and manually requested signaling link equipment diagnostics, fault detection, error analysis, and hardware status. This function is provided by the 2400 feature group for the 2400 DL equipment and by the PUC, PUCDL and CCISPC feature packages for the PUC/DL equipment.

(g) ***Software carrier group alarm*** detects failed carriers by means of a software algorithm based on CCK failures, and removes affected trunks from service. Trunks removed from service are periodically retested by the software carrier group alarm program to detect carrier restoral. Upon carrier restoral, the trunks are automatically removed from the carrier group alarm state.

(h) ***Trunk maintenance*** provides DL test access and CCIS trunk testing capability.

(i) ***Miscellaneous*** provides recent change capability, overload control, and plant/traffic measurements.

3.15 Table A defines the CCIS messages processed by the various software functions. For greater details concerning No. 1/1A CCIS software, see reference A(15) in Part 18. The following paragraphs provide brief descriptions of major areas of CCIS software.

Overload Controls

3.16 Incoming overload control is provided for the CCIS DLs. The buffers for the CCIS data links hold, in addition to call-related entries, link status, network management, and other noncall-related entries. Each terminal is completely emptied of messages each visit. However, during periods of processor overload, controls are placed on the number of new originations (IAMs) that will be processed. A national switching congestion (NSC) message will be returned for calls that exceed the control limit.

3.17 The CCIS features also include signaling link overload controls which provide automatic response to DL and STP overload. Initial address messages and direct signaling messages destined to use a terminal pair that is experiencing overload are denied DL access, causing new originations to fail. When the overload condition ends, full DL access is automatically restored.

Link Security

3.18 The purpose of CCIS link security is to maintain and restore signaling whenever failures occur. This includes the detection of signaling link failures, the automatic responses to these failures, and the manual maintenance procedures required to correct failure conditions. The link security programs used for No. 1/1A ESS CCIS are packaged such that the low level software, which is DL dependent (applicable to either the 2400 DL or the PUC/DL), has been grouped into separate packages and the common software has been included in the CCIS common package. This design provides for the coexistence of both the 2400 DL and the PUC/DL in a No. 1/1A ESS office. A minimum of two CCIS DLs (duplicated A links) are provided per switching office. Each A link connects the switching office with one of the two STPs within its area or region, (for example, A11 and A12 from L01 in Fig. 1). Through translation assignment, DL pairs are formed such that a link pair provides access to the CCIS signaling network via both STPs. A pair of DLs has signaling capacity for up to 2250 CCIS trunks or an equivalent amount of direct signaling traffic. The components of a DL pair are shown in Fig. 2.

3.19 The primary function of link security is to control maintenance activity on the CCIS DLs with emphasis on maintaining a viable signaling path for each CCIS trunk and for CCIS direct signaling messages. Under central control program control, a terminal can be operated in several maintenance states, a modem can be switched between VFL(a) and VFL(b), and a VFLA circuit can be used to provide maintenance access to a VFL.

3.20 The A links of a pair are normally operated in a load sharing mode; that is, each link carries approximately 50 percent of the signaling load directed toward the link pair. The link pairs are engineered such that a single link has enough capacity to carry all of the assigned signaling load for the link pair should the other member link be removed from active service.

3.21 Five extended maintenance procedures are supported by link security:

- Office recovery

- Normal link recovery
- Emergency link recovery
- Manual link recovery
- Manual VFL transfer.

3.22 The office recovery procedure is automatically initiated in a switching office emergency action phase 6 or 7 for 2400 DL and phases 4 through 7 for PUC/DL; the terminal is initialized and the DLs are placed into service as quickly as possible.

3.23 The normal link recovery procedure is automatically initiated when a single link failure occurs or when a link is released from an unavailable condition and the mate link is currently active. Before being returned to active service, the recovering link is monitored for 15 seconds to ensure acceptable transmission signaling error rates and then a CCIS signaling network status update is completed before service is restored.

3.24 The emergency link recovery procedure is automatically initiated when a double link failure occurs or when a link is released from an unavailable condition and the mate link is not currently active. Before being returned to active service, the recovering link is monitored for only 3 seconds and an abbreviated restoral sequence is followed.

3.25 The manual link recovery procedure is manually initiated from either the switching office or STP when a craft person wants to test or reconfigure the DLs. The manual link recovery procedure supports exercise of the DL without normal signaling traffic.

3.26 The manual VFL transfer procedure can be initiated from either the switching office or an STP and supports changing the VFL in service between VFL(a) and VFL(b) when the link is active.

3.27 The 2400 DL DTRM input message, DTRM-REQ, is used for manipulation of the DTRMs. Input message VFLK-REQ is used for manipulation of the 2400 DL modems, VFLs, and VFL access circuits. The PDL-input messages are used for the PUC/DL subsystem.

3.28 The following output messages apply to both the 2400 DL and the PUC/DL signaling subsystems. The LS01 message informs the craft person of automatically initiated link recovery procedures, the progress of manually initiated procedures, and DTRM or LIU status changes. The LS02 message informs the craft person of high transmission error rates on active links. The LS03 message is used to print the contents of the link security DL status tables when requested manually. The LS04 message is used to print the contents of link security status and input data when a DL is reinitialized.

Translation Integrity Check (TIC)

3.29 The CCIS TIC is a signaling check by which a No. 1/1A ESS office can determine if signals for one of its CCIS trunks are being consistently forwarded through the CCIS network to the proper far-end office. The TIC provides an interlocation CCIS translation data audit using only the signaling links. The existence of CCIS label translations are verified in both the near-end and far-end switching offices. The existence of, and the consistency of STP translations (ie, incoming signaling link and band to outgoing signaling link and band) for all intervening STPs (two for intraregional trunks or four for interregional trunks) are verified. These checks require that at least one signaling path between the switching offices be available as well as all intervening C links.

3.30 The TIC can be initiated only via the trunk maintenance TTY channel by using T-TNN-, T-CCISTRK-, or T-BAND- input messages. See references in Part 18B for details. When TIC is initiated, a test-translation (TTR) signal consisting of the band and trunk number of the CCIS trunk being tested is sent from the near-end switching office to the STP. The STP then sends a compare translation signal to the mate STP in the same region. If a TIC failure occurs, a signaling problem (SPR) message is returned from the STP where the failure occurred. The SPR contains the CLLI of the office returning the SPR. Craft personnel must visually inspect the output to verify whether or not the correct far-end office was reached.

3.31 When the TIC passes at all intervening STPs, the TTR is forwarded to the far-end switching office. If the TIC passes at a No. 4A ETS or No. 4 ESS far-end office, the office returns an identifier (ID) signal to the near-end office via the normal CCIS route. The ID contains the circuit identification number (CIN) of the trunk. If the TIC fails, an SPR is returned.

3.32 Where the far-end office is a No. 1/1A ESS, an SPR message containing the far-end office

CLLI code is always returned since No. 1/1A ESS offices are not equipped with CIN translations. Thus, in this case, it is not possible to completely verify translations at the trunk level; ie, it is not possible to check that the signals for a CCIS trunk are associated with the same originating and terminating facility.

3.33 System response to a TIC request input via a T-TNN or T-CCISTRK- message is a TIC output message. System response to a TIC request input via a T-BAND- message is a TN21 output message. These messages identify the responding office and contain the results of the TIC. See references in Part 18B for details.

Direct Signaling Translation Test (DSTT)

3.34 The (DSTT) is a signaling check which verifies the network routing data for routing direct signaling messages between nodes in the CCIS network. The existence and validity of routing data is verified in the origination node (the node initiating DSTT), the destination node, and all intervening STPs. That is, DSTT verifies the routing data base for all possible routes between the origination node and the destination node. It should be noted that DSTT performs the same function for CCIS direct signaling routing data as ***translation integrity check*** performs for CCIS banded signaling routing data.

3.35 To initiate the DSTT at a No. 1/1A office, a craft person enters the T-DSIGTT message at the trunk maintenance TTY. The test is then performed by the automatic exchange of DL messages between the origination node, all intervening STPs, and the destination node. In general, the origination and destination nodes can be switching offices, data bases, or STPs.

3.36 Normally, the reply to the DSTT test is returned from the destination node. The exception occurs when the test fails at an STP. In this case, the reply is returned from the failing STP.

3.37 Upon receipt of the reply at the origination node, the results of the test are retrieved from the reply message and outputted at the trunk maintenance TTY in a DSIGTT message. The outputted data includes the results of the test, the test routing address, and the function number and CLLI of the node returning the test results. Example results of the DSTT include success (all routing data exists and is correct), incorrect destination (a node other than an STP received a DSTT message that contained a routing address which was invalid for that node), and mismatch of outgoing routes between mate STPs. The craft person would then compare the results in the output message with expected results and proceed per local practice.

Software Carrier Group Alarm (SCGA)

3.38 The SCGA is a CCIS feature that provides carrier group alarm (CGA) by means of a software program that detects carrier failures. (See reference A(36) in Part 18 for details.) This feature provides CGA protection without requiring special hardware to report carrier failures. The SCGA program uses CCIS CCK failures as an indication that a carrier has failed.

3.39 Each SCGA group consists of a maximum of 12 trunks (minimum size = 2 trunks). It is thus sized for analog carriers which are groups of 12 trunks each. The SCGA feature is particularly useful for analog carriers, but it may be used with any type of carrier system. However, if the carrier groups contain more than 12 trunks, the trunks must be assigned to more than one SCGA group. The maximum size for an SCGA group is two trunks.

3.40 Operation of the SCGA program is as follows. When a circuit failure is experienced on a call, the SCGA program is entered and all 12 trunks in the TG are placed in a CGA state in which no outgoing traffic over these trunks is attempted, but incoming seizures are allowed. There is then a 5-second waiting period for a RLG message since CLF was sent after the CCK time-out occurred.

3.41 Upon receipt of the release guard (RLG), the SCGA program performs a retest (ie, a CCK) on a second trunk in the same carrier group to confirm the carrier failure. If the second trunk fails the test, a group blocking message (with the facility failure and cooperative test bits set to 1) is sent for the software carrier group and the trunks are taken out of service for incoming traffic. Only test calls are allowed, both incoming and outgoing. The SCGA program continues periodic testing to detect carrier restoral. When carrier restoral is detected, the trunks are returned to service and a group unblocking message (with the facility failure and cooperative test bits set to 1) is sent to the far-end office where the trunks are also restored to service.

3.42 If RLG is not received before the end of the 5-second time-out period, signaling congestion

is indicated as the probable problem, rather than carrier failure, and the trunks are restored to service.

E. Signaling Link Maintenance Facilities

3.43 The maintenance control and coordination of the CCIS signaling network and its parts generally follow the plan currently in use in the Bell System and is commonly referred to as the Control Office Plan. Inherent in the plan is a hierarchy of maintenance control and assignment of responsibilities that ensure orderly administration of the network. For No. 1/1A ESS CCIS, the STP has some automatic signaling link testing capabilities; however, the maintenance control office for the signaling link is the No. 1/1A ESS switching office, not the connected STP.

3.44 Automatic procedures are provided to assist in recovery from DL troubles. The objectives are to sectionalize a failure to the terminal-modem combination at either end or to the interconnecting VFL without manual intervention. This permits repair and return to normal service with a minimum of human interoffice communication.

3.45 A loop-around path is provided at the ESS to allow the STP to perform VFL testing. Also, the VFLA circuit provides switched access from the switching office test panels to the VFL via a shared maintenance bus. Network access circuits SD-1A176 (2-wire) or SD-1A397 HILO (4-wire) are required to interface with the VFLA circuits.

3.46 Periodic testing of the standby VFLs is accomplished on a routine basis from the STP. To initiate this test, the STP sends a test-standby-VFL (TSV) signal to the switching office. In response to this signal, the switching office applies a loop to the standby VFL. The STP then performs the test and sends the results to the switching office via a VFL-test-passed (VLP) signal or a VFL-test-failed (VLF) signal. This test can also be initiated from the switching office via TTY input (VFLK-REQ-TST for 2400 DL and PDL-VFL-TST for PUC/DL). The link security routine then applies the loop and sends a TSV signal to the STP. The STP then performs the test and returns the result.

3.47 Procedures related to testing and maintenance of the No. 1/1A ESS CCIS equipment are given in references A(14), A(20), A(23) through A(26), A(33), A(35), A(52), A(53), and A(55) in Part 18.

4. SYSTEM OPERATION

HARDWARE

A. Signaling Subsystem

4.01 A No. 1/1A ESS CCIS office requires a signaling subsystem consisting of either a terminal access controller-data terminal (2400 DL) or a PUC/DL. If the 2400 DL is not already in the office and the implementation of Local CCIS is planned, then it is recommended that the PUC/DL configuration be chosen since PUC/DL can be shared by other features. Sections B and C below provide a brief description of the 2400 DL and PUC/DL signaling subsystem. For further details, see references A(6) and A(7) in Part 18.

B. 2400 DL Signaling Subsystem

4.02 The 2400 DL comprises a basic terminal frame J1A094A and up to two supplementary frames J1A094B. Circuits for the basic and supplementary frames are SD-1A441 and SD-1A442, respectively. The basic frame is 6 feet 6 inches wide and each supplementary frame is 3 feet 3 inches wide.

4.03 A fully equipped basic DTRM frame contains two J1A094AB terminal access controllers SD-1A443, eight J1A094AC data terminal circuits SD-1A444, eight J1A094AD power converter circuits SD-1A445, eight DS-201 L1A data sets or modems SD-73090, and 16 J1A094AE voice frequency link access circuits SD-1A446. A fully equipped supplementary frame consists of one-half the quantity of circuits contained in a fully equipped basic frame, except that no terminal access controllers are provided.

C. PUC/DL Signaling Subsystem

4.04 The hardware required for the PUC/DL signaling subsystem consists of a J1A099A PUC/DL 7-foot ESS frame which is 2 feet 2 inches wide and 12 inches deep.

4.05 The PUC/DL frame contains duplicated peripheral unit controllers, 16 line interface units (LIUs), and duplicated power control units; but for CCIS, one PUC/DL frame will support up to a maximum of 6 CCIS LIUs. The PUC/DL frame and how it should be equipped can be determined by referencing J1A099A-1 and the associated list structure. The PUC/DL circuit is SD-1A478.

4.06 The current drains per frame are 9 amps from the −48 volt supply and 1 amp from the +24 volt supply.

4.07 The data communication control frame houses the data set units, each of which includes modems, etc, for two DLs. One modem and two VFLs are associated with each CCIS LIU. One VFLA circuit SD-1A446 per VFL provides switched access to the VFL from test panels at the switching office or at a switching control center. The VFLA circuit also serves as an interface between the modems and VFLs (Fig. 3). To ensure proper levels between the test position and the VFLA circuit, variable amplification and attenuation will be provided by the VFL maintenance circuit (JW430). This DL equipment is mounted on the miscellaneous trunk frame. The associated unit is J1A099AD. The circuit is SD-1A062.

D. CCTs

4.08 Unlike inband single-frequency/multifrequency signaling, CCIS does not pass signals for call routing over the voice channel. Thus, trunk failures cannot be detected by the loss of supervision. To determine that the voice path continuity and transmission level are acceptable, a CCK is required during call setup. A CCK consists of passing a tone (or tones) between switching offices as each link of the call is connected. The outgoing CCK is canceled 50 percent of the time to save real time when the system is under heavy load. In No. 1/1A ESS offices, this tone is provided and detected by CCT SD-1A436 for 2-wire networks. This circuit is used as a transceiver during outgoing calls and as a transponder for incoming calls.

4.09 Where a CCIS trunk terminates on a HILO network a HILO CCT SD-1A453 is required. Each SD-1A453 provided requires a HILO interface circuit SD-1A392.

E. CCK Diagnostic Test Circuit

4.10 Continuity-check circuits are diagnosed using CCK diagnostic-test circuits. These are the 2-wire SD-1A451 and the HILO SD-1A454. Each SD-1A454 also requires a HILO interface circuit SD-1A392.

F. Network Access Circuit

4.11 Network access circuits are required for test panel access to the VFL. In 2-wire offices SD-1A176 is used. In HILO (including combined 2-wire/HILO) offices SD-1A397 is used.

G. Test Access Trunk Circuits

4.12 Test access trunk circuits are required to provide test access trunks to perform the CCIS trunk and VFL tests. In 2-wire only offices, SD-1A322 or SD-1A176 is used. In HILO only offices, SD-1A397 and SD-1A361 are used. In combined 2-wire/HILO offices, SD-1A322 or SD-1A176, SD-1A397, and SD-1A361 are used.

OFFICE DATA STRUCTURES

A. Translations

4.13 Since all communication for a CCIS trunk is via the DL, all switching offices involved must have a common description of the trunk. This description is a terminal pair number and a label. The terminal pair number identifies the terminal pair over which all messages are sent for a particular CCIS trunk. The label identifies a unique trunk among all the CCIS trunks associated with a particular terminal pair. The label is included in each trunk-associated DL message. The label consists of two parts.

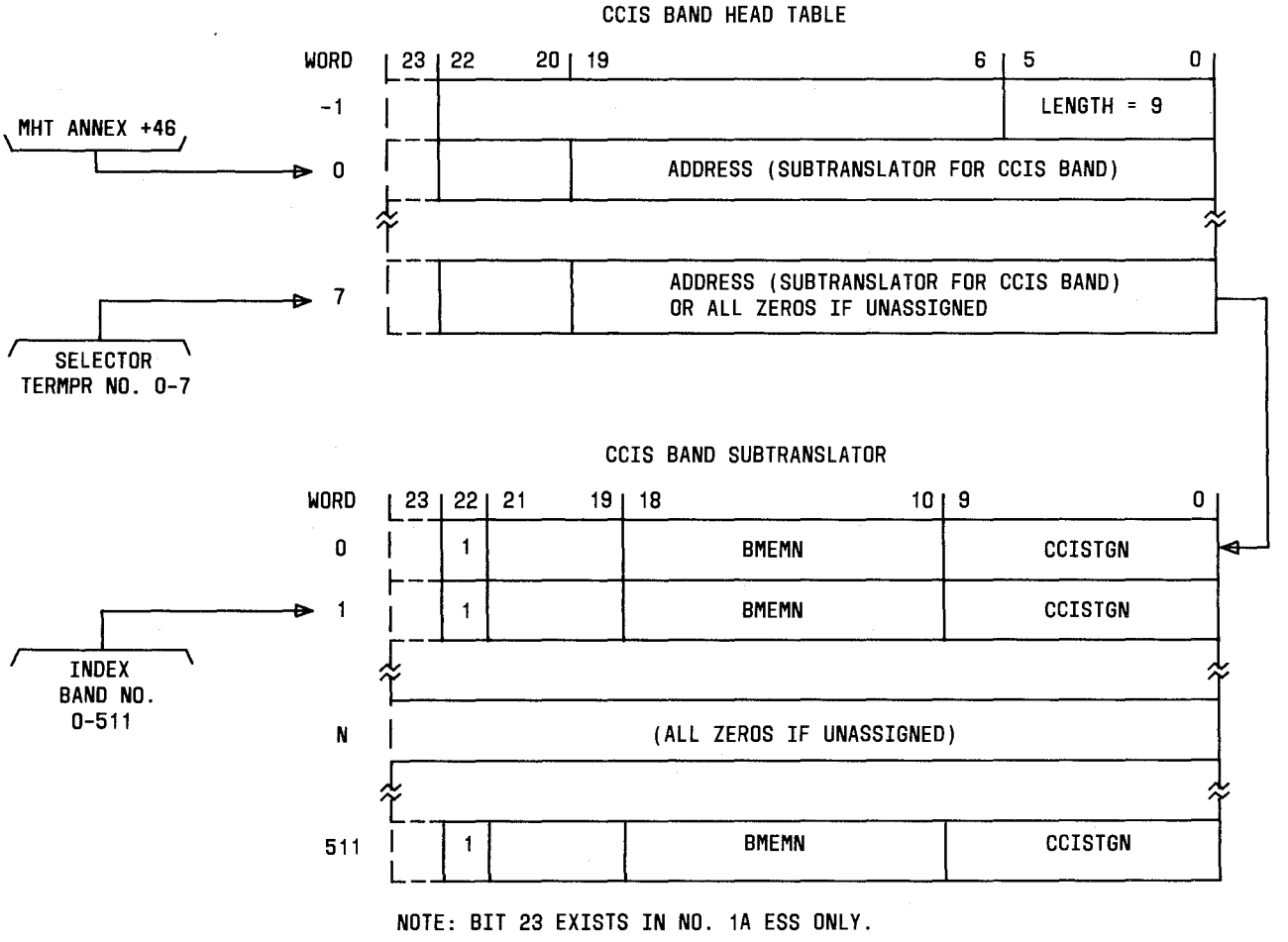
(a) ***Band Number:*** This is a number from 0 through 511 (assigned by the CCIS Network Administration Center [CNAC]) to identify a group of 16 consecutive trunk member numbers in a TG, beginning with a multiple of 16 (0 through 15, 16 through 31, etc). A given band number may have from 0 up to 16 equipped trunks. A No. 1/1A ESS TG may consist of many bands.

(b) ***Trunk Number:*** This is a number from 0 through 15 that selects the trunk from the band. Trunk numbers are also assigned by CNAC, and are then assigned corresponding member numbers within the TG (so that trunk numbers 0, 1, ---, 15 correspond respectively to TGN member numbers n, n+1, ---, n+15, where n is a multiple of 16).

4.14 The purpose of the CCIS band translator (Fig. 5) is to begin the mapping of the CCIS terminal pair, band, and trunk number into a trunk network number (TNN) for a CCIS trunk. The translator consists of a head table and a subtranslator per assigned CCIS terminal pair. The index into the head

table is the terminal pair. A No. 1/1A ESS may be equipped with up to eight terminal pairs. If the terminal pair is unassigned in the office, the entry in the head table is all zeros; otherwise, the head table entry points to a 512-word CCIS band subtranslator. Each unassigned band for the terminal pair contains all zeros in the subtranslator. For assigned bands, the subtranslator entry provides the trunk group number (TGN) of the CCIS trunk to which the terminal pair, band, and trunk number are assigned. The subtranslator entry also provides the base band member number (BMEMN) of the CCIS trunk. The BMEMN indicates the first of 16 consecutive trunk numbers in the band. All CCIS TGs in a No. 1/1A ESS are built with a list of TNNs in the TGN auxiliary block. Therefore, the TNN for a CCIS trunk can be determined by entering the TGN translator and indexing in the TGN auxiliary block list of TNNs with the BMEMN and the trunk number.

4.15 The CCIS terminal pair translator (Fig. 6) identifies the individual members that make up a terminal pair and contains signaling characteristics for the pair. This translator consists of a head



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:

BMEMN - BASE BAND MEMBER NO. (NO. OF LOWEST MEMBER NO. ASSIGNED TO THAT BAND)
CCISTGN - CCIS TRUNK GROUP NO.
TERMPR - TERMINAL PAIR

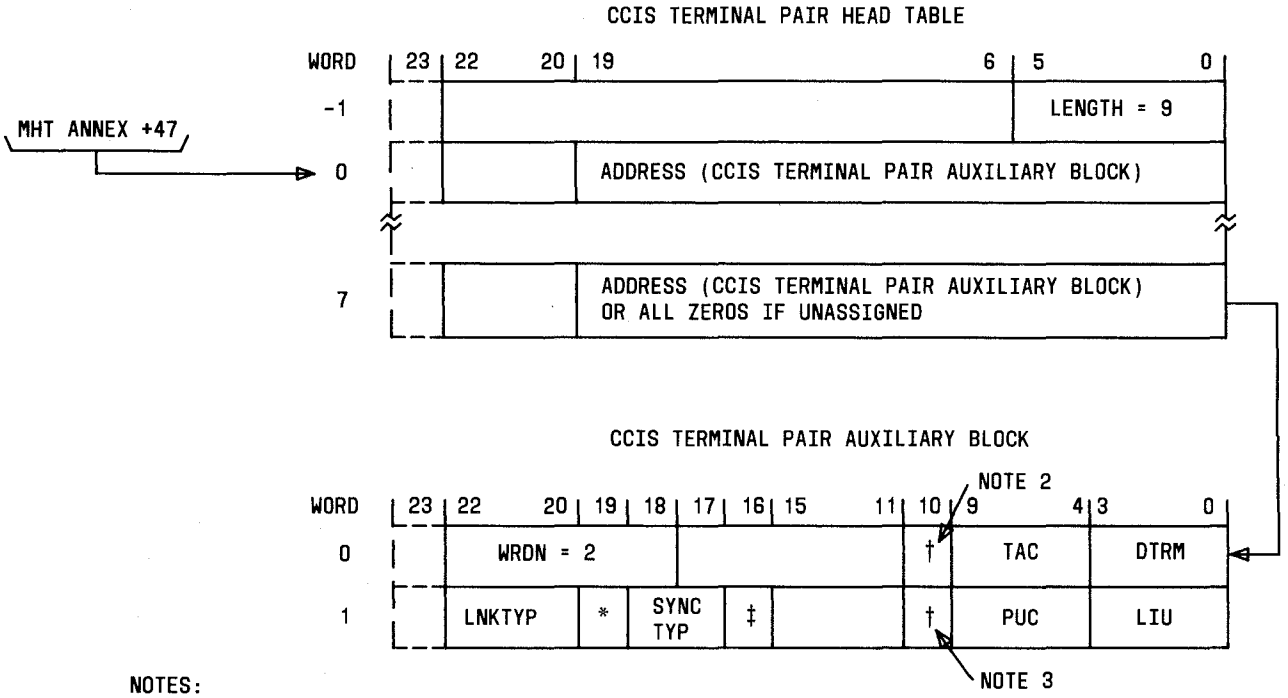
Fig. 5—CCIS Band Translator

table and a 2-word auxiliary block for each assigned CCIS terminal pair.

4.16 The interoffice trunk circuits used for CCIS are shown in Table B. Every CCIS trunk has a TNN-TGN auxiliary block.

4.17 The third word (word 2) of the TNN-TGN auxiliary block (Fig. 7) contains the terminal pair, band, and trunk number of the trunk. (If the trunk is equipped with CGA or trunk make busy keys, this data appears in subsequent words of the block.) The terminal pair number is supplied by CNAC at office installation. Item TNBAND identifies the CCIS band to which this trunk is assigned; it is supplied by CNAC. The CCIS trunk number (TRKNO) within the band is equal to the least significant four bits of the member number (word 0).

4.18 Since supervision, inpulsing, and outpulsing on CCIS trunks are accomplished solely by communication via the CCIS DL and the associated software, it is necessary to distinguish CCIS trunks from trunks with conventional signaling. To accom-



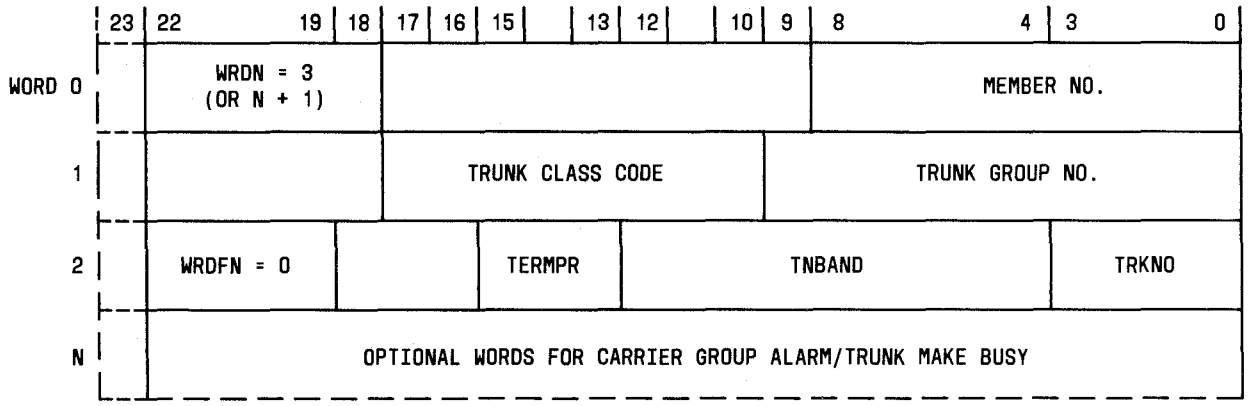
NOTES:
1. BIT 23 EXISTS IN NO. 1A ESS ONLY.
2. WHEN DLTYPE = 0
3. WHEN DLTYPE = 1

* STPTYP
† DLTYP
‡ DIRSIG

LEGEND:

DLTYP	- DATA LINK TYPE
DIRSIG	- DIRECT SIGNALING INDICATOR
DTRM	- DATA TERMINAL
LIU	- LINE INTERFACE UNIT
LNKTYP	- TYPE OF DATA LINK PAIR IN SIGNALING NETWORK = 0 FOR A LINK
PUC	- PERIPHERAL UNIT CONTROLLER
STPTYP	- STP TYPE (AREA OR REGIONAL)
SYNCTYP	- TYPE OF SYNC BEING SENT = 00 FOR EVEN (E ON FORM)
TAC	- TERMINAL ACCESS CONTROLLER

Fig. 6—CCIS Terminal Pair Translator



3≤N≤30 NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:
TERMPR - CCIS TERMINAL PAIR
TNBAND - CCIS BAND TO WHICH THIS TRUNK IS ASSIGNED
TRKNO - CCIS TRUNK NO. (EQUAL TO LOW 4 BITS OF MEMBER NO.)
WRDFN - WORD FUNCTION = 0 TO INDICATE THAT THIS WORD IS USED FOR CCIS

Fig. 7—Trunk Network Number to Trunk Group Number (TNN-TGN) Auxiliary Block for CCIS Trunks

plish this, new supervision (SUPV = 10), inpulsing (INPUL = 6), and outpulsing (OP = 6) types are used in the trunk class code expansion translations to identify CCIS trunks (Fig. 8). Also, in order to facilitate CCKs, three bits in word 0 are redefined for CCIS trunks. Items CCTF and LVL indicate the and transmit/receive frequency level of the CCTs during the trunk CCK. These items can differ on a TG basis for the CCIS trunks in an office. Since the tone exchange during a CCK is a timed event, this interval must be adjusted when the voice path is via a satellite (rather than terrestrial) facilities. Item STI in word 3 is used for this purpose with CCIS trunks.

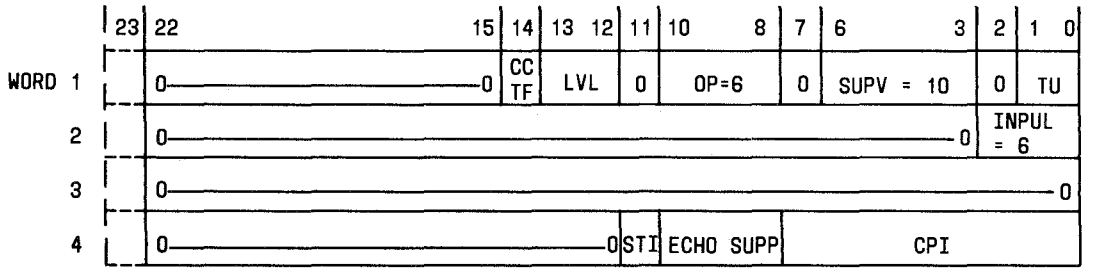
4.19 The CCIS service circuits use the standard trunk class code expansion tables (Fig. 9).

4.20 As with conventional signaling, trunk network number to peripheral equipment number (TNN-PEN) auxiliary blocks (Fig. 10) are required for all miscellaneous trunks while universal trunks require only a TNN-PEN primary translation word.

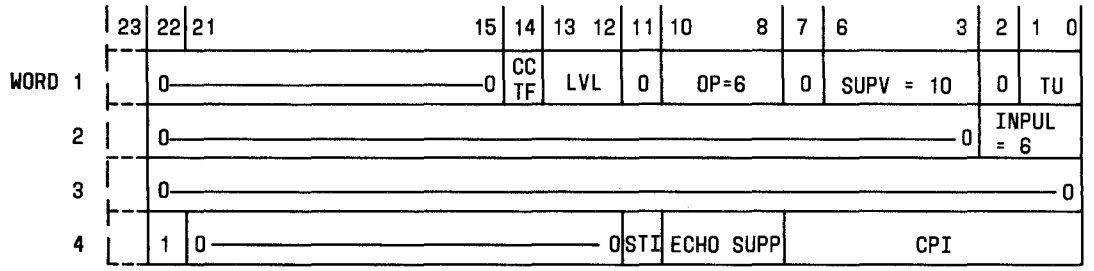
4.21 For manual access to the VFL, in HILO offices, one SD-1A397 network access circuit is required per bay of the basic DTRM frame and for each supplementary frame—ie, one SD-1A397 per eight VFLA circuits to terminate the maintenance access bus(es) shown in Fig. 4. In 2-wire offices, two SD-1A176 network access circuits (one transmit, one receive) are required per eight VFLA circuits. The TNNs for the network access circuits appear in words 5 through 12 of the UTYP 57 auxiliary block [A(7) in Part 18]. Unused words contain all zeros; for example, even numbered words in HILO offices or words 11 and 12 in offices not equipped with a second supplementary frame.

4.22 Three fixed route indexes (RIs) and three pseudo route indexes (PRIs) have been assigned for the CCIS feature (Fig. 11). Since the CCIS CCT has a function analogous to that of a transmitter and receiver, the TG containing these circuits in 2-wire offices is assigned RI 62 in the block of RIs assigned to transmitters and RI 70 in the block of RIs assigned to receivers. Similarly, PRI 20 in HILO offices is in the block of PRIs assigned to HILO transmitters/receivers.

4.23 Route index 185 is a fixed 2-wire RI to a vacant code announcement TG or to a regular overflow tone TG. Selection of announcement or tone is



(a) 2-WIRE



(b) HILO

NOTES:
1. BIT 23 EXISTS IN NO. 1A ESS ONLY
2. ALL VALUES ARE DECIMAL

LEGEND:

CCTF - CONTINUITY CHECK TONE FREQUENCY
FOR 2-WIRE TRUNKS:
= 0, F1/F2 (SEND 1780 HZ/RECEIVE 2010 HZ)
= 1, F2/F1 (SEND 2010 HZ/RECEIVE 1780 HZ)
FOR HILO TRUNKS:
= 0, F1/F2 (SEND 1780 HZ/RECEIVE 2010 HZ)
= 1, F2/F2 (SEND 2010 HZ/RECEIVE 2010 HZ)

CPI - CIRCUIT PROGRAM INDEX

ECHO SUPPRESSOR = 2 (010) FOR 1/2 (SPLIT) ES
= 3 (011) FOR FULL ES

INPUL - INPULSING = 6 FOR CCIS

LVL - LEVEL OF CCTF
= 0, LEVEL 1
= 1, LEVEL 2
= 2, LEVEL 3
= 3, LEVEL 4 (VALID FOR HILO TRUNKS ONLY)

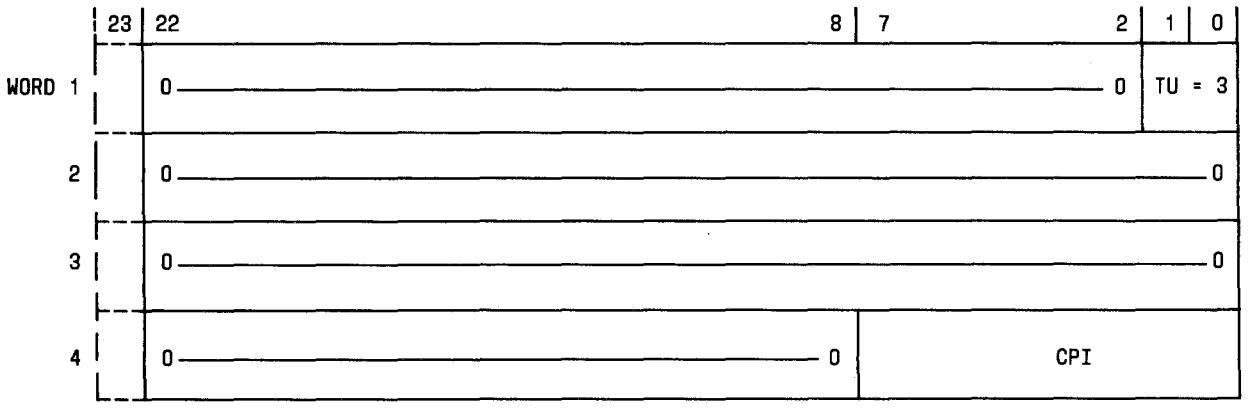
OP - OUTPULSING = 6 FOR CCIS

STI - SATELLITE TRUNK INDICATOR
= 0, TERRESTRIAL FACILITY
= 1, SATELLITE FACILITY

SUPV - SUPERVISION = 10 (DECIMAL)
FOR CCIS

TU - TRUNK USAGE

Fig. 8—Trunk Class Code Expansion Tables for CCIS Interoffice Trunks (2-Wire and HILO)



NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:
CPI - CIRCUIT PROGRAM INDEX
= 067 FOR SD-1A176 (2-WIRE)
= 088 FOR SD-1A436 (2-WIRE)
= 147 FOR SD-1A397 (HILO)
= 203 FOR SD-1A453 (HILO)
= 204 FOR SD-1A454 (HILO)
= 205 FOR SD-1A451 (2-WIRE)

TU - TRUNK USAGE = 3 MISCELLANEOUS

Fig. 9—Trunk Class Code Expansion Tables for CCIS Service Circuits (2-Wire and HILO)

an office option. Route index 185 (not unique to CCIS) is used upon reception of vacant code digits from secondary intertoll, intertoll, DDD access, centralized automatic message accounting (CAMA), and tandem incoming TGs. (The normal vacant code RI 85 may be arranged for cut through to operator which is inappropriate for toll/tandem operation.)

4.24 All RIs pointing to CCIS TGs must specify a transmitter type of six corresponding to the trunk class code outpulsing type (Fig. 8).

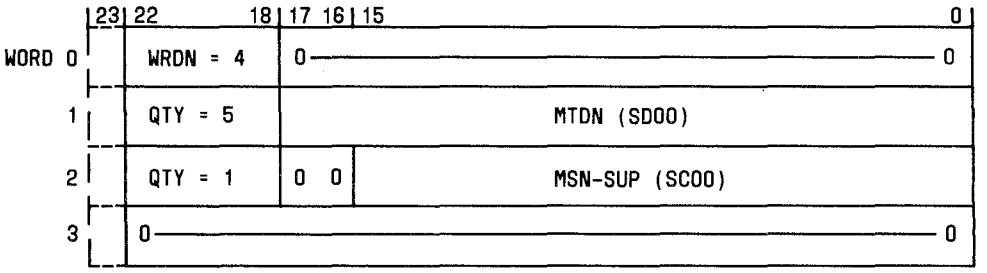
4.25 A TG number supplementary translator item is defined for CCIS trunks (Fig. 12). The glaremaster (GLRM) item indicates which office is in control if glare occurs on a 2-way TG. For CCIS trunks, GLRM = 1 indicates that the office has glare control of odd numbered trunks in the group; GLRM = 0 indicates control of even numbered trunks.

4.26 The possibility of glare on 2-way trunks is reduced if the offices search from opposite ends of the list of trunks. This is indicated by the reverse hunt (REVH) item in the TG supplementary translator. For CCIS trunks, the value of the GLRM item cannot equal the value of the REVH item. That is, offices in control of odd-numbered trunks do not hunt in a reverse sequence. Offices in control of even-numbered trunks do hunt in a reverse sequence.

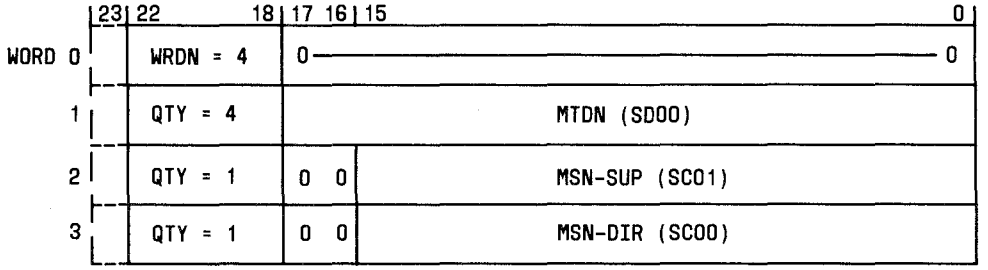
4.27 The CCIS feature adds one word to the UTYP 8 auxiliary block used for the trunk and line test panel (TLTP), supplementary trunk test panel (STTP), and manual trunk test position (MTTP). (See Fig. 13.) For STTPs with option ZJ, this word contains the base MTDN for the CCIS and BLKD (blocked) lamps. This word contains all zeros for TLTPs, MTTPs, and STTPs not equipped with option ZJ.

4.28 For 2400 DL applications, see reference A(7) in Part 18 for the unit type (UTYP) 57 auxiliary block required for manual access to the VFL and UTYP 58 auxiliary block required for each CCIS DTRM.

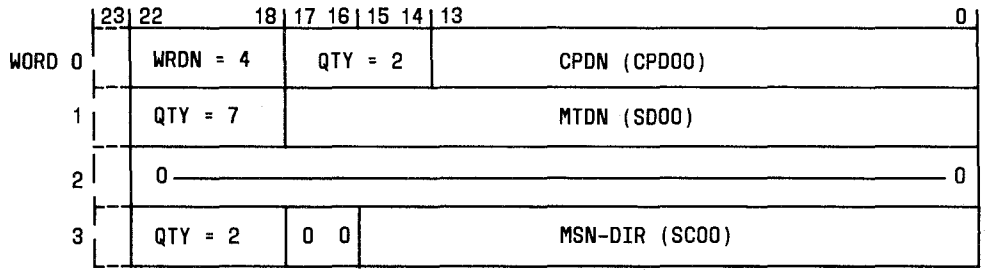
4.29 For PUC/DL applications, see reference A(6) in Part 18 for information regarding the



(a) CCIS Miscellaneous Message Trunks SD-1A236, SD-1A237, SD-1A163 (2-Wire)



(b) CCIS Continuity Check Circuits SD-1A436 (2-Wire), SD-1A453 (HILO)



(c) CCIS Continuity Check Circuit Diagnostic Test Circuits SD-1A451 (2-Wire), SD-1A454 (HILO)

NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

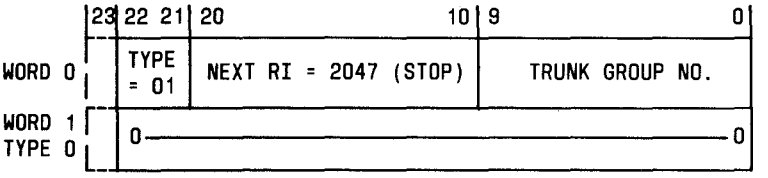
LEGEND:
CPDN - CENTRAL PULSE DISTRIBUTOR NUMBER
MSN - MASTER SCANNER NUMBER
MTDN - SIGNAL DISTRIBUTOR NUMBER

Fig. 10—Trunk Network Number to Peripheral Equipment Number (TNN-PEN) Auxiliary Blocks

UTYP 61 auxiliary block for each PUC/DL and the PUC maintenance (PUCMB) translator.

B. Parameters/Call Store

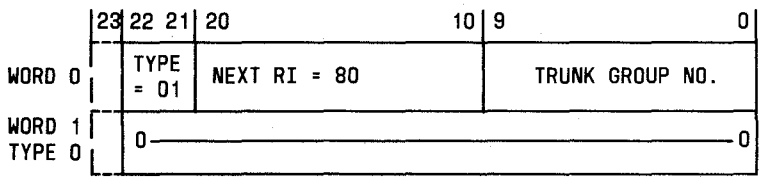
4.30 Incoming registers currently come from a pool of 20-word registers, called originating registers, defined by set card NOR. The value of NOR is determined primarily by the number of call processing related service circuits in the office. In all but a few cases, the only time that a client program is entitled to an incoming register is when it has a related service circuit in use. The CCIS incoming registers are also designed to be seized from this originating register pool.



RI OR PRI	SYMBOL	2-WIRE CIRCUIT	HILO CIRCUIT	TRUNK GROUP
RI 062	4FXMCCIS	SD-1A436	_	CCIS CONTINUITY CHECK CIRCUIT (T)
RI 070	4FCCISR	SD-1A436	_	CCIS CONTINUITY CHECK CIRCUIT (R)
RI 139	4FCCIST	SD-1A451	_	CCIS CONTINUITY CHECK CIRCUIT DIAGNOSTIC TEST CIRCUIT
PRI 020	4FPRI020	_	SD-1A453	HILO 4-WIRE CCIS CONTINUITY CHECK CIRCUIT
PRI 054	4FPRI054	_	SD-1A454	HILO 4-WIRE CCIS CONTINUITY CHECK CKT DIAGNOSTIC TEST CIRCIT
PRI 062	4FPRI062	SD-1A176	SD-1A397	VOICE FREQUENCY LINK ACCESS

RI - ROUTE INDEX
PRI - PSEUDO ROUTE INDEX
R - RECEIVERS
T - TRANSMITTERS

(a) Miscellaneous Trunk Circuits



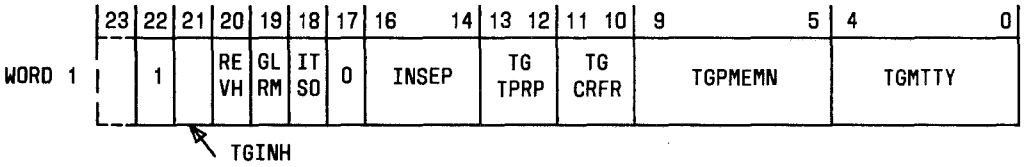
(b) RI 185 (4FRITVC) Vacant Code From Toll Tandem Trunks (2-Wire)

NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

Fig. 11—Route Index Expansion Tables

4.31 Call processing for CCIS maintains a retry capability until the receipt of the address complete (ADC) message from the far office. For at least a part of this interval, there is typically no service circuit associated with the call. To allow the CCIS program to hold the register during this interval, an additional quantity of registers, defined by set card CIR, must be added to the value of set card NOR. Parameter word C1CIRMAX (Fig. 14) contains the value of set card CIR and is used by the client programs as well as the audits to ensure that the CCIS incoming registers are administered properly.

4.32 Parameter word C1TIMBLK (Fig. 15) is a pointer to a call store block of 2-word timing blocks. The total block size is (2 * CITB) + 1, where



NOTES:
1. BIT 23 EXISTS IN NO. 1A ESS ONLY.
2. FOR CCIS TRUNK GROUPS, THE FOLLOWING COMBINATIONS OF REVH (BIT 20) AND GLRM (BIT 19) ARE INVALID:

REVH	GLRM
0	0
1	1

LEGEND:

GLRM-GLAREMASTER = 1 IF THIS OFFICE HAS CONTROL OF ODD-NUMBERED TRUNKS
= 0 IF THIS OFFICE HAS CONTROL OF EVEN-NUMBERED TRUNKS (NOTE 2)
INSEP-INCOMING SEPARATION OF REVENUE CLASS
ITSO- INCOMING TRUNK SERVICE OBSERVING
REVH-REVERSE HUNT = 0 OR 1 (NOTE 2)
TGCRFR-TRUNK GROUP CRAFT FORCE RESPONSIBILITY
TGINH-TRUNK GROUP INHIBIT SYSTEM DIAGNOSTICS
TGMTTY-TRUNK GROUP MAINTENANCE TTY CHANNEL
TGPMEMN-TRUNK GROUP TEST PANEL MEMBER NUMBER
TGTPRP-TRUNK GROUP TEST PAD REFERENCE POINT

Fig. 12—Trunk Group Number Supplementary Translator

CITB is a set card defining the engineered quantity of CCIS timing blocks. These 2-word blocks permit simultaneous timing of up to four different events associated with one call. (Initially CCIS calls require simultaneous timing for only two events.)

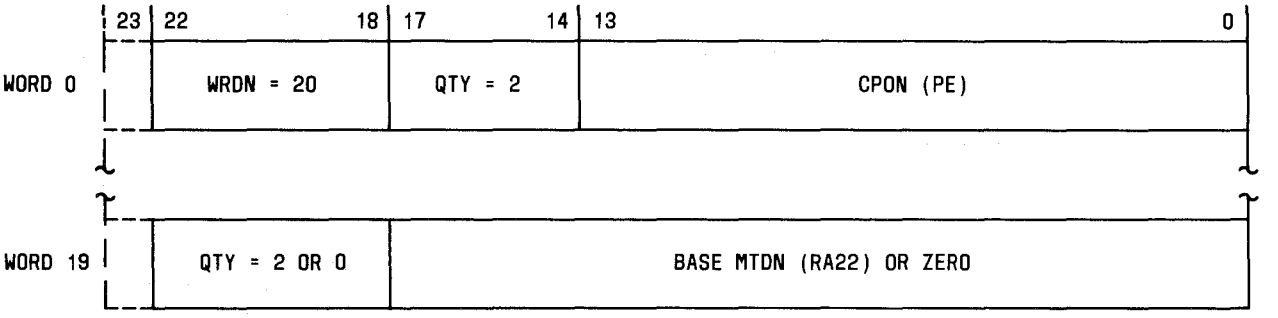
4.33 Each CCIS band requires a 32-word call store block consisting of sixteen 2-word CCIS trunk state blocks. The trunk state block is used to store call-related or trunk-related information. This block is accessed through the CCIS state word subtables via a triple addressing scheme using the CCIS terminal pair, band, and trunk number (Fig. 16). Parameter word C1STWORD contains the address of the CCIS trunk state block head table and specifies the total call store memory allocation for the state word subtables: CIMPR + 512 * CIPR + 32 * CIB. Item CIMPR is the maximum quantity of terminal pairs permitted in an office. Set card CIPR defines the actual quantity of CCIS terminal pairs in the office. Set card CIB defines the quantity of CCIS bands in the office for the engineering period.

4.34 For each assigned terminal pair in the office, the CCIS trunk state block head table entry points to a block of 512 call store words. This block of 512 words is indexed by the band number. Each assigned band is allocated 32 call store words for use as 16 trunk state blocks, one 2-word block per trunk number in the band. The trunk state blocks contain transient trunk state information for use by call processing and maintenance routines.

4.35 Parameter word C1BDSTAT points indirectly to the CCIS band status blocks via a CCIS band status head table (Fig. 17). The band status blocks contain the signaling status information for each band of each terminal pair. One 128-word band status block is required for each assigned terminal pair (CIPR * 128).

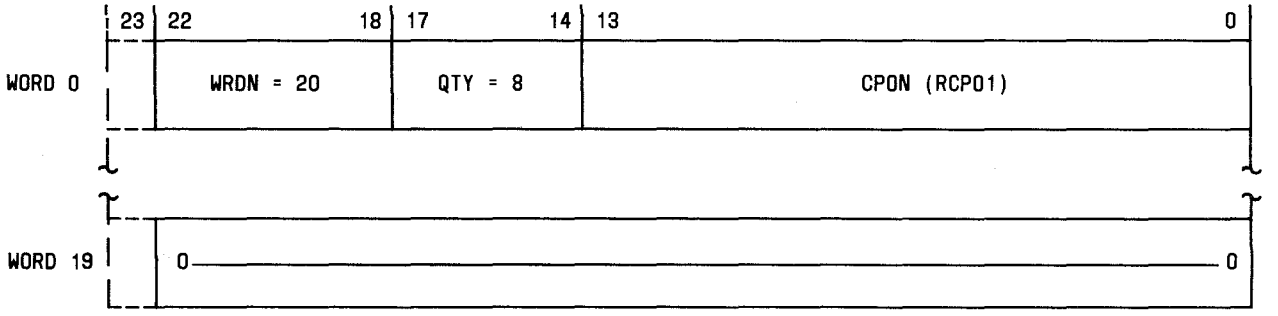
4.36 Parameter word C1PRSTAT (Fig. 18) is a pointer to a table of call store used to provide the operational programs with status and access information for each terminal pair. The size of this table is (16 * CIMPR) + 1. (See paragraph 4.33 for definition of CIMPR.)

4.37 Parameter word C1DFBUFA (Fig. 19) points to the call store address of the CCIS deferred



(a) STTPs AND TLTPs

NOTE: WORD AUX + 19 IS NONZERO FOR STTPs OPTION ZJ ONLY.



(b) MTTPs

NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

Fig. 13—Additional Word in UTYP Auxiliary Block

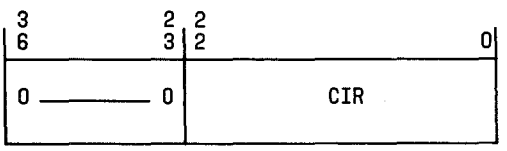
processing buffer entries. The quantity of these 2-word buffer entries is defined by set card CIDF. These buffers are used to temporarily store DL messages that must be processed by several program segments (eg, group blocking) or messages that cannot currently be processed due to software or hardware restrictions (eg, a clear forward signal is received on an incoming trunk and a disconnect register is unavailable). The total size of the call store block is (2 * CIDF) + 1.

4.38 Parameter word C1RBSTAT (Fig. 20) contains the call store address of a block of eight 3-word CCIS reset band status blocks. These blocks are used by a reset band procedure which idles CCIS trunks upon request from a connected CCIS office that has gone through a manual office recovery.

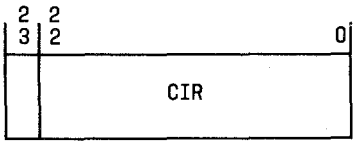
4.39 Parameter word C1ORSTAT (Fig. 21) contains the call store address of the CCIS office recovery status block. The size of this block is equal to CIMPR (see paragraph 4.33). This block is used by the office recovery program in controlling the transmission rate of reset band (RSB) messages.

4.40 Parameter word C1TQMEM (Fig. 22) contains the call store address of a 7-word CCIS trunk query memory block. This block is used by the trunk query program to format trunk query reply messages and to store trunk labeling information on automatic trunk queries.

4.41 A 4-word parameter block C1CLLI contains the common language location identification (CLLI) required by the translation integrity check



NO. 1 ESS (PROGRAM STORE)

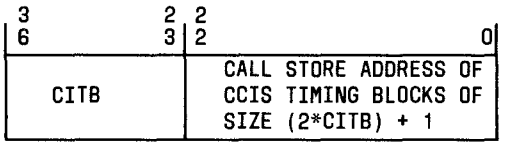


NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

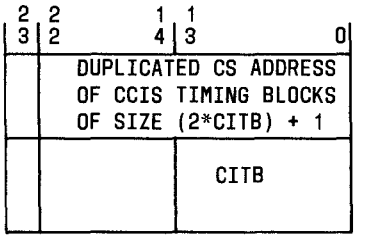
LEGEND:

CIR - SET CARD SPECIFYING THE QUANTITY OF REGISTERS IN THE POOL SPECIFIED BY NOR THAT ARE ALLOCATED FOR CCIS CALL REGISTER USE. THE REGISTER IDENTIFIER IS 17 (DECIMAL).

Fig. 14—Parameter Word C1CIRMAX—Quantity of CCIS Call Registers



NO. 1 ESS (PROGRAM STORE)



NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

LEGEND:

CITB - SET CARD SPECIFYING THE ENGINEERED QUANTITY OF 2-WORD CCIS TIMING BLOCKS

Fig. 15—Parameter Word C1TIMBLK—CCIS Timing Blocks

(Fig. 23). Set cards CLL01 through CLL11 specify the No. 1/1A ESS TTY decimal code of an alphabetic or alphanumeric character of the CLLI. These parameter words and set cards are applicable to 1E(B5)6, 1AE(B5)6, and later generic programs only.

4.42 Information regarding the parameter words required for 2400 DL and PUC/DL are contained in references A(6) and A(7) in Part 18.

FEATURE OPERATION

A. Normal Toll Call Sequences

4.43 A sample toll call involving the CCIS network is shown in Fig. 24. Party W will call party Z. For simplicity, only one STP is shown. The call sequences involving each of the Toll CCIS offices A, B, and C are presented chronologically. It should be noted that the basic switching functions that a toll switching machine has to perform are totally independent of the type of signaling used. Examples of these functions are: address analysis, screening, routing, trunk selection, and digit conversion. Also, the following assumptions have been made concerning the call sequences in Fig. 24:

- All Toll CCIS offices involved are No. 1/1A ESS.
- The call completes without encountering any irregularities (covered in subsequent paragraphs).
- The CCKs are not canceled due to processor heavy load.
- Party Z is not busy.
- Charging is handled in local office J.
- Party W hangs up first.
- Switchhook flashes do not occur.

4.44 Two of the actions in Fig. 24 that occur at the interfaces between the CCIS and PTS networks require amplification. First, in office A, the cross-office path is held open until receipt of the ADC

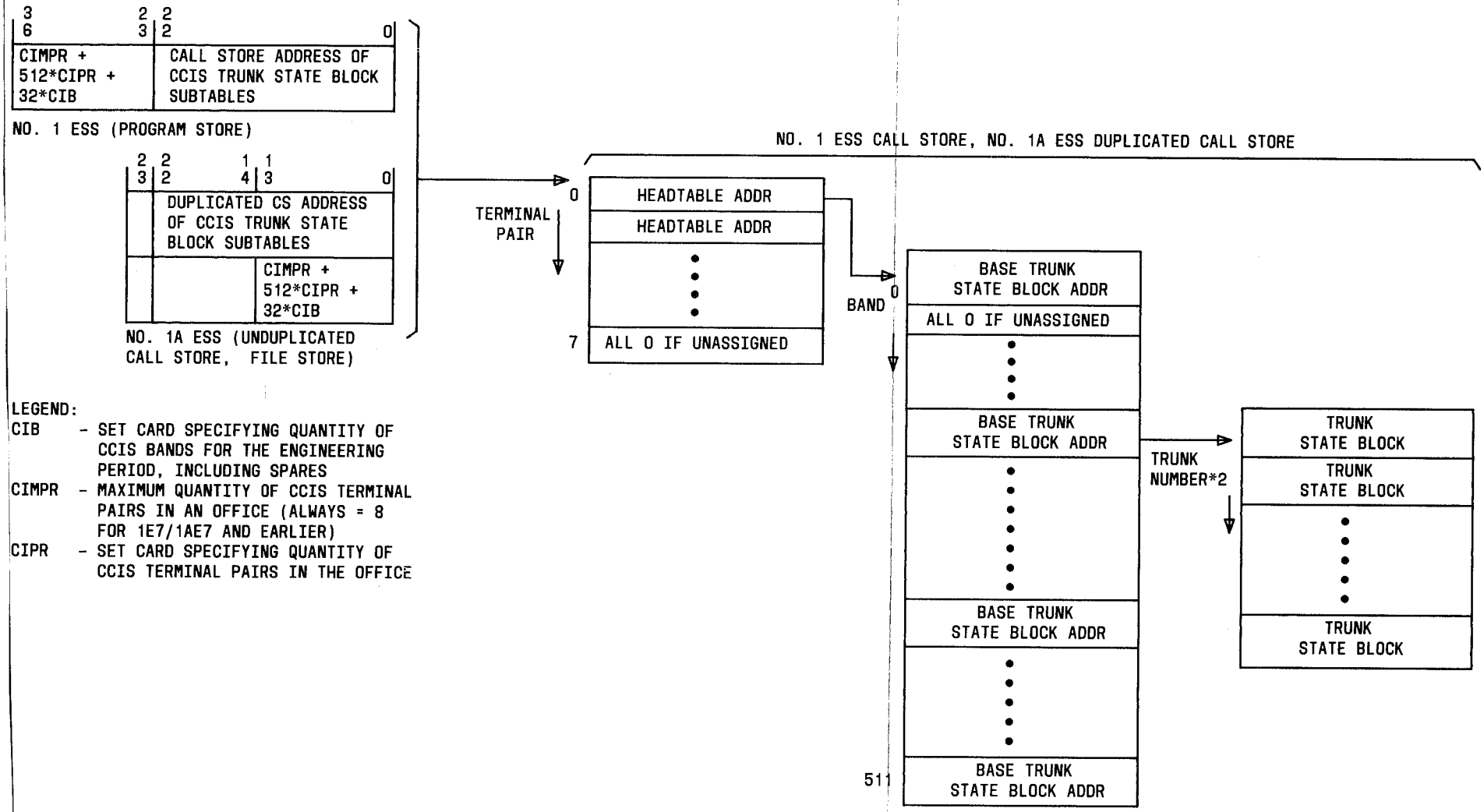


Fig. 16—Parameter Word C1STWORD—CCIS Trunk

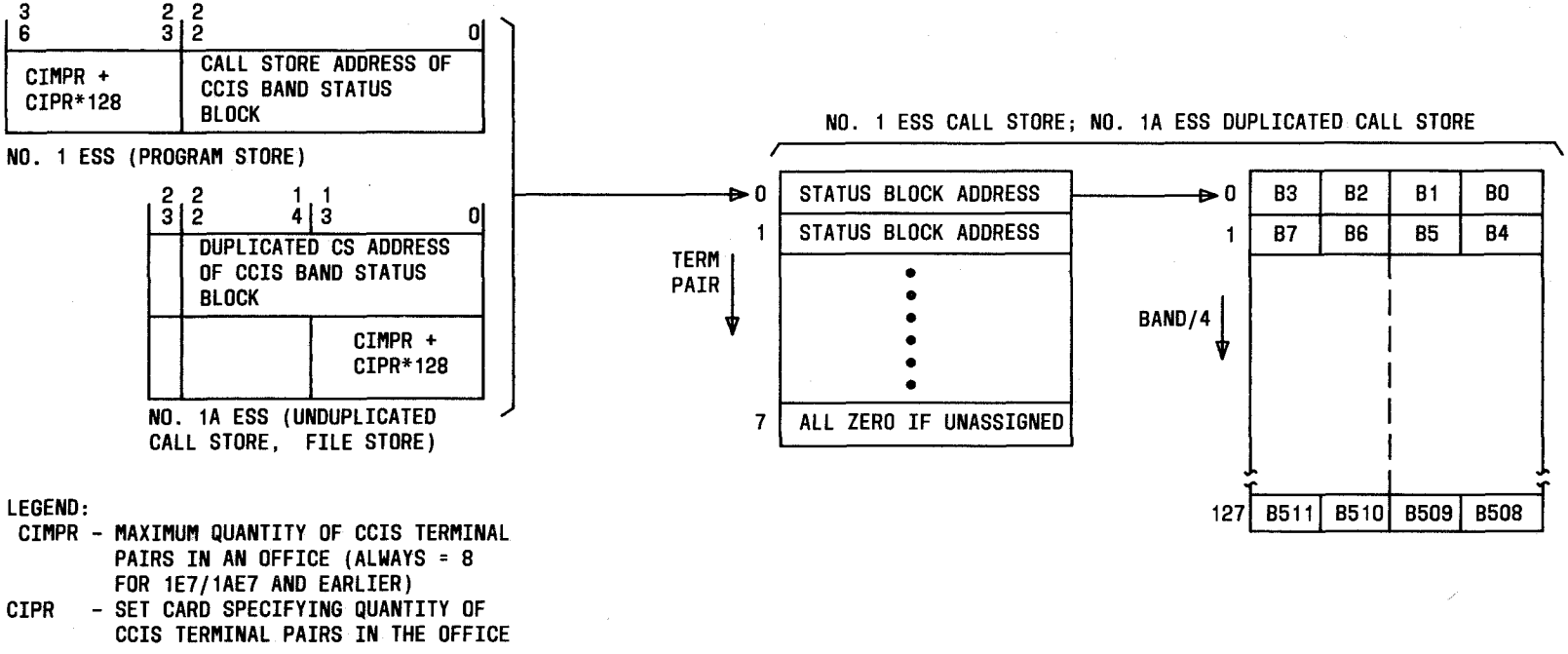
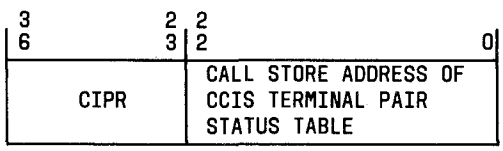
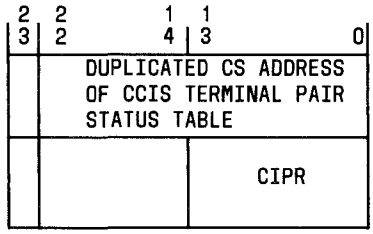


Fig. 17—Parmeter Word C1BDSTAT and CCIS Band Status Block



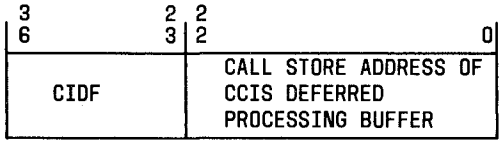
NO. 1 ESS (PROGRAM STORE)



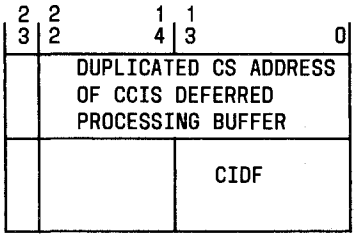
NO. 1A ESS (UNDUPLICATED CALL STORE. FILE STORE)

LEGEND:
CIPR - SET CARD SPECIFYING QUANTITY OF CCIS TERMINAL PAIRS IN THE OFFICE

Fig. 18—Parameter Word C1PRSTAT—CCIS Terminal Pair Status Table



NO. 1 ESS (PROGRAM STORE)

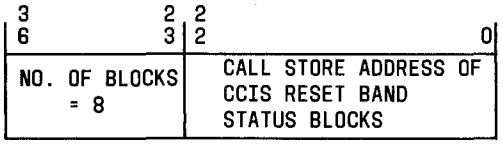


NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

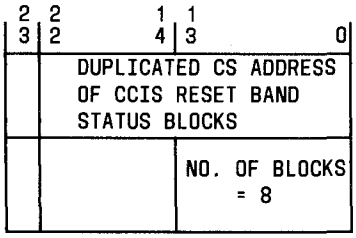
LEGEND:

CIDF - SET CARD SPECIFYING ENGINEERED QUANTITY OF CCIS DEFERRED PROCESSING BUFFER ENTRIES

Fig. 19—Parameter Word C1DFBUFA—CCIS Defined Processing Buffer

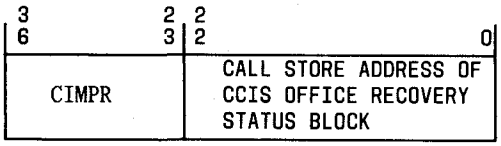


NO. 1 ESS (PROGRAM STORE)

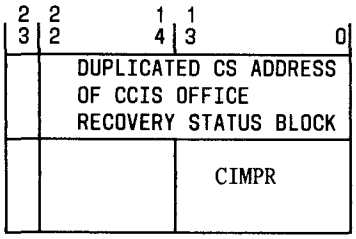


NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

Fig. 20—Parameter Word C1RBSTAT—CCIS Reset Band Status Blocks



NO. 1 ESS (PROGRAM STORE)



NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

LEGEND:

CIMPR - MAXIMUM QUANTITY OF CCIS TERMINAL PAIRS IN AN OFFICE (ALWAYS = 8 FOR 1E7/1AE7 AND EARLIER)

Fig. 21—Parameter Word C1ORSTAT—CCIS Office Recovery Status Block

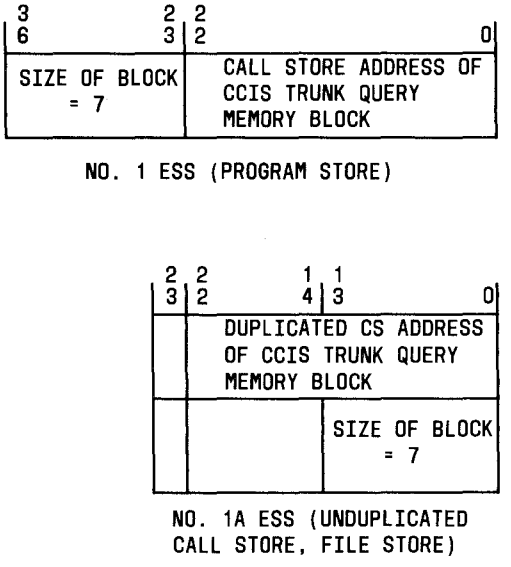


Fig. 22—Parameter Word C1TQMEM—CCIS Trunk Query Memory Block

signal to avoid inadvertently connecting the calling party (W) to the CCK tone. Second, in office C during outpulsing to office K, the last digit is held until the COT signal is received to prevent the called party (Z) from being rung prior to completion of verification of the voice path.

B. Calling Sequence Variations

Called Party Is Busy

4.45 The sequence in Fig. 24 proceeds up to the point where audible ringing would be returned to the calling party. When the called party is busy, busy tone is returned via the voice network. When the calling party hangs up, the CLF and RLG signals are used to take down the network.

Called Party Hangs Up First

4.46 If, at the conclusion of the stable talking state, an on-hook signal is received at office C prior to reception of a clear forward (CLF) from office B, this indicates that the called party (Z) hung up first. This signal is repeated to office A as a clear-back (CB1) signal. Disconnect timing is begun in office J; if the calling party (W) hangs up prior to time-out, an on-hook signal is sent to office A and office A takes down the network path per the sequence in Fig. 24 and sends a CLF signal immediately to office B. If the calling party does not hang up, and if the called party does not reanswer, office J generates the on-hook signal upon time-out (approximately 10 seconds).

Called Party Flashes

4.47 If the called party disconnects and reanswers, a sequence of clear-back and reanswer (CB1, RA1, CB2, RA2, CB3, RA3) signals are generated. In order to guarantee that the first Toll CCIS office (A) knows the final state of the call, clear-back and reanswer signals are given sequence numbers because of the possibility that they may get out of sequence due to retransmission along the way. Only the first Toll CCIS office requires the sequence numbers. Intermediate Toll CCIS offices do not have to resequence the clear-back and reanswer signals.

C. CCKs

4.48 A CCK is normally required on all CCIS calls. A CCT can function interchangeably on incoming trunks (ICTs) and outgoing trunks (OGTs). When attached to an OGT, the circuit is called a transceiver. When attached to an ICT, the circuit is called a transponder.

4.49 For CCIS trunks that terminate on a No. 1/1A ESS HILO network, HILO CCTs SD-1A453 are used. A HILO CCK for a CCIS outgoing call from a No. 1/1A ESS office is shown in Fig. 25(a). An initial address message (IAM) is sent to the far-switching office via one or two STPs. A CCT is seized, placed in the transceiver mode, and connected to the outgoing end of the trunk. When the far office receives the IAM, it connects a check loop or a transponder to the trunk. (A check loop is used in No. 4 ESS and No. 4A Electronic Translator System [ETS] offices; a transponder is used in No. 1/1A ESS offices.) A 2010-Hz check tone is sent from the outgoing No. 1/1A ESS office and it is looped at the far office. For a successful test, returning check tone lasting a minimum of 30 milliseconds must be detected at the outgoing end and after the tone is turned off at the far end, a loss of tone must be detected at the outgoing end before time-out (ie, 2 to 3 seconds). If the test is successful, the transceiver is disconnected and a continuity (COT) signal is transmitted to the far office. Upon receipt of the COT, the far-end office disconnects the loop or transponder.

4.50 If the time-out occurs before the CCK is completed, the transceiver is removed, and the call

36	23	22	21	20	14	13	07	06	00
0	0	0	0	CLLO1		CLLO2		CLLO3	
0	0	0	0	CLLO4		CLLO5		CLLO6	
0	0	0	0	CLLO7		CLLO8		CLLO9	
0	0	0	0	CLL10		CLL11			

NO. 1 ESS (PROGRAM STORE)

23	21	20	14	13	07	06	00
0	0	CLLO1		CLLO2		CLLO3	
0	0	CLLO4		CLLO5		CLLO6	
0	0	CLLO7		CLLO8		CLLO9	
0	0	CLL10		CLL11			

NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

LEGEND:

CLLO1 THROUGH CLL11 ARE SET CARDS DEFINING THE COMMON LANGUAGE LOCATION IDENTIFICATION (CLLI)

CLLO1 - DECIMAL CODE OF THE FIRST CHARACTER OF THE CLLI
CLLO2 - DECIMAL CODE OF THE SECOND CHARACTER OF THE CLLI
CLLO3 - DECIMAL CODE OF THE THIRD CHARACTER OF THE CLLI
CLLO4 - DECIMAL CODE OF THE FOURTH CHARACTER OF THE CLLI
CLLO5 - DECIMAL CODE OF THE FIFTH CHARACTER OF THE CLLI
CLLO6 - DECIMAL CODE OF THE SIXTH CHARACTER OF THE CLLI
CLLO7 - DECIMAL CODE OF THE SEVENTH CHARACTER OF THE CLLI
CLLO8 - DECIMAL CODE OF THE EIGHTH CHARACTER OF THE CLLI
CLLO9 - DECIMAL CODE OF THE NINTH CHARACTER OF THE CLLI
CLL10 - DECIMAL CODE OF THE TENTH CHARACTER OF THE CLLI
CLL11 - DECIMAL CODE OF THE ELEVENTH CHARACTER OF THE CLLI

THE ELEVEN CHARACTERS OF THE CLLI ARE DIVIDED INTO FOUR FIELDS:

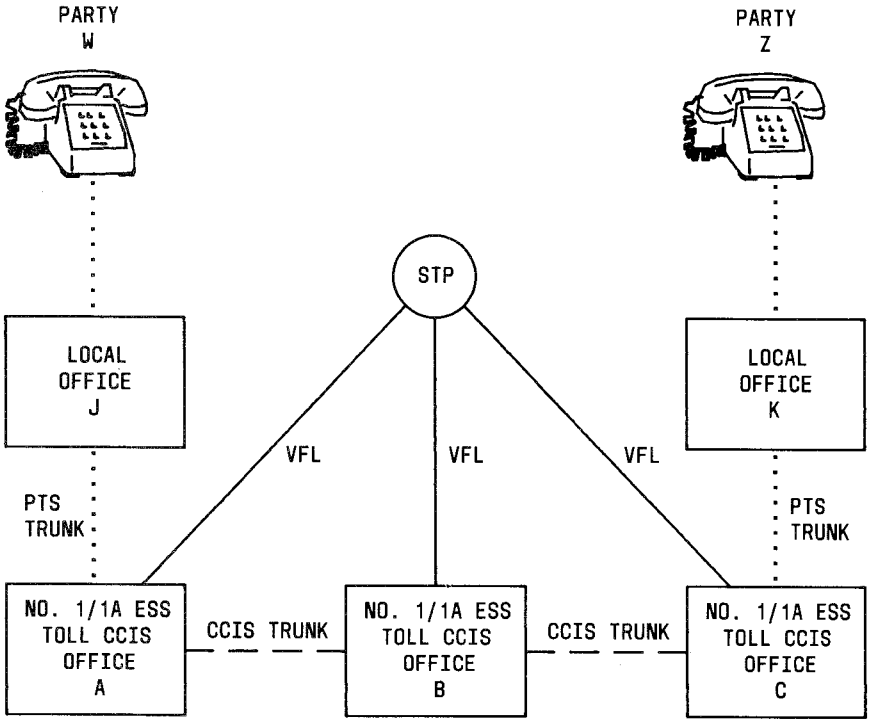
CHARACTERS	1 - 4	TOWN	(ONLY ALPHABETICS ARE ALLOWED)
CHARACTERS	5 - 6	STATE	(ONLY ALPHABETICS ARE ALLOWED)
CHARACTERS	7 - 8	BUILDING	(ONLY ALPHANUMERICS ARE ALLOWED)
CHARACTERS	9 - 11	BUILDING SUBDIVISION	(ONLY ALPHANUMERICS ARE ALLOWED)

Fig. 23—Parameter Block C1CLLI—Common Language Location Identification

is reattempted (if it is a first attempt) on another trunk. If a call fails two CCKs, a reorder announcement (RI 184 for 2-wire trunks or PRI 011 for HILO trunks) is returned to the calling party, either from the office where the CCKs were made or from one of the up-chain offices (if any). A failed trunk is removed from service until a continuity recheck is made under control of a maintenance program. For 1E7/1AE7 and later generic programs, software carrier group alarm (SCGA) is present for CCIS. With this feature, a CCK failure on a CCIS trunk causes the SCGA program to be entered. The SCGA program is described in paragraphs 3.37 through 3.41.

4.51 When a call is incoming to a HILO network in a No. 1/1A ESS office, a HILO CCT is used as a transponder [Fig. 25(b)]. The transponder loops the 2010 Hz tone back to the originating office. The transponder is disconnected upon receipt of a COT. If a COT is not received within 10 or 11 seconds after reception of the IAM, the transponder times out and is removed.

4.52 When a Toll CCIS call involves a CCIS intertoll trunk terminated on a 2-wire network in a No. 1/1A ESS office, a 2-wire CCT SD-1A436 is required. This circuit uses check-tone fre-



NOTE: SOLID ARROWS INDICATE CCIS DATA LINK MESSAGES VIA STP. BROKEN ARROWS INDICATE MESSAGE TRUNK SIGNALS BETWEEN TOLL OFFICES. DOTTED ARROWS INDICATE MESSAGE TRUNK COMMUNICATIONS WITH LOCAL OFFICES J AND K.

LEGEND:

ADC - ADDRESS COMPLETE MESSAGE
ANC - ANSWER, CHARGE MESSAGE
CCK - CONTINUITY CHECK TONE
CCT - CONTINUITY-CHECK CIRCUIT
CIR - CCIS INCOMING REGISTER
CLF - CLEAR FORWARD MESSAGE
COT - CONTINUITY MESSAGE
DR - DISCONNECT REGISTER
IAM - INITIAL ADDRESS MESSAGE
ICT - INCOMING TRUNK
IR - INCOMING REGISTER
OGT - OUTGOING TRUNK
PMT - PATH MEMORY FOR TRUNK WORD
PTS - PER TRUNK SIGNALING
RI - ROUTE INDEX
RLG - RELEASE GUARD MESSAGE
TB - CCIS TIMING BLOCK
TTM - TRUNK-TO-TRUNK MEMORY
XMTR - PTS TRANSMITTER

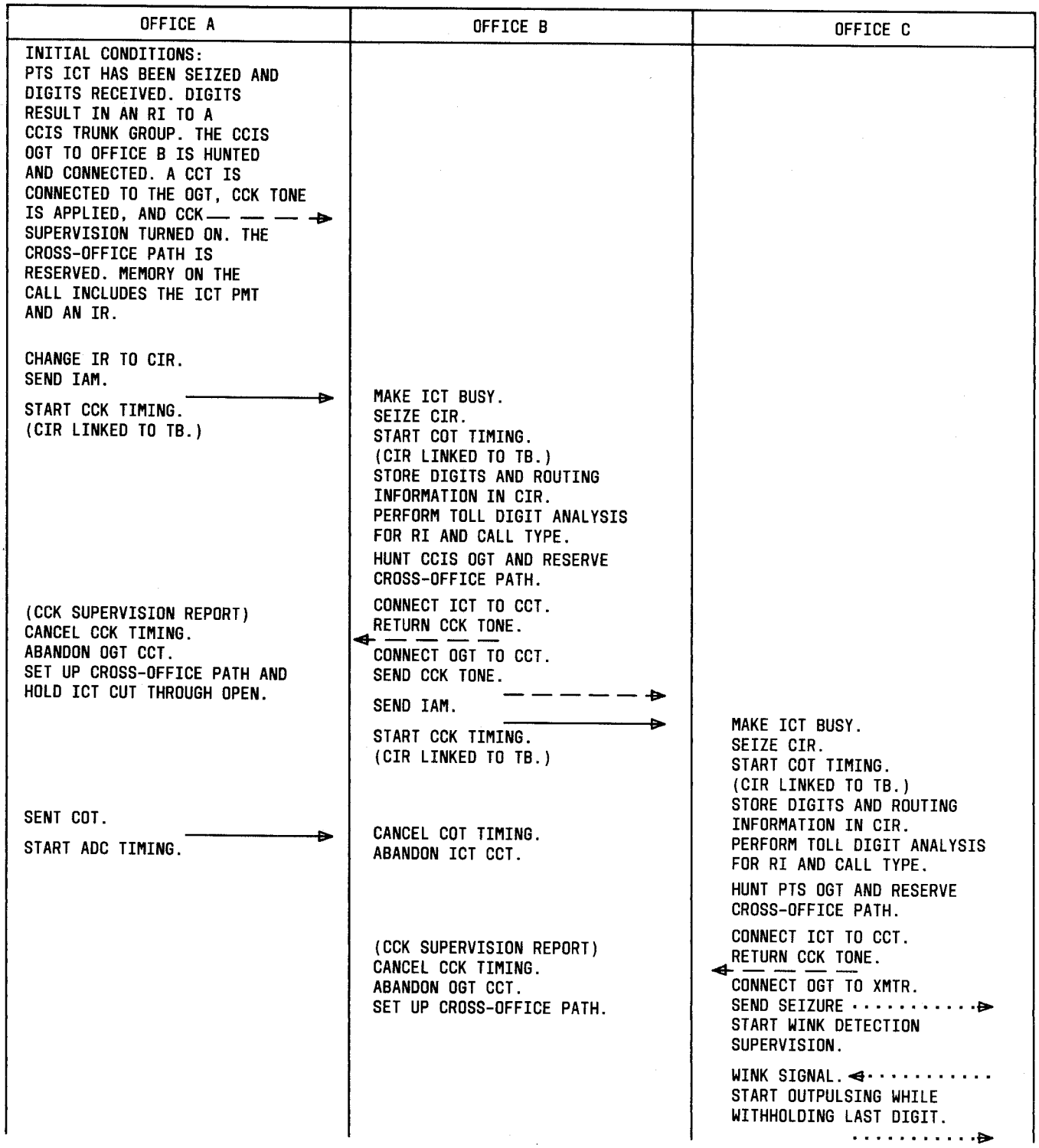
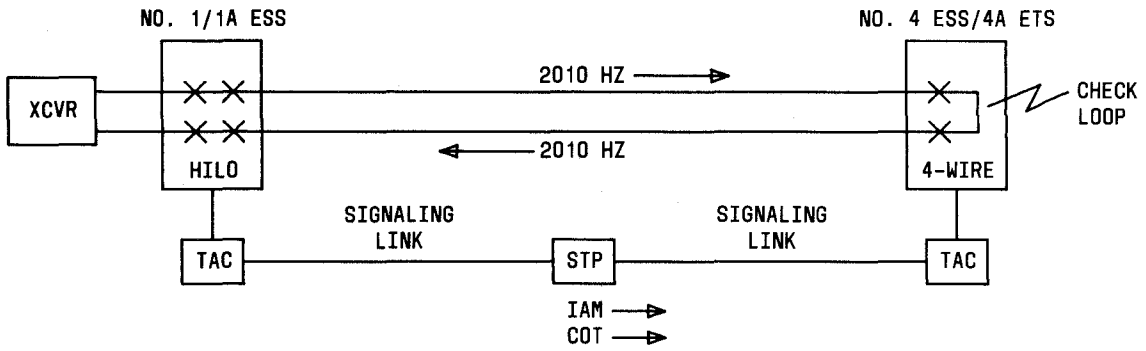
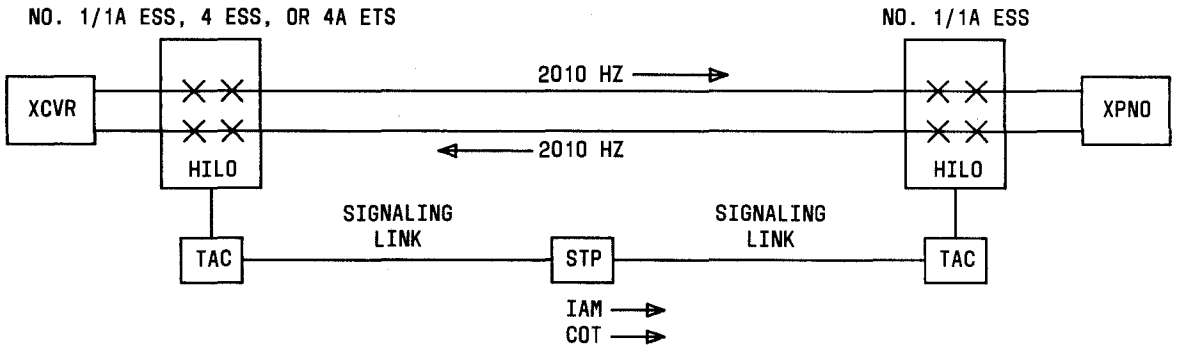


Fig. 24—Toll CCIS Network Call-Signaling Sequence Diagram



(a) 4-Wire Continuity Check Originating From a No. 1/1A ESS



(b) 4-Wire Continuity Check Incoming to a No. 1/1A ESS

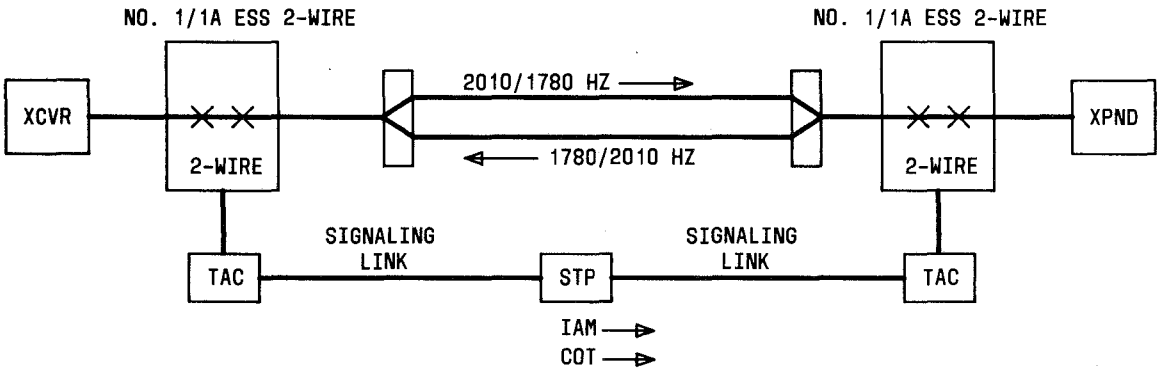
Fig. 25—Continuity Checks (HILO)

quencies of 1780 Hz and 2010 Hz to differentiate reflected tone caused by a 2-wire transmission impairment (eg, low trans-hybrid loss) from tone that actually reaches the incoming office. At the incoming office, a transponder detects the tone of one frequency and returns tone of the second frequency. The outgoing and incoming time-out intervals for the 2-wire CCT are 2.5 to 3.5 seconds and 10 to 11 seconds, respectively. Figures 26A, 26B, and 26C illustrate the possible configurations for 2-wire CCKs.

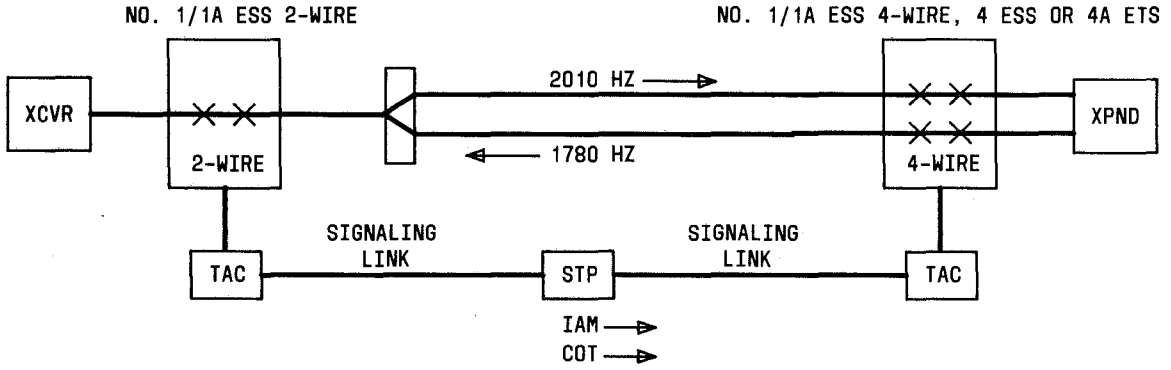
4.53 To avoid false CCK failures, a No. 4A ETS office sends a recycle timer (RCT) signal if there is excessive delay in attaching a transponder on an incoming CCIS call from a 2-wire No. 1/1A ESS office. When the RCT is received by the 2-wire office, the failure timing is restarted.

4.54 During periods of processor heavy load, 50 percent of the CCKs for outgoing CCIS attempts are canceled. Incoming CCKs cannot be canceled. CCIS calls, outgoing from or incoming to a No. 1/1A ESS office, do not queue for CCTs. If a CCT is not available for the call, the call is canceled.

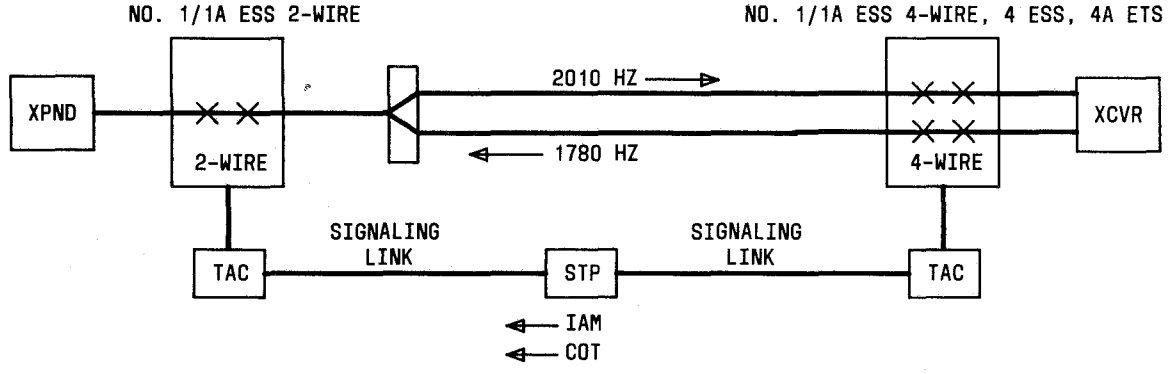
4.55 Where message trunks are equipped with echo suppressors, they must be disabled during the



A. 2-WIRE TO 2-WIRE CONTINUITY CHECK



B. 2-WIRE TO 4-WIRE CONTINUITY CHECK



C. 4-WIRE TO 2-WIRE CONTINUITY CHECK

Fig. 26—Continuity Checks (2-Wire)

CCK. (They may or may not be disabled for the call as determined appropriate by the call processing software.)

4.56 For 1E7/1AE7 and later generic programs, a bit has been defined in the trunk class code (TCC) to allow a group of trunks to have most of their CCKs canceled. If this bit is set in the TCC associated with a seized CCIS OGT, the trunk will have an average of 7/8 of its outgoing CCKs canceled. Initially, only CCIS trunks interconnecting the 2-wire and HILO TLNs in a combined local/toll office can have this indicator set.

D. Glare

4.57 Since Toll CCIS utilizes 2-way trunk groups, dual seizures are possible. Dual seizure or glare occurs when both ends of a 2-way trunk are seized before either seizure is recognized by the two offices involved. With CCIS, dual seizure happens when an IAM is sent for a trunk from each end simultaneously. To resolve this condition, one of the offices has been designated the control end and the other office the noncontrol end. When the noncontrol office receives an IAM after sending an IAM for the same trunk, it reattempts its outgoing call on a different trunk and processes the incoming call on the originally dual-seized trunk. At the control office, the outgoing call is completed in essentially the normal manner.

E. Anomalous Signals That May Be Encountered During Call Setup

4.58 During call setup, certain signals may be received by a CCIS office that are inconsistent with what is normally expected. These signals are sent in the backward direction and indicate that an up-chain office is unable to set up the call beyond that point. In cases where the chance of the call completing is highly probable, the call is reattempted. For those cases where the call is not reattempted (or the second attempt also fails), the call is redirected to the appropriate tone or announcement at the first PTS-to-CCIS interface office and the trunks associated with the Toll CCIS portion of the network are idled via clear forward (CLF)/RLG signals. (Second attempt failures may result in a different backward failure message.) This saves the intertoll network from being used for tones and announcements when the call will not complete. These signals are as follows.

(a) ***Address Incomplete (ADI):*** This signal indicates that the number of address digits received is insufficient for setting up the call. The call is not reattempted.

(b) ***Blocking (BLO):*** Receipt of this signal indicates that a trunk has been blocked by maintenance personnel at the far end. The call is reattempted on a different trunk.

(c) ***Call Failure (CFL):*** Receipt of this signal indicates that a time-out occurred or that a failure of a type not covered by specific signals occurred. The call is not reattempted.

(d) ***Confusion (COF):*** This signal is returned for certain irregularities where the probability of success on the reattempt is quite high. For example, two different IAMs may be received for the same trunk. The call is reattempted.

(e) ***Message Refusal (MRF):*** This signal is sent by an STP and indicates that it is unable to handle a telephone signal due to a transfer prohibited situation. The call is not reattempted.

(f) ***National Switching Congestion (NSC):*** Receipt of this signal indicates that the call setup attempt failed due to congestion in the switching equipment. The call is not reattempted.

(g) ***National Trunk Congestion (NTC):*** Receipt of this signal indicates that the call setup attempt failed due to congestion in a TG. The call is not reattempted.

(h) ***Reset Trunk (RST):*** This signal is sent for either ICTs or OGTs to force a release of the connection. It may be sent for the following conditions: (1) certain time-out situations, (2) failure situations uncovered by local trunk audits where other CCIS signals are inappropriate, (3) switching system recovery procedures, and (4) certain mismatch situations uncovered by interoffice trunk audits (trunk query). The trunk is kept busy until the other end office sends the proper response. If RST is received for an idle or incoming trunk, the response is an RLG. For an outgoing trunk, the response is CLF. When the CLF is received at the office that sent the RST, it returns an RLG. When the signaling sequence is completed, the trunk is returned to service provided no prior out-of-service condition existed. The RST signals

do not clear maintenance states that may exist at either end of the trunk. If an RST is received on an outgoing CCIS trunk prior to reception of the ADC signal, the call is reattempted.

(i) ***Unequipped Label (UQL):*** This signal indicates that the band number at the STP or the band or trunk number at the switching office is unassigned. If a UQL signal is received during a CCIS call setup sequence where (1) the trunk has been seized, (2) the IAM has been transmitted, and (3) the ADC has not been received, the office receiving the UQL signal removes the indicated trunk from service and reports it to maintenance. The call is reattempted on a different trunk.

(j) ***Vacant National Number (VNN):*** This signal indicates that the number is not in use. The call is not reattempted.

F. Out-of-Sequence Signals

4.59 Because of error conditions and resultant signal retransmission, signals may arrive out of sequence, be received twice, or even spill over from previous calls. Reasonableness checks are provided in both the terminal and the CCIS software. These cause most unexpected signals to either be ignored or inhibited if the transmission of a signal would lead to abnormal situations at the receiving office. However, in some apparently abnormal situations, timing is invoked to ascertain if the received signal is only unreasonable as a result of its getting out of sequence with the correct signal. In this case, if the correct signal does arrive, both signals are accepted and the call state is advanced accordingly.

G. Signal Time-Outs

4.60 Signal time-outs result in forcing a release of the connection. These time-outs and related procedures are summarized below.

(a) Timing for the COT signal after receiving an IAM is 10 to 11 seconds. If this period lapses, a CFL signal is sent.

(b) Timing for the ADC signal after sending the IAM or COT is 18 to 36 seconds. If this period lapses, a CLF signal is sent and the call is failed.

(c) Timing for a RLG signal after sending a CFL signal is 4 to 5 seconds. If this period lapses, a RST is sent.

(d) Timing for a CLF signal after sending a backward failure signal (eg, confusion, call failure, vacant national number, etc) is 4 to 5 seconds. If this period lapses, an RST is sent.

(e) Timing for receiving CCK tone after attaching a ***transceiver*** is 2.5 to 3.0 seconds, (3.0 to 3.5 seconds for satellite trunks). If this period lapses, BLO and CLF signals are sent. The call is reattempted, if this was a first attempt.

H. Interactions With Nontelephone Signals

4.61 Except for transfer prohibited (TFP), most nontelephone signals do not affect the processing of telephone calls. However, some signaling system control signals may have indirect effect since these signals are used to indicate signaling link failures.

I. Normal Local Call Sequences

4.62 A typical local interoffice CCIS call encounters a line-to-CCIS interface in the originating office, a CCIS-to-line interface in the terminating office, and involves one or two STPs. For discussion purposes, the network shown in Fig. 27 is used with party X calling party Y. The call sequence involving the two local offices (A and B) is presented chronologically. It should be noted that the basic switching functions that a local switching machine has to perform are totally independent of the type of signaling used. Also, the following assumptions have been made concerning the call sequence in Fig. 27.

(a) Offices A and B are No. 1/1A ESS.

(b) The call completes without encountering any irregularities (covered in subsequent paragraphs).

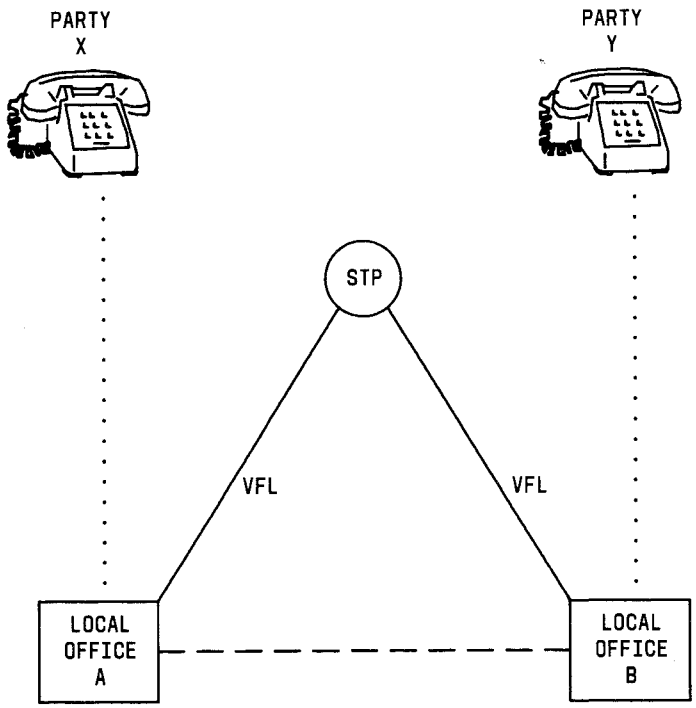
(c) The CCKs are not cancelled due to processor heavy load.

(d) Party Y is not busy and answers the call.

(e) There is no charging on the call.

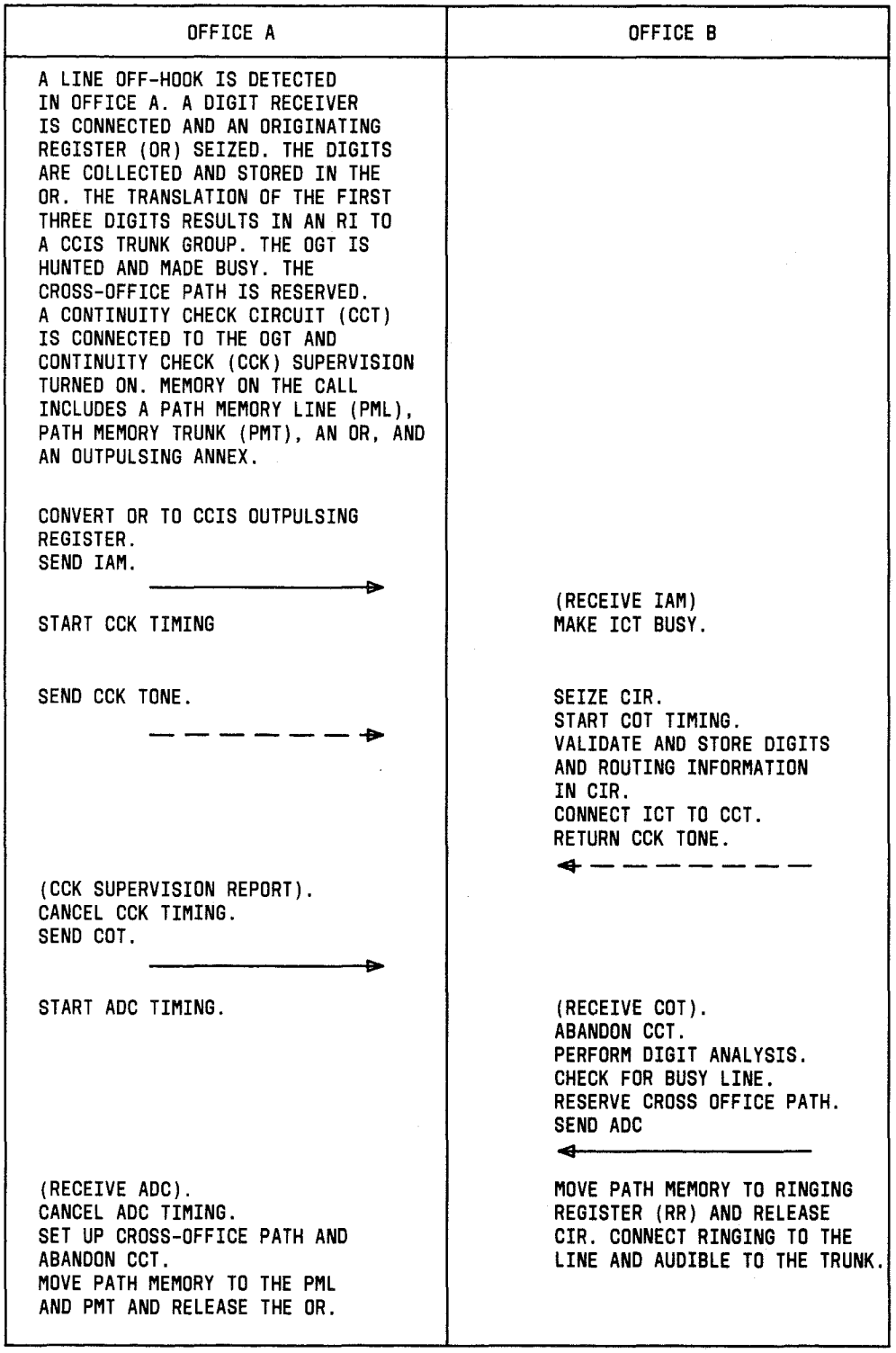
(f) Party X hangs up first.

(g) Switchhook flashes do not occur.



NOTE: SOLID LINES INDICATE CCIS DATA LINK MESSAGES VIA STP. BROKEN LINES INDICATE MESSAGE TRUNK COMMUNICATIONS BETWEEN LOCAL OFFICES A AND B.

LEGEND:
VFL - VOICE FREQUENCY LINK


OFFICE A
OFFICE B
A LINE OFF-HOOK IS DETECTED IN OFFICE A. A DIGIT RECEIVER IS CONNECTED AND AN ORIGINATING REGISTER (OR) SEIZED. THE DIGITS ARE COLLECTED AND STORED IN THE OR. THE TRANSLATION OF THE FIRST THREE DIGITS RESULTS IN AN RI TO A CCIS TRUNK GROUP. THE OGT IS HUNTED AND MADE BUSY. THE CROSS-OFFICE PATH IS RESERVED. A CONTINUITY CHECK CIRCUIT (CCT) IS CONNECTED TO THE OGT AND CONTINUITY CHECK (CCK) SUPERVISION TURNED ON. MEMORY ON THE CALL INCLUDES A PATH MEMORY LINE (PML), PATH MEMORY TRUNK (PMT), AN OR, AND AN OUTPULSING ANNEX.
CONVERT OR TO CCIS OUTPULSING REGISTER.
SEND IAM.
(RECEIVE IAM)
MAKE ICT BUSY.
START CCK TIMING
SEND CCK TONE.
SEIZE CIR.
START COT TIMING.
VALIDATE AND STORE DIGITS AND ROUTING INFORMATION IN CIR.
CONNECT ICT TO CCT.
RETURN CCK TONE.
(CCK SUPERVISION REPORT).
CANCEL CCK TIMING.
SEND COT.
START ADC TIMING.
(RECEIVE COT).
ABANDON CCT.
PERFORM DIGIT ANALYSIS.
CHECK FOR BUSY LINE.
RESERVE CROSS OFFICE PATH.
SEND ADC
(RECEIVE ADC).
CANCEL ADC TIMING.
SET UP CROSS-OFFICE PATH AND ABANDON CCT.
MOVE PATH MEMORY TO THE PML AND PMT AND RELEASE THE OR.
MOVE PATH MEMORY TO RINGING REGISTER (RR) AND RELEASE CIR. CONNECT RINGING TO THE LINE AND AUDIBLE TO THE TRUNK.

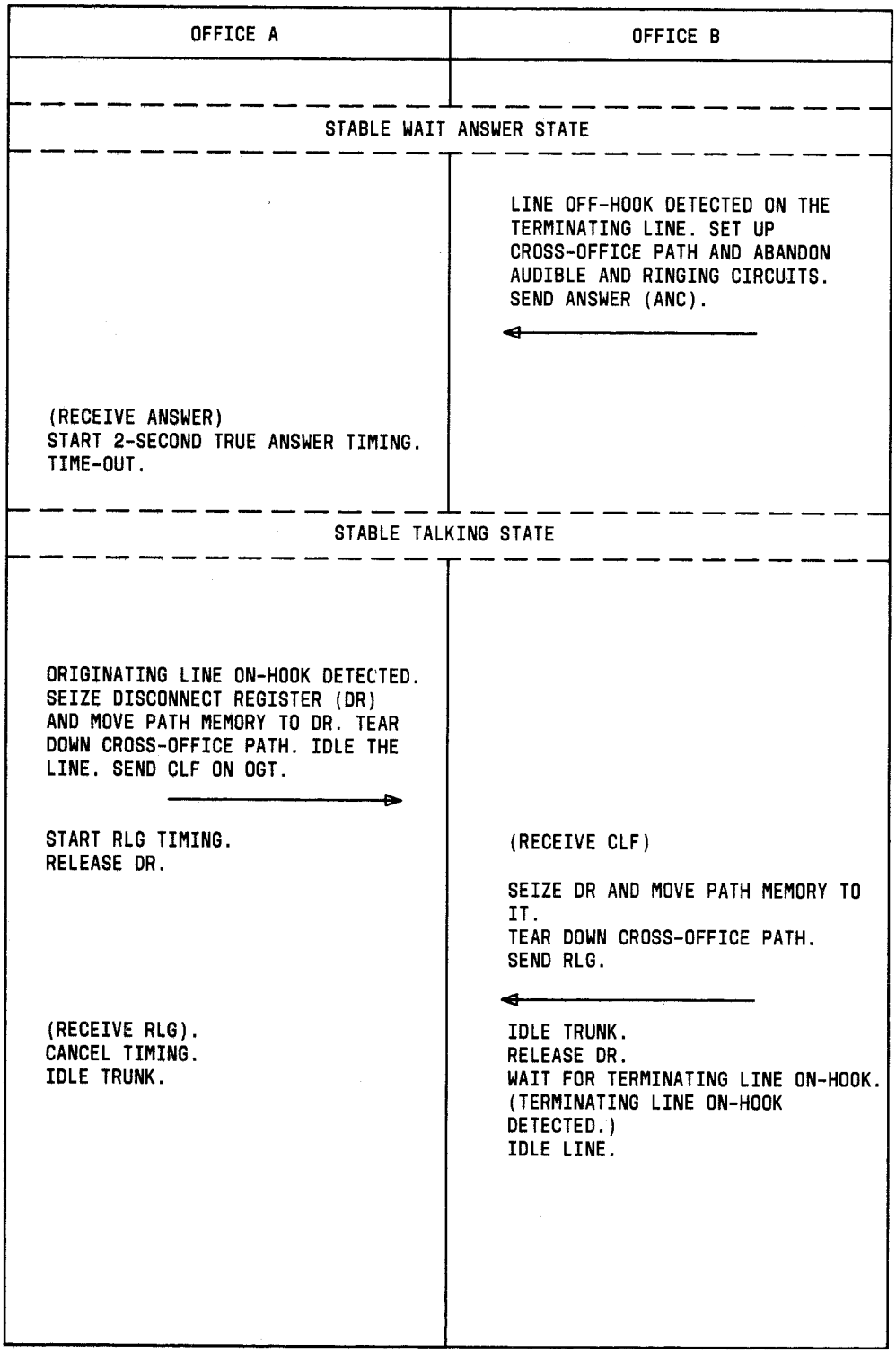


Fig. 27—Local CCIS Network Call-Signaling Sequence Diagram

J. Calling Sequence Variations

New End Busy

4.63 The sequence in Fig. 27 proceeds up to the point where audible ringing would be returned to the calling party. When the called party is busy, several checks are made to determine if a subscriber busy (SSB) message can be sent back to the originating office. The following situation must exist for SSB to be sent.

(a) The incoming trunk in the terminating office is a CCIS trunk.

(b) The IAM, which comes into the terminating office, has the stored program control (SPC) type call indicator set. (This indicates that each trunk in the call is a CCIS trunk.)

(c) The ADC message must not have been sent.

4.64 If the above situation exists, an SSB message is sent back to the originating office, the originating party is connected to busy tone in the originating office, and the trunks are idled. Otherwise, busy tone is connected in the terminating office. In this case, when the calling party hangs up, the CLF and RLG signals are used to take down the network connection.

Called Party Hangs Up First

4.65 If, at the conclusion of the stable talking state, an on-hook signal is received at office B prior to reception of a CLF from office A, this indicates that the called party Y hung up first. This signal is repeated to office A as a CB1 signal. Disconnect timing is now begun in office A. If the calling party (X) hangs up prior to time-out, office A sends a CLF immediately to office B and the network is taken down per the sequences in Fig. 27. If the calling party does not hang up, and the called party does not reanswer, office A sends a CLF to office B upon time-out, (approximately 10 seconds) and the call is taken down per the sequences in Fig. 27.

Called Party Disconnects and Reanswers

4.66 If the called party disconnects and reanswers, a sequence of clear-back and reanswer (CB1, RA1, CB2, RA2, CB3, RA3) signals are generated. In order to guarantee that office A knows the final state of the call, clear-back and reanswer signals are given sequence numbers because of the possibility that they may get out of sequence.

CHARACTERISTICS

5. FEATURE ASSIGNMENT

5.01 The CCIS features are applicable to all No. 1/1A ESS local, toll, tandem, combined local/toll, and local/tandem offices. They are provided on a per-office basis as a set of optionally loaded groups of feature packages.

6. LIMITATIONS

OPERATIONAL

6.01 Not applicable.

ASSIGNMENT

6.02 In a combined local/toll HILO office with both Local CCIS and Toll CCIS loaded, all HILO intraprocessor trunks used for any nonmaintenance traffic must be converted to CCIS. However, HILO intraprocessor TGs used for maintenance must remain as non-CCIS TGs. In this case, nonmaintenance message traffic cannot be combined with maintenance traffic on the same TG. If intraprocessor message traffic overflow is desired, eg, from a 1-way intraprocessor TG to a 2-way intraprocessor TG, then each of these TGs must be CCIS.

6.03 Echo suppressor control must be provided on CCIS trunks equipped with echo suppressors because the CCK requires duplex signaling.

6.04 Hardware or software carrier group failure alarms can be provided on CCIS trunks.

6.05 Incoming trunk service observing can be activated on CCIS trunks.

6.06 Single frequency (SF) SUs must be removed from trunks which are converted to CCIS.

6.07 Toll operator, Traffic Service Position System (TSPS), and CAMA trunks cannot be CCIS trunks.

6.08 Only nonassociated CCIS is permitted from No. 1/1A ESS offices. (CCIS DLs must terminate at STPs.)

6.09 No. 1/1A ESS cannot function as a gateway office but can interface with a gateway office that uses CCIS trunks.

6.10 The CCIS DTRM frames, DTRM pairs, and DTRMs are assigned sequentially by CNAC beginning with unit 0 up through the highest assigned unit number.

6.11 The first supplementary frame added to the basic DTRM frame must be located on the left side of the basic frame. This restriction is necessary because of cable dress between the supplementary and basic frames.

6.12 The CCIS feature is not available for private network facilities.

6.13 If a No. 1/1A ESS office has CCIS trunks on the HILO network, the office must have the CIHL feature group loaded. An office with only Local CCIS does not allow CCIS trunks on the HILO network. In addition, tandem CCIS trunks on the HILO network must be marked with TG type 10 (DDD access, intertoll) or TG type 1 (basic POTS 1-way OGT).

6.14 The TGN supplementary translator reverse hunt item (REVH) must be used for 2-way CCIS TGs that are hunted in reverse member number order. The procedure of implementing reverse hunt by ***flipping*** the trunk circuits at one office, so that its first group member is the last group member at the other office, cannot be used with CCIS TGs as it is incompatible with algorithms used to map the CCIS label to the TNN.

6.15 Rate and route patterns whose RI (primary) points to a CCIS group must not have the overlap operation (OLP) bit set in the rate and route pattern call identification word (CIW) or auxiliary block.

6.16 No. 1/1A ESS offices that have glare control of odd-numbered trunks in 2-way CCIS TGs cannot hunt in reverse sequence. Offices that have glare control of even-numbered trunks in 2-way CCIS TGs must hunt in reverse sequence.

7. INTERACTIONS

7.01 Not applicable.

8. RESTRICTION CAPABILITY

8.01 Not applicable.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

A. General

9.01 When using the 2400 DL, the CCIS DTRM group basic frame is equipped with the duplicated TACs peripheral bus interface units, and supportive power equipment. Data terminals are installed in the basic frame as required by implementation plans along with the associated power control equipment. After the basic frame is fully equipped with eight DTRMs, the first and, if required, the second supplementary frame can be installed adjacent to the left and right sides, respectively, of the basic frame.

9.02 Each supplementary frame can be equipped with a maximum of 4 DTRMs and associated power equipment. The 3 frames comprising the maximum size CCIS DTRM group provide mounting facilities for 16 DTRMs, which may be assigned to process the signaling traffic for up to 18,000 CCIS trunks.

9.03 The data communication control frame used with the PUC/DL houses up to six data set units along with the required wiring and power equipment. Each CCIS data set unit consists of two data interface units, two 201D modems, and two VFLA circuits per modem. The first data set unit in each data communications control frame also includes a VFL maintenance circuit.

9.04 A PUC/DL may be dedicated to CCIS or may be shared among several applications (eg, RSS, ETS, CSR, CCIS). One PUC/DL can support up to six CCIS LIUs, which are housed on the PUC/DL frame.

9.05 With 1E7/1AE7 generic programs, CCIS has the capability to process pass-along messages (PAMs). When a PAM is received for a CCIS trunk in a trunk-to-trunk connection, the PAM is forwarded on the connected trunk. When a PAM is received for a CCIS trunk in a line-to-trunk connection, a general denial PAM is returned on the trunk.

9.06 With 1E7/1AE7 generic programs, No. 1/1A ESS offices with CCIS loaded have the capability to handle ***hard-to-reach (HTR) codes***. These codes, which can be received from No. 4 ESS offices, indicate that difficulty will be encountered in

completing calls over certain trunks. To handle the HTR codes, the CCIS input processor converts the codes to standard input messages before passing the messages to the client programs.

9.07 CCIS trunks can be added to existing terminal pairs until the maximum capacity of approximately 2250 intertoll trunks per pair is reached. This trunk growth involves coordination with other switching offices, the affected STPs, and CNAC. (See Part 14.) Growth of CCIS trunks will probably also result in growth of CCTs. (See Part 10.)

B. Installation Procedures

9.08 Figure 28 illustrates the procedure for building CCIS translations. Refer to Part 13 for testing. For more detailed information, see reference A(13) or A(14) in Part 18.

9.09 For conversion of an existing office with conventional trunks to CCIS operation, see reference A(22) in Part 18.

9.10 Table C contains a summation of the set cards required by the CCIS feature. Both the maximum range and the typical values for a CCIS office are given. When these set cards are not input, their default values are zero. See references A(6) and A(7) in Part 18 for additional set cards required for PUC/DL and 2400 DL. Feature group and feature package set cards are shown in Table D.

9.11 To enable the direct signaling capability, two actions are necessary. First, the direct signaling indicator (DSI) item of the second word of the terminal pair translator auxiliary block must be set to one. In addition, the DSFN set card, which assigns the direct signaling function number ($0 < n < 32767$) for the switching office, must be supplied by CNAC as part of the CCIS common (CCISC) feature package.

10. HARDWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or if COEES is not available, the following guidelines may be used.

A. 2400 DL Signaling Subsystem

10.01 The DTRM frame has 7 supervisory scan points, 4 directed scan points, and 2 signal distributor points. It also has 16 unipolar CPD points arranged in two groups of eight points—one group of enables and the second group for frame isolation (1E5/1AE5 generic programs). With the 1E6/1AE6 and later generic programs, the DTRM frame has 24 unipolar CPD points. One group of eight CPD points is for the operation enables. The other group of 16 CPD points is for the isolation enables. Each DTRM has 2 signal distributor points and 4 supervisory scan points. One power alarm scan point is required per modem.

B. PUC/DL Signaling Subsystem

10.02 The type of feature applications on the PUC/DL frame determine the number of DLs on the frame. With the firmware available in 1E7/1AE7, a maximum of six DLs or three DL pairs per frame is possible with CCIS applications.

10.03 A PUC/DL may be dedicated to CCIS or shared with one or more other applications (eg, RSS, ETS). The digital carrier trunk (DCT) feature, which uses the PUC as its controller, uses the PUC/DCT feature, not the PUC/DL. Therefore, a PUC used for DCT ***cannot*** be shared by CCIS or any other DL application. One PUC/DL will support up to six CCIS LIUs, which are housed on the PUC/DL frame itself.

10.04 A data communication control (DCC) frame (J1A111A-1, SD-1A602) is required to provide an interface between the PUC/DL LIU pair and the VFLs used by the CCIS DLs. For details refer to reference A(6) in Part 18.

10.05 The PUC/DL has 24 master scanner points, 44 unipolar, and 12 bipolar CPD points per frame.

C. CCIS Circuits

10.06 Message trunk and miscellaneous circuits used with the CCIS feature are listed in Table B. Existing trunk circuits can be used in CCIS applications by following the CCIS trunk conversion procedure. See reference A(22) in Part 18.

10.07 Message trunk signal distributor and scan point requirements do not change due to CCIS operations.

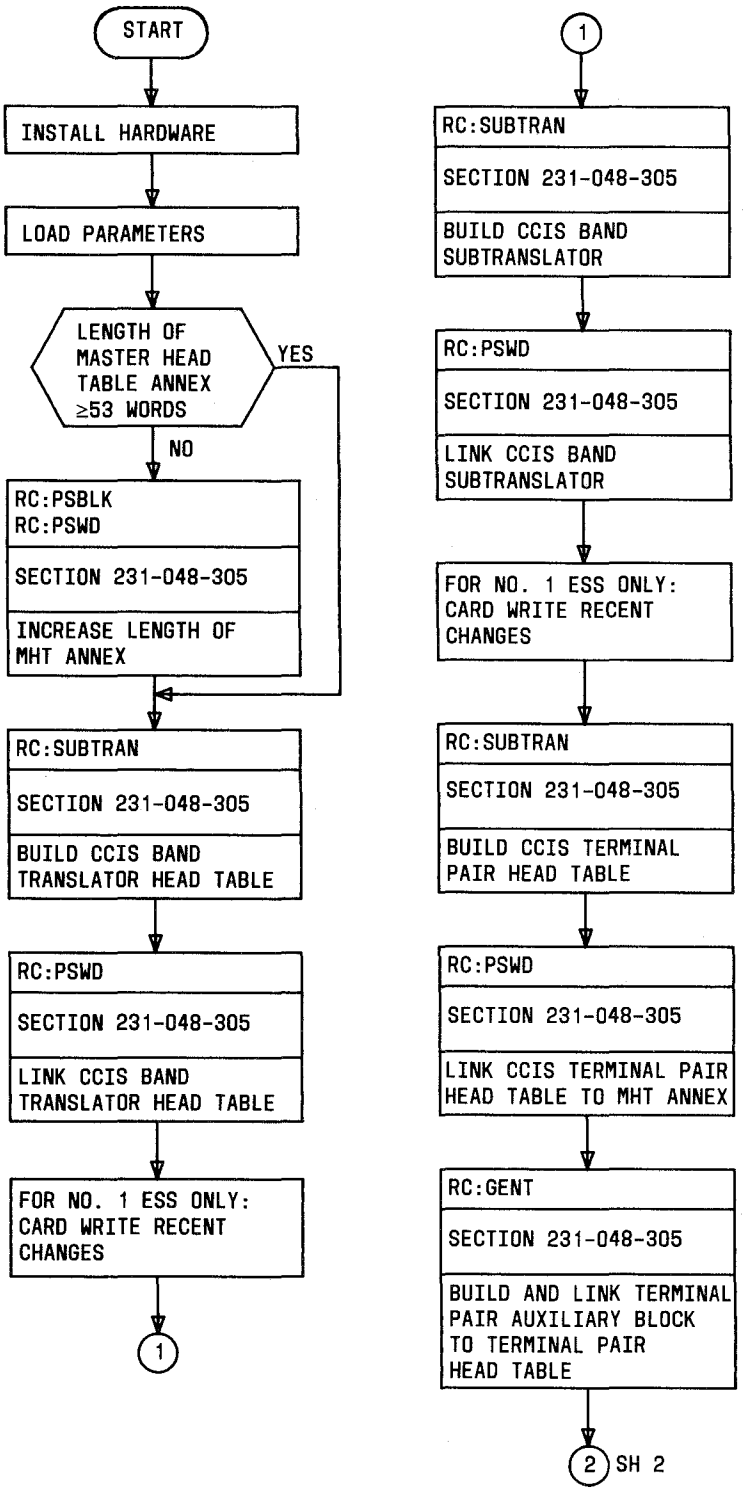


Fig. 28—Procedure for Building CCIS Translations (Sheet 1 of 2)

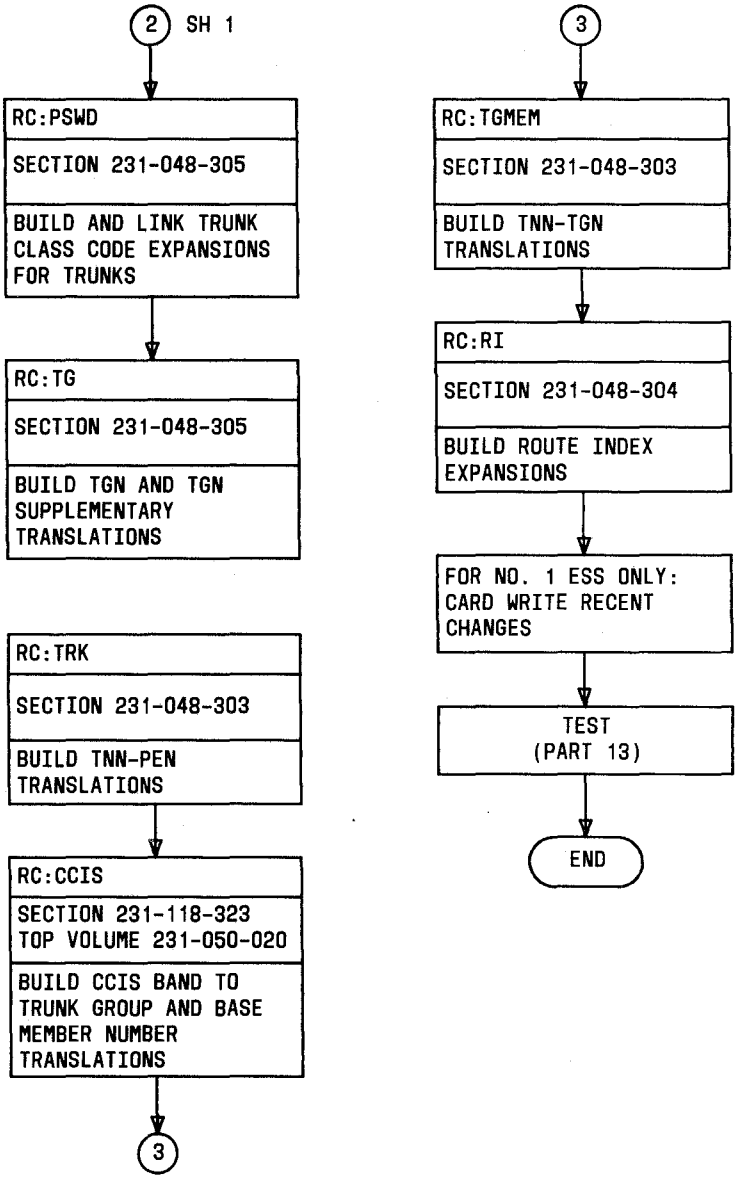


Fig. 28—Procedure for Building CCIS Translators (Sheet 2 of 2)

10.08 In HILO combined local/toll offices, intraprocessor TGs are required to switch calls between line terminations and HILO trunks, including CCIS trunks. These intraprocessor groups consist of 2-wire trunk circuits on the local TLNs connected back-to-back with HILO trunk circuits terminating on the HILO TLNs. These TGs may be 1- or 2-way and must be constructed of compatible pairs of trunk circuits. Allowable pairings are listed in Table E. Refer to paragraph 6.02 for restrictions when using HILO intraprocessor trunks.

10.09 In a combined local/toll office with both Local CCIS and Toll CCIS loaded, all HILO intraprocessor trunks used for nonmaintenance traffic must be converted to CCIS. In addition, the office should be restricted from overflowing 1-way intraprocessor trunk groups into 2-way intraprocessor trunk groups that are used for maintenance. If overflow is allowed, the overflow TG must be converted to CCIS and used only for nonmaintenance traffic. The TG used for maintenance must remain a non-CCIS TG.

TABLE C

SET CARDS REQUIRED FOR CCIS

SET CARD	DESCRIPTION	TYPICAL VALUES	MAXIMUM VALUES
CIB	Quantity of CCIS bands	1-512	1-4,096
CIPR	Quantity of CCIS terminal pairs in the office	1-4	1-8
CIR	Engineered quantity of CCIS call registers to be added to the formula calculating quantity of originating registers (set card NOR)	15-150	1-16,000
CITB	Engineered quantity of CCIS timing blocks	20-120	2-6,000
CIDF	Engineered quantity of CCIS deferred processing buffer entries	10-50	1-100
CLLii	Common Language Location Identifier (CLLI) where ii = 01 through 11 (decimal) (ie, the 11 characters of the office CLLI) if 01 ≤ ii ≤ 06 if 07 ≤ ii ≤ 11	 alpha alpha-numeric	 NA NA
NAX	Quantity of transmitter outpulsing annexes (includes CCIS continuity check circuits)	6-200	1-16,000
NAXC	Engineered quantity of local CCIS outpulsing annexes	6-200	1-16,000
NCAB	Number of SCGA carrier alarm blocks	0-20	210
NCCK2W	Number of 2-wire continuity check circuits used for SCGA	2	10
NCCK4W	Number of 4-wire continuty check circuits used for SCGA	2	10
NMFLXC	Number of flexible trunk group control blocks	16-127	127
OSFN	Direct Signaling Function Number	36-16428	32767

TABLE D

SUMMATION OF FEATURE GROUPS

FEATURE GROUP	SET CARD	FEATURE PACKAGE	SET CARD	PROGRAM STORE WORDS			
				NO. 1 ESS 1E7			NO. 1A ESS 1AE7
				LOADED	PATCH	TOTAL (NOTE)	TOTAL (ESTIMATED)
LOCAL CCIS (CILC)	9SCILC	COMMON CCIS (CCISC)	9FCCISC	21,274	3,748	25,024	26,600
		LOCAL CCIS (CCISLC)	9FCCISLC	993	349	1,344	1,250
		CCIS 2-WIRE (CCIS2W)	9FCCIS2W	914	172	1,088	1,150
		INWATS OSO (IWOSO)	9FIWOSO	1,765	601	2,368	2,200
TOLL CCIS 2-WIRE (CI2W)	9SCI2W	COMMON CCIS (CCISC)	9FCCISC	21,274	3,748	25,024	26,600
		TOLL CCIS (CCISTL)	9FCCISTL	9,606	2,104	11,712	12,000
		CCIS 2-WIRE (CCIS2W)	9FCCIS2W	914	172	1,088	1,150
		INWATS OSO (IWOSO)	9FIWOSO	1,765	601	2,368	2,200
TOLL CCIS HILO (CIHL)	9SCIHL	COMMON CCIS (CCISC)	9FCCISC	21,274	3,748	25,024	26,600
		TOLL CCIS (CCISTL)	9FCCISTL	9,606	2,104	11,712	12,000
		CCIS HILO (CCISHL)	9FCCISHL	1,304	102	1,408	1,630
		INWATS OSO (IWOSO)	9FIWOSO	1,765	601	2,368	2,200
CCIS PUCDL (CIPC)	9SCIPC	CCIS PUCDL (CCISPC)	9FCCISPC	7,458	4,828	12,288	9,325
PUCDL (PDL)	9SPDL	PUCDL (PUCDL)	9FPUCDL	12,068	1,626	13,696	15,085
PUC	9SPUC	PUC (PUC)	9FPUC	19,089	2,221	21,312	23,860
		DIAGNOSTIC LANGUAGE (DIAL)	9FDIAL	1,391	207	1,600	1,740

TABLE D (Contd)

SUMMATION OF FEATURE GROUPS

FEATURE GROUP	SET CARD	FEATURE PACKAGE	SET CARD	PROGRAM STORE WORDS			
				NO. 1 ESS 1E7			NO. 1A ESS 1AE7
				LOADED	PATCH	TOTAL (NOTE)	TOTAL (ESTIMATED)
2400 BIT/SECOND DATA LINK (2400)	9S2400	COMMON DATA LINK EQUIPMENT (2400DL)	9F2400DL	18,420	906	19,328	23,025
		CCIS 2400 DL (CCIS24)	9FCCIS24	8,455	1,527	9,984	10,570
		DIAGNOSTIC LANGUAGE (DIAL)	9FDIAL	1,391	207	1,600	1,740
HILO 4-WIRE SWITCHING (HL4W)	9SHL4W	HILO 4-WIRE SWITCHING SWITCHING (HL4W)	9FHL4W	8,272	302	8,577	10,340
BUSY/IDLE STATUS INDICATOR (BISI)	9SBISI	BUSY/IDLE STATUS INDICATOR (BISI)	9FBISI	3,919	687	4,608	4,900
NETWORK MANAGEMENT CODE BLOCKING ON TOLL TRANSLATORS (NMTC)	9SNMTC	NETWORK MANAGEMENT TOLL CODE BLOCKING (NMTC)	9FNMTC	1,255	87	1,344	1,570
MANUAL TRUNK TEST POSITION (MTTP)	9SMTTP	MANUAL TRUNK TEST POSITION (MTTP)	9FMTTP	1,369	165	1,536	1,710

Note: For No. 1 ESS, the total quantity equals patch plus loaded plus two overhead words.

TABLE E

2-WIRE/HILO INTRAPROCESSOR TRUNK CIRCUITS

2-WIRE TLN	HILO TLN	USE
SD-1A165	SD-1A367	One-way local-to-toll
SD-1A166	SD-1A373	One-way toll-to-local
SD-1A252	SD-1A361	Two-way

10.10 Where Toll CCIS trunks are terminated on 2-wire networks in 2-wire combined local/toll offices, special TGs are required to switch calls between line terminations and the CCIS trunks. These groups consist of pairs of 2-wire trunks connected back-to-back. The TGs may be 1- or 2-way and must be constructed of compatible trunk circuits. This only applies if Toll CCIS is loaded but Local CCIS is not loaded. It is recommended that both Local and Toll CCIS be loaded in combined local/toll offices if CCIS trunks are terminated on the 2-wire network.

D. CCTs

Toll CCIS

10.11 The quantity of CCTs required for call processing by Toll CCIS is based upon the number of high day-busy hour (HDBH) calls on CCIS trunks in the office. The CCTs should be engineered for a P.001 blocking probability. For planning purposes when data is not available, an average holding time (HT) of 1 second can be used.

10.12 In the absence of actual data, the following HTs should be applied to HDBH calls to other Toll CCIS offices in calculations for an initial office:

(a) Holding times for 2-wire CCT (transceiver) for calls to:

- No. 1/1A ESS 2-wire or HILO, HT = 0.90 second
- No. 4 ESS, HT = 0.78 second
- No. 4A ETS, HT = 1.8 seconds.

(b) Holding times for 2-wire CCT (transponder) for calls from:

- No. 1/1A ESS 2-wire or HILO, HT = 1.0 second
- No. 4 ESS, HT = 0.78 second
- No. 4A ETS, HT = 0.82 second.

(c) Holding times for HILO CCT (transceiver) for calls to:

- No. 1/1A ESS 2-wire or HILO, HT = 0.90 second
- No. 4 ESS, HT = 0.74 second
- No. 4A ETS, HT = 0.74 second.

(d) Holding times for HILO CCT (transponder) for calls from:

- No. 1/1A ESS 2-wire or HILO, HT = 0.95 second
- No. 4 ESS, HT = 0.78 second
- No. 4A ETS, HT = 0.82 second.

10.13 Calculate HDBH CCT CCS by multiplying the HDBH calls to/from each type of office by the applicable HT given above and dividing the product by 100 ([HDBH calls * HT]/100 = CCS). Obtain the total HDBH CCT CCS by adding all transceiver and transponder usage.

10.14 Determine the number of CCTs required for call processing by entering the total CCS value calculated above in Poisson table P.001. For Toll CCIS offices prior to 1E7/1AE7, add ten additional circuits to allow for abnormal holding times during carrier failures and for maintenance usage to obtain the total number of CCTs required.

10.15 For 1E7/1AE7 and later generic programs, the number of CCTs required by the Software Carrier Group Alarm feature can be determined from set cards NCCK2W and NCCK4W. The circuits should then be added to those required for call processing to obtain the total number of CCTs required.

10.16 In an existing Toll CCIS office, growth requirements for CCTs can be determined by using actual measured HBDH CCS/CCIS trunk for the CCTs. (Days having usage generated by carrier failures should be excluded.) This quantity is multiplied by a factor that allows for changes in the CCS/

CCIS trunk at the peak of the engineering interval. This trended CCS/CCIS trunk is then multiplied by the network of CCIS trunks at the peak of the engineering interval to determine the HDBH CCS for normal (no carrier failure) service. The quantity of CCTs required can now be determined as in paragraph 10.13.

Local CCIS

10.17 The quantity of CCTs required for call processing by Local CCIS are engineered on a P.001 average busy-season busy-hour service criterion.

10.18 In the absence of actual data on holding times, the following default holding times (in seconds) should be applied to the associated call type:

(a) Holding times for 2-wire CCT (transceiver) for calls from:

- Local to local (1 STP) = 0.86 second
- Local to toll (1 ESS) to local (4 STPs) = 1.65 seconds
- Local to toll (1 ESS) to toll (1 ESS) to local (6 STPs) = 2.29 seconds
- Local to toll (4 ESS) to local (4 STPs) = 1.31 seconds
- Local to toll (4A ETS) to local (4 STPs) = 2.00 seconds.

(b) Holding times for 2-wire CCT (transponder) for calls from:

- Local to local (1 STP) = 0.44 second
- Local to toll (1 ESS) to local (4 STPs) = 0.73 second
- Local to toll (1 ESS) to toll (1 ESS) to local (6 STPs) = 0.99 second
- Local to toll (4 ESS) to local (4 STPs) = 0.43 second
- Local to toll (4A ESS) to local (4 STPs) = 0.46 second.

10.19 Obtain the number of CCTs required for call processing as follows:

CCT = P.001 (Σ[ABSBH CCIS(i)*HT(i)*0.01]) where Σ is a summation of the products of the number of calls and their associated HT and (i) is one of the above the Local CCSI call types.

10.20 For planning purposes when no data is available on the specific types of Local CCIS calls and HTs, the total number of projected ABSBH Local CCIS outgoing and incoming calls and corresponding HTs of 1.9 and 0.6 seconds should be used. The quantity of CCTs can be calculated as follows:

CCT = P001 ([1.9X + 0.6Y] * 0.01), where

X = ABSBH Local CCIS outgoing calls

Y = ABSBH Local CCIS incoming calls.

10.21 After Local CCIS has been implemented in the office, actual usage data should be used in the calculation of CCTs.

Local/Toll CCIS

10.22 In a combined local/toll 2-wire office with both Local CCIS and Toll CCIS loaded, the quantity of CCTs required for CCIS call processing is engineered on a P.001 HDBH service criterion using total CCT usage in the common busy hour.

10.23 For planning purposes, the projected number of ABSBH Local CCIS calls converted to HDBH calls and their corresponding HTs should be used to estimate the HDBH Local CCIS CCT usage. The projected number of HDBH Toll CCIS calls and their corresponding HTs should be used to estimate the HDBH Toll CCIS CCT usage. Applying the P.001 service criteria to the combined Local and Toll CCIS estimated HDBH CCT usage would then result in the required number of CCTs for CCIS call processing.

10.24 When data is available on the actual usage of CCTs, the HDBH CCT usage and P.001 service criteria should be used to determine the quantity of CCTs for CCIS call processing.

10.25 After calculating the quantity of CCTs required for CCIS call processing in either a local or local/toll 2-wire office (1E7/1AE7), the AT&T standard recommended service protection margin should be applied to that quantity of circuits. Any additional CCTs required by the Software Car-

rier Group Alarm feature for testing purposes is specified by set card NCCK2W and set card NCCK4W, if applicable.

10.26 The CCIS CCTs SD-1A436 (2-wire) and SD-1A453 (HILO) require four signal distributor points and one supervisory and one directed scan point.

E. CCK Diagnostic Test Circuits

10.27 Two CCK diagnostic test circuits (2-wire SD-1A451 or HILO SD-1A454) are recommended per office. These circuits use one TLN termination per circuit installed in an office. Usage generated by these circuits is insignificant and can be ignored.

10.28 The CCIS CCK diagnostic test circuits require seven signal distributor points, two directed scan points, and two central pulse distributor points.

F. Network Access Circuit

10.29 When the 2400 DL signaling subsystem is implemented in 2-wire only offices, two 2-wire network access circuits are required for every four DTRMs. In HILO only and combined 2-wire/HILO offices, one HILO network access circuit is required for every four DTRMs.

10.30 When the PUC/DL signaling subsystem is used for CCIS applications in 2-wire only offices, two 2-wire network access circuits are required for every VFL maintenance circuit. In HILO only and combined 2-wire/HILO offices, one HILO network access circuit is required for every VFL maintenance circuit.

10.31 The network access circuits require two signal distributor points and one scan point.

G. Test Access Trunk Circuits

10.32 Test access trunk circuits are required to perform the CCIS trunk and VFL tests. For every test panel in an office used to perform the CCIS trunk and VFL tests, the following circuits are required to provide the test access trunks.

(a) In 2-wire only offices, three test access trunks are provided using one SD-1A322 (3-port circuit) or three SD-1A176.

(b) In HILO only offices, three test access trunks are provided using two SD-1A397 and one SD-1A361.

(c) In combined 2-wire/HILO offices, six test access trunks are provided using one SD-1A322 or three SD-1A176, two SD-1A397, and one SD-1A361.

H. Data Link Engineering

10.33 Determination of the number of DL pairs which should be provided is the responsibility of the CNAC. The number of DL pairs required depends on the amount of labeled and nonlabeled (direct signaling) traffic. Engineering DLs for labeled traffic are based on providing one DL pair for every 2250 CCIS trunks. Direct signaling used by the INWATS OSO feature is nonlabeled traffic and is converted by CNAC to equivalent CCIS trunks by assuming 10.4 busy hour 800 Service calls are equivalent to one CCIS trunk. Direct signaling traffic resulting from BISI messages can be converted to equivalent CCIS trunks by assuming the relationship that one 800 Service line is approximately equivalent to one CCIS trunk. The equivalent CCIS trunks are added to the actual CCIS trunks and the sum is divided by 2250 to determine the number of DL pairs required.

I. Network

10.34 Continuity check circuits use one TLN termination per circuit installed in the office. These circuits also generate a TLN additive which is twice the check circuit CCS during the TLN busy hour and a reserve path load for tandem calls which is twice the transceiver CCS attributed to those calls and is a TLN additive. The reserve path load for originating outgoing calls is composed of the corresponding transceiver CCS, and this network usage should be added to both the line link network (LLN) CCS and the TLN CCS.

10.35 The ABSBH transceiver CCS is the usage during the network ABS busy hour which should be added to the network CCS to compute the reserve path load. For planning purposes, the projected number of outgoing ABSBH local calls and a default holding time of 1.9 seconds should be used to estimate the transceiver usage during the network ABS busy hour. When data is available on the total ABSBH CCT usage, the ABSBH transceiver usage can be estimated as follows:

ABSB transceiver CCS = (1.9 * OIAM) ÷ (1.9 * OIAM + 0.6 * IIAM) *

total ABSBH CCT CCS, where

OIAM = Number of ABSBH outgoing initial address messages

IIAM = Number of ABSBH incoming initial address messages.

10.36 Network usage for CCTs is the same as for other message circuits. These additives should be taken into account when determining the total LLN and TLN CCS.

10.37 Additional quantities of other service circuits resulting from CCIS applications (eg, network access circuits) will generate additional TLN terminal requirements, but usage impact should be insignificant.

J. Test Panels

10.38 The CCIS trunk and VFL tests require the master test trunk (MTT) interface option. The MTT interface is standard for all switching office test panels (trunk and line test panel, supplementary trunk test panel, manual trunk test position, remote trunk test unit, and the switching control center test panel) for 1E7/1AE7 and later. Therefore, beginning with 1E7/1AE7, all test panels can be used for testing CCIS trunks and VFL. See Table F for No. 1/1A ESS test panel master test line (MTL)/MTT interface options.

10.39 Special 7XX dialing codes (where XX is a panel member number in a distant office) can be used to generate a 101-type test call over a specified CCIS trunk to the indicated test panel in a distant office.

10.40 The supplementary trunk test panels with option ZM require two signal distributor points for the CCIS and BLKD lamps.

10.41 The manual trunk test positions require option M to add the CCIS lamp. The BLKD lamp already exists.

K. Master Control Console

10.42 A pair of DL status lamps, primary and secondary, are added to the master control console with option ZJ. This option is required whenever either 2400 DL or PUC/DL is used in a No. 1/1A ESS office.

11. SOFTWARE REQUIREMENTS

Note: This part contains cost factors and determination of quantities. Central Office Equipment Engineering System (COEES) Planning and Mechanized Ordering Modules are the recommended procedures for developing these requirements. However, for planning purposes or

TABLE F

NO. 1/1A ESS TEST PANEL MTL/MTT INTERFACE OPTIONS

TEST PANEL TYPE	SCHEMATIC DRAWING	GENERICS 1E5/1E6		GENERIC 1E7 & LATER	
		MTL	MTT	MTT	OPTIONS REMOVED
No. 1 TLTP	SD-1A132-01	ZA	ZB	ZM	ZA, ZB, ZL
No. 1/1A STTP	SD-1A256-01	E	B	ZO	B, E, ZN
No. 1A TLTP (TRK & LINE)	SD-6A005-01	V, N, W	V, N, X	V, N, F	W, X, G
No. 1A TLTP (TRK only, local)	SD-6A005-01	T, N, W	T, N, X	T, N, F	W, X, G
No. 1A TLTP (TRK only, remote)	SD-6A005-01	T, Q, W	T, Q, X	T, Q, D	W, X, E

if COEES is not available, the following guidelines may be used.

MEMORY—NO. 1 ESS

A. Fixed

11.01 The following memory is required whether or not the CCIS features are used.

(a) ***Base Generic Program (Program Store):*** A total of 824 words is required.

(b) ***Parameters (Program Store):*** For CCIS, 15 words are required. For PUC/DL and 2400 DL, see references A(6) and A(7), respectively, in Part 18.

B. Conditional

11.02 The memory requirements presented in paragraphs 11.03 through 11.20 are required only when the CCIS features are loaded.

Optionally Loadable Feature Packages (Program Store)

Note: The following requirements are applicable to 1E7 and later. Feature groups applicable to 1E6 are given in Table G.

11.03 Feature groups that must be loaded with 1E7 to provide the CCIS features are summarized in Table D. Figures 29 through 31 define the software dependencies. Appropriate combinations of feature groups specified in paragraphs 11.04 through 11.09 must be loaded to provide the CCIS features in the respective types of No. 1 ESS offices. Normally the PUC/DL feature (CIPC, PDL, and PUC feature groups) would be used in new CCIS installations. Feature group NMTC is an existing feature group that is required for CCIS beginning with 1E7. Note that when feature groups are combined, the total number of words is considerably less than the sum of the groups due to the feature packages common to both.

11.04 ***CCIS in a Toll Office:*** The following feature groups are applicable when installing Toll CCIS in an office which does not have Local CCIS or any PUC features.

FEATURE GROUPS	PS WORDS
CI2W	40,192
CIHL	40,512
CI2W and CIHL	41,600
CIPC, PDL, and PUC	48,896
2400	19,328
NMTC	1,344.

11.05 ***CCIS in a Local Office:*** The following feature groups are applicable when installing Local CCIS in an office which does not have Toll CCIS or any PUC feature.

FEATURE GROUPS	PS WORDS
CILC	29,824
CIPC, PDL, and PUC	48,896
2400	19,328
NMTC	1,344
BISI (optional)	4,608.

11.06 ***CCIS in a Combined Local/Toll Office:*** The following feature groups are applicable when installing both Local CCIS and Toll CCIS in a combined local/toll office which does not have any PUC features.

FEATURE GROUPS	PS WORDS
CILC and CI2W	41,536
CILC and CIHL	42,944
CILC,CI2W, and CIHL	42,944
CIPC, PDL, and PUC	48,896
2400	19,328
BISI (optional)	4,608
NMTC	1,344.

11.07 ***Local CCIS in an Office Containing Toll CCIS:*** The following feature groups

TABLE G

TOLL CCIS FEATURE LOADED PACKAGES—1E6/1AE6

FEATURE GROUP	FEATURE PACKAGE	NO. 1 ESS			NO. 1 ESS
		LOADED	PATCH	TOTAL (NOTE)	TOTAL
TOLL CIS CI2W OR CIHL*†	CCISTL CCISTM	31,744 2,708	738 1,388	32,512 4,096	44,864 4,000
TOLL CCIS 2-Wire (CI2W)	CCIS2W	644	122	766	1,280
TOLL CCIS HILO (CIHL)	CCISHL	1,244	164	1,408	2,208
HILO 4-Wire (HL4W)†	HL4W	8,209	239	8,448	12,928
2400 BIT/Second Data Link (2400)	2400DL	19,570	1,098	20,672	32,448
Manual Trunk Test Position (MTTP)	MTTP	1,106	430	1,536	1,568

Note: For No. 1 ESS, the total quantity equals patch plus loaded plus two overhead words.

*For offices converting from 2-wire toll to the HILO 4-wire feature, with CCIS trunks in service before and after conversion, both CI2W and CIHL feature groups are required. This combination is temporary and required only during conversion. After conversion, CI2W can be deleted.

†Feature group CIHL applies only to offices equipped with the HILO 4-wire and MTTP feature groups. The MTTP feature group cost is shared. The HILO 4-wire group is included for information only.

are applicable when installing Local CCIS in a combined local/toll office which already contains Toll CCIS. Assume that the same type of DL being used for Toll CCIS will be used for Local CCIS and that the 1E7 Toll CCIS and CCIS 2-wire feature packages are already loaded. If the Toll CCIS and related packages presently loaded in the office are not yet 1E7, then the 1E7 CCIS software must be loaded when installing Local CCIS. The net effect of replacing the 1E6 CCIS software with the 1E7 CCIS software will be to require approximately 8000 words. This is in addition to the CILC and BISI software sizes which are stated below. This increment would also be applicable to toll offices upgrading from 1E6 to 1E7 CCIS software. The new code contained in this additional memory provides additional CCIS capabilities in No. 1 ESS including direct signaling, INWATS OSO, CCIS message pass along capability, CCIS software carrier group alarm, CCIS support of 1-way trunks and support of additional CCIS trunk circuit types.

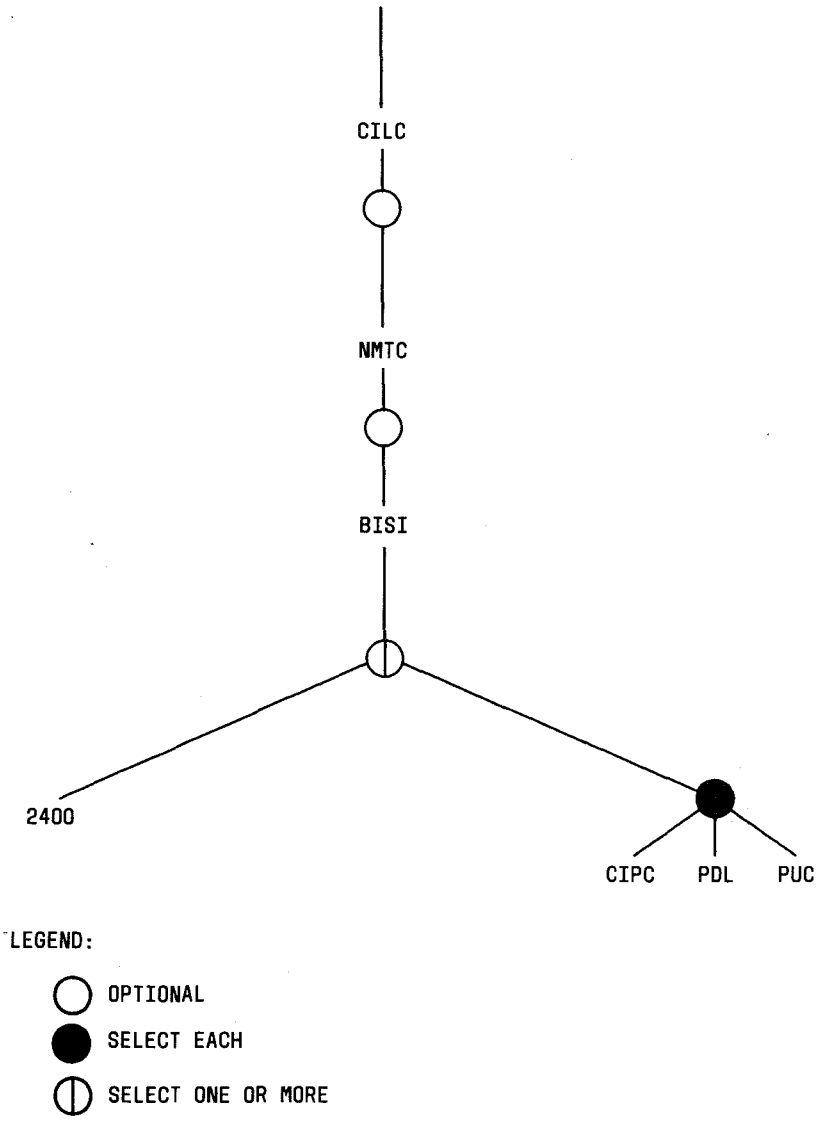


Fig. 29—Software Feature Group Dependencies for Local CCIS Office

FEATURE GROUPS	PS WORDS
CILC	1,344
BISI (optional)	4,608.

11.08 ***Toll CCIS in an Office Containing Local CCIS:*** The following feature packages are applicable when installing Toll CCIS in a combined local/toll office which already contains Local CCIS. Assume that the same type of DL being used for Local CCIS will be used for Toll CCIS.

FEATURE GROUPS	PS WORDS
CI2W	12,800
CIHL	13,120
CIHL and CI2W	14,620.

11.09 ***Local CCIS in an Office Containing PUC/DL:*** The following feature packages

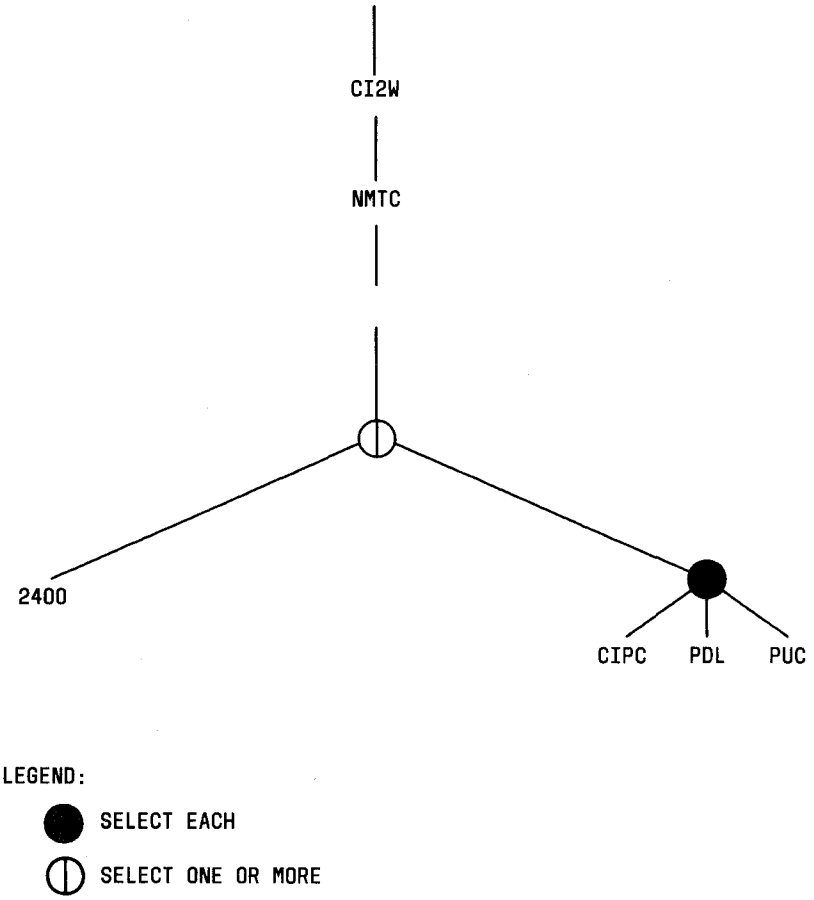


Fig. 30—Software Feature Group Dependencies for Toll CCIS 2-Wire Office

are applicable when installing Local CCIS in an office which does not have Toll CCIS but which already has PUC/DL installed for some other feature. Assume that Local CCIS will also use the PUC/DL for its DLs.

FEATURE GROUPS	PS WORDS
CILC	29,824
BISI (optional)	4,608
CIPC	12,288.

Call Store

11.10 ***Common CCIS*** call store requirements are as follows:

- CCIS incoming registers—20 words per register (normal range 15 to 100 registers)
- CCIS timing blocks—1 word, plus 2 words per block (set card CITB)
- CCIS state word subtables—8 words, plus 512 words per terminal pair, plus 32 words per CCIS band
- Terminal pair status table—16 words per terminal pair
- CCIS band status block—8 words, plus 128 words per terminal pair
- Deferred processing buffer—1 word, plus 2 words per entry (set card CIDF)
- SCGA activity blocks—2 words per block (set card NCAB)
- Reset band status block—24 words
- Trunk query memory block—7 words

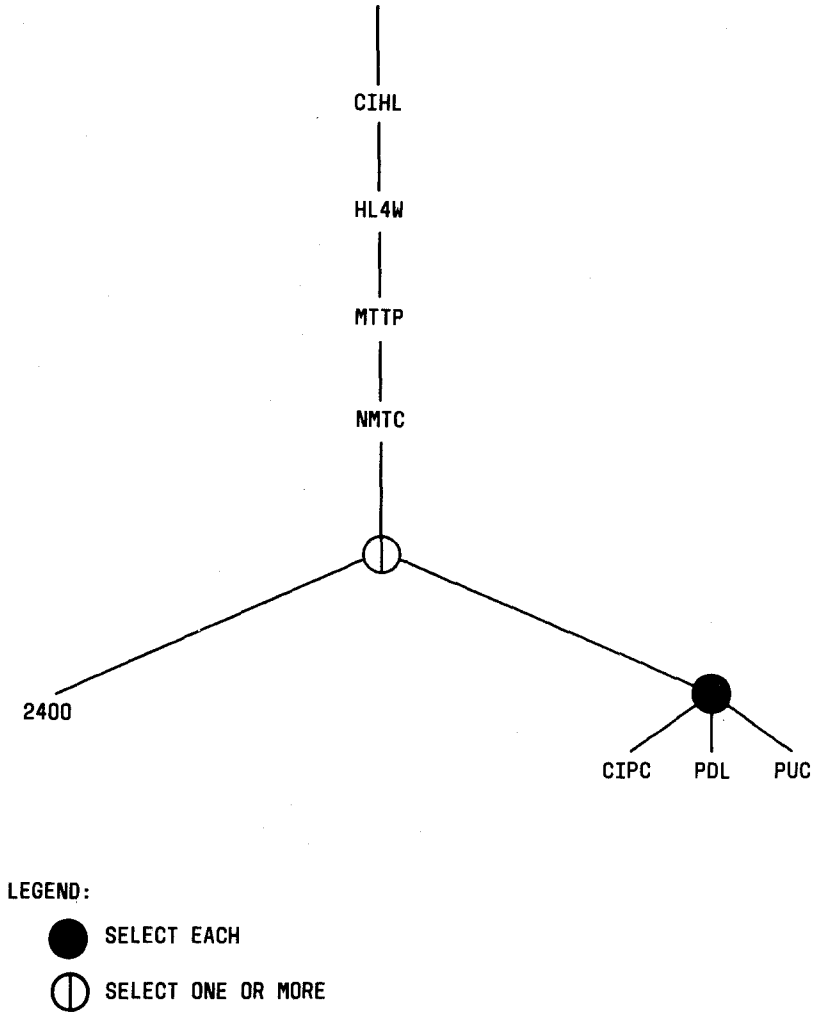


Fig. 31—Software Feature Group Dependencies for Toll CCIS HILO Office

- Office recovery status block—8 words
- CCIS trunk group control status words—1 word, plus 1 word per flexible trunk group control (set card NMFLXC).

11.11 For ***Local CCIS,*** ten call store words are required for each of the outpulsing annexes (set card NAXC).

11.12 For ***Toll CCIS,*** ten call store words are required for each of the outpulsing annexes. One annex per CCT is required (a portion of the NAX set card).

11.13 For ***2400 DL,*** see reference A(7) in Part 18 for call store requirements.

11.14 For ***PUC/DL,*** see reference A(6) in Part 18 for call store requirements.

11.15 Table C contains a summation of the set cards required by the CCIS feature. Both the maximum range and the typical values for a CCIS office are given. When these set cards are not input, their default values are zero.

11.16 For additional call store engineering criteria, see references C(1) through C(7) in Part 18.

Variable

11.17 The following ***translations (program store)*** memory is required when the CCIS feature is applied.

Common CCIS

11.18 The following translations are required for common CCIS.

(a) CCIS band head table—9 words.

(b) CCIS band subtranslator—512 words per terminal pair.

(c) CCIS terminal pair head table—9 words.

(d) CCIS terminal pair auxiliary block—2 words per terminal pair.

(e) TNN-TGN auxiliary block:

(1) Words required to convert existing trunks to CCIS:

- 2-way trunk—1 additional word
- 1-way trunk with carrier group alarm—1 additional word
- 1-way trunk without carrier group alarm—3 additional words.

(2) Words required for new 1- or 2-way CCIS trunks:

- Trunks without carrier group alarm—3 words
- Trunks with either hardware carrier group alarm or software carrier group alarm—4 words
- Trunks with both hardware carrier group alarm and software carrier group alarm—5 words.

(f) TGN primary table auxiliary block—16 words per assigned band. Total size for CCIS trunk groups is 3 words plus 16 words per assigned band in the trunk group.

(g) TNN-PEN auxiliary block—4 words per CCT.

(h) PUC maintenance bus translator—49 words.

2400 DL

11.19 See reference A(7) in Part 18 for translation requirements.

PUC/DL

11.20 See reference A(6) in Part 18 for translation requirements.

MEMORY—NO. 1A ESS

A. Fixed

11.21 The following memory is required whether or not the CCIS features are used.

(a) ***Base Generic Program (Program Store, File Store):*** Approximately 910 words are required.

(b) ***Parameters (Unduplicated Call Store, File Store):*** For CCIS, 22 words are required. For PUC/DL and 2400 DL, see reference A(6) and A(7), respectively, in Part 18.

B. Conditional

11.22 The memory requirements presented in paragraphs 11.23 through 11.30 are required only when the CCIS features are loaded.

Optionally Loadable Feature Packages (Program Store)

Note: The following requirements are applicable to 1AE7 and later. Feature groups applicable to 1AE6 are given in Table G.

11.23 Feature groups that must be loaded with 1E7 to provide the CCIS features are summarized in Table D. Figures 29 through 31 define the software dependencies. Appropriate combinations of feature groups specified in paragraphs 11.24 through 11.29 must be loaded to provide the CCIS features in the respective types of No. 1 ESS offices. Normally, the PUC/DL feature (CIPC, PDL, and PUC feature groups) would be used in new CCIS installations. Feature group NMTC is an existing feature group that is required for CCIS, beginning with 1AE7. Note that when feature groups are combined, the total number of words is considerably less than the sum of the groups due to the feature packages common to both.

11.24 ***CCIS in a Toll Office:*** The following feature groups are applicable when installing Toll CCIS in an office which does not have Local CCIS or any PUC features.

FEATURE GROUPS	PS WORDS
CI2W	50,240
CIHL	50,640
CI2W and CIHL	52,000
CIPC, PDL, and PUC	61,120
2400	24,160
NMTC	1,680.

11.25 ***CCIS in a Local Office:*** The following feature groups are applicable when installing Local CCIS in an office which does not have Toll CCIS or any PUC features.

FEATURE GROUPS	PS WORDS
CILC	37,280
CIPC, PDL, and PUC	61,120
2400	19,328
BISI (optional)	5,760
NMTC	1,680.

11.26 ***CCIS in a Combined Local/Toll Office:*** The following feature groups are applicable when installing both Local CCIS and Toll CCIS in a combined local/toll office which does not have any PUC features.

FEATURE GROUPS	PS WORDS
CILC and CI2W	51,920
CILC and CIHL	53,680
CILC, CI2W, and CIHL	53,680
CIPC, PDL, and PUC	61,120
2400	24,160
BISI (optional)	5,760
NMTC	1,680.

11.27 ***Local CCIS in an Office Containing Toll CCIS:*** The following feature groups are applicable when installing Local CCIS in a combined local/toll office which already contains Toll CCIS. Assume that the same type of DL being used for Toll CCIS will be used for Local CCIS and that the Issue 7 Toll CCIS, and CCIS 2-wire feature packages are already loaded. If the Toll CCIS and related packages presently loaded in the office are not 1AE7, then the 1AE7 CCIS software must be loaded when installing Local CCIS. The net effect of replacing the 1AE6 CCIS software with the 1AE7 CCIS software will be to require approximately 10,000 words. This is in addition to the CILC and BISI software sizes which are stated below. This increment would also be applicable to toll offices upgrading from 1AE6 to 1AE7 CCIS software. The new code contained in this additional memory provides additional CCIS capabilities in No. 1A ESS including direct signaling, INWATS OSO, CCIS message pass along capability, CCIS software carrier group alarm, CCIS support of 1-way trunks and support of additional CCIS trunk circuit types.

FEATURE GROUPS	PS WORDS
CILC	1,680
BISI (optional)	5,760.

11.28 ***Toll CCIS in an Office Containing Local CCIS:*** The following feature packages are applicable when installing Toll CCIS in a combined local/toll office which already contains Local CCIS. Assume that the same type of DL being used for Local CCIS will be used for Toll CCIS.

FEATURE GROUPS	PS WORDS
CIHL	16,400
CI2W	16,000
CIHL and CI2W	18,275.

11.29 ***Local CCIS in an Office Containing PUC/DL:*** The following feature packages are applicable when installing Local CCIS in an office which does not have Toll CCIS but which already has PUC/DL installed for some other feature. Assume that Local CCIS will also use the PUC/DL for its DLs.

FEATURE GROUPS	PS WORDS
CILC	37,280
BISI (optional)	5,760
CIPC	15,360.

Duplicated Call Store

11.30 These requirements are identical to No. 1 ESS. See paragraphs 11.10 through 11.16.

Variable

11.31 The ***unduplicated call store, file store*** memory required for translations when the CCIS feature is applied is the same as No. 1 ESS. See paragraphs 11.18 through 11.20.

REAL TIME IMPACT

11.32 The base level processor time requirements for various types of CCIS calls are shown in Table H. Table H also compares the CCIS processor time requirements to the processor time requirements for equivalent types of per-trunk-signaling (PTS) calls. It is important to note that the net effect on an individual switching office's call capacity is dependent on the CCIS traffic volume in that office as a percentage of total traffic volume in the office. COEES contains information which can be used for estimating processor real-time requirements for individual offices.

11.33 Cycle times for No. 1 ESS are as follows: 5.5 microseconds (0 percent speedup), 5.24 microseconds (5 percent speedup), or 5.0 microseconds (10 percent speed). Clock speedup is available with 1E7 and base restarts of the 1E6 generic programs. The cycle time for No. 1A ESS is 0.7 microsecond.

12. DATA ASSIGNMENTS AND RECORDS

TRANSLATION FORMS

12.01 The following ESS translation forms, detailed in reference C(1) in Part 18, are applicable to the CCIS feature.

- ESS 1201—Miscellaneous Trunk Frame Record
- ESS 1204 A/B—Trunk Class Code Record
- ESS 1220—Universal Trunk Frame (HILO) Record
- ESS 1223A/B—CCIS Terminal Pair, Trunk Number and Band Number Record
- ESS 1226—Software Carrier Group Index to TNN Record
- ESS 1303A/B/C—Trunk and Service Circuit Route Index Record
- ESS 1303D—Pseudo Route Index Records
- ESS 1400—Traffic Register Assignment Record
- ESS 1600—Master Scanner Record
- ESS 1601—Central Pulse Distributor Record
- ESS 1602—Miscellaneous Signal Distributor Record.

RECENT CHANGES

12.02 The following RC messages are affected by the CCIS feature. For details, see Part 18 references A(13) and A(60) for No. 1 ESS or A(19) and A(60) for No. 1A ESS.

RC MESSAGE	FUNCTION
RC:CCIS	Builds CCIS band translator or adds, changes, or deletes an entry in an existing translator. It associates a terminal pair and band number with a TG and base member number.
RC:TKCONV	Used to move a trunk from a PTS TG to a CCIS TG or vice versa without going through TG0.
RC:TGMEM	Used to assign trunks to TG0 and to move trunks from TG0 to an active TG. When moving trunks to an active CCIS TG, it builds the CCIS terminal pair, band number, and trunk number in the third word of the TNN-TGN auxiliary block by use of keyword CCISID.

TABLE H

ESTIMATED CCIS CALL PROCESSING REAL-TIME REQUIREMENTS PECENTAGE IMPACT FOR 1E7/1AE7 (NOTE)

TYPE OF CALL	NO. 1 ESS SP % IMPACT (ESTIMATED)	NO. 1 ESS CC & NO. 1A ESS % IMPACT (ESTIMATED)
Local 2-Wire		
Originating		
Line origination, outgoing PTS	—	—
Line origination, outgoing CCIS	20	5
Terminating		
Incoming PTS, terminating line	—	—
Incoming CCIS, terminating line	20	6
Tandem		
Incoming PTS, outgoing PTS	—	—
Incoming CCIS, outgoing CCIS	34	9
Toll-Tandem 2-Wire		
Incoming PTS, outgoing PTS	—	—
Incoming CCIS, outgoing CCIS	10	6
Incoming PTS, outgoing CCIS	21	7
Incoming CCIS, outgoing PTS	19	8
Toll-Tandem HILO		
Incoming PTS, outgoing PTS	—	—
Incoming CCIS, outgoing CCIS	29	7
Incoming PTS, outgoing CCIS	42	23
Incoming CCIS, outgoing PTS	39	23

Note: The above requirements apply to 2-way trunks.

13. TESTING

13.01 Translations for CCIS message trunks should be tested in the normal manner. See references A(11) or A(12) in Part 18 for HILO or 2-wire offices, respectively.

13.02 The following TTY message should be used to verify CCIS band subtranslator entries. See references in Part 18B for details.

MESSAGE	FUNCTION
V-BNDNO-	Requests the system to print one or all of the entries from the CCIS band subtranslator, beginning with the specified band number. System response is a TR62 output message.

13.03 The following TTY message should be used to verify the contents of the CCIS terminal pair auxiliary block(s). See references in Part 18B for details.

MESSAGE	FUNCTION
V-TPAIR	Requests the system to print one or all of the CCIS terminal pair auxiliary blocks in an office. System response is a TR112 output message.

13.04 The following TTY messages are used to verify CCIS signaling translations for CCIS trunks. Translations are verified in both terminating switching offices as well as all intervening SPTs by sending CCIS DL messages. See references in Part 18B for details.

MESSAGE	FUNCTION
T-CCISTRK-	Requests the system to perform translation integrity check on the specified CCIS trunk. System response is a TIC output message.
T-TNN-	Same as T-CCISTRK (uses different input).
T-BAND-	Requests the system to perform translation integrity checks on all of the trunks in the specified CCIS band. System response is a TN21 output message containing an output line from each assigned trunk in the band.
V-PUCMB	Requests the system to print all of the entries from the PUC maintenance bus translator. System response is a TR111 output message with the requested information, or a TR09 output message indicating an error has been encountered.

13.05 The following TTY messages are used to check the state of CCIS trunks. See references in Part 18B for details.

MESSAGE	FUNCTION
TRK-QALL-	Initiates a CCIS trunk query on all CCIS trunks in the office.
TRK-QUERY-	Requests a trunk query on the specified CCIS band.

13.06 Procedures for testing CCIS hardware are provided in references A(19), A(23) through A(26), A(33), and A(35) in Part 18.

13.07 The TTY messages used to diagnose 2400 DL or PUC/DL hardware are contained in reference A(6) or A(7) in Part 18, depending on the type of DL being used.

14. OTHER PLANNING TOPICS

14.01 *A CNAC* operated by Long Lines has been established to provide a centralized administrative control point for planning and analysis of CCIS requirements.

14.02 One of the functions performed by CNAC is planning analysis. The objective of this activity is to analyze the CCIS requirements as indicated by the Long Lines and operating company trunk forecasts to determine where and when additional signaling links are required in order to meet the forecasted requirements of the message network. The results of this analysis are forwarded to the appropriate carrier and equipment engineers for action.

14.03 In addition to planning analysis, CNAC assigns labels and signal paths to trunks, maintains the assignment files, and assigns direct signaling function numbers. See reference A(56) in Part 18 for more detailed information concerning the functions of CNAC.

14.04 For planning information involving CNAC, see references A(57) through A(59) in Part 18.

14.05 A toll No. 1/1A ESS to which a local CCIS office is homed must also be updated to 1E7/1AE7 if toll connecting trunks other than SD-1A236, SD-1A237, or SD-1A362 trunks are to be converted to CCIS in that toll office.

ADMINISTRATION

15. MEASUREMENTS

15.01 Two unique traffic measurement codes (TMCs) are available for the CCIS feature: TMC 109—CCIS Per Terminal Counts and TMC 110—CCIS Per VFL Counts. The counts are available on the hourly H and C, selected quarter hour DA15, and special studies S traffic measurement schedules.

15.02 A set of traffic counts that are collected on a per CCIS terminal basis are defined by TMC 109. The equipment group or office count num-

ber (EGO) consists of three items; CCIS terminal pair member number (TMN, bit 0), CCIS terminal pair number (TPN, bits 1-5), and the terminal count number (TCN, bits 6-10). The EGO can be computed by adding the values given in Table I for the applicable TCN, TPN, and TMN. (Example: To compute the EGO for TCN 5, TPN 3, TMN 1 the values are 320 + 6 + 1 = 327.) The TCNs are as follows.

TCN	DEFINITION
0	***Outgoing Data Filled SUs:*** The total number of non-SYU (synchronization signal unit), non-ACU (acknowledgment signal unit) SUs transmitted by the CCIS terminal specified in the EGO. This count includes all retransmitted data filled SUs. (Outgoing retransmissions indicate that the distant end received a questionable piece of data and requested retransmission.)
1	***Incoming Data Filled SUs:*** The total number of non-SYU, non-ACU SUs received by the CCIS terminal specified in the EGO. This count includes all retransmitted data filled SUs. (Incoming retransmissions indicate that locally received data was questionable and the near-end CCIS terminal requested the retransmission.)
2	***Outgoing IAMs:*** The total number of IAMs transmitted by the CCIS terminal specified in the EGO. This count includes all retransmitted IAMs.
3	***Incoming Initial Address Messages:*** The total number of IAMs received by the CCIS terminal specified in the EGO. This count includes all retransmitted IAMs.
4	***Outgoing ANC SUs:*** The total number of ANC SUs transmitted by the CCIS terminal specified in the EGO.
5	***Incoming ANC SUs:*** The total number of ANC SUs received by the CCIS terminal specified in the EGO.
6	***Outgoing Total Transitions:*** The total number of outgoing total transitions from the CCIS terminal specified in the EGO. (A total transition occurs whenever an SU passes from an information type—includes all SUs except SYU and ACU—to SYU or vice versa.)
7	***Incoming Total Transitions:*** The total number of total transitions incoming to the CCIS terminal specified in the EGO.
8	***Total Outgoing Messages:*** The total number of messages transmitted by the CCIS terminal specified in the EGO. Messages can consist of either initial SUs (ISUs) with attached strings of subsequent SUs (SSUs) or lone SUs (LSUs), and they can be call related or noncall related.
9	***Total Incoming Messages:*** The total number of messages received by the CCIS terminal specified in the EGO.
10	***Terminal Buffer Overflow:*** The total number of times that the CCIS terminal specified in the EGO denies signaling traffic due to all of its terminal buffer locations being in use.
11	***SUs in Error:*** The number of SUs in error received by the CCIS terminal specified in the EGO. An SU is considered in error when the decoder at the receiving terminal receives all 28 bits of an SU, and the check bits (27-20) indicate an error over the other 20 bits (19-0).
12	***Retransmission Requests:*** The number of retransmission requests received by the CCIS terminal specified in the EGO.

TCN	DEFINITION
13	***Failures That Clear in 3 Minutes:*** A measure of the number of times a signaling link is not available for service. This is a total count for the CCIS terminal specified in the EGO. (When a signaling failure occurs, a changeover is instituted so that a VFL transfer can take place. Thirty-six out of 37 occurrences of signaling failure are attributable to the VFL and 95 percent of all these failures correct themselves within 2 minutes. Whenever a self-correcting procedure clears up the problem within 3 minutes, this count is incremented. During changeover a VFL switch takes place; however, if that fails the originally active VFL remains active.)
14	***Received Repeated ACU:*** The number of times the CCIS terminal specified in the EGO receives an ACU containing a block acknowledgment number equal to the block acknowledgment number in the previous ACU.
15	***Received Skipped ACU:*** The number of times an ACU received by CCIS terminal specified in the EGO does not contain the next cyclical block acknowledgment number expected. (A retransmission request is made in an attempt to correct the problem.)
16	***Emergency Restart:*** This count is incremented whenever communication is reestablished between a switching office and the CCIS network without waiting for the normal prove-in period when both terminals of a pair have failed. The terminal pair member that achieves synchronization and passes the emergency prove-in period first is selected to reestablish signaling communication. This is the terminal pair of the terminal specified in the EGO.
17	***Seconds in Emergency Restart:*** The period of time (total signaling outage) measured from when both terminals of a pair fail until a communication path is reestablished via emergency restart. This is a count for the terminal pair of the terminal specified in the EGO.
18	***Number of Direct Signaling Messages Transmitted:*** The total number of direct signaling messages transmitted.
19	***Number of Direct Signaling Messages Received:*** The total number of direct signaling messages received.

15.03 A set of traffic counts that are provided on a per VFL basis is defined by TMC 110. The EGO consists of four items: the CCIS terminal pair number (TPN, bits 2-6), the terminal pair member number (TMN, bit 1), the VFL on which the counts are desired (V, bit 0), and the VFL count number (VCN, bits 7-10). The EGO can be computed by adding the values in Table J for the applicable VCN, TPN, TMN, and V. (Example: To compute the EGO for VCN 1, TPN 5, TMP 0, V 1 the values are 128 P 20 + 0 + 1 = 149.) The VCNs are as follows.

VCN	DEFINITION
0	***Near-End Initiated Automatic Changeover:*** The total number of times a VFL is automatically relieved of its traffic load; ie, a link failure occurs and is detected at the near-end of the VFL. This count is provided on a per VFL basis.
1	***Far-End Initiated Automatic Changeover:*** The total number of times a VFL is automatically relieved of its traffic load and this event is initiated by the far-end of the VFL. This count is provided on a per VFL basis.
2	***Half-Hour In-Service Peg Count:*** The in-service counter for

the active VFL of a pair is set to one each quarter-hour during which no changeovers occurred. The counter for the standby VFL of the pair is set to zero. If changeovers occur during the quarter-hour, the in-service counters for both VFLs are set to zero. Every 15 minutes the traffic program adds this count to accumulated counts of quarter-hours in service. When this count is output, it is divided by two to give half-hours of service. This count is provided on a per VFL basis.

Note: Since this is a half-hour measurement, placing VCN 2 on the DA15 traffic schedule for 15-minute data collection will result in only zeros being output.

TABLE I

EGO VALUES FO TMC 109

TCN	VALUE
0	0
1	64
2	128
3	192
4	256
5	320
6	384
7	448
8	512
9	576
10	640
11	704
12	768
13	832
14	896
15	960
16	1024
17	1088
18	1152
19	1216
TPN	**VALUE**
0	0
1	2
2	4
3	6
4	8
5	10
6	12
7	14
TMN	**VALUE**
0	0
1	1

TABLE J

EGO VALUES FOR TMC 110

VCN	VALUE
0	0
1	128
2	256
TPN	**VALUE**
0	0
1	4
2	8
3	12
4	16
5	20
6	24
7	28
TMN	**VALUE**
0	0
1	2
V	**VALUE**
0	0
1	1

15.04 The following total office counts (TMC 005) are available for CCIS on the hourly H and C, selected quarter-hour DA15, and special studies S traffic measurement schedules.

EGO	DEFINITION
414	***CCIS Incoming Register (CIR) Peg Count:*** The total number of attempts to seize a CIR.
416	***CIR Usage:*** Standard call register usage, provided on a 10-second basis.
417	***CIR Overflow Count:*** The total number of failures to find an idle CIR.
418	***CCIS Timing Block Peg Count:*** The total number of attempts to seize a CCIS timing block.
420	***CCIS Timing Block Usage:*** Standard usage, provided on a 10-second scan basis.
421	***CCIS Timing Block Overflow Count:*** The total number of failures to find an idle CCIS timing block.
422	***CCIS Deferred Processing Buffer Peg Count:*** The number of attempts to place an entry on the deferred processing buffer. (This is a call store buffer that is used by CCIS clients to defer the processing of messages that cannot be processed initially as they are unloaded from the DL due to insufficient resources, system overload, or real time constraints. These are 2-word entries—an SU and one word of associated data.)
424	***CCIS Deferred Processing Buffer Usage:*** A 10-second scan usage accumulation of the number of 2-word entries on the deferred processing buffer.
425	***CCIS Deferred Processing Buffer Overflow Count:*** The number of failures to place an entry on the deferred processing buffer due to all slots being in use.
426	***Calls Refused Due to Overload Controls Peg Count:*** The number of times an incoming IAM is not processed because incoming overload controls are in effect (these controls are a function of real time load on the central control). A national switching congestion signal is returned for each affected call.
619	***CCIS Backward Failure Messages Received Peg Count:*** Counts the number of national switching congestion (NSC), address incomplete (ADI), and call failure (CFL) backward failure messages that a class 5 CCIS office receives. This count should be subtracted from the offices raw overflow count for the network switching performance measurement plan.
620	***CCIS Backward Failure Messages Transmitted Peg Count:*** Counts the number of NSC, ADI, and CFL backward failure messages that a class 5 CCIS office transmits. This count should be added to the office's raw overflow count to the network switching performance measurement plan.

15.05 The following two office counts, TMC 129 and 130, respectively, are available for CCIS (same schedules as paragraph 15.04).

EGO	DEFINITION
001	***Occupancy Counts of Local CCIS Outpulsing Annexes:*** The number of local CCIS outpulsing annexes in use at a particular time.
001	***OR Pool Register Occupancy Counts of CIRS:*** The number of

EGO	DEFINITION
	CCIS incoming registers in use at a particular time.

15.06 The following existing TMC 005 measurements are also applicable to CCIS (same schedules as paragraph 15.04).

EGO	DEFINITION
273	***Calls Lost Due to Glare Peg* Count:** The number of times an outgoing call is lost due to second trial failures to complete an outgoing call when glare is encountered on a yielding trunk. This implies that the first trial on the call failed and the second choice trunk, which may or may not be in the same trunk group, encountered glare and yielded. This count may be scored on any outpulsed call—originating, or through switched.
274	***Occurrence of Glare on Yielding Trunks Peg Count:*** The number of times glare was encountered on an outgoing call on a yielding trunk. This includes both first and second trial encounters of glare.
275	***Occurrences of Glare on Controlling Trunks Peg Count:*** The number of times glare was encountered on an outgoing call on a controlling trunk. This includes both first and second trial encounters of glare.

15.07 The following are CCIS related TMC 005 counts.

EGO	DEFINITION
592	***Direct Signaling Message* Misrouted:** The total number of direct signaling messages misrouted.
622	***Processor Signaling Congestion (PSC) Received:*** The total number of times a processor signaling congestion signal is received from a CCIS STP.
623	***CCIS Buffer Full:*** The total number of times a CCIS link terminal buffer is found to be above its buffer full threshold.
624	***CCIS Buffer Overflows:*** The total number of times a CCIS link terminal buffer overflows.
625	***Calls Cancelled by CCIS DOC Control:*** The total number of calls affected by an automatically activated (via a CCIS DOC signal) "cancel-to" trunk group control.
626	***Calls Skipped by CCIS DOC* Control:** The total number of calls affected by an automatically activated (via a CCIS DOC signal) "skip" trunk group control.
627	***Calls Cancelled by Group Signaling Congestion (GSC)* Control:** The total number of calls affected by an automatically activated (via a GSC signal) "cancel-to" group control.
628	***Calls Skipped by GSC* Control:** The total number of calls affected by an automatically activated (via a GSC signal) "skip" trunk group control.

16. CHARGING

AUTOMATIC MESSAGE ACCOUNTING

16.01 With the CCIS feature, charging commences upon receipt of the ANC signal in the charging office.

16.02 When the calling party hangs up first, a CLF signal is sent and charging stops.

16.03 When the called party hangs up first, a CB1 signal is sent from the last CCIS office to the

toll CCIS office. If, after a timing interval, the calling party is still off-hook, a CLF signal is sent from the first CCIS office and charging stops.

UNIFORM SERVICE ORDER CODE (USOC)

16.04 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

Acknowledgment Control Unit (ACU)—This is the 12th signal unit of each signal block indicating the number of its block, the number of the block being acknowledged, and whether each of the 11 signal units of the block being acknowledged was received without error.

Address Complete, Charge (ADC)—A signal sent in the backward direction indicating that all address signals required for routing the call to the called party have been received and that no called party's line-condition signals (eg, subscriber busy) will be sent.

Address Incomplete (ADI)—A signal sent in the backward direction indicating that the number of address signals received is not sufficient for setting up the call.

A-Link—The signaling link (access link) between a switching office and a STP in the same region.

Answer, Charge (ANC)—A signal sent in the backward direction indicating that the called party has answered and that charging should commence.

Associated Signaling—An arrangement that has a direct CCIS signaling link between two switching offices, with no intervening STPs. (Associated signaling is not currently available with No. 1/1A ESS CCIS offices.)

B-Link—The signaling link (bridge link) between an STP in one region and its counterpart in another region.

Band Number—A subfield of the CCIS trunk label that divides trunk groups associated with a terminal pair into groups of 16 trunks each.

Blocking (BLO)—A signal sent for maintenance purposes to the office at the other end of a trunk to cause that trunk to appear busy to subsequent outgoing call attempts from that office. (The far-end office can still receive incoming calls on that trunk however unless that office has also sent a BLO signal for that trunk.)

Broadcast Dynamic Overload Control 3 (BD3)—Signal sent from a switching office to an STP indicating that the office cannot accept signaling messages. (BD3 is applicable with 1E5/1AE5 and subsequent generic programs.)

Clear Back (CB1, CB2, CB3)—Signals sent in the backward direction indicating that the called party hung up.

Call Failure (CFL)—A signal sent in the backward direction indicating the failure of a call setup attempt due to a time-out or a fault not covered by specific signals.

Changeover (COV)—A signal sent to indicate a signaling link failure. If this signal is sent on a link carrying information, it also indicates that a changeover to the standby signaling link is required.

Clear Forward (CLF)—A signal sent in the forward direction to terminate a call or a call attempt and to release the trunk involved. It is normally sent when the calling party hangs up.

C-Link—The signaling link (cross link) between an STP and its mate STP in the same region.

Confusion (COF)—A signal sent in the backward direction indicating that an office is unable to act upon a message received from the preceding office because the message appears unreasonable. Receipt of this signal causes the call to be retried (unless the call has previously retried).

Continuity (COT)—A signal sent in the forward direction indicating that the continuity check for an outgoing CCIS attempt was successful.

Continuity-Check Circuit (CCT)—A CCIS service circuit used to verify the voice path.

Data Link (DL)—The portion of the interconnection between a switching office and an STP that consists of a modem at each switch connected by duplicated voice frequency links.

Data Terminal (DTRM)—A device that provides storage and error handling for CCIS messages. (Also called signaling terminal.)

Data Terminal Group (DTG)—Duplicated terminal controllers and their associated data terminals, modems, and voice frequency link access circuits.

Data Set—A digital-to-analog and analog-to-digital converter (modem).

Data Translation Test (DTT)—A signal sent by a switching office to an STP to initiate a direct signaling translation test.

Direct Signaling—The ability to route a message to a particular destination based entirely on address information in the message and not based on the point of origination or on band assigned paths through the network.

Dynamic-Overload-Control Signals (DOC 0, DOC 1, DOC 2, DOC 3)—Signals sent from one switching office to another indicating the degree of traffic congestion in the transmitting office. These signals may also be sent by a signal transfer point in response to a switching office's request to broadcast these signals to a preassigned set of bands. The levels of congestion range from normal (dynamic-overload-control-level 0) to most severe (dynamic-overload-control-level 3). These signals are processed beginning with 1E(B7)7/1AE(B7)7.

Emergency Load Transfer (ELT)—A signal sent on the signaling link indicating that the error rate on this link has met the requirements of the emergency prove-in period and that emergency transfer can take place.

End-of-Status Update (ESU)—A signal sent by an STP following transmission of the last band status signal indicating the completion of the band status update.

Forward Transfer (FOT) or Ring Forward—A signal used by the originating operator on operator-to-operator handled calls to recall the incoming operator.

Group-Signaling-Congestion Signal (GSC)—A signal sent by a signal transfer point to an office to prevent that office from originating calls on a trunk group (or subgroup) whose corresponding signaling path is congested. This signal is processed beginning with 1E(B7)7/1AE(B7)7.

Identifier (ID)—A signal sent by a switching office to the switching office that initiated the translation integrity check indicating which trunk is being consistently associated with signals having the band and trunk number under test.

Initial Address Message (IAM)—A multiunit signal that implies trunk seizure and contains routing information, including digits, for a CCIS call.

Initial Signal Unit (ISU)—The first signal unit of a miscellaneous multiunit message identifying the type of message and indicating the number of subsequent signal units to follow.

Load Transfer (LTR)—A signal indicating that the error rate on that signaling link has met the standard requirements of the normal proving period and that signaling traffic should be transferred to that particular link.

Load Transfer Acknowledge (LTA)—A signal sent in response to a load transfer signal or to an emergency load transfer signal indicating that the load transfer to that particular link will take place.

Lone Signal Unit (LSU)—A message comprising a single signal unit.

Manual Changeover (MCO)—A signal initiating a changeover to a reserve signal link because of a need for rearrangement or for maintenance purposes.

Manual Changeover Acknowledge (MCA)—A signal sent in response to a manual changeover signal indicating that the changeover will take place.

Manual Voice Frequency Link Transfer (MVT)—A signal sent in either direction between a switching office and an STP indicating that the active VFL should be interchanged with the standby VFL.

Message Refusal (MRF)—A signal sent by an STP in response to the reception of an IAM signal that it is unable to handle.

Modem—A digital-to-analog and analog-to-digital converter (Data Set).

Multiunit Message (MUM)—A message composed of several signal units.

National Switching Congestion (NSC)—A signal sent in the backward direction indicating the fail-

ure of the call setup attempt is due to congestion in the switching equipment or in its engineered memory.

National Trunk Congestion (NTC)—A signal sent in the backward direction indicating that the failure of the call setup attempt is due to congestion encountered on trunk groups of the routing chain.

Network Management—A feature that improves the total network utilization by selectively limiting traffic destined for congested offices or areas through code blocking and trunk group controls.

Nonassociated Signaling—An arrangement in which CCIS data links from many switching offices are connected to STPs. This is the only arrangement used with No. 1/1A ESS.

Processor Notification (PRN)—A signal generated by the data terminal to notify the No. 1/1A ESS that a change in terminal status has occurred.

Processor Outage (PRO)—A signal sent in either direction indicating that the office is unable to accept signaling message due to processor failure and that alternate routing should be used.

Processor Signaling Congestion (PSC)—A signal sent by a congested signal transfer point to an office to prevent that office from originating calls on the congested data link pair. Beginning with Issue 6, this signal is processed but not transmitted.

Reanswer (RA1, RA2, RA3)—Signals sent in the backward direction indicating that the called party, after hanging up, reinitiates the answer condition.

Recycle Timer (RCT)—A signal sent by a 4A ETS office if there is excessive delay in attaching a transponder on an incoming CCIS call from a 2-wire No. 1/1A ESS office. When the RCT signal is received by the 2-wire office, the failure timing is restarted.

Release Guard (RLG)—A signal sent in the backward direction in response to the clear forward or reset signal when the trunk involved has been idled.

Remove Dynamic Overload Control 3 (RD3)—A signal sent from a switching office to an STP canceling a previously sent BD3 message.

Reply to Test (RTT)—A reply signal sent by a destination in response to a DTT signal. The RTT signal indicates that a direct signaling translation test was successful or was the reason for failure.

Request All Bands Status (RAB)—A signal sent by a switching office to an STP requesting a status update of all bands for the signaling link on which it is transmitted.

Request Particular Band Status (RPB)—A signal sent by a switching office to an STP requesting a status update of a particular band associated with the signaling link on which it is transmitted.

Reset Band (RSB)—A signal sent from a failed switching office during recovery that forces all trunks in a band to a compatible state between the failed office and the far-end office.

Reset Band Reply (RBR)—A signal sent in response to a reset band signal indicating whether a trunk is available for use or if it should be blocked in the failed office. The status of each of the 16 trunks in the band is sent in a single message.

Reset Trunk (RST)—A signal that is sent to release a trunk when it is unknown which other signal is appropriate and in certain other abnormal circumstances when the normal disconnect sequences have failed.

Second Start Dial (SSD)—A signal sent in the backward direction from a gateway office to initiate the second stage of outpulsing on international calls.

Signaling Link—The portion of the interconnection between a switching office and an STP that consists of a data terminal at each processor and a data link.

Signaling-Problem (SPR)—A signal sent by an STP or an SO to indicate that the translation integrity check for a trunk failed or was aborted.

Signal Transfer Point (STP)—A CCIS message processor that transfers signals between switching office signaling links (sometimes via other STPs).

Signal Unit (SU)—The basic data word for the CCIS system composed of 28 bits—20 data bits and 8 check bits.

Subscriber Busy (SSB)—A signal sent in the backward direction indicating the called party is

busy. When this signal is received prior to the receipt of address complete, it causes the call to be aborted, the outgoing CCIS trunk to be idled, and the customer to be connected to busy tone.

Subsequent Signal Unit (SSU)—A signal unit, other than the first, of a multiunit message.

Synchronization Signal Unit (SYU)—A signal that is transmitted to complete the block of 12 signal units when no signal messages are being transmitted.

Terminal Access Controller (TAC)—The interface between the switching office processor and the signaling links.

Test-Translation (TTR)—A signal sent by a switching office to an STP or vice versa to initiate the translation integrity check.

Test Voice Frequency Link (TSV)—A signal sent in either direction between a switching office and an STP indicating that the sending end is prepared for a standby VFL and requesting the other end to prepare for the test.

Transfer Allowed (TFA)—A signal sent by an STP when it is once again ready to transfer signals for a particular band.

Transfer Prohibited (TFP)—A signal sent by an STP for each band number of a failed signaling link when it is unable to transfer signals for these bands.

Transfer Restricted (TFR)—A signal sent by an STP for each band number of a failed signaling link to request that the affected signaling traffic be transferred to an alternate signaling route because the STP is routing traffic via the mate STP.

Trunk Label—An identification of the CCIS trunk associated with a terminal pair. It appears in each trunk-related data link message.

Trunk Number—A subfield of the CCIS trunk label that identifies one of the 16 trunks within a band.

Trunk Query (TQU)—A signal sent on a routine or demand basis to a far-end office to request the status of trunks in a band.

Trunk Query Reply (TQR)—A signal sent in response to a trunk query signal indicating the state of each trunk in the band (eg, idle, incoming busy, outgoing busy, transient, etc).

Unblocking (UBL)—A signal sent to a far-end office to cancel the busy condition of a trunk in that office caused by a previously sent blocking signal.

Unequipped Label (UQL)—A signal sent in the backward direction indicating that the band number or trunk number in the received signal is unassigned.

Vacant National Number (VNN)—A signal sent in the backward direction indicating that the received national number is not in use. (This signal has the same meaning as vacant code in per trunk signaling systems.)

Voice Frequency Link (VFL)—A 4-wire message-grade transmission facility used for CCIS signal transmission.

Voice Frequency Link Test, Failed (VLF)—A signal from an STP to a switching office indicating that the standby VFL is not satisfactory.

Voice Frequency Link Test, Passed (VLP)—A signal from an STP to a switching office indicating that the standby VFL is satisfactory.

18. REFERENCES

18.01 The following documentation contains information related to or affected by the CCIS feature.

A. Bell System Practices

(1) Section 333-200-100—Signaling Facilities—Common Channel Interoffice Signaling—Intertoll, General Description

(2) Section 333-200-101—Signaling Facilities—Common Channel Interoffice Signaling—Intertoll, Signaling Structure

(3) Section 212-100-002—Common Channel Interoffice Signaling (CCIS) No. 4XB Switching System—General Description

(4) Section 231-038-010—Common Channel Interoffice Signaling—Terminal Group and Voice Frequency Link Access Circuit Description—2-Wire No. 1 and No. 1A Electronic Switching Systems With HILO 4-Wire Feature

(5) Section 312-811-100—Data Set 201D Type—Description

(6) Section 231-090-062 (Issue 2)—Feature Document—Perpheral Unit Controller/Data Link—2-Wire No. 1 and No. 1A Electronic Switching Systems

(7) Section 231-090-067—Feature Document—2400 Data Link Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(8) Section 231-090-274—Feature Document—800 Service—Originating Screening Office Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(9) Section 231-090-275—Feature Document—800 Service—Terminating End Office Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(10) Section 231-090-276—Feature Document—Busy/Idle Status Indicator Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(11) Section 231-090-366—Feature Document—HILO 4-Wire Switching Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(12) Section 231-090-372—Feature Document—2-Wire Toll/Tandem Operation Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(13) Section 231-118-344—Recent Change Procedures for Common Channel Interoffice Signaling (CCIS)—Generic Program 1E7—2-Wire No. 1 Electronic Switching System

(14) Task Oriented Practice 231-050-020—Common Channel Interoffice Signaling—Toll—(1E6/1AE6 and Earlier Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems

(15) Section 231-045-405, Issue 2—Common Channel Interoffice Signaling—Software Subsystem Description—2-Wire No. 1 and No. 1A Electronic Switching Systems

(16) Section 231-037-025—Local CCIS Interface Description and Maintenance Considerations— 2-Wire No. 1 and No. 1A Electronic Switching Systems

(17) Section 231-045-430—Peripheral Unit Controller—Software Subsystem Description—2-Wire No. 1 and No. 1A Electronic Switching Systems

(18) Section 231-050-006—Trunk Test Panels and Test Lines—2-Wire No. 1 and No. 1A Electronic Switching Systems

(19) Section 231-120-302—Plant Measurements—2-Wire Electronic Switching System

(20) Task Oriented Practice 231-050-027—Peripheral Unit Controller—Data Link Frame—2-Wire No. 1 and 1A Electronic Switching Systems (when published)

(21) Task Oriented Practice 231-050-021—Common Channel Intraoffice Signaling—Local/Toll—1E7/1AE7 Generic Programs—2-Wire No. 1 and No. 1A Electronic Switching Systems

(22) Section 231-119-356—CCIS Trunk Conversion (Toll Application)—2-Wire No. 1 Electronic Switching System

(23) Section 231-138-501—CCIS Continuity-Check Transceiver Circuit SD-1A436—Operational Tests—2-Wire No. 1 Electronic Switching System

(24) Section 231-138-502—CCIS Continuity-Check Diagnostic-Test—SD-1A451 Operational Tests—2-Wire No. 1 Electronic Switching System

(25) Section 231-138-505—CCIS HILO 4-Wire Continuity Check Transceiver Circuit SD-1A453—Operational Tests—2-Wire No. 1 Electronic Switching System

(26) Section 231-138-506—CCIS HILO 4-Wire Continuity Check Diagnostic Test Circuit SD-1A454—Operational Tests—2-Wire No. 1 Electronic Switching System

(27) Section 231-032-020—Manual Trunk Test Position and Auxiliary Manual Test Circuit Description—2-Wire No. 1 and No. 1A Electronic Switching Systems with HILO 4-Wire Feature

(28) Section 231-032-010—Trunk and Line Test Panel, Supplementary Trunk Test Panel, and

Auxiliary Test Frame Description—2-Wire No. 1 and No. 1A Electronic Switching Systems

(29) Section 231-138-010—Common Channel Interoffice Signaling—Voice Frequency Link Office Lineup—2-Wire No. 1 Electronic Switching System

(30) Section 231-130-301—Trunk and Line Test Panel, Supplementary Trunk Test Panel, and Auxiliary Test Frame—Method of Operation—2-Wire No. 1 Electronic Switching System

(31) Section 231-130-321—Trunk and Line Test Panel, Supplementary Trunk Test Panel, and Auxiliary Test Frame—Method of Operation—2-Wire No. 1 Electronic Switching System With MTTP Feature Package

(32) Section 231-130-320—Manual Trunk Test Position and Auxiliary Manual Test—Method of Operation—2-Wire No. 1 Electronic Switching System

(33) Section 231-115-501—Office Alarm Tests—2-Wire No. 1 Electronic Switching System

(34) Section 231-125-301—Master Control Center Alarm, Display, and Control Panel—Method of Operation—2-Wire No. 1 Electronic Switching System

(35) Section 231-125-302—Master Control Center Alarm, Display, and Control Panel Diagnostic Procedures—2-Wire No. 1 Electronic Switching System

(36) Section 231-090-084 (Issue 2)—Feature Document—Carrier Group Alarm and Trunk Make-Busy Key Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(37) Section 231-032-005—Trunks and Service Circuit Testing Capability—2-Wire No. 1 and No. 1A Electronic Switching Systems

(38) Section 231-190-190—Feature Document—Office Overload Controls Feature—2-Wire No. 1 Electronic Switching System

(39) Section 231-390-190—Feature Document—Office Overload Controls Feature—2-Wire No. 1A Electronic Switching System

(40) Section 333-200-060—Signaling Facilities—Common Channel Interoffice Signaling—Intertoll—Design and Administration of CCIS Data Links

(41) Section 256-000-005—Common Channel Signaling System —Interdivisional Alphanumeric Index

(42) Section 231-060-210—Service Circuits—Network Switching Engineering—2-Wire No. 1 and No. 1A Electronic Switching Systems

(43) Section 231-061-450—Program Stores, Network Switching Engineering—2-Wire No. 1 Electronic Switching System

(44) Section 231-061-460—Call Stores, Network Switching Engineering—2-Wire No. 1 Electronic Switching System

(45) Section 231-090-054—Feature Document—Glare Resolution Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(46) Section 231-090-207—Feature Document—Traffic Measurements Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(47) Section 231-062-465—Processor Community Engineering—Duplicated Call Store—Network Switching Engineering—No. 1A Electronic Switching System

(48) Section 231-062-470—Processor Community Engineering—Unduplicated Call Store—Network Switching Engineering—No. 1A Electronic Switching System

(49) Section 231-062-460—Processor Community Engineering—Program Stores—Network Switching Engineering—No. 1A Electronic Switching System

(50) Section 231-062-475—Processor Community Engineering—File Stores—Network Switching Engineering—No. 1A Electronic Switching System

(51) Section 780-402-210—Basic Trunk Tables—Wilkinson B and B Tables—Trunk Engineering—Network Operations Methods

(52) Section 231-105-302—Procedures for Taking Equipment Out of Service, Removing and

Restoring Equipment to Service—2-Wire No. 1 Electronic Switching System

(53) Section 231-105-303—System Evaluation Procedures—2-Wire No. 1 Electronic Switching System

(54) Section 231-138-305—Toll CCIS Data Link Configuration and Recovery—2-Wire No. 1 Electronic Switching System

(55) Task Oriented Practice 231-360-002—Master Control Center/Processor Peripheral Interface Frame

(56) Section 333-200-025—Common Channel Interoffice Signaling—CCIS Network Administration Center—CNAC—General

(57) Section 333-200-026—Common Channel Interoffice Signaling—CCIS Network Administration Center—CNAC—Network Planning

(58) Section 333-200-027—Common Channel Interoffice Signaling—CCIS Network Administration Center—CNAC—Assignment/Administration

(59) Section 333-200-028—Common Channel Interoffice Signaling—CCIS Network Administration Center—CNAC—Cutover/Conversion Coordination

(60) Section 231-048-303—CCIS, CFTRK, TG, TGBVT, TGMEM, TKCONV, and TRK Trunk Translation Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems

(61) Section 231-048-304—ARS, CCOL, CHRGX, DITABS, DIGTRN, DNHT, IDDD, IWSA, NOCNOG, NOGRAC, RATPAT, RI, RLST, TDXD, AND TNDM Rate and Route Translation Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems

(62) Section 231-048-305—GENT, PSBLK, PSWD, and SUBTRAN Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems

(63) Section 231-048-307—CTRF, DIGTRN, NUTS, TNCTX, TRFHC, TRFLCU, and TRFSLB Traffic Measurement Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems

(64) Section 231-090-305—Feature Document—Network Management Feature—2-Wire No. 1 Electronic Switching System

(65) Section 231-048-310—ANIDL, BISI, CAMA, CFG, CLAM, CPD, JUNCT, MSN, NMTGC, PLM, PUC, PUCMB, ROTL, RSP, RSSCB, SCGA, SIMFAC, and TMGCA Recent Change Formats (1E6/1AE6 and 1E7/1AE7 Generic Programs)—2-Wire No. 1 and No. 1A Electronic Switching Systems.

B. Teletypewriter Input and Output Manuals

(1) Input Message Manual IM-1A001—2-Wire No. 1 Electronic Switching System

(2) Output Message Manual OM-1A001—2-Wire No. 1 Electronic Switching System

(3) Input Message Manual IM-6A001—2-Wire No. 1A Electronic Switching System

(4) Output Message Manual OM-6A001—2-Wire No. 1 Electronic Switching System.

C. Other References

(1) Translation Guide TG-1A—No. 1 and No. 1A Electronic Switching Systems—2-Wire

(2) Office Parameter Specification PA-591001—No. 1 Electronic Switching System—2-Wire

(3) Office Parameter Specification PA-6A001—No. 1A Electronic Switching System—2-Wire

(4) Parameter Guide PG-1—No. 1 Electronic Switching System—2-Wire

(5) Parameter Guide PG-1A—No. 1A Electronic Switching System—2-Wire

(6) Translation Output Configuration PA-591003—No. 1 Electronic Switching System—2-Wire

(7) Translation Output Configuration PA-6A002—No. 1A Electronic Switching System—2-Wire

(8) BISP 759-100-000 — Subject Index — Central Office Equipment Engineering System (COEES)

(9) BISP 759-100-100 — General Description — Central Office Equipment Engineering System (COEES).