

**Maintenance Manual**

# **Site Master Spectrum Analyzer MS2711B**

**Handheld Spectrum Analyzer for Measuring, Monitoring, and  
Analyzing Signal Environments**

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**Manufacturer's Name:** ANRITSU COMPANY

**Manufacturer's Address:** Microwave Measurements Division  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
USA

declares that the product specified below:

**Product Name:** Site Master

**Model Number:** MS2711B

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC  
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## **Electromagnetic Interference:**

**Emissions:** CISPR 11:1990/EN55011: 1991 Group 1 Class A  
EN 61000-3-2:1995 Class A  
EN 61000-3-3:1995 Class A

**Immunity:** EN 61000-4-2:1995/EN50082-1: 1997 - 4kV CD, 8kV AD  
EN 61000-4-3:1997/EN50082-1: 1997 - 3V/m  
ENV 50204/EN50082-1: 1997 - 3V/m  
EN 61000-4-4:1995/EN50082-1: 1997 - 0.5kV SL, 1kV PL  
EN 61000-4-5:1995/EN50082-1: 1997 - 1kV L-L, 2kV L-E  
EN 61000-4-6:1994/EN61326: 1998 - 3V  
EN 61000-4-11:1994/EN61326: 1998 - 100% @ 20msec

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Corporate Quality Director

Morgan Hill, CA

03 Dec 01

Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close,  
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For Chinese Customers Only YLNB

| 部件名称                                   | 有毒有害物质或元素 |           |           |                  |               |                 |
|--|-----------|-----------|-----------|------------------|---------------|-----------------|
|  | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>[Cr (VI)] | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 印刷线路板<br>(PCA)                         | ×         | ○         | ×         | ×                | ○             | ○               |
| 机壳、支架<br>(Chassis)                     | ×         | ○         | ×         | ×                | ○             | ○               |
| LCD                                    | ×         | ×         | ×         | ×                | ○             | ○               |
| 其他(电缆、风扇、<br>连接器等)<br>(Appended goods) | ×         | ○         | ×         | ×                | ○             | ○               |

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环保使用期限

|   |  |
|---|--|
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|---|--|



## Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Company uses the following symbols to indicate safety-related information. For your own safety, please read the information carefully *before* operating the equipment.

### Symbols Used in Manuals

#### Danger



This indicates a very dangerous procedure that could result in serious injury or death, and possible loss related to equipment malfunction, if not performed properly.

#### Warning



This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

#### Caution



This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

### Safety Symbols Used on Equipment and in Manuals

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all of the following five symbols may or may not be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.



This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.



## For Safety

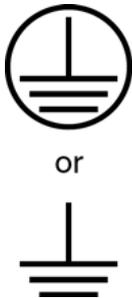
### Warning



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

### Warning



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

### Warning



This equipment can not be repaired by the operator. Do not attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

### Warning



Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

### Caution



Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

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# Chapter 1 — General Information

## 1-1 Introduction

This manual provides maintenance instructions for the MS2711B Spectrum Analyzer. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

## 1-2 Identification Number

All Anritsu instruments are assigned a six-digit serial number, such as “101001”. This number appears on a decal affixed to the back panel of the instrument. Please use this identification number during any correspondence with Anritsu Service Centers about this instrument.

## 1-3 Description

The MS2711B Spectrum Analyzer 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 1-1](#).

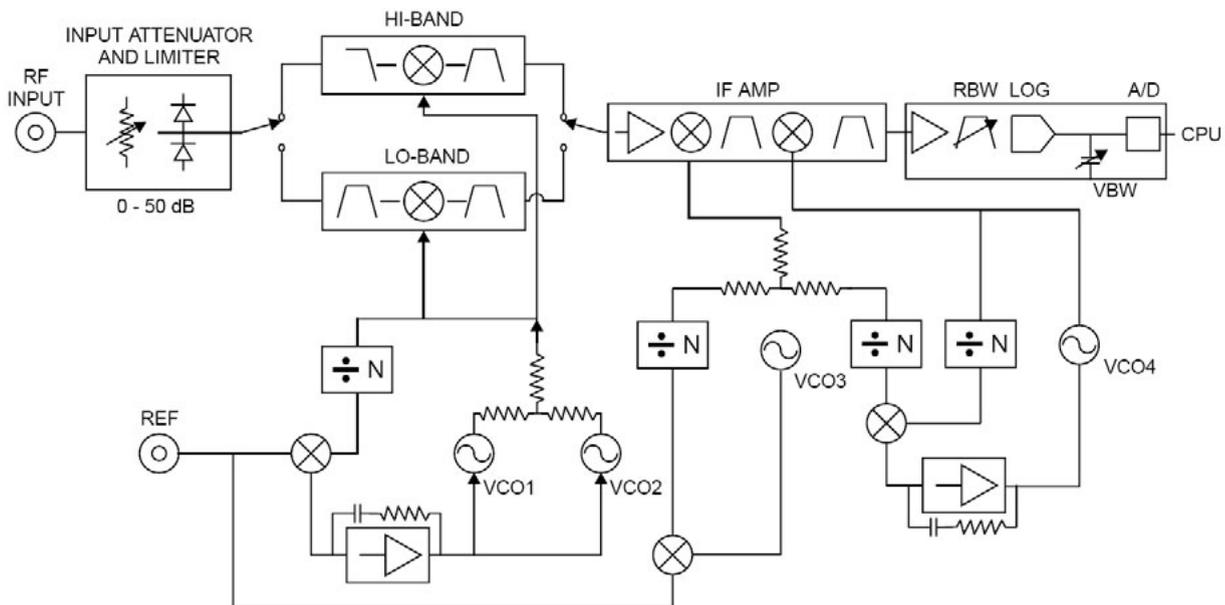


Figure 1-1. MS2711B Spectrum Analyzer Block Diagram

## 1-4 Options

The following options are available for the MS2711B:

- Option 5: RF Wattmeter Power Monitor (RF detector not included)
- Option 8: 3/4 Built-in 20 dB Preamplifier, 1 MHz to 3 GHz
- Option 20: 3/4 Built-in Tracking Generator, 10 MHz to 3 GHz

**Note**

Option 5 and Option 8 are mutually exclusive; that is, they cannot both be installed in the same instrument at the same time.

## 1-5 Replaceable Parts

Replaceable parts for the Model MS2711B Spectrum Analyzer are listed below.

**Table 1-1.** Replaceable Parts List

| Part Number              | Description  | Qty |
|--------------------------|--|-----|
| <b>Accessories</b>       |  |     |
| 10580-00074              | User Guide, MS2711B Spectrum Analyzer                                  | 1   |
| 10580-00071              | Programming Manual, MS2711B Spectrum Analyzer (available on disk only) | 1   |
| 2300-347                 | Software Tools, MS2711B Spectrum Analyzer                              | 1   |
| 40-115                   | Power Supply   | 1   |
| 2000-1029                | Battery Charger  | 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  | 1   |
| 551-152                  | Option 05 Input Connector  | 1   |
| 15-102                   | Liquid Crystal Display Assy  | 1   |
| 633-27                   | Rechargeable Battery, NiMH   | 1   |
| ND58427                  | MS2711B PCB Assembly   | 1   |
| ND58428                  | MS2711B PCB Assembly with Option 05                                    | 1   |
| ND58429                  | MS2711B PCB Assembly with Option 8                                     | 1   |
| ND58430                  | MS2711B PCB Assembly with Option 20                                    | 1   |
| ND58431                  | MS2711B PCB Assembly with Option 05 and Option 20                      | 1   |
| ND58432                  | MS2711B PCB Assembly with Option 08 and Option 20                      | 1   |
| 52737-3                  | Keypad PCB Assy  | 1   |
| 46649-3                  | Membrane Keypad, Main  | 1   |
| ND56502                  | Speaker and Cable Assembly   | 1   |
| <b>Hardware</b>          |  |     |
| 900-861                  | Pan Head Screw, 4-20, 0.365  | 18  |
| 900-869                  | Screw, 4-40, 0.875   | 4   |
| 900-720                  | Screw, 4-40, 0.187   | 9   |
| 900-697                  | Screw, 4-40, 0.312   | 3   |
| 900-326                  | Kep Nut, 4-40, 0.187   | 12  |

Table 1-1. Replaceable Parts List (Continued)

| Part Number                   | Description                   | Qty |
|-------------------------------|-------------------------------|-----|
| <b>Hardware (Continued)</b>   |                               |     |
| 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>             |                               |     |
| 46652-4                       | Top Case                      | 1   |
| 46653-1                       | Bottom Case                   | 1   |
| 48231-1                       | Battery Door                  | 1   |
| 790-509<br>790-510<br>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   | 3   |
| 55212                         | ID Label, Model MS2711B       | 1   |



# Chapter 2 — Performance Verification

## 2-1 Performance Verification Procedures

The following procedures can be used to verify the performance of the MS2711B Spectrum Analyzer having firmware version 2.09 or later.

## 2-2 Frequency Accuracy

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

### Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with Option 15A, or equivalent
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- 10 MHz Reference Standard
- BNC male to BNC male coaxial cable

### Procedure:

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the source to the MS2711B RF Input.
3. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
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 MG3692A Synthesized Signal Source.
6. Set the MG3692A output to 2000 MHz CW with an RF output level of 0 dBm.

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

7. On the MS2711B, 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 2000 and press the **ENTER** key to set the center frequency to 2000 MHz.
11. Press the SPAN soft key and enter 50. Press the kHz soft key to set the span to 50 kHz.
12. Press the **BW/SWEEP** key.
13. Press the RBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz, and press **BACK**.
14. Press the VBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
15. Press the **MARKER** (8) key, then the M1 soft key.
16. Press the EDIT soft key and use the **Up/Down** arrow key to center the marker on the waveform. Verify that the marker frequency is 2000 MHz  $\pm$ 4 kHz.

## 2-3 Phase Noise Verification

### Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with Option 2A, Option 4, and Option 15A, or equivalent
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent

### Procedure:

1. Connect the output of the source to the MS2711B RF Input.
2. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
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.)

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

4. Set the MG3692A output to 1000 MHz CW with an RF output level of  $-30$  dBm.
5. On the MS2711B, press the **BW/SWEEP** key.
6. Press the RBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz, and then press **BACK**.
7. Press the VBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
8. On the MS2711B, press the **FREQ/SPAN** key and the **CENTER** soft key.
9. Enter 1000 and press the **MHz** soft key to set the center frequency to 1000 MHz.
10. Press the **SPAN** soft key and enter 0.1. Press the **MHz** soft 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 the **ENTER** key to set the reference level to  $-27$  dBm.
13. Press the **MARKER** (8) key, then the **M1** soft key.
14. Press **EDIT** and enter 1000. Press the **MHz** soft key 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 1000.03. Press **MHz** 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 **SINGLE/CONT** (+/-) key and read and record the D2 reading.
19. Press the **SINGLE/CONT** (+/-) key to read and record five values, then calculate the average of the five recorded values.
20. Subtract 40 dB from the average value and verify that the result is  $\leq -75$  dBc/Hz.  
(For example:  $-35$  dBc measured  $-40$  dB =  $-75$  dBc/Hz.)

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

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

**Note**

At 10 kHz RBW,  $10 \times \log\left(\frac{\text{RBW}}{1\text{Hz}}\right) = 40$ , so

$$\frac{\text{dBc}}{\text{Hz}} = -|\text{measured} \cdot \text{dBc}| - 40$$

21. Press the **BACK** soft key and the **M3** soft key.
22. Press the **EDIT** key and enter 999.970. Press **MHz** to set the **M3** marker frequency to 999.970 MHz (30 kHz lower than the center frequency).
23. Press the **DELTA (M3-M1)** soft key.
24. Press the **SINGLE/CONT (+/-)** key. Read and record the  $\Delta 3$  reading.
25. Press the **SINGLE/CONT (+/-)** key to read and record five values, then calculate the average of the five recorded values.

Subtract 40 dB from the average value and verify that the result is  $\leq -75$  dBc/Hz.

(For example:  $-35$  dBc measured  $-40$  dB =  $-75$  dBc/Hz)

## 2-4 Second Harmonic Distortion Test

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

### Equipment Required:

- Anritsu MG3692A Synthesized Signal Source with Option 2A, Option 4, and Option 15A, or equivalent
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- 10 MHz Reference Standard
- 50 MHz Low Pass Filter (Anritsu part number 1030-96)
- BNC male to BNC male coaxial cable

### 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 Analyzer RF Input with the RF coaxial cable.
3. Connect the external power supply (Anritsu part number 40-115) to the Site Master.
4. On the MS2711B, 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 MG3692A Synthesized Signal Source.
6. Set the MG3692A output to 40 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.

7. On the Spectrum Analyzer, press the **AMPLITUDE** key and the REF LEVEL soft key.
8. Enter  $-27$  and press the **ENTER** key to set the Reference Level to  $-27$  dBm.
9. Press the **SCALE** soft key and enter 7, then press **ENTER**.
10. Press the **FREQ/SPAN** key and then the **CENTER** soft key.
11. Enter 40 and press the **MHz** soft key to set the center frequency to 40 MHz.
12. Press the **SPAN** soft key and enter 0.2. Press the **MHz** soft key to set the span to 0.200 MHz.
13. Press the **BW/SWEEP** key.
14. Press the **RBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz and press **BACK**.
15. Press the **VBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
16. Press the **MARKER (8)** key, then the **M1** soft key.
17. Press the **EDIT** soft key, then enter 40. Press the **MHz** soft key to set M1 to 40 MHz.
18. On the MG3692A Synthesized Signal Source, adjust the output level so that the M1 reading of the Spectrum Analyzer is  $-30$  dBm at 40 MHz.
19. On the Spectrum Analyzer, press the **FREQ/SPAN** key and then the **CENTER** soft key.
20. Enter 80 and press the **MHz** soft key to set the center frequency to 80 MHz.
21. Press the **MARKER (8)** key and the **M1** soft key.
22. Press the **EDIT** soft key, then enter 80. Press the **MHz** soft key to set M1 to 80 MHz.
23. Record the amplitude of the signal at M1 80 MHz:  
 Second Harmonic Level @ 80 MHz = \_\_\_\_\_ dBm

24. Convert this measured value to dBc using the following formula:

Input Related Spurious Response (dBc) =  
[Second Harmonic Level @ 80 MHz] + 30 dBm = \_\_\_\_ dBc

Specifications for this measurement are -45 dBc with -30 dBm into the first mixer.

## 2-5 Residual Spurious Response Test

The following test can be used to verify the residual spurious response of the Spectrum Analyzer.

### Equipment Required:

Anritsu 28N50-2 or SM/PL 50 ohm Termination or equivalent

### Procedure:

1. Connect the 50 ohm termination to the Spectrum Analyzer RF Input.
2. On the Spectrum Analyzer, 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.)

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

3. On the Spectrum Analyzer, press the **AMPLITUDE** key and the REF LEVEL soft key.
4. Enter  $-75$  and press the **ENTER** key to set the Reference Level to  $-75$  dBm.
5. Press the SCALE soft key and enter 5, then press **ENTER**.
6. Press the **BW/SWEEP** key.
7. Press the RBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz, and press **BACK**.
8. Press the VBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 100 Hz, and press **ENTER** to set the video bandwidth to 100 Hz.
9. Press the **FREQ/SPAN** key and the START soft key.
10. Enter 500 and press the kHz soft key to set the start frequency to 500 kHz.
11. Press the STOP soft key and enter 4, then press the MHz soft key to set the stop frequency to 4 MHz.
12. Wait until one full sweep is complete.
13. Press the **MARKER** (8) key and then the M1 soft key.
14. Press the ON/OFF soft key and then the MARKER TO PEAK soft key.
15. Record the M1 amplitude reading and verify whether it is less than or equal to  $-90$  dBm.

|  |
|--|
| <b>Note</b> If a spur with an amplitude larger than $-90$ dBm occurs, then 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. |
|--|

16. Press the **BW/SWEEP** key.
17. Press the VBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 3 kHz, and press **ENTER** to set the video bandwidth to 3 kHz.
18. Press the **FREQ/SPAN** key and the START soft key.
19. Enter 4 and press the MHz soft key to set the start frequency to 4 MHz.
20. Press the STOP soft key and enter 1000, then press the MHz soft key to set the stop frequency to 1000 MHz.
21. Wait until one full sweep is complete.
22. Press the **MARKER** (8) key and then the M1 soft key.
23. Press the ON/OFF soft key and then the MARKER TO PEAK soft key.
24. Record the M1 amplitude reading and verify that it is  $\leq -90$  dBm.
25. Press the **FREQ/SPAN** key and the START soft key.

26. Enter 1000 and press the MHz soft key to set the start frequency to 1000 MHz.
27. Press the STOP soft key and enter 2000, then press MHz soft key to set the stop frequency to 2000 MHz.
28. Wait until one full sweep is complete.
29. Press the **MARKER** (8) key and then the M1 soft key.
30. Press the ON/OFF soft key and then the MARKER TO PEAK soft key.
31. Record the M1 amplitude reading and verify that it is  $\leq -90$  dBm.
32. Press the **FREQ/SPAN** key and the START soft key.
33. Enter 2000 and press the MHz soft key to set the start frequency to 2000 MHz.
34. Press the STOP soft key and enter 3000, then press the MHz soft key to set the stop frequency to 3000 MHz.
35. Wait until one full sweep is complete.
36. Press the **MARKER** (8) key and then the M1 soft key.
37. Press the ON/OFF soft key and then the MARKER TO PEAK soft key.
38. Record the M1 amplitude reading and verify that it is  $\leq -90$  dBm.

## 2-6 Level Accuracy Test

This test verifies the level accuracy of the Spectrum Analyzer.

### Equipment Required:

Anritsu MG3692A Synthesized Signal Source, with Option 2A, Option 4, and Option 15A

Anritsu ML2430A-Series Power Meter or equivalent

Anritsu MA2442A High Accuracy Power Sensor or equivalent

Anritsu N241A50 Power Splitter or equivalent

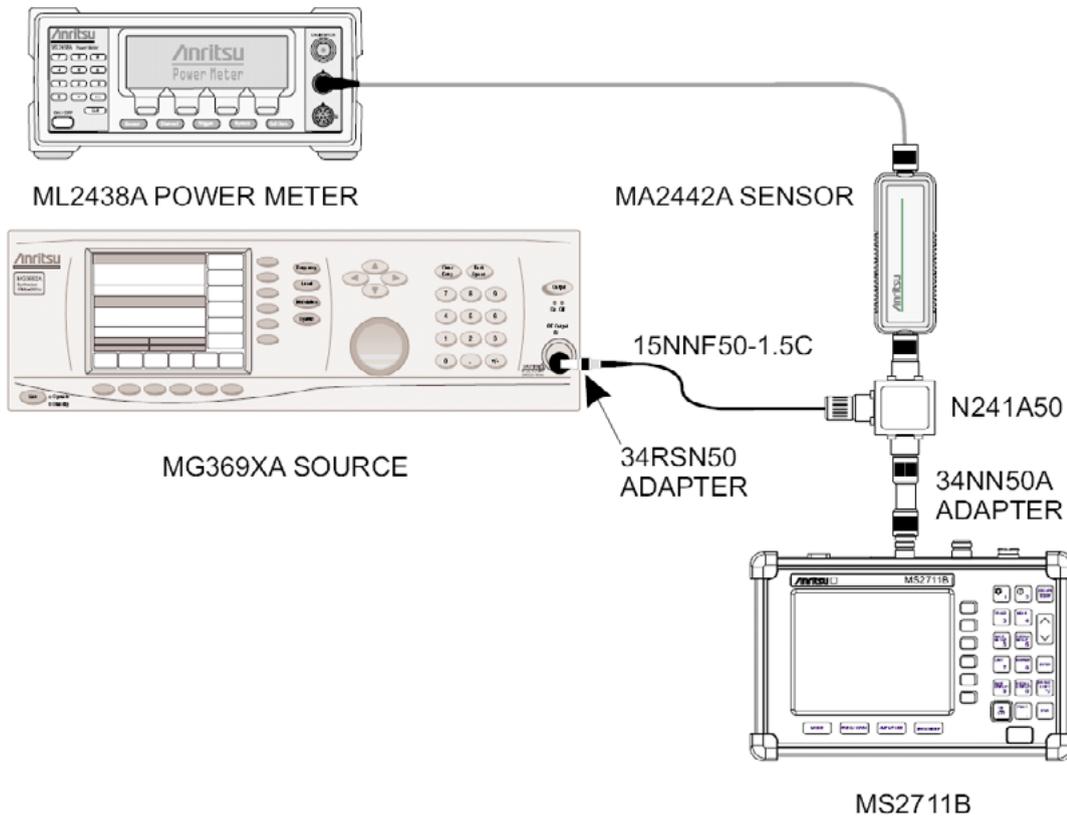
Anritsu 34NN50A 50 ohm adapter or equivalent

Anritsu 34RSN50 50 ohm adapter or equivalent

Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent

### Procedure:

1. Connect the power sensor to the power meter and calibrate the sensor.
2. Using the power splitter, coaxial cable and adapters, connect the Spectrum Analyzer to the signal source and the power sensor as shown in [Figure 2-1](#)



**Figure 2-1.** Measurement Accuracy Setup

3. Connect the external power supply (Anritsu part number 40-115) to the Spectrum Analyzer.
4. On the Spectrum Analyzer, 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 power meter and signal source.

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

6. On the Spectrum Analyzer, press the **BW/SWEEP** key.
7. Press the **RBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
8. Press **BACK**, then the **VBW** soft key, and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
9. Press **BACK**, then **DETECTION**, then **AVERAGE**.
10. Press the **FREQ/SPAN** key.
11. Press the **SPAN** soft key and enter 0.5, then press the **MHZ** key to set the span to 0.5 MHz.
12. Press the **AMPLITUDE** key.
13. Press the **REF LEVEL** soft key, enter -20, and press the **ENTER** key to set the reference level to -20 dBm.
14. Press the **FREQ/SPAN** key and the **CENTER** soft key.
15. Enter 50 and press the **MHZ** soft key to set the center frequency to 50 MHz.
16. On the Anritsu ML2430A-Series Power Meter, press the **Sensor** key and then the **CalFactor** soft key. Press 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.
17. Set the MG3692A power level to -30 dBm as indicated on the power meter.
18. Verify that the M1 reading is within  $\pm 1$  dBm maximum from the input signal.

## 2-7 Dynamic Range Test

This test can be used to verify the dynamic range of the Spectrum Analyzer.

### Equipment required:

- Two Anritsu MG3692A Synthesized Signal Sources with Option 2A, Option 4, and Option 15A, or equivalent
- Anritsu N241A50 Power Splitter or equivalent
- Anritsu 34NN50A 50 ohm adapter or equivalent
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Two Anritsu 15NNF50-1.5C RF Coaxial Cables or equivalent

### Procedure:

1. Connect the output of the Power Splitter to the RF In port of the Spectrum Analyzer.
2. Connect the output of both signal sources to the input of the Power Splitter and turn on both sources.
3. On the Spectrum Analyzer, 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.)

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

4. Set the center frequency of the first source to 1.0 GHz, and set the center frequency of the second source to 1.2 GHz.
5. On the Spectrum Analyzer, press the **FREQ/SPAN** key.
6. Press the **CENTER** soft key, enter 1100, and press the **MHz** soft key to set the center frequency to 1100 MHz.
7. Press the **SPAN** soft key and enter 500, then press the **MHz** key to set the span to 500 MHz.
8. Press the **AMPLITUDE** key and then the **REF LEVEL** soft key.
9. Enter -20 and then press the **ENTER** key to set the reference level to -20 dBm.
10. Press the **BW/SWEEP** key.
11. Press the **RBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 30 kHz, then press **ENTER** to set the resolution bandwidth to 30 kHz.
12. Press **BACK**, then the **VBW** soft key, and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 30 kHz, then press **ENTER** to set the video bandwidth to 30 kHz.
13. Adjust the signal levels of both signal sources so that both signal peaks are at -20 dBm as indicated on the Spectrum Analyzer display.
14. Refer to Step 10 through Step 12, and set the RBW to 10 kHz and the VBW to 1 kHz.
15. When the sweep is complete, reduce the power level of the second source signal to below -85 dBm and verify that the signal is visible at below -85 dBm.

## 2-8 Power Monitor (Option 5) Verification

If the Power Monitor is installed in the Spectrum Analyzer, then 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.

### Equipment Required:

RF Detector, 10 MHz to 20 GHz, Anritsu 560-7N50B

10 dB Attenuator, Weinschel 1-10

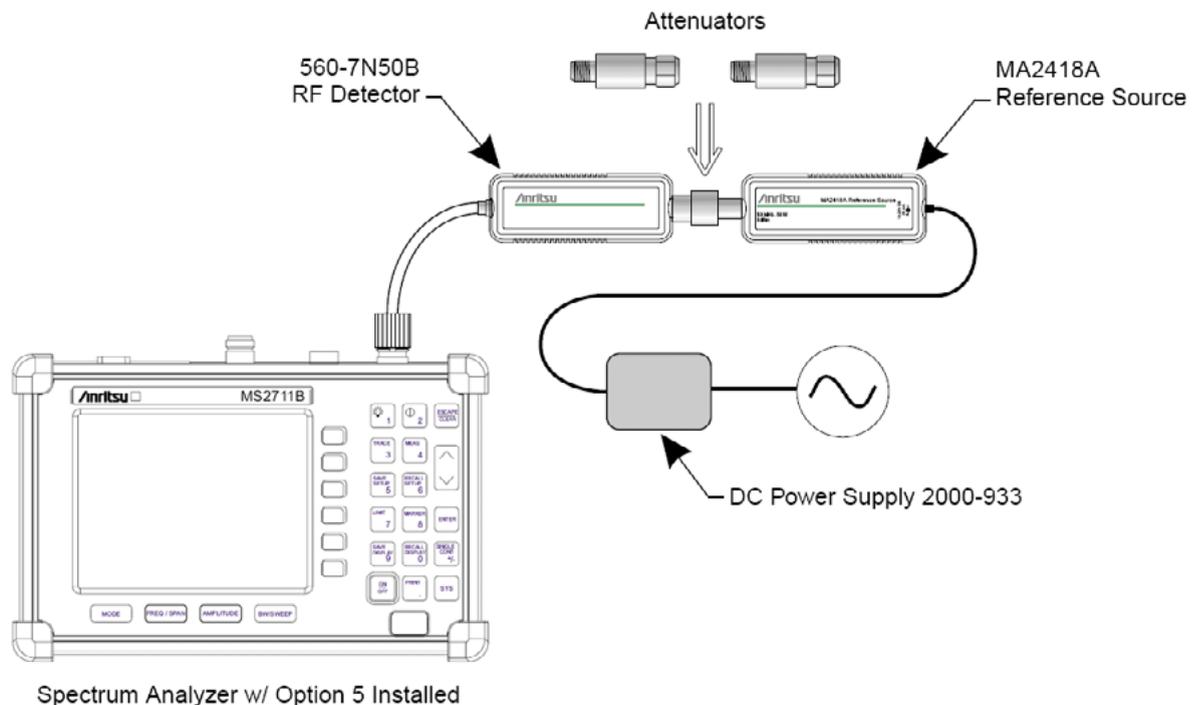
30 dB Attenuator, Weinschel 1-30

RF Reference Source, 0.050 GHz, Anritsu MA2418A

DC Power Supply, Anritsu 2000-933

### Procedure

1. Connect the DC power supply to the MA2418A Reference Source. (Refer to [Figure 2-2](#).)
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 MS2711B Spectrum Analyzer.
4. Connect the DC power supply to the appropriate line voltage in order to supply power to the MA2418A Reference Source.



**Figure 2-2.** Power Monitor Verification

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 dBm  $\pm$ 1 dB.
10. Connect the output of the MA2418A Reference Source to the two attenuators so as to add 40 dB of attenuation (refer to [Figure 2-2](#)).
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  $-40.0$  dBm  $\pm$ 2 dB.

## 2-9 Preamplifier (Option 8) Verification

If the Preamplifier (Option 8) is installed in the Spectrum Analyzer, then the following tests can be used to verify the functionality of the Preamplifier.

### Displayed Average Noise Level (DANL)

This test verifies the performance of the displayed average noise level with the Preamplifier turned on.

#### Equipment Required:

Anritsu 28N50-2 or SM/PL 50 ohm Termination or equivalent

#### Procedure:

1. Connect the 50 ohm termination to the MS2711B RF Input.
2. On the Spectrum Analyzer, 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.)

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

3. On the MS2711B, press the **AMPLITUDE** key and the REF LEVEL soft key.
4. Enter  $-75$  and press the **ENTER** key to set the Reference Level to  $-75$  dBm.
5. Press the **SCALE** soft key and enter 5, then press **ENTER**.
6. Press the **BW/SWEEP** key.
7. Press the **DETECTION** soft key, then press the **AVERAGE** soft key, then press **BACK**.
8. Press the **RBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 10 kHz.
9. Press **ENTER** to set the resolution bandwidth to 10 kHz, and press the **BACK** soft key.
10. Press the **VBW** soft key and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 100 Hz. Press **ENTER** to set the video bandwidth to 100 Hz.
11. Press the **MEAS** (4) key and then press the **PREAMP** soft key to turn the Preamplifier on.
12. Press the **FREQ/SPAN** key and the **START** soft key.
13. Enter 1 and press the **MHZ** soft key to set the start frequency to 1 MHz.
14. Press the **STOP** soft key and enter 4, then press the **MHZ** soft key to set the stop frequency to 4 MHz.
15. Wait until a full sweep is complete.
16. Press the **MARKER** (8) key and then press the **M1** soft key.
17. Press the **MARKER TO PEAK** soft key. Record the M1 amplitude reading and verify that it is  $\leq -115$  dBm.
18. Press the **BW/SWEEP** key.
19. Press the **VBW** soft key, and then the **MANUAL** soft key. Use the **Up/Down** arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
20. Press the **FREQ/SPAN** key and the **START** soft key.
21. Enter 4 and press the **MHZ** soft key to set the start frequency to 4 MHz.

22. Press the **STOP** soft key and enter 1000, then press the **MHZ** soft key to set the stop frequency to 1000 MHz.
23. Wait until a full sweep is complete.
24. Press the **MARKER** (8) key and then press the **M1** soft key.
25. Press the **MARKER TO PEAK** soft key. Record the M1 amplitude reading and verify that it is  $\leq -115$  dBm.
26. Press the **FREQ/SPAN** key and the **START** soft key.
27. Enter 1000 and press the **MHZ** soft key to set the start frequency to 1000 MHz.
28. Press the **STOP** soft key, enter 2000, and press the **MHZ** soft key to set the stop frequency to 2000 MHz.
29. Wait until a full sweep is complete.
30. Press the **MARKER** (8) key and then press the **M1** soft key.
31. Press the **MARKER TO PEAK** soft key. Record the M1 amplitude reading and verify that it is  $\leq -115$  dBm.
32. Press the **FREQ/SPAN** key and the **START** soft key.
33. Enter 2000 and press the **MHZ** soft key to set the start frequency to 2000 MHz.
34. Press the **STOP** soft key and enter 3000, then press **MHZ** soft key to set the stop frequency to 3000 MHz.
35. Wait until a full sweep is complete.
36. Press the **MARKER** (8) key and then press the **M1** soft key.
37. Press the **MARKER TO PEAK** soft key. Record the M1 amplitude reading and verify whether it is  $\leq -115$  dBm.

## 2-10 Level Accuracy Test

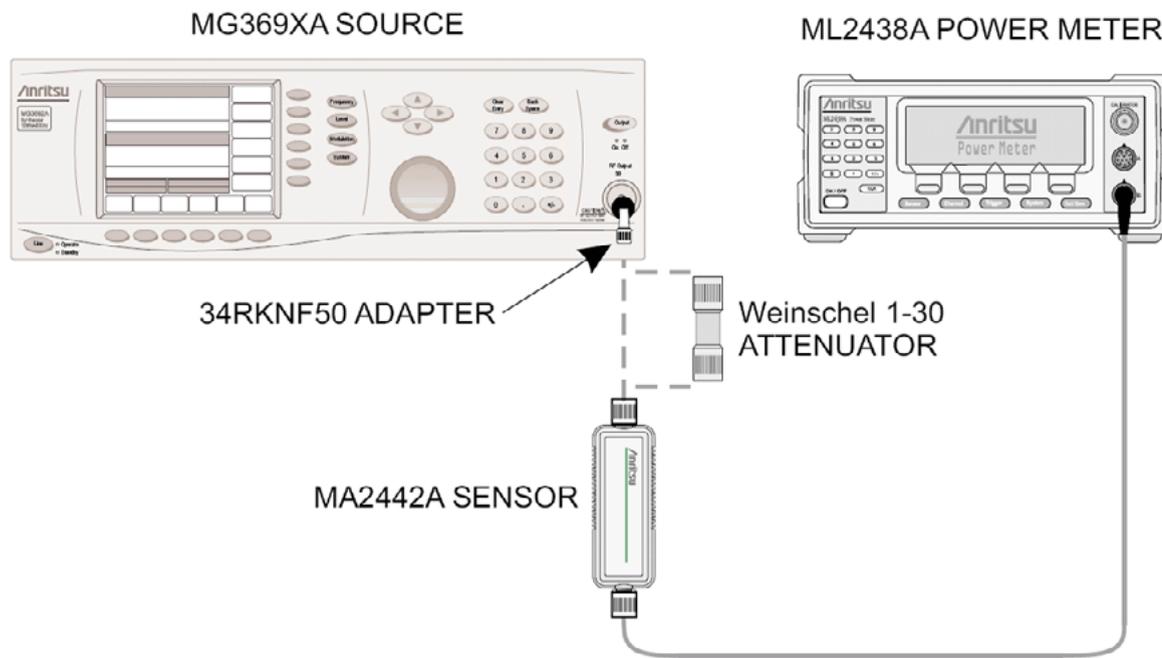
This test verifies the level accuracy of the spectrum analyzer with the Preamplifier turned on.

### Equipment Required:

- Anritsu MG3692A Synthesized Signal Source, with Option 2A, Option 4, and Option 15A
- Anritsu ML2430A-Series Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensor or equivalent
- Anritsu N241A50 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 1-30 Fixed Attenuator, 30 dB

### Procedure:

1. Connect the power sensor to the power meter and calibrate the sensor.
2. Connect the power meter, source, sensor, and attenuator as shown in [Figure 2-3](#).

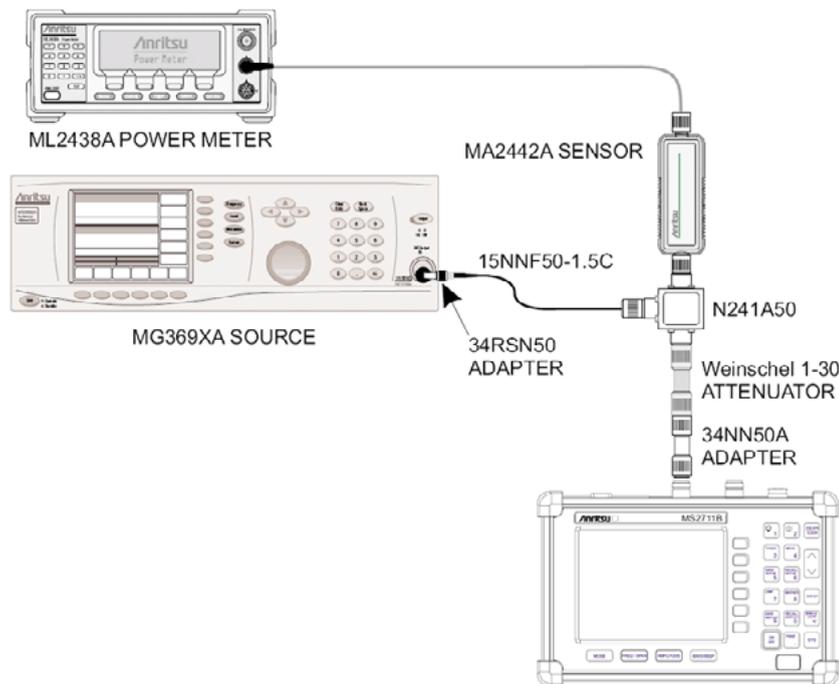


**Figure 2-3.** Power Meter Setup

3. 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.
4. Set the MG3692A output power level to 5 dBm.
5. Set the MG3692A output to 50 MHz CW.
6. Connect the power sensor to the RF output of the MG3692A. Record the output power level in [Table A-1](#), “Preamplifier Level Accuracy Test Settings” on page A-2 in [Appendix A](#) “Test Records”.
7. Connect the 30 dB Fixed Attenuator between the RF output of the MG3692A and the power sensor.

8. Enter the proper input signal frequency into the power meter and record the measured value in [Table A-1](#).
9. Calculate the Attenuator Insertion Loss using the following formula:  

$$\text{Attenuator Loss} = \text{Output Power @ Source} - \text{Output Power @ Attenuator}$$
10. Disconnect the 30 dB Fixed Attenuator.
11. Repeat Step 6 through Step 10 for frequencies of 500 MHz, 1000 MHz, 1500 MHz, 2000 MHz, 2500 MHz and 2950 MHz.
12. Using the power splitter, coaxial cable, adapters, and fixed attenuator, connect the MS2711B to the signal source and to the power sensor as shown in [Figure 2-4](#).



**Figure 2-4.** Level Accuracy Setup

13. Calculate the output power level that is required at the power splitter end that is connected to the power sensor in order to provide the desired power level at the MS2711B RF Input. Record the calculated value in [Table A-2](#), “Attenuator Characterization” on page A-3 in [Appendix A](#) “Test Records”.
14. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
15. On the Spectrum Analyzer, 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.)
16. Turn on the power meter and signal source.

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

17. Press the **BW/SWEEP** key.
18. Press the RBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
19. Press **BACK**, then the VBW soft key and then the MANUAL soft key. Use the **Up/Down** arrow key to select 3 kHz, then press **ENTER** to set the video bandwidth to 3 kHz.
20. Press **BACK**, then **DETECTION**, then **AVERAGE**, and then press **BACK**.

21. Press the **MEAS** (4) key and then press the **PREAMP** soft key to turn the Preamplifier on.
22. Press the **FREQ/SPAN** key.
23. Press the **SPAN** soft key and enter 0.5, then press the **MHz** key to set the span to 0.5 MHz.
24. Press the **AMPLITUDE** key.
25. Press the **REF LEVEL** soft key and enter -40, and then press the **ENTER** key to set the reference level to -40 dBm.
26. Press the **FREQ/SPAN** key and the **CENTER** soft key.
27. Enter 50 and press the **MHz** soft key to set the center frequency to 50 MHz.
28. On the power meter, press the **Sensor** key and then the **CalFactor** soft key. Press the **FREQ** soft key, then use the keypad to enter 50 MHz for the Input signal Frequency. This sets up the power meter to use the proper power sensor Cal Factor. Press the **Sensor** key to display the power reading.
29. Set the MG3692A output to 50 MHz CW and the power level to the value that was recorded in the Required Power Meter Level column of [Table A-2, “Attenuator Characterization” on page A-3 in Appendix A “Test Records”](#) for -50 dBm, as indicated on the power meter.

|             |   |
|-------------|---|
| <b>Note</b> | To insure accuracy, set the output of the signal source by using the power meter reading. Do not rely on the signal source display. |
|-------------|---|

30. On the MS2711B, press the **MARKER** (8) key, then the **M1** soft key.
31. Press the **MARKER TO PEAK** soft key to position the marker at the center of the response for the test frequency.
32. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal, and record the M1 reading in [Table A-3, “Preamplifier Level Accuracy Test Results” on page A-4 in Appendix A](#).
33. Press the **AMPLITUDE** key.
34. Press the **REF LEVEL** soft key and enter -45, and then press the **ENTER** key to set the reference level to -45 dBm.
35. Set the MG3692A power level to the value that was recorded in the Required Power Meter Level column of [Table A-2, “Attenuator Characterization” on page A-3 in Appendix A](#) for -55 dBm, as indicated on the power meter.
36. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal, and record the M1 reading in [Table A-3](#).
37. Press the **AMPLITUDE** key.
38. Press the **REF LEVEL** soft key and enter -50. Press **ENTER** to set the reference level to -50 dBm.
39. Set the MG3692A power level to the value that was recorded in the Required Power Meter Level column of [Table A-2](#) for -60 dBm, as indicated on the power meter.
40. Verify that the M1 reading is  $\pm 2$  dB maximum from the input signal, and record the M1 reading in [Table A-3](#).
41. Repeat Step [24](#) 24 through Step [40](#) 40 for frequencies of 500 MHz, 1000 MHz, 1500 MHz, 2000 MHz, 2500 MHz and 2950 MHz.

## 2-11 Tracking Generator (Option 20) Verification

If the Tracking Generator (Option 20) is installed in the Spectrum Analyzer, then the following tests can be used to verify the functionality of the tracking generator.

### Output Level Accuracy Test

This test verifies the output level accuracy of the tracking generator.

#### Equipment Required:

- Anritsu ML2430A Series Power Meter
- Anritsu MA2442A High Accuracy Power Sensor

#### Procedure:

1. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
2. On the Spectrum Analyzer, 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.)
3. Press the **ON/OFF** key to turn off the instrument.
4. Press and hold the **1** key, **5** key, and **9** key simultaneously, and then press the **ON/OFF** key to turn on the Spectrum Analyzer in the service mode.

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

5. Press the **MODE** key. Use the **Up/Down** arrow key to select TRACKING GENERATOR and press the **ENTER** key.
6. Press the **SYS** key.
7. Press the **SERVICE** soft key, then the **TG** soft key, and then the **TG POWER STATE** soft key twice in order to switch the state to **ON**.
8. Press the **FREQ/SPAN** key.
9. Press the **SPAN** and then the **ZERO** soft keys.
10. Connect the Power Sensor to the Power Meter Calibrator output.
11. On the Power Meter, press the **Cal/Zero** key and then the **Zero/Cal** soft key. Wait until the Power Meter completes the zeroing of the Power Sensor.
12. Disconnect the Power Sensor from the Power Meter Calibrator output and connect it to the RF Out connector of the MS2711B Spectrum Analyzer.
13. On the Power Meter, press the **Sensor** key and then the **CalFactor** soft key.
14. Press the **FREQ** soft key, then use the keypad to enter 10 MHz for the Input signal Frequency. This sets up the Power Meter to use the proper Power Sensor Cal Factor.
15. Press the **Sensor** key to display the measurement reading.
16. On the Spectrum Analyzer, press the **FREQ/SPAN** key and then the **CENTER** soft key.
17. Enter 10 and press the **MHz** soft key.
18. Press the **AMPLITUDE** key and then the **TG OUTPUT LEVEL** soft key.
19. Enter -50 and then press the **ENTER** key to set the tracking Generator output power level to -50 dBm.
20. On the power meter, verify that the reading is  $\pm 4$  dB maximum from the set power level, and record the reading in [Table A-4, "Tracking Generator Option Level Accuracy" on page A-5 in Appendix A "Test Records"](#).
21. On the Spectrum Analyzer, press the **TG OUTPUT LEVEL** soft key. Enter -40 and press the **ENTER** key. This sets the tracking generator power output level to -40 dBm.

22. On the power meter, verify that the reading is  $\pm 1.5$  dB maximum from the set power level, and record the reading in [Table A-4](#).
23. On the Spectrum Analyzer, press the TG OUTPUT LEVEL soft key. Enter  $-30$  and press the **ENTER** key. This sets the tracking generator power output level to  $-30$  dBm.
24. On the power meter, verify that the reading is  $\pm 1.5$  dB maximum from the set power level, and record the reading in [Table A-4](#).
25. On the Spectrum Analyzer, press the TG OUTPUT LEVEL soft key. Enter  $-20$  and press the **ENTER** key. This sets the tracking generator power output level to  $-20$  dBm.
26. On the power meter, verify that the reading is  $\pm 1.5$  dB maximum from the set power level, and record the reading in [Table A-4](#).
27. On the Spectrum Analyzer, press the TG OUTPUT LEVEL soft key. Enter  $-10$  and press the **ENTER** key. This sets the tracking generator power output level to  $-10$  dBm.
28. On the power meter, verify that the reading is  $\pm 1.5$  dB maximum from the set power level, and record the reading in [Table A-4](#).
29. On the Spectrum Analyzer, press the TG OUTPUT LEVEL soft key. Enter  $0$  and press the **ENTER** key. This sets the tracking generator power output level to  $0$  dBm.
30. On the power meter, verify that the reading is  $\pm 1.5$  dB maximum from the set power level, and record the reading in [Table A-4](#).
31. Repeat Step [13](#) through Step [30](#) for frequencies of  $100$  MHz,  $500$  MHz,  $1000$  MHz,  $1500$  MHz,  $2060$  MHz,  $2061$  MHz,  $2500$  MHz and  $3000$  MHz.

## Tracking Generator Harmonics And Spurious Test

This test verifies the second harmonics and spurious generated from the tracking generator.

### Equipment Required:

- Anritsu MS2665C Spectrum Analyzer or equivalent
- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent

### Procedure:

1. Set up the MS2665C Spectrum Analyzer as follows:
  - a. Press the **Preset** key and then press the Preset All (F1) soft key.
  - b. Press the **Frequency** key.(
  - c. Press the Start Freq (F2) soft key and enter 550 MHz to set the start frequency to 550 MHz.
  - d. Press the Stop Freq (F3) soft key and enter 4 GHz to set the stop frequency to 4 GHz.
2. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
3. On the Spectrum Analyzer, 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.)
4. Press the **ON/OFF** key to turn off the instrument.
5. Press and hold the **1** key, **5** key, and **9** key simultaneously, and then press the **ON/OFF** key to turn on the Spectrum Analyzer in the service mode.

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

6. Press the **MODE** key. Use the **Up/Down** arrow key to select TRACKING GENERATOR and press the **ENTER** key.
7. Press the **SYS** key.
8. Press the **SERVICE** soft key, then the TG soft key, and then the TG POWER STATE soft key twice to switch the state to ON.
9. Press the **AMPLITUDE** key and then the TG OUTPUT LEVEL soft key.
10. Enter 0 and the press the **ENTER** key to set the tracking Generator output power level to 0 dBm.
11. Press the **FREQ/SPAN** key.
12. Press the SPAN and then the ZERO soft keys.
13. Press the **BACK** soft key.
14. Press the **CENTER** soft key.
15. Enter 750 and press the MHz soft key to set the tracking generator frequency to 750 MHz.
16. Connect an RF cable between the RF Out connector of the MS2711B and the RF Input connector of the MS2665C.
17. On the MS2665C, press the **AMPLITUDE** key.
18. Press the Peak →RLV (F2) soft key to search the peak reference value.
19. Press the **MARKER** (8) key.
20. Press the Zone Width (F5) soft key.
21. Press the Spot (F1) soft key and then the Return (F6) soft key.
22. Use the rotary knob to move the marker to the response that is the second harmonic frequency of the tracking generator output frequency.

23. Subtract the marker reading from the Reference value reading. Verify that the calculated value is  $\leq -20$  dBc, and record the reading in [Table A-5, "Tracking Generator Harmonics and Spur"](#) on [page A-5](#) in [Appendix A "Test Records"](#).
24. Use the rotary knob to move the marker to the worst non-harmonic response.
25. Subtract the marker reading from the Reference value reading. Verify that the calculated value is  $\leq -20$  dBc, and record the reading in [Table A-5](#).
26. On the MS2711B, press the CENTER soft key. Enter 790 and press the MHz soft key to set the tracking generator frequency to 790 MHz.
27. On the MS2665C, press the **AMPLITUDE** key.
28. Press the Peak  $\rightarrow$ RLV (F2) soft key to search the peak reference value.
29. Repeat Step [22](#) through Step [25](#).
30. Repeat Step [26](#) through Step [29](#) for frequencies of 830 MHz, 870 MHz, 910 MHz, 950 MHz, 1600 MHz, 1680 MHz, 1760 MHz, 1840 MHz, 1920 MHz and 2000 MHz.

|             |   |
|-------------|---|
| <b>Note</b> | Change the Stop Frequency of the MS2665C to 6 GHz when you are testing frequencies that are higher than 1600 MHz. |
|-------------|---|

## Frequency Offset Tracking Test

This test verifies the functionality of the frequency offset tracking capability of the Tracking Generator.

### Equipment Required:

- Anritsu MS2665C Spectrum Analyzer or equivalent
- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent

### Procedure:

1. Set up the MS2665C Spectrum Analyzer as follows:
  - a. Press the **Preset** key and then press the Preset All (F1) soft key.
  - b. Press the **Frequency** key.
  - c. Press the Center Freq (F1) soft key and enter 2 GHz.
  - d. Press the **Span** key and then the Span (F1) soft key.
  - e. Enter 15 MHz to set the frequency span to 15 MHz.
2. Connect the external power supply (Anritsu part number 40-115) to the MS2711B.
3. On the Spectrum Analyzer, 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.)

|   |
|---|
| <b>Note</b> Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize. |
|---|

4. Press the **MODE** key. Use the **Up/Down** arrow key to select TRACKING GENERATOR, and press the **ENTER** key.
5. Press the **AMPLITUDE** key and then the TG OUTPUT LEVEL soft key.
6. Enter 0 and then press the **ENTER** key to set the tracking Generator output power level to 0 dBm.
7. Press the **FREQ/SPAN** key.
8. Press the **SPAN** and then the **ZERO** soft keys.
9. Press the **BACK** soft key.
10. Press the **CENTER** soft key.
11. Enter 2 and press the **GHz** soft key to set the tracking generator frequency to 2 GHz.
12. Connect an RF cable between the RF Out connector of the MS2711B and the RF Input connector of the MS2665C.
13. On the MS2665C, press the **A.B** key and then the **Storage** (F5) soft key.
14. Press the MaxHold (F2) soft key.
15. When a smooth peak response appears on the display, press the **AMPLITUDE** key.
16. Press the Peak →RLV (F2) soft key to search the peak reference value.
17. Press the log Scale (F5) soft key and then press the 5dB/Div (F2) soft key.
18. Press the **MARKER** (8) key.
19. Press the Zone Width (F5) soft key.
20. Press the **Spot** (F1) soft key and then the **Return** (F6) soft key.
21. Press the Marker **Peak Search** key and record the marker reading.
22. On the MS2711B, press the TG FREQ OFFSET soft key.
23. Enter 5 and press the **ENTER** key to set the offset frequency to +5 MHz above the selected center frequency.

24. On the MS2665C, press the **A.B** key and then the **Restart (F5)** soft key.
25. Press the Marker **Peak Search** key and record the marker reading. Then subtract the marking reading obtained in Step 21 from this new marker reading.
26. Verify that the calculated difference is  $5 \text{ MHz} \pm 400 \text{ kHz}$ .
27. On the MS2711B, press the **TG OFFSET** soft key.
28. Enter  $-5$  and press the **ENTER** key to set the offset frequency to  $-5 \text{ MHz}$  below the selected center frequency.
29. On the MS2665C, press the **A.B** key and then the **Restart (F5)** soft key.
30. Press the Marker **Peak Search** key and record the marker reading. Then subtract this new marker reading from the marker reading that was obtained in Step 21.
31. Verify that the calculated difference is  $5 \text{ MHz} \pm 400 \text{ kHz}$ .





# Chapter 3 — Removal and Replacement

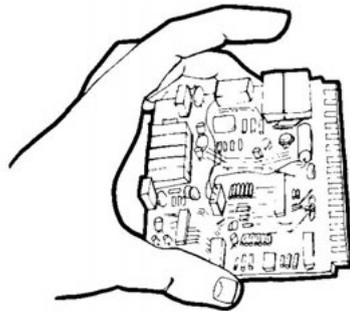
## 3-1 Introduction

Only qualified personnel should open the case and replace internal assemblies. Assemblies that are shown in the replaceable parts list are typically the only items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without specialized training. Removing RF shields from PC boards or adjusting screws on or near the shields may detune sensitive RF circuits and will result in degraded instrument performance.

**Caution** An Electrostatic Discharge (ESD) safe work area and proper ESD handling procedures (that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007) are mandatory to avoid ESD damage when handling subassemblies or components found in the MS2711B. Additional information pertaining to ESD can be found at the ESD Association Web site:  
<http://www.esda.org/s2020.html>

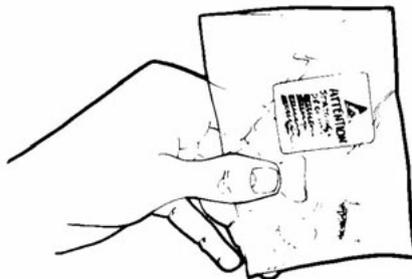
## 3-2 Static Sensitive Assembly Handling

The MS2711B contains components that can be damaged by static electricity. [Figure 3-1](#) through [Figure 3-3](#) illustrate the precautions that should be followed when handling static-sensitive subassemblies and components. If followed, these precautions will minimize the possibilities of static-shock damage to these items.



**Figure 3-1.** Handling a PCB

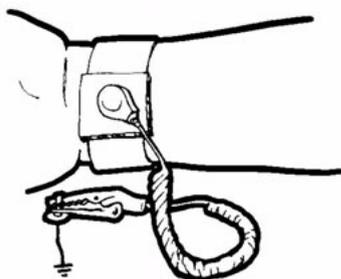
Handle PCBs only by the edges. Do not handle by the edge connectors.



**Figure 3-2.** Static-Shielded Container

Transport and store PCBs in static-shielded containers only.

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**Figure 3-3.** Static-Discharge Wristband

Always wear a static-discharge wristband when working with static sensitive components.

### **Additional Precautions**

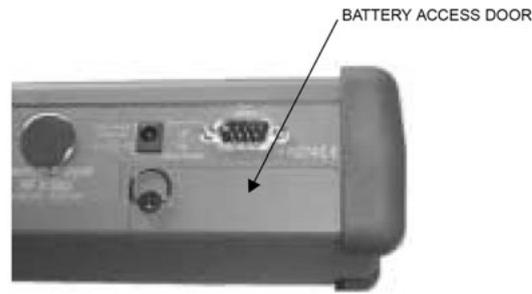
- Do not handle static sensitive components in areas where the floor or work surface covering is capable of generating a static charge.
- Keep work areas clean and free of any objects capable of holding or storing a static charge.

### 3-3 Battery Pack Removal And Replacement

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

**Note** Procedures in this manual may apply to many similar instruments. Photos and illustrations used are representative and may show instruments other than the MS2711B Spectrum Analyzer.

1. With the Spectrum Analyzer standing upright on a stable surface, locate the battery access door (Figure 3-4).



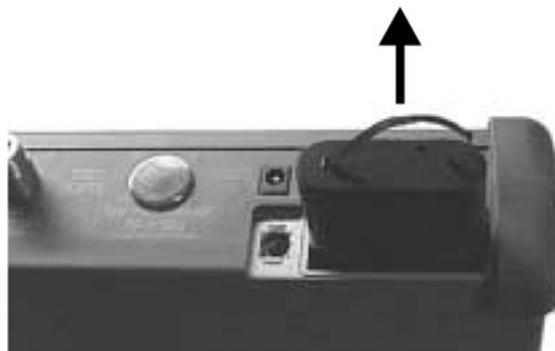
**Figure 3-4.** Opening the Battery Access Door

2. Lift up the access door handle and rotate it 90 degrees counterclockwise, as illustrated in Figure 3-4.
3. Lift the door and remove the door, as illustrated in Figure 3-5.



**Figure 3-5.** Battery Access Door, Opening

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



**Figure 3-6.** 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 3-7).

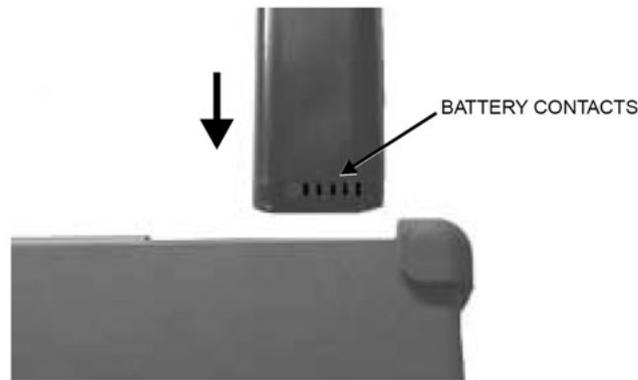


Figure 3-7. Battery Contacts

## Battery Information

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

- The Nickel Metal Hydride (NiMH) battery that is supplied with the MS2711B is shipped in a discharged state. Before using the MS2711B Spectrum Analyzer, the internal battery must first be charged for three hours, either in the instrument or in the optional battery charger (Anritsu part number: 2000-1029).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the instrument 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 either the MS2711B 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 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 charges becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.
- Storing the battery in extreme hot or cold places reduces the capacity and the 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.

## Battery Testing Procedure

1. With the instrument off and the battery installed, connect the Universal AC Adapter to the 12.5-15VDC (1100 mA) connector. The External Power LED and the Battery Charging LED will light.

**Note**

If the Battery Charging LED does not illuminate, then the battery state of charge may be too low to immediately start full charging. Leaving the unit connected to AC power for several hours may bring the battery up to a level where full charging can begin. Turn the unit off and back on to see if the Battery Charging LED illuminates, thereby indicating that a full charge cycle has begun.

2. Disconnect the AC-DC Adapter when the Battery Charging LED turns off, indicating that the battery is fully charged.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the instrument. This sets the instrument to the factory preset state. Press **Enter** when prompted to continue.
4. Press the **SYS** key, followed by the **STATUS** soft key. Verify that the indicated battery charge is  $\geq 80\%$ . If the value is 80% or above, then press the **ESCAPE/CLEAR** key and continue with this procedure. If the value is lower than 80%, then a discharge/charge cycle may be needed in order to improve the battery capacity. Completely discharge the battery, as described in Step 5 and Step 6 below, and then recharge the battery as described in Step 1 and Step 2. If the battery capacity does not increase after a discharge/charge cycle, then replace the battery.
5. Press the **START CAL** key (to keep the instrument from going into **HOLD** mode) and make note of the test start time.
6. When the instrument display fades and the instrument switches itself off, make note of the test stop time.
7. The total test time (Step 5 and Step 6) should be  $\geq 2.5$  hours. If the total test time is  $< 2.5$  hours, then replace the battery.

### 3-4 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 3-8](#)).

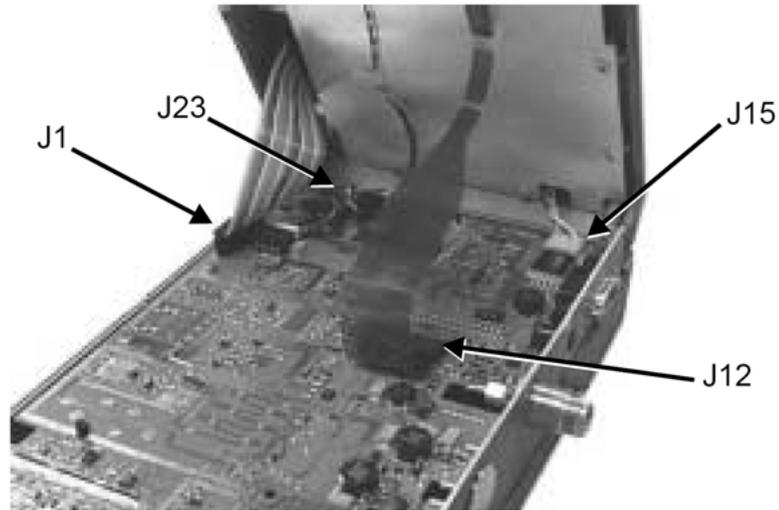


**Figure 3-8.** Removing the Corner bumpers

3. With the bumpers removed, the access holes for the case screws are revealed. Use a Phillips screwdriver to remove the four screws that secure 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 because delicate cables are attached between the two halves. These cables must be disconnected first. Refer to [Figure 3-9](#).

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 speaker cable from J23 on the main PCB.
8. Carefully disconnect the LCD display backlight cable from J15 on the main PCB.



**Figure 3-9.** Spectrum Analyzer Front Panel Cable Connections

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

|             |   |
|-------------|---|
| <b>Note</b> | The corner bumpers mount only one way. That is, the raised area inside one end of the bumper (Figure 3-10) is made to conform to the contour of only the front cover. |
|-------------|---|

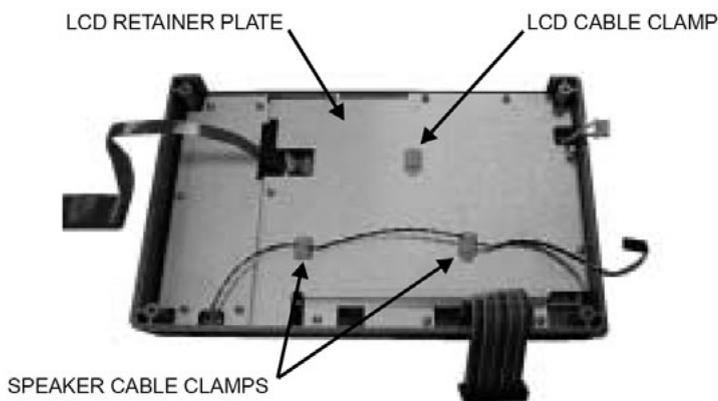


**Figure 3-10.** Corner Bumper Detail

### 3-5 LCD Assembly Replacement

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

1. Remove the front panel assembly as directed in section [“Front Panel Assembly Removal And Replacement”](#) on page 3-6.
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 and speaker cable from the retaining clips on the front panel backing plate.



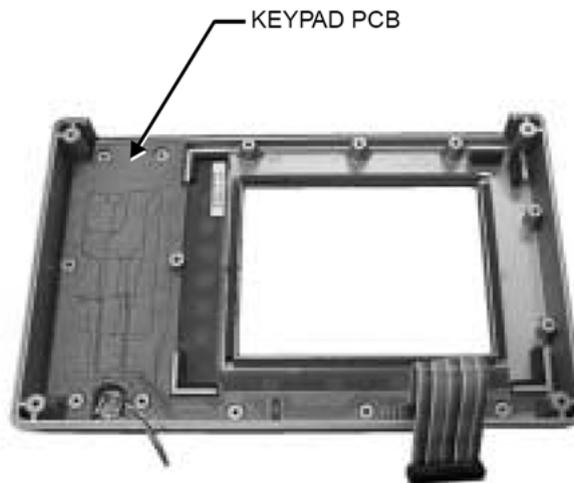
**Figure 3-11.** Front Panel Backing Plate

5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole in order to avoid damage to the cable or its 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.

## 3-6 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 [“Front Panel Assembly Removal And Replacement”](#) on page 3-6.
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 and speaker cable from the retaining clips on the front panel backing plate ([Figure 3-12](#)).
5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or its connector.
6. Remove the rubber cushion pad from the key pad PCB and remove the PCB.



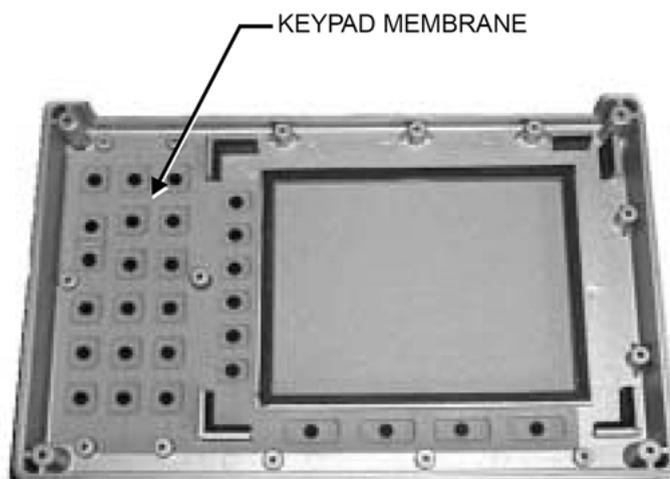
**Figure 3-12.** Front Panel Keypad PCB Location

7. Reverse the above steps to install the replacement assembly. Take care to position the speaker and speaker cable properly.

### 3-7 Key Pad Membrane Replacement

This procedure provides instructions for replacing the key pad membrane.

1. Remove the front panel assembly as directed in section [“Front Panel Assembly Removal And Replacement”](#) on page 3-6.
2. Remove the key pad PCB as directed in section [“Key Pad PCB Replacement”](#) on page 3-9.
3. Remove the keypad membrane by gently pulling the membrane up and out of the holes in the front panel.



**Figure 3-13.** Front Panel Keypad Membrane

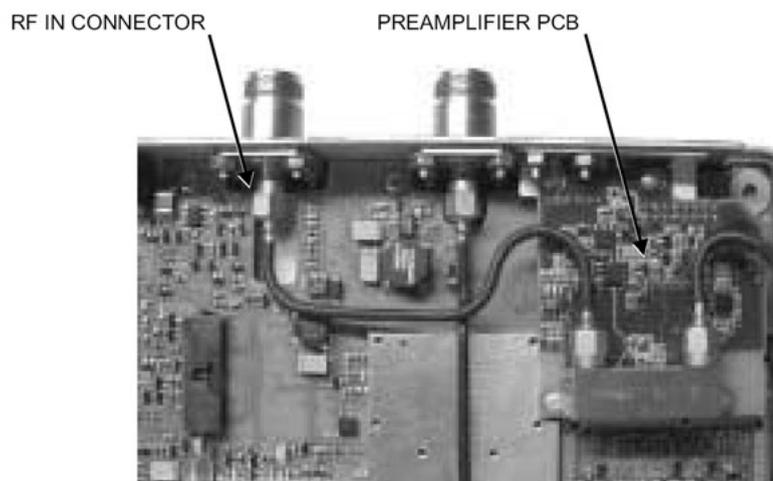
4. Reverse the above steps to install the replacement membrane.

### 3-8 PCB Assembly Replacement

This procedure provides instructions for replacing the PCB assembly with the connector panel attached. For an MS2711B with no options, or for an MS2711B with only Option 20, the PCB assembly consists of two PCBs (Control and Spectrum Analyzer). For an MS2711B with Option 5 or Option 8 installed, the assembly consists of three PCBs (Control, Spectrum Analyzer, and Preamplifier or Power Monitor). These PCB assemblies must always be replaced as a matched set.

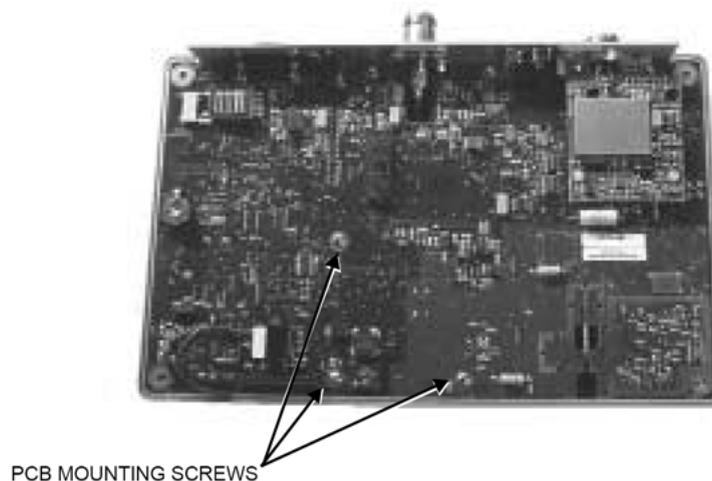
1. Remove the front panel assembly as directed in Section [“Front Panel Assembly Removal And Replacement”](#) on page 3-6.
2. Disconnect the battery connector from J13 on the main PCB.
3. Disconnect the semi-rigid coaxial cable from the RF In connector on the connector panel.

**Note** For an MS2711B with Option 8 installed, disconnect the semi-rigid cable from the Pre-Amplifier PCB as shown in [Figure 3-14](#).



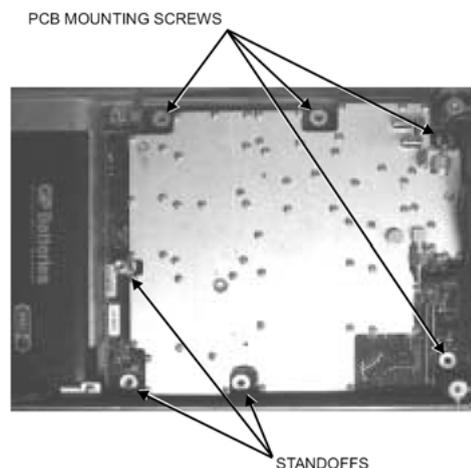
**Figure 3-14.** Cable Connections

4. Remove the three PCB mounting screws ([Figure 3-15](#)) and remove the Control PCB assembly with the connector panel attached.



**Figure 3-15.** Control PCB

- Remove the three 0.25-inch standoffs and four Phillips screws (Figure 3-16) and remove the Spectrum Analyzer PCB.



**Figure 3-16.** Spectrum Analyzer PCB

- Reverse the above steps to install the new Control and Spectrum Analyzer PCBs.

|             |   |
|-------------|---|
| <b>Note</b> | The Control and Spectrum Analyzer PCBs are adjusted as a matched set at the factory and must always be replaced together.<br>The PCB connector panel fits into grooves in the two halves of the Spectrum Analyzer case. Make sure that the panel is correctly aligned with the grooves before reassembling the two halves together. |
|-------------|---|

# Appendix A Test Records

This appendix provides test records that can be used to record the performance of the MS2711B Maintenance. Anritsu Company recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed will provide a detailed history of the instrument performance.

MS2711B Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Maintenance

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-1 Preamplifier (Option 8) Level Accuracy Test Settings

Table A-1. Preamplifier Level Accuracy Test Settings

| Freq (MHz) | Output Power at Source | Output Power at Attenuator | Attenuator Insertion Loss |
|------------|------------------------|----------------------------|---------------------------|
| 50         |                        |                            |                           |
| 500        |                        |                            |                           |
| 1000       |                        |                            |                           |
| 1500       |                        |                            |                           |
| 2000       |                        |                            |                           |
| 2500       |                        |                            |                           |
| 2950       |                        |                            |                           |

MS2711B Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Maintena  
 nce

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-2 Preamplifier (Option 8) Level Accuracy Test Characterization

Table A-2. Attenuator Characterization

| Freq (MHz) | Desired Test Level (dBm) | Attenuator Insertion Loss | Required Power Meter Level (dBm) <sup>a</sup> |
|------------|--------------------------|---------------------------|---|
| 50         | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 500        | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 1000       | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 1500       | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 2000       | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 2500       | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |
| 2950       | -50                      |                           |   |
|            | -55                      |                           |   |
|            | -60                      |                           |   |

a. Required Power meter Level = Desired Test level + Attenuator Insertion Loss

MS2711B Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Maintenance

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### A-3 Preamplifier (Option 8) Level Accuracy Test Results

Table A-3. Preamplifier Level Accuracy Test Results

| Freq (MHz) | Desired Test Level (dBm) | MS2711B Ref Level (dBm) | M1 Reading |
|------------|--------------------------|-------------------------|------------|
| 50         | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 500        | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 1000       | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 1500       | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 2000       | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 2500       | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |
| 2950       | -50                      | -40                     |            |
|            | -55                      | -45                     |            |
|            | -60                      | -50                     |            |

MS2711B Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Maintena  
 nce

Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

### A-4 Tracking Generator Option Level Accuracy

Table A-4. Tracking Generator Option Level Accuracy

| Output (dBm) | Spec.   | 10 MHz | 100 MHz | 500 MHz | 1000 MHz | 1500 MHz | 2060 MHz | 2061 MHz | 2500 MHz | 3000 MHz |
|--------------|---------|--------|---------|---------|----------|----------|----------|----------|----------|----------|
| 0            | ±1.5 dB |        |         |         |          |          |          |          |          |          |
| -10          | ±1.5 dB |        |         |         |          |          |          |          |          |          |
| -20          | ±1.5 dB |        |         |         |          |          |          |          |          |          |
| -30          | ±1.5 dB |        |         |         |          |          |          |          |          |          |
| -40          | ±1.5 dB |        |         |         |          |          |          |          |          |          |
| -50          | ±4.0 dB |        |         |         |          |          |          |          |          |          |

### A-5 Tracking Generator Harmonics and Spurious Test

Table A-5. Tracking Generator Harmonics and Spur

| Fundamental Freq. (MHz) | Spec.     | 750 | 790 | 830 | 870 | 910 | 950 | 1600 | 1680 | 1760 | 1840 | 1920 | 2000 |
|-------------------------|-----------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| Harmonics Level         | ≤ -20 dBc |     |     |     |     |     |     |      |      |      |      |      |      |
| Other Spurious Level    | ≤ -20 dBc |     |     |     |     |     |     |      |      |      |      |      |      |





# Anritsu



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