

## D4 CHANNEL BANK PORTABLE BAY DESCRIPTION, INSTALLATION, AND INITIAL TESTS DIGITAL TRANSMISSION SYSTEMS

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<b>3. FUNCTIONAL DESCRIPTION</b>	<b>2</b>	<b>1.01</b> This section provides a general description and procedures for installation and turnup for the J98726R D4 portable bay. General information on D4 common equipment may be found in Section 365-170-100 and channel unit information in Section 365-170-101.	
<b>4. BAY INSTALLATION PROCEDURES</b>	<b>3</b>	<b>1.02</b> Whenever this section is reissued, the reason for reissue will be given in this paragraph.	
Chart 1—External Wiring Connections	3	<b>1.03</b> The J98726R D4 portable bay is designed to be used for emergency service restoration or for the provision of temporary service.	
<b>5. INITIAL TESTS</b>	<b>3</b>	<b>1.04</b> The J98726R D4 portable bay is essentially a dolly mounted cabinet containing a D4 channel bank (48 channels), VF patch panels, a line terminating unit, and the necessary powering equipment to permit operation from -48V office battery or 110 Vac line.	
Chart 2—Installation of Channel Bank Common Equipment	4	<b>1.05</b> External connections to the D4 portable bay are via connectorized cables which connect voice circuits to the portable bay. Line facility, office alarm, and fault locating with pair connections are via a terminal strip mounted at the rear of the bay.	
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Chart 9—Channel Bank End-To-End Tests	17	<b>2.01</b> The D4 portable bay is 53 inches high, 25-1/2 inches wide, and 28 inches deep. The cabinet is mounted on four 4-inch casters—two swivel-type in the front and two fixed-type in the rear. The cabinet has front and rear doors which may be	
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## SECTION 365-170-103

locked or removed entirely for maintenance access. The total weight of the portable bay, including plug-in equipment, is approximately 550 pounds. Four lifting eyes are supplied on the top of the cabinet.

**2.02** The D4 portable bay contains (Fig. 1):

1. Standard D4 channel bank (48 channels)
2. T1C/T1 line terminating unit panel
3. KS-15620, List 23 48-volt rectifier for operation from 115 Vac
4. +130/-130 volt dc-to-dc converter
5. Six-wire VF patch panels
6. 20-Hz ringing supply panel
7. 150-foot connectorized cable for frame access. This cable is made up of two sections. One section is 50 feet long with the frame end arranged for termination on 66-type connecting blocks. The other section is 100 feet long and must be used with the 50-foot cable.
8. 100-foot length of ABAM cable for connection to digital line facilities.

### 3. FUNCTIONAL DESCRIPTION

#### +130V/-130V DC-to-DC Converter

**3.01** This converter changes the -48 Vdc (obtained from the office battery or the -48 Vdc rectifier) to the +130V and -130 Vdc required for repeatered line powering. Front panel controls include INPUT and SPARE fuses and an alarm indicator. The INPUT fuse is removed to turn the converter off.

#### Line Terminating Unit

**3.02** This unit operates as a miniature office repeater bay and provides mounting space for two office repeaters (type 221 or 231) for mode 3 operation or one office repeater (type 220) for mode 1 and 2 operation. General information on the operational modes may be found in Section 365-170-100. Power dissipation resistors required for 130V and -48V powering of repeaters are included in the line terminating unit (LTU), and

standard 310-type jacks are provided for line or bank looping and line monitoring.

**3.03** Equalizers must be installed in the rear of the LTU to equalize the short length of cable between the LTU and the D4 channel bank. Two ED-3C655-30, G1 equalizers are required for mode 3 operation (if both digroups are equipped), but only one equalizer is needed for mode 1 and 2 operation.

**3.04** The repeaters used in the LTU contain automatic line current regulators and have front-panel test jacks and fuses. The repeaters also have powering options and line current regulator options which must be selected at the time of their installation. Detailed descriptive information may be found in Section 365-200-101 for T1 repeaters and in Section 365-250-101 for T1C repeaters.

#### 6-Wire VF Patch Panels

**3.05** These panels provide the same access as a 6-wire jack field. The channel unit leads are brought out to MAC jacks corresponding to channels 1 through 24 of digroups A and B. A special test cord is provided which, when used to patch between J25 on the front of the GRP A CH panel and the MAC jack for the channel under test, provides circuit access at the 310-type jacks mounted on the left of the GRP A CH panel. These jacks are labeled OUT, IN, and EM for both line and drop sides. When the MAC plug is inserted into the MAC jack with the center card retracted, these jacks provide bridging access. If the center card is fully inserted into the MAC jack, the circuit is broken and the 310-type jacks then provide splitting access. Also provided on the GRP B CH panel are two tip-ring to tip-sleeve converters.

#### D4 Channel Bank

**3.06** The D4 channel bank is a 48-channel carrier terminal which produces pulse-code-modulated signals from VF inputs for transmission over T1 or T1C lines. The digital signal may be made compatible with D1D, D2, or D3 channel banks according to the option selected on the trunk processing unit (TPU).

**3.07** The bank may be operated in mode 1, 2, or 3 to produce DS1C or DS1 outputs to match the lines or far-end equipment. The complement of plug-in units establishes the bank

mode, with the line interface unit (LIU) playing the major role. Detailed information on the channel bank and its operational modes may be found in Section 365-170-100.

#### 48-Volt Rectifier

**3.08** The KS-15620, List 23 rectifier produces -48 Vdc from standard ac line power for installations where office battery is not available. The -48 Vdc can be used to power the repeatered line and the equipment in the portable bay. Front panel controls include main and spare fuses and two power indicator lamps.

#### 20-Hz Ringing Supply Panel

**3.09** This supply produces a 20-Hz signal (100 volts RMS superimposed on -48 Vdc) for ringing the customer when FXS, PLAR, or RD channel units are used. Fusing for the 20-Hz supply is located on the front panel, and ringing is not supplied when the fuse is not present.

#### 4. BAY INSTALLATION PROCEDURES

**4.01** After the bay has been received and checked for obvious physical damage, all external wiring connections should be made according to the procedures in Chart 1.

### CHART 1

#### EXTERNAL WIRING CONNECTIONS

STEP	PROCEDURE
1	Connect the jacks on the bank end of the 50-foot or the 150-foot length of channel cable (provided with the bay) to the corresponding plugs on the rear of the VF patching panels.  <i>Example:</i> Connect cable jack J38A to bay plug P38A, J44D to P44D, etc.
2	If the repeaters in the line terminating unit are to be utilized, connect the ABAM cable (provided with the bay) from the T1/T1C line to terminals 11 through 20 of TS2 as shown in Fig. 2 and proceed to Step 4; otherwise, proceed to Step 3.
3	Connect the ABAM cable (provided with the bay) from the remote T1/T1C office repeaters or DSX-1/DSX-1C patch and cross connect to terminals 1 through 10 of TS2 as shown in Fig. 2.
4	Connect the fault locate pairs from the MDF to terminals 21 through 25 as shown in Fig. 2.
5	Connect the office alarms (AUDIBLE and VISUAL) to terminals 26 through 29 as shown in Fig. 2.

#### 5. INITIAL TESTS

**5.01** The following charts provide the recommended initial test procedures which must be performed when the portable bay is installed. The procedures must be performed in the order given.

**5.02** If any requirement in these procedures cannot be met, refer to the Troubleshooting Guide (Table E). When troubleshooting, any board removed from the channel bank because of suspicion of a defect but not found responsible for the trouble should be reinserted in its original position.

## CHART 2

## INSTALLATION OF CHANNEL BANK COMMON EQUIPMENT

This chart contains the procedure for installing and testing the D4 channel bank common equipment. If any requirement cannot be met, refer to the Troubleshooting Guide, Table E.

## APPARATUS:

- 1—KS-14510 Volt-Ohm-Milliammeter (VOM) or equivalent
- 1—KS-21838, L1 Extractor Tool or Long Nose Pliers

## STEP

## PROCEDURE

**Note:** Before installing any plug-ins, both the plug-ins and the D4 channel bank should be inspected for any obvious physical damage, ie, bent or broken terminals, bent shelves, etc.

**PDU Installation**

- 1 Remove fuses labeled 10A, ALM, and -48 ABS from the power distribution unit (PDU) subassembly (Fig. 3) mounted in the D4 bank portion of the bay.
- 2 Straighten the PDU leads so they extend back, and slide the PDU into the bank until it locks in place.
- 3 At rear of bank, loosen screws 2, 3, and 4 on terminal strip TS1 (Fig. 4) and connect PDU spade lugs to the terminals, matching lead and terminal numbers.
- 4 Return the fuses to the subassembly, matching the fuse bead color with the color dot on the subassembly (Fig. 3). The 10A fuse does not have a color dot.
- 5 At the PDU, connect the VOM (KS-14510 or equivalent) + lead to the GRD jack (black), and the - lead to the -48V jack (red).

**Requirement:** -45 to -50 Vdc.

**Install PCU**

- 6 With the power converter unit (PCU) switch in the OFF position, insert the PCU into the proper slot in the bank.

**Note:** The proper slot may be determined by the panel stamping found below each slot or by referring to Fig. 5.

**Requirement:** FAIL and ACO lamps on the PCU should light.

## CHART 2 (Contd)

STEP	PROCEDURE			
	PCU TEST PT	VOM CONNECTIONS		NO LOAD VOLTAGE REQUIREMENTS (VDC)
	+RED LEAD	-BLACK LEAD		
7	Set the PCU switch to the ON position.			
	<b>Requirement:</b> FAIL and ACO lamps on the PCU should extinguish.			
8	Using the VOM (KS-14510 or equivalent), measure the dc voltages at the PCU test points detailed below:			
	+12	GRD		11.4 to 13
	+5	GRD		4.5 to 6
	-12	-12		11.4 to 13

**Install TPU**

9 Determine the D4 mode of operation from circuit order information, and determine the number of ED-3C655-30, G1 equalizers required. Mode 1 or 2 operation requires one equalizer, and mode 3 operation requires two equalizers.

10 Obtain the trunk processing unit (TPU) plug-in and note instructions printed on the circuit board concerning placement of the equalizer(s). Install equalizer(s).

**CAUTION:** *When service on one digroup will precede the other in mode 3, equalizers for both must be installed initially to prevent service interruption later.*

11 From circuit order information, determine which D bank will be connected at the far end.

**Note:** Modes 2 and 3 allow the use of D1D, D2, D3, or D4 banks at the far end. Mode 1 operation requires a D4 only.

12 Locate the option stamping alongside the TPU window (Fig. 6). Using the KS-21838, L1 extractor tool or long nose pliers, position the white plug inside the unit to match the far-end bank (SEQ should be selected if the far-end bank is D3 or D4).

13 Install the TPU in the TPU slot.

**Requirement:** TPD lamp should light.

## CHART 2 (Contd)

STEP	PROCEDURE
------	-----------

- |    |   |
|----|---|
| 14 | Obtain and install the two transmit units (TUs) and the two receive units (RUs) in their designated slots in the channel bank. (Notice stamping under each slot of the channel bank.) |
| 15 | Obtain the proper type and number of plug-ins as detailed below:  |

MODE	PLUG-INS REQUIRED	NUMBER REQUIRED
1	LIU-1	1
	ACU	1
2	LIU-2	1
	ACU	2
	SU	1
3	LIU-3	1
	ACU	2*

\* Only one ACU is required if only one digroup is to be equipped at this time.

- |    |  |
|----|--|
| 16 | Install the plug-ins as shown in Fig. 5 to produce the required mode of operation. |
| 17 | Momentarily depress the ACO button on the alarmed ACU.                             |

**Requirement:** The ACU lamp should light.

#### Installation of OIU

**Note:** If looped or external bank timing or connection to the T-Carrier Administration System (TCAS) is required, an office interface unit (OIU) must be installed in the bank. Both OIU-1 and -2 provide TCAS and looped timing capabilities, but only OIU-2 includes external timing capability and a front-panel jack to provide timing for the DDS test sets used in dataport applications.

- |    |   |
|----|---|
| 18 | Select the OIU timing option by positioning the white plugs in the front window of the OIU (Fig. 7). Using the KS-21838, L1 extractor tool or long-nose pliers, position plug so that it appears in the proper place in the front window to select loop timing or external timing, and one digroup as reference (Fig. 8). |
| 19 | Install the OIU in its designated slot in the channel bank (Fig. 5).  |

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**CHART 2 (Contd)**


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**STEP****PROCEDURE**

- 20 Using the VOM (KS-14510 or equivalent) measure the dc voltages at the PCU test points given below:

PCU TEST PT	VOM CONNECTIONS		VOLTAGE REQUIREMENT
	+RED LEAD	-BLACK LEAD	
+12	+12	GRD	11.4 to 12.6
+5	+5	GRD	4.5 to 5.5
-12	GRD	-12	11.4 to 12.6

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**CHART 3**
**CHANNEL ACCESS UNIT CALIBRATION**

The channel access unit (CAU) portion of the portable test set (PTS) should be checked to ensure proper calibration before the PTS-CAU is used for the looped or end-to-end tests.

**APPARATUS:**

- 1—J98718AL Portable Test Set (PTS) equipped with J98718AJ Channel Access Unit (CAU)

**STEP****PROCEDURE**

**Note:** When using the CAU for turnup tests, the calibration need only be checked once unless it is suspected of causing trouble.

- 1 On the CAU, set the controls as follows:

CONTROL	POSITION
REJ FLT	OUT
SEND LEVEL DB	OFF
TEST	CAL

**Requirement:** CAU meter should indicate within the raised black index (Fig. 10).

CHART 3 (Contd)

STEP	PROCEDURE
2	Turn VOL control clockwise.  <b>Requirement:</b> CAU speaker is emitting a tone.

CHART 4

3-TYPE NOISE MEASURING SET CALIBRATION

This procedure must be completed before using the 3-type noise measuring set (NMS) in the looped or end-to-end tests.

APPARATUS:

- 1—J94003A, B, or C Noise Measuring Set (NMS)
- 1—J98718AL D3/D4 Portable Test Set (PTS) with J98718AJ Channel Access Unit (CAU)
- 1—P6AD Patch Cord
- 1—3P6D Patch Cord
- 2—3P6A Patch Cord

STEP	PROCEDURE
	<b>Note:</b> When the NMS is being used for turnup tests, the calibration need only be checked once unless it is suspected of causing trouble.
1	Verify that the weighting network is installed and the C-MESSAGE is aligned with WTG (Fig. 9).
2	Rotate DBRN switch to 85.
3	Rotate FUNCTION switch to BAT. Pointer should indicate in the shaded area marked BAT or battery should be replaced.
4	Set DBRN switch to 80.
5	Set FUNCTION switch to 600 (or NM600/900 for 3CNMS).

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**CHART 4 (Contd)**


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STEP	PROCEDURE						
6	On the D3/D4 portable test set (PTS) channel access unit (CAU), set the controls as follows:						
	<table border="1"> <thead> <tr> <th data-bbox="561 558 651 590">CONTROL</th> <th data-bbox="813 558 902 590">POSITION</th> </tr> </thead> <tbody> <tr> <td data-bbox="561 621 683 653">REJ FLT</td> <td data-bbox="813 621 870 653">OUT</td> </tr> <tr> <td data-bbox="561 684 634 716">TEST</td> <td data-bbox="813 684 870 716">CAL</td> </tr> </tbody> </table>	CONTROL	POSITION	REJ FLT	OUT	TEST	CAL
CONTROL	POSITION						
REJ FLT	OUT						
TEST	CAL						
7	Make the test connections shown in Fig. 10.						
	<b>Note:</b> The P6AD cord between the channel unit and the PTS should <i>not</i> be in place at this time.						
	<b>Requirement:</b> The NMS meter scale should indicate 10 dBrn. Adjust the CAL screw on the meter to obtain this reading.						

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**CHART 5**
**DIGROUP LOOPING**


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The digroup(s) to be tested must be looped before the looped tests in Chart 6 can be performed. This can be accomplished at the alarm control unit (ACU) or at the line terminating unit (LTU). Looping at the ACU is preferred as trunk processing is included. All looped tests should be performed before unlooping the digroup(s).

**APPARATUS:**

- 1—3P6A Patch Cord or equivalent
- 1—KS-19531 Pin Plug or equivalent.

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STEP	PROCEDURE
	<b>Loop Digroup(s) at Channel Bank (Preferred Method)</b>
	<b>Note:</b> If the channel bank utilizes LIU-1, the common ACU will simultaneously loop both digroups. With other LIUs, each digroup can be looped separately.

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**CHART 5 (Contd)**


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STEP	PROCEDURE
1	<p>The digroup to be looped must first be in alarmed condition. If the ACU indicates an alarm, proceed to Step 2. If the ACU does not indicate an alarm, insert a pin plug (KS-19531 or equivalent) in the R CODE jack on the receive unit (RU) of the digroup under test.</p> <p><b>Requirement:</b> The AR and TP lamps should light on the ACU for the digroup under test.</p>
2	<p>Momentarily depress the ACO pushbutton on the ACU.</p> <p><b>Requirement:</b> The ACO lamp should light in the ACU.</p>
3	<p>Set the 3-position switch on the ACU to LT.</p> <p><b>Requirement:</b> The LT lamp should light.</p>
4	<p>Remove the pin plug from the R CODE jack on the RU.</p> <p><b>Loop Digroup(s) at LTU (Optional Method)</b></p> <p><b>Note:</b> It is possible to loop the digroup(s) at the line terminating unit (LTU). This is not the recommended procedure, however, as no provision is made for trunk processing. Consequently, the line may begin to oscillate. However, looping at the LTU may be useful in trouble clearing as an additional check to ensure that the channel bank is not at fault.</p>
5	<p>Using a patchcord (3P6A or equivalent), connect from the XOUT jack to the XIN jack on the LTU for the digroup to be tested.</p> <p><b>Requirement:</b> Distant office will register a red alarm. Local bank will momentarily register a yellow alarm when patch cord is removed.</p>

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**CHART 6**
**CHANNEL BANK LOOPED TESTS**


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The following looped bank tests can be performed *only* after the procedure in Chart 5 (for looping the channel bank) has been completed, and should be performed in the sequence listed. The channel bank is considered ready for service when the looped tests have been completed.

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**APPARATUS:**

1—J98718AL D3/D4 Portable Test Set (PTS) with J98718AJ Channel Access Unit (CAU)

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**CHART 6 (Contd)**


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**APPARATUS (Contd)**

- 1—J94003A, B, or C Noise Measuring Set (NMS)
  - 1—J98726MH Signaling Path Test Set (SPTS)
  - 1—D4 Channel Unit of any type
  - 1—KS-19531 Pin Plug or equivalent
  - 2—P6AD Test Cords
  - 2—3P6A Patch Cords
  - 1—3P6D or 3P178 Patch Cord
- 

**STEP****PROCEDURE**

**Note:** The digroup(s) must be looped before the looped tests can be performed.

**Looped Bank Signaling Test**

- 1 Insert a signaling path test set (SPTS) in any channel unit slot of the digroup to be tested (remove channel unit if installed).
- 2 Set the A switch on the SPTS to the 1 position, and the B switch to the 0 position.

**Requirement:** The A lamp should light.

- 3 Set the B switch on the SPTS to the 1 position.

**Requirement:** The B lamp should light.

- 4 Remove the SPTS.

**Looped Bank Net Loss Test**

- 5 Insert one D4 channel unit of any type or one signaling path test set (SPTS) in any position of the digroup to be tested.
- 6 Set the controls on the CAU portion of the D3/D4 PTS as follows:

CONTROL	POSITION
TEST	CHAN LINE
REJ FLT	OUT
SEND LEVEL DB	0

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**CHART 6 (Contd)**


---

**STEP****PROCEDURE**

7 Make the test connections shown in Fig. 9.

**Note:** The noise measuring set is not used in this measurement.

**Requirement:** The CAU meter should indicate between -0.5 and +0.5 dB.

**Looped Bank Receiver Gain Test**

8 Insert a pin plug (KS-19531 or equivalent) in the R CODE jack of the receive unit for the digroup under test.

**Requirement:** RCV lamp should light.

9 On the CAU, change the SEND LEVEL DB control to the OFF setting.

10 Make the test connections shown in Fig. 9.

**Note:** The NMS is not required for this measurement.

**Requirement:** The CAU meter must indicate in the center black area of the scale.

11 Remove the pin plug from the R CODE jack of the receive unit for the digroup under test.

**Looped Bank Idle Circuit Noise Test**

12 Connect the noise measuring set (NMS) to the CAU portion of the D3/D4 portable test set (PTS) as shown in Fig. 9.

13 On the NMS, set the controls as follows:

<b>CONTROL</b>	<b>POSITION</b>
FUNCTION	600 or NM 600/900 (for 3C test set)
NORM-DAMP	DAMP
DBRN	85
WTG	C-MESSAGE

## CHART 6 (Contd)

STEP	PROCEDURE
14	On the NMS, rotate the DBRN switch counterclockwise until the DBRN meter indicates between +2 and +9 dBrn.
15	Add the reading on the DBRN meter to the DBRN switch setting to obtain the noise level.  <b>Requirement:</b> The noise level must be 23 dBrnc or less.
<b>Looped Bank Distortion Test</b>	
16	On the CAU portion of the D3/D4 portable test set, change the REJ FLT control to the IN setting, and SEND LEVEL DB control to the 0 setting.
17	For each position of the CAU SEND LEVEL DB switch given in Table A, observe the NMS meter and rotate the NMS DBRN switch counterclockwise one step at a time until the DBRN meter indicates between +2 and +9. Note the DBRN switch and meter indications.  <b>Requirement:</b> The sum of the DBRN switch setting and the DBRN meter indication must meet the requirements listed in Table A for each CAU SEND LEVEL DB switch position.
<b>Looped Bank Crosstalk Test</b>	
18	On the trunk processing unit (TPU), locate the option stamping for the digroup to be tested (Fig. 10), and determine which option (D1D, SEQ, or D2) has been selected by the location of the white plug.
19	Go to the portion of Table B which corresponds to that option.
20	Select the channel to be measured from either column with that heading, and determine (from Table B) the two most likely interfering channels.
21	Insert D4 channel units or SPTSs in the channel unit slots for the channel to be measured and for one interfering channel.  <b>Note:</b> Test and interfering channel must be in the same digroup.
22	Change the test connections to those shown in Fig. 11.
23	On the CAU portion of the D3/D4 portable test set (PTS), change the REJ FLT control to the OUT setting.
24	On the NMS, set the DBRN control to 50.
25	Rotate the DBRN switch on the NMS counterclockwise until a position is found where the meter indicates between +2 and +9 dBrn.

## CHART 6 (Contd)

STEP	PROCEDURE
26	Add the DBRN meter indication and the DBRN switch setting to determine the noise level. <b>Requirement:</b> Noise level must be 27 dBrn or less.
27	To unloop the digroup(s), set the 3-position switch on the ACU for the digroup under test to NORM. <b>Requirement:</b> The LT lamp on the ACU should go out.
28	Disconnect the NMS and proceed to Chart 7.

## CHART 7

## INSTALLATION OF REPEATERS AND EQUALIZERS

Before installing the repeaters in the line terminating unit (LTU), the proper powering options must be selected and applied. The equalizer(s) must also be installed in the LTU.

STEP	PROCEDURE												
	<b>Install Repeater(s)</b>												
	<b>Note:</b> Before installing any plug-in unit in the portable bay, the plug-in should be visually checked for any obvious physical damage.												
1	Select the proper type and number of office repeaters as detailed below:												
	<table border="1"> <thead> <tr> <th>MODE</th> <th>NUMBER REQD</th> <th>REPEATER CODES</th> <th>POWERING</th> </tr> </thead> <tbody> <tr> <td>1 or 2</td> <td>1</td> <td>220A 220B</td> <td>Line Powering Loop</td> </tr> <tr> <td>3</td> <td>2*</td> <td>221A, 231A 221B, 231B 231D 231E</td> <td>Line Powering Loop Line Powering (MAT cable) Loop (MAT cable)</td> </tr> </tbody> </table>	MODE	NUMBER REQD	REPEATER CODES	POWERING	1 or 2	1	220A 220B	Line Powering Loop	3	2*	221A, 231A 221B, 231B 231D 231E	Line Powering Loop Line Powering (MAT cable) Loop (MAT cable)
MODE	NUMBER REQD	REPEATER CODES	POWERING										
1 or 2	1	220A 220B	Line Powering Loop										
3	2*	221A, 231A 221B, 231B 231D 231E	Line Powering Loop Line Powering (MAT cable) Loop (MAT cable)										

\* Two repeaters are required *only* if both digroups are equipped.

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**CHART 7 (Contd)**


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STEP	PROCEDURE
2	Select and apply the office repeater power options selected by S101 as summarized in Table C. The options are selected by turning option screws to the maximum clockwise position. Option screws not specified in the table should be turned back two complete turns counterclockwise. Figures 12 and 13 illustrate the position of the options in T1 and T1C repeaters.
3	Select and apply the repeater line current regulator options selected by S201, S202, S203, and S204 (S204 available on 221- and 231-type repeaters only) as summarized in Table D. The options are selected by inserting the selector blocks so that the arrow points to the option selected or by turning screws down (maximum clockwise). Figures 12 and 13 illustrate the location of the options in 220-, 221-, and 231-type repeaters.
	<b>Install Equalizer(s)</b>
4	If mode 3 operation is desired, obtain two ED-3C655-30, G1 equalizers and install them in jacks J4 and J11 on the rear of the LTU. If mode 1 or 2 operation is desired, obtain one equalizer and install it in jack J4 on the rear of the LTU.
	<b>Install Repeater(s) in LTU</b>
5	Install the repeater(s) in the line terminating unit (LTU) by inserting the repeater in the proper slot and pushing until the unit locks in place.

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**CHART 8**
**REPEATER LINE POWER LOOP TESTS**


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The line power loop tests are useful in determining that the power loop is being powered properly and that the regulator is operating within its proper range.

STEP	PROCEDURE
	<b>Line Current Test</b>
1	Inspect the fuses on the repeaters in the line terminating unit (LTU). Replace any blown fuses with new 70R fuses (red and white striped bead.)
2	Set the VOM (KS-14510 or equivalent) switch to 3DC VOLTS.

## CHART 8 (Contd)

## STEP

## PROCEDURE

- 3 Connect the - test probe of the VOM to the -V jack of the repeater, and the + test probe of the VOM to the -I jack of the repeater.

**Requirement:**

1.33 to 1.47 volts for 140 mA line current operation (T1)  
 .57 to .63 volts for 60 mA line current operation (T1)  
 1.16 to 1.24 volts for 120 mA line current operation (T1C)

**Line Voltage Test**

- 4 Set switch on VOM (KS-14510 or equivalent) to 300 DC VOLTS.
- 5 Connect the test probe of the VOM to the +V jack of the repeater. Connect the - test probe of the VOM to the -V jack of the repeater.

**Requirement:** NORM line voltage  $\pm 4$  percent.

**Note:** NORM line voltage may be found on form E-5416 or E-6900 and equals the supply voltage minus the regulator voltage drop.

**Regulator Voltage Test**

- 6 Set the switch on the VOM (KS-14510 or equivalent) to 300 DC VOLTS.
- 7 Connect the - test probe of the VOM to the REG jack on the repeater. Connect the + test probe of the VOM to the -V jack on the repeater.

**Requirement:** Deviation from the recorded norm shall not exceed the values listed below:

## ALLOWABLE REGULATOR VOLTAGE DEVIATIONS

POWER LOOP VOLTAGE	DIFFERENCE FROM NORMAL REGULATOR VOLTAGE
-48V and GRD	$\pm 2V$
+130V and GRD	$\pm 5V$
+130V and -48V	$\pm 7V$
+130V and -130V	$\pm 10V$

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## 6. TURNUP TESTS

6.01 The following chart provides the recommended turnup tests which must be performed prior to establishing service on the D4 portable bay.

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### CHART 9 CHANNEL BANK END-TO-END TESTS

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The end-to-end test procedures presented in this section may be used to establish system continuity and end-to-end channel identity. If any requirement cannot be met, refer to the Troubleshooting Guide, Table E.

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#### APPARATUS:

- 1—J98718AL D3/D4 Portable Test Set (PTS) with J98718AJ Channel Access Unit (CAU)
  - 1—P6AD Test Cord
  - 2—3P6A Patch Cords
  - 1—KS-19531 Pin Plug or equivalent
- 

#### STEP

#### PROCEDURE

---

##### End-to-End Net Loss Test

- 1 Establish communication with the far-end and determine the channel(s) to be tested.
- 2 Insert one D4 channel unit of any type or one signaling path test set (SPTS) in the slot of the channel to be tested.
 

**Note:** If channel units are provided in unassigned channels, insert card jack insulators in the TST jacks on these channels.
- 3 Make the test connections shown in Fig. 9.
 

**Note:** The NMS is not needed for this test.
- 4 Verify that the test equipment is connected at the far end and that the far office is ready to perform the test.
 

**Requirement:** The CAU meter should indicate between  $-0.25$  and  $+0.25$  dB (preferred meter reading is black area, near 0 dB). Far end meter should indicate within the same limits.

CHART 9 (Contd)

STEP	PROCEDURE
5	Disconnect all test equipment from the channel bank.
	<b>End-to-End Alarms Test</b>
6	Establish communication with the far-end and determine which digroup(s) will be tested.
7	Transmit an alarm to the far-end by inserting a pin plug (KS-19531 or equivalent) in the red R CODE jack of the receive unit (RU) for the digroup under test.  <b>Requirement:</b> The RCV, AR, and ALM lamps should light at the local office.
8	Momentarily depress the ACO button on the ACU for the digroup under test.  <b>Requirement:</b> The ACO lamp should light on the local office ACU, and the far end should indicate a yellow AY (or REMOTE) alarm.
9	Have the far-end depress the ACO button on the far-end ACU, and remove the pin plug from the R CODE jack at the local RU.  <b>Requirement:</b> The RCV and AR lamps at the local office should be extinguished immediately. The far-end yellow alarm lamp should extinguish after about 30 seconds.
10	Have the far end transmit alarm.  <b>Requirement:</b> The yellow AY lamp on the local ACU should light after about 4 seconds.
11	Have the far end remove alarm.  <b>Requirement:</b> The yellow AY lamp on the local ACU should extinguish after about 30 seconds.

7. LINE FAULT LOCATION PROCEDURES

7.01 Fault location line jacks are provided at the rear of the portable bay. Fault location procedures may be found in Section 365-227-500 (for T1 lines) or Section 365-271-000 (for T1C lines).

8. REFERENCES

SECTION	TITLE
365-170-100	D4 Channel Bank—Description

365-170-101	Channel Unit—Description D4 Channel Bank	<b>9. DRAWINGS</b>
		<b>DRAWING                      TITLE</b>
365-170-000	D4 Channel Bank—TOP	CD & SD-3C389-( ) D4 Portable Bay
365-227-500	T1 Digital Line—Trouble-Locating Procedures	CD & SD-3C304-( ) D4 Applications
365-271-000	T1C Digital Line—TOP	
365-200-101	T1 Digital Line—Repeater Description	
365-250-101	T1C Digital Line—Repeater Description	

**TABLE A**  
**LOOPED BANK DISTORTION**  
**REQUIREMENTS**

SWITCH	POSITIONS	REQUIREMENTS
SEND LEVEL DB	0	56 dBrnc or less
	10	46 dBrnc or less
	20	36 dBrnc or less
	30	26 dBrnc or less
	40	22 dBrnc or less

TABLE B  
INTERFERING CHANNELS FOR CROSSTALK TEST

CHANNEL COUNTING OPTION	CHANNEL TO BE MEASURED (1-12)	MOST LIKELY INTERFERING CHANNELS		CHANNEL TO BE MEASURED (13-24)	MOST LIKELY INTERFERING CHANNELS	
D1D	1	24	12	13	1	24
	2	13	1	14	2	13
	3	14	2	15	3	14
	4	15	3	16	4	15
	5	16	4	17	5	16
	6	17	5	18	6	17
	7	18	6	19	7	18
	8	19	7	20	8	19
	9	20	8	21	9	20
	10	21	9	22	10	21
	11	22	10	23	11	22
	12	23	11	24	12	23
D2	1	13	12	13	12	24
	2	14	11	14	11	23
	3	15	9	15	9	21
	4	16	10	16	10	22
	5	17	1	17	1	13
	6	18	2	18	2	14
	7	19	3	19	3	15
	8	20	4	20	4	16
	9	21	5	21	5	17
	10	22	6	22	6	18
	11	23	7	23	7	19
	12	24	8	24	8	20
D4 or D3 (SEQ)	1	24	23	13	12	11
	2	1	24	14	13	12
	3	2	1	15	14	13
	4	3	2	16	15	14
	5	4	3	17	16	15
	6	5	4	18	17	16
	7	6	5	19	18	17
	8	7	6	20	19	18
	9	8	7	21	20	19
	10	9	8	22	21	20
	11	10	9	23	22	21
	12	11	10	24	23	22

TABLE C

## REPEATER POWER OPTIONS FOR 220-, 221-, or 231- TYPE REPEATERS (S101)

METHOD OF POWERING OFFICE REPEATER *		LINE REPEATER POWERING ARRANGEMENT	REPEATER POWER OPTION BLOCK SCREWS (S101)
Office Repeater Powered In Series With Line Repeaters	At Powering Office	Bidirectional Operation	
		Unidirectional Operation †—Repeater A of power loop, office repeater powered in series with receive line repeaters	C, E, K ‡
		Unidirectional Operation †—Repeater B of power loop, office repeater powered in series with receiver line repeaters	A, G, M
	At Power Looping Office	Bidirectional Operation	D, K ‡
		Unidirectional Operation †—Repeater A of power loop, office repeater powered in series with receive line repeaters	C, E, K ‡
		Unidirectional Operation †—Repeater A of power loop, office repeater powered in series with transmit line repeaters	B, D, G
		Unidirectional Operation †—Repeater B of power loop, office repeater powered in series with receive line repeaters	A, G, M
	Office Repeater Powered Separately From Line	At Powering Office	Bidirectional Operation
Unidirectional Operation †—Repeater A of power loop			B, E, H, N
Unidirectional Operation †—Repeater B of power loop			A, F, H, N
At Power Looping Office		Bidirectional Operation	H, J, N ‡
		Unidirectional Operation †—Repeater A of power loop	B, E, H, N
		Unidirectional Operation †—Repeater B of power loop	A, F, H, N

\* When using 221-type repeaters for powering low power (60 mA) lines, they cannot be powered in series with the line because the regenerators in these repeaters require a minimum of 70 mA.

† For unidirectional operation, two office repeaters are required to complete the power loop.

‡ These options should be applied to 221- or 231-type repeaters *only*.

TABLE D

## LINE CURRENT REGULATOR POWERING OPTIONS (NOTE 1)

OFFICE BATTERY	OPTIONS REQUIRED			
	SWITCH		SELECTOR BLOCK S203	S203 SCREW POSITION
	S201	S202		
-48 volts & battery return *	W	Z	V closed	Down
+130 volts & battery return *	X	Y or Z	V open	Up
+130 & -130 volts (260 volts)	W	Y	V open	Up
+130 & -48 volts (178 volts)	W	Z	V open	Up

*Note 1:* For 140-mA line current operation, select option T. Option T (S204) available on 221A and 231A repeaters *only*.

\* When -48 volt office battery and battery return is used it is necessary to replace LINE + fuse with dummy fuse. Conversely, when +130 volt battery and battery return is used, replace LINE - fuse with dummy fuse.

**TABLE E**  
**TROUBLESHOOTING GUIDE**  
**(IF ACTION STEP DOES NOT CLEAR TROUBLE,**  
**RETURN ORIGINAL UNIT AND TAKE NEXT STEP.)**

TROUBLE SPOT	ACTION TO BE TAKEN
Chart 2 Step 5	<ol style="list-style-type: none"> <li>1. Verify that all PDU fuses are good (no beads extended).</li> <li>2. Check for battery voltage at terminals 2 and 3 (Fig. 5) at rear of PDU (terminal 4 is positive ground). If present, replace PDU; otherwise, clear bank wiring trouble [see SD-3C304-( )].</li> </ol>
Chart 2 Step 7	<ol style="list-style-type: none"> <li>1. Replace PCU and turn replacement on.</li> <li>2. If PDU has been replaced once, clear bank wiring trouble [see SD-3C304-( )]; otherwise, replace PDU.</li> </ol>
Chart 2 Step 8 or 19	<ol style="list-style-type: none"> <li>1. If PCU has been replaced once, clear wiring trouble [see SD-3C304-( )]; otherwise, replace PCU.</li> </ol>
Chart 3 Step 1 or 2	<ol style="list-style-type: none"> <li>1. Replace CAU.</li> </ol>
Chart 5 Step 1	<ol style="list-style-type: none"> <li>1. Remove pin plug, replace RU, and insert pin plug in R CODE jack of replacement.</li> <li>2. Replace ACU.</li> </ol>
Chart 6 Steps 2, 3, 7, 8, 10, 15, 17, or 26	<ol style="list-style-type: none"> <li>1. Recheck test connections.</li> <li>2. Replace channel unit used for test.</li> <li>3. Replace RU.</li> <li>4. Replace TU.</li> <li>5. Replace LIU.</li> <li>6. If PCU has been replaced once, disconnect all channel units except for test channel; otherwise, replace PCU.</li> <li>7. Replace remaining common equipment plug-ins one-by-one.</li> <li>8. Clear bank wiring trouble [see SD-3C304-( )].</li> </ol>
Chart 9 Step 4	<ol style="list-style-type: none"> <li>1. Recheck test connections.</li> <li>2. Replace channel unit used for test at local end.</li> <li>3. Replace channel unit used for test at far end.</li> <li>4. Perform looped net loss test.</li> <li>5. Replace RU.</li> <li>6. Replace TU.</li> <li>7. Replace LIU.</li> <li>8. If PCU has been replaced, disconnect all channel units except for test channel; otherwise, replace PCU.</li> </ol>

TABLE E (Contd)

**TROUBLESHOOTING GUIDE  
(IF ACTION STEP DOES NOT CLEAR TROUBLE,  
RETURN ORIGINAL UNIT AND TAKE NEXT STEP.)**

TROUBLE SPOT	ACTION TO BE TAKEN
Chart 9 (Contd) Step 4	9. Replace remaining common equipment plug-ins one-by-one. 10. Clear bank wiring trouble [see SD-3C304-( )].
Chart 9 Step 8	1. Replace local TU. 2. Replace far-end ACU. 3. Perform single-ended alarm test at both ends.
Chart 9 Step 9	1. Replace local ACU. 2. Replace far-end ACU. 3. Perform single-ended alarm test at both ends.
Chart 9 Step 10	1. Replace local ACU. 2. Replace far-end TU (D3 or D4), far-end ACU (D2), or far-end XMTG CONN SIG (D1D). 3. Perform single-ended alarm test at both ends.
Chart 9 Step 11	1. Replace far-end ACU. 2. Replace local ACU. 3. Perform single-ended alarm test at both ends.

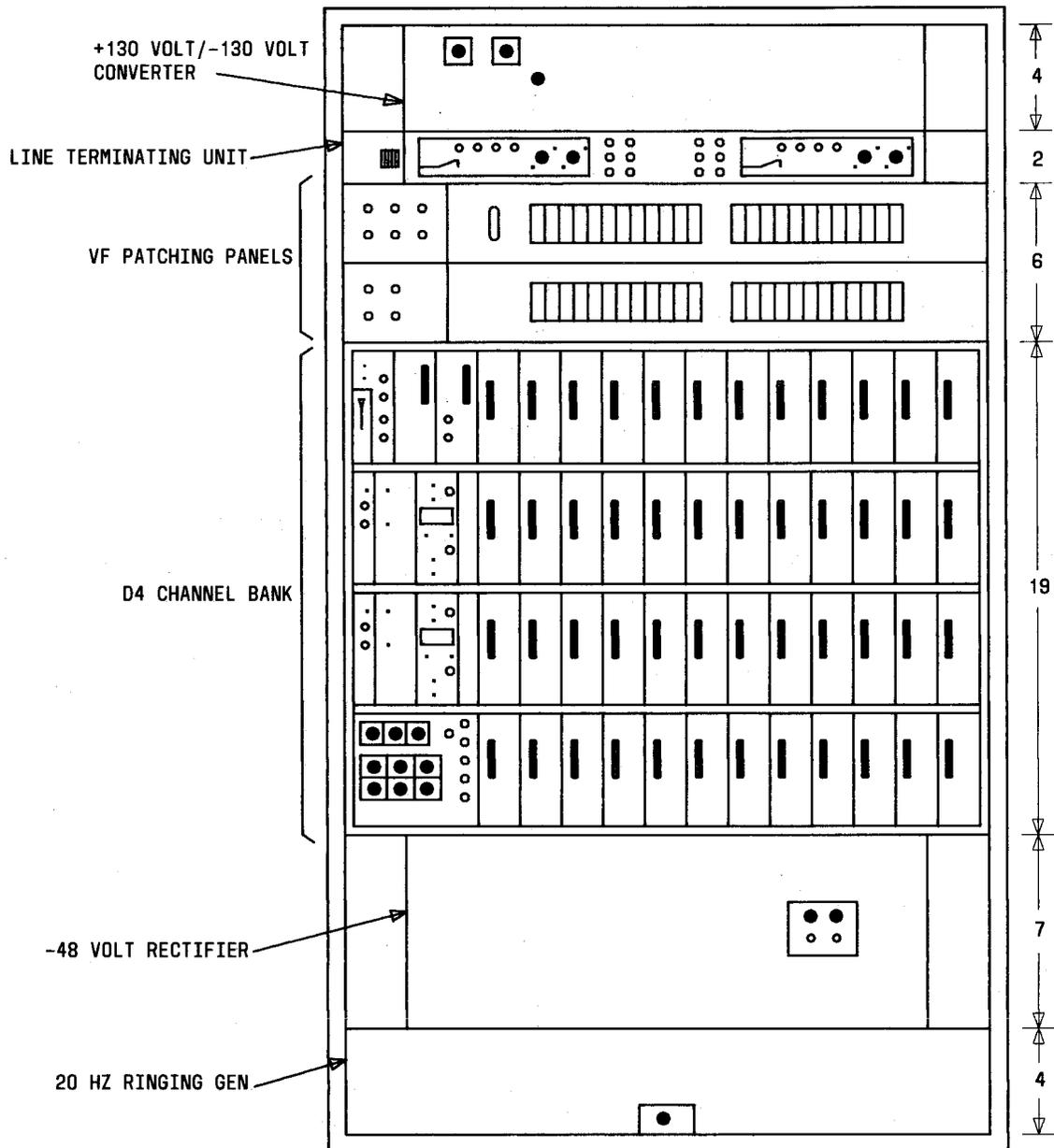
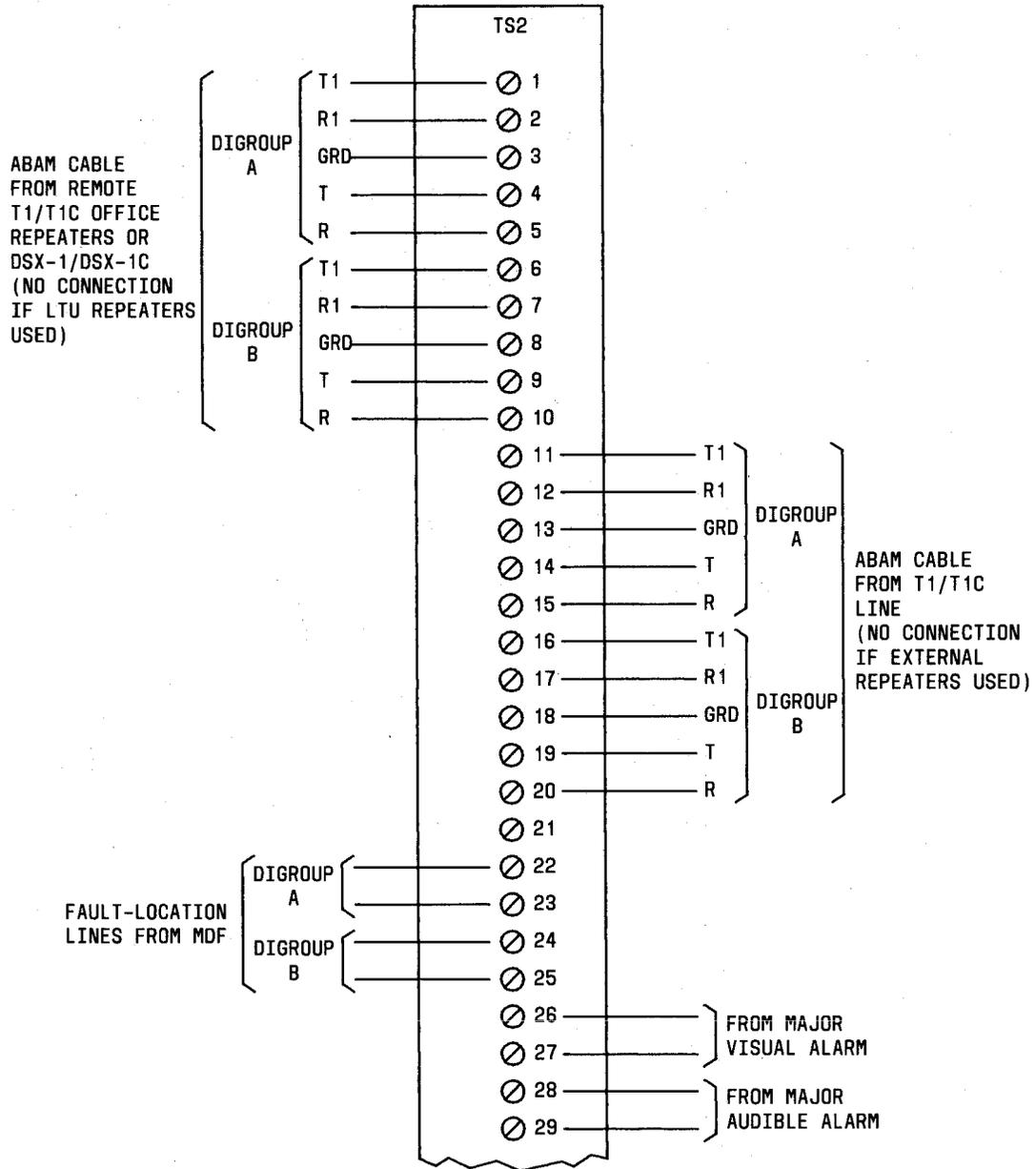


Fig. 1—D4 Channel Bank Portable Bay Equipment Arrangement



NOTE: TS2 LOCATED ON LEFT INSIDE WALL AT REAR OF BAY.

Fig. 2—External Wiring Connections

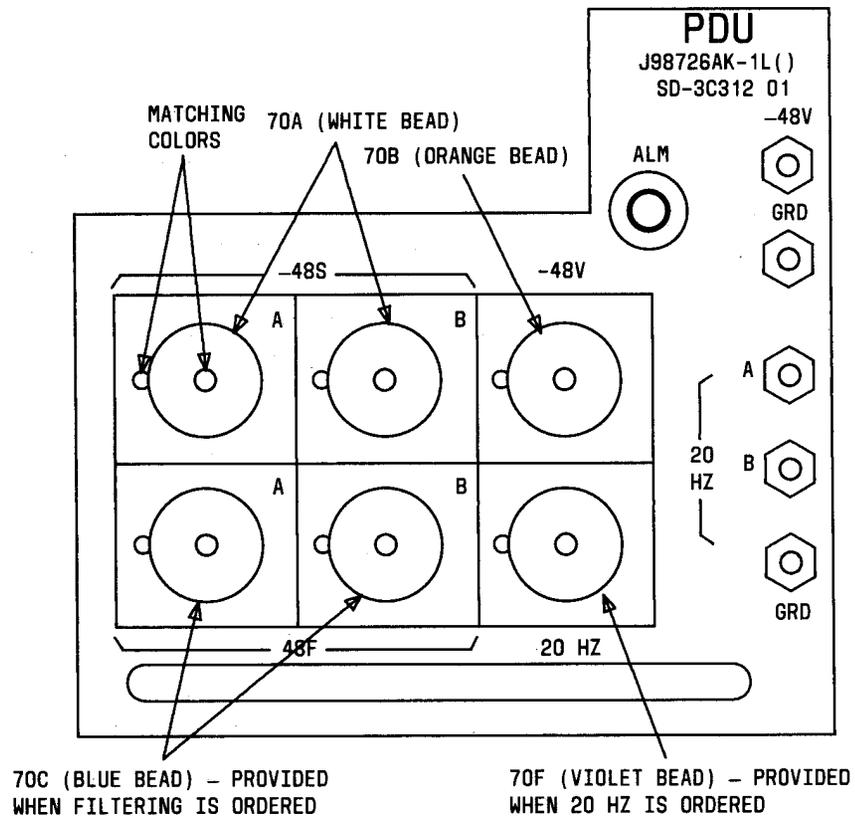
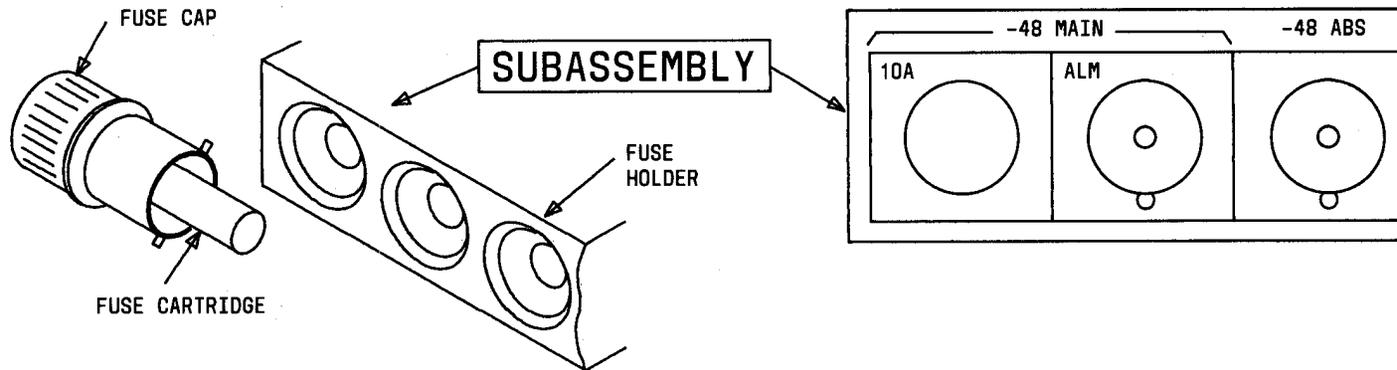


Fig. 3—Power Distribution Unit (PDU) and Subassembly



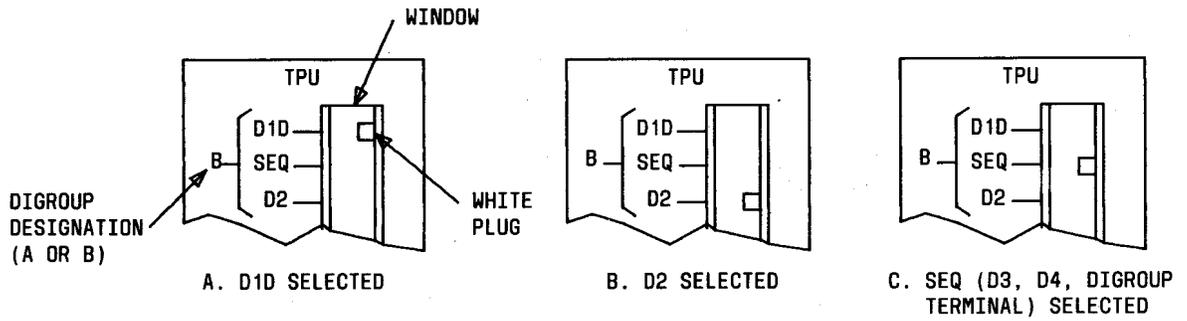


Fig. 6—TPU Channel Counting Options

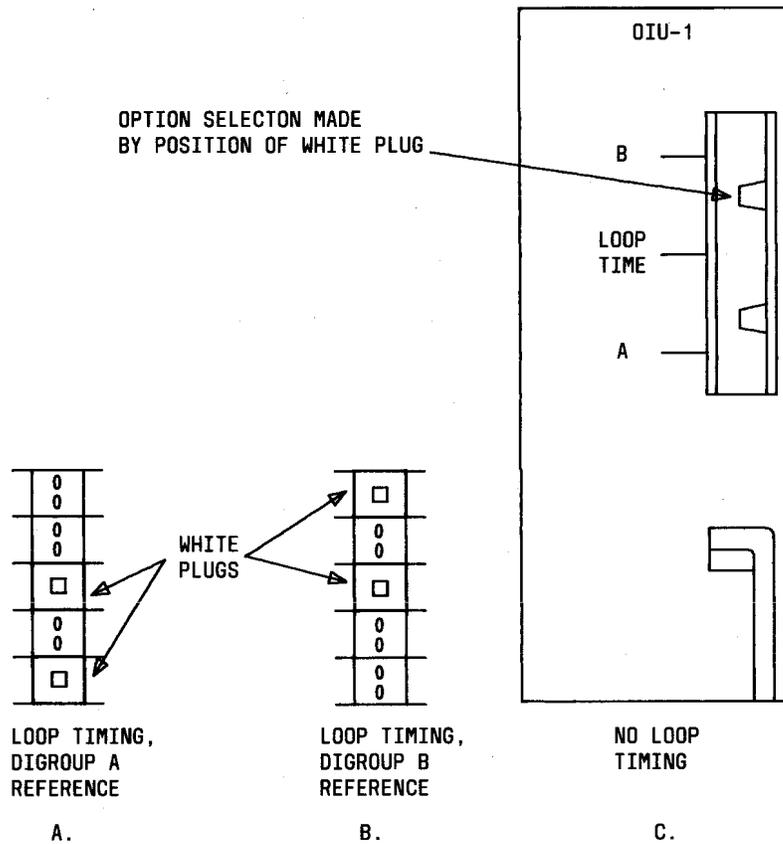


Fig. 7—OIU-1 Option Selection

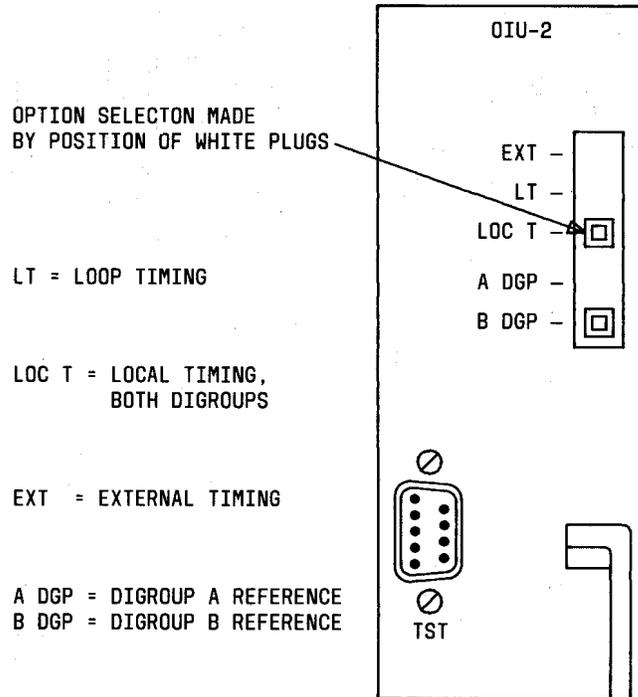


Fig. 8—OIU-2 Option Selection

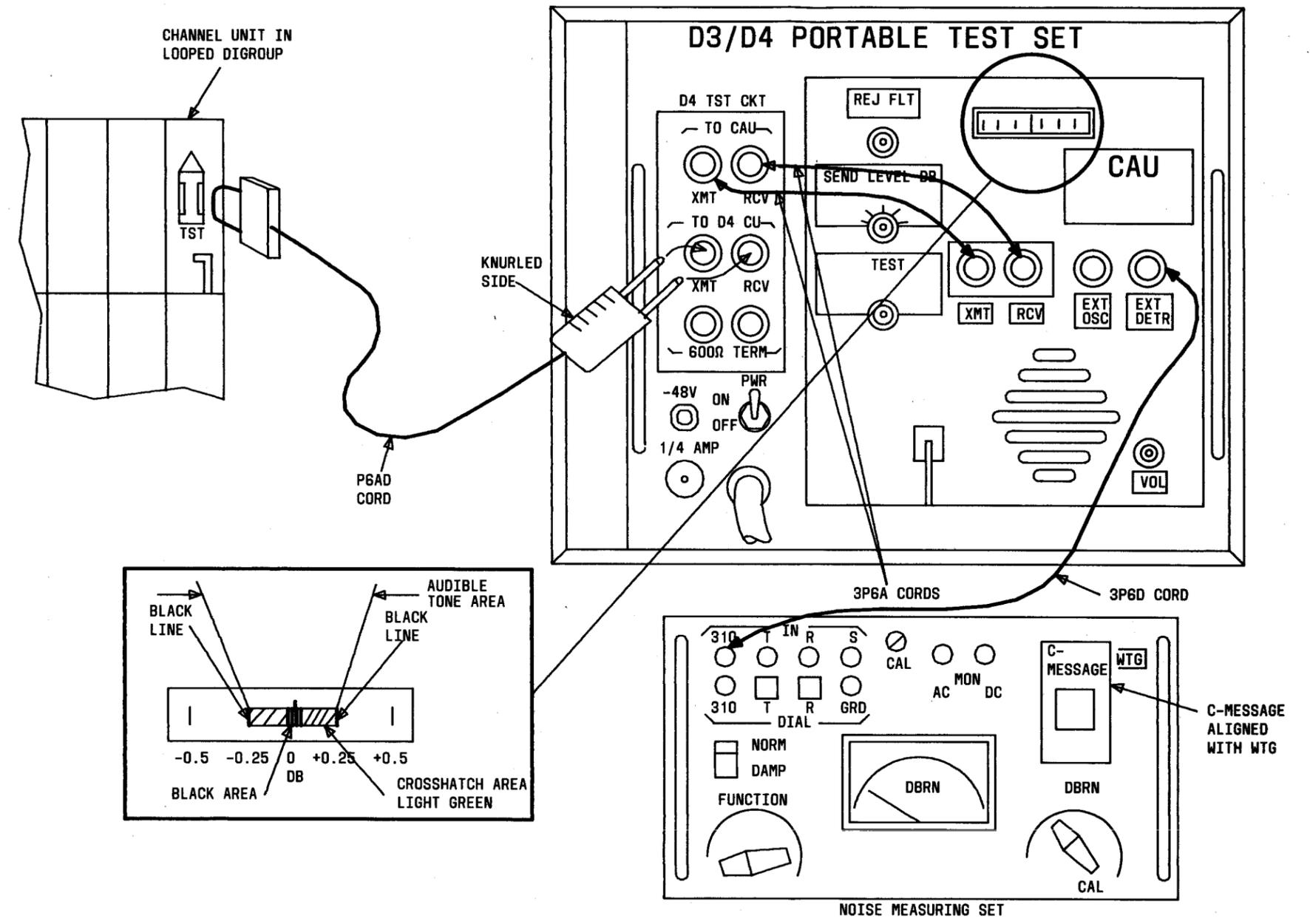


Fig. 9—Test Connections

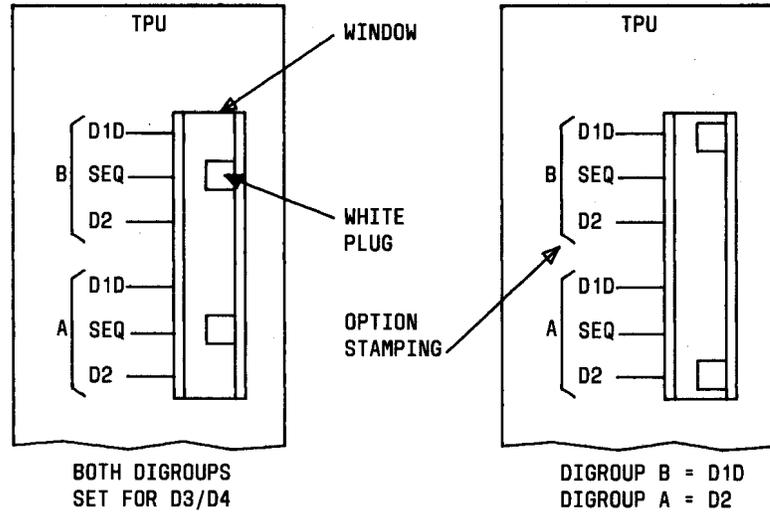


Fig. 10—Examples of Options Selected on TPU

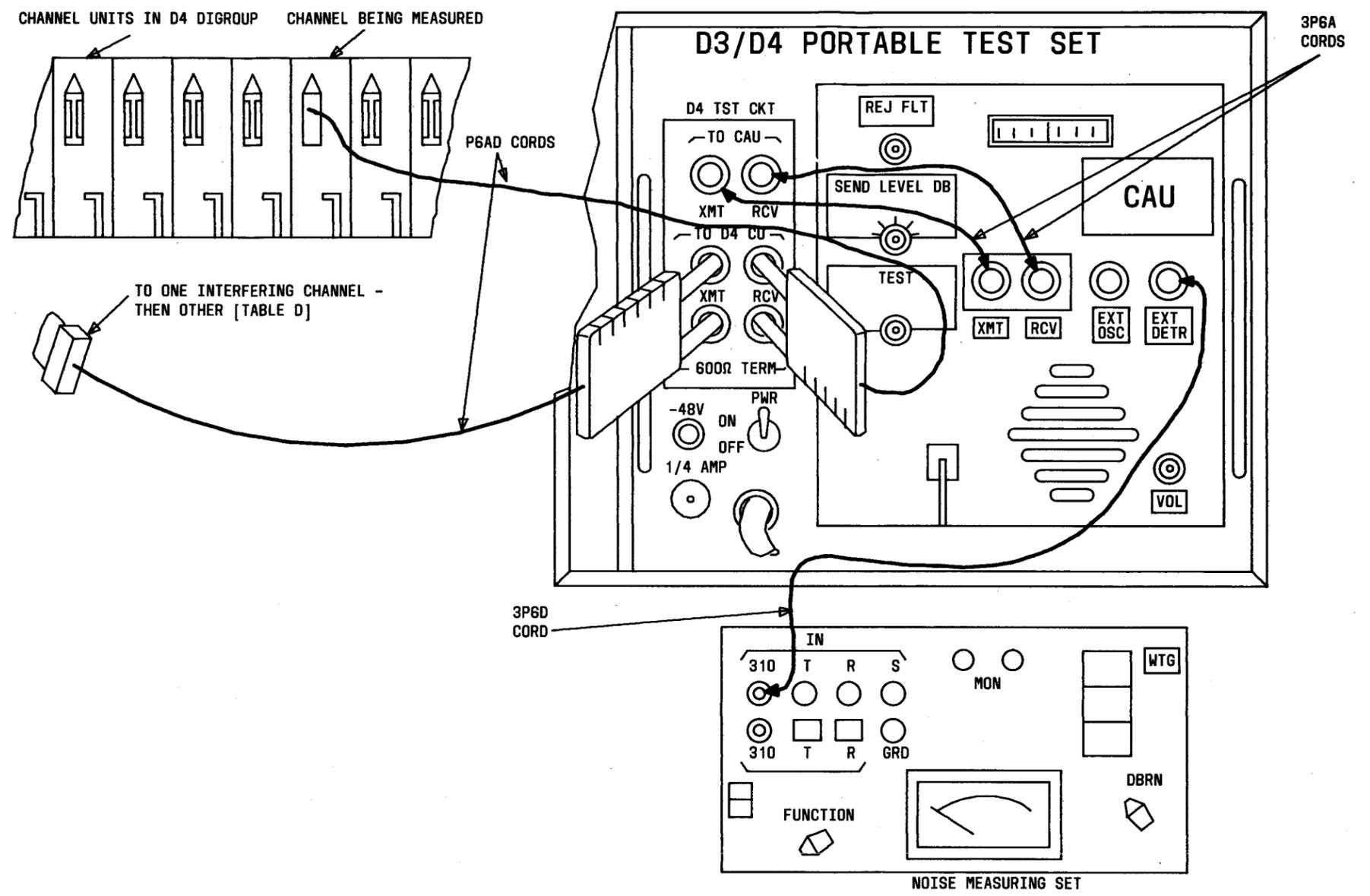


Fig. 11—Crosstalk Test Connections

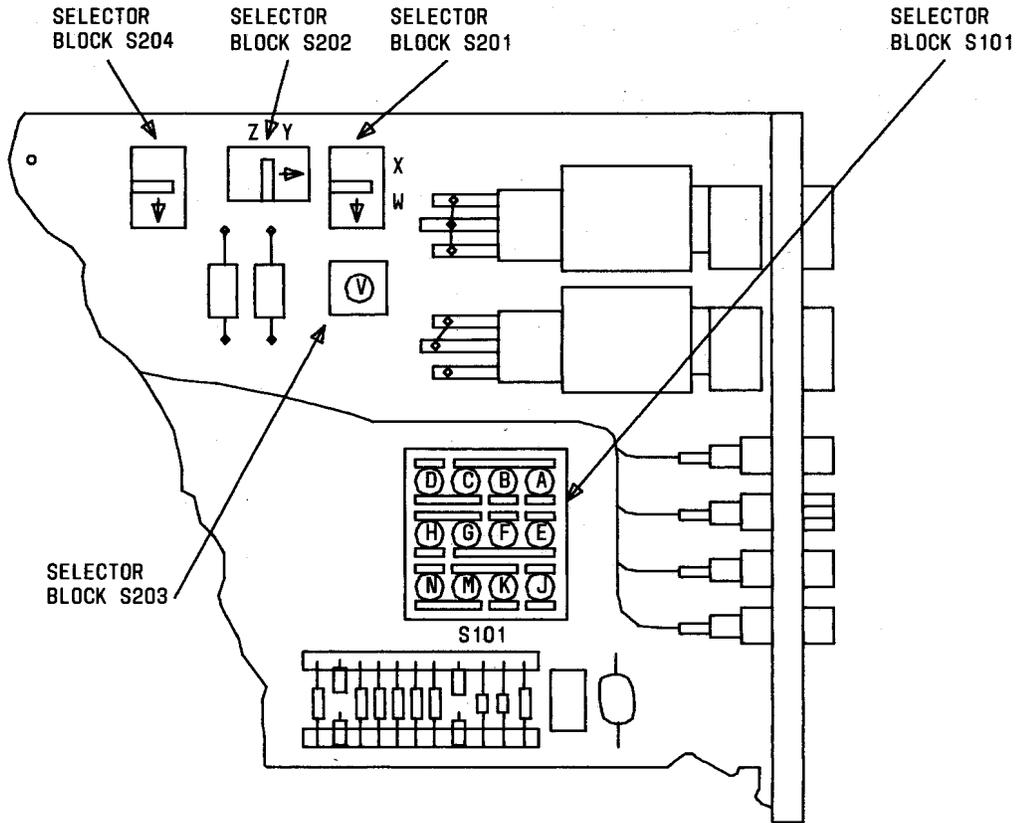


Fig. 12—Option Location on 221- and 231-Type Repeater

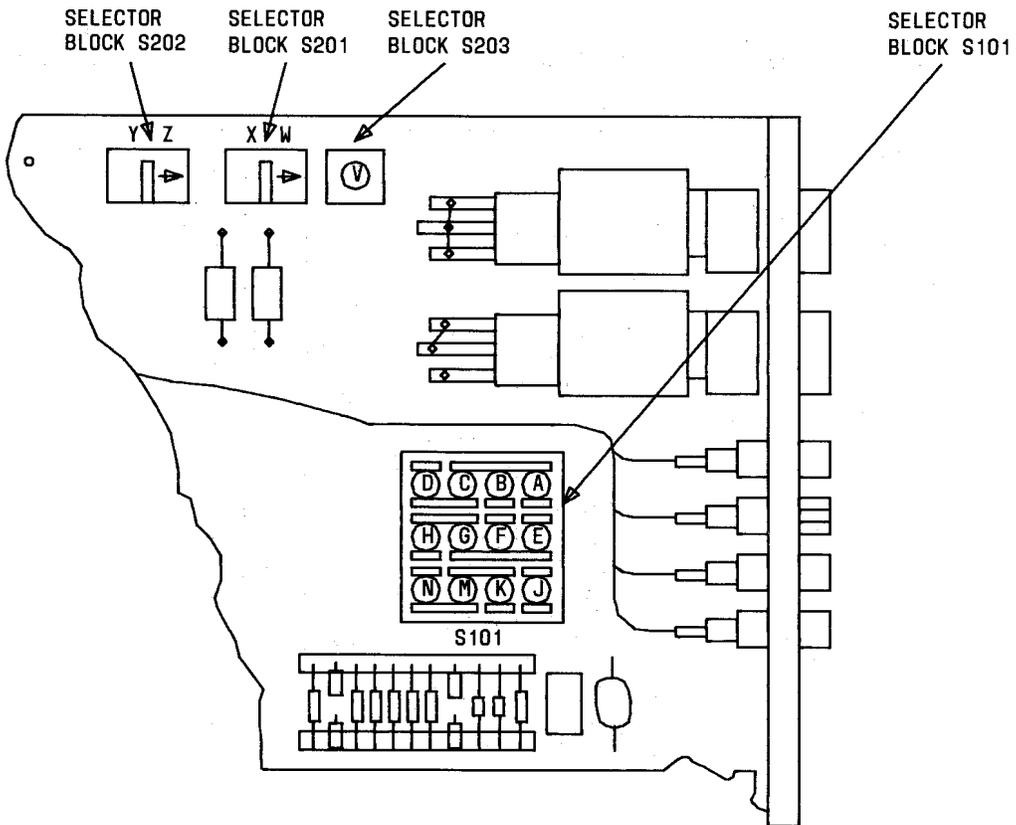


Fig. 13—Option Location on 220-Type Repeater