
TD-3 MICROWAVE RADIO
TRANSMITTER-RECEIVER BAY
COMMON EQUIPMENT TESTS
USING KRUSE 52011 IF/RF TEST SET
J68387R MICROWAVE GENERATOR AND 4-GHZ MULTIPLIER

This appendix, for the J68387R, List 1, 2, and 4 through 20 microwave generators (refer to Fig. 1 in the main section) contains the procedures necessary to align spare generator units or to realign a generator which has been in service but fails to meet the requirements of Section 411-404-501 or 411-406-501.

Note 1: A microwave generator unit exhibits its greatest output level change during the first 30 minutes after power is applied. This level change or frequency shift, in the case of the crystal oscillator, occurs as the temperature-sensitive components reach a stable operating temperature. After the initial tuning of a generator or unit, allow it to warm up for 30 minutes. Then slightly readjust its tuning controls for optimum output level and/or frequency, in accordance with this appendix.

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 this generator are shown as L4 through L20 in Table A.

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

The following drawings and sections are related to this appendix:

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

TD-3 Radio, Application Schematic, Transmitter-Receiver Bay—SD-50544-01

General Test Information—Section 411-400-500

Caution: 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.

TABLE A

FREQUENCY VERSUS LIST NUMBER OF J68387R 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

CHART	PAGE
A—Troubleshooting	2
B—500-MHz Generator Adjustment	3
C—500-MHz Filter Adjustment	6
D—1-GHz Multiplier Adjustment	7
E—4-GHz Multiplier Adjustment	8

CHART A

TROUBLESHOOTING

APPARATUS:

- 1—Kruse 52011 IF/RF Test Set

CHART A (Contd)

STEP	PROCEDURE
	<p><i>Note:</i> 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 level requirements specified in other sections.</p> <p>Fails Frequency Requirement</p> <p>1 Perform the tests outlined in Steps 1 through 4, Chart B.</p> <p>Fails Output Level Requirement</p> <p>2 Perform Steps 3 and 4 to check the overall output level performance of the 500-MHz generator.</p> <p>3 Operate the MWV GEN 3 pushbutton on the meter panel and read the meter.</p> <p><i>Requirement:</i> Stamped meter indication ± 5 units.</p> <p>If this requirement is not met, perform the adjustments outlined in Chart B.</p> <p>4 Operate the MWV CUR MON pushbutton on the meter panel. If the meter does not indicate 50 ± 5, perform Chart C and Chart D.</p> <p>5 Perform Chart E.</p>

CHART B

500-MHZ GENERATOR ADJUSTMENT

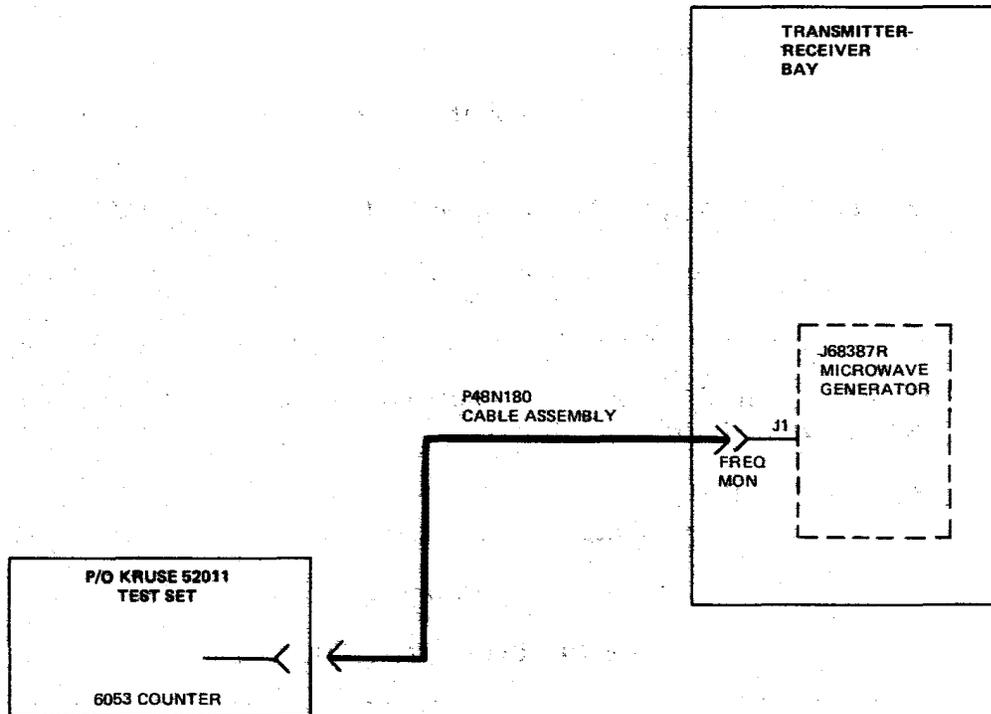
APPARATUS:

- 1—Kruse 52011 IF/RF Test Set
 - 1—P48N180 Cable Assembly
-

STEP	PROCEDURE
	<p><i>Note:</i> 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 such that the frequency is within limits when the adjustment tool is removed.</p> <p>1 Operate the MWV GEN 1 pushbutton on the bay meter panel.</p>

CHART B (Contd)

STEP	PROCEDURE
2	Adjust the FREQ ADJ control to maximum clockwise and then adjust the 125 MHz TUN control for a maximum indication on the panel meter.
3	Set up test connections according to Fig. 1.



Oscillator Frequency Measurement
Fig. 1

- 4 Adjust the **FREQ ADJ** control for a frequency equal to $f_0 \pm 10$ Hz (f_0 is the crystal frequency).

If this requirement is met, proceed to Step 6; if not, replace the crystal in accordance with Step 5 and repeat Steps 1 through 4. If this requirement cannot be met by replacing the crystal, replace the 500-MHz generator with a spare unit in accordance with 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 plug P1 which supplies power to the 500-MHz generator unit and connector P2 from the OUT jack.

CHART B (Contd)

STEP	PROCEDURE
------	-----------

- (b) Remove the 500-MHz generator unit from the generator chassis by removing the four retaining screws.
 - (c) Remove the top cover from the 500-MHz generator unit.
 - (d) Remove crystal Y1 from its socket and replace with one having the required frequency (value stamped on package).
 - (e) Replace the top cover on the 500-MHz generator unit.
 - (f) Reinstall the 500-MHz generator unit in the generator chassis and reconnect power plug P1 and connector P2 to the OUT jack.
- 6 Set LEV ADJ control to its maximum clockwise position.
- 7 Operate MWV GEN 2 pushbutton on the meter panel.
- 8 Adjust the 250 MHz TUN control for a maximum indication on the panel meter.
- 9 Operate MWV GEN 3 pushbutton 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 level 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 such 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 level 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 such 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.

CHART B (Contd)

STEP

PROCEDURE

- (g) Operate MWV GEN 2 pushbutton on the bay panel meter.
- (h) Adjust the 250 MHz TUN control for a maximum indication on the bay panel meter.
- (i) Operate MWV GEN 3 pushbutton on the bay panel meter.
- (j) Slowly adjust the 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.
- (l) Adjust the FREQ ADJ control for a frequency equal to $f_0 \pm 10$ Hz (f_0 is the crystal frequency).

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

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 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 level on the front of the unit. If this requirement is met, proceed to Chart C, if not, replace the 500-MHz generator with a spare unit in accordance with Step 5. Adjust the replaced 500-MHz generator as outlined in this chart.

CHART C

500-MHZ FILTER ADJUSTMENT

APPARATUS:

None

Note: In the procedure which follows, it is assumed that the filter is approximately adjusted for the generator frequency and that only a minor adjustment of the filter fine-tuning frequency control may be required.

CHART C (Contd)

STEP	PROCEDURE
1	Operate MWV CURR MON pushbutton on the meter panel.
2	If a meter indication greater than 20 units is observed, proceed to Step 4; if not, proceed to Step 3.
3	On the 1-GHz multiplier, rotate the CURR ADJ control to the maximum clockwise position; then back off two turns.
4	Adjust the 500-MHz filter fine-frequency tuning control, FLT TUN, for a maximum panel meter indication.
5	If no meter indication is observed, replace the 1-GHz multiplier with a spare (see Step 6) and repeat the tuning procedure outlined in Charts C and D.
6	Replace the 1-GHz multiplier as follows: <ul style="list-style-type: none"><li data-bbox="407 934 1490 961">(a) Disconnect input and output connectors P14 and P15 from the 4-GHz multiplier.<li data-bbox="407 997 1533 1058">(b) Remove the 4-GHz multiplier from the generator chassis by removing the three retaining screws.<li data-bbox="407 1094 1252 1121">(c) Disconnect plug P10 supplying power to the 1-GHz multiplier.<li data-bbox="407 1157 1203 1184">(d) Disconnect input connector P9 and output connector P11.<li data-bbox="407 1220 1533 1281">(e) Remove the 1-GHz multiplier from the generator chassis by removing the four retaining screws.<li data-bbox="407 1316 1533 1377">(f) Install the spare 1-GHz multiplier in the generator chassis and reconnect plugs P9, P10, and P11.<li data-bbox="407 1413 1365 1440">(g) Replace the 4-GHz multiplier and reconnect connectors P14 and P15.

CHART D

1-GHZ MULTIPLIER ADJUSTMENT

APPARATUS:

1—Kruse 52011 IF/RF Test Set

CHART D (Contd)

STEP	PROCEDURE
1	Monitor the MWV CURR MON meter indication while adjusting the 1-GHz multiplier tuning controls using the following procedure: <ol style="list-style-type: none">Adjust the OUT CPLG control to maximum counterclockwise.Adjust the IN TUN control to obtain a maximum meter reading.Adjust the OUT TUN control to obtain a minimum meter reading.Set the meter indication, using the CURR ADJ control, to 50 units.Repeat (b) through (d) to achieve the required current reading making (c) the last adjustment.
2	If the above tuning procedure cannot be achieved, replace the 1-GHz multiplier in accordance with Chart C, Step 6.
3	The final tuning procedure for this multiplier is performed in Chart E.

CHART E

4-GHZ MULTIPLIER ADJUSTMENT

APPARATUS:

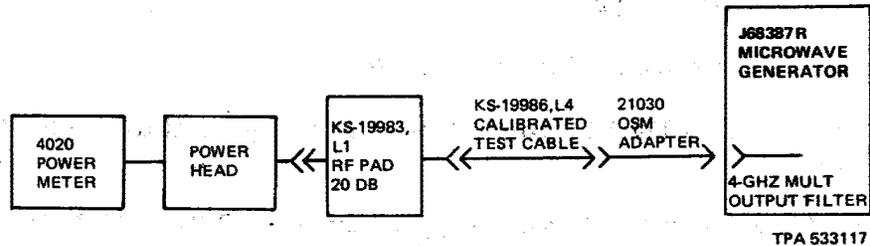
- 1—Kruse 52011 IF/RF Test Set
 - 1—KS-19986, L1 or L4 Calibrated Test Cable
 - 1—KS-19983, L1 20-dB RF Pad
 - 1—Adapter, OSM model 21030
-

STEP	PROCEDURE
1	Remove P15 from the output filter of the 4-GHz multiplier.
2	Connect the model 21030 OSM adapter to the output filter.
3	Using the calibrated test cable and 20-dB pad, make connections between the OSM adapter and the RF PWR HEAD on the test set as shown in Fig. 2.

CHART E (Contd)

STEP

PROCEDURE



Output Power Adjustment—Test Arrangement

Fig. 2

- 4 Adjust the two controls on the 4-GHz multiplier for maximum output power.

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

- 5 If the requirement is met, proceed to Step 11.

If the above requirement is not met, adjust the OUT CPLR of the 1-GHz multiplier three turns clockwise. (If there are not more clockwise turns left, see Step 6). Monitoring the MWV CURR 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.
 - (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 CURR MON meter.
 - (d) Repeat (a) through (c) making (b) the last step until no further control interaction is observed.
 - (e) Repeat Step 4.
- 6 If the above requirement is not met, replace diode CR4, which is located in the 4-GHz multiplier.
- 7 Adjust the OUT CPLR control to maximum counterclockwise and repeat Step 5. If after replacing the diode CR4, the requirement is still not met, replace the 1-GHz multiplier in accordance with Chart C, Step 6.

CHART E (Contd)

STEP	PROCEDURE
8	Remove the cable from the FREQ MON jack. Disconnect the calibrated cable and 20-dB pad and the OSM adapter from the 4-GHz output filter. Reconnect P15 to the output filter of the 4-GHz multiplier.
9	Set up the test connections shown in Fig. 1.
10	Adjust the FREQ ADJ control for a frequency equal to $f_0 \pm 10$ Hz (f_0 is the crystal frequency).
11	On the appropriate control panel, press the MVW GEN 1 , MVW GEN 2 , MVW GEN 3 , MVW CURR MON , and MVW GEN OUT pushbuttons and record the panel meter indications in the space provided.