TD-3 MICROWAVE RADIO
J68386G AND J68386H TRANSMITTER-RECEIVER BAYS
COMMON EQUIPMENT TESTS
J68387R-( ) MICROWAVE GENERATOR

This section contains the procedures necessary to align spare generator units or to realign generators which have been in service but fail to meet the requirements of Section 411-502-500. Either the J68392A or the J68428A transmitter-receiver test set may be used for these procedures by reference to the proper figures within the section. This section is reissued to add a note in Chart 9, Step 13. This reissue does not affect the Equipment Test List.

The J68387R-1 List 1, 2, and 4 through 20 is shown in Fig. 1; the J68387R-2 List 81, 82 through 99, 132, or 133 is shown in Fig. 2; and the J68387R-2 List 81, 82 through 99, 134, or 135 is shown in Fig. 3.

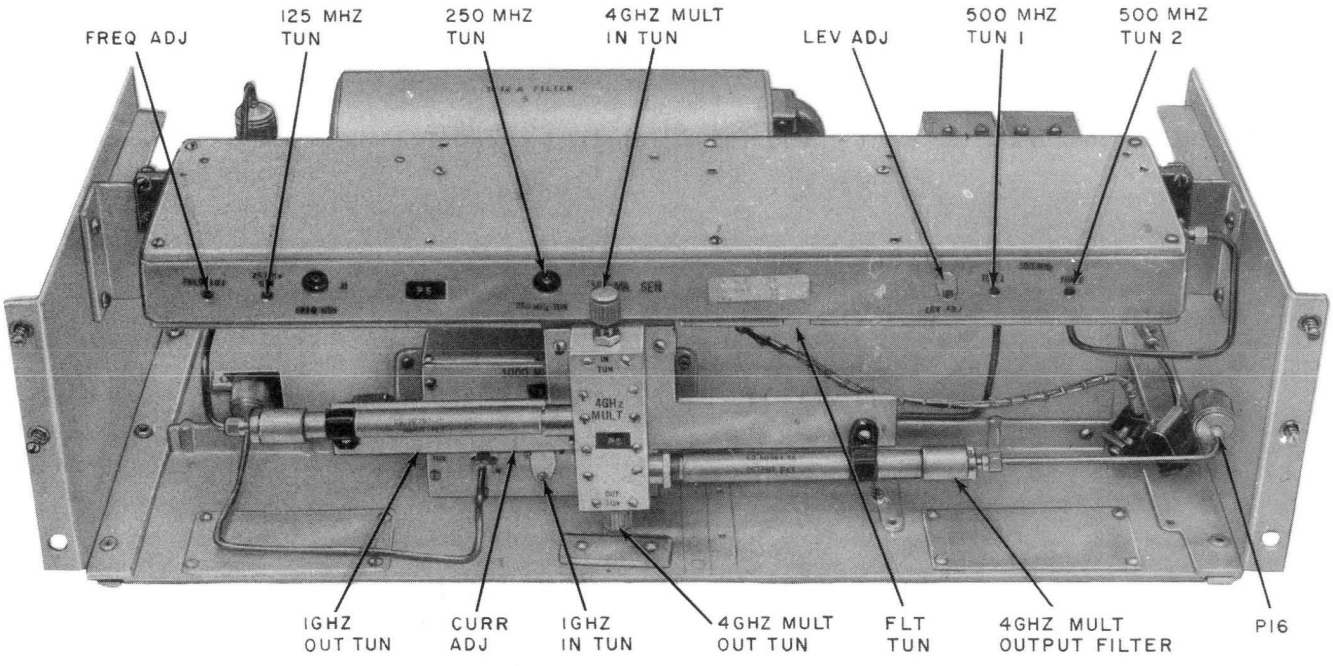

Fig. 1—J68387R-1 Microwave Generator

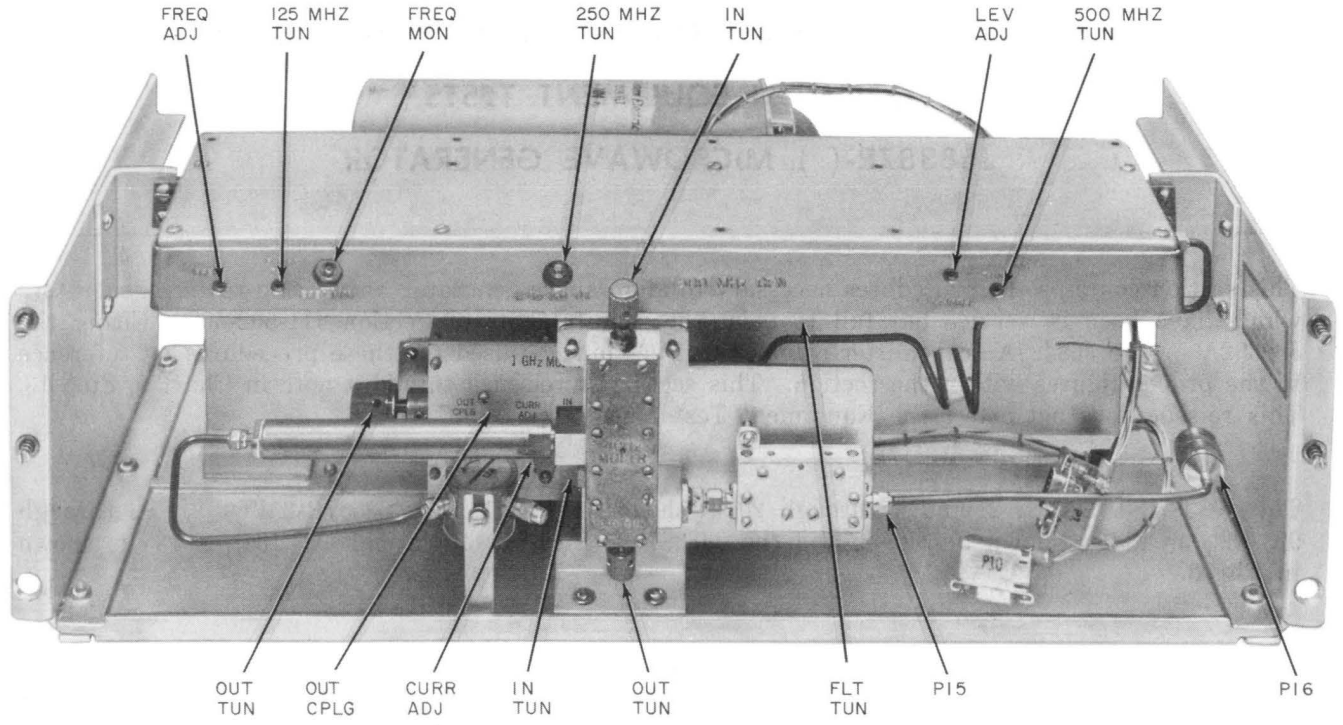

Fig. 2—J68387R-2 List 81, ( ), and 132 or List 81, ( ), and 133 Microwave Generators

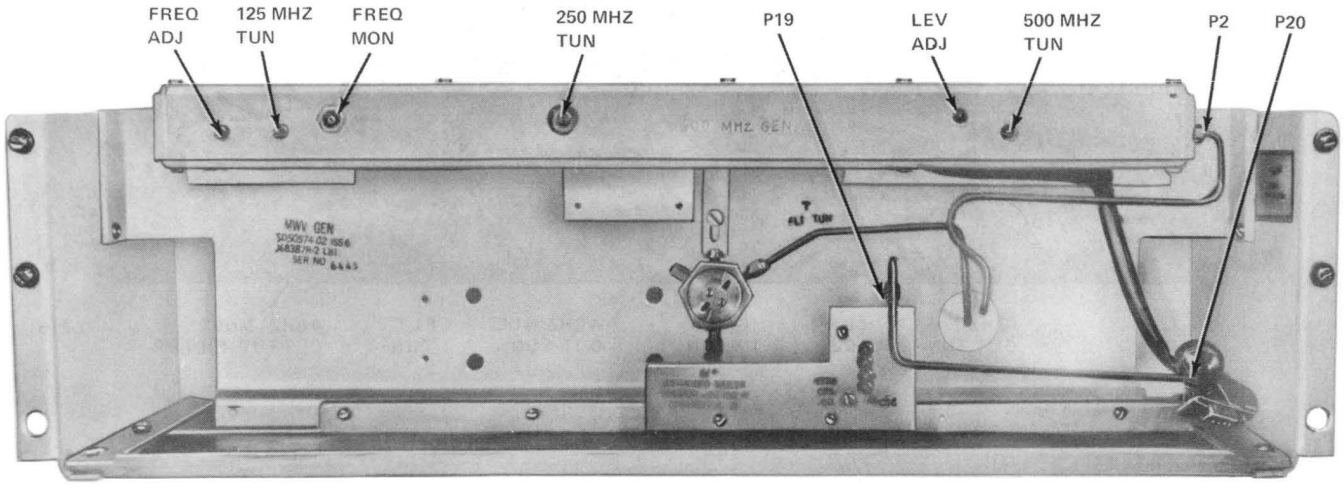

Fig. 3—J68387R-2 List 81, ( ), and 134 or List 81, ( ), and 135 Microwave Generators

Note 1: A microwave generator exhibits its greatest changes in output power and oscillator frequency during the first 30 minutes after the power is applied. These changes occur as the temperature-sensitive components reach a stable operating temperature. After the initial tuning of a replacement generator or subunit, allow it to warm up for 30 minutes. Then slightly readjust its tuning controls for optimum output power and/or frequency in accordance with this section.

Note 2: All tests are performed with the microwave generator installed in the radio bay and connected to the appropriate plugs and jacks.

Note 3: Frequencies for the J68387R-1 are shown as L4 through L20 in Table A. Frequencies for the J68387R-2 are shown as L82 through L99 in Table B.

TABLE A

FREQUENCY VERSUS LIST NUMBER OF J68387R-1 MICROWAVE GENERATOR

GENERATOR LIST NO.	GENERATOR FREQUENCY (MHz)	CRYSTAL FREQUENCY (MHz)
4	3780	118.12500
5	3800	118.75000
6	3820	119.37500
7	3840	120.00000
8	3860	120.62500
9	3880	121.25000
10	3900	121.87500
11	3920	122.50000
12	3940	123.12500
13	3960	123.75000
14	3980	124.37500
15	4000	125.00000
16	4020	125.62500
17	4040	126.25000
18	4060	126.87500
19	4080	127.50000
20	4100	128.12500

TABLE B

FREQUENCY VERSUS LIST NUMBER OF J68387R-2 MICROWAVE GENERATOR

GENERATOR LIST NO.	GENERATOR FREQUENCY (MHz)	CRYSTAL FREQUENCY (MHz)
82	3780	118.12500
83	3800	118.75000
84	3820	119.37500
85	3840	120.00000
86	3860	120.62500
87	3880	121.25000
88	3900	121.87500
89	3920	122.50000
90	3940	123.12500
91	3960	123.75000
92	3980	124.37500
93	4000	125.00000
94	4020	125.62500
95	4040	126.25000
96	4060	126.87500
97	4080	127.50000
98	4100	128.12500
99	4120	128.75000

Note 4: Use a P48Q352 adjustment tool to adjust all tuning controls on the microwave generator. For the J68387R-1, the LEV ADJ control uses a KS-20114 L2 adjustment tool.

Note 5: Use a 388A tool (1/4-inch spanner wrench) to loosen locknuts on the 4-GHz multiplier tuning adjustments.

Note 6: Use a 5/16-inch open-end wrench to remove P15.

Note 7: Use a 3/32-inch Allen wrench to loosen the OUT TUN control on the 1-GHz multiplier.

The following drawings and sections are related to this section:

TD-3 Radio, Microwave Generator—SD-50574-01

TD-3 Radio, Microwave Generator—SD-50574-02

TD-3 Radio, Application Schematic, Transmitter-Receiver Bay—SD-50583-01

General Test Information—Section 411-500-500

Common Equipment Tests, Preliminary Checks—Section 411-502-500

Caution 1: These tests are to be performed on an out-of-service basis. Check that the channel is not being used and has been removed from service. Alarms originated while performing the following tests may be disregarded.

Caution 2: On bays equipped with hot standby/space diversity, consult Section 411-600-500 for forced switching procedures to remove service from BOTH the transmitter and receiver. Exercise extra caution during the tests since service will be present in some waveguide and IF cabling within this bay.

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CHART 1

TROUBLESHOOTING (J68387R-1 GENERATOR)

STEP	PROCEDURE

Note: This chart is intended to direct maintenance personnel to the specific chart and test procedure to be followed when the microwave generator fails to meet the frequency and/or output power requirements specified in other sections.

Fails Frequency Requirement

1 Perform the tests outlined in Chart 2, Steps 1 through 4.

Fails Output Power Requirement

2 Perform Steps 3 and 4 to check the overall output power performance of the 500-MHz generator.

3 Select MWV GEN 3 on the meter panel, and read the meter.

Requirement: Stamped meter indication ±5 units

If this requirement is not met, perform the adjustments outlined in Chart 2.

4 Select MWV CUR MON on the meter panel. If the meter does not indicate the stamped meter indication ±5, perform Charts 3 and 4.

5 Perform Chart 5.

CHART 2

500-MHz GENERATOR ADJUSTMENT (J68387R-1 GENERATOR)

APPARATUS:

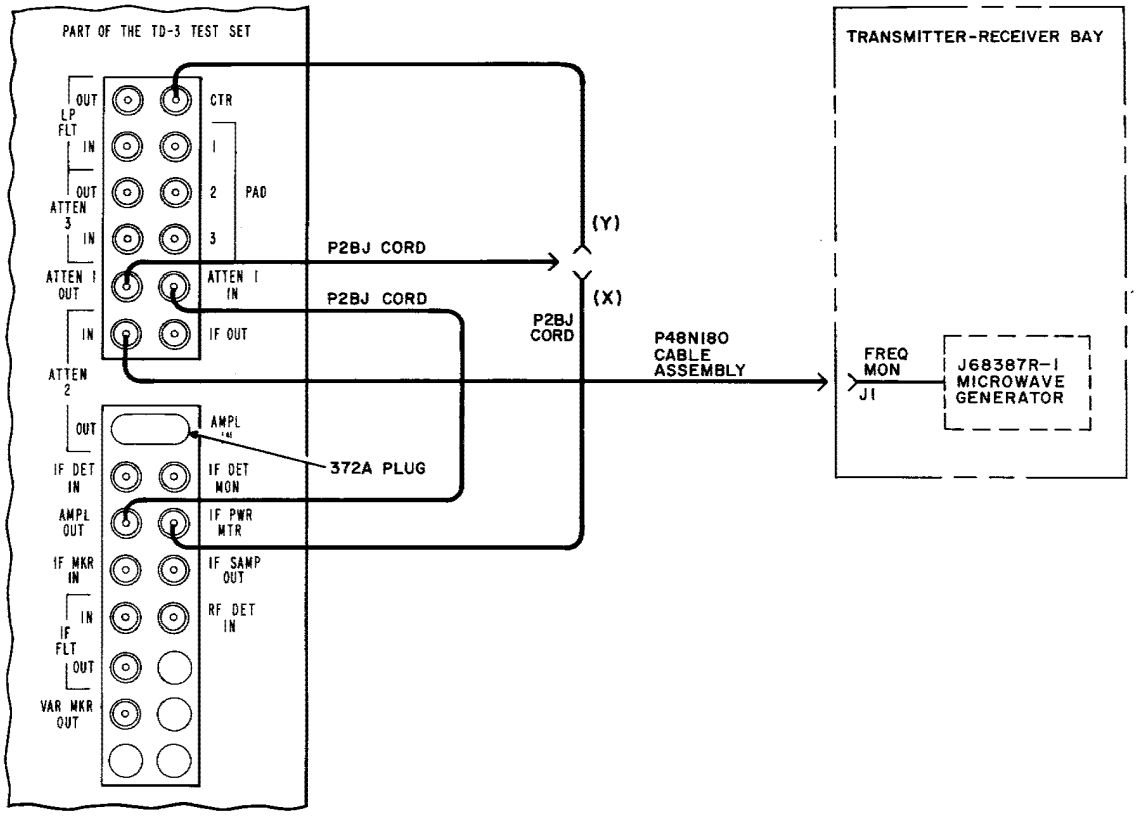
1—J68392A or J68428A Transmitter-Receiver Test Set

STEP	PROCEDURE

Note: The presence of a tuning adjustment tool inserted in the FREQ ADJ control will cause the frequency to shift. Adjust the FREQ ADJ control for a frequency within 500 Hz of the crystal frequency with the adjustment tool inserted. When the adjustment tool is removed, note the shift in frequency. Use this information to readjust the FREQ ADJ control so that the frequency is within limits when the adjustment tool is removed.

CHART 2 (Contd)

STEP	PROCEDURE
1	Select MWV GEN 1 on the bay meter panel.
2	Adjust the FREQ ADJ control to the maximum clockwise position, and then adjust the 125 MHz TUN control for a maximum indication on the panel meter.
3	Set up the test connections according to Fig. 4 or 5, option (X). Adjust the IF AMPL GAIN control for a -1 to +1 dBm output. Set up the test connections according to option (Y).
4	Adjust the FREQ ADJ control for a frequency equal to f_0 ±10 Hz (f_0 is the crystal frequency). If this condition is met, proceed to Step 6; if not, replace the crystal as given in Step 5 and repeat Steps 1 through 4. If this condition cannot be met by replacing the crystal, replace the 500-MHz generator with a spare unit as given in Step 5 and adjust the replaced generator as outlined in this chart.
5	Replace the 500-MHz generator and/or crystal Y1 as follows. (a) Disconnect the two power plugs, P1 and P10, and the coaxial output connector, P16. All are located on the connector mounting bracket on the right side of the microwave generator chassis. (b) Loosen the fasteners on the left and right sides of the microwave generator chassis, and remove the entire generator from the bay. (c) To replace the crystal, remove the top cover from the 500-MHz generator unit. (d) Remove crystal Y1 from its socket, and replace it with one having the required frequency (value stamped on package). (e) Replace the top cover on the 500-MHz generator unit, and reinstall the microwave generator in the bay. (f) To remove the 500-MHz generator unit from the generator chassis, disconnect the 500-MHz output connector (P2) located on the right side of the unit and then remove the four retaining screws that hold the unit in the chassis. (g) Install the replacement 500-MHz generator unit in the generator chassis, reconnect P2 to the OUT jack, and reinstall the microwave generator in the bay.
6	Set the LEV ADJ control to its maximum CW position.
7	Select MWV GEN 2 on the meter panel.
8	Adjust the 250 MHz TUN control for a maximum indication on the panel meter.



PREPARATION

1. Operate the test set controls to the following positions.

UNIT	CONTROL	POSITION
Control Panel	ATTEN 1	5 dB
	CTR	EXT
	ATTEN 2	20 dB
Power Meter	INPUT CHANNEL	IF
	POWER RANGE DBM	−25
Counter	FUNCTION	FREQUENCY

2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to 0.

Fig. 4—Oscillator Frequency Measurement (J68392A Test Set) for the J68387R-1 Generator

CHART 2 (Contd)

STEP	PROCEDURE

9 Select MWV GEN 3 on the meter panel, and adjust the 500 MHz TUN 1 and TUN 2 controls for a maximum meter indication using the following procedure.

Note: The 500 MHz TUN 1 and TUN 2 controls interact, and for a given frequency, the same maximum output can be obtained for slightly different combinations. In the following tuning procedure, the intent is to first tune the 500 MHz TUN 2 control for a maximum meter indication or output and then to tune the 500 MHz TUN 1 control slightly beyond the peak or maximum meter indication. By repeating this procedure a few times, the circuit can be quickly tuned. The circuit is then adjusted for the required output power by means of the LEV ADJ control.

(a) Adjust the 500 MHz TUN 1 control four turns counterclockwise from the full clockwise position.

(b) Adjust the 500 MHz TUN 2 control for a maximum meter indication.

(c) Adjust the 500 MHz TUN 1 control counterclockwise so that the meter indication drops approximately 3 units on the meter.

(d) Adjust the 500 MHz TUN 2 control for a maximum meter indication.

(e) If the meter indication obtained in (d) is greater than that obtained in (b), repeat (c) and (d) until further adjustments no longer cause an increase in the meter indication.

(f) If the meter indication obtained in (d) is less than that obtained in (b), adjust the 500 MHz TUN 1 control clockwise so that the meter indication drops approximately 3 units. Then adjust the 500 MHz TUN 2 control for a maximum meter indication. Repeat the adjustments until further minor adjustments no longer cause an increase in the meter indication.

(g) Select MWV GEN 2 on the meter panel.

(h) Adjust the 250 MHz TUN control for a maximum indication on the meter.

(i) Select MWV GEN 3 on the meter panel.

(j) Slowly adjust the 500 MHz TUN 2 control clockwise until the meter indication drops 6 units or equals the MWV GEN 3 indication stamped on the generator housing, whichever occurs first.

(k) Adjust the LEV ADJ control for a meter indication equal to that stamped on the 500-MHz generator unit.

Note: The 500-MHz generator unit has three meter indications stamped on it which correspond to three crystal frequencies (one labeled MG3 stamped on the front of the unit and two stamped on the right side).

PREPARATION FOR TEST

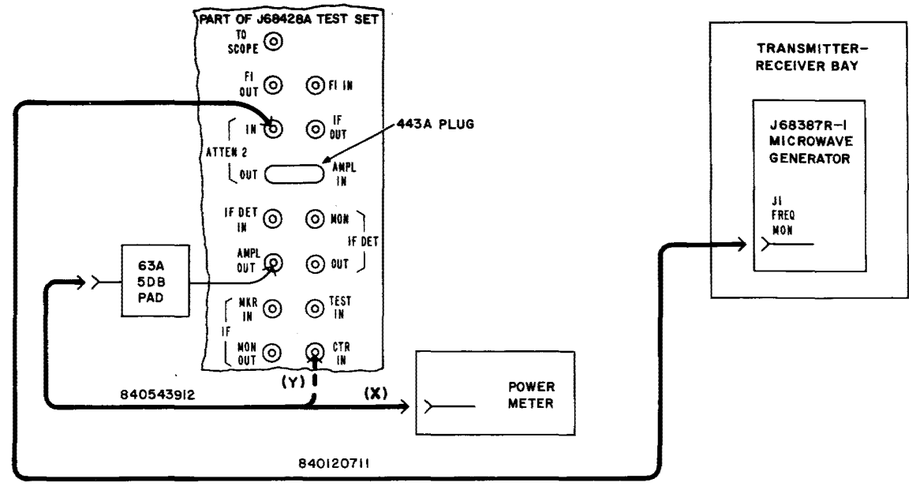
1. Determine the control unit that applies. Test arrangement A shows connections for J68428A test sets using the C and D control panels. For test sets with the F control panel, refer to test arrangement B.
2. Operate the test set controls to the following positions.

UNIT	CONTROL	POSITION
Control Unit	ATTEN*	20 dB
	COUNTER INPUT	135 MHZ MAX
Counter	FUNCTION	135 MHZ MAX
	SAMPLE RATE	Counterclockwise†
	DISPLAY BLANKING	Depress the BLANKING DISPLAY pushbutton at the extreme right.
Power Meter	MODE	ZERO
	INPUT	IF

* On test sets equipped with the J68428C and D control panels, use ATTEN 2.

† On some units the power switch is combined with the SAMPLE RATE control. Make sure the power is on.

3. Before connecting the IF cable to the power meter, zero the meter by adjusting the ZERO control for 000 indication on the digital display.
4. Set the MODE control to the POWER METER position.



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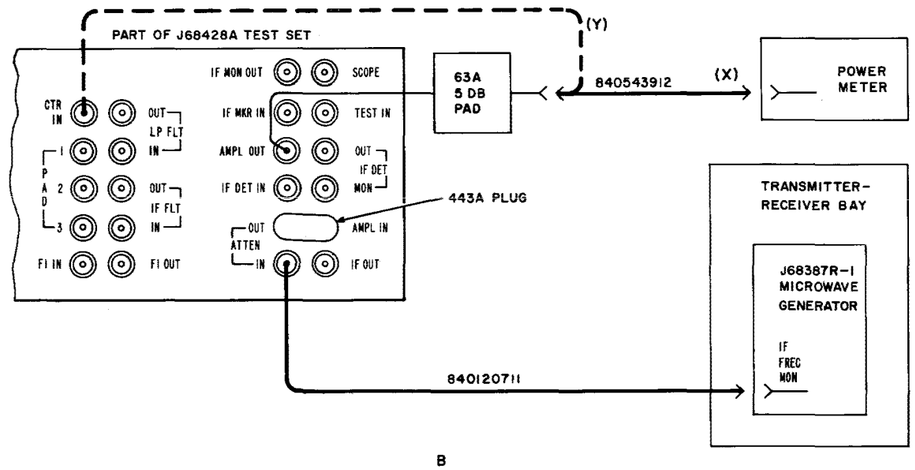

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Fig. 5—Oscillator Frequency Measurement (J68428A Test Set) for the J68387R-1 Generator

CHART 2 (Contd)

STEP	PROCEDURE
	For the unit in the bay, the frequency stamped on the front is the same as that of the crystal in the unit. The LEV ADJ control should be adjusted to obtain the MWV GEN 3 indication associated with this frequency. ***If a spare unit is inserted in the bay,*** adjust the LEV ADJ control for the MG3 indication nearest in frequency to that of the crystal in the spare generator unit and write the crystal frequency and MWV GEN 3 indication on the front of the unit. (l) Adjust the FREQ ADJ control for a frequency equal to f_0 ±10 Hz (f_0 is the crystal frequency). If the conditions of (k) and (l) are met, proceed to Chart 3; if not, replace the 500-MHz generator with a spare unit as given in Step 5. Adjust the replaced 500-MHz generator as outlined in this chart.
10	Adjust the LEV ADJ control for the indication stamped on the meter panel.

CHART 3

500-MHz FILTER ADJUSTMENT (J68387R-1 GENERATOR)

APPARATUS:

None

STEP	PROCEDURE
	Note: In the procedure which follows, it is assumed that the filter is approximately adjusted for the generator frequency and only a minor adjustment of the filter fine-tuning frequency control may be required.
1	Select MWV GEN 3.
2	Adjust the LEV ADJ control to obtain an MWV GEN 3 indication equal to that stamped on the generator housing. If the indication cannot be obtained, perform Chart 2.
3	Select MWV CUR MON on the meter panel.
4	If a meter indication greater than 20 units is observed, proceed to Step 6; if not, proceed with Step 5.

CHART 3 (Contd)

STEP	PROCEDURE
5	On the 1-GHz multiplier, rotate the CURR ADJ control to the maximum clockwise position; then back off two turns.
6	Adjust the 500-MHz filter fine-frequency tuning control, FLT TUN, for a maximum panel meter indication.
7	If no meter indication is observed, replace the 1-GHz multiplier with a spare (Step 8) and repeat the tuning procedure outlined in Charts 3 and 4.
8	Replace the 1-GHz multiplier as follows. (a) Disconnect input and output connectors P14 and P15 from the 4-GHz multiplier. (b) Remove the 4-GHz multiplier from the generator chassis by removing the three retaining screws. (c) Disconnect plug P10 supplying power to the 1-GHz multiplier. (d) Disconnect input connector P9 and output connector P11 from the 1-GHz multiplier. (e) Remove the 1-GHz multiplier from the generator chassis by removing the four retaining screws. (f) Install the spare 1-GHz multiplier in the generator chassis, and reconnect plugs P9, P10, and P11. (g) Replace the 4-GHz multiplier, and reconnect connectors P14 and P15.

CHART 4

1-GHz MULTIPLIER ADJUSTMENT (J68387R-1 GENERATOR)

APPARATUS:

None

STEP	PROCEDURE
1	Monitor the MWV CUR MON meter indication while adjusting the 1-GHz multiplier tuning controls using the following procedure.

CHART 4 (Contd)

STEP	PROCEDURE
	(a) Adjust the OUT CPLR control to maximum counterclockwise.
	(b) Adjust the IN TUN control to obtain a maximum meter indication.
	(c) Adjust the OUT TUN control to obtain a minimum meter indication. Use the 3/32-inch Allen wrench.
	(d) Using the CURR ADJ control, set the meter indication to 50 units.
	(e) Repeat (b) through (d) to achieve the required current indication, making (c) the last adjustment.
2	If the above tuning procedure cannot be achieved, replace the 1-GHz multiplier as outlined in Chart 3, Step 8.
3	The final tuning procedure for this multiplier is performed in Chart 5.

CHART 5

4-GHz MULTIPLIER ADJUSTMENT (J68387R-1 GENERATOR)

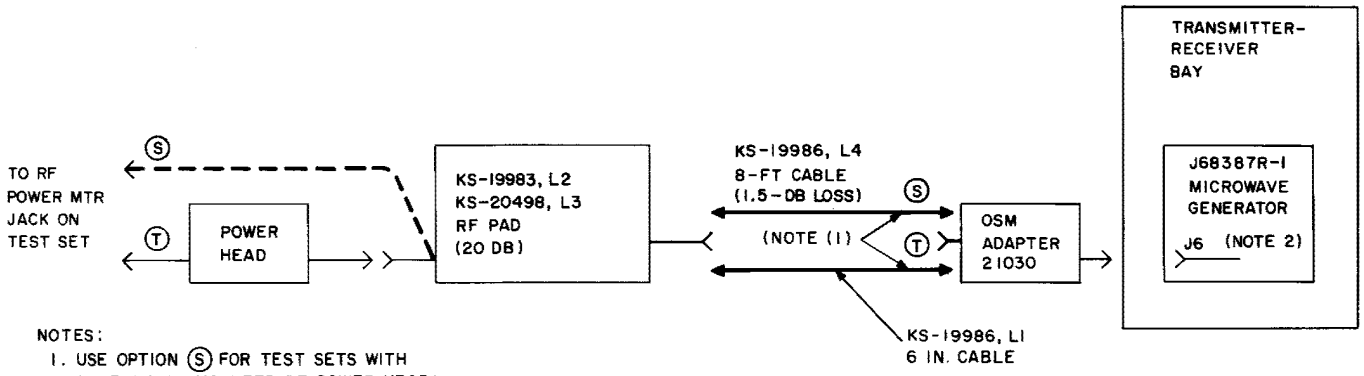
APPARATUS:

1—J68392A or J68428A Transmitter-Receiver Test Set

STEP	PROCEDURE
1	Select MWV GEN 3.
2	Adjust the LEV ADJ control to obtain the MWV GEN 3 indication equal to that stamped on the generator housing. If the indication cannot be obtained, perform Chart 2.
3	Remove connector P15 from the output filter of the 4-GHz multiplier. (To do this, remove connector P16 that connects the generator to the bay; then disconnect P15, and remove the cable assembly. Use the 5/16-inch open-end wrench.)
4	Connect the test apparatus to the microwave generator as shown in Fig. 6 or 7.
5	Loosen the locknuts on both tuning controls, and adjust the two controls on the 4-GHz multiplier for maximum output power.

CHART 5 (Contd)

STEP	PROCEDURE



PREPARATION FOR TEST

1. On the power meter, set the INPUT CHANNEL control to RF and the POWER RANGE DBM control to −25.
2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to +10.

Fig. 6—Output Power Adjustment—Test Arrangement (J68392A Test Set) for the J68387R-1 Generator

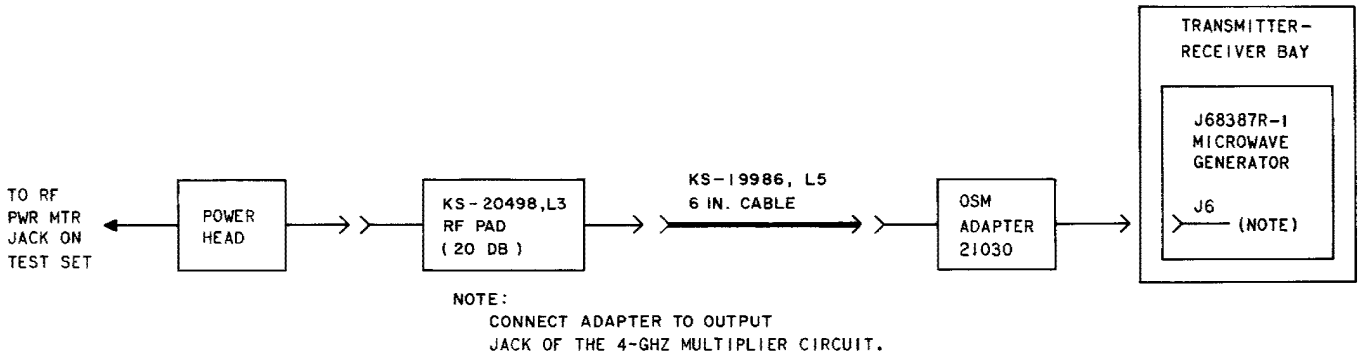
Requirement: The power meter indication shall be greater than +25 dBm minus the loss of the calibrated test cable and 20-dB pad.

If the requirement is met, proceed to Step 7. If the requirement is not met, adjust the OUT CPLR control of the 1-GHz multiplier three more turns clockwise. If there are no more clockwise turns left, adjust the OUT CPLR control to the maximum counterclockwise position and perform Step 6.

6 While monitoring the MWV CUR MON meter indication, adjust the 1-GHz multiplier tuning controls using the following procedure.

CHART 5 (Contd)

STEP	PROCEDURE



PREPARATION FOR TEST

1. On the power meter, set the MODE control to ZERO and the INPUT control to RF.
2. Before connecting RF power to the power head, zero the meter by adjusting the ZERO control for 000 indication on the digital display.
3. Set the MODE control to the POWER METER position.

Fig. 7—Output Power Adjustment—Test Arrangement (J68428A Test Set) for the J68387R-1 Generator

(a) Adjust the IN TUN control for a maximum meter indication.

(b) Adjust the OUT TUN control for a minimum meter indication.

(c) Adjust the CURR ADJ control for an indication as close as possible to 50 units on the MWV CUR MON meter.

(d) Repeat (a) through (c), making (b) the last step, until no further control interaction is observed.

(e) Adjust the two tuning controls on the 4-GHz multiplier for maximum output power.

The requirement is the same as in Step 5. If this requirement is met, proceed with Step 7. If this requirement is not met, replace diode CR4 which is located in the 4-GHz multiplier and repeat Step 6. If, after replacing diode CR4, the requirement still is not met, replace the 1-GHz multiplier in accordance with Chart 3, Step 8, and adjust the 1-GHz multiplier in accordance with Chart 4.

CHART 5 (Contd)

STEP	PROCEDURE
7	Make the following adjustments for output power. (a) Adjust the LEV ADJ control for an output power of 23.0 ±0.5 dBm. (b) Adjust both tuning controls on the 4-GHz multiplier for maximum power output. (c) Since the adjustments in (a) and (b) interact, repeat (a) and (b) until the output power of 23.0 ±0.5 dBm is obtained after completing (b).
8	Lock both tuning controls by turning the locknuts snugly against the stop. ***Note:*** It will be necessary to keep the tuning controls from turning while the locking adjustment is made.
9	Lock the OUT TUN control on the 1-GHz multiplier using the Allen wrench.
10	Repeat Steps 1 through 4 in Chart 2.
11	Remove the test apparatus, and replace the cable assembly.
12	Perform the checks in Section 411-502-500, Chart 3.

CHART 6

500-MHz GENERATOR ADJUSTMENT
[J68387R-2 L81, ( ), L132, OR L133 GENERATOR]

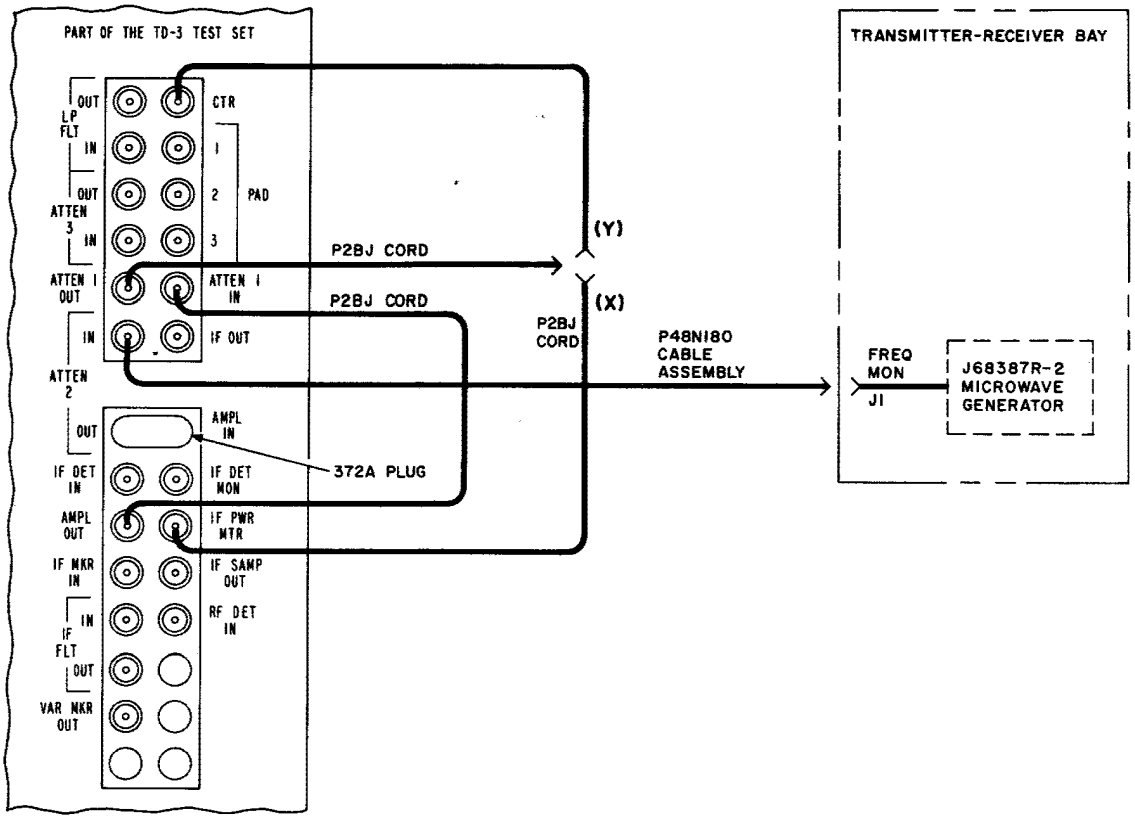
APPARATUS:

1—J68392A or J68428A Transmitter-Receiver Test Set

STEP	PROCEDURE
	Note: The presence of a tuning adjustment tool inserted in the FREQ ADJ control will cause the frequency to shift. Adjust the FREQ ADJ control for a frequency within 500 Hz of the crystal frequency with the adjustment tool inserted. When the adjustment tool is removed, note the shift in frequency. Use this information to readjust the FREQ ADJ control so that the frequency is within limits when the adjustment tool is removed.

CHART 6 (Contd)

STEP	PROCEDURE
1	Set up the test connections according to Fig. 8 or 9, option (X). Adjust the IF AMPL GAIN control for a -1 to +1 dBm output. Set up the test connections according to option (Y).
2	Set the FREQ ADJ, 125 MHz TUN, 250 MHz TUN, and LEV ADJ controls to their maximum clockwise positions.
3	Select MWV GEN 1 on the bay meter panel, and adjust the 125 MHz TUN control for a peak meter indication. ***Note:*** If a pegged meter indication results, perform Step 4; then return to Step 3 and continue normally.
4	Select MWV GEN 2 on the bay meter panel, and adjust the 250 MHz TUN control for a peak meter indication.
5	Adjust the FREQ ADJ control for a frequency equal to f_0 ±250 Hz (f_0 is the crystal frequency). If this condition is met, proceed to Step 7; if not, replace the crystal as given in Step 6 and repeat Steps 2 through 5. If this condition cannot be met by replacing the crystal, replace the 500-MHz generator with a spare unit as given in Step 6 and adjust the replaced generator as outlined in this chart.
6	Replace the 500-MHz generator and/or crystal Y1 as follows. (a) Disconnect the two power plugs, P1 and P10, and the coaxial output connector, P16. All are located on the connector mounting bracket on the right side of the microwave generator chassis. (b) Loosen the fasteners on the left and right sides of the microwave generator chassis, and remove the entire generator from the bay. (c) To replace the crystal, remove the top cover from the 500-MHz generator unit. (d) Remove crystal Y1 from its socket, and replace it with one having the required frequency (value stamped on package). (e) Replace the top cover on the 500-MHz generator unit, and reinstall the microwave generator in the bay. (f) To remove the 500-MHz generator unit from the generator chassis, disconnect the 500-MHz output connector (P2) located on the right side of the unit and then remove the four retaining screws that hold the unit in the chassis. (g) Install the replacement 500-MHz generator unit in the generator chassis, reconnect P2 to the OUT jack, and reinstall the microwave generator in the bay.



PREPARATION FOR TEST

1. Operate the test set controls to the following positions.

UNIT	CONTROL	POSITION
Control Panel	ATTEN 1	5 dB
	CTR	EXT
	ATTEN 2	20 dB
Power Meter	INPUT CHANNEL	IF
	POWER RANGE DBM	−25
Counter	FUNCTION	FREQUENCY

2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to 0.

Fig. 8—Oscillator Frequency Measurement (J68392A Test Set) for the J68387R-2 Generator

PREPARATION FOR TEST

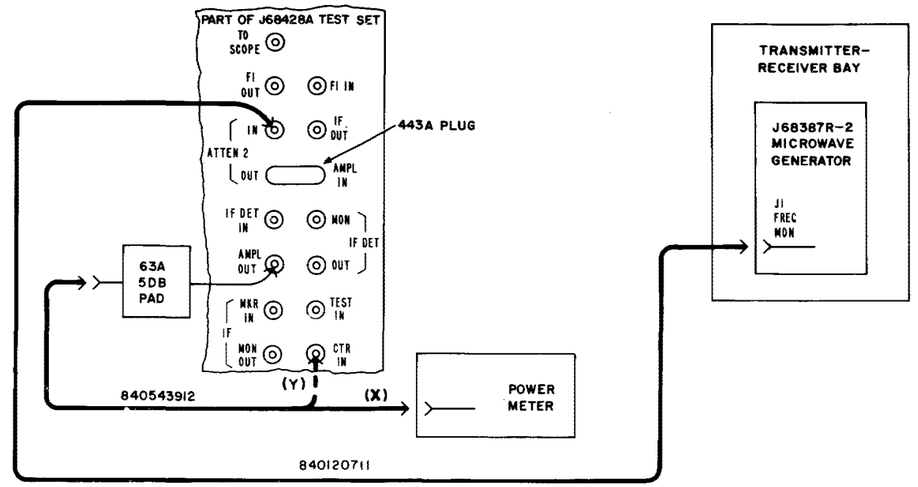
1. Determine the control unit that applies. Test arrangement A shows connections for J68428A test sets using the C and D control panels. For test sets with the F control panel, refer to test arrangement B.
2. Operate the test set controls to the following positions.

UNIT	CONTROL	POSITION
Control Unit	ATTEN*	20 dB
	COUNTER INPUT	135 MHZ MAX
Counter	FUNCTION	135 MHZ MAX
	SAMPLE RATE	Counterclockwise†
	DISPLAY BLANKING	Depress the BLANKING DISPLAY pushbutton at the extreme right.
Power Meter	MODE	ZERO
	INPUT	IF

* On test sets equipped with the J68428C and D control panels, use ATTEN 2.

† On some units the power switch is combined with the SAMPLE RATE control. Make sure the power is on.

3. Before connecting the IF cable to the power meter, zero the meter by adjusting the ZERO control for 000 indication on the digital display.
4. Set the MODE control to the POWER METER position.



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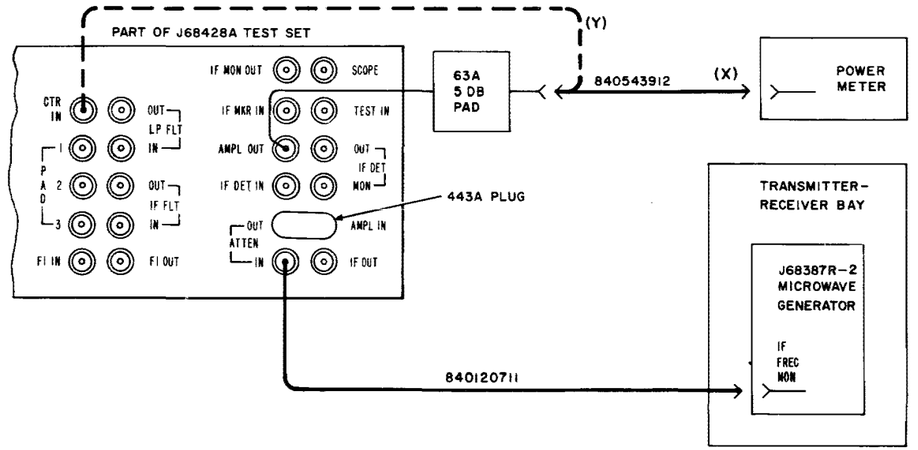

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Fig. 9—Oscillator Frequency Measurement (J68428A Test Set) for the J68387R-2 Generator

CHART 6 (Contd)

STEP	PROCEDURE
7	Select MWV GEN 3 on the meter panel, and adjust the 500 MHz TUN control for a maximum meter indication.
8	Select MWV GEN 1 on the bay meter panel, and adjust the 125 MHz TUN control for a maximum meter indication. When this maximum meter indication is reached, adjust the 125 MHz TUN control an additional 1/4 turn in the ***clockwise*** direction. ***Note:*** In the procedure which follows, it is assumed that the filter is approximately adjusted for the generator frequency and only a minor adjustment of the filter fine-tuning frequency control may be required.
9	Select MWV CUR MON on the meter panel. If a meter indication greater than 20 units is observed, proceed to Step 11; if not, proceed with Step 10.
10	On the 1-GHz multiplier, rotate the CURR ADJ control to the maximum clockwise position; then back off two turns.
11	Adjust the 500-MHz filter fine-frequency tuning control, FLT TUN, for a maximum panel meter indication. If this condition is met, proceed to Step 13. If no meter indication is observed, replace the 1-GHz multiplier with a spare (Step 12) and repeat Steps 9 through 11.
12	Replace the 1-GHz multiplier as follows. (a) Disconnect input and output connectors P14 and P15 from the 4-GHz multiplier. (b) Remove the 4-GHz multiplier from the generator chassis by removing the three retaining screws. (c) Disconnect plug P10 which supplies power to the 1-GHz multiplier. (d) Disconnect input connector P9 and output connector P11. (e) Remove the 1-GHz multiplier from the generator chassis by removing the four retaining screws. (f) Install the spare 1-GHz multiplier in the generator chassis. Reconnect plugs P9, P10, and P11. (g) Replace the 4-GHz multiplier, and reconnect P14 and P15.
13	Adjust the LEV ADJ control to the proper indication as outlined in the following note. ***Note:*** A regular microwave generator is tuned at the factory for a particular bay frequency. The crystal frequency and the proper meter indication are stamped on the front of the 500-MHz generator unit. A spare generator or a regular generator which is

CHART 6 (Contd)

STEP	PROCEDURE
	now being used for a spare will have two frequencies (118 and 132 MHz) and corresponding meter indications stamped on the right-hand side of the 500-MHz generator unit. The proper meter indication would be that indication corresponding to the frequency nearest to the new crystal frequency. If the adjustment cannot be made, replace the 500-MHz generator unit and repeat this chart.
14	Adjust the FREQ ADJ control for a frequency equal to f_0 ±10 Hz. If this condition is met, proceed with Chart 7; otherwise, repeat this chart.

CHART 7

1-GHz MULTIPLIER ADJUSTMENT
[J68387R-2 L81, ( ), L132, OR L133 GENERATOR]

APPARATUS:

None

STEP	PROCEDURE
1	Monitor the MWV CUR MON meter indication while adjusting the 1-GHz multiplier tuning controls using the following procedure. (a) Adjust the OUT CPLG control to the maximum counterclockwise position. (b) Adjust the IN TUN control to obtain a maximum meter indication. (c) Adjust the OUT TUN control to obtain a minimum meter indication. Use the 3/32-inch Allen wrench to loosen the locking screw. (d) Using the CURR ADJ control, set the meter indication to 50 units. (e) Repeat (b) through (d) to achieve the required current indication, making (c) the last adjustment.
2	If the above tuning procedure cannot be achieved, replace the 1-GHz multiplier as outlined in Chart 6.
3	The final tuning procedure for this multiplier is performed in Chart 8.

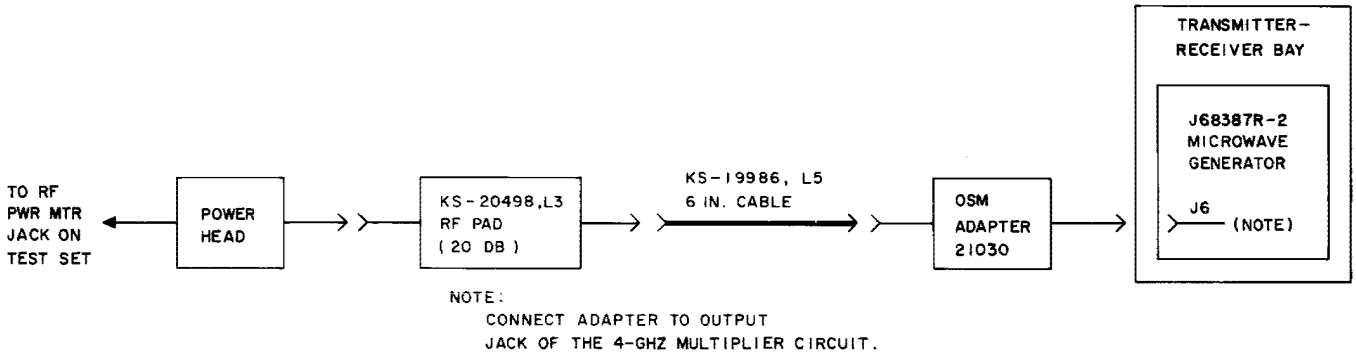
CHART 8

4-GHz MULTIPLIER ADJUSTMENT
[J68387R-2 L81, ( ), L132, OR L133 GENERATOR]

APPARATUS:

1—J68392A or J68428A Transmitter-Receiver Test Set

STEP	PROCEDURE
1	Remove connector P15 from the output filter of the 4-GHz multiplier. (To do this, remove connector P16 that connects the generator to the bay; then disconnect P15, and remove the cable assembly. Use the 5/16-inch open-end wrench.)
2	Connect the test apparatus to the microwave generator as shown in Fig. 10 or 11, depending on the test set used.
3	Loosen the locknuts on both tuning controls, and adjust the two controls on the 4-GHz multiplier for maximum output power.



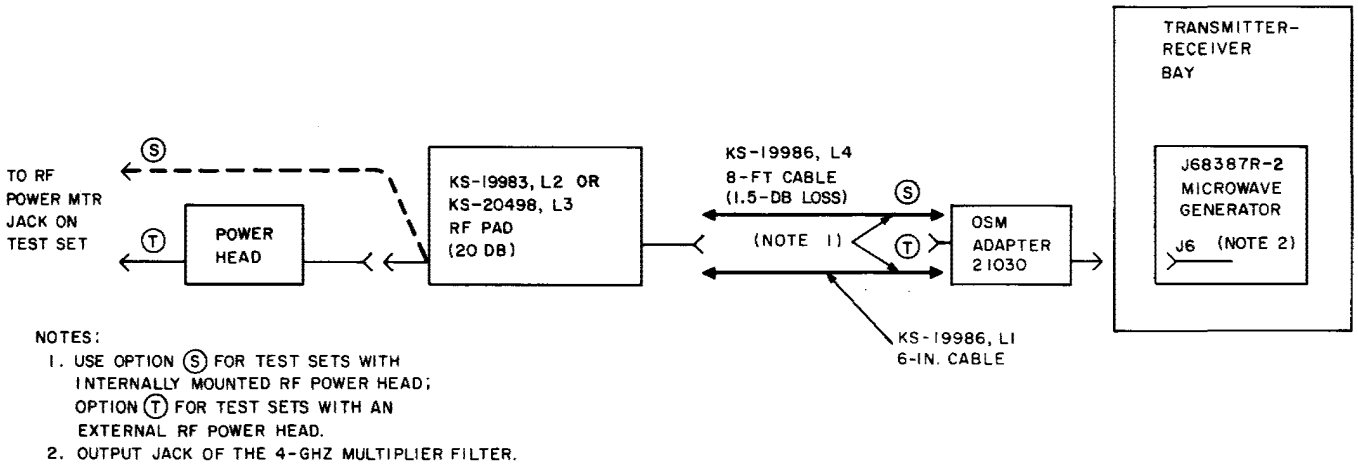
PREPARATION FOR TEST

1. On the power meter, set the MODE control to ZERO and the INPUT control to RF.
2. Before connecting RF power to the power head, zero the meter by adjusting the ZERO control for 000 indication on the digital display.
3. Set the MODE control to the POWER METER position.

Fig. 10—Output Power Adjustment—Test Arrangement (J68428A Test Set) for the J68387R-2 List 81, ( ), 132, or 133 Generator

CHART 8 (Contd)

STEP	PROCEDURE



PREPARATION FOR TEST

1. On the power meter, set the INPUT CHANNEL control to RF and the POWER RANGE DBM control to −25.
2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to +10.

Fig. 11—Output Power Adjustment—Test Arrangement (J68392A Test Set) for the J68387R-2 List 81, ( ), 132, or 133 Generator

Requirement: The power meter indication shall be greater than +25 dBm minus the loss of the calibrated test cable and 20-dB pad.

If the requirement is met, proceed to Step 5. If the requirement is not met, adjust the OUT CPLG control on the 1-GHz multiplier three turns clockwise. If there are no more clockwise turns left, adjust the OUT CPLG control to the maximum counterclockwise position and perform Step 4.

4 While monitoring the MWV CUR MON meter indication, adjust the 1-GHz multiplier tuning controls using the following procedure.

(a) Adjust the IN TUN control for a maximum meter indication.

CHART 8 (Contd)

STEP	PROCEDURE
	(b) Adjust the OUT TUN control for a minimum meter indication. (c) Adjust the CURR ADJ control for an indication as close as possible to 50 units on the MWV CUR MON meter. (d) Repeat (a) through (c), making (b) the last step, until no further control interaction is observed. (e) Adjust the two tuning controls on the 4-GHz multiplier for maximum output power. The requirement is the same as in Step 3. If the requirement is met, proceed with Step 5. If the requirement is not met, replace diode CR4 which is located in the 4-GHz multiplier and repeat Step 3. If, after replacing diode CR4, the requirement still is not met, replace the 1-GHz multiplier in accordance with Chart 6, Step 12, and adjust the 1-GHz multiplier in accordance with Chart 7.
5	Make the following adjustments for output power. (a) Adjust the LEV ADJ control for an output power of +23.0 ±0.5 dBm. (b) Adjust both tuning controls on the 4-GHz multiplier for maximum power output. (c) Since the adjustments in (a) and (b) interact, repeat (a) and (b) until the output power of +23.0 ±0.5 dBm is obtained after completing (b).
6	Lock both tuning controls by turning the locknuts snugly against the stop. ***Note:*** It will be necessary to keep the tuning controls from turning while the locking adjustment is made.
7	Lock the OUT TUN control on the 1-GHz multiplier using the Allen wrench.
8	If necessary, readjust the FREQ ADJ control for a frequency equal to f_0 ±10 Hz.
9	Remove the test apparatus, and replace the cable assembly.
10	Perform the checks in Section 411-502-500, Chart 3.

CHART 9

ADJUSTMENT OF GENERATOR EQUIPPED WITH 0.5- TO 4-GHz MULTIPLIER [J68387R-2 L81, ( ), L134, OR L135 GENERATOR]

APPARATUS:

1—J68392A or J68428A Transmitter-Receiver Test Set

1—Screwdriver, Xcelite R-3322 or equivalent

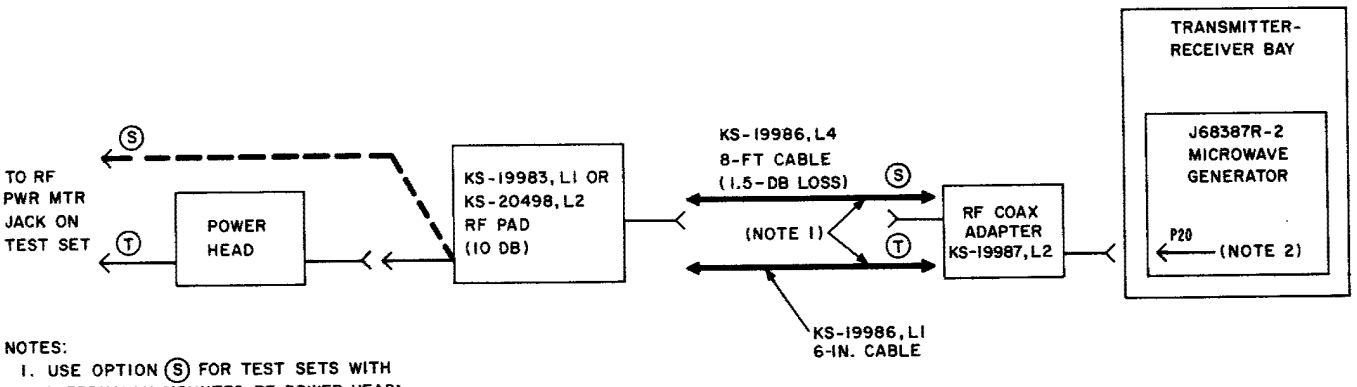
STEP	PROCEDURE
	Note: The presence of a tuning adjustment tool inserted in the FREQ ADJ control will cause the frequency to shift. Adjust the FREQ ADJ control for a frequency within 500 Hz of the crystal frequency with the adjustment tool inserted. When the adjustment tool is removed, note the shift in frequency. Use this information to readjust the FREQ ADJ control so that the frequency is within limits when the adjustment tool is removed.
1	Set up the test connections according to Fig. 8 or 9, option (X). Adjust the IF AMPL GAIN control for a -1 to +1 dBm output. Set up the test connections according to option (Y).
2	Set the FREQ ADJ, 125 MHz TUN, 250 MHz TUN, and LEV ADJ controls to their maximum clockwise positions.
3	Select MWV GEN 1 on the bay meter panel, and adjust the 125 MHz TUN control for a peak meter indication.
	Note: If a pegged meter indication results, perform Step 4; then return to Step 3 and continue normally.
4	Select MWV GEN 2 on the bay meter panel, and adjust the 250 MHz TUN control for a peak meter indication.
5	Adjust the FREQ ADJ control for a frequency equal to f_0 ±250 Hz (f_0 is the crystal frequency). If this condition is met, proceed to Step 7; if not, replace the crystal as given in Step 6 and repeat Steps 2 through 5. If this condition cannot be met by replacing the crystal, replace the 500-MHz generator with a spare unit as given in Step 6 and adjust the replaced generator as outlined in this chart.
6	Replace the 500-MHz generator and/or crystal Y1 as follows.

CHART 9 (Contd)

STEP	PROCEDURE
	(a) Disconnect power plug P1 and coaxial output connector P20. Both are located on the connector mounting bracket on the right side of the microwave generator chassis.
	(b) Loosen the fasteners on the left and right sides of the microwave generator chassis, and remove the entire generator from the bay.
	(c) To replace the crystal, remove the top cover from the 500-MHz generator unit.
	(d) Remove crystal Y1 from its socket, and replace it with one having the required frequency (value stamped on package).
	(e) Replace the top cover on the 500-MHz generator unit, and reinstall the microwave generator in the bay.
	(f) To remove the 500-MHz generator unit from the generator chassis, disconnect the 500-MHz output connector (P2) located on the right side of the unit and then remove the four retaining screws that hold the unit in the chassis.
	(g) Install the replacement 500-MHz generator unit in the generator chassis, reconnect P2 to the OUT jack, and reinstall the microwave generator in the bay.
7	Select MWV GEN 3 on the meter panel, and adjust the 500 MHz TUN control for a maximum meter indication.
8	Select MWV GEN 1 on the bay meter panel, and adjust the 125 MHz TUN control for a maximum meter indication. When this maximum meter indication is reached, adjust the 125 MHz TUN control an additional 1/4 turn in the ***clockwise*** direction.
9	Unscrew P20 and loosen connector P19 at the output of the 0.5- to 4-GHz multiplier. Carefully swing the semirigid coaxial cable out to the front. Tighten connector P19.
10	Connect the test apparatus to the microwave generator as shown in Fig. 12 or 13, depending on the test set used for this test. Support the test apparatus so that its weight will not strain the soldered plug connections on the small piece of the semirigid coaxial cable.
11	Adjust the 500-MHz filter fine-tuning frequency control (FLT TUN) for a maximum power meter indication. ***Note:*** It is assumed that the filter is approximately adjusted for the generator frequency and only a minor adjustment of the filter fine-tuning frequency control (FLT TUN) may be required.
12	Adjust the LEV ADJ control to the proper indication as outlined in the following note. ***Note:*** A regular microwave generator is tuned at the factory for a particular bay frequency. The crystal frequency and the proper meter indication are stamped on the

CHART 9 (Contd)

STEP	PROCEDURE



NOTES:
1. USE OPTION (S) FOR TEST SETS WITH INTERNALLY MOUNTED RF POWER HEAD; OPTION (T) FOR TEST SETS WITH AN EXTERNAL RF POWER HEAD.
2. THE SMALL SEMIRIGID COAXIAL CABLES WHICH ARE SOLDERED TO THE CONNECTING PLUGS MUST BE HANDLED WITH CARE AND SHOULD NOT SUPPORT WEIGHT FOR THEY ARE EASILY BROKEN.

PREPARATION FOR TEST

1. On the power meter, set the INPUT CHANNEL control to RF and the POWER RANGE DBM control to −25.
2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to +10.

Fig. 12—Output Power Adjustment—Test Arrangement (J68392A Test Set) for the J68387R-2 List 81, ( ), 134, or 135 Generator

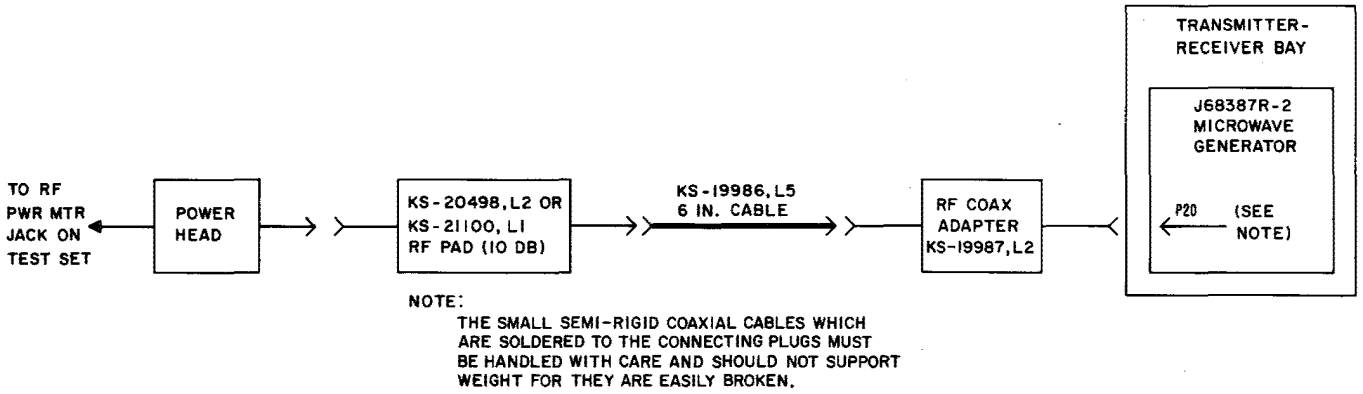
front of the 500-MHz generator unit. A spare generator or a regular generator which is now being used for a spare will have two frequencies (118 and 132 MHz) and corresponding meter indications stamped on the right-hand side of the 500-MHz generator unit. The proper meter indication would be that indication corresponding to the frequency nearest to the new crystal frequency. If the adjustment cannot be made, replace the 500-MHz generator unit and repeat this chart.

13 Measure the power.

Requirement: The power meter indication shall be greater than +9 dBm minus the loss of the calibrated test cable and the 10-dB pad.

CHART 9 (Contd)

STEP	PROCEDURE



PREPARATION FOR TEST

1. On the power meter, set the MODE control to ZERO and the INPUT control to RF.
2. Before connecting RF power to the power head, zero the meter by adjusting the ZERO control for 000 indication on the digital display.
3. Set the MODE control to the POWER METER position.

Fig. 13—Output Power Adjustment—Test Arrangement (J68428A Test Set) for the J68387R-2 List 81, ( ), 134, or 135 Generator

If the requirement is met, proceed with Step 14. If the requirement is not met, replace diode CR5 which is located in the 0.5- to 4-GHz multiplier.

▶***Note 1:*** Overtorquing the diode clamp may damage the diode or the diode housing. The correct torque for the diode clamp is between 3 and 4 inch-pounds. A torque indicating screwdriver, if available, should be used. As an alternative to the use of a torque indicating screwdriver, a commercially available small screwdriver, Xcelite R-3322 or equivalent, may be used in the normal hand-held position with normal grip to apply sufficient torque without exceeding the upper torque limit. The small Xcelite R-3322 screwdriver has a 1/10-inch wide blade and a hexagonal handle measuring 1/2 inch in diameter.◀

Note 2: No controls are provided for field adjustment of the 0.5- to 4-GHz multiplier.

CHART 9 (Contd)

STEP	PROCEDURE
14	Adjust the LEV ADJ control to obtain a power meter indication of +9 dBm minus the loss of the calibrated test cable and the 10-dB pad.
15	Adjust the FREQ ADJ control for a frequency equal to f_0 ±10 Hz.
16	Remove the test apparatus, and replace the cable assembly.
17	Perform the checks in Section 411-502-500, Chart 3.