SWITCHING SYSTEMS MANAGEMENT
TRANSACTION NETWORK
SYSTEM DESCRIPTION

CONTENTS PAGE

CONTENTS PAGE

Figures

CONTENTS PAGE

1. GENERAL

1.01 This section describes the operation and equipment for the Transaction Network (TN). The TN provides customers with a special exchange service referred to as Transaction Network Service (TNS).

1.02 When this section is reissued, this paragraph will contain the reason for reissue.

1.03 It is important that the network operations personnel responsible for a TN be familiar with its operation; it is also important that any network operations personnel responsible for an office which ***serves*** a TN or Transaction telephones be familiar with the TN.

1.04 TNS allows transmission of short data messages between a telephone set and a general-purpose computer in a customer service center (CSC).

1.05 The heart of the TN is a "queue-and-forward" message switch which sends and receives messages between dial-in sets and CSCs, between polled sets and CSCs, and between one CSC and another CSC.

1.06 Dial-in sets communicate with a CSC by a connection through the switched network the same as in a normally dialed call. The connection is to the TN which in turn communicates with the CSC. Dial-in service is possible without TNS; however, dial-in service without TNS differs in many respects from dial-in service with TNS. For a complete description of dial-in service without TNS see Dial Facilities Management Practices, Division F, Section 10, Transaction Telephone Service.

1.07 Polled sets communicate directly with the TN over a separate dedicated network. The TN message switch constantly polls the sets; that is, the TN message switch constantly requests data messages from the sets. Polled service is available only with TNS.

1.08 TNS is used for electronically handling fund transactions (such as credit authorization, check verification, and account transfer), for reservation systems, for inventory control quotation systems, or for any other applications utilizing the short-message inquiry/response format.

1.09 The title of each figure in this section includes a number(s) in parentheses which identifies the paragraph(s) in which the figure is referenced.

2. TN CONFIGURATION

OVERVIEW

2.01 The TN, as diagrammed in Figure 1, is described in 2.02 through 2.19.

2.02 The TN serves two networks of stations: the dial-in access network (DAN) and the polled access network (PAN). Stations in the DAN are TOUCH-TONE® telephones which may be connected through the switched telephone network including the Transaction I and Transaction II sets (Fig. 2).

2.03 Access is gained to the TN in the DAN by means of telephone lines to the TN which appear on a switching machine which serves other telephone customers (such as an ESS or No. 5 crossbar). Any telephone which dials the telephone number assigned to the TN lines may gain access to them.

2.04 Transaction I sets may be routed to special ports in the DAN which provide automatic voice answer-back (AVA) service. AVA service provide voice responses to inquiries consisting of words, phases, and tones produced by an audio response unit (ARU) located in the message switch.

2.05 Transaction II sets may be routed to other ports which return frequency shift keying (FSK) responses. FSK responses are used to light displays on the Transaction II sets.

2.06 Transaction II sets can also be routed to AVA ports, in which case the sets perform in the same manner as Transaction I sets. Operation of the Transaction telephone sets is discussed in 2.48 through 2.80.

2.07 Because in the DAN it is necessary to dial up the TN whenever a transaction is to

occur, the DAN stations are intended for low-usage applications.

2.08 The other network of stations served by the TN is the PAN. Stations in the PAN are the Transaction III set (Fig. 3) or an equivalent set. The Transaction III set has no receiver and cannot be used as a telephone.

2.09 The PAN is a network which uses only TN facilities and uses no switched telephone network facilities. Each PAN station is sent an interrogation message by the TN message switch at frequent intervals (the interval length depends upon network load conditions) requesting an inquiry message. The sending of interrogation messages by the TN message switch is called ***polling.***

2.10 Since the inquiry and response from a PAN terminal can be made without establishing a connection to the TN message switch, the PAN terminals are intended for high-usage applications.

2.11 The TN message switch is the interface between the two station networks and the CSCs. Each CSC computer is connected to the TN by one or more 4-wire lines.

2.12 Through the TN message switch each CSC can communicate with terminals on both the PAN and the DAN. Each CSC can also communicate with another CSC served by the TN.

2.13 Stations on both the PAN and the DAN may be served by an alternate CSC when the originally selected CSC is unable to serve them.

2.14 Two terms which are frequently used in reference to TNS are ***synchronous*** and ***asynchrnous.*** Both refer to different methods of data transmission. ***Synchronous*** transmission is a high-speed, bit-oriented technique which maintains continuous bit synchronization. ***Asynchronous*** transmission is a low-speed, character-oriented technique in which each character transmitted is individually synchronized with start and stop bits.

2.15 Lines serving CSCs use synchronous transmission and are referred to as ***synchronous lines.*** Lines serving polled stations use asynchronous transmission and are referred to as ***asynchronous lines.*** Lines serving dial-in stations use TOUCH-TONE inquiry and voice and asynchronous response and are neither synchronous nor asynchronous.

2.16 The control of the TN is supplied by the auxiliary 3A processor. The auxiliary 3A processor uses the 3A central control (3ACC) which is the same central control used in the No. 2B and the No. 3 ESSs. There are two 3ACCs in the auxiliary 3A processor. One is in active control of the system while the other is on standby, ready to assume control if there is a failure in the active processor. The auxiliary 3A processor is described in more detail in 6.02 through 6.10.

2.17 Each 3ACC can communicate with a peripheral device by means of a subparallel channel (SPCH). Different SPCHs are used for different types of peripheral devices. The SPCHs for each 3ACC are multiplexed in a main parallel channel (MPCH) at the auxiliary 3A processor.

2.18 As stated in 1.05, the TN message switch is a queue-and-forward system. This means that there is no direct switch path created between a terminal and a CSC; instead, inquiry messages from terminals are placed in a queue by the TN message switch and are forwarded to the appropriate CSC when possible. Responses from the CSC are delivered directly to terminals.

2.19 The DAN, the PAN, and the CSC network and their operations are described in more detail in 2.20 through 2.137.

DIAL-IN ACCESS NETWORK

2.20 The discussion in 2.21 through 2.25 describes the DAN as shown in Figure 4.

2.21 Access to the TN is gained through lines which appear in a hunt group on a switching machine in the telephone network. Each line is connected to a ***407A data set*** (Fig. 5) in the TN. The 407A data set receives TOUCH-TONE signals, converts them into 2-out-of-8 code, and passes the transmission of keyed answer tone (KAT) and FSK signals from the message switch.

2.22 The access lines to the 407A data sets appear in a hunt group on a switching machine in the telephone network and are assigned a telephone number. Access to the lines may be gained by any telephone which dials the assigned telephone number. (A telephone number unique to the TN

message switch memory will also be assigned to the line.)

2.23 Each 407A data set is connected to a separate dial line adaptor (DLA). The DLA serves as an interface between the 407A data set the line adapter selector (LAS) and the ARU. The DLA supplies the 25-point connector plug required by the 407A data set.

2.24 A maximum of 16 DLAs is connected to one LAS. The LAS multiplexes messages between multiple DLAs and the SPCH.

2.25 Each LAS and each ARU are connected to a duplex bus selector (DBS). As stated in 2.16, there are two 3ACCs in the auxiliary 3A processor. Each 3ACC has its own SPCHs to peripheral devices. Only one 3ACC will be actively sending and receiving and therefore only one SPCH will be actively sending and receiving. The DBS is used to make a connection to the active SPCH.

DIAL-IN OPERATION

2.27 The 407A data sets in the TN may be arranged in one or several hunt groups in one central office or they may be arranged in hunt groups in different central offices. Some of the data sets may be attached to foreign exchange or tie lines.

2.28 Regardless of how they are arranged, each hunt group should be large enough that overflow in the group does not exceed 1 percent (Table 10, P.01 design criteria) in the busy hour for the group during the group busy season.

2.29 Each dial-in port is identified in TN memory by a ***port number.*** The port number is in the digit format of a telephone number; however, this 7-digit number is not the same number as the telephone number assigned to the port on the telephone switching machine.

2.30 When a connection is made to a dial-in port by a telephone, the port is assigned a class-of-service character (CSCH) by the TN message switch and stored in memory for the duration of the connection. The CSCH identifies the port as dial-in and ensures that the response delivered by the TN message switch is to the same telephone which made the inquiry.

2.31 Port numbers and CSCHs are discussed further in Dial Facilities Management Practices, Division H, Section 17e, Assignment Administration.

2.32 When a telephone is connected to a dial-in port and transmits an inquiry message, the message is checked by the TN message switch for proper format text length, reasonableness of values in the message heading, longitudinal redundancy check (LRC) validity, and the proper number of characters.

2.33 In Transaction II applications, the TN responds to the inquiry with a positive acknowledgement sequence (ACK) if the checks listed in 2.32 pass and responds with a negative acknowledgement sequence (NAK) if any of the checks fail to pass.

2.34 This checking procedure is performed before delivery of the inquiry message to the CSC. It helps to ensure that only valid inquires reach the CSC.

2.35 Responses from the CSC are returned to dial-in ports after the TN message switch checks the CSCH of the telephone attached to the port. CSCH checking eliminates the possibility of a telephone disconnecting from a dial-in port after making an inquiry and another telephone connecting and receiving the response intended for the first telephone.

2.36 Response messages returned to telephones use voice, KAT, and FSK signals generated by the TN message switch. The signals control Transaction telephone displays.

2.37 The Transaction telephone (either Transaction I or Transaction II) is a telephone designed to provide efficient operation in short-message, inquiry/response applications. It provides a means of reading information from plastic cards with an encoded magnetic stripe. The Transaction telephone also provides a buffer for storing this information before transmission. Instruction lamps are provided to guide the telephone user through the transaction. In addition, means are provided for manually entering data via a manual entry pad and for transmitting data, in TOUCH-TONE form, to the CSC. Optionally, a remote TOUCH-TONE pad entry may be added for the entry of additional information such as a personal identification number (PIN) by a customer.

2.38 The card reader (Fig. 2) is located on top of the set at the rear. The manual entry pad is on the face of the Transaction telephone. This pad is used to enter data manually during a transaction. The key-labeling differs from the labeling on a TOUCH-TONE telephone in that the (*) key is labeled with a (.) and the (#) key is labeled with a (/). The card reader, the manual entry pad, and an optional remote entry pad are the means of entering data into the Transaction telephone set.

2.39 Features include automatic dialing in dial pulse or TOUCH-TONE dialing. The set is compatible with PBX or key telephone installations in the automatic dialing mode; that is, it is capable of 2-part dialing. It can also operate in a split mode, with the first part of a 2-part number dialed in dial pulse and the second part dialed in TOUCH-TONE signals, or vice-versa. The set provides response lamps which are activated by a special signal from the TN message switch to indicate approval of transactions or the presence of a voice response. A FOLLOW SPECIAL INSTRUCTIONS lamp is also included which indicates that the user is to refer to instructions provided by the CSC.

2.40 On the face of the Transaction telephone are a set of lamps, three additional keys, plus an ON and OFF key on the Transaction II set to use to go off- and on-hook. The lamps are functionally separated into three categories. The first category consists of the instruction lamps. These lamps light in sequence to guide the user through a transaction. The second group of lamps are the green/yellow response lamps. These lamps light in response to answer tone signals from the TN message switch. In the financial industry, for example, the green lamp might mean "credit approved" while the yellow lamp would mean "please listen for voice response." Finally, the special instructions lamp is provided on the faceplate for operation during computer-down periods.

2.41 The three additional keys mounted above the manual entry pad are ATTN, END, and ERASE. The ATTN (attention) key is used to activate the dialing of the number, stored in a buffer in the set, of the proper TN ports and to transmit stored set identification data. An option can be specified which permits dialing to the begun and customer information to be transmitted upon entry of a customer card and without the operation of the ATTN key. Operation of the ERASE key erases from the buffer the entire field being entered. If the field has already been transmitted, operation of the ERASE key transmits a certain TOUCH-TONE sequence. The END key signals the Transaction telephone that a block of data has been entered, and depending upon the particular entry, causes one of a variety of actions within the telephone.

2.42 The set also provides basic telephone service. Manual dialing is accomplished by using a TRIMLINE® handset provided with the telephone, or optionally, by using the manual entry pad. For dial-pulse service, key depressions on the manual entry pad are converted to dial pulses during dialing but TOUCH-TONE signaling is used after a call is completed to the TN message switch. In addition, appropriately encoded cards can be used to automatically dial telephone numbers.

2.43 The 407A data set is the interface between the Transaction telephone and the TN. The Transaction telephone is connected through the switched network to a 407A data set. The data set receives signals from the telephone and converts them into a format usable by the TN message switch. Only one telephone can be connected to a 407A data set at one time.

2.44 All messages from the Transaction I and II sets are coded in TOUCH-TONE signaling. Although the TOUCH-TONE pad on the Transaction telephone contains only 12 characters, 16 characters are available. The additional characters are identified by the letters a, b, c, and d. The arrangement of TOUCH-TONE characters and assigned frequencies is shown in Figure 6.

2.45 The TOUCH-TONE signals form a 2-out-of-8 code which means that each character is represented by a combination of two frequencies out of a total of eight frequencies.

2.46 Responses are sent to Transaction I sets using KAT and AVA messages. KAT uses a 2025-Hz tone. The tone is generated for a 1.5-second interval and a 3.0-second interval, with each length of interval representing a different signal. The meaning of the different KAT signals is explained in 2.67. AVA messages are generated by the ARU under control of the auxiliary 3A processor using message-encoding specified by the CSC.

2.47 Responses are sent to Transaction II sets using FSK messages. FSK is an alternating audible tone which represents a stream of binary bits. FSK is used in the Transaction II set to light the light-emitting diode (LED) display and all indicator lamps. FSK is not used in the Transaction I set. The FSK transmission rate between a Transaction II set and a 407 data set is 150 bits per second (bps).

2.48 The Transaction telephone receives its input data through either a magnetic-stripe card reader or a manual-entry pad. The card reader is designed for the American National Standards Institute (ANSI) Track II also known as the American Banking Association Track II; it was developed specifically for the Transaction telephone. The card reader is hand-powered and contains no moving parts.

2.49 The Transaction telephone automatically dials a telephone number based on input from the card reader or manual-entry pad. It stores all additional card or manual-entry-pad entries until a special answer tone signal is received from the TN. This tone automatically triggers transmission.

2.50 An optional, remote-entry pad can be provided to customers for entering PINs. The PIN is used in verifying the use of the card by the CSC and is not used by the Transaction set or the TN. The PIN pad is activated by the Transaction set only during a particular part of the transaction.

2.51 The input source of the set is two magnetic striped cards. One card is encoded according to the ANSI Track II specification and may be a bank card or credit card. The other card is a dialing card, encoded in a manner similar to the manner in which the ANSI standard card is encoded but containing information pertinent to controlling the Transaction telephone.

2.52 The dialing card is used first and the telephone number of the proper TN port and CSC is encoded on it. In addition, the dialing card contains identification information, access codes, or transaction codes associated with the user to be transmitted to the CSC when the connection has been established. The dialing card also contains special characters that control features of the Transaction telephone.

2.53 Typically, dialing cards are associated with and kept with the Transaction telephone in slots provided for them. There may be any number of dialing cards: one for reaching each of a number of CSCs or one containing each of several access or transaction codes.

2.54 The second card (customer card) is typically not associated with a particular Transaction telephone and contains information pertaining to the particular transaction being performed. With a bank or credit card, the second card is carried by the merchant's customer and has an account number, an expiration date, and possible additional discretionary data encoded on it. Alternatively, the card could be an inventory control card with a part number and inventory control information on it.

2.55 Magnetic-striped cards are inserted by placing the edge of the card containing the stripe into the right-hand end of the long slot of the card reader with the stripe facing the user as the user faces the keyboard. The edge of the card should rest against the bottom of the slot to align the encoded portion of the stripe with the reading equipment. The card is then moved steadily from right to left through the slot.

2.56 The card reader is designed to be insensitive to the velocity at which the card is moved through the reading slot and to accommodate reasonable changes in velocity as the card moves. However, jerky motion of the card (or extremely fast or slow motion) is not recommended. The card reader accepts velocities between 2-1/2 and 50 inches per second.

2.57 If a card is misread, the Transaction set can detect the error through coding checks on the magnetic stripe of the card. The error condition is noted by flashing an instruction lamp on the faceplate. When an error is detected, the set does not transmit the suspected data but instead expects the data to be reentered. The card may be inserted again or the information may be manually keyed in.

2.58 Information can be entered manually using the manual entry pad instead of either of the card operations described in 2.51 through 2.57. More typically, data are entered manually after the two cards have been entered to provide specific information that is not reasonably stored on cards.

In the banking and credit industry, the information provided manually could include the dollar amount of the transaction.

2.59 The Transaction telephone has storage space for a maximum of 61 additional characters in its buffer after the cards (or equivalent manual data) have been entered. If a field separator (/) is used, a maximum of 15 characters can be entered before the first field separator and a maximum of 45 characters can be entered after the field separator.

2.60 In a typical transaction, the user lifts the handset and the first instruction lamp lights. The user then inserts the dialing card into the card reader and the second lamp lights. The user listens for dial tone. Upon receipt of dial tone, the second card (the customer card) is inserted into the card reader and the third instruction lamp lights. Additional data may then be entered on the manual entry pad. Meanwhile, the set automatically dials the TN and buffers all input data. The user may depress the ERASE key to delete erroneous manual input and the END key is depressed when data input is complete.

2.61 Upon completion of the call from the Transaction telephone set to the 407A data set at the TN, the 407A data set returns answer tone and the Transaction set begins transmitting data encoded in TOUCH-TONE characters at a rate of 8.8 characters per second. If the user has not completed manual data entry, the Transaction telephone sends all data that have been entered and then sends each additional individual character as it is entered by the user. When the END key is finally depressed, the set sends the end-of-text (ETX) sequence (##), and LRC, and a character count.

2.62 An LRC is a code which is used to check that data have been properly read from the stripe. The LRC is a binary sum without carry of the characters preceding it on the stripe. A character count is the least significant digit of the number of characters in the message. For example, if the number of characters in the message was 29, the character count would be 9; if the number of characters in the message was 30, the character count would be 0.

2.63 After data entry, final depression of the END key, and transmission of data, the manual entry pad and card reader are active. However, rather than entering additional data, the usual application requires waiting for a response to the initial inquiry in the form of voice or KAT in Transaction I sets and FSK in Transaction II sets.

2.64 The Transaction II set is also capable of using KAT to light lamps and may be used in the same applications as a Transaction I set.

2.65 Voice responses could include an approval or acknowledgment of the transaction, a rejection or denial of the transaction, a request for additional information, or a request for reentry of information. Reentries or additional information can be entered from the keyboard, from the magnetic-strip reader, or from both. However, if the dialing card is reinserted at this time, all data on the card are transmitted with the exception of the start and end signals and the LRC.

2.66 The Transaction I and Transaction II sets have two response lamps located to the right of the manual entry pad; one lamp is green and the other yellow. These lamps are intended as a replacement of voice response. The green lamp may be used when an inquiry is approved and no further action is necessary. The yellow lamp may be used to indicate that the response is more complicated and that the user should listen for a detailed audio response.

2.67 KAT responses can be used to light either the green or the yellow response lamp on the Transaction I telephone. FSK is oridnarily used to light the lamps on the Transaction II telephone. When either lamp is lighted, the Transaction telephone (both Transaction I and Transaction II) acknowledges receipt of the answer tone by sending either a TOUCH-TONE "a" (for the green lamp) or a TOUCH-TONE "b" (for the yellow lamp) to verify that the correct response is received. If the incorrect response is indicated, the CSC may retransmit the correct signal. If the action is taken within 7 seconds and the user has not disconnected, the new signal causes the appropriate response at the Transaction telephone. The correct lamp lights and the acknowledgment is sent. With yellow lamp responses the Transaction telephone automatically sends a signal (##) indicating that it is ready for the audio response after the "b" which indicates that yellow lamp reception has

been sent. In this instance, the sequence indicates that the terminal is ready for voice.

2.68 The Transaction telephone can operate in either a TOUCH-TONE or rotary dial-pulse mode so that any customer with telephone service can be served by the Transaction telephone. The primary dialing mode is established at the time of installation of the telephone, in accoreance with a service order, and does not affect the operation of the telephone once it has contacted the TN port. Data are always sent as TOUCH-TONE data.

2.69 Optional characters on the dialing card can be used to control special dialing features. These include:

- 2-part dialing to serve customers who must dial part of a telephone number, wait for dial tone, and then dial the remainder of the number.
- 2-part dialing with a change in dialing mode (split-mode dialing) to allow for part rotary dialing and part TOUCH-TONE dialing.
- Predialing to cause the telephone number to be dialed after insertion of the dialing card rather than the customer card (particularly useful on TOUCH-TONE lines for long distance calls).
- Automatic one-number dialing without insertion of the dialing card. In this case, the Transaction telephone automatically dials the number on the last dialing card entered.

2.70 The 2-part dialing option is used with PBX or tie-line installations where a second dial tone wait is required. With centrex-CO service in an electronic switching system (ESS), second dial tone is instantaneous and no wait is required. One-part dialing can be used.

2.71 Unless the option is disabled by a dialing card character, the Transaction telephone stores the information on the dialing card. Unless the use of the ATTN key is necessary (as described in 2.41), insertion of the customer card automatically causes the stored information to be used and dials the last number entered with a dialing card. All information on the stored dialing card is retained and the set transmits data just as if the dialing card had been inserted. The old dialing and user information remains in memory until different information is entered either by using a dialing card or the manual entry pad. However, in the Transaction I set, when the manual entry pad is used for dialing, the dialed number is not stored for future use. In the Transaction I set, when 2-part dialing is required and this option is used, the predialed portion of the number must be entered on the TRIMLINE handset before the customer card is entered. All dialing information may be on the card for a Transaction I set. In both Transaction I and Transaction II sets, the stored information is lost if commercial power is interrupted.

2.72 The dialing card includes a character which enables or disables the green/yellow lamps. If the green/yellow lamps are disabled, only voice response can be sent to the Transaction telephone.

2.73 A character may be placed on the dialing card to prevent checking of the customer card LRC character.

2.74 The Transaction telephone is equipped with a TRIMLINE handset which can be used for manual dialing or the manual entry pad may be used for manual dialing. The manual entry pad may be disabled from dialing by the installer according to the service order. The dialing feature of the TRIMLINE handset is not disabled by this option.

2.75 When the manual entry pad is used to dial numbers, it is used in the same manner as a TOUCH-TONE pad. The Transaction telephone automaticallyperformspush-button-to-rotary-dial-pulse conversion, if required.

2.76 When using the manual entry pad to manually address a TN port, the END key is depressed after dialing the telephone number. The user identification information is then keyed in and the END key is depressed again to signify the end of the user information before entering the customer data or card. When the manual entry pad is used to call a telephone number that is not the number of a TN port, the END key should not be depressed at the end of the number. User information may be punctuated with the (.) or (/) keys. The Transaction telephone transmits this information after answer tone from the CSC is detected and after entry of customer data begins.

2.77 The transaction telephone can also be used as a TOUCH-TONE telephone to call CSCs which are programmed to communicate with TOUCH-TONE telephones only. In such cases, the manual entry pad is used in exactly the same manner as the pad on the TOUCH-TONE telephone and the END key is not depressed. A total of 100 characters can be transmitted in this mode.

2.78 Data may be entered manually to replace use of the customer card whenever the second instruction lamp is either lighted or blinking. This lamp lights after entry of the dialing card or after manual data entry and blinks after a misread of the customer card.

2.79 A maximum of 47 characters can be manually entered in this field in including any digit, the (.) key, and the (/) key. The Transaction telephone denotes manually entered data in this field by sending a TOUCH-TONE character between the user identification field and the second field different from the one it would send if card entry were used. The ERASE key, used when the second lamp is lighted, applies to all of the characters entered while the lamp is lighted and cannot affect entries made while the first lamp was lighted.

2.80 The END key is depressed at the end of data to be manually entered in this field; depressing this key causes the third instruction lamp to light. Data entry is completed from this point in the same manner as it would be completed if cards had been inserted.

POLLED ACCESS NETWORK

2.81 The PAN, as shown in Figure 7, is described in 2.82 through 2.90.

2.82 Access to the TN message switch by terminals on the PAN is permanently in effect by means of a dedicated, shared path to all terminals. Each terminal is connected to the PAN through a channel service unit (CSU). The CSU is a protective interface device.

2.83 Each CSU is attached to a data station selector (DSS). The DSS takes two channels and branches out to 64 outputs. Three DSS outputs cannot be assigned, thus 61 ports are left which can be used for station service.

2.84 The DSS uses split duplication. One TN channel serves part of the DSS outputs and the other TN channel serves the remainder of the DSS outputs. However, if one TN channel fails, the other channel can serve all of the DSS outputs.

2.85 It is possible to expand the number of DSS outputs by using a secondary DSS. A secondary DSS uses two outputs of another DSS as service channels instead of channels directly from the TN.

2.86 It is not necessary to locate the DSS (primary or secondary) near the other TN message switch frames. The DSS may be located in another central office or at a remote location such as a shopping center.

2.87 Each TN channel to a DSS is connected to an asynchronous line adaptor (ALA) in the TN. The ALA serves as the interface between the SPCH and the DSS service channel.

2.88 The configuration which consists of a primary DSS, its secondary DSSs, and the local loops and ALAs serving them is known as a polled access circuit.

2.89 A maximum of 16 ALAs is connected to one LAS. The LAS switches messages between multiple ALAs and the TN SPCH. the LAS is physically identical to the LAS described in 2.24.

2.90 Each LAS is connected to a DBS. The DBS is described in 2.25.

POLLED OPERATION

2.91 Operation of the Transaction III set on the PAN is similar to operation of the Transaction II set on the DAN. The main difference between the two types of operation is that with the operaton of the Transaction III set on the PAN there is no need to establish a path through the switched telephone network and no voice response is possible.

2.92 A connection is established by the 3ACC when a poll address is transmitted to the DSS. Either a poll (a shot burst of carrier) or a response may be transmitted after the poll address. If a poll is transmitted the terminal has a brief period in which to initiate an inquiry before the next poll address is sent.

2.93 Cards are inserted through a card reader on the back of the set (see Fig. 3). However, the card used in place of a dialing card in the Transaction III set contains only the identity of the CSC to be connected and set options; it does not contain a telephone number in the switched telephone network.

2.94 The Transaction III set stores all information on the last identification (ID) card entered and transmits this information whenever the user depresses the LAST ID key.

2.95 The keys on the Transaction III set are not represented by TOUCH-TONE frequencies as are the keys on Transaction I and Transaction II sets. All communication between the Transaction III set and the TN uses FSK at the rate of 1200 baud.

2.96 A Transaction III set may be used in conjunction with a printer into which credit slips are inserted. Upon return of the appropriate message from the CSC, the printer prints the credit slip.

2.97 The Bell System optional printer is a self-contained unit which allows stacking the Transaction III terminal above the printer for an integrated package. Alternatively, the printer may be located a maximum of 3 feet from the terminal. The character set includes all upper- and lower-case alphabetic characters, all numerics, and the following symbols: ! " # $ ¢ , ( ) * + - . / [ ] @: ; < > = ? - .

2.98 The Transaction III set operates in either a ***paired*** or a ***nonpaired*** mode. In the paired mode the operator normally inserts an ID card, inserts a customer card, keys in miscellaneous data (such as a dollar amount), and depresses the END key. The terminal automatically sends the message and waits until a response is received. The operator must wait for the response before proceeding with a new inquiry; however, status messages are permitted. In the nonpaired mode the operator follows the same data-entry procedure except that after the message is sent, the terminal automatically resets in order that it may accept a new inquiry.

2.99 When using the terminal in a paired mode, the user performs the following steps in the most common installation and application.

(a) Observe that the first instruction lamp is lighted and the SYSTEM READY indicator is flickering (extinguishing momentarily when polled).

(b) Insert the ID card for the desired data center in the card reader.

(c) When the second instruction lamp lights, insert the customer's card in the card reader.

(d) Key in the amount of the transaction and/or other variable data and depress the END key.

(e) Observe that TRANSACTION IN PROGRESS (TIP) lamp lights indicating that the TN is forwarding the message to the CSC. After the CSC processes the inquiry the TN delivers the data response message from the CSC to the terminal. The message can include information to light any one of five response lamps on the Transaction III terminal, other information for display on the character display, and if the optional Bell system printer is connected still, other additional information may be printed on regular paper. When the terminal is waiting for a response from the CSC after transmitting the initial inquiry, no new inquiries are allowed.

2.100 If the user wishes to query the CSC concerning the current transaction or cancel the current transaction, a status or cancel message is used. The terminal pairs status and cancel messages so that further attempts at status or cancel requests by the user are ignored by the terminal until a valid CSC response is received. Only one cancel message is allowed per transaction.

2.101 When the terminal is in the nonpaired mode of operation, all of the steps in 2.99 are followed except (e). In the nonpaired mode the final step (e) is as follows:

Observe that the first instruction lamp lights again indicating that the TN has forwarded the message to the CSC.

2.102 The operating mode of the Transaction III set (inquiry-response or inquiry only) is determined by characters an the ID card.

2.103 Information normally entered by using the magnetic-striped cards can also be entered

through the manual entry pad. At the onset of data entry the user keys in the number of the CSC, depresses the (/) key, keys in the user number, and depresses the END key. The customer number is manually entered or the customer's card is inserted. Finally, the user enters the dollar amount and other information as before.

2.104 The Transaction III terminal can be equipped with a PIN pad. This pad is used to enter manual data by another user and is enabled by the user by depressing the PIN key any time that the second or third instruction lamps light. When the additional user has inputted all entries, the PIN pad is disabled by depressing the END key on the PIN pad.

2.105 The Transaction III terminal can receive a 128-character text data message; however, the numeric display can show only 8 characters at a time. When a message with more than eight characters is received for the display, the first eight characters are displayed immediately. Then the DISPLAY lamp adjacent to the numeric display blinks. When the display key is depressed, the next eight characters are cycled into the display. The procedure is continued until all characters have been viewed and the DISPLAY lamp is extinguished. If the ERASE key is depressed before all of the characters have been viewed, the display message is restored to its beginning and can be repeated as before.

2.106 The display shows the characters zero through nine and (.) corresponding to key pad entries for the digits and decimal point. A dash (—) is displayed for the / key. Other key depressions are shown as spaces. In addition, the set displays the characters A, b, C, d, E, F, G, H, i, J, L, n, o, P, Q, r, S, t, U, v, Y, Z and - in messages received. The characters displayed correspond to the ASCII characters in the received text. Only upper-case letters are decoded but either upper- or lower-case letters are displayed according to the available character set shown above. Characters that cannot be displayed are shown as spaces except for control characters.

2.107 The END key is used to end segments of a data entry. When this key is depressed and the third instruction lamp is lighted, the set transmits the message upon reception of the next poll. Where appropriate, depressing the END key with paper inserted in the printer causes the paper to be clamped and the current terminal operation to proceed.

2.108 The PIN key is depressed to allow entry of data from the PIN pad. After entry of the PIN, the END key on the PIN pad is depressed and the pad is deactivated. The pad may also be deactivated by once again depressing the PIN key on the Transaction III set.

2.109 The STATUS key is used to send followup inquiries to the CSC regarding the current transaction. Its operation is inhibited until a message is sent to the CSC. To send a status message, the user depresses STATUS, waits for the lamp adjacent to the key to light, follows it with a one-digit numeric entry (the specific entry is determined by agreement between the CSC and the station user), and depresses END. Depressing ERASE resets the status operation before END is depressed. The numeric entry is inserted into the status field of the message and is transmitted with the original message on the next poll. The terminal inhibits all further entries except CANCEL until a status response is received from the CSC.

2.110 The CANCEL key clears the current terminal operation which may result in various actions, depending upon the state of the terminal.

2.111 A RESET key located on the front lower left corner of the terminal is provided for occasions when the user cannot correct a problem using normal procedures. An example would be a case wherein a message is delivered to a CSC and before the response is returned to the terminal the CSC becomes unavailable. The user should first attempt to clear the terminal properly by sending a cancel message. However, if the transaction cannot be resolved, the user depresses RESET and logs the transaction for later reconciliation with the CSC.

2.112 When the CSC anticipates a delay in providing a complete response to an inquiry, it may send a message to the terminal which lights the WAIT lamp. The user can continue to enter status or cancel messages. However, new inquiries are not permitted until a completed response which automatically resets the WAIT lamp is received. If a printer is used, the paper is not available to the user (remains clamped) until the WAIT lamp is reset. In other applications, this lamp could be

used as a far-end acknowledgment from the CSC that the message is being processed.

2.113 The SPECIAL CONDITON lamp lights when the TN message switch experiences some difficulty with the inquiry for any reason. A list of errors is indexed by code number. When experiencing one of these errors, the TN message switch returns a message which displays "codE" on the LED display of the set. If the set itself detects an entry error, "Error" appears on the LED display.

2.114 The CANCEL, PIN, and STATUS lamps light when these keys are activated.

2.115 When inquiry data are entered into the Transaction III set, they are stored in the set's memory. No interaction between the TN message switch, the DSS, and the set occurs until the sets's user depresses the END key. This arms the set for delivery of the data.

2.116 The ALA is equipped with a list of stations to poll. The polling occurs at one particular station approximately every 1 to 4 seconds, depending upon load. When the set which is armed receives a poll from the ALA, it transmits the data in FSK at 1200 baud.

2.117 The TN message switch checks the validity of the inquiry and returns error messages to the DSS if any checks fail. The DSS switches the message to the proper station.

2.118 If all checks pass, the TN message switch determines the appropriate CSC for delivery. The TN delivers the message and returns responses from the CSC to the DSS. The DSS switches the message to the proper station.

2.119 As stated in 2.116, the ALA polls a particular station approximately every 1 to 4 seconds, depending upon load. The polling load should be limited in such a manner that no station averages more than a 1.25-second delay in the busy hour during the busy season.

CSC NETWORK

2.120 The CSC network, as shown in Figure 8, is described in 2.121 through 2.127.

2.121 The TN provides message delivery and response reception to CSCs over 4-wire private lines using synchronous transmission. For each line, the CSC may select one of three transmission speeds: 2400 bps, 4800 bps, or 9600 bps. Each CSC may also select analog or digital transmission.

2.122 If transmission between the TN message switch and the CSC is analog, the channel to the CSC is served by a data set located in the TN message switch. The 201C data set is used for 2400 bps transmission, the 208A data set is used for 4800 bps transmission, and the 209A data set is used for 9600 bps transmission.

2.123 If transmission between the TN message switch and the CSC is digital, the channel to this CSC is served by a 500A data service unit (DSU) located in the TN. The DSU is used for all speeds of data transmission.

2.124 Each line to the CSC is connected through relays to a data set or DSU. Another data set or DSU and port are reserved as a hot standby, ready to assume duty as the active set or unit if the active set fails. Only one spare set or unit is provided for each ***type*** of data set or DSU installed in the TN. For example, for any number of required 201C data sets in the TN one additional 201C data set is installed as the spare.

2.125 The relay connections are controlled by the switch control and monitor (SCAM). The SCAM also monitors the connection of data sets or DSUs to the CSC.

2.126 Each data set or DSU is connected to a synchronous line adaptor (SLA). The SLA is the interface between the data set or DSU and the SPCH.

2.127 The DBS is used to make a connection to the active SPCH as in the DAN and the PAN.

CSC OPERATION

2.128 A group of lines to one CSC comprise a ***line group.*** A CSC may subscribe to more than one line group. A line group may contain one or more 4-wire lines. The TN message switch evenly distributes message traffic over all members of a line group.

2.129 When an inquiry message is received by the TN message switch from either a polled or dial-in terminal, the TN message switch checks the message for proper format, determines from the message the CSC line group to which it is to be delivered, and determines if the indicated CSC has selected to serve the class of terminal from which the message originated.

2.130 Each CSC may select to serve only terminals which are in the following communities.

- All polled and no dial-in
- No polled and all dial-in
- All polled and all dial-in
- Only certain polled and no dial-in
- Only certain polled and all dial-in.

The TN cannot distinguish one dial-in terminal from another and if a CSC selects service to dial-in terminals, it must serve all dial-in terminals.

2.131 After determining that a CSC has selected to serve the particular class of terminal, the message is delivered.

2.132 The CSC may also select to have messages forwarded to another CSC when the CSC computer is inoperable or overloaded or a line group is out of service. If the message cannot be delivered to the CSC, the TN message switch attempts alternate delivery.

2.133 If the CSC computer is out of service or if the message queue exceeds ten messages and no alternate delivery is possible the message is considered ***undeliverable.*** The TN returns the message to the terminal which made the inquiry after attaching an indication in the heading that the message was undeliverable.

2.134 In addition to inquiry and response messages, ***service messages*** are passed between the TN message switch and CSCs. A service message is a message used to designate changes in the state of a CSC line. For example, if the CSC wants to remove a line from service, a service message is initiated by the CSC to the TN message switch requesting that the TN message switch change the state of the line.

2.135 In addition to message delivery between a station and a CSC, the TN permits CSCs to deliver messages to other CSCs. A CSC group in which it is possible for the CSCs to deliver messages among themselves is known as an ***affiliation.***

2.136 An affiliation may consist of any number of CSCs and each CSC may belong to a maximum of ten different affiliations.

2.137 When the computer in a CSC originates a message for another CSC which belongs to the same affiliation, it attaches the affiliation identification to the message and transmits it to the TN message switch. The TN message switch checks the affiliation identification in the message against the affiliation information in memory for the CSC to which the message is to be delivered. If there is a match, the TN delivers the message to the CSC.

3. TN EQUIPMENT DESCRIPTION

3.01 A description of each of the equipment components which make up the TN is provided in 3.02 through 3.35.

AUXILIARY 3A PROCESSOR

3.02 The auxiliary 3A processor (Fig. 9) is a 6-foot 6-inch wide frame containing two of each of the following:

(a) ***3A Central Control:*** This is the same processor used in the No. 2B and No. 3 ESSs. The 3ACC executes stored program instructions.

(b) ***Main Store (MAS) Memory and Controllers:*** The MAS is a capacitor storage memory device used to store progam instructions and transient and nontransient data.

(c) ***Input/Output Units:*** The input/output units consist of the direct memory access (DMA) unit and the parallel channel (PCH) unit. the DMA unit permits the Programmable Magnetic Tape System (PROMATS) (described in 3.11) to access MAS memory with a minimum of intervention by the 3ACC. The PCH unit is the control circuitry for the main parallel channel (MPCH).

(d) ***CDI-to-TTL Interface (CTI)/Power Unit:*** This unit converts the input/output logic signals of the 3ACC to the logic signals used in the PCH units. The logic signals of the 3ACC are created by collector diffused isolation (CDI) devices and the PCH units use transistor-transistor logic (TTL).

(e) ***3A Power:*** This is the power supply for the frame.

3.03 The auxiliary 3A processor controls all call processing, system maintenance, diagnostics, billing, and administrative functions in the TN.

3.04 High reliability is achieved in the TN processor through the use of a duplicated configuration. One 3ACC and its associated memory system are active and control all of the peripheral actions. The active 3ACC is also continuously updating the standby memory. The standby 3ACC and its memory are automatically switched on-line if there is a fault in the active equipment. Fault diagnosis and isolation may then be initiated by maintenance personnel.

3.05 Most of the standard peripheral components are self-checked and use a variety of techniques, including parity, echo checking, read-after-write, and duplication. This convention permits the on-line processor to manage the peripheral configuration and switch to a backup peripheral if there is a fault.

3.06 Each word in the 3ACC is 18 bits long consisting of 16 bits of data and 2 parity bits. An exception to this convention is the ***microcode*** which is 32 bits long. The microcode does not reside in MAS memory but is stored instead in an area of the 3ACC itself. The microcode controls the internal sequencing of actions in the processor. These instructions can be executed very quickly. One microcode instruction is performed in 150 nanoseconds.

3.07 The MAS memory provides the means for storing the program instructions and data used by the 3ACC to direct and control system actions. The MAS memory of each 3ACC may consist of a maximum of four stores. Each store contains a MAS controller and one MAS module ranging in size from 64K to 256K words of storage (where K = 1024 words). The maximum size of memory is 1,048,576 words when supplemental MAS units are used. This memory is growable in increments of 32K words and is subdivided functionally into the following areas:

- The program store which contains the generic program
- The translation store which contains translations tables, control blocks, and buffers for billing and temporary storage of messages.

3.08 The generic program is a collection of subprograms which contain instructions that enable the 3ACC to perform its required functions. The term generic indicates that the subprograms can be updated and replaced as a package. Updates are required to correct errors and add features.

3.09 As stated in 3.02(b), the MAS memory is a capacitor storage device memory. Since the storage device is a capacitor, it is necessary to periodically refresh the information contained in the memory. Built-in hardware in the memory system accomplishes this function automatically. If a total power failure occurs, critical startup information is reloaded into MAS memory from backup information stored on magnetic tape located in a tape cartridge on the maintenance frame.

MAINTENANCE FRAME

3.10 The maintenance frame (Fig. 10) is a 3-foot 3-inch wide frame located to the left of the processor frame and contains the following:

(a) ***Tape Data Controller (TDC) Units:*** There are two TDC units on the maintenance frame. Each contains a magnetic tape cartridge, control mechanisms, and circuitry. The main purpose of the tape cartridge is to store a backup copy of the data in MAS memory.

(b) ***Teletypewriter Controller (TTYC) Units:*** There are two TTYC units on the maintenance frame. They are used to control the input and output between the TN and all teletypewriters (TTYs) associated with the TN.

(c) ***Maintenance TTY:*** The maintenance TTY is used by maintenance personnel to communicate with the TN processor. This channel may also have a remote TTY with the same capabilities as the maintenance TTY located at the TN.

(d) ***System Status Panel (SSTP) and Related Equipment:*** The SSTP contains an array of lamps which provide a visual indication of various conditions in the TN and several pushbutton controls. Associated with the SSTP are the SSTP controller unit (located behind the SSTP) and the SSTP relay unit.

PROGRAMMABLE MAGNETIC TAPE SYSTEM

3.11 The PROMATS is used to record billing information on magnetic tape under the control of the TN processor. The PROMATS consists of two 2-foot 2-inch wide frames and each frame contains identical equipment. One frame actively records customer billing information while the other frame is on standby. The frame on standby assumes active control if a failure or tape exhaust occurs in the active frame.

3.12 Each PROMATS frame (Fig. 11) contains the following:

(a) ***Tape Transport:*** The tape transport drives the magnetic tape through the recording heads. The magnetic tape is a type which can be placed on a general-purpose computer for compilation of customer bills.

(b) ***Duplex Bus Selector:*** The DBS is used to attach the PROMATS frame circuitry to the active SPCH.

(c) ***Control Logic:*** The control logic provides operational functions to the PROMATS.

(d) ***Programmable Controller (PROCON):*** The PROCONs are designed to receive and execute a variety of commands associated with the tape unit. The PROCONs contain their own program consisting of 16-bit words to perform their functions. Because the PROMATS contains controllers which execute their own program, the tape system is called ***programmable.***

3.13 The billing functions performed by the PROMATS pertain only to message-handling within the TN. All station billing for a connection between a dial-in station and a dial-in port on the TN must be handled by the switching machine which serves the dial-in station and the switching machine which serves the dial-in port.

AUDIO RESPONSE UNIT

3.14 The ARU frame (Fig. 12) contains two ARUs. Each is equipped with 76 ports which can be connected to a maximum of 76 DLAs. Each ARU normally serves one-half of the dial-in ports equipped for AVA service. If one ARU fails, the other ARU can serve all AVA ports.

3.15 When the ARU receives data from a CSC it creates a spoken message for delivery to a dial-in port. A vocabulary of 1664 speech segments is stored within the ARU, each of which is of the same duration (approximately 1/6 second). These speech segments are selected and joined together to create a spoken message. The ARU frame contains MAS memory units of its own for storage of the vocabulary.

3.16 Each speech segment is called a ***grunt.*** The 3A processor determines which grunt is placed on which port at what time. A backup copy of the grunt vocabulary is stored on magnetic tape cartridge.

DIAL LINE ADAPTOR FRAME

3.17 The DLA frame (Fig. 13) is a 3-foot 3-inch wide frame used for serving dial-in ports. The frame contains two dial line adaptor hardware (DLAH) units. Each DLAH unit contains the following.

(a) ***407A Data Sets (DS407):*** The DS407 is the basic serving unit required for each dial-in port. Each dial-in port (a line on a telephone switching machine) is connected through the SCAM to the DS407. The DS407 provides the conversion of incoming TOUCH-TONE signals into 2-out-of-8 code. Each DLAH unit may house a maximum of 16 DS407s.

(b) ***Dial Line Adapters:*** The DLA provides the 25-point connector required by the DS407 and is the interface between the DS407 and the TN SPCH. The DLA controls the answering, disconnecting, and other control features of the DS407 based on commands received from the processor. ARU connections are made through the DLA. There is one DLA for each DS407 installed on the DLAH unit.

(c) ***Line Adaptor Selector:*** The LAS multiplexes messages between multiple DLAs and the SPCH.

(c) ***Duplex Bus Selector:*** The DBS makes a connection to the active SPCH.

(d) ***Power:*** The power unit supplies power for the frame.

3.18 There may a maximum of eight DLA frames in a TN office. There are 256 DLAs and DS407s in a fully equipped TN office.

ASYNCHRONOUS LINE ADAPTOR FRAME

3.19 The ALA frame (Fig. 14) is a 3-foot 3-inch wide frame used for servicing polled access lines. The frame contains two asynchronous line adaptor hardware (ALAH) units. Each ALAH contains the following.

(a) ***Asynchronous Line Adaptors:*** The ALA is the polling interface between the outgoing connection and the TN SPCH. When no information is being transmitted or received, the ALA automatically implements the polling procedure without intervention from the processor. The list of stations to be polled is kept in a recirculating register and stations are sequentially and repetitively polled until a station answers or the processor intervenes. After each poll is transmitted, the ALA remains silent for a certain period of time in order to wait for a possible station answer before beginning the next poll. Each ALAH may house a maximum of 16 ALAs.

(b) ***Line Adapter Selector:*** The LAS multiplexes messages between multiple ALAs and the SPCH.

(c) ***Duplex Bus Selector:*** The DBS makes a connection to the active SPCH.

(d) ***Power:*** This is the power unit for the ALAH unit.

3.20 In addition to the ALAH units, the ALA frame contains auxiliary data sets located above and below each ALAH unit. Each of these auxiliary data sets is an 829-series data set and is used as an interface between an ALA and the polled access line.

3.21 There may be a maximum of eight ALA frames in a TN office. When the TN office is fully equipped, there are 256 ALAs which may serve a maximum of 128 primary DSSs.

SYNCHRONOUS LINE ADAPTOR FRAME

3.22 The SLA frame (Fig. 15) is a 3-foot 3-inch wide frame which serves CSC private lines. The SLA frame may be configured in several different ways, depending upon the data sets or DSUs used. A CSC line may be served using any one of the following:

(a) ***201C Data Set:*** Used for 2400-bps analog communication.

(b) ***208A Data Set:*** Used for 4800-bps analog communication.

(c) ***209A Data Set:*** Used for 9600-bps analog communication.

(d) ***500A DSU:*** Used for 2400-bps, 4800-bps, or 9600-bps digital communication.

3.23 If only 201C data sets are used, an SLA frame may contain 12 sets. If only 208A and 209A data sets are used, an SLA frame may contain six sets. If only 500A DSUs are used, an SLA frame may contain ten units. However, an SLA frame need not contain all of one type of set or unit and various mixes are possible.

3.24 In addition to data sets and DSUs, each SLA frame contains one SLA for each set or unit installed. The SLA is the interface between the data set or DSU and the TN SPCH. In a TN office a maximum of 92 SLAs may serve a maximum of 92 CSC private lines. The 92 SLAs require from 8 to 12 SLA frames, depending upon the arrangement of data sets and DSUs.

SWITCH CONTROL AND MONITOR

3.25 The SCAM (Fig. 16) is a 6-foot 6-inch wide frame containing arrays of wire-spring relays and performs the following functions:

- Switches spare data sets into service to synchronous lines when an active data set fails

- Monitors connection on synchronous lines

- Busies-out defective 407A data sets and DLAs
- Allows connection of 407A data sets and DLAs to test circuits
- Monitors office alarms and power supplies
- Monitors the health of certain office alarms.

3.26 Two relays on the SCAM are associated with each dial-in port. One relay is capable of removing the line from service. The other connects the 407A data set to the dial test unit, which is part of the SCAM, and simultaneously removes the line from service.

3.27 Two relays are also associated with each of the synchronous ports. One relay causes the output of the data set to be looped back to its input through an attenuator. This feature is not used for 500A DSUs. The other relay switches in a spare SLA and data set to replace a defective data set and connect the spare to the transmission facility.

3.28 The SCAM accepts commands from the processor to operate and to release relays. Normally, relays are operated or released singularly but relays may be operated in groups of 16 and all relays may be released by a single instruction.

3.29 The SCAM reports the state of contacts to the processor in groups of 16 contacts at a time. A special roll-call mode permits 256 scan points to be reported back automatically in 16 steps.

3.30 A special group of scan points is used for monitoring power supply contacts and other critical points.

DATA STATION SELECTOR

3.31 The DSS (Fig. 17) is a device 12-1/2 inches deep, 12-1/2 inches wide, and 10 inches high which controls the flow of messages between two channels from ALAs in the TN and a maximum of 61 polled stations. The DSS may be located either on the telephone company's premises or the customer's premises in either a primary or a secondary arrangement.

3.32 The DSS is controlled by FSK signals sent from two ALAs over dual 4-wire facilities. Each path from an ALA to the DSS operates independantly of the other. One channel can assume complete control of the DSS if a failure occurs in the other channel.

3.33 Each DSS is equipped with all of the circuit packs shown in Figure 16 except the ***port cards.*** Each port card contains the circuitry to serve eight polled stations and only the number of port cards required to serve existing stations need be installed.

3.34 Each DSS has a maximum of 8 port cards and 64 ports available. However, ports 0, 7, and 63 cannot be assigned, leaving 61 ports available for service. The actual number of ports which the network administrator may assign depends upon the message load exerted by served stations. Figure 18 shows the numbering arrangement of DSS ports.

3.35 For additional information on the DSS capacity determination and assignment procedure, refer to Dial Facilities Management Practices, Division H, Section 17f, Capacity Setting, and Division H, Section 17e, Assignment Administration.

4. GLOSSARY

4.01 The following is a glossary of acronyms used in references to TNS. A brief definition of each acronyn is given.

ACCL (access link) The trunk from a particular ALA to a DSS.

ACK (positive acknowledgement signal) A signal returned by the TN to indicate that the TN has accepted a message.

ALA (asynchronous line adaptor) The interface between a channel to a DSS and the SPCH.

ALAH (asynchronous line adaptor hardware) A grouping of ALAs and associated equipment on the ALA frame.

ARU (audio response unit) A device for synthesizing spoken messages for dial-in stations.

ARUH (audio response unit hardware) A grouping of ARU equipment on the ARU frame.

ASCII (American Standard Code for Information Interchange) A standard binary code in which each alphanumeric character is represented by a 7-bit word.

AVA (automatic voice answer-back) A service wherein station inquiries are answered by a synthesized spoken message.

BSC (binary synchronous communications) A system of synchronous coding commonly used in data processing.

CSC (customer service center) A teleprocessing center which accepts and generates messages over synchronous lines.

CSCH (class-of-service character) A code used by the TN to identify dial-in stations.

CSU (channel service unit) An interface device used to terminate a 2-wire local loop for polled service.

DAN (dial-in access network) That portion of the TN and switched telephone network used to serve dial-in stations.

DBS (duplex bus selector) A device used in various places in the TN which attaches a peripheral device to the active SPCH.

DLA (dial line adaptor) The interface between the 407A data set and the TN bus.

DLAH (dial line adaptor hardware) A grouping of DLAs and associated equipment on the DLA frame.

DMA (direct memory access) A unit on the auxiliary 3A processor frame which allows access to MAS memory by the PROMATS with a minimum of interaction with the 3ACC.

DS (data set) A device which transforms digital signals into a form suitable for transmission over communications facilities.

DSS (data station selector) A device used to switch messages between two ALA channels and a maximum of 63 ports.

DSU (data service unit) A digital communication device used in data applications.

EFT (electronic funds transfer) A service allowing access to CSC account data for the purpose of account verification or manipulation.

FSK (frequency shift keying) A form of binary, asynchronous transmission using certain frequency tones to represent bits and spaces.

KAT (keyed answer tone) A 2025-Hz tone, timed at different intervals, used for signaling to dial-in stations.

LAS (line adaptor-selector) A device located in different TN frames and used to connect one of a number of identical devices to a common processor bus.

LRC (longitudinal redundacy check) A character transmitted at the end of a message which is used to check the accuracy of the message received; a binary sum of the characters in the message, without carry.

MPCH (main parallel channel) The circuitry which contains communication channels for the auxiliary 3A processor to all peripheral devices.

NAK (negative acknowledgement signal) A signal returned by the TN to signify that the TN does not accept a transmitted message.

PAC (polled access circuit) The configuration which consists of a primary DSS, its secondary DSSs, and the local loops and ALAs serving them.

PAN (polled access network) The portion of the TN used to serve polled stations.

PIN (personal identification number) A number which must be used in conjunction with an EFT transaction by the user of a credit card or bank card.

SCAM (switch control and monitor) A frame in the TN office which performs certain switching and supervisory functions.

SLA (synchrnous line adaptor) The interface between a CSC private line and the TN bus.

SPCH (subparallel channel) One of the multiplexed subchannels of the MPCH.

STN (switched telephone network) The network used by regular telephone subscribers.

TID (terminal identification) Information inserted into the heading of a message by a station which identifies that station to the TN message switch. The last four digits of the 7-digit station number.

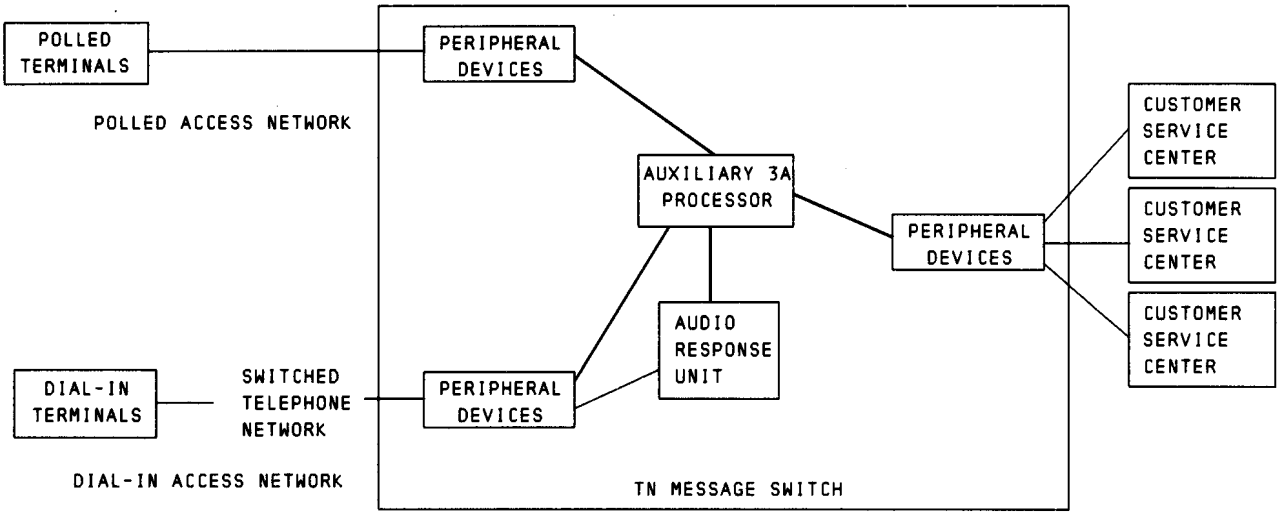


Fig. 1—Overview of the TN

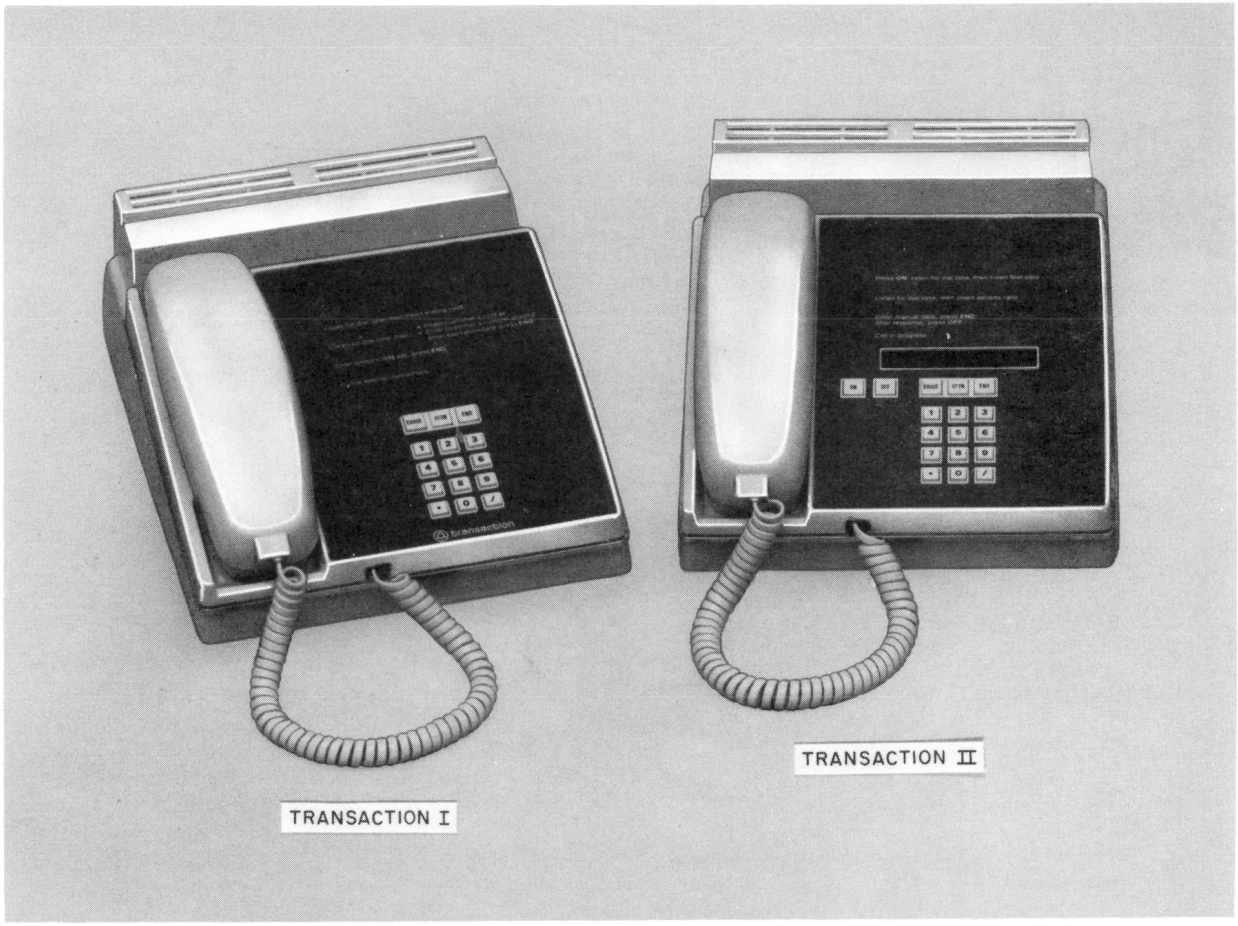
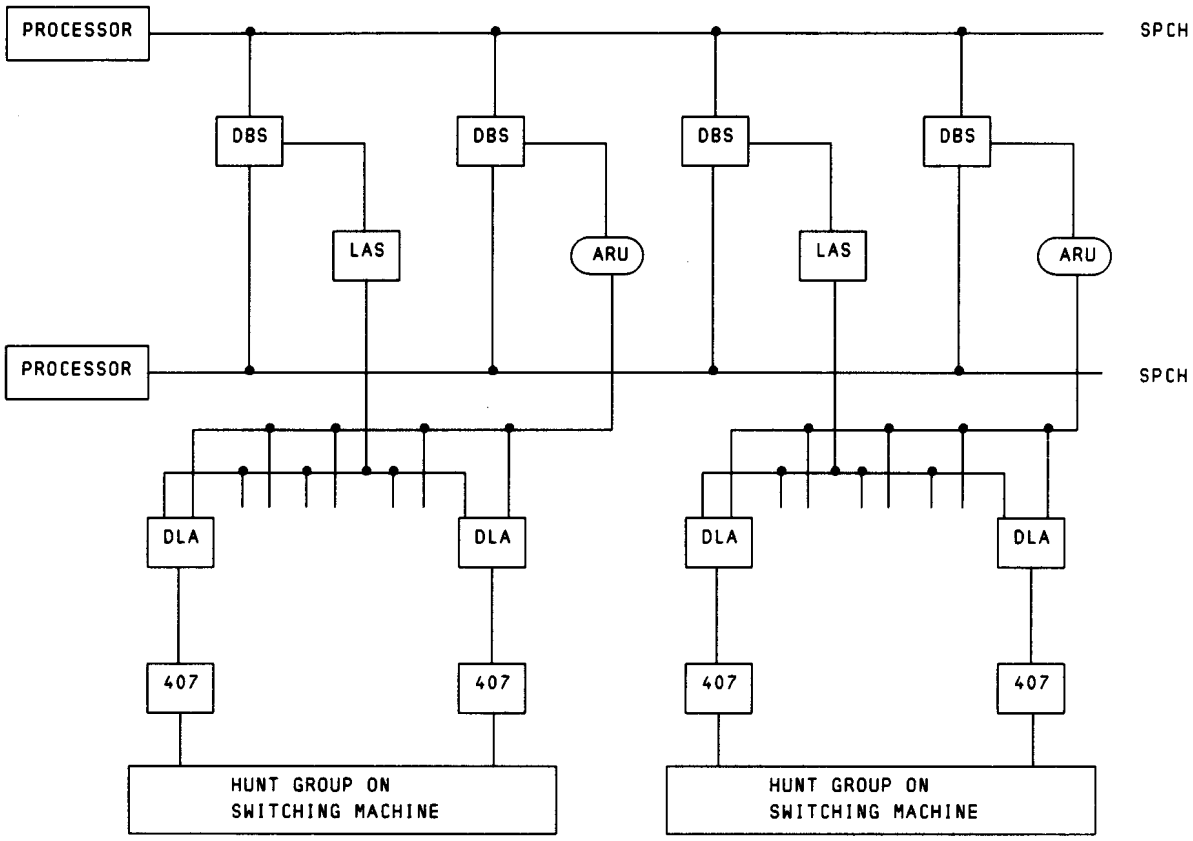


Fig. 2—Transaction I and Transaction II Sets

Fig. 3—Transaction III Set



KEY: ARU - AUDIO RESPONCE UNIT
DBS - DUPLEX BUS SELECTOR
DLA - DIAL LINE ADAPTOR
LAS - LINE ADAPTER-SELECTOR
SPCH - SUBPARALLEL CHANNEL
407 - 407 DATA SET

Fig. 4—Dial-In-Access Network

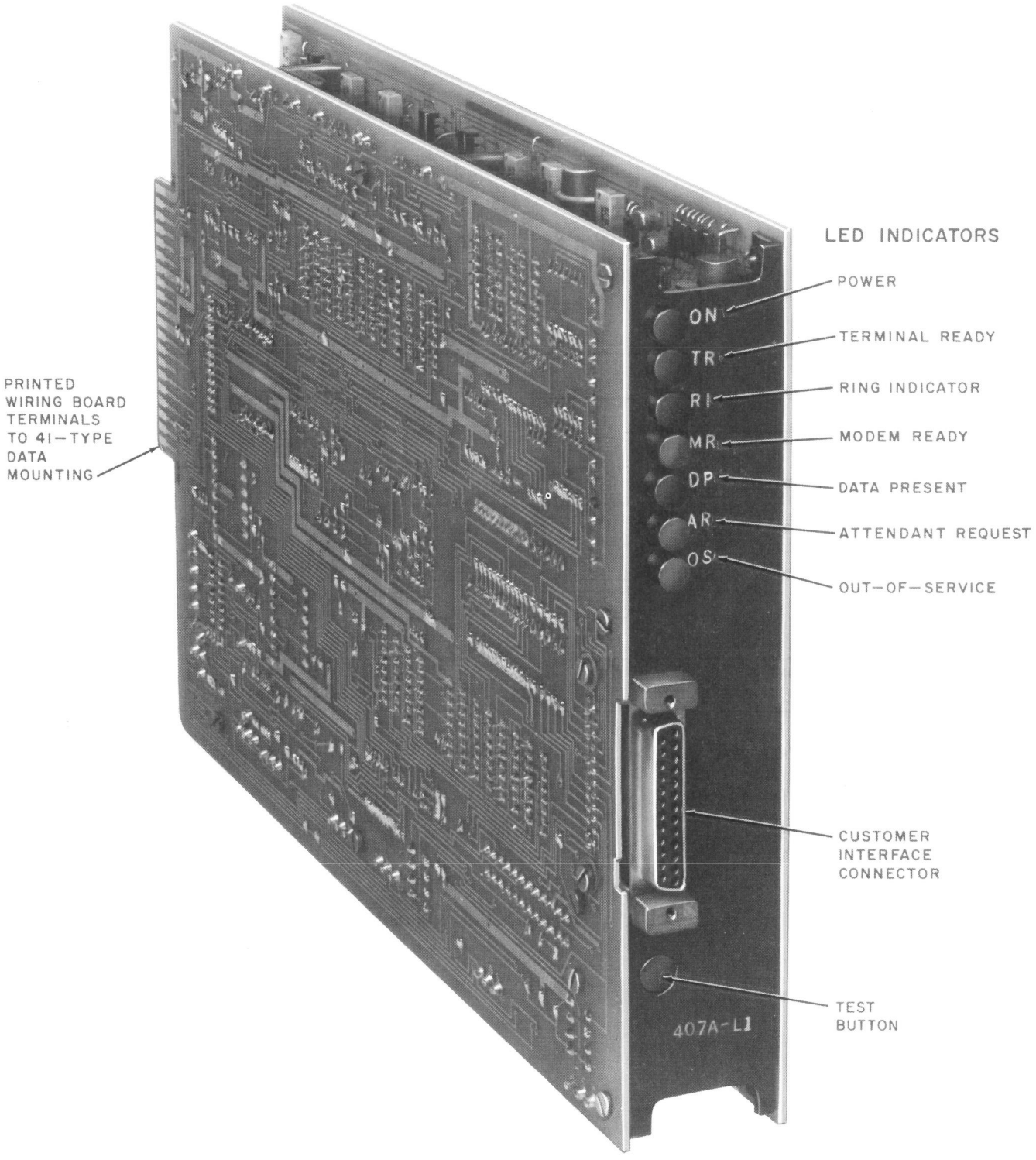


Fig. 5—407A Data Set

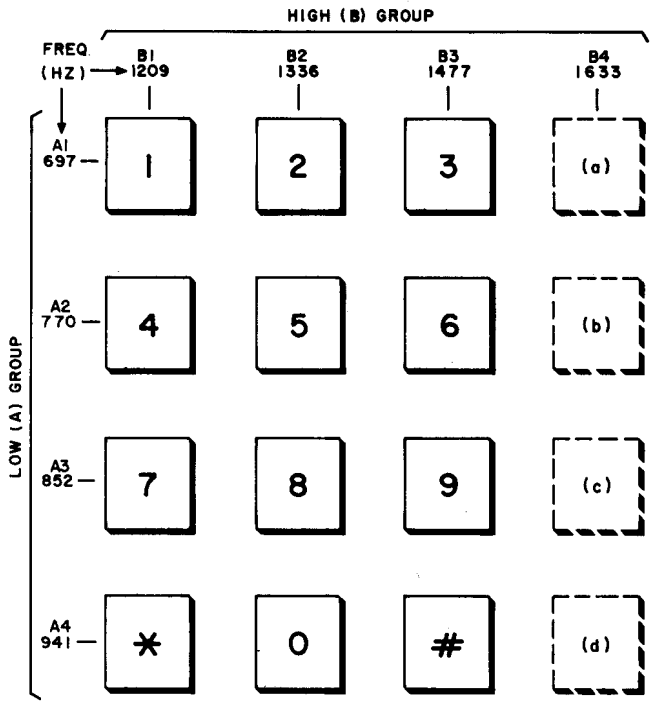


Fig. 6—TOUCH-TONE Frequency Assignments

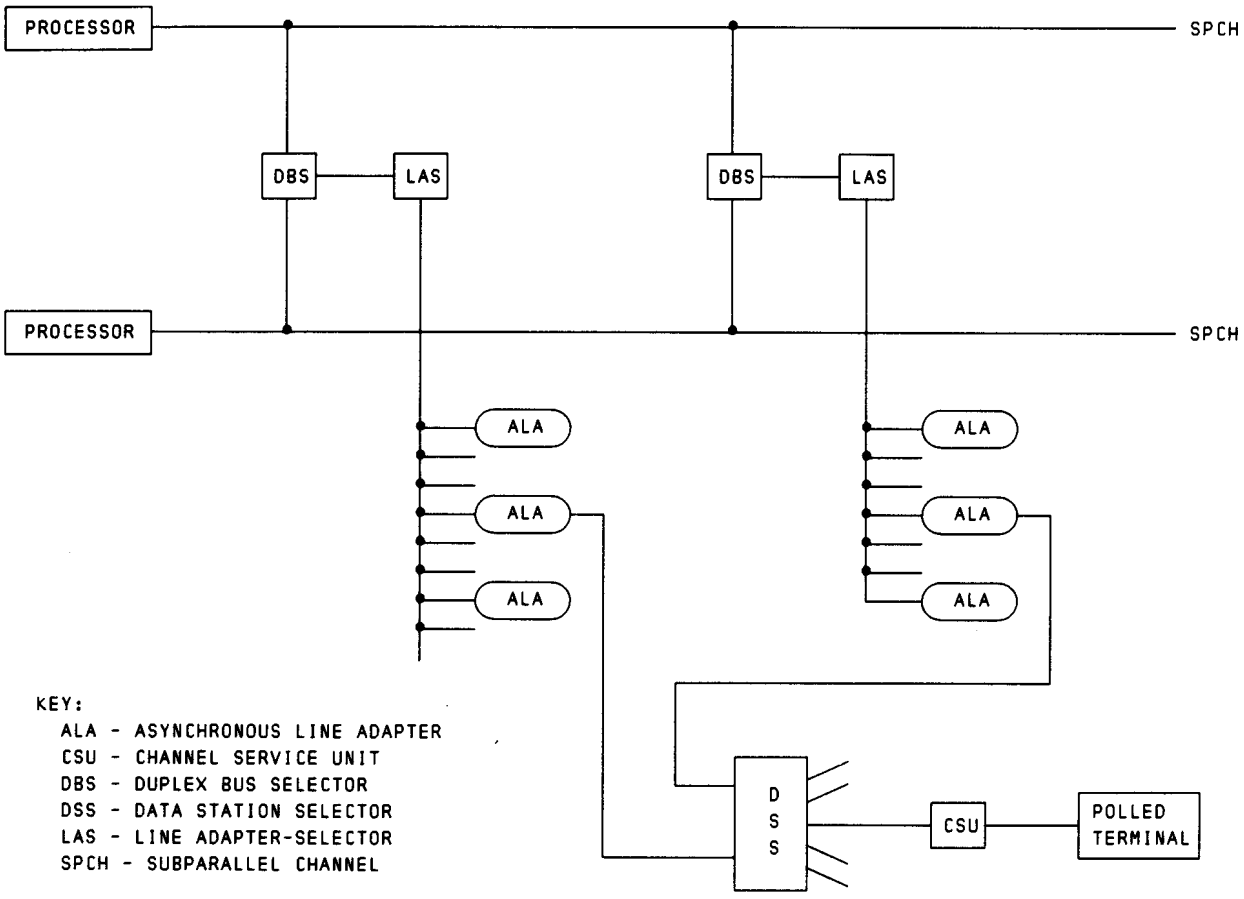


Fig. 7—Polled Access Network

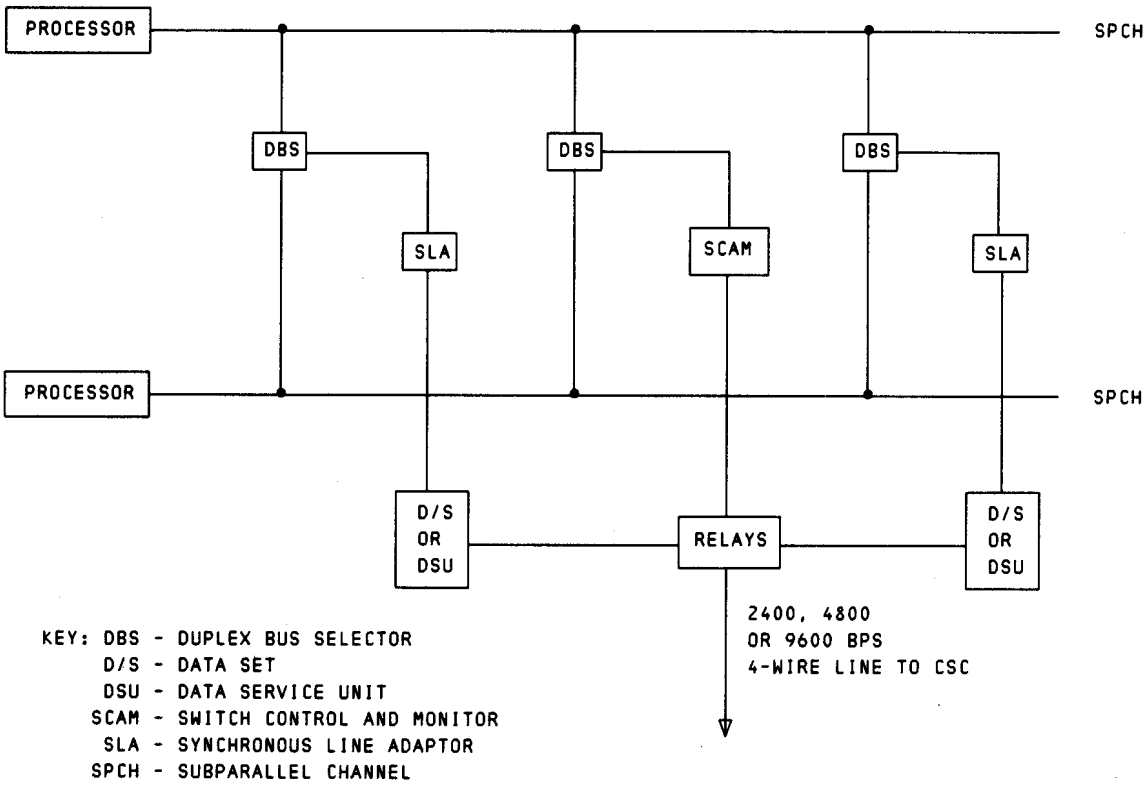


Fig. 8—CSC Network

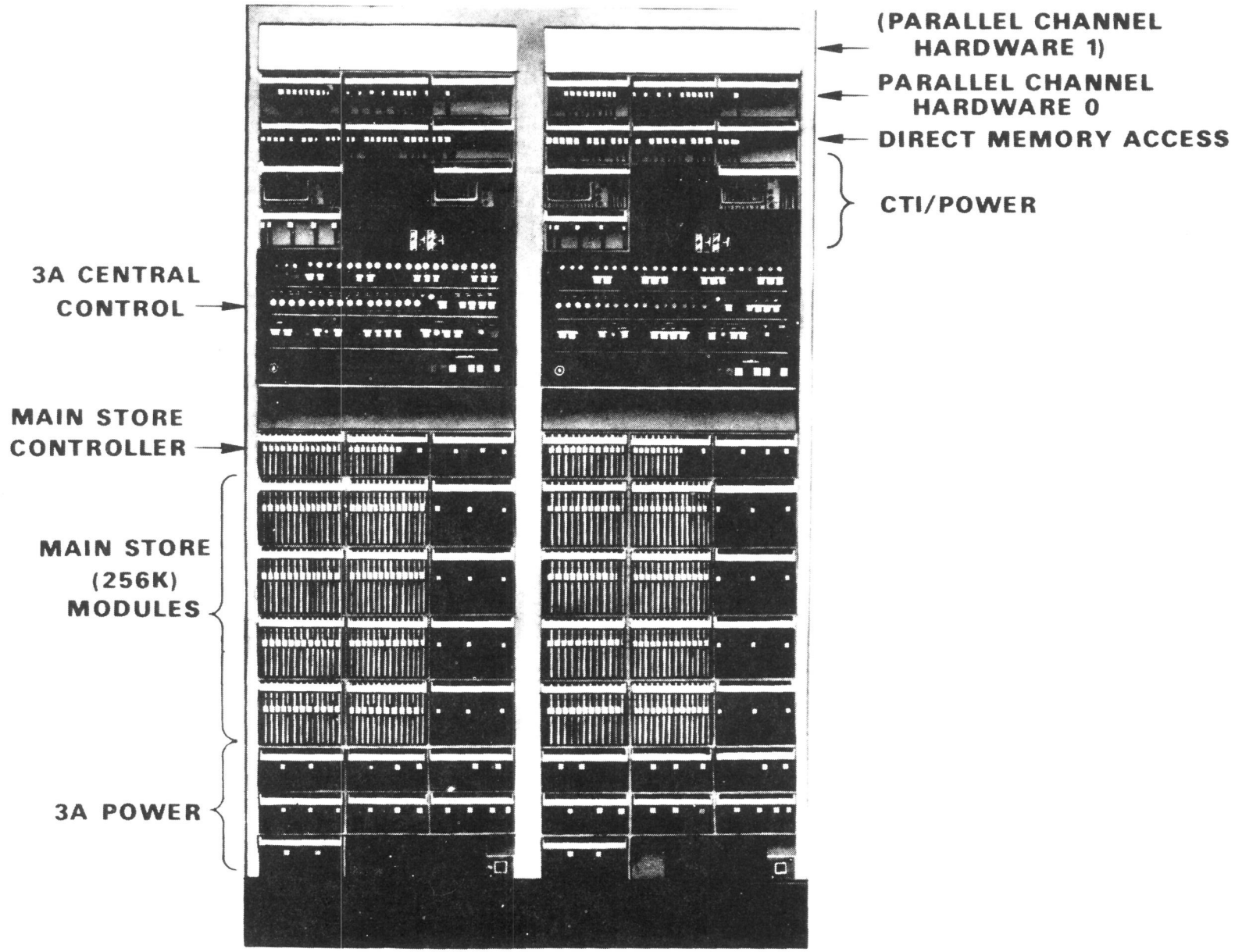


Fig. 9—Auxiliary 3A Processor

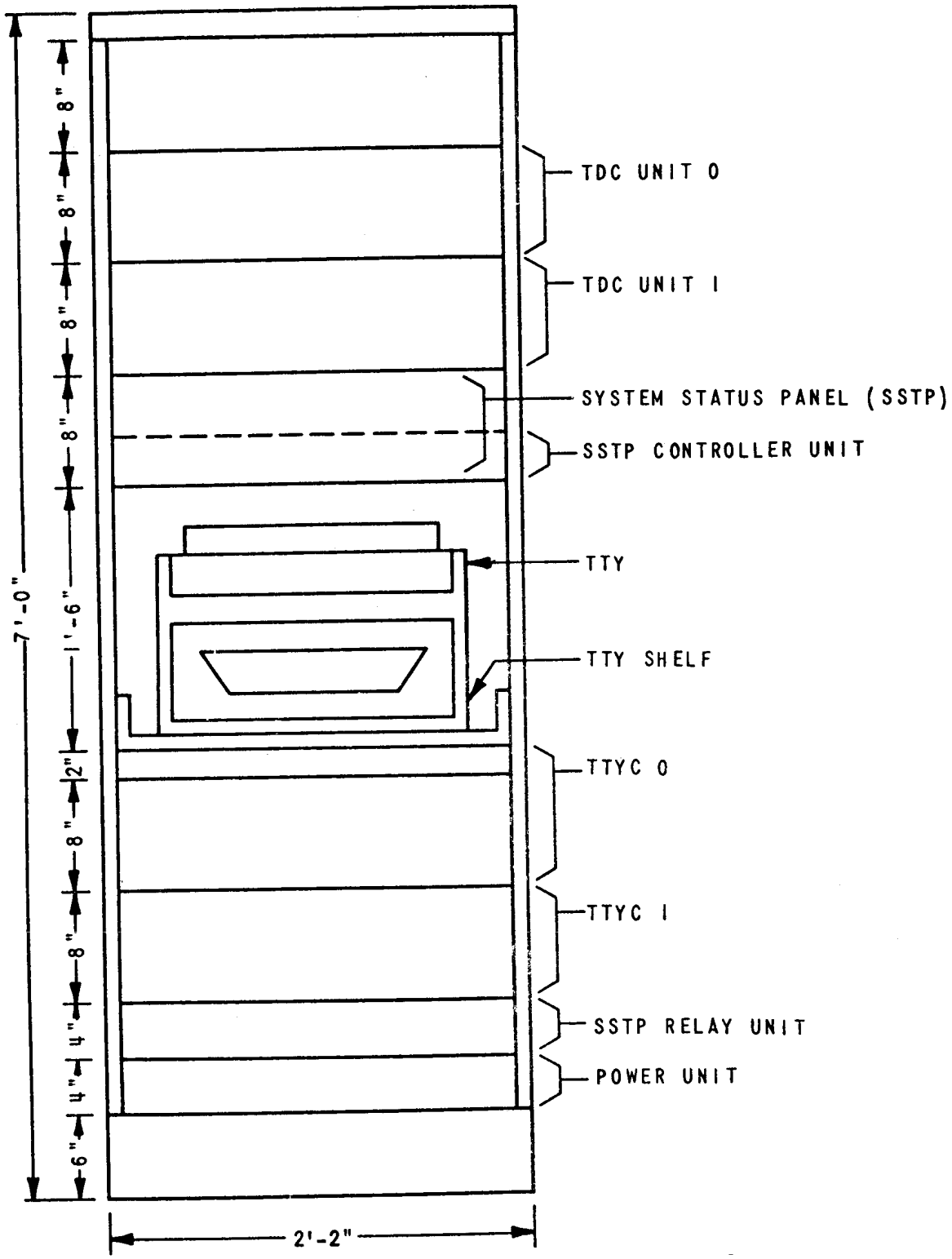


Fig. 10—Maintenance Frame

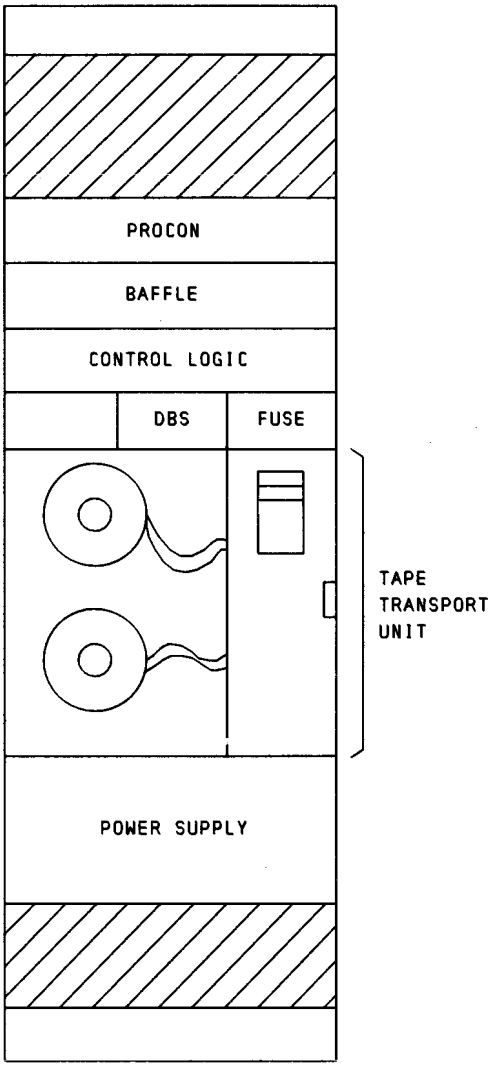


Fig. 11—PROMATS Frame

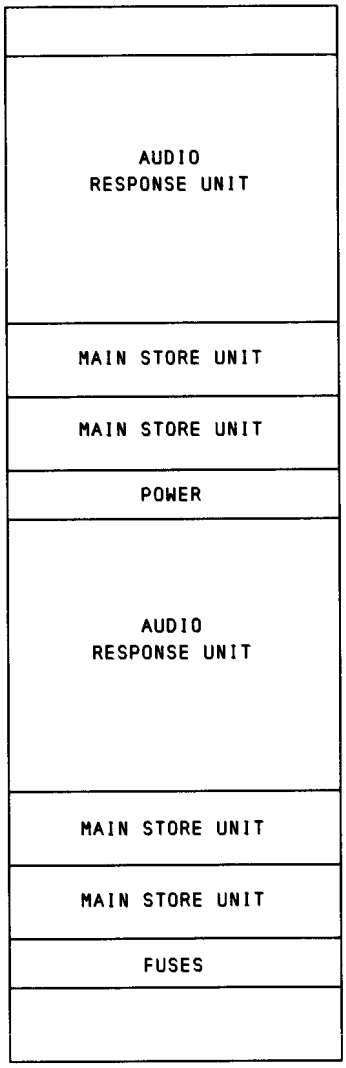


Fig. 12—ARU Frame

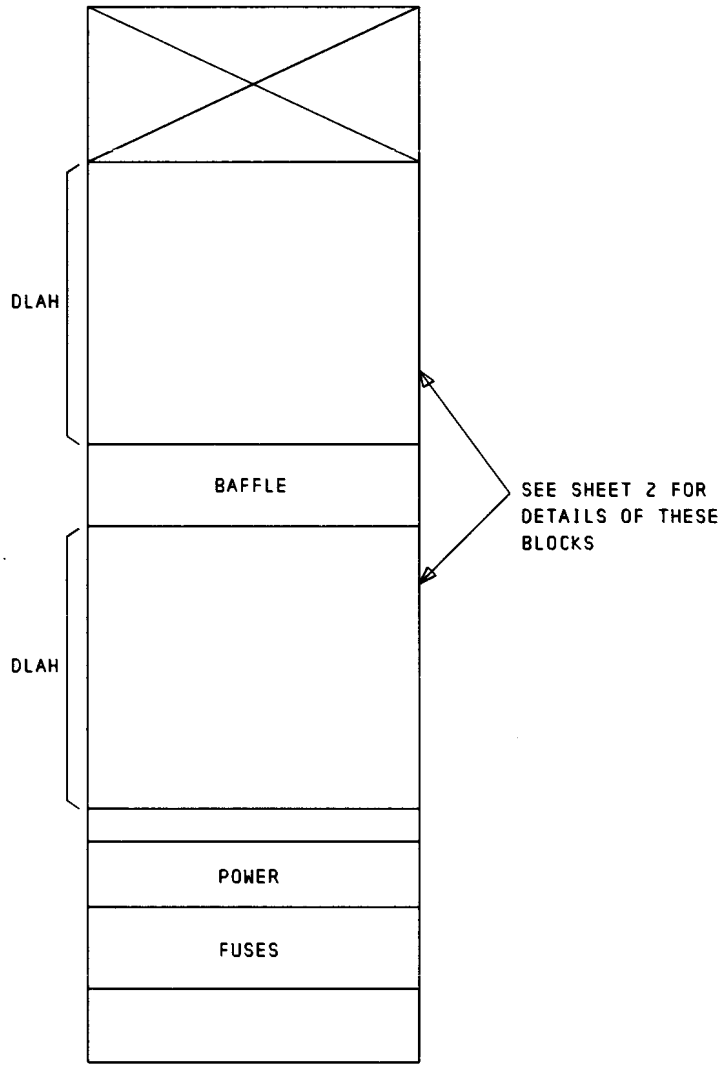


Fig. 13—DLA Frame (Sheet 1 of 2)

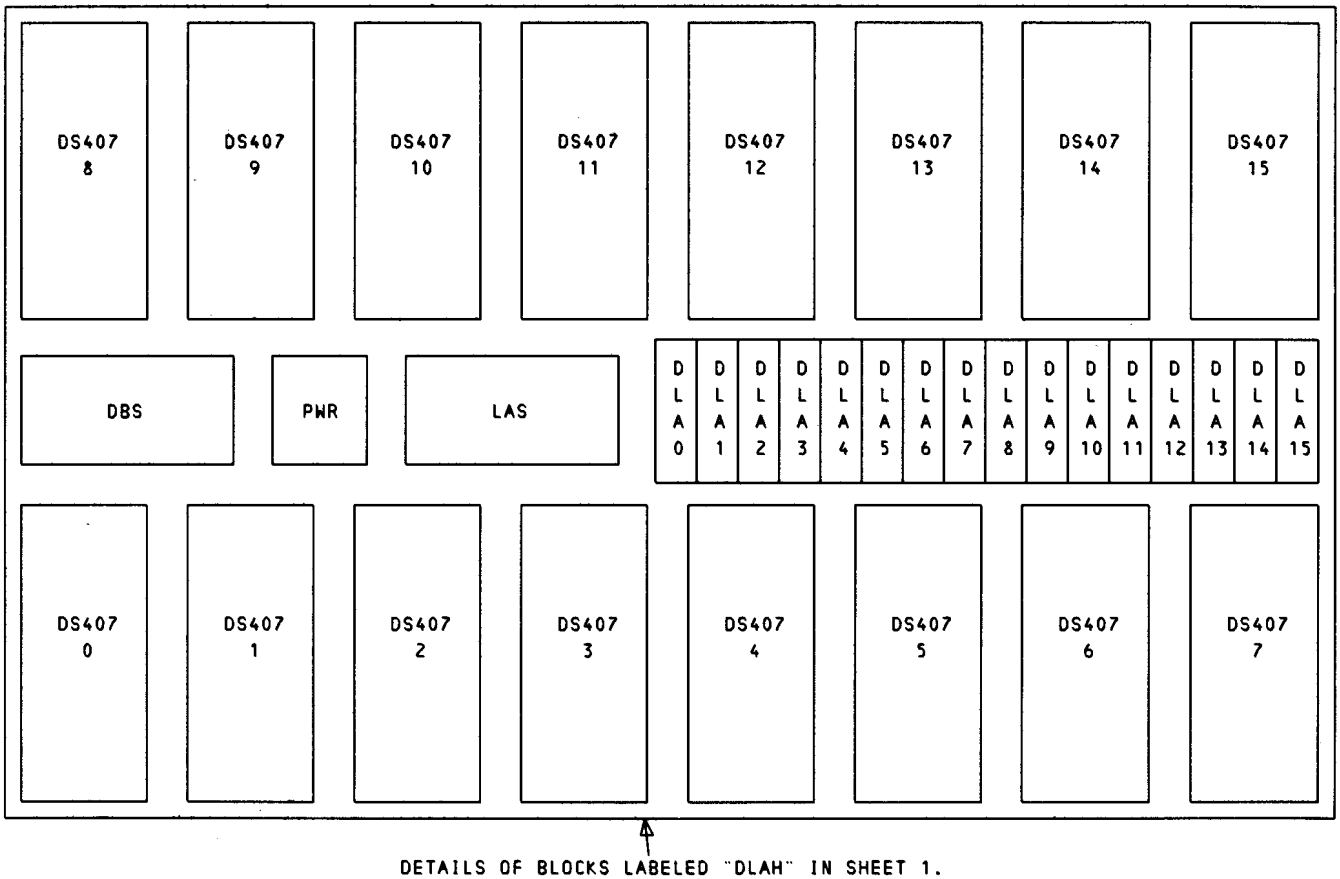


Fig. 13—DLA Frame (Sheet 2 of 2)

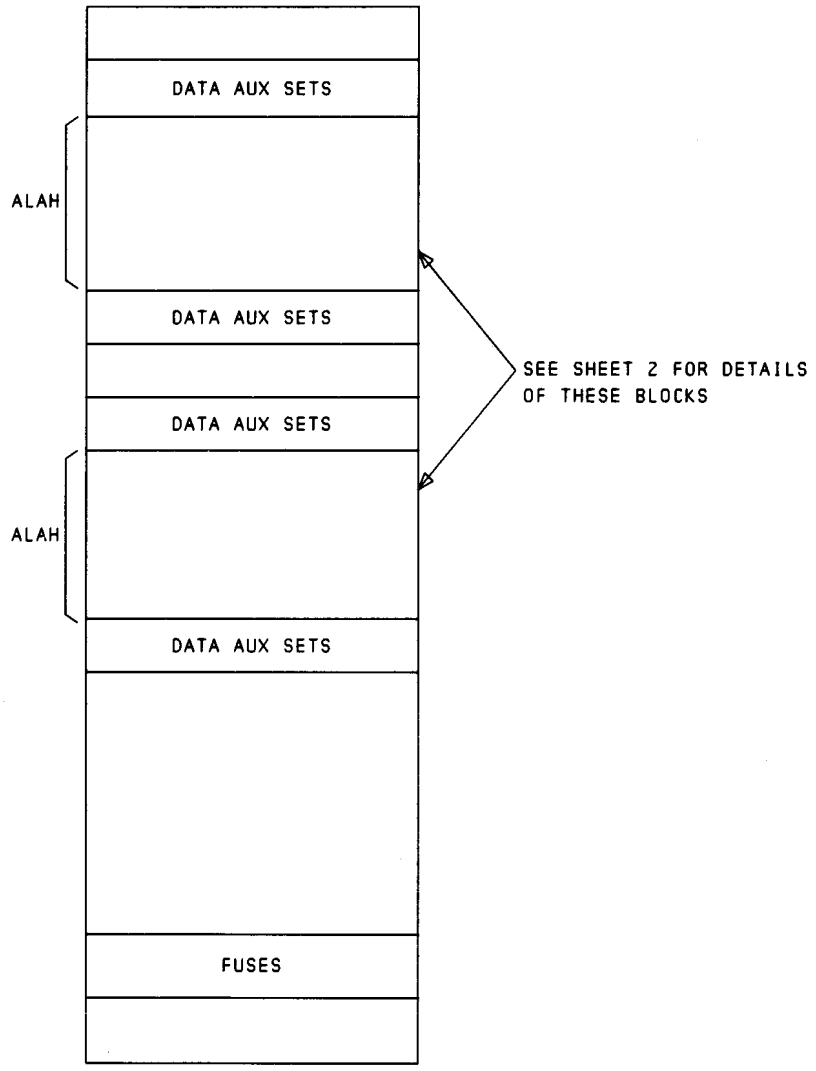


Fig. 14—ALA Frame (Sheet 1 of 2)

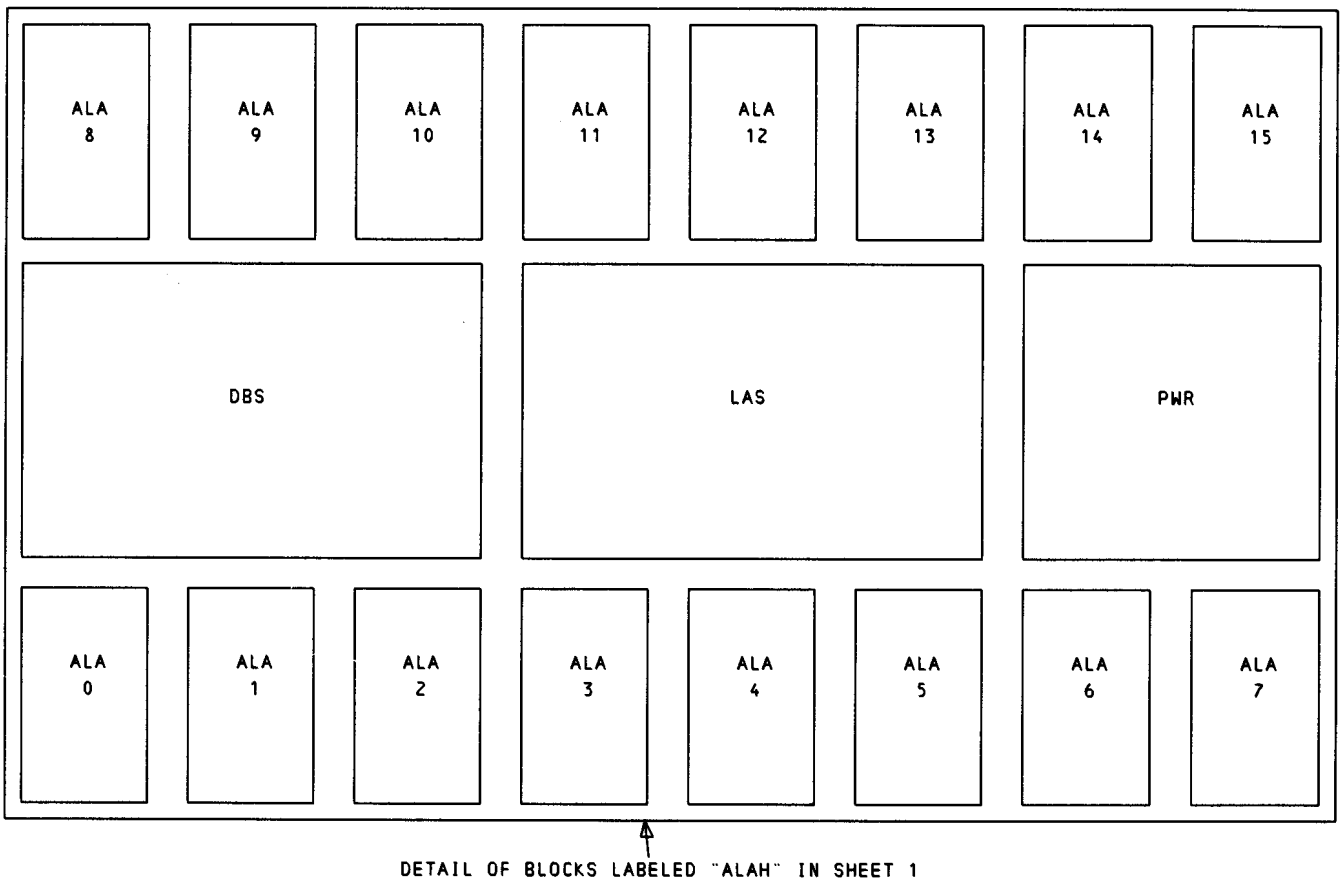


Fig. 14—ALA Frame (Sheet 2 of 2)

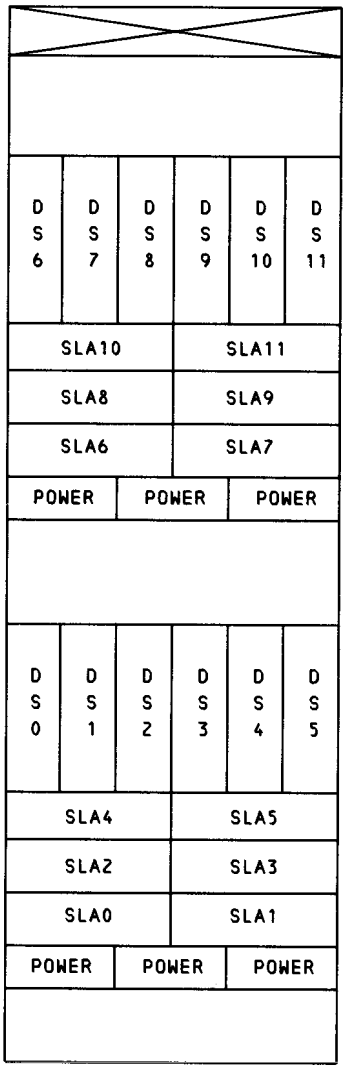


Fig. 15—SLA Frame—Configured with Only 201C Data Sets

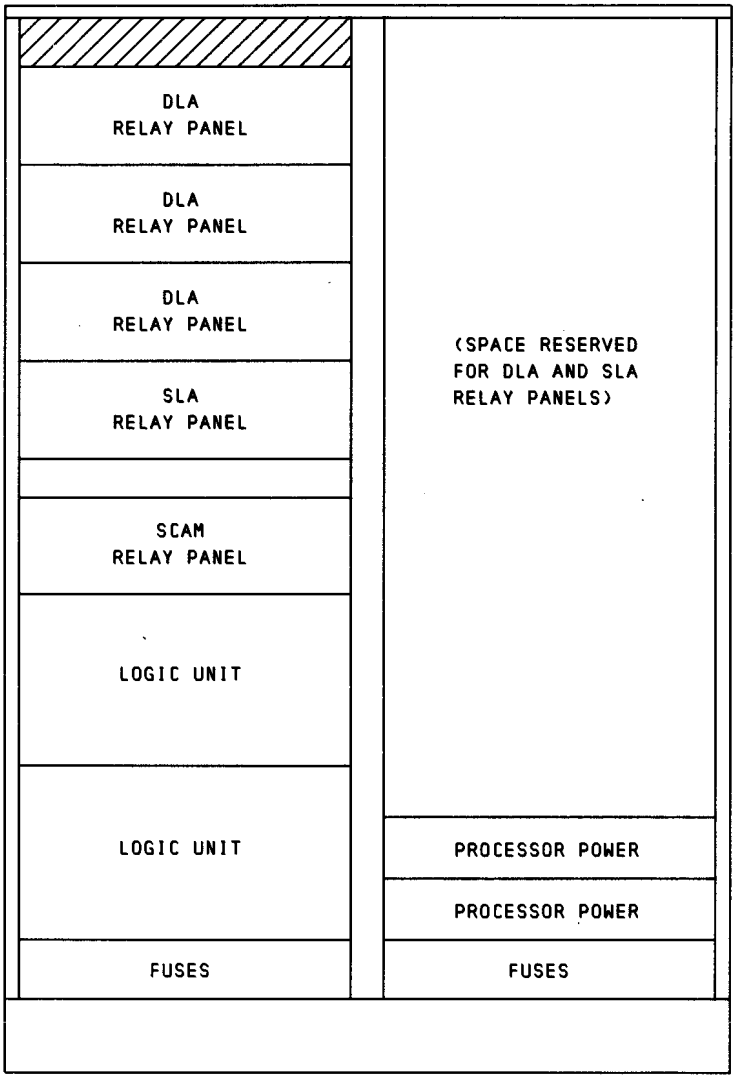


Fig. 16—Switch Control and Monitor

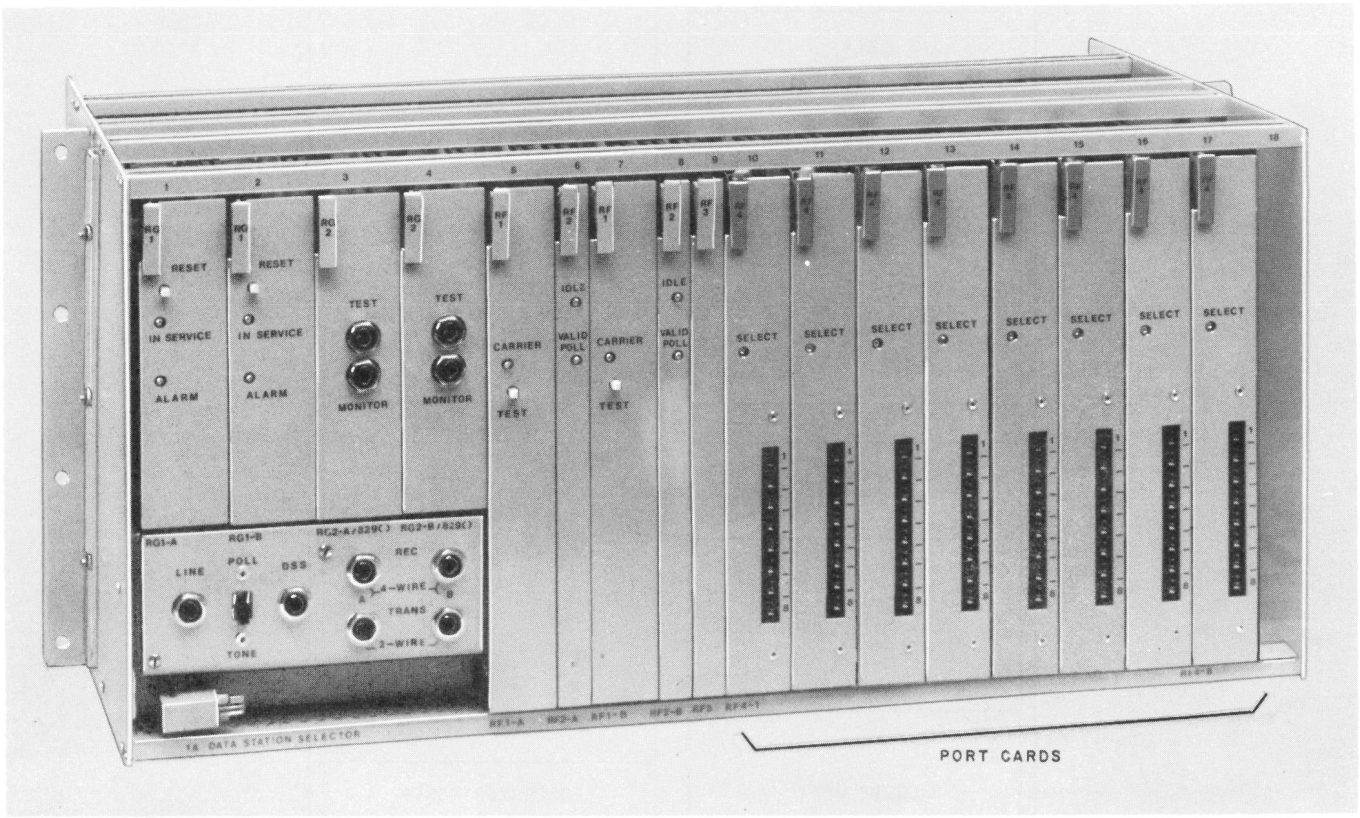


Fig. 17—Data Station Selector

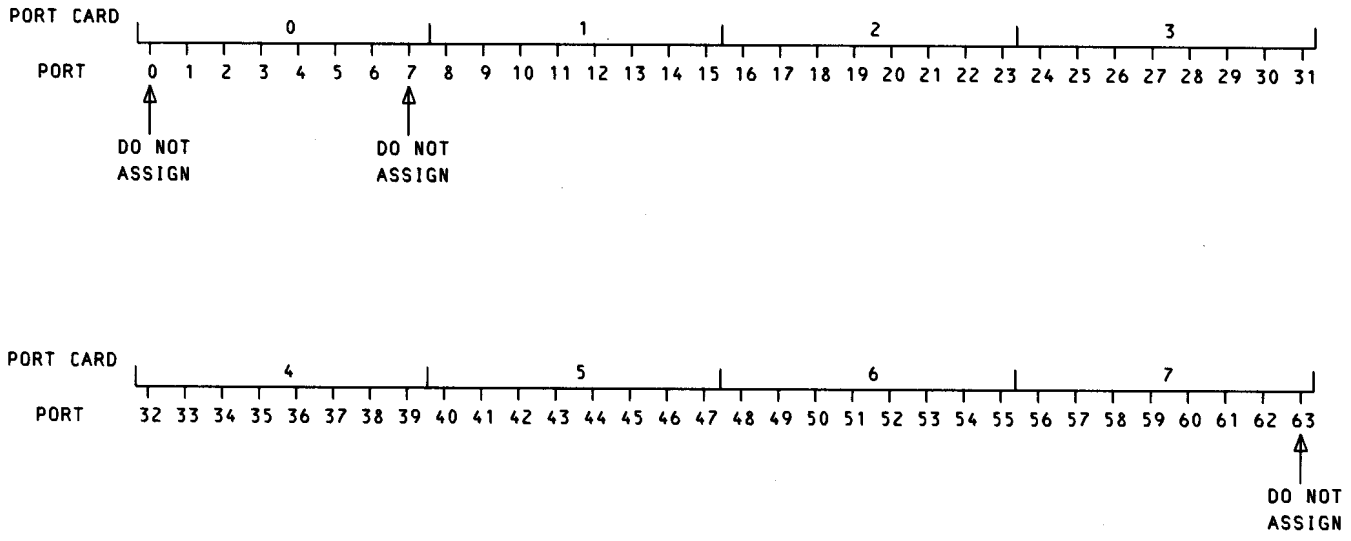


Fig. 18—DSS Port Numbering Plan