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**L MULTIPLEX TERMINALS**  
**LMX-1**  
**TRANSMITTING CIRCUITS**  
**GROUP AND SUPERGROUP MODULATORS**  
**IN-SERVICE TEST**

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The purpose of this test is to measure and, if necessary, to adjust the gain of each group and supergroup modulator circuit so that all group pilots are the same level ( $-63.4$  dBm) at the supergroup bank out test (SG BK OUT TST) jack, or regular supergroup modulators out (SG MODS OUT) jack.

*Caution: Modulators for groups assigned to N3—L junctions must be tested only on an out-of-service basis (Section 356-105-502). Testing on an out-of-service basis is necessary to prevent the 104-kHz (N3) carrier frequency from interfering with the 104.08-kHz group pilot.*

This section is reissued to change the procedure for adjusting the levels of groups and supergroups to correct any nonlinearity of group pilots caused by characteristics of the supergroup bandpass filters and the gain/frequency slope of office cabling. A caution note regarding groups assigned to N3—L junctions is also added. Due to extensive changes, marginal arrows have been omitted. *Equipment Test Lists are affected.*

This procedure includes material previously contained in Section 356-110-501 which has been canceled.

Each group modulator circuit in a group bank:

- (a) Accepts the 60- to 108-kHz frequency band, at  $-42$  dBm, from either the output of a channel bank or 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. After amplification by the transmitting intermediate amplifier, the combined signals are passed by a low-pass filter, attenuated by a 21.7-dB pad, reamplified, and delivered to the GR BK OUT jacks at approximately  $-25$  dBm. Hence, a gain of approximately 17 dB exists between the GR MOD IN jacks and the GR BK OUT jacks.

Each supergroup modulator circuit in a supergroup bank:

- (a) Accepts the basic supergroup frequency band (312 to 552 kHz), at approximately  $-25$  dBm, from either a group bank or supergroup connector.
- (b) Translates the supergroup frequency band into its proper frequency allocation for further modulation or for transmission over a carrier or radio facility.

The translated output of each supergroup modulator circuit, combined with the output of all other supergroup modulator circuits in the supergroup bank, is delivered to the supergroup bank output

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jacks at  $-43.4$  dBm. Hence, a loss of 18.4 dB exists between the SG MOD IN jacks and the SG BK OUT TST jack or regular supergroup modulators out (REG SG MODS OUT) jack.

**Note:** Supergroup pilots are 20 dB below message transmission level.

### METHOD OF TESTING

- (1) Measure all group 1 pilots (315.92 kHz) at GR BK OUT jack (multiple) (Fig. 1 and 2) and adjust to  $-45$  dBm with the GAIN control on the transmitting intermediate amplifiers.
- (2) Measure all translated supergroup pilots at the SG BK OUT TST jack (or REG SG MODS OUT jack) and, if necessary, adjust to  $-63.4$  dBm  $\pm 0.3$  dB with the SG ADJ control if provided (if not provided make out-of-service test per Section 356-110-502).
- (3) Measure all translated pilots for groups 2 through 5 (Table C) at the SG BK OUT TST jack (or REG SG MODS OUT jack). Adjust each group pilot to  $-63.4$  dBm  $\pm 0.3$  dB with the GR ADJ control (if equipped with strapped PADS, perform out-of-service tests per Section 356-105-502).

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### APPARATUS

The tests in this section require suitable transmission test equipment. Refer to Section 356-010-500 and select, from available equipment, a receiving unit having the following capabilities:

**Receiving Test Equipment (RTE)** capable of detecting, from 75-ohm circuits, signals between 104 and 3080 kHz at powers of  $-45.0$  to  $-83.4$  dBm.

**P2BJ cords** as required.

**Note:** Before proceeding with this test, check group pilot secondary distribution circuits for the correct level of the buses. (See Section 356-011-502.)

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### CHART 1

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#### STEP

#### PROCEDURE

**Caution:** *Modulators for groups assigned to N3-L junctions must be tested only on an out-of-service basis* (Section 356-105-502). *Testing on an out-of-service basis is necessary to prevent the 104-kHz (N3) carrier frequency from interfering with the 104.08 kHz group pilot.*

**Note:** Some jack strips in LMX-1 HFPB are equipped with GR ADJ and REG SG ADJ controls; others are equipped with either GR ADJ controls only or with strappable pads for setting the levels of group pilots and supergroup outputs. This section covers procedures for only those jack strips equipped with GR ADJ and REG SG ADJ controls (Fig. 1). Those equipped otherwise must be tested on an out-of-service basis.

- 1 Prepare RTE for 135-ohm measurement.
- 2 Connect RTE to CH BANK OUT or GR CONN ALT jack. (Fig. 1).

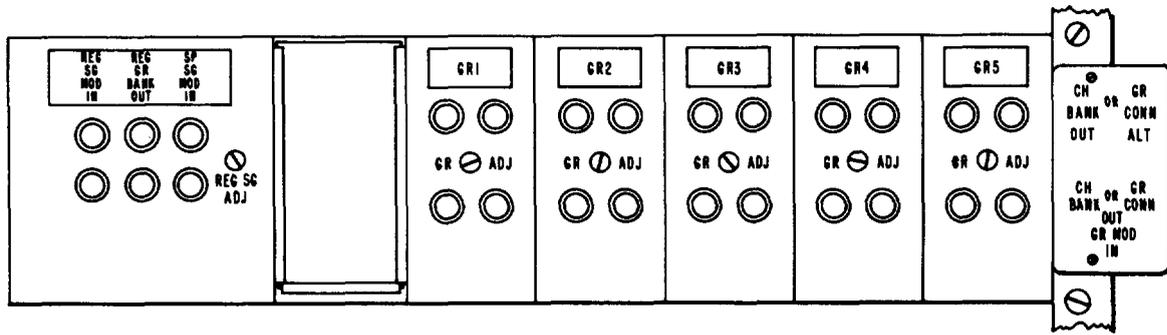
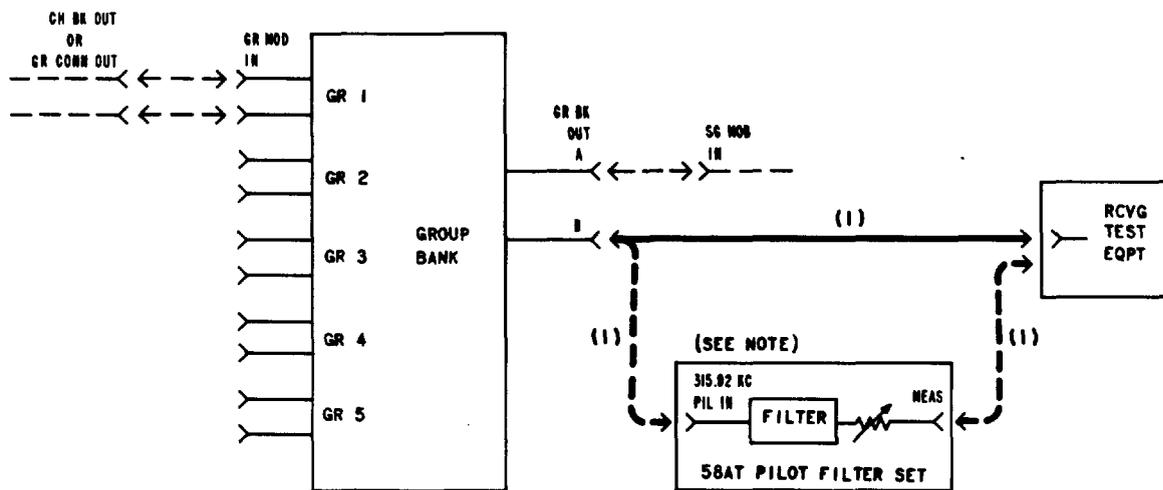


Fig. 1—Jack Strip at HFPB Showing Adjustment Controls



NOTE:  
IF THE SELECTED RECEIVING TEST EQUIPMENT IS OTHER THAN THE 49A MEASURING SYSTEM, THE 58AT PILOT FILTER SET MUST BE USED WHEN MEASURING GROUP 1.

Fig. 2—In-Service Gain Test—Test Connections

CHART 1 (Cont)

STEP	PROCEDURE
3	Measure all five group pilots at CH BANK OUT or GR CONN ALT jack (104.08 kHz).  <b>Requirement:</b> $-62.0 \text{ dBm} \pm 0.05 \text{ dB}$ $-72.0 \text{ dBm} \pm 0.05 \text{ dB}$ if 58AT pilot filter is used
4	If requirement is not met, adjust level of group pilots with ADJ control on pilot insertion units mounted in the top of the HFPB to meet requirement for terminal groups only. For through groups, check loss of group connector.

## CHART 1, (Cont)

STEP	PROCEDURE
5	Prepare RTE for 75-ohm bridged measurement (or terminated measurement if the transmitting intermediate amplifier has been modified from the tube type to the transistor type).
6	Connect RTE to REG GR BK OUT jack (75-ohm) and measure the group 1 pilot in each supergroup. (See TABLE A for group pilot frequency.)  <i>Requirement:</i> $-45.0 \text{ dBm} \pm 0.05 \text{ dB}$ $-55.0 \text{ dBm} \pm 0.05 \text{ dB}$ if 58AT pilot filter is used
7	If requirement is not met, adjust the GR ADJ (Fig. 1) control to meet the requirement. If the GR ADJ control will not bring measurement into requirement, make out-of-service gain test of the transmitting intermediate amplifier per Section 356-105-503 and out-of-service test of group modulators per Section 356-105-502.
8	Prepare RTE for a bridged 75-ohm measurement of SG pilots (or terminated measurement if SG BK OUT TST jack is provided).  <i>Caution: In Step 9 connect the patch cord to test equipment before making connection to SG BK OUT TST jack or REG SG MODS OUT jack (Fig. 3).</i>
9	Connect RTE to SG MODS OUT (multiple) (Fig. 3) or SG BK OUT B for bridged measurement of SG pilots. Terminated measurements may be made if SG BK OUT TST jack is provided on HFPB. (See Table B for SG pilots.)
10	Measure the level of each SG pilot and, if necessary, adjust REG SG ADJ (Fig. 1) control to meet requirements.  <i>Note:</i> For SPARE SG, the adjust control is located in the spare supergroup equipment bay.  <i>Requirement:</i> $-63.4 \text{ dBm} \pm 0.3 \text{ dB}$ $-83.4 \text{ dBm} \pm 0.3 \text{ dB}$ if 58AT filter and 9A attenuator are used for measurement of supergroup 2.
11	If requirements cannot be met, make out-of-service tests per Section 356-110-502.
12	With RTE connected as in Step 9, measure the power of groups 2 through 5 of each supergroup. (See TABLE C for translated group pilot frequencies.)  <i>Requirement:</i> $-63.4 \text{ dBm} \pm 0.3 \text{ dB}$ $-83.4 \text{ dBm} \pm 0.3 \text{ dB}$ if 58AT filter and 9A attenuator are used for measurement of supergroup 2
13	If requirement is not met, adjust the group pilot power with the GR ADJ control to meet requirement. (See Fig. 1.)

TABLE A  
 FREQUENCY TRANSLATION (GROUP MODULATORS)

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

\* Use the 58AT pilot-filter set for group 1 if the selected test equipment is other than the 49A Measuring System.

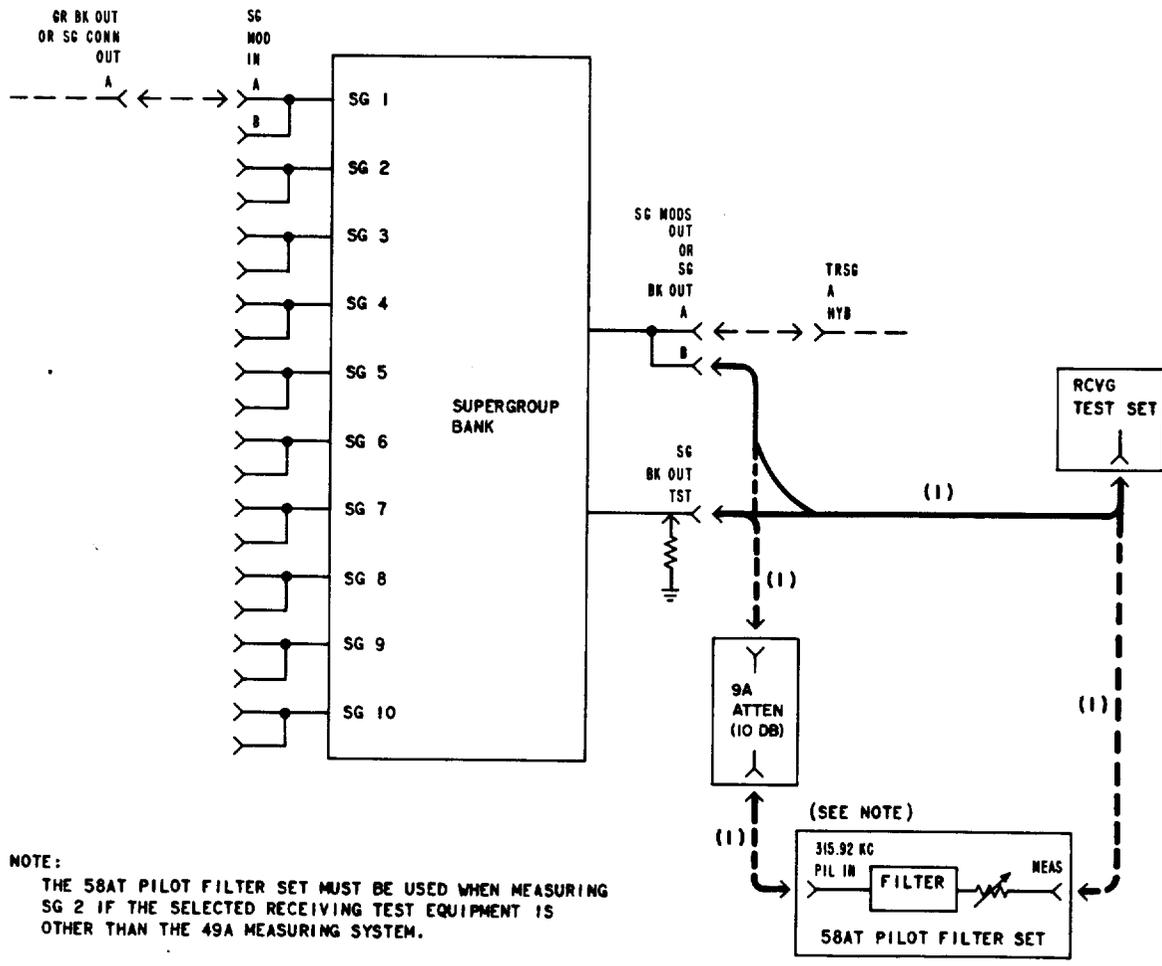


Fig. 3—In-Service Loss Test—Test Connections

**TABLE B**  
**FREQUENCY TRANSLATION (SUPERGROUP PILOTS)**

INPUT PILOT FREQUENCY (KHZ)	OUTPUT PILOT FREQUENCY (KHZ) FOR SUPERGROUPS 1 - 10				
	1*	2 and 12	3 and 13	4 and 14	5 and 15
315.92	296.08 (304.08)†	315.92	800.08	1048.08	1296.08
	6 and 16	7 and 17	8 and 18	9	10
315.92	1544.08	1792.08	2040.08	2175.92	2784.08

\* The carrier frequency of LMX-1 SG1 may be 612 or 620 kHz.  
† The frequency in parentheses applies where the LMX-1 SG1 allocation is 68 to 308 kHz (620-kHz carrier frequency).

**TABLE C**  
**GROUP PILOT FREQUENCIES FOR  
LMX-1 SUPERGROUPS**

SG	G1	GR2	GR3	GR4	GR5
1 with 612 kHz carrier	296.08	248.08	200.08	152.08	104.08
1 with 620 kHz carrier	304.08	256.08	208.08	160.08	112.08
2 and 12	315.92	363.92	411.92	459.92	507.92
3 and 13	800.08	752.08	704.08	656.08	608.08
4 and 14	1048.08	1000.08	952.08	904.08	856.08
5 and 15	1296.08	1248.08	1200.08	1152.08	1104.08
6 and 16	1544.08	1496.08	1448.08	1400.08	1352.08
7 and 17	1792.08	1744.08	1696.08	1648.08	1600.08
8 and 18	2040.08	1992.08	1944.08	1896.08	1848.08
9	2175.92	2223.92	2271.92	2319.92	2367.92
10	2784.08	2736.08	2688.08	2640.08	2592.08

**CHART 1 (Cont)**

STEP	PROCEDURE
14	If GR ADJ control will not bring group pilot within requirement, make out-of-service test of transmitting intermediate amplifier per Section 356-105-503 and supergroup modulator out-of-service loss test per Section 356-110-502.
15	Remove RTE connection from HFPB.