

DIGITAL TRANSMISSION SYSTEMS

DSX-1, DSX-1C, AND DSX-2 PATCH AND CROSS-CONNECT

GENERAL DESCRIPTION

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Note: The circuit connection tables on SD-99503-01 (not included in this section) give further connecting information.

1. GENERAL

1.01 The term DSX which is used throughout this section is the common term for digital system cross-connect. This section contains a general description of the DSX for the DS-1 (1.544 Mb/s), DS-1C (3.152 Mb/s), and DS-2 (6.312 Mb/s) digital transmission systems. These systems are identified as DSX when describing a feature common to all three systems, and as the DSX-1, the DSX-1C, or the DSX-2 when describing exclusive features.

1.02 This section is reissued to update information on DSX-1, and to include a general description of the DSX-1C and DSX-2. The information pertaining to DSX-2 was originally contained in Section 365-302-101. Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The DSX serves as a common location in a central office for cross-connecting, rearranging (rolling), and restoration patching of service, and also as a common maintenance center. The relationship of the cross-connects to terminals and transmission facilities for the digital transmission hierarchy, including both existing and planned features, is shown in Fig. 1 (see Note).

2. EQUIPMENT DESCRIPTION

2.01 At the DSX, digital equipment connected to the IN and OUT jacks must have the same bit rate and code format. In addition, signal level and delay distortion are uniform with identical input and output specifications (ie, a common level point). These specifications vary from bit rate to bit rate, and mixing of bit rates in the same cable, panel, or bay is not recommended. Also, separate input and output cables are recommended for all bit rates and are required for some. The shield of these cables shall be grounded at one end only except at individually engineered offices. When any of these recommendations must be ignored, crosstalk interference and administrative confusion should be kept to a minimum. For small installations where a single equipment rack will suffice, all DSXs may share the same bay with the bit rates segregated so that the higher rate is on top. Normally, the DSX for a given bit rate is located in a separate part of the office from that for other bit rates and may include several bays. Depending on the office arrangement these are 7-foot, 9-foot, or 11-foot 6-inch cable duct bays. To accommodate the connecting cables 2-1/2 inches of additional duct is required on each side of each bay. A typical arrangement for the panels is shown in Fig. 2. The jack panels are mounted from about 17 inches above the floor to a maximum of about 7 feet 8 inches above the floor to keep jacks within reach and to avoid cable pileup.

2.02 The DSX jack panels are available in 2-, 3-, or 4-inch heights to accommodate 12, 16, or 25 jack circuits. These sizes permit growth in convenient steps which match the circuit requirements of the connecting equipment (eg, the 3-inch panel

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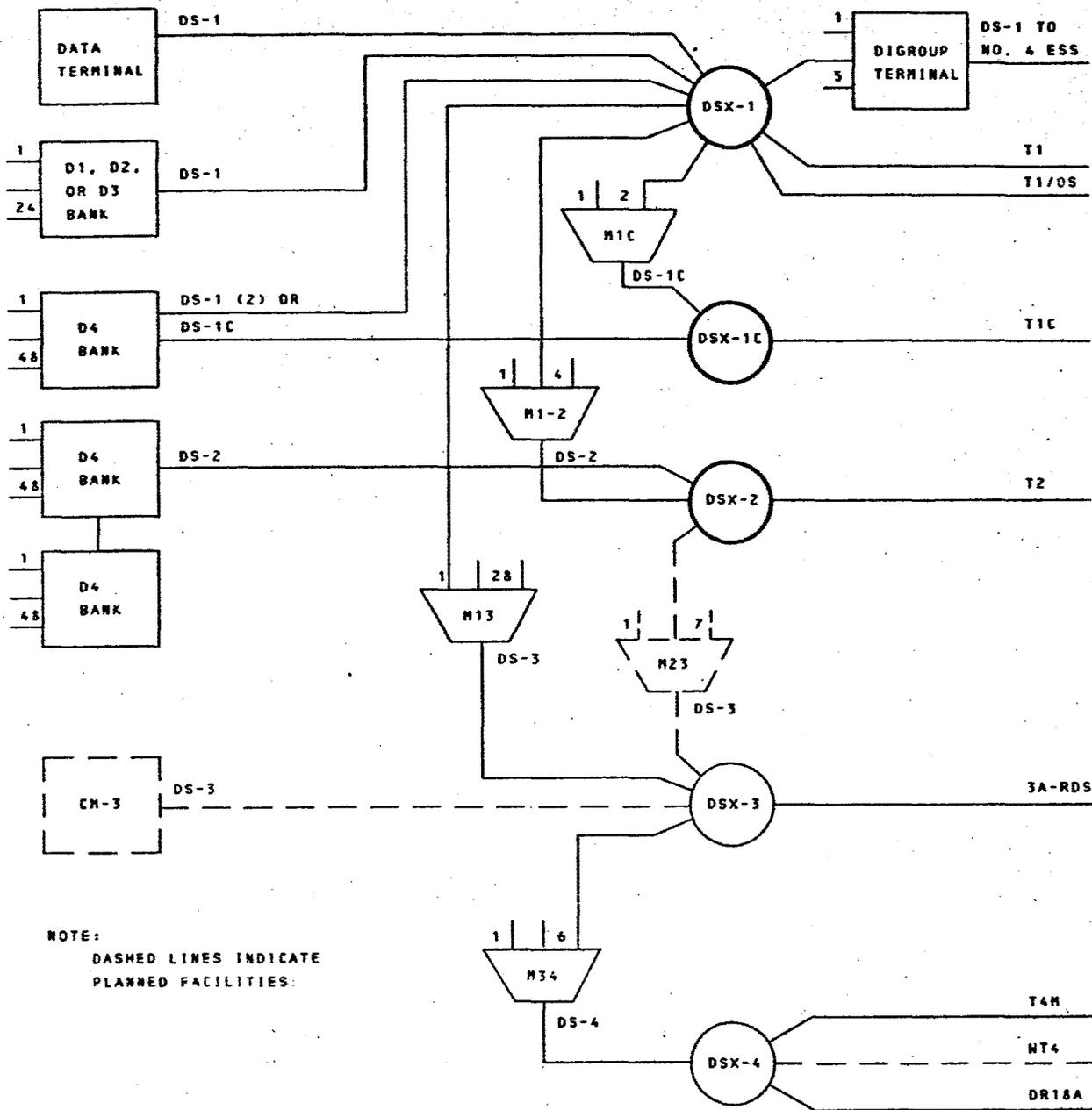


Fig. 1—Digital Hierarchy and Transmission Facilities

For the M1-2 muldem bay and the 4-inch panel for line T2 span terminating bay, etc). The arrangement of the jack circuits on the 4-inch panel is shown in Fig. 3. Each jack circuit (Fig. 4 and Fig. 5) consists of monitor (MON), OUT, and IN jacks. The MON jack is bridged through resistors to the OUT jack. Error detecting sets, line monitors, and the input to bridging regenerators may be patched to the MON jacks. A trace lamp (TL) associated with the MON jack lights when a plug

is inserted at either end of a cross-connect. On the DSX-2 every fifth MON jack has pin 3 connected to frame ground. A special jack circuit (Fig. 6) is required for connection to the maintenance line (ML) for T1 and T1C systems. In the DSX-1 this circuit may be in either position 1 or 25 but in the DSX-1C it is restricted to position 25. This ML jack circuit has a terminating resistor on the OUT jack and bridging resistors in the cross-connection pairs. Therefore, the bridging regenerator in the

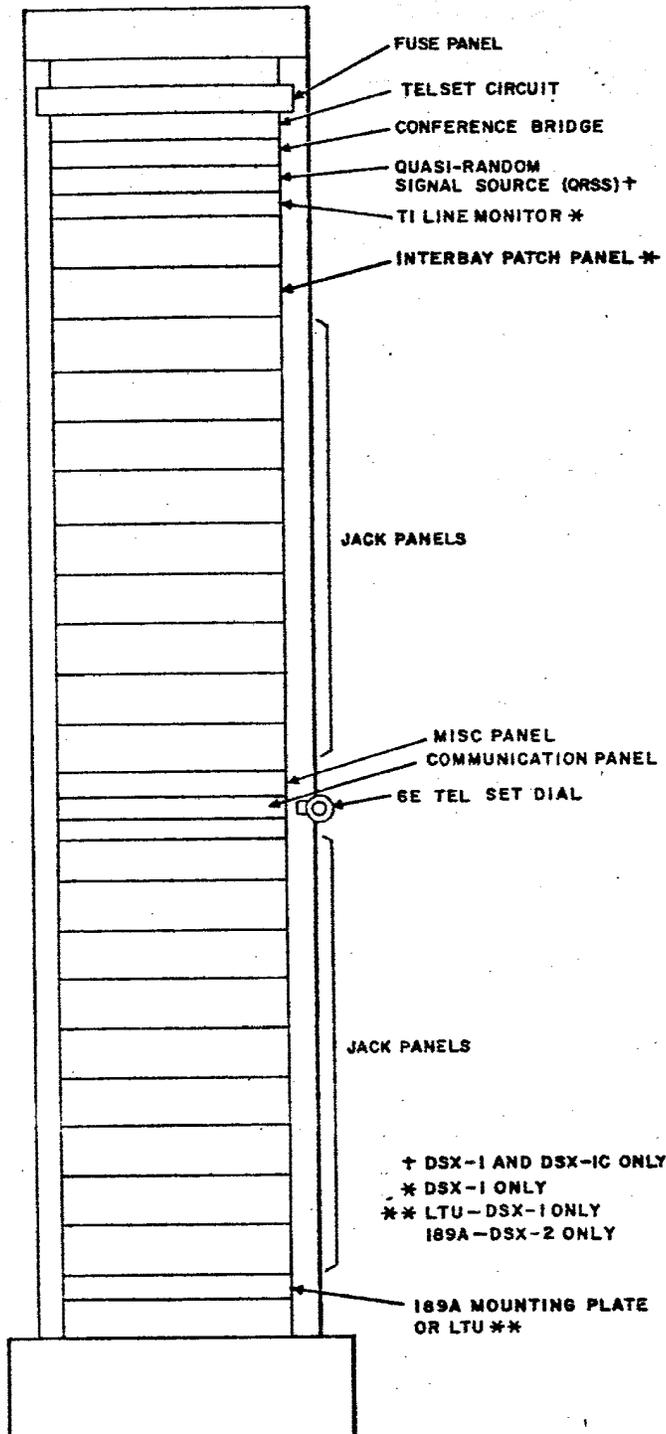


Fig. 2—Typical DSX Bay Arrangement

office repeater bay must not contain additional resistors (eg, 201L, 206P, or 206S, etc). As shown in Fig. 6, the ML is either terminated or interconnected to another ML by cross-connections at the DSX.

2.03 The jack identification numbers are used when the digital system (DS) assignments are recorded on Form E-6457 (Fig. 7), which should be attached to each side of the panel using a 91K adhesive-back card holder. The blank area at the top of the card should identify the connecting span and apparatus case or connecting equipment such as channel banks or muldems. The adhesive-back designation strips (8BD) should be attached across the lower portion on the front of each panel. A designation card inserted in the designation strip should list the connecting equipment by relay rack location. The connecting equipment relay rack locations will be stenciled on the rear of each panel by WECO when the panel is installed. The designation cards are Form E-6490 (white) for DSX-1, E-6489 (violet) for DSX-1C, and E-6458 (tan) for DSX-2. Refer to Fig. 8 for typical examples of designation strip locations, designation cards, and field designations.

2.04 Where 85-foot long cross-connections are permitted, patch cord connections of the same length are also permitted. To accommodate these long patching distances with standard P3BH cords, every third bay in a line of DSX-1 bays (starting with the second bay) may be equipped with an interbay patch panel containing 25 jack circuits (Fig. 9). Permanent cross-connections between panels and between jacks in the same set join an IN() jack to an OUT() jack. Thus, patching a signal into an INR jack makes the signal available at the similarly located OUTL jacks on every panel to the right in the line. Similarly, patching into an INL jack routes the signal to the OUTR jack in the bays to the left. The INR and INL jacks at the ends of the line are terminated by 100-ohm resistors wired between pins 4 and 6.

2.05 A busy (BSY) lamp is associated with each interbay patching jack set. These lamps are wired together so that back contacts on the IN() jacks light the BSY lamps, and back contacts on the OUT() jacks selectively extinguish the lamps. Plugging into either an INL or INR jack in the same set will light all the BSY lamps in both directions on the line by shorting together the BY and GRD leads. Plugging into an OUTL jack

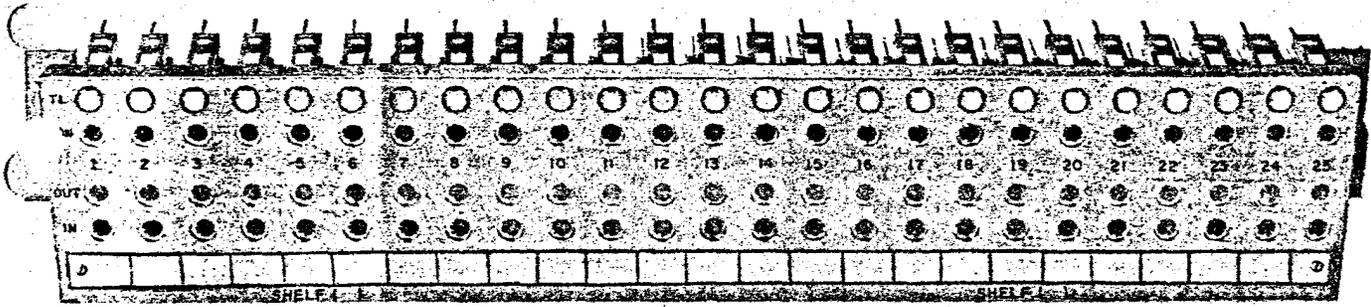


Fig. 3—4-Inch Jack Panel

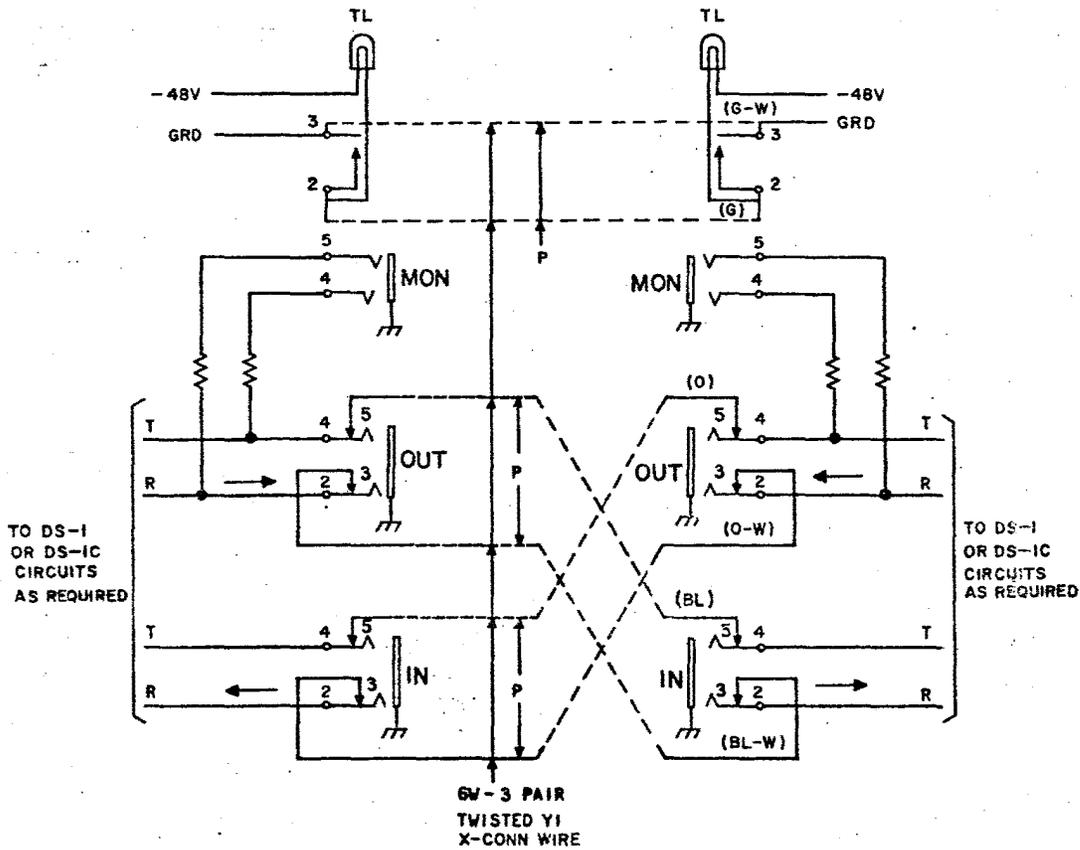
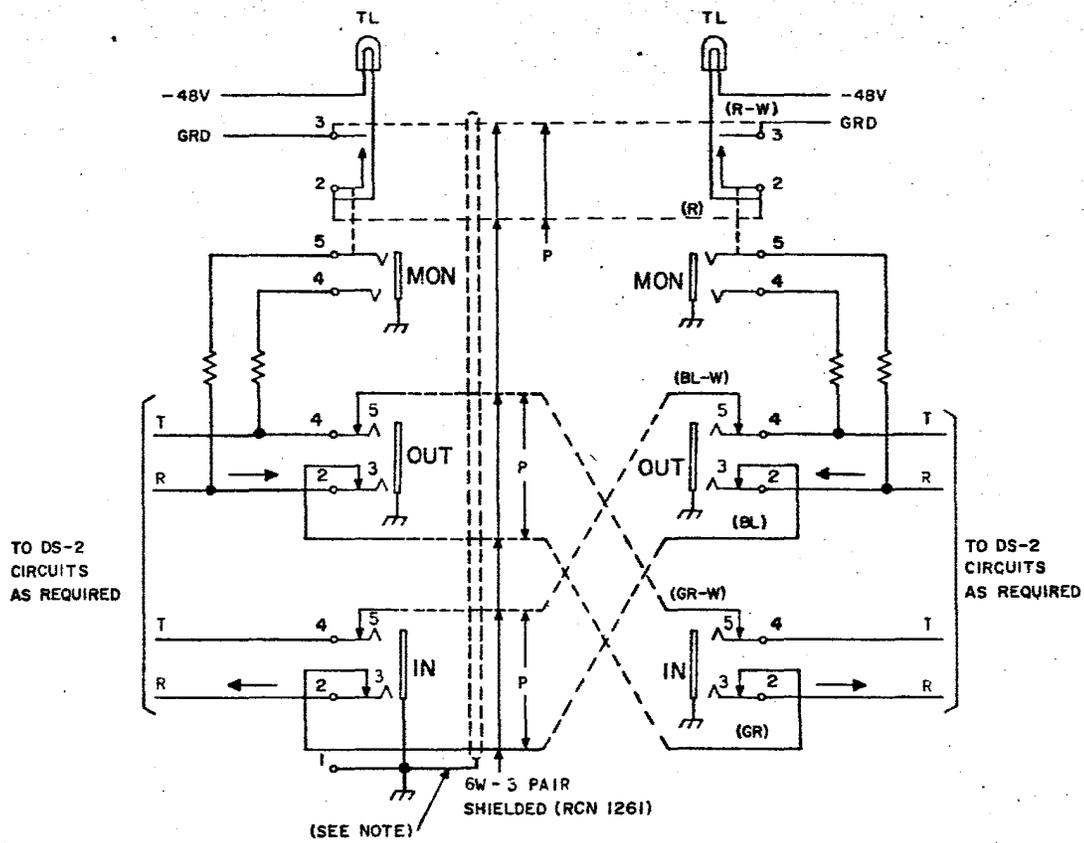


Fig. 4—DSX-1 and DSX-1C Jack Circuit Schematic

separates the associated BSY lamp and BY lead to the right from any shorts to the GRD lead that exist on the BY lead to the left. Similarly, plugging into the OUTR jack separates any BY to GRD lead shorts to the right. Thus, if a bidirectional patch has been completed, a lighted BSY lamp means signals are present at the OUTL and OUTR jacks.

A lighted BSY lamp where the OUTL jack is occupied means the OUTR jack has a signal present and vice versa.

2.06 When T1 bridging repeaters (other than those at ML inputs) are desired, a line terminating unit (LTU) will be mounted below the bottom jack



NOTE:

THE SHIELD MUST BE TERMINATED AT THE IN JACK HAVING THE BL AND BL-W PAIR.

Fig. 5—DSX-2 Jack Circuit Schematic

panel. The LTU will house two bridging repeaters (see Section 365-200-103). If T2 bridging regenerators are required, they will be installed in an ED-2C341-30, G2 mounting assembly which is installed in a 189A mounting plate at the bottom of the DSX-2 bay. Either a 1A or 1E regenerator equipped with a 933ABBR or 933BBBR equalizer may be used (Fig. 10). For a description of the T2 regenerators, refer to Section 365-500-103.

2.07 The ED-1C642-30 fuse and alarm panel, which is two inches high, contains the 70-type distribution fuses for the TL lamp circuits and the main power fuse (Fig. 11). The fuse circuit is connected to the office alarm, and the FA lamp in the circuit lights when any of the fuses blow. When bridging repeaters, bridging regenerators, quasi-random signal source, or telephone set circuit

is included in the bay, power for these is derived from the fuse panel.

2.08 Communications equipment that is jack-ended in the 2-inch communication jack panel is comprised of one or more of each of the following:

Telephone set and telephone line

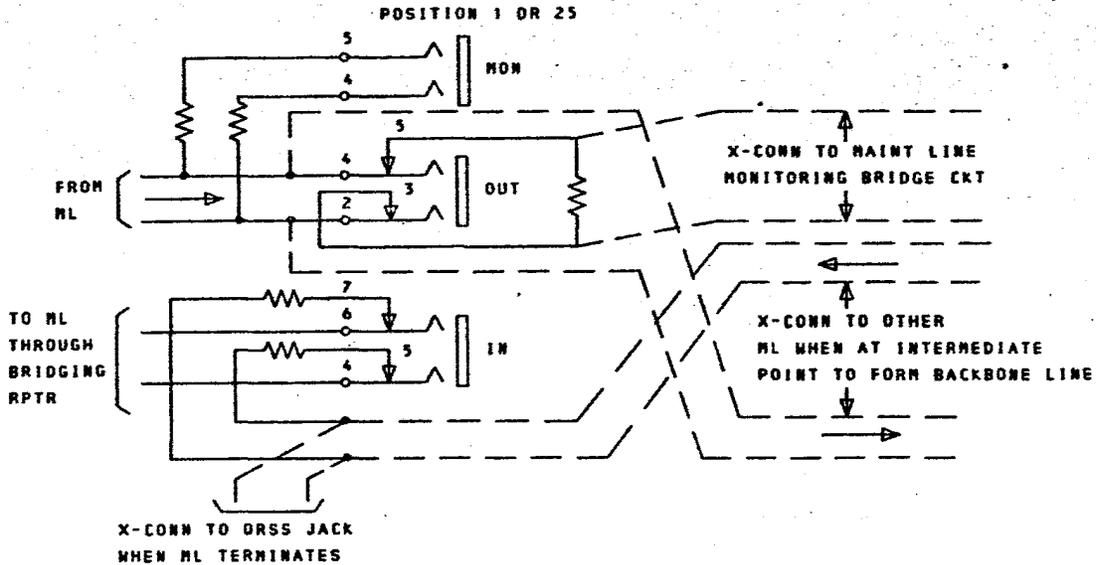
Dial lines

Four-part conference bridge

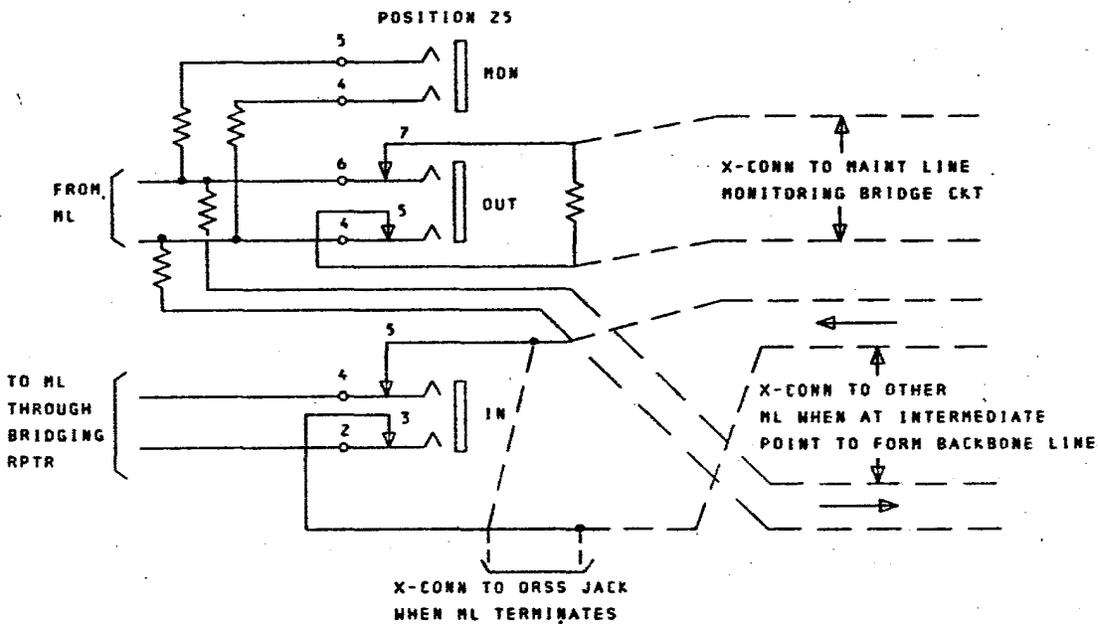
Frame lines (DSX--2)

Order wires

-48 volt test outputs for portable test equipment



A - DSX-1 (A&M ONLY)



B - DSX-1 AND DSX-1C

Fig. 6—Maintenance Line (ML) Jack Circuit Schematic

2-inch miscellaneous panel is provided with jack appearances for maintenance facilities as follows:

Fault-locate lines (except DSX-2 and DSX-1 for T1/OS with automatic protection switching (APS))

Quasi-random signal source (DSX-1 and DSX-1C)

T1 line monitor (DSX-1)

Bridging repeater monitor jacks (DSX-1 and DSX-1C)

-48 volt power for portable test equipment

Typical arrangements of these panels are shown in Fig. 12.

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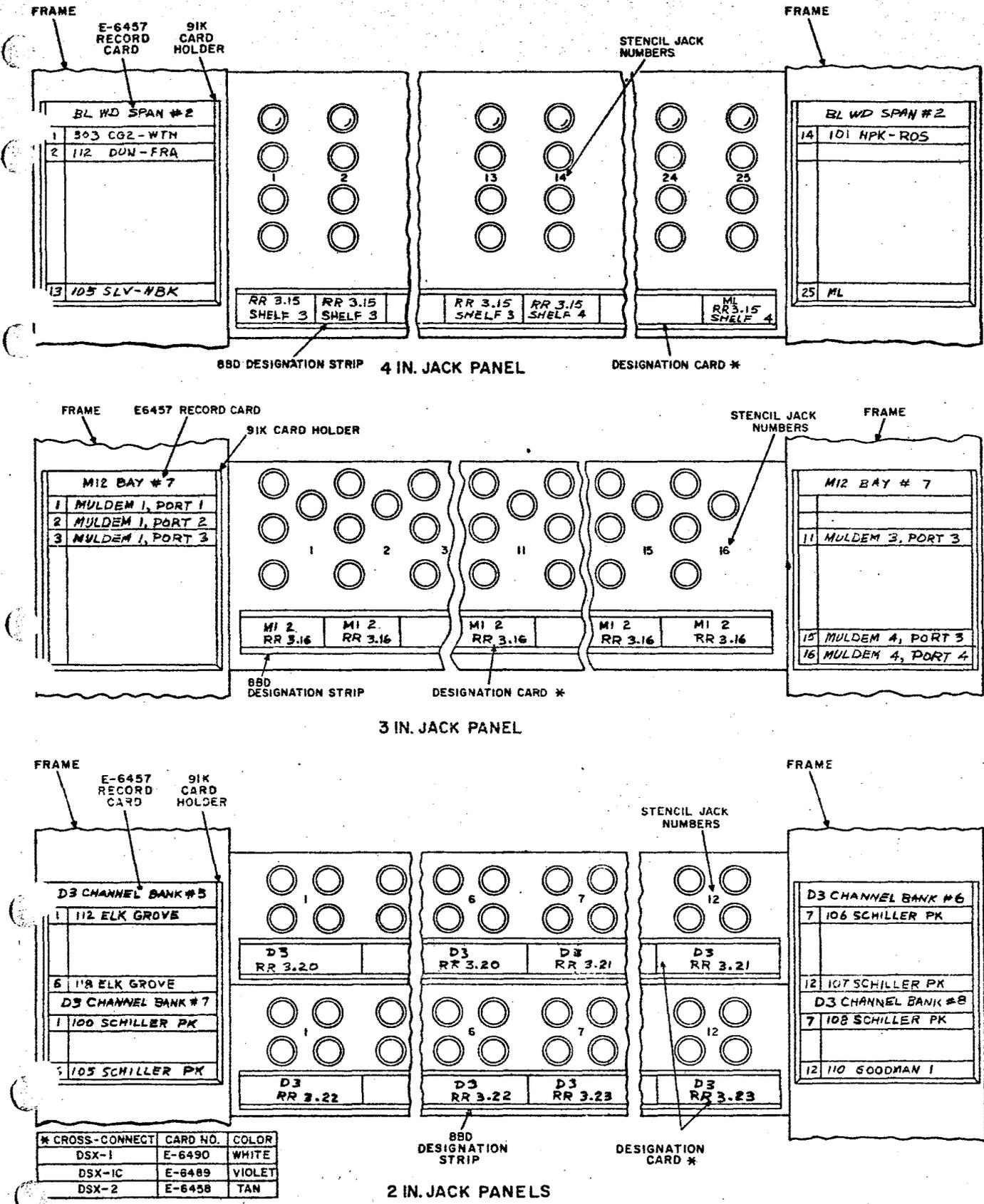


Fig. 8—Typical Jack Panel Identification

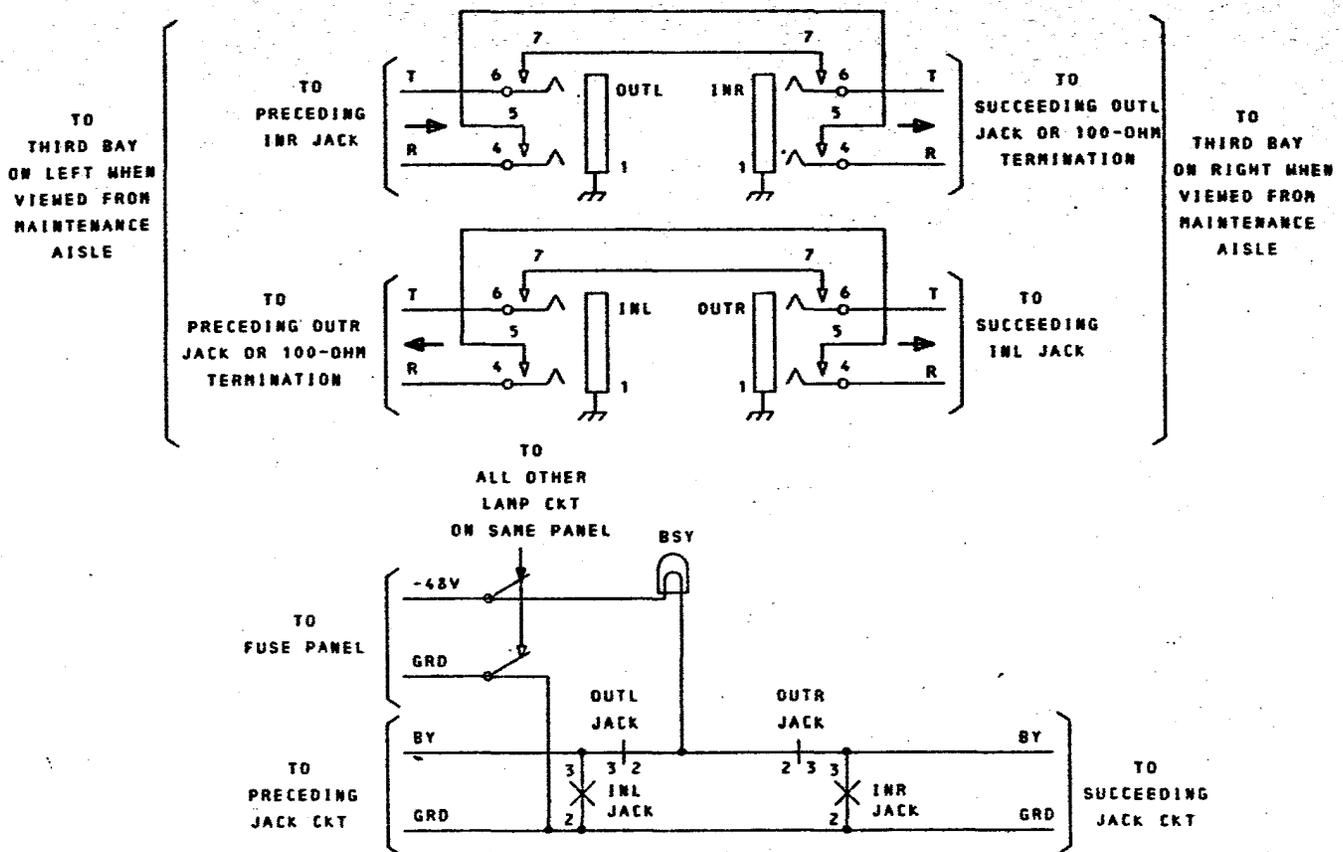


Fig. 9—Interbay Patching Jack Circuit Schematic

operation the faulty apparatus is bypassed for the restoration of service. In the second type of operation a working circuit is bypassed which shares faulty apparatus with a failed circuit (eg, unidirectional spans). The third type of operation is the initial transferring of service that is to be permanently rerouted. In the first, only the transfer from protection or standby equipment back to the repaired apparatus is critical. In the second, the transfer of service in both directions is critical. In the third, the transfers, both before and after the rearrangement of the cross-connects, are critical. In all three types of operations the in-service patching procedure, "rolling", is used to accomplish these transfers. Although rolling will create digital errors and reframing, the disturbance is usually short enough to avoid the loss of customer service by dropping calls.

Note 1: Use only 100- to 110-ohm patch cords having shielded stranded twisted-pair wire such as P3BH or P6AA cords. P3BH

cords are available in 3-, 6-, and 12-foot lengths and P6AA cords are available in 8- and 12-foot lengths.

Note 2: When large numbers of circuits are to be patched lighted TL lamps should be limited to 50 by removing fuses from the fuse and alarm panel to extinguish TL lamps.

Caution: Patching in-service lines directly from an OUT jack to an IN jack will cause service outages. Therefore, the procedure in 4.02 should be used.

4.02 The general rolling procedure consists of the following operations:

- (1) Establish communications between DSX locations.

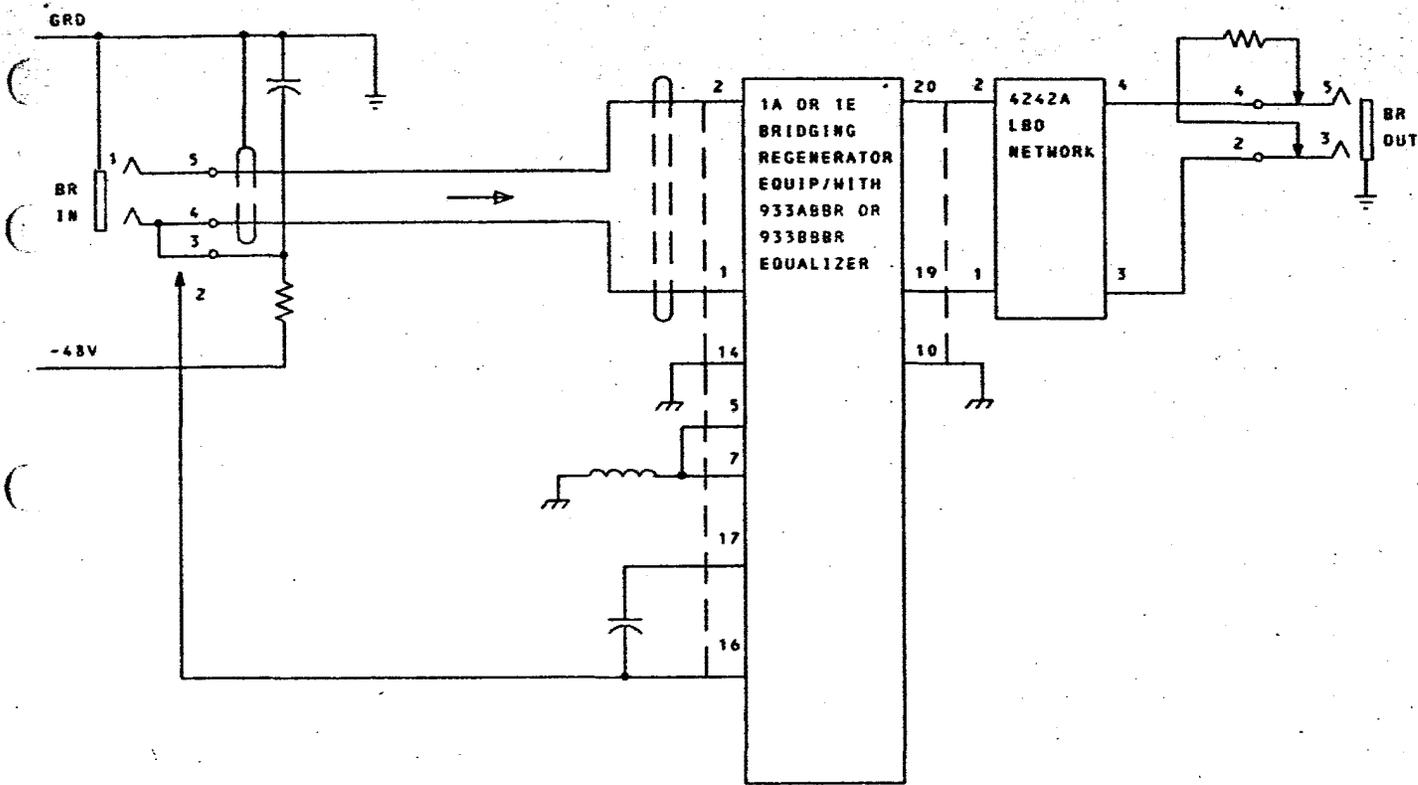


Fig. 10—T2 Bridging Regenerator Block Diagram

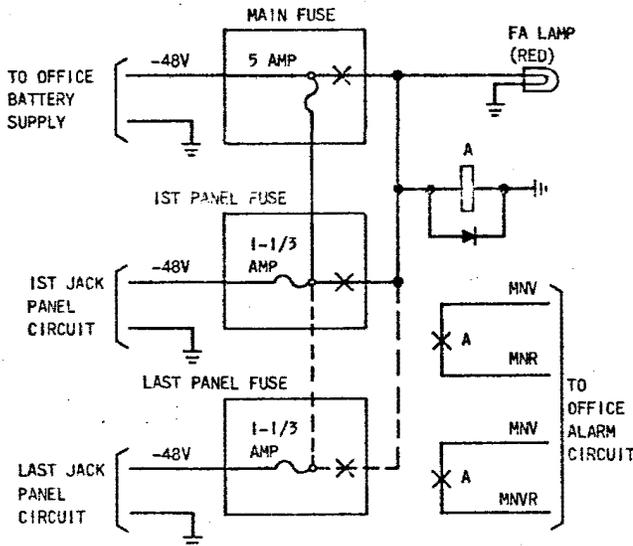


Fig. 11—Fuse Circuit

- (2) Bridge the service onto the alternate routes by patching from the MON jacks to the IN jacks of bridging repeaters (DSX-1 and DSX-1C), bridging regenerators (DSX-2), or ML IN jacks of T1, T1C, or T2 systems as appropriate (see 4.03 for T1/OS and T2 applications). The exact sequence of this is Steps 1 through 4 on Fig. 16 for maintenance lines, or Steps 1 through 8 on Fig. 17 for applications using separate bridging repeaters or regenerators.
- (3) Verify that the bridging alternate routes are delivering signals at their output MON jacks that satisfy error rate requirements.
- (4) Complete the signal transfer by patching the OUT jacks of the alternate routes to the IN jacks at the far end of the bypass, and terminate the outputs of the bypassed routes by inserting 386B plugs in the OUT jacks. This is done in Steps 5 through 10 on Fig. 16 or Steps 9 through 14 on Fig. 17.
- (5) If the cross-connect is to be rerouted or if, for maintenance reasons, a test signal is to

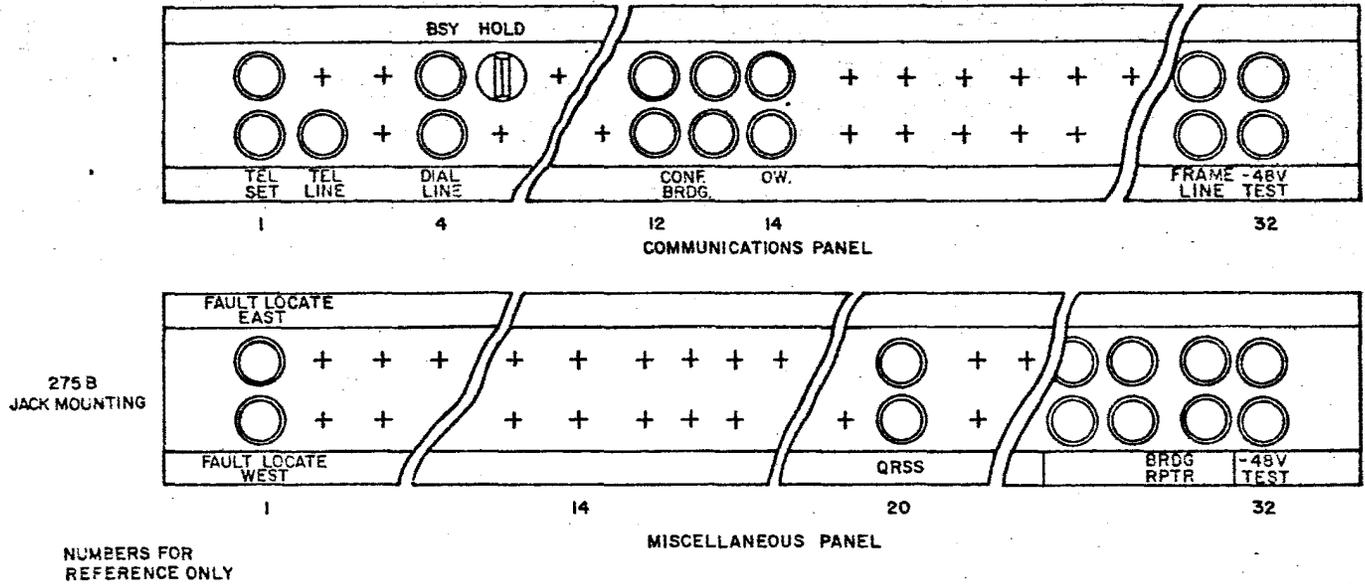


Fig. 12—Typical Miscellaneous and Communication Panel

be placed on a faulty circuit, terminate the outputs at the head-end bridge by inserting 386B plugs in the OUT jacks as shown in Steps 11 and 12 of Fig. 16 or Steps 15 and 16 of Fig. 17.

Caution: If the bypassed facility is a T1 line an input signal may be required to prevent oscillations. Therefore, if the cross-connect is to be rerouted, patch a QRSS signal into the bypassed line IN jacks.

(6) After completion of maintenance procedures or reconnection of the cross-connects and updating the designation cards verify that the signals at the regular facility output MON jacks satisfy the error rate requirements.

(7) Restore the regular facility to full service by following the steps of Fig. 16 or Fig. 17 in reverse order.

4.03 If the T1 Outstate (T1/OS) or the T2 line is equipped with APS and DSX patching access to the protection line is desired, the following operations are required:

(1) Lock out the protection switch circuit (PSC).

(2) Condition the alarm circuits to produce major alarms on failure of circuits which are now unprotected.

(3) Connect the protection line through to the DSX.

Details of these operations are described in Sections 365-010-110 and 365-250-110 for the T1/OS and in Sections 365-500-300 and 365-500-301 for the T2 line.

4.04 Additional patching information is contained in the following Bell System Practices:

SECTION	TITLE
365-200-410	T1/OS Line and System Maintenance Considerations and Tests
365-226-500	T1 Spare Line Patching
365-271-000	T1C Digital Line
365-500-301	T2 Protection Line Patching
365-600-507	M1-2A and M1-2B Muldem Patching

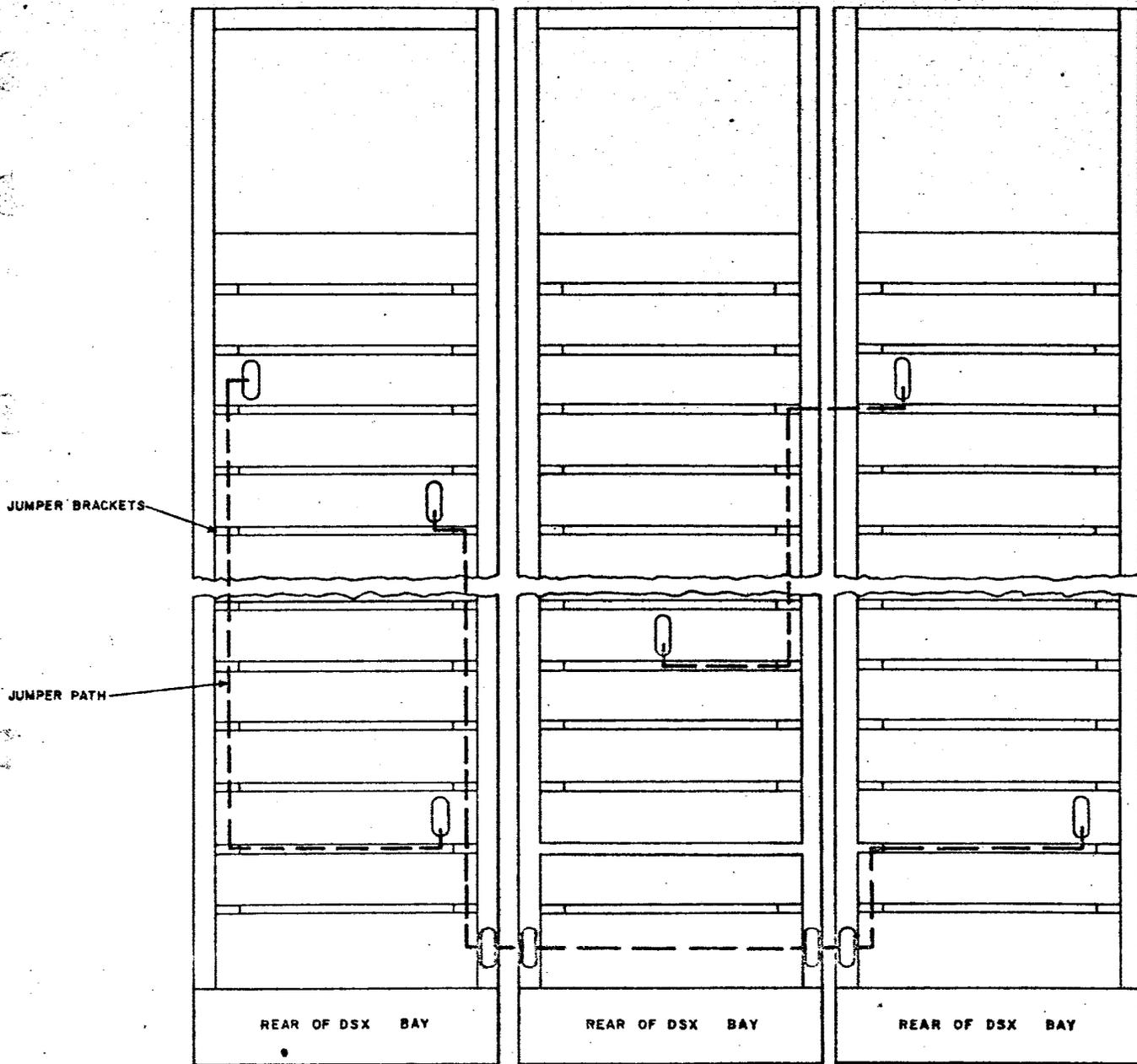


Fig. 13—Typical Cross-Connect Runs

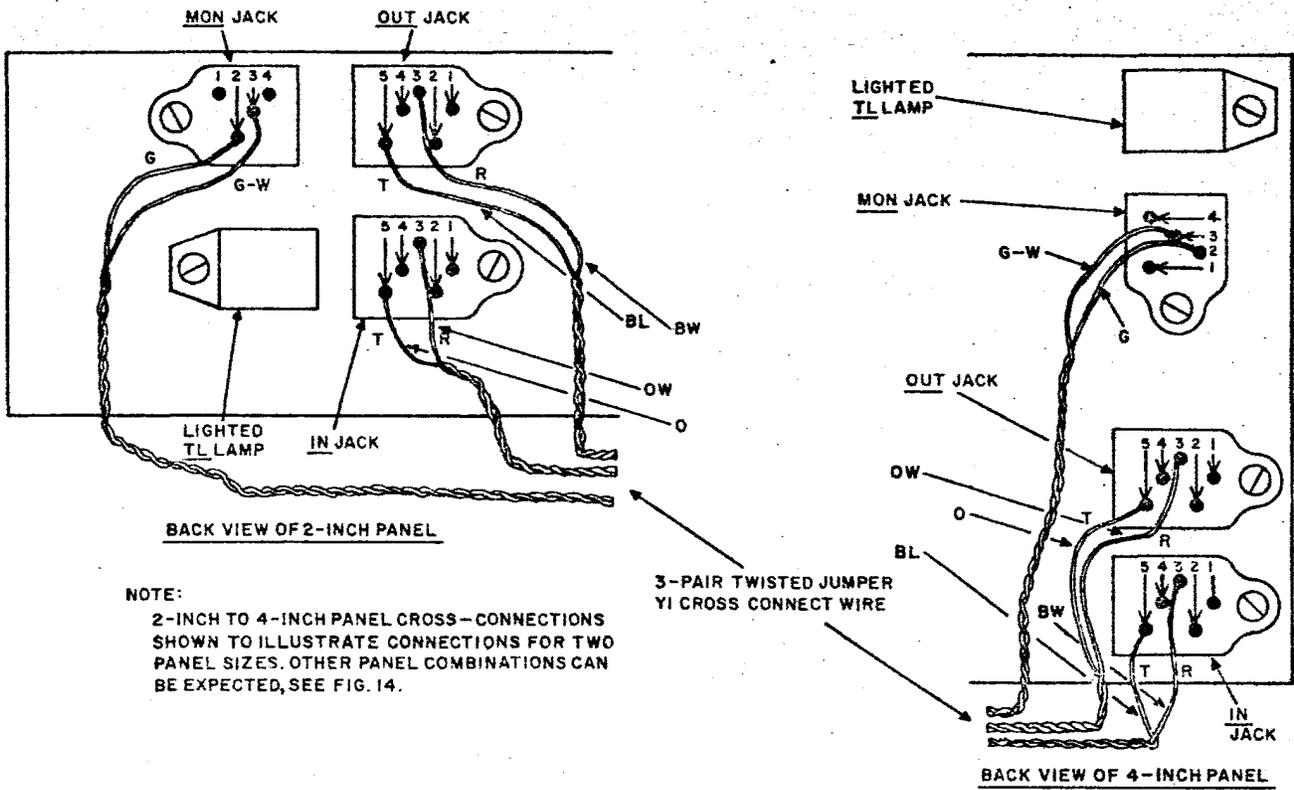


Fig. 14—DSX-1 and DSX-1C Permanent Cross-Connections

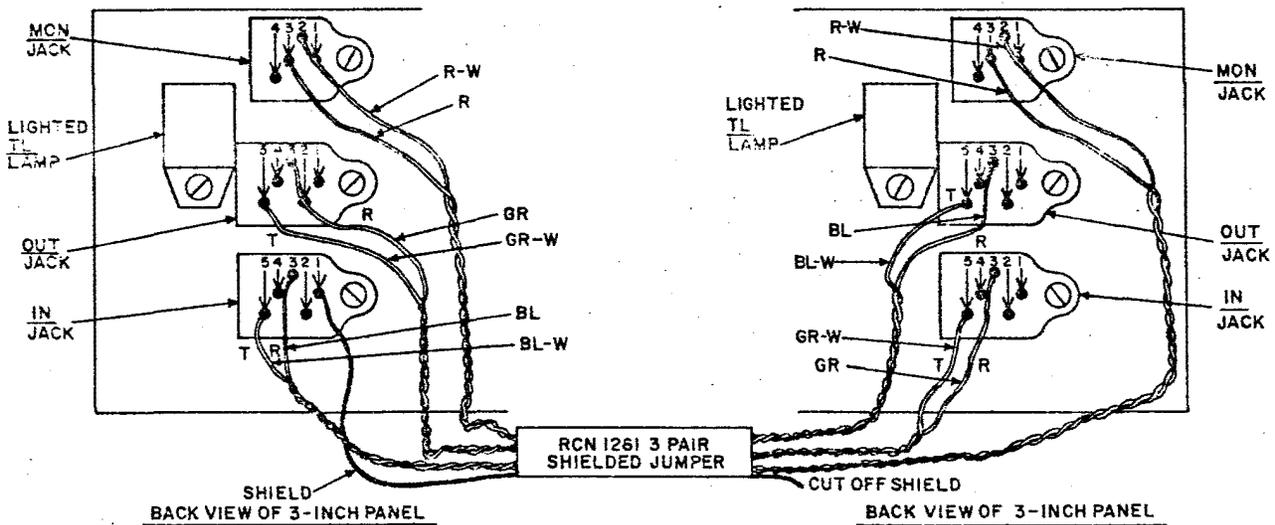


Fig. 15—DSX-2 Permanent Cross-Connections

5. ASSOCIATED DRAWINGS

01 The following drawings (not attached) are related to this section:

DRAWING	SUBJECT
D & SD-99503-01	Common Systems - Digital Transmission Facilities - Patch and Cross-Connect
ED-1C543-10	Common Systems - DSX-1, DSX-1C, and DSX-2 Patch and Cross-Connect - Typical Bay Layout Using 11-Foot 6-Inch, 9-Foot 0-Inch, and 7-Foot 0-Inch Unequal-Flange Duct Bay
ED-1C544-30	Common Systems - Digital Transmission Facilities - Specification for DSX-1, DSX-1C, and DSX-2 Patch and Cross-Connect Panel