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**L MULTIPLEX TERMINALS**  
**LMX-1**  
**CARRIER AND PILOT SUPPLY**  
**4-KHZ HARMONIC GENERATOR**  
**OUTPUT POWER TESTS**

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The purpose of these tests is to verify the correct output power of the 4-kHz harmonic generators (Fig. 1).

This section is reissued to change the type RTE and plugs listed in the APPARATUS list. *Equipment Test Lists are not affected.*

The 4-kHz harmonic generator (Fig. 1) receives its input directly from the primary frequency supply or, if provided, from the impedance transformation and 4-kHz distributing circuit. Odd harmonics of the 4-kHz base frequency are generated by a saturated core inductor circuit driven by the push-pull amplifier stage, AMP T and AMP R. Even harmonics are generated by a copper oxide bridge rectifier circuit in parallel with the saturated core inductor (Fig. 2). The odd harmonic output from the 4-kHz harmonic generator is distributed to the group and supergroup carrier supply circuits. A combination of odd and even harmonics is distributed to the channel carrier supply circuits.

Jacks designated TST ODD and TST EVEN are provided at the 4-kHz harmonic generators. These jacks are wired in series with each other and with the OUT jack on the associated 124-kHz harmonic generator located in the supergroup carrier supply bay. Insertion of plugs to open all three jacks allows the 4-kHz harmonic generator to function normally after it has been manually transferred out of service.

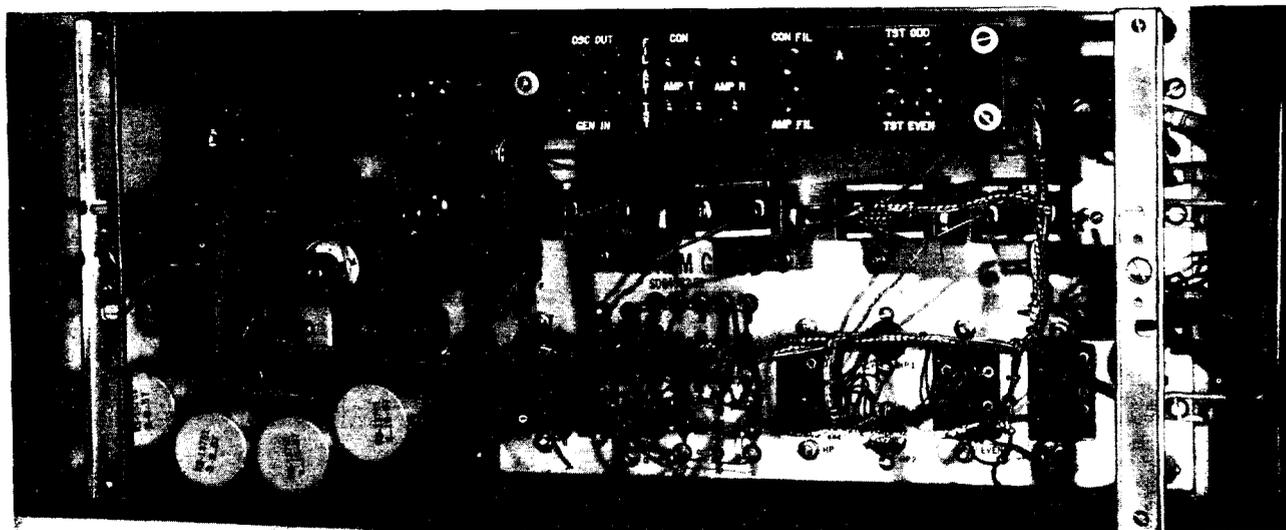


Fig. 1—J68775G 4-kHz Harmonic Generator—Front Cover Removed

**SECTION 356-152-501**

Jacks designated OSC OUT and GEN IN are also provided at the 4-kHz harmonic generator for emergency restoration purposes. The OSC OUT jack is used in these tests to verify the correct input from the 4-kHz supply circuits.

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**APPARATUS**

*Receiving Test Equipment* (RTE), per Section 356-010-500, having the following input characteristics:

Frequency: 4 kHz

Power: 0 dBm

Impedance: 135 ohms

*Wideband Power Meter (J64070B or equivalent)*

*305A Plug* (Chart 2 only)

*165C Plug*

*323A Plug*

*2P13B (135 ohm) Cords* as required

*30-dB Attenuator*

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**CHART 1**

**OUTPUT MEASUREMENT AT TST ODD AND TST EVEN JACKS**

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<b>STEP</b>	<b>PROCEDURE</b>
	<i>Caution: Transfer of the carrier supply will cause hits on data and telegraph service; therefore, the number of transfers should be limited to minimize service interruptions.</i>
1	Referring to Section 356-150-300, manually transfer the 4-kHz harmonic generator to be tested out of service.  <i>Caution: Do not proceed with this test until the green A lamp on the 4-kHz harmonic generator to be tested is lighted.</i>
2	Insert a 165C plug (to open the circuit) into the OUT jack of the 124-kHz harmonic generator associated with the 4-kHz harmonic generator to be tested.

## CHART 1 (Cont)

STEP	PROCEDURE
3	Insert a 323A 135-ohm plug (to open the circuit) into the TST EVEN jack of the 4-kHz harmonic generator to be tested.
4	Prepare the wideband power meter for a 135-ohm measurement at +30.0 dBm.  <i>Note:</i> If measurement is made with selective detector type RTE, the reading will be erroneous, indicating trouble where none exists.
5	Connect the wideband power meter through a suitable 30-dB attenuator to the TST ODD jack of the 4-kHz harmonic generator [patch (1), Fig. 2].
6	Measure the power at the TST ODD jack. (This is a reading of 4 kHz and its odd harmonics.)  <i>Requirement:</i> +29.5 dBm minimum  <i>Note:</i> The value of attenuation plus the meter indication is equal to the output power at the TST ODD jack.
7	Remove patch (1), Fig. 2.
8	If the requirement of Step 6 is met, proceed to Step 9. If it is not met, perform the trouble location procedures in Chart 2.
9	Remove the 323A 135-ohm plug from the TST EVEN jack of the 4-kHz harmonic generator and insert this plug (to open the circuit) into the TST ODD jack.
10	Connect the wideband power meter through a suitable 30-dB attenuator to the TST EVEN jack of the 4-kHz harmonic generator [patch (2), Fig. 2].
11	Measure the power at the TST EVEN jack. (This is a reading of 4 kHz and its even harmonics.)  <i>Requirement 1:</i> +29.5 dBm minimum  <i>Requirement 2:</i> The difference between the requirements of Step 6 and Step 11 should not be greater than 1.0 dB. If this requirement is not met, the bridge rectifier circuit is suspect. If the measurements made in Step 11 and Step 6 are both about the same but lower than +29.5 dBm, trouble in the amplifier or inductor circuits, or a low 4-kHz level from the primary frequency supply is indicated.  <i>Note:</i> The value of attenuation plus the meter indication is equal to the output power at the TST EVEN jack.
12	Remove patch (2), Fig. 2.
13	If the requirement of Step 11 is met, proceed to Step 14. If it is not met, perform trouble location procedures in Chart 2.

## CHART 1 (Cont)

STEP	PROCEDURE
14	Remove the 323A 135-ohm plug from the TST ODD jack of the 4-kHz harmonic generator.
15	Remove the open-circuit 165C plug from the OUT jack of the associated 124-kHz harmonic generator.
16	Referring to Section 356-150-300, manually transfer the 4-kHz harmonic generator to normal service.

## CHART 2

## TROUBLE LOCATION PROCEDURE

STEP	PROCEDURE
1	At the 104.08-kHz pilot supply unit, insert an open-circuit 305A plug into the TST jack (REG or STBY) adjacent to the BUS ON REG or BUS ON STBY lamp which is <i>not</i> lighted. This will prevent an accidental transfer of the 104.08-kHz pilot supply unit to the 4-kHz supply bus which is idle.
2	Prepare the wideband power meter for a 135-ohm measurement of 4 kHz at a level of approximately +1.0 dBm.
3	Connect the wideband power meter to the OSC OUT jack of the 4-kHz harmonic generator under test [patch (3), Fig. 2.]. (This is a reading of the 4-kHz output only.)
4	Measure the power at the OSC OUT jack.  <b>Requirement:</b> +1.0 dBm $\pm$ 3.0 dB
5	If the requirement of Step 4 is not met, proceed to Step 6. If it is met, perform the following steps: <ul style="list-style-type: none"> <li>(a) Remove the front panel cover of the 4-kHz harmonic generator under test (only if the green A lamp is lighted).</li> <li>(b) Test, and replace if necessary, electron tubes CON, AMP T, and AMP R per Section 356-150-501.</li> <li>(c) Repeat tests in Chart 1.</li> </ul>
6	Perform test of the J68775AU impedance transformation and 4-kHz distributing circuit in Section 356-151-503.

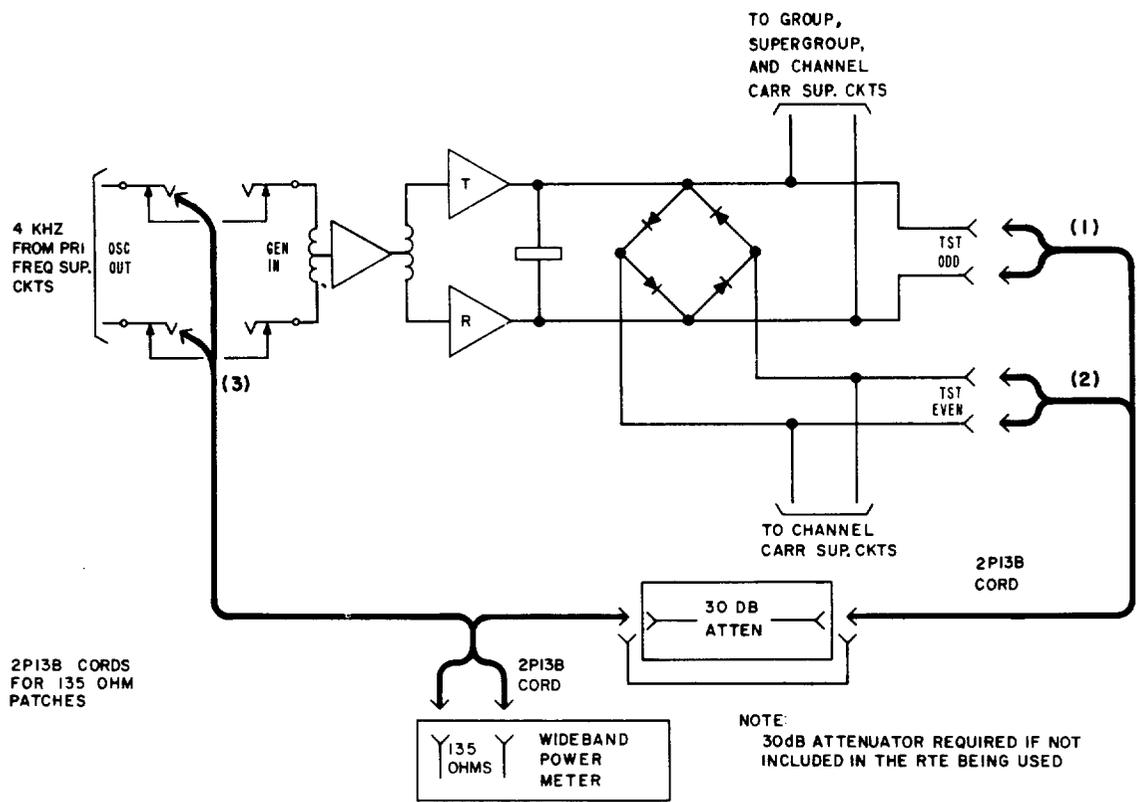


Fig. 2—J68775G 4-kHz Harmonic Generator-Measurement of Output Power