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**L MULTIPLEX TERMINALS**  
**LMX-2**  
**MOBILE CARRIER SUPPLY**  
**OPERATION AND MAINTENANCE**

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This section provides operation and test procedures for the mobile carrier supply (Fig. 1).

All steps in Charts 1, 2, and 3 must be performed in sequence.

**Caution:** *The use of the mobile carrier supply (MCS) must be understood before attempting to use it on in-service transmission circuits. Incorrect use of the apparatus may cause service interruptions.*

**Note:** All personnel must also have an understanding of the following:

- (a) The regular and spare transmission circuits involved
- (b) The local LMX-2 bays and jack designations.

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**APPARATUS:**

**Transmission Measuring Set (TMS)** capable of detecting, from 75-ohm unbalanced and 135-ohm balanced circuits, signals between 4 and 3396 kHz, with power between -20 and +20 dBm

**Volt-Ohm-Millammeter (VOM) KS-14510** or suitable voltmeter with a sensitivity of at least 20,000 ohms per volt.

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

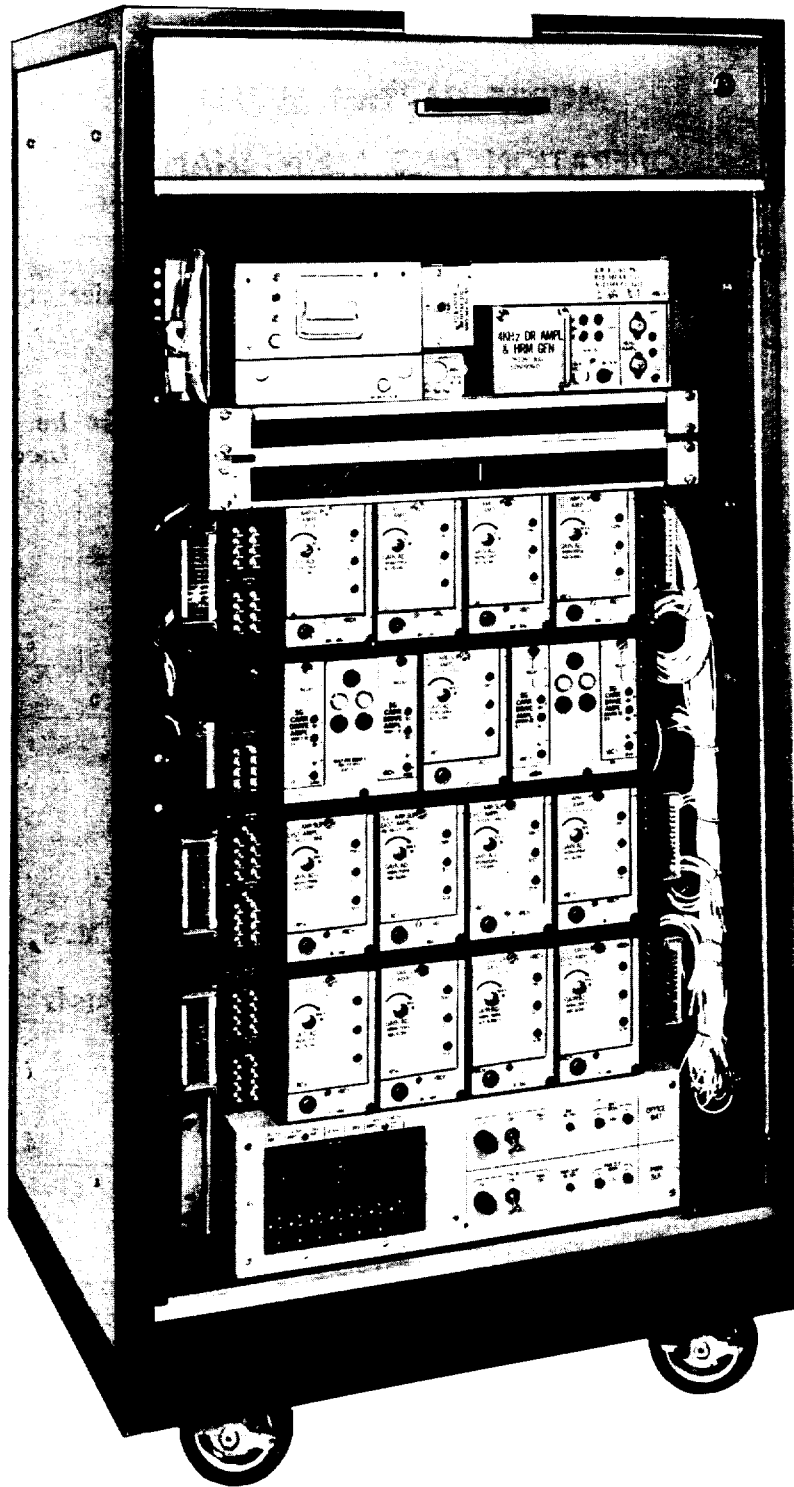


Fig. 1—Mobile Carrier Supply

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**APPARATUS (Cont)**

**-24 Vdc Power Cord** locally fabricated per Fig. 2

**Cord 3P20C**

**Cable Assembly P-43R350**

**Cable Assembly 841615016 through 841615180** (furnished with mobile carrier supply)

**Extractor Tool KS-21279 L1.**

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**CHART 1**

**PREPARE MOBILE CARRIER SUPPLY FOR USE**

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**STEP**

**PROCEDURE**

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**Power Connections**

- 1 Use the power cord supplied with the MCS to connect from AC IN on the back of the power supply panel to any 117 Vac, single phase, convenience outlet.

**Note:** A dc power input can be provided for redundancy, if desired. A power cord to connect the MCS to -24 Vdc office battery must be fabricated by the user. The required connector which mates with the DC IN chassis connector is furnished. Because of differences in office layouts, the provision of the dc power cord is left to local office personnel. Figure 2 shows the cord-to-connector wiring.

- 2 Connect from DC IN on the back of the power supply to a **spare** source of -24 Vdc **filtered** office battery with a minimum capacity of 9.5 amperes.

**Note:** If the system is not carrying data, and a filtered source is not available, then an unfiltered supply may be used. An alternate source equivalent to -24 Vdc filtered office battery would be two 12-volt automotive batteries connected in series.

**Power Turn-On and Adjustments**

- 3 Operate 115V AC switch on PWR SUP panel to ON.

**Requirement:** 115V AC PWR ON and PWR SUP IN SRV lamps light.

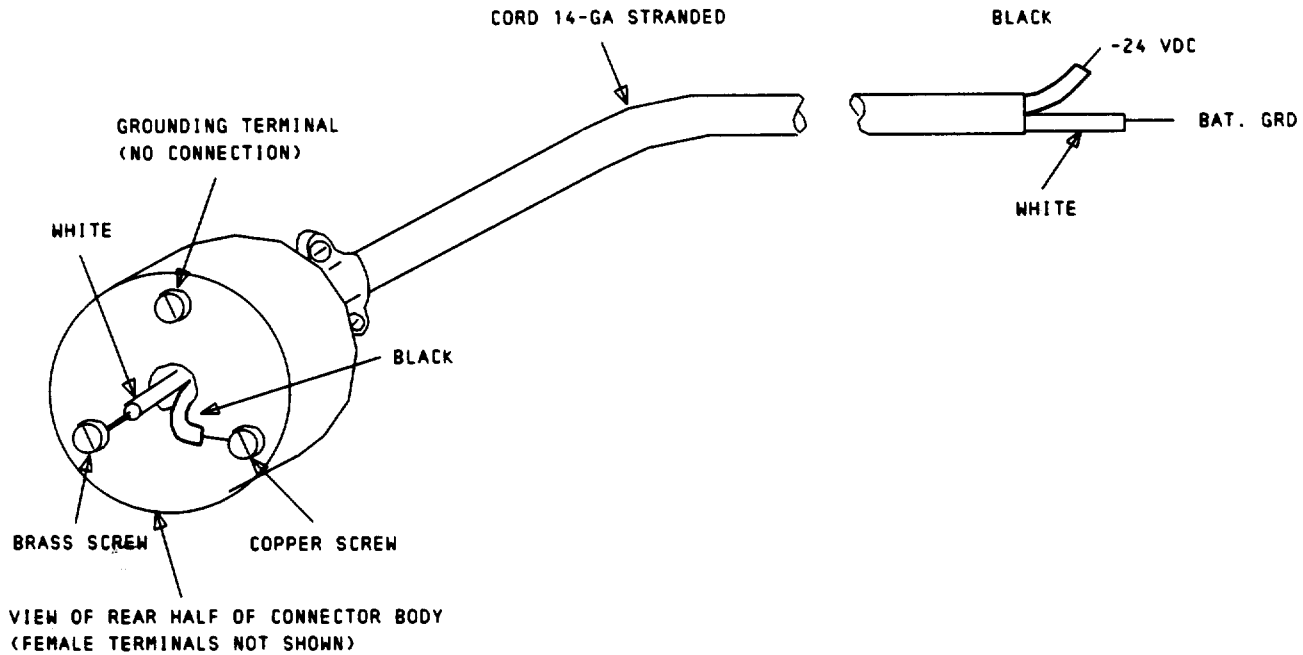
- 4 Prepare the VOM to measure 27 Vdc.

- 5 Connect the VOM to the PWR SUP MON + and -27 V pin jacks on the PWR SUP panel.

- 6 Use a screwdriver at the back of the PWR SUP to adjust the voltage to 27 Vdc.

## CHART 1 (Cont)

STEP	PROCEDURE
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**Fig. 2—Wiring Power Cord for -24 Vdc to Mobile Carrier Supply**

7 Remove the VOM leads from the PWR SUP MON + and -27V pin jacks.

8 Operate -24V FLT switch for OFFICE BAT to ON.

**Requirement:** -24V FLT PWR ON lamp lights.

9 Connect the VOM to the BAT MON + and - pin jacks.

**Requirement:**  $24 \pm 2$  Vdc

**Note:** If the voltage is not within this range, the supply is unacceptable for use with the MCS.

10 Remove the VOM leads from the MCS.

## CHART 1 (Cont)

STEP	PROCEDURE
	<b>Connection to 4-kHz Drive Source</b>
11	Use the TMS to make a 135-ohm measurement of the 4-kHz signal power from the 4-kHz office primary frequency supply.  <i>Condition 1:</i> Power at jack in LMX-2 bay jack mounting strip is -25 dBm $\pm$ 2 dB. Proceed to Step 12.  <i>Condition 2:</i> Power at primary frequency supply is +1 dBm $\pm$ 1 dB. Proceed to Step 15.  <i>Note:</i> If Condition 1 or Condition 2 is not met, the 4-kHz primary frequency supply output power should be corrected per Section 354-102-506 (PFS-2A) or Section 354-105-506 (PFS-2B).  <i>For Condition 1,</i>
12	Patch from the 4 KC OUT jack on the MISC jack mounting in the LMX-2 transmitting bay to the 4 kHz PRE AMPL IN jack in the lower MCS jack strip with a 3P20C cord.
13	Measure the power at the 4 kHz PRE AMPL OUT jack on the MCS, and adjust the 227F amplifier on the MCS alarm and control panel to obtain a power of +1.0 dBm.
14	Remove the TMS cord from the 4 kHz PRE AMPL OUT jack.  <i>For Condition 2,</i>
15	Patch from the 4 KC OUT jack on the MISC jack mounting in the LMX-2 transmitting bay to the 4 kHz DR AMPL IN jack in the lower MCS jack strip with a 3P20C cord.
	<b>Supergroup Carrier Supply Power Measurements</b>
16	Prepare the TMS to measure +19 dBm.  <i>Caution:</i> When using a power meter, prepare to measure a power as high as +25 dBm to avoid damage to the power meter.
17	Make patch (1) in Fig. 3.
18	Remove the 75-ohm termination from the tap on the distribution bus for supergroup 3 or 13 in the MCS.  <i>Note:</i> All taps on the distribution bus should be properly terminated.
19	Make patch (2) in Fig. 3 to the tap from which the termination was removed.

CHART 1 (Cont)

STEP PROCEDURE

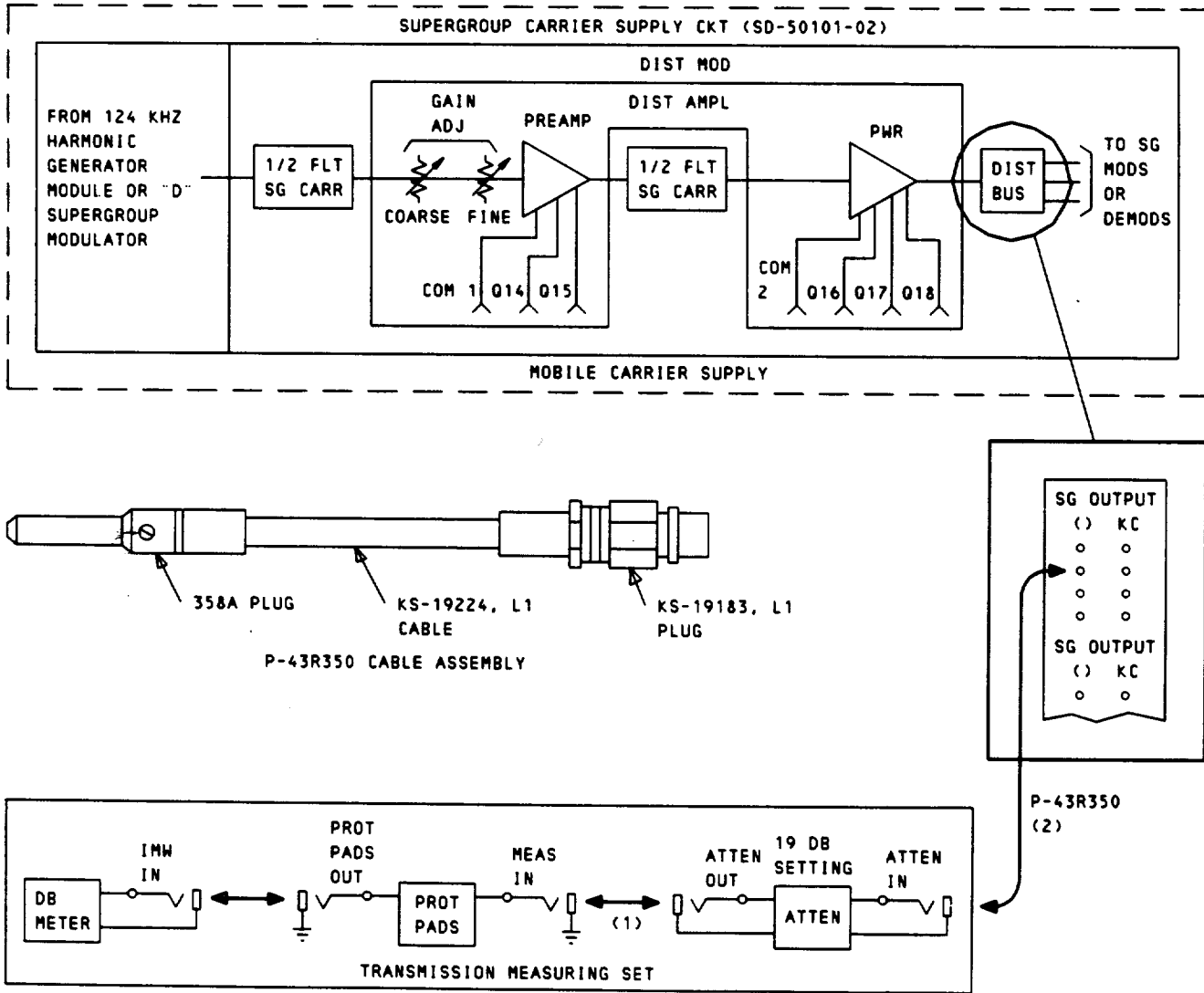


Fig. 3—Supergroup Carrier Supply Power Measurement

- 20 Measure the supergroup carrier power.
- 21 Adjust the GAIN ADJ control(s) on the supergroup carrier supply distribution amplifier for supergroup 3 or 13 to obtain a power of +19 dBm.
- 22 Remove patch (2) from the supergroup distribution bus.

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**CHART 1 (Cont)**


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<b>STEP</b>	<b>PROCEDURE</b>
23	Replace the 75-ohm termination on the open tap.
24	Repeat Steps 18 through 23 for the remaining supergroups.
	<b>Supergroup Carrier Supply Phase Jitter Measurement</b>
	<b>Important:</b> If the system is carrying data, the following step must be performed before proceeding with the use of the MCS on in-service equipment.
25	Determine that the PWR SUP IN SRV lamp on the MCS power supply panel is lighted.
26	Perform the phase jitter tests specified in Section 356-022-504 or 356-270-506.
	<b>Note:</b> Some parts of these sections are not applicable to the MCS. However, phase jitter limits are given as well as suggestions for correcting trouble, if encountered. Do not use the MCS on systems carrying data until phase jitter requirements are met. If the MCS is being powered from an unfiltered office battery supply, supergroup carrier supply phase jitter requirements may not be met. The use of the MSC under such conditions may require that data circuits be rerouted. Office battery should be used only as an emergency backup for the ac input power to the MCS.
	<b>Office Alarm Option</b>
	<b>Note:</b> Minor and major office alarms can be made to operate concurrently with the alarms which have been included in the MCS. If the extra alarm feature is wanted, perform Steps 27 through 29.
27	Locate the four-point terminal block TB-1 located on the rear of the power supply panel.
28	Remove the front cover from the carrier alarm panel J68858AL which is located on one of the LMX-2 transmitting bays.
29	Use the four leads furnished with the MCS to make the connections shown in Fig. 4.
	<b>Note:</b> The leads have spade terminals on one end and test clips on the other end.
	<b>Alarm Tests</b>
30	Depress ALM TST key on the lower MCS jack strip.
	<b>Requirement 1:</b> CF MJ and CF MN lamps light in MCS jack strip.
	<b>Requirement 2:</b> Audible and visual office alarms, if connected to the MCS, are activated.
31	Release the ALM TST key.

CHART 1 (Cont)

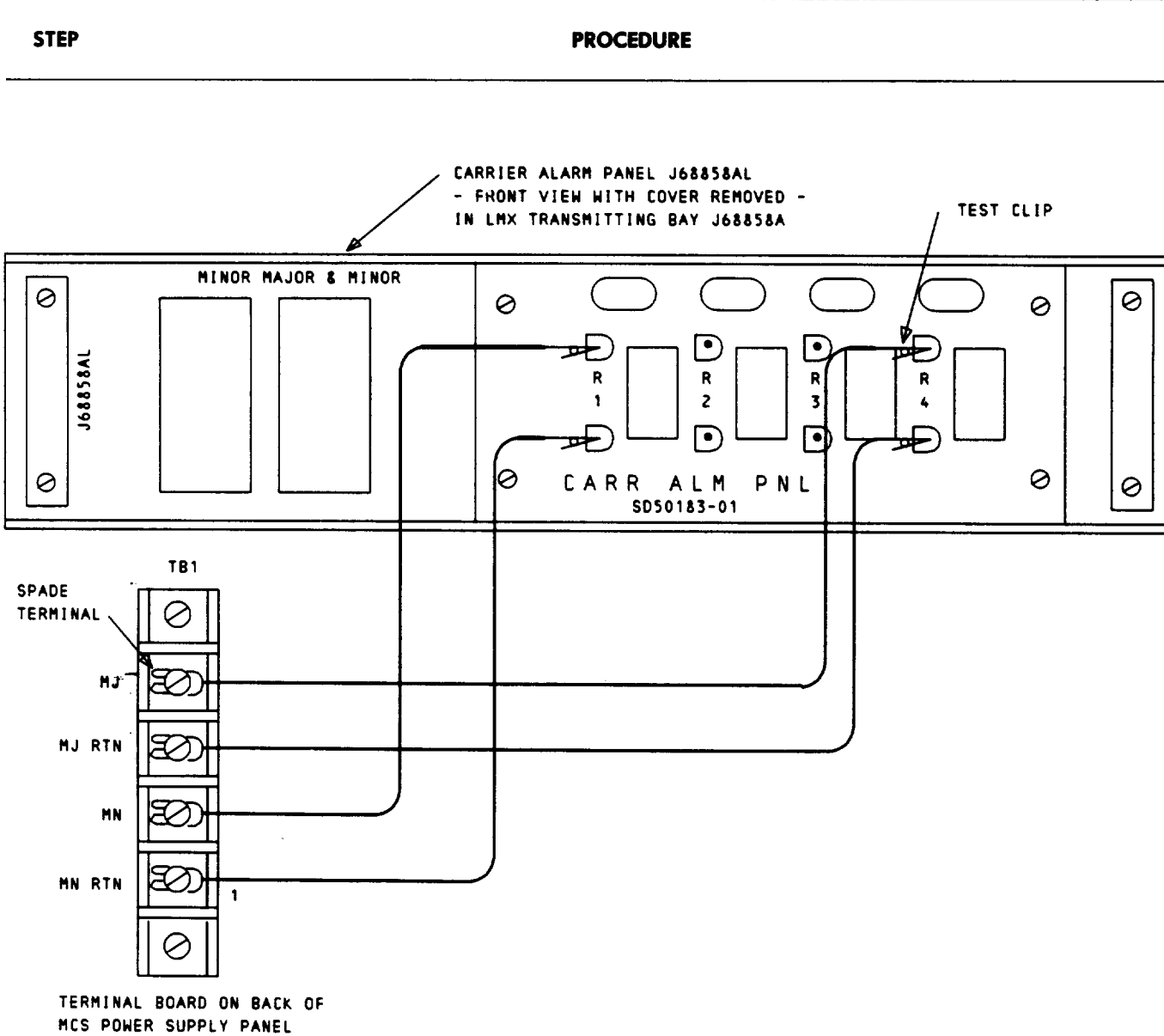


Fig. 4—Alarm Connections for Mobile Carrier Supply

32 Depress the ALM RST key on the lower MCS jack strip.

**Requirement 1:** CF MJ and CF MN lamps extinguished in MCS jack strip.

**Requirement 2:** Office alarms, if used, are deactivated.

33 Release the ALM RST key.



## CHART 2

## TRANSFER SERVICE FROM LMX-2 BAY SUPERGROUP CARRIER SUPPLY TO MCS

STEP	PROCEDURE
<b>Preparation</b>	
1	Prepare cable tags for each coaxial cord connected to the SG distribution buses on the in-service LMX-2 bay supergroup carrier supply.  <i>Note:</i> Each tag should be marked with the number of the jack to which the cord is connected.
2	Use electrical tape to cover exposed wire-wrap terminals at both sides of the four supergroup carrier supply shelves in the LMX bay.  <i>Note:</i> The covering of the exposed terminals is a preventive measure to avoid the accidental shorting of energized terminals at the supergroup carrier supply distribution buses.
3	Attach the marked tags to all the coaxial cords connected to the supergroup carrier supply distribution buses on the LMX-2 bay.
<b>Transferring Service from a Regular Supergroup Bank to a Spare Supergroup Bank</b>	
<i>Note:</i> Care must be exercised when connecting or disconnecting the mating miniature coaxial connectors which carry the supergroup carrier frequencies. An extractor tool KS-21279 L1 should be used.	
4	Release from service a regular transmitting supergroup bank and the associated regular receiving supergroup bank by patching transmission through the spare transmitting supergroup bank and spare receiving supergroup bank.  <i>Note:</i> Sections 356-210-300 and 356-215-300 provide the patching procedures.
<b>Transferring Supergroup Carrier Supply for Out-of-Service Regular Supergroup Bank to MCS</b>	
<i>Note:</i> Two taps on each supergroup distribution bus feed the modulator and demodulator of each associated supergroup of the regular transmitting supergroup bank and regular receiving supergroup bank taken out of service in Step 4.	
5	Record the jack designations of the two taps of each supergroup.
6	Locate the distribution bus on the MCS corresponding to the lowest numbered supergroup recorded in the previous step.
7	Remove the 75-ohm termination from the tap on the bus corresponding to the tap in the LMX-2 bay which feeds the modulator for that supergroup in the transmitting bay.

## CHART 2 (Cont)

STEP	PROCEDURE
8	Use one of the 9-conductor cables supplied with the MCS, and connect one end of the cable to the jack on the MCS from which the termination was removed in Step 7.  On the LMX-2 bay supergroup carrier supply,
9	Disconnect the coaxial cord from the jack bearing the same number as the MCS jack to which a connection was made in Step 8.  <i>Note:</i> The cord must have been previously tagged with the number of the jack to which it was connected.
10	Reset any alarms which are initiated.
11	Use the transmission measuring set with a P-43R350 cable assembly to measure the frequency and power at the free end of the coaxial cord which was connected to the MCS in Step 8. Then make the same measurements on the jack opened in Step 9.  <i>Note:</i> The powers measured at the end of the coaxial cord and at the jack must be +19 dBm $\pm$ 1 dB.
12	Connect a 75-ohm termination to the open jack on the LMX-2 bay supergroup carrier supply at which measurements were made in the previous step.
13	Make an end-to-end connection between the LMX-2 bay cord disconnected in Step 9 and the free end of the coaxial cord which was connected to the MCS in Step 8.
14	Repeat Steps 7 through 13 for the next supergroup in numerical order until all supergroups associated with the regular transmitting supergroup bank are completed.
15	Repeat Steps 7 through 14 for the regular receiving supergroup bank.
<b>Returning Service to Regular Supergroup Banks</b>	
16	Release from service the spare transmitting supergroup bank and spare receiving supergroup bank by patching transmission through the regular transmitting supergroup bank and the associated regular receiving supergroup bank.  <i>Note:</i> Refer to Sections 356-210-300 and 356-215-300.
17	Repeat Steps 4 through 16 for each transmitting and receiving supergroup bank in the system.

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**CHART 2 (Cont)**


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STEP	PROCEDURE
	<b>Transferring Supergroup Carrier Supply for Out-of-Service Spare Transmitting Supergroup Bank to MCS</b>
18	Transfer the supergroup carrier supply for the out-of-service spare transmitting supergroup bank to the MCS using the method given in Steps 5 through 14.
	<b>Verification of MCS Signal Powers</b>
19	Repeat the supergroup carrier supply power measurements in Steps 16 through 24 in Chart 1.
	<i>Note:</i> The taps on the MCS distribution buses at which the measurements are to be made are those remaining to be used for the spare receiving supergroup bank.
	<b>Transferring Supergroup Carrier Supply for Out-of-Service Spare Receiving Supergroup Bank to MCS</b>
20	Transfer the supergroup carrier supply for the out-of-service spare receiving supergroup bank to the MCS using the method given in Steps 5 through 13, and 15.

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**CHART 3****TRANSFER SERVICE FROM MCS TO LMX-2 BAY SUPERGROUP CARRIER SUPPLY**

STEP	PROCEDURE
	<b>Preliminary</b>
1	Verify that all alarm lamps are extinguished on the LMX-2 bay supergroup carrier supply.
2	Measure and adjust to +19 dBm, if required, the distribution bus levels on the LMX-2 bay supergroup carrier supply.
	<i>Note:</i> The procedure for supergroup carrier supply power measurements is given in Chart 1, Steps 16 through 24.
	<b>Transferring Supergroup Carrier Supply for Out-of-Service Spare Supergroup Banks from MCS to LMX-2 Bay</b>
	On the LMX-2 bay supergroup carrier supply,

## CHART 3 (Cont)

STEP	PROCEDURE
3	Remove the 75-ohm termination from the distribution bus tap corresponding to the tap on the MCS which is connected to the lowest numbered supergroup modulator in the transmitting bay.
4	Pull apart the two in-line connectors between the coaxial cord from the spare supergroup modulator (same supergroup number as in Step 3), and the mating MCS cord.
5	Reset any alarms which are initiated.
6	Connect the free end of the modulator cord to the tap on the LMX-2 bay supergroup carrier supply from which the 75-ohm termination was removed.  <i>Note:</i> Maintain jack connection corresponding to the tag on the cord end.
7	Connect a 75-ohm termination to the open tap on the MCS.
8	Repeat Steps 3 through 7 for the next supergroup in numerical order until all supergroups for the transmitting bay in the spare supergroup banks are transferred.
9	Transfer all the supergroups for the receiving bay using the procedure just completed for the transmitting bay.  <i>Note:</i> In Step 6, the modulator cord is a demodulator cord for the receiving bay.
<b>Transferring Service from Regular Supergroup Banks to Out-of-Service Spare Supergroup Banks</b>	
10	Release from service a regular transmitting supergroup bank by patching transmission through the spare transmitting supergroup bank.  <i>Note:</i> Refer to Sections 356-210-300 and 356-215-300.
11	Repeat Step 10 for the regular receiving supergroup bank.
<b>Transferring Supergroup Carrier Supply for Out-of-Service Regular Supergroup Banks from MCS to LMX-2 Bay</b>	
12	Repeat Steps 3 through 9 for the regular transmitting supergroup bank and regular receiving supergroup bank which were taken out of service in Steps 10 and 11.
<b>Returning Service to Regular Supergroup Banks</b>	
13	Release from service the spare transmitting supergroup bank by patching transmission through the regular transmitting supergroup bank which was taken out of service in Step 10.

## CHART 3 (Cont)

STEP	PROCEDURE
14	Repeat the previous step for the spare receiving supergroup bank.
15	Repeat Steps 10 through 14 for each pair of transmitting and receiving supergroup banks in the system.

## CHART 4

## TRANSFER GROUP PILOT SUPPLY FROM LMX-2 BAY TO MCS

STEP	PROCEDURE
<b>A. Transfer Group Pilot Supply to MCS</b>	
At LMX-2 bay,	
1	Verify that the BUS ON REG lamp associated with the 104.08-kHz pilot supply is lighted on the LMX-2 bay.
<b>Note:</b> Two generations of 104.08-kHz pilot supplies are used in LMX-2 equipment. The earlier List 1 pilot supply J68857S is shown in Fig. 5. The test jacks and two panel lamps for the pilot supply are located in carrier supply test panel J68857J-2 shown in Fig. 6. A later List 3 pilot supply, with the functions consolidated, is the 104.08-kHz pilot supply J68857S shown in Fig. 7.	
2	Use the TMS to make a 135-ohm power measurement at the 104.08-kHz OUT jack in the lower MCS jack mounting strip.
<b>Requirement:</b> 0 dBm.	
<b>Note:</b> If the requirement is not met, adjust the STAB control on the 104.08-kHz pilot generator in the MCS.	

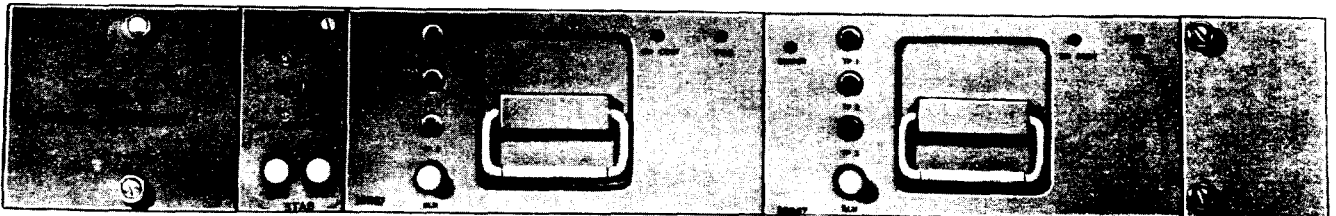


Fig. 5—104.08-kHz Pilot Supply J68857S List 1

CHART 4 (Cont)

STEP

PROCEDURE

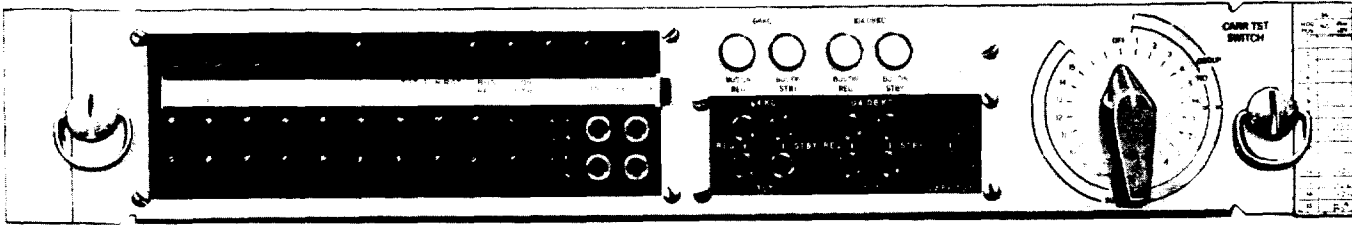


Fig. 6—Carrier Supply Test Panel J68857J

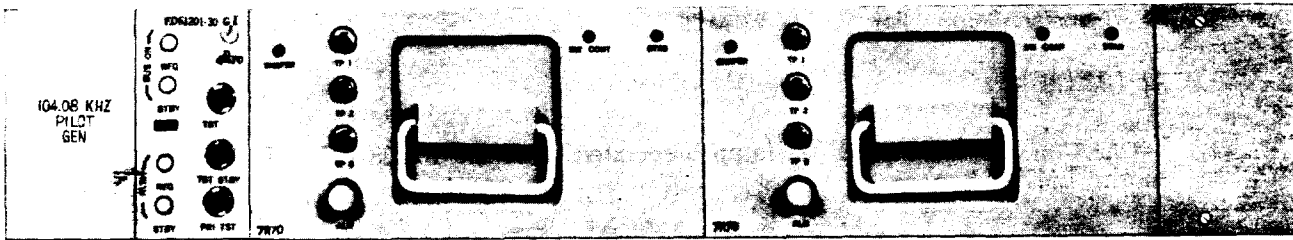


Fig. 7—104.08-kHz Pilot Supply J68857S List 3

- 3 Remove the TMS cord from the 104.08-kHz OUT jack on the MCS.
- 4 Choose a suitable patch cord which will reach from the 104.08-kHz OUT jack on the MCS to the 104.08-TST STBY jack on the carrier supply test panel J68857J-2, or the TST STBY jack on the List 3 104.08-kHz pilot supply J68857S, if so equipped.
- 5 Connect one end of the patch cord to the 104.08-kHz OUT jack on the MCS.
- 6 Measure the power at the free end of the patch cord with the TMS.

**Requirement:** 0.0 dBm  $\pm$ 0.2 dB

## CHART 4 (Cont)

STEP	PROCEDURE
7	Disconnect the patch cord from the TMS, and reconnect to the 104.08 TST STBY or the TST STBY jack in the LMX-2 bay.  <i>Note:</i> In some designs, alarms may be initiated when this step is performed.
8	Reset alarms which may have occurred.
9	Verify that all alarm lamps on the MCS are extinguished.
10	Disengage the STBY 104.08-kHz pilot supply module.  <i>Requirement:</i> STAB STBY lamp lights on pilot supply J68857S List 1 (Fig. 5) <i>or</i> ALM STBY lamp lights on pilot supply J68857S List 3 (Fig. 7).
11	Reset alarms.
12	Insert a 135-ohm termination plug into the 104.08-KC TST REG jacks on carrier supply test panel J68857J-2 if the LMX-2 bay is equipped with a List 1 104.08-kHz pilot supply J68857S. Insert a 135-ohm termination plug into the single TST jack if the bay is equipped with a List 3 pilot supply J68857S.  <i>Requirement:</i> BUS ON STBY lamp lights.  <i>Note:</i> The insertion of the 135-ohm termination plug forces the transfer switch to connect to the STBY pilot supply but, since the STBY supply has been disengaged, the 104.08-kHz pilot is actually being supplied from the MCS.
13	Reset alarms.
<b>B. Return Group Pilot Supply to LMX-2 Bay</b>	
14	Remove the 135-ohm termination plug which was inserted in Step 12.
15	Push the STBY 104.08-kHz pilot supply module into the fully seated position.
16	Remove the patch cord which fed the 104.08-kHz pilot from the MCS.
17	Reset any alarms which may have been initiated.

## CHART 5

## TRANSFER GROUP CARRIER SUPPLY DRIVE FROM LMX-2 BAY TO MCS

STEP	PROCEDURE
<b>A. Transfer of Group Carrier Supply Drive to MCS</b>	
1	Verify that no alarm lamps are lighted on the LMX-2 bay carrier or pilot supply panels.  <i>Note:</i> The green AMPL 2 STBY lamp should be lighted on the group carrier supply 12-kHz harmonic generator panel. If the lamp is not lighted, first check for a burned-out bulb. Perform Step 2, if required, to light the AMPL 2 STBY lamp.
2	Disengage and quickly reengage the 4-KC AMPL 2 module on intermediate frequency supply unit J68857N in LMX-2 bay.  <i>Note:</i> This step will simulate an amplifier 2 failure, and result in the transfer of service to amplifier 1.  <i>Requirement:</i> AMPL 2 STBY lamp is lighted.
3	Reset the office alarms.
4	Check that no alarm lamps are lighted on the LMX-2 bay carrier or pilot supply panels.
5	Use the procedure in Section 356-265-501 to measure the carrier power of the 12-kHz amplifier 2 in the group carrier supply 12-kHz harmonic generator panel J68857E on the LMX-2 bay.  <i>Requirement:</i> -2.0 dBm or greater (-1.0 dBm is greater)
6	Remove the 12-kHz restoration adapter from the alarm and control panel on the MCS.
7	Remove the 12-kHz AMPL 2 module from the LMX-2 bay and insert in the opening in the alarm and control panel vacated in the preceding step.
8	Reset the office alarms.
9	Patch from the TMS to the CARR TST 2 jack on the LMX-2 bay carrier supply test panel, and measure the carrier power.  <i>Requirement:</i> -2.0 dBm or greater
10	Remove the TMS cord from the CARR TST 2 jack.
11	Patch from the IN jack on the 12-kHz restoration adapter in the LMX-2 bay to the 12 kHz OUT jack on the MCS.



## CHART 5 (Cont)

STEP	PROCEDURE
	<p><b>Requirement 1:</b> AMPL 2 FAIL lamp on group carrier supply 12-kHz harmonic generator panel J68857E is extinguished.</p> <p><b>Requirement 2:</b> AMPL 2 STBY lamp on this panel is lighted.</p>
12	<p>Use the procedure in Section 356-265-501 to measure the carrier power of amplifier 2 at the LMX-2 bay carrier supply test panel.</p> <p><b>Requirement:</b> -2.0 dBm or greater</p>
13	<p>Remove AMPL 1 module from the J68857E panel.</p> <p><b>Requirement 1:</b> AMPL 1 FAIL lamp is lighted.</p> <p><b>Requirement 2:</b> AMPL 2 STBY lamp is extinguished.</p> <p><b>Requirement 3:</b> The carrier power of amplifier 2 continues to meet the requirement of -2.0 dBm or greater.</p>
14	<p>Reset office alarms.</p> <p><b>B. Return of Group Carrier Supply Drive to LMX-2 Bay</b></p>
15	<p>Engage the AMPL 1 module in the LMX-2 bay.</p> <p><b>Requirement 1:</b> AMPL 1 FAIL lamp is extinguished.</p> <p><b>Requirement 2:</b> AMPL 1 STBY lamp is lighted.</p>
16	<p>Use the procedure in Section 356-265-501 to measure the carrier power of amplifier 1 at the LMX-2 bay carrier supply test panel.</p> <p><b>Requirement:</b> -2.0 dBm or greater</p>
17	<p>Remove the plug from the IN jack on the 12-kHz restoration adapter in the LMX-2 bay.</p> <p><b>Note:</b> Also remove the other end of the cord from the MCS.</p> <p><b>Requirement 1:</b> AMPL 2 FAIL lamp is lighted.</p> <p><b>Requirement 2:</b> AMPL 1 STBY lamp is extinguished.</p>
18	<p>Reset office alarms.</p>
19	<p>Remove the 12-kHz restoration adapter from the LMX-2 bay, and insert in this place the amplifier 2 module from the MCS.</p>

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CHART 5 (Cont)

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STEP	PROCEDURE
	<p><i>Requirement 1:</i> AMPL 2 FAIL lamp is extinguished.</p> <p><i>Requirement 2:</i> AMPL 2 STBY lamp is lighted.</p>
20	<p>Use the procedure in Section 356-265-501 to measure the carrier power of amplifier 2 at the LMX-2 bay carrier supply test panel.</p> <p><i>Requirement:</i> -2.0 dBm or greater.</p>

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