

**Spectrum Master**  
**Model MS2711D**  
**Spectrum Analyzer**  
**MAINTENANCE MANUAL**

**SpectrumMaster** 

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**Anritsu**

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## Table of Contents

1. Introduction . . . . .	1
2. Description . . . . .	1
3. Spectrum Analyzer Frequency Accuracy . . . . .	1
4. Spectrum Analyzer Phase Noise Verification. . . . .	2
5. Spectrum Analyzer Second Harmonic Distortion Test. . . . .	3
6. Spectrum Analyzer Residual Spurious Response Test. . . . .	4
7. Spectrum Analyzer Resolution Bandwidth Accuracy Test. . . . .	6
8. Spectrum Analyzer Measurement Accuracy Verification . . . . .	9
9. Power Monitor Verification (Option 5). . . . .	17
10. Bias Tee (Option 10) Verification . . . . .	19
11. Bias Tee Verification (Option 10A) . . . . .	19
12. Transmission Measurement Verification (Option 21) . . . . .	21
13. Power Meter Verification (Option 29) . . . . .	23
14. FCN4760 Frequency Converter Verification. . . . .	25
15. Battery Pack Removal and Replacement. . . . .	31
16. Battery Information. . . . .	33
17. Front Panel Assembly Removal and Replacement. . . . .	34
18. LCD Assembly Replacement . . . . .	36
19. Key Pad PCB Replacement . . . . .	37
20. Key Pad Membrane Replacement . . . . .	38
21. Main PCB Assembly Replacement . . . . .	38
22. Option 5 Power Monitor PCB Assembly Replacement . . . . .	40
23. Accessories and Replaceable Parts . . . . .	41
24. Customer Service . . . . .	43



## 1. Introduction

This manual provides maintenance instructions for the Spectrum Master Model MS2711D Spectrum Analyzer. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

## 2. Description

The Spectrum Master MS2711D is a handheld spectrum analyzer with optional power meter (Option 29) and transmission measurement (Option 21) capabilities.

The following sections contain tests that can be used to verify the performance of the Spectrum Master Model MS2711D.

## 3. Spectrum Analyzer Frequency Accuracy

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

### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source, with 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

### b. Procedure:

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the source to the RF Input of the Spectrum Master.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (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.

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

7. 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 **ENTER** to set the center frequency to 2000 MHz.
11. Press the Span soft key, enter 20, and press the kHz soft key to set the span to 20 kHz.
12. Confirm that the RBW is 100 Hz, and the VBW is 30 Hz. If adjustment of the RBW and VBW are required:
  - (a) Press the **BW/SWEEP** key and the Bandwidth soft key.
  - (b) Press the RBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the resolution bandwidth to 100 Hz.
  - (c) Press the VBW Manual soft key and use the Up/Down arrow key to select 30 Hz. Press **ENTER** to set the video bandwidth to 30 Hz.
13. Press the **MARKER** key, then the M1 soft key.
14. 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 2000 MHz  $\pm$  4 kHz.

## 4. Spectrum Analyzer Phase Noise Verification

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

### a. Equipment Required:

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

### b. Procedure:

1. Connect the output of the source to the Spectrum Master RF Input.
2. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (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 MG3692A output to 1000 MHz CW, with an RF output level of -30 dBm.
5. Press the **BW/SWEEP** key and the Bandwidth soft key.
6. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.
7. Press the VBW Manual soft key and use the Up/Down arrow key to select 30 Hz. Press **ENTER** to set the video bandwidth to 30 Hz.
8. 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 0.1. 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 1000.03. Press **ENTER** to set the M2 marker frequency to 1000.03 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  $\Delta 2$  reading
19. Press the **SINGLE/CONT** key to read and record five values, then calculate the average of the five recorded values.
20. Subtract 30 dB from the average value and verify that the result is  $\leq -75$  dBc/Hz. (For example: -45 dBc measured - 30 dB = -75 dBc/Hz.)

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

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

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

21. Press the **BACK** soft key and the M3 soft key.
22. Press the EDIT key and enter 999.97. Press MHz to set the M3 marker frequency to 999.97 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.
26. Subtract 30 dB from the average value and verify that the result is  $\leq -75$  dBc/Hz. (For example:  $-45$  dBc measured  $- 30$  dB =  $-75$  dBc/Hz.)

## 5. Spectrum Analyzer Second Harmonic Distortion Test

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

### a. *Equipment Required:*

- Anritsu MG3692A Synthesized Signal Source with options 2A, 4 and 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

### b. *Procedure:*

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect one end of the 50 MHz Low Pass Filter to the output of the source and the other end to the Spectrum Master RF Input with the coaxial cable.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (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. 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 Atten/Preamp soft key and then the Manual soft key.
11. Enter 0 and press **ENTER** to set the attenuation to 0 dB.
12. Press the **FREQ/SPAN** key and then the Center soft key.
13. Enter 40 and press the MHz soft key to set the center frequency to 40 MHz.
14. Press the Span soft key and enter 0.2. Press the MHz soft key to set the span to 0.200 MHz.
15. Press the **BW/SWEEP** key and the Bandwidth soft key.
16. Press the RBW Manual soft key and use the Up/Down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
17. Press the VBW Manual soft key and use the Up/Down arrow key to select 3 kHz. Press **ENTER** to set the video bandwidth to 3 kHz.
18. Press the **MARKER** key, then the M1 soft key.
19. Select the Edit soft key, then enter 40. Press the MHz soft key to set M1 to 40 MHz .

20. On the MG3692A Synthesized Signal Source, adjust the output level so that the M1 reading of Spectrum Master is  $-30$  dBm at 40 MHz.
21. On the Spectrum Master, press the **FREQ/SPAN** key and then the Center soft key.
22. Enter 80 and press the MHz soft key to set the center frequency to 80 MHz.
23. Press the **MARKER** key and the M1 soft key.
24. Select the Edit soft key, then enter 80. Press the MHz soft key to set M1 to 80 MHz .
25. Record the amplitude of the signal at M1 80 MHz:

Second Harmonic Level @ 80 MHz = \_\_\_\_\_ dBm

26. 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.

## 6. Spectrum Analyzer Residual Spurious Response Test

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

### a. Equipment Required:

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

### b. Procedure:

1. Connect the 50 ohm termination to the Spectrum Master RF Input.
2. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)

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

3. 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 and the Bandwidth soft key.
7. Press the RBW Manual soft key and use the Up/Down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
8. Press the VBW Manual soft key and use the Up/Down arrow key to select 3 kHz and press **ENTER** to set the video bandwidth to 3 kHz.
9. Press the **FREQ/SPAN** key and the Start soft key.
10. Enter 100 and press the kHz soft key to set the start frequency to 100 kHz.
11. Press the Stop soft key and enter 10, then press the MHz soft key to set the stop frequency to 10 MHz.
12. Wait till one full sweep is complete.
13. Press the **MARKER** key and then the M1 soft key.
14. Press the Marker To Peak soft key.



15. Record the M1 amplitude reading and verify whether it is less than or equal to  $-90$  dBm.

*NOTE: If a spur with an amplitude larger than  $-80$  dBm occurs, wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep was not real.*

16. Press the **FREQ/SPAN** key and the Start soft key.

17. Enter 10 and press the MHz soft key to set the start frequency to 10 MHz.

18. Press the Stop soft key and enter 1000, then press the MHz soft key to set the stop frequency to 1000 MHz.

19. Wait until one full sweep is complete.

20. Press the **MARKER** key and record the M1 amplitude reading and verify it is  $\leq -90$  dBm.

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

21. Press the **FREQ/SPAN** key and the Start soft key.

22. Enter 1000 and press the MHz soft key to set the start frequency to 1000 MHz.

23. Press the Stop soft key and enter 2000, then press the MHz soft key to set the stop frequency to 2000 MHz.

24. Wait until one full sweep is complete.

25. Press the **MARKER** key and record the M1 amplitude reading and verify it is  $\leq -90$  dBm.

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

26. Press the **FREQ/SPAN** key and the Start soft key.

27. Enter 2000 and press the MHz soft key to set the start frequency to 2000 MHz.

28. Press the Stop soft key and enter 3000, then press the MHz soft key to set the stop frequency to 3000 MHz.

29. Wait until one full sweep is complete.

30. Press the **MARKER** key and record the M1 amplitude reading and verify it is  $\leq -90$  dBm.

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

## 7. Spectrum Analyzer Resolution Bandwidth Accuracy Test

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

### a. Equipment Required:

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

### b. Procedure:

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the Anritsu MG3692A Synthesized Signal Source to the Spectrum Master RF Input.
3. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **On/Off** key to turn on the Spectrum Master. (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 MG3692A output to 1 GHz, with an RF output level of -30 dBm.
5. Press the **AMPLITUDE** key and the Ref Level soft key.
6. Enter -27 and press the **ENTER** key to set the Reference Level to -27 dBm.
7. Press the Scale soft key and enter 3, then press **ENTER**.
8. Press the **FREQ/SPAN** key and the Center soft key.
9. Enter 1 and press the GHz soft key to set the center frequency to 1 GHz.

*NOTE: The Measured Occupied BW value for each RBW setting can be recorded in Table 1, page 8.*

#### 1 MHz RBW Test

10. Press the Span soft key, enter 1.5 and press the MHz soft key to set the span to 1.5 MHz.
11. Press the **BW/SWEEP** key and the Bandwidth soft key.
12. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 MHz. Press **ENTER** to set the resolution bandwidth to 1 MHz.
13. Press the VBW Manual soft key and use the Up/Down arrow key to select 3 kHz and press **ENTER** to set the video bandwidth to 3 kHz and select **BACK**.
14. Press the **MEAS** key, the **OBW** soft key, the **dBc** soft key, and then the **ENTER** key.
15. Press the **MEAS** key, then the **MARKER** key. Press the M2 soft key and then the Delta (M2-M1) soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

#### 300 kHz RBW Test

16. Press the **FREQ/SPAN** key.
17. Press the Span soft key, enter 450 and press the kHz soft key to set the span to 450 kHz.
18. Press the **BW/SWEEP** key and the Bandwidth soft key.
19. Press the RBW Manual soft key and use the Up/Down arrow key to select 300 kHz. Press **ENTER** to set the resolution bandwidth to 300 kHz and select **BACK**.
20. Press the **MEAS** key and then the **MARKER** key.
21. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### **100 kHz RBW Test**

22. Press the **FREQ/SPAN** key.
23. Press the Span soft key, enter 150 and press the kHz soft key to set the span to 150 kHz.
24. Press the **BW/SWEEP** key and the Bandwidth soft key.
25. Press the RBW Manual soft key and use the Up/Down arrow key to select 100 kHz. Press **ENTER** to set the resolution bandwidth to 100 kHz and select **BACK**.
26. Press the **MEAS** key and then the **MARKER** key.
27. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### **30 kHz RBW Test**

28. Press the **FREQ/SPAN** key.
29. Press the Span soft key, enter 45 and press the kHz soft key to set the span to 45 kHz.
30. Press the **BW/SWEEP** key and the Bandwidth soft key.
31. Press the RBW Manual soft key and use the Up/Down arrow key to select 30 kHz. Press **ENTER** to set the resolution bandwidth to 30 kHz and select **BACK**.
32. Press the **MEAS** key to measure the bandwidth, then press the **MARKER** key.
33. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### **10 kHz RBW Test**

34. Press the **FREQ/SPAN** key.
35. Press the Span soft key, enter 15 and press the kHz soft key to set the span to 15 kHz.
36. Press the **BW/SWEEP** key and the Bandwidth soft key.
37. Press the RBW Manual soft key and use the Up/Down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz and select **BACK**.
38. Press the VBW Manual soft key and use the Up/Down arrow key to select 30 Hz. Press **ENTER** to set the video bandwidth to 30 Hz and select **BACK**.
39. Press the **MEAS** key, then the **MARKER** key.
40. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### **3 kHz RBW Test**

41. Press the **FREQ/SPAN** key.
42. Press the Span soft key, enter 4.5 and press the kHz soft key to set the span to 4.5 kHz.
43. Press the **BW/SWEEP** key and the Bandwidth soft key.
44. Press the RBW Manual soft key and use the Up/Down arrow key to select 3 kHz. Press **ENTER** to set the resolution bandwidth to 3 kHz and select **BACK**.
45. Press the **MEAS** key to measure the bandwidth, then press the **MARKER** key.
46. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### **1 kHz RBW Test**

47. Press the **FREQ/SPAN** key.
48. Press the Span soft key, enter 1.5 and press the kHz soft key to set the span to 1.5 kHz.
49. Press the **BW/SWEEP** key and the Bandwidth soft key.
50. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz and select **BACK**.

51. Press the **MEAS** key then the **MARKER** key.

52. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### 300 Hz RBW Test

53. Press the **FREQ/SPAN** key.

54. Press the Span soft key, enter 450 and press the Hz soft key to set the span to 450 Hz.

55. Press the **BW/SWEEP** key and the Bandwidth soft key.

56. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 300 Hz and select **BACK**.

57. Press the **MEAS** key then the **MARKER** key.

58. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

### 100 Hz RBW Test

59. Press the **FREQ/SPAN** key.

60. Press the Span soft key, enter 150 and press the Hz soft key to set the span to 150 Hz.

61. Press the **BW/SWEEP** key and the Bandwidth soft key.

62. Press the RBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the resolution bandwidth to 100 Hz and select **BACK**.

63. Press the **MEAS** key then the **MARKER** key.

64. Press the M2 soft key. The displayed  $\Delta 2$  frequency should be  $\pm 5\%$  of the RBW.

**Table 1.** RBW Check

RBW Setting	Lower Limit	Measured Value	Upper Limit
1 MHz	0.95 MHz		1.05 MHz
300 kHz	285 kHz		315 kHz
100 kHz	95 kHz		105 kHz
30 kHz	28.5 kHz		31.5 kHz
10 kHz	9.5 kHz		10.5 kHz
3 kHz	2.85 kHz		3.15 kHz
1 kHz	0.95 kHz		1.05 kHz
300 Hz	285 Hz		315 Hz
100 Hz	95 Hz		105 Hz

## 8. Spectrum Analyzer Measurement Accuracy Verification

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

- Level Accuracy with Frequency Test
- Level Accuracy with Power Test

### Level Accuracy with Frequency Test

#### a. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensors or equivalent (2)
- 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 1-10 10 dB Fixed Attenuator

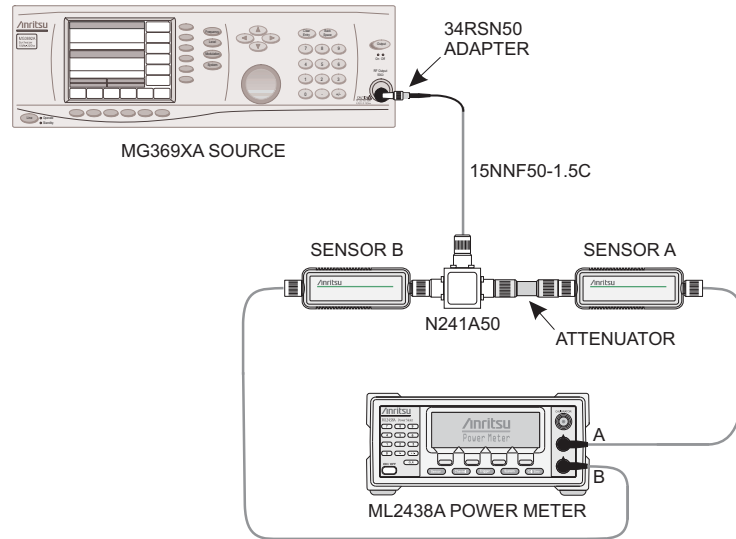
#### b. Procedure

1. Turn on the power meter and signal source.

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

2. On the power meter, press the Channel key, the Setup soft key and then the CHANNEL soft key to display Channel 2 setup menu. Press the INPUT key twice to set the Input Configuration to B. Press the Sensor key to display both Sensor A and Sensor B readings.
3. Connect the power sensors to the power meter and calibrate the sensors.
4. Set the MG3692A output power level to 5 dBm.
5. Set the MG3692A output to 30 MHz CW.
6. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter 30 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
7. Connect Sensor A to the MG3692A output, measure the output power level and record the value in column A of Table 2.
8. Disconnect Sensor A from the MG3692A output.
9. Connect the power splitter to the MG3692A output and Sensor B to one of the power splitter outputs. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator. Refer to Figure 1.
10. Record the new sensor A reading in column B of Table 2.
11. Record the Sensor B reading in column D of Table 2.
12. Calculate the Splitter/Attenuator Combined Loss using the following formula and record the result in column C of Table 2:  $C = A - B$
13. Calculate the Sensor B path Power Splitter Loss using the following formula and record the result in column E of Table 2:  $E = A - D$

14. Repeat steps 5 through 13 for 50 MHz, 550 MHz, 1000 MHz, 1244 MHz, 1411 MHz, 2000 MHz, 2512 MHz, 2850 MHz and 2925 MHz.



**Figure 1.** Level Accuracy with Frequency Test Setup

**Table 2.** Output Power Level

	A	B	C	D	E
Freq (MHz)	Sensor A Reading @ Source Output	Sensor A Reading @ end of Attenuator	Splitter/Attenuator Combined Loss	Sensor B Reading @ Power Splitter Output	Sensor B Path Power Splitter Loss
30					
50					
550					
1000					
1244					
1411					
2000					
2512					
2850					
2925					

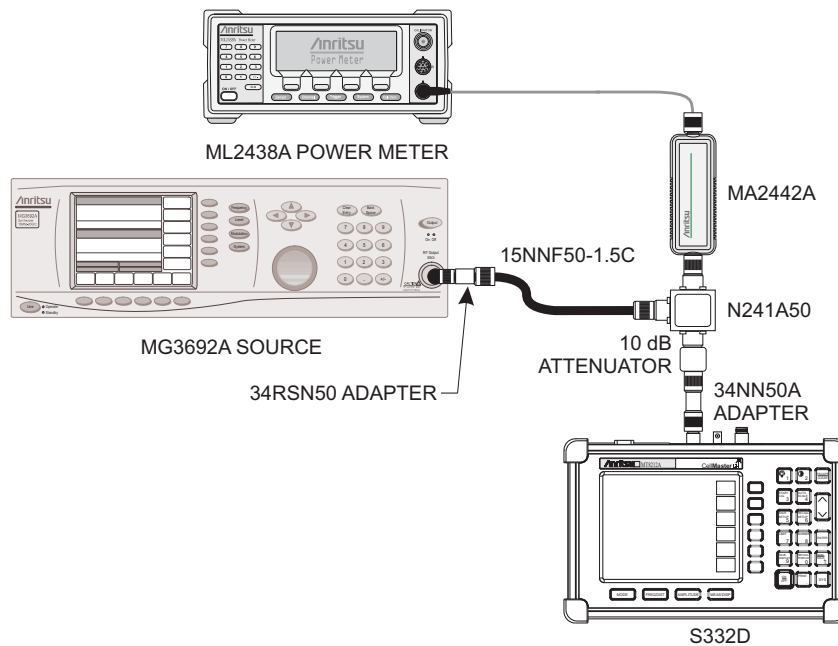
15. Calculate the desired Sensor B reading for 0 dBm and -39 dBm Test Power Level using the following formula: Desired Sensor B reading = Desired Test Power Level + C - E

16. Record the calculated results in Table 3.

**Table 3.** Level Accuracy with Frequency Test Setting

Freq (MHz)	Desired Sensor B reading for 0 dBm @ Attenuator output	Desired Sensor B reading for -39 dBm @ Attenuator output
30		
550		
1000		
1244		
1411		
2000		
2512		
2850		
2925		

17. Using the power splitter, coaxial cable, adapters and fixed attenuator, connect the Spectrum Master to the signal source and the power sensor as shown in Figure 2.



**Figure 2.** Level Accuracy Test Setup

18. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
19. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
20. Press the **BW/SWEEP** key and the Bandwidth soft key.

21. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.
22. Press the VBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the video bandwidth to 100 Hz.
23. Press the **FREQ/SPAN** key.
24. Press the Span soft key and enter .10, then press the MHz key to set the span to 0.10 MHz.
25. Press the **AMPLITUDE** key.
26. Press the Ref Level soft key, enter 10 and press the **ENTER** key to set the reference level to +10 dBm.
27. Press the **FREQ/SPAN** key and the Center soft key.
28. Enter 30 and press the MHz soft key to set the center frequency to 30 MHz.
29. On the Power Meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 30 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.
30. Set the MG3692A output to 30 MHz CW. Adjust the source power level so that the power meter displays the corresponding desired Sensor B reading for 0 dBm (as recorded in Table 3).
31. On the Spectrum Master, press the **MARKER** key, then the M1 soft key.
32. Select the Marker To Peak soft key to position the marker at the center of the response for the test frequency.
33. Verify that the M1 reading is within the specification as shown in Table 4.
34. Repeat steps 27 to 33 for 550 MHz, 1000 MHz, 1244 MHz, 1411 MHz, 2000 MHz, 2512 MHz, and 2925 MHz.
35. Repeat steps 27 to 34 for a power level of -39 dBm.

*NOTE: Change the reference level to -30 dBm.*

**Table 4.** Level Accuracy with Frequency

Freq (MHz)	@ 0 dBm	@ -39 dBm	Specification
30			±1.5 dB*
550			±1.5 dB*
1000			±1.5 dB*
1244			±1.5 dB*
1411			±1.5 dB*
2000			±1.5 dB*
2512			±1.5 dB
2925			±1.5 dB

\* ±1 dB for units with serial number 405039 and below.



## Level Accuracy with Power Test

### c. *Equipment Required:*

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensor or equivalent (Two each)
- 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 1-10 10 dB Fixed Attenuator
- Weinschel 1-30 30 dB Fixed Attenuator

### d. *Procedure:*

1. Use the recorded values for 50 MHz in Table 5, calculate the desired Sensor B Reading for Test Power Level > -50 dBm at 50 MHz using the following formulas:  
Desired Sensor B Reading = Test Power Level + C - E
2. Record the calculated results in Table 5.

**Table 5.** *Level Accuracy with Power Test Setting*

Test Power Level (dBm) @ 50 MHz	Desired Sensor B Reading
+3	
0	
-11	
-13	
-19	
-27	
-32	
-39	
-49	
-51	
-53	
-60	

3. Using the power splitter, coaxial cable, adapters and fixed attenuator, connect the Spectrum Master to the signal source and the power sensor as shown in Figure 2.
4. On the power meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 50 MHz for the Input Signal Frequency. This sets the power meter to the proper power sensor cal factor. Press the Sensor key to display the power reading.
5. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
6. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
7. Press the **BW/SWEEP** key and the Bandwidth soft key.
8. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.

9. Press the VBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the video bandwidth to 100 Hz.
10. Press the **FREQ/SPAN** key.
11. Press the Span soft key and enter .10, then press the MHz soft key to set the span to 0.10 MHz.
12. Press the **AMPLITUDE** key.
13. Press the Ref Level soft key, enter 10 and press the **ENTER** key to set the reference level to +10 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. Set the MG3692A output to 50 MHz CW. Adjust the source power so that the power meter displays the corresponding desired Sensor B Reading for +3 dBm (as recorded in Table 5).
17. Press the **MARKER** key, then the M1 soft key.
18. Select the Marker To Peak soft key to position the marker at the center of the response for the test frequency.
19. Verify that the M1 reading is within the specification from the input signal as shown in Table 7.
20. Repeat steps 15 through 20 for input levels of 0 dBm, -11 dBm, -13 dBm, -19 dBm, -27 dBm, -32 dBm, -39 dBm and -49 dBm.

*NOTE: Change the reference level as indicated in Table 7 for the corresponding test power level.*

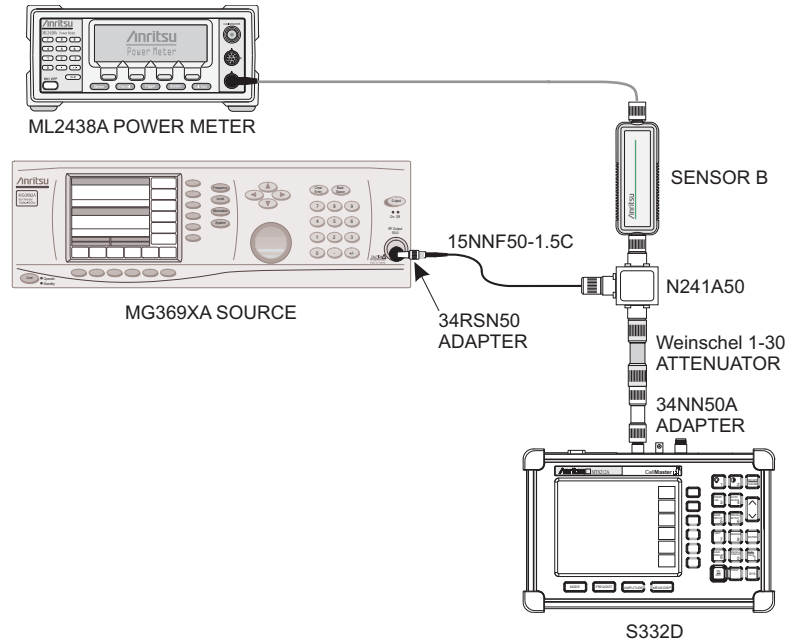
21. Disconnect the power splitter and attenuator from the Spectrum Master.
22. Set the MG3692A output power level to 5 dBm.
23. Connect sensor A to the MG3692A output, measure the output power level and record the value in column A of Table 6.

**Table 6.** *Output Power Level*

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>Freq (MHz)</b>	<b>Sensor A Reading @ Source Output</b>	<b>Sensor A Reading @ End of Attenuator</b>	<b>Splitter/Attenuator Combined Loss</b>	<b>Sensor B Reading @ Pwr Splitter Output</b>	<b>Sensor B Path Power Splitter Loss</b>
50					

24. Disconnect sensor A from the MG3692A output.
25. Connect the power splitter to the MG3692A output and connect Sensor B to one of the power splitter outputs. Install the 30 dB fixed attenuator to the other power splitter output, and connect Sensor A to the attenuator. Refer to Figure 1.
26. Record the new sensor A reading in column B of Table 6.
27. Record the Sensor B reading in column D of Table 6.
28. Calculate the Splitter/Attenuator Combined Loss using the following formula and record the result in column C of Table 6:  $C = A - B$
29. Calculate the Sensor B path Power Splitter Loss using the following formula and record the result in column E of Table 6:  $E = A - D$
30. Calculate the desired Sensor B Reading for Test Power Level < -50 dBm using the following formulas:  $\text{Desired Sensor B Reading} = \text{Test Power Level} + C - E$
31. Record the calculated results in Table 5.

32. Using the power splitter, coaxial cable, adapters and 30 dB fixed attenuator, connect the Spectrum Master to the signal source and the power sensor as shown in Figure 3.



**Figure 3.** Level Accuracy Setup, 30 dB Attenuator

33. Adjust the MG3692A output power level so that the power meter displays the corresponding desired Sensor B reading for  $-51$  dBm (as recorded in Table 5).
34. Press the **MARKER** key, then the M1 soft key.
35. Select the Marker To Peak soft key to position the marker at the center of the response for the test frequency.
36. Verify that the M1 reading is within the specification from the input signal as shown in Table 7.
37. Repeat steps 34 to 37 for Test Power Levels of  $-53$  dBm and  $-60$  dBm.

*NOTE: Change the reference level as indicated in Table 7 for the corresponding test power level.*

**Table 7.** *Level Accuracy with Power*

<b>Input Power Level (dBm)</b>	<b>Reference Level (dBm)</b>	<b>Specification (dB)*</b>	<b>Marker Reading (dBm)</b>
+3	+10	±1.5	
0	+10	±1.5	
-11	-10	±1.5	
-13	-10	±1.5	
-19	-10	±1.5	
-27	-20	±1.5	
-32	-30	±1.5	
-39	-30	±1.5	
-49	-40	±1.5	
-51	-40	±1.5	
-53	-50	±1.5	
-60	-50	±1.5	

\* ±1 dB for units with serial number 405039 and below.

## 9. Power Monitor Verification (Option 5)

The following test can be used to verify the accuracy of the power monitor function.

### a. Equipment Required:

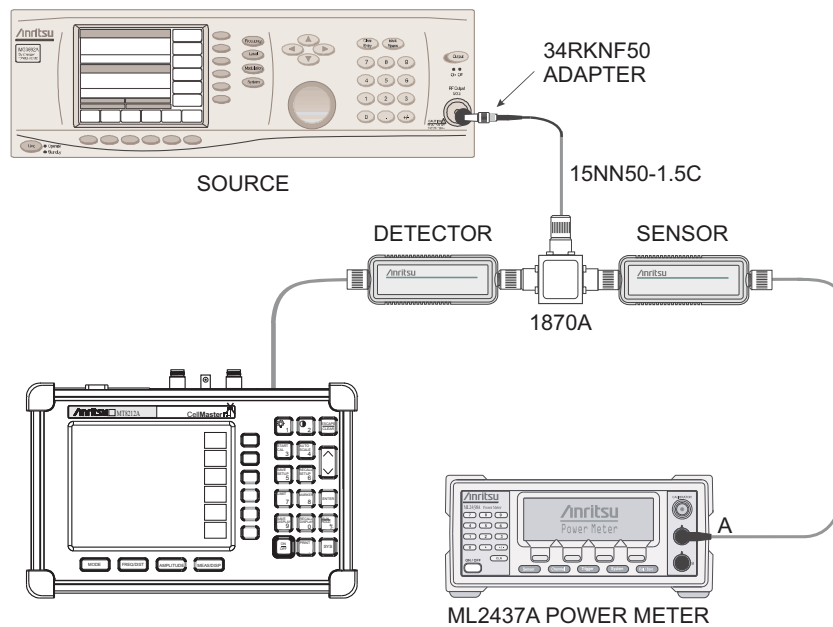
- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442D High Accuracy Power Sensor or equivalent
- Anritsu 34NN50A 50 Ohm adapter or equivalent
- Anritsu 34RKNF50 50 Ohm adapter or equivalent
- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent
- Anritsu 560-7N50B N Type RF Detector
- Aeroflex/Weinschel 1870A Power Splitter

### b. Procedure:

1. Turn on the power meter and signal source.

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

2. Set the MG3692A output power level to 5 dBm.
3. Set the MG3692A output to 1 GHz CW.
4. Connect the power sensors to the power meter and calibrate the sensors.
5. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter 1 GHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
6. Connect MG3692A, power meter, RF detector, Power Splitter and Power Sensor as shown in



**Figure 4.** Power Monitor Verification Setup

7. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.

8. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
9. Press the **MODE** key. Use the Up/Down arrow key to highlight Power Monitor and then press **ENTER**.
10. On the MG3692A press the Level key, then use the knob to adjust the power level so that the power meter reads -40 dBm.
11. Verify that the Spectrum Master reading is  $-40 \text{ dBm} \pm 1.0 \text{ dB}$ .
12. Repeat steps 10 and 11 for the other power level settings shown in

**Table 8.** *Power Monitor Test Levels*

Power In @ 1 GHz	Specification
0 dBm	$\pm 1 \text{ dB}$
-7 dBm	$\pm 1 \text{ dB}$
-21 dBm	$\pm 1 \text{ dB}$
-40 dBm	$\pm 1 \text{ dB}$

## 10. Bias Tee (Option 10) Verification

If the Bias Tee (Option 10) is installed in the Spectrum Master, the following test can be used to verify the performance of the bias termination.

### a. Equipment Required:

- 105 Ohm, 1 Watt, Low Current Load, Anritsu T3377
- Spectrum Master External Power Supply, Anritsu Part Number 40-168

### b. Procedure:

1. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
2. On the Spectrum Master, press and hold the ESCAPE/CLEAR key, then press the On/Off key to turn on the Spectrum Master and set the instrument to the factory preset state.

*NOTE: Before continuing, allow a 5-minute warm up for the internal circuitry to stabilize.*

3. Press the System Options key, then select the Application Options soft key.
4. Connect the 105 Ohm load to the RF In test port.
5. Press the Bias Tee (On/Off) soft key to turn the Bias Tee On.
6. Verify the voltage and current readings displayed on the upper left side of the screen are within the specifications shown in Table 9.

**Table 9.** Bias Tee Verification, 105 Ohm Load

Voltage Setting (V)	18
Voltage Specification (V)	± 1.0
Current Specification (mA)	120 - 220

7. Press the Bias Tee (On/Off) soft key to turn the Bias Tee Off.

## 11. Bias Tee Verification (Option 10A)

If the Bias Tee (Option 10A) is installed in the Spectrum Master, the following test can be used to verify the performance of the bias termination.

### a. Equipment Required:

- 105 Ohm, 1 Watt, Low Current Load, Anritsu T3377
- 40 Ohm, 5 Watt, High Current Load, Anritsu T2904
- Spectrum Master External Power Supply, Anritsu Part Number 40-168

### b. Procedure:

1. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
2. Press the On/Off key to turn on the Spectrum Master.
3. Press the Recall Setup (6) key, then select the Default mode setting.
4. Press the Enter key.

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

### Bias Tee Test

5. Press the System Options key, then select the Application Options soft key and the Bias Tee soft key.
6. Select the Bias Tee Voltage soft key and enter 12 then press the Enter key.
7. Connect the 105 Ohm load to the RF In test port.
8. Press the Bias Tee On/Off soft key to turn the Bias Tee On.
9. Verify the voltage and current readings displayed on the top left side of the screen are within the specifications shown in Table 10.
10. Press the Bias Tee On/Off soft key to turn the Bias Tee Off
11. Select each of the voltage settings and verify the voltage and current readings displayed on the top left side of the screen are within the specifications shown in Table 10.

**Table 10.** *Bias Tee Verification, 105 Ohm Load, Low Current*

Voltage Setting (V)	Voltage Specification (V)	Current Specification (mA)
12	$\pm 0.5$	85-145
15	$\pm 0.6$	113-173
18	$\pm 0.7$	142-202
21	$\pm 0.8$	172-230
24	$\pm 1.0$	199-259

### Fault Test

12. Disconnect the 105 Ohm load and connect the 40 Ohm load to the RF In port.
13. Select the Bias Tee Voltage soft key and enter 17 then press the Enter key.
14. Press the Bias Tee On/Off soft key to turn the Bias Tee On.
15. Verify that the instrument makes a clicking sound and the Bias Tee Error/Fault dialog appears on the screen.
16. Press the Bias Tee On/Off soft key to turn the Bias Tee Off.



## 12. Transmission Measurement Verification (Option 21)

The tests in this section can be used to verify the Transmission Measurement functionality (Option 21) of a Spectrum Master equipped with Option 21. There are three parts to this test:

- Transmission Power Verification
- Insertion Loss Verification
- Isolation Test

### Transmission Power Verification

#### a. *Equipment Required:*

- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent

#### b. *Procedure:*

1. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
2. On the Spectrum Master, press the **MODE** key. Use the up/down arrow key to highlight Transmission Measurement and press **ENTER** to select Transmission Measurement mode.
3. On the display, verify that the Trans. Meas Cal Off message is displayed and that the RBW is 1 MHz, the VBW is 300 kHz, the Ref Level is 0.0 dBm, and Atten is Dynamic.
4. Use the 15NN50-1.5C RF Coaxial Cable to connect the RF In port of the Spectrum Master to the RF Out port.
5. Press the **LIMIT** key, select the Single Limit soft key and then the Edit soft key. Use the keypad to enter -21 and press **ENTER** to set the limit line to -21 dBm.
6. Verify that the signal is above the -21 dBm limit line.

*NOTE: Ignore the "Fail if data is: Above Line" message on the bottom of the display.*

### Insertion Loss Verification

#### c. *Equipment Required:*

- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent
- Weinschel 44-20, 20 dB attenuator

#### d. *Procedure:*

1. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
2. On the Spectrum Master, press the **MODE** key. Use the Up/Down arrow key to highlight Transmission Measurement and press **ENTER** to select Transmission Measurement mode.
3. Press the **BW/SWEEP** key and select the Calibrate TM soft key.
4. Use the 15NN50-1.5C RF Coaxial Cable to connect the RF In port of the Spectrum Master to the RF Out port. Press the **ENTER** key on the Spectrum Master to calibrate. The Spectrum Master will beep when one sweep is completed.
5. Insert the 20 dB attenuator between the RF Coaxial cable and the RF Out port.
6. Press the **AMPLITUDE** key and select the Ref Level soft key. Use the Up/Down arrow key or the keypad to enter -15 and press the **ENTER** key to set the reference level to -15 dBm.
7. Press the Scale soft key and use the Up/Down arrow key or the keypad to enter 1 and press the **ENTER** key to set the scale to 1 dB/Div.
8. Press the **LIMIT** key and select the Multiple Upper Limits soft key.

9. Select the Segment 1 soft key and then the Edit soft key. Use the keypad to enter 25 and press the **ENTER** key to set the start frequency to 25 MHz.
10. Use the keypad to enter -18.5 and press **ENTER** key to set the start limit to -18.5 dB.
11. Use the keypad to enter 3 and press the GHz soft key to set the end frequency to 3 GHz.
12. Use the keypad to enter -18.5 and press **ENTER** key to set the end limit to -18.5 dB.
13. Press the **LIMIT** key and then select Multiple Lower Limits soft key.
14. Press the Segment 1 soft key and then press the Edit soft key. Use the keypad to enter 25 and press the **ENTER** key to set the start frequency to 25 MHz.
15. Use the keypad to enter -21.5 and press the **ENTER** key to set the start limit to -21.5 dB.
16. Use the keypad to enter 3 and press GHz soft key to set the end frequency to 3 GHz.
17. Use the keypad to enter -21.5 and press the **ENTER** key to set the end limit to -21.5 dB.
18. Verify that the trace is within the -18.5 and -21.5 limit lines.

## Isolation Test

### e. *Equipment Required:*

- Anritsu 28N50-2 or SM/PL 50 Ohm Termination
- Anritsu 15NN50-1.5C RF Coaxial Cable or equivalent

### f. *Procedure:*

1. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
2. On the Spectrum Master, press the **MODE** key. Use the Up/Down arrow key to highlight Transmission Measurement and press **ENTER** to select Transmission Measurement mode.
3. Press the **BW/SWEEP** key and then press the Calibrate TM soft key.
4. Use the 15NN50-1.5C RF Coaxial Cable to connect the RF In port of the Spectrum Master to the RF Out port. Press the **ENTER** key on the Spectrum Master to calibrate. The Spectrum Master will beep when one sweep is completed.
5. Disconnect the RF cable from RF In Port and connect the 50 ohm Termination.
6. Press the **LIMIT** key and select the Multiple Upper Limits soft key.
7. Press the Segment 1 soft key and select the Edit soft key. Use the keypad to enter 25 and press the **ENTER** key to set the start frequency to 25 MHz.
8. Use the keypad to enter -80 and press the **ENTER** key to set the start limit to -80 dB.
9. Use the keypad to enter 1 and press the GHz soft key to set the end frequency to 1 GHz.

*NOTE: For instruments with serial number 525001 and above, set the end frequency to 2 GHz.*

10. Use the keypad to enter -80 and press the **ENTER** key to set the end limit to -80 dB.
11. Press the Next Segment soft key. Verify that Segment: 2 Upper appears at the bottom left corner of the display.
12. Press the Edit soft key. Use the keypad to enter 1 and press the GHz soft key to set the start frequency to 1 GHz.

*NOTE: For instruments with serial number 525001 and above, set the start frequency to 2 GHz.*

13. Use the keypad to enter -60 and press the **ENTER** key to set the start limit to -60 dB.
14. Use the keypad to enter 3 and press the GHz soft key to set the end frequency to 3 GHz.

15. Use the keypad to enter -60 and press the ENTER key to set the end limit to -60 dB.
16. Verify that the trace is below the limit lines.

### 13. Power Meter Verification (Option 29)

The following test can be used to verify the accuracy of the power measurements.

**a. Equipment Required:**

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A
- Anritsu ML2438A Dual Channel Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensor or equivalent
- Anritsu N241A50 Power Splitter or equivalent
- Anritsu 34NN50A 50Ω adapter or equivalent
- Anritsu 34RSN50 50Ω adapter or equivalent
- Anritsu 34RKNF50 50Ω adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent
- Weinschel 1-10 10 dB Fixed Attenuator

**b. Procedure:**

1. Turn on the power meter and signal source.

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

2. On the power meter, press the Channel key, the Setup soft key and then the CHANNEL soft key to display Channel 2 setup menu. Press the INPUT key twice to set the input configuration to B. Press the Sensor key to display both Sensor A and Sensor B Readings.
3. Connect the power sensors to the power meter and calibrate the sensors.
4. Set the MG3692A output power level to 5 dBm.
5. Set the MG3692A output to 50 MHz CW.
6. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter 50 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
7. Connect sensor A to the MG3692A output, measure the output power level and record the value in column A of Table 11.

**Table 11.** Output Power Level

	A	B	C	D	E
Freq (MHz)	Sensor A Reading @ Source Output	Sensor A Reading @ end of Attenuator	Splitter/Attenuator Combined Loss	Sensor B Reading @ Power Splitter Output	Sensor B Path Power Splitter Loss
50					
1000					
2000					
2850					

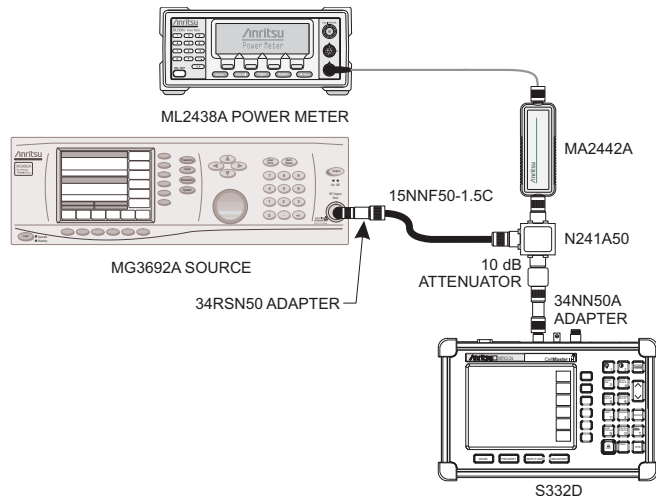
8. Disconnect Sensor A from the MG3692A output.
9. Connect the power splitter to the MG3692A output and the Sensor B to one of the power splitter outputs. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator. Refer to Figure 1.

10. Record the new sensor A reading in column B of Table 11.
11. Record Sensor B reading in column D of Table 11.
12. Calculate the Splitter/Attenuator Combined Loss using the following formula and record the result in column C of Table 11:  $C = A - B$
13. Calculate the Sensor B path Power Splitter Loss using the following formula and record the result in column E of Table 11:  $E = A - D$
14. On the power meter, press the INPUT soft key seven times and then press the System key to display the sensor A reading.
15. Repeat steps 4 through 11 for 1000 MHz, 2000 MHz and 2850 MHz.
16. Calculate the desired Sensor B Reading for  $-30$  dBm Test Power Level at the end of 10 dB attenuator using the following formula:  $\text{Desired Sensor B Reading} = \text{Test Power Level} + C - E$
17. Record the calculated results in Table 12.

**Table 12.**  $-30$  dBm Test Power Level

Freq (MHz)	Desired Sensor B Reading for $-30$ dBm Input to Spectrum Master
50	
1000	
2000	
2850	

18. Using the power splitter, coaxial cable and adapters, connect the Spectrum Master to the signal source and the power sensor as shown in Figure 5.



**Figure 5.** Power Meter Verification Setup

19. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
20. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
21. Press the **MODE** key. Use the Up/Down arrow key to highlight Power Meter and then press **ENTER**.
22. Press the Center soft key and enter 50, then press the MHz soft key to set the center frequency to 50 MHz.

23. Press the Span soft key and enter 3, then press the MHz key to set the span to 3 MHz.
24. On the Power Meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 50 MHz for the Input Signal Frequency. This sets the power meter to the proper power sensor cal factor. Press the Sensor key to display the power reading.
25. Set the MG3692A output to 50 MHz CW and adjust the power level so that the power meter displays the corresponding desired Sensor B Reading for -30 dBm as recorded in Table 12.
26. Verify that the Power Meter reading on the Spectrum Master is within the specifications in Table 13.

*NOTE: If the reading is unstable, turn on RMS Averaging by pressing the BW/SWEEP key, then the RMS Averaging soft key. The number of points to average can be set to low, medium or high.*

**Table 13.** Output Power Level

Freq (MHz)	Measured Value	Specification
50		-30 dBm ± 1.5 dB*
1000		-30 dBm ± 1.5 dB*
2000		-30 dBm ± 1.5 dB*
2850		-30 dBm ± 1.5 dB

\* ±1 dB for units with serial number 405039 and below.

27. Repeat steps 22 and 26 for 1000 MHz, 2000 MHz, and 2850 MHz.

## 14. FCN4760 Frequency Converter Verification

The tests in this section verify the performance of Model FCN4760 Frequency Converter. The tests include:

- Phase Noise Verification
- Second Harmonic Distortion Test
- Residual Spurious Response Test
- Measurement Accuracy Verification

### Phase Noise Verification

This test verifies the combined phase noise of the FCN4760 Frequency Converter and the Spectrum Master.

#### a. Equipment Required:

- Anritsu FCN4760 Frequency Converter
- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A, or equivalent
- Anritsu 34RSN50 50 ohm adapter or equivalent
- Anritsu 15NNF50-1.5C RF Coaxial Cable or equivalent

#### b. Procedure:

1. Connect the output of the FCN4760 to the Spectrum Analyzer RF In port of the Spectrum Master.
2. Connect the output of the source to the FCN4760 RF Input with the coaxial cable.
3. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
4. Press and hold the **ESCAPE/CLEAR** key and press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)

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

5. Set the MG3692A output to 5999 MHz CW, with an RF output level of -45 dBm.
6. Press the **BW/SWEEP** key and select the Bandwidth soft key.
7. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.
8. Press the VBW Manual soft key and use the Up/Down arrow key to select 30 Hz. Press **ENTER** to set the video bandwidth to 30 Hz.
9. Press the **FREQ/SPAN** key and select the Center soft key.
10. Use the keypad to enter 5999 and press the **ENTER** key to set the center frequency to 5999 MHz.
11. Press the Span soft key and use the keypad to enter 0.1. Press the **ENTER** key to set the span to 0.100 MHz.
12. Press the **AMPLITUDE** key.
13. Press the Ref Level soft key and enter -40. Press **ENTER** to set the reference level to -40 dBm.
14. Press the **MARKER** key, then select the M1 soft key.
15. Press Edit and enter 5999. Press **ENTER** to set the M1 marker frequency to 5999 MHz.
16. Press the Back soft key and the M2 soft key.
17. Press Edit and enter 5999.03. Press **ENTER** to set the M2 marker frequency to 5999.03 MHz (30 kHz higher than the center frequency).
18. Press the Delta (M2-M1) soft key.
19. Press the **SINGLE/CONT** key and read and record the  $\Delta 2$  reading.
20. Press the **SINGLE/CONT** key and read and record five values, then calculate the average of the five recorded values.
21. Subtract 30 dB from the average value and verify that the result is = -65 dBc/Hz.  
(For example: -35 dBc measured - 30 dB = -65 dBc/Hz.)

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

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

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

22. Press the Back soft key and the M3 soft key.
23. Press the Edit soft key and enter 5998.97. Select the MHz soft key to set the M3 marker frequency to 5998.97 MHz (30 kHz lower than the center frequency).
24. Press the Delta (M3-M1) soft key.
25. Press the **SINGLE/CONT** key and record the  $\Delta 3$  reading.
26. Press the **SINGLE/CONT** key to read and record five values, then calculate the average of the five recorded values.
27. Subtract 30 dB from the average value and verify that the result is  $\leq$  -65 dBc/Hz.  
(For example: -35 dBc measured - 30 dB = -65 dBc/Hz.)

## Second Harmonic Distortion Test

The following test can be used to verify the combined input related spurious response of the FCN4760 Frequency Converter and Spectrum Master.

### c. *Equipment Required:*

- Anritsu MG3692A Synthesized Signal Source with options 2A, 4 and 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

### d. *Procedure:*

1. Connect the 10 MHz reference source to the Anritsu MG3692A Synthesized Signal Source.
2. Connect the output of the FCN4760 to the Spectrum Analyzer RF In port of the Spectrum Master.
3. Connect the output of the source to the FCN4760 RF Input with the coaxial cable.
4. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
5. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key and press the **ON/OFF** key to turn on the Spectrum Master. (This sets the instrument to the factory preset state.)
6. Turn on the 10 MHz reference source and the Anritsu MG3692A Synthesized Signal Source.
7. Set the MG3692A output to 5 GHz CW, with an RF output level of  $-45$  dBm.

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

8. Press the **AMPLITUDE** key and the Ref Level soft key.
9. Enter  $-40$  and press the **ENTER** key to set the Reference Level to  $-40$  dBm.
10. Press the Scale soft key and enter 7 then press **ENTER**.
11. Press the **FREQ/SPAN** key and then the Center soft key.
12. Enter 5 and press the GHz soft key to set the center frequency to 5 GHz.
13. Press the Span soft key and enter 0.2. Press the MHz soft key to set the span to 0.200 MHz.
14. Press the **BW/SWEEP** key and the Bandwidth soft key.
15. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.
16. Press the VBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the video bandwidth to 100 Hz.
17. Press the **MARKER** key, then the M1 soft key.
18. Select the Edit soft key. Enter 5 and press the GHz soft key to set M1 to 5 GHz.
19. On the MG3692A Synthesized Signal Source, adjust the output level so that the M1 reading on the Spectrum Master is  $-45$  dBm at 5 GHz.
20. On the Spectrum Master, press the **FREQ/SPAN** key and then the Center soft key.
21. Enter 5750 MHz and press the MHz soft key to set the center frequency to 5750 MHz.
22. Press the **MARKER** key and the M1 soft key.
23. Select the Edit soft key. Enter 5750 and press the MHz soft key to set M1 to 5750 MHz .
24. Record the amplitude of the signal at M1 5750 MHz:

Second Harmonic Level @ 5750 MHz = \_\_\_\_\_ dBm

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

$$\text{Input Related Spurious Response (dBc)} = [\text{Second Harmonic Level @ 5750 MHz}] + 45 \text{ dBm} = \text{_____ dBc}$$

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

### Residual Spurious Response Test

The following test can be used to verify the combined residual spurious response of the FCN4760 Frequency Converter and Spectrum Master.

**e. Equipment Required:**

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

**f. Procedure:**

1. Connect the output of the FCN4760 to the Spectrum Master RF In port.
2. Connect the 50 ohm termination to the FCN4760 RF Input.
3. On the Spectrum Master, press and hold the **ESCAPE/CLEAR** key and press the **ON/OFF** key to turn on the Spectrum Master. (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 **AMPLITUDE** key and the Ref Level soft key.
5. Enter  $-75$  and press the **ENTER** key to set the Reference Level to  $-75$  dBm.
6. Press the Scale soft key and enter 5, then press **ENTER**.
7. Press the **BW/SWEEP** key and the Bandwidth soft key.
8. Press the RBW Manual soft key and use the Up/Down arrow key to select 10 kHz. Press **ENTER** to set the resolution bandwidth to 10 kHz.
9. Press the VBW Manual soft key and use the Up/Down arrow key to select 3 kHz and press **ENTER** to set the video bandwidth to 3 kHz.
10. Press the **FREQ/SPAN** key and the Start soft key.
11. Enter 4.7 and press the GHz soft key to set the start frequency to 4.7 GHz.
12. Press the Stop soft key and enter 6, then press the GHz soft key to set the stop frequency to 6 GHz.
13. Wait till one full sweep is complete.
14. Press the **MARKER** key and then the M1 soft key.
15. Press the Marker To Peak soft key.
16. Record the M1 amplitude reading and verify whether it is less than or equal to  $-90$  dBm.

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



## Measurement Accuracy Verification

The test in this section verifies the combined level accuracy of the FCN4760 Frequency Converter and Spectrum Master.

### Level Accuracy with Frequency Test

#### g. Equipment Required:

- Anritsu MG3692A Synthesized Signal Source, with options 2A, 4 and 15A
- Anritsu ML2430A-Series Power Meter or equivalent
- Anritsu MA2442A High Accuracy Power Sensor or equivalent (2)
- 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 30 dB Fixed Attenuator
- Weinschel 1506A Power Splitter or equivalent

#### h. Procedure:

1. Turn on the power meter and signal source.

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

2. On the power meter, press the Channel key, the Setup soft key and then the CHANNEL soft key to display Channel 2 setup menu. Press the INPUT key twice to set the Input Configuration to B. Press the Sensor key to display both Sensor A and Sensor B Readings.
3. Connect the power sensors to the power meter and calibrate the sensors.
4. Set the MG3692A output power level to 5 dBm.
5. Set the MG3692A output to 4750 MHz CW.
6. On the power meter, press the Sensor key, the Cal Factor soft key, and then the FREQ soft key. Use the keypad to enter 4750 MHz as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the SENSOR key on the power meter to display the power reading.
7. Connect Sensor A to the MG3692A output, measure the output power level and record the value in column A of Table 14.

**Table 14.** Output Power Level

	A	B	C	D	E
Freq (MHz)	Sensor A Reading @ Source Output	Sensor A Reading @ end of Attenuator	Splitter/Attenuator Combined Loss	Sensor B Reading @ Power Splitter Output	Sensor B Path Power Splitter Loss
4750					
5153					
5284.9					
5800					

8. Disconnect Sensor A from the MG3692A output.
9. Connect the power splitter to the MG3692A output and Sensor B to one of the power splitter outputs. Install the 30 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator. Refer to Figure 1.
10. Record the new sensor A reading in column B of Table 14.

11. Record Sensor B reading in column D of Table 14.
12. Calculate the Splitter/Attenuator Combined Loss using the following formula and record the result in column C of Table 14:  $C = A - B$
13. Calculate the Sensor B path Power Splitter Loss using the following formula and record the result in column E of Table 14:  $E = A - D$
14. Repeat steps 5 to 13 for 5153 MHz, 5284.9 MHz, and 5800 MHz.
15. Calculate the desired Sensor B reading for -60 dBm Test Power Level using the following formula:  $\text{Desired Sensor B reading} = \text{Desired Test Power Level} + C - E$
16. Record the calculated results in Table 15.

**Table 15.** *Level Accuracy with Frequency Test Setting*

Freq (MHz)	Desired Sensor B Reading for -60 dBm @ Attenuator Output
4750	
5153	
5284.9	
5800	

17. Using the power splitter, coaxial cable, adapters and fixed attenuator, connect the FCN4760 to the signal source and the power sensor as shown in Figure 3.
18. Connect the external power supply (Anritsu part number 40-168) to the Spectrum Master.
19. Press and hold the **ESCAPE/CLEAR** key and press the **ON/OFF** key to turn on the Spectrum Master.
20. Press the **BW/SWEEP** key and the Bandwidth soft key.
21. Press the RBW Manual soft key and use the Up/Down arrow key to select 1 kHz. Press **ENTER** to set the resolution bandwidth to 1 kHz.
22. Press the VBW Manual soft key and use the Up/Down arrow key to select 100 Hz. Press **ENTER** to set the video bandwidth to 100 Hz.
23. Press the **FREQ/SPAN** key.
24. Press the Span soft key and enter .10, then press the MHz key to set the span to 0.10 MHz.
25. Press the **AMPLITUDE** key.
26. Press the Ref Level soft key, enter 10 and press the **ENTER** key to set the reference level to -40 dBm.
27. Press the **FREQ/SPAN** key and the Center soft key.
28. Enter 4750 and press the MHz soft key to set the center frequency to 4750 MHz.
29. On the Power Meter, press the Sensor key and then the CalFactor soft key. Select the FREQ soft key and enter 4750 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.
30. Set the MG3692A output to 4750 MHz CW. Adjust the source power level so that the power meter displays the corresponding desired Sensor B reading for -60 dBm (as recorded in Table 15).
31. On the Spectrum Master, press the **MARKER** key, then the M1 soft key.
32. Select Marker To Peak to position the marker at the center of the response for the test frequency.
33. Verify that the M1 reading is within  $\pm 2.25$  dB.

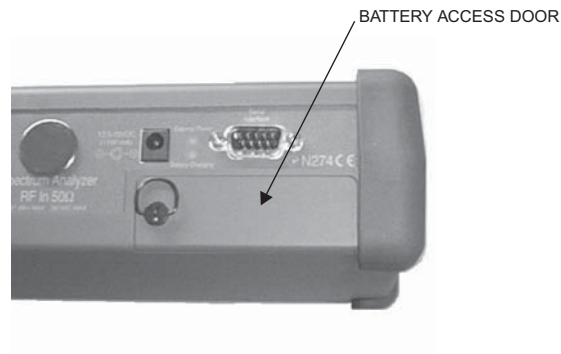
34. Repeat steps 27 to 33 for 5153 MHz, 5284.9 MHz, and 5800 MHz and verify that the M1 reading is within  $\pm 2.25$  dB for each frequency.

## 15. Battery Pack Removal and Replacement

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

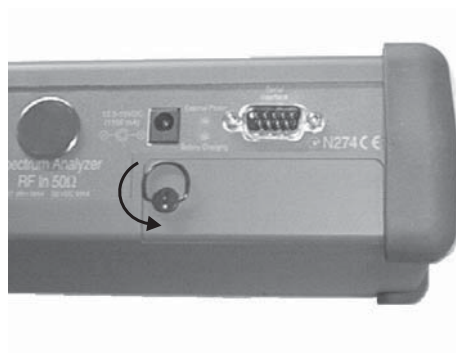
*NOTE: Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations used are representative and may show instruments other than the Spectrum Master.*

1. With the Spectrum Master standing upright on a stable surface, locate the battery access door (Figure 6).



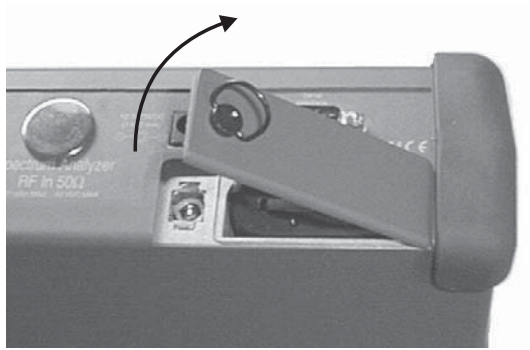
**Figure 6.** Battery Access Door Location

2. Lift up the access door handle and rotate it 90 degrees counterclockwise, as illustrated in Figure 7.



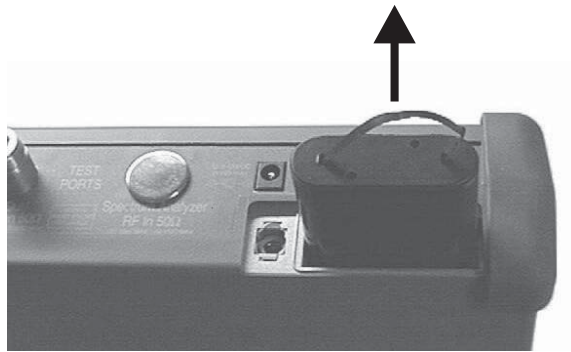
**Figure 7.** Rotate the Battery Access Door Handle

3. Lift the door and remove, as illustrated in Figure 8.



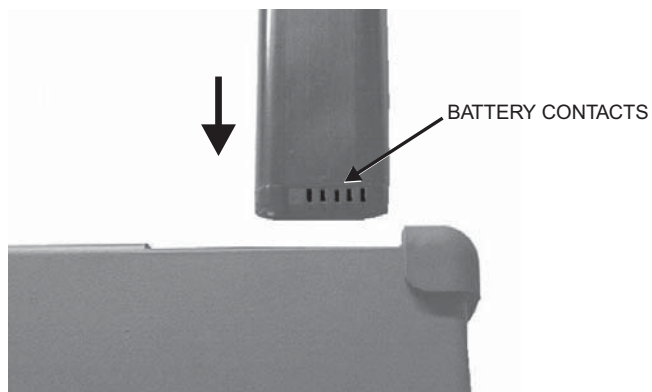
**Figure 8.** Removing the Battery Access Door

4. Grasp the battery lanyard and pull the battery straight up and out of the unit, as illustrated in Figure 9.



**Figure 9.** 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 10).



**Figure 10.** Battery Orientation

## 16. Battery Information

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

- The Nickel Metal Hydride (NiMH) battery supplied with the Spectrum Master is shipped in a discharged state. Before using the Spectrum Master, the internal battery must first be charged for three hours, either in the Spectrum Master or in the optional battery charger (Anritsu part number: 2000-1029).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the Spectrum Master 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 Master or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours; overcharging may shorten battery life.
- If left unused a fully charged battery will discharge itself over time.
- Temperature extremes will affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.
- Discharge 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.

### 16.1. Battery Testing Procedure

1. With the Spectrum Master off and the battery installed, connect the Universal AC Adapter to the 12.5-15VDC (1350 mA) connector. The External Power LED and the Battery Charging LED will light.

*NOTES: If the Battery Charging LED does not light, the battery 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 lights indicating a full charge cycle has begun.*

*Charging is inhibited below 0°C and above 45°C. If the unit is too hot, the battery will not start charging until the unit temperature has reached 43°C.*

2. Disconnect the AC-DC Adapter when the Battery Charging LED turns off, indicating the battery is fully charged.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Spectrum Master. 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, press the **ESCAPE/CLEAR** key and continue with this procedure.

If the value is lower than 80%, a discharge/charge cycle may be needed to improve the battery capacity. Completely discharge the battery, as described in Steps 5 and 6 below, and then recharge the battery as described in Steps 1 and 2. If the battery capacity does not increase after a discharge/charge cycle, replace the battery.

5. Press the **START CAL** key (to keep the Spectrum Master from going into HOLD mode) and make note of the test start time.
6. When the Spectrum Master display fades and the Spectrum Master switches itself off, make note of the test stop time.
7. The total test time (Step 5 to Step 6) should be  $\geq 1.5$  hours. If the battery charge started at 80% or more and the total battery test time is  $< 70$  minutes, replace the battery.

## 17. Front Panel Assembly Removal and Replacement

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

*NOTE: Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations used are representative and may show instruments other than the Spectrum Master.*

1. Remove the external power supply, if installed, and remove the battery from the unit.
2. Place the Spectrum Master face up on a stable work surface.
3. Remove the four rubber corner bumpers by carefully lifting and sliding the bumpers off of the case corners (Figure 11).



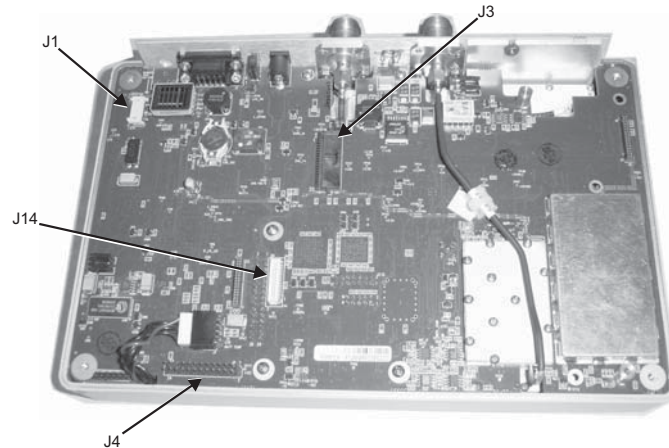
**Figure 11.** Removing the Corner Bumpers

4. 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 Master case together.
5. 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 completely, as there are delicate cables attached between the two halves that must be disconnected first.*

6. If the unit is equipped with a monochrome display, carefully depress the latch tab and disconnect the monochrome LCD display cable from J3 on the main PCB.  
or  
If the unit is equipped with a color display, carefully disconnect the display cable from J14 on the main PCB.
  7. Carefully disconnect the keypad interface cable from J4 on the main PCB.
  8. Carefully disconnect the LCD display backlight cable from J1 on the main PCB.
- 



**Figure 12.** *Spectrum Master Front Panel Cable Connections*

9. Remove the front panel assembly.
10. 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 13) is made to conform to the contour of the front cover only.*

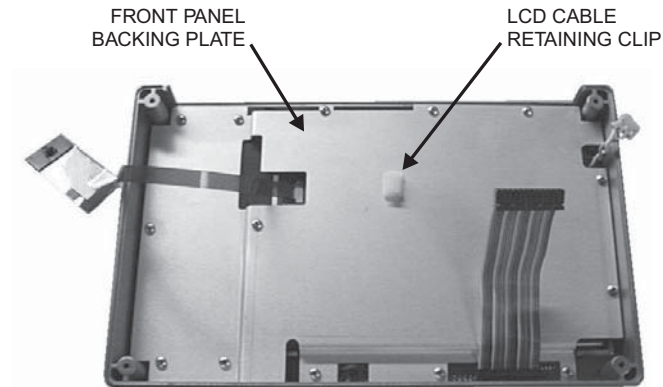


**Figure 13.** *Corner Bumper Detail*

## 18. 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 Master.

1. Remove the front panel assembly as directed in section 17.
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.



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**Figure 14.** *Front Panel Backing Plate*

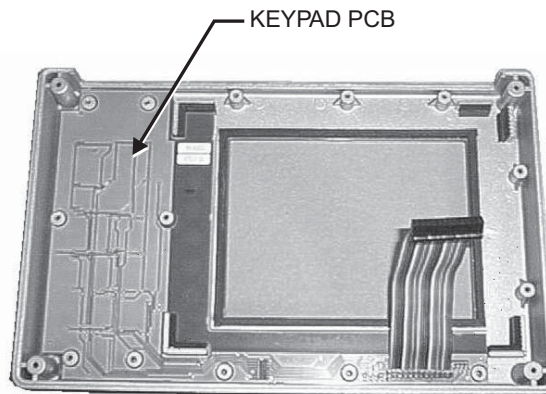
5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or connector.
6. Remove the rubber cushion pad from the LCD assembly and remove the assembly.
7. Reverse the above steps to install the replacement assembly.



## 19. 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 17.
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 14).
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.



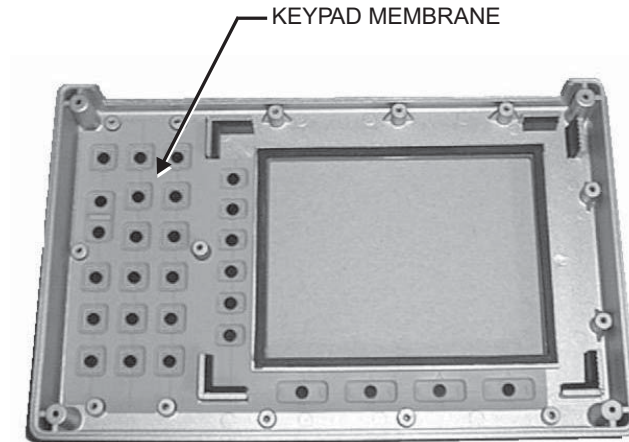
**Figure 15.** Front Panel Keypad PCB Location

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

## 20. Key Pad Membrane Replacement

This procedure provides instructions for replacing the key pad membrane.

1. Remove the front panel assembly as directed in section 17.
2. Remove the key pad PCB as directed in section 19.
3. Remove the keypad membrane by gently pulling the membrane up and out of the holes in the front panel.



**Figure 16.** *Front Panel Keypad Membrane*

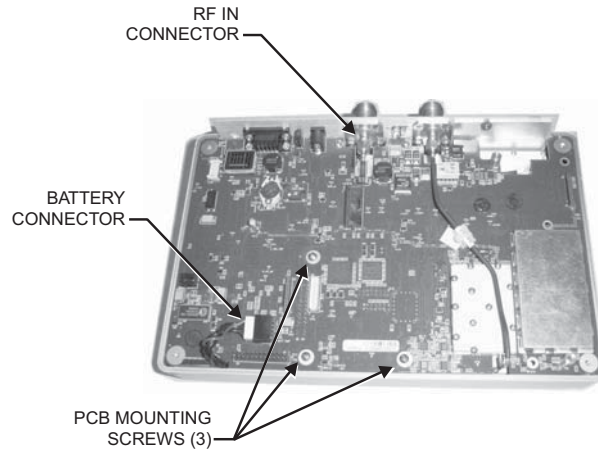
4. Reverse the above steps to install the replacement membrane.

## 21. Main PCB Assembly Replacement

This procedure provides instructions for replacing the main PCB assembly with the connector panel attached.

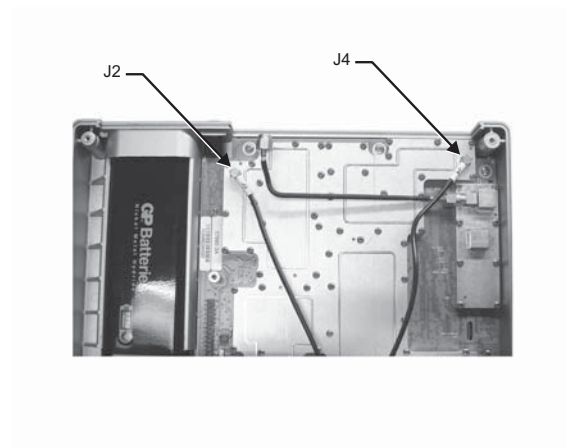
1. Remove the front panel assembly as directed in section 17.
2. Disconnect the battery connector from J7 on the main PCB.
3. Disconnect the semi-rigid coaxial cable from the RF In connector on the connector panel.

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



**Figure 17.** Main PCB (shown with optional T1/E1 PCB installed)

5. Carefully reach between the Main PCB and the SPA PCB and disconnect the cables from J2 and J4 on the SPA PCB.



**Figure 18.** Spectrum Analyzer PCB

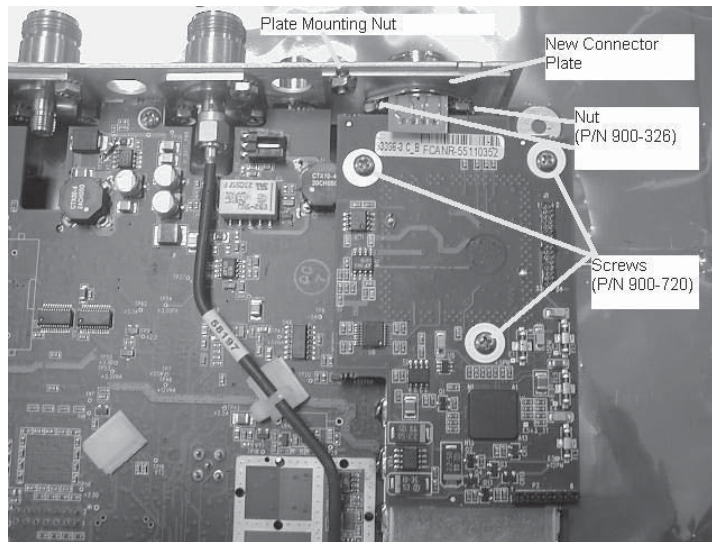
6. Remove the Main PCB.
7. Remove the three .25" standoffs and four Phillips screws and remove the Spectrum Analyzer PCB.
8. Reverse the above steps to install the new main PCB.

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

## 22. Option 5 Power Monitor PCB Assembly Replacement

This procedure provides instructions for replacing the Power Monitor PCB Assembly.

1. Remove the front panel assembly as directed in on page 34, Front Panel Assembly Removal and Replacement.
2. Remove the entire Main PCB assembly from the bottom case as directed on page 38.
3. On the upper right corner, locate and remove the nut that secures the blank plate to the connector panel.
4. Carefully remove the blank plate from the connector panel.
5. Install the new connector plate (p/n 61536) to the connector panel and secure it with the nut that was removed in step 4.
6. Peel off the rectangular portion from the overlay (p/n 61503) and stick it to the connector plate.
7. Install the three standoffs (p/n 785-405) to the main board on the side that faces the Front Panel assembly and secure them with three Phillips screws (p/n 900-720) from the side that faces the bottom case.
8. Install the Option 5 PCB assembly (p/n 63066-3) to the main board. Carefully align J1 to J6 of the main board when installing. Refer to Figure 19.
9. Secure the Option 5 PCB assembly to the standoffs using the last three Phillips screws.
10. Carefully push the DIN connector through the opening on the connector panel and secure it with the nuts (p/n 900-326) supplied.



**Figure 19.** Power Monitor PCB Assembly Replacement

## 23. Accessories and Replaceable Parts

Accessories and replaceable parts for the Spectrum Master MS2711D are listed below.

### Accessories

Part Number	Description	Qty
10580-00097	User's Guide, Spectrum Master MS2711D	1
10580-00098	Programming Manual, Spectrum Master MS2711D (disk only)	1
2300-347	Handheld Software Tools	1
40-187-R	Power Supply	1
2000-1029	Battery Charger	1
22N50	Open/Short, N Male	1
SM/PL	Precision Termination, N Male	1
806-62	Automotive Power Adapter	1
806-16	Bantam Plug to Bantam Plug Cable Assembly	1
806-116	Bantam Plug to BNC Male Cable Assembly, 8 ft	1
806-117	Two Bantam Plugs to RJ48 Cable Assembly, 8 ft	1
800-441	Serial Interface Cable Assembly	1
65717	Soft Carrying Case	1

### Replaceable Parts

Part Number	Description	Qty
510-87	N Connector	2
15-102	Monochrome Liquid Crystal Display Assembly	1
15-123	TFT Color Liquid Crystal Display Assembly	1
633-27	Rechargeable Battery, NiMH	1
ND63394	Main PCB Assembly, MS2711D, Serial Number ≤ 538117	1
ND63395	Main PCB Assembly, MS2711D/10, Serial Number ≤ 538117	1
ND63396	Main PCB Assembly, MS2711D/21, Serial Number ≤ 538117	1
ND63397	Main PCB Assembly, MS2711D/10/ 21, Serial Number ≤ 538117	1
ND65206	Main PCB Assembly, MS2711D/31, Serial Number ≤ 538117	1
ND65207	Main PCB Assembly, MS2711D/10/31, Serial Number ≤ 538117	1
ND65211	Main PCB Assembly, MS2711D/21/31, Serial number ≤ 538117	1
ND65772	Main PCB Assembly, MS2711D/10/21/31, Serial Number ≤ 538117	1
ND68506	Main PCB Assembly, MS2711D, Serial Number > 750062	1
ND68507	Main PCB Assembly, MS2711D/10A, Serial Number > 750062	1
ND68508	Main PCB Assembly, MS2711D/21, Serial Number > 750062	1
ND68509	Main PCB Assembly, MS2711D/31, Serial Number > 750062	1
ND68510	Main PCB Assembly, MS2711D/10A/21, Serial Number > 750062	1
ND68511	Main PCB Assembly, MS2711D/10A/31, Serial Number > 750062	1
ND68512	Main PCB Assembly, MS2711D/21/31, Serial Number > 750062	1
ND68513	Main PCB Assembly, MS2711D/10A/21/31, Serial Number > 750062	1
ND65212	Main PCB Assembly, MS2711D/10A, Serial Number 538118 through 750062	1
ND65213	Main PCB Assembly, MS2711D/10A/21, Serial Number 538118 through 750062	1
ND65214	Main PCB Assembly, MS2711D/10A/21/31, Serial Number 538118 through 750062	1
ND65215	Main PCB Assembly, MS2711D/10A/31, Serial Number 538118 through 750062	1
ND65782	Main PCB Assembly, MS2711D, Serial Number 538118 through 750062	1
ND65783	Main PCB Assembly, MS2711D/21, Serial Number 538118 through 750062	1
ND65784	Main PCB Assembly, MS2711D/31, Serial Number 538118 through 750062	1
ND65785	Main PCB Assembly, MS2711D/21/31, Serial Number 538118 through 750062	1
3-71657-3	Keypad PCB Assembly	1
46649-5	Keypad Membrane with Contrast Symbol	1
46649-7	Keypad Membrane without Contrast Symbol	1

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**Hardware**

<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
900-861	Pan Head Screw, 4-20, 0.365	18
900-791	Screw, 2-56, 0.375	77
900-720	Screw, 4-40, 0.187	6
900-326	Kep Nut, 4-40, 0.187	3
790-18	M-F Standoff, 4-40, 0.375, Hex	4
785-405	Plain Standoff, 4-40, 0.187, Hex	1
785-927	M-F Standoff, 4-40, 0.625	3
761-79	Cap Vinyl, Black, round	2

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**Case Parts**

<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
46652-3	Top Case only (for units with Monochrome LCD Display)	1
61440-1	Top Case only (for units with TFT Color LCD Display)	1
46653-3	Bottom Case only	1
48231-3	Battery Door	1
790-509 790-510 48241	Battery Door Latch (3 pieces)	1
790-511	Door Lock Receptacle	1
46655-2	Case Corner Bumpers	4
46662	LCD Retainer Plate	1
48241	Foam, LCD Corners	9
48278	Foam, LCD Window	1
46659	Foam, LCD Backing	1
46661	Foam, Keypad Backing	1
720-19	Cable Clamp	1
790-515	Spring, Battery Compartment	1
58247	ID Label, Model MS2711D	1

## 24. Customer Service

To locate the nearest Anritsu Customer Service Center, please refer to the Anritsu web page:

<http://www.anritsu.com/Contact.asp>



**Anritsu**

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