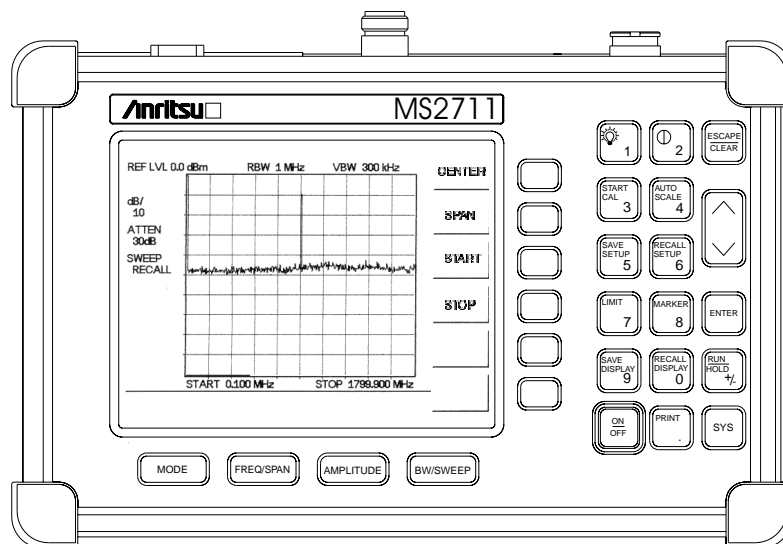


# MAINTENANCE MANUAL

## MS2711

### Hand Held

### Spectrum Analyzer



**Figure 1.** MS2711 Hand Held Spectrum Analyzer

## 1. INTRODUCTION

This manual provides maintenance instructions for the MS2711 Spectrum Analyzer. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

## 2. DESCRIPTION

The MS2711 Spectrum Analyzer (Figure 1) is a synthesizer-based hand held spectrum analyzer that provides quick and accurate signal results. Measurements can be easily made using the main instrument functions: frequency, span, amplitude and bandwidth. A simplified block diagram is provided in Figure 2.

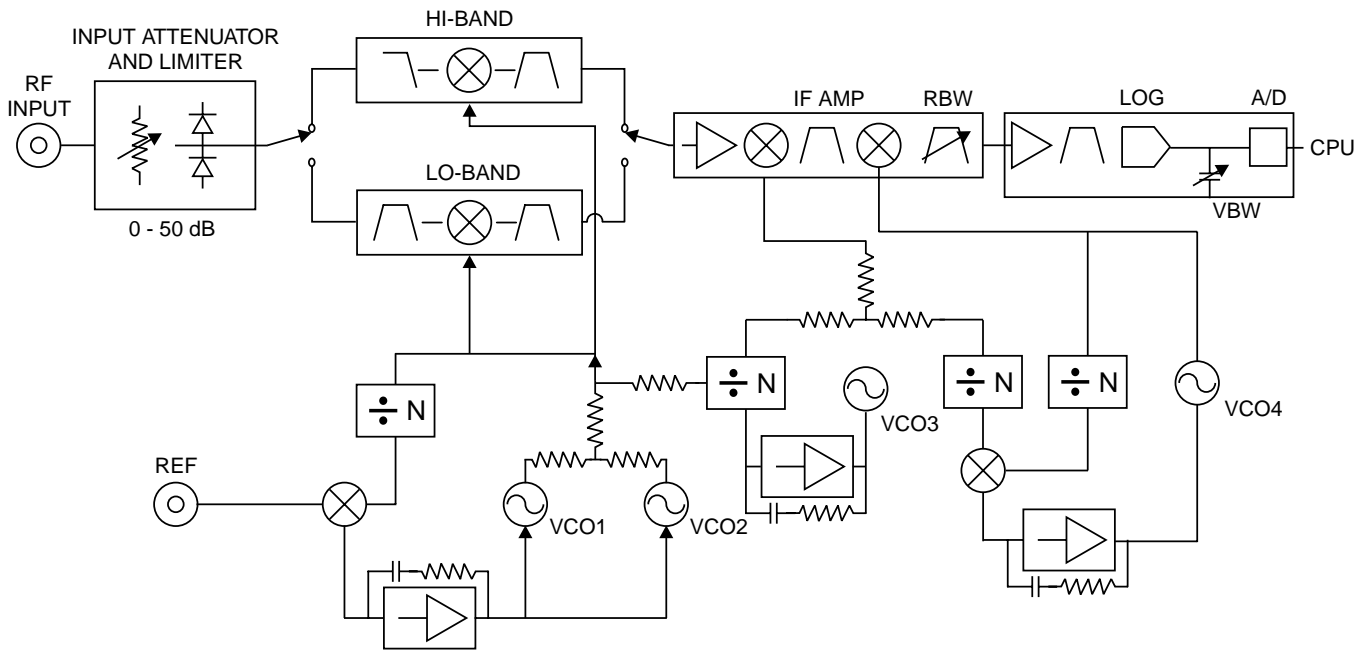
## 3. PERFORMANCE VERIFICATION PROCEDURES

Paragraphs 4 through 7 contain tests that can be used to verify the performance of the MS2711 Spectrum Analyzer having any version of firmware.

### 3.1. Display Contrast Adjustment

1. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Analyzer. (This sets the instrument to the factory preset state.) When the instrument has completed the self test, press the **ENTER** key to continue.
2. Use the Up/Down arrow key to adjust the display contrast if necessary and press the **ENTER** key to continue.

# Anritsu



**Figure 2.** MS2711 Spectrum Analyzer Block Diagram

#### 4. FREQUENCY ACCURACY

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

##### a. Equipment Required:

- Anritsu 68047C Synthesized Signal Source, with options 11 and 15A
- 10 MHz Reference Standard

##### b. Procedure:

1. Connect the 10 MHz reference source to the Anritsu 68047C Synthesized Signal Source.
2. Connect the output of the source to the MS2711 RF Input.
3. Connect the external power supply (Anritsu part number 40-115) to the MS2711.
4. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Analyzer. (This sets the instrument to the factory preset state.)

5. Turn on the 10 MHz reference source and the Anritsu 68047C Synthesized Signal Source.
6. Set the 68047C output to 1000 MHz, with an RF output level of 0 dBm.

##### **NOTE**

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

7. On the MS2711, press the **AMPLITUDE** key and the **REF LEVEL** soft key.
8. Enter 20 and press the **ENTER** key to set the Reference Level to 20 dBm.
9. Press the **FREQ/SPAN** key and the **CENTER** soft key.
10. Enter 1000 and press the **ENTER** key to set the center frequency to 1000 MHz.
11. Press the **SPAN** soft key and enter 0.1. Press the **ENTER** key to set the span to 0.100 MHz.
12. Press the **BW/SWEEP** key.

13. Press the **RBW** soft key and use the Up/down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
14. Press the **VBW** soft key and use the Up/down arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
15. Press the **MARKER** key, then the **M1** soft key.
16. Select the **EDIT** soft key and use the Up/down arrow key to center the marker on the waveform. Verify that the marker frequency is 1000 MHz,  $\pm 2$  kHz.

## 5. PHASE NOISE VERIFICATION

### a. Equipment Required:

- Anritsu 68047C Synthesized Signal Source, with options 11 and 15A

### b. Procedure:

1. Connect the output of the source to the MS2711 RF Input.
2. Connect the external power supply (Anritsu part number 40-115) to the MS2711.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Analyzer. (This sets the instrument to the factory preset state.)

#### **NOTE**

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

4. Set the 68047C output to 1000 MHz, with an RF output level of  $-30$  dBm.
5. Press the **BW/SWEEP** key.
6. Press the **RBW** soft key and use the Up/down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
7. Press the **VBW** soft key and use the Up/down arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.

8. On the MS2711, press the **FREQ/SPAN** key and the **CENTER** soft key.
9. Enter 1000 and press the **ENTER** key to set the center frequency to 1000 MHz.
10. Press the **SPAN** soft key and enter 0.100. Press the **ENTER** key to set the span to 0.100 MHz.
11. Press the **AMPLITUDE** key.
12. Press the **REF LEVEL** soft key and enter  $-27$ . Press **ENTER** to set the reference level to  $-27$  dBm.
13. Press the **MARKER** key, then the **M1** soft key.
14. Press **EDIT** and enter 1000. Press **ENTER** to set the M1 marker frequency to 1000 MHz.
15. Press the **BACK** soft key and the **M2** soft key.
16. Press **EDIT** and enter 1000.030. Press **ENTER** to set the M2 marker frequency to 1000.030 MHz (30 kHz higher than the center frequency).
17. Press the **DELTA (M2-M1)** soft key.
18. Press the **RUN/HOLD** key and read and record the amplitude of the signal at the M1 30 kHz offset.
19. Press the **RUN/HOLD** key to read and record five values, then calculate the average of the five recorded values.
20. Add  $-40$  dB to the average value and verify that the result is  $\leq -74$  dBc/Hz.  
(For example:  $-35$  dBc measured +  $(-40$  dB) =  $-75$  dBc/Hz.)

## 6. MEASUREMENT ACCURACY

Measurement accuracy involves testing the MS2711 over three frequencies at four power levels. Table 1 provides a guide to the frequencies, power levels and reference levels required for each measurement, and can be used to record the readings.

### a. Equipment Required:

- Anritsu 68047C Synthesized Signal Source, with options 11 and 15A

**b. Procedure:**

1. Connect the output of the source to the MS2711 RF Input.
2. Connect the external power supply (Anritsu part number 40-115) to the MS2711.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Analyzer. (This sets the instrument to the factory preset state.)

**NOTE**

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

4. Press the **BW/SWEEP** key.
5. Press the **RBW** soft key and use the Up/down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
6. Press the **VBW** soft key and use the Up/down arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
7. Press the **FREQ/SPAN** key.
8. Press the **SPAN** soft key and enter 5, then press the **ENTER** key to set the span to 5 MHz.
9. Press the **AMPLITUDE** key.
10. Press the **REF LEVEL** soft key and enter 20. Press **ENTER** to set the reference level to +20 dBm.
11. Press the **FREQ/SPAN** key and the **CENTER** soft key.
12. Enter 1000 and press the **ENTER** key to set the center frequency to 1000 MHz.
13. Set the 68047C output to 1000 MHz and the power level to +10 dBm.
14. Press the **MARKER** key, then the **M1** soft key.
15. Select the **MARKER TO PEAK** soft key to position the marker at the center of the response for the test frequency.

**NOTE**

Optionally, markers 2, 3 and 4 may be set to OFF for a cleaner display.

16. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal.
17. Set the 68047C power level to -10 dBm.
18. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal.
19. Press the **AMPLITUDE** key.
20. Press the **REF LEVEL** soft key and enter -20. Press **ENTER** to set the reference level to -20 dBm.
21. Set the 68047C power level to -30 dBm.
22. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal.
23. Set the 68047C power level to -50 dBm.
24. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal.
25. Repeat steps 9 through 24 for frequencies of 1800 MHz and 2700 MHz.

**Table 1.** Measurement Accuracy Settings

Freq (MHz)	Power Level (dBm)	MS2711 Ref Level (dBm)	M1 Reading
1000	+10	+20	
	-10	+20	
	-30	-20	
	-50	-20	
1800	+10	+20	
	-10	+20	
	-30	-20	
	-50	-20	
2700	+10	+20	
	-10	+20	
	-30	-20	
	-50	-20	

## 7. POWER MONITOR VERIFICATION

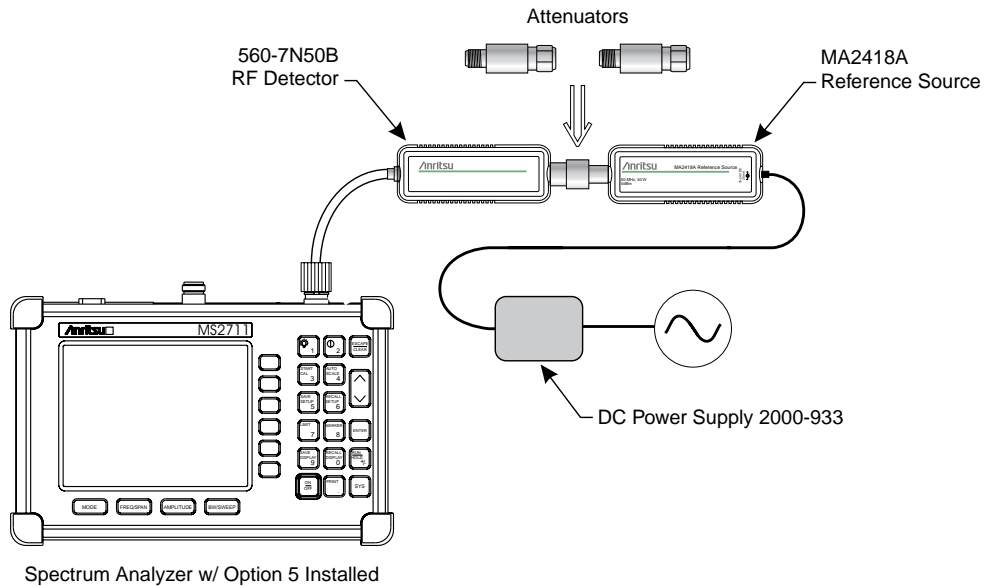
If the Power Monitor (Option 5) is installed in the Spectrum Analyzer, the following test can be used to verify the accuracy of the power measurements. Measurement calibration of the Spectrum Analyzer is **not** required for this test.

### a. Equipment Required:

- RF Detector, 10 MHz to 20 GHz, Anritsu 560-7N50B
- 10 dB Attenuator, Weinschel 1R-10
- 30 dB Attenuator, Weinschel 1R-30
- RF Reference Source, 0.050 GHz, Anritsu MA2418A
- DC Power Supply, Anritsu 2000-933

### b. Procedure

1. Connect the DC power supply to the MA2418A Reference Source. (Refer to Figure 3, page 5.)
2. Connect the MA2418A Reference Source to the input of the 560-7N50B RF detector.
3. Connect the RF Detector output to the RF Detector input of the MS2711 Spectrum Analyzer.
4. Connect the DC power supply to the appropriate line voltage to supply power to the MA2418A Reference Source.
5. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Analyzer. (This sets the instrument to the factory preset state.)
6. Press the **MODE** soft key.
7. Use the Up/Down Arrow key to highlight **POWER MONITOR**, then press **ENTER**.
8. Press the **ZERO** soft key to zero the power monitor. When complete, **ZERO ADJ:ON** is displayed in the message area.
9. Verify that the power monitor reading is  $0.0 \text{ dBm} \pm 1 \text{ dB}$ .
10. Connect the output of the MA2418A Reference Source to the two attenuators so as to add 40 dB of attenuation (Figure 3).
11. Connect the MA2418A Reference Source and the attenuators to the input of the 560-7N50B RF detector.
12. Verify that the power monitor reading is now  $-40.0 \text{ dBm} \pm 2 \text{ dB}$ .



**Figure 3.** Power Monitor Verification

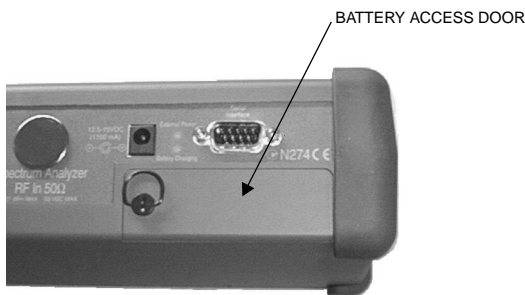
## 8. BATTERY PACK REMOVAL AND REPLACEMENT

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

### NOTE

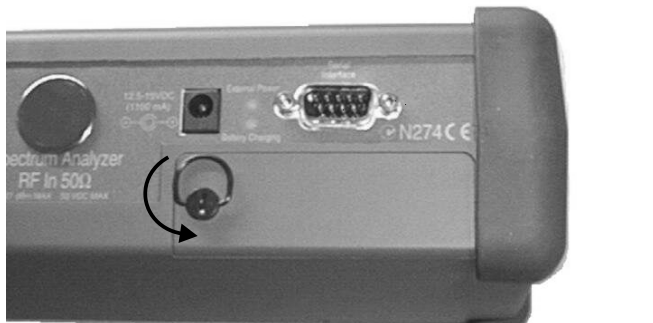
The following procedures apply to many similar instruments. Photos and illustrations may show instruments other than the MS2711 Spectrum Analyzer.

1. With the Spectrum Analyzer standing upright on a stable surface, locate the battery access door (Figure 4).



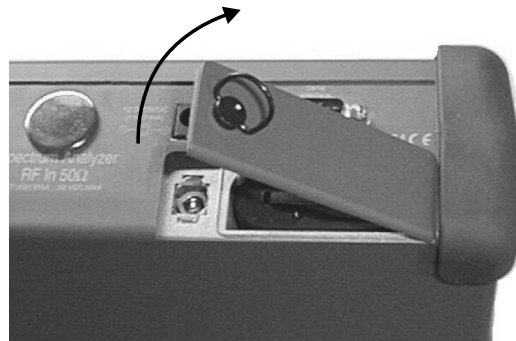
**Figure 4.** Battery Access Door Location

2. Lift up the access door handle and rotate it 90 degrees counterclockwise, as illustrated in Figure 5.

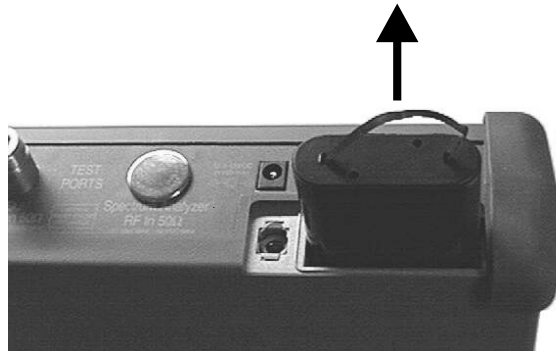


**Figure 5.** Rotate the Battery Access Door Handle

3. Lift the door and remove, as illustrated in Figure 6.
4. Grasp the battery lanyard and pull the battery straight up and out of the unit, as illustrated in Figure 7.

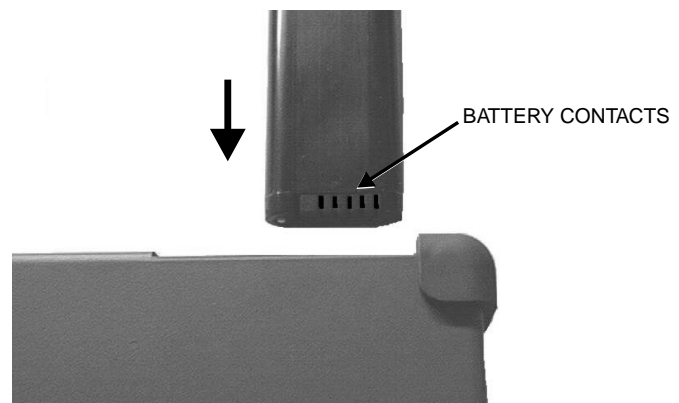


**Figure 6.** Removing the Battery Access Door



**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 rear of the unit (Figure 8).



**Figure 8.** Battery Orientation

## 9. BATTERY INFORMATION

The following information relates to the care and handling of the Spectrum Analyzer battery, and NiMH batteries in general.



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**Figure 9.** *Spectrum Analyzer Battery*

- The Nickel Metal Hydride (NiMH) battery supplied with the Spectrum Analyzer is shipped in a discharged state. Before using the Spectrum Analyzer, the internal battery must first be charged for three hours, either in the Spectrum Analyzer or in the optional battery charger (Anritsu part number: 2000-1029).
  - Use only Anritsu approved battery packs.
  - Recharge the battery only in the Spectrum Analyzer or in an Anritsu approved charger.
  - With a new NiMH battery, full performance is achieved after three to five complete charge and discharge cycles.
  - When the Spectrum Analyzer 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 an NiMH 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.

## 10. FRONT PANEL ASSEMBLY REMOVAL AND REPLACEMENT

This procedure provides instructions for removing and replacing the Spectrum Analyzer front panel assembly. With the front panel assembly removed, the LCD display, keypad PCB, keypad membrane, and main PCB assemblies can be removed and replaced.

1. Place the Spectrum Analyzer face up on a work surface.
2. Remove the four rubber corner bumpers by carefully sliding the bumpers off of the case corners (Figure 12).



**Figure 10.** Removing the Corner Bumpers

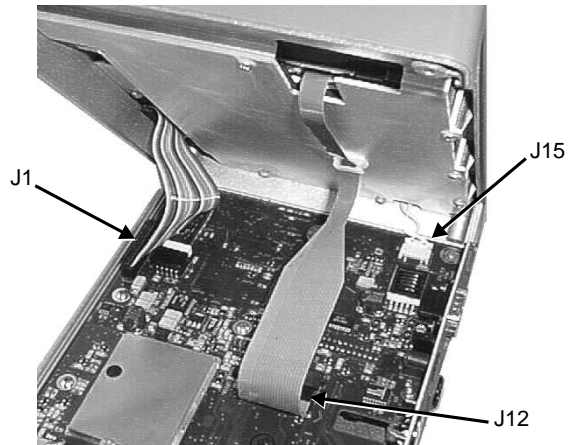
3. With the bumpers removed, the access holes for the case screws are revealed. Use a Phillips screwdriver to remove the four screws securing the two halves of the Spectrum Analyzer case together.
4. Carefully lift up on the right side (as viewed from the front) of the front half of the case and begin to separate the two halves.

### **CAUTION**

Do not force or pull the two halves of the case apart as there are delicate cables attached between the two halves that must be disconnected first.

5. Carefully depress the latch tab and disconnect the LCD display cable from J12 on the main PCB.
6. Carefully disconnect the keypad interface cable from J1 on the main PCB.

7. Carefully disconnect the LCD display backlight cable from J15 on the main PCB.



**Figure 11.** Spectrum Analyzer Front Panel Cable Connections

8. Remove the front panel assembly.
9. Reverse the above steps to replace the front panel assembly.

### **NOTE**

The corner bumpers only mount one way. That is, the raised area inside one end of the bumper (Figure 12) is made to conform to the contour of the front cover only.



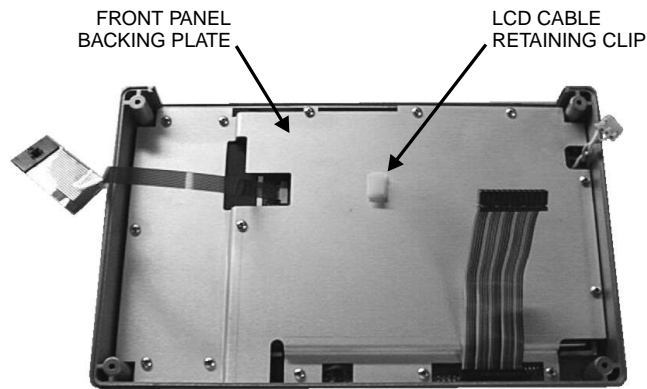
**Figure 12.** Corner Bumper Detail



## 11. LCD ASSEMBLY REPLACEMENT

This procedure provides instructions for removing and replacing the Liquid Crystal Display (LCD) once the front panel assembly has been separated from the Spectrum Analyzer.

1. Remove the front panel assembly as directed in section 10.
2. Place the front panel assembly face down on a protected work surface.
3. Remove the 14 Phillips screws that attach the backing plate to the front panel assembly.
4. Release the LCD display cable from the retaining clip on the front panel backing plate.



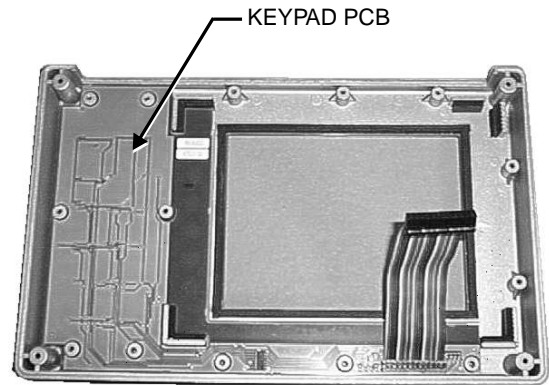
**Figure 13.** Front Panel Backing Plate

5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or connector.
6. Remove the rubber cushion pad from the LCD assembly and remove the assembly.
7. Reverse the above steps to install the replacement assembly.

## 12. KEY PAD PCB REPLACEMENT

This procedure provides instructions for removing and replacing the key pad PCB.

1. Remove the front panel assembly as directed in section 10.
2. Place the front panel assembly face down on a protected work surface.
3. Remove the 14 Phillips screws that attach the backing plate to the front panel assembly.
4. Release the LCD display cable from the retaining clip on the front panel backing plate (Figure 13).
5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or connector.
6. Remove the rubber cushion pad from the key pad PCB and remove the PCB.



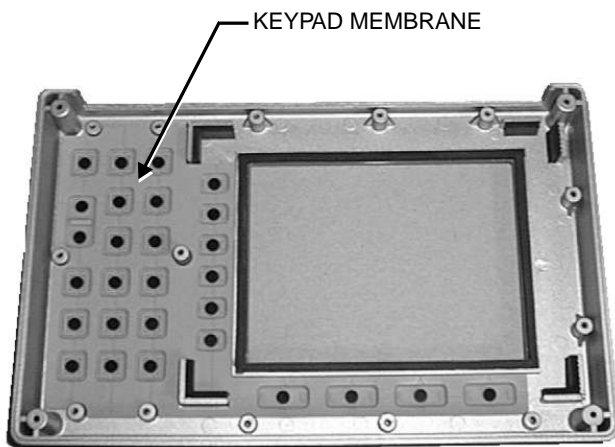
**Figure 14.** Front Panel Keypad PCB Location

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

### 13. KEY PAD MEMBRANE REPLACEMENT

This procedure provides instructions for replacing the key pad membrane.

1. Remove the front panel assembly as directed in section 10.
2. Remove the key pad PCB as directed in section 12.
3. Remove the keypad membrane by gently pulling the membrane up and out of the holes in the front panel.



**Figure 15.** Front Panel Keypad Membrane

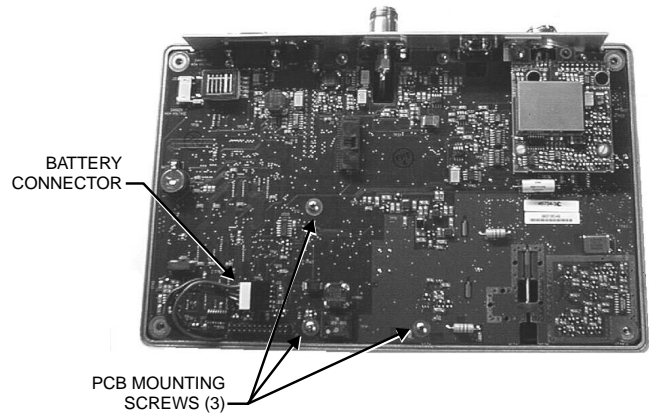
4. Reverse the above steps to install the replacement membrane.

### 14. MAIN PCB ASSEMBLY REPLACEMENT

This procedure provides instructions for replacing the main PCB assembly with the connector panel attached. The assembly consist of two PCBs (Control and RF) which must be replaced together.

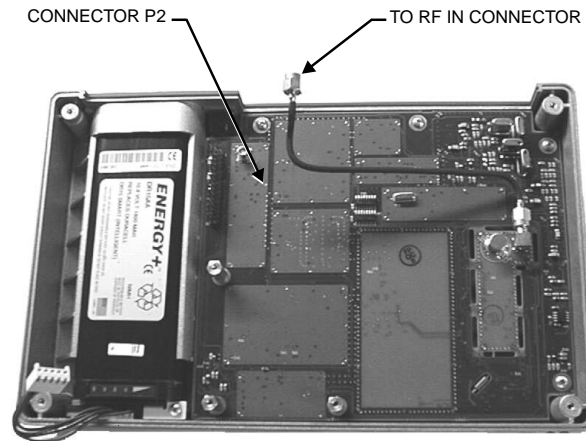
1. Remove the front panel assembly as directed in section 10.
2. Disconnect the battery connector from J13 on the main PCB.
3. Disconnect the semi-rigid coaxial cable from the RF connector on the connector panel.

4. Remove the three PCB mounting screws and remove the Control PCB assembly with the connector panel attached.



**Figure 16.** Control PCB

5. Remove the three .25" standoffs and four Phillips screws and remove the RF PCB.



**Figure 17.** RF PCB

6. Reverse the above steps to install the new main PCB.

#### **NOTE**

The main PCB connector panel fits into grooves in the two halves of the Spectrum Analyzer case. Make sure the panel is correctly aligned with the grooves before reassembling the two halves together.

## 15. REPLACEABLE PARTS

Replaceable parts for the Model MS2711 Spectrum Analyzer are listed below.

**Table 2.** *Replaceable Parts List*

Part Number	Description	Qty
<b>Accessories</b>		
10580-00026	User's Guide, MS2711 Spectrum Analyzer	1
10580-00036	Programming Manual, MS2711 Spectrum Analyzer (available on disk only)	1
2300-347	Software Tools, MS2711 Spectrum Analyzer	1
40-115	Power Supply	1
2000-1029	Battery Charger	
22N50	Precision Short/Open, N Male	1
SM/PL	Connector, RF Termination	1
806-62	Cable Assy, Cig Plug, Female	1
800-441	Serial Interface Cable Assy	1
48258	Soft Carrying Case	1
<b>Replaceable Parts</b>		
510-87	N-Connector	2
551-152	Option 05 Input Connector	1
15-102	Liquid Crystal Display Assy	1
633-27	Rechargeable Battery, NiMH	1
ND51899	MS2711 Logic and Digital Control PCB Assembly	1
ND53263	MS2711 Logic and Digital Control PCB Assembly with Option 05	1
ND53250	Option 05 PCB Assembly	1
47812-3	Keypad PCB Assy	1
46649-1	Membrane Keypad, Main	1

Part Number	Description	Qty
<b>Hardware</b>		
900-861	Pan Head Screw, 4-20, 0.365	15
900-869	Screw, 4-40, 0.875	4
900-720	Screw, 4-40, 0.187	3
900-697	Screw, 4-40, 0.312	3
785-929	M-F Stand off, 4-40, 11/16	3
900-326	Kep Nut, 4-40, 0.187	8
790-516	Hole Plug, 0.6875L	1
790-42	Hole Plug, 0.625	1
761-79	Cap Vinyl, Black, round	1
<b>Case Parts</b>		
46652-1	Top Case only	1
46665	Top Case w/ hardware	1
46653-1	Bottom Case only	1
46664	Bottom Case w/ hardware	1
48231-1	Battery Door	1
790-509 790-510 790-511	Battery Door Latch (3 pieces)	1
46655	Case Corner Bumpers	4
46662	LCD Retainer Plate	1
48241	Foam, LCD Corners	8
48278	Foam, LCD Window	1
46659	Foam, LCD Backing	1
46661	Foam, Keypad Backing	1
48246	Foam, Battery Door	1
48271	Foam, Battery Compartment	1
720-19	Cable Clamp	1
790-515	Spring, Battery Compartment	1
48274	ID Label, Model MS2711	1

***NOTES***

**Table 3.** Anritsu Service Centers

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ANRITSU COMPANY  
685 Jarvis Drive  
Morgan Hill, CA 95037-2809  
Telephone: (408) 776-8300  
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FAX: 201-575-0092

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3 Shenton Way #24-03  
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FAX: 2265207

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12 Surrey Square Office Park  
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FAX: 011-27-11-787-0446

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ANRITSU AB  
Botivd Center  
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8F, No. 96, Section 3  
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***NOTES***

**Anritsu**