SWITCHED DIGITAL DATA SYSTEM
950B TESTBOARD (J70176C)
DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section contains a physical and functional description of the 950B testboard.

1.02 This section is reissued to:

- Add information concerning the alarm indicator panel.
- Add references to the 921A data test set (DTS).
- Add references to the 71D and 76D power units.
- Make revisions due to equipment changes.

Since this reissue constitutes a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The 950B testboard (Fig. 1) is located in a serving test center (STC) and is used for testing the switched digital data system (SDDS) equipment at the DS-0 (64-kb/s) level. The 950B testboard may also be used for testing private line digital data system (DDS) equipment.

1.04 The 950B testboard contains jacks, alarm indicators, remote digital register sender interface unit (DRSIU) jacks, cord reel units, a clock circuit, a control and test code generator (optional), a multipoint signaling unit (MSU) (optional), a digital signaling test unit (DSTU) (optional), a local maintenance center display (LMCD) referred to as trunk failure display (TFD) in SDDS (optional), and telephone circuits. A KS-20908 DTS digital receiver and a KS-20909 DTS digital transmitter

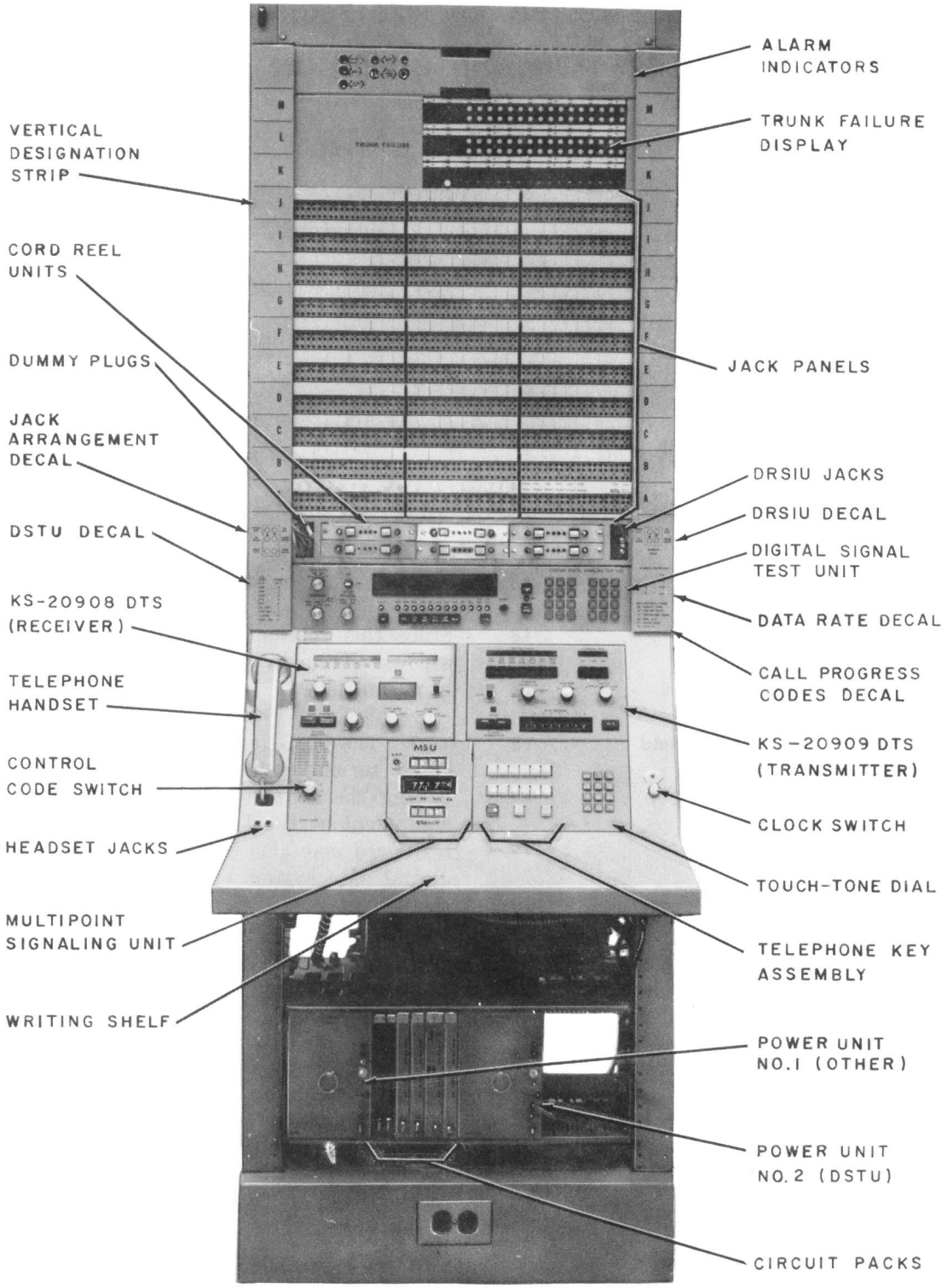


Fig. 1—Overall View of 950B Testboard

are also mounted in the testboard but can be removed for use as portable test sets.

Note: The MSU is used for private line multipoint system testing only.

1.05 The testboard contains up to 12 key-operated telephone circuits associated with a key telephone unit (KTU) shelf assembly to allow communication over station line circuits with local DDS and SDDS equipment bays, and over central office (CO) line circuits with other STC testboards, customers, and telephone company (telco) employees in the field in order to properly coordinate any tests.

1.06 The testboard is equippd with a TOUCH-TONE® or rotary dial for use in conjunction with a push-to-talk handset. Headset jacks are provided below the handset so that a telephone headset can also be used in conjunction with or in place of the handset.

1.07 The testboard is also provided with the following:

- A buzzer to alert the testboard operator of incoming calls.
- A key to disable the buzzer.
- A key to place central office line calls on hold.
- A key to enable the CO service alarm on an incoming call when the testboard is left unattended.
- A key to enable the CO service alarm on a testboard fuse or power unit failure when the testboard is left unattended.
- A key to enable the CO service alarm on a trunk failure when the testboard is left unattended.
- Twelve pickup keys that are used in coordination with the telephone circuits so that incoming calls can be identified by an illuminated lamp under the key.
- A feature that allows conference calls to be set up by bridging telephone lines.

1.08 A KTU shelf assembly is associated with the 950B testboard. The KTU shelf assembly provides a maximum of 12 telephone lines. A second KTU shelf may be used to provide an additional 12 lines. If a CALL DIRECTOR® telephone, private branch exchange (PBX), etc, is to be connected to the lines between the testboard and the KTU shelf, a KS-19252 bridging adapter must be used.

1.09 The transmitter and receiver DTSs are mounted in the control panel and writing shelf assembly of the testboard. The transmitter DTS is used to generate test signals and control codes for loopback and straightaway testing. The receiver DTS is used to monitor signals and detect and display errors.

1.10 The MSU is used to gain access to any multipoint junction unit (MJU) port, located downstream from the MSU, for testing purposes. After the MSU has gained access to a desired MJU port, the transmitter and/or receiver DTS can then be used to test the local customer channel by performing loopback tests as in point-to-point operation.

1.11 The control code generator can generate 11 control codes: 9 are presently generated plus the ALL 1's code which are available on a switch-selectable basis at four outputs simultaneously. The test code is available continuously at each of the four test outputs simultaneously with the DSTU and six test outputs without the DSTU. The control and test code generators are used in place of the transmitter DTS when repeated control codes are required during prolonged testing from the testboard.

1.12 Jack circuits in the testboard provide access to individual lines (customer channels) and interoffice trunk circuits brought into the testboard. In an MJU network, the jack circuits provide access to each port of every MJU in the hub office. Supplemental jack bays are also available for use with the testboard when the number of customer channels exceed the number of jack circuits in the testboard and another fully equipped testboard is not needed just to provide the extra jack circuits.

1.13 The TFD provides a centralized display of alarm conditions for up to 64 trunk circuits. Supplemental units are also available to expand the capacity of the TFD.

1.14 All test equipment in the testboard is synchronized by the timing supply (TS). The testboard is provided with two clock lines from the TS, designated "A" and "B" and either one of the lines can be selected and connected to the clock circuit. The clock circuit derives an 8-kHz and a 64-kHz clock signal from the composite TS signal and uses them to synchronize the SDDS test equipment. The clock circuit distributes the clock signal to the test equipment and provides necessary alarms for absence of clock.

1.15 Cord reels are used to provide access from the MSU or the transmitter and receiver, DSTU and outputs from the control and test code generator to the jacks in the jack panels.

1.16 The 950B testboard can be used to test a data service unit (DSU), channel service unit (CSU), office channel unit (OCU), service channels between the STC and the units, an MJU, subrate data multiplexer links at the DS-0 (64-kb/s) level, and through the 758C switch. For information concerning the units and channels tested by the 950B testboard, refer to the following Bell System Practices:

SECTION	TITLE
314-901-500	Digital Data System—Serving Test Center—Private Line Circuit—Test Procedures
314-910-500	Digital Data System—Office Channel Unit (OCU) Assembly—Test Procedures
314-911-501	Digital Data System—Subrate Data Multiplexer—Initial Tests
314-911-502	Digital Data System—Subrate Data Multiplexer—Trouble Location and Correction Tests
314-917-500	Digital Data System—Multipoint Junction Units and Auxiliary Circuits—Test Procedures
595-100-500	Digital Data System—550A-Type Channel Service Unit—Test Procedures
595-300-500	Switched Digital Data System—501A-Type Switched Data Service Unit—Test Procedures

1.17 The 950B testboard can be used in performing the following tests:

(a) Straightaway tests from STC to customer location or vice versa to verify proper operation of installations and to isolate trouble. The tests require a telco employee at the customer location with test equipment (912A, 914-type, or 921A DTS).

(b) Remote loopback tests from the testboard to the interface side of the DSU, channel side of the CSU, or channel side of the OCU.

(c) STC to another STC dynamic test to verify proper facility operation.

(d) Signal tracing tests can be performed by transmitting the test code (00011100) through the system.

(e) Remote loopback tests of trunks—near-end or far-end loopback test by means of test line in the 758C switch.

2. PHYSICAL DESCRIPTION

2.01 This part contains a description of the physical features of the 950B testboard and the components in the testboard, as shown in Fig. 1.

2.02 The J70176C testboard is 11 feet 6 inches in height and is 23 inches wide. The testboard is of the cable duct-type arranged for 2- by 23-inch mounting plates. The alarm indicator panel is located in the upper portion of the testboard. The panel contains the following alarm indicators: trunk failure display fuse alarm (TRK FAIL DISPL FA), testboard fuse alarm (TST BD FA), and power unit failure alarm (PWR UN FAIL ALM). Keys and indicators for the trunk failure alarm cutoff (TRK FAIL ACO), and testboard fuse/power unit failure alarm cutoff (TST BD F/PWR UN FAIL ACO) are also located on the alarm indicator panel.

2.03 The TFD (J98722C) located below the alarm indicator panel, has 64 trunk status indicator

(SI) LEDS or lamps arranged in a matrix of 16 columns and 4 rows. In addition to the SIs, each unit contains a row of horizontal indicator lamps with associated driver (CP1) and vertical indicator lamps with associated driver (CP2). A status cutoff key (SCO) and lamp test (LT) keys are located on the left side of the TFD. When necessary, up to three supplementary trunk failure display (STFD) units (J98722D) can be mounted below the initial unit. The rear of the TFD (Fig. 2) contains the following:

Note: The numbers preceding each description below correspond to the numbers in Fig. 2.

(1) Two KS-16672 L-10 connectors (J1 and J2) for connection from the trunk circuit distribution frame to a maximum of four horizontal indicator drivers (CP1).

(2) One KS-16786, L-2 connector (J3) for connection to a STFD.

(3) One 285A terminal strip for connection to the fuse block located at the rear of the alarm indicator panel.

(4) Five 927B printed circuit board connectors for up to four CP1s and one CP2.

2.04 Beneath the TFD assembly, space is provided for up to ten jack panels (KS-21042-L3) according to the number of STFDs required. Each jack panel consists of 30 six-jack modules (KS-21156-L1 through L30); therefore, the testboard can contain up to 300 modules. The jacks in the modules are miniature-type telephone jacks. A colored pin is located in the middle of the top four jacks in each module to indicate the data rate of that particular channel (Fig. 3). Dummy plugs can be inserted into the jacks for opening channel lines at the testboard. Designation signal plugs are also available for priority circuits to prevent channel service from being inadvertently interrupted at the testboard. Designation labels above each jack module can be marked so that data channels can be identified.

2.05 Supplemental jack bays (ED-73449-30), used to provide additional jack appearances, may be located adjacent to the testboards and are available in 7-foot or 11-foot 6-inch heights. The jack bays are available in two configurations: one configuration is a jack bay with a writing shelf assembly and space for up to 15 jack panels (450 six-jack modules) and the other configuration is a bay with space for up to 26 jack panels (780 six-jack modules).

2.06 Immediately below the jack panel is space for up to six cord reel units. Each cord reel unit (ED-73469-30) contains two plugs and four KS-21001-L1 jacks. Connection to the cord reel is at the KS-19088-L7 connector on the rear of each cord reel unit. On the right side of the cord reel units are four DRSIU access jacks, which are

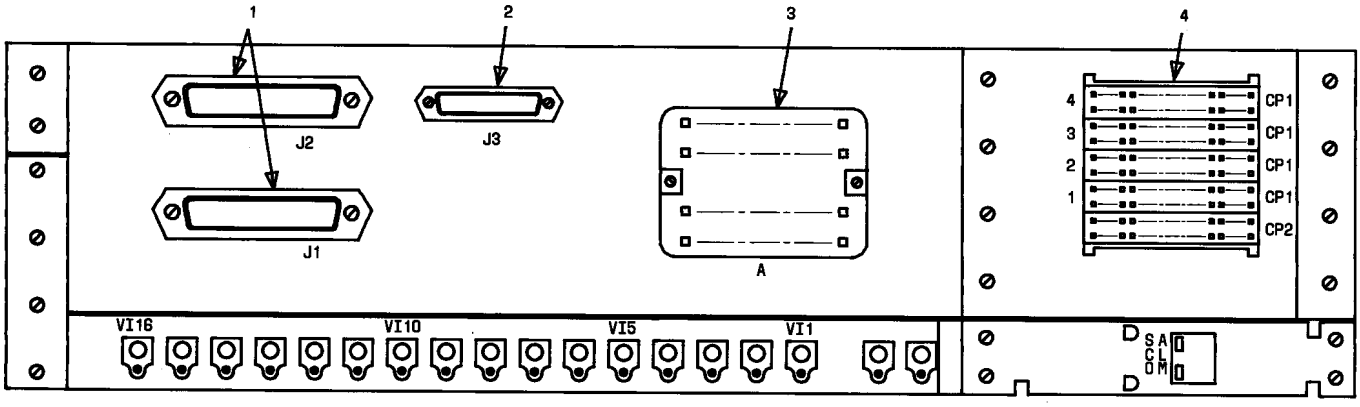
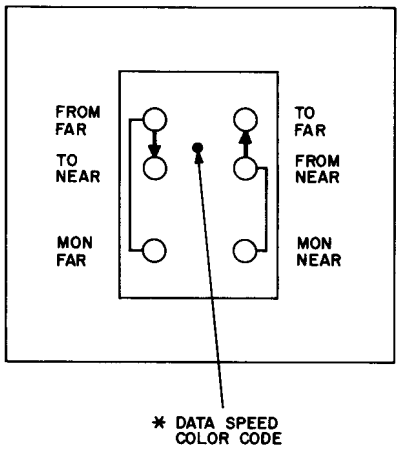


Fig. 2—Rear View of Trunk Failure Display



* THE DATA SPEED COLOR CODES ARE AS FOLLOWS:

PIN COLOR	DATA SPEED (kb/s)
ORANGE	2.4
YELLOW	4.8
GREEN	9.6
BLUE	56

Fig. 3—Jack Module

connected via DRSIU test lines to the DRSIU at the 758C switch.

2.07 The DSTU is located just below the cord reel units. The DSTU is held in place by screws in each of two mounting brackets, which are on the sides of the DSTU. A clock cord and a power cord with connectors at one end are furnished with the testboard. A signal cord is supplied with the DSTU. The cords have 5-pin, 3-pin, and 15-pin connectors, respectively. The signal cord plugs into the cord reel unit; the clock cord and power cord plug into the DSTU. Functions of the controls and indicators on the DSTU are covered in Section 107-602-100.

2.08 The transmitter and receiver DTSs are located in the control panel and writing shelf assembly (J70176AA) (hereafter referred to as the "control panel") below the DSTU. The test sets are held in place by a sliding bracket located on the sloping shelf so that they can be removed for portable use.

2.09 The receiver and transmitter DTS signal cords plug into the RCV (KS-21001-L1) and TRMT (KS-21001-L1) jacks, respectively, in the rear of the control panel. The RCV and TRMT jacks are then connected through a cable to the rear of the MSU when the MSU is provided; otherwise, the RCV and TRMT jacks are connected to the connector on the rear of a cord reel unit. The clock cords from the test sets are inserted into a 5-pin male connector located at the top rear of the equipment shelf. The power cords plug into a duplex receptacle on the rear of the control panel.

2.10 The front panel of both DTSs contain switches to condition the test set for transmission or reception of data and indicators [lamps and light-emitting diodes (LEDs)] to indicate the position and status of the switches. The controls and indicators on the receiver are described in Section 107-601-100. The controls and indicators on the transmitter are described in Section 107-600-100.

2.11 The push-to-talk telephone handset located on the control panel is a G5GR-61 handset and is connected to the telephone circuitry in the 950B testboard via a latching cord reel unit. Located below the handset is a pair of 223A jacks to be used for connection of a headset. An 8J rotary dial or a 35Y3A TOUCH-TONE dial is used in conjunction with the handset.

2.12 The CONT CODE switch, located on the control panel below the receiver DTS and to the right of the handset, is a 12-position rotary switch. The codes are printed above the switch and the numbers adjacent to the codes correspond to the switch positions.

2.13 The MSU control panel, located below the receiver DTS and to the right of the CONT CODE switch, contains the following:

- A momentary contact pushbutton switch (DISPLAY TEST) associated with the display readouts.
- Eight pushbutton keys (TST, SIG, CLR, BLK, and four BRANCH keys) with a 328-type lamp located under the TST, SIG, and CLR keytops.
- A display which is divided into two sections (OLD and NEW) with each section containing

two LED readouts for the hub identification (HUB ID) code and one LED readout for the branch (BR) number. Each LED readout contains seven segments.

- The BLK (block) key is reserved for future applications.

2.14 The telephone key assembly, located below the transmitter DTS and to the left of the dial, may contain 12 pickup keys, a HOLD key, a TEL ALM key (optional), and an AUD OFF key. Each of the keys is push-to-operate and push-to-release type equipped with a 51A lamp. The pickup keys and the TEL ALM key contain clear plastic keytops. The HOLD and AUD OFF keys contain a red and an amber plastic keytop, respectively. Designation tabs appear under the plastic keytops so that the keys can be identified.

2.15 When more than one 950-type testboard is installed in a hub office, A25D connector cables may be used to connect the telephone circuits between testboards are shown in Fig. 4. The cables are connected to 66E3 connector blocks on the rear of the control panel.

2.16 The CLOCK switch, located to the right of the dial, is a 3-position rotary switch. A clock failure lamp is associated with the CLOCK switch and is located directly above it.

2.17 The rear of the control panel contains the following:

Note: The numbers preceding each description below correspond to the numbers in Fig. 5.

(1) Two KS-21001-L1 signal jacks, J9 and J10 (labeled RCV and TRMT, respectively).

(2) Three KS-19088-L7 connectors:

- P8—Connects to the two signal jacks J9 and J10.
- P12—Connects to the CONT CODE switch.
- P14—Connects to the CLOCK switch, clock alarm circuitry and lamp, and to the two clock connectors on the rear of the equipment shelf.

(3) One 8-contact terminal strip (TSA) labeled CLK—Connects to the CLOCK switch and terminates the lines from the TS.

(4) One 3-contact terminal strip (TSB)—Connects to the PWR SUP and DIAL fuses and terminates the CO battery lines.

(5) Two 70D-type fuses rated at 5A and labeled PWR SUP are the following:

- F2—Handles power to the 74A or 78A power units
- F3—Handles power to the 71D or 76D power units.

(6) One 70A-type fuse (F1) rated at 1-1/3A and labeled DIAL—Handles power to the telephone circuitry.

(7) One duplex 117-volt ac receptacle—Supplies power to the transmitter and receiver DTSs.

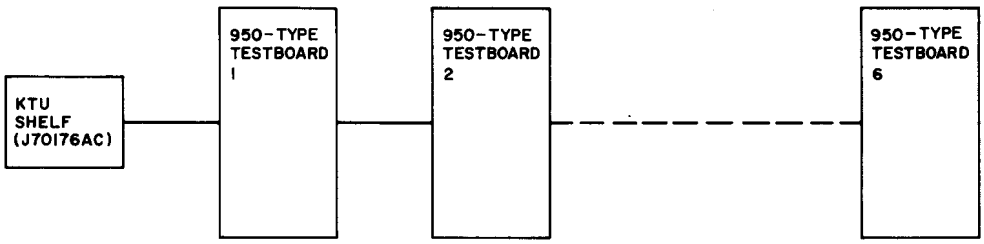
(8) Two 66E3 connecting blocks:

- TSF—Connects the KTU shelf assembly or connecting block TSH of the preceding testboard to connecting block TSG
- TSH—Connects the succeeding testboard to the KTU shelf assembly.

(9) One 66E7 connecting block (TSG)—Connects to connecting blocks TSF, TSH, and the pickup key assembly.

2.18 An equipment shelf (J70176AB) is located in the lower section of the testboard and, when fully equipped, contains one 74A or 78A power unit, one 71D or 76D power unit, and six circuit packs (CPs) as follows:

- HL49B line terminator
- HL52 clock line driver
- HL66 control and test code generator
- HL67 line drivers
- HL81 MSU mode control and timing
- HL82 MSU input/output and memory.



NOTE:
ALL CONNECTIONS ARE MADE WITH A25D CABLES OR EQUIVALENT

Fig. 4—Interconnection of Telephone Circuits Between 950-Type Testboards in a Multi-Testboard Installation

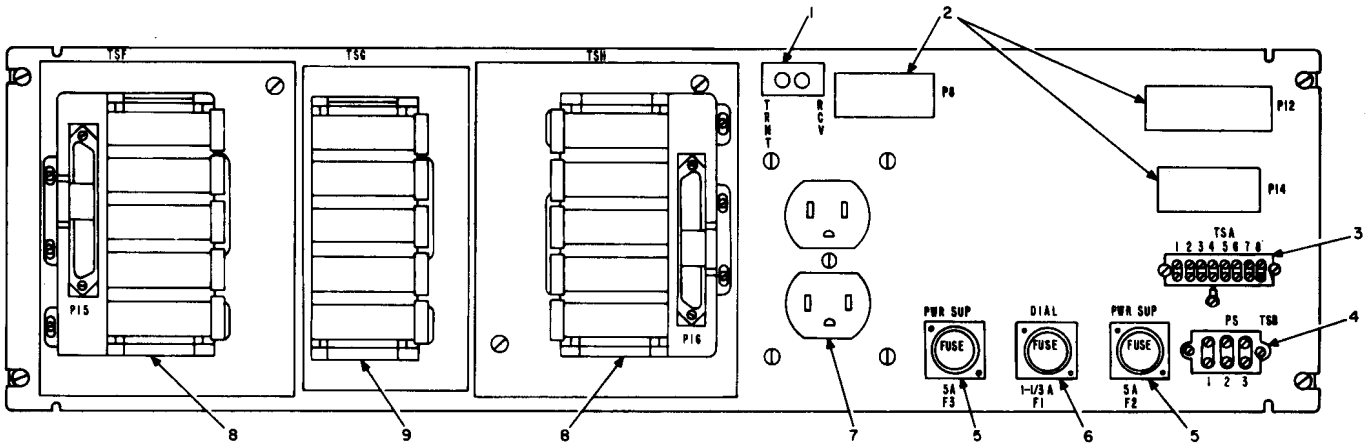


Fig. 5—Rear View of Control Panel

The 74A and 78A power units are dc-to-dc converters which require -48 and -24 volts, respectively, from the CO and have an output of +5 volts and -12 volts dc. This power unit provides +5 volts to all the above CPs plus the controls and displays of the MSU and the clock alarm circuitry and lamp. It also provides -12 volts to the DTSU. The second power unit is also a dc-to-dc converter and may be a 71D or 76D that requires -48 or -24 volts, respectively from the CO. It provides +5 volts to the DTSU.

2.19 The rear of the equipment shelf contains the following:

Note: The numbers preceding each description below correspond to the numbers in Fig. 6.

(1) One KS-19088-L16 male connector (P1) which is wired to HL67 CP supplies the control and test codes, via a cord, to the cord reel units.

(2) Two KS-19088-L7 male connectors: One connector (P11) is wired to HL66 CP and connects the CONT CODE switch via a cord to HL66 CP. The other connector (P13) is wired to HL49B and HL52 CPs and one 74A or 78A power unit. This connector, via a cord, supplies clock signals to two auxiliary clock plugs (P19 and P20), supplies power to the clock alarm circuitry, connects the line terminator (HL49B CP) to the clock alarm circuitry, and connects the CLOCK switch to the line terminator CP.

(3) Two 5-pin male clock connectors (P17 and P18) which are wired to HL52 CP and supply clock signals to the transmitter and receiver DTSs.

(4) One KS-16672-L12 female connector (J28) which is wired to HL81 and HL82 CPs and connects to the MSU control panel via a cord.

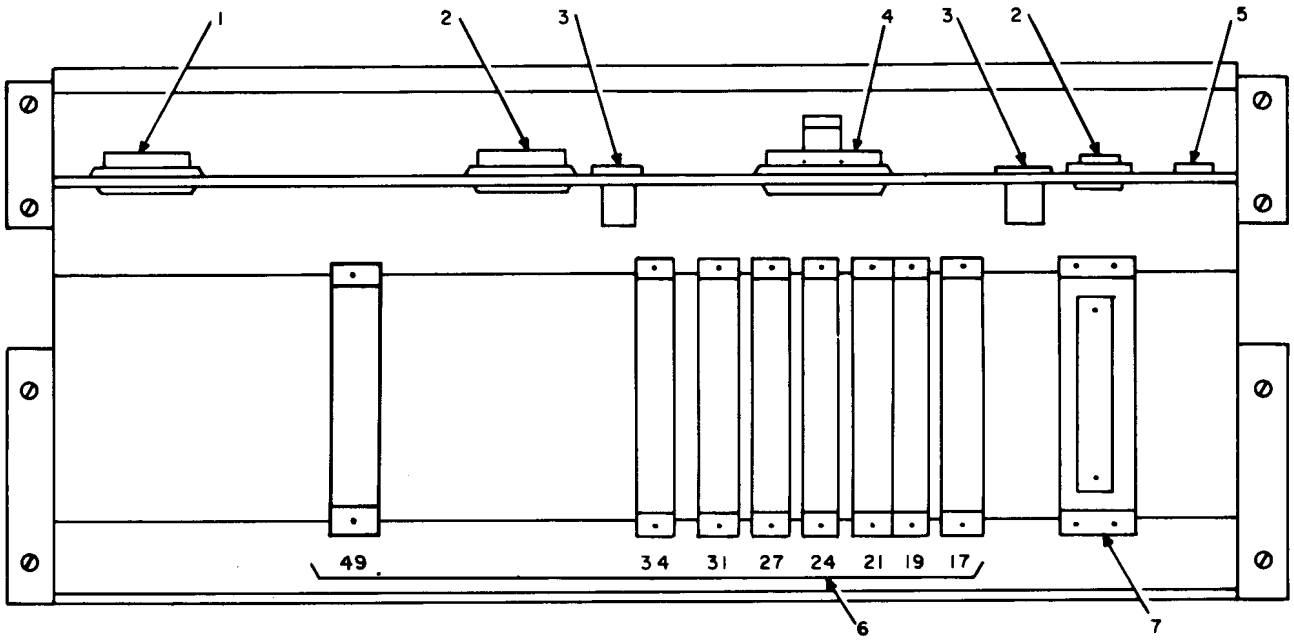


Fig. 6—Rear View of Equipment Shelf in a 950B Testboard

(5) One 2-contact terminal strip (TSC) that connects the 74A or 78A, and 71D or 76D power units to CO battery lines via TSB and fuses F2 and F3.

(6) Eight 940A printed circuit board connectors.

(7) One 15-pin terminal strip, TSF, used for ground connections.

2.20 Two auxiliary clock plugs (P19 and P20) are also located under the writing shelf and are wired to HL52 CP.

2.21 The KTU shelf assembly (J70176AC) (Fig. 7) is equipped with a KS-19175-L1 interrupter, a relay, a 19C2 power unit, and 400D and 416A KTUs as required. The 19C2 power unit supplies power to the interrupter, relay, KTUs, buzzer, and testboard key assembly lamps. The power cord for the 19C2 power unit is available in 1-1/2, 2-, 4-, 6-, and 12-foot lengths. A25D cables (or equivalent) connect the KTU shelf (or shelves) to the testboards. The cables plug into 66E3 connecting blocks on the rear of the control panel. One KTU shelf can hold a maximum of 12 KTUs. The KTU shelf can be equipped with 400D and 416A KTUs according to job requirements. Positions 1 through 4 in the shelf are for 416A KTUs only, while positions 5 through 12 are for 416A or 400D KTUs. The HOLD key in the testboard key assembly functions only with 400D KTUs. The KTU shelf assembly can be located above the jack panels or in a remote bay.

3. FUNCTIONAL DESCRIPTION

3.01 This part contains the basic functional operation of the test equipment and components in the 950B testboard.

3.02 The alarm indicators display failures of the power units, testboard fuses, and trunks. When the testboard is left unattended, the alarms can be connected to the CO service alarm via the TRK FAIL ACO and TST BD F/PWR UN FAIL ACO keys.

3.03 The TFD below the alarm indicator panel provides a centralized display of trunk alarm conditions. When a trunk failure occurs, a status indicator (SI) assigned to that trunk will light. A corresponding horizontal (HI) and vertical (VI) indicators will light to indicate the grid location of the lighted SI. The SI will remain lighted only when the alarm condition is present. The HI and VI lamps are locked in and will remain lighted until they are manually cleared by operation of the SCO switch. Additional failures can be displayed without disturbing the initial failure indication.

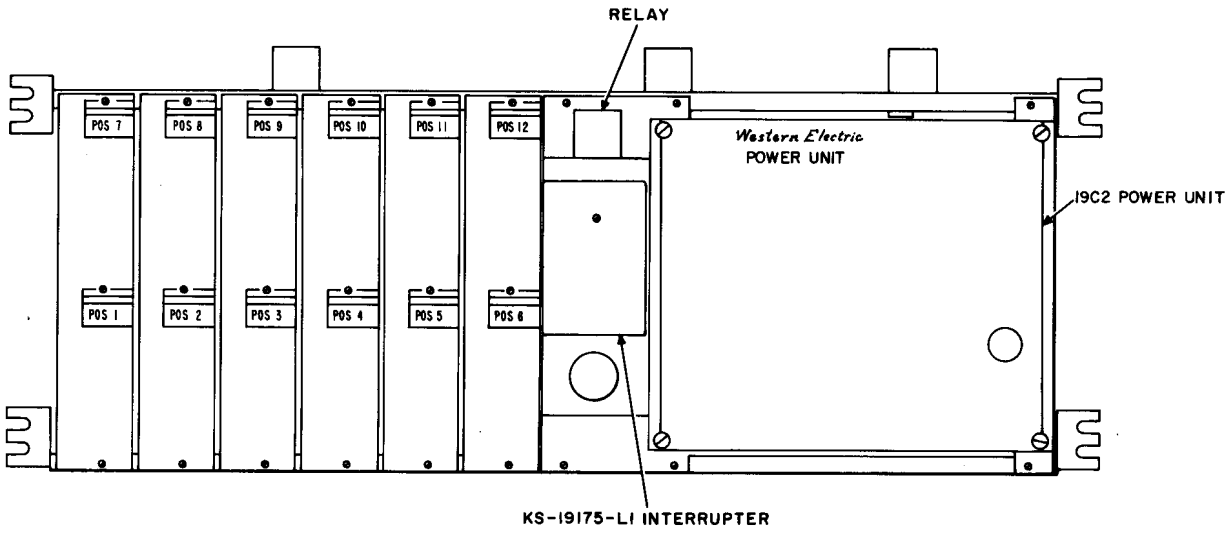


Fig. 7—Key Telephone Unit Shelf Assembly

Lamp test keys are provided to test the SI, VI, and HI lamps. For a detailed description of the circuitry, controls and indicators on the TFD, refer to Section 365-330-110.

3.04 All line and trunk circuits in the SDDS pass through the 950B testboard at the switch hub office, and may be monitored (bridged) or opened by line jacks or trunk jacks on the testboard (Fig. 8). The jacks in the jack panels are used to monitor customer data or test signals and to transmit and receive test signals at the testboard. The stations associated with a customer channel and brought into a jack module must be identified as either far end or near end to correspond to the designations on the jack modules (Fig. 3). Line jacks with the FAR designation are connected to line circuits toward the 758C switch (Fig. 9). Line jacks with the NEAR designation are connected to lines toward the local channel. Trunk jacks are located on the opposite side of the switch from the line jacks (Fig. 8 and 10). Their function is similar to that of the line jacks. When the RCV cord reel plug is inserted into either one of the two monitor jacks, the channel is not interrupted and data can be monitored without disrupting the circuit. The MON NEAR jack permits monitoring of signals from the near end. The MON FAR jack permits monitoring of signals from the far end. When the RCV cord reel plug is inserted into either the FROM NEAR or FROM FAR jack, the channel pair is opened at this point and data or test signals from either the near or far end can be checked at the testboard. When the TRMT, CONT CODE, or TEST CODE plug is inserted into either the TO NEAR or TO FAR jack, the channel pair is opened and test signals can be sent to either the near or far end from the testboard.

3.05 The cord reel plugs are used to connect the transmitter, receiver, MSU, DSTU, and control and test code generator to the jacks in the jack panels. The cord reel plugs are inserted into the jacks in order to connect the transmitter, receiver, MSU, control and test code generator, or DSTU to the desired channel. Refer to Fig. 11 for cord reel designations. Connection to the transmitter is available through one cord reel plug. Connection to the receiver is also available through only one cord reel plug. Connection to the control code generator is available through four cord reel plugs. Connection to the test code generator is available through four cord reel plugs with the DSTU provided and six cord reel plugs without the DSTU. The test code is simultaneously available on the test code jacks, regardless of the CONT CODE switch setting. Connection to the DSTU is available through two cord reel plugs; one for receive and one for transmit. Two additional logic level jacks (labeled LLO and LLI) are provided to allow far-end loopback and error runs over a completed call circuit using the transmitter and receiver DTSs. Connection to the MSU is available through the transmitter and receiver cord reel plugs when the MSU SIG key is depressed. Access to the transmitter, receiver, MSU, control and test

code generator and DSTU can also be made by means of patch cords from the jacks in the associated cord reel units. The cords in the cord reel units are long enough to permit the cord reel plugs to be inserted into jacks in adjacent bays. The two inner jacks located between the output plugs on the front of each cord reel unit (and MON jacks on the DSTU cord reel unit) can also be used to monitor the signals on the cord reel units. The jack on the left side of the cord reel unit is associated with the plug on the left side of the same cord reel unit and the jack on the right side is associated with the plug on the right side of the cord reel unit.

3.06 The DRSIU jacks at the right of the cord reel units provide access from the DSTU at the 758C switch to the 950B testboard, and through the testboard line and trunk jacks to any point in the system.

3.07 For a functional description of the circuitry, controls, and indicators on the DSTU, refer to Section 107-602-100.

3.08 For a functional description of the circuitry, controls, and indicators in the receiver and the transmitter DTSs, refer to Sections 107-601-100 and 107-600-100, respectively.

3.09 The MSU controls and display (Fig. 12) function as follows:

- DISPLAY TEST—Operation of this key causes all seven segments of each LED readout in the display to light. Numbers appearing in the display at the time the key is depressed will not be erased, but will reappear when the key is released.

- TST key—Operation of this key connects the transmitter and receiver signal cords to the TRMT/RCV cord reel unit through relay contacts in the MSU. A lamp under the keytop lights when the key is depressed if the SIG key has been depressed and an MJU branch has been selected. The lamp is not lighted when the transmitter and receiver are being used for private line point-to-point testing.

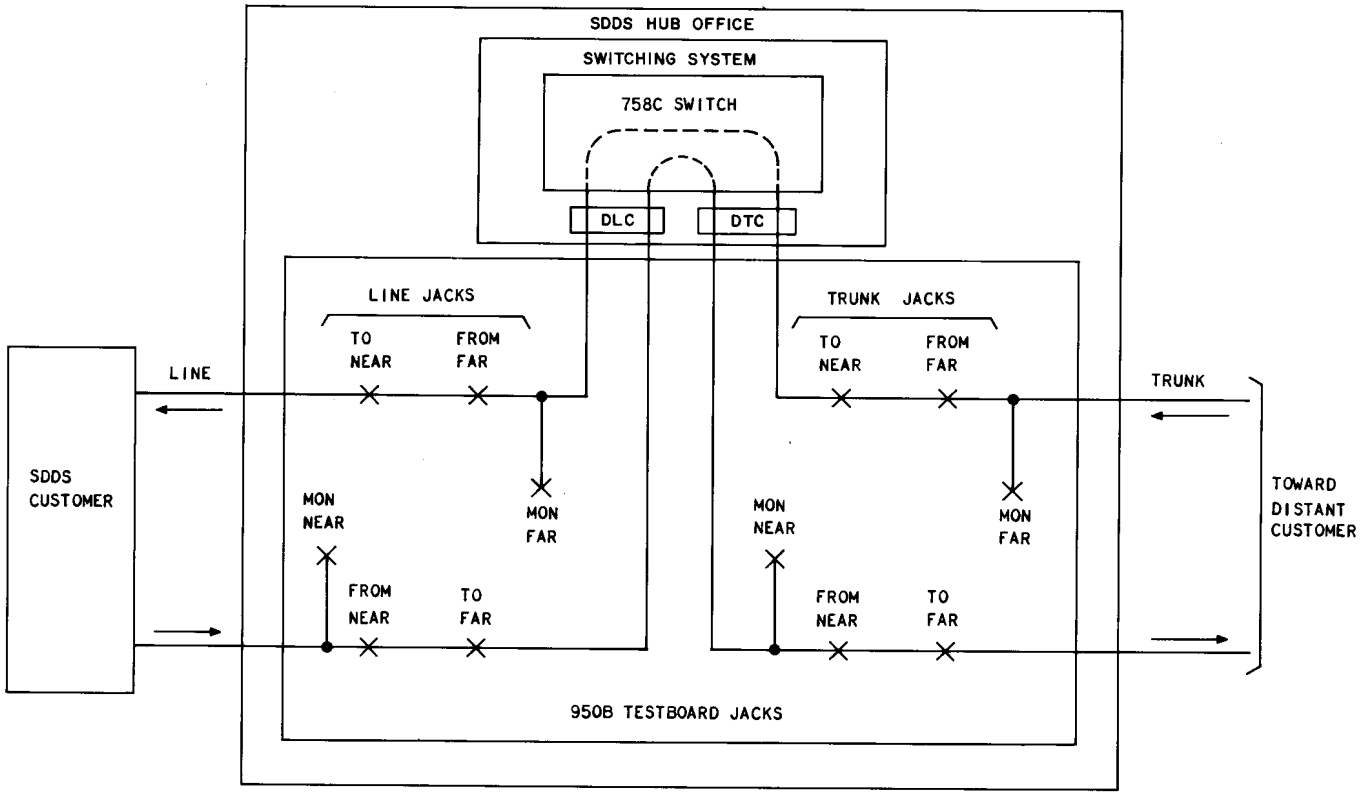


Fig. 8—Location of 950B Testboard Jacks in SDDS

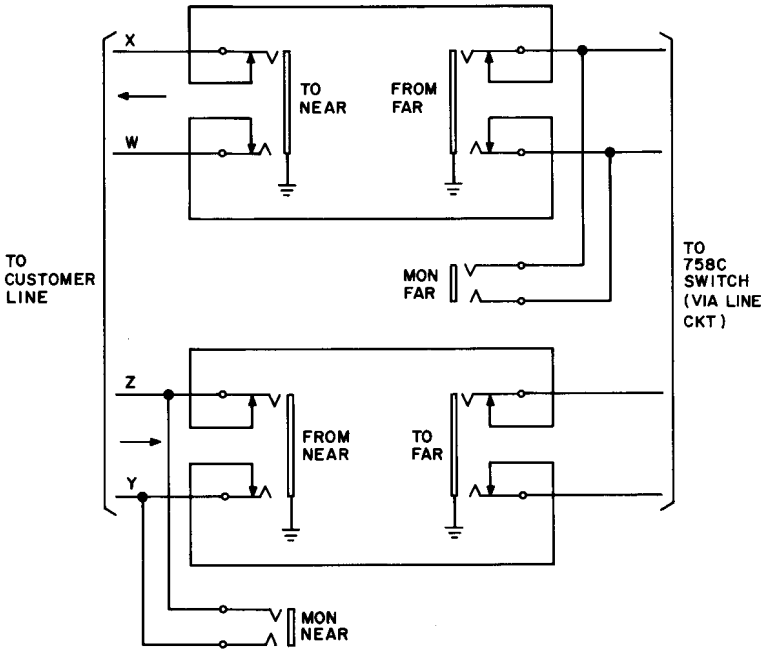


Fig. 9—Line Jacks

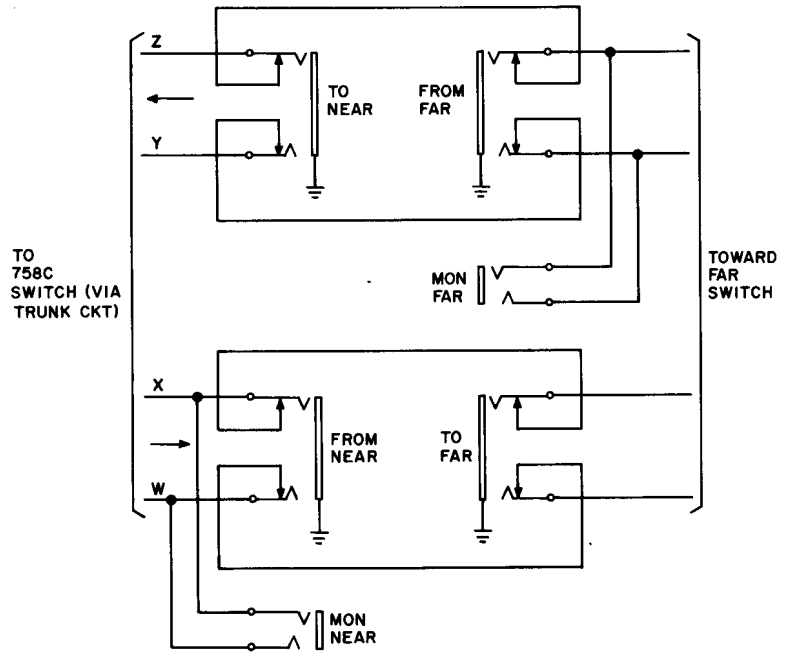


Fig. 10—Trunk Jacks

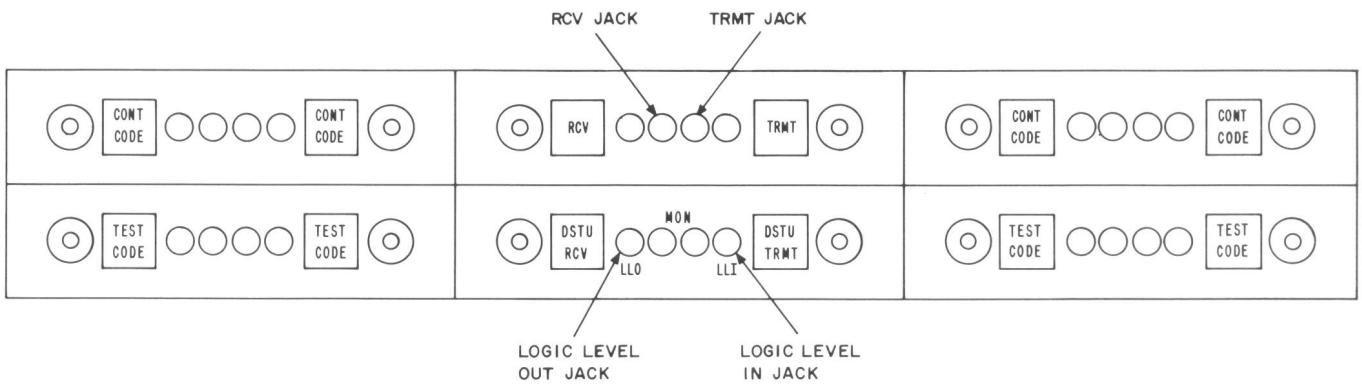


Fig. 11—Cord Reel Designations

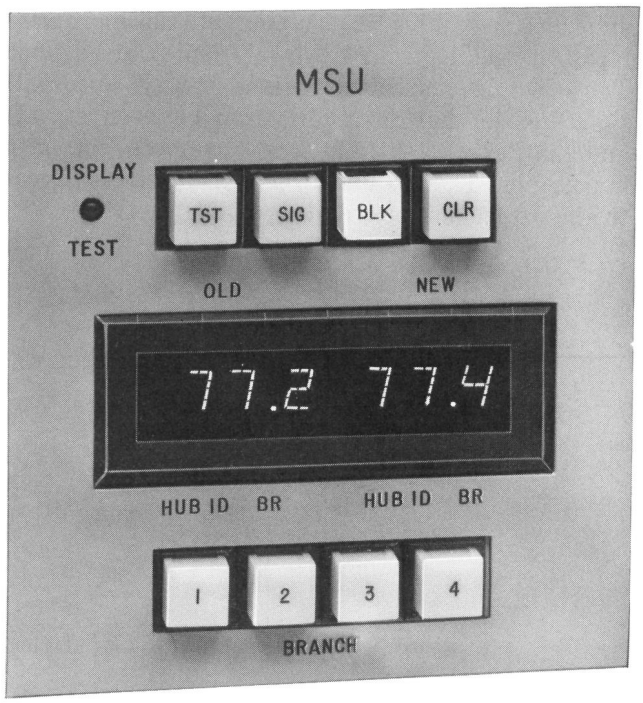


Fig. 12—Front View of MSU

- SIG key—Operation of this key connects the MSU transmitter and receiver to the TRMT/RCV cord reel unit. A lamp under the keytop lights when the key is depressed.

- BLK key—Reserved for future applications.

- CLR key—Operation of this key causes the MSU to send idle code to the MJUs downstream and remove them from the test mode. A lamp under the keytop will light for approximately one-half second when the key is depressed. The lamp will also flash if the CLR key is ***not*** depressed ***before*** the TRMT cord reel plug is removed from the testboard jack after an MJU has been signaled.

- BRANCH keys (1 through 4)—These keys are used to select the proper MJU ports required to gain access to a desired station downstream in private line service. Each operation of a BRANCH key selects one port out of each MJU located between the MSU and the station to be checked until a path between the two is complete. In each case the port selected corresponds to the number on the BRANCH key. A path between an MSU and a station when the appropriate BRANCH keys are depressed is shown in Fig. 13. When a BRANCH key is depressed, the MSU sends 80 consecutive bytes to an MJU downstream. The 80 bytes are:

  20 bytes of test alert (TA)

  20 bytes of MJU alert (MA)

  20 bytes of branch code (BR1-4)

  20 bytes of unassigned mux chan (UMC).

- Display—The MSU display will show branch (BR) numbers and hub identification (HUB ID) codes received from MJUs selected by the BRANCH keys. The display will show BR numbers and HUB ID codes as follows:

(a) When only one BR number and HUB ID code is received, they will appear in the NEW section of the display.

(b) When two BR numbers and HUB ID codes are received, the last one received will appear in the NEW section and the remaining one will appear in the OLD section of the display.

(c) When more than two BR numbers and HUB ID codes are received, the display will show the last two received. After all BRANCH keys are depressed, the display will only show the last two BR numbers and HUB ID codes received. The last BR number and HUB ID code received will appear in the NEW section and the next to last BR number and HUB ID code will appear in the OLD section of the display. Figure 14 shows the sequence of BR numbers and HUB ID codes displayed when MSU BRANCH keys are depressed in order to access the station specified in Fig. 13. Figure 14, parts A, B, and C show the BR numbers and HUB ID codes displayed after BRANCH keys 2, 2, and 3 are depressed, respectively. Figure 15 shows the sequence of operation followed when an MSU is used to gain access to a desired station.

3.10 The telephone handset and dial are used with two types of line circuits: a station line circuit (416A KTU) and a CO line circuit (400D KTU). The station line circuit is 2-wire and provides local voice communication via an interbay talk trunk with SDDS equipment bays. One-way signaling to the testboard is provided when a telco employee inserts his headset plug into the appropriate jacks at the bay clock, power, and alarms shelf. The CO line circuit provides 2-way automatic signaling so that communication between an STC and another STC or other local or remote testboards is possible. The CO line circuit also provides access to the direct distance dialing (DDD) network. The

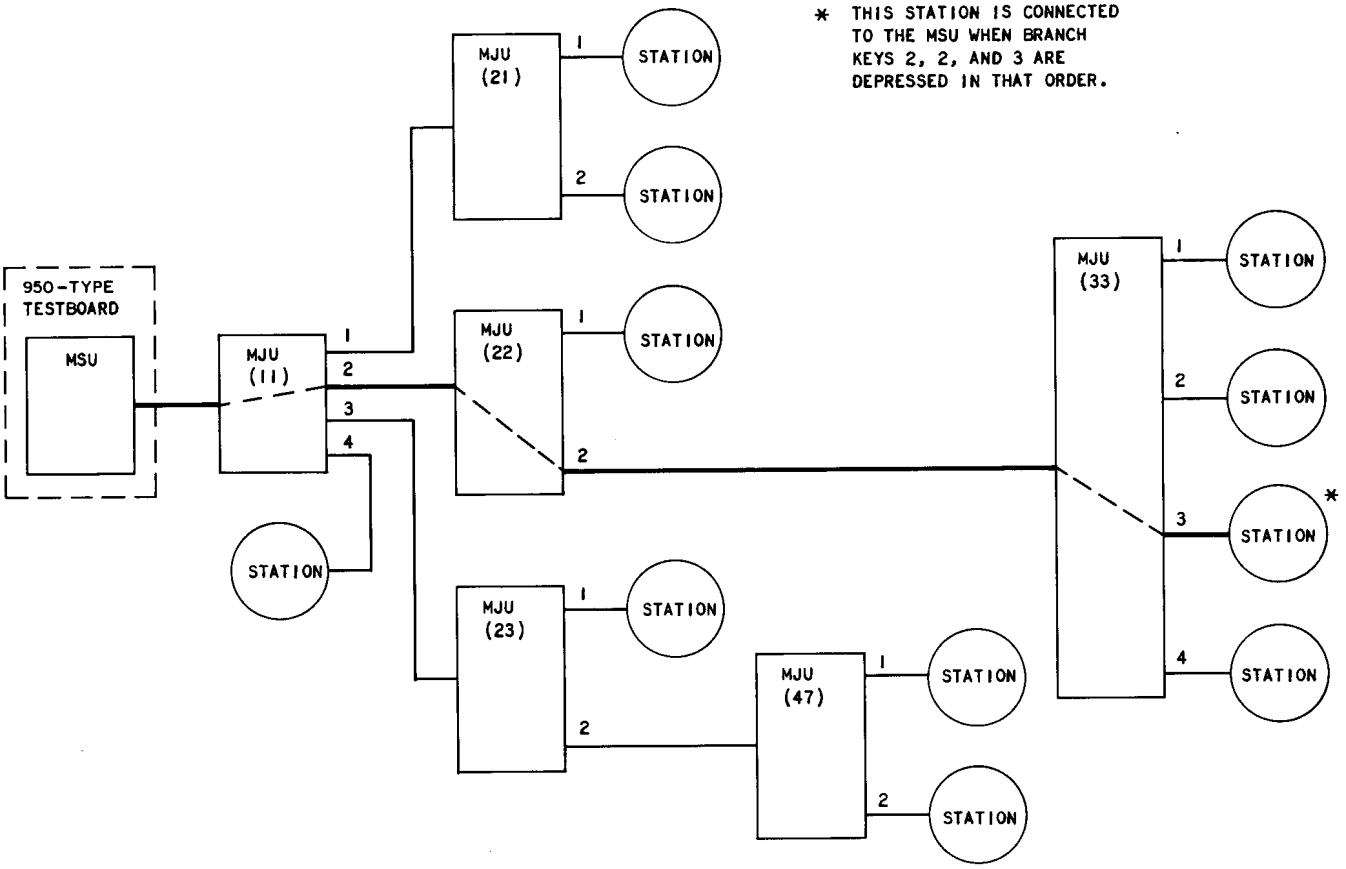


Fig. 13—Connection of MSU to a Desired Station by Selection of Proper MJU Branches

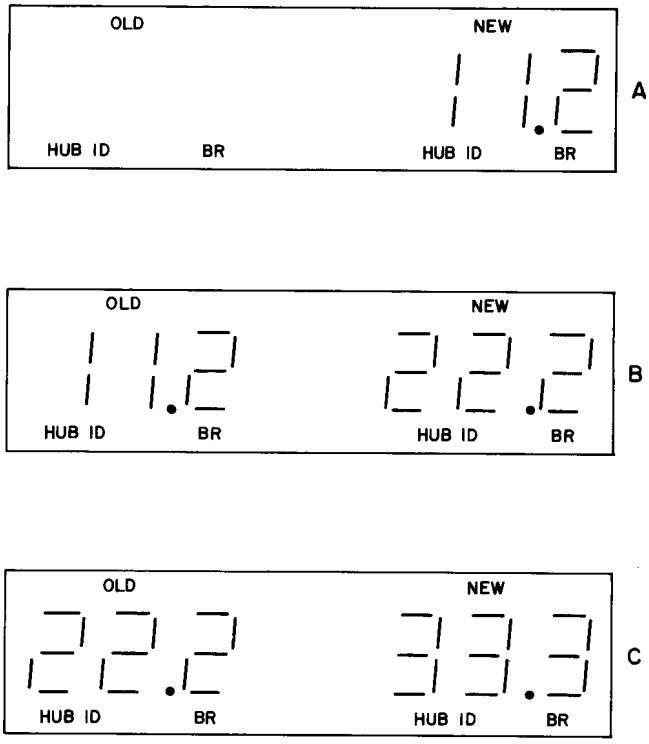


Fig. 14—MSU Display After Depression of Branch Keys

telephone circuits also make it possible to have conference calls with several persons; however, a reduction in level occurs as each additional telephone line is bridged for a conference call.

3.11 The pickup keys on the control panel are provided so that calls can be placed from and received at the testboard. The lamp under the keytop lights when the key is depressed, and flashes when a call is being made to the testboard. The flashing key must be depressed to establish connection to the line over which the incoming call is being made. Outgoing calls can be made on CO lines only.

3.12 The TEL ALM key permits activation of the central office service alarm when an incoming call is being received at the testboard. When the testboard is left unattended, the CO service alarm will alert CO personnel of an incoming call. Where multiple testboard installations occur, the TEL ALM key is located only in the testboard that connects directly to the KTU shelf. When more than one KTU shelf is associated with a group of testboards, the TEL ALM key can be multipled to the testboards associated with the particular KTU shelves.

3.13 The HOLD key permits the testboard operator to hold a CO line. When a line is placed on hold, the pickup key lamp associated with that line will wink.

3.14 The AUD OFF key is used to disable the buzzer. When an incoming call is being received, the AUD OFF lamp will flash at the same rate as the buzzer would normally buzz.

3.15 The 400D KTUs in the KTU shelf provide pickup or hold of a CO line when a call is placed to or received from another STC or other location. The 400D KTUs also cause the buzzer to sound and the lamp under the keys to light on an incoming call; the KTUs cause the HOLD key lamp to light when the key is in the hold condition. The 416A KTUs provide a station line circuit so that one-way signaling from SDDS equipment locations in a hub office to the testboard can be accomplished via an interbay talk trunk. The 19C2 power unit on the equipment shelf requires 117 volts ac at 60 Hz. The power unit provides 10 volts ac and -24 volts dc and delivers it to the KTUs, the buzzer, the interrupter, the relay and lamps in the testboard key assembly. The interrupter is driven by an ac motor and it gives the telephone buzzer an alternating on and off sequence. The relay operates on incoming calls and provides power to the interrupter through a set of contacts. Two other sets of relay contacts, in conjunction with the operated TEL ALM key, activates the CO service alarm when an incoming call is being received.

3.16 The CLOCK switch selects either one of two bipolar clock lines (A or B) brought into the testboard and connects the line to the clock line terminator (HL49B CP). The switch also checks the clock failure lamp for proper operation. When the switch is operated to the middle position, the clock failure lamp, located above the switch, should light. If the lamp lights when the CLOCK switch is in position A or B, this indicates a loss of clock or faulty clock on line A or B, respectively.

3.17 The clock line terminating circuit (HL49B CP) and the 8- and 64-kHz clock driver board (HL52 CP) are located in the equipment shelf and are associated with the clock timing signals. HL49B CP provides the proper termination for the composite

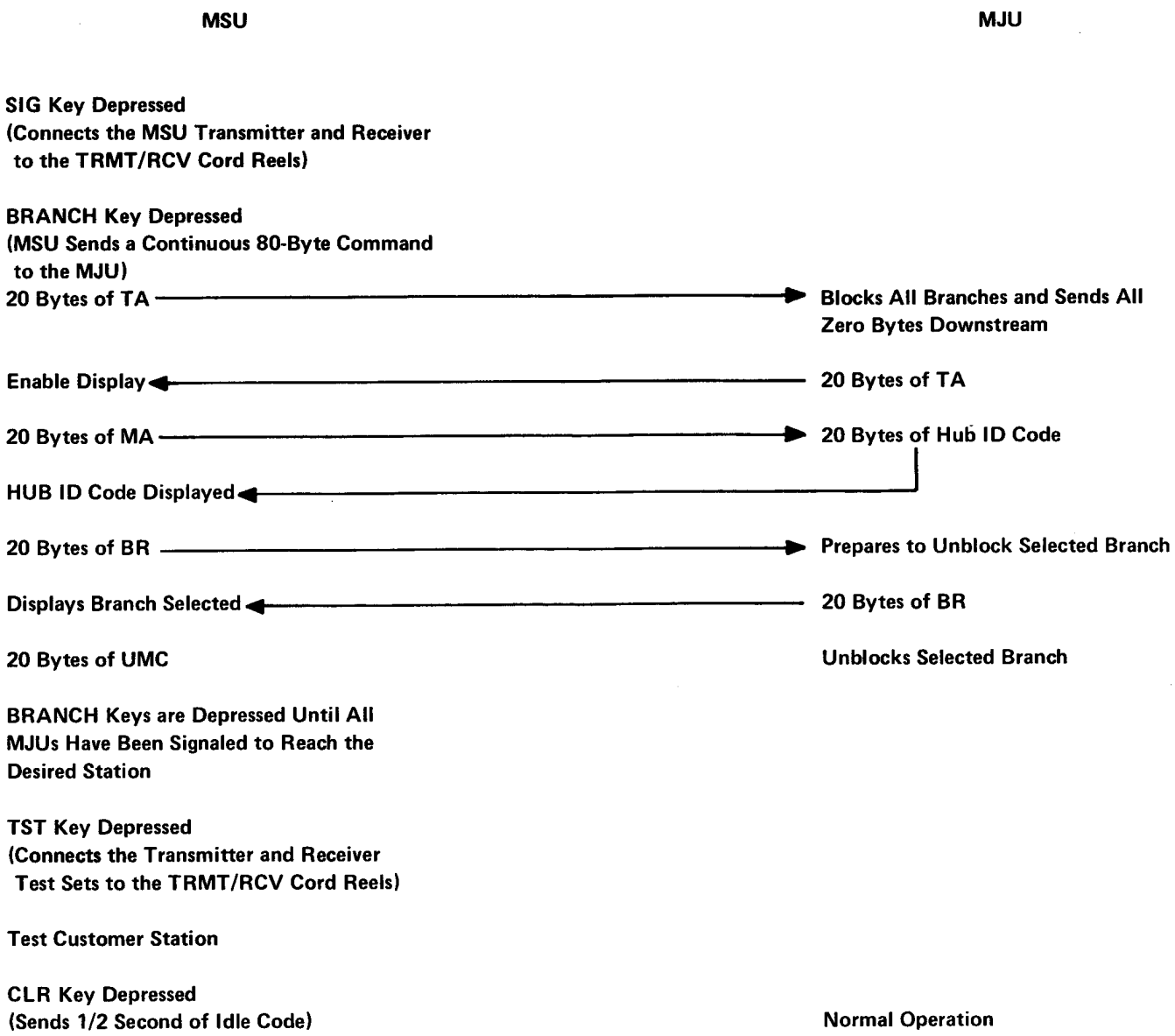


Fig. 15—Operational Sequence of a Multipoint Signaling Unit

clock signal selected by the clock switch. The bipolar clock signal is a composite signal which contains both the 8-kHz and 64-kHz timing signals. HL49B CP separates the 8- and 64-kHz signals from the incoming clock signal and checks to see if they are present and in proper alignment. If the incoming clock signal is out of alignment or is not present, the lamp located above the clock line switch lights. The logic output from HL49B CP is sent to the driver board HL52 CP which distributes the timing signals to the test equipment.

3.18 The CONT CODE switch can be used to select each of nine control codes or an ALL 1's code as shown in Table A. Each code is a byte which consists of eight bits and is produced by the control code generator (P/O HL66 CP) located in the equipment shelf. HL66 CP also produces a test code which is available at the cord reel outputs as described previously. The line driver circuit pack (HL67 CP) converts the unipolar logic signal of HL66 CP into the SDDS balanced bipolar format with + and -3 volts amplitude.

TABLE A

CODES SELECTED BY CONT CODE SWITCH

SWITCH POSITION	DESIGNATION	CODE
1	SR IDLE	01111110
2	56 IDLE	11111110
3	DSU LOOP	00101100
4	CHAN LOOP	00101000
5	OCU LOOP	00101010
6	OUT SYNC	00011010
7	TEST CODE	00011100
8	UASGN CHAN	00011000
9	NOT READY	01111010
10, 11	—	—
ALL 1's	ALL 1's	11111111

TABLE B

CODES GENERATED BY THE MSU

DESIGNATION	CODE
TEST ALERT	01101100
MJU ALERT	01110001
BRANCH 1	00101001
BRANCH 2	00101011
BRANCH 3	00101101
BRANCH 4	00101111
UMC	00011000
IDLE	01111110
HUB ID	0XXXXXX1*

* Bit positions 2 through 7 of the HUB ID code can contain a 1 or a 0 according to the office code.

3.19 The CPs associated with the MSU (HL81 and HL82 CPs) are located in the equipment shelf. HL81 CP provides the timing for HL82 CP and part of HL81 CP and, in conjunction with the keys on the MSU, it controls the mode of MSU operation. HL82 CP provides generation and recovery of certain codes (Table B) to and from an MJU.

Screw switch S1 located on HL81 CP (Fig. 16) must be in the "up" position when the CO battery is -48 volts and must be tightened "down" when the CO battery is -24 volts.

3.20 The power units located in the equipment shelf may be either a 74A and a 71D (-48 volt CO battery) or a 78A and a 76D (-24 volt CO battery). The 74A or 78A power unit provides +5 volts to the CPs in the equipment shelf, to the clock alarm circuit and clock alarm lamp, and to the MSU circuitry. A -12 volt output supplys the DTSU. The 71D or 76D power unit provides +5 volts for the DSTU.

4. OPERATION

4.01 This part contains operating procedures to be followed when originating or answering telephone calls, using the MSU, and sending control and test codes from the 950B testboard. Refer to Sections 107-600-100 and 107-601-100, respectively, for operating procedures concerning the transmitter and receiver DTSs. Refer to Section 107-602-100 for operating procedures on the DSTU and Section 365-330-110 for operating procedures for the TFD.

Originating a Telephone Call

Note: Outgoing calls to other STC testboards, customers, and telco employees in the field can only be placed over CO lines. Outgoing calls to local SDDS equipment cannot be placed over the station line circuit.

4.02 To place a call, depress the appropriate pickup key to make connection to a CO line and the lamp under the pickup key will light. Dial the telephone number of the location to be called.

Answering and Terminating a Telephone Call

4.03 When a call is received at a 950B testboard, a buzzer and/or CO service alarm, if enabled, will sound and the lamp under the associated pickup key will flash. To answer an incoming call, operate the flashing pickup key. The lamp will stop flashing and remain lighted. To disconnect the telephone

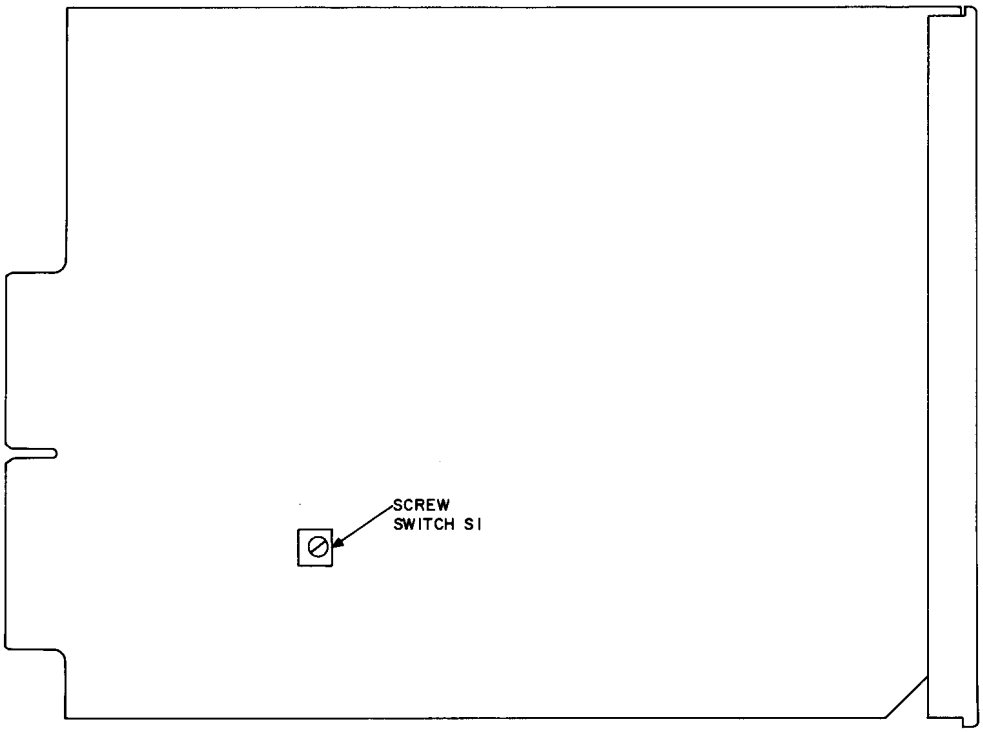


Fig. 16—Screw Switch S1 on HL81 CP

line, release the same pickup key and the lamp will extinguish.

Using the AUD OFF Key

4.04 The AUD OFF key is operated to disable the telephone buzzer when a call is being received.

Using the TEL ALM Key

4.05 When the TEL ALM key is operated, the CO service alarm is enabled and the lamp under the key lights. When an incoming call is received, the service alarm will sound and the lamp under the pickup key associated with the call will flash.

Placing a CO Line on Hold

4.06 To place a CO line on hold:

(1) Originate or answer a call.

(2) Operate HOLD key. The HOLD lamp will light and the pickup lamp will wink.

(3) Release pickup key and pickup lamp will still wink.

(4) Release HOLD key. HOLD lamp will extinguish. (Line should now be on hold.)

(5) Originate or answer another call.

4.07 To remove a call from hold, operate the pickup key and pickup lamp will light.

4.08 To terminate a call, release the pickup key.

Placing a Station Line on Hold

4.09 To place a station line on hold:

(1) Answer a call from a DDS equipment location.

(2) Instruct the person at the DDS equipment location not to remove the headset plug from the jacks in the bay clock, power, and alarms (BCPA) unit.

(3) Release the pickup key and the lamp under the key should remain lighted. (Line should now be on hold).

(4) Answer another call.

4.10 To remove a call from hold, operate the pickup key. The lamp under the pickup key will remain lighted and voice communication may continue.

4.11 To terminate a call, request the person at the DDS equipment location to remove the headset plug from the BCPA jacks; then, release the pickup key.

Conference Call

4.12 A conference call between several persons can be made by performing the following steps.

Note: Volume is reduced for each additional line bridged for conferencing.

(1) Place a call to or answer a call from one of the stations to be included in the conference.

(2) Place the line on hold as described in 4.06 or 4.09.

(3) Place a call to or answer a call from the other stations to be included in the conference. Place these lines on hold.

(4) After all calls have been made, operate the pickup keys associated with the conference participants.

(5) The calls can be disconnected by releasing the pickup keys.

Multipoint Signaling Unit

4.13 The following procedure describes how to use the MSU to gain access to a desired station in an MJU network for test purposes.

(1) Insert the TRMT and RCV cord reel plugs into the appropriate jacks in the testboard associated with the desired channel.

(2) Depress SIG key and the lamp under the key will light.

(3) Depress the desired BRANCH key(s), in the proper order, required to reach the desired station. The MSU display will show each BR number and HUB ID code as they are received.

The transmitter DTS IDLE CODE key should not be depressed and the BYTE ENCODER switches should not display the idle code byte (01111110 or 11111110) before or during the following steps.

(4) Depress TST key and the lamp under the key will light.

Note: If a mistake is made while performing Steps (2) through (4) above, depress the CLR key and start again.

(5) Tests can now be performed using the KS-20908 and KS-20909 DTSs.

(6) At the conclusion of testing, depress the CLR key and the lamp under the key will light for approximately one-half second. If the SIG or TST lamps under the keys are lighted when the CLR key is depressed, they will extinguish. If the SIG or TST lamps under the keys were lighted prior to the CLR key being depressed but were extinguished when the CLR key was depressed, they will remain extinguished and the MSU will automatically go into the test mode.

(7) After the CLR lamp extinguishes, remove the TRMT and RCV cord reel plugs from the testboard jacks.

Note: If the TRMT and RCV cord reel plugs are removed from the jacks before the CLR key is depressed, the CLR lamp will flash. The CLR lamp will extinguish after the TRMT and RCV cord reel plugs are reinserted into the jacks. Testing can then be continued or the channel can be returned to normal by performing Steps (6) and (7) above.

Control and Test Codes

4.14 When using the control code generator and test code generator to send codes:

(1) Set the CONT CODE switch to the desired position.

Caution: Verify that customer data is not being transmitted over the channel to be tested by monitoring the channel with the receiver as follows: Plug the receiver cord reel

plug into the appropriate MON jack. If receiver BYTE PATTERN LED 8 is lighted and LEDs 2 through 7 are dimly lit, customer data is being sent over that channel. Notify customers at both stations that tests are about to be performed and obtain customer permission to test the channel. If permission is granted, inform the customer that data should not be transmitted until further notice. When receiver BYTE PATTERN LED 8 is extinguished, continue with the test.

(2) If the TEST CODE (00011100) is to be transmitted, insert one of the test code cord reel plugs into the appropriate jack labeled TO NEAR or TO FAR. If a control code is to be transmitted, select the appropriate control code and insert one of the control code cord reel plugs into the appropriate jack labeled TO NEAR or TO FAR.

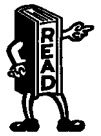
(3) After completing all tests, remove the cord reel plug from the jack and ***notify the customer that data transmission can be resumed.***

Dummy and Signal Plugs

4.15 Dummy plugs are used to open the channel lines at the testboard. The plugs can be inserted into any of the top four jacks in a jack module when a channel is being tested.

4.16 A signal plug is used for priority circuits. It covers the top four jacks of a jack module and prevents plugs from being inserted into the jacks and interrupting service on the channel lines.

Clock Circuit Check



Check the clock failure lamp, located above the clock switch, and for presence of clock signals on both lines DAILY.

4.17 The lamp should be extinguished when the switch is in position A or B. The lamp should be lighted when the switch is in the middle position. If the lamp does not light when the switch is in the middle position, it should be replaced according to Section 666-600-301.

Using the TRK FAIL ACO Key

4.18 When the TRK FAIL ACO key is operated, the CO service alarm is not activated by a trunk failure monitored by the TFD and the TRK FAIL ACO lamp is lighted.

Using the TST BD F/PWR UN FAIL ACO Key

4.19 When the TST BD F/PWR UN FAIL ACO key is operated, the CO service alarm is not activated by a testboard fuse or power unit failure and the TST BD F/PWR UN FAIL ACO lamp is lighted.

5. REFERENCES

5.01 This part contains lists of Bell System Practices (BSPs), schematic drawings (SDs), and circuit descriptions (CDs) that pertain to the equipment and apparatus in the 950B testboard.

5.02 For more detailed information on the testboard, refer to the following:

NUMBER	TITLE
CD- & SD-73076-01	KS-20908 Data Test Set
CD- & SD-73077-01	KS-20909 Data Test Set
CD- & SD-73085-01	950-Type Testboard
CD- & SD-73102-01	Digital Signaling Test Unit
CD- & SD-99609-01	Local Maintenance Center Display Circuit [Trunk Failure Display (TFD)]
SD-69513-01	400D Key Telephone Unit
SD-69559-01	416A Key Telephone Unit

5.03 The following BSPs contain additional information on equipment in the 950B testboard:

SECTION	TITLE
107-600-100	Digital Data System—KS-20909 Data Test Set (Transmitter)—Description and Operation
107-601-100	Digital Data System—KS-20908 Data Test Set (Receiver)—Description and Operation
107-602-100	Switched Digital Data System—Digital Signaling Test Unit (DSTU)—Description and Operation
365-330-110	Digital Transmission Systems—T-Carrier Administration System—Remote Office Equipment Description (Trunk Failure Display)
365-330-200	Digital Transmission System—T-Carrier Administration System—Turnup Procedures—Remote Office Equipment (Trunk Failure Display)
365-330-500	Digital Transmission Systems—T-Carrier Administration System—Test Procedures—Remote Office Equipment (Trunk Failure Display)
518-215-100	Reference—1A2 Key Telephone System—Identification and Arrangements
518-215-400	Service—1A2 Key Telephone System—Key Telephone Units—400 Series
666-600-301	Switched Digital Data System—950B Testboard (J70176C)—Maintenance Procedures
666-600-501	Switched Digital Data System—950B Testboard (J70176C)—Inspection and Maintenance Tests
807-601-150	950-Type Testboard—DSX-0 Cross-Connect and Test Set—Equipment Design Requirements
807-601-180	950-Type Testboard—Performance Requirements.