

**RADIO TEST EQUIPMENT**  
**MICROWAVE TEST SETS**  
**J68392A TRANSMITTER-RECEIVER TEST SET**  
**MAINTENANCE**  
**J68392F IF DETECTOR CIRCUIT**

This section contains the procedure for testing the return loss and gain of the IF detector circuit and the voltage measurements required for troubleshooting the circuit. For the description of the IF detector circuit, refer to Section 104-415-100. The schematic diagram is shown on SD-50568-01.

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**Note:** Before proceeding with the tests outlined in Charts 1, 2, and 3, it is assumed that the output power and flatness in Chart 2 of Section 104-415-501 have been met.

**CHART 1**  
**Input Return-Loss Test**

STEP	PROCEDURE
1	Set up the test as shown in Fig. 1.
2	Adjust the IF CENTER FREQ control on the test set control panel for an indication of $60 \pm 0.1$ MHz on the counter.
3	Adjust the AMPL GAIN control on the test set control panel for an indication of -2 on the power meter (-7 dBm).

## CHART 1 (Cont)

STEP	PROCEDURE
4	Connect the KS-19982, L2 termination to the UNKNOWN connector in the return-loss bridge.
5	Set ATTEN 2 to 0 dB.  <b>Requirement:</b> The power meter indication shall be below -2 (such as, -3, -4, etc.).
6	Set ATTEN 2 to 50 dB and remove the KS-19982, L2 termination.
7	Using the P2DE 6-inch cable assembly, connect the UNKNOWN connector on the return-loss bridge to the IF DET IN jack on the test set.
8	Adjust ATTEN 2 for a power meter indication of -2.
9	Subtract the setting of ATTEN 2 (Step 8) from 50. Record this number.  <b>Requirement:</b> The difference between 50 and the ATTEN 2 setting shall be 35 dB or greater.
10	Repeat Steps 3, 7, 8, and 9 at frequency settings of $70 \pm 0.1$ MHz and $80 \pm 0.1$ MHz.
11	If the requirements are met, proceed to Step 17. If the requirements are not met, adjust IN RL1 and IN RL2 until the requirements are met and proceed to Step 17. If the requirements still cannot be met, disconnect the P-48N290 cable going to the IF IN jack on the test set IF detector (inside test set). The IF IN jack is located on the right front of the unit as one faces the front of the test set.
12	Disconnect the P2DE 6-inch cable from the IF DET IN jack on the test set.
13	Repeat Steps 2 and 3.
14	Using the P2DE 6-inch cable, connect the UNKNOWN connector on the return-loss bridge to the IF IN jack on the IF detector.
15	Repeat Steps 8 through 10.
16	If the requirements in Step 15 are not met, repeat Steps 2, 3, 6, 7, 8, 9, and 10, readjusting IN RL1 and IN RL2 until the requirements are met. If the requirements can now be met, the P-48N290 cable is faulty and should be repaired or replaced.  <b>Note:</b> When this has been done, repeat Steps 2, 3, 6, 7, 8, 9, and 10 to insure that the requirements are met with the new or repaired cable.
	If the requirements cannot be met by readjusting IN RL1 and IN RL2, check the IF detector according to Chart 5.

CHART 1 (Cont)	
STEP	PROCEDURE
17	<p>Compare the return loss at 60, 70, and 80 MHz.</p> <p><b>Requirement 1:</b> The return loss (the number obtained in Step 9) at 60 and 80 MHz shall be within .5 dB of each other and shall be at least 35 dB.</p> <p><b>Requirement 2:</b> The return loss at 70 MHz shall be at least 35 dB and shall be within 3 dB of the return loss at 60 and 80 MHz.</p>
18	<p>If the requirements cannot be met, adjust IN RL1 and IN RL2 until they are met. If the requirements still cannot be met, check the unit according to Chart 5.</p>
CHART 2	
Output Return-Loss Test	
STEP	PROCEDURE
1	Set up the test as shown in Fig. 1.
2	Adjust the IF CENTER FREQ control on the test set control panel for an indication of $60 \pm 0.1$ MHz on the counter.
3	Adjust the AMPL GAIN control on the test set control panel for an indication of -2 on the power meter (-7 dBm).
4	Connect the KS-19982, L2 termination to the UNKNOWN connector on the return-loss bridge.
5	Set ATTEN 2 to 0 dB.
	<b>Requirement:</b> The power meter indication shall be below -2 (that is, -3, -4, etc.).
6	Set ATTEN 2 to 50 dB and remove the KS-19982, L2 termination.
7	Using the P2DE 6-inch cable assembly, connect the UNKNOWN connector on the return-loss bridge to the IF DET MON jack on the test set.
8	Adjust ATTEN 2 for a power meter indication of -2.
9	Subtract the setting of ATTEN 2 (Step 8) from 50. Record this number.
	<b>Requirement:</b> The difference between 50 and the ATTEN 2 setting shall be 25 dB or greater.

## CHART 2 (Cont)

STEP	PROCEDURE
10	Repeat Steps 3, 7, 8, and 9 at frequency settings of $70 \pm 0.1$ and $80 \pm 0.1$ MHz.
11	If the requirements are met, the test is complete. If the requirements are not met, proceed to Step 12.
12	Disconnect the P-48N291 cable to the MON OUT jack on the test set IF detector (inside the test set). The MON OUT jack is on the left front of the unit as one faces the front of the test set.
13	Disconnect the P2DE 6-inch cable from the IF DET MON jack on the test set.
14	Repeat Steps 2 and 3.
15	Using the P2DE 6-inch cable, connect the UNKNOWN connector on the return-loss bridge to the MON OUT jack on the detector.
16	Repeat Steps 8 through 10.
17	If the requirements are met, the P-48N291 cable is faulty and should be repaired or replaced.  <i>Note:</i> When this has been done, repeat Steps 2, 3, 6, 7, 8, 9, and 10 to insure that the requirements can be met with the new or repaired cable.
18	If the requirements are not met, check the IF detector according to Chart 5.  Make the normal connections inside the test set to the detector.

## CHART 3

## Monitor Loss Test

STEP	PROCEDURE
1	Set up the test as shown in Fig. 2.
2	Adjust the IF CENTER FREQ control on the test set control panel for an indication of $70 \pm 0.1$ MHz on the counter.
3	Adjust the AMPL GAIN control on the test set control panel for an indication of $0 \pm 0.2$ on the power meter (0 dBm).
4	Change the test connections to option (Y).

## CHART 3 (Cont)

STEP	PROCEDURE
5	Remove the P2BJ 6-foot cord from the IF SAMP OUT and CTR jacks.
6	Using the P2BJ 6-foot cord, connect the IF DET MON jack to the ATTEN 2 IN jack.
7	Adjust ATTEN 2 for a power meter indication of $0 \pm 0.1$ .
8	Subtract the setting of ATTEN 2 (Step 7) from 30.  <b>Requirement:</b> The difference between 30 and the ATTEN 2 setting shall be $25 \pm 1.0$ dB. If the requirement is not met, check the unit according to Chart 5.

## CHART 4

## Amplitude Response and Sensitivity Test

STEP	PROCEDURE
1	Set up the test as shown in Fig. 3.
2	Observe the indication on the power meter.  <b>Requirement:</b> The indication on the power meter shall be $-3 \pm 0.1$ (+7 dBm). If the requirement is not met, adjust the OUTPUT control on the IF sweep oscillator (rear of test set) until the requirement is met.
3	Set ATTEN 2 to 20 dB.
4	Set the POWER RANGE DBM switch on the power meter to -10.
5	Adjust the IF CENTER FREQ control on the test set control panel for an indication of $70 \pm 0.1$ MHz on the counter.
7	Adjust ATTEN 2 for a power meter indication of $0 \pm 0.1$ (-10 dBm).
8	Change the test connections to option (Y).
9	Adjust the TEST TRACE and REF TRACE controls on the test set control panel to center the two traces on the oscilloscope display.  <b>Note:</b> The POSITION and DC BALANCE controls on the oscilloscope differential amplifier may also be used, if necessary.

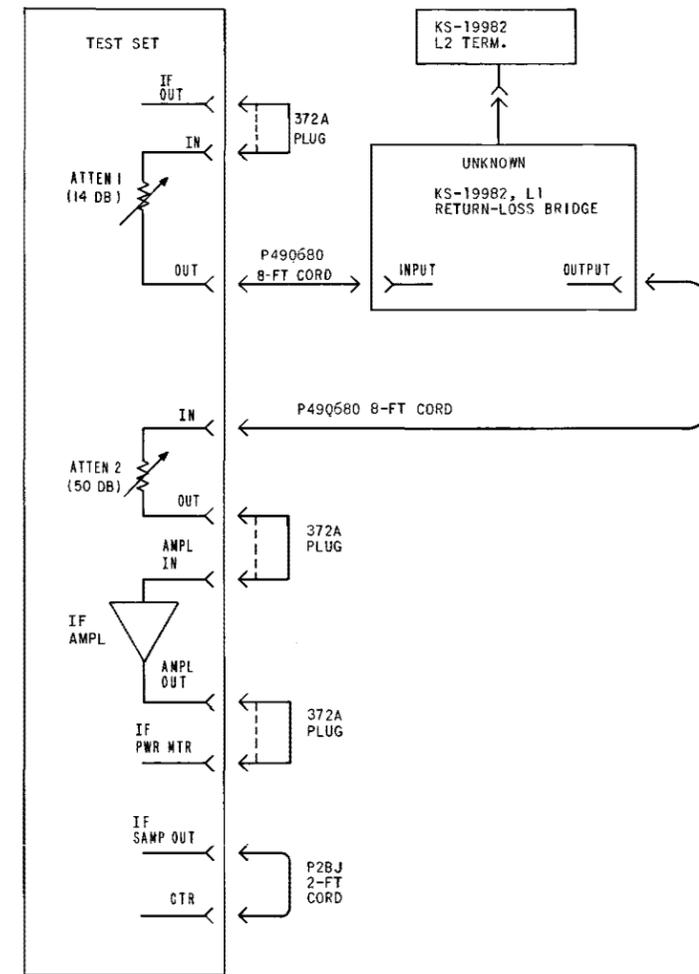
## CHART 4 (Cont)

STEP	PROCEDURE
10	Adjust the SWEEP TIME and POSITION controls on the scope time base unit for approximately 10 centimeters horizontal deflection.
11	<p>Change the setting of ATTEN 2 by 0.1 dB.</p> <p><b>Requirement:</b> The test trace on the oscilloscope shall change by at least 3 centimeters.</p> <p>If the requirement is not met, check the unit according to Chart 5.</p>
12	Remove the P2BJ 6-foot cord from the IF SAMP OUT and CTR jacks.
13	Set the CTR switch to MKR FREQ.
14	Set the IF MARKER amplitude to approximately midrange.
15	Adjust the IF SWEEP WIDTH and IF CENTER FREQ controls on the test set control panel for a 60-to 80-MHz sweep.
16	<p>Calibrate the oscilloscope for .01 dB per centimeter.</p> <p><b>Requirement:</b> The test trace shall be flat to within .01 dB from 60 to 80 MHz.</p> <p>If the requirement is met, proceed to Step 17.</p> <p>If the requirement is not met, refer to Section 104-415-501, Charts 2 and 3.</p>
17	Adjust the IF SWEEP WIDTH and IF CENTER FREQ controls for a 55 to 95 MHz sweep.
18	<p>Calibrate the oscilloscope for .01 dB per centimeter.</p> <p><b>Requirement:</b> The test trace shall be flat to within .05 dB between 55 to 95 MHz.</p>

<b>Chart 5</b>	
<b>Voltage Measurements (Troubleshooting)</b>	
<b>APPARATUS:</b>	
1—KS-14510, L1 Volt-Ohm-Milliammeter (VOM)	
<b>STEP</b>	<b>PROCEDURE</b>
1	Make the following voltage measurements at Q1 and Q2. The voltages given are typical and are measured to ground.

Q1	Emitter	-12.2 vdc
	Base	-12.0
	Collector	- 2.4
Q2	Emitter	-15.3
	Base	-14.5
	Collector	- 5.8





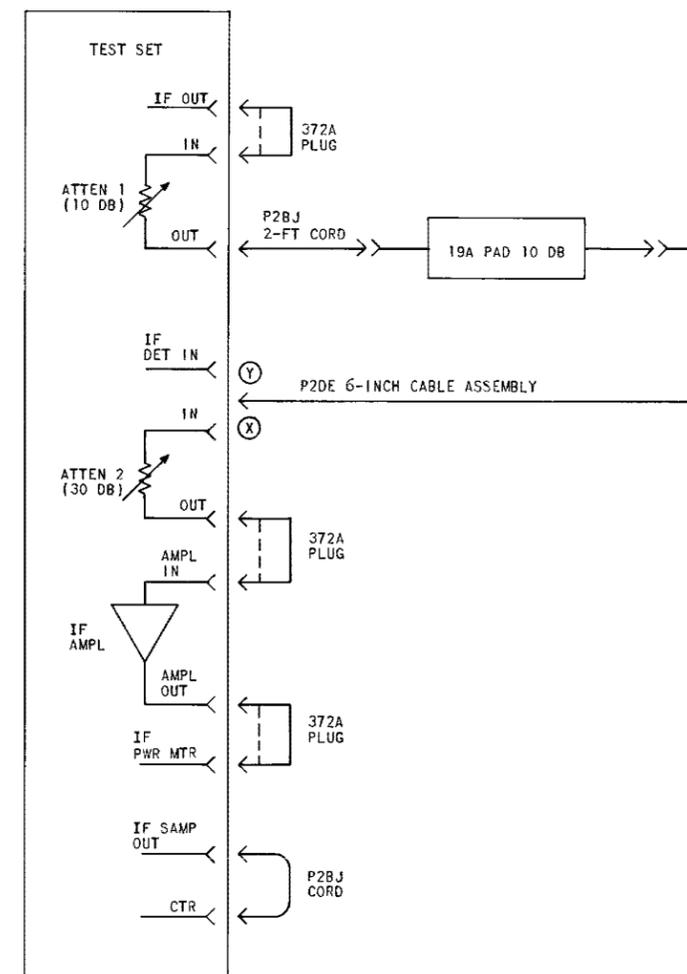
PREPARATION FOR TEST

1. SET THE ATTENUATORS AS INDICATED.
2. ESTABLISH THE TEST CONNECTIONS BUT LEAVE THE UNKNOWN CONNECTOR ON THE RETURN-LOSS BRIDGE UNTERMINATED.
3. MAKE THE FOLLOWING CONTROL SETTINGS ON THE TEST SET:

UNIT	CONTROL	POSITION
CONTROL PANEL	FUNCTION IF SWEEP WIDTH CTR	IF - IF MAX CCW EXT
POWER METER	INPUT CHANNEL POWER RANGE DBM	IF -5

4. ADJUST THE GATE TIME SWITCH ON THE COUNTER TO INDICATE MHZ ON THE COUNTER DISPLAY.

Fig. 1—Input and Output Return-Loss Test Setup



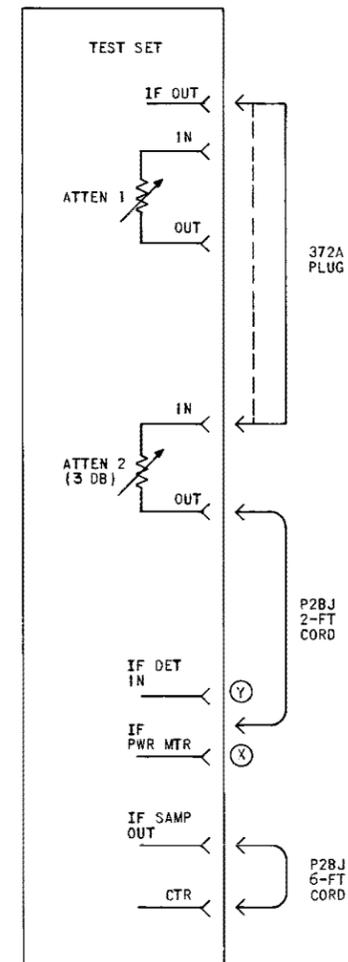
PREPARATION FOR TEST

1. SET THE ATTENUATORS AS INDICATED.
2. SET CONTROLS ON THE TEST SET AS FOLLOWS:

UNIT	CONTROL	POSITION
CONTROL PANEL	FUNCTION IF SWEEPWIDTH CTR	IF - IF MAX CCW EXT
POWER METER	INPUT CHANNEL POWER RANGE DBM	IF -10

3. ESTABLISH THE TEST CONNECTIONS BUT DO NOT CONNECT OPTION (X) OR (Y).
4. DISCONNECT THE 372A PLUG FROM THE AMPL OUT AND THE IF PWR MTR JACKS.
5. CONNECT THE P2DE CABLE TO IF POWER MTR JACK.
6. OBSERVE THE POWER METER.  
REQUIREMENT: THE POWER METER SHALL INDICATE  $0 \pm 0.01$  (-10 DBM). IF THE REQUIREMENT IS NOT MET, ADJUST THE OUTPUT CONTROL OF THE IF SWEEP OSCILLATOR (REAR OR TEST SET).
7. ESTABLISH THE TEST CONNECTIONS SHOWN FOR OPTION (X).
8. ADJUST THE GATE TIME SWITCH ON THE COUNTER TO INDICATE MHZ ON THE COUNTER DISPLAY.
9. SET THE POWER RANGE DBM SWITCH ON THE POWER METER TO 0.

Fig. 2—Monitor Loss Test Setup



PREPARATION FOR TEST

1. SET ATTEN 2 TO 3 DB.
2. SET THE CONTROLS ON THE TEST SET AS FOLLOWS:

UNIT	CONTROL	POSITION
CONTROL PANEL	FUNCTION IF SWEEP WIDTH CTR	IF - IF MAX CCW EXT
POWER METER	INPUT CHANNEL POWER RANGE DBM	IF +10
SCOPE TIME BASE	MAGNIFIER SWEEP TIME SINGLE-NORMAL	X 10 EXT NORMAL
SCOPE DIFFERENTIAL AMPLIFIER	BANDWIDTH AMPLIFIER SENSITIVITY VERNIER AC-DC-OFF (+INPUT) AC-DC-OFF (-INPUT)	4 DC 1MV/CM CAL DC OFF

3. CHECK THE CALIBRATION OF THE OSCILLOSCOPE BY SETTING THE SENSITIVITY AND VERNIER SWITCH ON THE DIFFERENTIAL AMPLIFIER TO CAL.  
REQUIREMENT: THE SQUARE WAVE NOW DISPLAYED ON THE OSCILLOSCOPE SHALL BE 6 CENTIMETERS IN HEIGHT. IF THE REQUIREMENT IS NOT MET, ADJUST THE SENS CAL CONTROL ON THE SCOPE DIFFERENTIAL AMPLIFIER UNTIL THE REQUIREMENT IS MET.
4. SET THE SENSITIVITY SWITCH TO 1MV/CM.

Fig. 3—Transmission Response and Sensitivity Test Setup