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# 1. General

## 1.1. Introduction

This manual provides maintenance instructions for the Spectrum Master Model MS2721A Spectrum Analyzer. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

## 1.2. Description

The Spectrum Master MS2721A is a synthesizer-based handheld spectrum analyzer.

## 1.3. Recommended Test Equipment

The following test equipment is recommended for use in testing and maintaining the Spectrum Master.

Instrument	Critical Specification	Recommended Manufacturer/Model
Synthesizer	Frequency: 2 to 20 GHz with options 2A, 3, 4, 15A, and 22	Anritsu Model MG3692A
Power Meter	Power Range: -70 to + 20 dBm	Anritsu Dual Channel Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz, -67 to +20 dB	Anritsu Model MA2442A
Frequency Reference	Frequency: 10 MHz	Absolute Time Corp., Model 300
Low Pass Filter	Frequency: 50 MHz	Anritsu Model 1030-96
Fixed Attenuator	10 dB Attenuation	Weinschel Model 1-10
Power Splitter	Frequency: DC to 18 GHz	Weinschel Model 1870A
Adapter	Frequency: DC to 20 GHz WSMA(m)-N(f), 50 Ohm	Anritsu Model 34RSN50
50 Ohm Adapter	Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm	Anritsu Model 34RKNF50
50 Ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
RF Coaxial Cable	Frequency: DC to 6.0 GHz N(m)-N(f), 50 Ohm	Anritsu Model 15NNF50-1.5C
Coaxial Cable	BNC Male to Male 60 Inch, 50 Ohm	Pasternack Enterprises Model PE3067-60

**Table 1. Recommended Test Equipment**

## 2. Performance Verification

The following sections contain tests that can be used to verify the performance of the Spectrum Master Model MS2721A.

### 2.1. Spectrum Analyzer Frequency Accuracy

The following test can be used to verify the CW frequency accuracy of the Spectrum Master.

#### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4, 15A, and 22, or equivalent
- 10 MHz Reference Standard
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Anritsu Spectrum Master External Power Supply (part number 40-168)
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- BNC male to BNC male coaxial cable

#### b. Procedure:

1. Connect the 10 MHz Reference Standard to the Anritsu MG3692A Synthesized Signal Source and to the Spectrum Master.
2. Connect the output of the MG3692A Synthesized Signal Source to the RF In connector of the Spectrum Master.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **ON/OFF** key to turn on the Spectrum Master.
5. Press the **Shift** key, the **Preset** key (1), and then the Preset soft key to reset the instrument to the default starting conditions.
6. Turn on the 10 MHz Reference Standard and the Anritsu MG3692A Synthesized Signal Source.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

7. Set the MG3692A output to 1 GHz CW, with an RF output level of  $-30$  dBm.
8. Press the **Amplitude** key and select the Reference Level soft key.
9. Use the keypad to enter  $-10$  and select the dBm soft key.
10. Press the **Freq** key and select the Center Freq soft key.
11. Use the keypad to enter 1 and select the GHz soft key.
12. Press the **Span** key, use the keypad to enter 10, and select the kHz soft key.
13. Press the **BW** key and select the RBW soft key.
14. Use the keypad to enter 100 and select the Hz soft key.
15. Press the VBW soft key and use the keypad to enter 30, then select the Hz soft key.
16. Press the **Marker** key, and select the Peak Search soft key.
17. Verify that the marker frequency is 1 GHz,  $\pm 1$  kHz.
18. Repeat steps 7 through 15 for 7 GHz.
19. Verify that the marker frequency is 7 GHz,  $\pm 7$  kHz.

**NOTE:** If the unit fails the Spectrum Analyzer Frequency Accuracy test, perform the Internal Reference Frequency Adjustment procedure in Section 2.2. If the unit still fails the Frequency Accuracy test after the Internal Reference Frequency adjustment has been completed, replace the PCB assembly.

## 2.2. Spectrum Analyzer Internal Reference Frequency Adjustment

Use this procedure to adjust the frequency if the unit fails the Spectrum Analyzer Frequency Accuracy verification test in Section 2.1.

### a. **Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 3, 4, 15A, and 22, or equivalent
- 10 MHz Reference Standard
- Anritsu Spectrum Master External Power Supply (part number 40-168)
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- BNC male to BNC male coaxial cable

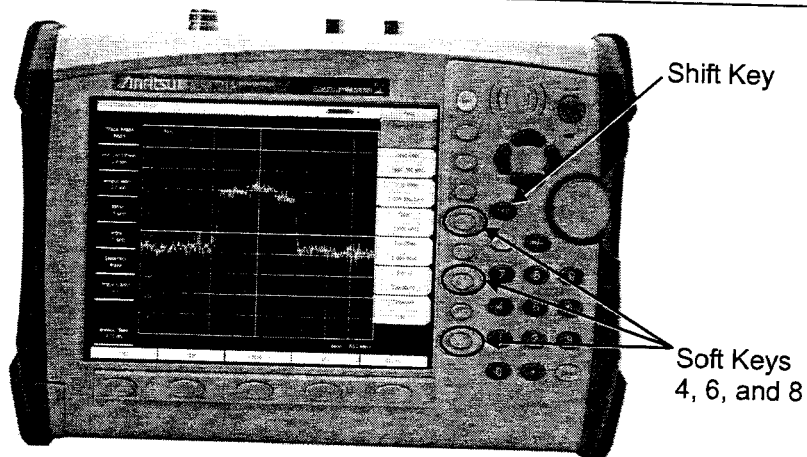
### b. **Procedure**

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the MG3692A Synthesized Signal Source to the RF In connector of the Spectrum Master.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **ON/OFF** key to turn on the Spectrum Master.
5. Press the **Shift** key, the **Preset** key (1), and then the Preset soft key to reset the instrument to the default starting conditions.
6. Turn on the 10 MHz reference source and the Anritsu MG3692A Synthesized Signal Source.
7. Set the MG3692A output to 7 GHz with an RF output level of -30 dBm.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

8. Press the **Amplitude** key and select the Reference Level soft key.
9. Use the keypad to enter -10 and select the dBm soft key.
10. Press the **Atten Lvl** soft key, use the keypad to enter 0 and press the dB soft key.
11. Press the **Freq** key and select the Center Freq soft key.
12. Use the keypad to enter 7 and select the GHz soft key.
13. Press the **Span** key, use the keypad to enter 10, and select the kHz soft key.
14. Press the **BW** key and select the RBW soft key.
15. Use the keypad to enter 100 and select the Hz soft key.
16. Press the **VBW** soft key and use the keypad to enter 30, then select the Hz soft key.

Press and hold the **Shift** key and press the **4**, **6**, and **8** (from top) soft keys together to enter into the Spectrum Master Service Mode.



**Figure 1.** MS2721A Spectrum Master Service Mode Key Sequence

17. Press the Service Menu soft key, then the APP Service soft key.
18. Press the Calibration soft key, the 10 MHz TXCO soft key.
19. Use the Up/Down arrow key or the rotary knob to slowly adjust the displayed signal to the center of the display. Allow the signal to stabilize between adjustments, and repeat as necessary.
20. Turn the Spectrum Master off, and then back on to exit Service Mode.

### 2.3. Spectrum Analyzer Phase Noise Verification

This test can be used to verify the phase noise of the Spectrum Master.

#### a. **Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 3, 4, 15A, and 22, or equivalent
- Anritsu Spectrum Master External Power Supply (part number 40-168)
- 10 MHz Reference Standard
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent

#### b. **Procedure:**

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the MG3692A Synthesized Signal Source to the RF In connector of the Spectrum Master.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **ON/OFF** key to turn on the Spectrum Master.
5. Press the **Shift** key, the **Preset** key (1), and then the Preset soft key to reset to the default starting conditions.
6. Turn on the 10 MHz reference source and the Anritsu MG3692A Synthesized Signal Source.
7. Set the MG3692A output to 7.09 GHz CW, with an RF output level of +13 dBm.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

8. Press the **Amplitude** key and select the Reference Level soft key.
9. Use the keypad to enter 0 and select the dBm soft key.
10. Press the **Atten Lvl** soft key, use the keypad to enter 15 and press the dB soft key.
11. Press the **Freq** key and select the Center Freq soft key.
12. Use the keypad to enter 7.090050 and press the GHz soft key.
13. Press the **Span** key, use the keypad to enter 110, and select the kHz soft key.
14. Press the **BW** key and select the RBW soft key.
15. Use the keypad to enter ~~1~~<sup>30</sup> and select the ~~kHz~~<sup>R.S.</sup> soft key.
16. Press the **VBW** soft key and use the keypad to enter 3, then select the Hz soft key.
17. Press the **Shift** key and then press the **Trace** (5) key.
18. Select the Trace A Operations soft key.
19. Press the # of Average soft key, use the keypad to enter 7, then press the Enter soft key.
20. Wait until the Trace Count displays 7/7.
21. Press the **Marker** key and select the Peak Search soft key.
22. Press the Delta On/Off soft key to turn Delta on.
23. Use the keypad to enter 10 and press the kHz soft key, and record  $\Delta 1$ .
24. Subtract 30 dB from the average value and verify that the result is  $\leq -100$  dBc/Hz.  
(For example:  $-70$  dBc measured  $- 30$  dB =  $-100$  dBc/Hz.)

### 2.3. Spectrum Analyzer Phase Noise Verification

This test can be used to verify the phase noise of the Spectrum Master.

#### a. **Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 3, 4, 15A, and 22, or equivalent
- Anritsu Spectrum Master External Power Supply (part number 40-168)
- 10 MHz Reference Standard
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent

#### b. **Procedure:**

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the MG3692A Synthesized Signal Source to the RF In connector of the Spectrum Master.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **ON/OFF** key to turn on the Spectrum Master.
5. Press the **Shift** key, the **Preset** key (1), and then the Preset soft key to reset to the default starting conditions.
6. Turn on the 10 MHz reference source and the Anritsu MG3692A Synthesized Signal Source.
7. Set the MG3692A output to 7.09 GHz CW, with an RF output level of +13 dBm.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

8. Press the **Amplitude** key and select the Reference Level soft key.
9. Use the keypad to enter 0 and select the dBm soft key.
10. Press the Atten Lvl soft key, use the keypad to enter 15 and press the dB soft key.
11. Press the **Freq** key and select the Center Freq soft key.
12. Use the keypad to enter 7.090050 and press the GHz soft key.
13. Press the **Span** key, use the keypad to enter 110, and select the kHz soft key.
14. Press the **BW** key and select the RBW soft key.
15. Use the keypad to enter ~~1~~<sup>30</sup> and select the ~~kHz~~<sup>R.S.</sup> soft key.
16. Press the VBW soft key and use the keypad to enter 3, then select the Hz soft key.
17. Press the **Shift** key and then press the **Trace** (5) key.
18. Select the Trace A Operations soft key.
19. Press the # of Average soft key, use the keypad to enter 7, then press the Enter soft key.
20. Wait until the Trace Count displays 7/7.
21. Press the **Marker** key and select the Peak Search soft key
22. Press the Delta On/Off soft key to turn Delta on .
23. Use the keypad to enter 10 and press the kHz soft key, and record  $\Delta 1$ .
24. Subtract 30 dB from the average value and verify that the result is  $\leq -100$  dBc/Hz.  
(For example:  $-70$  dBc measured  $- 30$  dB =  $-100$  dBc/Hz.)

**NOTE:** The measured value is converted to dBc/Hz using the following formula:

$$dBc / Hz = - |measured dBc| - \left[ 10_{\log} \left( \frac{RBW}{1Hz} \right) \right]$$

At 1 kHz RBW,  $10_{\log} \left( \frac{RBW}{1Hz} \right) = 30$ , so  $dBc / Hz = - |measured dBc| - 30$ .

25. Repeat steps 15 through 22 for 20 kHz, 30 kHz, and 100 kHz.

## 2.4. Spectrum Analyzer Second Harmonic Distortion Test

The following test can be used to verify the input related spurious response of the Spectrum Master.

### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4, 15A, and 22, or equivalent
- 10 MHz Reference Standard
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- 50 MHz Low Pass Filter (Anritsu part number 1030-96)
- BNC male to BNC male coaxial cable

### b. Procedure:

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect one end of the 50 MHz Low Pass Filter to the output of the source and the other end to the Spectrum Master RF In with the coaxial cable.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **ON/OFF** key to turn on the Spectrum Master.
5. Press the **Shift** key, the **Preset** key (1), and then the Preset soft key to reset the instrument to the default starting conditions.
6. Turn on the 10 MHz reference source and the Anritsu MG3692A Synthesized Signal Source.
7. Set the MG3692A output to 50.1 MHz CW, with an RF output level of -30 dBm.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

8. Press the **Amplitude** key and select the Reference Level soft key.
9. Use the keypad to enter -27 and press the dBm soft key.
10. Press the **Atten Lvl** soft key and enter 0, then press the dB soft key.
11. Press the **Span** key, use the keypad to enter 100, and select the kHz soft key.
12. Press the **Shift** key and then press the **Sweep** (3) key.
13. Press the **Detection** soft key, and then the **Peak** soft key.
14. Press the **BW** key and select the RBW soft key.
15. Use the keypad to enter 1 and select the kHz soft key.
16. Press the **VBW** soft key and use the keypad to enter 10, then select the Hz soft key.
17. Press the **Freq** key and select the Center Freq soft key.
18. Use the keypad to enter ~~50.0~~<sup>50.1425</sup> and press the MHz soft key.
19. Press the **Shift** key and then press the **Trace** (5) key.
20. Select the Trace A Operations soft key.

21. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
22. Wait until the Trace Count displays 5/5.
23. Press the **Marker** key and select the Peak Search soft key.
24. Record the amplitude for 50.1 MHz.
25. Press the **Freq** key and select the Center Freq soft key.
26. Use the keypad to enter 100.2 and press the MHz soft key.
27. Press the **Shift** key and then press the **Trace (5)** key.
28. Select the Trace A Operations soft key.
29. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
30. Wait until the Trace Count displays 5/5.
31. Press the **Marker** key and select the Peak Search soft key.
32. Record the amplitude for 100.2 MHz.
33. Convert the measured value to dB using the following formula:

Amplitude @50.1 MHz – amplitude @100.2 MHz = \_\_\_\_\_ dBc = Second Harmonic Level @ 100.2 MHz

34. Verify that the converted Second Harmonic Level is –50 dBc or better.

## 2.5. Spectrum Analyzer Residual Spurious Response Test

The following test can be used to verify the residual spurious response of the Spectrum Master. This test is performed using the positive peak detection mode. There are two parts to this test:

- Residual Spurious Test with Preamp off
- Residual Spurious Test with Preamp on

### Residual Spurious Test with Preamp Off

#### a. **Equipment Required:**

- Anritsu 28N50-2, 50 Ohm Termination or equivalent
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)

#### b. **Procedure:**

1. Connect the 50 Ohm termination to the Spectrum Master RF In.
2. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
3. Press the **ON/OFF** key to turn on the Spectrum Master.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

5. Press the **Amplitude** key and select the Reference Level soft key.
6. Use the keypad to enter -40 and press the dBm soft key.
7. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
8. Make sure that the Pre Amp On/Off key is in off position. If the preamp is on, press the Pre Amp On/Off soft key to turn it off.
9. Press the **Shift** key and then press the **Sweep** (3) key, then select the Detection and then the Peak soft keys.
10. Press the **Freq** key and select the Start Freq soft key.
11. Use the keypad to enter 100 and select the kHz soft key.
12. Press Stop Freq soft key, enter 10 and press the MHz soft key.
13. Press the **BW** key and select the RBW soft key.
14. Use the keypad to enter 3 and select the kHz soft key.
15. Press the **VBW** soft key and use the keypad to enter 300, then select the Hz soft key.
16. Wait until one sweep is completed.
17. Press the **Marker** key and select the Peak Search soft key.
18. Record the Marker 1 amplitude reading and verify that it is  $\leq -90$  dBm.

**NOTE:** If a spur with amplitude larger than -90 dBm occurs, wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep was not real.

19. Repeat steps 8 through 16 for the other settings in Table 2.

Start Freq.	Stop Freq.	RBW	VBW	Measured Values (dBm)	Specification (dBm)
100 kHz	10 MHz	3 kHz	300 Hz		- 90
10 MHz	1.0 GHz	30 kHz	1kHz		- 90
1 GHz	2.2 GHz	10 kHz	300 Hz		- 90
2.2 GHz	2.7 GHz	1 kHz	300 Hz		- 90
2.7 GHz	2.8 GHz	1 kHz	100 Hz		- 90
2.8 GHz	3.199 GHz	10 kHz	300 Hz		- 90
3.2 GHz	4.009 GHz	30 kHz	1 kHz		- 84
4.009 GHz	5.083 GHz	10 kHz	300 Hz		- 84
5.083 GHz	5.895 GHz	10 kHz	100 Hz		- 84
5.895 GHz	7.1 GHz	10 kHz	100 Hz		- 84

**Table 2. Residual Spurious Test with Preamp Off**

**Exceptions:**

Frequency	Spur Level
250, 300, and 350 MHz	-85 dBm max
~4010 MHz	-80 dBm max
~5084 MHz	-70 dBm max
~5894 MHz	-75 dBm max
~7028 MHz	-80 dBm max

**Residual Spurious Test with Preamp On**

**c. Equipment Required:**

- Anritsu 28N50-2, 50 Ohm Termination or equivalent
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)

**d. Procedure:**

1. Connect the 50 Ohm termination to the Spectrum Master RF In.
2. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
3. Press the **ON/OFF** key to turn on the Spectrum Master.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

5. Press the **Amplitude** key and select the Reference Level soft key.
6. Use the keypad to enter -40 and press the dBm soft key.
7. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
8. Make sure that the Pre Amp On/Off key is in On position. If the preamp is off, press the Pre Amp On/Off soft key to turn it on.
9. Press the **Shift** key and then press the **Sweep** (3) key, then select the Detection and then the Peak soft keys.
10. Press the **BW** key and select the RBW soft key.

11. Use the keypad to enter 10 and select the kHz soft key.
12. Press the VBW soft key and use the keypad to enter 1, then select the kHz soft key.
13. Press the **Freq** key and select the Start Freq soft key.
14. Use the keypad to enter 100 and select the kHz soft key.
15. Press Stop Freq soft key, enter 10 and press the MHz soft key.
16. Wait until one sweep is completed.
17. Press the **Marker** key and select the Peak Search soft key.
18. Record the Marker 1 amplitude reading and verify that it is  $\leq -100$  dBm.
19. Repeat steps 12 through 17 for the other settings in Table 3.

Start Freq	Stop Freq	Measured Values (dBm)	Specification (dBm)
100 KHz	10 MHz		-100
10 MHz	1.0 GHz		-100
1.0 GHz	2.0 GHz		-100
2.0 GHz	3.0 GHz		-100
3.0 GHz	4.0 GHz		-100
4.0 GHz	5.0 GHz		-100
5.0 GHz	6.0 GHz		-100
6.0 GHz	7.1 GHz		-100

**Table 3. Residual Spurious Test with Preamp On**

*NOTE: If a spur with amplitude larger than -100 dBm occurs, wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep was not real.*

## 2.6. Display Average Noise Level (DANL)

The following test can be used to verify the display average noise level of the Spectrum Master. This test is performed using the RMS detection mode.

### a. Equipment Required:

- Anritsu 28N50-2, 50 Ohm Termination or equivalent
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)

### b. Procedure:

1. Connect the 50 Ohm termination to the Spectrum Master RF In.
2. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
3. Press the **ON/OFF** key to turn on the Spectrum Master.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

5. Press the **Amplitude** key and select the Reference Level soft key.
6. Use the keypad to enter -50 and press the dBm soft key.
7. Press the **Atten Lvl** soft key and enter 0, then press the dB soft key.
8. Make sure that the Pre Amp On/Off key is in the On position. If the preamp is off, press the Pre Amp On/Off soft key to turn it on.
9. Press the **Shift** key and then press the **Sweep** (3) key, then select the Detection and then the RMS soft key.
10. Press the **BW** key and select the RBW soft key.
11. Use the keypad to enter 100 and select the kHz soft key.
12. Press the **Freq** key and select the Start Freq soft key.
13. Use the keypad to enter 10 and select the MHz soft key.
14. Press the Stop Freq soft key, enter 1 and press the GHz soft key.
15. Wait until one sweep is completed.
16. Press the **Marker** key and the Peak Search soft key.
17. Record the Marker reading in the Measured Value column of Table 4.

**NOTE:** The noise floor consists of totally random signals where a spur is a fixed spike of varying amplitude that is always visible. If Peak Search lands the marker on a spur, the rotary knob can be used to move the marker to the next peak.

18. Subtract 40 dB from the Measured Value to normalize it for a 10 Hz RBW and record the new value in the Normalized Value column of Table 4. Verify that the normalized value is less than the Specification value.

$$\begin{aligned} \text{NOTE: DANL @ 10 Hz RBW} &= \text{Measured DANL @ 100 kHz} - 10 \log \left( \frac{100 \text{ kHz}}{10 \text{ Hz}} \right) \\ &= \text{Measured DANL @ 100 kHz} - 40 \text{ dB} \end{aligned}$$

19. Repeat steps 12 through 18 for the other frequency settings in Table 4.

Frequency	Measured Value @ 100 kHz RBW (dBm)	Normalized Value for 10 Hz RBW (dBm)	Max DANL in 10 Hz RBW (dBm)
10 MHz to 1.0 GHz			-151
1 GHz to 2.2 GHz			-149
2.2 GHz to 2.8 GHz			-143
2.8 GHz to 4.0 GHz			-149
4.0 GHz to 7.1 GHz			-144

**Table 4. Display Average Noise Level (DANL)**

## 2.7. Input Related Spurious Signals

The following test can be used to verify the input related spurious signals of the Spectrum Master at different frequencies.

### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4 and 15, or equivalent
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)
- 10 MHz Reference Standard
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- BNC male to BNC male coaxial cable

### b. Procedure:

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the Anritsu MG3692A Synthesized Signal Source to the Spectrum Master RF In.
3. Set the MG3692A output to 1674 MHz, with an RF output level of -30 dBm.
4. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
5. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

*NOTE: Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.*

### Checking Input Spurs Related to 1674 MHz

6. Press the **Amplitude** key and select the Reference Level soft key.
7. Use the keypad to enter -27 and press the dBm soft key.
8. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
9. Press the **Shift** key and then press the **Sweep** (3) key, then select the Detection and then the Peak soft key.
10. Press the **Freq** key and select the Center Freq soft key.
11. Use the keypad to enter 1674 and select the MHz soft key.
12. Press the **Span** key, use the keypad to enter 2, and select the MHz soft key.
13. Press the **BW** key and select the RBW soft key.
14. Use the keypad to enter 10 and select the kHz soft key.
15. Press the VBW soft key and use the keypad to enter 1, then select the kHz soft key.
16. Wait until one sweep is completed.
17. Press the **Marker** key and select the Peak Search soft key.

18. Record the Marker 1 amplitude reading for 1674 MHz.
19. Press the **Freq** key and select the Start Freq soft key.
20. Use the keypad to enter 100 and select the kHz soft key.
21. Press Stop Freq soft key, enter 1673 and press the MHz soft key.
22. Press the **Marker** key and select the Peak Search soft key.
23. Record the Marker 1 amplitude reading.
24. Calculate the input related spurious level and verify that it is  $\leq -46$  dBc:  
(Input Related Spurious = Marker 1 reading – amplitude reading for 1674 MHz)
25. Repeat steps 19 through 23. Set a start frequency of 1675 MHz and a stop frequency of 2800 MHz.

#### Checking Input Spurs Related to 1701 MHz

26. Set the MG3692A output to 1701 MHz, with an RF output level of  $-30$  dBm.
27. On the Spectrum Master, press the **Amplitude** key and select the Reference Level soft key.
28. Use the keypad to enter  $-27$  and press the dBm soft key.
29. Press the **Freq** key and select the Center Freq soft key.
30. Use the keypad to enter 1701 and select the MHz soft key.
31. Press the **Span** key, use the keypad to enter 2, and select the MHz soft key.
32. Press the **Shift** key and then press the **Trace (5)** key.
33. Select the Trace A Operations soft key.
34. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
35. Wait until the Trace Count displays 5/5.
36. Press the **Marker** key and select the Peak Search soft key.
37. Record the amplitude at 1701 MHz.
38. Press the **Freq** key and select the Start Freq soft key.
39. Use the keypad to enter 26 and select the MHz soft key.
40. Press Stop Freq soft key, enter 28 and press the MHz soft key.
41. Press the **Shift** key and then press the **Trace (5)** key.
42. Select the Trace A Operations soft key.
43. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
44. Wait until the Trace Count displays 5/5.
45. Press the **Marker** key and select the Peak Search soft key.
46. Record the Marker 1 amplitude reading.
47. Calculate the input related spurious level and verify that it is  $\leq -50$  dBc.

#### Checking Input Spurs Related to 2145 MHz

48. Set the MG3692A output to 2145 MHz, with an RF output level of  $-30$  dBm.
49. On the Spectrum Master, press the **Amplitude** key and select the Reference Level soft key.
50. Use the keypad to enter  $-27$  and press the dBm soft key.
51. Press the **Freq** key and select the Center Freq soft key.
52. Use the keypad to enter 2145 and select the MHz soft key.
53. Press the **Span** key, use the keypad to enter 2, and select the MHz soft key.

54. Press the **Shift** key and then press the **Trace (5)** key.
55. Select the Trace A Operations soft key.
56. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
57. Wait until the Trace Count displays 5/5.
58. Press the **Marker** key and select the Peak Search soft key.
59. Record the amplitude at 2145 MHz.
60. Press the **Freq** key and select the Start Freq soft key.
61. Use the keypad to enter 470 and select the MHz soft key.
62. Press Stop Freq soft key, enter 472 and press the MHz soft key.
63. Press the **Shift** key and then press the **Trace (5)** key.
64. Select the Trace A Operations soft key.
65. Press the # of Average soft key, use the keypad to enter 5, then press the Enter soft key.
66. Wait until the Trace Count displays 5/5.
67. Press the **Marker** key and select the Peak Search soft key.
68. Record the Marker 1 amplitude reading.
69. Calculate the input related spurious level and verify that it is  $\leq -60$  dBc.

## 2.8. Spectrum Analyzer Resolution Bandwidth Accuracy Test

The following test can be used to verify the resolution bandwidth accuracy of the Spectrum Master at different frequencies.

### a. **Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4, 15A, and 22, or equivalent
- Anritsu Spectrum Master External Power Supply (Anritsu part number 40-168)
- 10 MHz Reference Standard
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- BNC male to BNC male coaxial cable

### b. **Procedure:**

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the Anritsu MG3692A Synthesized Signal Source to the Spectrum Master RF In.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

5. Set the MG3692A output to 1 GHz, with an RF output level of  $-30$  dBm.
6. Press the **Amplitude** key and select the Reference Level soft key.
7. Use the keypad to enter  $-10$  and press the dBm soft key.
8. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
9. Press the Scale soft key and enter 10, then press dB/div soft key.
10. Press the **Freq** key and select the Center Freq soft key.
11. Use the keypad to enter 1 and select the GHz soft key.

### **RBW Test**

12. Press the **Span** key, use the keypad to enter the span according to Table 5 below.
13. Press the **BW** key and select the RBW soft key.
14. Use the keypad to enter 3 and select the MHz soft key.
15. Set the VBW according to Table 5 below.
16. Press the **Shift** key then **Measure** (4) key, then press the OCC BW soft key.
17. Press the dBc soft key and enter 3, then press the Enter key.
18. Press the OCC BW On/Off soft key to turn on occupied bandwidth.
19. Record the OCC BW reading in Table 5 below.
20. Verify that the OCC BW reading frequency is  $\pm 10\%$  of the RBW.

21. Repeat steps 12 through 20 for other settings in Table 5.

RBW Setting	Span	VBW	Lower Limit	Measured Values	Upper Limit
3 MHz	4.5 MHz	Auto	2.7 MHz		3.3 MHz
1 MHz	1.5 MHz	Auto	900 kHz		1.1 MHz
300 KHz	450 kHz	Auto	270 KHz		330 KHz
100 KHz	150 kHz	Auto	90 KHz		110 KHz
30 kHz	45 kHz	Auto	27 kHz		33 kHz
10 kHz	15 kHz	Auto	9 kHz		11 kHz
3 kHz	4.5 kHz	Auto	2.7 kHz		3.3 kHz
1 kHz	2 kHz	Auto	.9 kHz		1.1 kHz
300 Hz	450 Hz	Auto	270 Hz		330 Hz
100 Hz	150 Hz	Auto	90 Hz		110 Hz
30 Hz	50 Hz	3 Hz	27 Hz		33 Hz
10 Hz	30 Hz	3 Hz	9 Hz		11 Hz

**Table 5. RBW Accuracy Test**

## 2.9. Spectrum Analyzer Measurement Accuracy Verification

The tests in this section verify the level accuracy of the Spectrum Master. There are two parts to this test:

- Level Accuracy across Frequency Test
- Level Accuracy through Power Test

### Level Accuracy across Frequency Test

#### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4, 15A, and 22, or equivalent
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensors or equivalent (2)
- Anritsu ML2400A/20 Power Meter Cable (2)
- Weinschel 1870A Power Splitter or equivalent
- Anritsu 34NN50A 50 Ohm adapter or equivalent
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 34RKNF50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- Weinschel 1-10 10 dB Fixed Attenuator

#### b. Test Setup Component Characterization

1. Turn on the power meter and signal source.
2. On the power meter, press the Channel key, the Setup soft key and then the CHANNEL soft key to display the Channel 2 setup menu. Press the INPUT key twice to set the Input Configuration to B and press the Sensor key to display both Sensor A and Sensor B readings.
3. Connect the power sensors to the power meter and calibrate the sensors.
4. Connect the power splitter to the MG3692A output and Sensor B to one of the power splitter outputs.
5. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator (Refer to Figure 2, page 18).

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

6. Set the MG3692A output to the frequency listed in Table 6 starting with 50 MHz CW.
7. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter value matching the frequency of MG3692A as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
8. Adjust the power level reading on Sensor A to  $-2$  dBm by adjusting the power level on the MG3692A.
9. Record the sensor B reading in Table 6.
10. Repeat steps 5 through 8 for all of the frequencies in column 1 of Table 6.
11. Repeat steps 6 through 10 for a power of  $-30$  dBm and record the results in Table 6.

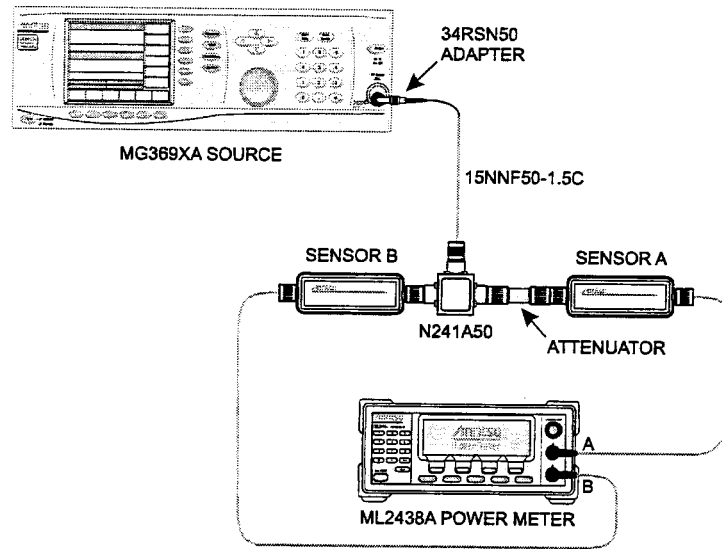


Figure 2. Level Accuracy Across Frequency Component Characterization Test Setup

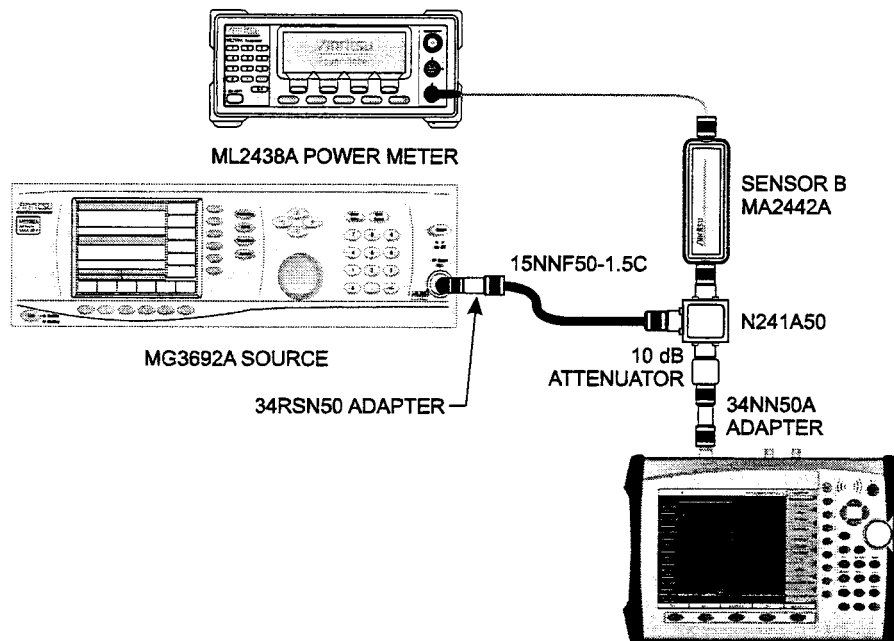
Freq (MHz)	Required Sensor B reading for -2 dBm @ Attenuator output	Required Sensor B reading for -30 dBm @ Attenuator output
50		
100		
500		
1000		
2000		
3000		
4000		
5000		
6000		
7000		

Table 6. Level Accuracy Across Frequency Component Characterization Test Setting

NOTE: Do not disassemble the Sensor B, power splitter and 10 dB pad or this characterization will be lost.

c. **Measuring the Unit for Frequency Level Accuracy**

1. Remove Sensor A, add an adapter, and connect to the MS2721A as shown in Figure 2 below.



**Figure 3.** Frequency Level Accuracy Test Setup

2. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
3. Press the **ON/OFF** key to turn on the Spectrum Master.
4. Press the **Shift** key, the **Preset (1)** key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

5. Press the **Amplitude** key and select the Reference Level soft key.
6. Use the keypad to enter 10 and press the dBm soft key.
7. Press the Atten Lvl soft key and enter 60, then press the dB soft key.
8. Press the BW soft key and the RBW soft key.
9. Use the keypad to enter 1 and select the kHz soft key.
10. Press the VBW soft key and use the keypad to enter 10, then select the Hz soft key.
11. Press the **Span** key, use the keypad to enter 10, and select the kHz soft key.
12. Press the **Freq** key and select the Center Freq soft key.
13. Use the keypad to enter 50 and select the MHz soft key.
14. On the Power Meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 50 MHz for the Input Signal Frequency. This sets the power meter to the proper power sensor cal factor. Press the Sensor key to display the power reading.
15. Set the MG3692A output to match the frequency in the preceding step.
16. Adjust the source power level so that the power meter displays the corresponding Sensor B reading as recorded for -2 dBm in Table 6 for this same frequency.

17. Press the **Marker** key and select the Peak Search soft key.
18. Record the Marker 1 amplitude reading in Table 7.
19. Verify that the Marker 1 amplitude reading is within the specification shown in Table 7.
20. Repeat steps 12 to 19 for the other frequencies in column 1 of Table 7.
21. Repeat steps 12 to 19 for a power level of -30dBm.

**NOTE:** Change the reference level to -20 dBm and the input attenuation level to 0 dB.

Freq (MHz)	-2 dBm Input		-30 dBm Input	
	Measured Values (dBm)	Specification (dBm)	Measured Values (dBm)	Specification (dBm)
50		±1.75		±1.25
100		±1.75		±1.25
500		±1.75		±1.25
1000		±1.75		±1.25
2000		±1.75		±1.25
3000		±1.75		±1.25
4000		±1.75		±1.25
5000		±1.75		±1.75
6000		±1.75		±1.75
7000		±3.0		±1.75

**Table 7. Frequency Level Accuracy Across Frequency Test Setting**

**NOTE:** Do not disconnect anything except the adapter.

## Level Accuracy vs Input Power Level Test

### d. **Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source with options 2A, 3, 4, 15A, and 22, or equivalent
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensor or equivalent (2)
- Anritsu ML2400A/20 Power Meter Cable (2)
- Weinschel 1870A Power Splitter or equivalent
- Anritsu 34NN50A 50 Ohm adapter or equivalent
- Anritsu 34RSN50 50 Ohm adapter or equivalent
- Anritsu 34RKNF50 50 Ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- Weinschel 1-10 10 dB Fixed Attenuator

### e. **Test Setup Components Characterization**

1. Turn on the power meter and signal source.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

2. On the power meter, press the Channel key, the Setup soft key and then the CHANNEL soft key to display Channel 2 setup menu. Press the INPUT key twice to set the Input Configuration to B. Press the Sensor key to display both Sensor A and Sensor B readings.
3. Connect the power sensors to the power meter and calibrate the sensors.
4. Connect the power splitter to the MG3692A output and Sensor B to one of the power splitter outputs.
5. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator (refer to Figure 2).
6. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter 50 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
7. Adjust the power level of the MG3692A to get a reading on Sensor A that matches the power level in column 1 of Table 8, starting with 0 dBm.
8. Record the Sensor B reading in column 2 of Table 8.
9. Repeat steps 7 and 8 for the other input levels in column 1 of Table 8.
10. Record the results in column 2 of Table 8.

Test Power Level (dBm) @ 50 MHz	Required Sensor B Reading
0	
-4	
-10	
-14	
-20	
-24	
-30	
-34	
-40	
-44	
-50	

**Table 8. Level Accuracy vs Input Power Level Test Setting**

**NOTE:** To maintain test setup integrity, do not disconnect Sensor B, the splitter or the attenuator pad.

**f. Measuring the Unit for Accuracy vs Input Power Level**

1. Remove Sensor A, add the adapter and connect it to the Spectrum Master as shown in Figure 3.
2. On the power meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 50 MHz for the Input Signal Frequency. This sets the power meter to the proper power sensor cal factor. Press the Sensor key to display the power reading.
3. Set the MG3692A output to 50 MHz CW.
4. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
5. On the Spectrum Master, press the **Shift** key, the **Preset (1)** key, and then the Preset soft key to reset the instrument to the default starting conditions.

**NOTE:** Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

6. Press the **Freq** key and select the Center Freq soft key.
7. Use the keypad to enter 50 and select the MHz soft key.
8. Press the **BW** soft key and the **RBW** soft key.
9. Use the keypad to enter 1 and select the kHz soft key.
10. Press the **VBW** soft key and use the keypad to enter 10, then select the Hz soft key.
11. Press the **Span** key, use the keypad to enter 10, and select the kHz soft key.
12. Press the **Amplitude** key and select the Reference Level soft key.
13. Use the keypad to enter 10 and press the dBm soft key.
14. Press the **Atten Lvl** soft key and enter 30, then press the dB soft key.

15. Adjust the source power so that the power meter displays the corresponding desired Sensor B reading as recorded for 0 dBm in column 2 of Table 8.
16. Press the **Marker** key and select the Peak Search soft key.
17. Record the Marker 1 amplitude reading.
18. Verify that the Marker 1 amplitude reading is within the specification shown in Table 9.
19. Repeat steps 12 through 18 for the other power level settings in column 1 of Table 9.

Input Power Level (dBm)	Reference Level (dBm)	Input Atten Level (dB)	Marker Reading (dBm)	Specification (dBm)
0	10	30		± 1.25
-4	10	30		± 1.25
-10	0	20		± 1.25
-14	0	20		± 1.25
-20	-10	10		± 1.25
-24	-10	10		± 1.25
-30	-20	0		± 1.25
-34	-20	0		± 1.25
-40	-30	0		± 1.25
-44	-30	0		± 1.25
-50	-40	0		± 1.25

**Table 9. Accuracy vs input Power Level Test Setting**

### 3. Battery Pack Removal and Replacement

This procedure provides instructions for removing and replacing the Spectrum Master battery pack.

1. With the Spectrum Master laying flat, face up, on a stable surface, locate the battery access door (Figure 4).

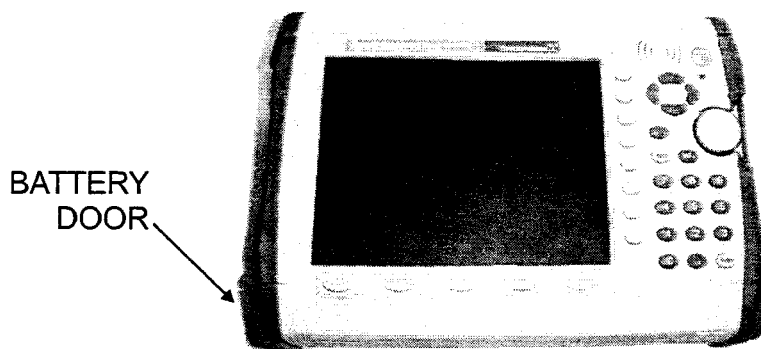


Figure 4. Battery Access Door Location

2. Place a finger in the battery access door notch and push the door down towards the bottom of the instrument (Figure 5).

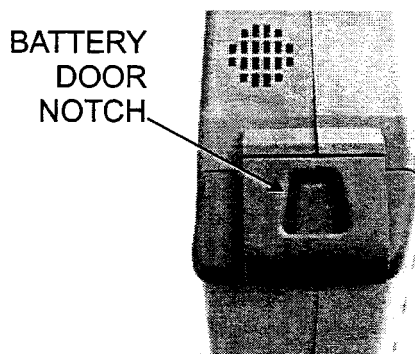


Figure 5. Battery Access Door Notch

3. Remove the battery access door, as illustrated in Figure 6.

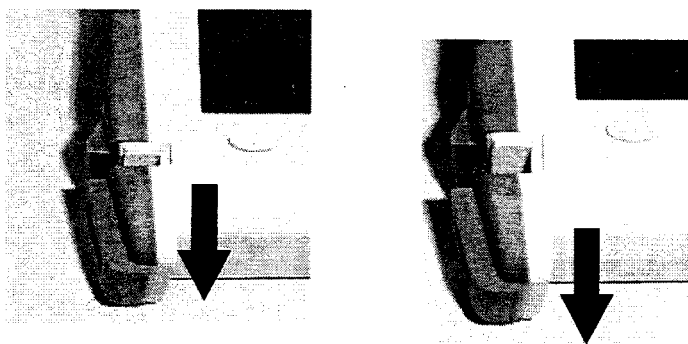
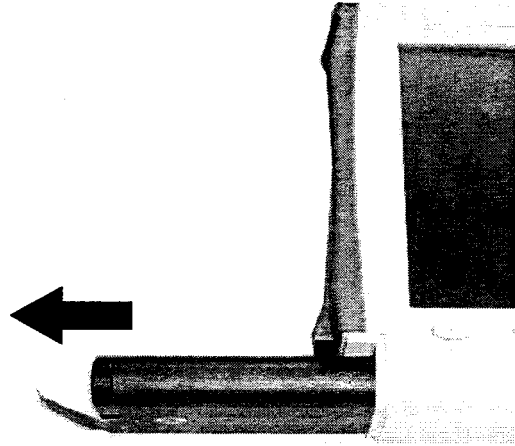


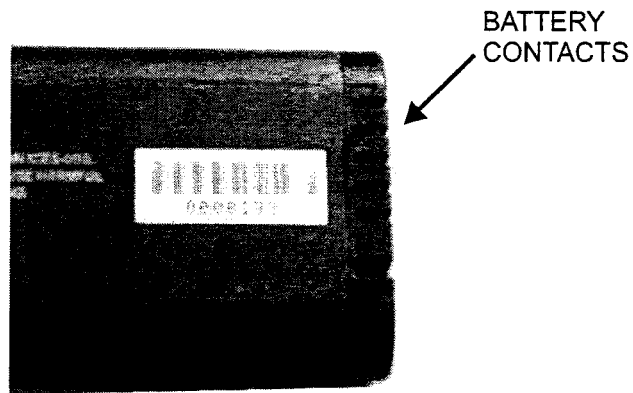
Figure 6. Removing the Battery Access Door

4. With the battery access door completely removed, grasp the battery lanyard and pull the battery straight out of the unit, as illustrated in Figure 7.



**Figure 7.** Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the unit (Figure 8).



**Figure 8.** Battery Contacts

## 4. Battery Information

The following information relates to the care and handling of the Spectrum Master battery, and Lithium-Ion batteries in general.

- The battery supplied with the Spectrum Master may need charging before use. Before using the Spectrum Master, the internal battery may be charged either in the Spectrum Master, using either the AC-DC Adapter (40-168) or the 12-Volt DC adapter (806-62), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the Spectrum Master or in an Anritsu approved charger.
- When the Spectrum Master or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours; overcharging may shorten battery life.
- If left unused a fully charged battery will discharge itself over time.
- Temperature extremes will affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.
- Discharge the battery from time to time to improve battery performance and battery life.
- The battery can be charged and discharged hundreds of times, but it will eventually wear out.
- The battery may need to be replaced when the operating time between charging becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.
- Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.
- Never short-circuit the battery terminals.
- Do not drop, mutilate or attempt to disassemble the battery.
- Do not dispose of batteries in a fire!
- Batteries must be recycled or disposed of properly. Do not place batteries in household garbage.
- Always use the battery for its intended purpose only.

## 5. Real Time Clock Battery Replacement

This procedure provides instructions for replacing the Lithium Coin Real Time Clock Battery (part number 633-26).

1. Open the Spectrum Master case as detailed in Section 6.
2. Locate the RTC battery (see Figure 13, page 29).
3. Using a non-metallic probe, gently pry the battery from its holder, taking care not to damage the holder or surrounding components.

*NOTE: The RTC battery may be secured in the holder with a small quantity of clear RTV sealant on top of the battery. Replace this sealant when replacing the battery to insure that the battery remains properly secured. Do not allow the sealant to come between the battery and the holder contacts.*

4. Install the new RTC battery, making sure that the positive (+) side of the battery faces up.
5. Close the Spectrum Master case as detailed in Section 6.

## 6. Opening the Spectrum Master Case

This procedure provides instructions for opening the Spectrum Master case. With the case opened, the internal assemblies can be removed and replaced, as detailed in the following sections.

1. Place the Spectrum Master face down on a stable work surface.
2. Remove the battery door and battery as shown in Section 3.
3. Use a Phillips screwdriver to remove the four screws securing the two halves of the Spectrum Master case together (Figure 9).

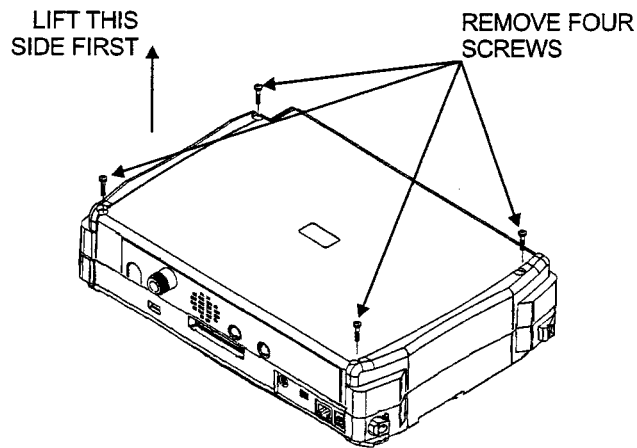


Figure 9. Removing the Cover Screws

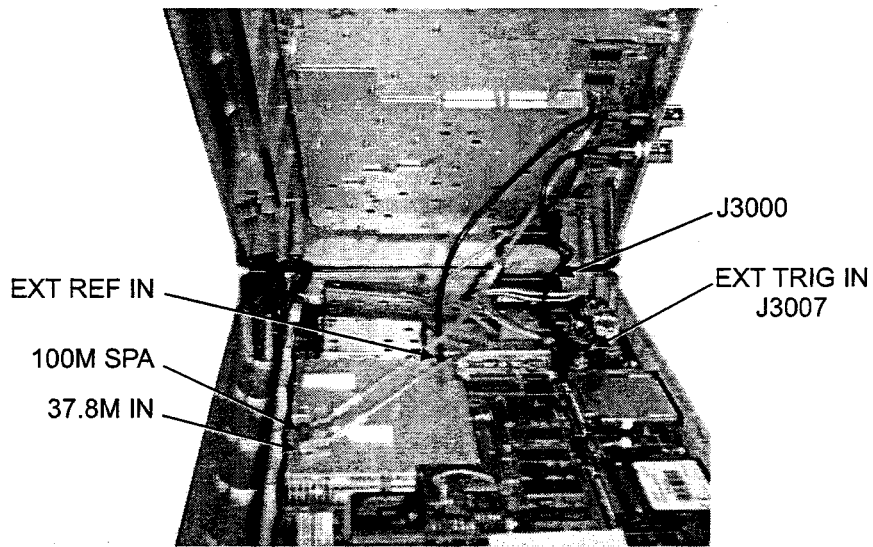
4. Carefully lift up on the side of the case shown and begin to separate the two halves.

### CAUTION

*Do not force or pull the two halves of the case apart completely, as there are delicate cables attached between the two halves that must be disconnected first. Refer to Figures 10 and 11 and note the position and routing of the cables, as they should be similarly routed when the unit is reassembled.*

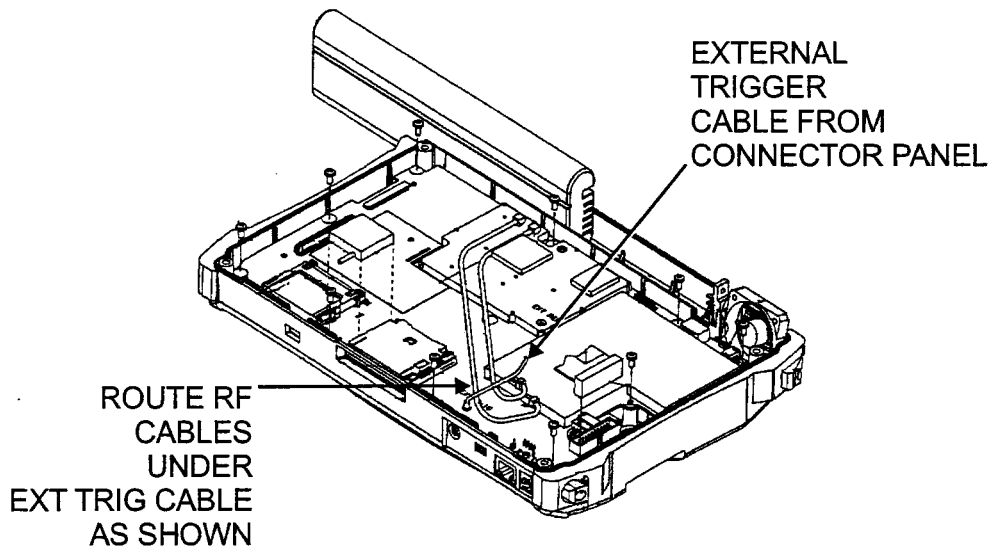
*There is an RF gasket material between the two halves of the case. Take care not to remove or damage this material when separating the case.*

5. Carefully disconnect the External Reference In cable from the main PCB assembly connection marked EXT REF.
6. Carefully disconnect the External Trigger In cable from the main PCB connection marked J3007.
7. Carefully disconnect the cable that comes from J9007 of the Spectrum Analyzer module from the connector marked 100M SPA on the main PCB assembly.
8. Carefully disconnect the cable that comes from J3008 of the Spectrum Analyzer module from the connector marked 37.8M IN on the main PCB assembly.
9. Carefully disconnect the ribbon cable that connects the Spectrum Analyzer module to the main PCB assembly at connector J3000.
10. The two halves of the instrument can now be safely separated. Refer to the following sections to remove and replace specific components of the instrument.
11. Reverse the above steps to reassemble the case.



**Figure 10.** Front Panel Assembly Removal and Cable Connections

*NOTE: Proper routing of the cables is important for instrument performance. Note the cable routing as illustrated in the drawing below.*



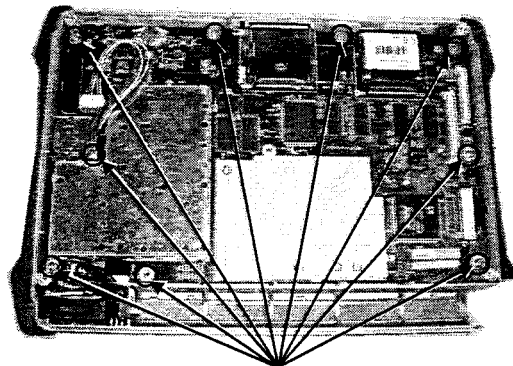
**Figure 11.** Cable Routing Diagram

## 7. Main PCB Assembly Replacement

This procedure provides instructions for replacing the Main PCB assembly. The Main PCB assembly is located in the front panel half of the instrument.

**NOTE:** The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set.

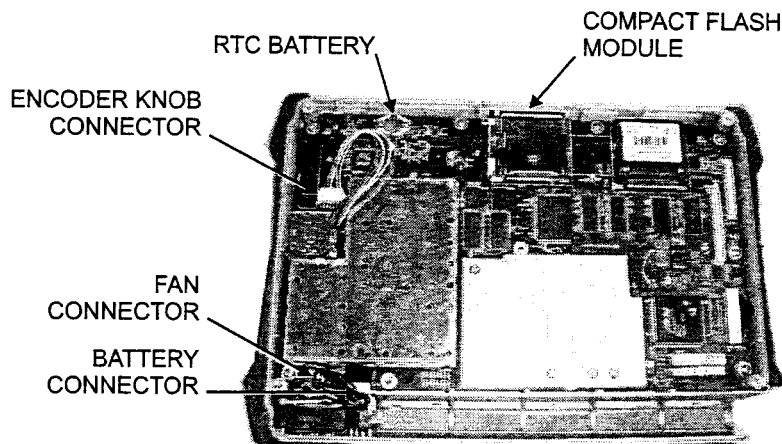
1. Open the Spectrum Master case as detailed in Section 6.
2. Disconnect the Fan connector at J1002 on the Main PCB assembly.
3. Disconnect the Encoder Knob connector at J501 on the Main PCB assembly.
4. Use a Phillips screwdriver to remove the nine screws securing the main PCB assembly to the Front Panel section.



REMOVE  
SCREWS

**Figure 12.** Main PCB Assembly Mounting Screws

5. Lift the bottom edge of the Main PCB assembly and disconnect the battery connector from J1001 on the main PCB.



**Figure 13.** Main PCB Assembly Replacement

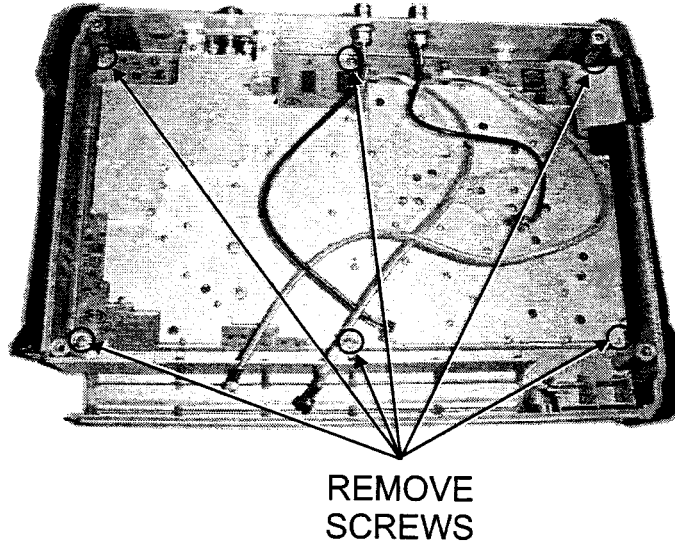
6. Pull the Main PCB assembly down and out of the Front Panel section, taking care to slide the Compact Flash module clear of the case.
7. Replacement is the reverse of removal. Take care to insure that the connector on the Main PCB aligns with the connector on the Keypad PCB coming through the front panel.

## 8. Spectrum Analyzer Module Assembly Replacement

This procedure provides instructions for removing and replacing the Spectrum Analyzer Module. The Spectrum Analyzer Module Assembly is located in the back half of the case and includes the connector panel.

**NOTE:** The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set.

1. Open the Spectrum Master case as detailed in Section 6.
2. Use a Phillips screwdriver to remove the six screws securing the Spectrum Analyzer Module Assembly to the back half of the instrument case..



**Figure 14.** Spectrum Analyzer Module Removal

3. Carefully lift the Spectrum Analyzer Module Assembly and connector panel out of the case.
4. Installation is the reverse of removal. Take care to properly fit the connector panel into the grooves in the top of the case

**NOTE:** There is an RF gasket material between the two halves of the case, and in the connector panel grooves. Take care not to remove or damage this material when removing or replacing the Spectrum Analyzer Module and connector panel assembly.

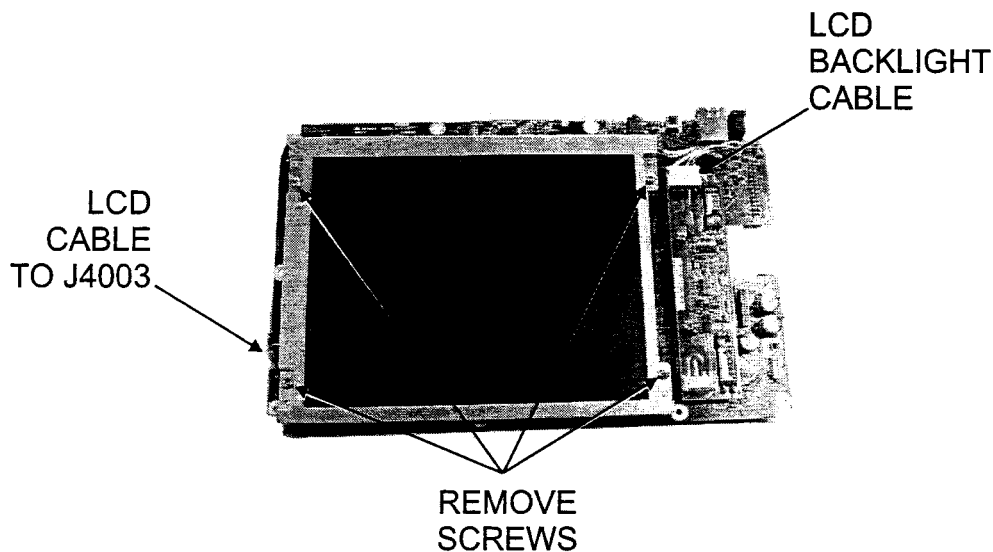
## 9. LCD Assembly Replacement

This procedure provides instructions for removing and replacing the Liquid Crystal Display (LCD) once the Main PCB assembly has been separated from the Spectrum Master.

1. Open the Spectrum Master case as detailed in Section 6.
2. Remove the Main PCB assembly from the front panel as directed in Section 7.
3. Use a Phillips screw driver to remove the four screws securing the LCD to the Main PCB assembly.
4. Disconnect the LCD backlight cable from the LCD backlight PCB.

**NOTE:** Pay attention to the routing of the LCD Backlight Cable. The cable must be positioned so as not to be pinched when the assembly is reattached to the front panel.

5. Disconnect the LCD cable from J4003 on the back side of the Main PCB.
6. Carefully remove the LCD.



**Figure 15.** LCD Assembly Replacement

7. Reverse the above steps to install the replacement LCD.

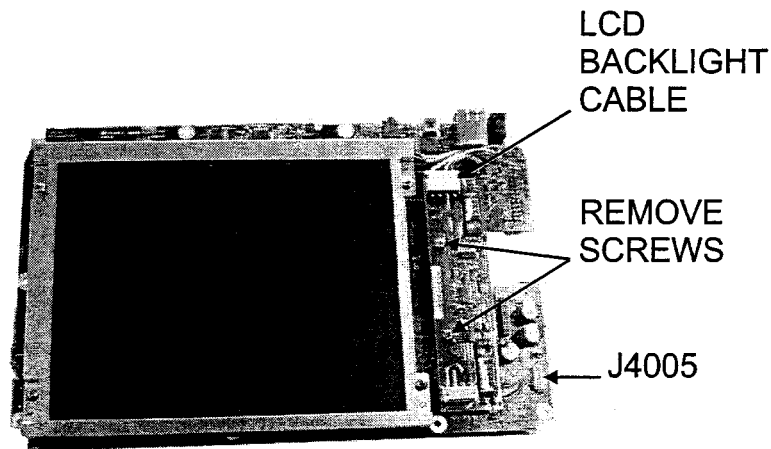
**NOTE:** Pay attention to the routing of the LCD Backlight Cable. The cable must be positioned so as not to be pinched when the assembly is reattached to the front panel.

## 10. LCD Backlight PCB Removal and Replacement

This procedure provides instruction for removing and replacing the Spectrum Master LCD backlight PCB.

1. Open the Spectrum Master case as detailed in Section 6.
2. Remove the Main PCB assembly from the front panel as directed in Section 7.
3. Disconnect the LCD backlight cable from the LCD backlight PCB.

**NOTE:** Pay attention to the routing of the LCD Backlight Cable. The cable must be positioned so as not to be pinched when the assembly is reattached to the front panel.



**Figure 16.** LCD Backlight PCB Removal and Replacement

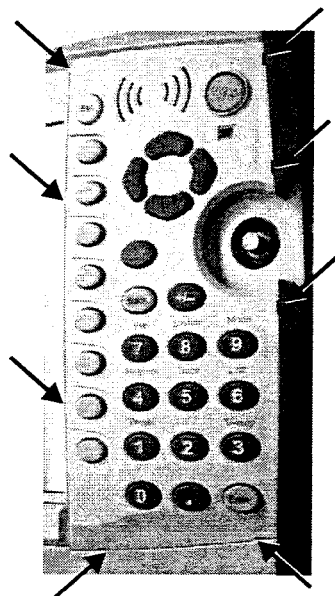
4. Use a Phillips screw driver to remove the two screws securing the backlight PCB to the Main PCB assembly.
5. Lift the LCD Backlight PCB and disconnect the backlight control cable from J4005 on the Main PCB.
6. Carefully remove the LCD Backlight PCB.
7. Replacement is the opposite of removal.

## 11. Keypad Membrane and PCB Replacement

This procedure provides instructions for removing and replacing the keypad membrane and PCB.

**NOTE:** The keypad PCBs and membranes can be replaced without opening the Spectrum Master case.

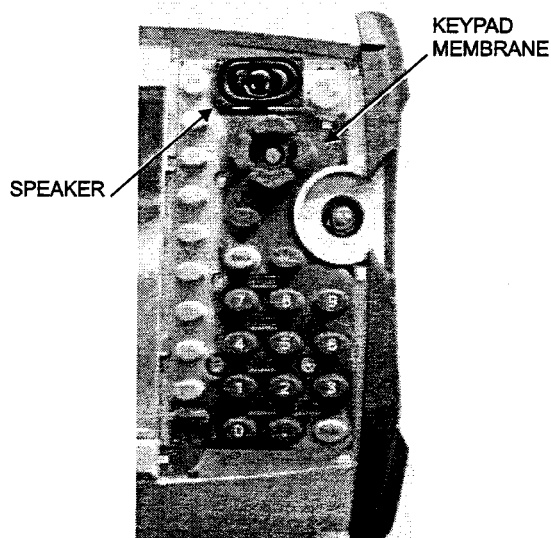
1. Place the instrument face up on a protected work surface.
2. There are eight locking tabs holding the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane.



ARROWS POINT TO  
FRONT BEZEL  
LOCKING TAB LOCATIONS

**Figure 17.** Front Panel Keypad Bezel

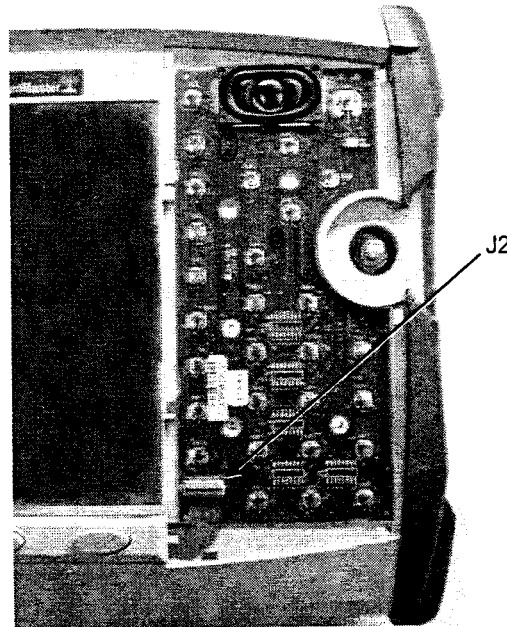
3. Remove the keypad membrane by carefully lifting the speaker and pulling the membrane off of the keypad PCB.



**Figure 18.** Keypad Membrane

**NOTE:** The speaker is held in place by four locating pins on the inside of the keypad bezel. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Use care not to damage the speaker wires when removing or replacing the keypad membrane or PCB.

4. Disconnect the function key flexible switchpad from J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad.



**Figure 19.** Keypad PCB

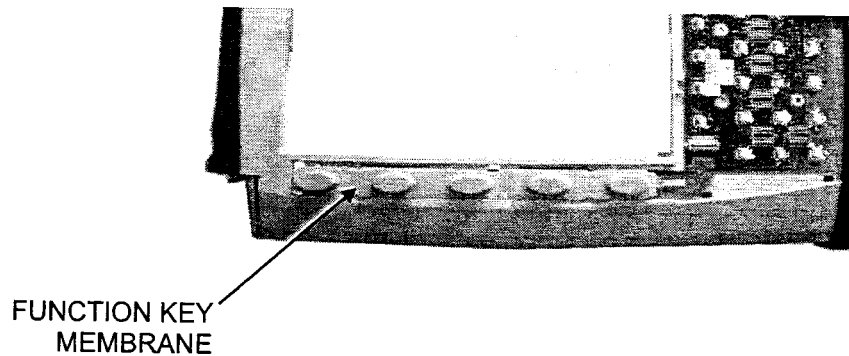
5. Remove the keypad PCB, taking care not to damage the speaker wires.
6. Reverse the above steps to install the replacement assembly, with the following cautions:
  - Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should “snap” into position when fully closed.
  - Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB.
  - The speaker is held in place by four locating pins on the inside of the keypad bezel. Be sure that the four locating pins are properly seated into the four corner holes of the speaker when reinstalling the bezel.
  - Be sure that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

## 12. Function Key Membrane and Switchpad Replacement

This procedure provides instructions for replacing the function key membrane and switchpad.

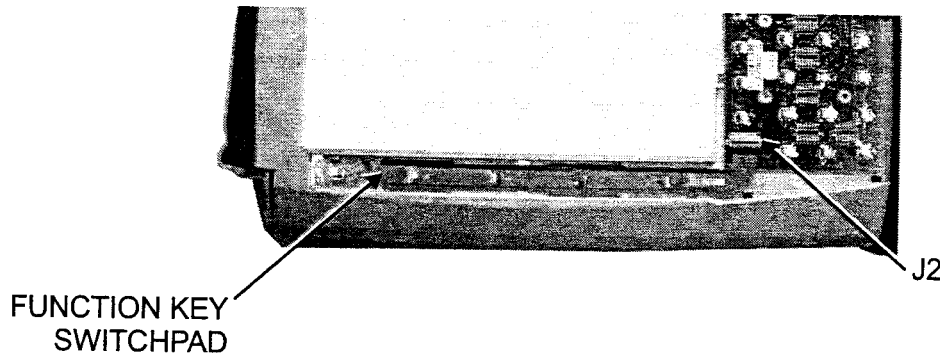
**NOTE:** The function key PCB and membrane can be replaced without opening the Spectrum Master case.

1. Place the instrument face up on a protected work surface.
2. Remove the keypad bezel and membrane as directed in section 11.
3. There are six locking tabs holding the function key bezel to the case. Using a small flat blade screwdriver, carefully pry the function key bezel locking tabs free of the main body of the case. This will expose the function key membrane.
4. Remove the function key membrane by gently pulling the membrane up and away from the front panel.



**Figure 20.** Function Key Membrane

5. Disconnect the function key flexible switchpad from J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad.



**Figure 21.** Function Key Switchpad

6. Reverse the above steps to install the replacement switchpad or membrane.

**NOTE:** Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should "snap" into position when fully closed.

### 13. Accessories and Replaceable Parts

Accessories and replaceable parts for the Spectrum Master MS2721A are listed below.

#### Accessories

Part Number	Description	Qty
10580-00103	User's Guide, Spectrum Master MS2721A	1
10580-00104	Programming Manual, Spectrum Master MS2721A (disk only)	1
2300-498	Handheld Software Tools CD	1
40-168	AC-DC Adapter	1
806-141	Automotive Power Adapter	1
2000-1360	USB A-mini B Interface Cable	1
2000-1371	Ethernet Interface Cable	1
2000-1358	64 MB Compact Flash	1
1091-27	Type N male to SMA female adapter	1
1091-172	Type N male to BNC female adapter	1
61382	Soft Carrying Case	1

#### Replaceable Parts

Part Number	Description	Qty
633-44	Rechargeable Battery, Lithium-Ion	1
633-26	Lithium Coin Battery for Real Time Clock	1
ND63412	Main/SPA PCB Assembly, MS2721A	1
61333-3	Function Key Switchpad Assembly	1
61334-3	Main Keypad PCB Assembly	1
2000-1346	Liquid Crystal Display Backlight PCB	1
15-118	Liquid Crystal Display Assembly	1
61361	Function Key Membrane	1
61362	Keypad Membrane	1

**Hardware**

<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
905-2639P	Screw, Pan, M3 x 6, Phillips, SS, PCH	16
905-2642P	Screw, Pan, M3 x 12, Phillips, SS, PCHL	4
905-2633P	Screw, Pan, M2 x 6, Phillips, SS, PCHL	14
905-2663	M3 x 0.5 KEP Nut	4
905-2684P	Screw, M2 x 14 MM, 18-8 SS	47
905-2685	Screw, 4 MM, Phillips, SS, Shoulder	2
410-101	Encoder	1
58211	Cable Assembly, BNC-MCX	1
61370-1	Cable Assembly, 3IN, INV BD	1
61465	Cable, Ribbon	1
61466-1	100 MHZ Coax Cable	1
61466-2	37.8 MHZ Coax Cable	1

**Case Parts**

<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
ND64730	Case Replacement Kit, Aluminum to Plastic (see Appendix B)	1
64126	Top Case, Plastic	1
64127	Bottom Case, Plastic	1
61379-1	Battery Door, Plastic Case	1
61363-1	Keypad Bezel, Numeric, Plastic Case	1
61378-1	Function Key Bezel, Plastic Case	1
61360-1	Encoder Knob, Plastic Case	1
61368	LCD Protective Cover	1
61381	Fan Bracket	1
ND64383	Fan Assembly	1
800-473	Battery Cable, Connector	1
61463	ID Label, Model MS2721A	1

## 14. Appendix A: MS2721A Test Records

The following sections contain test records that can be used to record the performance of the Spectrum Master Model MS2721A.

### 14.1. Spectrum Analyzer Frequency Accuracy Test

Frequency	Measured Value	Specification
1 GHz		$\pm 1$ KHz
7 GHz		$\pm 7$ KHz

### 14.2. Spectrum Analyzer Phase Noise Verification

Frequency	Measured Value (dBc/Hz)	Specification (dBc/Hz)
10 kHz		-100
20 kHz		-100
30 kHz		-100
100 kHz		-102

### 14.3. Spectrum Analyzer Second Harmonic Distortion Test

Frequency	Measured Values	Converted Value (dBc)	Specification (dBc)
50.1 MHz			-50
100.2 MHz			

### 14.4. Spectrum Analyzer Residual Spurious Response Test with Pre-Amp Off

Start Freq.	Stop Freq.	RBW	VBW	Measured Values (dBm)	Specification (dBm)
100 kHz	10 MHz	3 kHz	300 Hz		-90
10 MHz	1.0 GHz	30 kHz	1kHz		-90
1 GHz	2.2 GHz	10 kHz	300 Hz		-90
2.2 GHz	2.7 GHz	1 kHz	300 Hz		-90
2.7 GHz	2.8 GHz	1 kHz	100 Hz		-90
2.8 GHz	3.199 GHz	10 kHz	300 Hz		-90
3.2 GHz	4.009 GHz	30 kHz	1 KHz		-84
4.009 GHz	5.083 GHz	10 kHz	300 Hz		-84
5.083 GHz	5.895 GHz	10 kHz	100 Hz		-84
5.895 GHz	7.1 GHz	10 kHz	100 Hz		-84

#### 14.5. Spectrum Analyzer Residual Spurious Response Test with Pre-Amp On

Start Freq	Stop Freq	Measured Values (dBm)	Specification (dBm)
100 KHz	10 MHz		-100
10 MHz	1.0 GHz		-100
1.0 GHz	2.0 GHz		-100
2.0 GHz	3.0 GHz		-100
3.0 GHz	4.0 GHz		-100
4.0 GHz	5.0 GHz		-100
5.0 GHz	6.0 GHz		-100
6.0 GHz	7.1 GHz		-100

#### 14.6. Spectrum Analyzer Display Average Noise Level (DANL)

Frequency	RBW	VBW	Measured for 100 kHz RBW (dBm)	Calculated for 10 Hz RBW (dBm)	Max DANL in 10 Hz RBW (dBm)
10 MHz to 1.0 GHz	100 kHz	1 kHz			-151
1 GHz to 2.2 GHz	100 kHz	1 kHz			-149
2.2 GHz to 2.8 GHz	100 kHz	300 Hz			-143
2.8 GHz to 4.0 GHz	100 kHz	1 kHz			-149
4.0 GHz to 7.1 GHz	100 kHz	300 Hz			-144

#### 14.7. Spectrum Analyzer Input Related Spurious (IRS)

##### a. Amplitude Reading at 1674 MHz:

Frequency	Measured Values (dBm)	Calculated IRS (dBc)	Specification (dBc)
100 kHz - 1673 MHz			-46
1675 MHz - 2800 MHz			-46

**b. Amplitude Reading at 1701 MHz:**

Frequency	Measured Values (dBm)	Calculated IRS (dBc)	Specification (dBc)
26 MHz - 28 MHz			-50

**c. Amplitude Reading at 2145 MHz:**

Frequency	Measured Values (dBm)	Calculated IRS (dBc)	Specification (dBc)
470 MHz - 472 MHz			-60

**14.8. Spectrum Analyzer Resolution Bandwidth Accuracy Test**

BW Setting	Span	VBW	Lower Limit	Measured Values	Upper Limit
3 MHz	6 MHz	Auto	2.7 MHz		3.3 MHz
1 MHz	2 MHz	Auto	900 kHz		1.1 MHz
300 KHz	600 kHz	Auto	270 KHz		330 KHz
100 KHz	200 kHz	Auto	90 KHz		110 KHz
30 kHz	60 kHz	Auto	27 kHz		33 kHz
10 kHz	20 kHz	Auto	9 kHz		11 kHz
3 kHz	6 kHz	Auto	2.7 kHz		3.3 kHz
1 kHz	2 kHz	Auto	.9 kHz		1.1 kHz
300 Hz	600 Hz	Auto	270 Hz		330 Hz
100 Hz	200 Hz	Auto	90 Hz		110 Hz
30 Hz	60 Hz	3 Hz	27 Hz		33 Hz
10 Hz	60 Hz	3 Hz	.9 Hz		11 Hz

14.9. (b) Spectrum Analyzer Level Accuracy Across Frequency Test Setting

Freq (MHz)	Desired Sensor B Reading for -2 dBm @ Attenuator Output	Desired Sensor B Reading for -30 dBm @ Attenuator Output
50		
100		
500		
1000		
2000		
3000		
4000		
5000		
6000		
7000		

14.10. (c) Spectrum Analyzer Level Accuracy Across Frequency Test Setting

Freq (MHz)	-2 dBm Input		-30 dBm Input	
	Measured Values (dBm)	Spec. (dBm)	Measured Values (dBm)	Spec. (dBm)
50		±1.75		±1.25
100		±1.75		±1.25
500		±1.75		±1.25
1000		±1.75		±1.25
2000		±1.75		±1.25
3000		±1.75		±1.25
4000		±1.75		±1.25
5000		±1.75		±1.25
6000		±1.75		±1.75
7000		±3.0		±1.75

**14.11. (e) Spectrum Analyzer Level Accuracy Through Power Test Setting**

Test Power Level (dBm) @ 50 MHz	Desired Sensor B Reading
0	
-4	
-10	
-14	
-20	
-24	
-30	
-34	
-40	
-44	
-50	

**14.12. (f) Spectrum Analyzer Level Accuracy Through Power Test Setting**

Input Power Level (dBm)	Reference Level (dBm)	Input Atten Level (dB)	Marker Reading (dBm)	Spec. (dBm)
0	10	30		±1.25
-4	10	30		±1.25
-10	0	20		±1.25
-14	0	20		±1.25
-20	-10	10		±1.25
-24	-10	10		±1.25
-30	-20	0		±1.25
-34	-20	0		±1.25
-40	-30	0		±1.25
-44	-30	0		±1.25
-50	-40	0		±1.25

## 15. Appendix B: MS2721A Case Replacement Instructions (Kit # ND64730)

This procedure is used with Kit # ND64730 to convert the early MS2721A aluminum case to the current plastic case. Note that if any part of the aluminum case needs to be replaced, the entire case must be replaced using this kit. For more information, refer to Anritsu Service Note MS2721A-4, or contact your nearest Anritsu Service Center.

1. Place unit face down on an ESD safe protective platform with test port facing away from you. Remove battery door and battery pack. Remove four case screws found at each corner.
2. Carefully begin to lift bottom case off. Only lift the right side just high enough to view cables that attach both halves of the case together. Observe location and routing of all cables (very important) as you will need to replace them in the identical locations when reinstalling them into the new poly case.
3. Carefully disconnect the black coax cable from the main PCB assembly connection marked EXT REF.
4. Carefully disconnect the black coax cable from the main PCB connection marked J3007.
5. Carefully disconnect the cable that comes from J9007 of the Spectrum Analyzer module from the connector marked 100M SPA on the main PCB assembly.
6. Carefully disconnect the cable that comes from J3008 of the Spectrum Analyzer module from the connector marked 37.8M IN on the main PCB assembly.
7. Carefully disconnect the ribbon cable that connects the Spectrum Analyzer module to the main PCB assembly at connector J3000.
8. Separate the two halves and set the bottom half aside for now.
9. Unplug the Fan, Battery and Encoder Knob cable harnesses from the Mother Board.
10. Remove eight perimeter screws plus one screw next to the encoder knob.
11. Carefully lift the Mother Board straight up off the keypad connection header then back and all the way out and set aside for now. Remove the encoder PCB and harness assembly by removing the encoder knob and nut on the front side.
12. Reassemble encoder knob, encoder PCB and harness assembly into new Poly case in reverse order. Remove the tape holding the LCD protective cover onto the new poly case. Leave the LCD protective cover where it is and clean it from any dust and smudge marks in preparation for assembly. For cleaning, use either Reztore ESD surface + mat cleaner or pure Isopropyl Alcohol with a lint free cloth.
13. Install the Mother Board in the reverse order into the poly case as previously removed from the aluminum case. Observe alignment of keypad connection header. As a help to alignment, observe correct alignment of encoder knob screw hole with the female threads on the inside top case.
14. Plug in the Fan, Battery and Encoder Knob harnesses into the Mother Board. Temporarily install the battery pack and power on the unit and observe whether or not the Anritsu logo appears on the screen. This will verify that the keypad connection header was properly fitted. After verification, turn unit off and remove the battery pack.
15. Using the new screws supplied, install the eight perimeter screws plus one screw next to the encoder knob. This completes the top half, set aside for now.
16. Remove five perimeter screws (one screw should be missing from the bottom right side) from bottom case Spectrum Analyzer Module. Remove the Spectrum Analyzer Module from the aluminum case.
17. Remove four nuts from the test port adapter to the panel. Remove three screws attaching the panel to the Spectrum Analyzer Module. The panel can now be pulled straight out and off. Remove the two BNC cables from the panel.
18. In reverse order attach the two BNC cables to the new panel. Slide the panel onto the test port adapter and then use the three screws to reattach the panel to the Spectrum Analyzer Module, do not tighten the 3rd (short) screw all the way to the right yet. This screw will be tightened when the panel is first correctly aligned into the new poly case grooves. Install the four nuts onto the test port adapter to panel and tighten all the way.

19. Place the Spectrum Analyzer Module into the bottom half of the new poly case. Make sure the panel is properly aligned into the case grooves and then fully tighten the screw left loose in the previous step. Using five new screws, install them into their original locations, leaving the bottom right screw empty.
20. Place the top half of the assembled top poly case face down and reattach all cables in the reverse order they were removed. Observe the routing and place cables in the same location (very important) as they were found.
21. Carefully fit the bottom half poly case into the top half assembly while observing that the panel is aligned into the case grooves for both bottom and top halves. Note: Take your time with this part of the assembly because you will have to correctly align the battery compartment and top panel at the same time. Also observe that the two tan coax cables do not press up against the reset switch just below the real time clock battery built onto the motherboard. If the coax cables press up against this switch, the unit will fail to turn on.
22. Reinstall the four case screws at each corner. These four screws must be very tight, but before tightening all the way, double check that the top panel is correctly aligned in both the bottom and top half of the case grooves. Remove the Serial Number label from the aluminum case and reattach it to the Poly case. Install the battery pack and battery door.
23. Remove the hand strap from the aluminum case and reinstall onto the poly case.
24. Finally, turn the unit on and observe that no error messages pop up. After successfully booting up press the shift key, then press the #1 key then press the soft key titled "Preset". This will cause the unit to sweep full band, verify that no error messages pop up.

**Table 1. Anritsu Service Centers**

**UNITED STATES**

ANRITSU COMPANY  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
Telephone: (408) 776-8300  
1-800-ANRITSU  
FAX: 408-776-1744

ANRITSU COMPANY  
10 New Maple Ave., Unit 305  
Pine Brook, NJ 07058  
Telephone: (973) 227-8999  
1-800-ANRITSU  
FAX: 973-575-0092

ANRITSU COMPANY  
1155 E. Collins Blvd  
Richardson, TX 75081  
Telephone: 1-800-ANRITSU  
FAX: 972-671-1877

**AUSTRALIA**

ANRITSU PTY. LTD.  
Unit 21, 270 Ferntree Gully Road  
Notting Hill, VIC 3168  
Australia  
Telephone: 03-9558-8177  
FAX: 03-9558-8255

**BRAZIL**

ANRITSU ELECTRONICA LTDA.  
Praia de Botafogo, 440, Sala 2401  
CEP22250-040, Rio de Janeiro, RJ, Brasil  
Telephone: 021-527-6922  
FAX: 021-53-71-456

**CANADA**

ANRITSU INSTRUMENTS LTD.  
700 Silver Seven Road, Suite 120  
Kanata, Ontario K2V 1C3  
Telephone: (613) 591-2003  
FAX: (613) 591-1006

**CHINA**

ANRITSU ELECTRONICS (SHANGHAI) CO. LTD.  
2F, Rm B, 52 Section Factory Building  
No. 516 Fu Te Rd (N)  
Shanghai 200131 P.R. China  
Telephone: 21-58680226, 58680227, 58680228  
FAX: 21-58680588

**FRANCE**

ANRITSU S.A.  
9 Avenue du Quebec  
Zone de Courtaboeuf  
91951 Les Ulis Cedex  
Telephone: 016-09-21-550  
FAX: 016-44-61-065

**GERMANY**

ANRITSU GmbH  
Konrad-Zuse-Platz 1  
Muenchen 81829  
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Telephone: 089-442308-0  
FAX: 089-442308-55

**INDIA**

MEERA AGENCIES PVT. LTD.  
23 Community Centre  
Zamroodpur, Kailash Colony Extension,  
New Delhi, India 110 048  
Phone: 011-2-29233700  
FAX: 011-2-29242500

**ISRAEL**

TECH-CENT, LTD.  
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FAX: (03) 64-78-334

**ITALY**

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00144 Roma EUR  
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FAX: (06) 50-22-4252

**JAPAN**

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FAX: 0462-25-8379

**KOREA**

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832-41, Yeoksam Dong  
Kangnam-Gu  
Seoul, South Korea 135-080  
Telephone: 82-2-553-6603  
FAX: 82-2-553-6605

**SINGAPORE**

ANRITSU (SINGAPORE) PTE LTD.  
10, Hoe Chiang Road  
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FAX: 282-2533

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FAX: 011-27-11-787-0446

**SWEDEN**

ANRITSU AB  
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164 40 Kista, Sweden  
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FAX: (08) 534-707-30

**TAIWAN**

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7F, No. 316, Section 1  
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Telephone: 886-2-8751-1816  
FAX: 886-2-8751-2126

**UNITED KINGDOM**

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200 Capability Green  
Luton, Bedfordshire  
LU1 3LU, England  
Telephone: 015-82-433200  
FAX: 015-82-731303