FEATURE DOCUMENT

CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA) FEATURE

2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

CONTENTS PAGE

INTRODUCTION 2

1. GENERAL INFORMATION 2

2. DEFINITION/BACKGROUND 3

DESCRIPTION 4

3. USER OPERATION 4

4. SYSTEM OPERATION 7

CHARACTERISTICS 15

5. FEATURE ASSIGNMENT 15

6. LIMITATIONS 15

7. INTERACTIONS 16

8. RESTRICTION CAPABILITY 16

INCORPORATION INTO SYSTEM . . 16

9. INSTALLATION/ADDITION/DELETION . . 16

10. HARDWARE REQUIREMENTS 17

11. SOFTWARE REQUIREMENTS 18

12. DATA ASSIGNMENTS AND RECORDS . . 20

13. TESTING 21

14. OTHER PLANNING TOPICS 25

ADMINISTRATION 25

CONTENTS PAGE

15. MEASUREMENTS 25

16. CHARGING 27

SUPPLEMENTARY INFORMATION . 27

17. GLOSSARY 27

18. REFERENCES 27

Figures

1. Typical CAMA-ANI and CAMA-ONI Arrangement 30

2. No. 1/1A ESS CAMA Office Serving Three Number Plan Areas 31

3. CAMA Trunk Group Index Translator—Auxiliary Block Words 32

4. Trunk Group Number Primary Tables Translator—Type 8/9 Auxiliary Block Words—Trunk Group Number Table . . 32

5. Unit Type Translator—Auxiliary Block Words—CAMA Calls Waiting and Suspension Circuit, Unit Type 51, Member Number 1 33

6. Route Index Expansion Table Translator—Route Index Expansion Table Words . . 33

7. Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Incoming Trunks . . 34

8. Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks . . . 36

NOTICE
Not for use or disclosure outside the
Bell System except under written agreement

CONTENTS PAGE

9. Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables 43

10. Master Scanner Translator—Primary Translation Words 50

11. Trunk Network Number to Trunk Group Number Translator—Primary Translation Word 53

12. Universal Trunk Scanner Number to Trunk Network Number Translator—Primary Translation Words 54

13. Parameter Word C7ONPA—NPA (Area Code) of ESS Office 54

14. Parameter Word CAMR—Quantity of CAMA Type 0 Registers 55

15. Parmeter Word CAMR1—Quantity of CAMA Type 1 Registers 55

16. Parameter Word C7HMSG—Pointer to CAMA Plant Measurements and Error Counts 56

17. Procedure to Install the CAMA Feature . 57

18. Calls Waiting and CAMA Suspension Circuit Arrangement 58

Tables

A. No. 1/1A ESS CAMA Incoming Trunks . 59

B. No. 1/1A ESS CAMA Operator Trunks . 60

C. Calls Waiting and CAMA Suspension Circuits 60

D. Multifrequency Receivers 60

E. Other Service Circuits Used for No. 1/1A ESS CAMA Feature Audible Ringing . . 60

F. MF and DP Address Signaling Formats on CAMA Incoming Trunks 61

G. ANI Calling Number Format 61

CONTENTS PAGE

H. System Processing of CAMA Operator Signals 63

I. Threshold Values 65

J. CAMA Feature Hardware Usage Costs . 66

K. No. 1 ESS Generic Program Words . . 69

L. No. 1A ESS Generic Program 69

M. CAMA Feature Processor Cycle Counts . 70

INTRODUCTION

1. GENERAL INFORMATION

SCOPE

1.01 This document describes the Centralized Automatic Message Accounting (CAMA) feature provided by a No. 1 or No. 1A Electronic Switching System (ESS).

REASON FOR REISSUE

1.02 When this document is reissued, the reason will be stated in this paragraph.

FEATURE AVAILABILITY

1.03 The CAMA feature is available in all active generic programs. Prior to the 1E4/1AE4 generic programs, CAMA software was contained in the base generic program.

1.04 Effective with the 1E4/1AE4 generic programs, feature group HLCA (feature package HLCA) became optional. This was due to the availability of HILO 4-wire CAMA. HILO 4-wire CAMA requires that optional feature groups HL4W (feature package HL4W) and MTTP (feature package MTP) be ordered.

1.05 Effective with the 1E5/1AE5 generic programs, the CAMA feature group (feature package CAMA and CDIS) became optional. The message unit CAMA calls capability (MUCC) is included in the CAMA feature package. The CAMA Operator Connections During Office Growth (COCO)

feature is an optional feature group (feature package COCO) effective with the 1E5/1AE5 generic programs which allowed the transition from 2-wire CAMA to HILO 4-wire CAMA.

1.06 Effective with the 1E6/1AE6 generic programs, a HILO 4-wire CAMA trunk circuit (SD-1A484-01) using E&M signaling was introduced to interface with remote CAMA operators. Trunk diagnostics for this new circuit were included in feature group HL4W.

2. DEFINITION/BACKGROUND

DEFINITION

2.01 The Centralized Automatic Message Accounting (CAMA) feature enables a toll office to provide the billing capabilities for subtended central offices.

BACKGROUND

2.02 The CAMA feature provides toll billing capabilities for billable customer dialed station-to-station calls originated from subtended central offices without local automatic message accounting (LAMA). Billable customer dialed station-to-station calls may consist of 1+ direct distance dialing (DDD) calls. CAMA treatment is also given to certain billable toll calls requiring operator assistance for calling number identification (e.g., multiparty).

2.03 Two methods are used for CAMA:

(a) Automatic number identification (ANI)—With ANI operation, calling number identification is automatically accomplished by ANI equipment located in the originating central office. This data is transmitted to the No. 1/1A ESS CAMA office where billing is handled automatically.

(b) Operator number identification (ONI)—For multiparty and special trunk billing calls, and for subtended central offices without ANI equipment, the ONI method is used to identify a calling number. ONI is accomplished with CAMA operators located at a CAMA office or at a remote location from the CAMA office. ONI can also be accomplished with nearby Traffic Service Position (TSP) or Traffic Service Position System (TSPS) operators. In case of ANI equipment failure, CAMA operation reverts to the ONI method.

Note: Within this document only TSPS will be referenced; however, the comments will generally apply to TSP as well. Where capabilities differ between the TSP and TSPS, the difference will be noted.

Either or both of these methods can be employed in a CAMA office. Though a subtended central office is arranged for ANI, ONI is always required to serve calls from multiparty and special trunk billing customers.

2.04 The CAMA feature offers the following advantages:

- Serving local dial systems that do not have means for automatically charging station-to-station extra charge calls.
- Charging calls from multiparty and special trunk billing line customers that cannot be charged by local facilities.
- Concentrating operator facilities for handling toll calls where they can be more efficiently used by several remote offices.
- Concentrating the charging equipment and serving offices in which local automatic charging facilities are not warranted (economically) for the volume of traffic involved.

2.05 A typical CAMA feature arrangement is shown in Fig. 1.

2.06 The COCO feature is used for gradual retrofit of a HILO 4-wire network into an existing 2-wire office. This feature allows incoming CAMA calls (over 2-wire trunks) to be connected to CAMA operators (on HILO 4-wire trunks) for ONI during a retrofit period of several months. CAMA calls not requiring ONI are not affected.

2.07 A CAMA disconnect capability provides 10- to 11-second terminating party disconnect timing on incoming trunk-to-line and trunk-to-trunk calls, when the incoming trunk is CAMA and the terminating party disconnects first.

2.08 Dedicated CAMA incoming trunk groups use multifrequency (with wink start) or dial pulse (with immediate dial) signaling for the called number, and multifrequency signaling for the calling

number. Both loop and E&M supervision for CAMA incoming trunks are provided.

2.09 A No. 1/1A ESS CAMA office can serve subtended central offices located in separate numbering plan areas (NPAs). Figure 2 illustrates a CAMA office serving central offices located in three NPAs. There is no practical limit to the maximum number of NPAs which can be served, however, no more than three NPAs are expected to be served by a No. 1/1A ESS CAMA office.

DESCRIPTION

3. USER OPERATION

CUSTOMER

3.01 Ordinarily, billable customer dialed station-to-station calls can be identified with local automatic message accounting (LAMA) treatment within the originating central office. When these calls are served by CAMA-ANI, there is no operational difference to the customer. If a CAMA-ANI failure occurs, an operational difference results from CAMA-ONI being used as discussed below.

3.02 If a subtended central office is not equipped for ANI or an ANI failure occurs, CAMA-ONI is then used for billable station-to-station calls. Shortly after customer dialing, a CAMA operator is connected to request the calling telephone number. Before connection, audible ringing may or may not be returned to the calling party. After the CAMA operator receives and keys in a valid telephone number, the call is released to complete in the normal manner. If a CAMA operator cannot be readily attained, common overflow signal is returned. Common overflow signal may also be intentionally returned if the CAMA operator cannot ascertain a valid calling telephone number.

3.03 If CAMA operator positions are used for CAMA-ONI and the telephone numbers given for billing purposes are the telephone numbers from which the toll calls are originating, the call is processed as described above. If the calling party requests alternative billing, the CAMA operator informs the calling party to reinitiate the call using operator assistance by dialing "0" or "0+". Alternative billing results from credit card use, collect calls, bill-to-third-number calls, and special trunk billings.

3.04 All CAMA offices are equipped to protect the calling party from unintentional disconnect by the called party. If a called party disconnects first, the CAMA office allows a 10-second interval before the switch connections are taken down. During this interval, if the calling party has not hung up and the called party reconnects (unintentionally or not), the talking connection is reestablished. Should the calling party disconnect first or at any time during this interval, the switch connections are taken down immediately. If the timing interval has elapsed and the calling party is still off-hook, the switching connections are also taken down immediately. The calling party then receives dial tone or common overflow tone. In essence, call control is always retained by the calling party.

TELEPHONE COMPANY

A. CAMA-ANI

3.05 CAMA-ANI is fully automatic and requires no telephone company actions unless multiparty service or special trunk billing is involved, or if the originating central office ANI equipment fails to operate properly. In these events, CAMA-ONI is used.

B. CAMA-ONI

3.06 When the toll calls appear at an idle CAMA operator position (or TSPS position), the CAMA operator verbally requests the calling telephone number. After receiving and keying in a valid telephone number, the call is released for call completion. If a valid calling telephone number cannot be ascertained, the position disconnect feature may be used to terminate the call to common overflow signal. CAMA-ONI is not used for free calls.

C. QZ Billing

3.07 Special trunk billing (sometimes called QZ billing) is a CAMA-ONI billing arrangement that is used when a customer requires special toll call records such as on a per department or contract basis. A QZ billing number is distinguished from a regular DN by digit 1, digit 2, and digit 3 (office code) of the DN. The QZ billing number has a 0 or 1 in the first digit. For example, a block of QZ billing numbers assigned to a customer could be 012-0001, 012-0002, and 012-0003, each number representing the customer's different department numbers. A customer originating a toll call would contact the operator. The operator keys the QZ billing number into the ESS, thereby making an AMA record for that department. Then the operator completes the call.

3.08 A QZ billing number is used for automatic message accounting (AMA) purposes only.

D. Calling Directory Number Validity Checks

3.09 Each CAMA-ONI and CAMA-ANI incoming trunk group has associated with it in the CAMA office translations a set of legal NXX codes (office codes) that may be received on that trunk group as the first three digits of the calling directory numbers (DNs). This list of the NXX codes includes all valid NXX codes served by that trunk group. When a CAMA operator keys in the 7-digit calling DN after it is obtained from the calling party, the No. 1/1A ESS CAMA machine verifies that the office code keyed in is valid for that incoming trunk group and that the calling DN is not the same as the called DN. The first three digits of QZ billing numbers do not have to appear in this translator since the program checks for a 0 or 1 in the first digit of the office code. If either is present, it assumes a valid number.

3.10 The purpose of this test is to ensure as much as possible that the customer is giving the CAMA operator a valid calling DN.

3.11 When the CAMA office serves more than one NPA, the system verifies that the calling DN office codes received on ANI incoming trunks are valid for that trunk group. This check is not made when the CAMA office serves only one NPA. However, for all CAMA-ANI calls requiring operator assistance, the validity check is made to verify the DN received from the operator. These calls include ANI failures, multiparty, and QZ billing calls from CAMA-ANI trunk groups.

E. Calls Waiting

3.12 In a No. 1/1A ESS CAMA office, CAMA calls requiring operator handling for identification of the calling DN are put in a queue and receive audible ringing when all occupied operator positions are busy. An operator position is occupied whenever a headset is plugged into its PO jack. The Calls Waiting feature provides CAMA operators and the operator supervisor with a visual indication that calls are waiting in the queue, and also give some indication of the number of calls waiting per occupied position.

3.13 This visual indication consists of three lamps, green, white, and red, that may be located in the same building as the CAMA office or in a remote building. When none of the three lamps is lighted, no calls (or very few calls) are in the queue waiting for an available operator. If the green lamp is lighted, only a few calls are waiting. When the white lamp is lighted (green lamp stays lighted also), an approaching overload condition is identified. The lighting of the red lamp (green and white lamps remain lighted) signifies an existing overload condition.

F. CAMA Suspension

3.14 CAMA suspension permits the CAMA operators to abandon their positions in case of an emergency without interrupting traffic. When this capability is activated, all calls offered to the No. 1/1A ESS equipment for CAMA service that require ONI operation are completed free of charge.

3.15 CAMA suspension is activated or deactivated via the abandon switchboard (AS) key located near the CAMA operator positions and associated CAMA suspension circuit, or via maintenance teletypewriter (TTY) message. The TTY inputs take priority over the CAMA suspension circuit control.

3.16 When CAMA suspension is activated via the CAMA-SUSP- input message, a minor alarm is sounded in the central office. The system ignores the CAMA suspension circuit (key) and a TTY output message is printed at 6-minute intervals. This TTY output message indicates that CAMA suspension is still in effect. Scanning of the CAMA suspension circuit is resumed when CAMA suspension is ended via TTY message. If the circuit indicates no CAMA suspension, the system leaves CAMA suspension off. If the circuit indicates CAMA suspension, the system immediately turns CAMA suspension back on. The circuit can be taken out of service before ending CAMA suspension via TTY message. When CAMA suspension is terminated, the TTY message printed out every 6 minutes is also terminated.

3.17 If CAMA suspension is in effect via CAMA suspension circuit, it can be ended via TTY by first taking the CAMA suspension circuit out of service and then ended via TTY input message.

G. Position Monitoring

3.18 Monitoring facilities are provided so that a monitoring operator can monitor any one of the other CAMA positions. Monitoring is used to check the accuracy and grade of service provided by

the CAMA operators in a CAMA office. Monitoring is done from a combined CAMA position (a CAMA position arranged for both monitoring and regular operation) or from a modified 3C or 3CL cord switchboard. (Position monitoring is also available at the TSPS.)

3.19 In order to use a CAMA position for monitoring, the CAMA position must be modified by the addition of a key and a display panel. When the key is in the normal position, the operator position operates like a regular CAMA position. The operation of the key prepares this CAMA position for the monitoring operations, and makes the position appear unoccupied to the No. 1/1A ESS. The modified CAMA position panel displays the keyed number and the number of the connected operator position.

3.20 The monitoring position operator selects the position to be monitored by keying in two digits on the MF keyset. When an operating CAMA operator position is being monitored, the key monitoring circuit displays the CAMA operator keyed numbers as well as the necessary supervisory signals at the monitor position. The operator position is released by the operation of the position disconnect (PD) key on the monitoring position.

3.21 When a call is received by the monitored CAMA position, the monitor receives an order tone. The monitor operator is able to hear all conversation between the calling customer and the CAMA operator. A display of the number keyed in by the CAMA operator appears before the monitor operator. The monitor may delete the display by operating the register reset (RS) key.

3.22 If the CAMA operator deletes the keyed number by depressing the RS key and rekeys in the calling number, the monitoring display is extinguished and the monitor reset lamp in the display panel is lighted. This lamp is extinguished when the CAMA operator begins keying again.

3.23 If a CAMA operator receives a reorder signal from the system, the monitoring position receives a flashing lamp at the time of reorder. If the CAMA operator operates the PD key, two lamps are lighted on the display panel at the monitoring position.

3.24 The 3C or 3CL operator positions used for monitoring must be modified to monitor CAMA calls to selected 3C and 3CL positions. A jack is furnished at the monitoring position for each position to be observed. The monitor operator selects the position to be monitored by inserting a cord into the jack associated with the position to be monitored.

H. CAMA Operator Position Exercise (COPE)

3.25 The main purpose of CAMA operator position exercise is to provide a fast and easy method of verifying that a CAMA operator position is good or bad, and if bad, to give an indication of what is faulty. The operator position exercise verifies the operation of the following:

(a) MF keyset

(b) RS key

(c) PO jack

(d) PD key

(e) Talking and keying paths of a CAMA operator position.

COPE is discussed in detail in Part 13.

I. Output Messages

3.26 Several output messages are used by the CAMA feature. These output messages are briefly discussed in the following paragraphs. For detailed information, refer to references B(3) or B(4) in Part 18.

3.27 The CA01 output message is used to indicate the state of CAMA suspension due to a TTY requested change, or to alert the office that CAMA suspension is in effect.

3.28 The CA02 output message indicates a CAMA error has occurred, and details pertinent data available at the time of the error occurrence. TW02 output messages may follow a CA02 output message. The printing of the CA02 and associated TW02 output message is controlled by the CAMA-PRINT input message and is output daily at 2:30 A.M. A summary of CA02 errors, by error category, is printed hourly on the half hour by the CA03 output message.

3.29 The CA03 output message is a summary of the CAMA errors that have occurred in the past

hour. This message is printed every hour on the half hour if errors have occurred in the previous hour. This message can also be printed upon demand by using the CAMA PRINT input message. If requested by CAMA PRINT, a count for a specific trunk group number (TGN) can be given for each error category. The TGN count is a count of errors associated with a particular trunk group. The following counts are available:

PRG	PROGRAM ERRORS
TDA	TRANSLATION ERRORS
DIG	DIGIT ERRORS
OPR	OPERATOR ERRORS
HDW	HARDWARE ERRORS

3.30 The CA04 output message is a summary of the CAMA traffic over the past hour or over the past day. The CA04 output message is printed either every hour on the half hour or once a day at 2:30 A.M., depending on what has been specified by the CAMA PRINT input message. (This message can also be used to print the CA04 output message upon demand.) The CA04 output message is not printed if there has been no CAMA traffic since the last scheduled printout. A total count is given for each of the following traffic categories:

ANI	ANI INCOMING TRUNK SEIZURES
ONI	ONI INCOMING TRUNK SEIZURES
EDA	CALLED NUMBER RECEIVED ON ANI INCOMING TRUNK
EDO	CALLED NUMBER RECEIVED ON ONI INCOMING TRUNK
IDA	CALLING NUMBER IDENTIFIED BY ANI
IDO	CALLING NUMBER IDENTIFIED BY ONI
MTY	MULTIPARTY/QZ BILLING INFORMATION DIGIT RECEIVED
FAL	ANI-FAILURE INFORMATION DIGIT RECEIVED
OPR	CAMA OPERATOR SEIZURE
AUD	CAMA ICT CONNECTED TO AUDIBLE BEFORE OPERATOR
AU5	AUDIBLE GIVEN FOR MORE THAN 5 SECONDS
OVF	CAMA CALL ROUTED TO OVERFLOW
NO$	CAMA CALL PROCESSED - BILLING LOST.

4. SYSTEM OPERATION

HARDWARE

A. CAMA Incoming Trunks

4.01 Incoming trunk hardware used by the CAMA feature is shown in Table A.

B. CAMA Operator Trunks

4.02 Operator trunk hardware used by the CAMA feature is shown in Table B.

C. Calls-Waiting and CAMA Suspension Circuits

4.03 Calls-waiting and CAMA suspension circuits used by the CAMA feature are shown in Table C. These optional circuits are used to indicate the number of calls waiting for a CAMA operator per occupied position as a function of operator team size. This is accomplished by lighting the proper combination of lamps at the operator location. These circuits are also used to recognize an abandoned switchboard signal from the operator location. This allows all CAMA calls requiring ONI to be processed without billing.

D. Multifrequency Receivers

4.04 Additional multifrequency (MF) receivers are required for the CAMA feature. They are used for the collection of the calling number on MF ANI and step-by-step ANI calls. MF receivers are also used for the collection of the calling number from the CAMA operators. See Table D.

E. Other Service Circuits

4.05 A No. 1/1A ESS providing the CAMA feature is equipped with audible ringing circuits. See Table E.

F. Loop Back Trunk Arrangement

4.06 The CAMA feature does not provide for direct connection of local lines to CAMA operators for calling number identification. Only CAMA incoming trunks are connected to CAMA operator trunks (outgoing). Instead, a loop back trunk arrangement is used. An SD-1A203 (J1A032BF/J1A084BF) outgoing trunk is looped back to an SD-1A192 CAMA incoming trunk. SD-1A203 is a 2-wire universal trunk with reverse battery supervision.

OFFICE DATA STRUCTURES

A. Translations

4.07 The ***CAMA trunk group index translator*** defines the valid calling number office codes and the originating numbering plan area (NPA) for any given CAMA incoming trunk (ICT) group. This translator is used on CAMA ANI and ONI calls to determine whether or not a calling number has a valid NPA and NXX code. A validity check is always made on ONI calls, and only on ANI calls if the call is operator handled or if more than one NPA is involved. Item NQZ indicates whether QZ billing is permitted on the CAMA ICT group. See Fig. 3.

4.08 The ***trunk group number primary tables translator*** yields an auxiliary block for the trunk group number table used by the CAMA feature. CAMA ANI trunk groups use a type 8 auxiliary block; CAMA ONI trunk groups use a type 9 auxiliary block. This translator is used to define incoming trunk translation data. See Fig. 4.

4.09 The auxiliary block contains a screening line equipment number (LEN). The chart column of the screening LEN can be selected to route traffic from the trunk group as required. This is particularly important for trunk groups originating within different NPAs, as well as for properly handling misdirected CAMA calls from each originating office. The screening LEN has the following major classes: originating—04 individual, and terminating—22 denied termination. Since detailed billing is provided for all calls, the chart column is not used to provide different billing for different trunk groups. If an office has no line link network, rate and route information in the auxiliary block is used to route the CAMA call.

4.10 The calls waiting and CAMA suspension circuits use the ***master scanner number to trunk network number translator*** to specify a nontrunk unit type of 51 and member number 1. This translation yields a subtranslator for member number 1, which contains the address for the auxiliary block shown in Fig. 5.

4.11 ***Route index expansion table translator:*** Access to a trunk group is gained only through a route index (RI). RI 160 is used to route calls to an announcement if the "1" access code is dialed (noncommon control offices), attempting completion over an incoming CAMA trunk group when the call does not require a CAMA prefix. If CAMA access is erroneously dialed by a HILO 4-wire incoming CAMA trunk, pseudo route index (PRI) 042 is assigned similar to RI 160. PRI 042 contains a nonfixed RI used to access a HILO 4-wire recorded announcement. See Fig. 6.

4.12 RI 161 is used to establish a connection between a CAMA operator trunk port 1 and a CAMA MF receiver. This allows the CAMA operator to key in the calling number for ONI calls. For HILO 4-wire offices, either combined local/toll or toll only, RI 161 is still used to access MF receivers (operators and receivers connected to HILO 4-wire network).

4.13 ***The trunk network number-to-peripheral equipment number (TNN-to-PEN) translator*** auxiliary blocks used for CAMA incoming trunks are shown in Fig. 7. The TNN-to-PEN auxiliary block contains master scan point and signal distributor information.

4.14 The TNN-to-PEN auxiliary blocks used for CAMA operator trunks are shown in Fig. 8.

4.15 ***The trunk class code expansion translator*** tables used by CAMA incoming trunks and CAMA operator trunks are shown in Fig. 9. Trunk class code expansion tables contain certain software and hardware specifications for trunks.

4.16 ***The master scanner translator*** used by the CAMA feature is shown in Fig. 10. This translator provides trunk network numbers and trunk program indexes used for scanning.

4.17 CAMA incoming trunks use the ***trunk network number to trunk group number translator*** shown in Fig. 11. This translator is used for converting known trunk data into common stored translation data on a trunk group basis. Known

trunk data consists of information for ordering trunk equipment, wiring, path switches, options, etc.

4.18 The ***universal trunk scanner number to trunk network number translator*** is used for CAMA incoming trunks of a universal type (i.e., SD-1A192 and SD-1A312). See Fig. 12.

B. Parameters/Call Store

4.19 The ***CAMA register 0 (CR0)*** is a 12-word call store register with the following uses:

(a) controls the collection of ANI digits

(b) controls the collection of ONI digits and related operator signals

(c) controls calls on the CAMA operator queue

(d) controls the collection of request digits from a CAMA operator position exercise.

4.20 Whenever an attempt to seize a CR0 fails, the call is put on the ***CR0 queue.*** This queue consists of a one-way link list of incoming registers (IRs), incoming step-by-step registers (ISRs), and/or CR1s. CR1 is discussed below. There is no limit to the length of the CR0 queue. Parameter routine E4PAUL includes this queue when guaranteeing queue visitation during initialization and certain audits. E4PAUL and timetables E4FSUN and E4MID provide hourly entries on the half hour to print CA03 and CA04 messages if required.

4.21 The ***CAMA register 1 (CR1)*** is used to control the transmission of the keying signals of the calling number from the operator to a multifrequency receiver, and also is used to control the path between the receiver and operator port 1. The CR1 queue is actually the CAMA operator queue.

4.22 In a CAMA office, parameter set card CAMLPS may set to 1. This is required for offices equipped with the calls waiting and CAMA suspension circuits. Otherwise CAMLPS always equals zero. Set card CAMNPA is another set card required in a CAMA office. A CAMNPA value of 1 indicates that the office may provide CAMA for offices in another numbering plan area (NPA). A value of zero indicates otherwise.

4.23 The set card CAMNPA is used to set parameter memory location C7ONPA. If CAMNPA = 0, then C7ONPA = 0. If CAMNPA = 1, C7ONPA = NPA. NPA is determined from set card AREA. See Fig. 13. Memory location C7ONPA is used to determine if the AMA records for all calls (CAMA and non-CAMA) must contain the calling NPA and defines that NPA as required.

4.24 Set cards CAMR and CAMR1 define the quantities of CR0 and CR1 registers, respectively. See Fig. 14 and 15.

4.25 Parameter word C7HMSG = 0 if a No. 1/1A ESS does not provide CAMA. If an office does provide CAMA, C7HMSG equals the address of the third word of a 40-word table in variable call store. This call store block is used to store the CAMA counts in the CA03 and CA04 output messages. It is also used for storage of information from input message CAMA-PRINT. The contents of C7HMSG are copied into call store word C7HDCL_MSG_DATA for fast access by call processing. See Fig. 16.

4.26 ***Parameter word C7HLRF*** is used by the COCO feature to enable a CAMA 2-wire office to properly bill HILO 4-wire test calls requiring ONI during conversion. C7HLRF is zeroed at all times except during conversion. At this time C7HLRF is set to contain a special 7-digit test number chosen by an office craft person. This number is recognized by the AMA accounting center as a special billing number and treated as such. When conversion is complete, C7HLRF must be set back to zero by an office craft person.

FEATURE OPERATION

A. Automatic Number Identification

4.27 ***Called Number Collection:*** CAMA-ANI traffic is received over dedicated incoming trunk groups designated as CAMA-ANI in the trunk group number translation. The called number is received on the CAMA-ANI trunk using wink start MF signaling or immediate dial DP signaling in the format specified in Table F. After three digits of the called number have been collected, a 3-digit translation is performed using as inputs the first three digits received and the class of service information of the CAMA ICT found in the TGN translation. The 3-digit translation indicates dialing complete, 7-digit intraoffice, 7-digit interoffice, 10-digit interoffice, foreign area translator, invalid 7-digit, invalid 10-digit, or conflicting office and area code. The remain-

ing digits (if any), as specified by the 3-digit translations, are then collected. Normal interdigital timing for MF or immediate dial DP trunks is used during the collection of the called number.

4.28 ***ANI Request Signal:*** After collection of the called number (the reception of the proper number of digits for immediate dial DP or the reception of the ST signal for MF), CAMA receives control of the call. A CAMA register type 0 (CR0) is seized and controls the call. If no CR0 is available, the incoming register or incoming SXS register is placed on a CR0 queue. If the ICT is DP, a connection is made from the ICT to an MF receiver from the office pool. If all MF receivers are busy or if the connection is blocked, the ICT is connected to common overflow tone. If the connection to the MF receiver is successful, the ICT is then placed in the off-hook state. This is the ANI request signal which notifies the originating office that the No. 1/1A ESS is ready to receive the calling number. Off-hook is maintained toward the originating office until the termination of the call.

4.29 ***ANI Time-Out:*** After the ANI request signal has been sent, the system starts 8-second timing. If this timing period ends without a complete calling number having been received, the system considers the call to be an ANI time-out, prints a CA02 error output message, and routes the call to a CAMA operator.

4.30 ***Calling Number Reception:*** The ANI in the originating office sends an information digit and the calling number in the format given in Table G. The information digit is interpreted as follows:

0—Calling number identified.

1—Multiparty or special trunk billing—no calling number.

2—ANI failure—no calling number.

3—Calling number identified—service observed.

4—Multiparty or special trunk billing—service observed.

5—ANI failure—service observed.

4.31 If the information digit is other than 0 or 3, the call is routed to a CAMA operator. For these cases, an ST signal may or may not be received so the system routes the call after reception of the information digit. A delay is introduced to prevent the operator from hearing the ST signal if it is received.

4.32 If the information digit indicates that a calling number will be received, the digits are collected and stored in the CR0 register. If a KP, information digit, seven digits, and an ST signal are not received, a CA02 error message is printed and the call is routed to a CAMA operator. After a valid calling number has been received, control of the call is returned to the ISR or IR and to normal call processing. The CR0 register remains on the call until the MF receiver has been idled, an AMA register has been seized, and the calling number transferred to the AMA register. No AMA register is placed on the call if the 3-digit translation indicated a free call. If the DN translation indicates a free DN, the AMA register is removed from the call and no billing is performed. If no AMA registers are available, the ICT is routed to overflow unless the shortage is caused by both AMA units being out of service (in which case the call proceeds without billing).

B. Operator Number Identification

4.33 ***Called Number Collection:*** CAMA-ONI traffic is received over dedicated incoming trunk groups designated as CAMA-ONI in their trunk group number translation. The called number is collected as described at the beginning of Feature Operation.

4.34 ***Off-Hook Toward Originating Office:*** After collection of the called number (the reception of the proper number of digits for immediate dial DP or the reception of the ST signal for MF), CAMA receives control of the call using a CR0 register. The incoming trunk is placed in the off-hook state in order to improve transmission for the audible or operator connection and to be consistent with ANI operation.

4.35 ***CAMA Suspension Check:*** A check is made at this point to determine if CAMA suspension is activated in the office. If CAMA suspension is activated and the ICT is MF, the MF receiver is idled, the ICT to MF receiver path is idled, and control is given to normal call processing to process the call without billing. If the ICT is DP, the ICT trunk is put in the off-hook state and control is given nor-

mal call processing. In both cases, an indicator in the CR0 register indicates that billing cannot be performed.

4.36 ***Free Calls:*** If CAMA suspension is not activated, a check is made to determine if the call is free (designated as free in the 3-digit translation). Free calls are handled as described above for calls with CAMA suspension activated. Note that free CAMA-ANI calls send an ANI request signal and collect a calling number but a CAMA operator is not used for free ONI calls or free ANI failure calls. However, this does not apply to calls to free directory number (DN) service by the No. 1/1A ESS, since an indication that a DN is free is not received until a DN translation is performed and this occurs after CAMA processing. The AMA register is released so the call can be processed without billing. Free DNs served by other switching machines routed through the No. 1/1A ESS do not generate a charge condition since answer supervision is not returned from the far-end switcher.

4.37 ***Audible Ringing Connection—CAMA Operator Queue:*** At this point, the available operator list is interrogated to determine the next available operator position, i.e., the next CAMA register type 1 (CR1) on the available list. If there is no available operator, an attempt is made to queue the call for an operator. A check is made to determine if the length of the CAMA operator queue is equal to or greater than four times the number of occupied positions (or if there are no occupied positions, if the queue length is greater than or equal to four calls). If the queue is full, the CAMA ICT is routed to common overflow, the CR0 register is released, and a trunk-to-trunk memory register is used to supervise for ICT abandon.

4.38 If there are no occupied operators and the operator queue is empty, the green calls-waiting lamp is lit to alert the operator force immediately that a call is waiting.

4.39 If the queue is not full, the ICT is connected to the phase of audible ringing which will provide immediate audible (at least 1 second of audible in at least 1 second). The audible ringing trunk is selected from the system pool. However, if a TSPS is used to provide the ONI function, phase 1 of audible is used. The system does not use a translation or parameter item to select phase 1 or immediate audible, but instead uses the type of occupied positions (TSPS, non-TSPS or a mix) to determine the audible phase. The CR0 register is then put on the CAMA operator queue and supervision on the ICT is set to detect a customer abandon.

4.40 If an abandon is detected, the ICT and the audible ringing circuit are idled, the path between them abandoned, and all registers are idled.

4.41 ***Off CAMA Operator Queue:*** When a CAMA operator is made available, CAMA seizes the next available CR1 register, takes the CR0 off the CAMA operator queue, and associates the CR0 with the CR1. The ICT is then connected to the CAMA operator, as described below.

4.42 ***Operator Connection:*** When it is determined that a CAMA operator is available, the ICT may have no network path (a DP trunk that has not queued) or it may be connected to another trunk (an MF receiver for an MF ICT that did not queue or an audible ringing trunk for any call that queued). The TNN of port 0 of the operator trunk is determined by TNN-to-PEN translation data for the port 1 TNN in the CR1. If the ICT is connected to another trunk, the path is abandoned and the operator trunk port 0 is connected to the ICT. If the call resulted from an ANI failure, an 800-ms burst of zip tone is sent to the operator. If the call is a normal ONI or ANI multiparty call, two bursts of 100-ms zip tone with a 100-ms silent interval between them are sent to the operator. Supervision is then set for customer abandon and operator position disconnect.

4.43 If the operator trunk is connected to a TSPS incoming trunk, audible ringing of phase 1 is returned to the customer from an audible source wired to the operator circuit. When the TSPS has connected a position to its incoming trunk, a position attached signal is sent to the operator circuit which autonomously removes the audible. This feature provides a consistent single audible tone source to the incoming CAMA trunk up to the point that an available TSPS operator has been connected to the CAMA operator trunk at the TSPS location.

4.44 ***Operator Signals:*** The operator challenges the customer for their number and then keys the number into the MF keyset. The digit frequencies are sent to the CAMA operator trunk on the keying pair, are received at the MF receiver connected to port 1, and are stored in the CR0 register. When seven digits have been received, a 1-second fatigue

period is initiated. At the end of 1 second, a check is made to determine if the calling office code is valid for the incoming trunk group via CAMA trunk group translator. A check is also made to insure that the first three digits (or six for 10-digit calls) of the calling number do not equal the first three digits (or first six digits) of the called number. If either of these checks fail, the operator is given operator reorder (120 ipm flashing of the CS lamp). The operator may clear the previous digits and the operator reorder condition by depressing the reset key. The reset signal may also be used when the position is not in the operator reorder condition to clear the digits previously received. The reset key sends a digit 11 causing CAMA to perform the above actions. The operator rekeys the number. After a valid number has been received, the ICT to port 0 connection is abandoned and control of the call is passed to normal call processing except that there is no receiver connected to the ICT as in the ANI case. After a 1-second fatique period, the CR1 associated with the port 1 to MF receiver path is placed on 3-second timing for a position occupied report. If this report is received, the CR1 is put back on the available list. If a time-out occurs without a position occupied report being received, the CAMA operator circuit and MF receiver are idled, the path between them is abandoned, the CR1 is idled, and scanning for a position occupied signal is initiated.

4.45 If the operator is unable to determine a valid calling number from the customer, the position disconnect key may be used to terminate the call. If this key action is requested, the ICT is connected to common overflow, the CR0 released, and the CR1 put on 3-second timing for a position occupied signal as described above. If the position disconnect occurs during the 1-second fatigue period, it is ignored. In addition, if the operator unoccupies during the fatigue period, the generated position disconnect is also ignored. The call being handled may complete and the operator will become idle by a 3-second time-out described previously.

4.46 If the operator keys an invalid digit (an invalid combination of MF frequencies) or 5 seconds elapse after the sixth digit with no further digit received, the position is given operator reorder. The operator may key a reset to clear the digits and the operator reorder. If the calling number is rekeyed and an invalid digit is received, 5-second timing is performed after every digit and the call is routed to common overflow when seven digits have been received or when 5 seconds elapse with no digits received. The CR0 is released and the CR1 is put on 3-second timing for position occupied.

4.47 A complete description of the system reaction to any sequence of CAMA operator signals may be found in Table H.

4.48 ***Collocated CAMA:*** The collocated CAMA arrangement allows the No. 1/1A ESS to use its own CAMA operators to provide the ONI function for toll calls from multiparty or special trunk billing customers served by the ESS. This is accomplished by routing toll traffic from these customers to a ***loop-around trunk group.*** The most efficient trunks to use for this purpose are SD-1A203 OGTs and SD-1A192 ICTs. The OGTs are translated as outgoing to CAMA and the ICTs are translated as CAMA-ONI incoming trunks. Since these loop-around trunks are performing a toll connecting trunk function, they should have a fixed 2-dB loss inserted.

C. CAMA Operator Trunks

4.49 ***Position Occupied:*** CAMA operator trunks are directly connected to a CAMA position, a modified 3C or 3CL board, or to a TSPS trunk circuit. These trunks are marked as incoming trunks in the system translations. Each operator trunk has two network appearances termed port 0 and port 1. Port 0 is the talking port while port 1 is the keying port. When the positions to which they are wired are unoccupied, the trunks have no network path associated with either port and supervision on the supervisory scan point of port 1 is set to detect a position occupied condition. When this condition is detected, a path is connected between port 1 and an MF receiver from a group of dedicated CAMA operator MF receivers.

4.50 ***Blocked or Busy:*** If a blocked condition is encountered for this port 1 to MF receiver path, a 3-second delay is encountered after which a retry is performed. If the condition still exists, the operator trunk is idled. If the position is still occupied, the sequence repeats itself until either the connection attempt is successful or the position is unoccupied.

4.51 If no CAMA operator MF receivers are available, the system prints a CA02 error message and then attempts to connect port 1 to an MF receiver from the system pool. If this attempt fails, the system puts the operator trunk on the trunk high and

wet list (THAW). The operator receives a steady high tone. No further actions are taken until the operator unoccupies and the trunk is removed from the THAW list.

4.52 ***Timing for COPE Digits:*** After an MF receiver has been connected to port 1 and a CR1 register associated with the path, a check is made to determine whether to time for 1 to 2 seconds for MF digits which indicate a request for a CAMA operator position exercise (COPE). Operator trunks connected to TSPS do not provide this timing. In addition, if no other operator positions are occupied and calls are waiting on the CAMA operator queue, this timing is not performed. This is necessary since a single 3CL position could handle light CAMA-ONI traffic by switching to/from CAMA operation. A 1- to 2-second delay during every switch would be intolerable.

4.53 ***COPE Digits Received:*** When the timing is performed, if any MF digits are received, the operator trunk and MF receiver are idled, the operator trunk is put in the trunk out-of-service state giving the operator steady high tone.

4.54 ***No COPE Digits Received:*** After COPE timing is completed (if performed) and no digits have been received, port 0 is idled and the interrupter applique for local operators is set for 120 ipm (used for operator reorder). Three seconds of scanning is then performed to determine if a position occupied signal is still present. If it is still present, the CR1 register associated with the port 1 to MF receiver path is placed on the available operator list. It is from this list that incoming CAMA calls that require operator number identification determine the next available CAMA operator trunk.

4.55 If 3 seconds elapse with no position occupied detected, the trunk is treated as though a position unoccupied had been detected while on the available operator list.

4.56 ***Position Unoccupied:*** A CAMA operator is scanned for position unoccupied while on the available operator list. If a position unoccupied is detected, the CR1 register is removed from the available operator list; the MF receiver and port 1 of the operator trunk are idled; the path between them is idled; the interrupter applique for local operators is idled; the CR1 register is released; and scanning is started for a position occupied signal.

4.57 When the operator position is unoccupied while the operator is handling a call, the operator trunk generates a position disconnect report. However, after the ICT has been properly processed to reorder, the CR1 register associated with the port 1 to MF receiver path is placed on 3-second timing for a position occupied report. Since the position is unoccupied, 3 seconds elapse without a report whereupon the MF receiver and port 1 are idled, the path between them is abandoned, the interrupter applique for local circuits is idled, the CR1 register is released, and scanning is started for a position occupied signal.

D. CAMA Suspension

4.58 Circumstances may dictate that all CAMA operators must abandon their positions. This would deny toll traffic to ONI offices and to multiparty customers in ANI offices. In order to avoid this curtailment of service, the CAMA suspension feature is provided for CAMA offices. Activation of CAMA suspension causes all CAMA traffic requiring operator number identification to be processed without billing. CAMA suspension may be activated either by a TTY message on the maintenance TTY or via the calls-waiting and CAMA suspension signaling circuit (CWCSSC) by operating the abandon switchboard key at the CAMA operator location.

4.59 ***CAMA Suspension From the TTY:*** The CAMA-SUSP- input message may be used to begin or end CAMA suspension, to put the CWCSSC in or out of service, and to diagnose the CWCSSC. If a request to begin suspension is entered, CAMA suspension is activated, scanning for CAMA suspension signals from the CWCSSC is terminated, and the system is initialized to print a CA01 message every 6 minutes indicating CAMA suspension is in effect. If a request to end suspension is entered, CAMA suspension is deactivated, scanning for CAMA suspension signals from the CWCSSC is resumed, and a CA01 message is printed indicating suspension terminated. If a request to take the CWCSSC out of service is entered, the circuit is marked out of service in the CAMA suspension control word, scanning the CWCSSC is terminated, and a CA01 message is printed indicating that the circuit is out of service. If a request to put the CWCSSC into service is entered, the CWCSSC is marked in service, scanning is resumed, and a CA01 message is printed indicating that the circuit is in-service. If a request is made to diagnose the CWCSSC, a central pulse distributor (CPD) point in the circuit is operated which should result in both scan points changing state. If the diagnostic is successful, the circuit is left in the same ser-

vice state as it was in when the diagnostic was requested. If the circuit fails the diagnostic, it is taken out of service.

4.60 The proper combination of TTY input messages may always be used to override the CWCSSC. For example, the following messages end suspension that was put in effect from the CWCSSC:

CAMA-SUSP-COS.—takes CWCSSC out of service.

CAMA-SUSP-END.—ends CAMA suspension.

4.61 ***CAMA Suspension From the CWCSSC:*** The CWCSSC contains two supervisory scan points which are used to indicate the state of CAMA suspension to the ESS. The ferrods associated with these scan points are normally saturated. If the abandon switchboard key is thrown, both of these ferrods unsaturate. This indicates to the system that CAMA suspension is in effect causing the minor alarm to be activated, scanning of the CWCSSC for the end of CAMA suspension to be initiated, and a CA01 message to be printed every 6 minutes indicating that CAMA suspension is in effect. If the abandon switchboard key is then released, both of the ferrods saturate indicating the end of CAMA suspension. This causes the system to end CAMA suspension, resume scanning the CWCSSC for CAMA suspension, and print a CA01 message indicating CAMA suspension is terminated.

4.62 ***Diagnostic Capability of the CWCSSC:*** Whenever a ferrod change is detected from the CWCSSC, 6- to 12-second timing is performed to allow the system to detect a change of state of the other ferrod. Normally a maximum of several hundred milliseconds is sufficient. If the second report is received, a diagnostic of the CWCSSC is performed. If the diagnostic is successful, the system performs as described above. If the diagnostic fails, the CWCSSC is taken out of service and a CA02 message is printed. The diagnostic is described in detail in Part 13. If a second report is not received within the 6- to 12-second period, the circuit is diagnosed and either put back in service or not depending on the results of the diagnostic.

E. CAMA Disconnect

4.63 The CAMA disconnect program is entered from the disconnect program after hit timing and, if required, flash timing has been performed on a CAMA incoming trunk. At this point, a time scan junior register (TSJR) and a disconnect register (DR) are associated with the call. The TSJR is used to scan the terminating party (line or outgoing trunk) for off-hook, while the DR is on a 10- to 11-second timing list. Supervision remains except on scan point 1 of the incoming trunk to permit detection of the incoming trunk disconnect. At this time, three reports are possible:

(a) Terminating party off-hook

(b) Originating party on-hook

(c) 10- to 11-second time-out.

4.64 Should a terminating party off-hook signal be received prior to expiration of the 10- to 11-second timing, the call is restored to the normal talking state.

4.65 Should an originating party disconnect signal be received prior to expiration of the 10- to 11-second timing, the connection is released and idled.

4.66 Should a 10- to 11-second time-out occur, the connection is released, the terminating line or outgoing trunk is released, the terminating line or outgoing trunk is idled, and the incoming trunk is put on the high and wet list.

4.67 Should simultaneous reports occur, an originating party disconnect signal has priority over a 10- to 11-second time-out which, in turn, has priority over a terminating party off-hook signal. The actions associated with the highest priority are performed.

F. Calls-Waiting Lamps

4.68 ***Usage:*** Every ESS office which provides CAMA service must provide one or more CAMA operators. (This function may be performed by CAMA positions, 3C or 3CL boards, or by a TSPS. Any of these facilities may be in the same building or a remote location. However, trunks to TSPS are always provided as though the TSPS were in a remote location, even if it is in the same building.) The calls-waiting lamps are used in connection with a CWCSSC to notify the CAMA operator supervisor of a current or approaching overload condition. They consist of green, white, and red lamps. The green

lamp indicates slight operator queueing activity. Thus, if the green lamp lights occasionally, it indicates an ideal operator team size. The green and white lamps indicate an approaching overload condition while the green, white, and red lamps indicate an existing overload condition.

4.69 ***Calculation of Calls-Waiting Lamp Threshold Values:*** CAMA receives a 6-second entry from the main program. The first of these entries after a phase or the first after a change in the number of occupied operators causes the system to calculate the threshold values for lighting the three lamps. Refer to Table I. The team size is the number of occupied operators. The threshold values are calculated and stored to be used until the team size changes.

4.70 ***Lighting the Calls-Waiting Lamps:*** Every 6 seconds CAMA compares the CAMA operator queue length to the threshold values for the calls-waiting lamps and lights the proper lamps using the CPD points of the CWCSSC associated with the lamps. If the lamps are already in the proper state, the CPD points are still set but no change is noticed. This produces a self-auditing system. Note that due to the 6-second entries, it is possible that the state of the lamps will not accurately represent the number of calls waiting for a period of a few seconds. This delay is beneficial except when a single operator is manning a modified 3CL position and busy handling a non-CAMA call when a CAMA call queues. In this situation, a delay of up to 6 seconds before notifying the operator of a queued call is intolerable since a delay of less than 5 seconds for about 90 percent of the incoming calls is desirable. Thus, the green calls-waiting lamp is lit immediately if no operators are occupied and a call is put on the CAMA operator queue.

CHARACTERISTICS

5. FEATURE ASSIGNMENT

5.01 The CAMA feature is provided on a toll office basis where the No. 1/1A ESS toll office is designated to serve the toll billing functions for subtended class 5 central offices. The COCO feature is provided in an existing 2-wire No. 1/1A ESS CAMA office during a gradual retrofit period to a HILO 4-wire switching system.

6. LIMITATIONS

OPERATIONAL

6.01 Every No. 1/1A ESS toll office which provides the CAMA feature must provide one or more CAMA operators. ONI can be provided by CAMA positions, 3C/3CL boards, or by a TSPS. Operators may be provided from remote locations.

6.02 The CAMA feature does not provide for direct connection of local lines to CAMA operators for calling number identification. Instead a loopback trunk arrangement is used.

6.03 Any calls that must queue for an operator trunk must be connected to the same phase of audible ringing to avoid phase shift upon connection.

6.04 The COCO feature is only applicable to CAMA calls that must be operator identified (i.e., CAMA-ONI and CAMA-ANI failure calls).

6.05 The general handling of POB failures does not depart from normal practice unless a CAMA operator trunk is involved in the connection. If port 1 is involved in the failure, the MF receiver was either being connected or abandoned and port 0 is, therefore, idle. Thus, if port 1 is not the failing trunk, it is idled (and reseized if still occupied). However, if port 1 was the failing trunk, it is put on the trunk maintenance request list (TML) or on the trunk high and wet list (THAW) if the TML is full. If it is put on the THAW list, the operator receives steady high tone. The operator may unoccupy and occupy again to clear this condition. If port 1 is put on the TML, a steady high tone is given to the operator until the diagnostic is completed. The operator may not remove this tone by unoccupying. If the diagnostic is successful, the trunk is idled (resulting in a seizure if still occupied). If the diagnostic fails, the operator receives steady high tone which may only be cleared by idling the circuit at the test position.

6.06 If port 0 is involved in the failure, port 1 still has an MF receiver connected. Thus, if port 0 was not the failing trunk, port 0 is idled but the port 1 to receiver connection is left intact. The operator is normally not even aware of this type of failure.

6.07 If port 0 is the failing trunk, the connection between port 1 and the receiver is abandoned and port 0 is put on the TML or THAW as previously described.

ASSIGNMENT

6.08 CAMA trunks may originate in an NPA other than that of the No. 1/1A ESS toll office equipped for CAMA. No more than three NPAs are expected to be served by any one CAMA office.

6.09 A particular CAMA trunk group may contain only ANI incoming trunks or ONI incoming trunks, but not both. CAMA incoming trunks have appearances on the trunk link network (never on a service link network).

7. INTERACTIONS

7.01 Not applicable.

8. RESTRICTION CAPABILITY

8.01 Circumstances may dictate that all CAMA operators must abandon their switchboards. This would deny toll traffic to ONI offices and to multiparty customers in ANI offices. In order to avoid this curtailment of service, the CAMA suspension feature is provided for CAMA offices. Activation of CAMA suspension causes all CAMA traffic requiring operator number identification to be processed without billing. CAMA suspension may be activated either by a TTY message on the maintenance TTY or via the calls-waiting and CAMA suspension signaling circuit (CWCSSC) by operating the abandon switchboard (AS) key at the CAMA operator location.

INCORPORATION INTO SYSTEM

9. INSTALLATION/ADDITION/DELETION

9.01 Applicable hardware such as trunk circuits, service circuits, plug-ins and network cross connections are normally installed by an installation force per telephone company order. In conjunction with hardware installation, telephone company personnel input software data supplied by Western Electric on Growth Recent Change forms. Refer to reference C(8) in Part 18, and applicable recent change BSP documentation Sections 231-048-XXX, 231-118-XXX, and 231-318-XXX referenced in Part 18. Figure 17 outlines the procedure to install the CAMA feature.

9.02 Parameter set cards applicable to the CAMA feature are the following:

9SCAMA	Centralized Automatic Message Accounting Feature Group
9FCAMA	Centralized Automatic Message Accounting Feature Package
9FCDIS	CAMA Disconnect Feature Package
9SCOCO	CAMA Operator Connection During Office Growth Feature Group
9FCOCO	CAMA Operator Connection During Office Growth Feature Package
9SHLCA	2-Wire CAMA Circuit Diagnostic Feature Group
9FHLCA	2-Wire CAMA Circuit Diagnostic Feature Package.

9.03 In addition to the parameter set cards listed above, the CAMA feature affects the following set cards:

CAMLPS	Office Equipped With Call Waiting and CAMA Suspension Circuits
CAMNPA	CAMA for Other NPA
CAMR	Type 0 CAMA Registers
CAMR1	Type 1 CAMA Registers

9.04 The following set cards, used to describe step-by-step incoming trunks in a No. 1/1A ESS office, are also used for CAMA incoming trunks of the miscellaneous trunk type:

BLH	Bylink hopper entries
BLJA	Bylink junior registers in segment A
BLJB	Bylink junior registers in segment B
BLJC	Bylink junior registers in segment C
BLJS	Bylink junior registers
NHT	Hit timing junior registers
SXOR	Bylink senior registers

SXRii Lowest bylink row number on each master scanner.

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.

10.01 Hardware usage costs for the CAMA feature are shown in Table J.

10.02 Tables A and J detail the trunk circuits used for CAMA incoming trunks. The type of pulsing described in Table A refers to the called number only. CAMA ANI calling number pulsing is always MF. No. 1/1A ESS CAMA incoming trunks are engineered on a per office basis, based upon historical and/or traffic administration data.

10.03 Tables B and J detail the CAMA operator trunks. They are connected to either a CAMA operator position, a modified 3C or 3CL board, or a TSPS incoming trunk circuit. Each trunk circuit is a two-port circuit with two trunk link network appearances. Each trunk circuit is marked as an incoming trunk in translations, but can be functionally considered as an outgoing trunk to a CAMA operator. Port 0 consists of the T and R leads; it provides a voice transmission path to connect a calling customer to a CAMA operator. Port 1 consists of the KPT and KPR leads; it provides the transmission facility for the operator's MF keypulse signals. Like CAMA incoming trunks, CAMA operator trunks are engineered on a per CAMA office basis based upon historical and/or traffic administration data.

10.04 The HILO CAMA Operator (HICOP) trunk, SD-1A484, is available with E&M signaling. The loop signaling from the SD-1A394 HILO trunk requires that conversion circuits be used for proper interface with the carrier. This arrangement is not recommended due to improper signaling and impaired operator functions. When used in conjunction with SD-1A394, the HICOP trunk eliminates these problems. HICOP trunks are compatible with CAMA positions, 3C or 3CL switchboards, or TSPS arrangements.

10.05 The CAMA feature does not provide for direct connection of local lines within a CAMA office to CAMA operators. Instead, CAMA ONI for multiparty and special billing lines is accomplished using a loopback trunking arrangement. An SD-1A203 outgoing trunk is looped back to an SD-1A192 CAMA incoming trunk. The SD-1A203 is translated so that no digits are deleted or prefixed. The SD-1A192 is translated as a CAMA-ONI incoming trunk. The quantity of loopback trunk arrangements in a CAMA office are engineered according to the amount of multiparty and special billing traffic using the same considerations as for other CAMA incoming trunks.

10.06 A No. 1/1A ESS that provides CAMA must provide a calls waiting and CAMA suspension circuit, SD-1A317 or SD-1A318, unless the CAMA operator function is provided by TSPS. These circuits do not have a trunk link network appearance. They are under stored program control (unit type 51, member number 1), and indicate the number of calls waiting for a CAMA operator per occupied position. They are also used to recognize an abandon switchboard signal from the operators' locations. See Fig. 18 for connecting circuit information.

10.07 Additional MF receivers, SD-1A246 (2-wire) or SD-1A379 (HILO), are required for the CAMA feature. Some receivers are placed in the office pool, and some are placed in a separate trunk group for exclusive use by the CAMA feature. The MF receivers in the office pool are used for ANI collection of calling numbers. The other MF receivers are used for ONI collection of calling numbers. The quantity of MF receivers used for ONI is equal to the number of CAMA operator positions that are to be simultaneously occupied.

10.08 A No. 1/1A ESS providing the CAMA feature is equipped with four audible ringing circuits, SD-1A218 (2-wire) or SD-1A384 (HILO), for each CAMA operator trunk. These ringing circuits are used to handle calls queueing for a CAMA operator. The following engineering restrictions determine the quantity of audible trunks:

(1) If the office uses only CAMA/3C/3CL positions

Phase 1 = 4/3C

Phase 2 = 4/3C

Phase 3 = 4/3C.

(2) If the office uses only TSPS

Phase 1 = 4T

Phase 2 = 0

Phase 3 = 0.

(3) If the office uses CAMA/3C/3CL positions for some shifts and TSPS for the remainder of the day

Phase 1 = Max. (4/3C, 4T)

Phase 2 = 4/3C

Phase 3 = 4/3C.

(4) If the office uses a mixture of CAMA/3C/3CL positions and TSPS

Phase 1 = 4C + 4T

Phase 2 = 0

Phase 3 = 0.

If the office uses the mixture only for periods of very heavy traffic, it should be engineered closer to (3).

where

C = number of CAMA operator trunks using CAMA/3C/3CL positions.

T = number of CAMA operator trunks using a TSPS.

Max(A,B) = the maximum of A and B.

Additional circuits must also be provided to give common overflow for the following circumstances:

1. Calls that CAMA operators cannot identify.
2. Certain busy or blocked conditions.
3. Calls that overflow the CAMA operator queue.

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

MEMORY

A. No. 1 ESS

Fixed

11.01 The following memory is required whether or not the CAMA feature is used:

- ***Base generic program (program store):*** See Table K.
- ***Compool defined words (call store):*** Three words for parameter words C7HLRF, C7HMSG, and C7ONPA.

Conditional

11.02 The following memory is required when the CAMA feature is activated but not yet applied:

- ***Optionally loadable feature packages (program store):*** See Table K.
- ***Variable parameters (program store):*** The following words are required for the CAMA feature parameter set cards:

CAMLPS	1
CAMNPA	1
CAMR	1
CAMR1	1.

- ***Call store:***

(a) The CR0 requires a 12-word call store (CS) register, engineered five registers per CAMA operator trunk, plus an engineered quantity for calling number digit collection for ANI trunks.

(b) The CR1 requires a 12-word CS register engineered one per CAMA operator trunk.

(c) The number of incoming registers, used on CAMA MF calls, reflects the fact that two sets

of MF digits are collected on MF ANI calls. For MF ONI calls, the incoming registers are associated with an ICT to audible or ICT to CAMA operator connection. It is recommended that CAMA operator circuits and audible circuits (four times the quantity of operators) be provided for CAMA when calculating the number of incoming registers required.

(d) The number of incoming senior registers, used on CAMA step-by-step calls, reflects the additional holding time on CAMA calls. ANI calls are increased by the time required to connect the MF receiver, collect a 7-digit calling number, and abandon the MF receiver connection. ONI calls are increased by the time required for the operator connection and the time spent queueing for an operator.

(e) A 13-word CS AMA register is required for every charged CAMA call. The register is seized after the collection of the called and calling number and held for the duration of the call.

(f) Peripheral order buffer (POB) holding times for CAMA calls are longer than similar non-CAMA incoming and tandem calls. Additional POB usage is required for connection to audible and an operator for ONI traffic and for connection to an MF receiver for ANI step-by-step. ANI MF calls do not require additional POB holding times.

(g) A 40-word CS block is required for plant measurements

(h) One word for call store word C7HDCL_MSG_DATA.

Variable

11.03 The following memory is required when the CAMA feature is applied:

- ***Translations (program store):***

(a) The CAMA trunk group index translator requires 64 primary words (includes 1 data word for each CAMA trunk group allowed in an office) plus 1 auxiliary block for each data word. Each auxiliary block contains 1 word plus 1 word per originating NNX (minimum 2 words, maximum 31 words).

(b) CAMA incoming trunk circuits require the usual number of words for trunk translations except as follows:

(1) The trunk group number primary tables translator requires 4 words (1 primary translation word plus 3 auxiliary block words) per incoming trunk group.

(2) The trunk network number to peripheral equipment number translator requires the following quantities of words (1 primary translation word plus auxiliary block words):

SD-1A163	7
SD-1A192	1
SD-1A236	5
SD-1A237	7
SD-1A311	5
SD-1A312	1.

(c) CAMA operator trunk circuits require the usual number of words for trunk translations except as follows:

(1) The trunk network number to peripheral equipment number translator requires the following quantities of words (1 primary translation word plus auxiliary block words) per port:

SD-1A313	9
SD-1A315	8
SD-1A316	8
SD-1A394	8
SD-1A395	9
SD-1A484	8.

(d) CWCSSC requires 4 words (1 primary translation word plus 3 auxiliary block words for unit type translator.

(e) 4 words for route index expansion table translator for SD-1A484, as required.

(f) 4 words for route index expansion table translator for route indexes 160 and 161.

B. No. 1A ESS

Fixed

11.04 The following memory is required whether or not the CAMA feature is used:

- ***Base generic program (program store, file store):*** See Table L.
- ***Compool defined words (duplicated call store):*** See paragraph 11.01 similar heading.

Conditional

11.05 The following memory is required when the CAMA feature is activated but not yet applied:

- ***Optionally loadable feature packages (program store, file store):*** See Table L.
- ***Variable parameters (unduplicated call store, file store):*** See paragraph 11.02 similar heading.
- ***Duplicated Call Store:*** Same as call store for No. 1 ESS, see paragraph 11.02.

Variable

11.06 The following memory is required when the CAMA feature is applied:

- ***Translations (unduplicated call store, file store):*** See paragraph 11.03 similar heading.

REAL TIME IMPACT

11.07 The real-time requirements for CAMA calls are higher than for corresponding non-CAMA calls for the following reasons:

(a) Collection of full called number.

(b) Connection of MF receiver for ANI SXS.

(c) Collection of calling number.

(d) Connection to audible ringing for CAMA operator queueing.

(e) Connection to CAMA operator.

(f) AMA tape entry.

Table M shows cycle counts for selected CAMA ANI and ONI calls.

12. DATA ASSIGNMENTS AND RECORDS

TRANSLATION FORMS

12.01 ESS translation forms, found in reference C(1) in Part 18, requiring completion are as follows:

(a) ESS 1107A—Supplementary Information Record: This form is used to assign a pseudo line equipment number (LEN) to a trunk group number. Each trunk group must have at least one legal office code. The pseudo LEN assigned to each CAMA trunk group is given an appropriate line class code with major originating class 04 and major terminating class 24. Individual chart column screening provides proper routing and billing.

Note: Effective with 1E7/1AE7, the revised ESS 1107A form is standard for assigning features and options. Some of these assignments were previously contained on the ESS 1101 and/or ESS 1115 forms. For 1E6/1AE6 and earlier, either the old or revised versions of these forms can be used; however, they cannot be mixed.

(b) ESS 1208A/B—Trunk Screening Group Record: This form associates CAMA incoming trunk groups with line link network appearances. The ICT circuit is made to look like an originating line so that optimum use of existing screening arrangements can be utilized.

(c) ESS 1215—CAMA Trunk Group Index Record: This form provides data required to convert a CAMA trunk group index to the numbering plan area and valid office codes for the CAMA incoming trunk groups.

(d) ESS 1303B3—Trunk and Service Circuit Route Index Record—RI 0150 through 0174 Typical: This form assigns the trunk group number, options, and next route index (RI) for fixed RI 0160 (CAMA access code dialed in error). Fixed RI 0161 is used to connect the CAMA operator circuit to an MF receiver to record the calling number.

(e) ESS 1303D1/2/3—Pseudo Route Index Record: This form specifies data for pseudo route in-

dexes (PRIs). PRI 042 is used for CAMA access code dialed in error in HILO 4-wire CAMA offices.

(f) ESS 1304—Rate and Route Chart Record: Normal screening code and charge index assignments are used to properly treat either charge or free calls.

RECENT CHANGE

12.02 The following recent change message is used exclusively by the CAMA feature. The recent change message is RC:CAMA. RC:CAMA is used to add, change, or delete the numbering plan area or office codes in the CAMA trunk group index translator. Refer to references A(5), A(21), or A(30) in Part 18.

12.03 The CAMA feature uses special keyword units when adding CAMA incoming trunks with the RC:TG recent change message. Keyword TYP8 is used to designate CAMA ANI, and TYP9 is used to designate CAMA ONI. Refer to references A(2), A(18), or A(27) in Part 18.

13. TESTING

CAMA INCOMING TRUNKS

13.01 The basic responsibility for maintenance of CAMA ICTs, as with other ICTs, lies with the originating office. Therefore, No. 1/1A ESS does not provide for routine automatic operational testing. However, manual verification of these trunks is possible from the test positions. These testing procedures on CAMA ICTs are similar to those available on other incoming trunks. The trunk may be accessed directly from the test position if a 101-type test call cannot be placed from the originating office. The transmission and signaling testing facilities of the test position are then available for the craft personnel to use in working with other locations to sectionalize problems. Transmission tests are available for CAMA incoming trunks. Trunk testing procedures are detailed in references A(1) and A(7) in Part 18.

CAMA OPERATOR TRUNKS

A. Diagnostic

13.02 Routine diagnostic testing is provided for each 2-port CAMA operator trunk. While diagnosing the CAMA operator trunk in the loop-around state, the leads connecting the trunk to the CAMA position for remote operation are opened and, when necessary, idle circuit termination is returned to the distant end. The operator trunk, when in the loop-around state, can be put in all other call and test states without interfering with the CAMA operator. This also prevents the CAMA operator from interfering with the diagnostic tests.

13.03 Whenever the ESS office puts the CAMA operator trunk on the trunk out-of-service (TOS) list, the trunk is put in the TOS state and steady high tone (HT) is returned to the CAMA position. This signals occupied positions that no CAMA calls will be routed to that position. No TOS indication will be returned to TSPS since to do so would tie up a TSPS operator position. In TSPS systems if the CAMA operator trunk is TOS, the TSPS ICT is also unavailable for use, but the TSPS operator positions are still available for use since they are not dedicated to a particular ICT and, therefore, are not seized when the CAMA trunk is TOS.

13.04 For the first set of tests, a network connection is set up between a tone circuit (steady low tone)—SD-1A218 [2-wire/SD-1A384 (HILO)]and the major port (port 0). The minor port (port 1) is connected to a tone presence detector (TPD)—SD-1A152 [2-wire/SD-1A382 (HILO)]. After performing network continuity checks, the two ports are put through their tandem and local talking states for continuity verification. Additional tests are performed to verify the operation of the position occupied (PO), position disconnect (PD), and busy (BY) relays. For SD-1A313 [2-wire/SD-1A395 (HILO)], additional tests are performed to verify the operation of the interrupter applique circuit—SD-1A130. For SD-1A316 [2-wire/SD-1A484 (HILO)], additional tests are done to test the E&M control circuitry.

13.05 After the above tests have been done, another network connection is set up with the tone source again connected to the major port; this time, however, the minor port is connected to a continuity polarity test circuit—SD-1A226. These tests verify the proper polarity of tip and ring and in the case of SD-1A313 and SD-1A315 verify the correct battery polarity on the facility side of the trunk.

B. CAMA Operator Position Exercise (COPE)

13.06 The main purpose of COPE is to provide a fast and easy method of verifying that a CAMA operator position is either good or bad and, if

bad, to give an indication of what is faulty. Though it is true that in most cases the CAMA operator will detect a malfunction, it is also true that in some cases the CAMA operator will not know whether the malfunction is in the position, transmission facilities, or operator trunk. A manual approach in isolating one of these three faults can be very tedious and time consuming. COPE reduces the time and effort that would be required in isolating and repairing those faults associated with CAMA operator positions.

13.07 The tests performed by COPE are the same as those done by the incoming sender and register test frame in No. 4A and 4M toll switching systems. However, No. 1/1A ESS does not use a manual test frame. The tests are accomplished by using the trunk and service circuit diagnostic program to process and analyze the results of the fixed set of tests that are performed by an attendant at the position. Some different features of COPE are as follows:

(a) The exercise can be initiated either manually by craft personnel from the test position or TTY, or automatically by test personnel from the CAMA position.

(b) Pass and fail indications after each individual test are returned to the CAMA position. This enables the testing personnel at the CAMA position to know which tests passed and which tests failed.

(c) The results of the exercise are printed out on the TTY using the existing messages used in diagnosing trunks and service circuits.

Requesting COPE From Test Position or TTY

13.08 COPE cannot be requested from the test position or TTY if the CAMA operator trunk is traffic busy, (i.e., the CAMA operator position is occupied). The trunk must be made maintenance busy before requesting the test. To make the trunk maintenance busy, it is necessary to inform the attendant at the CAMA position to go position unoccupied (remove the headset from PO jack). Only after the position is unoccupied can the craft personnel make the operator trunk maintenance busy. After the trunk has been made maintenance busy, the craft personnel can inform the attendant to again return to position occupied. When the craft person has determined that the attendant has again gone position occupied the test can be initiated. As implied from the above, a separate communications link is required between the attendant and the switching office in order to perform the exercise.

13.09 The exercise is initiated by requesting a single diagnostic on either TNN (port) of the CAMA operator trunk. The second digit of the 2-digit test code must be a 1. If it is a 0, only the diagnostic on the CAMA operator trunk is performed. If it is anything other than a 0 or 1, an output message is printed (TN05) indicating that test is not available (NTST).

13.10 No further action is required from the craft person during the exercise. After analyzing the output message, the craft personnel can either idle the CAMA operator trunk and make it available for service or leave it maintenance busy for further testing or repair.

Requesting COPE From CAMA Position

13.11 Unlike initiating COPE from the test position or TTY, no assistance from central office craft personnel is required by the tester at the CAMA position when requesting the test, providing that the CAMA operator trunk is not out of service or maintenance busy. Under normal operation the system does not make a position available for calls until 1 to 2 seconds after detection of a position occupied signal. To request the exercise, the tester must key in any digit (and any number of digits) within 1 to 2 seconds after going occupied. Detection of a digit during this 1 to 2 seconds signals the system that a position exercise is to be performed; otherwise, the position is made available to traffic.

13.12 When the request is detected, the trunk is placed in the trunk out-of-service (TOS) state. The TOS state returns steady high tone to the tester. The CAMA diagnostic enters a request to diagnose the CAMA operator trunk and to execute the position exercise. In a busy office it could be several minutes before the request is processed. Steady high tone is returned during the entire time. (It should be noted here that, though this steady high tone is the TOS indication which means that no more calls will be routed to that position, it is not possible to automatically take the CAMA operator trunk out of service on a position exercise request.) If the attendant goes position unoccupied while in the TOS state, the position exercise request is canceled. If the attendant again goes position occupied and does not key in any

digits within 1 to 2 seconds, normal traffic is channeled to the position.

13.13 When the request is processed and the diagnostic on the CAMA operator trunk is started (always performed before the position exercise), the TOS tone is terminated. After the exercise is finished, the CAMA position is made available to handle CAMA traffic. The results of the exercise are printed out on the TTY (whether pass or fail). The source of the diagnostic request in the output message contains a 6 indicating the source was from the CAMA position. No provisions are made for removing the CAMA position from service automatically when the exercise fails.

Description of COPE Tests

13.14 Three 500-ms long high-tone beeps separated by 500 ms of no tone are sent to the tester signifying the start of the test. Prior to this, however, the normal diagnostic of only the CAMA operator trunk is performed. If this diagnostic fails, the position exercise is not started. The following tests are done prior to sending tone to the attendant.

(1) A check is made to see if the position is occupied. If it is not, the exercise is terminated and a TN01 failure message is printed.

(2) After the network connection is set up with the major port connected to a low tone trunk (SD-1A218 or SD-1A384) and the minor port connected to an MF receiver, continuity checks on both ports are performed. If either port fails, the test is terminated and a TN01 failure message is printed.

13.15 After the three 500 ms tone beeps, the CAMA supervisory (CS) lamp is lit steady. When the CS lamp is lit, the tester then has 6 seconds to key in a RESET. If the RESET is valid, a 75-ms low tone beep is sent to the tester. If the RESET was invalid, the CS lamp will be set to flash at 120-ipm rate for 1.5 seconds and then return to steady. If no RESET is registered within 6 seconds, the exercise times out and terminates with a TN01 failure message.

13.16 Following the RESET, digits 1 through 9 and 0 must be keyed in sequence (with 0 last). The same pass, fail, and time-out indicators used for the RESET are also used for the digits. The next digit may be keyed only after either the 75-ms tone beep is heard or the CS lamp has returned to steady (after flashing) and must be keyed within 6 seconds.

13.17 The RESET key can also be used in the digits part of the exercise providing it functioned correctly in its own test. The following options are available with the RESET key during the digit's part of the exercise:

(1) Operation of the RESET key cancels out the results of the last digit, enabling that digit to be rekeyed without incurring a failure. This procedure can be done more than once on any one digit.

(2) Operating the RESET key twice in a row cancels out the results of all digits that have been keyed. This enables the digit test to be restarted (starting with digit 1).

13.18 The following operations of the RESET key cause the exercise to terminate with a TN01 failure message:

(a) Detection of three RESETs in a row.

(b) Detection of two sets of two RESETs at any time during the digit's test.

(c) Detection of a total of 30 digits including RESETs.

13.19 After the tenth digit (digit 0) has been keyed, the tester then has 6 seconds to either key in a RESET or operate the position disconnect (PD) key. If after releasing the PD key the CS lamp does not go out, the PD function failed. If the PD key did not work, the 6-second time-out occurs and the exercise is terminated with a TN01 failure message. If it passes, the exercise is ended.

13.20 At the end of the exercise or when the exercise is terminated early due to a failure, the CS lamp is extinguished and steady high tone returned to the tester for 10 seconds. This signals the tester that the test is ended. During this 10-second interval, the tester must go position unoccupied or a failure will be marked for the exercise.

COPE Failure Results

13.21 The trouble number which is printed in the TN01 failure message is generated by COPE. Each bit in the trouble number represents the pass

(0) or fail (1) results for a particular test. It is possible to have more than one failure bit set in any one exercise.

13.22 If a raw diagnostic was requested (first digit of test code equal to a 4), the ferrod results in the MF receiver for each digit that failed would be printed. Care should be taken to insure that the MF receivers are all tests pass (ATP) before running the diagnostic.

13.23 A more detailed description of the COPE procedures and results may be found in reference A(24) in Part 18.

C. Demand Testing

13.24 Access to either cable pair (T and R or KPT and KPR) for dc testing is provided from the test position by selecting the port 0 or port 1 TNN, respectively, of the CAMA operator trunk. Operation of the voltmeter key on the test position automatically places the CAMA operator trunk in a bypass state providing direct access to the cable pair. To access these trunks for transmission tests, it is necessary that the CAMA position be initial unoccupied.

13.25 The standard E&M tests which include monitoring, control, and pulsing of the E&M leads are available on the E&M CAMA operator trunk.

CALLS-WAITING AND CAMA SUSPENSION SIGNALING CIRCUIT (CWCSSC)

A. Calls-Waiting Circuitry

13.26 No facilities have been provided for automatic program fault detection for the calls-waiting circuitry in the CWCSSC. Faults in this circuitry produce a malfunction of the call-waiting lamps which should be obvious to the operating force.

B. CAMA Suspension Circuitry

13.27 Both versions (SD-1A317 and SD-1A318) of the CWCSSC have been designed to utilize two ferrods to indicate the state of CAMA suspension. If both ferrods are saturated, CAMA suspension is not in effect; if both ferrods are unsaturated, CAMA suspension is in effect. The CWCSSC is equipped with a TEST relay which allows the system to reverse the input, thus complementing the ferrod states.

Automatic Diagnostic

13.28 Once a day at 2:00 a.m., the system scans the ferrods, operates the TEST relay, scans the ferrods again, and then releases the TEST relay. No action is taken if the ferrods are complemented by the TEST relay as expected. If a problem is detected, a CA02 error message is printed with an error number which can be used to help isolate the fault. The circuit is taken out of service and the major alarm is activated.

Diagnostic by TTY Request

13.29 The input message CAMA-SUSP- may be used to diagnose the CWCSSC. This causes the TEST relay to be operated and the ferrods scanned. If the diagnostic is successful, an ATP is printed. If the diagnostic fails, a CA02 error message is printed as described above but the circuit is not taken out of service. The CAMA-SUSP- input message may also be used to take the CWCSSC out of service if it fails the diagnostic.

Unscheduled Diagnostic

13.30 Whenever a change of state in the two ferrods is detected, a diagnostic is performed to insure that the circuit is functioning properly. If the diagnostic succeeds, the request is processed. If the diagnostic fails, a CA02 error message is printed, the circuit is marked out of service, and the major alarm is activated.

13.31 If a single ferrod change is detected and the other ferrod change is not detected in 6 to 12 seconds, a diagnostic is performed. Thus, a majority of faults are detected when they occur since they cause a change of state of only one of the ferrods. Faults which do not cause a change of state of one of the ferrods are detected by the daily diagnostic or by the diagnostic performed when a CAMA suspension signal is received. Normally, the daily diagnostic is the first to occur.

CAMA DISCONNECT

13.32 Generate a CAMA incoming call and establish a talking connection. Put the terminating line on-hook for 1 to 9 seconds and then return to off-hook. If the feature is assigned properly, the talking path should remain connected.

14. OTHER PLANNING TOPICS

14.01 Refer to the applicable SD drawing for the details concerning power requirements.

ADMINISTRATION

15. MEASUREMENTS

TRAFFIC MEASUREMENTS

15.01 The following traffic counts have been provided for use on the H, C, S1, S2, S3, or DA-15 schedule with type measurement code 05 and the following office count numbers.

15.02 ***CAMA ANI and ONI Port 0 Register Usage—152:*** Usage count taken at 10-second intervals of the number of CR0 registers being used for CAMA traffic.

15.03 ***CR1 Usage—Positions Occupied Usage—154:*** Usage count taken at 100-second intervals of the number of CR1 registers being used by CAMA operators. This is equal to the number of occupied CAMA operators.

15.04 ***Service Usage—157:*** Usage count taken at 100-second intervals of the number of CAMA operator trunks which are occupied with service calls.

15.05 ***CAMA Positions Peg Count—179:*** Peg count of the total number of calls handled by all the CAMA positions.

15.06 ***ONI Peg Count—180:*** Peg count of the total number of calls requiring operator identification because they were received from an ONI trunk group or from an ANI trunk group with an information digit indicating multiparty line or a special billing line. This count does not include calls routed to the operator due to an ANI failure.

15.07 ***ANI Time-Out Peg Count—181:*** Peg count of the number of calls routed to an operator because the ANI information was not received within the 8-second time out interval.

15.08 ***ANI Failure Peg Count—182:*** Peg count of the number of calls routed to an operator because the ANI failure information digit was received.

15.09 ***Position Disconnect Peg Count—183:*** Peg count of the number of calls routed to reorder because the operator depressed the position disconnect key. This count also includes the number of calls routed to reorder because an operator unoccupied the position before keying a valid 7-digit calling number.

15.10 ***CAMA Queue Peg Count—184:*** Peg count of the number of calls placed in the COP queue to wait for an idle operator.

15.11 ***CAMA Queue Usage—186:*** Usage count taken at 10-second intervals of the total number of calls waiting on the CAMA operator queue.

15.12 ***Delay Limiting Loss—CAMA Queue Overflow—187:*** Peg count of the number of calls given overflow treatment because they encountered a full CAMA operator queue.

15.13 ***Match Check Failure Count—188:*** Peg count of the total number of times that the number keyed by the operator is the same as the called number.

15.14 ***Wrong Calling Code Peg Count—189:*** Peg count of the total number of times that the office code keyed by the operator is not an office code that could originate over the trunk group on which the call arrived.

15.15 ***Misrouted CAMA Treatment Peg Count—190:*** Peg count of the number of calls given intercept treatment for superfluous prefixes as a result of a nontoll call received over a CAMA trunk group.

15.16 ***CAMA Queue Abandoned Peg Count—191:*** Peg count of the number of calls that abandon while queued for a CAMA operator. This count plus the CAMA position peg count and delay limiting loss count gives the total volume of CAMA calls offered for operator number identification.

15.17 ***CAMA Abandons During ANI Collection Peg Count—338:*** Peg count of the total number of CAMA incoming trunk abandons while the No. 1/1A ESS is collecting ANI information from the originating office.

PLANT MEASUREMENTS

15.18 The following counts are taken on CAMA traffic and error conditions. Some are used to

compute plant measurement counts as explained in paragraph 15.38, while others are available only through the CA03 and CA04 TTY messages. See reference A(6) in Part 18.

A. Error Counts

15.19 The following error counts are printed hourly on the half hour in the CA03 output message. They may also be requested by the CAMA-PRINT input message.

15.20 ***DIG:*** Count of the number of times an inconsistency has been detected in the digits of a CAMA called or calling number.

15.21 ***HDW:*** A count of the number of POB hardware failures on CAMA calls.

15.22 ***OPR:*** A count of the number of times a CAMA operator has had trouble determining the calling number.

15.23 ***TDA:*** A count of the number of translation errors encountered.

B. CAMA Counts

15.24 The following CAMA counts are printed hourly on the half hour or daily at 2:30 A.M. in the CA04 output message. They may also be requested by the CAMA-PRINT- input message.

15.25 ***ANI:*** The number of seizures on CAMA-ANI incoming trunks (ICTs). For SXS ICTs, this count is incremented after the first digit is received.

15.26 ***ONI:*** The number of seizures on CAMA-ONI ICTs. For SXS ICTs, this count is incremented after the first digit is received.

15.27 ***EDA:*** The number of calls for which a valid called number has been received on a CAMA-ANI ICT.

15.28 ***EDO:*** The number of calls for which a valid called number has been received on a CAMA-ONI ICT.

15.29 ***IDA:*** The number of calls whose calling number has been identified by the ANI in their office.

15.30 ***IDO:*** The number of calls whose calling number has been identified by a CAMA operator.

15.31 ***MTY:*** The number of calls on ANI trunk groups for which an information digit indicating a multiparty line or special trunk billing has been received.

15.32 ***FAL:*** The number of calls on ANI trunk groups for which an information digit indicating an ANI failure has been received.

15.33 ***OPR:*** The number of CAMA operator seizures.

15.34 ***AUD:*** The number of calls that had to queue for a CAMA operator. These calls receive audible ringing while waiting.

15.35 ***AU5:*** The number of calls that queued for an operator and received audible ringing for more than 5 seconds.

15.36 ***OVF:*** The number of calls that were routed to common overflow due to either a full CAMA operator queue or an action of the operator.

15.37 ***NO$:*** The number of CAMA calls that were processed without billing due to either CAMA suspension or no AMA registers as a result of a major AMA hardware failure.

C. Plant Measurement Counts

15.38 These counts are provided as part of the PM01 and PM02 messages. Although these counts are similar to some of the counts described previously, they are printed at different times and for different periods as described in the appropriate output message manual.

15.39 ***CAMA SEIZ:*** The number of seizures of CAMA ICTs. This count is equal to ANI plus ONI as described in paragraphs 15.25 and 15.26.

15.40 ***CAMA Lost Billing:*** The number of CAMA calls that were processed without billing. This count is equal to NO$ as described in paragraph 15.37.

15.41 ***CAMA ANI Failures:*** The number of times the ANI failure information digit was received. This count is equal to FAL as described in paragraph 15.32.

15.42 ***Answer Time Recorder (ATR):*** The ESS is not equipped for connection to an elec-

tromechanical ATR as is found in other systems. The equivalent data may be obtained from output messages on either the maintenance or traffic TTY. The CA04 output message can be used to determine the following ATR type data for the office (not just for a traffic sample):

(a) Calls requiring ONI = EDO + FAL + MTY

(b) Calls queued = AUD

(c) Calls queued longer than 5 seconds = AU5

Force Administration Data System (FADS) type CAMA operator answer time data may be obtained from the traffic TTY by using the following office count numbers:

(a) Work volume CCS = service usage—157

(b) Position occupied CCS = position occupied usage—154

(c) Calls = CAMA position peg count—179

(d) Calls waiting CCS = CAMA queue usage—196.

16. CHARGING

AUTOMATIC MESSAGE ACCOUNTING

16.01 Prior to the 1E5/1AE5 generic program, toll calls are billed as station paid bills, call type 01. Message rate calls are not entered.

16.02 Effective with the 1E5/1AE5 generic program, the message unit CAMA calls (MUCC) capability allows message rate service to be applied to CAMA incoming calls. MUCC adds the following call types:

(a) Message rate timed—call type 16

(b) Message rate untimed—call type 17

(c) Detailed message rate with message billing index—call type 18

(d) Detailed message rate timed—call type 22

(e) Detailed message rate untimed—call type 23.

Each CAMA incoming trunk group receives billing treatment based upon its class of service. This is determined from the chart class column or LEN information of the CAMA trunk group.

16.03 In order for a call to be billed, it must be marked as a charge call in the 3-digit translator. No calls are billed if (1) the 3-digit translator is not marked, (2) CAMA suspension is active, (3) a major automatic message accounting (AMA) hardware failure exists, or (4) a call is to a free directory number.

16.04 Calls to a free number in other central offices are not billed since answer supervision is not returned to the CAMA office.

16.05 A 13-word AMA register is required for every charged toll call. The register is seized after collection of both calling and called numbers. See reference A(25) or A(31) in Part 18.

UNIFORM SERVICE ORDER CODES

16.06 Not applicable.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

17.01 Not applicable.

18. REFERENCES

18.01 The following documentation contains information pertaining to or affected by the CAMA feature.

A. Bell System Practices

(1) Section 231-032-005—Trunk and Service Circuit Testing Capabilities, 2-Wire No. 1 and No. 1A Electronic Switching Systems (Through 1E6/1AE6 Generic Programs)

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

(3) Section 231-048-304—Rate and Route Translation Recent Change Formats for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, TDXD, and

RLST (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems

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

(5) Section 231-048-310—Recent Change Formats for ANIDL, CAMA, CFG, CPD, CLAM, JUNCT, MSN, NMTGC, PLM, ROTL, SIMFAC, TMBCGA, LRE, PUC, RSSCB, RSSCH, and RSP (1E6 and 1AE6 Generic Programs), 2-Wire No. 1 and No. 1A Electronic Switching Systems

(6) Section 231-049-302—Plant Measurements, 2-Wire No. 1 and No. 1A Electronic Switching Systems

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

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

(9) Section 231-060-320—Network Engineering—Trunk Link Networks—Network Switching Engineering—No. 1 and No. 1A Electronic Switching Systems

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

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

(12) Section 231-061-605—Traffic Measurements — Network Switching Engineering Worksheets—No. 1 Electronic Switching System

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

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

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

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

(17) Section 231-090-114—Feature Document—Interface With TSP and TSPS Feature—2-Wire No. 1 and No. 1A Electronic Switching Systems

(18) Section 231-118-323—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM (Through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(19) Section 231-118-324—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (Through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(20) Section 231-118-325—RC Procedures for PSWD, GENT, PSBLK, SUBTRAN (Through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(21) Section 231-118-337—RC Procedures for ANIDL, CAMA, CFG, CPD, MSN, NMTGC, PLM, ROTL, SIMFAC, and TMBCGA (Through 1E5 Generic Programs), 2-Wire No. 1 Electronic Switching System

(22) Section 231-128-520—Two-Way Trunk Circuit SD-1A192-01 and SD-1A192-05—Operational Tests, No. 1 Electronic Switching System

(23) Section 231-128-573—Outgoing Trunk Circuits SD-1A394-01 and SD-1A395-01, CAMA Operator Positions (3C, 3CL, or TSPS) Switchboards, Transmission Tests for HILO 4-Wire Switching, No. 1 Electronic Switching System Using the Manual Trunk Test Position

(24) Section 231-160-320—CAMA Operator Position Exercise—Procedures

(25) Section 231-190-063—Feature Document—Automatic Message Accounting Feature—2-Wire No. 1 Electronic Switching System

(26) Section 231-201-101—Centralized Automatic Message Accounting, CAMA Tandem—ANI and ONI, Description, 2-Wire No. 1 Electronic Switching System

(27) Section 231-318-303—Trunk Translation Recent Change Procedures for TG, TGBVT, TRK, CFTRK, and TGMEM, CCIS, and TKCONV (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(28) Section 231-318-304—Rate and Route Translation Recent Change Procedures for NOCNOG, DNHT, NOGRAC, RATPAT, DIGTRN, TOLDIG, CCOL, RI, CHRGX, DITABS, TNDM, IDDD, and TDXD (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(29) Section 231-318-305—RC Procedures for PSWD, PSBLK, SUBTRAN, and GENT (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(30) Section 231-318-310—RC Procedures for ANIDL, CAMA, CPD, JUNCT, MSN, NMTGC, PLM, ROTL, SIMFAC, CFG, TMBCGA, and CLAM (Through 1AE5 Generic Program), 2-Wire No. 1A Electronic Switching System

(31) Section 231-390-063—Feature Document—Automatic Message Accounting Feature—2-Wire No. 1A Electronic Switching System

(32) Section 660-440-010—Codes—Test Line Circuits and Communications Trunks Nationwide Distance Dialing Plan.

B. TTY Input and Output Manuals

(1) Input Message Manual IM-1A001, No. 1 Electronic Switching System

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

(3) Output Message Manual OM-1A001, No. 1 Electronic Switching System

(4) Output Message Manual OM-6A001, No. 1A Electronic Switching System.

C. Other Documentation

(1) Translation Guide TG-1A, No. 1 Electronic Switching System—2-Wire

(2) Translation Output Configuration PA-591003, No. 1 Electronic Switching System

(3) Translation Output Configurations PA-6A002, No. 1A Electronic Switching System

(4) Office Parameter Specification PA-591001, No. 1 Electronic Switching System

(5) Office Parameter Specification PA-6A001, No. 1A Electronic Switching System

(6) Parameter Guide PG-1, No. 1 Electronic Switching System, 2-Wire

(7) Parameter Guide PG-1A, No. 1A Electronic Switching System, 2-Wire

(8) Growth Recent Change (GRC) Form Manual, 2-Wire No. 1 and No. 1A Electronic Switching System, PA-591099.

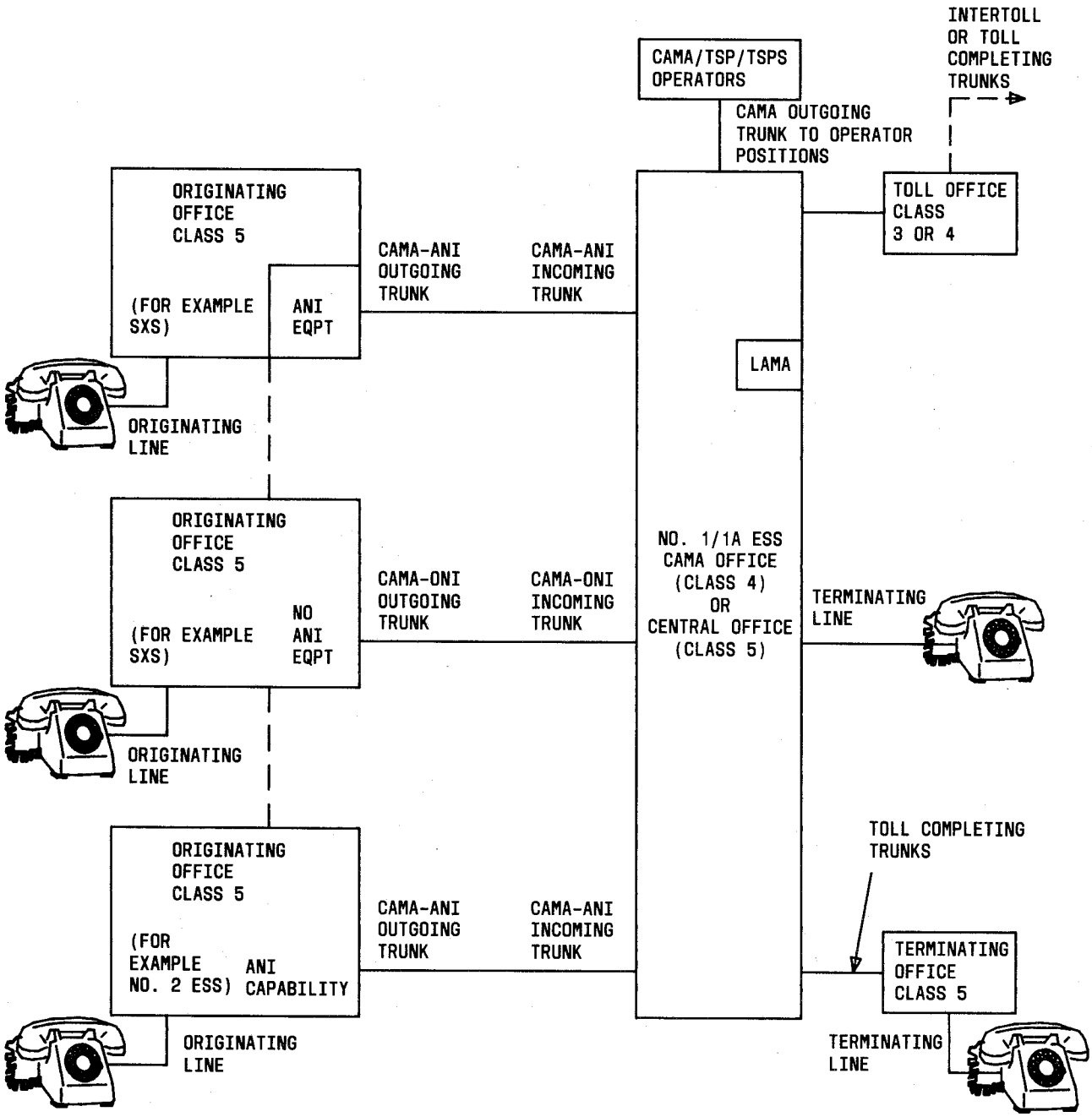


Fig. 1—Typical CAMA-ANI and CAMA-ONI Arrangement

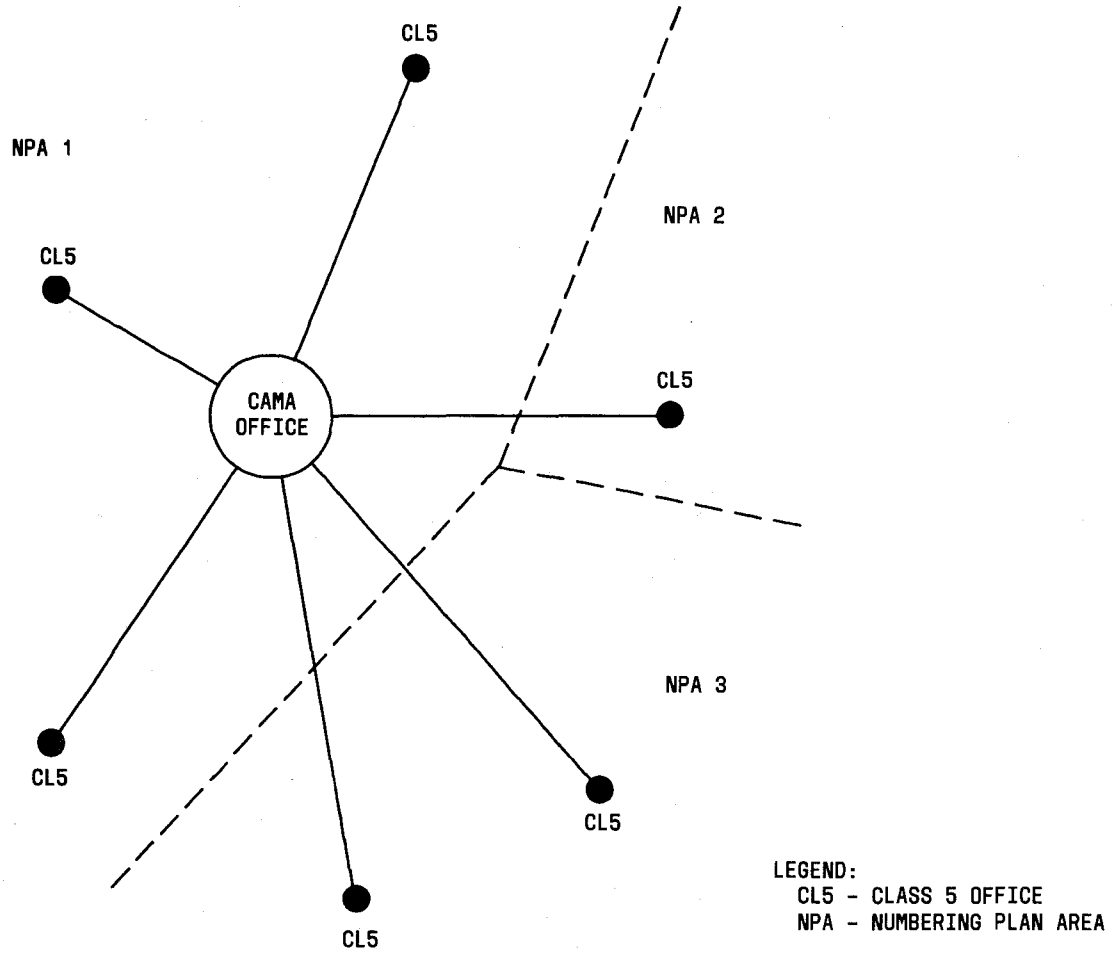
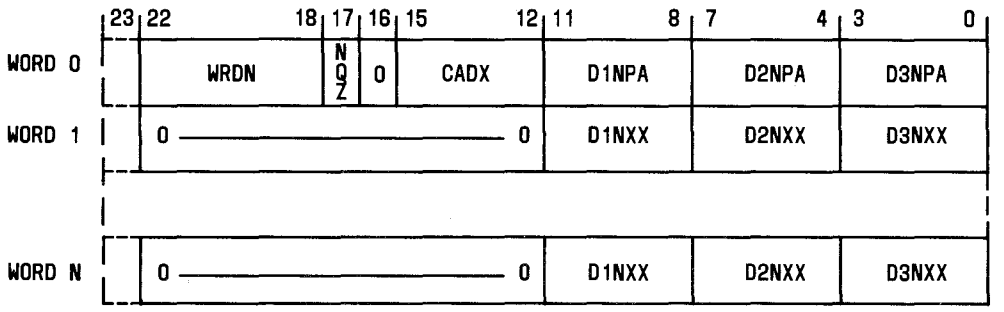


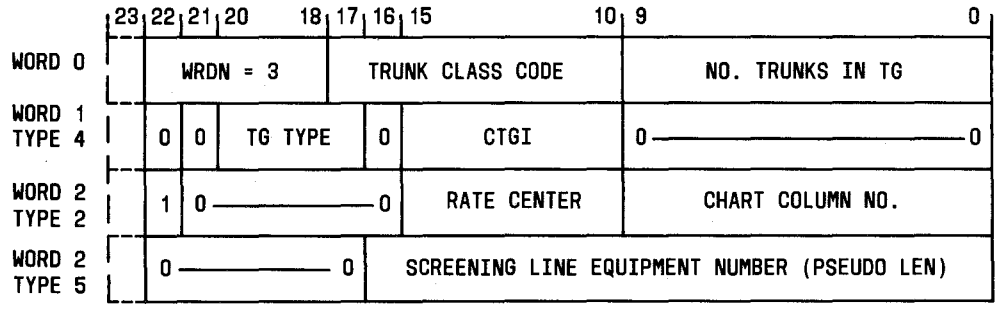
Fig. 2—No. 1/1A ESS CAMA Office Serving Three Number Plan Areas



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

LEGEND:
CADX - DIGIT X OF X11 CODE
D#NPA - DIGIT NUMBER OF NUMBERING PLAN AREA
D#NXX - DIGIT NUMBER OF VALID OFFICE NXX CODE
N - 2 THROUGH 30
NQZ - NON-QZ BILLING BIT. 0 = ALLOWED, 1 = NOT ALLOWED
WRDN - NUMBER OF AUXILIARY BLOCK WORDS FOR THIS CAMA TRUNK GROUP

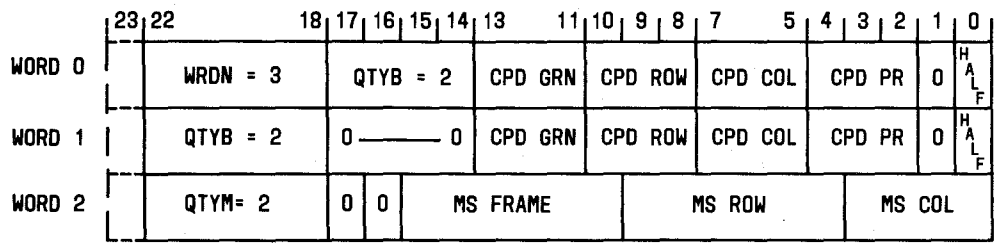
Fig. 3—CAMA Trunk Group Index Translator—Auxiliary Block Words



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

LEGEND:
CTGI - CAMA TRUNK GROUP INDEX
TG - TRUNK GROUP
WRDN - NUMBER OF AUXILIARY BLOCK WORDS FOR THIS CAMA TRUNK GROUP

Fig. 4—Trunk Group Number Primary Tables Translator—Type 8/9 Auxiliary Block Words—Trunk Group Number Table

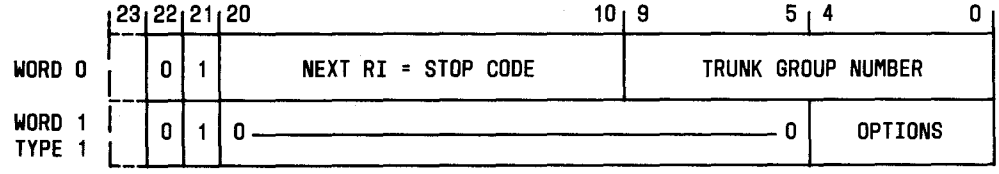


NOTES:
1. BIT 23 EXISTS IN NO. 1A ESS ONLY.
2. WORD 0 IS FOR CALL WAITING CIRCUIT (CPD00); WORD 1 IS FOR SUSPENSION CIRCUIT (CPD02).

LEGEND:
COL - COLUMN
CPD - CENTRAL PULSE DISTRIBUTOR
GRN - GROUP NUMBER
HALF - CPD HALF
MS - MASTER SCANNER
PR - PAIR
QTYB - QUANTITY OF BIPOLAR CPD POINTS
QTYM - QUANTITY OF SUPERVISORY MASTER SCANNER POINTS
WRDN - NUMBER OF AUXILIARY BLOCK WORDS PER CAMA OFFICE

Fig. 5—Unit Type Translator—Auxiliary Block Words—CAMA Calls Waiting and Suspension Circuit, Unit Type 51, Member Number 1

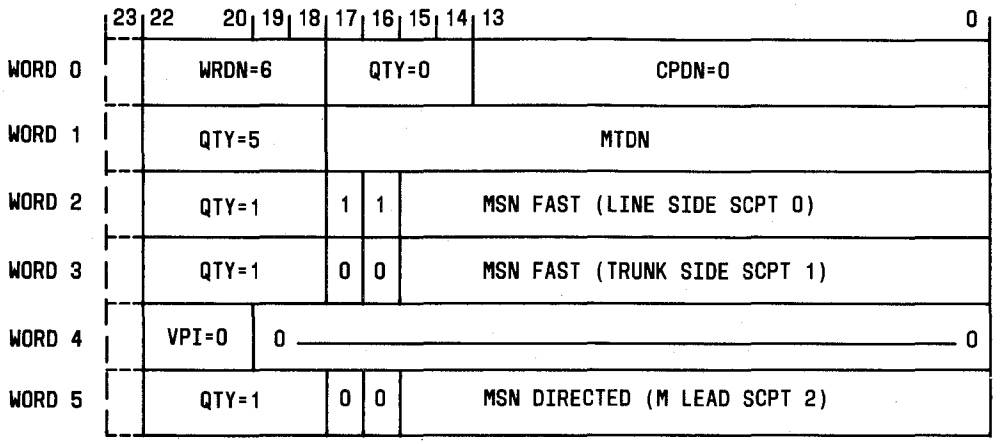
ROUTE INDEX EXPANSION TABLE FOR RI 160, 161, OR NONFIXED RI OF PRI 042



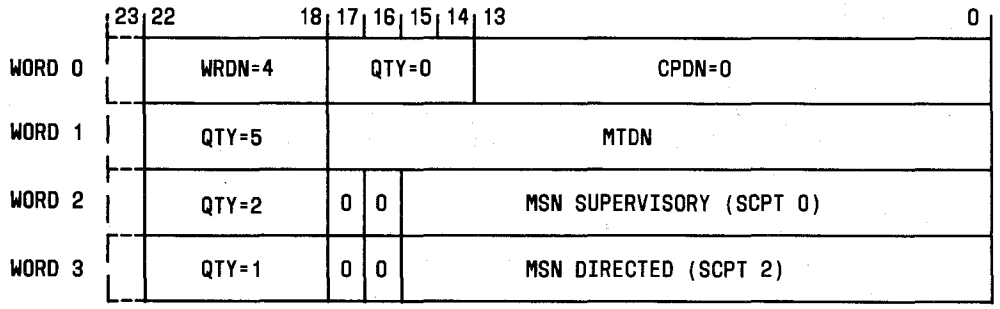
NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

LEGEND:
PRI - PSEUDO ROUTE INDEX (HILO 4-WIRE)
RI - ROUTE INDEX

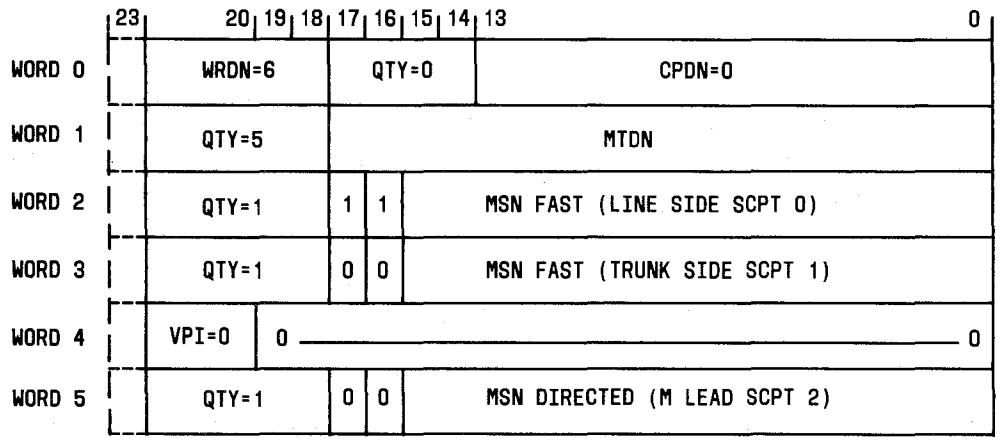
Fig. 6—Route Index Expansion Table Translator—Route Index Expansion Table Words



A. SD-1A163 CAMA INCOMING TRUNK

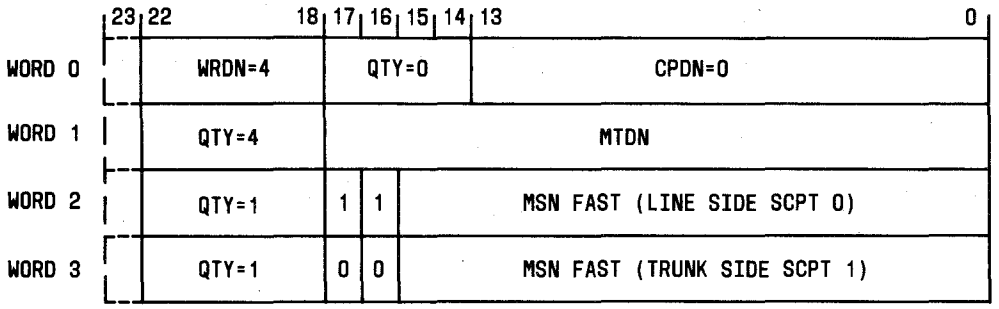


B. SD-1A236 CAMA INCOMING TRUNK



C. SD-1A237 CAMA INCOMING TRUNK

Fig. 7—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Incoming Trunks (Sheet 1 of 2)

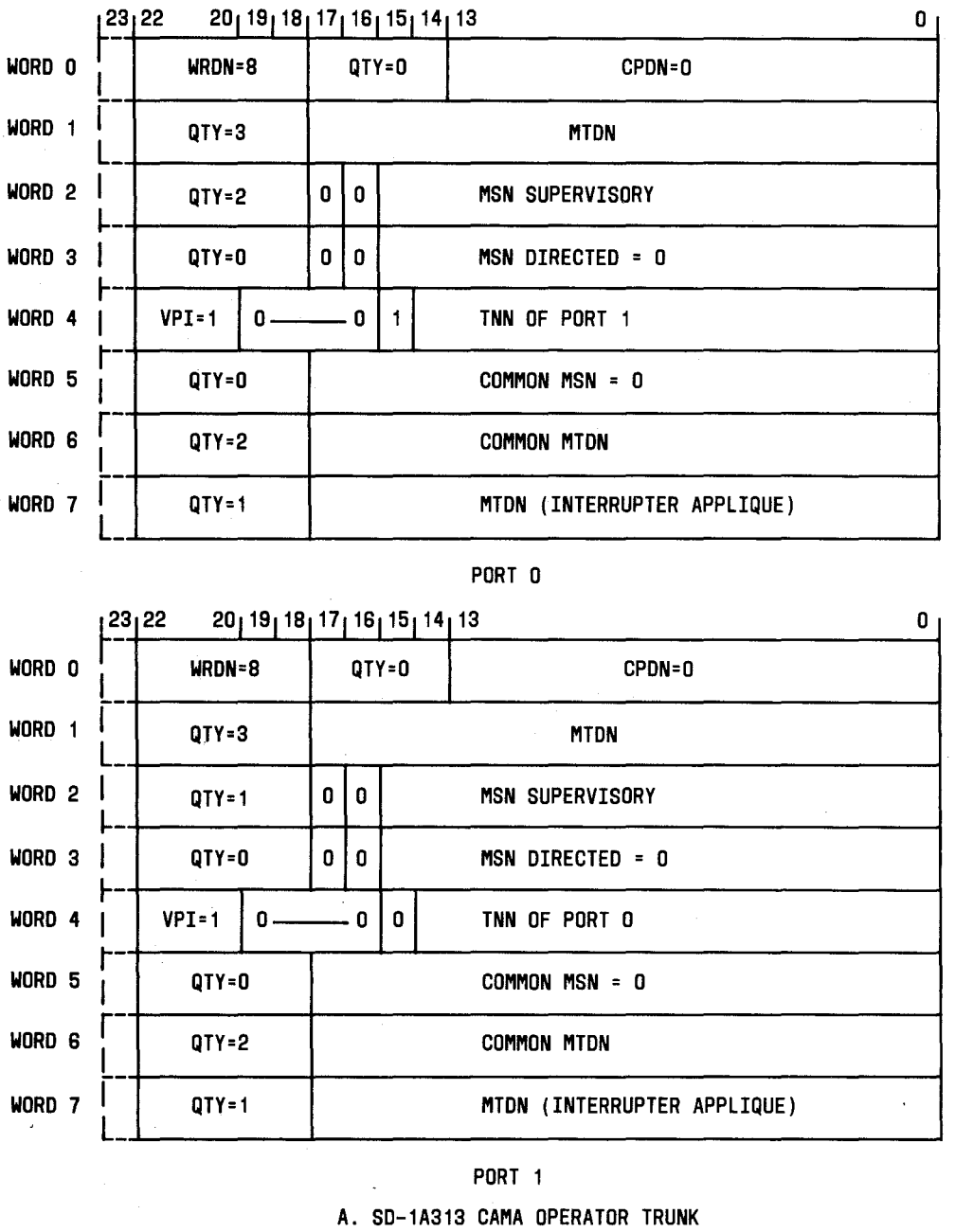


D. SD-1A311 CAMA INCOMING TRUNK

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

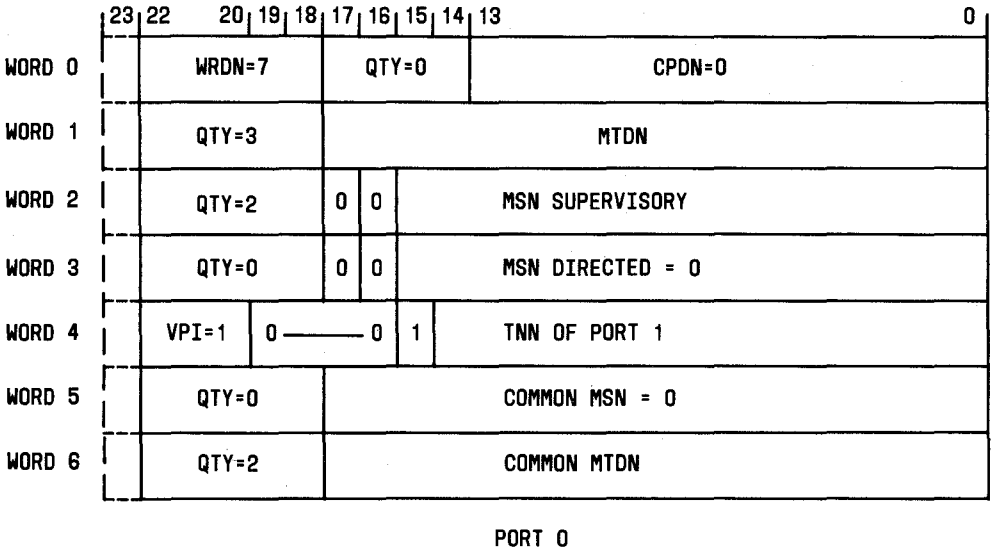
LEGEND:
- CPDN - CENTRAL PULSE DISTRIBUTOR NUMBER
- MSN - MASTER SCANNER NUMBER
- MTDN - MISCELLANEOUS TRUNK DISTRIBUTOR NUMBER
- QTY - QUANTITY
- SCPT - SCANPOINT
- VPI - VARIABLE PART INDICATOR
- WRDN - NUMBER OF AUXILIARY BLOCK WORDS

Fig. 7—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Incoming Trunks (Sheet 2 of 2)

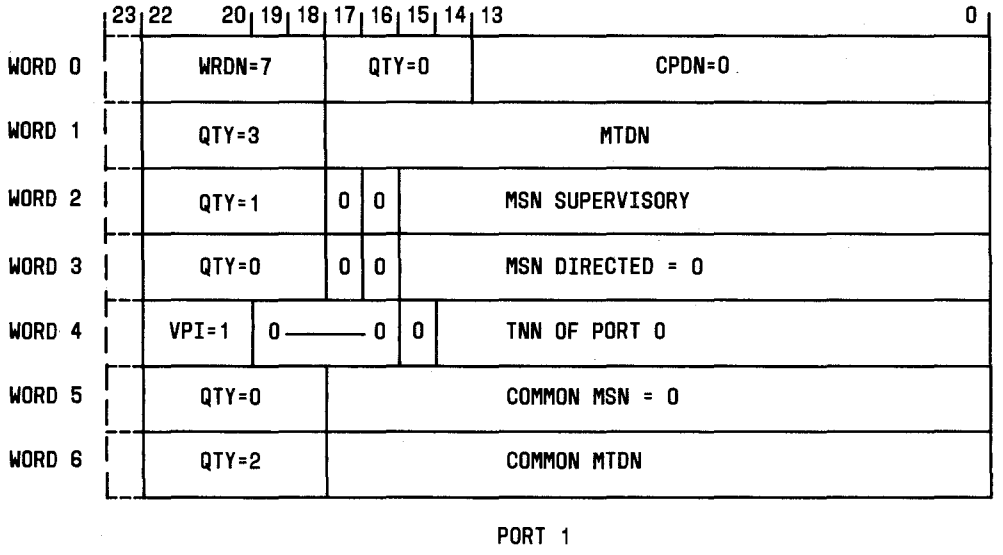


A. SD-1A313 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 1 of 7)



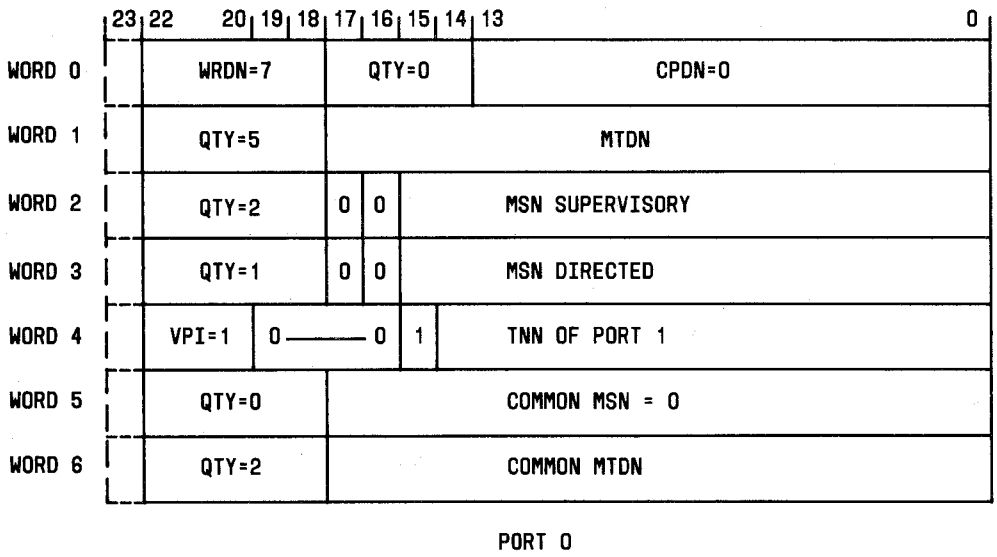
PORT 0



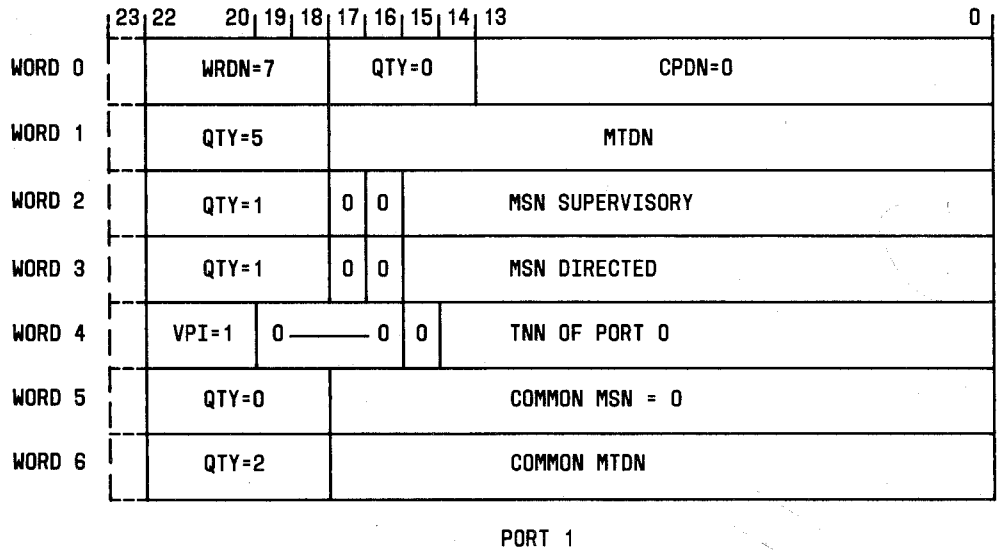
PORT 1

B. SD-1A315 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 2 of 7)



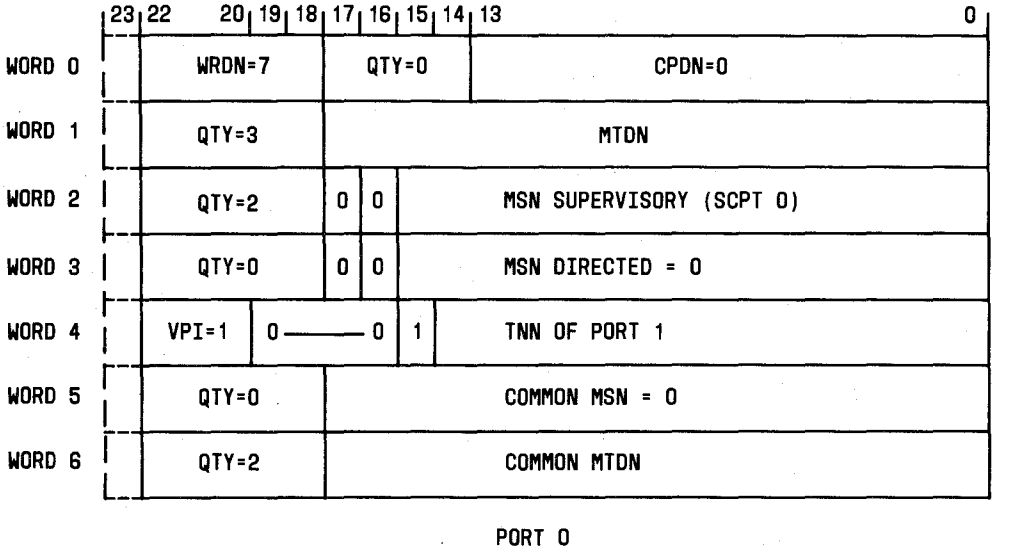
PORT 0



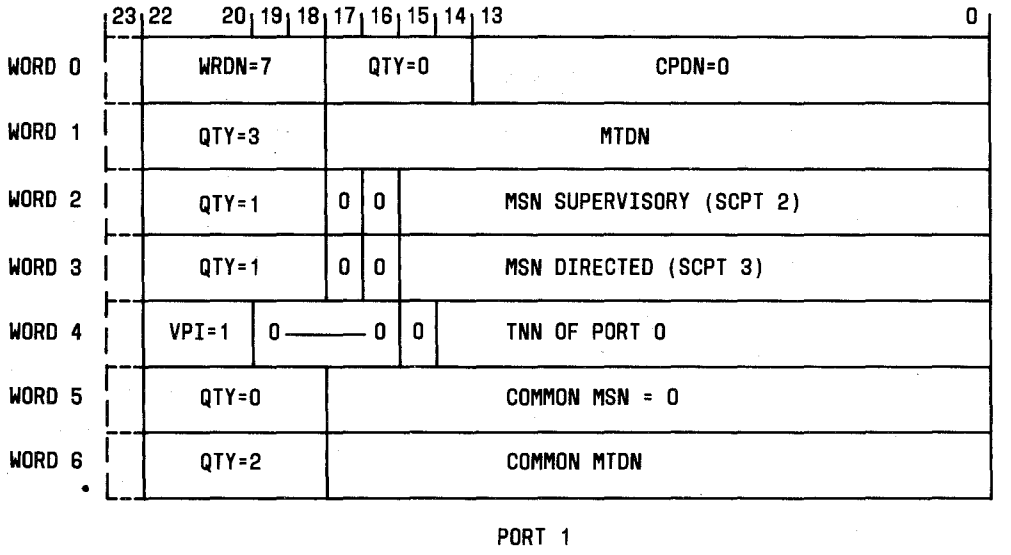
PORT 1

C. SD-1A316 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 3 of 7)



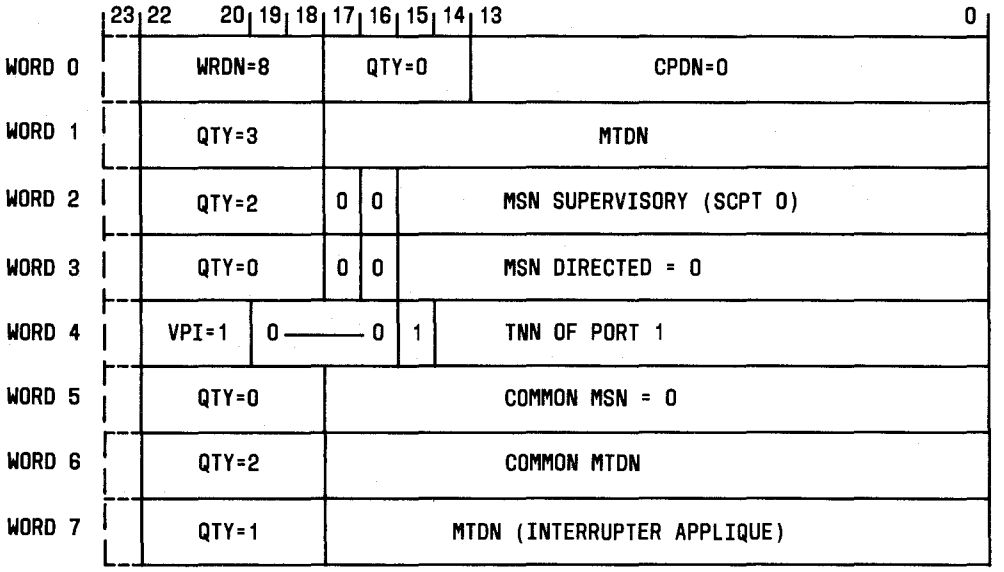
PORT 0



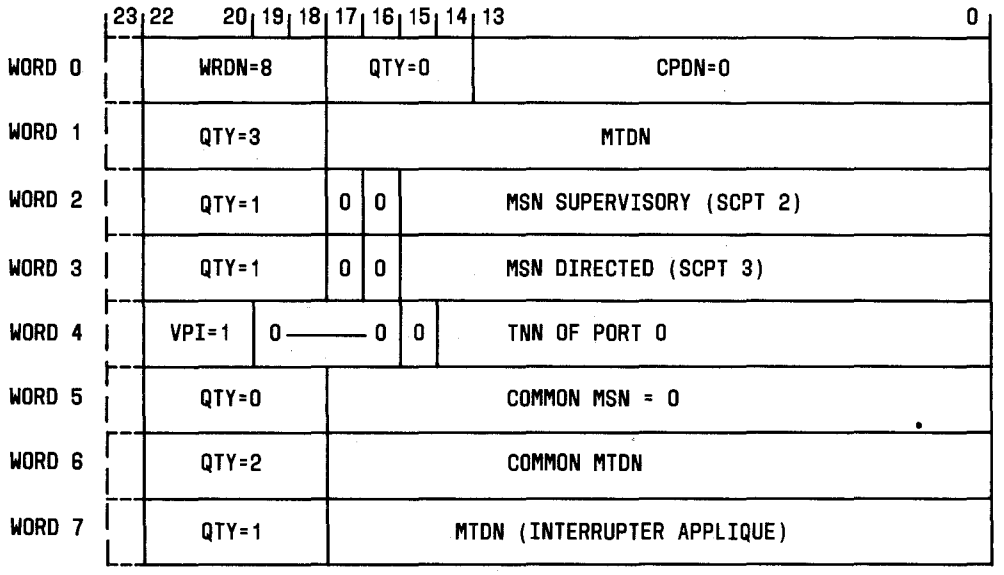
PORT 1

D. SD-1A394 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 4 of 7)



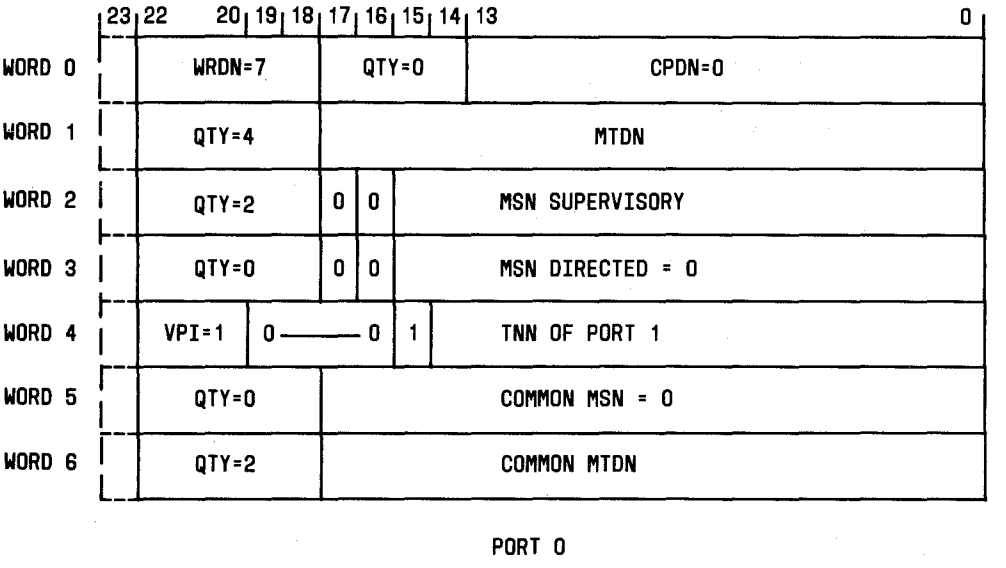
PORT 0



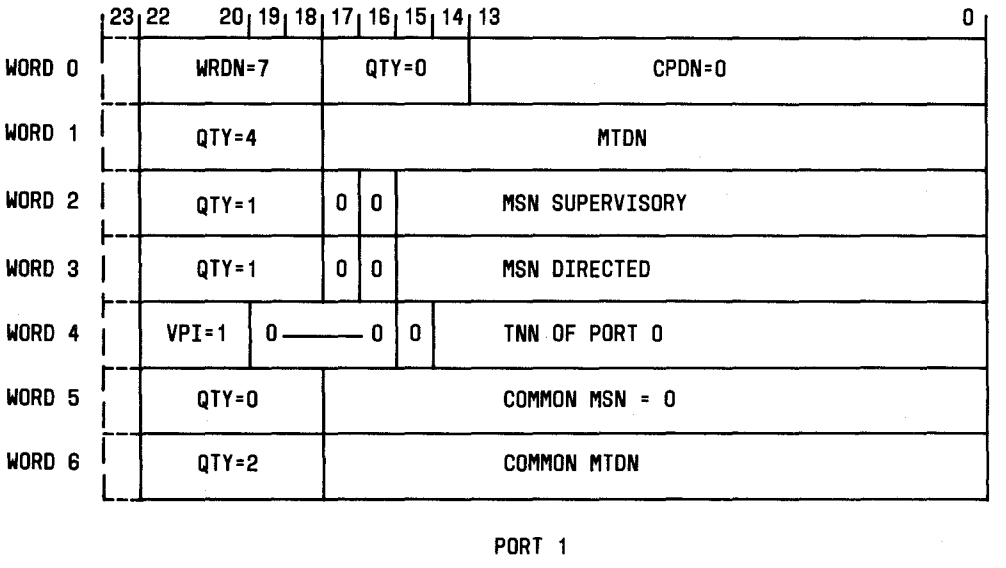
PORT 1

E. SD-1A395 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 5 of 7)



PORT 0



PORT 1

F. SD-1A484 CAMA OPERATOR TRUNK

Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 6 of 7)

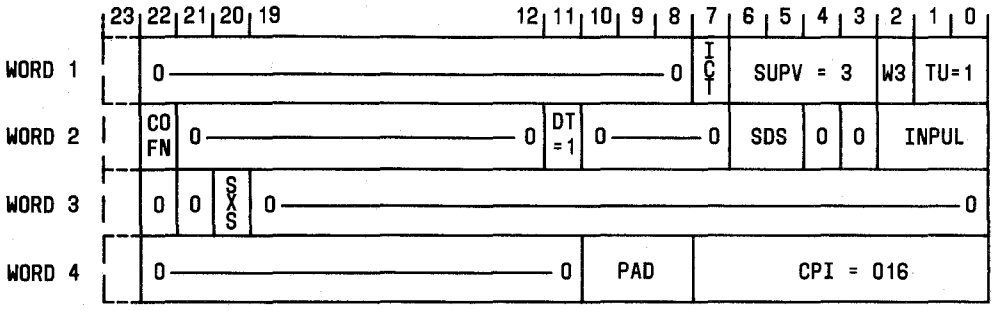
NOTES:
1. BIT 23 EXISTS IN NO. 1A ESS ONLY.

2. THE COMMON MTDN IS THE FIRST OF THE CIRCUIT, I.E., THE SAME MTDN AS IN WORD 1 OF THE PORT 0 AUXILIARY BLOCK.

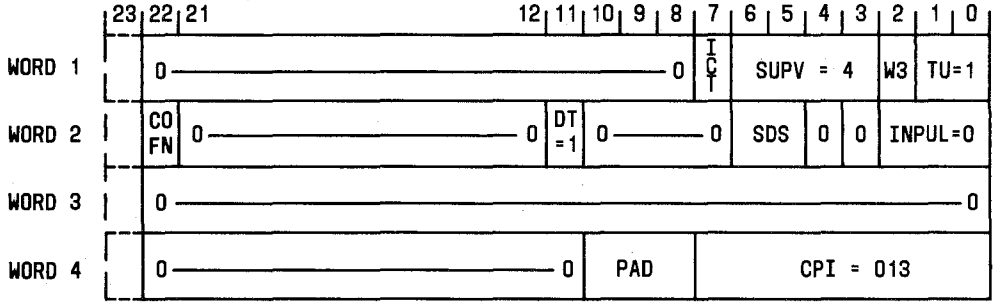
3. IN THE PORT 1 MTDN OF SD-1A394 AND SD-1A395 CIRCUITS, ONLY 2 OF 3 RELAYS ARE USED. SIGNAL DISTRIBUTOR POINTS MUST BE ASSIGNED TO BE CONSISTENT WITH EXISTING 2-WIRE CIRCUITS.

LEGEND:
CPDN - CENTRAL PULSE DISTRIBUTOR NUMBER
MSN - MASTER SCANNER NUMBER
MTDN - MISCELLANEOUS TRUNK DISTRIBUTOR NUMBER
QTY - QUANTITY
SCPT - SCANPOINT
TNN - TRUNK NETWORK NUMBER
VPI - VARIABLE PART INDICATOR
WRDN - NUMBER OF AUXILIARY BLOCK WORDS

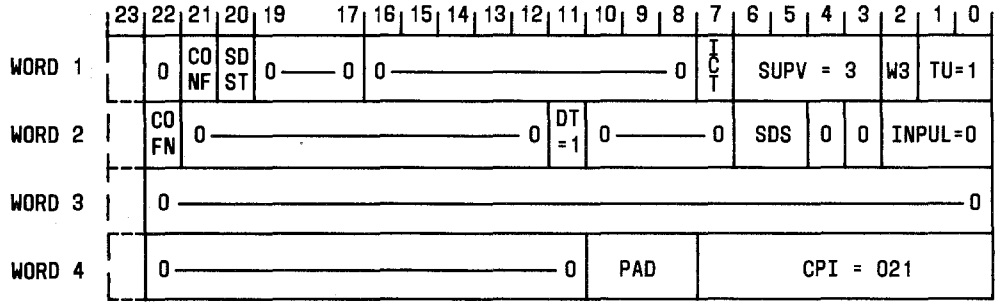
Fig. 8—Trunk Network Number to Peripheral Equipment Number Translator—Auxiliary Blocks for CAMA Operator Trunks (Sheet 7 of 7)



A. SD-1A163 (CAMA) INCOMING TRUNK

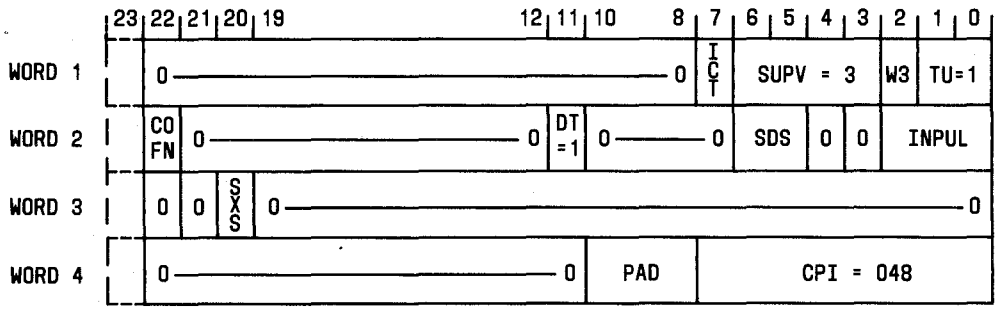


B. SD-1A192 (CAMA) INCOMING TRUNK

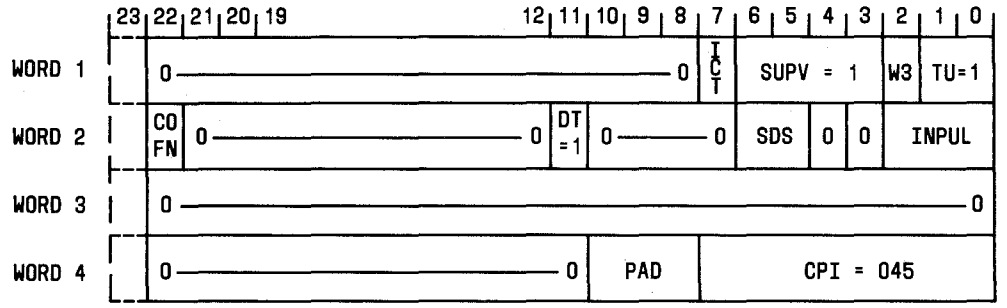


C. SD-1A236 (CAMA) INCOMING TRUNK

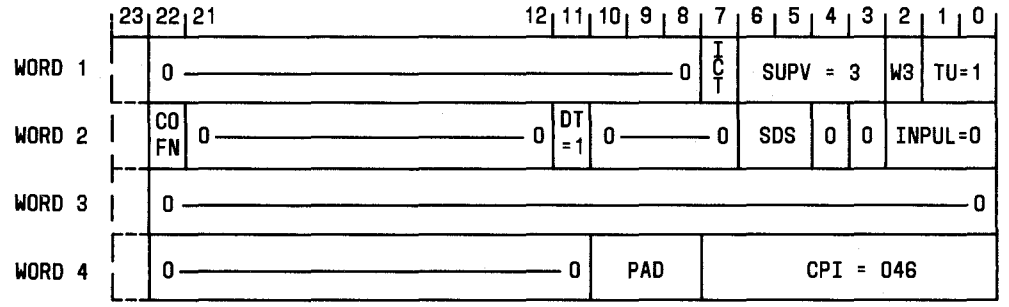
Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 1 of 7)



D. SD-1A237 (CAMA) INCOMING TRUNK

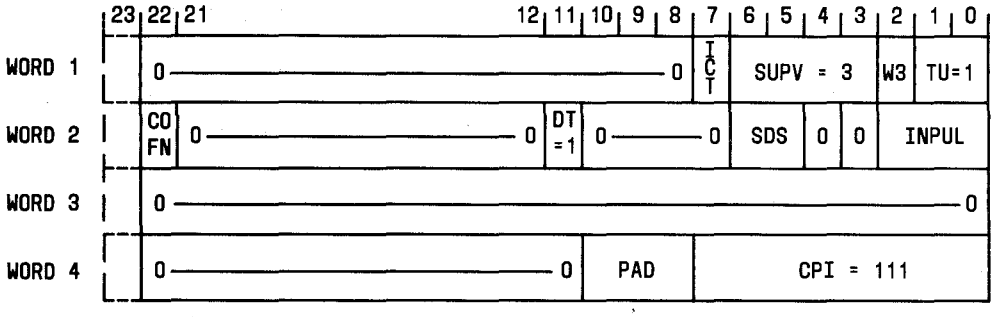


E. SD-1A311 (CAMA) INCOMING TRUNK

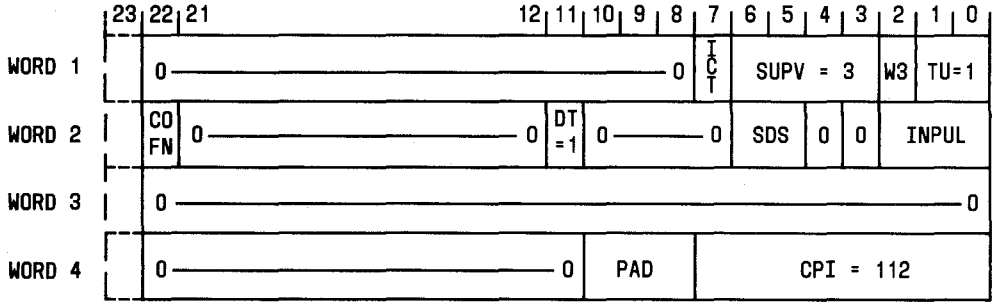


F. SD-1A312 (CAMA) INCOMING TRUNK

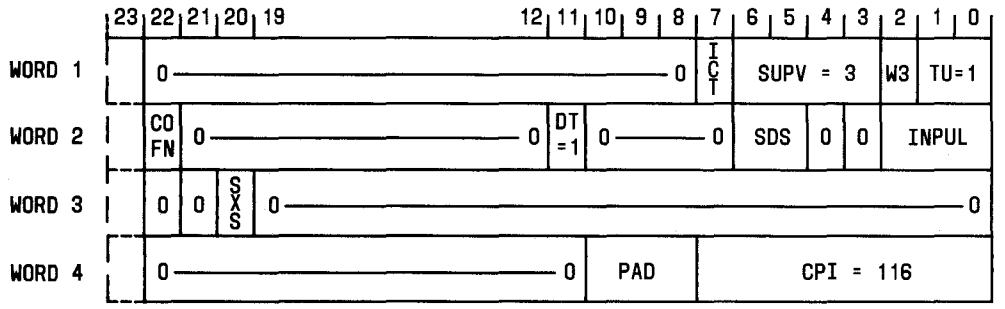
Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 2 of 7)



G. SD-1A361-01 (CAMA) INCOMING TRUNK

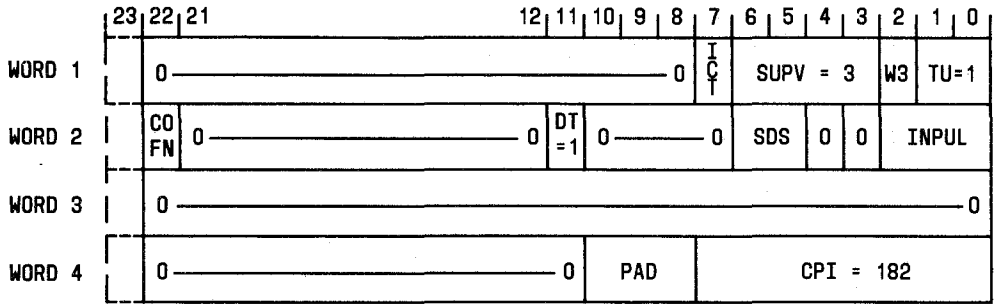


H. SD-1A362-01 (CAMA) INCOMING TRUNK

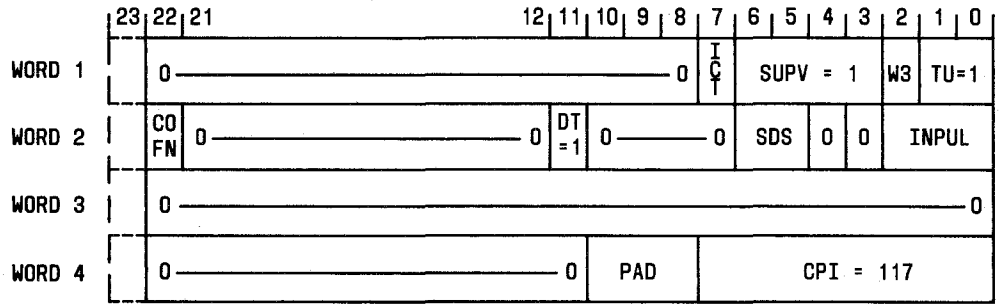


I. SD-1A366-01 (CAMA) INCOMING TRUNK

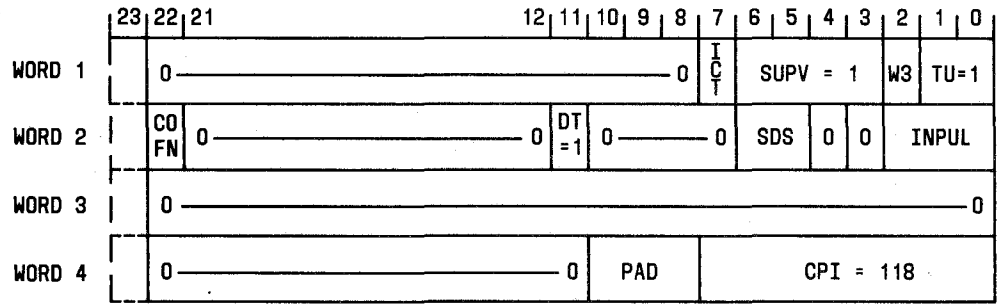
Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 3 of 7)



J. SD-1A366-02 (CAMA) INCOMING TRUNK

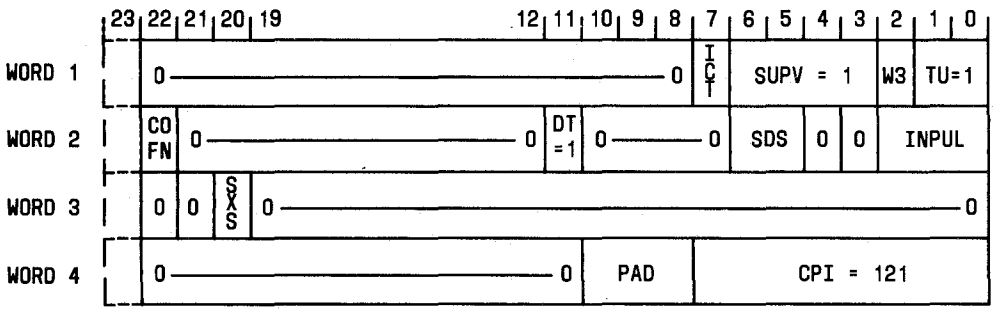


K. SD-1A367-01 (CAMA) INCOMING TRUNK

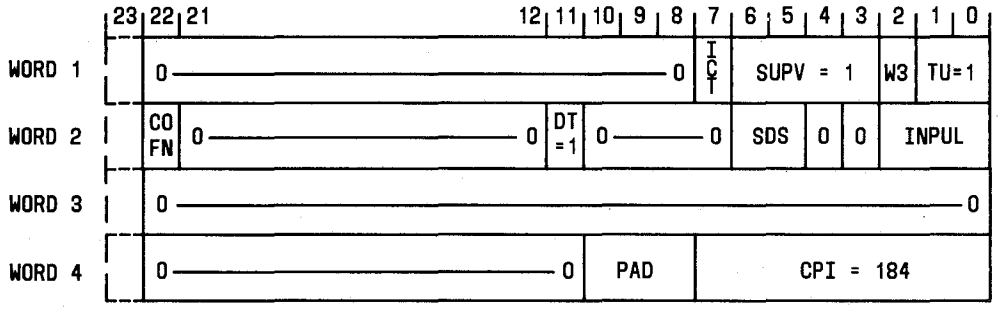


L. SD-1A368-01 (CAMA) INCOMING TRUNK

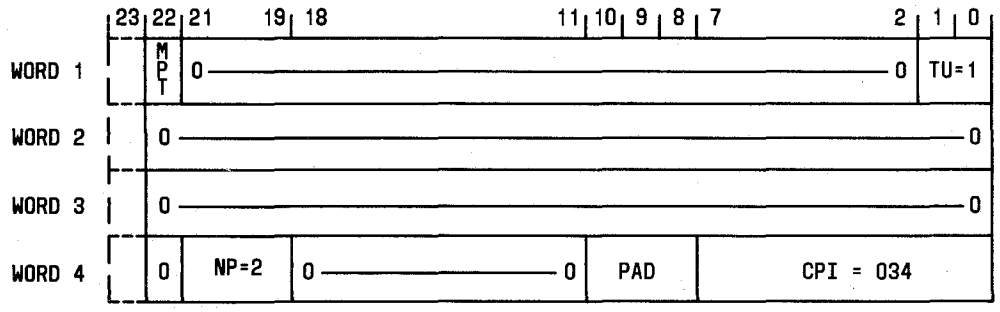
Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 4 of 7)



M. SD-1A371-01 (CAMA) INCOMING TRUNK

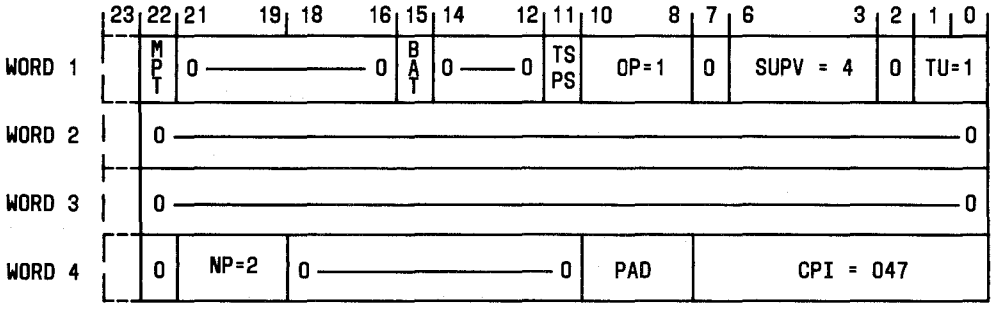


N. SD-1A371-02 (CAMA) INCOMING TRUNK

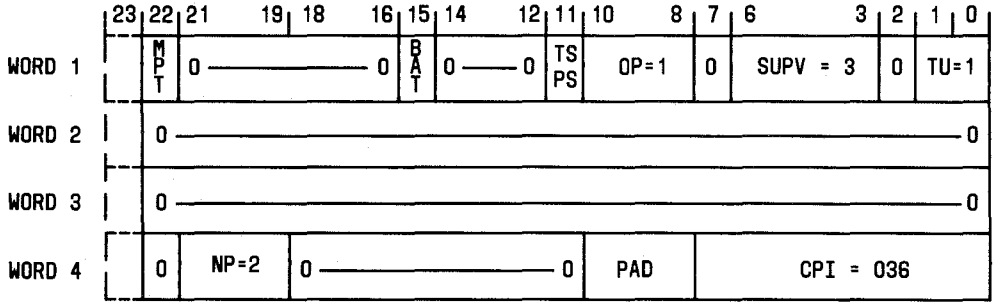


O. SD-1A313 CAMA OPERATOR TRUNK

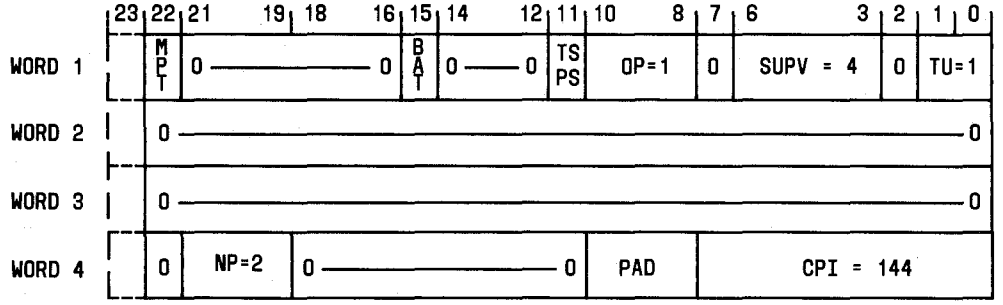
Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 5 of 7)



P. SD-1A315 CAMA OPERATOR TRUNK

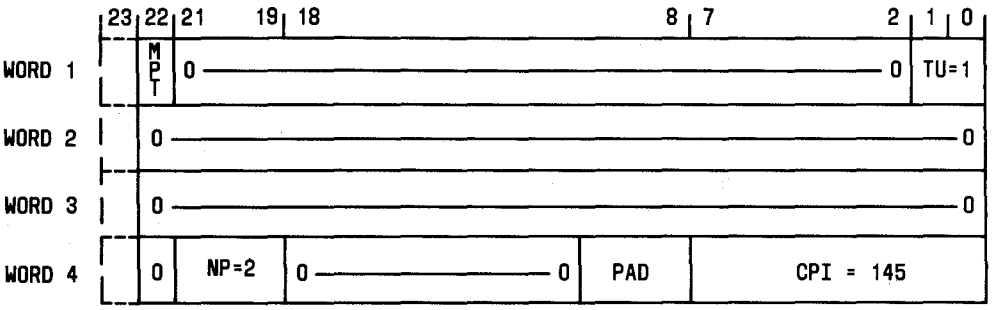


Q. SD-1A316 CAMA OPERATOR TRUNK

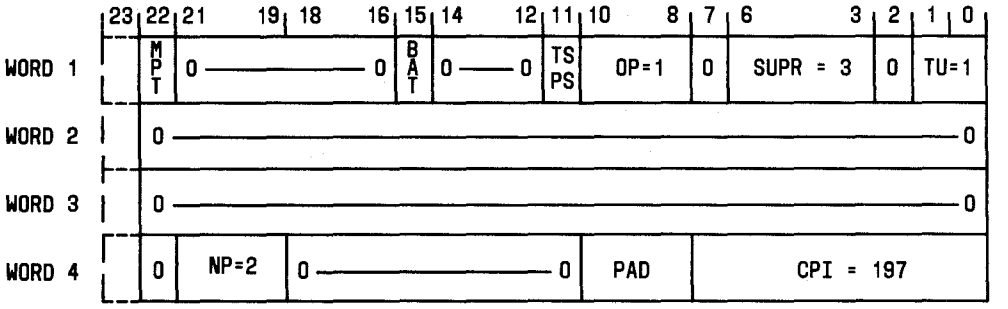


R. SD-1A394 CAMA OPERATOR TRUNK

Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 6 of 7)



S. SD-1A395 CAMA OPERATOR TRUNK



T. SD-1A484 CAMA OPERATOR TRUNK

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

LEGEND:

BAT	- BATTERY = 1 IF ON TIP, = 0 IF ON RING
COFN	- CHARGE ON FREE NUMBER = 1 IF APPLICABLE
CONF	- CONFERENCE RESTRICTED = 1
CPI	- CIRCUIT PROGRAM INDEX
DT	- DISCONNECT TIMING = 1 FOR CAMA INCOMING TRUNKS
ICT	- IDLE CIRCUIT TERMINATION
INPUL	- INPULSING = 0 FOR NONE, = 1 FOR MULTIFREQUENCY, = 2 FOR DIAL PULSE, = 5 FOR TOUCH-TONE OR DIAL PULSE
MPT	- MULTIPORT TRUNK = 1
NP	- NUMBER OF PORTS FOR MULTIPORT TRUNK
SDS	- START DIAL SINGAL = 1 FOR STEADY DIAL, = 2 FRO WINK
SDST	- START DIAL SIGNAL TIMING = 1 FOR REDUCED TRANSMITTER T
SUPV	- SUPERVISION = 1 FOR REVERSE BATTERY, = 3 FOR E & M SIGNALING, = 4 FOR HIGH-LOW REVERSE BATTERY, = 11 FOR GROUND START
SXS	- INCOMING FROM STEP BY STEP = 1
TSPS	- TRAFFIC SERVICE POSITION
TU	- TRUNK USAGE = 1 FOR INCOMING TRUNK
W3	- WORD 3 IS APPLICABLE = 1

Fig. 9—Trunk Class Code Expansion Table Translator—Trunk Class Code Expansion Tables (Sheet 7 of 7)

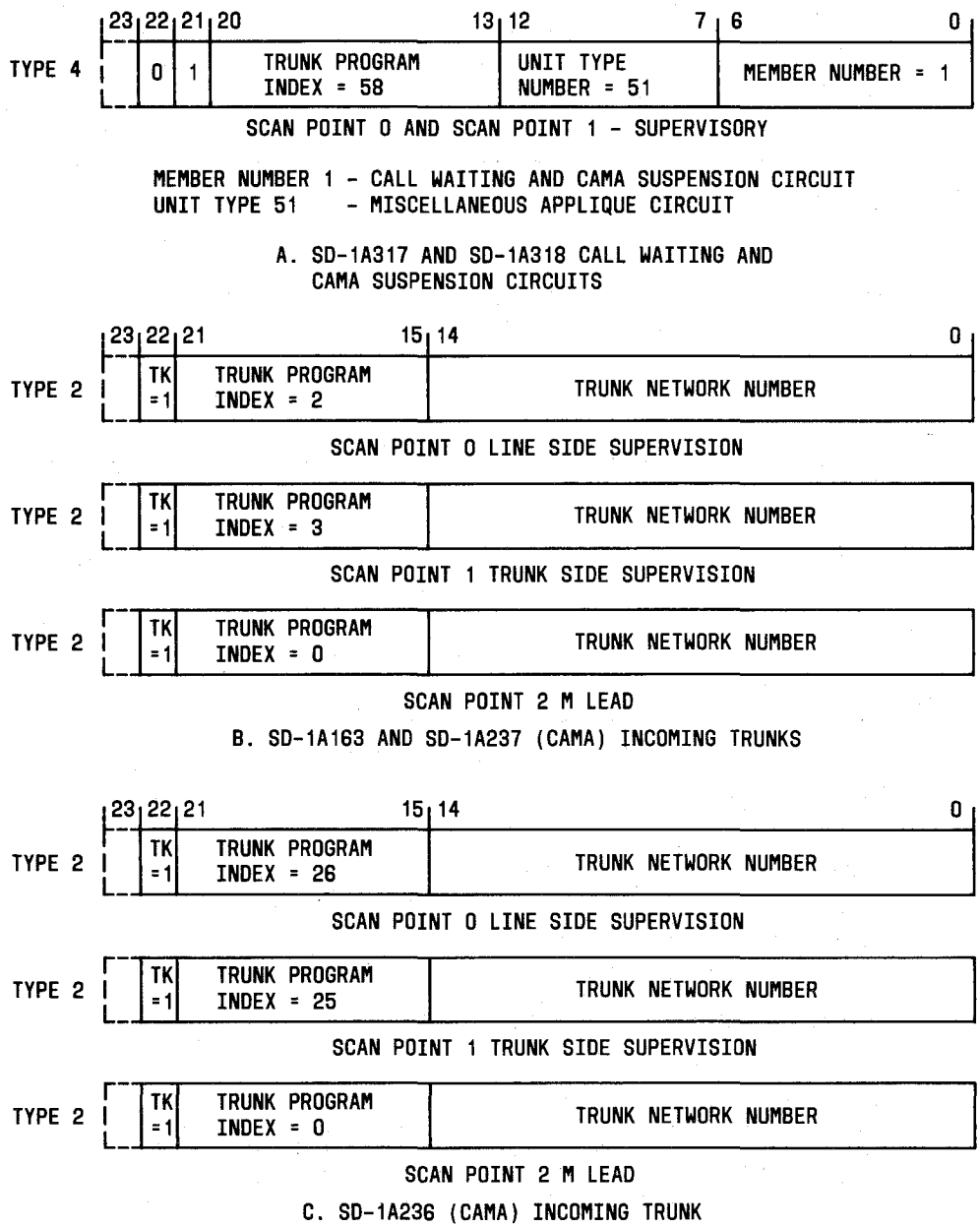


Fig. 10—Master Scanner Translator—Primary Translation Words (Sheet 1 of 4)

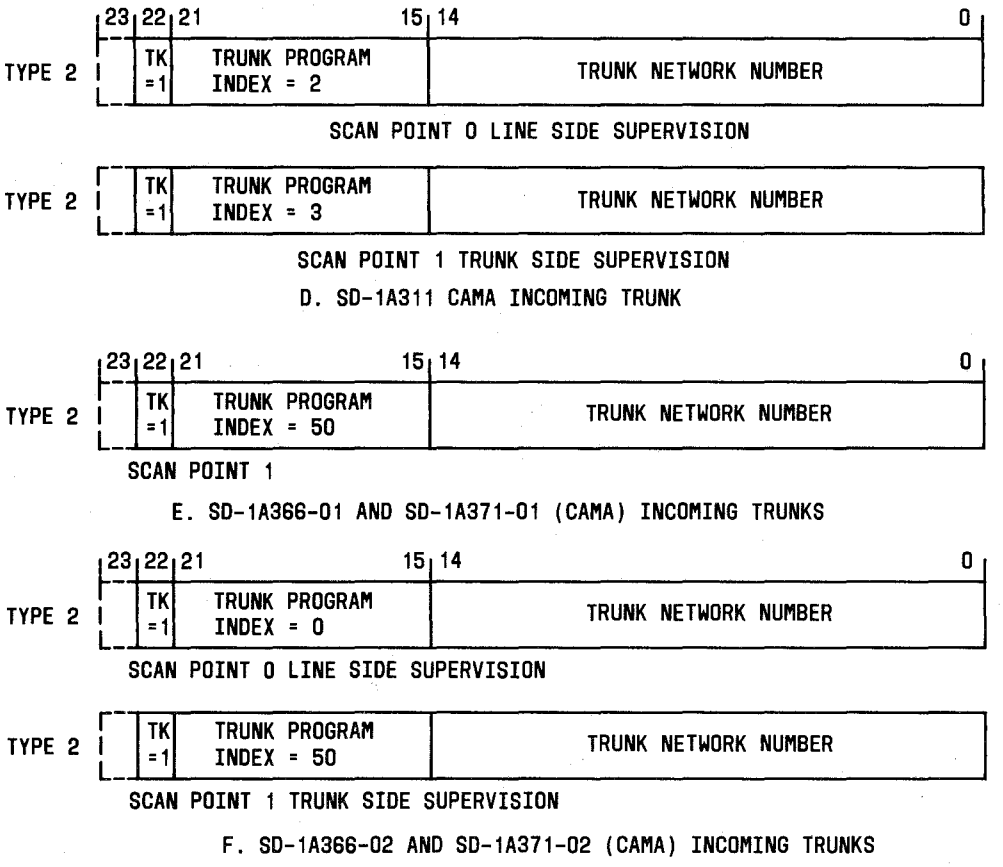


Fig. 10—Master Scanner Translator—Primary Translation Words (Sheet 2 of 4)

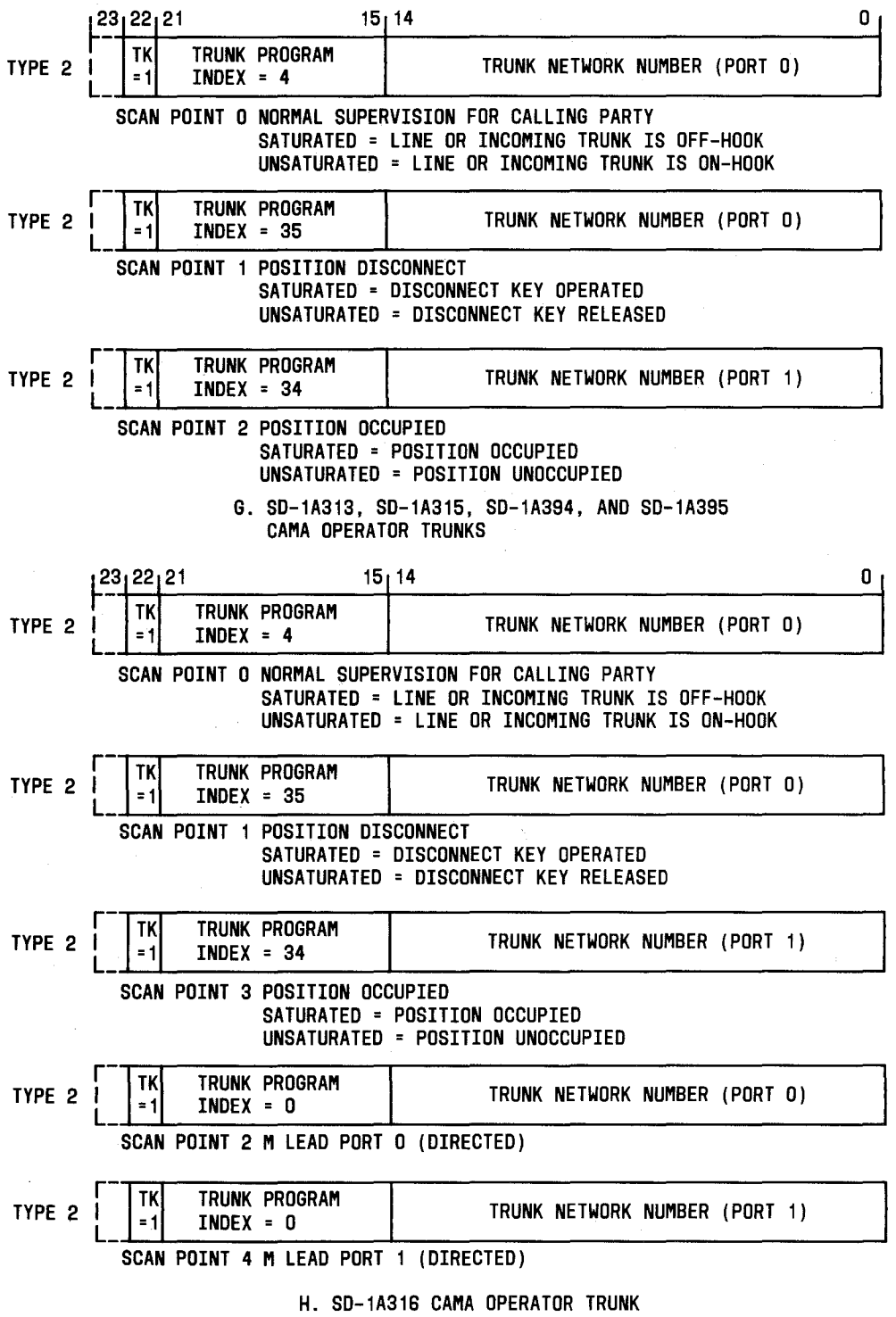


Fig. 10—Master Scanner Translator—Primary Translation Words (Sheet 3 of 4)

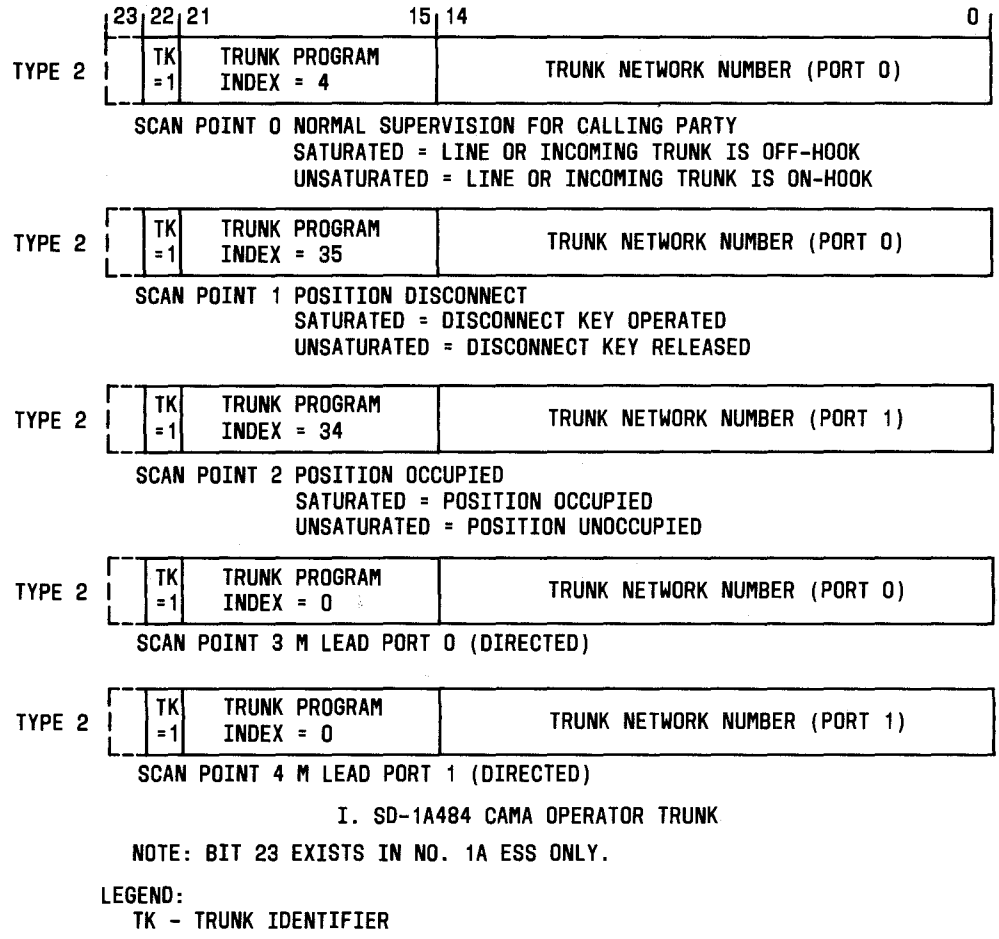


Fig. 10—Master Scanner Translator—Primary Translation (Sheet 4 of 4)

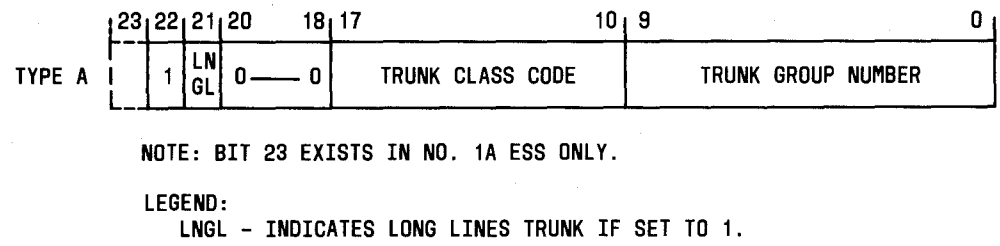
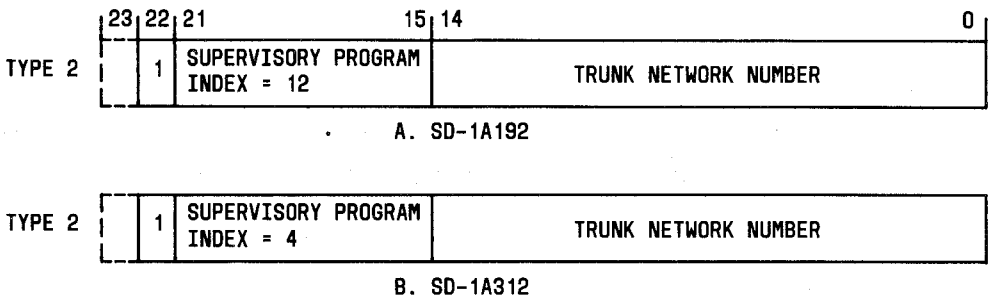
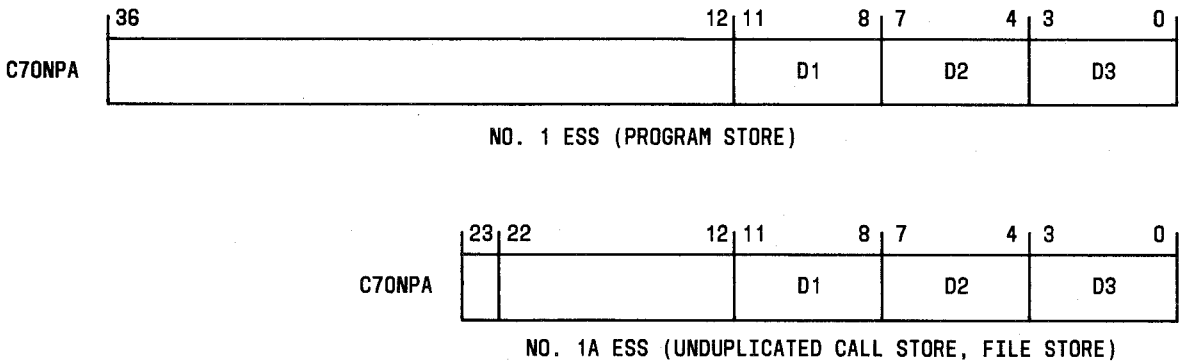


Fig. 11— Trunk Network Number to Trunk Group Number Translator—Primary Translation Word



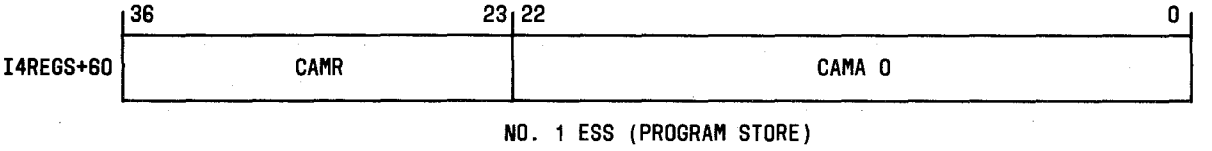
NOTE: BIT 23 EXISTS IN NO. 1A ESS ONLY.

Fig. 12—Universal Trunk Scanner Number to Trunk Network Number Translator—Primary Translation Words

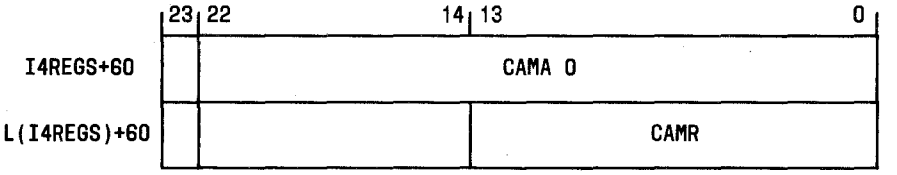


NOTE: D1, D2, AND D3 REPRESENT THE DIGITS OF THE NUMBERING PLAN AREA NUMBER WHICH THE CAMA OFFICE SERVES.

Fig. 13—Parameter Word C7ONPA—NPA (Area Code) of ESS Office



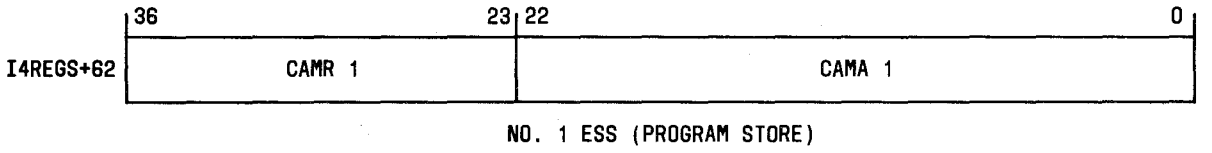
NO. 1 ESS (PROGRAM STORE)



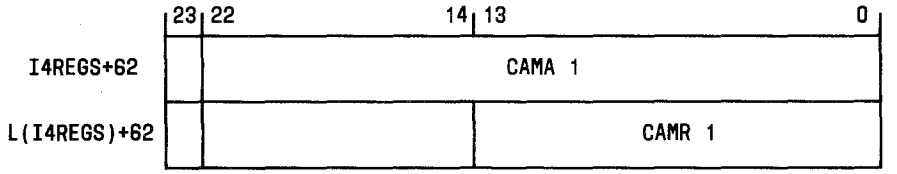
NO. 1A ESS (UNDUPLICATED CALL STORE, FILE STORE)

LEGEND:
CAMA 0 - VARIABLE CALL STORE ADDRESS OF BLOCK OF CAMA TYPE 0 REGISTERS
CAMR - QUANTITY OF CAMA TYPE 0 REGISTERS

Fig. 14—Parameter Word CAMR—Quantity of CAMA Type 0 Registers



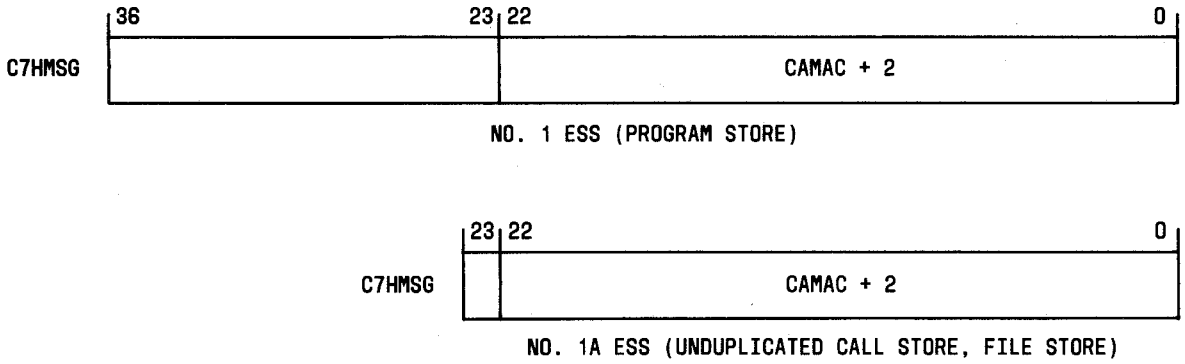
NO. 1 ESS (PROGRAM STORE)



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

LEGEND:
CAMA 1 - VARIABLE CALL STORE ADDRESS OF BLOCK OF CAMA TYPE 1 REGISTERS
CAMR 1 - QUANTITY OF CAMA TYPE 1 REGISTERS

Fig. 15—Parmeter Word CAMR1—Quantity of CAMA Type 1 Registers



NOTE: CAMAC IS A CALL STORE TABLE ADDRESS.

Fig. 16— Parameter Word C7HMSG—Pointer to CAMA Plant Measurements and Error Counts

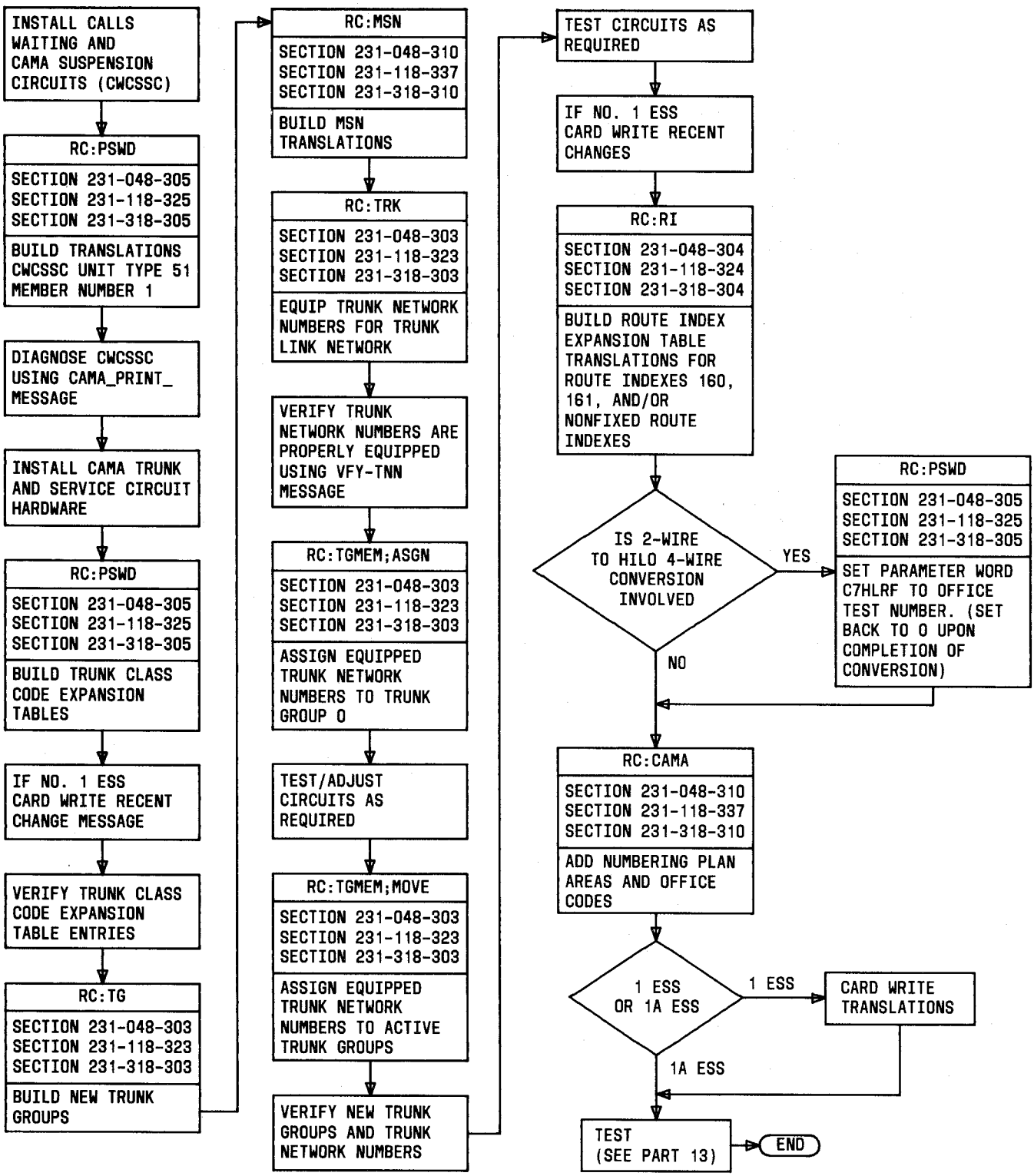


Fig. 17—Procedure to Install the CAMA Feature

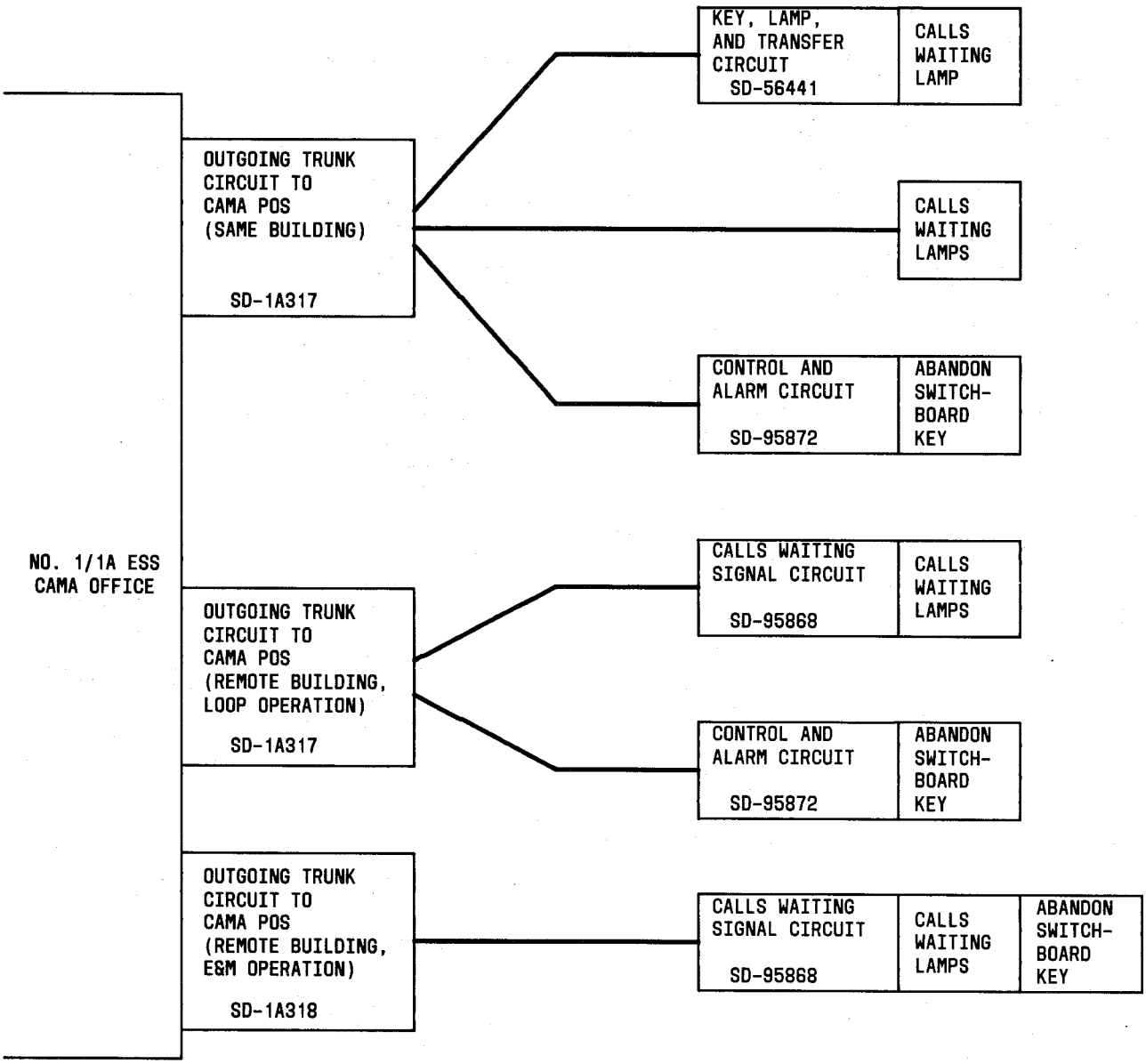


Fig. 18—Calls Waiting and CAMA Suspension Circuit Arrangement

TABLE A

NO. 1/1A ESS CAMA INCOMING TRUNKS

SD NUMBER	J NUMBER	TRUNK TYPE	SUPERVISION	CALLED NUMBER PULSING	START SIGNAL
1A163	1A033CA 1A088CA	2-Wire Misc	E&M	DP	Immediate
1A192	1A032CB 1A084CB	2-Wire Univ	Rev Bat	MF	Wink
1A236	1A033CB 1A088CB	4-Wire Misc	E&M	MF	Wink
1A237	1A033CC 1A088CC	4-Wire Misc	E&M	DP	Immediate
1A311	1A033AD 1A088AD	2-Wire Misc	Rev Bat	DP	Immediate
1A312	1A032AF 1A084AF	2-Wire Univ	E&M	MF	Wink
1A361	1A090BA	HILO Univ	E&M	MF	Wink
1A362	1A090BB	HILO Univ	E&M	MF	Wink
1A366	1A091BB	HILO Misc	E&M	DP	Immediate
1A367	1A090BC	HILO Univ	Rev Bat	MF	Wink
1A368	1A090BD	HILO Univ	Rev Bat	MF	Wink
1A371	1A091BC	HILO Misc	Rev Bat	DP	Immediate

Note: CAMA ANI calling number pulsing is always MF.

LEGEND:

DP	— dial pulse
MF	— multifrequency
Misc	— miscellaneous
Rev Bat	— reverse battery (loop)
SD	— schematic diagram
Univ	— universal

TABLE B

NO. 1/1A ESS CAMA OPERATOR TRUNKS

SD NUMBER	J NUMBER	TRUNK TYPE	REMARKS
1A313	1A033BH	2-Wire Misc	Position (not TSPS) located in same building as ESS.
1A315	1A033BJ	2-Wire Misc	Position in remote location. ICT requires loop signaling.
1A316	1A033BK	2-Wire Misc	Position in remote location. ICT requires E&M signaling.
1A394	1A033BL	HILO Misc	Position in remote location. ICT requires loop supervision
1A395	1A033BN	HILO Misc	Position (not TSPS) located in same building as ESS.
1A484	1A033BP	HILO Misc	Position in remote TSPS location. ICT requires E&M signaling.

LEGEND:
ICT — incoming trunk
Misc — miscellaneous
TSPS — traffic service position or traffic service position system

TABLE C

CALLS WAITING AND CAMA SUSPENSION CIRCUITS

SD NUMBER	J NUMBER	TITLE
1A317	1A033JM	Calls Waiting and CAMA Suspension Signaling Unit - Loop
1A318	1A033JN	Calls Waiting and CAMA Suspension Signaling Unit - E&M

TABLE D

MULTIFREQUENCY RECEIVERS

SD NUMBER	J NUMBER	TITLE
1A246	1A033DW	Multifrequency Receiver
1A379	1A033MA	Multifrequency Receiver HILO 4-Wire Switching

TABLE E

OTHER SERVICE CIRCUITS USED FOR NO. 1/1A ESS CAMA FEATURE AUDIBLE RINGING

SD NUMBER	J NUMBER	TITLE
1A218	1A032DC 1A084DC	Tone or Recorded Announcement Circuit
1A384	1A033MD	Audible Ring and Recorded Announcement HILO 4-Wire Switching

TABLE F

MF AND DP ADDRESS SIGNALING FORMATS ON CAMA INCOMING TRUNKS

CALLED NUMBER	DIGIT FORMAT					PULSING
3 digit		NXX				DP
	KP	NXX			ST	MF
7 digit		NXX	XXXX			DP
	KP	NXX	XXXX		ST	MF
10 digit		NXX	NXX	XXXX		DP
	KP	NXX	NXX	XXXX	ST	MF

Note: At present, the only valid 3-digit code is 411. However, the program does not specifically check for 411 but expects any other 3-digit codes to be routed to reorder or an announcement via the 3-digit translator.

LEGEND:
- DP — dial pulse
- KP — key pulse signal
- MF — multifrequency
- N — any digit 2 thru 9
- ST — start signal
- X — any digit 0 thru 9

TABLE G

ANI CALLING NUMBER FORMAT

DIGIT FORMAT					FUNCTION
KP	I	NXX	XXXX	ST	Identified Calls
K	I			ST	ANI failure, multiparty calls, or special trunk billing calls
KP	I				

LEGEND:
- ANI — automatic number identification
- I — information digit
- KP — key pulse signal
- NXX XXXX — calling number
- ST — start signal

TABLE H

SYSTEM PROCESSING OF CAMA OPERATOR SIGNALS

STATE \ INPUT →	FIRST DIGIT	SECOND DIGIT	THIRD DIGIT	FOURTH DIGIT	FIFTH DIGIT	SIXTH DIGIT	SEVENTH DIGIT	ILLEGAL DIGIT	RS KEY	TIME-OUT	PD KEY	ABANDON (CALLING PARTY)
-ILLEGAL NO ONNECTION) PERATOR)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR
-NORMAL IGIT OLLECTION	1 FIRST DIGIT STORED	1 SECOND DIGIT STORED	1 THIRD DIGIT STORED	1 FOURTH DIGIT STORED	1 FIFTH DIGIT STORED	3 SIXTH DIGIT STORED TIME FOR 5 SEC	2 ERROR	4 DIGITS CLEARED OPERATOR REORDER GIVEN	1 DIGITS CLEARED	2 ERROR	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
-OPERATOR EORDER (AFTER ILL DIGIT OR IME-OUT OR NVALID IGIT)	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 DIGIT IGNORED	2 ERROR	2 ERROR	2 DIGIT IGNORED	4 OPERATOR REORDER REMOVED	2 ERROR	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN
-NORMAL DIGIT OLLECTION OR 7TH IGIT (ON 5-ECOND IMING)	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	2 ERROR	7 SEVENTH DIGIT STORED TIME FOR 1 SEC	4 DIGITS CLEARED OPERATOR REORDER GIVEN	1 DIGIT CLEARED	4 DIGITS CLEARED OPERATOR REORDER GIVEN	3 PATH TAKEN DOWN OVERFLOW GIVEN TO CALLING PARTY	3 PATH TAKEN DOWN

| | | |

TABLE I

THRESHOLD VALUES

LAMPS	TEAM SIZE			
	1-2	3-4	5-10	>10
Green	1 call	2 calls	3/8 team size	1/4 team size
White	2 calls	3 calls	5/8 team size	1/2 team size
Red	3 calls	6 calls	team size	team size

TABLE J

CAMA FEATURE HARDWARE USAGE COSTS

SD—	TITLE	J—	FACILITY	SUPERVISION	TRUNK ORDER CODE	POINTS/CIRCUIT			TRUNK FRAME	UNIT SIZE	CIRCUITS PER UNIT	RATING
						SCAN	SD	CPD				
1A163-02	2-Way DP (Inc Bylink)	1A033CA	2-W	E&M	01602	1D, 2F	5	—	MTF	4″	1	Std
1A163-05	2-Way DP (Inc Bylink)	1A088CA	2-W	E&M	01603	1D, 2F	5	—	CMT	Plug-in	1	Prov
1A192-02	2-Way MF	1A032CB	2-W	Rev Bat	01358	2S	3	—	UT	Plug-in	2	Std
1A192-05	2-Way MF	1A084CB	2-W	Rev Bat	01302	2S	3	—	MUT	Plug-in	2	Std
1A218-01	Tone or Ann	1A032DC	2-W	—	07870	2S	2	—	UT	Plug-in	2	Std
1A218-05	Tone or Ann	1A084DC	2-W	—	07800	2S	2	—	MUT	Plug-in	2	Std
1A236-02	2-Way MF	1A033CB	4-W	E&M	02106	2S, 1D	5	—	MTF	4″	1	Std
1A236-05	2-Way MF	1A088CB	4-W	E&M	02108	2S, 1D	5	—	CMT	Plug-in	1	Prov
1A237-02	2-Way DP (Inc Bylink)	1A033CC	4-W	E&M	04802	1D, 2F	5	—	MTF	6″	1	Std
1A237-05	2-Way DP (Inc Bylink)	1A088CC	4-W	E&M	04803	1D, 2F	5	—	CMT	Plug-in	1	Prov
1A246-01	MF Rcvr	1A033DW	2-W	—	06570	2S, 2D, 1F	2	—	MTF	4″	1	Std
1A311-01	CAMA ICT SXS	1A033AD	2-W	Rev Bat	0451C 0459C	2F	4	—	MTF	Plug-in	1	Std
1A311-05	CAMA ICT SXS	1A088AD	2-W	Rev Bat	04503	2F	4	—	CMT	Plug-in	2	Std
1A312-01	CAMA ICT MF	1A032AF	2-W	E&M	04618	3S	4	—	UT	Plug-in	1	Std
2A312-05	ICT MF	1A084AF	2-W	E&M	04600	3S	4	—	MUT	Plug-in	1	Std
1A313-01	CAMA OGT to CAMA Pos 3C or 3CL Swbd	1A033BH	2-Port	Rev Bat	03400-03406	3S	8	—	MTF	6″	2	Std
1A315-01	CAMA OGT to Remote CAMA Pos-Loop Sig	1A033RJ	2-Port	Rev Bat	04700 04701	3S	8	—	MTF	6″	2	Std

TABLE J (Contd)

CAMA FEATURE HARDWARE USAGE COSTS

SD—	TITLE	J—	FACILITY	SUPERVISION	TRUNK ORDER CODE	POINTS/CIRCUIT			TRUNK FRAME	UNIT SIZE	CIRCUITS PER UNIT	RATING
						SCAN	SD	CPD				
1A316-01	CAMA OGT to CAMA Pos in Remote Loc	1A033BK	2-Port	E&M	03600 03602	3S, 2D	12	—	MTF	4″	1	Std
1A317-01	CWCSSC	1A033JM	—	Rev Bat	None	2S	—	4	MTF	4″	1	Std
1A318-01	CWCSSC	1A033JN	—	E&M	None	2S	—	4	MTF	4″	1	
1A361-01	2-Way HILO	1A090BA	2-W	E&M	11100	2S	3	—	H(U)	Plug-in	2	Std
1A362-01	2-Way HILO	1A090BB	4-W	E&M	11200 11201	2S	3	—	H(U)	Plug-in	2	Mfr Disc
1A362-02	2-Way HILO	1A090BB	4-W	E&M	11202 11203	2S	3	—	H(U)	Plug-in	2	Std
1A366-01	Inc Bylink HILO	1A091BB	4-W	E&M	11600	2S	3	—	H(M)	Plug-in	2	Std
1A366-02	Inc Bylink HILO	1A091BB	4-W	E&M	18200	2S	3	—	H(M)	Plug-in	2	Std
1A367-01	Inc Loop HILO	1A090BC	2-W	Rev Bat	11700	2S	3	—	H(U)	Plug-in	2	Mfr Disc
1A367-02	Inc Loop HILO	1A090BC	2-W	Rev Bat	11701	2S	3	—	H(U)	Plug-in	2	Std
1A368-01	Inc Loop HILO	1A090BD	4-W	Rev Bat	11800	2S	3	—	H(U)	Plug-in	2	Std
1A368-02	Inc Loop HILO	1A090BD	4-W	Rev Bat	11801	2S	3	—	H(U)	Plug-in	2	Std
1A371-01	Inc Bylink HILO	1A091BC	2-W	Rev Bat	12100	2S	3	—	H(M)	Plug-in	2	Std
1A371-02	Inc Bylink HILO	1A091BC	2-W	Rev Bat	18400	2S	3	—	H(M)	Plug-in	2	Std
1A379-01	MF Rcvr HL4W	1A033MA	HL4W	—	12900	1S, 2D	2	—	MTF	4″	1	Prov
1A384-01	Aud Rng & Tone Ann HL4W	1A033MD	HL4W	—	13402 13403	2S	2	—	MTF	6″	6	Prov
1A394-01	OGT to CAMA 3C, 3L Swbd, or TSPS HL4W	1A033BL	HL4W	—	14400 14401	2S, 1D	7	—	MTF	4″	1	Prov
1A395-01	OGT to CAMA or 3C, 3CL Swbd HL4W	1A033BN	HL4W	—	14500- 14505	2S, 1D	7	—	MTF	4″	1	Prov
1A484-01	HILO CAMA Oper Trunk (HICOP) to Remote TSPS	1A033BP	HL4W	E&M	19700	3S, 1D	9	—	MTF	4″	1	Prov

Note 1: SD-1A484-01 requires an SD-1A392 Interface Circuit.

TABLE J (Contd)

CAMA FEATURE HARDWARE USAGE COSTS

LEGEND:

Ann	— announcement
CAMA	— centralized automatic message accounting
CMT	— combined miscellaneous trunk frame
CWCSSC	— calls waiting and CAMA suspension circuit
D	— direct scan
DP	— dial pulse
F	— fast scan
HL4W	— HILO 4-wire
H(M)	— HILO miscellaneous
H(U)	— HILO universal
Inc	— incoming
ICT	— incoming trunk circuit
Loc	— location
MF	— multifrequency
Mfr Disc	— manufacture discontinued
MTF	— miscellaneous trunk frame
OGT	— outgoing trunk
Oper	— operator
Pos	— position
Prov	— provisional
RCVR	— receiver
Rev Bat	— reverse battery
S	— supervisory scan
SD	— schematic diagram
Sig	— signal
Std	— standard
SXS	— step-by-step
Swbd	— switchboard
TSPS	— traffic service position or traffic service position system
UT	— universal trunk
W	— wire

Note 2:

TRUNK NETWORK APPEARANCES PER UNIT			
0	1	2	6
SD-1A317 SD-1A318	SD-1A163 SD-1A192 SD-1A236 SD-1A237 SD-1A246 SD-1A311 SD-1A312 SD-1A361 SD-1A362 SD-1A366 SD-1A367 SD-1A368 SD-1A371	SD-1A192 SD-1A218 SD-1A313 SD-1A315 SD-1A316 SD-1A394 SD-1A395 SD-1A484	SD-1A384

TABLE K

NO. 1 ESS GENERIC PROGRAM WORDS

GENERIC	FEATURE GROUP	WORDS	
		FIXED	CONDITIONAL
Prior to 1E4	CAMA	5056	
Effective with 1E4	CAMA	4288	
	HLCA		896
	HL4W		8960
Effective with 1E5	CAMA		4992
	CDIS		192
	HLCA		960
	HL4W		8576
	COCO		320
Effective with 1E6	CAMA		4864
	CDIS		128
	HLCA		896
	HL4W		8448
	COCO		320

TABLE L

NO. 1A ESS GENERIC PROGRAM

GENERIC	FEATURE GROUP	WORDS	
		FIXED	CONDITIONAL
Effective with 1AE4	CAMA	5536	
	HLCA		1600
	HL4W		13248
Effective with 1AE5	CAMA		6400
	CDIS		160
	HLCA		1600
	HL4W		14176
	COCO		352
Effective with 1AE6	CAMA		6240
	CDIS		160
	HLCA		1536
	HL4W		12928
	COCO		352

TABLE M

CAMA FEATURE PROCESSOR CYCLE COUNTS

TYPE OF ICT / TYPE OF CALL	NO. 1 ESS		NO. 1A ESS	
	MF	SXS	MF	SXS
ANI Locally Completing	6986	6980	13972	13960
ANI Tandem MF4 Out	6993	7033	13986	14066
ONI Locally Completing	8759	7254	17518	14508
ONI Tandem MF4 Out	8332	7470	16664	14950
Operator Queueing (Add to Above Counts)	1216	1465	2432	2930

LEGEND:
ANI — automatic number identification
ICT — incoming trunk
MF — multifrequency
ONI — operator number identification
SXS — step-by-step