UNITIZED BAY DESCRIPTION
D4 CHANNEL BANK
DIGITAL TRANSMISSION SYSTEMS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the D4 unitized bay which includes voice circuit access and testing equipment with the D4 channel banks in a bay. The access and testing equipment will be covered herein while Section 365-170-100 continues to be the reference for the D4 channel bank description.

1.02 This section is being reissued to include changes and additions in the D4 unitized bay. Revision arrows are used to emphasize the more significant changes. The following are the specific reasons for the reissue.

(a) To change requirement for maintenance bank mounting.

(b) To add interface equipment for Dial-Up Intertoll Testing (DUIT) centers.

(c) To add ED-97918—( ) fuse and alarm panel for 72-volt option.

1.03 Like other D-banks, the D4 is a digital terminal using pulse code modulation to produce the digital signals from the voice frequency inputs. The D4 48-channel bank is organized into two 24-channel digroups which can be operated in any one of the four D4 modes to produce signals for T1 (Mode 3), T1C (Modes 1 or 2), or T2 (Mode 4) lines.

1.04 Unitized terminal equipment (UTE) is the name given to the transmission and signaling equipment, the circuit accessing equipment, and the testing equipment that is mounted together in a bay. In the D4 UTE bay, D4 channel banks perform the transmission and signaling functions. The circuit accessing equipment is wired on the drop side of the channels and provides the means of accessing the circuits for maintenance. This accessing equipment forms the circuit access point for connections with the Switched Maintenance Access System (SMAS) and with office milliwatt and measuring systems. Unitized equipment adds circuit testing capability without installing VF patch bays and improves the SMAS installation since most of the wiring is connectorized and done in the shop. Two basic variations in unitized equipment are panels for tests from the SMAS test position only,

and panels allowing manual access at the UTE bay as well. This latter type is equivalent to having VF jacks at the carrier equipment.

1.05 SMAS provides selective access to the channel leads from a centralized test position through a switching concentrator. After the circuit is accessed, bridged measurements can be made or the circuit can be split for connection to the line and drop sides. SMAS allows many circuit order and maintenance tests to be made from a test position without the assistance of another tester at the carrier equipment; thus it is useful for testing toll trunks and special service circuits. The D4 UTE can be equipped for SMAS 3B or SMAS 5A.

2. EQUIPMENT DESCRIPTION

2.01 The bay arrangements for the D4 UTE are given in this portion along with a brief description of the equipment panels which are listed with the functions in Table A. The D4 channel banks, the fuse and alarm panel, and maintenance connector panels for circuit access will be included in any bay arrangement; but there are equipment panel variations for the type of SMAS and the features at the bay. Aside from the difference between a bay for SMAS access only and a bay for both local bay access and SMAS access, some bays will include distribution networks and an optional communication panel.

A. Bay Arrangements

2.02 UTE bays are available in 11-foot 6-inch, 9-foot, and 7-foot heights to accommodate four, three, or two channel banks for 192, 144, or 96 voice channels. The general layout of the channel banks and UTE panels in a bay is shown in Fig. 1; the number of banks and panels in the bay, of course, depends on the bay size. The association of two maintenance connectors (24 voice circuits each) with each channel bank is apparent from Fig. 1. The fuse and alarm panel is also common to all bays. When a communication panel is desired in the bay lineup, it is placed where it will serve three to five bays; likewise, the manual access panel, when equipped, will be shared among bays and has a 9-foot retractable cord to make connections. The D4 maintenance bank, containing D4 maintenance plug-ins, can be mounted ▶in preference to other equipment in the office or UTE bay. The maintenance bank requires 10 inches of panel space. For example, SMAS 5 can replace a communication panel, manual access panel, and distribution network for the maintenance bank.◀ Only one maintenance bank is required on the floor of an office.

2.03 ▶The 11-foot 6-inch bay can be arranged to include interface equipment to Dial Up Intertoll Testing (DUIT) Centers (Fig. 2). This equipment includes relay panel ED-7C207-( ), fuse and alarm panel ED-1P466-30, and voice frequency (VF) attenuator panel NJ-01061A-01. The -72V power converter ED-97918-( ), and fuse and alarm panel ED-7C201-( ) are not required to interface with DUIT.◀

B. Channel Bank

2.04 Each bank is a self-contained arrangement including its own power converter equipment for bank plug-ins. The bank measures 23 by 19 inches high. Most of the external leads are connectorized at the bank; the exceptions are the power, alarm, and 20-Hz ringing leads which are wired through the D4 bank power distribution unit and the high frequency line leads which are wired to the bank Trunk Processing Unit (TPU) position. Common transmission equipment is located on the left side of the bank, and channel units are located on the right. The digroups are designated A and B, and channel positions are numbered 1A to 24A and 1B to 24B.

C. Equipment Panels

2.05 These panels are listed in Table A along with referenced Fig. 3, 4, 5, 6, and 7. All panels are sized for 23-inch bay openings and range in heights from 2 to 6 inches. Most of the interconnections between panels are made with connectorized leads, but in general the power and alarm leads and any telephone lines to the communication panel are not connectorized. The working combination of these panels depends on the type of SMAS (3 or 5) and the type of maintenance connectors installed. When either maintenance connector with MAC jacks (J98622BL, L2, L3 or J98622BK) is installed, the J98622AU manual access panel with the retractable access cord (also referred to as Type 2 BX panel) may be provided in the bay or in a neighboring bay in the office lineup for local testing capability. In addition, the companion communication panel, called the communication, patch, and test panel (CPTP) would be used, if required. The MAC jacks are multiple access connectors with spring contacts arranged

for normal through circuit operation until a cord plug is inserted in the jack. The cord plug breaks the normal path and makes connection to the contacts on the line and drop sides. When the maintenance connectors without MAC jacks (J98622BL, L2 or J98622BT) are installed, the manual access panel is not used and 660 communication panel is used if required.

2.06 When manual access is desired and SMAS is planned for the future, the J98622BK maintenance connectors for manual access only (also referred to as Type 2BX) can be installed temporarily. These panels contain no SMAS circuitry and merely provide the MACs for manual access to the channel drop leads. Replacement with SMAS panels is expedited by the connectorized leads, but service must be interrupted to make the replacement.

3. FUNCTIONAL DESCRIPTION

A. Overall

3.01 Figure 8 is the functional block diagram of the D4 UTE showing the transmission and signaling leads for only one of the 24 channels in both the A and B digroups. These leads are connectorized for each channel position and, in the UTE, are coupled to the maintenance connectors where the actual circuit access is made through relays. The E&M signaling leads will only be accessible when Type 2 maintenance connectors are installed; these leads are not wired through Type 3 maintenance connectors. Distribution networks are only used with SMAS 5 as an interface between the control leads and the maintenance connectors, and to produce one stage of switching concentration. Otherwise for SMAS 3 the control leads brought to the top-bay terminal strip connect directly to the maintenance connectors. The optional communication panel adds office intercom facilities and telephone lines to originate and receive calls at the unitized bay. In a bay equipped for a manual access panel, connection of the access cord to the circuit MAC jack makes the circuit available at the manual access panel and at the communication, patch, and test panel for testing.

3.02 The relays in the maintenance connectors normally provide a through connection of the leads carrying the voice and signaling information. When maintenance is required on the circuit, it can be accessed by operating the circuit relays from the office test position. This is accomplished through the SMAS switching network by keying the access code for the circuit. Each maintenance connector has a designation card giving the SMAS directory number for the connector and the channel bank number. Once accessed in the normal mode, the circuit can be monitored at the test position on a bridged basis and split for tests on the line and drop sides. At the D4 UTE equipped with MAC jacks on the maintenance connectors, the circuit can also be accessed by connecting the manual access cord to the circuit (Fig. 9) for long term tests that would otherwise be done at a VF patch bay. The card on the cord contacts both the line and drop sides of the leads and makes the circuit available at the manual access panel and communication panel for tests. Test sets and a milliwatt supply can then be connected. In addition, a failed circuit can be restored by patching it with ED-2C002-20 cord to an unassigned circuit on the same or another maintenance connector, or at the communication panel.

B. Maintenance Connectors

3.03 These panels contain all the relay circuitry for accessing and splitting any circuit wired to the panel. Power can be removed from the panels without affecting customer service because the access relays provide through circuit connections in the nonoperated state. Type 2 and Type 3 maintenance connectors are available for the D4 UTE. The Type 2 connector is intended for 6-wire access points and may be equipped with MAC jacks for manual access. The access includes three pairs: one for T&R leads, one for T1&R1 leads, and the other pair which can be used for either E&M or A&B signaling leads or for the T&R leads on the metallic extension side of the E or F signaling unit. This latter use of the third pair allows two-way access on many special service circuits by means of a single access code. Likewise, there is two-way access on the signaling leads which may be wired to the third pair. The Type 3 connector is intended for 2-wire and 4-wire circuit access; both 2- and 4-wire circuits can be mixed on the same maintenance connector. When either circuit is accessed and split for testing, both the line and drop circuits will be available simultaneously. A single access code (1 of 24) can be used to access two 2-wire circuits making a total of 48 2-wire circuits that can be served by a maintenance connector. Note however that special circuits are limited to 24 for marker purposes so that making one 2-wire circuit special makes its companion also

special. Only one 4-wire circuit can be accessed by a single access code, making a total of 24 that can be served.

3.04 The contacts of the trunk maintenance (TM) relay normally connect the voice and signaling leads through; but when the circuit is accessed from SMAS, the TM relay operates to bridge high impedance transformer windings across the transmission leads (see Fig. 10 and 11). In this condition, the leads can be monitored at a SMAS facility jack. When signals are sent to split the circuit, different relay operations take place in the maintenance connectors as described in paragraphs 3.05 and 3.06. Reference is made to the A and B access points which are identified with a direction of transmission in the associated figures.

3.05 ***Type 2 Maintenance Connector (Fig. 10)***—When a signal is sent to split the circuit toward the facility, the SL relay interrupts continuity of both transmission access points, switches out both monitor transformers, and delivers the facility (line) side of both access points to the SMAS. Similarly, if the maintenance connector receives a control signal to split the circuit toward the equipment (drop) side, the SD relay interrupts continuity of transmission access points, switches out both monitor transformers, and delivers the equipment sides of both transmission access points to the SMAS. In both cases, splitting the circuit toward the facility or equipment side is independently controlled and is retained over the split/monitor status of the signaling access point. Under split conditions, either the facility direction of both transmission access points or the equipment direction of both transmission points is delivered to the SMAS, but not both. Regardless of the split/monitor status of the transmission access points, if the maintenance connector receives a control signal to split the signaling circuit, both sides of the signaling access point are delivered to the SMAS. Therefore, transmission testing is independent of signaling testing and vice versa.

3.06 ***Type 3 Maintenance Connector (Fig. 11)***—When a control signal is sent to split the A access point, the SP2 relay interrupts A access point continuity, switches out the A monitoring transformer (T2), and delivers both sides (line and drop) of the A access point to the SMAS. Similarly, if the connector receives a control signal to split the B access point, the SP1 relay interrupts B access point continuity, switches out the B monitoring transformer (T1), and delivers both sides of the B access point to the SMAS. In the type 3 maintenance connector, split monitor control of the A access point is independent of that of the B access point. In addition when an access point is in the split condition, both sides of the access point are delivered to the SMAS, permitting testing in the facility and equipment directions simultaneously.

3.07 Pin jacks in the SPL CKT IDENT field on the maintenance connectors are to be used to mark any special service circuits. Any 2-wire circuit marked special service must have its companion marked. Plug-in 525A diodes are placed in the jacks for such a circuit to serve as a visual reminder and an electrical marker. When the marked circuit is accessed, an indicator lamp will light at the SMAS test position.

3.08 The LOOP TST jacks on the J98622BL panel allows tone to be sent and measured in order to test the transmission losses in the SMAS lines. A GT1 TST (gating test) jack allows testing the gating circuits in the remote access circuit of the maintenance connector.

3.09 A TPB (test position busy) lamp indicates that the access circuit is busy and the maintenance connector cannot be further accessed until the circuit is released. If access results in an alarm condition caused by component failure within the connector, a control signal is sent to the SMAS indicating the same. Simultaneously, the TM relay is prevented from operating, thereby preserving circuit continuity. The alarm condition indicated by the ALM lamp at the connector remains until corrected, and the associated ALM RLS key is turned.

C. Manual Access Panel

3.10 The J98622AU manual access panel (Fig. 5) makes the circuit, accessed by its card-plug retractable cord, available for test connections and communications through an optional communication panel. Test connections to the office milliwatt supply or to the transmission and noise measuring system (TMS) are made by the switches on the panel. These switches control splitting the circuit toward the line or drop. The M LEAD LINE/E LEAD DROP switches control the supervision on the E&M leads. Other test equipment can also be patched to the accessed circuit at the jacks on the

panel equivalent to the equipment and line jacks found at a VF patch bay.

3.11 The manual access panel has the following switches, jacks, and lamps for the various functions:

(a) Two nonlocking lever switches (designated MEAS TMS LINE/DROP and MEAS NOISE LINE/DROP are used to separate the line and drop in the selected VF channel. When these switches are operated, they make connections between the selected VF channel and an associated TMS for making level, noise, and frequency tests toward either the line or the drop.

(b) Two white lamps (designated TMS BSY and NOISE BSY) light to indicate that the transmission and noise functions, respectively, of the associated TMS are in use locally or at another test position.

(c) Two level switches [designated SEND LINE/DROP (locking) and SEND NOR/DOWN 10 DB (nonlocking)] are used to open the connections between the line and drop in the selected VF channel and to make connections between that channel and an associated milliwatt distribution system (MDS). The MDS sends a 1-kHz test tone of either -16 or -26 dBm toward the line or +7 or -3 dBm toward the drop.

(d) Two locking lever switches (designated M LEAD LINE, ON HOOK/OFF HOOK and E LEAD DROP, ON HOOK/OFF HOOK) are used to simulate on-hook and off-hook signaling conditions on the line and drop circuits associated with the selected VF channel. When operated, these switches also open connections between the line and drop to permit external test equipment to be connected to the signaling circuits via associated jacks on the panel.

(e) Two red lamps (designated M DROP and E LINE) are used to indicate the signaling conditions on the E&M leads associated with the selected VF channel. The M DROP lamp lights when the drop circuit is in the on-hook condition and is extinguished when it is in the off-hook condition. Similarly, the E LINE lamp lights when the line circuit is in the on-hook condition and is extinguished when it is in the off-hook condition. The state of these lamps is not affected by the positioning of their adjacent level switches.

(f) The accessed circuit is connected to the equipment test jacks LINE IN, DROP OUT, LINE OUT, DROP IN, EM LINE, and EM DROP in the manual access panel. Tests and measurements equivalent to those made at a 6-wire VF patch jack field can now be performed from the equipment test jacks in the manual access panel. Operation of the MEAS TMS/NOISE keys to the LINE or DROP position splits the transmission paths through these line and drop jacks for tests in either direction.

(g) A nonlocking level switch (designated CAL CK LINE/DROP) is used for connecting the -16 and +7 dBm test tones from the MDS to the TMS for checking the accuracy of these test tones. In addition, two associated jacks, designated CAL LINE and CAL DROP, can be used to check these test tones with external test equipment.

D. Communication Panels

3.12 The J98626AA communication panel (Fig. 6) allows connecting a headset for talking over any VF channel selected at the manual access panel or patched to the TDM PATCH jacks on the panel. In addition, it provides for communication over either of two 4-wire order-wire circuits, or over any of five 2-wire circuits (e.g., trunk tie lines, local station lines). Data set operation over one of these 2-wire circuits (line 5) and tandem patching for a maximum of six VF channels are also provided.

3.13 The 660 communication panel (ED-3C660-30) (Fig. 7), available for bays without MAC jacks, provides cross- and inter-office communication capabilities. This panel contains nine pushbutton switches for 2-wire communications over any of seven trunk tie lines, local station lines, or test trunks (see subparagraph 3.14(f) and two intercom lines, rotary or dial touch tone keys for calling on these lines; and rotary switch to connect remote headset jacks to any of these lines. The 660 panel cannot be connected to the accessed circuit through the SMAS maintenance connectors.

3.14 The features provided on the J98626AA communication panel are as follows:

(a) There are six pairs of 20-pin miniature MACS designated TDM PATCH. One connector

of each pair is designated DROP; the other, FAC. Each TDM PATCH pair provides a tandem line to an external tandem patch bay where other unassigned D4 channels and drop circuits are available to restore service. The DROP connector is used when a D4 channel has failed and it is necessary to patch to a good D4 channel via a tandem line. The FAC connector is used when a drop circuit fails and it is necessary to patch to a good drop via a tandem line. The ED-2C002-20 patch cord is used for this patching between the failed circuit on the maintenance connector to the TDM PATCH jacks.

(b) The rotary switch (designated FAC ACCESS) selects one of the EQUIP switch positions corresponding to the six TDM PATCH pairs on the same panel to allow testing failed channels [patched per (a) above] from the manual access panel.

(c) A 3-position locking lever switch (designated OW-1/MAN ACS/OW-2) is used to connect either of two order-wire circuits or the VF channel selected at the manual access panel to a local headset (via transmitting and receiving amplifiers) for communication over the selected 4-wire facility.

(d) A 3-position locking lever switch (designated FAC/NOR/EQPT) is used to connect the communication circuit to either the line, the drop, or both line and drop sides of the facility selected with the OW1/MAN ACS/OW-2 switch at MAN ACS position.

(e) A 3-position locking lever switch (designated 4W TLK/MON/2W) is used to connect the 4-wire communication circuit to the 4-wire facility selected with the OW-1/ACS/OW-2 and FAC/NOR/EQPT switches, to open the transmitting portion of the 4-wire communication circuit to permit monitoring via the receiving portion, or to disconnect the 4-wire communication circuit from the 4-wire facilities and connect the 2-wire communication circuit to 2-wire facilities.

(f) A 6-section pushbutton-type switch (designated HOLD, LINE 1, LINE 2, LINE 3, LINE 4, and LINE 5) is used to connect the 2-wire communication circuit to any of five trunk tie lines, local station line circuits, or test trunk circuits. Each of the LINE switches locks when operated and releases when another LINE switch is operated. An operated LINE switch is indicated by a lighted white lamp behind its plastic pushbutton. Operation of the red HOLD switch releases any operated LINE switch, but holds that line while communication is established on one of the four remaining lines.

(g) A rotary dial is used with the 2-wire communication circuit when suitable dial lines are available via the LINE switches.

(h) A jack (designated EXT DATA SET) is used to disconnect the 2-wire communication circuit from line 5 and connect an external data set in its place in order to permit data transmission on this line. This jack allows connecting a CRT display unit to the office circuit maintenance system (CMS) when provided. An optional lamp and key for CMS can be added to the panel.

(i) A jack (designated EXT MF KEY) permits an external multifrequency key set to be connected for key pulsing on the 4-wire facility selected with the OW-1/MAN ACS/OW-2, FAC/NOR/EQPT, and 4W TKL/MON/2W switches.

(j) A pair of jacks (designated TEL&T&R) is used to connect a headset to the 2- and 4-wire communication circuits for both VF communication and monitoring.

E. Fuse and Alarm Panel

3.15 ▶Each of the three fuse and alarm panels (ED-7C201-( ), ED-97918-( ), and ED-1P466-30◀ distributes -48 volt battery to the distribution networks, maintenance connectors, manual access panel, and communication panel. ▶The ED-7C201-( ) fuse and alarm panel replaces fuse and alarm panel ED-97918-( ) or ED-1P466-30 when either -48 volt or -72 volt battery is used . Fuse and alarm panel ED-97918-( ) provides an option for -72V talk battery for extended loops. The -72V option is selected by the option plugs on the appropriate plug-ins. Fuse and alarm panel ED-1P466-30 is used when DUIT centers are required.◀

3.16 Fuses on the panel are the indicator type with a plastic bead that extends if the fuse blows. Power connections are made at the wire-wrap terminals of the fuse blocks. Power leads in connectorized cables going from maintenance connectors to the SMAS 3B or distribution networks

outside the bay are split out on the fuse and alarm panel so that fuses will be in the bay with the maintenance connectors. The relay on the fuse and alarm panel sends control signals to the office minor alarms when an alarm condition exists in any one of the SMAS panels in the bay. There is space at the top of the bay for terminal strip TSA. TSA is required with SMAS 3B to multiple leads from the maintenance connectors to the SMAS 3B concentrator and control circuit. TSB, TS2 or TS9 is required for all interconnections with a communication panel.

F. Distribution Network

3.17 This network, containing terminal blocks and relays, serves as the interface between the local test port (LTP), associated with the SMAS 5A, and the UTE maintenance connectors. Each network serves five maintenance connectors and has connectorized leads. This five-to-one relationship produces one level of circuit concentration at the UTE bay for SMAS 5A. When a distribution network in a bay is not being used to capacity, maintenance connectors outside the bay can be wired to it. This means that the maintenance connectors in a bay could be wired to a distribution network outside the bay, but mounting in the same or adjacent bay is most desirable for cable economy.

G. ▶Relay Panel

3.18 The ED-7C207-( ) relay panel receives a control signal for each group (A and B) from the D4 TPU. When the TPU detects a channel failure, it causes a relay in the panel to operate and close contacts for telemetry indications. The indications are provided to the following circuits:

(a) The E-type status reporting and control system

(b) The intertoll manual test frame (IMTF) office circuits

(c) SMAS via the maintenance connector circuit.

These circuit connections are shown in SD-7C086-01.

H. Voice Frequency (VF) Attenuator Panel

3.19 The VF attenuator (ASA) panel contains attenuators that adjust the signal levels for the voice circuit to the proper value at the switch appearance. The ASA panel is a drawer-type unit that consists of two or three circuit boards, each having 24-circuit capability. Ribbon-type cables allow the drawer to slide out and expose the attenuator sockets. The plug-in attenuators (KS-21265, L6) are available in 0.1 dB increments from 0.1 dB to 16.5 dB, and from 22 dB to 25 dB. The attenuators also are in 1 dB increments from 17 dB to 21 dB, and from 26 dB to 35 dB. Zero db and infinite loss units are available.◀

4. REFERENCES

4.01 The following drawings, same numbered circuit descriptions, and related information are associated with D4 UTE.

SD-3C304-02	D4 Application Schematic
SD-7C086-01	D4 Unitized Terminal Equipment (J98733)
SD-1P138-01	Mtce Connector Application Schematic
SD-1C454-01	J98622BL SMAS Type 2 and and J98622BK Type 2BX Mtce Connectors
SD-1C491-01	J98622AU Manual Access Panel
SD-99555-01	J98626AA Communication, Patch, and Test Panel and Auxiliary Communication Panel
SD-3C292-01	ED-3C660-30 Communication Panel
SD-7C091-01	ED-97918 Fuse and Alarm Panel with 72-Volt Option
ED-1P465-01	Installation Guide for UTE Equipment

TABLE A

EQUIPMENT	FUNCTION
J98622BL, L2, L3 Type 2 Maintenance Connector (Fig. 3)	Type 2 connector containing circuit access relays; L2 without MAC jacks; L2, L3 with MAC jacks
J98622BT, L2, L3, L4 Type 3 Maintenance Connector (Fig. 4)	Type 3 connector containing circuit access relays
J98622AU, L3 Manual Access Panel (Fig. 5)	Connects to maintenance connector MAC jacks and to external test equipment
J98626AA, L5 Communication, Patch and Test Panel (Fig. 6)	Connects to office communication lines; has MAC jacks
J1P033AB, L7 Distribution Network	Interface for SMAS 5A or 5B
ED-2C371-30 Terminal Strip Mounting Unit	Mounts TS1 for all non-connectorized SMAS and communication panel leads; TS2 for SMAS 3B when used
ED-3C660-30 Communication Panel (Fig. 7)	Connects to office communication lines
ED-7C201- ( ) or ED-97918- ( ) or ED-1P466-30 Fuse and Alarm Panel	Supplies office battery to SMAS panels; office alarm connections
ED-7C207- ( ) Relay Panel	Relay operates contacts for telemetry indications
NJ-01061A-01 Voice Frequency Attenuator Panel	Adjust voice frequency signal levels to proper value at switch

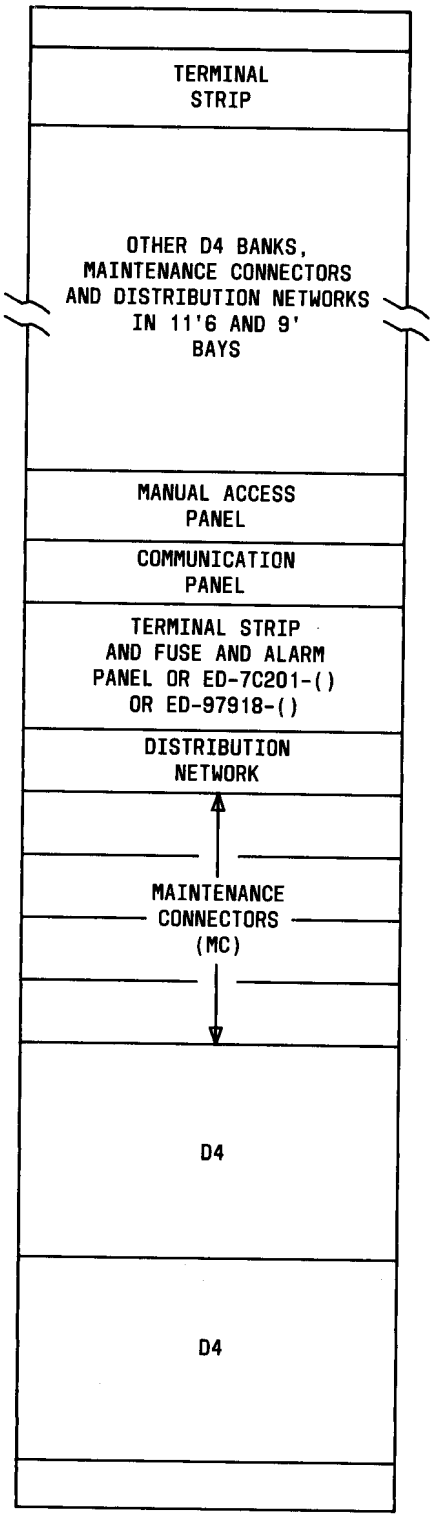

Fig. 1—D4 Unitized Bay Configuration

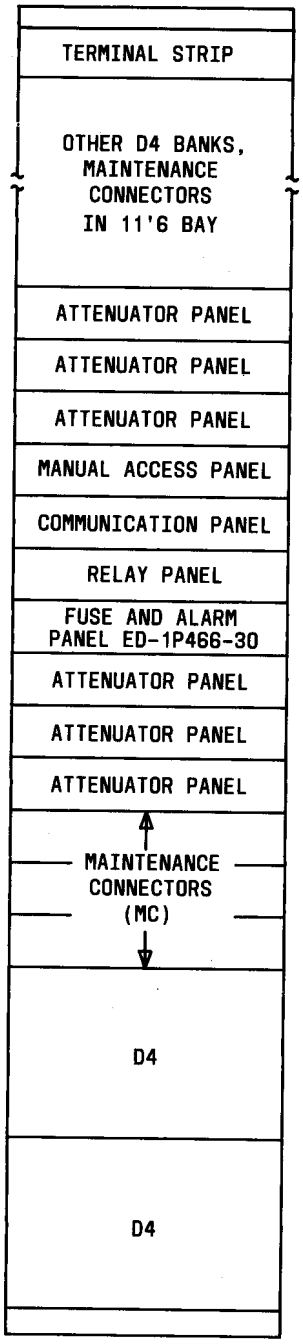

Fig. 2—D4 Unitized Bay for DUIT Operation

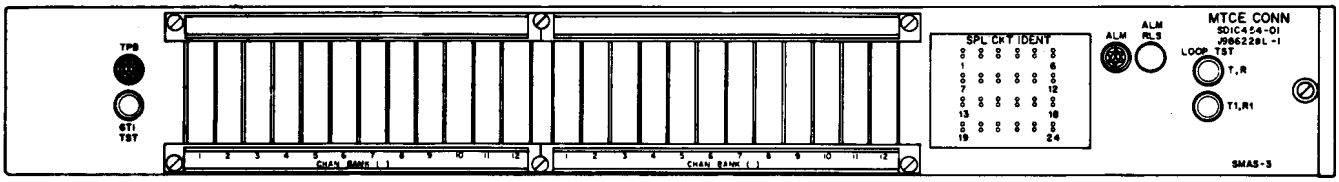

Fig. 3—J98622BL Maintenance Connector

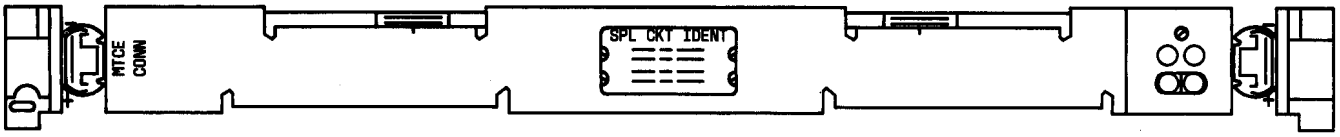

Fig. 4—J98622BT Maintenance Connector

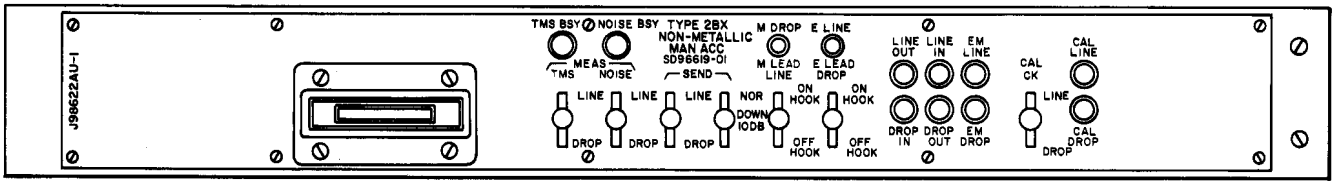

Fig. 5—J98622AU Manual Access Panel

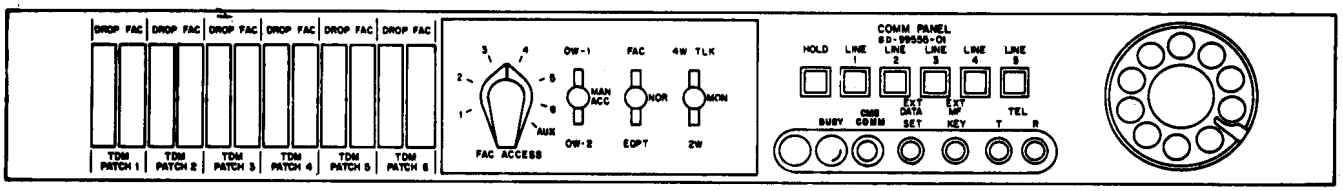

Fig. 6—J98626AA Communication, Patch, and Test Panel

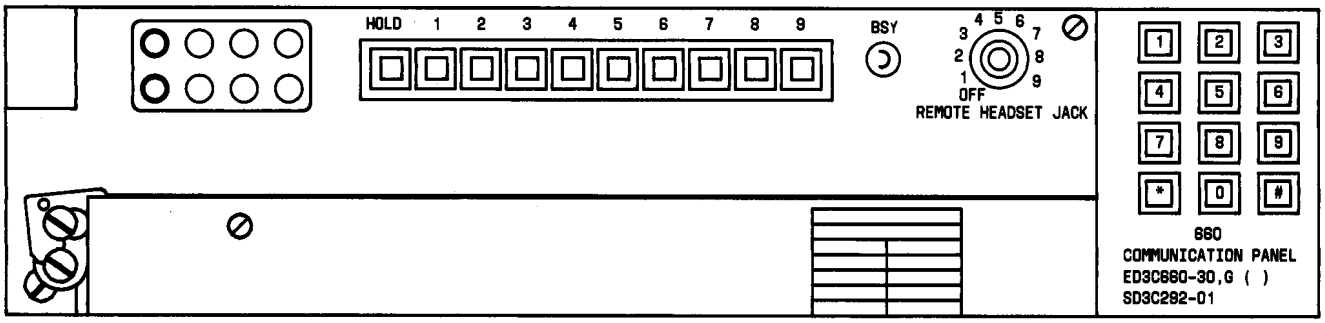

Fig. 7—660 Communication Panel

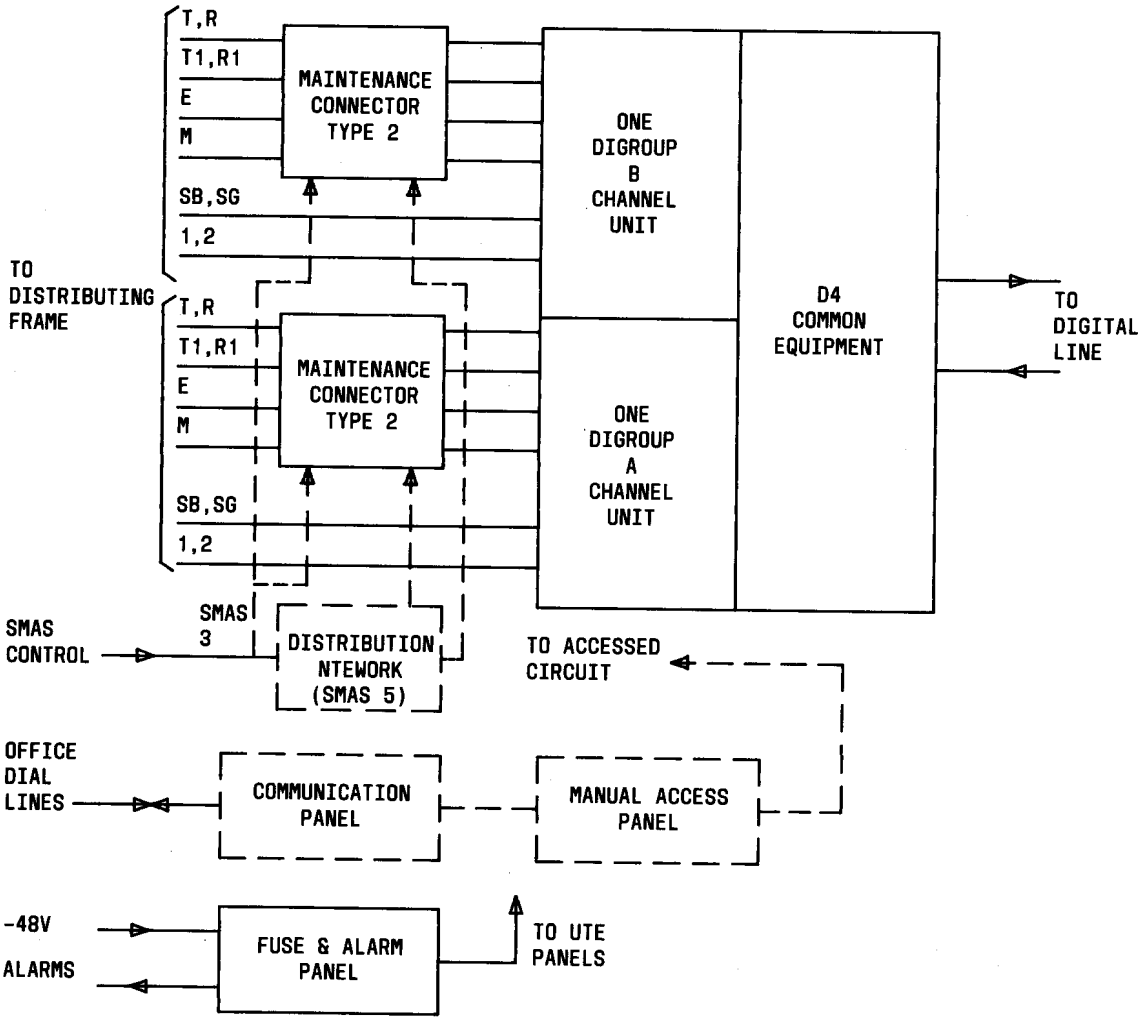

Fig. 8—D4 Unitized Bay Block Diagram

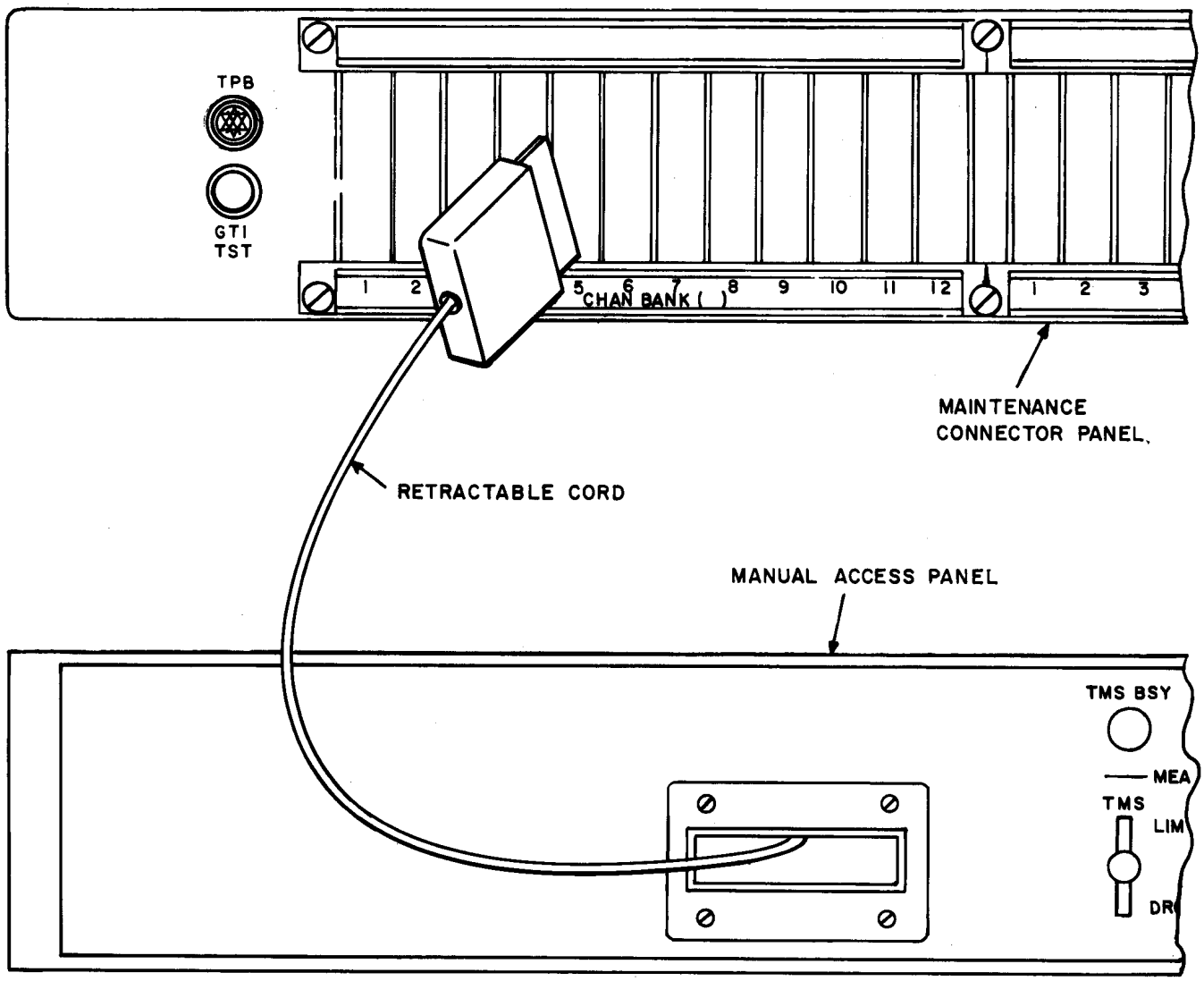

Fig. 9—Manual Access Technique

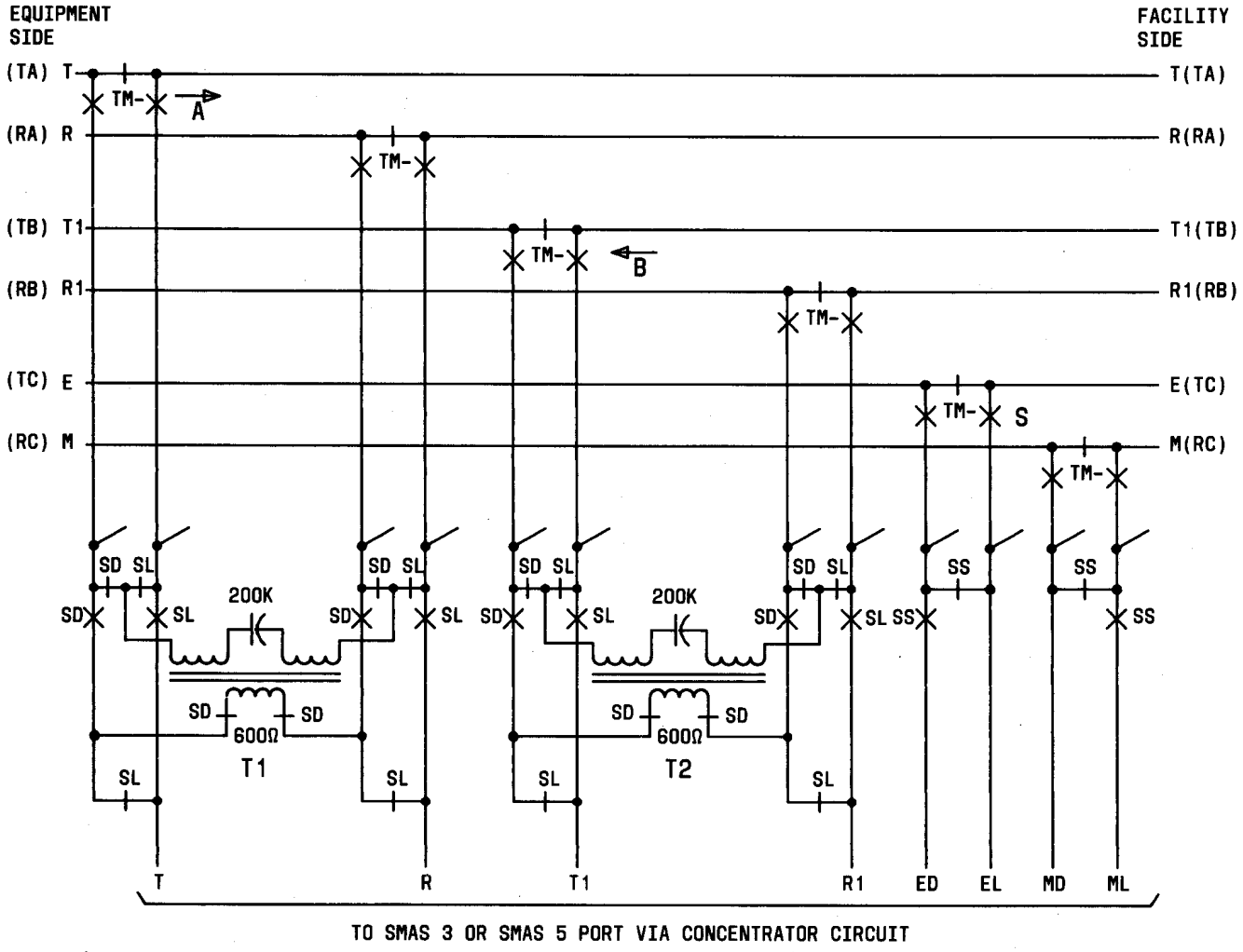

Fig. 10—Type 2 Maintenance Connector (Simplified Schematic)

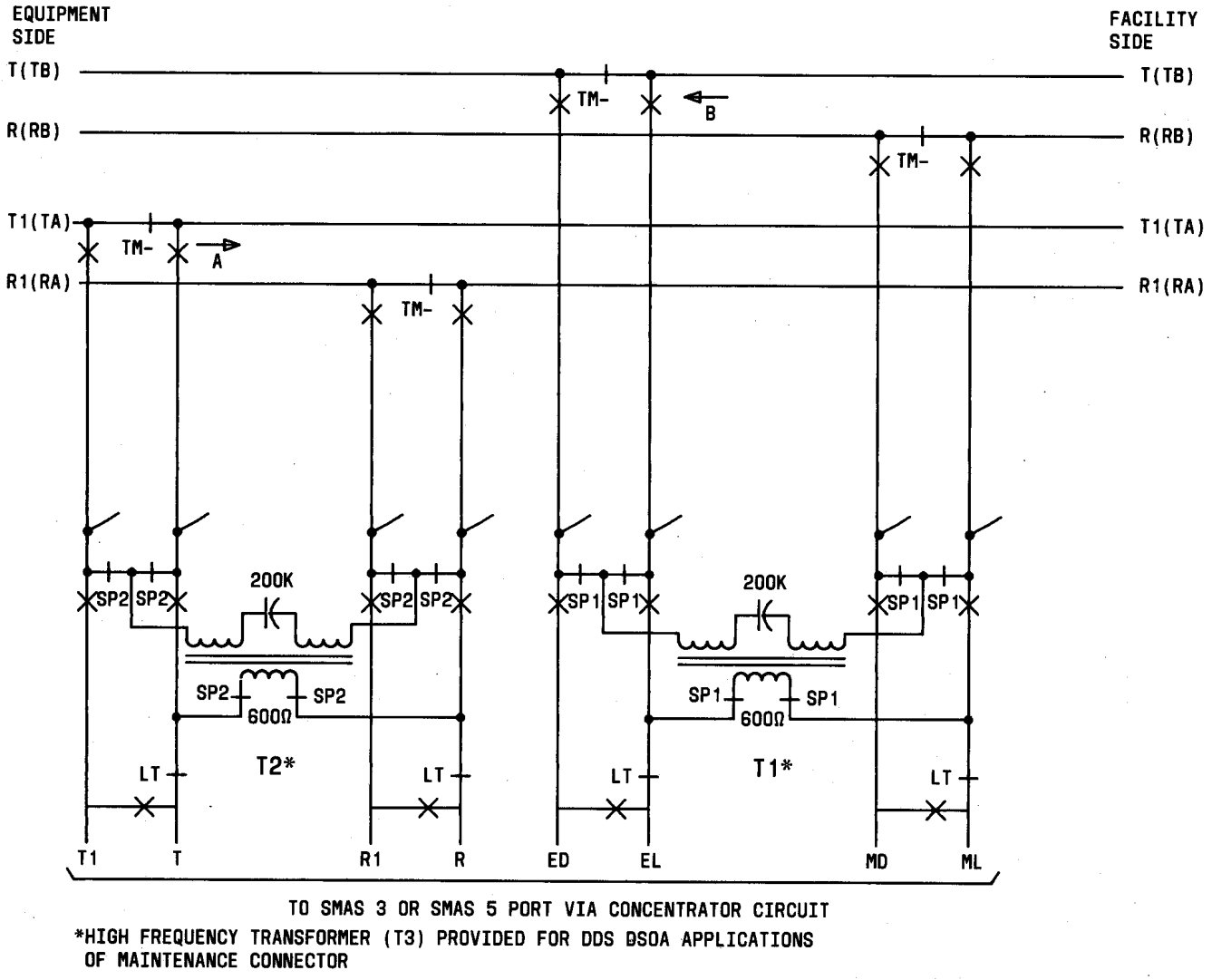

Fig. 11—Type 3 Maintenance Connector (Simplified Schematic)