

the DOT MARKER and LEVEL controls as necessary to place the left edge of the displayed signal on the left edge reference line and the top peak of the signal on the top amplitude reference line.

b. Carefully examine the Low Frequency Spectrum Analyzer display for spurs at the offset frequencies listed in Table 5-8. Verify that all spurs are  $-70$  dBc for offsets greater than 550 Hz and less than  $-56$  dBc for offsets less than 550 Hz.

**Table 5-8. Display and Microprocessor Spurs**

SPUR SOURCE	FREQUENCY OFFSETS (In Hz) FROM 1 MHz CARRIER
DISPLAY	500 $\pm$ 20, 1500 $\pm$ 30, 1000 $\pm$ 40, (1000n) $\pm$ (40n)
MICROPROCESSOR	500 $\pm$ 20, 1500 $\pm$ 30, 1000 $\pm$ 40, (1000n) $\pm$ (40n)
Where: n = The number of the harmonic being checked. Example: The fifth harmonic offset would be in the area of 5000 $\pm$ 200 Hz	

#### 5-34. Direct Through Low Pass/High Pass Filter Spur Check

---

PURPOSE:	Verify spur performance by direct observation.
TEST EQUIPMENT:	Low Frequency Spectrum Analyzer, Low Pass Filter, High Frequency Spectrum Analyzer, DC Block (High Pass Filter).
REMARKS:	The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this check is started.

---

5-35. Complete the following steps to verify spur performance by direct observation:

1. Before making any connections, set the equipment up as follows:

a. Set the Low Frequency Spectrum Analyzer controls as follows:

DOT FREQUENCY	450 kHz
DOT MKR	center
FREQUENCY SPAN/DIV	1 kHz
RESOLUTION (Hz)	COUPLED
TIME/DIV	AUTO
INPUT TERMN Z	50 Ohms
INPUT REF	50 Ohms dBm
REF LEVEL	$-60$ dBm

b. Program the UUT for an output of 450 kHz at a level of  $-100$  dBm, select special function 00, and press all the MODULATION controls so that they are dark.

2. Connect the RF OUTPUT of the UUT to the input of the Low Frequency Spectrum Analyzer through the Low Pass Filter. Verify that the 450 kHz signal is at the -40 dB line on the Low Frequency Spectrum Analyzer. This means that the -40 dB line on the analyzer is the equivalent of -100 dBm from the UUT. Adjust LEVEL on the Low Frequency Spectrum Analyzer as necessary.
3. Change the equipment setup as follows:
  - a. Set the Low Frequency Spectrum Analyzer controls as follows:
 

FREQUENCY SPAN/DIV	0
RESOLUTION	1 kHz (this is 26 dB BW factor)
TIME/DIV	10S
  - b. Press the REL FREQ control so that it is lit. Program the UUT for an output of 5 MHz at a level of +1 dBm.
4. Verify that the trace (noise) on the Low Frequency Spectrum Analyzer is less than -129 dBc. Since the -40 dB line on the analyzer is equivalent to -100 dBm, the -40 dB line on the analyzer is equivalent to -127 dBc.

*NOTE*

*The value of the -40 dB line was calculated using the formula:*

$$-100 \text{ dBm} - X - (+1 \text{ dBm})$$

*where X is the equivalent noise bandwidth factor. For the TEK 7L5, 1 kHz bandwidth, X= 26 dB. Therefore, -100 dbm - 26 dB - (+1 dBm) = -127 dBc.*

5. Change the equipment setup as follows:
  - a. Set the RESOLUTION control on the Low Frequency Spectrum Analyzer to the 100 Hz position.
  - b. Store a reference frequency of 450 kHz, then sequentially program the UUT for the relative frequencies listed below and verify at each frequency that the trace on the Low Frequency Spectrum Analyzer is less than 90 dBc (remember that the -40 dB line on the analyzer is equivalent to -101 dBc).

UUT frequencies: 12, 14, 16, 18, 10, 20, 30, 40, 50, 60 MHz

*NOTE*

*The Low Frequency Spectrum Analyzer SPAN control is set to zero span width and is always tuned to 450 kHz, so slow sweep speed is always averaging the result. There is no need to wait for a complete scan.*

6. Set up the equipment as follows:
  - a. Press the REL FREQ control so it is dark and connect the UUT to the High Frequency Spectrum Analyzer through the DC Block.
  - b. Program the High Frequency Spectrum Analyzer for 520 MHz, -90 dBm, FREQUENCY SPAN 50 kHz/DIV, and calibrate at -90 dBc.
  - c. Program the UUT for an RF output frequency of 100 kHz at a level of 0 dBm.
7. Verify that the spurs at 519.9 and 520 MHz are less than -90 dBc.

**5-36. Mixer Carrier Null Spur Check**


---

<b>PURPOSE:</b>	Verify spur performance by using a LO (6071A) and an RF Mixer to cancel the carrier and to provide a zero difference beat frequency that can be examined for spurs on the High Frequency Spectrum Analyzer.
<b>TEST EQUIPMENT:</b>	High Frequency Spectrum Analyzer, Spur Test System, UHF Synthesized Signal Generator (UHF SSG), Low Frequency Synthesized Signal Generator (LF SSG), Oscilloscope.
<b>REMARKS:</b>	The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this check is started.

---

5-37. Complete the following steps to perform the Mixer Carrier Null Spur Check:

1. Program the UUT for a 0 dBm output level and program the LO for a +8 dBm output level.
2. Connect the equipment as shown in Figure 5-4.
3. Set up the equipment as follows:
  - a. Set the Low Frequency Spectrum Analyzer controls as follows:
 

DISPLAY A&B	On
INPUT BUFFER	OFF
BASELINE CLIPPER	To the top of the screen
TRIGGER	FREE RUN
NORM	On
REFERENCE LEVEL	-10 dB
INPUT TERMINATION	50 ohms
INPUT REFERENCE	dBm 50 ohms
FREQUENCY SPAN/DIV	5 kHz
RESOLUTION	COUPLED
DOT FREQUENCY	20 kHz
DOT MARKER	Center
SWEEP	AUTO
  - b. Program the LF SSG for an output of 20 kHz at a level of 0.766 mV, terminated.
  - c. Set up the oscilloscope so that:
    1. Channel 1 is 50 mV/div, dc coupled, trace in upper half of the CRT.
    2. Channel 2 is 0.2V/div, ac coupled, trace in the lower half of the CRT.
    3. Sweep time is 1 msec/div.
  - d. Program the UHF SSG for an RF output frequency of 350 MHz, a level of +8 dBm, and an FM deviation of 9 kHz DEV. Turn on the EXT FM/ØM and the DC COUPLED controls.

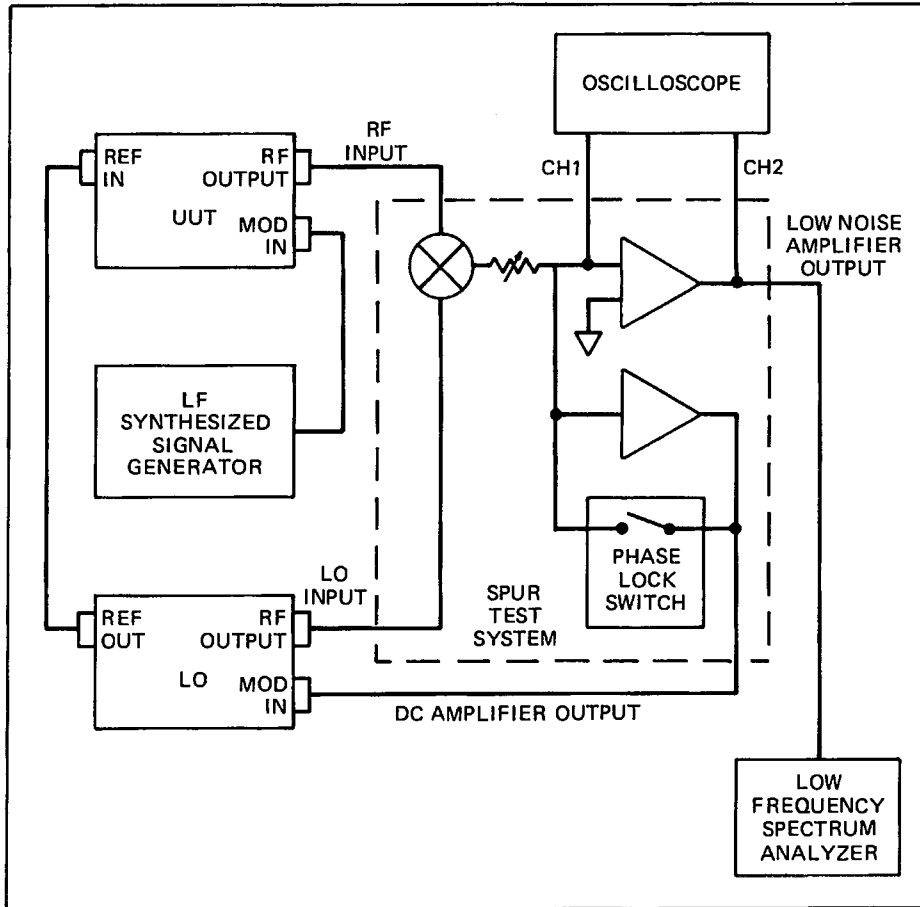


Figure 5-4. Mixer Carrier Null Spur Check

- e. Program the UUT for an output of 350 MHz at a level of 0 dBm, select special function 00, program a FM deviation of 20 kHz DEV. Turn on the EXT FM/ $\emptyset$ M control and turn off the DC COUPLED control.
  - f. Rapidly press and release (tap) the Phase Lock switch on the spur test system until the Channel 1 trace on the oscilloscope is  $0V \pm 10 mV$ . This indicates that the UUT and the UHF SSG RF output signals are phase locked.
4. Calibrate the assembled test system as follows:
    - a. Set the REFERENCE LEVEL control on the Low Frequency Spectrum Analyzer so that the 20 kHz signal is at the -10 dB line. This means that the 0 line on the analyzer is now equivalent to -50 dBc and the -50 line on the analyzer is equivalent to -100 dBc.

**NOTE**

*Lock between the UUT and the LO must be maintained at all calibration points and during subsequent measurements.*

- b. Sequentially program both the LO and the UUT for RF output frequencies of 10, 50, 100, 200, 250, 400, 500, and, if the UUT is a 6071A, 800 MHz. At each frequency, record the error in dB from the level at the original frequency of 350 MHz.
  - c. Verify that the error at 10 MHz and 50 MHz is less than +2 dB and less than  $\pm 1$  dB at all other points.
5. Establish the proper phase relationship between the UUT and the LO RF output frequencies as follows:
- a. Turn off the EXT FM/ $\theta$ M controls on the LO and the UUT.
  - b. Disconnect the DC Amplifier Output of the spur test system from the MOD IN connector on the LO.
  - c. Use the UUT Edit Knob to quickly change the UUT RF Output frequency up 1 Hz and back down 1 Hz. Repeat this step until the Channel 1 trace on the oscilloscope is  $0V \pm 10$  mV.

6. Set the Low Frequency Spectrum Analyzer controls as follows:

FREQUENCY SPAN/DIV	50-Hz
RESOLUTION (Hz)	10
DOT FREQUENCY	0 Hz
DOT MARKER	to left edge

7. Check for spurs at the line and fan frequency and for display/microprocessor spurs. Verify that the spurs at the line and fan frequency are less than  $-56$  dBc and that the display/microprocessor spurs are less than  $70$  dBc. The display and line frequency spurs may be difficult to distinguish. If so, select special function 05 to turn off the display (one LED will flash). It may be necessary to turn off the displays on both the UUT and the LO.
8. On the Low Frequency Spectrum Analyzer, set the FREQUENCY SPAN/DIV control to  $200$  Hz and set the TIME/DIV control to  $10$  S. Verify that the spurs above  $550$  Hz are less than  $-70$  dBc.

9. Change the equipment setups as follows:

- a. Press the EXT FM/ $\theta$ M and the DC COUPLED controls on the LO so that they are lit.
- b. Connect the DC Amplifier Output of the spur test system to the MOD IN connector on the LO.
- c. Set the Low Frequency Spectrum Analyzer controls as follows:

FREQUENCY SPAN/DIV	50 Hz
RESOLUTION (HZ)	10
Dot	Mid Screen
DOT FREQUENCY	Edit to 2 kHz (Fine Tune On)

10. Program the UUT and the UHF SSG for the frequencies listed in Table 5-9. Verify that the spurs listed are less than the specified value (the 0 line on the analyzer is equivalent to -50 dBc). Edit DOT FREQUENCY as necessary.

Table 5-9. 2 kHz and 10 kHz Spurs

RF OUTPUT FREQUENCIES (MHz)		SPUR (KHz)	SPECIFIED LIMIT (dBc)
UUT	UHF SSG		
300.250005 300.250500	300.250 300.250	2	-70
299.999998	300	10	-90

11. Change the equipment setup as follows:
- Program the UHF SSG for an RF output of 500.3 MHz at a level of +8 dBm and press the EXT FM/0M and the DC COUPLED controls on the UHF SSG so that they are dark. Use the EDIT FREQ and DIGIT controls to place the Bright Digit in the 1 kHz position of the FREQUENCY Display.
  - Move the DC Amplifier Output of the spur test system to the MOD IN connector on the UUT.
  - Program the UUT for an RF output of 500.3 MHz at a level of 0 dBm and program FM to 49 kHz DEV. Press the EXT FM/0M and the DC COUPLED controls so that they are lit.
12. Rapidly press and release the Phase Lock Switch.
13. Slowly edit the UHF SSG RF output frequency to 500.325 MHz while maintaining lock as indicated by the Channel 2 trace of the Oscilloscope.
14. Change the Low Frequency Spectrum Analyzer setup as follows:
- |                    |                                  |
|--------------------|----------------------------------|
| DOT FREQUENCY      | 0                                |
| Dot                | One graticule line from the left |
| FREQUENCY SPAN/DIV | 200 Hz                           |
| RESOLUTION (Hz)    | COUPLED                          |
| TIME/DIV           | COUPLED                          |
15. Check for spurs at 500, 1000, 1500, and 2000 Hz. Verify that all spurs are less than -70 dBc (the -40 line is equivalent to -90 dBc).
16. Change the Low Frequency Analyzer setup as follows:
- |                    |                                  |
|--------------------|----------------------------------|
| DOT FREQUENCY      | 10 kHz                           |
| Dot                | One graticule line from the left |
| FREQUENCY SPAN/DIV | 1 kHz                            |
| RESOLUTION (Hz)    | 100                              |
17. Verify that all spurs are less than -90 dBc (the -40 line is equivalent to -90 dBc).

18. Set up the equipment as follows:
- a. Program the UUT for an RF output frequency of 250 MHz and turn off all MODULATION controls.
  - b. Move the DC Amplifier Output of the spur test system to the MOD IN connector of the UHF SSG.
  - c. Program the UHF SSG for an RF output frequency of 250 MHz and an FM of 9 kHz DEV and turn on the EXT FM/0M and DC COUPLED controls.
  - d. Change the Low Frequency Spectrum Analyzer setup as follows:

DOT FREQUENCY	50 kHz
DOT MARKER	Mid-screen
FREQUENCY SPAN/DIV	1 kHz
RESOLUTION	COUPLED

19. Look for spurs from 20 to 100 kHz. Verify that all the spurs are less than -90 dBc. Change DOT FREQUENCY as necessary.
20. Program the LO and the UUT for the RF output frequencies listed in Table 5-10. Repeat step 20 for each frequency.

Table 5-10. 50 kHz and 100 kHz Spurs

UUT AND UHF SSG RF OUTPUT FREQUENCY (MHz)	SPUR (kHz) (APPROXIMATELY ±10%)
500	50 100
50	50 100

21. On the UUT, select special function 21 (HI DEV Mode on), set the RESOLUTION (HZ) control on the analyzer to 30, and repeat the preceding step.
22. Set the equipment up as follows:
- a. Select special function 20 (HI DEV Mode off) on the UUT and program the UUT for an RF output frequency of 350 MHz and a frequency step size of 100 kHz.
  - b. Program the UHF SSG for an RF output frequency of 350.001 MHz and a frequency step size of 100 kHz.
  - c. Set the analyzer DOT FREQUENCY to 100 kHz.
23. Simultaneously set up the UHF SSG and the UUT RF output frequencies to 351.1 and 351.101, respectively. At each 100 kHz step, verify that lock is maintained and that the 100 kHz spur is less than -90 dBc (the -50 line is equivalent to -100 dBc).

24. Set the analyzer DOT FREQUENCY to 200 kHz. Simultaneously step down the UUT and the UHF SSG RF output frequencies to 350 and 350.001 MHz, respectively, observing at each 100 kHz step that lock is maintained and that the 200 kHz spur is less than -90 dBc.

25. Change the equipment setup as follows:

a. Set the Low Frequency Spectrum Analyzer controls to the positions:

DOT FREQUENCY	210 kHz
DOT	Centered
FREQUENCY SPAN/DIV	0.1 kHz
RESOLUTION	100

b. Program the UUT for an RF output frequency of 250.210 MHz, a level of 0 dBm, and a frequency step size of 10 MHz. Turn off the MODULATION controls.

c. Program the UHF SSG for an RF output frequency of 250.211 MHz, a level of +8 dBm, and a frequency step size of 10 MHz. Turn on the EXT FM/ØM and the DC COUPLED controls.

26. Look at the spurs as follows:

a. Rapidly press and release the Phase Lock Switch until the Oscilloscope indicates that the UUT and the UHF SSG are phase locked.

b. Simultaneously step the UUT and the UHF SSG output frequencies up from 250.210 (250.211 on the UHF SSG) MHz to 510.210 (510.211 on the UHF SSG) MHz while observing the Low Frequency Spectrum Analyzer for spurs (especially at 210 kHz) at every step.

c. Verify that the spurs are less than -90 dBc (the -40 dB line is equivalent to -90 dBc).

#### NOTE

*UHF SSG spurs may be present at 211 kHz. Ignore these spurs.*

27. Maintain lock during the remainder of the procedure.

28. Select special function 21 (HI DEV Mode on) on the UUT. Simultaneously step the UUT and the UHF SSG RF frequencies down while looking for spurs as in the previous step. Verify that the spurs are less than -85 dBc.

29. Set the analyzer dot frequency to 840 kHz and select special function 20 (HI DEV Mode off) on the UUT. Simultaneously step up the UUT and the UHF SSG RF output frequencies while observing spurs at 840 kHz as in the previous step. UHF SSG spurs may occur at 844 kHz and should be ignored. Verify that all spurs are less than -90 dBc.

30. Select special function 21 on the UUT and simultaneously step down the UUT and the UHF SSG RF output frequencies while looking for 840 kHz spurs as in the previous step. Verify that all spurs are less than -85 dBc.



31. Repeat Steps 26 through 31 if necessary (around the frequency of interest where spurs just meet specifications) programing a smaller step size (such as 100 kHz) on both the UUT and the UHF SSG. Maintain lock.

32. Change the equipment setup as follows:

a. Set the analyzer setup as follows:

DOT FREQUENCY            400 kHz  
 Dot                            Centered  
 RESOLUTION (Hz)        100  
 FREQUENCY SPAN/DIV    50

b. Program the UUT for an RF output frequency of 519.6 MHz at a level of +1 dBm and select special function 20. Turn all MODULATION controls off.

c. Program the UHFSSG for an RF output frequency of 519.601 MHz at a level of +8 dBm and select special function 20. Turn on the FM/ØM and the DC COUPLED controls.

33. Check for a 400 kHz spur. Verify that the 400 Hz spur is less than -90 dBc (The -50 line is equivalent to -101 dBc).

34. Change the equipment setup as follows:

a. Select special function 31 (fixed range) on the UUT, then program the UUT for an RF output of 62 MHz at a level of 0 dBm.

b. Program the UHF SSG for an RF output frequency of 64.951 MHz.

c. Edit the UUT RF output frequency to 64.95 MHz.

d. Use the Phase Lock Switch to establish phase lock.

35. Verify proper operation in fixed range as follows:

a. Verify that the 400 kHz spur is -90 dBc (the -40 line is the equivalent of -90 dBc).

b. Program the UUT for an RF output level of 0 dBm and repeat this step at the RF output frequencies listed in Table 5-11.

**NOTE**

*At each frequency, establish lock using the Phase Lock Switch.*

c. Select special function 30 on the UUT to disable fixed range operation.

**Table 5-11. UUT and UHF SSG Frequencies**

UUT	LO
57.333333 MHz	57.333000 MHz
51.960000 MHz	51.961000 MHz
47.236354 MHz	47.236000 MHz

**5-38. PHASE NOISE CHECK**


---

<b>PURPOSE:</b>	Verify phase noise performance of the UUT.
<b>TEST EQUIPMENT:</b>	Low Frequency spectrum Analyzer, Low Frequency Synthesized Signal Generator (LF SSG), Signal Analyzer, Spur Test System, UHF Signal Generator (UHF SSG)
<b>REMARKS:</b>	<ol style="list-style-type: none"> <li>1. The noise performance of the UHF SSG must be equal to or better than the noise performance of the UUT because this check measures total noise performance of the UUT, the UHF SSG, and the test setup.</li> <li>2. The UUT and all test equipment must be a room temperature and must be operating for at least 30 minutes before this check is started.</li> </ol>

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5-39. Complete the following steps to set up the equipment for the Phase Noise Check.

1. Connect the test equipment as shown in Figure 5-5. Construction of the spur test system is described in the Spurious Output Checks material presented earlier in this section.
2. Set up the equipment as follows:
  - a. Program the UUT for an RF output frequency of 250 MHz at a level of 0 dBm and for an FM deviation of 19 kHz DEV. Turn on the EXT FM/ØM control.
  - b. Program the UHF SSG for an RF output frequency of 250 MHz at a level of +8 dBm and for an RM of 9 kHz DEV. Turn on the EXT FM/ØM and the DC COUPLED controls.
  - c. Program the LF SSG for an output frequency of 19 kHz at a level of 0.766 mV rms, terminated.
  - d. Set up the Signal Analyzer as follows:

<b>INPUT</b>	
Ground Selection Switch	ISOL
A COUPLING	Up Position (AC)
CHANNEL A SENSITIVITY	1V
CAL Knob	Calibrated Position
<b>TRIGGER</b>	
LEVEL	FREE RUN
RESETITIVE	In
<b>FREQUENCY</b>	
SPAN	25 kHz
MODE	0 START
<b>MARKER</b>	
ON	In
÷BW	Out
<b>DISPLAY</b>	
AMPLITUDE A	In

SCALE 10 dB/DIV	In
AMPLITUDE REFER-EL	
LEVEL	NORM
PASSBAND SHAPE	HANNING
AVERAGE	
OFF	In
SHIFT	In
NUMBER 256	In

Set all other pushbuttons to the output positions. Adjust INTENSITY, FOCUS, and GRAT. ILLUM for the optimum display.

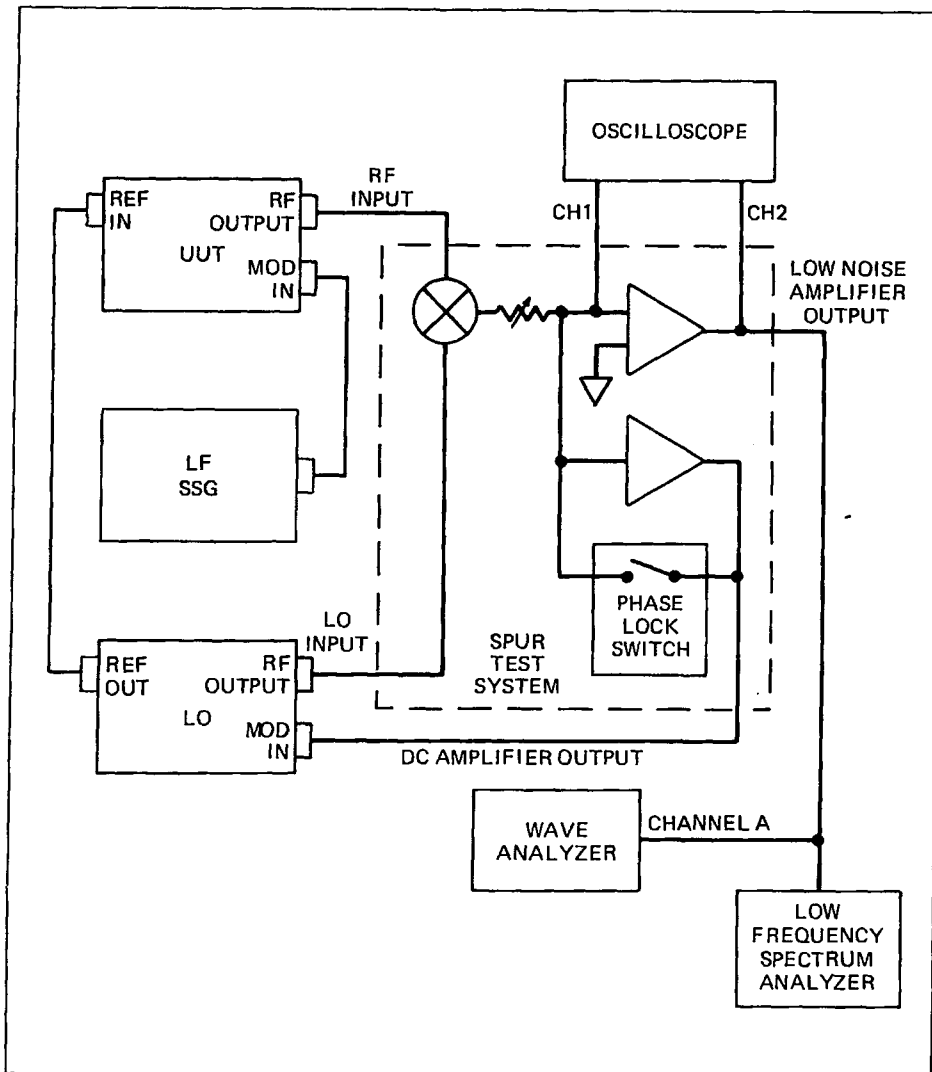


Figure 5-5. Phase Noise Check

- f. Set up the Low Frequency Spectrum Analyzer as follows:

Frequency	0
Dot	1 graticule from the left .
FREQUENCY SPAN/DIV	5 kHz
TIME/DIV	1 S
Termination	600 ohms
Reference	dBv

- g. Rapidly press and release the Phase Lock switch to establish lock.

3. On the Low Frequency Spectrum Analyzer, adjust the dot for 19 kHz signal at one minor division left of center and adjust amplitude so that the 19 kHz signal peak is 1 division from the top.

4. Verify that the waveforms on the oscilloscope and the Low Frequency Spectrum analyzer agree with the waveforms shown in Figure 5-6. These waveforms should remain consistent through the remainder of the check.

5-40. Complete the following steps to verify the phase noise performance of the UUT.

1. Establish the proper phase relationship between the UUT and the UHF SSG RF output frequencies.

a. Turn off the EXT FM/ØM controls on the UUT and the UHF SSG.

b. Disconnect the DC Amplifier output of the spur test system from the MOD IN connector on the UHF SSG.

c. Use the UUT Edit Knob to quickly change the UUT RF output frequency up 1 Hz and back down 1 Hz. Repeat this step until the Channel 1 trace on the oscilloscope is  $0V \pm 10$  mV.

d. Turn on the EXT FM/ØM control on the UUT.

2. On the Signal Analyzer, set FREQUENCY SPAN to 25 kHz, MARKER BW out, press AVERAGE OFF, and adjust Channel A sensitivity for maximum without overloading.

3. Rotate the MARKER POSITION knob so that the marker is on the 19 kHz signal in the display and record the marker reading (upper left corner of the display in dBV).

4. On the UUT, turn off the EXT FM/ØM control.

5. On the Signal Analyzer (SA), rotate the MARKER POSITION knob so that marker frequency is 20 kHz (lower part of the display) and press the MARKER÷BW control in.

6. Complete the following steps to determine the phase noise.

a. Press the AVERAGE RMS control then the RESTART control.

b. Wait for the TRIGGER DATA LOADING indicator to stop flashing then record the marker reading in dBV/ Hz.

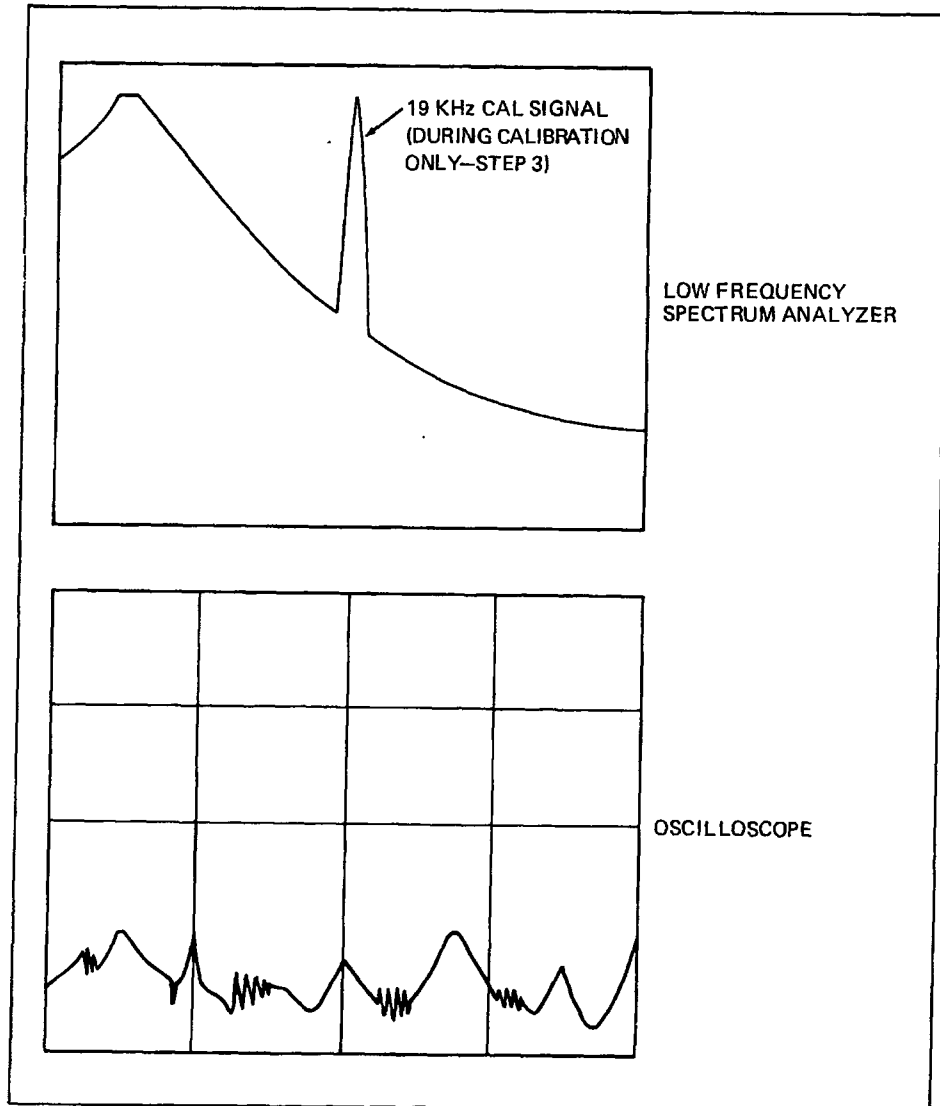


Figure 5-6. Displays During Phase Noise Check

- c. Calculate phase noise using the formula:

$$\text{Phase Noise} = \text{Marker Reading From Step 5C} - \text{Marker Reading From Step 3} - 60 \text{ dB}$$

- d. Record the computed value for phase in the appropriate space in Table 5-12 and verify that the values for phase noise is not greater than the indicated limit.
7. On the WA, rotate the MARKER POSITION knob so that marker frequency is 5 kHz.

Table 5-12. Phase Noise Check

UUT AND LO RF OUTPUT FREQUENCIES (MHz)	PHASE NOISE (dBc/Hz)* AT:			
	100 Hz	1 kHz	5 kHz	20 kHz
250 500 250 AND 500 LIMITS*	-82	-88	-115	-132
800 (6071A ONLY) 800 LIMITS	-76	-82	-109	-126
50 50 LIMITS	-75	-85	-107	-123

\*This is the total noise of the UUT, the LO, and the test setup. Two sources (UUT and LO) with equal noise performance are each 3 dB better than the values listed.

8. Note the marker reading dBV/HZ. Complete the following steps:
  - a. Calculate phase noise using the following formula:  
Phase Noise = Marker Reading Noted in This Step - Marker Reading From Step 3 - 60 dB
  - b. Record the computed value for phase noise in the appropriate space in Table 5-12 and verify that the value for phase noise is not greater than the indicated limit.
9. On the WA, set the FREQUENCY SPAN control to 1 kHz. Press the RESTART control and wait for the DATA LOADING complete indication.
10. On the WA, rotate the MARKER POSITION knob so that the marker frequency is 1 kHz.
11. Note the marker reading in dBV/Hz. Complete the following steps:
  - a. Calculate phase noise using the following formula:  
Phase Noise = Marker Reading Noted in This Step - Marker Reading From Step 3 - 60 dB
  - b. Record the computed value for phase noise in the appropriate space in Table 5-12 and verify that the value for phase noise is not greater than the indicated limit.
12. On the WA, rotate the MARKER POSITION knob so that the marker frequency is 100 Hz.
13. Note the marker reading in dBV/Hz. Complete the following steps:
  - a. Calculate phase noise using the following formula:  
Phase Noise = Marker Reading Noted in This Step - Marker Reading From Step 3 - 60 dB

- b. Record the computed value for phase noise in the appropriate space in Table 5-12 and verify that the value for phase noise is not greater than the indicated limit.
14. Program the UUT and the UHF SSG RF output frequencies to the values listed in Table 5-12. Repeat the procedure from Step 1 for each RF frequency.

#### 5-41. ANGLE MODULATION PERFORMANCE CHECK

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<b>PURPOSE:</b>	Verify performance and calibration of all modulation circuitry.
<b>TEST EQUIPMENT:</b>	Modulation Analyzer, Low Frequency Spectrum Analyzer.
<b>REMARKS:</b>	<ol style="list-style-type: none"> <li>1. This is a confidence check. A comprehensive check requires software.</li> <li>2. The UUT and all test equipment must be a room temperature and must be operating for at least 30 minutes before this check is started.</li> </ol>

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5-42. This angle modulation performance check verifies that all internal modulation circuits are functioning and properly calibrated. A comprehensive performance check of all angle modulation parameters at all frequencies, modulation rates, and depths is beyond the scope of this manual. Such a check requires the use of automated test programs.

5-43. Complete the following steps to verify the performance and calibration of all modulation circuitry.

1. Set up the equipment as follows:
  - a. Connect the Modulation Analyzer to the UUT RF OUTPUT connector.
  - b. Set the Modulation Analyzer controls as follows:

AUTOMATIC OPERATION	On
MEASUREMENT	FM
DETECTOR	PEAK +
Bandwidth	50 Hz to >200 kHz.

c. Recall Memory Location 96 (Press RECALL MEMORY and 9 and 6 DATA controls). This memory location contains information peculiar to this particular instrument. This information is collected and stored during the software calibration procedure and, among other data, contains the following:

1. FREQUENCY Display has the mid-band frequency of 25X.XXXX MHz where X.XXXX can be any combination of decimal digits.
2. The size of the frequency step is the delta F between consecutive mid-band frequency points.

- d. Connect the Low Frequency Spectrum Analyzer to the Modulation output jack on the Modulation Analyzer.
  - e. Step the UUT RF output frequency down to 250.XXXX. For example, the frequency in step c, part I may have been 256.1129 MHz. Step this to 250.1129 MHz.
2. Step frequency up to 519.YYYY MHz (where YYYY is any combination of decimal digits which may or may not be different from XXXX).
    - a. Verify at each step that the Modulation Analyzer reading is in the range 88 to 112 kHz.
    - b. Observe harmonics on the Low Frequency Spectrum Analyzer at 20 kHz at 30 kHz. Verify that the level at each point is 38 dB or greater below the level at 10 kHz.
  3. Program the UUT for a frequency step size of 20 MHz and forced high deviation operation (special function 21). Verify that the HI DEV MODE indicator turns on.
  4. Step frequency down to 259.YYYY MHz (where YYYY are arbitrary digits).
    - a. Verify at each step that the Modulation Analyzer reading is in the range 88 to 112 kHz.
    - b. Observe harmonics on the Low Frequency Spectrum Analyzer at 20 kHz and 30 kHz. Verify that the level at each point is 36 dB or greater below the level of 10 kHz.
  5. Set up the equipment as follows:
    - a. Set the Modulation Analyzer bandwidth for the range 50 Hz to 15 kHz.
    - b. Program the UUT for a frequency step size of 50 MHz, a modulation frequency of 400 Hz, and an RF output frequency of 250 MHz.
  6. Step frequency up to 500 MHz. Verify at each step that the Modulation Analyzer reading is in the range 93 to 107 kHz and that harmonics are >36 dB below fundamental at 400 Hz.
  7. Disable high deviation mode operation (special function 20) and step frequency down to 250 MHz. Verify at each step that the Modulation Analyzer reading is in the range 90 to 110 kHz and that harmonics are > 38 dB below fundamental at 400 Hz.
  8. Enable force DCFM operation (special function 11).
  9. Step frequency up to 500 MHz. Verify at each step that the Modulation Analyzer reading is in the range 90 to 110 kHz and that harmonics are > 30 db below fundatmental at 400 Hz.
  10. Program UUT so that the RF output frequency is 50 MHz. Verify that the Modulation Analyzer reading is in the range 90 to 110 kHz.



11. Program the instrument for forced high deviation mode operation (special function 21). Verify that the Modulation Analyzer reading is in the range 90 to 110 kHz.
12. Disable the forced high deviation and DCFM modes of operation (special functions 10 and 20).
13. Program the instrument so that the RF output frequency is 385 MHz and the  $\theta$ M deviation is 9.99 radians. Verify that the Modulation analyzer reading is in the range of 3.6 to 4.4 kHz.
14. Program the UUT so that the modulation frequency is 3 kHz. Verify that the Modulation Analyzer reading is in the range of 26.4 to 33.6 kHz.
15. Program UUT so that the modulation frequency is 400 Hz.
16. Program the instrument for each of the FM deviations listed in Part A of Table 5-13. For each programmed deviation, verify that the Modulation Analyzer reading is within the appropriate range listed in Part A of the table.
17. Set up the equipment as follows:
  - a. Set the Modulation Analyzer bandwidth for the range 50 Hz to >20 kHz.
  - b. Program the UUT so that the RF output frequency is 100 MHz and modulation frequency is 10 kHz.
18. Program the UUT for each of the FM deviations listed in Part B of Table 5-13. For each programmed deviation, verify that the Modulation analyzer reading is within the appropriate range listed in Part B of the table.
19. Set up the equipment as follows:
  - a. Set the Modulation Analyzer bandwidth for the range 50 Hz to 15 kHz.
  - b. Program the UUT for an RF output frequency of 50 MHz, a modulation frequency of 1 kHz, and forced DCFM operation (special function 11).
20. Program the UUT for each of the FM deviations listed in Part C of Table 5-13. For each programmed deviation, verify that the Modulation analyzer reading is within the appropriate range listed in Part C of the table.
21. Program the UUT as follows:
  - a. Program the UUT to recall memory location 96 and to enable the internal audio output (special function 71).
  - b. Press the EX FM/ $\theta$ M MODULATION control so that it is lit.
  - c. Connect a BNC cable between the MOD OUT and MOD IN connectors.
22. Adjust the UUT MOD OUT knob so that the Modulation Analyzer reading is 100 kHz (the MOD OUT knob is nearly at the maximum clockwise position).

23. Set up the equipment as follows:
- Program the UUT for a modulation frequency 20 Hz and press the DC COUPLED MODULATION control so that it is lit.
  - Set the Modulation Analyzer bandwidth for the range <20 Hz to 15 kHz.
24. Verify that the Modulation analyzer reading is in the range of 90 to 110 kHz.

Table 5-13. Angle Modulation Performance Check

FM DEVIATION (kHz DEV)	MODULATION METER READING	
	FROM	TO
PART A		
199	179.1	218.9
100	90	110
50	45	55
20	18	22
10	9	11
5	4.5	5.5
1	0.9	1.1
PART B		
199	175.12	222.88
125	110	135
100	88	112
50	44	56
25	22	28
10	8.8	11.2
5	4.4	5.6
2	1.76	2.24
1	0.88	1.12
PART C		
300	264	336
200	176	224
100	88	112
50	44	56
20	17.6	22.4
10	8.8	11.2
5	4.4	5.6
1	0.88	1.12

**5-44. RF OUTPUT LEVEL CHECK**

- 
- PURPOSE:** To verify that the RF output level is within specified limits without the use of a controller.
- TEST EQUIPMENT:** Power Meter with power sensor calibrated from 5 MHz to 1.1 GHz, VSWR <1.1, +20 dBm to -20 dBm (a calibrated 10 dB pad will be required if the Power Meter has a maximum input level of +10 dBm); RF Voltmeter; JF2904-442905; Y9308; 50 Ohm Coaxial Cable <1 ft., with BNC connectors; Controller or Bus Exerciser (necessary only if Procedure II is performed).
- REMARKS:**
1. This procedure verifies the output level accuracy within the measurement range of the power meter. Due to the extreme complexity of verifying the level accuracy down to -140 dBm, customers are advised to use the calibration and verification services available at John Fluke Service Centers (listed in Appendix A). Those customers interested in measurement techniques should contact Customer Service Department; John Fluke Mfg. Co., Inc.
  2. The test limits listed in the tables take into account the worst case measurement uncertainties due to VSWR interaction of the UUT and the specified power sensor.
  3. The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this check is started.
- 

**5-45. Introduction**

5-46. The RF Output Level Check is performed in two procedures. Procedure I does not use a controller and verifies that the instrument amplitude correction factors are correct for the high level amplifier, the basic detector range, the 6 dB, the 12 dB, and the first 24 dB attenuator pads. Procedure II uses a controller to verify proper operation of the other 24 dB pads that are used when RF output level is programmed below -41.2 dB.

**5-47. Procedure I**

5-48. Complete the following steps to perform Procedure I:

1. Set up the equipment as follows:
  - a. Program the UUT for an RF output frequency of 5 MHz at a level of +7 dBm. Turn off all MODULATION controls, and use the EDIT and DIGIT controls to place the Bright Digit in the 10 kHz position of the FREQUENCY Display.
  - b. Connect the equipment as shown in Figure 5-7.
  - c. Set the RF Voltmeter controls as follows:

VOLTS/dB	dB
AC/DC	AC
REL/dBm	dBm
dBm REFERENCE	50 Ohm

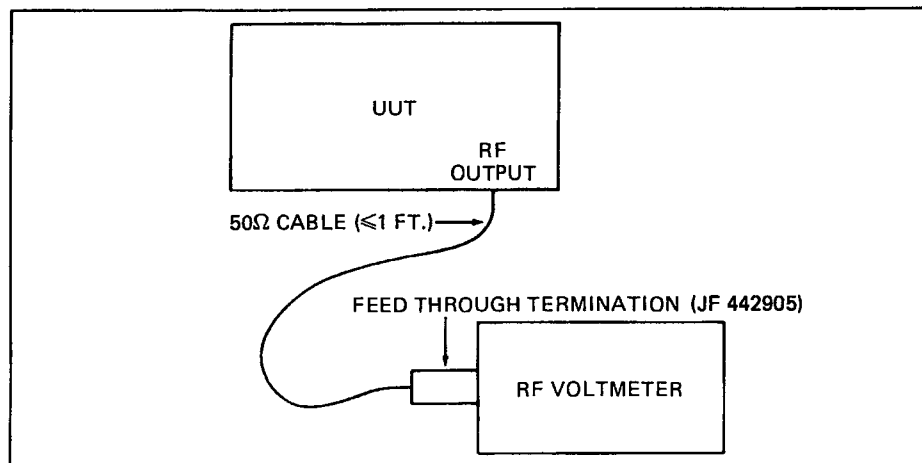


Figure 5-7. RF Output Level Check - Voltmeter

2. Slowly edit frequency from 5 MHz to 0.2 MHz observing the highest and the lowest readings on the RF Voltmeter. Verify that the maximum reading is less than +7.6 dBm (+8.1 dBm with the 607XA-870 Reverse Power Protection Option installed) and that the minimum reading is greater than +6.4 dBm (+5.9 dBm with the 607XA-870 Option).
3. Program the UUT for the RF output levels listed in Table 5-14. At each level, slowly edit frequency from 0.2 MHz to 5 MHz observing the highest and lowest readings on the RF Voltmeter. Verify that the highest and lowest readings are within the limits listed in Table 5-14.
4. Set up the equipment as follows:
  - a. Disconnect the RF Voltmeter and connect the equipment as shown in Figure 5-8.
  - b. Program the UUT for an RF output frequency of 5 MHz at a level of +7 dBm. Use the EDIT and DIGIT controls to place the Bright Digit in the 1 MHz position of the FREQUENCY Display.

Table 5-14. Level Checks for Both the 6070A and the 6071A

PROGRAMMED LEVEL (dBm)	RF VOLTMETER OR POWER METER READINGS (dBm)			
	WITHOUT 607XA-870 OPTION		WITH 607XA-870 OPTION	
	THE HIGHEST READING MUST BE LESS THAN	THE LOWEST READING MUST BE GREATER THAN	THE HIGHEST READING MUST BE LESS THAN	THE LOWEST READING MUST BE GREATER THAN
+18	+19.3	+16.7	+19.8	+16.2
+4	+4.7	+3.3	+5.2	+2.8
-1	-0.3	-1.7	-0.2	-2.2
-12	-11.2	-12.8	-10.7	-13.3

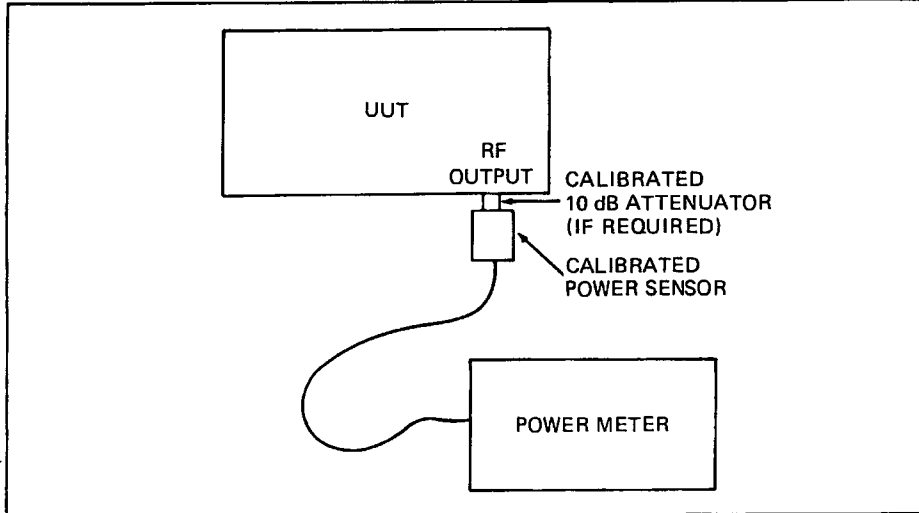


Figure 5-8. RF Output Level Check - Power Meter

5. Slowly edit frequency from 5 MHz to 519 MHz observing the highest and lowest readings on the Power Meter. Verify that the highest reading is less than +7.6 dBm (+8.1 dBm with the 607XA-870 Option installed) and that the lowest reading is greater than +6.4 dBm (+5.9dBm with the 607XA-870 Option installed).

**CAUTION**

**If the power meter does not have a +20 DBM input capability, the RF output of the UUT must be connected through the calibrated 10 dB pad to the power meter input to prevent possible damage to the meter at a level of +18 dBm.**

6. Program the UUT for the RF output levels listed in Table 5-14. At each level, slowly edit frequency from 5 MHz to 519 MHz observing the highest and lowest readings on the Power Meter. Verify that the highest and lowest readings are within the limits listed in Table 5-14. Remove the 10 dB pad when measuring levels below +10 dBm to improve Power Meter sensitivity.

7. If the UUT is a 6071A, program the UUT for the output levels listed in Table 5-15. At each level, slowly edit frequency from 520 to 1040 MHz observing the highest and lowest readings on the Power Meter. Verify that the highest and lowest readings are within the limits listed in Table 5-15.

Table 5-15. Level Checks for the 6071A Only

PROGRAMMED LEVEL (dBm)	POWER METER READINGS (dBm)			
	WITHOUT 607XA-870 OPTION		WITH 607XA-870 OPTION	
	THE HIGHEST READING MUST BE LESS THAN	THE LOWEST READING MUST BE GREATER THAN	THE HIGHEST READING MUST BE LESS THAN	THE LOWEST READING MUST BE GREATER THAN
+13	+15.3	+10.7	+15.8	+10.2
+2	+3.4	+0.6	+3.9	+0.1
-2	-0.5	-3.6	-0	-4.1
-8	-6.4	-9.6	-5.9	-10.1
-18	-16.3	-19.7	-15.8	-20.2

**5-49. Procedure II**

5-50. Complete the following steps to perform Procedure II:

1. Connect the equipment as shown in Figure 6-8 and program the UUT for an RF output frequency of 10 MHz at a level of -17 dBm.
2. Program the Controller or use the Bus Exerciser to send the strings listed in Table 5-16. All message strings enclosed by the symbols < > must be sent as shown. Verify at each setting that the Power Meter reading is within the range of -16.2 to -17.8 dBm.
3. Program the UUT for an RF output frequency of 519 MHz and repeat Step 2.
4. If the UUT is a 6071A, program the UUT for an RF output frequency of 1039 MHz at a level of -18 dBm.
5. Repeat Step 3, but verify that the Power Meter reading is within the range -16.3 to 19.7 dBm for each setting.

Table 5-16. Level Check -- IEEE-488 Messages

ATTENUATOR ENABLED	IEEE-488 MESSAGE
24DB1	< OD123AT >
24DB2	< OD119AT >
24DB3	< OD111AT >
24DB4	< OD95AT >
24DB5	< OD63AT >

**5-51. AM CHECK**


---

<b>PURPOSE:</b>	To verify that AM performance is within specified limits.
<b>TEST EQUIPMENT:</b>	Modulation Analyzer, Low Frequency Spectrum Analyzer, Low Frequency Synthesized Signal Generator, Systems DMM
<b>REMARKS:</b>	The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this check is started.

---

5-52. Perform the following steps to complete the AM Check:

1. Perform the AM calibration on the Modulation Analyzer using the internal calibrator as follows:
  - a. Connect the calibrator output of the Modulation Analyzer to the RF input of the Modulation Analyzer.
  - b. Press AM, +PEAK, CALIBRATION and wait for one minute.
  - c. Press 16.1, SPCL to enable application of the internal calibration factor.

- d. Remove the connection between the modulation Analyzer calibrator output and RF input.
2. Set up the equipment as follows:
  - a. Connect the UUT RF OUTPUT to the Modulation Analyzer input.
  - b. Connect the output of the LF Synthesized Signal Generator (LFSSG) to the UUT MOD IN connector through a BNC Tee. Connect the input of the systems DMM to the other arm of the BNC Tee.
  - c. Connect the MODULATION OUTPUT of the Modulation Analyzer to the input of the Spectrum Analyzer.
  - d. Program the UUT for an RF output frequency of 0.2 MHz, a level of 13 dBm, and an AM depth of 90%. Turn on the EXT AM control.
  - e. Program the LFSSG for an input to the UUT MOD IN connector of 1 kHz at a level of 0.7071V rms as measured by the System DMM.
  - f. Set up the Spectrum Analyzer to display the 1 kHz modulation signal to full scale with sufficient span to include at least three harmonics.
3. Allow Modulation Analyzer to settle and record the reading.
4. Press -PEAK on the Modulation analyzer. Wait for the Modulation Analyzer to settle and record the reading.
5. Calculate the average AM by dividing the sum of the +PEAK and the -PEAK readings by 2. Verify that the average AM is greater than 82% but less than 95%.
6. Verify that the level of the harmonics on the Spectrum Analyzer are less than -26 dB with respect to the level of the fundamental modulation signal.

**NOTE**

*Since AM distortion is specified as total harmonic distortion, the effect of all harmonics should be included. If there is one dominant harmonic component (more than 6 dB larger than any other harmonic components), then there is only a small error (< 1 dB) in ignoring the other harmonic components. The test limit for the dominant harmonic is shown in Table 5-17. If there is not one dominant harmonic component, then the second through the fourth harmonic should be measured to determine the total harmonic distortion. Use the following formula to determine the total harmonic distortion (this formula includes the contribution of all harmonics).*

$$\text{THD}_{\text{dB}} = 10 \log_{10} [10^{\frac{H_2}{10}} + 10^{\frac{H_3}{10}} + 10^{\frac{H_4}{10}} \dots + 10^{\frac{H_n}{10}}]$$

Where: H2, H3, H4, etc. are the levels (in dB) of each harmonic with respect to the fundamental as measured on the Low Frequency Spectrum Analyzer.

7. Program the combinations of UUT RF output frequency, level, and AM depth listed in Table 5-17. For each step, verify that the average AM is between the indicated limits and that the level of any harmonics is less than the listed limit (with respect to the level of the fundamental modulation signal).

Table 5-17. 6070A/6071A AM Level Check -- 1kHz Modulation

UUT			AVERAGED AM (%)		MAXIMUM HARMONIC LEVEL (dB) WITH RESPECT TO THE LEVEL OF THE FUNDAMENTAL MODULATION SIGNAL
FREQUENCY (MHz)	LEVEL (dBm)	AM (%)	MAX.	MIN.	
0.2	+13	90	95	82	-23
		70	75	62	-26
		30	35	22	-34
	+1	90	95	82	-23
		70	75	62	-26
		30	35	22	-34
4.999	+13	90	95	82	-23
		70	75	62	-26
		30	35	22	-34
	+1	90	95	82	-23
		70	75	62	-26
		30	35	22	-34

8. Program the LF SSG for an input of 3 kHz to the UUT MOD IN connector and set the Spectrum Analyzer to include the fundamental and at least three harmonics.

9. Program the combinations of UUT RF output frequency, level, and AM depth listed in Table 5-18. for each step, verify that the average AM is between the indicated limits and that the level of any harmonic is less than the listed limit (with respect to the level of the fundamental modulation signal).

Table 5-18. 6070A/6071A AM Level Check -- 3 kHz Modulation

UUT			AVERAGED AM (%)		MAXIMUM HARMONIC LEVEL (dB) WITH RESPECT TO THE LEVEL OF THE FUNDAMENTAL MODULATION SIGNAL
FREQUENCY (MHz)	LEVEL (dBm)	AM (%)	MAX.	MIN.	
5	+13	90	95	85	-30
		30	35	25	-36
	+1	90	95	85	-30
		30	35	25	-36
30	+13	90	95	85	-30
		30	35	25	-36
	+1	90	95	85	-30
		30	35	25	-36
100	+13	90	95	85	-30
		30	35	25	-36
	+1	90	95	85	-30
		30	35	25	-36
300	+13	90	95	85	-30
		30	35	25	-36
	+1	90	95	85	-30
		30	35	25	-36
519	+13	90	95	85	-30
		30	35	25	-36
	+1	90	95	85	-30
		30	35	25	-36



10. If the UUT is a 6071A, program the combination of UUT RF output frequency, level, and AM depth listed in Table 5-19. For each step, verify that the average AM is between the indicated limits and that the level of any harmonic is less than the listed limit (with respect to the level of the fundamental modulation signal).

Table 5-19. 6071A Only AM Level Check -- 3 kHz Modulation

UUT			AVERAGED AM (%)		MAXIMUM HARMONIC LEVEL (dB) WITH RESPECT TO THE LEVEL OF THE FUNDAMENTAL MODULATION SIGNAL
FREQUENCY (MHz)	LEVEL (dBm)	AM (%)	MAX.	MIN.	
550	+7	90	95	85	-26
		70	75	65	-30
		30	35	25	-34
	-5	90	95	85	-26
		70	75	65	-30
		30	35	25	-34
1039	+7	90	95	85	-26
		70	75	65	-30
		30	35	25	-34
	-5	90	95	85	-26
		70	75	65	-30
		30	35	25	-34

#### 5-53. IEEE-488 CHECK

---

**PURPOSE:** To test for proper operation of the IEEE-488 bus.

**TEST EQUIPMENT:** Controller or Bus Exerciser

**REMARKS:**

1. The commands sent to the UUT exercise most of the instrument's IEEE-488 functions.
2. The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this check is started.

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5-54. To test the IEEE-488 bus, program the controller or bus exercise to complete each step of the flow diagram shown in Figure 5-9.

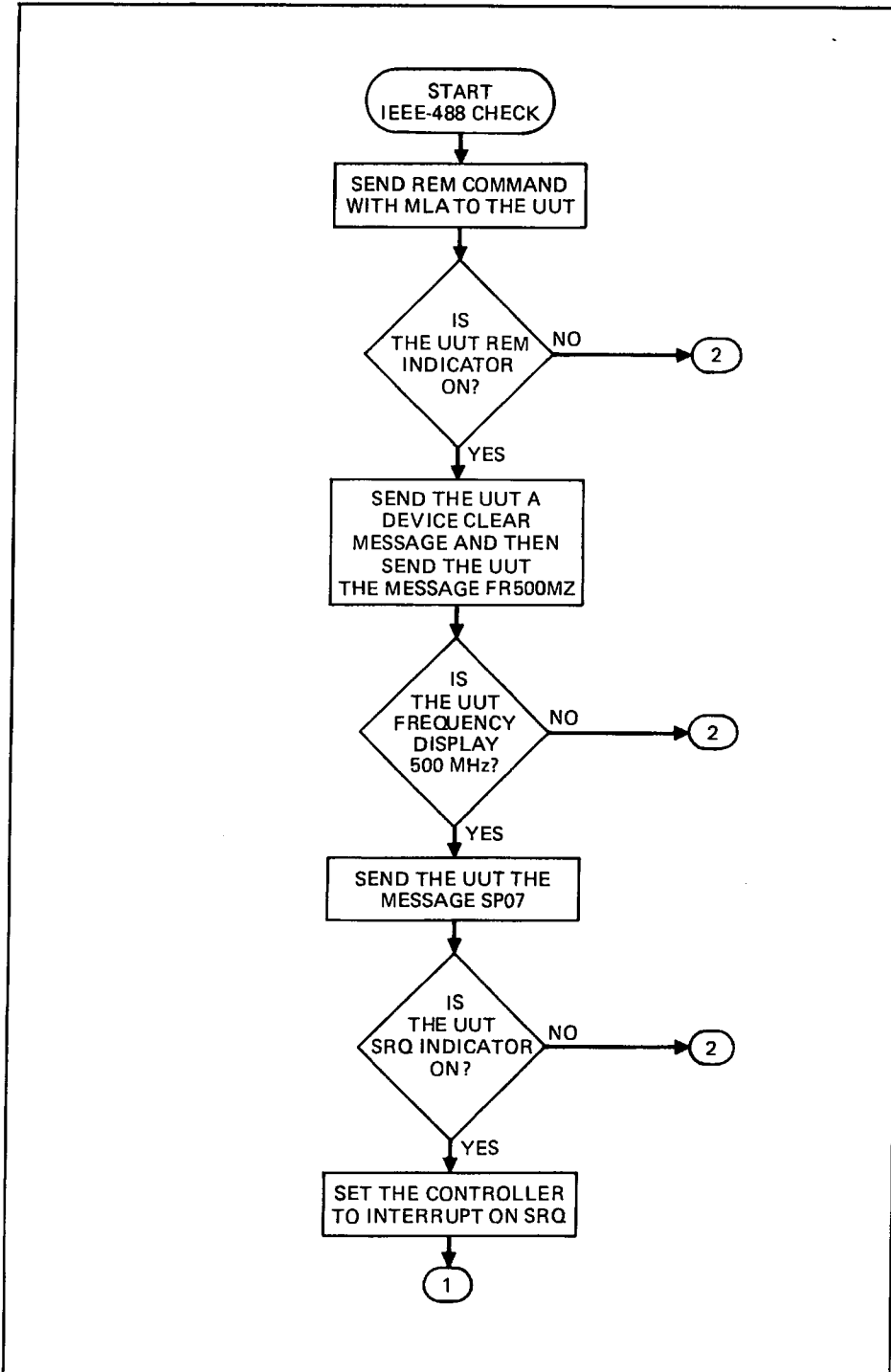


Figure 5-9. IEEE-488 Check

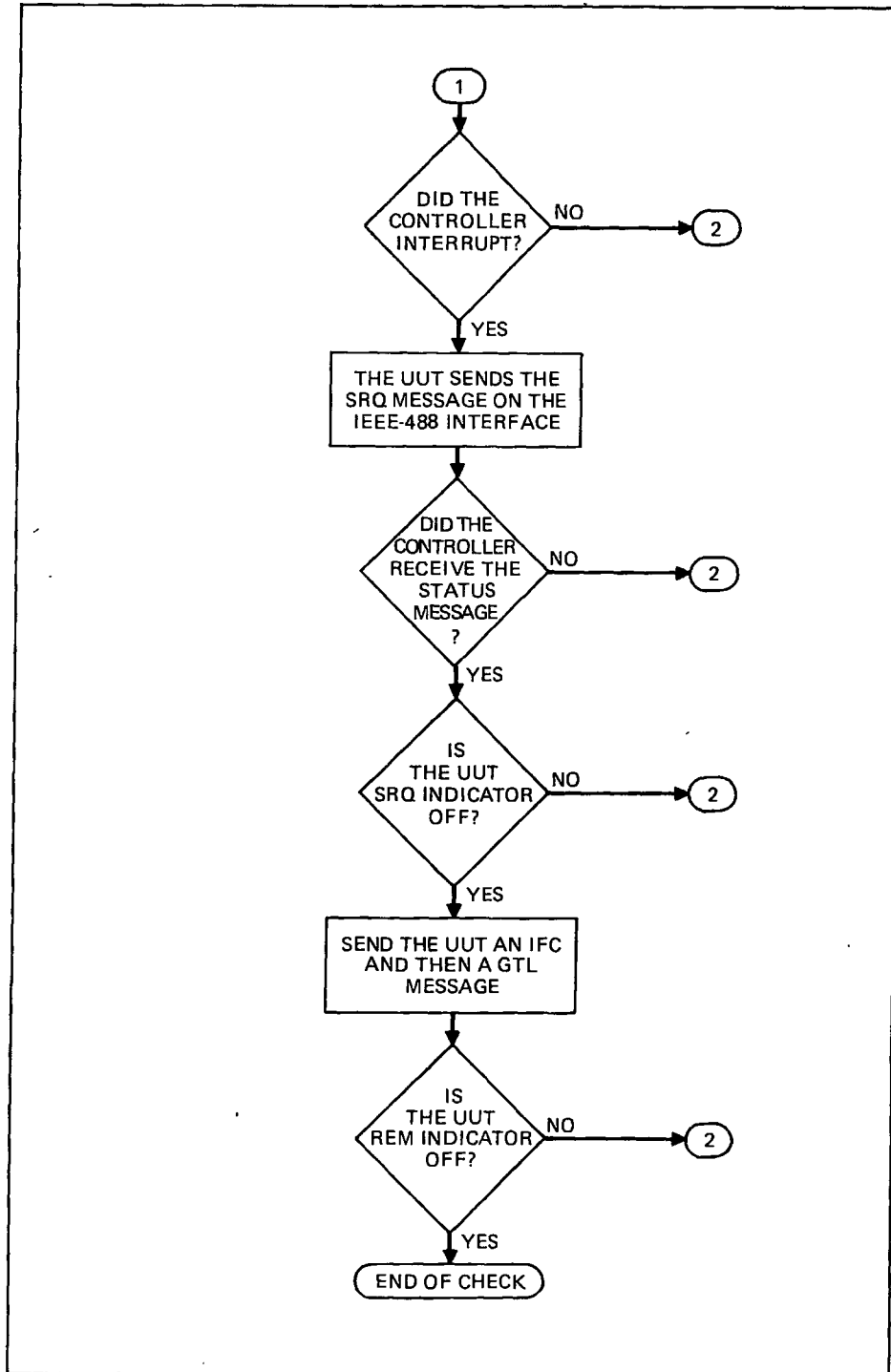


Figure 5-9. IEEE-488 Check (cont)

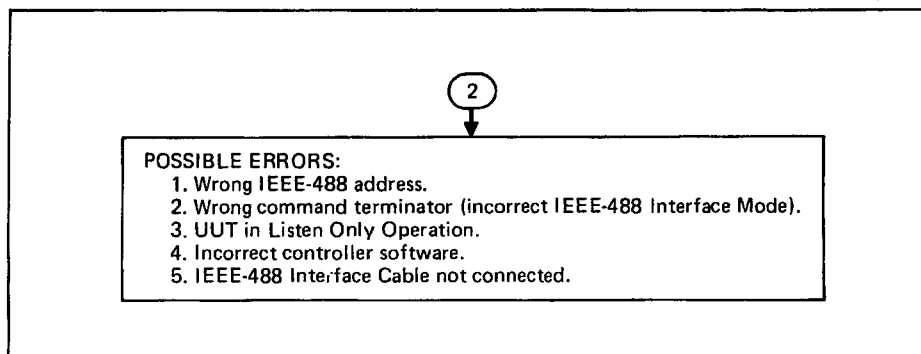


Figure 5-9. IEEE-488 Check (cont)

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○

○

○

25 points ATT calib. @ 1:

100Kc - 200 - 400 - 800 - 2Mc - 5Mc - 12 - 25 ~~50~~ 50 Mc →  
6070A/6071A

100 Mc - 200 - 300 - 350 - 400 - 460 - 519 Mc →

600 Mc - 700 - 750 - 800 - 850 - 900 - 950 - 1000 - 1040

## Section 6 Adjustment Procedures

### 6-1. INTRODUCTION

6-2. The information in this section describes Programming The Calibration EPROM and the Manual Adjustment Procedure. Normally the internal Calibration EPROM has to be reprogrammed only when the instrument fails certain performance checks or when certain components are adjusted, replaced, or repaired. Components that can be adjusted according to manual procedures that do not require specialized test equipment are listed in Table 6-1. The Manual Adjustment Procedure describes the adjustment of these components.

### 6-3. PROGRAMMING THE CALIBRATION EPROM

6-4. An internal microprocessor correction technique applied to the output signal amplitude and angle modulation provides high accuracy with economical circuitry. However, this design approach requires that each generator be characterized during manufacture or whenever repairs or adjustments are made which affect the characterized parameters.

6-5. The generators are characterized in five general steps:

1. The internal microprocessor corrections are disabled.
2. Generator performance is measured very accurately at a large number of points.
3. The measurement data is converted into correction factors.
4. The correction factors are programmed into a new Calibration EPROM.
5. The Calibration EPROM inside the generator is replaced with the Calibration EPROM programmed in Step 4.

6-6. Because of the large amount of data involved, the only practical procedure for characterizing the generator, for converting the data, and for reprogramming the Calibration EPROM requires the use of an external controller, the appropriate software, and other equipment. This procedure is not presented in this manual. Instead, the user is urged to return the generator to the nearest John Fluke Service Center when Calibration EPROM programming the Calibration EPROM at their facility should contact the Customer Service Department of John Fluke Mfg. Co., Inc.; P.O. Box 43210; Mountlake Terrace, WA 98043; telephone (206) 7740221; for addition information.

### 6-7. MANUAL ADJUSTMENT PROCEDURES

#### 6-8. Introduction

6-9. The information in this section describes procedures for completing those

Software addr:

0000 - 7FFF

RAM - 8000

GP1B - A000

NRAM - D000

addr = Cφφφ

ATT addr starts:

CφC9 = Global

C1φ5 = Detail

ATT. CALIB.

CAN BE DONE BY  
HAND, USE GLOBAL  
CORRECTION AT CφC9  
25 points



adjustments that can be made without requiring that the Calibration EPROM be reprogrammed. There are four manual adjustment procedures:

1. Power Supply Adjustment Procedures
2. FM/ØM Adjustment Procedure
3. AM And Level Adjustment Procedure
4. 10 MHz Reference Oscillator Frequency Adjustment

**Table 6-1. Manual Adjustments**

ASSEMBLY	DEVICE	USE
A3A1 Phase Detector PCB	R4 R5 R10 R12	High-rate, FM/ØM Deviation High-rate, FM/ØM Balance Low-rate, FM Deviation Low-rate, ØM Deviation
A3A2 10 MHz Reference PCB	C9	Crystal Oscillator Frequency
A3A3 Discriminator PCB	R53 R67 R103	Not HI DEV Mode: Low-rate, 99.9 kHz Deviation Not HI DEV Mode: Low-rate, 199 kHz Deviation HI DEV Mode: High-rate Deviation
A3A9 Synth Distribution PCB	R10	Overall Deviation Calibration
A4A2 Mod Oscillator PCB	R6	Mod Oscillator Level
A4A5 RPP PCB (607XA-870 Option see Section 7C for adjustment procedure)	R7	RPP Trip Level
A4A6 X2/Output Amplifier PCB (6071A only)	R29 R37 R53	>5 MHz Detector Offset <5 MHz Detector Offset U15 Input Offset Zero
A4A7 Output Amplifier PCB (6070A only)	R4 R6 R9	>5 MHz Detector Offset <5 MHz Detector Offset U4 Input Offset Zero
A4A10 Mod Distribution PCB	R22 R30 R33 R48 R55	AM Calibration DCFM Mode: High-rate Deviation DCFM Mode: High-rate, 500 kHz Deviation DCFM Mode: Low-rate Deviation Output Level Calibration
607XA-130 Option (See Section 7A for adjustments procedure)	COARSE FINE	Coarse Frequency Fine Frequency



**6-10. Power Supply Adjustment Procedure****WARNING**

**LIFE HAZARD VOLTAGES ARE PRESENT IN THE POWER SUPPLY WHEN THE INSTRUMENT IS DISASSEMBLED FOR THIS PROCEDURE. USE RECOGNIZED SAFETY PRACTICES AT ALL TIMES.**

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PURPOSE:	<ol style="list-style-type: none"> <li>1. Check all power supply voltages.</li> <li>2. Adjust the power supply frequency.</li> <li>3. Adjust the output voltage of the switching power supply.</li> <li>4. Adjust the output voltage of the series pass regulator.</li> </ol>
TEST EQUIPMENT:	Oscilloscope or Frequency Counter, System DMM
REMARKS:	<ol style="list-style-type: none"> <li>1. The following procedure assumes that the UUT is connected to line power, that the POWER control is at the STBY position, and that the MAIN POWER switch is set to OFF.</li> <li>2. The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this procedure is started.</li> </ol>

---

**6-11. Complete the following steps to adjust the power supply.**

1. Complete the disassembly portions of the Interior Access Procedure and the Power Supply Access Procedure in Section 3.
2. Verify proper operation of the auxiliary power supply as follows:
  - a. Connect the DVM to the A6A2 Series Pass Motherboard : LO input to TP7 and HI input to J6-15 (Figure 6-1).
  - b. Set the MAIN POWER switch to the ON position and verify that the DVM display is between 18.5 and 24.0V dc.
  - c. Set the POWER control to the ON position and verify that the DVM display drops to 0V dc.
3. Set the switching frequency as follows:
  - a. Connect the oscilloscope or the frequency counter to pin 11 or pin 13 of U1 on the A5A2 P/S Regulator PCB (Figure 6-2).
  - b. Adjust R1 on the A5A2 Regulator PCB until either the period of the waveform on the oscilloscope is 20 usec or the frequency counter displays 50 kHz.
4. Adjust and verify the output voltages of the switching power supply as follows:
  - a. Connect the DVM across C17 on the A5A1 Power Supply PCB (Figure 6-3).

- b. Adjust R7 on the A5A2 Regulator PCB (Figure 6-2) so that the DVM display is between 5.94 and 5.96V dc.
    - c. Connect the DVM across the pins of J7 on the A5A1 Power Supply PCB (Figure 6-3) listed in Table 6-2. Verify that the voltage displayed on the DVM is within the indicated limits for each measurement.
  5. Adjust and verify the output voltages of the Series Pass Regulator as follows:
    - a. On the A6A2 Series Pass Motherboard, connect the DVM: HI to TP6 and LO to TP7.
    - b. Adjust R5 on the A6A4 +24V, +12V Series Pass Regulator PCB (Figure 6-4) so that the DVM display is between 23.997 and 24.003 mV dc.
    - c. Leave the LO input of the DVM connected to TP7 and connect the + input of the DVM to the test points listed in Table 6-3. Verify that the DVM display is within the indicated limits for each measurement.
  6. Disconnect all test equipment. Assemble the instrument using the assembly portions of the Interior Access Procedure and the Power Supply Access Procedure in Section 3.

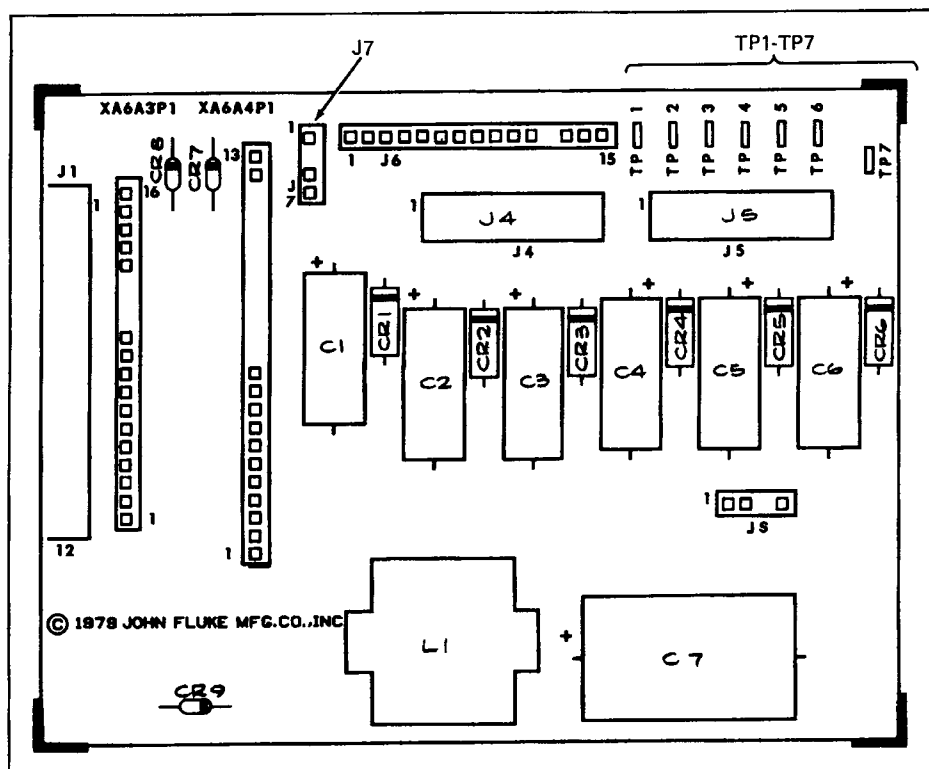


Figure 6-1. A6A2 Series Pass Motherboard PCB

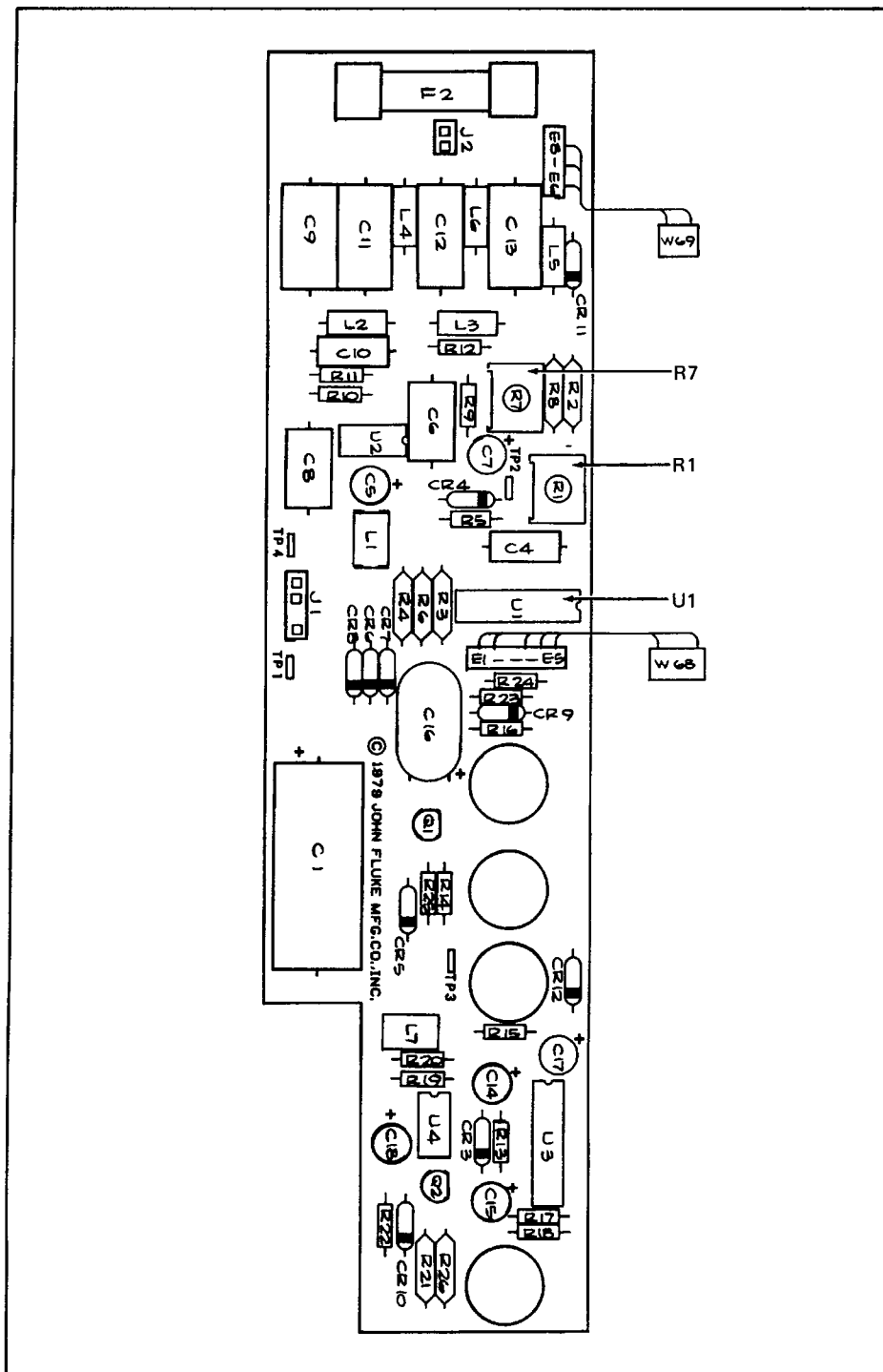


Figure 6-2. A5A2 P/S Regulator PCB

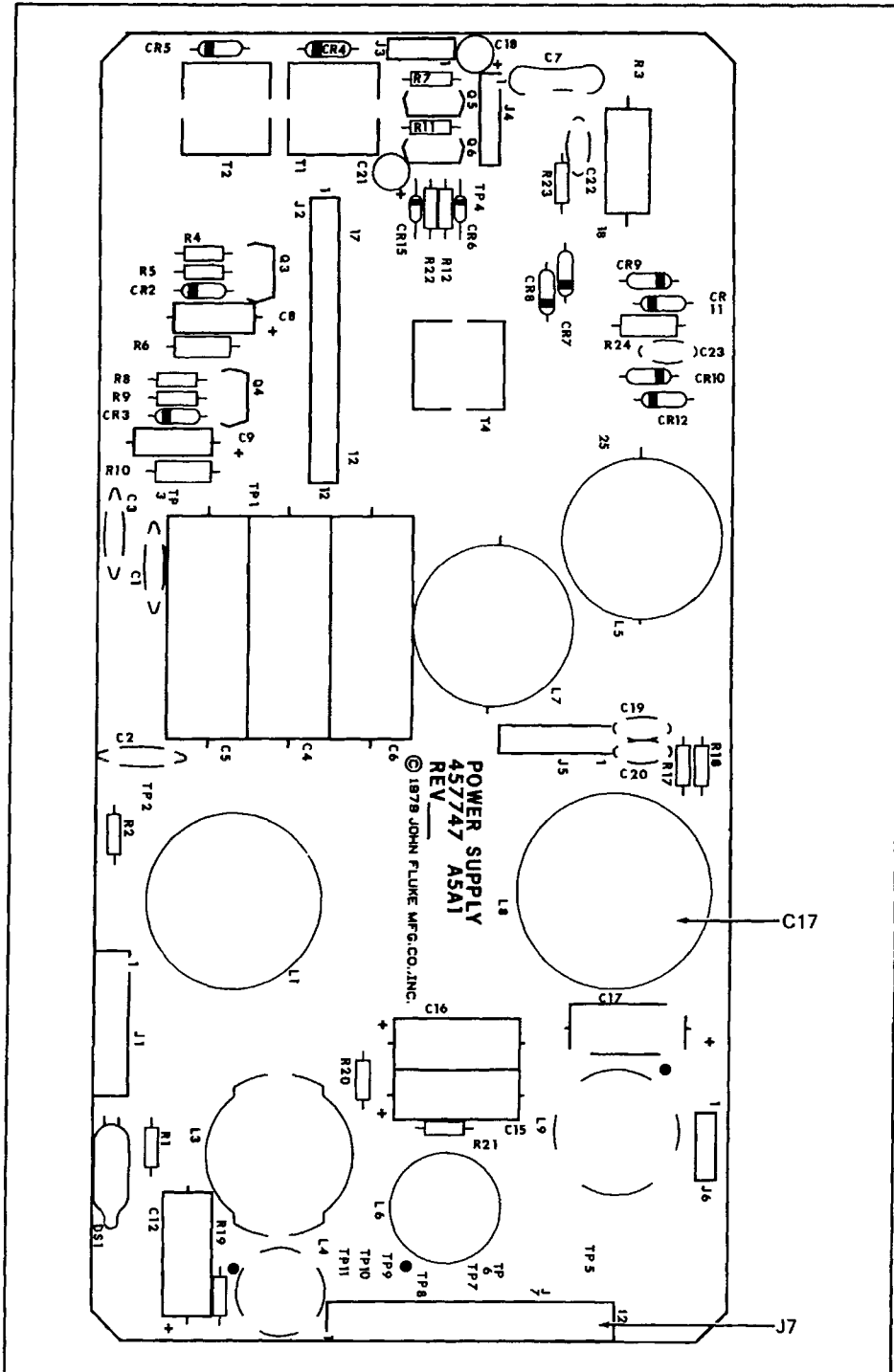


Figure 6-3. A5A1 Power Supply PCB

Table 6-2. Switching Power Supply Voltage Limits

CONNECT THE DVM		LIMITS in V dc	
HI to J7, pin	LO to J7, pin	MINIMUM	MAXIMUM
11	8	5.85	5.94
4	5	13.00	13.65
6	5	-13.00	-13.90
1	2	24.80	25.95

5,86  
-13,39  
+25,98  
+13,30

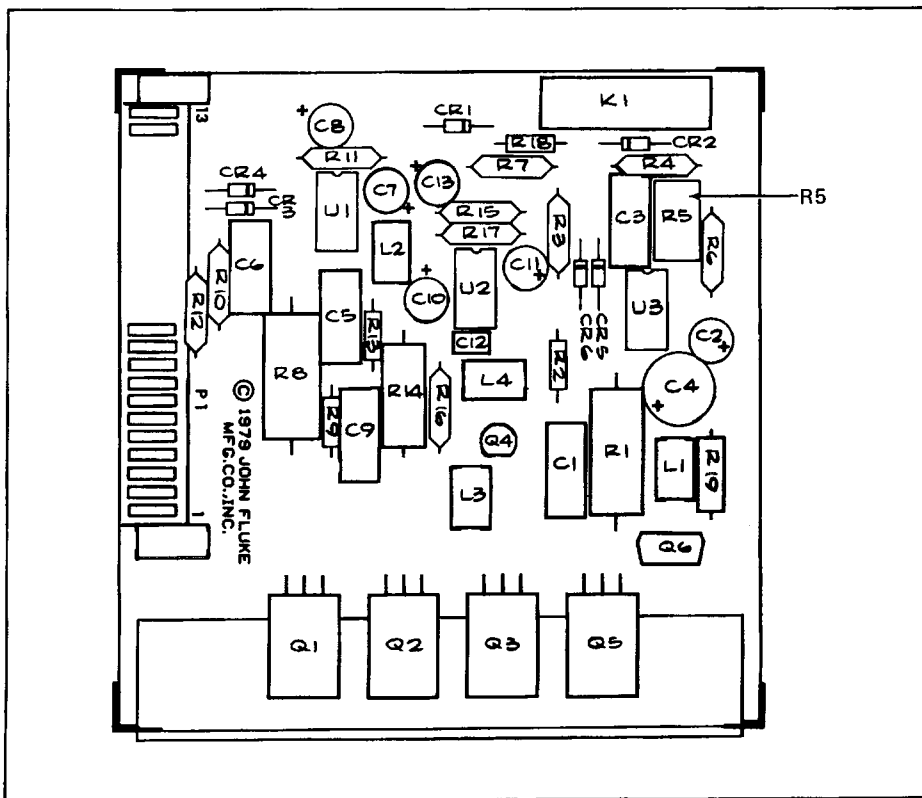


Figure 6-4. A6A4 +12, -12, +24V Series Pass PCB

= 23,99

Table 6-3. +12, -12, +24V Series Pass Regulator Voltage Limits

CONNECT THE DVM INPUT TO	LIMITS IN DC VOLTS	
	MINIMUM	MAXIMUM
TP1	5.090	5.141
TP2	5.090	5.141
TP3	5.090	5.141
TP4	11.975	12.012
TP5	-11.954	-12.036

5,141  
5,23  
5,141

Series Pass Regulator Voltage Limits

+12,00  
-11,99  
6-7  
↓  
V<sub>TP7</sub>

**6-12. FM/ØM Adjustment Procedures**


---

<b>PURPOSE:</b>	Provide adjustment of the FM/ØM modulation circuitry.
<b>TEST EQUIPMENT:</b>	Low Frequency Synthesized Signal Generator, Modulation Analyzer, RMS Voltmeter, BNC Tee Connector, Oscilloscope (Oscilloscope is for Procedure II only)
<b>REMARKS:</b>	<ol style="list-style-type: none"> <li>1. There are two FM/ØM adjustment procedures. The first procedure is used for normal calibration and maintenance. The second procedure is used if certain criteria of the first procedure are not met. Perform the second procedure only when necessary.</li>   <li>2. The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this procedure is started.</li> </ol>

---

**6-13. PROCEDURE I****6-14. Complete the following steps to perform Procedure I:**

1. Insure that the instrument has been warmed up for a minimum of 2 hours with all covers in place before starting this procedure.
  
2. Set up the equipment as follows:
  - a. Connect the Low Frequency Synthesized Signal Generator output to the UUT MOD IN connector through a BNC tee. Connect the RMS Voltmeter input to the other arm of the BNC tee.
  
  - b. Connect the UUT RF OUTPUT connector to the Modulation analyzer input.
  
  - c. Set the RMS Voltmeter dB/VOLTS control to the VOLTS position.
  
  - d. Program the Modulation Analyzer to AUTO, FM, 50 Hz HP Filter, and PEAK +.
  
  - e. Program the Low Frequency Synthesized Signal Generator for an output of 10 kHz at a level of 141.6 mV rms as measured on the RMS Voltmeter.
  
  - f. Program the UUT for an RF output frequency of 50 MHz, a level of +7 dBm, and an FM deviation of 499 kHz. Turn on the EXT FM/ØM and the DC COUPLED controls.
  
3. Remove the outer covers from the UUT using the disassembly portion of the Interior Access procedure in Section 3. Do not remove any module covers.
  
4. Adjust R33 on the A4A10 Mod Distribution PCB (Figure 6-5) for a reading of 100.1 kHz on the Modulation Analyzer.
  
5. Program the Low Frequency Synthesized Signal Generator for an output level of 707.1 mV rms as read on the RMS voltmeter. Program the UUT FM deviation to 99.9 kHz.

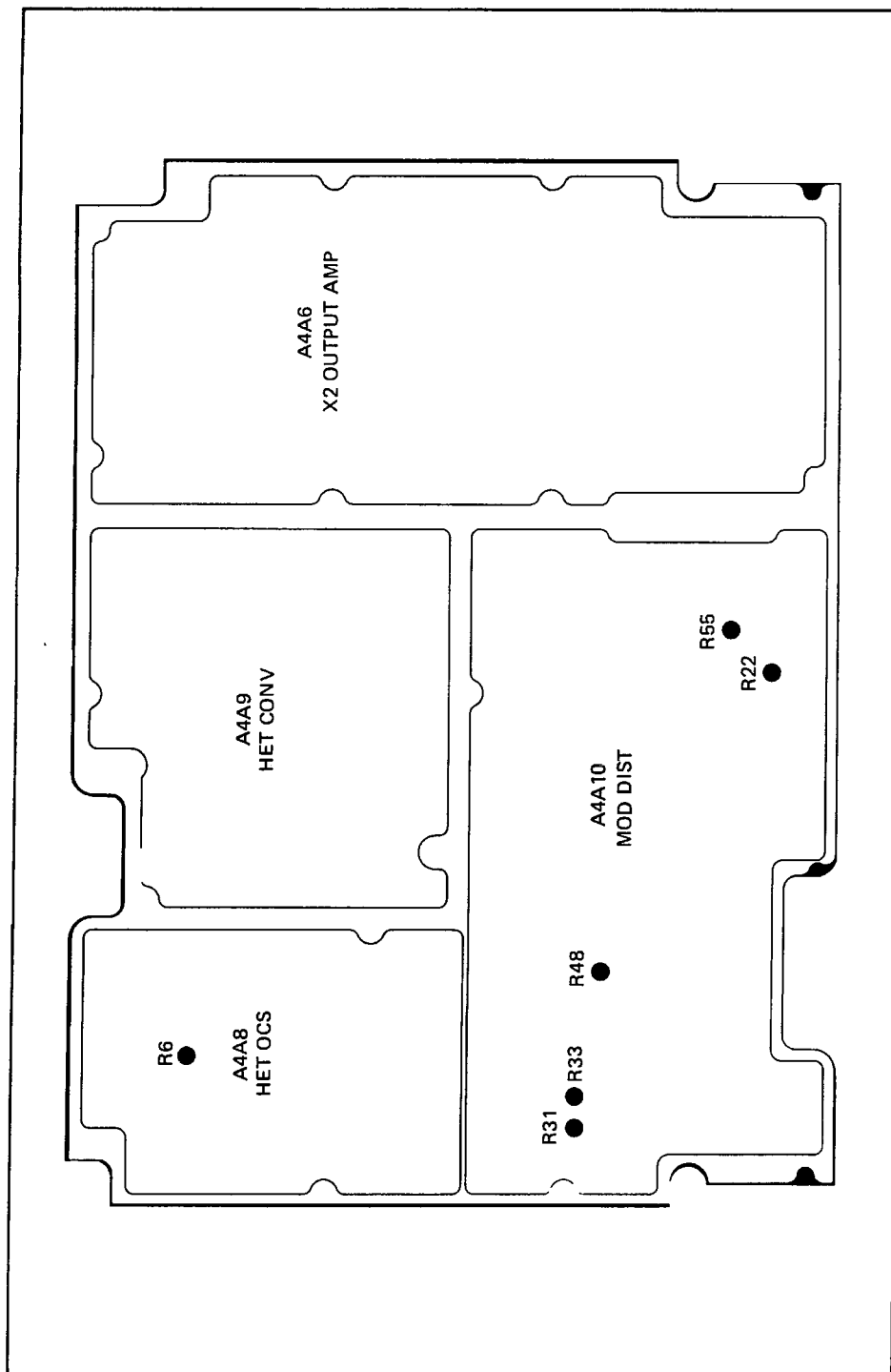


Figure 6-5. FM/PM Adjustments - Output Plate

6. Adjust R31 on the Mod Distribution PCB (Figure 6-5) for a reading of 100.1 kHz on the Modulation Analyzer.
7. Program the UUT to RECALL 96 and turn on the EXT FM/ØM control.
8. Program a new frequency step size as follows:
  - a. Press SHIFT, **FREQ STEP**. Frequency step size appears in the **FREQUENCY** Display (typically, 1.0XXX MHz).
  - b. Program a new frequency step size that is equal to 4 times the value displayed in Step a.
9. Step the UUT RF output frequency up as close to 385 MHz as possible.
10. Complete the following steps to determine if it is necessary to perform procedure II:
  - a. Record the Modulation Analyzer reading (typically 100 kHz).
  - b. Select special function 21 on the UUT and record the Modulation Analyzer reading.
  - c. Program the Low Frequency Synthesized Signal Generator for an output of 400 Hz and record the Modulation Analyzer reading.
  - d. Select special function 20 on the UUT and record the Modulation Analyzer reading.
  - e. Program the UUT for phase modulation of 9.99 radians and enable the 3 kHz LPF on the Modulation Analyzer. Record the Modulation Analyzer reading.
  - f. Select special function 21 on the UUT and record the Modulation Analyzer reading.
  - g. Criteria for the Modulation Analyzer readings collected in Steps a through f follow. Go to Step 11 if the readings meet the criteria. Go to Procedure II if the readings do not meet the criteria.
    1. The readings recorded in Steps a and c must be equal to the reading recorded in Step b  $\pm 2\%$ .
    2. The reading recorded in Step d must be equal to the reading recorded in Step b  $+3\%$ ,  $-1\%$ .
    3. The readings recorded in Steps e and f must be  $4.00 \pm 0.1$  kHz.
11. Program the Low Frequency Synthesized Signal Generator for an output of 10 kHz and set the Modulation Analyzer BW to  $>200$  kHz. Program the UUT for an FM deviation of 99.9 kHz and turn on the EXT FM/ØM control.
12. Adjust R10 on the A3A9 Synthesizer Distribution PCB (Figure 6-6) for a Modulation Analyzer reading of 100.1 kHz.



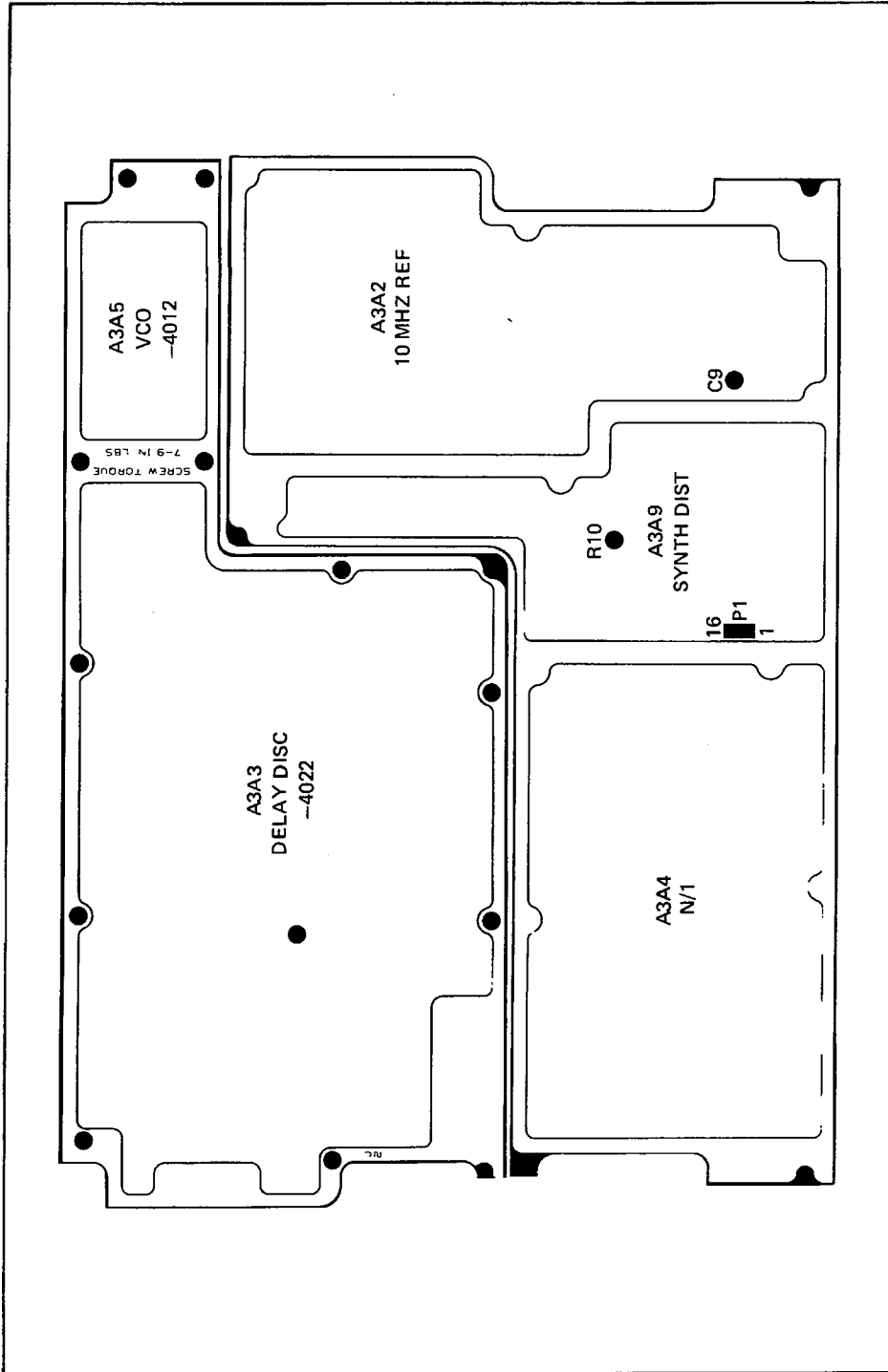


Figure 6-6. FM/θM Adjustments - Synthesizer Plate

13. Program the Low Frequency Synthesized Signal Generator for an output of 400 Hz and turn on the DC COUPLED control on the UUT. Record the Modulation Analyzer reading.

14. Select special function 20 on the UUT and record the Modulation Analyzer reading.

15. Adjust R48 on the Mod Distribution PCB (Figure 6-5) so that the readings in Steps 13 and 14 are symmetrical about 100.1 kHz. (It will be necessary to shift in and out of the HI DEV Mode (special functions 20 and 21) in order to make this adjustment).

16. Program the Low Frequency Synthesized Signal Generator for an output of 1 kHz. Select special function 20 on the UUT and turn off the DC COUPLED control. Record the Modulation analyzer reading.

17. Program the UUT Modulation Frequency to 1 kHz and turn on the INT FM/ $\emptyset$ M control. Adjust R6 on the A4A2 Mod Oscillator PCB (Figure 6-5) so that the Modulation Analyzer reading is the same as the reading recorded in Step 16.

*the 707 mV*

18. Disconnect all test equipment from the UUT. Assemble the UUT using the assembly portion of the Interior Access procedure in Section 3.

6-15. PROCEDURE II

6-16. If the UUT failed to meet the criteria in Procedure I, complete the following steps:

1. Insure that the instrument has been warmed up for a minimum of 2 hours with all covers in place before starting this procedure.

2. Set up the equipment as follows:

a. Connect the Low Frequency Synthesized Signal Generator output to the UUT MOD IN connector through a BNC Tee. Connect the RMS Voltmeter input to the other arm of the BNC Tee.

b. Connect the UUT RF OUTPUT connector to the Modulation Analyzer input.

c. Set the RMS Voltmeter dB/VOLTS control to the VOLTS position.

d. Program the Modulation Analyzer to AUTO, FM, bandwidth of 50 Hz to >200 kHz, and PEAK+.

e. Program the Low Frequency Synthesized signal Generator for an input to the MOD IN connector of 10 kHz at a level of 707.1 mV rms as read on the RMS Voltmeter.

f. Program the UUT for RECALL 96 and turn on the EXT FM/ $\emptyset$ M control.

3. Program a new frequency step size as follows:

a. Press SHIFT, FREQ STEP. Frequency step size appears in the FREQUENCY Display (typically 1.0XXX MHz).

b. Program the new frequency step size that is equal to 4 times the value displayed in Step a.

4. Step the UUT RF output frequency up as close to 385 MHz as possible.
5. Remove the outer covers from the UUT using the disassembly portion of the Interior Access Procedure in Section 3.
6. Program the UUT for a phase modulation index of 9.99 radians.
7. Adjust R10 on the A3A9 Synthesizer Distribution PCB (Figure 6-6) for a Modulation analyzer reading of 92.7 kHz.
8. Use the disassembly portion of the A3A1 Phase Detector PCB Access procedure in Section 3 to swing out the Synthesizer Plate and to access the Phase Detector compartment. Turn on the UUT and return the UUT to the setup that existed in Step 7.
9. Program the UUT for an FM deviation of 99.9 kHz.
10. Adjust R5 on the A3A1 Phase Detector PCB (Figure 6-7) for a Modulation Analyzer reading of 100.1 kHz.
11. Use the disassembly portion of the A3A3 Delay Discriminator PCB Access Procedure in Section 3 to remove that cover to the Discriminator Compartment.
12. On the UUT, select special function 21.
13. Adjust R103 on the A3A3 Delay Discriminator PCB (Figure 6-8) for a Modulation Analyzer reading of 100.1 kHz.
14. Program the Low Frequency Synthesized Signal Generator for an output of 400 Hz.
15. Adjust R10 on the A3A1 Phase Detector PCB (Figure 6-7) for a Modulation Analyzer reading 100.1 kHz.
16. Program the UUT for a phase modulation index of 9.99 radians and enable the 3 kHz low pass filter on the Modulation Analyzer.
17. Adjust R12 on the A3A1 Phase Detector PCB (Figure 6-7) for a Modulation Analyzer reading of 4.0 kHz.
18. Program the Low Frequency Synthesized Signal Generator for level of 353.6 mV rms at the UUT MOD IN connector as read on the RMS Voltmeter.
19. Set the Modulation Analyzer BW to 50 Hz to >200 kHz.
20. Program the UUT for an FM deviation of 199 kHz and select special function 20.
21. Connect the oscilloscope to TP2 on the A3A3 Delay Discriminator PCB (Figure 6-8) and adjust R67 for a Modulation Analyzer reading of 100.1 kHz. If the signal on TP2 is greater than 0.7V peak-to-peak, adjust R67 until the signal at TP2 is 0.7V peak-to-peak. Verify that the Modulation Analyzer reading is <102.2 kHz. Record the reading.
22. Program the Low Frequency Synthesized Signal Generator for level of 707.1 mV rms at the UUT MOD IN connector as read on the RMS Voltmeter.

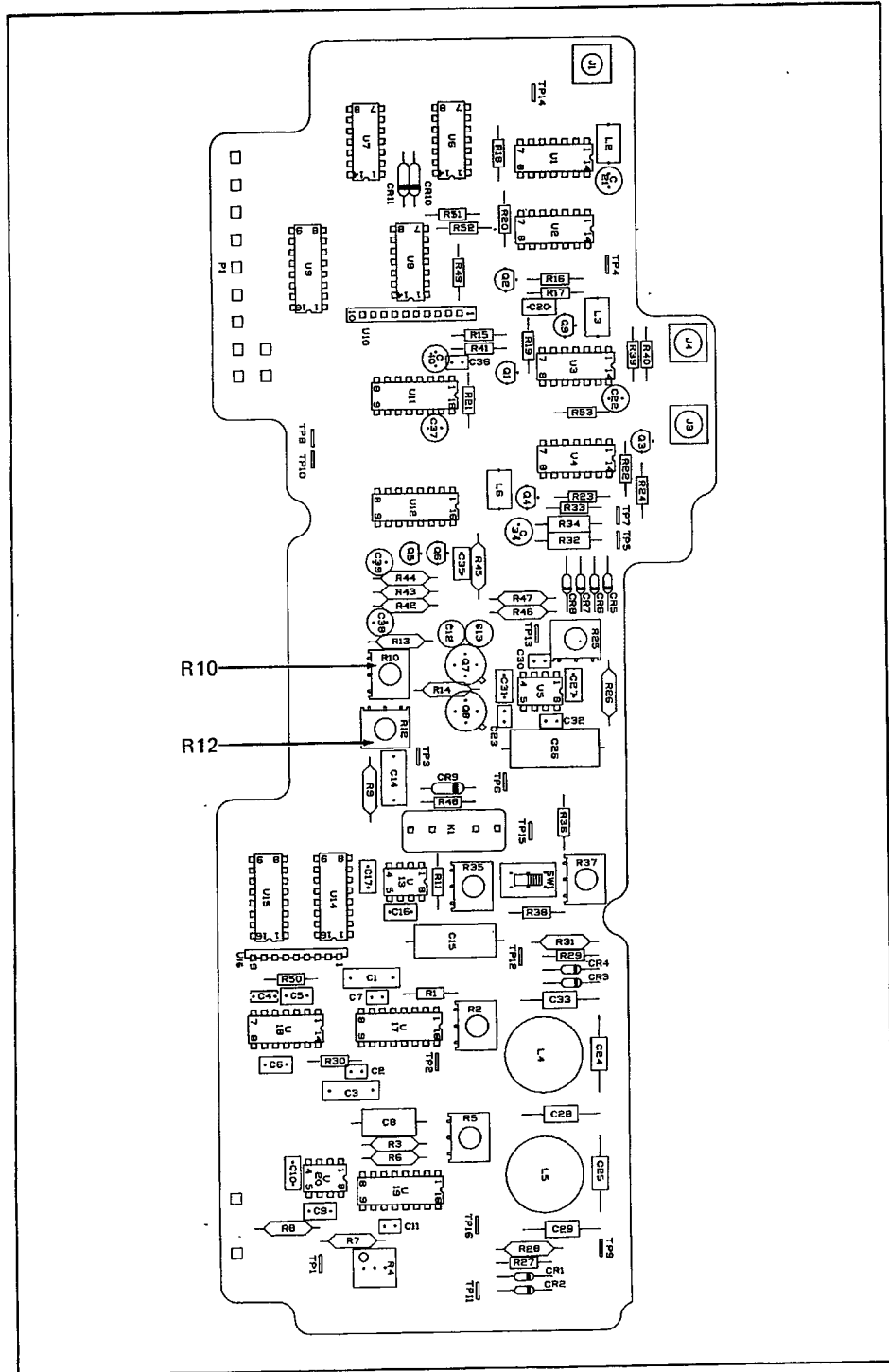


Figure 6-7. A3A1 Phase Detector PCB

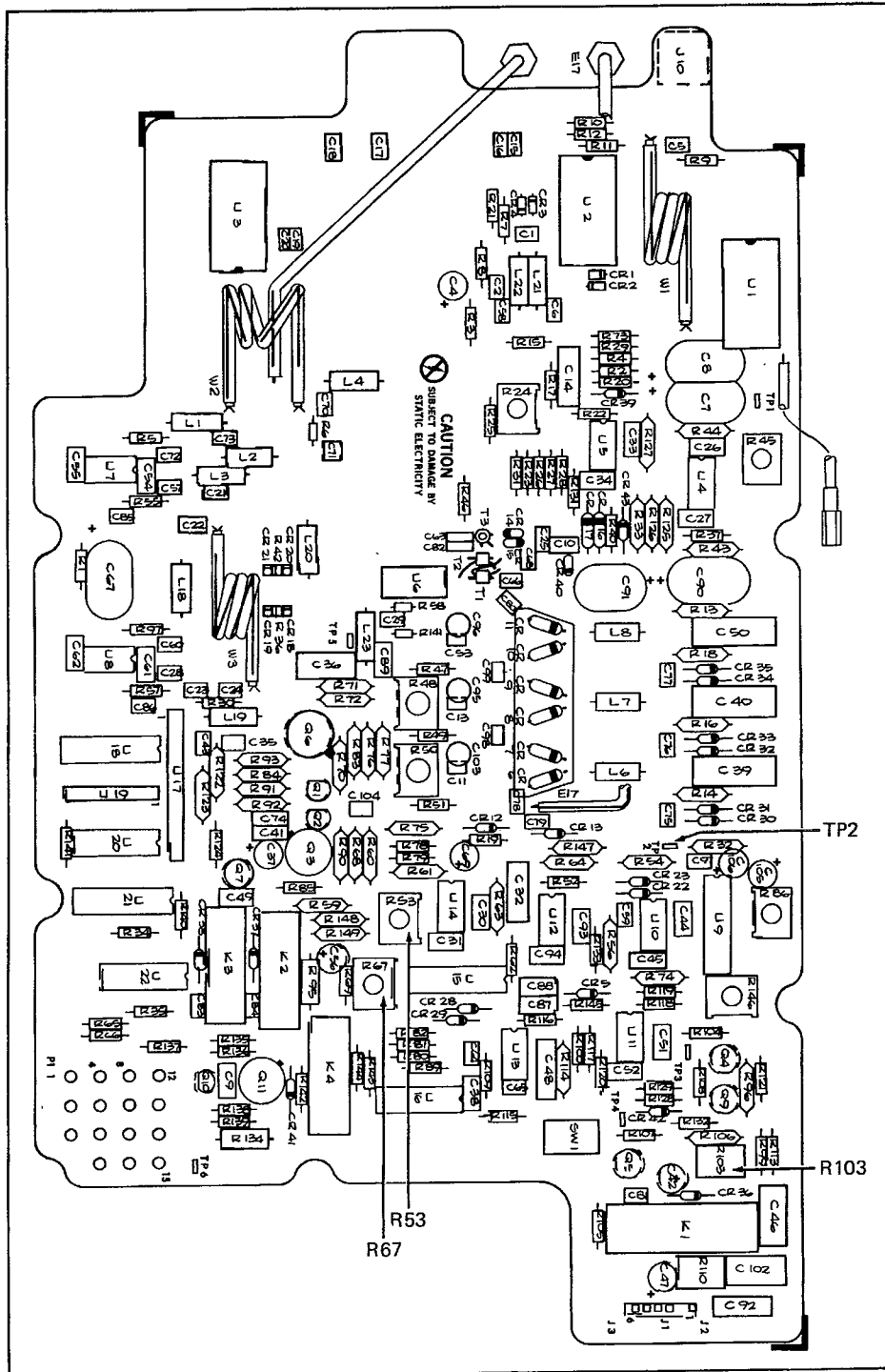


Figure 6-8. A3A3 Delay Discriminator PCB

23. Program the UUT for an FM deviation of 99.9 kHz.
24. Adjust R53 on the A3A3 Delay Discriminator PCB (Figure 6-8) until the Modulation Analyzer reading is the same as the reading recorded in Step 20.
25. Disconnect all test equipment. Assemble the UUT using the assembly portions of the Interior Access Procedure, the A3A1 Phase Detector PCB Access Procedure, and the A3A3 Delay Discriminator PCB Access Procedure.
26. After the UUT has thermally stabilized, repeat Procedure 1.

**6-17. AM and Level Adjustment Procedure**

---

PURPOSE:	Provide final check and adjustment of the AM and level circuitry.
TEST EQUIPMENT:	Low Frequency Synthesized Signal Generator, Modulation Analyzer, Calibrated Power Meter
REMARKS:	<ol style="list-style-type: none"><li>1. The AM adjustments must always be performed before the level adjustments.</li><li>2. The UUT and all test equipment must be at room temperature and must be operating for at least 30 minutes before this procedure is started.</li></ol>

---

6-18. Complete the following steps to provide a final check and adjustment of the AM and level circuitry.

1. Perform the AM calibration on the Modulation Analyzer using the internal calibrator as follows:
  - a. Connect the calibrator output of the Modulation Analyzer to the RF input of the Modulation Analyzer.
  - b. Press AM, +PEAK, CALIBRATION and wait for one minute.
  - c. Press 16.1, SPCL to enable application of the internal calibration factor.
  - d. Remove the connection between the Modulation analyzer calibrator output and RF input.
2. Remove the bottom cover of the UUT (procedures in Section 3). Do not remove the module covers.
3. Set up the equipment as follows:
  - a. Connect the output of the Low Frequency Synthesized Signal Generator to the MOD IN connector on the UUT and turn on the EXT AM control.
  - b. Program the Low Frequency Synthesized Signal Generator for a 3 kHz signal at a level of 0.7071V rms at the UUT MOD IN connector.

- c. Connect the UUT RF OUTPUT connector to the Modulation analyzer RF input.
  - d. Program the Modulation Analyzer for AM, AUTO, +PEAK, 15 kHz low pass filter on.
  - e. Program the UUT for an RF output frequency of 110 MHz, a level of +4 dBm, and an AM depth of 69.5%.
4. Allow the Modulation Analyzer to settle, and record the settled reading. Press -PEAK and record the new reading. Adjust R22 on the A4A10 Mod Distribution PCB (Figure 6-5) so that the readings are symmetrical about 70.0% AM. Press +PEAK and -PEAK as necessary for new readings.
  5. Disconnect the Modulation Analyzer.
  6. Set up the equipment as follows:
    - a. Program the UUT for an RF output frequency of 50 MHz at a level of +5 dBm. Turn off the UUT MODULATION and the RF OUTPUT ON controls off.
    - b. Connect the Power Meter head to the UUT RF OUTPUT connector.
    - c. Set the Power Meter range switch to -20 dBm and press FINE ZERO. Verify that the Power Meter zero reading has stabilized. Set the Power Meter RANGE switch to +10 dBm.
  7. Turn on the UUT RF OUTPUT ON control.
  8. Adjust R55 on the A4A10 Mod Distribution PCB (Figure 6-5) for a reading of approximately +5 dBm on the Power Meter.
  9. Program the UUT for an RF output level of +9 dBm and adjust R55 for a reading of exactly +9 dBm on the Power Meter.
  10. Disconnect all test equipment and replace all covers (procedures in Section 3).

#### 6-19. Output Amplifier Adjustment Procedure

---

PURPOSE:	To provide final adjustment of the output amplifier.
TEST EQUIPMENT:	System DMM, True RMS Voltmeter, 50 $\Omega$ TERMINATION JF442905
REMARKS:	Although the same procedure is used to adjust the output amplifier in the 6070A and the 6071A, the component numbers of some devices to be adjusted vary between the two models. When there is a difference in component numbers, the 6070A component number is enclosed in parentheses. Figure 6-9 shows the location of all adjustments.

---

#### 6-20. Complete the following steps to adjust the output amplifier circuitry:

1. Use the procedures in Section 3 to access the output amplifier (A4A7 Output Amplifier PCB for 6070A or A4A6 X2 Output Amplifier PCB for 6071A).

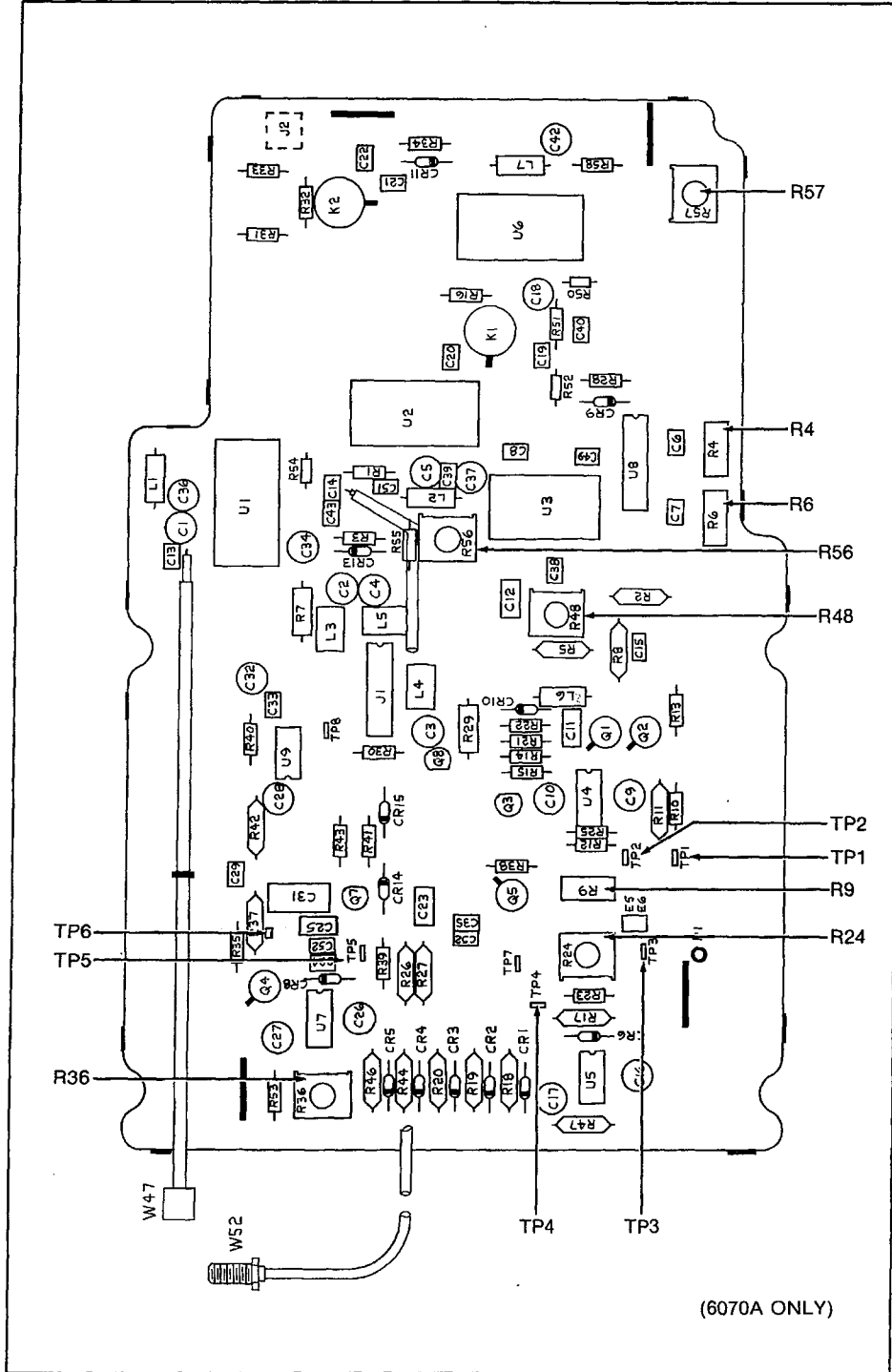


Figure 6-9. Output Amplifier PCB



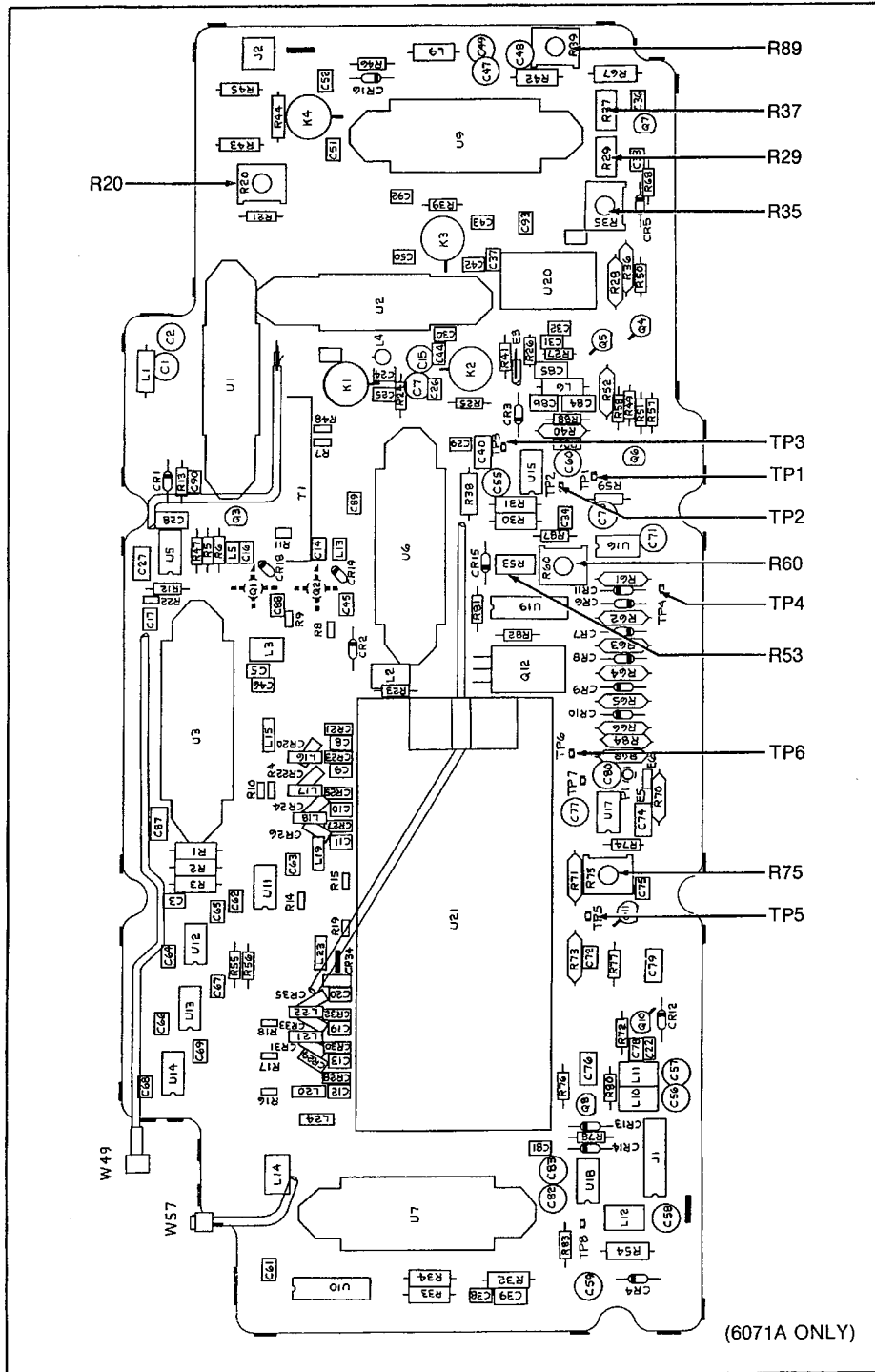


Figure 6-9. Output Amplifier PCB (cont)

2. Set up the equipment as follows:
  - a. Program the UUT for an RF output frequency of 5 MHz at a level of +10 dBm. Turn off the RF OUTPUT ON control. Use the EDIT and DIGIT controls to place the Bright Digit at the 1 kHz position in the FREQUENCY Display.
  - b. Connect the True RMS Voltmeter through a FJ442905 50 ohm termination to J1 of the Output Module. (If the 6070A-870 Reverse Power Protection Option is installed, connect the meter to J3 instead of J1). Set the True RMS Voltmeter to measure dB.
  - c. Set the System DMM to dc volts, autoranging. Short the test leads together and zero the System DMM on its most sensitive range. Connect the HI test lead to TP1 and the LO test lead to TP2 on the output amplifier.
3. Adjust R53 (R9 if 6070A) for a reading of  $-20 \pm 20 \mu\text{V}$  on the systems DMM.
4. Connect the Systems DMM HI test lead to TP3 and the Lo test lead to TP4. Adjust R60 (R24 if 6070A) for a reading of  $0 \pm 20 \mu\text{V}$  on the System DMM.
5. Turn on the RF OUTPUT ON control. Verify that the UNCAL annunciator is not flashing.
6. Connect the System DMM HI test lead to TP5 and LO test lead to TP6. Adjust R75 (R36 to 6070A) for a reading of  $0 \pm 20 \mu\text{V}$  on the System DMM.
7. Turn off the UUT RF OUTPUT ON control. Connect the Systems DMM HI test lead to TP3 and LO test lead to TP2. Adjust R29 (R4 if 6070A) for a reading of  $0 \pm 80 \mu\text{V}$  on the System DMM.
8. Use the Edit Knob to decrease RF output frequency to 4.999 MHz and record the Systems DMM reading.
9. Use the Edit Knob to increase RF output frequency to 5 MHz. Adjust R29 (R4 if 6070A) for a System DMM reading that is 1/3 the magnitude of the reading recorded in Step 8.
10. Use the Edit Knob to decrease RF output frequency to 4.999 MHz. Adjust R37 (R6 if 6070A) for a reading of  $0 \pm 80 \mu\text{V}$ .
11. Use the Edit Knob to increase RF output frequency to 5 MHz. Adjust R29 (R4 if 6070A) for a System DMM reading of  $0 \pm 40 \mu\text{V}$  on the Systems DMM.
12. Use the Edit Knob to decrease RF output frequency to 4.999 MHz. Verify that the Systems DMM reading is  $0 \pm 40 \mu\text{V}$ . If the reading is not  $0 \pm 40 \mu\text{V}$ , repeat Steps 10 through 12 until the reading is  $0 \pm 40 \mu\text{V}$  with either RF output frequency programmed.
13. Use the Edit Knob to increase RF output frequency to 5 MHz. Turn on the RF OUTPUT ON control.
14. Set the True RMS Voltmeter to the relative mode.
15. Use the Edit Knob to decrease RF output frequency to 4.999 MHz. Note the

reading and adjust R35 (R48 if 6070A) for a True RMS Voltmeter reading of 1/2 the magnitude of the noted reading.

16. Repeat Steps 7 through 15 until the readings on the Systems DMM are  $0 \pm 40 \mu\text{V}$  and the readings on the True RMS Voltmeter change less than 0.05 dB between the two frequencies.

17. Disconnect the test equipment. Use the access procedures in Section 3 to assemble the UUT.

#### **6-21. TIMEBASE ADJUSTMENT PROCEDURE**

---

**PURPOSE:** To adjust the 10 MHz Timebase.

**TEST EQUIPMENT:** Frequency Standard, Frequency Counter

**REMARKS:**

1. This procedure is for the UUT standard timebase. If the UUT has the 607XA-130 Oven Reference Option installed use the adjustment procedure in Section 7A. (The 10 MHz Timebase can be adjusted even if the 607XA-130 Option is installed by setting the INT XO/OPTION 130 Switch to the INT X0 position).
2. The UUT and all test equipment must be at room temperature and must be warmed up for at least 30 minutes before this procedure is started.

---

6-22. Use the following procedure to adjust the 10 MHz Timebase:

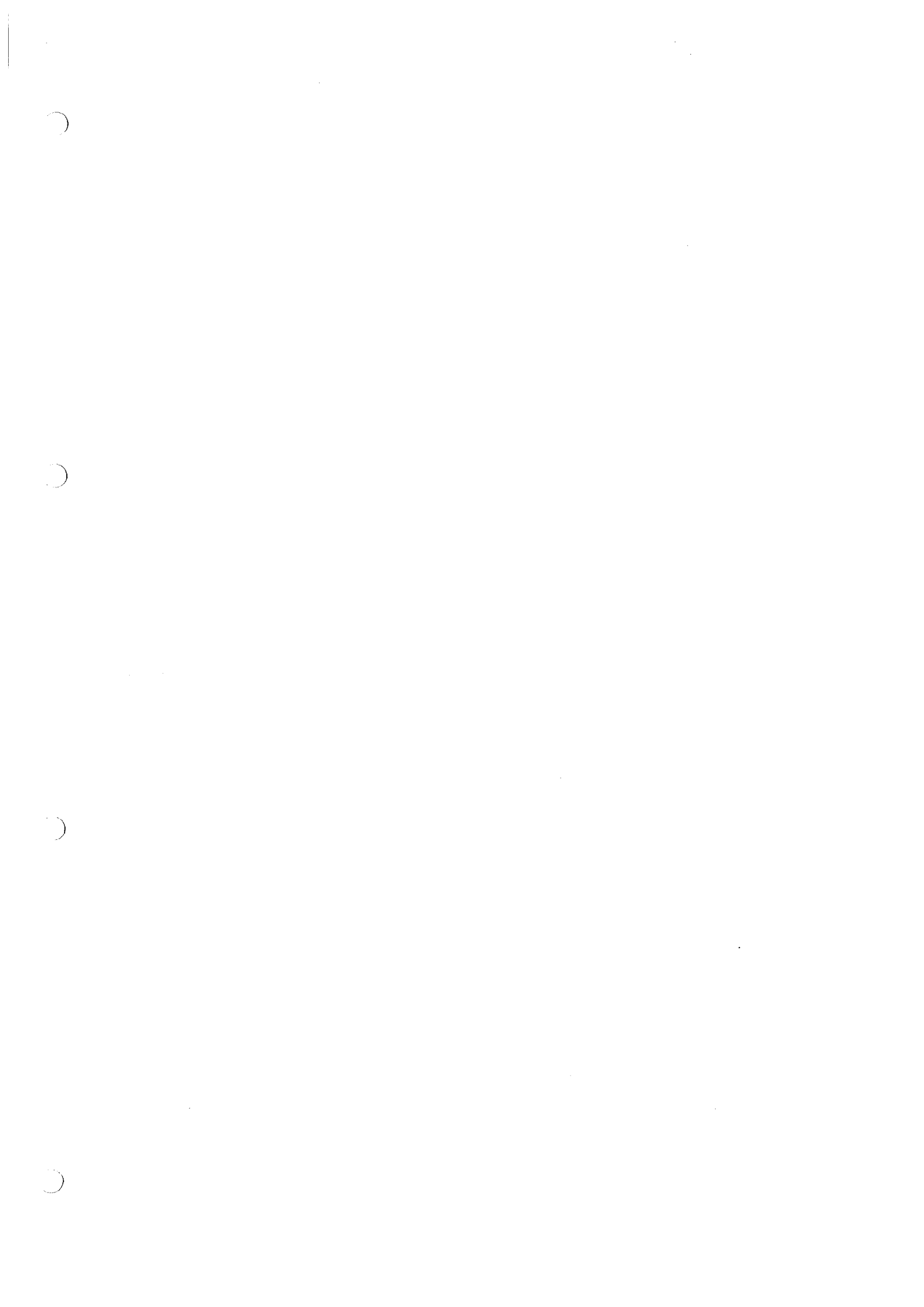
1. Use the Internal Access Procedure (Section 3) to remove the top cover of the instrument.
2. If the 607XA-130 Oven Reference Option is installed, set the INT XO/OPTION 130 switch to the INT XO position. If the option isn't installed, go to Step 3.
3. Connect the Frequency Standard to the REF IN connector on the Frequency Counter.
4. Connect the UUT REF OUT to the Channel A input of the Frequency Counter.
5. On the UUT, adjust C9 on the 10 MHz Timebase PCB (C9 has an access hole in the module cover) so that the Frequency Counter displays  $10 \text{ MHz} \pm 2 \text{ Hz}$ .
6. If the 607XA-130 Oven Reference Option is installed, return the INT XO/OPTION 130 switch to the OPTION 130 position.
7. Use the Interior Access Procedure (Section 3) to replace the UUT cover.



## **Section 7**

# **Performance Checks and Calibration of Options**

The following subsections describe the performance checks and calibration procedures for options to the 6070A and the 6071A. Each option has a separate subsection. For example, the performance check for the 607XA-130 Option is described in Section 7A.



## Section 7A

# 607XA-130 Oven Reference Option Performance Check and Adjustment

### 7A-1. INTRODUCTION

7A-2. The information in this section describes the performance check and adjustment procedure for the 607XA-130 Oven Reference Option. Additional information about the Oven Reference Option is provided when appropriate throughout the 6070A/6071A Instruction Manual Set..

### 7A-3. PERFORMANCE CHECK

---

PURPOSE:	Verify that the frequency of the UUT timebase is within specified limits.
TEST EQUIPMENT:	Frequency Standard, and Frequency Counter
REMARKS:	<ol style="list-style-type: none"><li>1. This procedure is for a UUT with the 607XA-130 Oven Reference Option installed. for instruments with the standard timebase installed, see the Frequency Accuracy Check in Section 5.</li><li>2. The UUT must be warmed up, with the covers in place, for at least 30 minutes before attempting this procedure.</li></ol>

---

7A-4. Complete the following steps to verify that the frequency of the UUT timebase is within specified limits.

1. Connect the Frequency Standard output to the 10 MHZ REF IN connector on the counter.
2. Connect the UUT REF OUT connector to the counter CHANNEL A input connector.
3. Verify that the counter display is 10 MHz +/- 0.1 Hz.

### 7A-5. ADJUSTMENT PROCEDURE

---

PURPOSE:	Verify that the frequency of the UUT timebase is within specified limits.
----------	---

**TEST EQUIPMENT:** Frequency Standard, and Frequency Counter

**REMARKS:**

1. This procedure is for a UUT with the 607XA-130 Oven Reference Option installed. For instruments with the standard timebase installed, see the Frequency Accuracy Check in Section 5.
2. The UUT must be warmed up, with the covers in place, for at least 30 minutes before attempting this procedure.

---

7A-6. Complete the following steps to adjust the frequency of the UUT timebase.

1. Connect the Frequency Standard output to the 10 MHZ REF IN connector on the counter.
2. Connect the UUT RF OUTPUT connector to the counter CHANNEL A input connector.
3. Program the UUT for an RF OUTPUT of 100 MHz at a level of 100 mV.
4. Use the Interior Access procedure in Section 3 to remove the top cover of the UUT. The Oven Reference Option is located in the right rear corner of the UUT.
5. Rotate the FINE and COARSE adjustments so that that counter reading is 100 MHz  $\pm 1$  Hz (for error less than  $1 \times 10^{-8}$ ) or better if needed.



## Section 7B

# 607XA-831 Auxiliary Output Option Performance Check

### 7B-1. INTRODUCTION

7B-2. The information in this section describes the performance check for the 607XA-831 Auxiliary Output Option. The 6070XA-831 Option has no calibration adjustments. Additional information about the Auxiliary output Option is provided when appropriate throughout the 6070A/6071A Instruction Manual Set.

### 7B-3. PERFORMANCE CHECK

---

**PURPOSE:** To Verify the level of the signal at the AUX OUT connector.

**TEST EQUIPMENT:** True RMS Voltmeter

**REMARKS:** The auxiliary output signal is intended for use as a frequency reference, so that:

1. The frequency of the AUX OUT signal matches the accuracy and precision of the RF OUTPUT signal.
  2. The level of the AUX OUT signal is independent of the programmed RF output.
  3. The accuracy of the AUX OUT signal level is not guaranteed.
- 

7B-4. Complete the following steps to verify the level of the signal at the AUX OUT connector.

1. Program the UUT for an RF output frequency of 10 MHz at a level of +13 dBm.
2. Verify the level of the AUX OUT signal:
  - a. Connect the UUT AUX OUT to the True RMS Voltmeter input through a 50 Ohm termination.
  - b. Set the True RMS Voltmeter controls to:
 

REL/dBm	dBm
dB/VOLTS	dB
dBm REFERENCE	50 Ohm
  - c. Verify that the True RMS Voltmeter displays a level greater than -10 dBm.

## Section 7B

# 607XA-831 Auxiliary Output Option Performance Check

### 7B-1. INTRODUCTION

7B-2. The information in this section describes the performance check for the 607XA-831 Auxiliary Output Option. The 6070XA-831 Option has no calibration adjustments. Additional information about the Auxiliary output Option is provided when appropriate throughout the 6070A/6071A Instruction Manual Set.

### 7B-3. PERFORMANCE CHECK

---

**PURPOSE:** To Verify the level of the signal at the AUX OUT connector.

**TEST EQUIPMENT:** True RMS Voltmeter

**REMARKS:** The auxiliary output signal is intended for use as a frequency reference, so that:

1. The frequency of the AUX OUT signal matches the accuracy and precision of the RF OUTPUT signal.
  2. The level of the AUX OUT signal is independent of the programmed RF output.
  3. The accuracy of the AUX OUT signal level is not guaranteed.
- 

7B-4. Complete the following steps to verify the level of the signal at the AUX OUT connector.

1. Program the UUT for an RF output frequency of 10 MHz at a level of +13 dBm.
2. Verify the level of the AUX OUT signal:
  - a. Connect the UUT AUX OUT to the True RMS Voltmeter input through a 50 Ohm termination.
  - b. Set the True RMS Voltmeter controls to:
 

REL/dBm	dBm
dB/VOLTS	dB
dBm REFERENCE	50 Ohm
  - c. Verify that the True RMS Voltmeter displays a level greater than -10 dBm.

## Section 7C

# 607XA-870 Reverse Power Protection Option Adjustment

### 7C-1. INTRODUCTION

7C-2. The information in this section describes the adjustment procedure that sets the trip point for the 607XA-870 Reverse Power Protection (RPP) Option. Additional information about the RPP Option is provided when appropriate throughout the 6070A/6071A Instruction Manual Set.

### 7C-3. RPP TRIP POINT ADJUSTMENT PROCEDURE

---

<b>PURPOSE:</b>	To set the trip point of the RPP circuit just above the open-circuit trip point at any frequency and phase.
<b>TEST EQUIPMENT:</b>	Approximately six feet RG58 coaxial cable with BNC connectors, BNC to Type-N adapter.
<b>REMARKS:</b>	<ol style="list-style-type: none"><li>1. The RF OUTPUT ON control flashes to indicate that the RPP circuit has tripped.</li><li>2. Press and release the RF OUTPUT ON control to reset the RPP circuit.</li></ol>

---

7C-4. Complete the following steps to perform the RPP Trip Point Adjustment Procedure:

1. Use the appropriate procedures in Section 3 to access the A4A5 R.P.P. PCB.
2. Program the UUT RF output frequency to 200 kHz at a level of +20 dBm. If the RF OUTPUT ON control is flashing (RPP circuit tripped), go to Step 3. If the RF OUTPUT ON control is not flashing, adjust R7 cw on the A4A5 R.P.P. PCB so that the RF OUTPUT ON control is flashing.
3. Adjust R7 ccw until the RPP circuit can just be reset.
4. Use the DIGIT and EDIT controls to place the Bright Digit at the 100 kHz position of the FREQUENCY Display.
5. Edit frequency from 200 kHz to 10 MHz while watching for the RPP circuit to trip.
6. At each frequency where the RPP circuit trips, adjust R7 so that the RPP circuit

can just be reset. Verify that the adjustment is correct by editing back through that frequency to make sure that the RPP circuit no longer trips.

7. Use the DIGIT and EDIT controls to place that Bright Digit at the 1 MHz position of the FREQUENCY Display.

8. Edit frequency from 10 MHz to 519 MHz (1040 MHz with 6071A). Repeat the procedure described in Step 6 whenever the circuit trips.

9. Connect the 6 foot coaxial cable to the UUT RF OUTPUT connector through the BNC to Type-N adapter. Leave the other end of the coaxial cable unterminated. Repeat Steps 5 through 7 so that the RPP circuit doesn't trip at any frequency with the cable connected.

10. Note the final position of R7. Adjust R7 1/8 turn further ccw.

11. Repeat Steps 5 through 8. Verify that the RPP circuit does not trip.

12. Disconnect the coaxial cable and use the access procedures in Section 3 to assemble the instrument.

## Appendix A Fluke Sales and Service Centers

Appendix A contains four tables that list the address and telephone numbers of each John Fluke Sales Representative and each John Fluke Service Center. These four tables are as follows:

1. Table A-1. Fluke Technical Service Centers - U.S. and Canada
2. Table A-2. Fluke Technical Service Centers - International
3. Table A-3. Sales Representatives - U.S. and Canada
4. Table A-4. Sales Representatives - International

Table A-1. Fluke Technical Service Centers - U.S. and Canada

<p><b>UNITED STATES</b></p> <p><b>CA, Burbank</b> Fluke Technical Center 2020 N. Lincoln Street Burbank, CA 91504 (213) 849-4641</p> <p><b>CA, Santa Clara</b> Fluke Technical Center 2300 Walsh Avenue Santa Clara, CA 95050 (408) 985-1200</p> <p><b>CO, Denver</b> Fluke Technical Center 1980 S. Quebec Street, Unit 4 Denver, CO 80231 (303) 750-1228</p> <p><b>FL, Orlando</b> Fluke Technical Center 940 N. Fern Creek Avenue Orlando, FL 32803 (305) 896-2296</p> <p><b>IL, Rolling Meadows</b> Fluke Technical Center 1400 Hicks Road Rolling Meadows, IL 60008 (312) 398-5800</p>	<p><b>MA, Waltham</b> Fluke Technical Center 244 Second Avenue Waltham, MA 02154 (617) 890-1604</p> <p><b>MD, Rockville</b> Fluke Technical Center 5640 Fishers Lane Rockville, MD 20852 (301) 770-1576</p> <p><b>MN, Apple Valley</b> Fluke Technical Center 7373 West 147th Street, Suite 196 Apple Valley, MN 55124 (612) 432-9400</p> <p><b>NC, Greensboro</b> Fluke Technical Center 1310 Beaman Place Greensboro, NC 27408 (919) 273-1918</p> <p><b>NJ, Paramus</b> Fluke Technical Center West 75th Century Road Paramus, NJ 07652 (210) 262-9550</p>	<p><b>TX, Dallas</b> Fluke Technical Center 14400 Midway Road Dallas, TX 75240 (214) 233-9945</p> <p><b>WA, Mountlake Terrace</b> John Fluke Mfg. Co., Inc. 21707 66th Avenue W., Suite 1 Mountlake Terrace, WA 98043 (206) 774-2206</p> <p><b>CANADA</b></p> <p><b>ALB, Calgary</b> Allan Crawford Assoc., Ltd. 1935 30th Avenue N.E. #14 Calgary, ALB T2E 6Z5 (403) 230-1341</p> <p><b>ONT, Mississauga</b> Allan Crawford Assoc., Ltd. 6503 Northam Drive Mississauga, ONT L4V 1J5 (416) 678-1500</p> <p><b>QUE, St. Laurent</b> Allan Crawford Assoc., Ltd. 7018 Cote de Liesse St. Laurent, QUE H4T 1E7 (514) 731-8564</p>
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Table A-2. Fluke Technical Service Centers - International

<p><b>ARGENTINA</b> Fluke Latin American Service Headquarters Virrey del Pino 4071 Buenos Aires, Argentina Tel: 523185</p> <p><b>AUSTRALIA</b> Elmeasco Instrument Pty Ltd. P.O. Box 30 Concord, N.S.W. Australia 2137 Tel: (02) 736-2888</p> <p><b>AUSTRIA</b> Walter Rekirsch Elektronische Gerate GmbH &amp; Co. Vertriebs-K.G. Lichtensteinstrasse 97/6 A-1090 Vienna, Austria Tel: 09-43-222-347646</p> <p><b>BELGIUM</b> Fluke (Belgium) S.A./N.V. 6, Rue de Geneve 1140 Brussels, Belgium Tel: 09-32-2-2164090</p> <p><b>BRAZIL</b> Arotec S.A. Industria e Comercio Av. Pacaembu 811 01234 Sao Paulo S.P., Brazil Tel: 826-2266</p>	<p><b>CHILE</b> Intronica Chile Ltda. Casilla 16228 Santiago 9, Chile Tel: 44940</p> <p><b>COLOMBIA</b> Coasin Ltda. Carrera 13, # 37-37, Of. 407 Ap. Aero 29583 Bogota DE, Colombia Tel: 285-0230</p> <p><b>DENMARK</b> Tage Olsen A/S Ballerup Byvej 222 DK-2750 Ballerup Denmark Tel: (01) 2-65 81 11</p> <p><b>ECUADOR</b> Protoco Coasin Cia., Ltda. Edificio "Jerico" Ave. 12 de Octubre #2285y Ave. Orellana (Planta Baja) Quito, Ecuador Tel: 526759</p> <p><b>EGYPT</b> Lotus Engineering Organisation P.O. Box 1252 Cairo, Egypt Tel: 71617</p>	<p><b>FINLAND</b> Oy Findip AB Teollisuustie 7 02700 Kauniainen Finland Tel: 09-358-0-502255</p> <p><b>FRANCE</b> M.B. Electronique S.A. Rue Fourny ZAC de BUC B.P. #31 78530 BUC, France Tel: 09-33-1-9568131</p> <p><b>GREECE</b> Hellenic Scientific Representations Ltd. 11, Vrassida Street Athens 615, Greece Tel: 09-30-1-711140</p> <p><b>HONG KONG</b> Gilman Industrial Bldg., 9F 107-109 Wai Yip Street Kwun Tong Kowloon, Hong Kong Tel: 3-427144</p>
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Table A-2. Fluke Technical Service Centers - International (cont)

<p><b>INDIA</b> Hinditron Services Pvt. Ltd. "Hinditron House" 412 Raj Mahal Vilas Extension Bangalore 560 006, India Tel: 33139</p> <p>Hinditron Services Pvt. Ltd. 69 A.L. Jagmohandas Marg Bombay 400 006, India Tel: 365344</p> <p><b>INDONESIA</b> P.T. Dwi Tunggal Jaya Sakti Sangga Buana Bldg., 1st Floor Jl. Senen Raya 44, P.O. Box 4435 Jakarta, Indonesia Tel: 376608</p> <p><b>IRAN</b> Irantronics Company Ltd. 20 Salm Road Roosevelt Avenue Tehran, Iran Tel: 828294/831564</p> <p><b>ISRAEL</b> R.D.T. Electronics Engineering Ltd. P.O. Box 75 46, Sokolov Street Ramat Hasharon 47235 Israel Tel: 09-972-3-483211</p> <p><b>ITALY</b> Sistrel S.p.A. Via Timavo 66 20099 Sesto S. Giovanni (Milan) Italy Tel: 09-39-2-2476693</p> <p>Sistrel S.P.A. Via Giuseppe Armellini #37 00143 Rome, Italy Tel: 09-39-6-5915551</p> <p><b>JAPAN</b> John Fluke Mfg. Co., Inc. Japan Branch 1 Higashikata-machi Midori-ku Yokohama 226, Japan Tel: (045) 473-5425</p> <p><b>KOREA</b> Electro-Science Korea Co. C.P.O. Box 8446 Room 1201 Bowon Bldg. 490 Chongro - 5 Ka Chongro-ku Seoul, Korea Tel: 261-7702</p> <p><b>MALASIA</b> O'Connor's (Malaysia) SDN. BHD. P.O. Box 91 Petaling Jaya, Selangor West Malaysia Tel: 51563</p>	<p><b>MEXICO</b> C.J. Christensen S.A. De C.V. Melchor Ocampo 150-8 Mexico 4 D.F., Mexico Tel: (905) 535-2258</p> <p><b>NETHERLANDS</b> Fluke (Nederland) B.V. P.O. Box 5053 5004 EB Tilburg The Netherlands Tel: (013) 673973</p> <p><b>NEW ZEALAND</b> W &amp; K McLean Ltd. P.O. Box 18065 Glen Innes Auchland, New Zealand Tel: 587-037</p> <p><b>NORWAY</b> Morgensterne &amp; Co. A/A Konghellegate 3 P.O. Box 6688, Rodelokka Oslo 5, Norway Tel: 09-47-2-356110</p> <p><b>PAKISTAN</b> Pak International Operations 505 Mohammadi House 1.1. Chundrigar Road Katrachi-2 Pakistan Tel: 221127/239052</p> <p><b>PERU</b> Importaciones Y Representaciones Electronicas S.A. Avda. Franklin D. Roosevelt 105 Lima 1, Peru Tel: 288650</p> <p><b>PORTUGAL</b> Equipamentos de Laboratorio, Lda P.O. Box 1100 Lisbon 1002, Portugal Tel: 09-351-1-578936/547512</p> <p><b>REPUBLIC OF SINGAPORE</b> Rank O'Connor's (PTE) Ltd. 98 Pasir Panjang Road Singapore 0511 Republic of Singapore Tel: 637944</p> <p><b>REPUBLIC OF SOUTH AFRICA</b> Fluke S.A. (Pty) Ltd. P.O. Box 39797 Bramley 2018 Republic of South Africa Tel: (011) 786-3170</p> <p><b>SPAIN</b> Hispano Electronica S.A. Apartado de Correos 48 Alcorcon (Madrid) Spain Tel: 09-3416194108</p>	<p><b>SWEDEN</b> Teleinstrument AB P.O. Box 490 S-162 Vallingby 4 Sweden Tel: 09-46-8-380370</p> <p><b>SWITZERLAND</b> Traco Electronic AG Jenatschstrasse 1 8002 Zurich Switzerland Tel: 09-41-1-2010711</p> <p><b>TAIWAN</b> CCT Associates, Inc. P.O. Box 24209 Taipei, Taiwan Republic of China Tel: (02) 391-6894/393-5760</p> <p><b>THAILAND</b> Dynamic Supply Engineering R.O.P. # 56 Ekamai, Sukhumvit 63 Bangkok-11, Thailand Tel: 914434/928532</p> <p><b>TURKEY</b> Erkman Elektronik Aletler Ticaret Anonim Sirketi Necatiby Cad 92/3 Karakoy, Istanbul, Turkey Tel: 09-44-1-5461</p> <p><b>UNITED KINGDOM</b> Fluke International Corp. - UK Colonial Way Watford, Herts. WD24TT United Kingdom Tel: 09-4492340511</p> <p><b>URUGUAY</b> Coasin Uruguaya S.R.L. Edificio Ciudadela Sarandi 690 D. Esc. 109 Casilla de Correos 1400 Correo Central Montevideo, Uruguay Tel: 917978</p> <p><b>VENEZUELA</b> Coasin C.A. Apdo. Postal 50939 Sabana Grande # 1 Caracas 105, Venezuela Tel: 782-9109</p> <p><b>WEST GERMANY</b> Fluke (Deutschland) GmbH Krausstrasse 32 8045 Ismaning West Germany Tel: (089) 96251</p>
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Customers in the following countries: Bulgaria, Czechoslovakia, Hungary, Poland, Romania, U.S.S.R., and Yugoslavia, contact: Amtest Associates Ltd., P.O. Box 55, Addlestone, Surrey, KT 15 1DU, England, Tel. (0932) 52121

Table A-3. Sales Representatives - U.S. and Canada

<p><b>UNITED STATES</b></p> <p><b>AK, Anchorage</b> Harry Lang &amp; Associates 1371 Hillcrest Drive #303 Anchorage, AK 99503 (907) 279-5741</p> <p><b>AL, Huntsville</b> John Fluke Mfg. Co., Inc. 3322 Memorial Parkway Huntsville, AL 35807 (205) 881-8220 (404) 321-0980 (Atlanta)</p> <p><b>AZ, Tempe</b> John Fluke Mfg. Co., Inc. 2125 S. 48th Street, Suite 104 Tempe, AZ 85285 (602) 967-8724</p> <p><b>CA, Los Angeles</b> John Fluke Mfg. Co., Inc. 20902 S. Bonita Street Carson, CA 90746 (213) 538-3900</p> <p><b>CA, Santa Clara</b> John Fluke Mfg. Co., Inc. 2300 Walsh Avenue Santa Clara, CA 95050 (408) 244-1505</p> <p><b>CA, Tustin</b> John Fluke Mfg. Co., Inc. 15445 Red Hill Avenue, Suite F Tustin, CA 92680 (714) 838-8863 (714) 226-1254 (San Diego)</p> <p><b>CO, Denver</b> John Fluke Mfg. Co., Inc. 1980 S. Quebec, #4 Denver, CO 80231 (303) 750-1222</p> <p><b>CT, Hartford</b> John Fluke Mfg. Co., Inc. 124 Hebron Avenue Glastonbury, CT 06033 (203) 633-0777</p> <p><b>FL, Orlando</b> John Fluke Mfg. Co., Inc. 940 N. Fern Creek Avenue Orlando, FL 32803 (305) 896-4881</p> <p><b>HI, Honolulu</b> EMC Corporation 2979 Ualena Street Honolulu, HI 96819 (808) 847-1138</p> <p><b>IA, Iowa City</b> John Fluke Mfg. Co., Inc. 1027 Hollywood Blvd., Suite 309 Iowa City, IA 52240 (319) 354-2811</p>	<p><b>IL, Chicago</b> John Fluke Mfg. Co., Inc. 4300 Lincoln, Unit K Rolling Meadows, IL 60008 (312) 398-0850</p> <p><b>IN, Indianapolis</b> John Fluke Mfg. Co., Inc. 5610 Crawfordsville Road, Suite 802 Indianapolis, IN 46224 (317) 244-2456</p> <p><b>LA, Metairie</b> John Fluke Mfg. Co., Inc. 2700 Kingman Street, Suite 103 Metairie, LA 70002 (504) 455-0814</p> <p><b>MA, Waltham</b> John Fluke Mfg. Co., Inc. 244 Second Avenue Waltham, MA 02154 (617) 890-1600</p> <p><b>MD, Baltimore</b> John Fluke Mfg. Co., Inc. 5640 Fishers Lane Rockville, MD 20852 (301) 770-1570 (301) 792-7060 (Baltimore)</p> <p><b>MI, Detroit</b> John Fluke Mfg. Co., Inc. 13955 Farmington Road Livonia, MI 48154 (313) 522-9140</p> <p><b>MN, Minneapolis</b> John Fluke Mfg. Co., Inc. 7373 W. 147th Street, Suite 196 Apple Valley, MN 55124 (612) 432-9400</p> <p><b>MO, Kansas City</b> John Fluke Mfg. Co., Inc. 4406 Chouteau Traffic Way Kansas City, MO 64117 (816) 454-5836</p> <p><b>MO, St. Louis</b> John Fluke Mfg. Co., Inc. 300 Brookes Drive, Suite 100 Hazelwood, MO 63042 (314) 731-3388</p> <p><b>NC, Greensboro</b> John Fluke Mfg. Co., Inc. 1310 Beaman Place Greensboro, NC 27408 (919) 273-1918</p> <p><b>NJ, Paramus</b> John Fluke Mfg. Co., Inc. West 75 Century Road Paramus, NJ 07625 (201) 262-9550</p>	<p><b>NM, Albuquerque</b> John Fluke Mfg. Co., Inc. 1108 Alvarado Drive N.E. Albuquerque, NM 87110 (505) 265-8431</p> <p><b>NY, Rochester</b> John Fluke Mfg. Co., Inc. 4515 Culver Road Rochester, NY 14622 (716) 266-1400</p> <p><b>OH, Cleveland</b> John Fluke Mfg. Co., Inc. 7830 Freeway Circle Middleburg Heights, OH 44130 (216) 234-4540</p> <p><b>OH, Dayton</b> John Fluke Mfg. Co., Inc. 4756 Fishburg Road Dayton, OH 45424 (513) 233-2238</p> <p><b>OR, Portland</b> John Fluke Mfg. Co., Inc. 18360 S.W. Springfield Lane Aloha, OR 97006 (502) 642-1342</p> <p><b>PA, Philadelphia</b> John Fluke Mfg. Co., Inc. 1010 W. 8th Avenue, Suite H King of Prussia, PA 19406 (215) 265-4040 (412) 261-5171 (Pittsburgh)</p> <p><b>TX, Austin</b> John Fluke Mfg. Co., Inc. 111 W. Anderson Lane, Suite 213 Austin, TX 78752 (512) 478-9901</p> <p><b>TX, Dallas</b> John Fluke Mfg. Co., Inc. 14400 Midway Road Dallas, TX 75243 (214) 233-9990</p> <p><b>TX, Houston</b> John Fluke Mfg. Co., Inc. 1014 Wirt Road, Suite 270 Houston, TX 77055 (713) 683-7913 (512) 222-2726 (San Antonio)</p> <p><b>UT, Salt Lake City</b> John Fluke Mfg. Co., Inc. 782 E. 8325 South Sandy, UT 84070 (801) 566-4864</p> <p><b>WA, Kennewick</b> John Fluke Mfg. Co., Inc. 3613 W. 16th Place #C Kennewick, WA 99336</p> <p><b>WA, Seattle</b> John Fluke Mfg. Co., Inc. 975 Industry Drive Seattle, WA 98188 (206) 575-3765</p>
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For more information on Fluke products or Sales Offices you may dial (800) 426-0361 toll free in most of U.S. From Alaska, Hawaii, Washington, or Canada phone (206) 774-2481. From other countries phone (206) 774-2398.



Table A-3. Sales Representatives - U.S. and Canada (cont)

<b>CANADA</b>	<b>NS, Halifax</b>	<b>ONT, Toronto</b>
<b>ALB, Calgary</b> Allan Crawford Assoc., Ltd. 1935 30th Avenue N.E., #14 Calgary, ALB T2E 6Z5 Tel: (403) 230-1341	Allan Crawford Assoc., Ltd Townsend Place, Suite 201 800 Windmill Road Burnside Industrial Park Dartmouth, NS B3B 1L1 Tel: (902) 469-7865	Allan Crawford Assoc., Ltd. 6503 Northam Drive Mississauga, ONT L4V 1J5 Tel: (416) 678-1500
<b>BC, North Vancouver</b> Allan Crawford Assoc., Ltd 3795 William Street Burnaby, BC Y5C 3H3 Tel: (604) 294-1326	<b>ONT, Ottawa</b> Allan Crawford Assoc., Ltd 1299 Richmond Road Ottawa, ONT K2B 7Y4 Tel: (613) 829-9651	<b>QUE, Montreal</b> Allan Crawford Assoc., Ltd. 7018 Cote de Liesse St. Laurent, QUE H4T 1E7 Tel: (514) 731-8564
<b>For Canadian areas not listed, contact the office nearest you or Allan Crawford Assoc. Ltd., Mississauga (Toronto), Ontario.</b>		

Table A-4. Sales Representatives - International

<b>Supplied and Supported by Fluke International Corporation, P.O. Box 43210, Mountlake Terrace, WA 98043, Tel: (206) 774-2398, TLX: 152662 JOHNFLUKE MTLT</b>		
<b>ARGENTINA</b> Coasin S.A. Virrey del Pino 4071 Buenos Aires, Argentina Tel: 525130 TLX: 390122284 COASN AR	<b>BRAZIL</b> Arotec S.A. Industria e Comercio Av. Pacaembu 811 01234 Sao Paulo S.P., Brazil Tel: (011) 67-2393 TLX: 1122207 AROT BR	<b>COLOMBIA</b> Coasin Ltda. Carrera 13, # 37-37, Of. 407 Ap. Aero 29583 Bogota DE, Colombia Tel: 285-0230/0250 TLX: 45787 COASN CO
<b>AUSTRALIA</b> Elmeasco Instruments Pty Ltd. P.O. Box 30 Concord, N.S.W. Australia 2137 Tel: (2) 736-2888 TLX: 79025887  Elmeasco Instruments Pty Ltd. P.O. Box 107 Mt. Waverly, VIC. 3149 Australia Tel: 233-4044 TLX: 26206 (ELMVIC)  Elmeasco Instruments Pty Ltd Professional Suite's Bldg. B.P.O. Box 2360 Brisbane, 4001 Australia Tel: (07) 229-3161  Elmeasco Instruments Pty Ltd. P.O. Box 1240 G.P.O. Adelaide 5001 South Australia	<b>BRUNEI</b> O'Connor's Limited (Brunei Branch) Chin Kian Bldg. P.O. Box 2126 Bandar Seri Begawan, Brunei Tel: 26680  <b>CHILE</b> Intronica Chile Ltda. Manuel Montt 024 - Of. D Casilla 16228 Santiago 9, Chile Tel: 44940 TLX: 40301 Cab Publ., Attn: Intronica Chile	<b>ECUADOR</b> Proteco Coasin Cia., Ltda. Edificio "Jerico" Ave. 12 de Octubre #2285 y Ave. Oreliana (Planta Baja) Quito, Ecuador Tel: 529684 TLX: 2865 Protec Ed  Proteco Coasin Cia., Ltda Casilla 9733 9 de Octubre 424 Edificio Gran Pasaje, Of. 1012 Guayaquil, Ecuador
<b>BOLIVIA</b> Coasin Bolivia S.R.L. Casilla 7295 La Paz, Bolivia Tel: 40962 TLX: Public Booth # 5377, indicate "Para Coasin B.S.R.L., Av 6 de Agosto 2300 3er Piso, La Paz tl 40962"	<b>CHINA, PEOPLE'S REPUBLIC OF</b> China National Instrument Import & Export Corp. P.O. Box 49, Erh-Li-Kou Hsi Chi'ao Beijing People's Republic of China TLX: CO 2242 CNIEC	<b>HONG KONG</b> Gilman & Co., Ltd. P.O. Box 56 Gilman Ind. Bldg. 9 F 107-109 Wai Yip Street Kwun Tong, Kowloon Hong Kong Tel: 5-7909633 TLX: 73358 GILMN HX  <b>ICELAND</b> Kristjan O Skagfjord Ltd. P.O. Box 906 Reykjavik, Iceland Tel: 24120 TLX: 2133 KOS-1S
		<b>INDIA</b> Hinditron Services Pvt Ltd. 69 A.L., Jagmohandas Marg Bombay 400 006 India Tel. 811316 TLX: 953-112326 Hspl In

Table A-4. Sales Representatives - International (cont)

<p>Hinditron Services Pvt. Ltd. "Hinditron House" 412 Raj Mahal Vilas Extension Bangalore 560 006 India Tel: 33139 TLX: 043741</p>	<p><b>MALAYSIA</b> O'Connor's (PTE) Limited P.O. Box 91 Petaling Jaya, Selangor West Malaysia Tel: 51563 TLX: OCONOR MA37649</p>	<p><b>PERU</b> Importaciones Y Representaciones Electronicas S.A. Avda. Franklin D. Roosevelt 105 Lima 1, Peru Tel: 288650 TLX: 37425663</p>
<p><b>INDONESIA</b> P.T. Dwi Tunggal Jaya Sakti Sangga Buana Bldg., 1st Floor Jl. Senen Raya 44, P.O. Box 4435 Jakarta, Indonesia Tel: 367390-9 TLX: 46624 SABUANA 1A</p>	<p>O'Connor's (PTE) Limited Lot # 5 Taman Mesra Mile 3, Jalan Penampang Kota Kinabulu East Malaysia Tel: 55322 TLX: MA80286FL</p>	<p><b>SINGAPORE</b> Rank O'Connor's (PTE) Limited 98 Pasir Panjang Road Singapore 0511 Republic of Singapore Tel: 637944 TLX: OCONSIN RS21023</p>
<p>P.T. Dwi Tunggal Jaya Sakti Jalan Sasakgantung 45 Bandung, Indonesia Tel: 367390-9 TLX: 46624 SABUANA 1A</p>	<p><b>MEXICO</b> C.J. Christensen S.A. De C.V. Instrumentos Electronicos de Medicion Melchor Ocampo 150-8 Mexico 4 D.F., Mexico Tel: (905) 535-2258</p>	<p><b>SOUTH AFRICA</b> Fluke S.A. (Pty) Ltd. P.O. Box 39797 Bramley 2018 Republic of South Africa Tel: (011) 786-3170 TLX: 82899</p>
<p><b>JAPAN</b> John Fluke Mfg. Co., Inc. Japan Branch (PC Board Testers only) 1 Higashikata-machi Midori-ku Yokohama 226, Japan Tel: (045) 473-5425 TLX: 3823-666 FLUKJJPJ</p>	<p><b>NEW ZEALAND</b> W &amp; K McLean Ltd. P.O. Box 18065 Glen Innes Auckland, New Zealand Tel: 587-037 TLX: N.Z. 7912763</p>	<p><b>TAIWAN</b> CCT Associates, Inc. P.O. Box 24209 Bramley 2018 Republic of China Tel: (02) 391-6894 TLX: 24263 Longgulf</p>
<p>Tokyo Electron Ltd. 38 Fl. Shinjuku Nomura Bldg. 1-26-2, Nishi-Shinjuku Shinjuku-ku Tokoyo 160, Japan Tel: 03-343-4411 TLX: 2322220 LABTEL J</p>	<p>W &amp; K McLean Ltd. P.O. Box 2421 Christchurch, New Zealand</p>	<p><b>THAILAND</b> Dynamic Supply Engineering R.O.P. # 56 Ekamai, Sukhumvit 63 Bangkok-11, Thailand Tel: 914434 TLX: TH 82938 MONTIEN TH</p>
<p><b>KENYA</b> Advanced Communications Ltd. P.O. Box 30070 Nairobi, Kenya East Africa Tel: 331955 TLX: 22639 ADCOM</p>	<p>W &amp; K McLean Ltd. P.O. Box 496 Wellington, New Zealand Tel: 851-450</p>	<p><b>URUGUAY</b> Coasin Uruguay S.R.L. Edif. Ciudadela Sarandí 690 D. Esc. 109 Casilla de Correos 1400 Correo Central Montevideo, Uruguay Tel: 917978 TLX: Public Booth UY901 Coasin</p>
<p><b>KOREA</b> Electro-Science Korea Co. C.P.O. Box 8446 Room. 1201 Bowon Bldg. 490 Chongro - 5 Ka Chongro-ku Seoul, Korea Tel: 261-7702 TLX: 78723270+</p>	<p><b>NIGERIA</b> Mofat Engineering Co., Ltd. P.O. Box 6369 Lagos, Nigeria TLX: 21353, Attn: MOFAT</p>	<p><b>VENEZUELA</b> Coasin C.A. Apdo. Postal 50939 Sabana Grande # 1 Caracas 105, Venezuela Tel: 782-9109-8741 TLX: 39531228</p>
<p><b>PAKISTAN</b> Pak International Operations 505 Muhammadi House - McLeod Road P.O. Box 5323 Karachi, Pakistan Tel: 221127 TLX: 24494 PIO PK</p>	<p>Latin America also Supported by -</p> <p>Sr. Leonardo Cusnir, c/o COASIN A.A., Virrey del Pino 4071, Buenos Aires, Argentina, Tel: 523185, TLX: 390122284 COASN AR</p> <p>Sr. Benewaldo Padovani, c/o AROTEC S.A., Industria e Comercio, Av. Pacaembu 811, 01234 Sao Paulo S.P., Brazil, Tel: (011) 67-2393, TLX: 1122207 AROT BR</p>	

Table A-4. Sales Representatives - International (cont)

Supplied and Supported by Fluke (Holland) B.V., P.O. Box 5053, Zevenhevelenweg 53, 5004 EB Tilburg, Netherlands, Tel: (013) 673973, TLX: 522337

**AUSTRIA**

Walter Rekersch  
Electronische Gerate GmbH & Co.  
Vertriebs-KG  
Liechtensteinstrasse 97/6  
A-1090 Vienna, Austria  
Tel: (222) 347646  
TLX: 134759

**BELGIUM**

Fluke (Belgium) S.A./N.V.  
6 Rue de Geneve  
1140 Brussels, Belgium  
Tel: (2) 2164090  
TLX: 26312

**BULGARIA**

Amtest Associates Ltd.  
P.O. Box 55  
Addlestone, Surrey KT15 1DU  
United Kingdom  
Tel: Weybridge (923) 52121  
TLX: 928855

**CHAD**

Fluke (Holland) B.V.  
P.O. Box 5053,  
Zevenhevelenweg 53  
5004 EB Tilburg, Netherlands  
Tel: (013) 673973  
TLX: 52237

**CYPRUS**

Chris Radiovision Ltd  
P.O. Box 1989  
Nicosia, Cyprus  
Tel: 66121  
TLX: 2395

**CZECHOSLOVAKIA**

Amtest Associates Ltd.  
P.O. Box 55  
Addlestone, Surrey KT15 1DU  
United Kingdom  
Tel: Weybridge (932) 52121  
TLX: 928855

**DENMARK**

Tage Olsen A/S  
Ballerup Byvej 222  
DK - 2750 Ballerup, Denmark  
Tel: (2) 658111  
TLX: 35293

**EGYPT AND SUDAN**

Lotus Engineering Organisation  
P.O. Box 1252  
22, Kasi El Nil  
Cairo, Egypt  
Tel: 971617  
TLX: 92504

**EIRE (REPUBLIC OF IRELAND)**

Euro Electronics  
32 Brews Hill  
Naven, County Meath  
Tel: 46-23577  
TLX: 31821

**ETHIOPIA**

Fluke (Holland) B.V.  
P.O. Box 5053,  
Zevenhevelenweg 53  
5004 EB Tilburg, Netherlands  
Tel: (013) 673973  
TLX: 52237

**FINLAND**

Oy Findip AB  
Teollisuustie 7  
02700 Kauniainen, Finland  
Tel: (0) 502255  
TLX: 123129

**FRANCE**

M.B. Electronique S.A.  
Rue Fourny  
ZAC de BUC  
B.P. # 31  
78530 BUC, France  
Tel: (1) 9568131  
TLX: 695414

**GERMAN DEMOCRATIC  
REPUBLIC**

Amtest Associates Ltd.  
P.O. Box 55  
Addlestone, Surrey KT15 1DU  
United Kingdom  
Tel: Weybridge (932) 52121  
TLX: 928855

**GERMAN FEDERAL REPUBLIC**

Fluke (Deutschland) GmbH  
Krausstrasse 55  
8045 Ismaning  
West Germany  
Tel: (089) 96251  
TLX: 0522472  
Rapitax: (089) 966718

**Fluke (Deutschland) GmbH**

Meineckestrasse 53  
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West Germany  
Tel: (0211)450831  
TLX: 8585576

**Fluke (Deutschland) GmbH**

Oberer Kirchhaldenweg 135  
7000 Stuttgart 1  
West Germany  
Tel: (0711) 694091  
TLX: 722518

**PK Elektronik**

Lietzenburger Strasse 91  
1000 Berlin 15  
West Germany  
Tel: (030) 8831058

**GREECE**

Hellenic Scientific  
Representations Ltd  
11, Vrasside Street  
Athens 615, Greece  
Tel: (1) 711140  
TLX: 219330

**HUNGARY**

Amtest Associates Ltd.  
P.O. Box 55  
Addlestone, Surrey KT15 1DU  
United Kingdom  
Tel: Weybridge (932) 52121  
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**IRAN**

Irantronics Company Ltd.  
20, Salm Road  
Roosevelt Avenue  
Tehran, Iran  
Tel: 828294/831564  
TLX: 212956/212876

**IRAQ**

Fluke (Holland) B.V.  
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5004 EB Tilburg, Netherlands  
Tel: (013) 673973  
TLX: 52237

**IRELAND**

Euro Electronics  
32 Brews Hill  
Naven County Meath  
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Tel: (46) 23577  
TLX: 3182

**ISRAEL**

R.D.T. Electronics Engineering Ltd.  
P.O. Box 75  
46, Sokolov Street  
Ramat Hasharon 47235  
Israel  
Tel: (3) 483211  
TLX: 32143

**ITALY**

Sistrel S.p.A.  
Via Giuseppe Armellini # 37  
00143 Rome, Italy  
Tel: (6) 5915551  
TLX: 680356

**Sistrel S.p.A.**

Via Timavo 66  
20099 Sesto S. Giovanni (Milan)  
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TLX: 320346

**Sistrel S.p.A.**

Via Cintia  
Parco S. Paolo 35  
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**KUWAIT**

Tareq Company  
P.O. Box Safat 20506  
Kuwait, Arabian Gulf  
Tel: 436100/436045  
TLX: 2315

Table A-4. Sales Representatives - International (cont)

**LEBANON AND JORDAN**

Mabek (Electronics Division)  
P.O. Box 11-3823  
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Tel: 252631/348728  
TLX: 22889

**LIBYA**

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**MOROCCO**

Mainvest  
Residence Moulay Ismail  
Bat. C.  
Boulevard Moulay Slimane  
Rabat, Morocco  
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TLX: 31036

**NETHERLANDS**

Fluke (Nederland) B.V.  
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**NORWAY**

Morgensterne & Co. A/A  
Konghellegate 3  
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Oslo 5, Norway  
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TLX: 11719

**PDR YEMEN**

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**POLAND**

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**PORTUGAL**

Equipamentos de Laboratorio, Ltda.  
P.O. Box 1100  
1002 Lisbon, Portugal  
Tel: (1) 578936/547512  
TLX: 18469

**QATER, OMAN &  
UNITED ARAB EMIRATES**

Technology Organisation  
P.O. Box 5549  
Doha, Qatar  
Tel: 321431  
TLX: 4581

**ROMANIA**

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**SAUDI ARABIA**

Electronic Equipment  
Marketing Co. Ltd.  
P.O. Box 3750  
Riyadh, Saudi Arabia  
Tel: 32761/32700/37023  
TLX: 201120

**SOMALIA**

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**SPAIN**

Hispano Electronica S.A.  
Piligono Industrial Urtinsa  
Apartado de Correos 48  
Alcorcon (Madrid)  
Spain  
Tel: (1) 6194108  
TLX: 22404/42634

**SWEDEN**

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P.O. Box 490  
S-162 04 Vallingby 4  
Sweden  
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TLX: 11347

**SWITZERLAND**

Traco Electronic Company Ltd.  
I. Jenatschstrasse  
Postfach, 8027 Zurich  
Switzerland  
Tel: (1) 2010711  
TXL: 54318

**SYRIA**

Mabek (Electronics Division)  
P.O. Box 4238  
Damascus, Syria

**TURKEY**

Erkman Elektronik Aletler  
Ticaret Anonim Sirketi  
Necatib Cad 92/3  
Karakoy, Istanbul, Turkey  
Tel: (1) 5461  
TLX: 23353

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**U.S.S.R.**

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**YEMEN**

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**YUGOSLAVIA**

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