L MULTIPLEX TERMINALS

LMX-1

TRANSMITTING CIRCUITS

GROUP MODULATOR

OUT-OF-SERVICE GAIN TESTS

PURPOSE OF TESTS

(a) To measure and, if necessary, adjust the gain of each group modulator circuit in a group bank.

(b) To determine that each group modulator circuit meets its passband requirements.

REASON FOR ISSUE

Reorganization and update of the 356- division. The information in this section supersedes similiar information in Section 356-123-502. ***Equipment Test Lists are affected.***

SYNOPSIS (Fig. 5)

Each group modulator circuit in a group bank:

(a) Accepts the 60- to 108-kHz frequency band, at −42 dBm, from either a channel bank or a group connector

(b) Translates this signal into its allocated slot in the 312- to 552-kHz supergroup band.

This translated signal is combined with the translated signals from four other group modulator circuits. When options for in-service testing and adjusting are not provided, the combined signals are amplified by the intermediate amplifier and provided directly to the GR BANK OUT jacks at −25 dBm. When the options are provided, the combined signals, after amplification by the intermediate amplifier, are attenuated by a 21.7-dB pad, reamplified by a 231B (or F) amplifier, which has a nominal gain of 28 dB, and delivered to the GR BK OUT jacks at −25 dBm. Hence, a gain of 17 dB exists between the GR MOD IN jacks and the GR BANK (or GR BK) OUT jacks.

APPARATUS

Transmission Test Equipment. Refer to Section 356-010-500 and select, from available equipment, sending and receiving units having the following capabilities:

Sending test equipment capable of delivering, into 135-ohm circuits, signals between 60 kHz and 108 kHz at −42 dBm

APPARATUS (Cont):

Receiving test equipment capable of detecting, from 75-ohm circuits, signals between 312 kHz and 552 kHz at −25 dBm.

3P20B Cord

P2BJ Cords

STEP	PROCEDURE
	A. Gain Test—With Options For In-Service Testing And Adjusting
	Note: See Fig. 3 and 5 for location of jacks and controls used in this test.
1	Verify that the group equipment to be tested is out-of-service.
2	Prepare the RTE (receiving test equipment) for a 75-ohm terminated measurement of the translated output frequency (for the group being tested) at −25 dBm.
	Note: The translated frequencies are listed in Table A.

TABLE A

FREQUENCY TRANSLATION (GROUP MODULATORS)

INPUT FREQUENCY (KHZ)	OUTPUT FREQUENCY (KHZ) FOR GROUPS 1 THROUGH 5				
	1	2	3	4	5
104.08	315.92	363.92	411.92	459.92	507.92

3	Prepare the STE (sending test equipment) to deliver into 135 ohms, a 104.08-kHz signal at −42 dBm.
4	Connect the STE to the GR MOD IN jacks of the group being tested [patch (1), Fig. 1].
5	Connect the RTE to the GR BK OUT A jack [patch (2), Fig. 1].
6	Measure the level of the translated output frequency for each group (Table A).
	Requirement: −25 dBm ±0.05 dB
	Note: Repeat Steps 2 and 4 as required.
7	If the requirement of Step 6 is met for all groups, proceed to Step 32. If it is not met for all groups, proceed to Step 8.

STEP	PROCEDURE

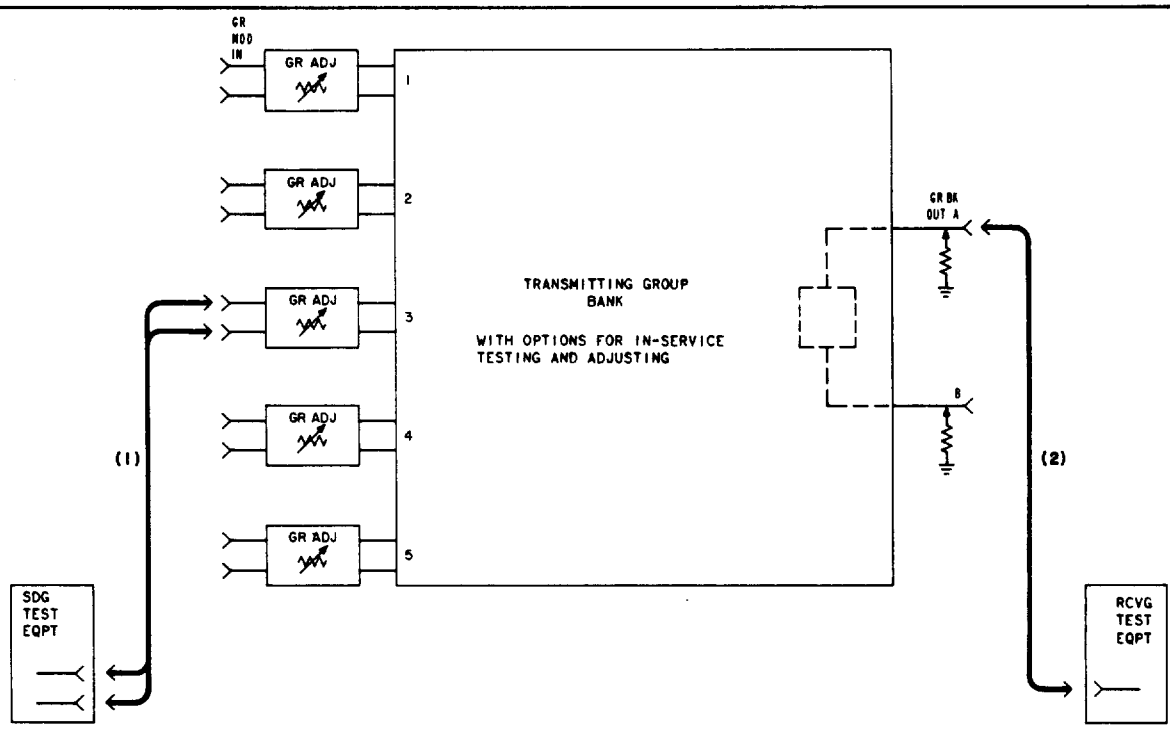


Fig. 1—Gain and Passband Tests—Test Connections

8 Locate the group equipment to be tested.

9 Remove the group modulator equipment covers.

10 Verify that PAD A (input pad) in each group modulator circuit has been adjusted (by strapping) for zero loss (Fig. 2).

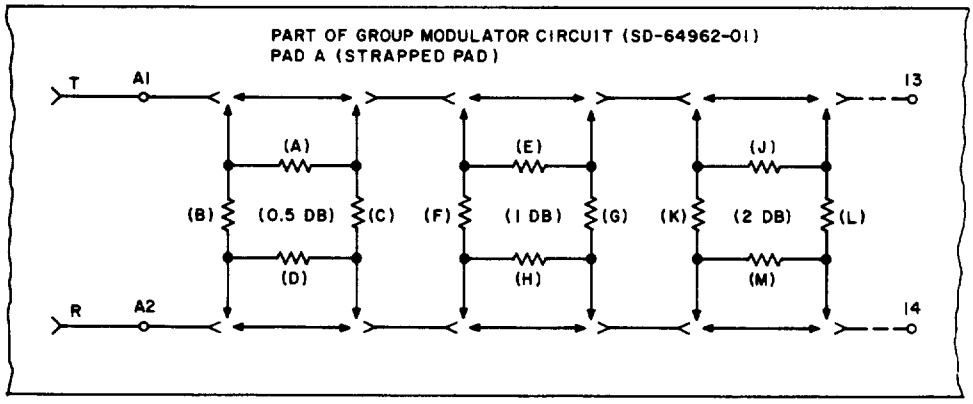


Fig. 2—Group Modulator—Input Pad A

STEP	PROCEDURE
11	Set the GR ADJ control (Fig. 3) for group 3 to its mechanical center.

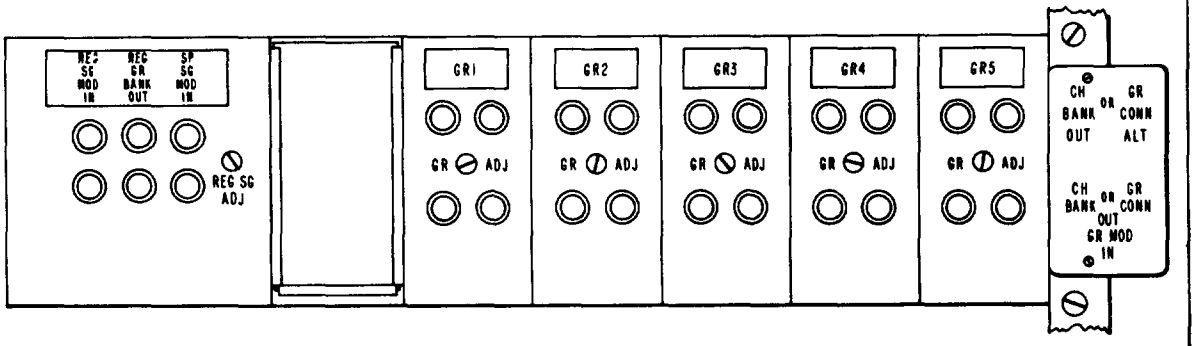


Fig. 3—Jack Strip at HFPB Showing Adjustment Controls

12	Adjust the RTE to measure 411.92 kHz.
13	Connect the STE to the GR MOD IN jacks of the group 3 modulator circuit [patch (1), Fig. 1].
14	Measure the level of the 411.92-kHz signal. ***Requirement:*** −25 dBm.
15	If the requirement of Step 14 is met, proceed to Step 18. If it is not met, adjust the GAIN control on the transmitting intermediate amplifier to meet the requirement. ***Note:*** The GAIN control is located in the equipment bay.
16	If the requirement of Step 14 cannot be met, proceed as follows to determine if the trouble is common to all group modulators. (a) Remove patch (1) in Fig. 1. (b) Select group modulator 1, 2, 4, or 5. (c) Connect the STE to the GR MOD IN jack of the selected group modulator. (d) Adjust the RTE to measure the translated 104.08-kHz signal for the selected group modulator. ***Note:*** The translated 104.08-kHz test signals are listed in Table A. (e) Measure the level of the signal. ***Requirement:*** −25 dBm.

STEP	PROCEDURE
	Note: It may be necessary to adjust the associated GR ADJ control to meet the requirement.
	(f) If the requirement of Step (e) is met, trouble exists in the GR 3 modulator circuit. Clear the trouble and repeat Steps 10 through 15.
	(g) If the requirement of Step (e) is not met, assume that trouble is common to all group modulators. Proceed to Step 17.
17	Perform the following steps until the trouble is cleared.
	(a) Reconnect the STE to the GR MOD IN jacks of the GR 3 modulator.
	(b) Readjust the RTE for 411.92 kHz.
	(c) Replace the 231( ) amplifier.
	(d) Perform tests on the intermediate amplifier as prescribed in Section 356-105-503.
18	Adjust the RTE to measure the translated 104.08-kHz signal for any one of the remaining group modulator circuits (GR 1, 2, 4, or 5).
	Note: The translated 104.08-kHz test signals are listed in Table A.
19	Connect the STE to the GR MOD IN jacks of the selected group.
20	Measure the level of the translated signal for the selected group.
	Requirement: −25 dBm.
21	If the requirement of Step 20 is met, proceed to Step 32. If it is not met, adjust the associated GR ADJ control to meet the requirement.
22	If the requirement of Step 20 cannot be met, trouble exists in the group modulator circuit.
23	Locate and clear the trouble and repeat Steps 20 and 21.
	B. Gain Test—Without Options For In-Service Testing And Adjusting
	Note: See Fig. 3 and 5 for location of jacks and controls used in this test.
24	Verify that the group equipment to be tested is out-of-service.
25	Prepare the RTE (receiving test equipment) for a 75-ohm terminated measurement of the translated output frequency (for the group being tested) at −25 dBm.
	Note: The translated frequencies are listed in Table A.
26	Prepare the STE (sending test equipment) to deliver into 135 ohms, a 104.08-kHz signal at −42 dBm.

STEP	PROCEDURE
27	Connect the STE to the GR MOD IN jack of the group being tested [patch (1), Fig. 4].
28	Connect the RTE to the GR BANK OUT A jack [patch (2), Fig. 4].

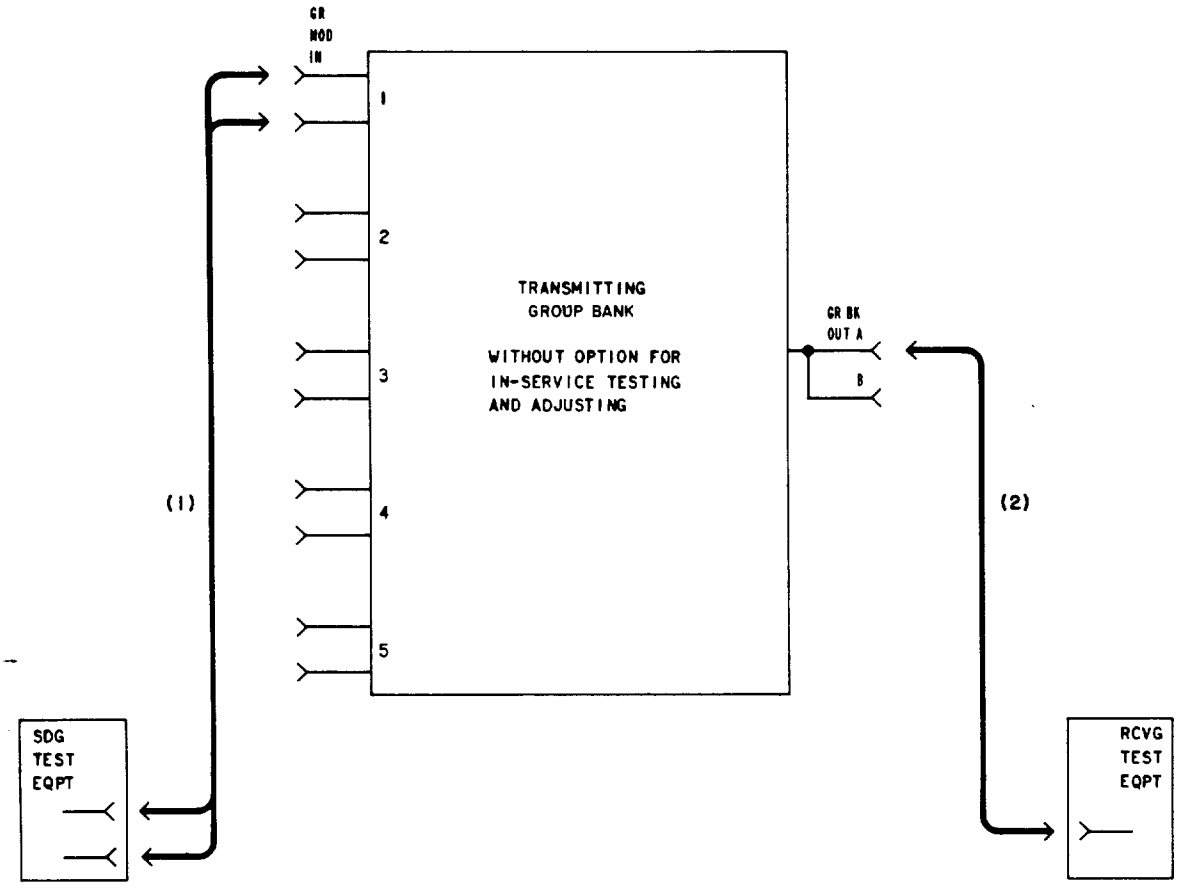


Fig. 4—Gain and Passband Tests—Test Connections

29	Measure the level of the translated output frequency for each group (Table A). ***Requirement:*** -25 dBm ± 0.3 dB ***Note:*** Repeat Steps 25 and 27 as required.
30	If the requirement of Step 29 is met for all groups, proceed to Step 32. If it is not met for all groups, proceed as follows. (a) Remove the group modulator equipment covers. (b) Set the GAIN control on the associated intermediate amplifier to its mechanical center. (c) Adjust, by strapping, the input pad (Fig. 2) in each group circuit to obtain the same level for each circuit as measured at the GR BANK OUT A jack.

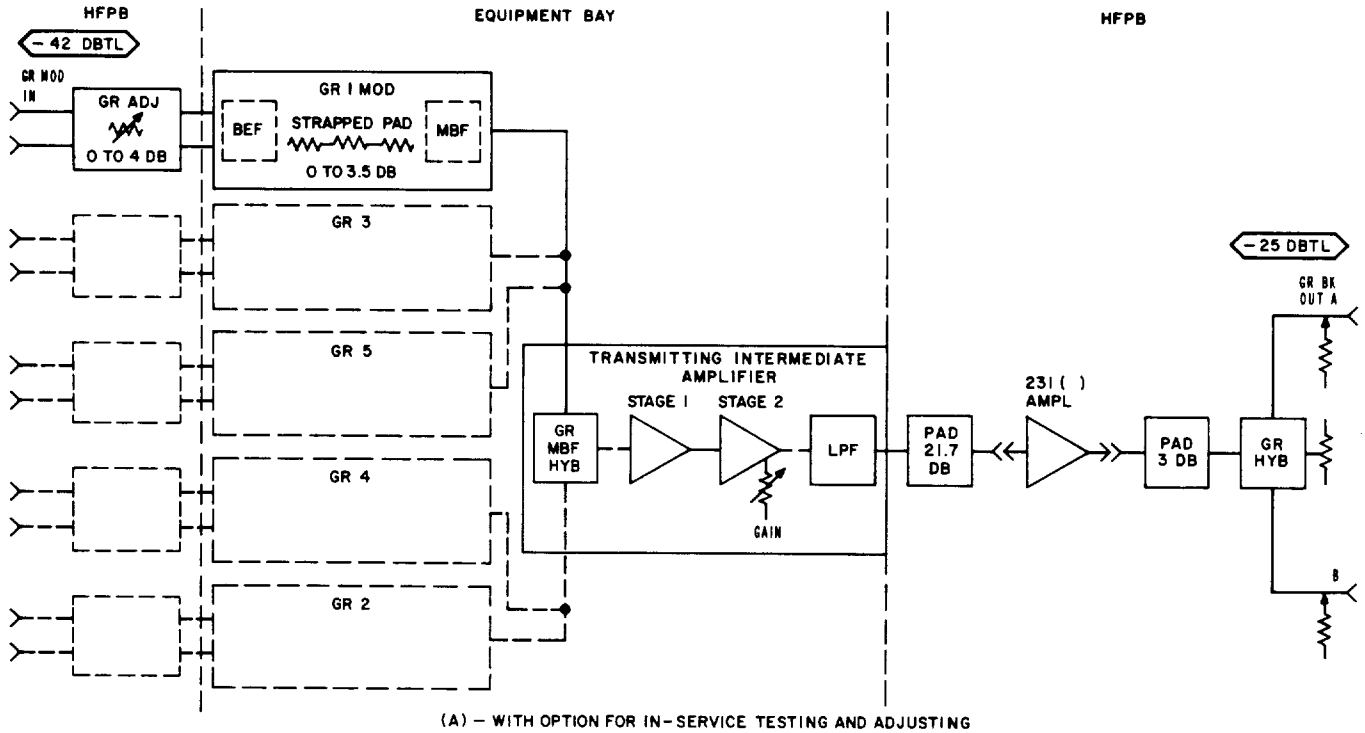
STEP	PROCEDURE
	(d) Adjust the GAIN control on the associated intermediate amplifier. ***Requirement:*** −25 dBm ±0.3 dB
31	If the requirement of Step 30(d) is met, proceed to Step 32. If it is not met, (a) For all groups: Perform tests in Section 356-105-503 and repeat this test. (b) For 4 groups or less: Trouble is indicated in the individual group circuits. Locate and clear the trouble and repeat Steps 29 and 30.
	C. Passband Test
32	Adjust the RTE to measure the translated 95-kHz signal for the group modulator circuit being tested. ***Note:*** All translated test signals are listed in Table B.

TABLE B
FREQUENCY TRANSLATION (GROUP MODULATORS)

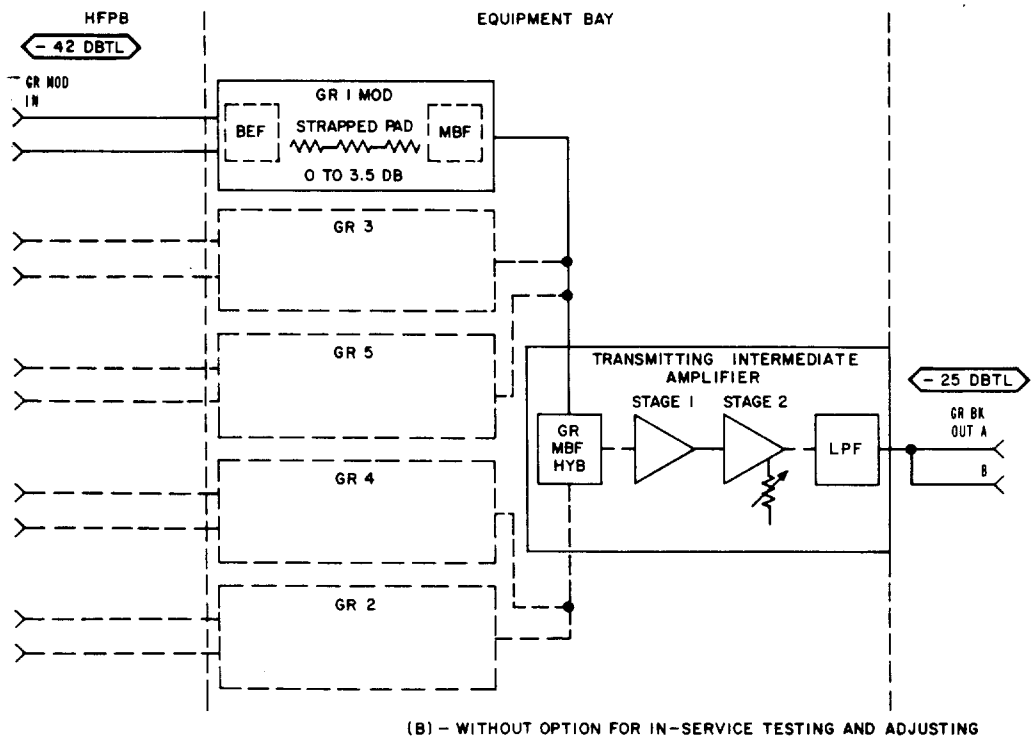
INPUT TEST FREQUENCY (KHZ)	OUTPUT TEST FREQUENCY (KHZ) FOR GROUPS 1 THROUGH 5				
	1	2	3	4	5
63	357	405	453	501	549
95	325	373	421	469	517
107	313	361	409	457	505

33	Adjust the STE to deliver 95 kHz at −42 dBm.
34	Measure and record the level of the translated 95-kHz signal.
35	Adjust the RTE to measure the translated 63-kHz signal.
36	Adjust the STE to deliver 63 kHz.
37	Measure the translated 63-kHz signal. ***Requirement:*** Within −0.5 dB to +0.5 dB of the value recorded in Step 34.
38	Adjust the RTE to measure the translated 107-kHz signal.
39	Adjust the STE to deliver 107 kHz.

STEP	PROCEDURE
40	Measure the translated 107-kHz signal. ***Requirement:*** Within −0.7 dB to +0.5 dB of the value recorded in Step 34.
41	Repeat Steps 32 through 40 for each of the remaining group modulator circuits in the group bank.
42	Remove patches (1) and (2) in Fig. 1 or 4.
43	Replace the covers removed for testing.
44	Restore service to normal.



(A) – WITH OPTION FOR IN-SERVICE TESTING AND ADJUSTING



(B) – WITHOUT OPTION FOR IN-SERVICE TESTING AND ADJUSTING

Fig. 5—LMX-1 Transmitting Group Bank—Block Diagram