FEATURE DOCUMENT

INTERFACE WITH CUSTOMER NETWORK CONTROL CENTER FEATURE

ENHANCED PRIVATE SWITCHED COMMUNICATION SERVICE

2-WIRE NO. 1 ELECTRONIC SWITCHING SYSTEM

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FEATURE DEFINITION AND DESCRIPTION

1. DEFINITION/INTRODUCTION

DEFINITION

1.01 The interface with the Customer Network Control Center (CNCC) feature provides various types of network data on the Enhanced Private Switched Communications Service (EPSCS) in real time at the EPSCS customer premises and allows network functions to be changed at will by the customer.

INTRODUCTION

1.02 To fully comprehend this feature document the reader must be familiar with references A(2) and A(7) in Part 19. The EPSCS network is composed of a group of HILO 4-wire No. 1 ESS offices, acting as network switches providing a private network of dedicated facilities with full duplex communications on all connections. Associated with the EPSCS network is a customer center, from which the EPSCS customer can exercise monitor and control functions relative to the performance of the network, called the Customer Network Control Center (CNCC). Monitor and control messages are transmitted between the network switches (No. 1 ESS office[s] and the CNCC via a peripheral data storage processor (PDSP) colocated with the No. 1 ESS. The PDSP consists of interfacing hardware (Processor Interface Unit [PIU], Universal Data Link Controller [UDLC], and Data Link Interface Circuit [DLI]) with the No. 1 ESS, data links that are located on the peripheral interface frame, and a 3A auxiliary processor. The 3A auxiliary processor and the PIU serve as an interface between the No. 1 ESS and the monitor and control data links going to the CNCC. The monitor and control information from the No. 1 ESS via the PDSP is transmitted via a data link from the network switches to a small computer arrangement at the customer's location. This includes a status display board, cathode ray tube display, printer, magnetic tape recorder, and keyboard. The CNCC minicomputer is capable of formatting, storing, and correlating network data (see Fig. 1). This feature document covers the interface between the No. 1 ESS office and the PIU concerning the messages sent to and from the No. 1 ESS EPSCS switch to the CNCC.

1.03 The CNCC utilizing this minicomputer arrangement gives the EPSCS customer the capability to monitor and exercise limited control of certain switching and trunking functions. The customer monitors the network activity using the call datail data (traffic and circuit availability data which is automatically received by the CNCC). Control of the network stems from the capability of changing routing controlling the network configuration patterns and user authorization codes.

2. USER PERSPECTIVE

CUSTOMER

2.01 The user of the CNCC is isolated from the activities in the No. 1 ESS network switching office and therefore needs some network information data to aid CNCC personnel in exercising their control functions. The data passed between the No. 1 ESS network switches and the CNCC can be divided into the major categories (1) network information and (2) network controls.

NETWORK INFORMATION

2.02 Network information, which enables CNCC personnel to monitor the performance of the EPSCS network, consists of regularly scheduled traffic reports, event reports, and information requests and responses.

A. Regularly Scheduled Traffic Summary Reports

2.03 Traffic information provided for EPSCS consists of three types of traffic messages. These messages are half-hour trunk group traffic counts, 100-second trunk group usage, and 2-hour nonusage trunk scans (NUTS) and locked up trunk scans (LUTS).

Half-Hour Traffic Summary

2.04 A summary of trunk and access line group usage, queue usage, and conference bridge usage will be sent to the CNCC periodically on the half hour. The trunk and access line group summary will contain the incoming peg count, outgoing peg count, overflow peg count, traffic busy usage, and maintenance usage per trunk group or access line group. The queue summaries include peg counts, abandons from queue, overflow, total queue usage per queue slot, and a count for the number of calls greater than x seconds.

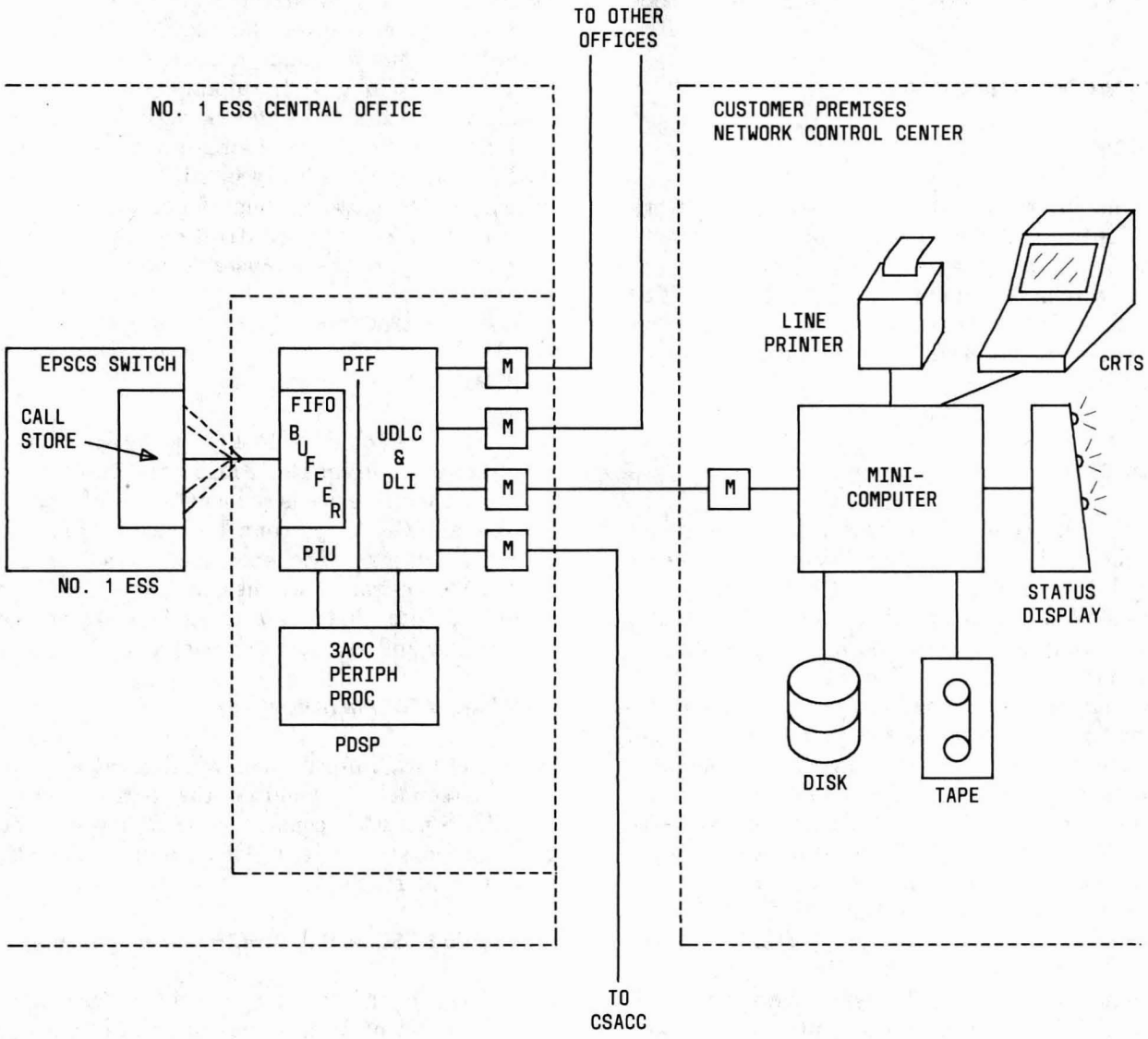


Fig. 1—No. 1 ESS Network Switch and CNCC Layout

Conference bridge usage summaries contain incoming peg count, outgoing peg count, overflow, traffic busy usage, and maintenance usage.

100-Second Trunk Group Usage

2.05 A list of all trunk and access line groups and their usage is generated periodically and sent to the CNCC to indicate circuits busy in the groups. This data is updated with scans at 100- second intervals.

2-Hour Nonusage Reports

2.06 An indication of trunks and access lines not being used is sent to the CNCC periodically at 2-hour intervals. To be included in this report a trunk or access line must not have been used during the 2-hour interval.

B. Automatic Event Reports

Message Detail Records

2.07 A message detail record is made for every originating network call. This includes all calls coming on the network over an FX trunk or network access line. There is a record for each call that terminates off-net. If a call originates and goes off-net in the same office, only the originating record is provided. However, if the call goes off-net in a different office than it originated in, a separate terminating record will be provided. In the event of call failure after all the called digits have been received, a message detail record is still provided. If the failure results in the calling party receiving tone or announcement, the record will have the answer time blank and outgoing trunk zero. If the call fails because the calling party abandons, the record will have the answer time blank and the outgoing trunk network number (TNN) if one exists; otherwise this field is blank. See reference A(5) in Part 19.

Maintenance Reports

2.08 The CNCC receives maintenance status reports from the ESS office both automatically and on request. These maintenance reports are in the nature of out-of-service circuits reports. Whenever a circuit is either removed or restored to service a real-time data message is sent to the CNCC. On removal from service, the data message contains the ESS office and circuit, the time and date, and a trouble code indicating the reason for removal.

Error and Exceptional Condition Messages

2.09 The CNCC receives messages that indicate invalid or improper CNCC commands or that indicate special circumstances that would cause the CNCC to receive incomplete information from the network switches, e.g., short holding times on trunks and calls that stay up for more than two midnights. These messages include errors or conditions recognized by both the PDSP and the No. 1 ESS.

C. Information Requests and Responses

2.10 The CNCC can make requests of the system that will result in the receipt of system configuration data. This data may be either the number of trunks per trunk group, the number of access lines per access line group, or trunk groups being queued as well as directory numbers of all the trunks or direct access lines (DALs) which have off-hook service and the directory number to which they connect. In addition, the system configuration request can include a listing of network identifications and current routing patterns in effect at the switches. The CNCC can request all the active authorization codes associated with a particular PBX, access line group, and the treatment relative to a single authorization code. Other information that can be requested is the status of network queuing (on or off) and the confirmation of conference bridge access codes. The CNC can request, at any time, a list of all out-of-service circuits (i.e., circuits in one or a combination of the out-of-service states). See Table A for a list of CNCC information request messages.

TABLE A

INFORMATION REQUEST MESSAGES

Out-of-service request
Request authorization code treatment
Basic system parameters; current routing status
System configuration; lines, trunks, and queues
Status of off-hook service controls
Status of queue controls
Audit request

2.11 A response message from the EPSCS switch occurs for every request made by the CNCC (Table A), whether a command for a control change or a request for information. In the case of control changes, the response will acknowledge the receipt of the request and confirm the implementation of the change. In the case of information requests, the network will acknowledge the request and send the data requested, assuming a legal request has been made. See Table B for a list of response messages.

NETWORK CONTROLS

2.12 The CNCC is capable of exercising defined controls over certain EPSCS features. The features or functions subject to CNCC control actions are network routing pattern selections, changes in the off-hook access line routing, changes to the user-dialed authorization codes, control of the use

TABLE B

RESPONSE MESSAGES

Identification of switching machines
Current route patterns
Line/trunk configuration
Conference bridge configuration
Circuits out of service
Status of queue controls
Status of off-hook service lines
Time and date
Reply authorization code treatment
Confirm authorization code treatment change
Confirm conference bridge
Confirm route pattern change
Confirm turn queues off/on

of the meet-me conference feature, and the ability to turn on and off the queuing feature.

A. Network Routing Controls

2.13 The CNCC may send a data message to any EPSCS switching office directing it to activate a specified routing pattern. Each network switch has access to three pre-stored routing patterns which can be internally altered only through a telephone company service order. When the pattern choice in use is changed, a message is sent to the CNCC indicating the previous and current routing pattern. A request from the control center for the identity of the pattern in current use will be answered at any time. These routing configurations help insure efficient utilization of the customer's private facilities by allowing the customer to tailor network routing according to actual network conditions.

2.14 The routing configurations govern how calls can be routed through the private network based on the called number and authorization code. Calls that cannot complete via the first-choice route can be alternate routed or can be queued to await an available facility. The routing configuration determines how the alternate routing occurs.

B. Routing Off-Hook Access Lines

2.15 Calls that enter the EPSCS network by an off-net access line (ONAL) are automatically routed to some predefined destination on the network. This destination is specified by a 7-digit EPSCS network number associated with the ONAL and is dependent on the time mode that the ONAL is in. For example, the time modes for the ONAL could be designated as day and night modes. In this case, when the ONAL is in the day mode (corresponding to business hours), one 7-digit destination will be reached; when in the night mode (corresponding to after hours, weekends, and holidays), another 7-digit destination will be reached.

2.16 The CNCC allows the network controller to select the time mode of each ONAL in the network. The CNCC also allows the controller to define the 7-digit numbers to be associated with each mode for each ONAL in the network.

C. Authorization Codes

2.17 EPSCS allows the customer to define a set of network dialing capabilities and to restrict the use of these capabilities to authorized personnel. The restrictions are enforced by requiring individuals to dial authorization codes for designated network uses. Each authorization code is assigned a class of service corresponding to distinct dialing capabilities, which can be defined by the customer through service orders. The class of service assigned to an authorization code can be determined and/or changed from the CNCC. See reference A(6) in Part 19.

2.18 Two types of authorization codes are available. Codes of the first type, called local codes, have significance only within a specific access line group; that is, the class of service associated with a local authorization code may be different for different access line groups. These codes typically begin with the digits 2, 3, 4, 5, 6, or 7 and are a fixed length of either 3, 4, 5, or 6 digits for each access line group. Codes of the second type, called portable codes, have the same meaning throughout the entire network. These codes typically begin with the digits 0, 1, 8, or 9 and are a fixed length for each customer.

2.19 The codes and their associated classes of service are stored in the network ESS switches; however, the class of service assigned to an authorization code can be set or changed from the CNCC.

D. Conferencing—Conference Coordinator

2.20 In exercising control and management of the conferencing feature, the CNCC conference coordinator is concerned with scheduling the call and assigning dialing codes to the conference originator.

2.21 When it is time for a scheduled conference call to occur, the following operations are automatically executed:

(a) Two minutes before the beginning of the call, the authorization code that is currently active for the assigned bridge is deactivated.

(b) The CNCC issues a preemption warning message which causes the preemption warning tone to be heard by all parties still on the assigned bridge.

(c) One minute before the beginning of the call, all parties are disconnected from the assigned bridge.

(d) The CNCC receives a status message verifying that the bridge is idle.

(e) On receipt of the idle message, the CNCC activates the authorization code for the conference call. As soon as the first party enters the bridge, a status message is sent to the CNCC to indicate that the bridge is in use.

2.22 Although the procedures just described are carried out automatically by the CNCC for a scheduled conference call, the conference coordinator can issue any of the commands affecting the conference call at any time.

2.23 The commands that the conference coordinator uses to manage the conference system fall into two categories. The four control commands (deactivate code, activate code, preempt, and disconnect) comprise the first category. These are commands that affect network operation and, when issued, are sent directly to the ESS machines where the appropriate action is taken. The second category includes the commands used to enter, modify, and display the information stored in the CNCC computer. These commands are provided to help the coordinator but do not directly influence the operation of the network. See reference A(3) in Part 19.

E. Queuing

2.24 The customer with the queuing feature can turn that feature on and off from the CNCC allowing for more efficient usage of network trunk circuits by providing the capability for a user to control the queuing capabilities. See reference A(4) in Part 19.

3. SYSTEM PERSPECTIVE

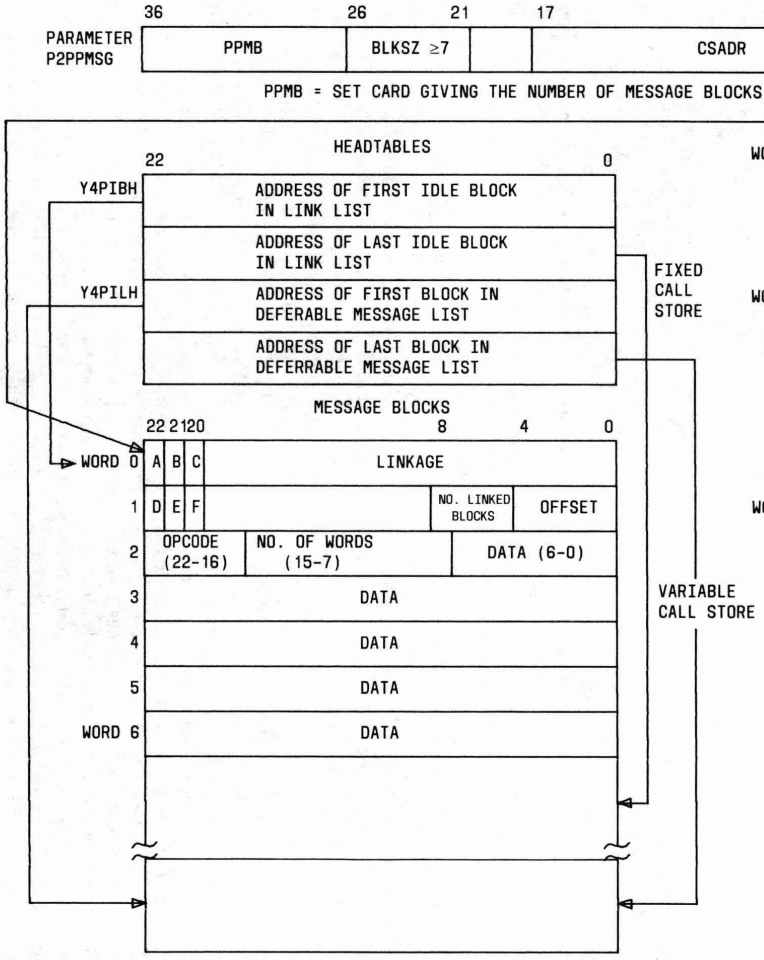
SOFTWARE DATA STRUCTURES

A. Translations

3.01 No translation data is designed exclusively for the interface with the CNCC feature.

B. Call Store

3.02 No call store was designed exclusively for the interface with CNCC; however, call store memory designed to transfer data messages from the PDSP to the appropriate No. 1 ESS application program is used by the interface with CNCC feature. Incoming messages from the CNCC are assembled in call store. The call store is organized into units called message blocks dedicated to the storage of incoming messages from the PIU. Each message block is a group of seven contiguous words. The first two words of the block are used for control purposes; the remaining words of the block store incoming message data. Messages longer than the usable length of one message block will have several message blocks linked together. If message blocks are linked together, the second word of the message block indicates the number of additional linked blocks of the message. Message blocks when not in use are organized into an idle link list using the first word in each block as a one-way linkage to the next. The first and last member of the linked list are specified in a two-word list head cell (Y4PIBH). Parameter word P2PPMSG acts as a pointer to these blocks of call store. Some messages received by the No. 1 ESS from its associated CNCC via the PDSP do not require immediate action. An OPCODE transfer table contains a priority indicator for each entry indicating if a message is deferrable or requires immediate action. If the messages are deferrable (when emptied from the FIFO buffer and stored in message blocks), they are placed on a deferrable list of message blocks linked together and headed by a 2-word head table Y4PILH. (See Fig. 2.)



WORD 0
- A = BLOCK IN USE (=1). BUSY BIT
- B = FIRST BLOCK IN MESSAGE (=1)
- C = TIME-OUT BIT (SET TO 1 BY AUDIT)
- LINKAGE = ADDRESS OF NEXT BLOCK WHEN ON IDLE OR DEFERRABLE LINKED LISTS OR WHEN PART OF A MULTIBLOCK MESSAGE

WORD 1
- D = POLARITY BIT, USED ON DEFERRED MESSAGE LIST TO DETERMINE IF MESSAGE WAS THERE AT ENTRY TIME OR JUST PUT ON LIST FOR NEXT CLASS 'E' ENTRY
- E = LONG (TIME) MESSAGE BIT
- F = BLOCK RETURNED BIT IS USED BY THE PDSP WHEN A CONFIRMATION MESSAGE IS SENT TO IT
- BITS 5-7 = NUMBER OF ADDITIONAL LINKED BLOCKS ON THIS MESSAGE
- BITS 0-4 = OFFSET OF LAST WORD USED IN THIS BLOCK

WORD 2

THIS IS THE FIRST DATA WORD OF MESSAGE. IT CONTAINS THE MESSAGE HEADING. CONSISTING OF OPCODE (BITS 16-22) AND NUMBER OF WORDS (BITS 7-15) IN MESSAGE.

Fig. 2—Call Store Message Block Layout

FEATURE OPERATION

A. General

3.03 The No. 1 ESS interfaces with the CNCC via a peripheral interface unit (PIU) and its PDSP. The peripheral processor interfaces with other peripheral processors in the network and the CNCC via standard data links. The message data from the CNCC is sent to the PDSP in a header, body, and trailer type format which is loaded into a first-in, first-out (FIFO) buffer. The FIFO buffer is part of the PIU. The ESS processor interface unit program, which enables No. 1 ESS call processing programs to communicate through the PIU, unloads the FIFO buffer into a block of call store referred to as a message block. Each message block contains a distribution code (OP CODE) which routes the message block to a message distribution transfer table in the processor interface unit program. The transfer table routes the message block to the proper program segment for further processing. This further processing is performed by the EPSCS features administrative programs used to provide the customer feature capabilities. The administrative programs perform the actions specified in the input mesages from the CNCC, or send data to the CNCC routinely, or when an event occurs in the network switch of importance to the CNCC. Upon completion, the reply information can be taken out of registers and immediately sent to FIFO or stored in call store and sent to the FIFO one word at a time. The FIFO is 300 words long, and the information sent to the FIFO must fit into this 300 word restriction. All the information loaded into the FIFO buffer must contain a header, body, and trailer or it will be discarded. Therefore, the length of a message sent to the CNCC is limited to 300 words including the header, body, and trailer.

B. Regularly Scheduled Traffic Summary Messages

3.04 The EPSCS regular scheduled traffic messages sent to the CNCC must be scheduled by the ESS. Of the regularly scheduled reports only the half-hour report has a manual mechanism for inhibiting or enabling the report. The EPSCS half-hour report receives indirect entry via the selected traffic data to customer features (CTRF) 15-minute main program entries. The CTRF entries are set up by a traffic map. The main program looks at the traffic map every 15 minutes and enters CTRF with a customer traffic group (CTFG) number requesting a report at that time. In the CTRF program the CTFG numbers are checked for EPSCS. If an EPSCS CTFG is found, a main program event flag is set to begin transmitting those EPSCS customer half-hour counts.

3.05 The 100-second message and NUTS messages are scheduled by the main program every 100 seconds and 2 hours, respectively. There is no provision to inhibit or enable either of these messages. When an entry is received from the main program, each CTFG (1 through 22) is checked for EPSCS. If an EPSCS CTFG is found, the corresponding data is transmitted.

3.06 Similar to messages from the CNCC, messages from the ESS follow a common format. Traffic messages are in a header, body, and trailer format. The header and trailer format is identical for all three traffic messages. The header consists of one word containing the message subtype and the EPSCS customer ID. The trailer (one word) consists of a segment number for segmented messages, a completion code, and the number of ESS words in the transmission including the header and trailer. (See Fig. 3.)

3.07 The body of each traffic message is different except for one word in each segment, the segment identification word, which follows the header and contains the time of day the report began. The body of the half-hour traffic summary contains the traffic counts of the trunk groups or queues within a customer's CTFG auxiliary block (ESS 1406).

3.08 The counts transmitted for a trunk group are incoming peg, outgoing peg, overflow, traffic busy usage, and maintenance usage. The counts transmitted for a queue are peg count (number placed on queue), abandon from queue, overflow, usage, and calls greater than X seconds. These counts are specified within the auxiliary block by type measurement code (TMC). The order of the TMC is restricted to minimize searching of the auxiliary block to send the traffic counts in a predetermined order. There are four acceptable sets of TMCs: queue group, 2-way trunk group, 1-way incoming trunk, and 1-way outgoing trunk group. (See Fig. 3.)

3.09 The body of the 100-second message contains the usage of every trunk group or queue within a customer's CTFG auxiliary block (see Fig. 4). There may be as many as 49 trunk groups

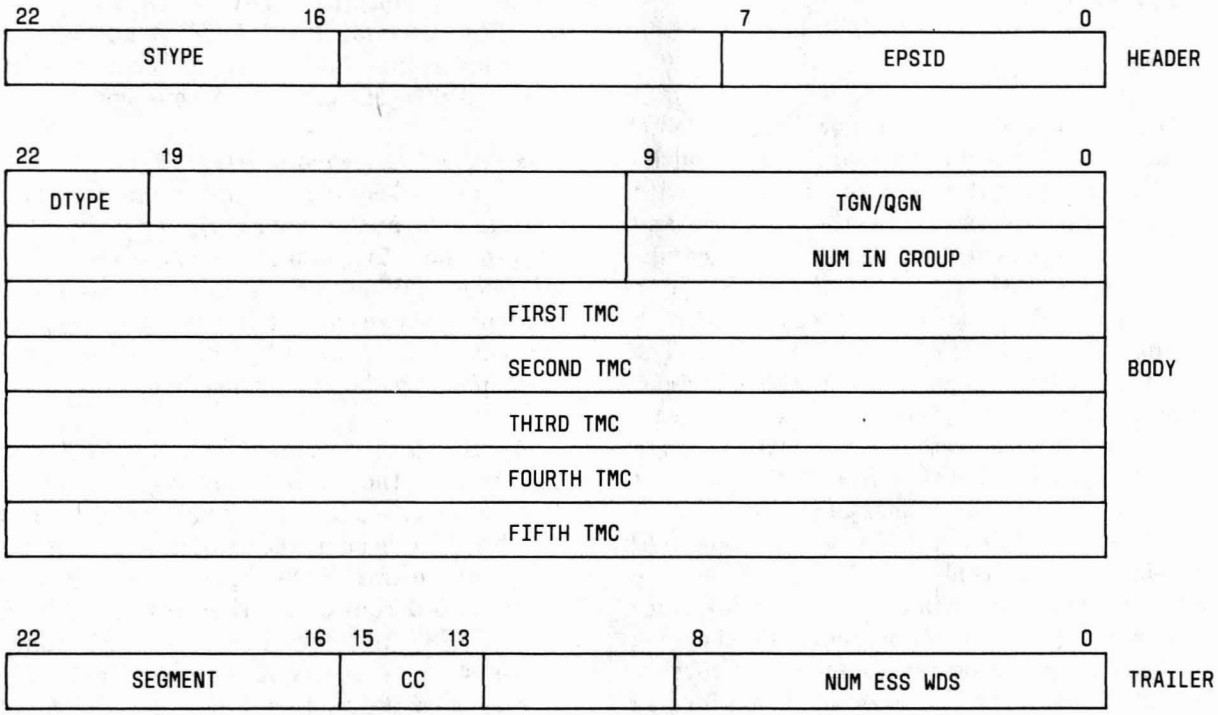
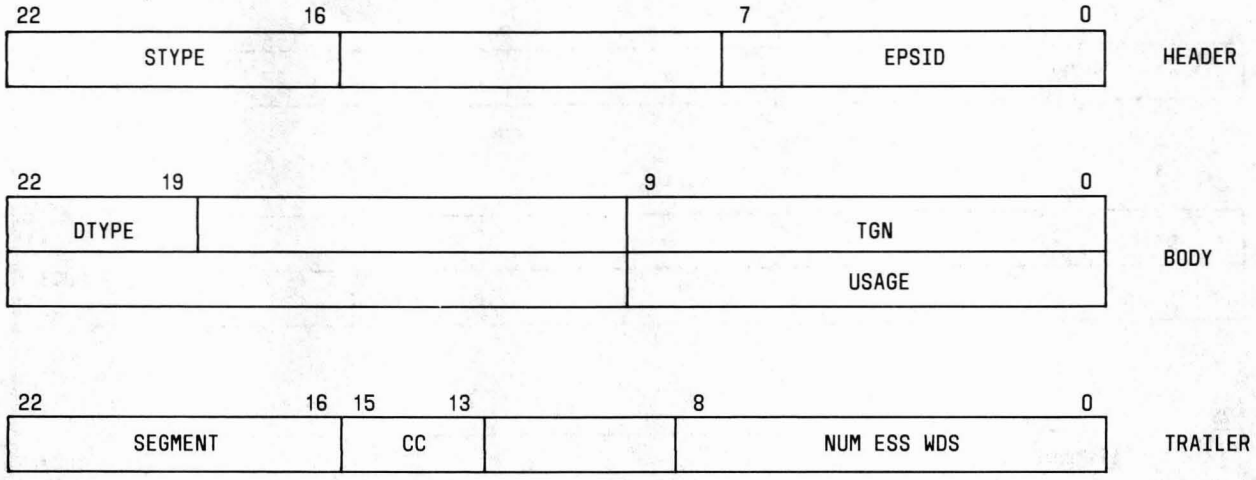


Fig. 3—Half-Hour Traffic Summary Message Layout

or queues in a block making the maximum size of one segment 101 words. The usage related to a trunk group is a combination of the number of trunks found traffic and maintenance busy at that moment of time. Thus if a customer has more than one auxiliary block, the usage scan for each auxiliary block will occur at a different time.

3.10 The body of a nonusage trunk scan (NUTS) segment contains a list of trunk network numbers (TNNs) from a NUTS auxiliry block (see Fig. 5). The TNNs in the list were not used during the preceding 2-hour period. The 2-hour periods range from the first quarter-hour of an even numbered hour (2:15, 4:15, etc.). Each TNN in the segment is specified by its member number in the trunk group and contains a high and wet indicator. If the high and wet indicator is set, the trunk has not been in service for the entire 2 hours. A NUTS auxiliary block may contain 255 TNNs. If all the TNNS were to be sent in one message, the message would contain over 500 words. Since the maximum size a segment can be is 300 words, an auxiliary block would be divided into two segments. The first segment may have up to 128 TNNs or a message body of 259 words; the second segment, if necessary, may have up to 127 TNNs or a message block of 257 words. A time break is taken after every NUTS segment is transmitted and the delay between segments is 6 seconds.

3.11 A call store table (B6CTNL) of customer's TNNs is checked to find out if a TNN was used during the past 2-hour period. Each TNN entry in the table contains a busy bit indicator which was previously updated by the CTRF pident routine, CTNUTS. If a TNN was used during the past 2 hours, that TNN is not sent to the customer. If a TNN was not used, the TNN is converted to a trunk group number and member number format and sent to the customer. In addition, the TNN



STYPE – MESSAGE SUBTYPE
EPSID – CUSTOMER ID
DTYPE – DATA TYPE OF GROUP
=0, TGN
SEGMENT – SEGMENT NUMBER FOR SEGMENTED MESSAGES
CC – COMPLETION CODE

Fig. 4—100-Second Line Usage Traffic Message Layout

is checked to determine if it has been high and wet for that period and the result of the check is also sent. The high and wet condition is an indication that the trunk has been locked up (off-hook) during the preceding 2 hours.

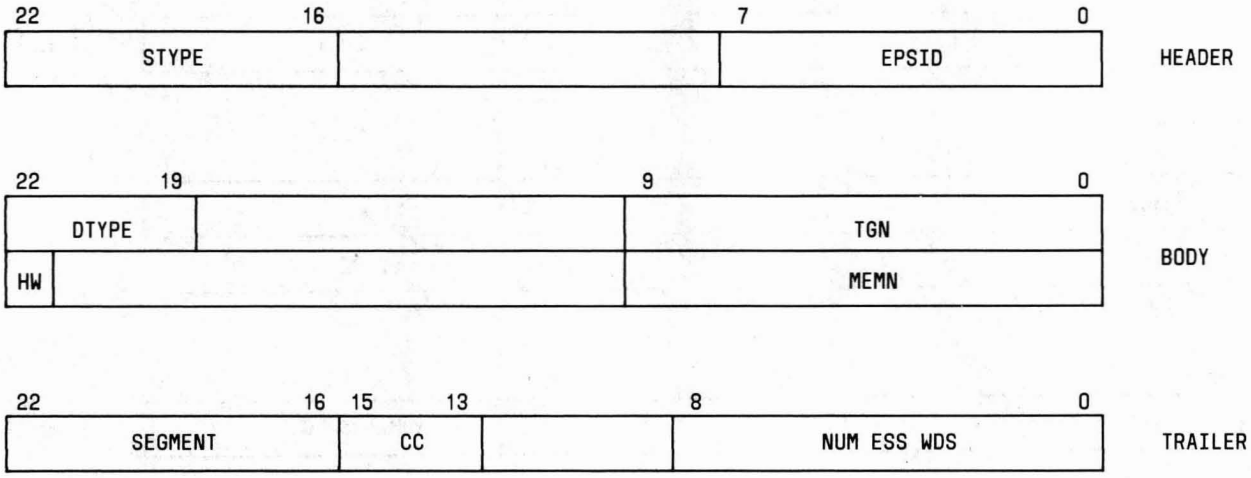
C. Automatic Event Messages

Message Detail Record

3.12 A message detail record is provided for every originating network call. When a network seizure occurs and the first digit of the called number is received, the line equipment number (LEN) translation is examined to determined if the message detail item (MSGD) in the LEN auxiliary block is set indicating that a message detail record must be sent to the CNCC for every incoming call over the trunk group. If the item is set, a 13-word MDR register (AMA register) is seized and linked to the call. When all the dialed digits are collected, the digits and the end of the dialing time are stored in the MDR register. The MDR register is disassociated from the call and the contents of the register are sent to the PDSP. The message sent to the PDSP consists of a header and the body containing the calling number, incoming trunk, called number, authorization code, outgoing trunk, and the answer time. When the PDSP receives the report indicating that the trunk circuit associated with the call has been released, the disconnect time is associated with that release, and the PDSP formats all the originating message information and sends it to the CNCC.

3.13 When outpulsing has been successfully completed, an MDR register is seized and linked to the call to provide a terminating record. Terminating records are sent only for terminating off-network calls.

3.14 Upon answer or disconnect, the MDR register containing the terminating message data is disassociated from the call, and the data is formatted into a header, body, trailer message and sent to the PDSP. The body of the terminating message contains the incoming trunk and the outgoing trunk (incoming WATS if applicable), the called number, and the answer time. The PDSP formats all the terminating message information and sends it to



STYPE – MESSAGE SUBTYPE
EPSID – CUSTOMER ID
DTYPE – DATA TYPE OF GROUP
=0, TGN
HW – HIGH AND WET INDICATOR USED TO INDICATE LUTS
SEGEMENT= SEGMENT NUMBER FOR SEGMENTED MESSAGES
CC= COMPLETION CODE

Fig. 5—2-Hour NUTS Message Layout

the CNCC. For additional information concerning message detail records see reference A(5) in Part 19.

Trunk Seizures or Restores

3.15 Every time a trunk circuit is seized or restored to the ESS idle link list a message is sent to the PDSP. The message format consists of a header, body, and trailer. The body of this message contains the TNN of the trunk, the time of day that the seizure or release occurred, and the date. (See Fig. 6.) Another message is sent when the trunk is restored to the link list. The PDSP compares TNNs seizures and restorals to determine the holding times on the trunks and reports short holding times to the CNCC, CSACC, and the ESS.

Maintenance Reports

3.16 Maintenance status reports are sent to the CNCC automatically and on request. Automatic reports are sent whenever a trunk circuit or access line is either removed from service or restored to service. When a circuit is removed from service, the message body sent to the CNCC contains the circuit identities such as the trunk group number and member number, a trouble code, time of day, and date. The trouble code which indicates the cause for removal can be any of the following:

- Manual (circuit removed manually)
- Diagnostic test failure
- CAROT (transmission problem) remote make busy key
- Error analysis
- Supervisory condition (high and wet)
- Carrier group alarm

The trouble code also includes out-of-service states listed below that a trunk or access line circuit has either entered or left.

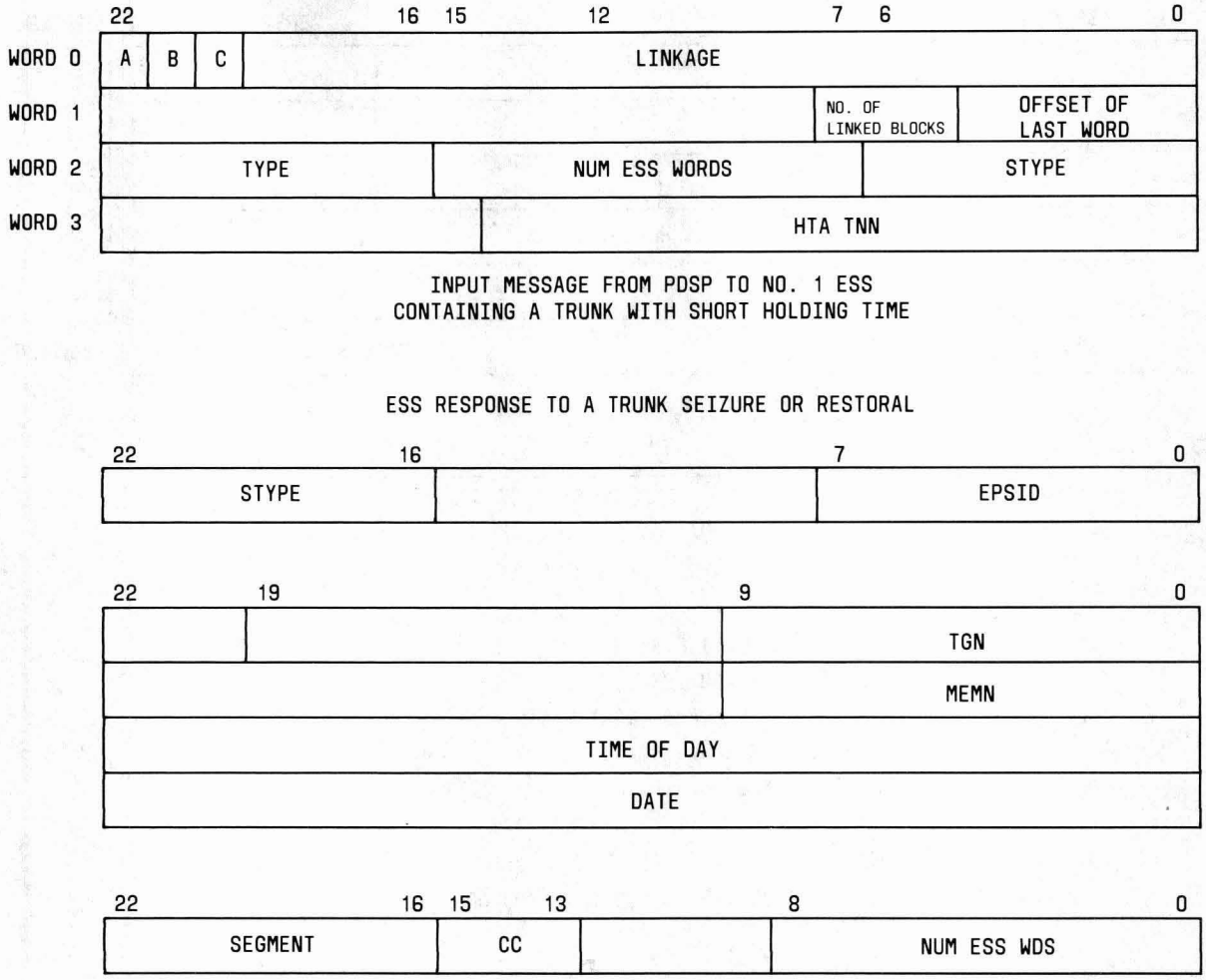


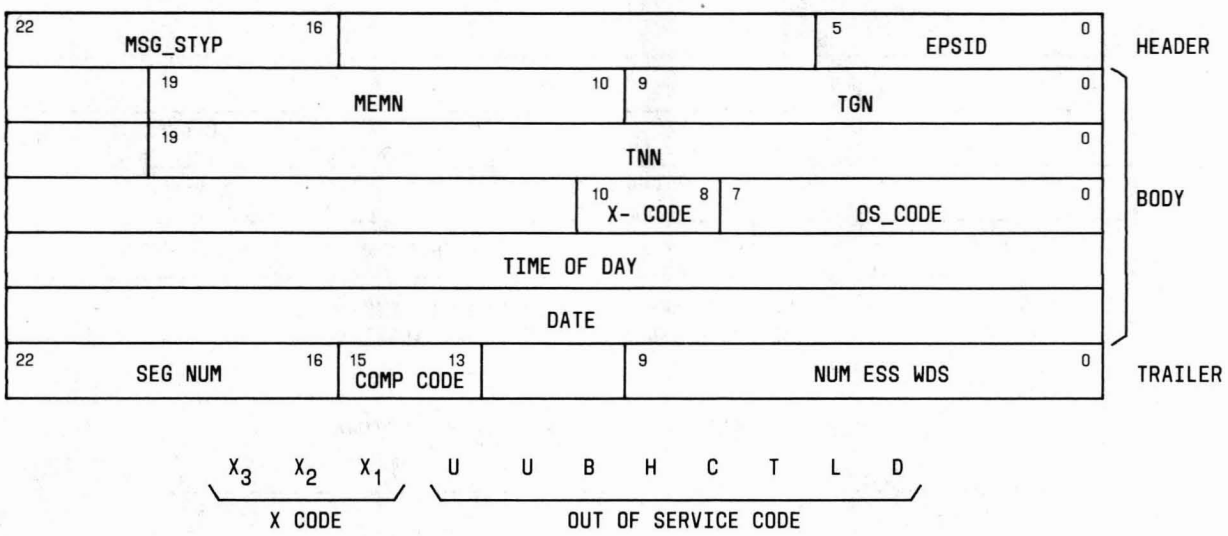
Fig. 6—Trunk Seizures or Restores Message Layouts

- Disabled (DSBLD)
- Locked out (LKDO)
- Carrier group alarm (CGA)
- High and wet (H&W)
- Trunk make busy (TMB)

The trouble code consists of 6 bits representing the out of service state and 3 bits representing the cause of removal from or restoral to the locked out or disabled state. (See Fig. 7.)

Trunks Out of Service

3.17 The CNCC personnel can request that a list of a customer's out-of-service circuits be



WHERE

D=1	DISABLED (DSBLD) STATE
L=1	LOCKED OUT (LKDO) STATE
C=1	CARRIER GROUP ALARM (CGA) STATE
H=1	HIGH AND WET (H&W) STATE
B=1	BLOCKED (BLKD) STATE
T=1	TRUNK MAKE-BUSY (TMB) STATE
U	UNUSED BITS
$X_3,X_2,X_1 = 0$	NONE OF FOLLOWING CAUSED AN LKDO OR DSBLD STATE CHANGE
$X_3,X_2,X_1 = 1$	MANUAL ACTION
$X_3,X_2,X_1 = 2$	DIAGNOSTIC FAILURE
$X_3,X_2,X_1 = 3$	REMOTE MAKE BUSY (CAROT)
$X_3,X_2,X_1 = 4$	ERROR ANALYSIS
$X_3,X_2,X_1 = 5$	NEW TRUNK
$X_3,X_2,X_1 = 6\text{-}7$	

Fig. 7—Removal From or Restoral to Service Message Layout

sent from an ESS switch to the CNCC. The generation of a list of out-of-service circuits requires two main functions: recognition of the request and generation of a list. The request message is received by the PIU and routed to the proper program segment to determine the state of the trunk or access line.

3.18 When the proper program segment is reached, a message block containing the message data and the customer ID is examined. If the message ID is not correct, an error message is sent to the CNCC. If the message is valid, the No. 1 ESS maintenance list is checked for trunks out of service, a TNN to trunk group number (TGN)

translation is performed, and a trunk group supplementary translator is checked for the presence of optional word D which identifies the trunk as an EPSCS trunk. If optional word D is present, the EPSID is obtained and formatted into the header of the data sent to the CNCC. The body of the message is divided into groups of three words for each trunk containing the trunk group, member number, and the trouble code. The trailer of this message may indicate that this message is a segmented message. (See Fig. 8.)

D. Network Information Messages

Status of Queue Controls

3.19 The status of the queues request message results in the local night (LN) item in the QTL head cell being examined. (The LN item in the QTL head cell is set to 1 to turn the associated queue off and to 0 to turn the queue on. An examination of this bit can tell the status of the queue.) Every queue in the office is examined. Queues matching the EPSID number in the request data and their current status are loaded into the FIFO buffer. Two words containing the queue group and status of the queue are sent to the CNCC.

3.20 An audit of the queue groups can be initiated by the ESS cycling through all trunk groups. The queue groups and the number of queues slots in the group are transmitted to the CNCC.

Status of Off-Hook Service Controls

3.21 An audit request from the CNCC for the status of a customer's off-hook service line is a request to find which of the customer's trunk groups contain direct access lines with off-hook service. The CNCC input message request consists of two words containing the subtype of the message, the source of the originating request, and the EPSID. All trunk groups in the EPSCS network switch are checked for an ID matching the request ID and having the off-hook service in blocks of 49 trunks. A TGN translation is performed to check the network type and the EPSID. A trunk class code translation is performed to determine if the EPSCS trunk has a manual impulsing type indicating the trunk has off-hook service. A TGN translation is performed to find the screening LEN. A screening LEN translation is performed to find the directory number the off-hook service line completes to. A LEN translation yields the billing number associated with the off-hook service line. Each member within the trunk group is transmitted with the 7-digit directory number of the direct access line (billing DN), and the 7-digit directory number that the direct access line connects to is sent in the body of the response message stating the current status of the off-hook line.

Status of Lines, Trunks, and Queues

3.22 A request (audit request) from the CNCC for a customer's status of lines, trunks, and queues requests from the ESS all the trunks per trunk group, direct access lines per trunk group, and queue slots per queue group. The ESS will cycle through all the trunk groups of an office trying to match the customer ID with the trunk group ID. If the IDs match the trunk group, the number of equipped trunks in that group are sent to the CNCC (see Fig. 9). If there is a queue group associated with the transmitted trunk group, the queue group and the number of queue slots in the group are also transmitted to the CNCC.

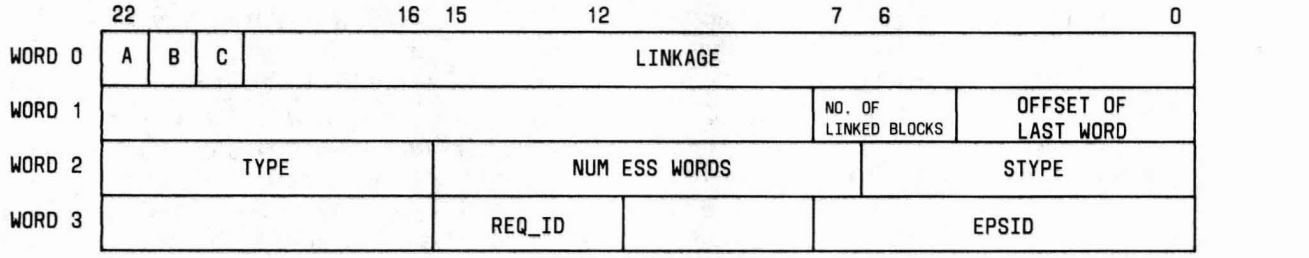
Request Authorization Code Treatment

3.23 A request authorization code treatment message consists of a message block containing the authorization code, and the trunks group. An authorization code to treatment group translation is performed to obtain the treatment group number (treatment code) for the specified authorization code. The data is formatted into a header, body, and trailer (end of message) format containing the treatment group number and all the data that came in the (message block) request. This data is then loaded into the FIFO buffer for transmission to the CNCC.

3.24 A request from the CNCC for all active authorization codes results in the PDSP sending single requests for active codes formatting all the active codes in the ESS office (network switch) and sending the result to the CNCC. The request for all active authorization codes contains the trunk group message. The ESS reply is the same as for a request authorization code (mentioned previously).

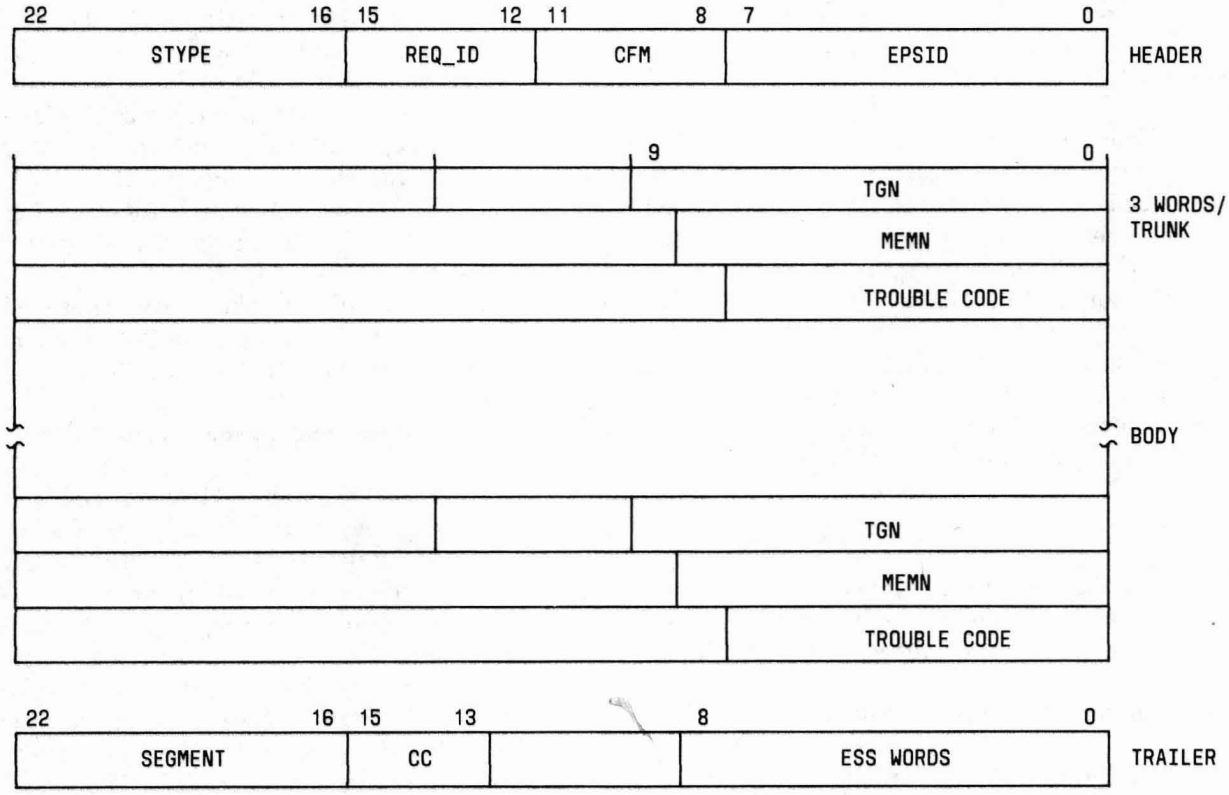
Conference Bridge Confirmations

3.25 CNCC personnel can verify the status of the conference bridge via a verify status



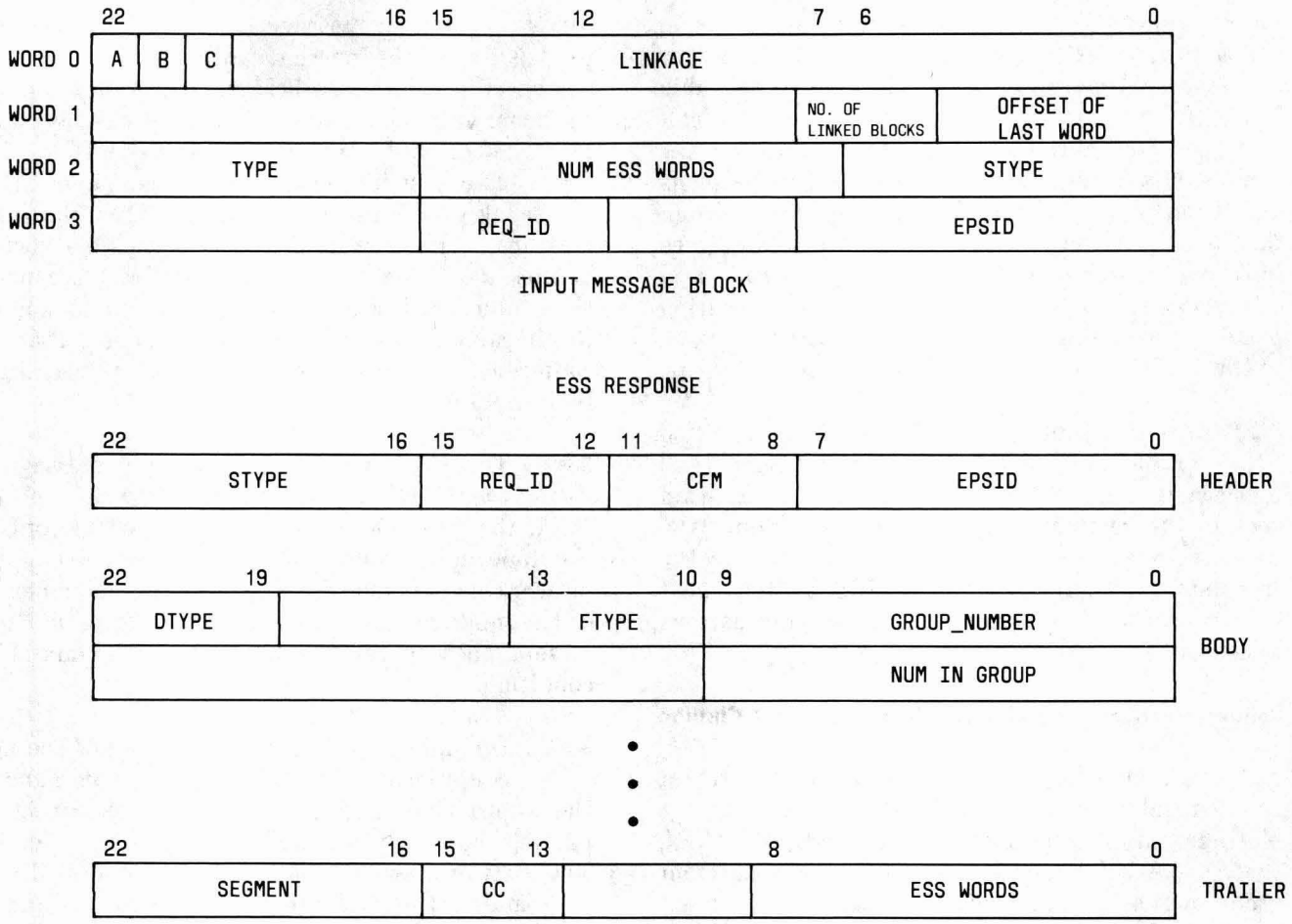
INPUT MESSAGE BLOCK
O/S TRUNK LIST REQUEST FROM CNCC

ESS RESPONSE



STYPE – MESSAGE SUBTYPE
REQ_ID – SOURCE OF THE ORIGINATING REQUEST
CFM – CONFIRMATION CODE ON MESSAGE REQUEST
=0, WILL DO
=1, ACTION TAKEN
=3 ALREADY DOING REQUEST
EPSID – CUSTOMER ID
DTYE – DAT TYPE OR GROUP
=0, TGN
SEGMENT – SEGMENT NUMBER FOR SEGMENTED MESSAGES
CC – COMPLETION CODE

Fig. 8—List of Trunks Out of Service Message Format



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CC – COMPLETION CODE

Fig. 9—Status of Lines, Trunks, and Queues Message Layouts

message. The network switch checks the customer IDs and does a comparison check; if they agree, a message reply is sent containing the customer ID, the access code of the conference circuit, and the state of the bridge.

Time and Date

3.26 The CNCC can request the time and date from the ESS network switch office. The ESS determines the time and date from the ESS clock and sends a response to the CNCC containing the time of day and the date.

E. Network Controls

Request Routing Pattern Change

3.27 The input message block contains the header information, the new routing pattern, and

the customer ID. Upon receiving this message, the ESS accesses (via the customer ID) a block of call store called the customer identification table F4CUST. This table consists of one word of call store per four customer IDs. Each customer has 5 bits, 4 bits containing the current routing patterns and 1 bit for a recent change indicator. When the routing pattern is changed, the program goes into the customer identification CS table and overwrites the old routing pattern. The old routing pattern and the new routing pattern are sent back to the CNCC to confirm the routing pattern change.

3.28 The rate center translator has been modified to include an EPSID; during normal call processing if an EPSID is incurred, the program goes to the customer ID table and determines the routing pattern and adds to the rate center in the translator. Therefore, the EPSCS switch must have consecutive rate centers to have route pattern selection.

Request/Confirm Authorization Code Treatment Change

3.29 A request to change authorization treatment results in the CNCC sending a message block containing the authorization code, the TGN, the customer ID number, and the new treatment group number. An authorization code to treatment group translation is performed to obtain the primary translation word (PTW) containing the old treatment group. The new treatment group is written over the old treatment group via a recent change, the new treatment and the old treatment group plus the original input data are sent back to the CNCC to confirm the No. 1 ESS action.

3.30 The CNCC is notified when recent change (RC) memory on a particular ESS switch is 80 percent full. At this time the customer is not allowed to make any further authorization code changes until the RC area is updated. However, when an emergency change of treatment is required, e.g., due to fraudulent use of calling privileges by a station user, CNCC can request CSACC to reassign an authorization code for them.

Conference Controls

3.31 The network conference coordinator, located at the CNCC, schedules a network conference by selecting a conference bridge and time and date convenient for the originator. Two minutes before the beginning of a scheduled conference, the CNCC sends a command message to all network switches to deactivate the current authorization code for the specific conference bridge. The CNCC follows the deactivation message with a preemption warning message containing the EPSID and the TGN. The ESS network switch compares the customer ID of the trunk group and the customer ID of the input message. If they agree, the associated switch applies a 480 Hz high-tone burst for 1 second to the conference bridge. The 1-second tone is audible to all parties on the bridge and indicates that the conference bridge will be preempted, if necessary, in 1 minute.

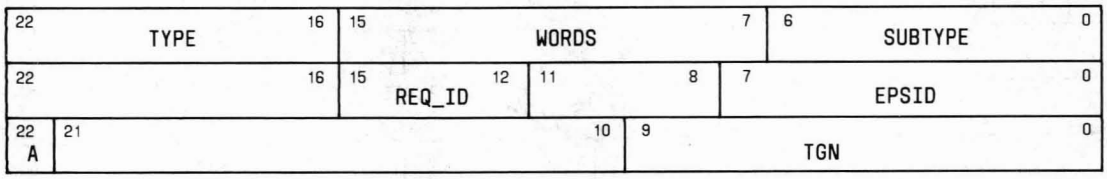
3.32 The ESS switch sends a reply message to the CNCC containing the EPSID and the TGN; the preemption tone was applied to confirm the tone application. If the customer ID of the network switch trunk group and the customer ID of the input request do not agree, an error message is sent back to the CNCC stating a nonmatching condition.

3.33 One minute before the beginning of the next conference the CNCC sends a command to the appropriate network switch to disconnect all parties from the conference bridge (see Fig. 10). The network switch compares customers IDs; if they match, the conference call is canceled and all parties are disconnected from the conference bridge. Upon completion, the EPSCS switch sends an acknowledgment to the CNCC that the bridge is idle (released). See Fig. 10.

3.34 Upon receipt of the acknowledged message from the network switch, the CNCC sends a command to all network switches to activate the new authorization code for the next conference. The next conference is thereby permitted to proceed. As soon as the first party of the next conference is connected to the bridge, the ESS network switch sends a message to CNCC to indicate that the conference bridge has been seized. (See Fig. 10.) This message contains the customer ID, access code of the conference circuit, and the state (busy) of the bridge.

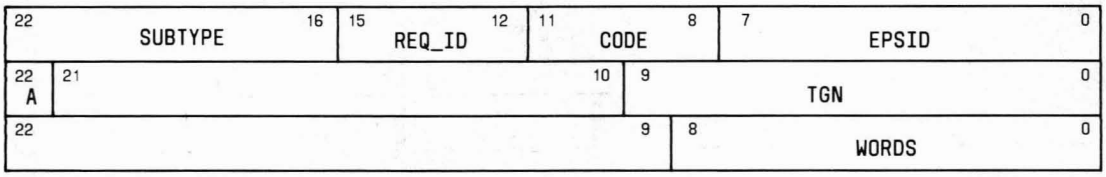
3.35 It is possible for the conference to end before its scheduled time. The conference bridge is considered idle (released) when the last party disconnects. When the network switch (ESS office) recognizes that the bridge has become idle, a message is sent to the CNCC to indicate that the conference circuit is released.

N7 (CNCC → ESS) PREEMPT/WARNING MESSAGE



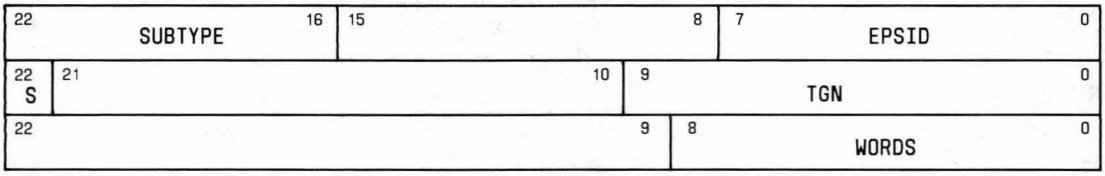
A = { 0 – WARN
1 – PREEMPT

E21 (ESS → CNCC) PREEMPT/WARNING CONFIRMATION



A = { 0 – WARN
1 – PREEMPT

E8 (ESS → CNCC) BRIDGE SEIZED/RELEASED MESSAGE

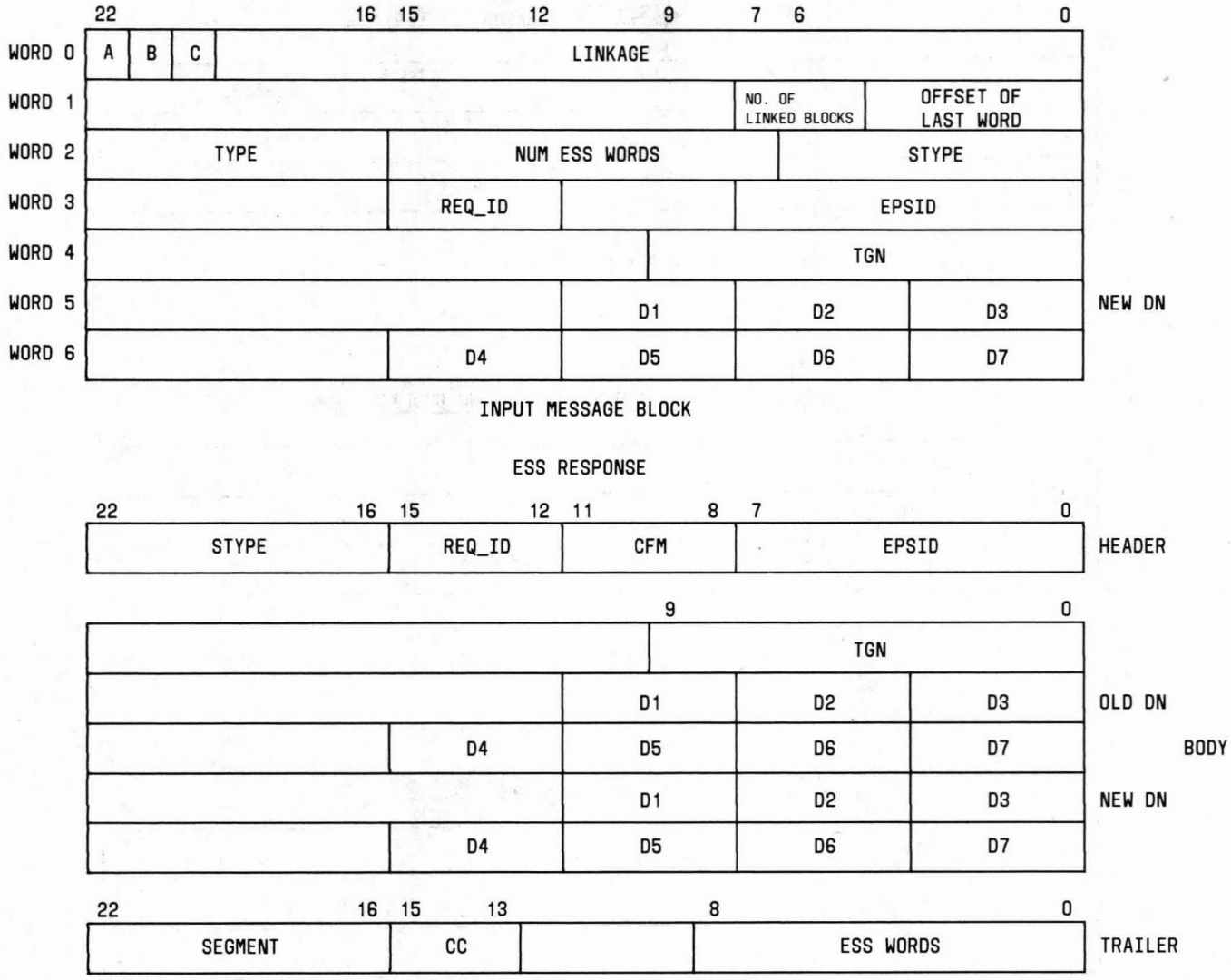


S = { 0 – RELEASED
1 – SEIZED

Fig. 10—Conference Control Message Formats

Change Status of the Designated Off-Hook Service Access Line

3.36 A request to change the status of the off-hook service access line essentially changes the DN that the line terminates to. The input request message block contains the general data of a request message (message subtype identifying the type of message, source of the originating request, and the EPSID) plus the TGN of the access line and the new directory number (see Fig. 11). The network switch checks to see if it is a valid TGN (compares EPSIDs) and determines if there is a screening LEN associated with that TG. The screening LEN is translated to determine the present DN of the access line. Taking the TGN and the new DN, a recent change register is created using the customer changeable 1-digit speed calling list; the old DN is overwritten with the new DN for the access line. A reply message is sent to the CNCC containing the TGN, old DN, and new DN confirming the system action. (See Fig. 11.)



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=3 ALREADY DOING REQUEST
EPSID – CUSTOMER ID
DTYE – DAT TYPE OR GROUP
=0, TGN
SEGMENT – SEGMENT NUMBER FOR SEGMENTED MESSAGES
CC – COMPLETION CODE

Fig. 11—Change the Status of the Designated Off-Hook Service Access Line Message Layouts

Turn Queues On/Off

3.37 A request from the CNCC to turn queues on/off results in the local night (LN) item being set/reset in the QTL call store head cell. When a request to turn queue on/off is received, the ESS verifies the TG belongs to the customer and turns the associated queue on/off. A unit type 55 auxiliary block translation is performed to find the trunk group number associated with the queue. The TGN points to the trunk group supplementary translator containing (optional word D) the EPSID.

The ESS finds the associated queues by matching EPSIDs. The LN bit in the QTL head cell is set to 1 to turn the associated queue off and 0 to turn the queue on. When night transfer is turned on, no more calls are allowed on queue. Any calls that are on the queue at that time will be unloaded as usual. When the request is completed, a reply is sent to the CNCC containing the queue number and the status of the queue.

FEATURE ATTRIBUTES

4. APPLICABILITY

4.01 The CNCC is provided on a per EPSCS network basis. The interface with the CNCC is provided on a per network switch (ESS office) in the network. All No. 1 ESS network switches can communicate with the CNCC; however, only one office (the one closes to the CNCC) has a direct data link into the CNCC. Data information is passed between No. 1 ESS network switches through the office with a data link directly into the CNCC.

5. LIMITATIONS AND RESTRICTIONS

OPERATIONAL

5.01 The closeout times for traffic counts are not synchronized between network switches; therefore, the outgoing peg count may not be exactly equal to the corresponding incoming peg count at the opposite end of a trunk group. Pairs of usage figures will exhibit discrepancies from the same cause. Additionally, there will not necessarily be a message detail record corresponding to each access line incoming peg count increment. The peg count is advanced every time a circuit is seized. A message detail record is not initiated unless the call provides a realistic called number. Many incomplete calls may abandon between these two states.

5.02 The CNCC cannot directly restrict EPSCS network calling. This can only be done indirectly from the CNCC through the use of authorization codes. The CNCC cannot make trunks busy. It is notified when trunks are taken out of service or restored, and it can request a list of out-of-service trunks.

5.03 Only one PDSP is available per EPSCS switch of the network.

5.04 The maximum number of customer traffic schedules available is 22. This maximum number of schedules is reflected by the maximum number of customer traffic groups.

5.05 The maximum number of rate center indexes is 64.

ASSIGNMENT

5.06 EPSID numbers, which range from 1 to 63, must match the PDSP assignments and must be assigned in the PDSP first to prevent error messages.

6. COMPATIBILITY AND INTERACTIONS

COMPATIBILITY WITH OTHER FEATURES AND HARDWARE

6.01 The EPSCS feature operation is dependent upon the interface with CNCC to provide the customer with network flexibility. This flexibility allows the customer control of his network. The CNCC was designed as a component of EPSCS and aids it in providing several feature capabilities. These are: message detail recording, traffic counts, and circuit assurance. The interface with the CNCC enables the CNCC to control what data it receives in terms of the type of call and the time of day. Variable routing patterns, customer dialed authorization codes, conference control, and changing off-hook service controls all operate through commands originating at the CNCC.

6.02 The interface with the CNCC feature interacts with existing No. 1 ESS features to provide network data. The traffic messages (half-hour traffic summary, 100-second line usage, 2-hour nonusage reports) use the selected traffic data to customer (CTRF) feature to provide traffic data to the CNCC. The meet-me conferencing feature provides the capabilities for control of a network conference from the CNCC. The queuing of trunks and lines feature is used to provide the capability of turning queues on and off. Customer changeable 1-digit speed calling enables the CNCC to change the destination of an off-hook service control.

7. COST FACTORS

MEMORY—NO. 1 ESS

A. Fixed

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

- Generic Program Base (program store): See reference A(2) in Part 19.

B. Conditional

7.02 The following memory is required only when the feature is active in an office:

- Generic Program (program store): For the generic program store costs for the interface with CNCC feature (which is a part of the EPSCS feature) refer to A(2) in Part 19.

PROCESSOR TIME

7.03 To be supplied by an addendum.

8. AVAILABILITY

8.01 The interface with CNCC feature, which is a part of the EPSCS feature, is initially available with the 1E5 generic program.

CONSIDERATIONS FOR INCORPORATION OF FEATURE INTO THE SYSTEM

9. PLANNING

9.01 See reference A(2) in Part 19.

10. HARDWARE

10.01 The interface with CNCC feature is a software only type feature; however, hardware is required by the link to the CNCC. For the required hardware see reference A(2) in Part 19.

11. DETERMINATION OF QUANTITIES

HARDWARE

11.01 See reference A(2) in Part 19.

MEMORY

11.02 Parameter set card PPMB provides memory to store the incoming message data from the CNCC. This set card defines the number of message blocks for an office having EPSCS. The quantity of message blocks determined by set card PPMB = 6 + 14 N, when N is the number of EPSCS customers in the office for the engineering period.

11.03 For determination of program store required to provide the interface with CNCC feature, refer to A(2) in Part 19.

12. ASSIGNMENTS AND RECORDS

ASSIGNMENT RECOMMENDATIONS AND GUIDE LINES

12.01 Not applicable.

INPUT AND RECORD KEEPING

A. Translation Forms

12.02 Not applicable.

B. Recent Change Messages

12.03 The interface with CNCC feature has no affect on recent change message formats. However, the interface with CNCC has affect on the EPSCS switch area. A RC register is created to allow the customer to change the treatment of a treatment group, change authorization codes, and numerous other control functions.

C. Uniform Service Order Codes

12.04 Not applicable.

13. NEW INSTALLATIONS AND GROWTH

13.01 The procedures required to provide an ESS office with the interface with CNCC feature are given in Fig. 12. However, an ESS office must have the HILO 4-wire switching feature and 1E5 or later generic programs.

14. TESTING

14.01 Testing of the interface with the CNCC feature envolves call-through type testing procedures. This procedure verifies the interface

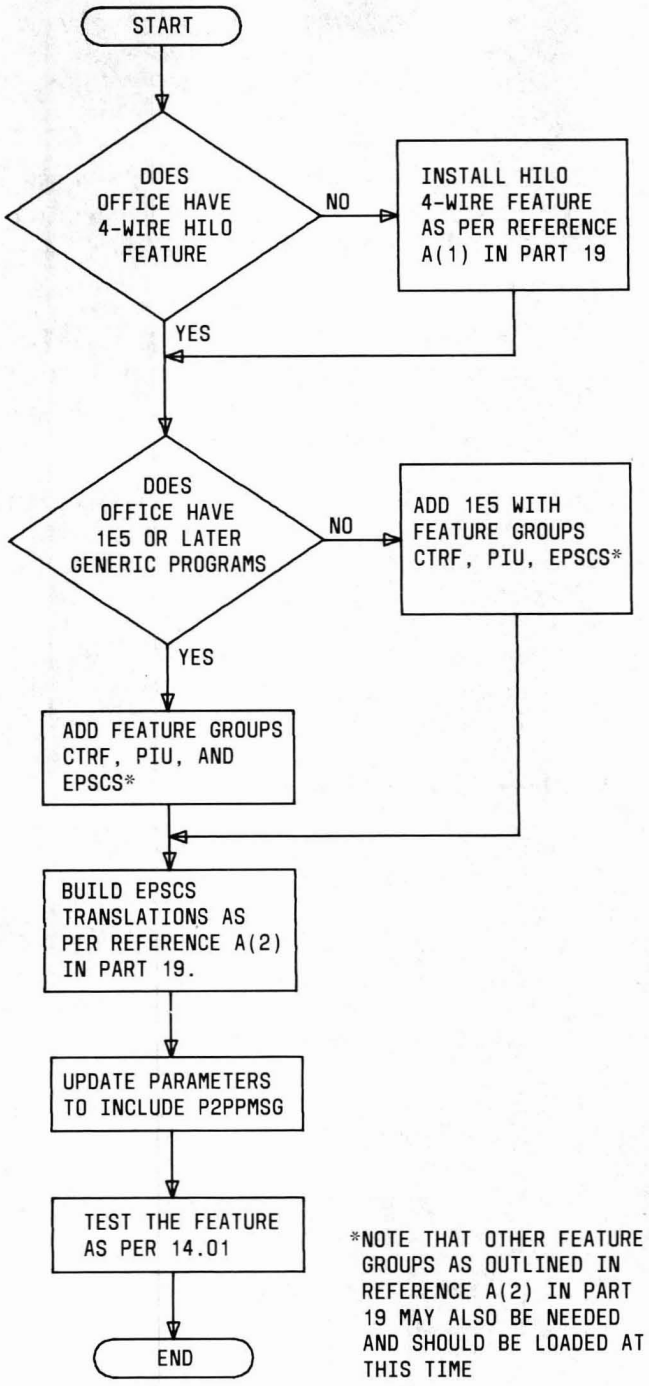

Fig. 12—Growth/Retrofit Procedures for the Interface With CNCC Feature

between the CNCC and the No. 1 ESS network switch in addition to some of the EPSCS network capabilities and their associated software. Upon completion of establishing the network and its associated software (see reference A(2) in Part 19) CNCC will activate, at predetermined times, (1) a change in the network routing to include all three available routing patterns, (2) change and deactivate authorization codes, (3) a change in the status of the off-hook service access line, (4) a change in the interval during which the "2-hour" nonusge data will be accumulated, and (5) a change in the status of queues. The No. 1 ESS network switch will respond with a message signifying the action taken as verification if the interface between the network switch and CNCC is operating properly. This procedure will verify the EPSCS network, associated data links, the PDSP, the PIU in addition to the CNCC interface .

15. MEASUREMENTS

15.01 The CNCC is a facility for providing various measurements of network operation; however, there are no traffic measurements taken on the interface with CNCC.

16. CHARGING

16.01 The EPSCS charges are basically fixed charges based on the number of terminations utilized by the customer and the optional features selected. Therefore, no AMA being is associated with the interface with the CNCC feature.

SUPPLEMENTARY INFORMATION

17. GLOSSARY

Authorization Code—Each station in the EPSCS network has a unique number. In addition, an optional feature of assigning account numbers or security codes to individuals, groups, or projects may be selected by the customer. After dialing a called number, the user is notified to dial an authorization code (3 to 6 digits). Calls cannot be completed unless the proper code is dialed correctly.

CSACC—Customer Service Administrative Control Center—A shared centrally located facility used by the telephone companies and Long Lines to monitor and control the operation of all EPSCS networks. CSACC serves as a single maintenance contact point for customers; it responds to all problems and questions related to service options.

PIF—Processor Interface Frame—Provides the mounting space for the PIU. In addition, the PIF provides filters, power converters fires, and a

means for control and distribution of power to all circuits using the frame.

PIU—Processor Interface Unit—This provides a channel for data communications between the No. 1 ESS CC and the 3A processor. The PIU connects to the No. 1 ESS call store bus and responds to call store read and write commands from the CNCC.

NUTS—Nonusage Trunk Scan—Feature provided to check the usage of certain trunks during a 2-hour period. Once every 2 hours, lists are printed on all trunks that have not been found traffic busy on an incoming call during the preceding 2 hours.

LUTS—Locked Up Trunk Scan—Feature provided to check the usage of certain trunks during a 2-hour period. Once every 2 hours lists are printed, and trunks that have been locked up (off-hook) during the previous 2 hours are indicated by an asterisk.

EPSCS Switch—An EPSCS switch is a No. 1 ESS switching office used to build a private network of dedicated facilities providing full duplex communications on all connections.

18. REASONS FOR REISSUE

18.01 Not applicable.

19. REFERENCES

A. Bell System Practices

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

(2) Section 231-190-127—Enhanced Private Switched Communications Service (EPSCS) Description, 2-Wire No. 1 Electronic Switching System.

(3) Section 231-190-128—Meet-Me Conferencing Feature—Enhanced Private Switched Communications Service (EPSCS), 2-Wire No. 1 Electronic Switching System

(4) Section 231-190-129—Network Trunk Queueing—Enhanced Private Switched Communications Service (EPSCS), 2-Wire No. 1 Electronic Switching System

(5) Section 231-190-130—Network Message Detail Recording—Enhanced Private Switched Communications Service (EPSCS), 2-Wire No. 1 Electronic Switching System

(6) Section 231-190-135—User Dialed Authorization Codes—Enhanced Private Switched Communications Service (EPSCS), 2-Wire No. 1 Electronic Switching System

(7) Section 231-190-136—Interface With the Processor Interface Unit Feature, 2-Wire No. 1 Electronic Switching System.

B. Other Documentation

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

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

(3) Translation Guide TG-1A

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

(5) PG-1 Parameter Guide, No. 1 Electronic Switching System

(6) PA 591001 Office Parameter Specifications, 2-Wire No. 1 Electronic Switching System.