

A1, A2, A3, A4, AND A5 CHANNEL BANKS
OUT-OF-SERVICE TESTS
ANALOG MULTIPLEX TERMINAL EQUIPMENT

The A-type channel bank (Fig. 1) is a frequency-division multiplex terminal that translates 12 voice-frequency (VF) channels to the 60- to 108-kHz group band in its transmitting section and translates the 60- to 108-kHz group band to 12 VF channels in its receiving section.

This section provides procedures for performing tests required to ensure proper operation of the A1, A2, A3, A4, and A5 channel banks. These procedures are intended to be used for initial lineup and trouble location, as required.

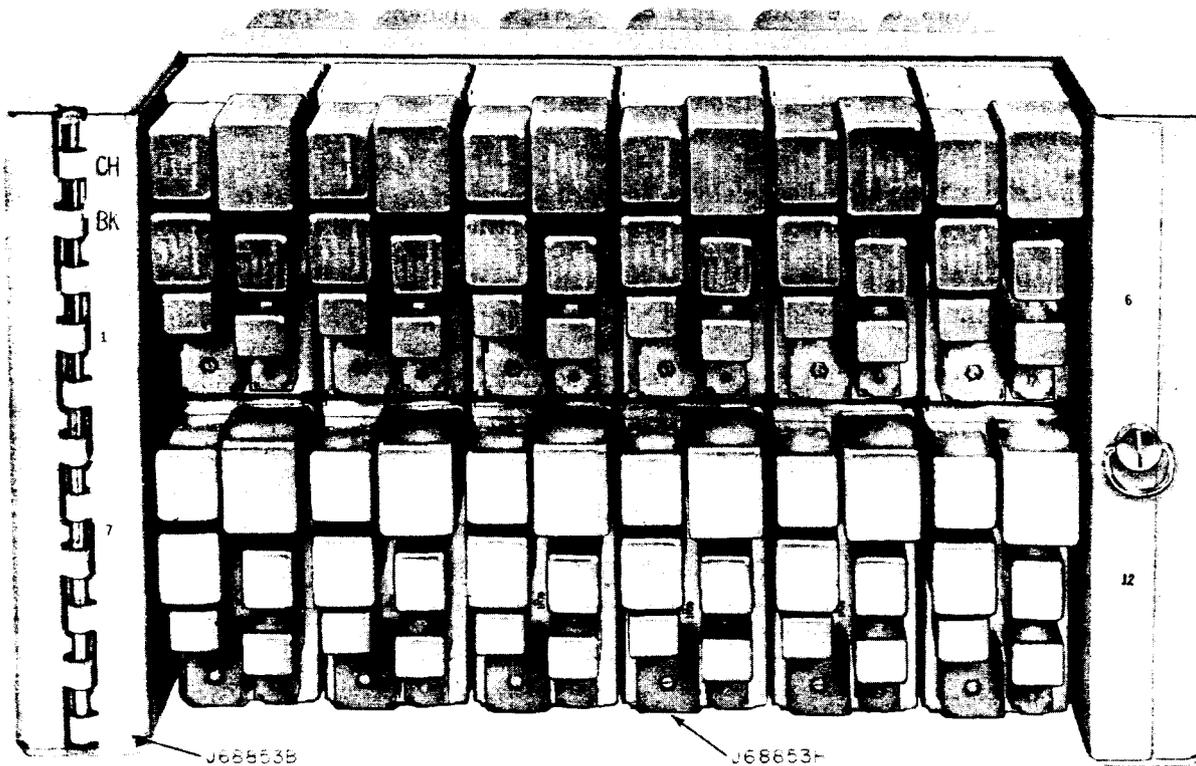


Fig. 1—J68853B 12-Channel A5 Bank Equipped With J68853H Modems—Front View

NOTICE

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SECTION 356-015-501

This section is reissued to:

- (a) Delete all tests for type K terminals.
- (b) Lower some VF test levels to -10 dBm0.
- (c) Include noise requirements for channel banks having associated CFA equipment.
- (d) Separate the noise and crosstalk (interchannel) tests.
- (e) Add an intrachannel crosstalk test previously contained in Section 356-015-310 (now deleted).

Due to extensive changes, change arrows are not used. **Equipment Test Lists are not affected.**

Prior to making the tests and adjustments in this section, ensure that

- (a) All test equipment has been calibrated.
- (b) The equipment under test is out of service.

Note 1: If desired, the steps in the procedures in this section can be bypassed by referring to the applicable illustrations.

Note 2: Where equipment specifications are given in the apparatus list for any chart, this indicates only the **minimum** requirements for the tests in that chart. Any equipment meeting these requirements can be used.

Note 3: In the following charts, all operations are made at the VF patch bay associated with the channel bank under test, unless specified otherwise.

Note 4: All J multiplex tests have been deleted from this section; therefore, Issue 4 of Section 356-015-500 should be retained and renumbered locally at all offices still using J multiplex equipment.

Note 5: All K multiplex tests have been deleted from this section; therefore, Issue 2 of Section 356-015-501 should be retained and renumbered locally at all offices still using K multiplex equipment.

The jacks and controls used in making the tests in this section are located as listed in Table A.

TABLE A
JACK AND CONTROL LOCATION

| DESIGNATION | LOCATION |
|--------------------|-----------------------|
| MOD IN jack | VF Patch Bay |
| DEM OUT jack | VF Patch Bay |
| CH BK IN jack | HF Patch Bay (LMX-2) |
| CH BK OUT jack | HF Patch Bay (LMX-2) |
| CH BK OUT ALT jack | HF Patch Bay (LMX-2) |
| GDF IN jack | LMX equipment (LMX-3) |
| GDF OUT ALT jack | LMX equipment (LMX-3) |
| GR BK IN jack | LMX equipment |
| GR BK OUT jack | LMX equipment |
| GAIN ADJ control | VF Patch Bay |

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CHART 1

TRANSMITTING LEVEL ADJUSTMENT

For proper channel bank operation, the channel bank output power must be set to the standard transmission level. Using a 1-kHz VF test tone (-26 dBm) at the MOD IN jack, adjust the corresponding channel modulator pad to obtain the required output (-51.7 to -52.3 dBm) at the CH BK OUT ALT (LMX-2) or GDF OUT ALT (LMX-3) jack.

APPARATUS:

Sending Test Equipment (STE):

Milliwatt Distributing System (via the -26, 1000~, 600Ω jack on the VF test, monitor, and talk panel)

Receiving Test Equipment (RTE) (Section 356-010-500):

Frequency: 63 to 107 kHz

Power: -52 dBm

Impedance: 135 ohms, balanced

3P7A Cord (for 600-ohm patches)

3P20B Cord (for 135-ohm patches)

STEP

PROCEDURE

- 1 Adjust the RTE as follows:
 - Impedance: 135 ohms, balanced
 - Frequency: 107 kHz (Channel 1, Table B)
 - Power: -52.0 dBm
 - 2 Connect the STE to the MOD IN jack for the channel selected in Step 1 [patch (1), Fig. 2].
-

CHART 1 (Contd)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

TABLE B

**TEST FREQUENCIES AT CH BK OUT ALT (LMX-2) OR
GDF OUT ALT (LMX-3) JACK WITH 1-KHZ INPUT**

| CHAN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------------|-----|-----|----|----|----|----|----|----|----|----|----|----|
| TEST FREQ (kHz) | 107 | 103 | 99 | 95 | 91 | 87 | 83 | 79 | 75 | 71 | 67 | 63 |

- 3 At the LMX equipment, connect the RTE to the CH BK OUT ALT (LMX-2) or GDF OUT ALT (LMX-3) jack [patch (2), Fig. 2].
- 4 At the LMX equipment, measure the signal power at the CH BK OUT ALT or GDF OUT ALT jack.
- Requirement:** -51.7 to -52.3 dBm (-52.0 dBm ± 0.3 dB)
- 5 If the requirement of Step 4 is **not** met, adjust the channel modulator pad to meet the requirement.
- 6 If the requirement of Step 4 **cannot** be met,
- (a) **In A1, A2, A3, and A4 channel banks**, look for trouble in the modulator and the transmitting channel filter for the channel under test.
 - (b) **In A5 channel banks**,
 - (1) Replace the applicable plug-in channel modem with a spare unit.
 - (2) If the requirement of Step 4 **still cannot** be met, reinsert the channel modem replaced in Step 6(b)(1) and refer to Sections 356-015-500 and 356-015-501, Chart 4, to clear channel filter problems.
 - (c) Repeat Step 4.
- 7 Remove patch (1), Fig. 2.
- 8 Repeat applicable Steps 1 through 7 for Channels 2 to 12 of the channel bank under test.
- 9 At the LMX equipment, remove patch (2), Fig. 2.
- 10 Repeat applicable Steps 1 through 9 for all other channel banks to be tested.

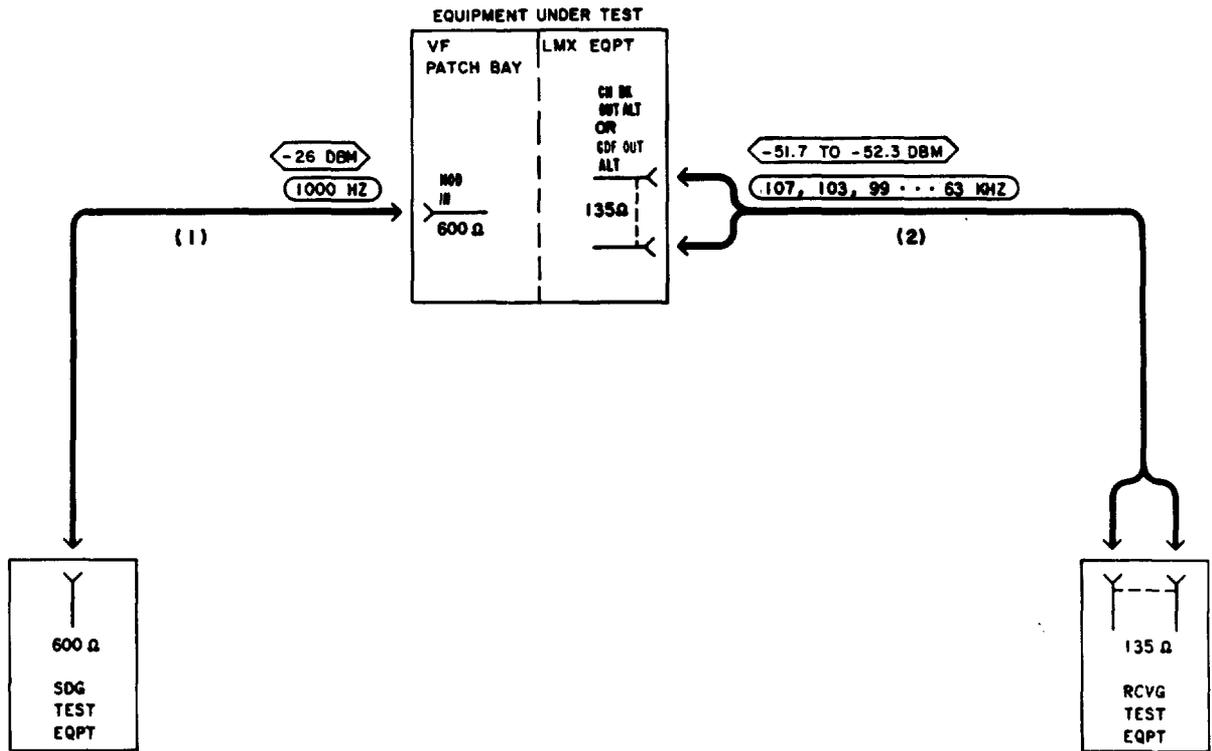


Fig. 2—Patching Diagram—Transmitting Level Adjustment

CHART 2
CARRIER LEAK TEST

For proper channel bank operation, carrier leak for the 12 channels of the A-type channel bank must be kept at a low value (see Table D) to avoid interference with the group and supergroup pilots and the message information.

APPARATUS:

Receiving Test Equipment (RTE) (Section 356-010-500):

Frequency: 64 to 108 kHz

Power: -62 to -85 dBm

Impedance: 75 ohms, unbalanced and 135 ohms, balanced

J68858AT (58AT) Pilot Filter Set

3P20B Cord (for 135-ohm patches)

P2BJ Cord (for 75-ohm patches)

262B Plug (600-ohm termination)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

- | | |
|---|---|
| 1 | Adjust the RTE as follows: Impedance: (a) Channels 1, 3, 4 ... 12: 135 ohms balanced (b) Channel 2: 75 ohms unbalanced Frequency: 108 kHz (Channel 1, Table C) Power: -62 dBm |
|---|---|

TABLE C
CHANNEL CARRIER FREQUENCIES

| CHAN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------------|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| TEST FREQ (kHz) | 108 | 104 | 100 | 96 | 92 | 88 | 84 | 80 | 76 | 72 | 68 | 64 |

CHART 2 (Contd)

STEP

PROCEDURE

- 2 Insert a 262B plug in the MOD IN jack for the channel under test (Fig. 3).
- 3 At the LMX equipment, connect the RTE to the CH BK OUT ALT (LMX-2) or GDF OUT ALT (LMX-3) jack [patch (1), Fig. 3].
- 4 At the LMX equipment, measure the signal power at the CH BK OUT ALT or GDF OUT ALT jack.

Requirement: See Table D.

Note: If the channel bank is equipped for CFA,
 (a) Remove the CFA unit while making the Channel 3 carrier leak test.
 (b) Reinsert the CFA unit after the Channel 3 carrier leak test is completed.

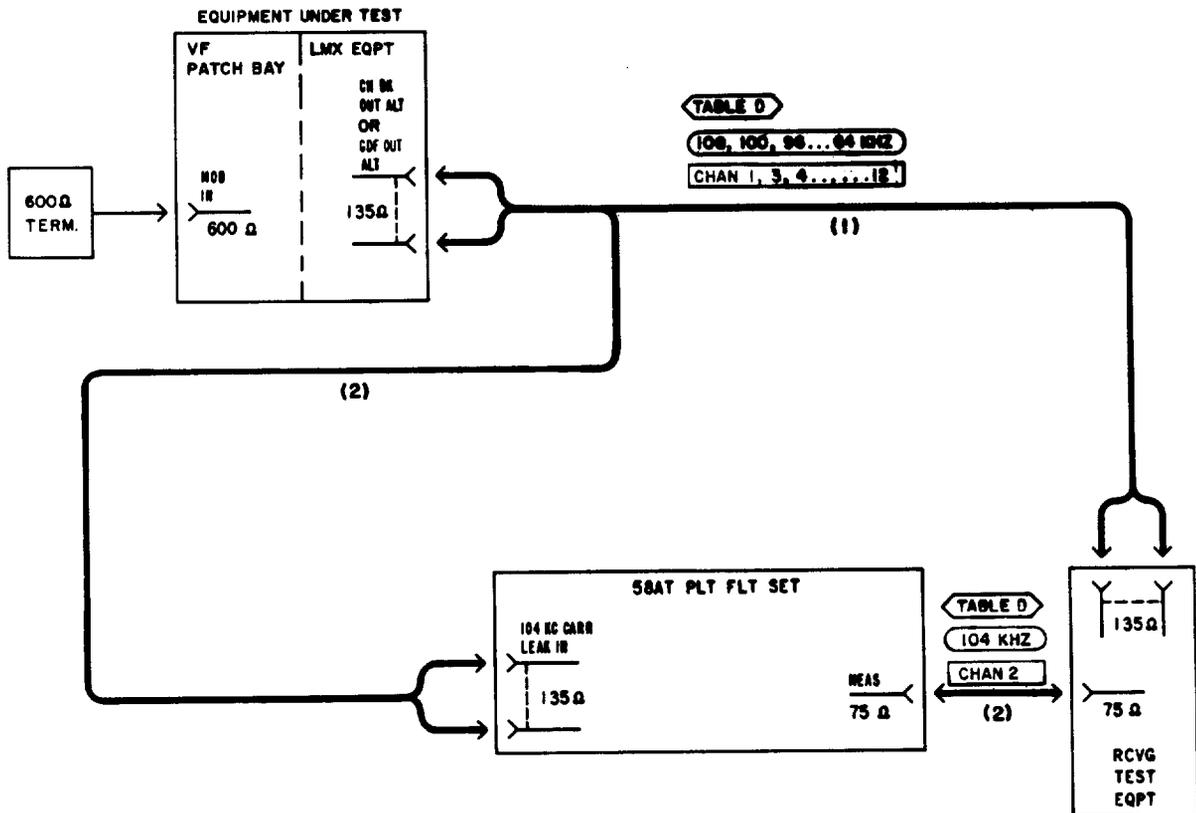


Fig. 3—Patching Diagram—Carrier Leak Test

CHART 2 (Contd)

| STEP | PROCEDURE |
|------|--|
| 5 | If the requirement of Step 4 is <i>not</i> met, <ul style="list-style-type: none"> (a) Replace the varistor if an A1, A2, A3, or A4 channel bank is under test. (b) Replace the plug-in modem if an A5 channel bank is under test. (c) Repeat Step 4. |
| 6 | Remove the terminating plug inserted in Step 2. |
| 7 | Repeat applicable Steps 1 through 6 for Channels 3 to 12 of the channel bank under test. |
| 8 | At the LMX equipment, remove patch (1), Fig. 3. |
| 9 | At the LMX equipment, connect the RTE, via the 104 KC CARR LEAK IN/MEAS jacks on the 58AT pilot filter set, to the CH BK OUT ALT or GDF OUT ALT jack [patch (2), Fig. 3]. |
| 10 | Repeat applicable Steps 1 through 6 for Channel 2. <p>Note: If desired, the approximate frequency can be determined by first locating the pilot via the 104.08 KC PIL IN/MEAS jacks. The measurement is then made via the 104 KC CARR LEAK IN/MEAS jacks.</p> |
| 11 | At the LMX equipment, remove patch (2), Fig. 3. |
| 12 | Repeat applicable Steps 1 through 11 for all other channel banks to be tested. |

TABLE D
CARRIER LEAK REQUIREMENTS

| CHANNEL BANK | | MAXIMUM LEVEL AT CH BK OUT ALT (LMX-2) OR GDF OUT ALT (LMX-3) JACK (dBm) | | |
|--------------|--------------------------|---|------------|------------|
| TYPE USED | TYPE BAND FILTER USED | CHANNELS 1 AND 3-11 | CHANNEL 2* | CHANNEL 12 |
| A1 | 75 219 or 536 | -62 -69 | -85 -85 | -62 -69 |
| A2 | 219, 239, or 536 | -69 | -85 | -65 |
| A3 | 219, 239, or 536 | -65 | -85 | -65 |
| A4 | 219, 239, or 536 | -69 | -85 | -65 |
| A5 | 561 | -69 | -85 | -69 |

* Use 58AT pilot filter set if 104.08-kHz pilot is being transmitted. Value shown includes 10-dB loss of 58AT filter.

CHART 3

RECEIVING LEVEL ADJUSTMENT

For proper channel bank operation, the VF output from the 12 channels of the A-type channel bank must be of equal level (-3.0 dBm). The GAIN ADJ controls on the VF patch bay are adjusted to obtain the required output.

Note: This chart may be omitted if Charts 4, 5, 6, or 7 are to be used at this time.

APPARATUS:

Sending Test Equipment (STE) (Section 356-010-500):

Frequency: 63 to 107 kHz

Power: -15 dBm

Impedance: 135 ohms, balanced

Receiving Test Equipment (RTE):

Transmission and Noise Measuring System (via the MEAS 600Ω TERM jack on the VF test, monitor, and talk panel)

3P7A Cord (for 600-ohm patches)

3P20B Cord (for 135-ohm patches)

| STEP | PROCEDURE |
|------|---|
| 1 | Adjust the RTE for a measurement of -3 dBm. |
| 2 | Adjust the STE as follows: Impedance: 135 ohms, balanced Frequency: 107 kHz (Channel 1, Table E) Power: -15.0 dBm (LMX-2) -14.0 dBm (LMX-3) |
| 3 | At the LMX equipment, connect the STE to the CH BK IN (LMX-2) or GDF IN (LMX-3) jack [patch (1), Fig. 4]. |
| 4 | Connect the RTE to the DEM OUT jack for the channel under test [patch (2), Fig. 4]. |
| 5 | Carefully adjust the corresponding channel GAIN ADJ control (on the VF patch bay) to obtain a signal power of -3.0 dBm at the DEM OUT jack. |
| | Note: The GAIN ADJ control should produce a change of at least 12 dB when varied from maximum counterclockwise to maximum clockwise. |

CHART 3 (Contd)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

TABLE E

TEST FREQUENCIES AT CH BK IN (LMX-2) OR GDF IN
(LMX-3) JACK FOR 1-KHZ OUTPUT

| CHAN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------------|-----|-----|----|----|----|----|----|----|----|----|----|----|
| TEST FREQ (kHz) | 107 | 103 | 99 | 95 | 91 | 87 | 83 | 79 | 75 | 71 | 67 | 63 |

- 6 If the adjustment of Step 5 *cannot* be made,
- (a) ***In A1, A2, A3, or A4 channel banks,***
 - (1) Replace the demodulator amplifier electron tube with a spare.
 - (2) If the adjustment of Step 5 *still cannot* be made, reinsert the tube replaced in Step 6(a)(1) and look for trouble in the demodulator and the receiving channel filter for the channel under test.
 - (b) ***In A5 channel banks,***
 - (1) Replace the applicable plug-in channel modem unit with a spare.
 - (2) If the adjustment of Step 5 *still cannot* be made, reinsert the channel modem removed in Step 6(b)(1) and refer to Sections 356-015-500 and 356-015-501, Chart 4, to clear channel filter problems.
 - (c) Repeat Step 5.
 - (d) If the adjustment *can* now be made, repeat applicable steps in Charts 1 and 2.
- 7 Remove patch (2), Fig. 4.
- 8 Repeat applicable Steps 1 through 7 for Channels 2 to 12 of the channel bank under test.
- 9 At the LMX equipment, remove patch (1), Fig. 4.
- 10 Repeat applicable Steps 1 through 9 for all other channel banks to be tested.

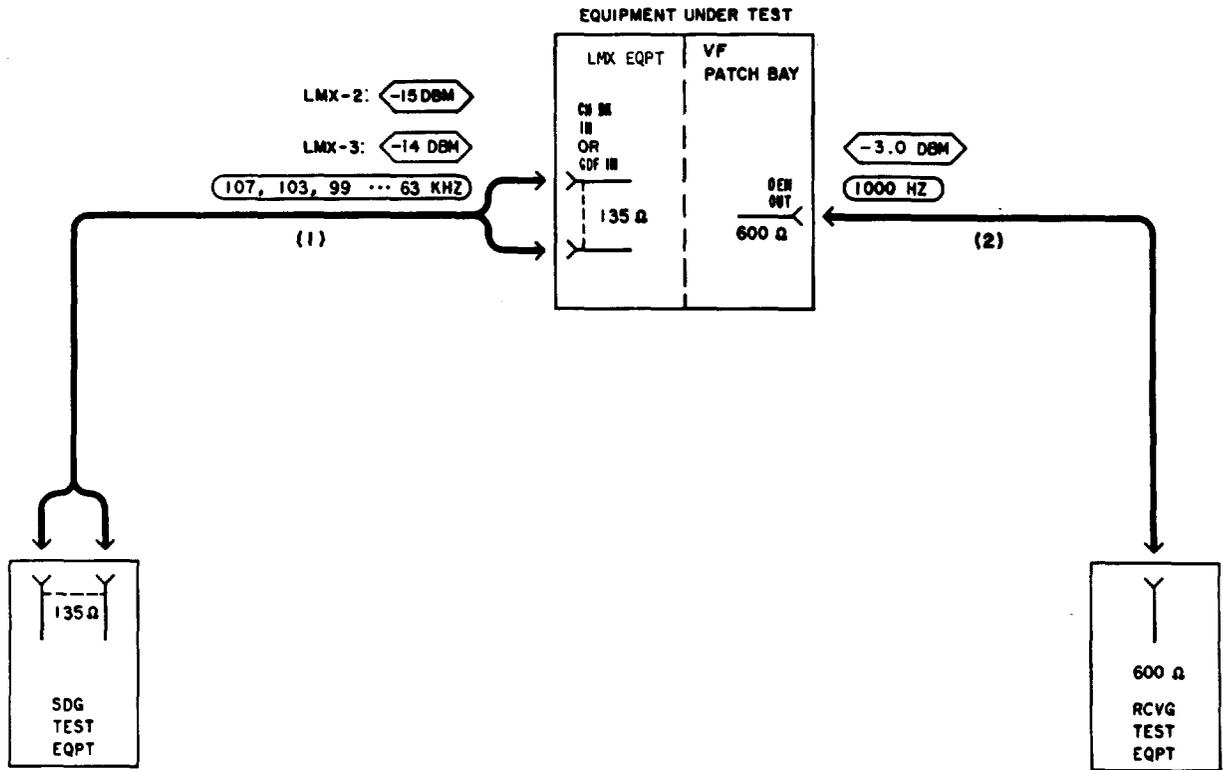


Fig. 4—Patching Diagram—Receiving Level Adjustment

CHART 4
FREQUENCY RESPONSE TEST

The frequency response of each channel in the A-type bank must be such that when the output at 1000 Hz is -3.0 dBm, the output at 200, 400, and 2800 Hz is as specified in Table F. This test ensures that the channel filters have the required frequency response.

APPARATUS:***Sending Test Equipment (STE):***

Frequency: 200 to 2800 Hz

Power: -26 dBm

Impedance: 600 ohms, balanced

Receiving Test Equipment (RTE):

Transmission and Noise Measuring System (via the MEAS 600 Ω TERM jack on the VF test, monitor, and talk panel)

3P7A Cords (for 600-ohm patches)

P2BJ Cords (for 75-ohm patches)

368A Plug (75-ohm termination) if spare hybrid coil is used for looping

Spare Hybrid Coil, 3-dB T Pad (75-ohm impedance), or ***Spare Group Transmitting Trunk*** (LMX-2)

or

ED-52536-20 MTCE Group Bank Pad (LMX-3)

STEP**PROCEDURE**

Note 1: The gain of the transmitting and receiving group equipment should be adjusted as prescribed in applicable sections of the 356- Division.

Note 2: The STE and RTE should be calibrated as a test group prior to use at each test frequency.

- 1 Adjust the RTE for a measurement of -3 dBm.

CHART 4 (Contd)

| STEP | PROCEDURE |
|------|---|
| 2 | Adjust the STE as follows: Impedance: 600 ohms, balanced Frequency: 1000 Hz Power: -26.0 dBm |
| 3 | At LMX-2 equipment, make looping connections as shown in Fig 5(a) or 5(b), as applicable. |
| 4 | At LMX-3 equipment, make looping connections as shown in Fig. 6. |
| 5 | Connect the STE to the MOD IN jack for Channel 1 of the channel bank under test [patch (1), Fig. 7]. |
| 6 | Connect the RTE to the DEM OUT jack for the channel under test [patch (2), Fig. 7]. |
| 7 | Observe that the signal power at the DEM OUT jack is -3.0 dBm. <i>Note:</i> If the requirement is <i>not</i> met, check the looping connections at the LMX bay. Then, if necessary, adjust the corresponding channel GAIN ADJ control (on the VF patch bay) to obtain -3.0 dBm. |
| 8 | Set the STE frequency as indicated in Table F. |
| 9 | Measure and record the signal power at the DEM OUT jack. Requirement: See Table F. |
| 10 | If the requirement of Step 9 is <i>not</i> met, (a) Perform the corresponding interchannel crosstalk test in Chart 6. (b) Replace the channel filter indicated as defective. (c) Repeat applicable steps in Charts 1 and 2 for the channel under test. (d) Repeat applicable Steps 1 through 9. |
| 11 | Repeat Steps 8 and 9 for each frequency listed in Table F. |
| 12 | Remove patches (1) and (2), Fig. 7. |
| 13 | Repeat applicable Steps 1 through 12 for Channels 2 to 12 of the channel bank under test. |
| 14 | At the LMX equipment, remove looping connections made in Step 3 or 4. |
| 15 | Repeat applicable Steps 1 through 14 for all other channel banks to be tested. |

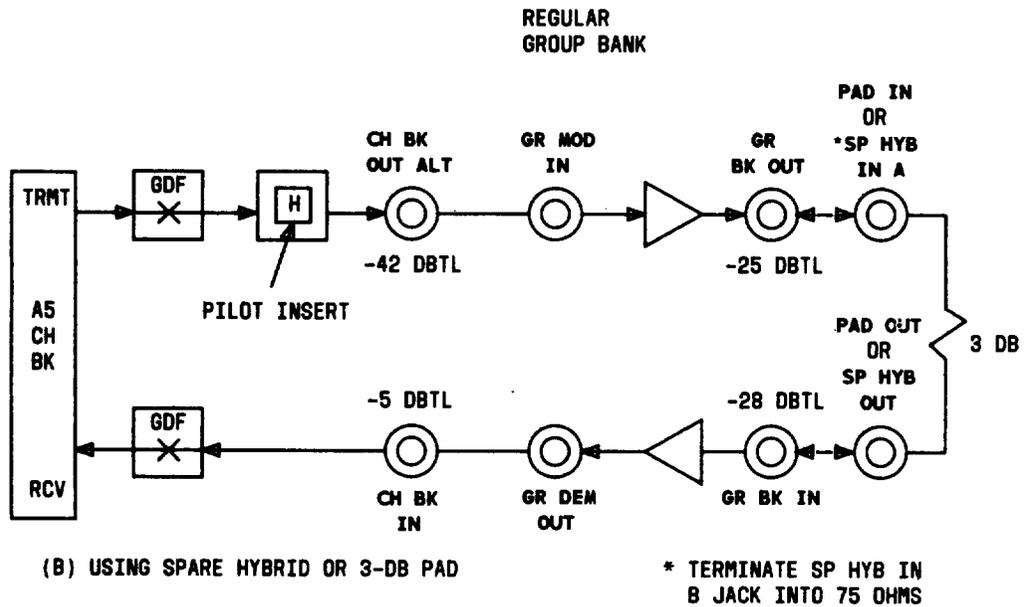
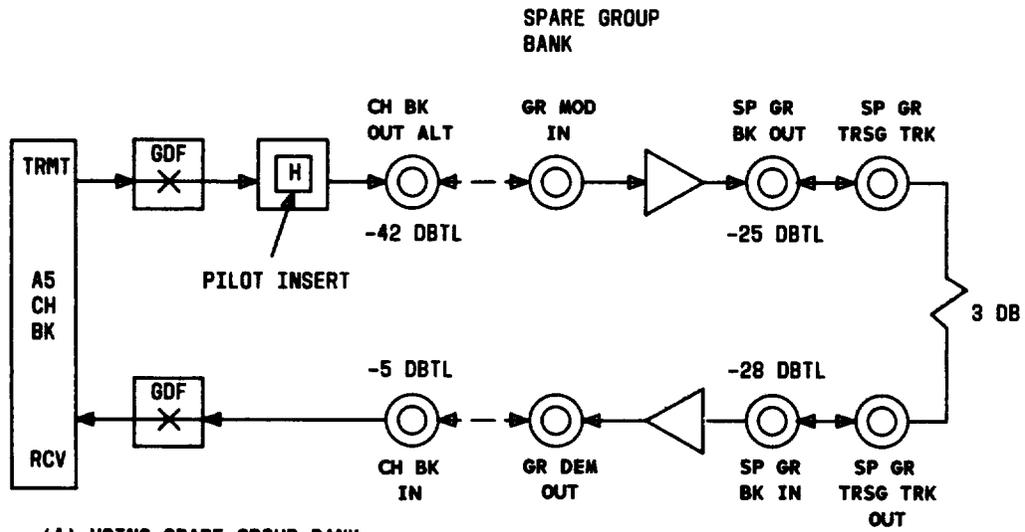


Fig. 5—Typical Channel Bank Equal-Level Looping Arrangements—LMX-2

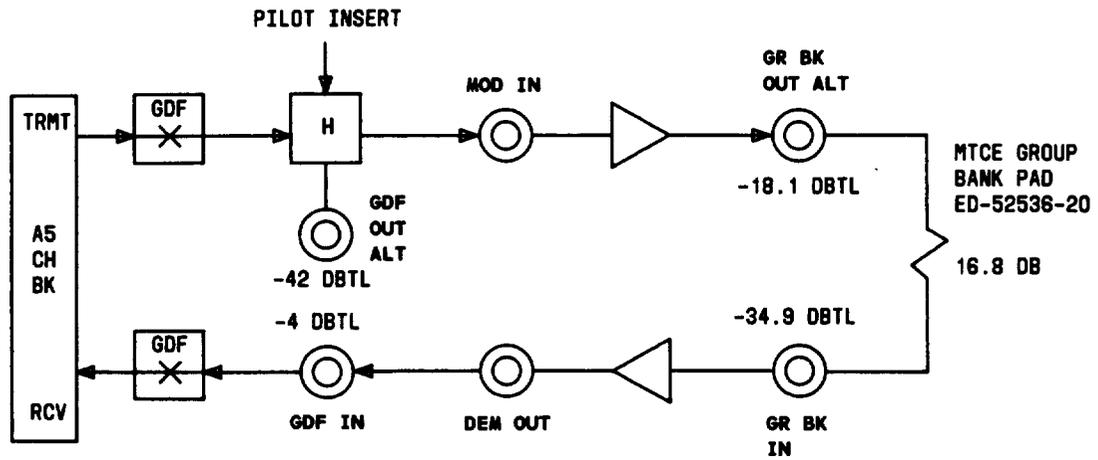


Fig. 6—Typical Channel Bank Equal-Level Looping Arrangements—LMX-3

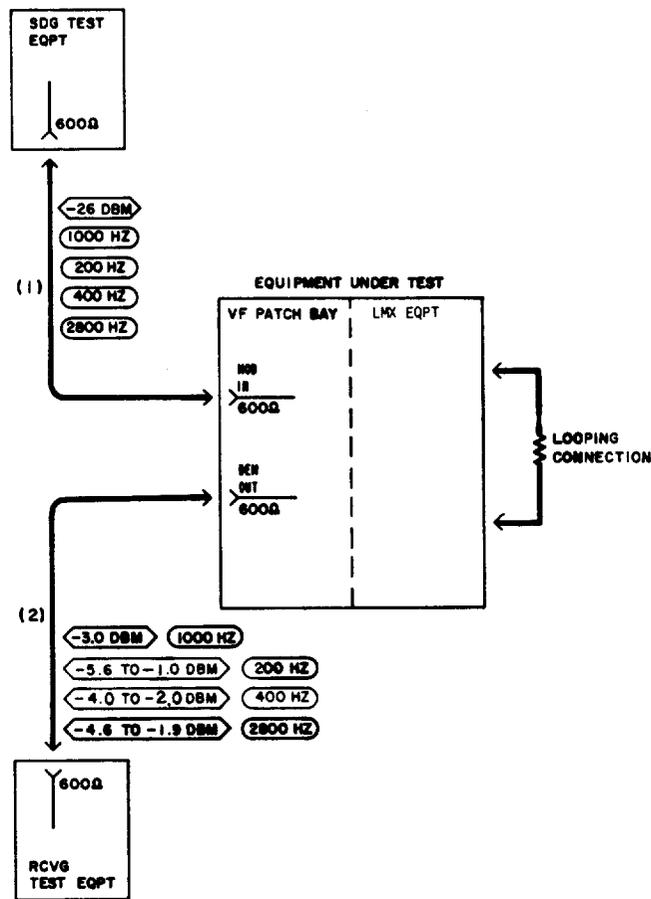


Fig. 7—Patching Diagram—Frequency Response Test

TABLE F
CHANNEL-FILTER FREQUENCY
RESPONSE REQUIREMENTS

| TEST FREQ | SIGNAL POWER AT DEM OUT JACK |
|-----------|------------------------------|
| 200 Hz | -5.6 to -1.0 dBm |
| 400 Hz | -4.0 to -2.0 dBm |
| 2800 Hz | -4.6 to -1.9 dBm |

CHART 5

NOISE TEST

For proper channel bank operation, the noise level in each channel of the A-type channel bank must not exceed the limit beyond which it interferes with normal speech.

APPARATUS:

Sending Testing Equipment (STE):

Frequency: 1000 Hz

Power: -26 dBm

Impedance: 600 ohms, balanced

Note: The 1000-Hz test tone can be obtained from the Milliwatt Distribution System (via the -26, 1000~, 600Ω jack on the VF test, monitor, and talk panel).

Receiving Test Equipment (RTE):

Transmission and Noise Measuring System (via the MEAS 600Ω TERM jack on the VF test, monitor, and talk panel)

Noise Measuring Set (NMS):

Range: 29 to 63 dBm

Weighting: C Message and 3 kHz flat

Impedance: 600 ohms, balanced

Type: 3A or 3B, or equivalent

3P7A Cords (for 600-ohm patches)

P2BJ Cords (for 75-ohm patches)

262B Plugs (600-ohm terminations)

386A Plug (75-ohm termination) if spare hybrid coil is used for looping

Spare Hybrid Coil, 3-dB T Pad (75-ohm impedance), or ***Spare Group Transmitting Trunk*** (LMX-2)

CHART 5 (Contd)

APPARATUS:

OR

ED-52536-20 MTCE Group Bank Pad (LMX-3)

STEP

PROCEDURE

Note 1: The gain of the transmitting and receiving group equipment should be adjusted as prescribed in applicable sections of the 356- Division.

Note 2: The STE and RTE should be calibrated as a test group prior to use at each test frequency.

Note 3: If the channel bank under test is equipped with CFA, **be sure** that the RCV FAIL lamp on the CFA unit is extinguished.

Preparation

- 1 Adjust the RTE for a measurement of -3 dBm.
- 2 Adjust the STE as follows:
 - Impedance: 600 ohms, balanced
 - Frequency: 1000 Hz
 - Power: -26.0 dBm
- 3 At LMX-2 equipment, make looping connections as shown in Fig. 5(a) or 5(b), as applicable.
- 4 At LMX-3 equipment, make looping connections as shown in Fig. 6.
- 5 Connect the STE to the MOD IN jack for Channel 1 of the channel bank under test [patch (1), Fig. 8].
- 6 Connect the RTE to the DEM OUT jack for the channel under test [patch (2), Fig. 8].
- 7 Observe that the signal power at the DEM OUT jack is -3.0 dBm.

Note: If the requirement is *not* met, check the looping connections at the LMX bay. Then, if necessary, adjust the corresponding channel GAIN ADJ control (on the VF patch bay) to obtain -3.0 dBm.
- 8 Remove patches (1) and (2), Fig. 8.
- 9 Repeat Steps 5 through 8 for Channels 2 to 12 of the channel bank under test.

CHART 5 (Contd)

| STEP | PROCEDURE |
|------|--|
| | Noise |
| 10 | Adjust the NMS as follows: Range: Minimum sensitivity (85 dBrn on the 3A NMS) Weighting: C Message Impedance: 600 ohms, balanced Damping: DAMP |
| 11 | Insert a 262B plug (600-ohm termination) in the MOD IN jack for Channel 1 of the channel bank under test (Fig. 9). |
| 12 | Connect the NMS to the DEM OUT jack for the channel under test [patch (1), Fig. 9]. |
| 13 | Measure the noise at the DEM OUT jack. Requirement: If not equipped with 2-Way CFA: Channel 1: 38 dBrnc or less (37 dBrnc is less than 38) Channels 2 to 12: 29 dBrnc or less (28 dBrnc is less than 29) If equipped with 2-Way CFA: Channels 1 and 2: 38 dBrnc or less (37 dBrnc is less than 38) Channels 3 to 12: 29 dBrnc or less (28 dBrnc is less than 29) |
| 14 | Set the NMS range switch to minimum sensitivity. |
| 15 | Set the NMS weighting to 3 kHz flat. |
| 16 | Measure the noise at the DEM OUT jack. Requirement: If not equipped with 2-Way CFA: Channel 1: 57 dBrn or less (56 dBrn is less than 57) Channel 2: 63 dBrn or less (62 dBrn is less than 63) Channels 3 to 12: 45 dBrn or less (44 dBrn is less than 45) If equipped with 2-Way CFA: Channel 1: 57 dBrn or less (56 dBrn is less than 57) Channels 2 and 3: 63 dBrn or less (62 dBrn is less than 63) Channels 4 to 12: 45 dBrn or less (44 dBrn is less than 45) |
| 17 | If the requirement of Steps 13 and 16 are <i>not</i> met, (a) Remove the associated CFA unit from its shelf slot (if this option is used). (b) Substitute a through-pilot insertion unit in the LMX position corresponding to the channel bank under test. (c) Measure the noise at the DEM OUT jack. Requirement: Channels 1 to 12: 45 dBrn or less (44 dBrn is less than 45) |

CHART 5 (Contd)

| STEP | PROCEDURE |
|-------------|---|
| 18 | If the requirement of Step 17(c) <i>is</i> met, <ul style="list-style-type: none">(a) Remove the through-pilot insertion unit and reinsert the unit removed in Step 17(b).(b) Reinsert the CFA unit removed in Step 17(a). |
| 19 | If the requirement of Step 17(c) is <i>not</i> met, <ul style="list-style-type: none">(a) Remove the through-pilot insertion unit and reinsert the unit removed in Step 17(b).(b) Reinsert the CFA unit removed in Step 17(a).(c) Replace the channel modem under test with a spare unit.(d) Repeat applicable steps in Charts 1, 2, and 4 for the channel under test.(e) Repeat applicable Steps 1 through 18. |
| 20 | If the requirements of Steps 13 and 16 still <i>cannot</i> be met, <ul style="list-style-type: none">(a) Reinsert the channel modem replaced in Step 19(c).(b) Check the looping connection, then, if necessary, check the LMX equipment and make necessary repairs.(c) Repeat applicable Steps 1 through 19. |
| 21 | Set the NMS range switch to minimum sensitivity. |
| 22 | Remove patch (1), Fig. 9. |
| 23 | Remove the 262B plug inserted in Step 11. |
| 24 | Repeat applicable Steps 10 through 23 for Channels 2 to 12 of the channel bank under test. |
| 25 | At the LMX equipment, remove looping connections made in Step 3 or 4. |
| 26 | Repeat applicable Steps 1 through 25 for all other channel banks to be tested. |

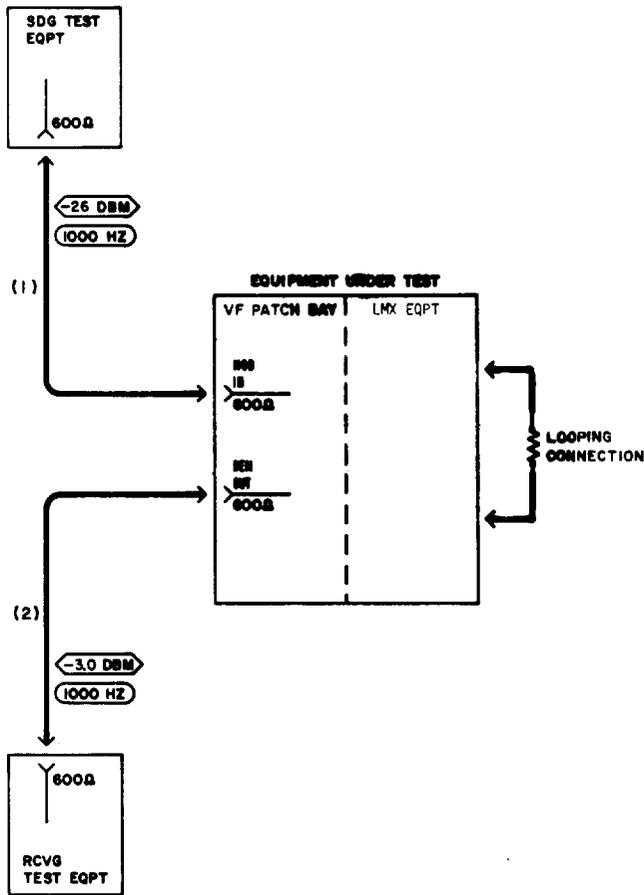


Fig. 8—Patching Diagram—Preparation

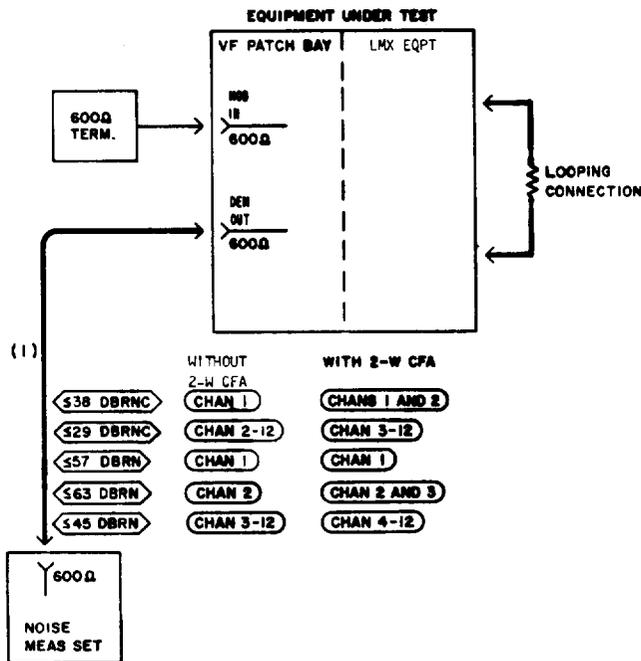


Fig. 9—Patching Diagram—Noise Test

CHART 6

INTERCHANNEL CROSSTALK TEST

For proper channel bank operation, the interchannel crosstalk in each channel of the A-type channel bank must not exceed the limit beyond which it interferes with normal speech. This test is performed with the channel bank under test looped back on itself, with test tone applied to one VF channel and measured in both adjacent channels.

APPARATUS:***Sending Testing Equipment (STE):***

Frequency: 1000, 3000, and 5000 Hz

Power: -16 and -26 dBm

Impedance: 600 ohms, balanced

Note: The 1000-Hz test tone can be obtained from the Milliwatt Distribution System (via the -26, 1000~, 600Ω jack on the VF test, monitor, and talk panel).

Receiving Test Equipment (RTE):

Transmission and Noise Measuring System (via the MEAS 600Ω TERM jack on the VF test, monitor, and talk panel)

Noise Measuring Set (NMS):

Range: 43 to 47 dBm

Weighting: C Message

Impedance: 600 ohms, balanced

Type: 3A or 3B, or equivalent

3P7A Cords (for 600-ohm patches)

P2BJ Cords (for 75-ohm patches)

262B Plugs (600-ohm terminations)

368A Plug (75-ohm termination) if spare hybrid coil is used for looping

Spare Hybrid Coil, 3-dB T Pad (75-ohm impedance), **or Spare Group Transmitting Trunk**
(LMX-2)

CHART 6 (Contd)

APPARATUS:

or

ED-52536-20 MTCE Group Bank Pad (LMX-3)

| STEP | PROCEDURE |
|------|---|
| | <p>Note 1: The transmitting channel is designated B_T and is the disturbing channel in which tone is sent. Adjacent receiving channels are designated A_R and C_R, and are the disturbed channels in which crosstalk is measured.</p> <p>Note 2: The gain of the transmitting and receiving group equipment should be adjusted as prescribed in applicable sections of the 356- Division.</p> <p>Note 3: The STE and RTE should be calibrated as a test group prior to use at each test frequency.</p> <p>Note 4: If the channel bank under test is equipped with the CFA unit, be sure that the RCV FAIL lamp on the CFA unit is extinguished.</p> <p>Preparation</p> |
| 1 | If an external RTE is used, adjust for a measurement of -3 dBm. |
| 2 | Adjust the STE as follows: <ul style="list-style-type: none"> Impedance: 600 ohms, balanced Frequency: 1000 Hz Power: -26.0 dBm |
| 3 | At LMX-2 equipment, make looping connections as shown in Fig. 5(a) or 5(b), as applicable. |
| 4 | At LMX-3 equipment, make looping connections as shown in Fig. 6. |
| 5 | Connect the STE to the MOD IN jack for Channel 1 of the channel bank under test [patch (1), Fig. 10]. |
| 6 | Connect the RTE to the DEM OUT jack for the channel under test [patch (2), Fig. 10]. |

CHART 6 (Contd)

| STEP | PROCEDURE |
|------|--|
| 7 | Observe that the signal power at the DEM OUT jack is -3.0 dBm. <i>Note:</i> If the requirement is <i>not</i> met, check the looping connections at the LMX bay. Then, if necessary, adjust the corresponding channel GAIN ADJ control (on the VF patch bay) to obtain -3.0 dBm. |
| 8 | Remove patches (1) and (2), Fig. 10. |
| 9 | Repeat Steps 5 through 8 for Channels 2 to 12 of the channel bank under test. Interchannel Crosstalk |
| 10 | Adjust the STE as follows: Impedance: 600 ohms, balanced Frequency: 3000 Hz Power: -16 dBm |
| 11 | Adjust the NMS as follows: Range: Minimum sensitivity (85 dB _{rn} on the 3A NMS) Weighting: C Message Impedance: 600 ohms, balanced Damping: DAMP |
| 12 | Insert a 262B plug (600-ohm termination) in the MOD IN jack for Channels A _r and C _r in Test A (Table G and Fig. 11) of the channel bank under test. |
| 13 | Connect the STE to the MOD IN jack for Channel B _r [patch (1), Fig. 11]. |
| 14 | Insert a 262B plug in the DEM OUT jack for Channel B _r (Fig. 11). |
| 15 | Connect the NMS to the DEM OUT jack for Channel A _r [patch (2), Fig. 11]. |
| 16 | Measure the noise at the DEM OUT jack for Channel A _r . Requirement: 43 dB _{rn} c or less (42 dB _{rn} c is less than 43) |

CHART 6 (Contd)

STEP

PROCEDURE

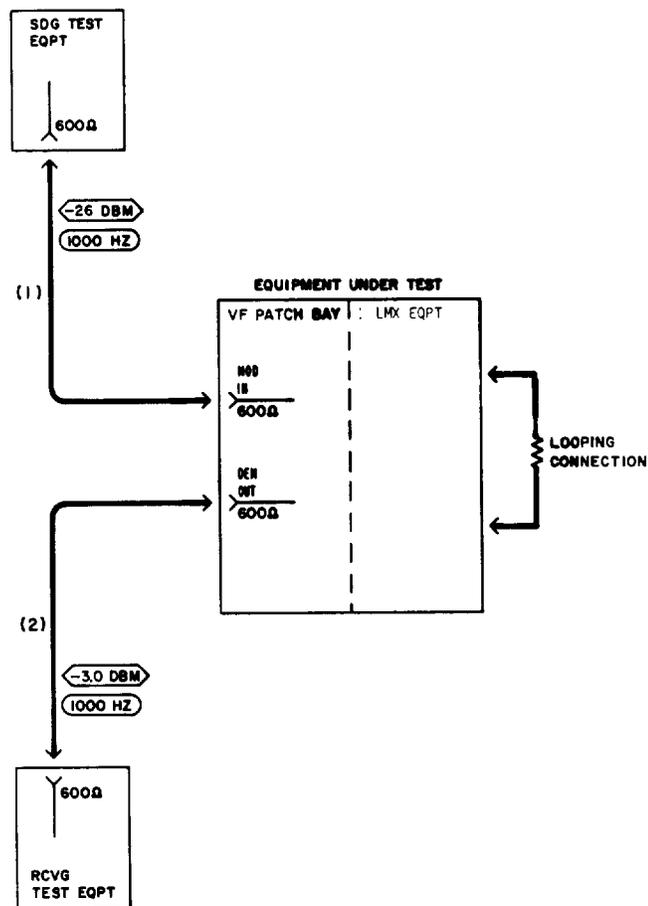


Fig. 10—Patching Diagram—Preparation

- 17 If the requirement of Step 16 is *not* met,
- Replace the transmitting channel filter for Channel B (Br).
 - Repeat applicable steps in Charts 1, 2, and 4 for Channel B.
 - Repeat applicable Steps 1 through 16.

TABLE G
CROSSTALK TEST CONNECTIONS

| TEST | AT MOD IN JACKS | | AT DEM OUT JACKS | |
|------|-----------------------------------|----------------|----------------------------------|--------------------------------------|
| | CONNECT 600-OHM TERM. TO CHANNELS | | CONNECT 600 OHM TERM. TO CHANNEL | CONNECT NMS TO CHANNEL |
| | A _T AND C _T | B _T | B _R | A _R * OR C _R † |
| A | 1 3 | 2 | 2 | 1 3 |
| B | 2 4 | 3 | 3 | 2 4 |
| C | 3 5 | 4 | 4 | 3 5 |
| D | 4 6 | 5 | 5 | 4 6 |
| E | 5 7 | 6 | 6 | 5 7 |
| F | 6 8 | 7 | 7 | 6 8 |
| G | 7 9 | 8 | 8 | 7 9 |
| H | 8 10 | 9 | 9 | 8 10 |
| I | 9 11 | 10 | 10 | 9 11 |
| J | 10 12 | 11 | 11 | 10 12 |
| K | 11 — | 12 | 12 | 11 — |
| L | — 2 | 1 | 1 | — 2 |

* For 3000-Hz measurement only.

† For 3000- and 5000-Hz measurements.

Note: Subscripts "T" and "R" denote transmitting and receiving sections of the indicated channels. For example, in Test A:

Channel A_T = Channel 1, transmitting

Channel B_T = Channel 2, transmitting

Channel C_T = Channel 3, transmitting

Channel A_R = Channel 1, receiving

Channel B_R = Channel 2, receiving

Channel C_R = Channel 3, receiving

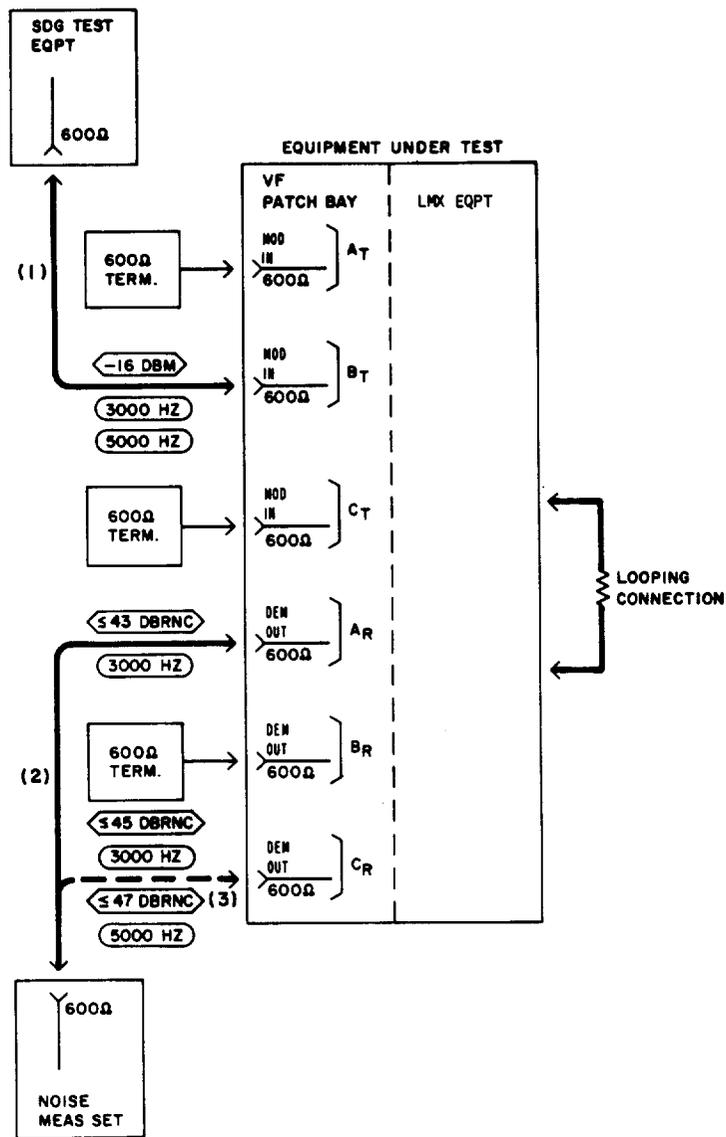


Fig. 11—Patching Diagram—Interchannel Crosstalk Test

CHART 6 (Contd)

| STEP | PROCEDURE |
|------|---|
| 18 | Set the NMS range switch to minimum sensitivity. |
| 19 | Remove patch (2), Fig. 11. |
| 20 | Connect the NMS to the DEM OUT jack for Channel C _R [patch (3), Fig. 11]. |
| 21 | Measure the noise at the DEM OUT jack for Channel C _R . Requirement: 45 dBrnc or less (44 dBrnc is less than 45) |
| 22 | If the requirement of Step 21 is <i>not</i> met, (a) Replace the receiving channel filter for Channel C (C _R). (b) Repeat applicable steps in Charts 1, 2, and 4 for Channel C. (c) Repeat applicable Steps 1 through 21. |
| 23 | Set the STE to -16 dBm at 5000 Hz. |
| 24 | Measure the noise at the DEM OUT jack for Channel C _R . Requirement: 47 dBrnc or less (46 dBrnc is less than 47) |
| 25 | If the requirement of Step 24 is <i>not</i> met, (a) Replace the transmitting channel filter for Channel B (B _T). (b) Repeat applicable steps in Charts 1, 2, and 4 for Channel B. (c) Repeat applicable Steps 1 through 24. |
| 26 | Set the NMS range switch to minimum sensitivity. |
| 27 | Remove patches (1) and (3), Fig. 11. |
| 28 | Remove the 262B plugs inserted in Steps 12 and 14. |
| 29 | Repeat applicable Steps 10 through 28 for Tests B through L listed in Table G. |
| 30 | At the LMX equipment, remove looping connections made in Step 3 or 4. |
| 31 | Repeat applicable Steps 1 through 30 for all other channel banks to be tested. |

CHART 7

INTRACHANNEL CROSSTALK TEST

For proper channel bank operation, the intrachannel crosstalk must not exceed the limit beyond which it interferes with normal speech. When a -5.0 dBm (LMX-2) or -4.0 dBm (LMX-3) 1-kHz-point test tone is applied to the CH BK IN (LMX-2) or GDF IN (LMX-3) jack, the output (same frequency) should not exceed -97.6 dBm at the CH BK OUT ALT (LMX-2) or GDF OUT ALT (LMX-3) jack.

APPARATUS:

Sending Test Equipment (STE) (Section 356-010-500):

Frequency: 63 to 107 kHz

Power: -4 to -15 dBm

Impedance: 135 ohms, balanced

Receiving Test Equipment (RTE) (Section 356-010-500):

Frequency: 63 to 107 kHz

Power: -50 to -100 dBm

Impedance: 135 ohms, balanced

3P20 () Cords (for 135-ohm patches)

6P10() Cord (23-dB, 600-ohm pad)

262B Plugs (600-ohm terminations)

STEP

PROCEDURE

Note 1: The channel bank under test must be out of service to perform this test.

Note 2: The gain of the channel(s) under test should be adjusted as prescribed in Charts 1 and 3.

Note 3: The STE and RTE should be calibrated as a test group prior to use at each test frequency.

CHART 7 (Contd)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

Preparation

- 1 Adjust the STE as follows:

Impedance: 135 ohms, balanced

Frequency: For channel under test, per Table H

Power: -15.0 dBm (LMX-2)

-14.0 dBm (LMX-3)

- 2 Adjust the RTE as follows:

Impedance: 135 ohms, balanced

Frequency: Same as for STE in Step 1

Power: -52 dBm

- 3 For the VF channel under test, connect the DEM OUT jack to the MOD IN jack, via a 6P10() cord (Fig. 12).
- 4 At the LMX equipment, connect the STE to the CH BK IN (LMX-2) or GDF IN (LMX-3) jack [patch (1), Fig. 12].
- 5 At the LMX equipment, connect the RTE to the CH BK OUT ALT (LMX-2) or GDF OUT ALT (LMX-3) jack [patch (2), Fig. 12].
- 6 At the LMX equipment, measure the signal power at the CH BK OUT ALT or GDF OUT ALT jack.

Requirement: -51.6 to -52.4 dBm

TABLE H

TEST FREQUENCIES AT CH BK IN AND CH BK OUT ALT (LMX-2) OR
GDF IN AND GDF OUT ALT (LMX-3) JACKS

| CHAN NO. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------------|-----|-----|----|----|----|----|----|----|----|----|----|----|
| TEST FREQ (kHz) | 107 | 103 | 99 | 95 | 91 | 87 | 83 | 79 | 75 | 71 | 67 | 63 |

CHART 7 (Contd)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

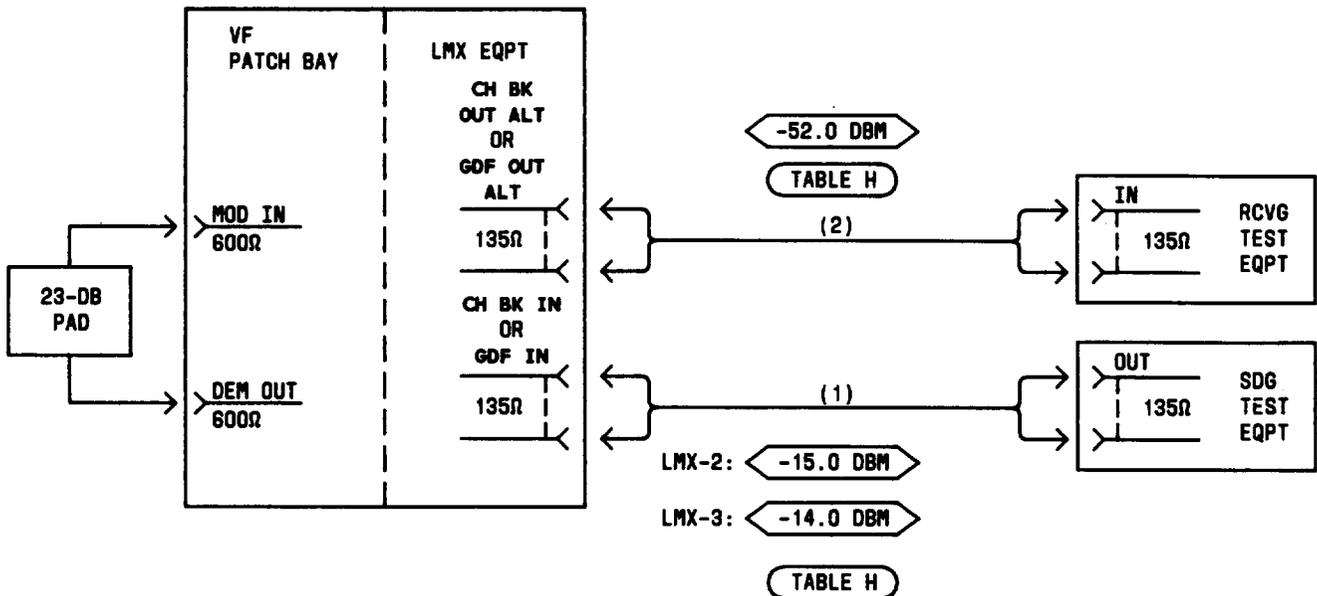


Fig. 12—Patching Diagram—Preparation

- 7 If the requirement of Step 6 is *not* met, adjust the corresponding channel GAIN ADJ control (on the VF patch bay) to obtain -52.0 dBm.
- 8 Remove the 6P10() cord from the MOD IN/DEM OUT jacks (connected in Step 3).
- 9 Repeat applicable Steps 1 through 8 for all other VF channels to be tested.

Intrachannel Crosstalk

- 10 At the LMX equipment, adjust the STE as follows:

Impedance: 135 ohms, balanced

Frequency: For channel under test, per Table H

Power: -5.0 dBm (LMX-2)

-4.0 dBm (LMX-3)

CHART 7 (Contd)

| STEP | PROCEDURE |
|------|---|
| 11 | <p>At the LMX equipment, adjust the RTE as follows:</p> <p>Impedance: 135 ohms, balanced</p> <p>Frequency: Same as for STE in Step 10</p> <p>Power: -97.6 dBm</p> |
| 12 | Insert 262B plugs in the MOD IN and DEM OUT jacks for the channel under test (Fig. 13). |
| 13 | At the LMX equipment, measure the signal power at the CH BK OUT ALT or GDF OUT ALT jack. |
| | <p>Requirement: -97.6 dBm or less (-98 dBm is less)</p> |

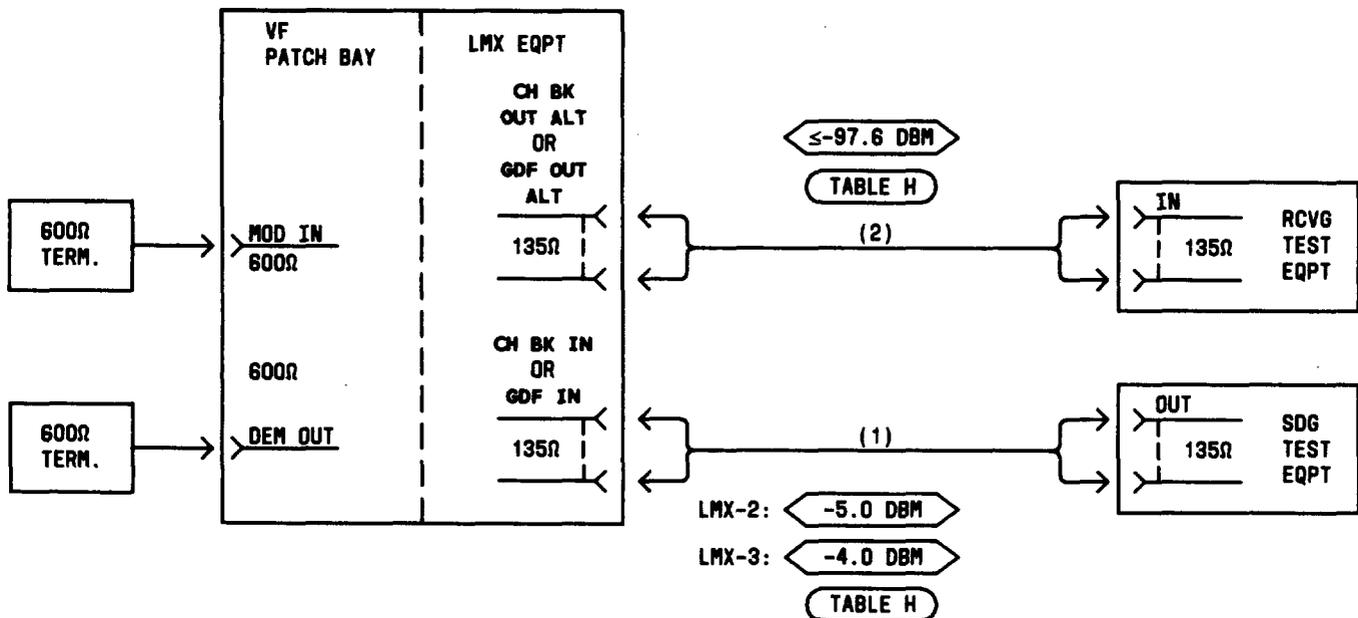


Fig. 13—Patching Diagram—Intrachannel Crosstalk Test

- 14 Remove the 262B plugs from the MOD IN and DEM OUT jacks (inserted in Step 12).
- 15 Repeat applicable Steps 10 through 14 for all other channels to be tested.

CHART 7 (Contd)

| STEP | PROCEDURE |
|------|--|
| 16 | <p data-bbox="316 451 1088 480">If the requirement of Step 13 was <i>not</i> met for some channels,</p> <ol style="list-style-type: none"><li data-bbox="349 514 1485 598">(a) Observe whether or not the type 561 channel filter associated with all channels having excessive intrachannel crosstalk has a star imprinted between, and slightly to the left of, Terminals 2 and 3 of the filter.<li data-bbox="349 630 1485 1648">(b) If any filter does <i>not</i> have a star imprint, replace it with a starred unit as follows:<ol style="list-style-type: none"><li data-bbox="381 682 1485 745">(1) Unsolder all leads connected to Terminals 1 and 2 of all unstarred filters; then, cut these leads back to the point where they enter the cable form.<li data-bbox="381 777 1485 892">(2) Unsolder the three pairs of twisted leads connected to Terminals 1 and 2 of the RCVG NET; then, unsolder the pair that connects to the ED-50077-30 pad assembly and remove this pair from the cable form. Cut back the other two pairs to the point where they enter the cable form.<li data-bbox="381 924 1485 987">(3) Unsolder the pair of leads connected to Terminals 5 and 6 of the RCVG HY; then, unsolder this pair from the ED-50077-30 pad assembly and remove it from the cable form.<li data-bbox="381 1018 1485 1081">(4) Remove all filters not having a star imprint and replace each with the type having a star imprint.<li data-bbox="381 1113 1485 1291">(5) Connect and solder a length of 24-gauge, twisted-pair wire from Terminals 1 and 2 of the RCVG NET to Terminals 1 and 2 of each of the 12 channel filters in the bank. Connect Terminals 1 and 2 of the last filter in the string to Terminals 1 and 2 of the RCVG NET to form a closed loop as shown in Fig. 14. <i>Be sure that all No. 1 terminals in the loop are connected to one lead of the pair and all No. 2 terminals are connected to the other lead.</i><li data-bbox="381 1323 1485 1648">(6) Complete the D3 wiring illustrated in Fig. 14 by connecting:<ol style="list-style-type: none"><li data-bbox="430 1375 1485 1438">(a) Terminals 1 and 2 of the RCVG NET to Terminals 3 and 5 of the ED-50077-30 pad assembly.<li data-bbox="430 1470 1485 1533">(b) Terminals 1 and 2 of the pad assembly to Terminals 5 and 6 of the RCVG HY. Form the leads and tape as shown in Fig. 14.<li data-bbox="430 1564 1226 1596">(c) Repeat from Step 1 for all channels in the bank under test.<li data-bbox="430 1606 1226 1648">(d) Repeat Charts 1 through 6 for the channel bank under test. |
| 17 | Remove patches (1) and (2), Fig. 13. |
| 18 | Repeat applicable Steps 1 through 17 for all other channel banks to be tested. |

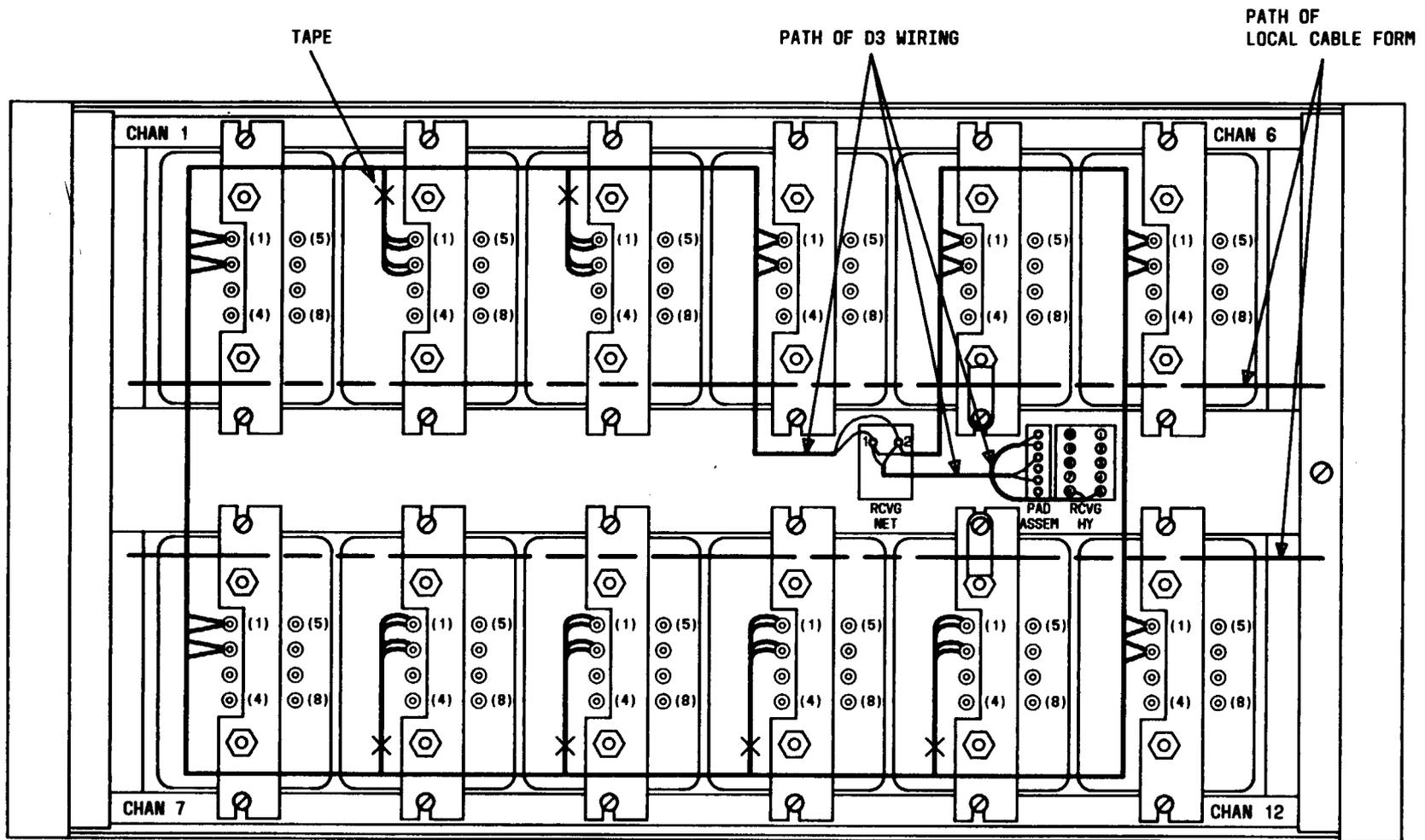


Fig. 14—Path of Receiving High-Frequency Leads in A5 Channel Bank (Banks Manufactured After October 1, 1961)

CHART 8

TURNOVER TEST

For proper channel bank operation, the signal at the two output ports of the channel bank hybrid must be in-phase (no turnover). This test ensures that the phase will be correct.

APPARATUS:

Receiving Test Equipment (RTE) (Section 356-010-500):

Frequency: 104.08 kHz

Power: -62 dBm

Impedance: 135 ohms, balanced

3P20B Cords (for 135-ohm patches)

323A Plugs (135-ohm terminations)

Multiple Jack Assembly (balanced)

STEP

PROCEDURE

Caution: *Patch cords must be oriented properly (knurled side of plugs at either the top or left) to avoid error in this test.*

At LMX-2 equipment:

- 1 Adjust the RTE as follows:
 - Impedance: 135 ohms, balanced
 - Frequency: 104.08 kHz
 - Power: -62.0 dBm
- 2 Connect the RTE (through a multiple jack) to the CH BK OUT jack of the channel bank under test [patches (1) and (2), Fig. 15].
- 3 Measure and record the signal power at the CH BK OUT jack (via the multiple jack).

Requirement: -62.0 dBm \pm 0.05 dB

Note: If the requirement is *not* met, refer to Chart 1.

CHART 8 (Contd)

STEP

PROCEDURE

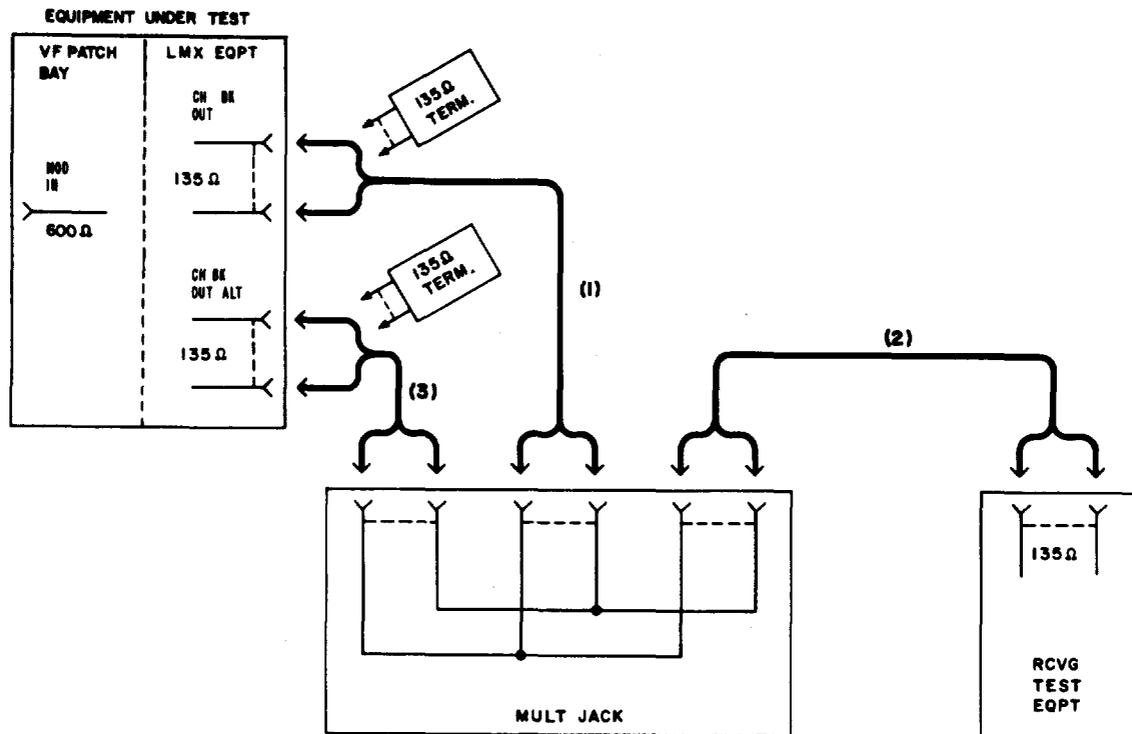


Fig. 15—Patching Diagram—Turnover Test

- 4 Insert a 323A plug (135-ohm termination) in the CH BK OUT ALT jack (Fig. 15).
- 5 Measure the signal power at the CH BK OUT jack (via the multiple jack).
Requirement: Not more than ± 1.5 dB from the value recorded in Step 3.
- 6 Remove the 323A plug inserted in Step 4.
- 7 Connect the RTE (through the multiple jack) to the CH BK OUT ALT jack [patch (2), Fig. 15]
- 8 Measure the signal power at the multiplied CH BK OUT and CH BK OUT ALT jacks (via the multiple jack).

CHART 8 (Contd)

| STEP | PROCEDURE |
|------|--|
| | Requirement: 0.5 to 4.0 dB <i>greater</i> than the value recorded in Step 3. (-61.5 dBm is 0.5 dB greater than -62.0 dBm.) |
| 9 | Remove patch (1), Fig. 15. |
| 10 | Insert a 323A plug (135-ohm termination) in the CH BK OUT jack (Fig. 15). |
| 11 | Measure the signal power at the CH BK OUT ALT jack (via the multiple jack). |
| | Requirement: Not more than ± 0.5 dB from the value recorded in Step 3. |
| 12 | If the requirements of Steps 5, 8, and 11 are <i>not</i> met, <ul style="list-style-type: none"><li data-bbox="354 945 1484 1008">(a) Check (and correct, if necessary) the wiring between the channel bank hybrid output ports and either the CH BK OUT or the CH BK OUT ALT jacks.<li data-bbox="354 1039 727 1066">(b) Remove patch (3), Fig. 15.<li data-bbox="354 1098 927 1125">(c) Remove the 323A plug inserted in Step 10.<li data-bbox="354 1157 756 1184">(d) Reconnect patch (1), Fig. 15.<li data-bbox="354 1215 727 1243">(e) Repeat Steps 3 through 11<li data-bbox="354 1274 922 1302">(f) Repeat applicable steps in Charts 1 and 4. |
| 13 | If the requirements of Steps 5, 8, and 11 <i>cannot</i> be met, replace the channel bank hybrid with a spare and repeat applicable Steps 1 through 12. |
| 14 | Remove patch (3) in Fig. 15 and the 323A plug inserted in Step 10. |
| 15 | Repeat applicable Steps 1 through 14 for all other channel banks to be tested. |
| 16 | Remove patch (2), Fig. 15. |