Maintenance Manual

Spectrum Master™ Models MS2723B and MS2724B

Handheld Spectrum Analyzer

/inritsu

DECLARATION OF CONFORMITY

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: Spectrum Master

Model Number: MS2723B, MS2724B

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

Electromagnetic Interference: EN61326:1997 A1:1998 A2:2001 A3:2003

Emissions: EN55011:1998 A1:1999 A2:2002 Group 1 Class A

Immunity: EN 61000-4-2:1995 A1:1998 A2:2001 - 4kV CD, 8kV AD
EN 61000-4-3:2002 A1:2002 - 3V/m
EN 61000-4-4:2004 - 0.5kV SL, 1kV PL
EN 61000-4-5:1995 A1:2001 - 1kV L-L, 2kV L-E
EN 61000-4-6:1996 A1:2001 - 3V
EN 61000-4-11:1994 A1:2001 - 1 cycle @ 100%

Electrical Safety Requirement:

Product Safety: The Product Complies when used with Company supplied Power
Supply (tested to IEC 60950-1:2001)

Eric McLean, Corporate Quality Director

Morgan Hill, CA

22 Jan 2007
Date

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$$\mathsf{C}\,\mathsf{E}$$

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⊘N274

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产品中有毒有害物质或元素的名称及含量 　　For Chinese Customers Only　　YLYB

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	×	○	×	×	○	○
机壳、支架 (Chassis)	×	○	×	×	○	○
LCD	×	×	×	×	○	○
其他（电缆、风扇、 连接器等） (Appended goods)	×	○	×	×	○	○
○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。						

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注意事项的基础上，从生产日起算的该年限内，不会因产品所含有害物质的泄
漏或突发性变异，而对环境污染，人身及财产产生深刻地影响。
注）电池的环保使用期限是 5 年。生产日期标于产品序号的前四码
　　（如 S/N 0728XXXX 为07 年第 28 周生产）。

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	
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 ⏚ or ⏚	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 **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.
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 Anritsu Spectrum Master Models MS2723B and MS2724B. It provides a list of recommended test equipment, performance verification procedures, parts replacement procedures, and a replaceable parts list (Table 1-3 on page 1-4). Appendix A contains blank test records, which should be copied before use. Familiarity with the basic operation of the front panel keys is assumed (for example, how to change measurement mode, how to preset the instrument, or the meaning of "soft key" or "submenu key"). Before making any measurement, ensure that all equipment has warmed up for at least 30 minutes.

1-2 Recommended Test Equipment

The following test equipment is recommended for use in testing and maintaining Anritsu Spectrum Master Models MS2723B and MS2724B. Table 1-1 is a list of test equipment that is required for verifying the spectrum analyzer functions. Table 1-2 is a list of test equipment that is required for verifying the functions of installed options.

Table 1-1. Test Equipment Required for Verifying Spectrum Analyzer Functions

Instrument	Critical Specification	Recommended Manufacturer/Model
Synthesized Signal Generator	Frequency: 0.1 Hz to 20 GHz, Power Output: +16 dBm, Step attenuator installed	Anritsu Model MG3692A or MG3692B with Options 2A, 4, 22, 15x *
Power Meter	Power Range: −70 to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 100 kHz to 18 GHz Power Range: −30 to +20 dB	Anritsu Model MA2421D or SC7816 (Qty 2)
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: −67 to +20 dB	Anritsu Model MA2442D (Qty 2)
Vector Network Analyzer	40 MHz to 20 GHz	Anritsu Model 37x47A,B,C or D
Type N Calibration Kit for VNA	40 MHz to 18 GHz	Anritsu Model 3653
Test Port Converter for VNA	40 MHz to 18 GHz	Anritsu Model 34UN50
50 Ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
Adapter	Frequency: DC to 20 GHz N(m)-N(m), 50 Ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm	Anritsu Model 34RKNF50
RF Coaxial Cable	Frequency: DC to 18 GHz N(m)-N(f), 50 Ohm	Anritsu Model 15NN50-1.5B (Qty 2)
Lowpass Filter	Frequency: 50 MHz	Anritsu Part Number 1030-96
Low Frequency Cal Fixture	Frequency: 9 kHz to 100 kHz	Anritsu Part Number T3449
Frequency Reference	Frequency: 10 MHz	Symmetricom RubiSource T&M
Signal Generator		Agilent Model 8648D with Options 1ES and 1EA
Multimeter	Capable of measuring True RMS AC voltage in millivolts range	Agilent Model 34401A
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10 (Qty 2)
Fixed Attenuator	20 dB Attenuation	Aeroflex/Weinschel Model 44-20 (Qty 2)

Table 1-1.   Test Equipment Required for Verifying Spectrum Analyzer Functions (Continued)

Instrument	Critical Specification	Recommended Manufacturer/Model
Fixed Attenuator	6 dB Attenuation	Aeroflex/Weinschel Model 44-6 (Qty 2)
Fixed Attenuator	2 dB Attenuation	Aeroflex/Weinschel Model 44-2 (Qty 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Coaxial Cable	BNC(m) to BNC(m), 50 Ohm	Any (Qty 2)
Adapter	Dual Banana Plug to BNC(f)	Any

* Note that MG3692A models require Option 15 to achieve power of +16 dBm at 3.5 GHz. MG3692B models do not require Option 15 to achieve power of +16 dBm at 3.5 GHz.

Caution	Factory tests have shown that the equipment that is listed above will provide satisfactory results at 20 GHz (the upper limit of the MS2724B) even though the chart above specifies 18 GHz (per manufacturers specifications). Many Type N cables have excessive loss for testing the spectrum analyzer section of the instrument up to 20 GHz. An SMA cable or K cable should therefore be installed on the MG synthesizer for all spectrum analyzer tests on the MS2724B.

Table 1-2.   Test Equipment Required for Verifying Functions of Installed Options

Instrument	Critical Specification	Recommended Manufacturer/Model
Synthesizer	Frequency: 0.1 Hz to 20 GHz, +16 dBm power	Anritsu Model MG3692A or MG3692B with options 2A, 4, 15, and 22 [a]
Vector Signal Generator	Frequency: 100 kHz to 3 GHz	Anritsu Model MG3700A with Options MG3700A-002 and MG3700A-021 [b]
Power Meter	Power Range: −70 to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: −60 to +20 dBm	Anritsu Model MA2482D with Option 1 (Qty 2)
Frequency Counter	Frequency: 20 GHz	Anritsu Model MF2412B
Programmable Attenuator	Frequency: DC to 2 GHz Attenuation:100 dB (1 and 10 dB steps)	Anritsu Model MN63A
Fixed Attenuator	Frequency Range: DC to 18 GHz Attenuation: 10 dB	Aeroflex/Weinschel Model 44-10 (Qty 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
RF Power Amplifier	Frequency:100 to 1000 MHz Gain: 35 dB min	Mini Circuits Model TIA-1000-1R8 (Qty 2 BNC(m) to N(f) Adapters required)
Adapter	Frequency: DC to 20 GHz N(m)-N(m), 50 Ohm	Maury Microwave Model 8828B Quantity: 2 each [One each required only if Anritsu Coupler and Circulator are used]
Adapter	Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm	Anritsu Model 34RKNF50
Adapter	Frequency: 881.5 MHz BNC(m) to N(f), 50 Ohm	Midwest Microwave Model ADT-2615-NF-BNM-02 (Qty 2)

Table 1-2. Test Equipment Required for Verifying Functions of Installed Options (Continued)

Instrument	Critical Specification	Recommended Manufacturer/Model
Adapter	Frequency: 881.5 MHz SMA(m) to N(f), 50 Ohm	Midwest Microwave Model ADT-2582-NF-SMM-02 (Qty: 4) [Required only if Anritsu Coupler and Circulator are used.]
Adapter	Frequency: 881.5 MHz SMA(m) to SMA(m), 50 Ohm	Midwest Microwave Model ADT-2594-MM-SMA-02 [Required only if Anritsu Coupler and Circulator are used.]
50 Ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
High Power Load	DC to 18 GHz, 10W	Aeroflex/Weinschel Model M1418
Coupler	Frequency: 881.5 MHz Coupling Factor: 30 dB	Midwest Microwave Model CPW-5140-30-NNN-05 or CPW-5141-30-NNN-05 Alternative: Anritsu part number 1091-307 [Two SMA(m) to N(f) adapters required.]
Circulator	Frequency Range: 800 to 1000 MHz Isolation: 20 dB min	Meca Electronics, Inc. part number CN-0.900 Alternative: Anritsu part number 1000-50 [Two SMA(m) to N(f) adapter and one SMA(m) to SMA(m) Adapter required.]
RF Coaxial Cable	Frequency: DC to 18 GHz N(m)-N(m), 50 Ohm	Anritsu Model 15NN50-1.5B (Qty 3)
GPS Antenna		Anritsu 2000-1410
Coaxial Cable	BNC(m) to BNC(m), 50 Ohm	Any

a.Note that MG3692A models require Option 15 to achieve power of +13 dBm. MG3692B models do not require Option 15 to achieve +13 dBm power.

b.Note that the MG3700A requires that several factory custom test pattern files be installed into its memory.

1-3   Replaceable Parts

Table 1-3.   List of Replaceable Parts

Part Number	Description
ND67986	MS2723B Main/Spec Analyzer PCB Assembly, with Opt 9 & 31 *
ND67987	MS2724B Main/Spec Analyzer PCB Assembly, with Opt 9 & 31 *
ND66821	MS272xB Demodulation PCB (Opt 9)
3-790-661	Gasket material for case edge
3-15-118	LCD Display
61368	Clear Plastic LCD Protector
3-66549-3	LCD Backlight Inverter PCB
65729	Soft Carrying Case
64126	Case Top (excludes model ID Label and keypad items)
64127	Case Bottom
66148	Model MS2723B ID Label
66149	Model MS2724B ID Label
61379-1	Battery Door
633-44	Li-ion Battery Pack
513-64	Type N RF connector
ND64383	Fan
3-633-26	3V RTC Battery
40-168	AC to DC Power Converter
3-2000-1567	Internal Compact Flash Card (512 MB)
65027-3	Main Keypad PCB
61362	Main Keypad
61363-1	Main Keyboard Bezel
61361	Soft keys Keypad
61378-1	Soft key Bezel
61333-3	Soft key PCB
790-625	Speaker
3-410-101	Encoder (excluding knob)
61360-2	Knob (excluding encoder)

*When ordering the Main/Spectrum Analyzer PCB Assembly, in order to ensure installation of correct options, all options that are installed on the instrument must be declared on the order. The options are listed on a label on the top of the MS272xB and are shown in the System / Status display.

Chapter 2 — Performance Verification

2-1   Introduction

This chapter contains tests that are used to verify the performance of Spectrum Master Models MS2723B and MS2724B. Section 2-2 "Spectrum Analyzer Function Verification" begins the instructions to verify Spectrum Analyzer functions, and Section 2-3 "Optional Functions Verification" on page 2-33 begins the instructions to verify Options. Blank performance verification test records are provided in Appendix A. Make a copy of the blank test records and use them to record measured values.

Caution	Verify that all equipment has warmed up for at least 30 minutes before making any measurements.

2-2   Spectrum Analyzer Function Verification

Spectrum Analyzer Frequency Accuracy

This test verifies the CW frequency accuracy of the Spectrum Analyzer in Spectrum Master Models MS2723B and MS2724B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
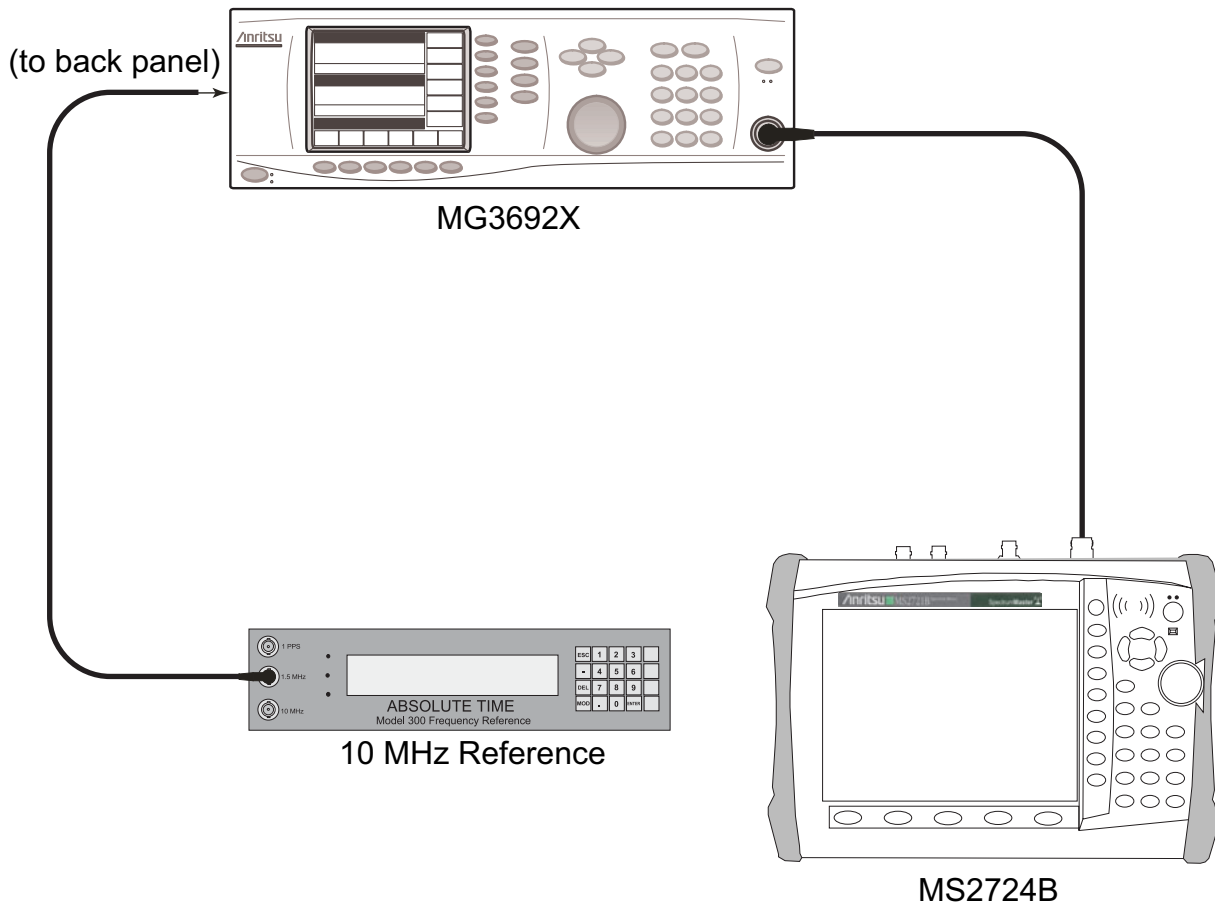
Figure 2-1.   Spectrum Analyzer Frequency Accuracy − Test Setup

Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator, as shown in Figure 2-1.

Note	**Do Not Connect** the external 10 MHz Reference to the Spectrum Master Models MS2723B or MS2724B.

2. Connect the output of the synthesized Signal Generator to the Spectrum Analyzer RF In of the MS2723B or MS2724B.

3. On the MS2723B or MS2724B, change the Mode to Spectrum Analyzer. Preset the instrument.

4. Set the MG3692x output to 1 GHz CW, with an RF output level of −30 dBm.

5. On the MS2723B or MS2724B, press the Amplitude soft key, and set the Reference Level to −10 dBm.

6. Press the Freq soft key and set the Center Freq to 1.0 GHz.

7. Press the Span soft key, set the span to 10 kHz.

8. Press the BW soft key and set RBW to 100 Hz.

9. Press the VBW soft key and set to 30 Hz.

10. Press the **Marker** key, and press the Peak Search soft key.

11. Record the marker frequency into the "Measured Value" column of Table A-1, "Spectrum Analyzer Frequency Accuracy" on page A-2. Verify that it is within specification.

12. For MS2723B, set the MG3692x output to 12.0 GHz CW, and set the center frequency of the MS2723B to 12.0 GHz. For MS2724B, set the MG3692x output to 19.0 GHz CW, and set the center frequency of the MS2724B to 19.0 GHz.

13. On the MS2723B or MS2724B, press the **Marker** key, and press the Peak Search soft key.

14. Record the marker frequency in Table A-1. Verify that it is within specification.

Note	If the instrument fails the Spectrum Analyzer Frequency Accuracy test, then perform the following Spectrum Analyzer Internal Reference Frequency Adjustment procedure. If the instrument still fails the Frequency Accuracy test after the Internal Reference Frequency adjustment has been completed, then replace the Main/SPA PCB assembly (Section 3-5).

Spectrum Analyzer Internal Reference Frequency Adjustment

Use this procedure to adjust the internal reference frequency only if the instrument failed the preceding Spectrum Analyzer Frequency Accuracy verification test. If the instrument still fails the Frequency Accuracy test after this Internal Reference Frequency adjustment has been completed, then replace the Main/SPA PCB assembly (refer to "Removal of the Spectrum Analyzer PCB" on page 3-5).

Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator, as shown in Figure 2-1.

Note	Do not connect the external 10 MHz Reference to the MS2723B or to the MS2724B.

2. Connect the MG3692x output to the Spectrum Analyzer RF In of the MS2723B or MS2724B.

3. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

4. Set the MG3692x output to 7 GHz with an RF output level of −30 dBm.

5. On the MS2723B or MS2724B, press the Amplitude soft key and set the Reference Level to −10 dBm.

6. Set the Atten Lvl to 0 dB.

7. Press the Freq soft key and set the Center Freq to 7.0 GHz.

8. Press the Span soft key, enter 10 kHz.

9. Press the BW soft key and set the RBW to **100 Hz**.

10. Press the VBW soft key and set to 30 Hz.

11. Press and hold the **Shift** key and press the 4th, 6th, and 8th (below **Esc**) soft keys together (simultaneously) to enter into Service Mode on the MS2723B or MS2724B (Figure 2-2).

Figure 2-2.   MS272xB Service Mode

12. Press the Service Menu soft key, then the APP Service soft key.

13. Press the Calibration soft key, then the 10 MHz Ref soft key.

14. Use the **Up/Down** arrow keys or the rotary knob to slowly adjust the displayed signal to the center of the display. Allow the signal to stabilize between adjustments, and repeat as necessary.

15. Turn the MS2723B or MS2724B Off, and then back On to exit Service Mode.

Spectrum Analyzer SSB Phase Noise Verification

This test verifies the single sideband phase noise of the Spectrum Analyzer in Spectrum Master Models MS2723B and MS2724B.

Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator, as shown in Figure 2-1.

2. Connect the output of the synthesized signal generator to the Spectrum Analyzer RF In connector of the MS2723B or MS2724B.

3. Set the MG3692A output to 2.00 GHz CW, with an RF output level of +4 dBm.

4. Verify that the MS272xB is in the Spectrum Analyzer mode. Preset the instrument.

5. Press the Amplitude soft key, then set the Reference Level to 0 dBm.

6. Press the Atten Lvl soft key and enter 15 dB.

7. Press the Freq soft key and set the Center Frequency to 2000.05 MHz.

8. Press the Span soft key and set the span to 110 kHz.

9. Press the BW soft key and set the RBW to 1 kHz.

10. Press the VBW soft key and set the VBW to 3 Hz.

11. Press the **Shift** key and then press the **Trace** (5) key.

12. Press Trace A Operations, and set the # of Averages to 7.

13. Wait until the Trace Count (left side of display) displays 7/7.

14. Press the **Marker** key and press the Peak Search soft key.

15. Press the Delta On/Off soft key to turn Delta On.

16. Use the keypad to enter 10, and press the kHz soft key.

17. Subtract 30 from the dB value that is shown on the marker readout in order to convert the value to dBc/Hz (for example, if the marker reads −80 dB, then the value becomes −110 dBc/Hz). Record the dBc/Hz value in Table A-2, "Spectrum Analyzer 2.0 GHz SSB Phase Noise Verification" on page A-2.

18. Repeat Step 16 and Step 17 for 20 kHz marker delta, 30 kHz marker delta, 100 kHz marker delta, 1000 kHz marker delta, and 10 MHz marker delta.

    Record the dBc/Hz values in Table A-2.

19. Repeat Step 3 through Step 18 for 3.44 GHz, 3.46 GHz, and 12.0 GHz CW, and also 19 GHz CW for the MS2724B only. That sets Center Frequency of the DUT to 3440.05 MHz, 3460.05 MHz, and 12000.05 MHz, and also to 19000.05 MHz for the MS2724B only.

    Record the dBc/Hz values in Table A-3 on page A-2, and in Table A-4, Table A-5, and Table A-6 on page A-3,

Spectrum Analyzer Resolution Bandwidth Accuracy

This test verifies the accuracy of the resolution bandwidth settings.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
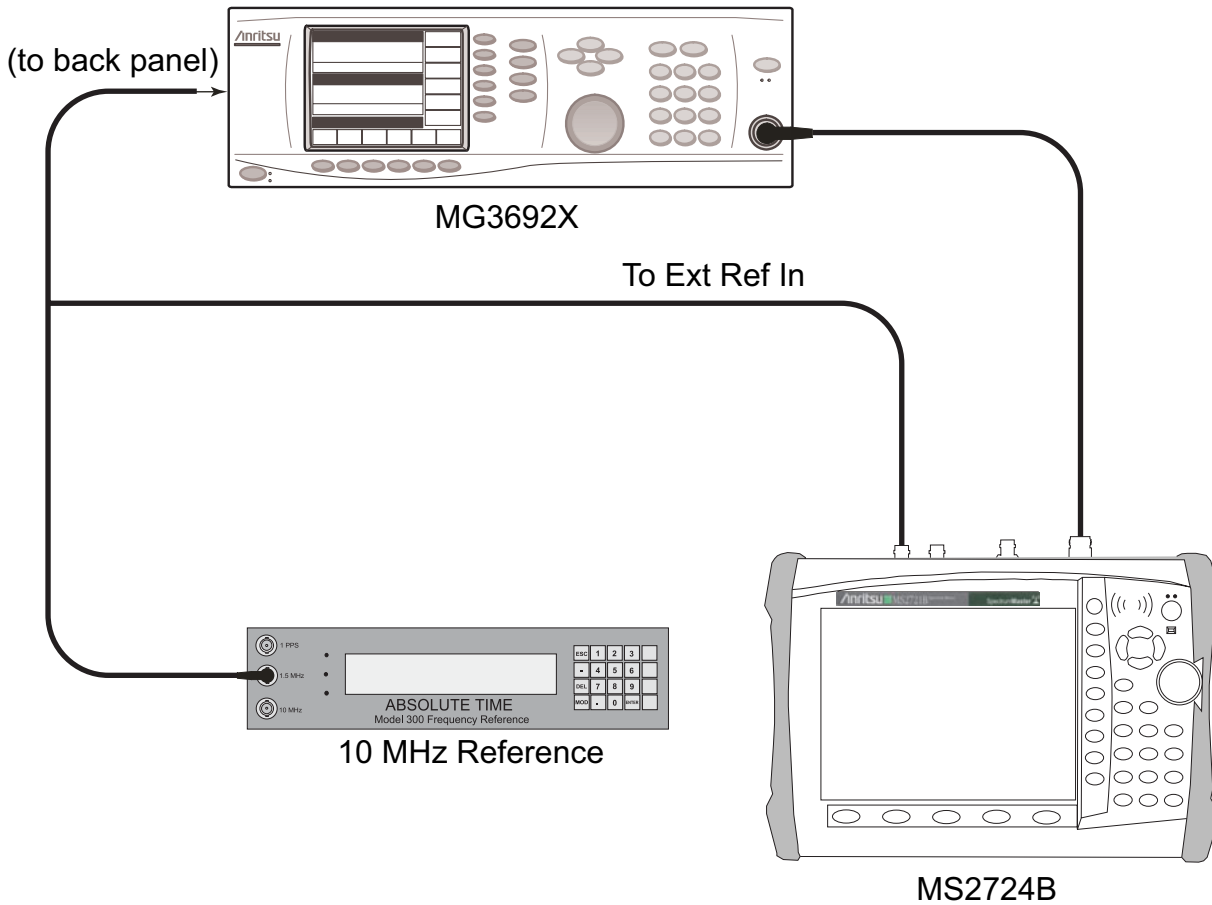
Figure 2-3.   Spectrum Analyzer Resolution Bandwidth Accuracy – Test Setup

Procedure:

1. Connect the external 10 MHz Reference both to the MG3692x Synthesized Signal Generator and to the Spectrum Master MS2723B or MS2724B, as shown in Figure 2-3.

2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

3. Set the MS2723B or MS2724B as follows:

    • Center Frequency: 1.0 GHz

    • Reference Level: −10 dBm

    • Atten Lvl: 0 dB

4. Set the MG3692x to 1 GHz CW, with an output level of −30 dBm. Apply the signal to the Spectrum Analyzer RF In connector of the MS2723B or MS2724B.

5. On the MS2723B or MS2724B, set the Span to 4.5 MHz.

6. Press the BW soft key and set the RBW to 3 MHz.

7. Under the Measure menu, press OCC BW and set it to On.

8. Press the dBc soft key and enter 3.

9. Record the occupied bandwidth in Table A-7, "Spectrum Analyzer Resolution Bandwidth Accuracy" on page A-4 and verify that it is within specification.

10. Repeat Step 5 through Step 9 for all other settings in Table A-7.

Spectrum Analyzer Second Harmonic Distortion

This test verifies the second harmonic distortion of the Spectrum Analyzer in Spectrum Master Models MS2723B and MS2724B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
- Lowpass Filter, Anritsu Part Number 1030-96 (RLC Electronics)
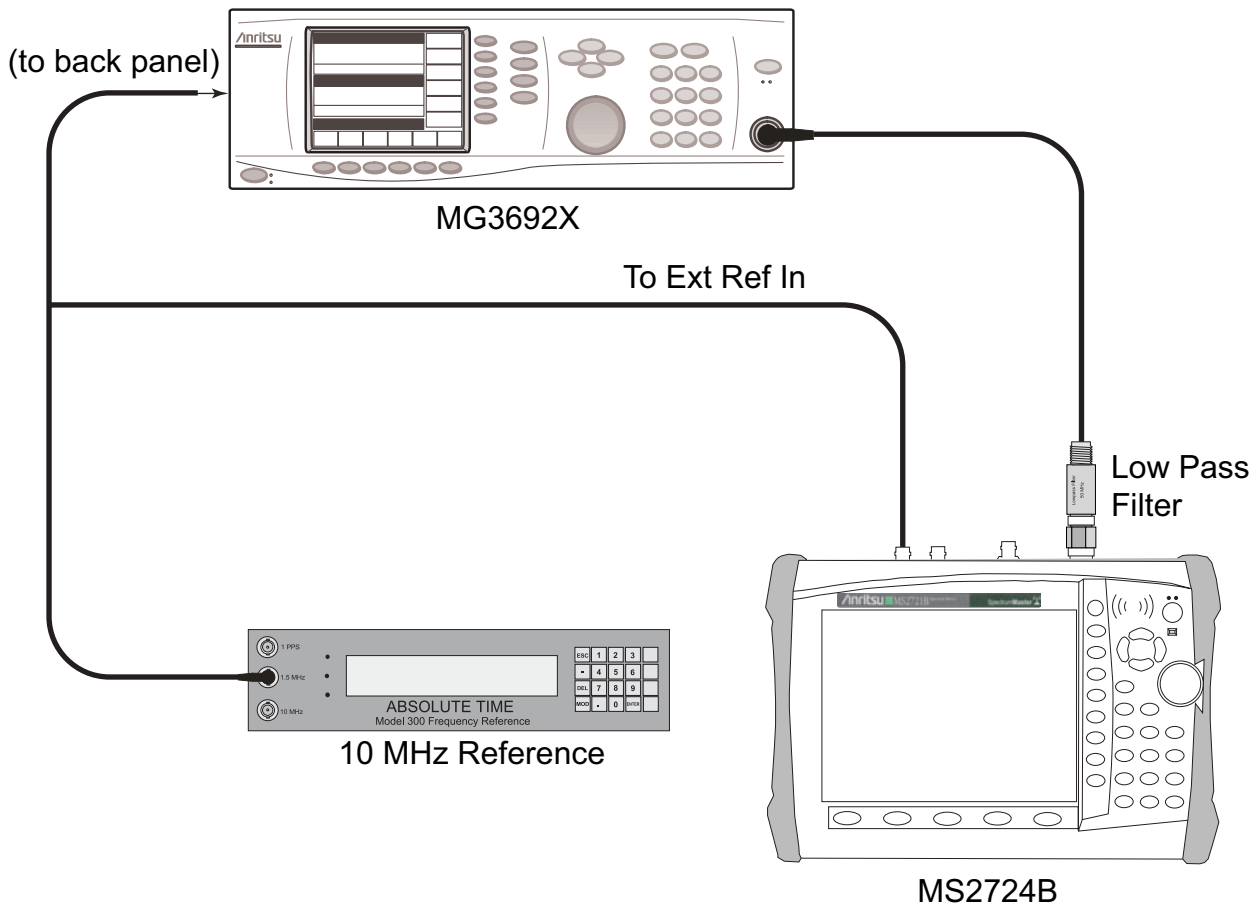
Figure 2-4.   Spectrum Analyzer Second Harmonic Distortion – Test Setup

Procedure:

1. Set the MG3692x Synthesized Signal Generator to 50.1 MHz CW, and set the output level to –30 dBm.

2. Connect the synthesized signal generator output to the Spectrum Analyzer RF In connector of the MS2723B or MS2724B through the 50 MHz lowpass filter, as shown in Figure 2-4.

3. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

4. Set the MS2723B or MS2724B as follows:

> Center Frequency: 50.1 MHz
>
> Span: 100 kHz
>
> Reference Level: –20 dBm
>
> Atten Lvl: 0 dB
>
> RBW: 1 kHz
>
> VBW: 10 Hz
>
> Detection: Peak

5. Press the **Shift** key and then the **Trace** (5) key. Press Trace A Operations and set # of Averages to 5.

6. After the Trace Count displays "5/5" (left side of display), press the Marker soft key and press Peak Search.

7. Record the amplitude of the 50.1 MHz signal in Table A-8, "Spectrum Analyzer Second Harmonic Distortion" on page A-4.

8. Change the Center Frequency of the MS2723B or MS2724B to 100.2 MHz. **Do not adjust** the MG3692x Synthesized Signal Generator.

9. After the Trace Count shows "5/5", press the Marker soft key and press Peak Search.

10. Record the amplitude of the signal at 100.2 MHz in Table A-8.

11. Convert the values of the 50.1 signal and the 100.2 signal to positive values and subtract the smaller from the larger. Record the result into the "Second Harmonic Distortion" column in Table A-8, and verify that it is within specification.

Spectrum Analyzer Third Order Intercept Verification

The following test verifies the Third Order Intercept point (also known as TOI or IP3) of the spectrum analyzer in Spectrum Master Models MS2723B and MS2724B.

2400 MHz TOI Test

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
- Power Meter, Anritsu Model ML2438A
- Signal Generator, Agilent Model 8648D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2442D (10 MHz to 18 GHz, −67 dB to +20 dB)
- Fixed Attenuator, Aeroflex/Weinschel Model 44-2
- Fixed Attenuator, Aeroflex/Weinschel Model 44-6
- Fixed Attenuator, Aeroflex/Weinschel Model 44-20
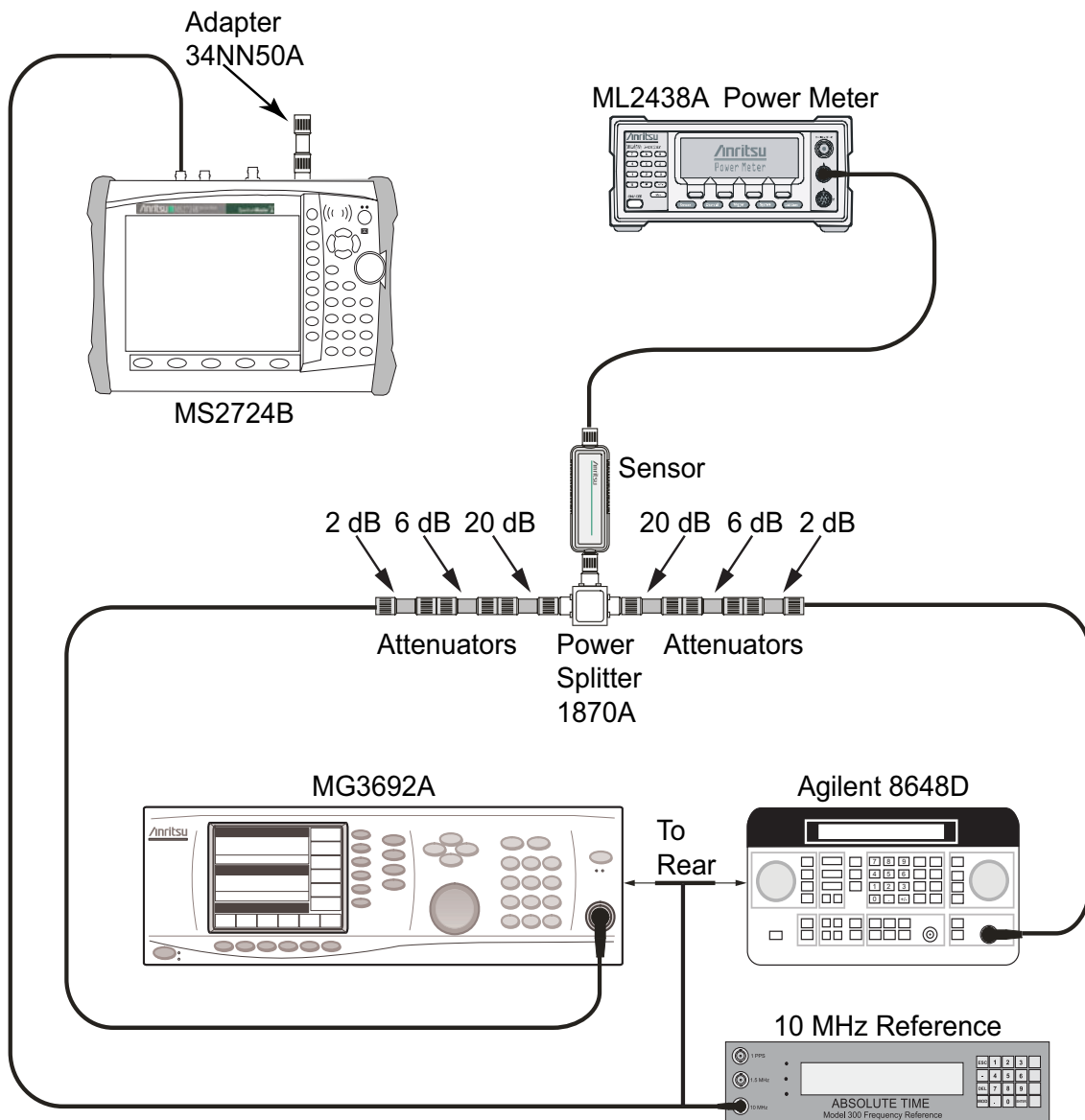
Figure 2-5. 2400 MHz TOI Verification - Characterization − Component Characterization Setup

Procedure:

1. Connect the equipment as shown in . The splitter will be used as an RF combiner (the normal RF outputs will become inputs, and the normal input will become the RF output).

2. Set the MG3692x Synthesized Signal Generator to 2399.951 MHz CW, and set the Agilent 8648D Signal Generator to 2400.051 MHz.

3. Set the Agilent 8648D Signal Generator RF to OFF ("RF OFF" appears on the right side of the display).

4. On the ML2438A power meter, zero the sensor and set the calibration factor to 2.4 GHz.

5. Connect the power sensor to the splitter output and adjust the power of the MG3692x so that −20 dBm appears at the splitter output (approximately +16 dBm).

6. Turn Off the RF of the MG3692x Synthesized Signal Generator.

7. On the Agilent 8648D Signal Generator, turn the RF On, and adjust the RF amplitude so that −20 dBm appears at the splitter output (approximately +16 dBm).

8. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

9. Set the MS2723B or MS2724B as follows:

> Center Frequency: − 2400.151 MHz
>
> Span: 100 Hz.
>
> RBW: 30 Hz
>
> VBW: 1 Hz
>
> Reference Level: −15 dBm
>
> Atten Lvl: 0 dB
>
> Preamp: Off

10. Press the **Shift** key and the **Sweep** (3) key. Press Detection, and press RMS (red dot appears on the label).

11. Disconnect the power sensor from the output of the splitter and connect the splitter output to the MS2723B or MS2724B Spectrum Analyzer RF In connector through the Anritsu Model 34NN50A adapter.
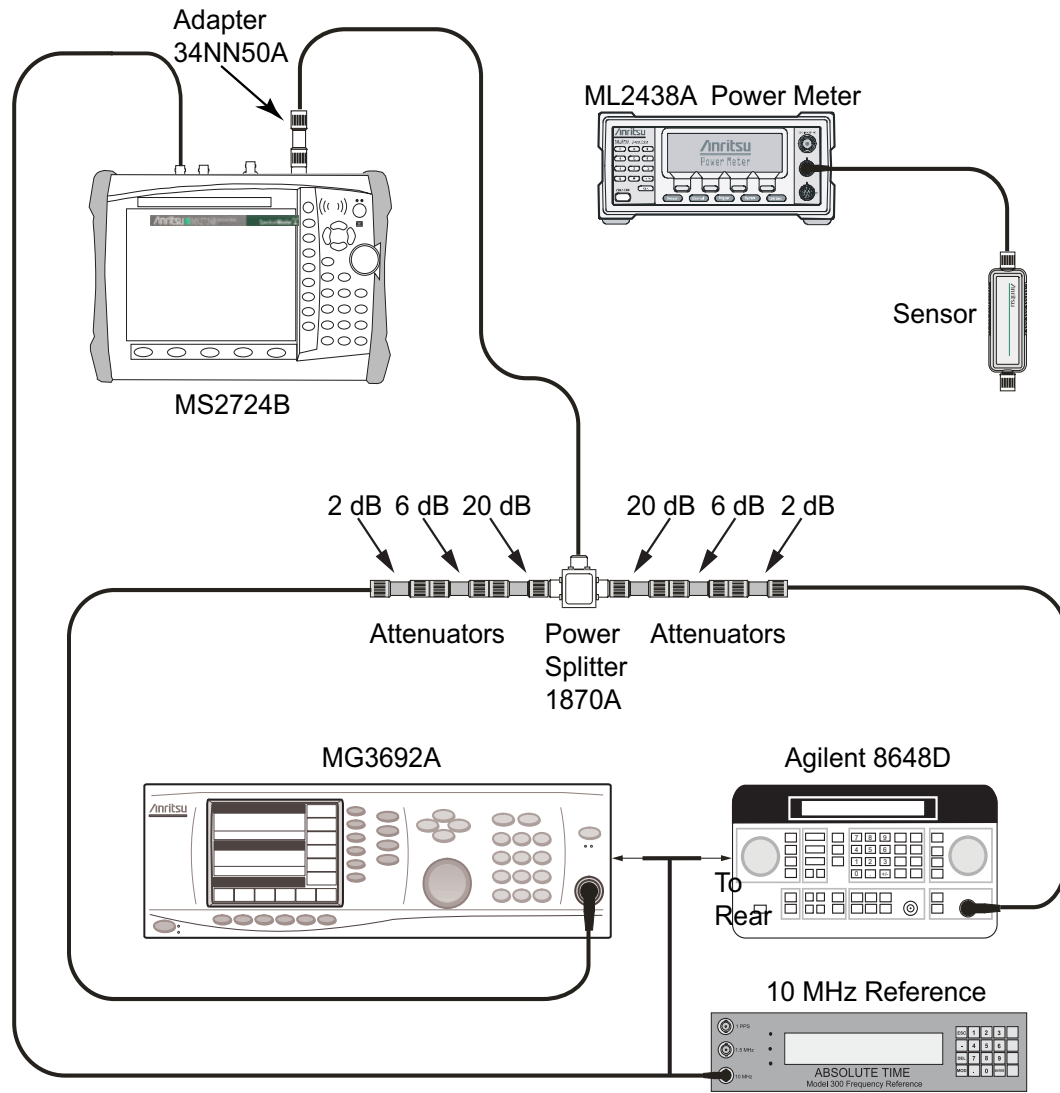
Figure 2-6.   2400 MHz TOI Verification – Test Setup

12. Turn On the RF of the MG3692x and the 8648D.

13. Press the **Shift** key and then the **Trace** (5) key. Press Trace A Operations, and set # of Averages to 2.

14. After two sweeps have occurred (Trace Count 2/2 appears on the left of the display), turn on a marker, and press Peak Search. Record the amplitude of the signal at 2400.151 MHz in Table A-9, "Spectrum Analyzer Third Order Intercept" on page A-4.

15. Change the Center Frequency of the MS2723B or MS2724B to 2399.851 MHz. Record the amplitude of this signal in Table A-9.

16. Determine which signal is larger (the 2399.851 MHz signal or the 2400.151 MHz signal). Use the larger value for max in the following formula to calculate the TOI for 2400 MHz (refer to the example calculation below the formula):

`TOI = −20 + [(−20 − max)/2] dBm`

Example: `Assume max = −90 dBm,` **then:** `TOI = −20 + [(−20 − (−90))/2] = +15 dBm`

17. Record the calculated 2400 MHz TOI measurement in Table A-9.

Spectrum Analyzer Displayed Average Noise Level (DANL)

The following test can be used to verify the Displayed Average Noise Level of the MS2723B or MS2724B. This test is performed using the RMS detection mode, first with preamp On, then with preamp Off.

Required Equipment:

- 50 ohm termination, Anritsu Model 28N50-2
- Spectrum Master: MS2723B or MS2724B
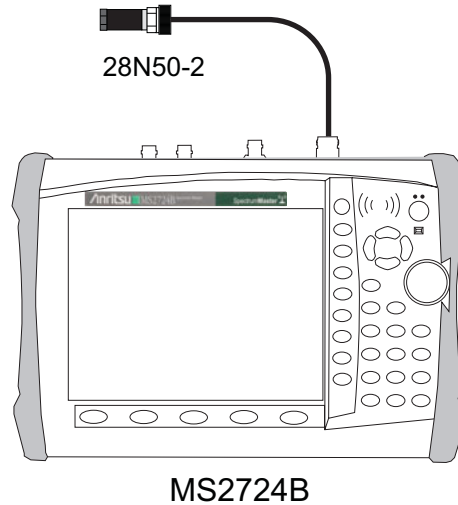
Figure 2-7.   Displayed Average Noise Level – Test Setup

Procedure (Preamp On):

   1. Connect the 28N50-2 50 Ohm termination to the MS2723B or MS2724B Spectrum Analyzer RF In.

   2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

   3. Press the Amplitude soft key and set Atten Lvl to 0 dB and Reference Level to –50 dBm.

   4. Press the Pre Amp On/Off soft key to turn it On.

   5. Press the **Shift** key and then press the **Sweep** (3) key, then press Detection, then press RMS (red dot appears on the RMS label).

   6. Press the BW soft key and select RBW of 100 kHz.

   7. Enter into the MS2723B or MS2724B the Start and Stop frequencies from Table A-10, "Spectrum Analyzer DANL (Preamp On)" on page A-4.

   8. Wait until one sweep has been completed.

   9. Press the **Marker** key, and press Peak Search.

  10. Record the Marker reading in the "Measured dBm (100 kHz RBW)" column in Table A-10, "Spectrum Analyzer DANL (Preamp On)" on page A-4.

  11. Repeat Step 7 through Step 10 for the other frequencies on the list in Table A-10.

  12. For each measured 100 kHz value in Table A-10, convert the value to 1 Hz RBW value by subtracting 50 dB. (For example, if the marker shows a value of –110 dBm at 100 kHz RBW, then the calculated value at 1 Hz RBW is –160 dBm.) Enter the calculated values in Table A-10. Example equation:

```
(-110 dBm) - (50 dB) = -160 dBm
```

Procedure (Preamp Off):

13. Press the Amplitude soft key.

14. Set Reference Level to −20 dBm, and set the preamp to Off.

15. Repeat Step 7 through Step 11 for the preamp Off measurements, recording the measured values in Table A-11, "Spectrum Analyzer DANL (Preamp Off)" on page A-5.

16. Enter the calculated 1 Hz RBW values in Table A-11.

Spectrum Analyzer Residual Spurious Response

The following test verifies the residual spurious response of the Spectrum Analyzer. This test is performed using the positive peak detection mode. This test has two parts:

- Residual Spurious Test with Preamp On
- Residual Spurious Test with Preamp Off

Residual Spurious Test with Preamp On

Procedure:

1. Connect the 50 ohm termination (Figure 2-7) to the Spectrum Analyzer RF In connector.

2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

3. Press the **Amplitude** key, then press the Reference Level soft key.

4. Use the keypad to enter −50 and press the dBm soft key.

5. Press the Atten Lvl soft key and enter 0, then press the dB soft key.

6. Ensure that the Pre Amp On/Off soft key is in the On position. If the preamp is Off, then press the Pre Amp On/Off soft key to turn it On.

7. Press the **Shift** key and then press the **Sweep** (3) key, then press Detection and then the Peak soft key.

8. Press the **BW** key and press the RBW soft key.

9. Use the keypad to enter 10, and press the kHz soft key.

10. Press the VBW soft key and use the keypad to enter 1, then press the kHz soft key.

11. Press the **Freq** key, and press the Start Freq soft key.

12. Use the keypad to enter 100, and press the kHz soft key.

13. Press the Stop Freq soft key, enter 10, and press the MHz soft key.

14. Wait until one sweep is completed.

15. Press the **Marker** key, and press the Peak Search soft key.

16. Verify that the Marker 1 amplitude reading is ≤ −100 dBm and record it in Table A-12, "Spectrum Analyzer Residual Spurious (Preamp On)" on page A-5.

Note	If a spur with amplitude larger than −100 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.

17. Repeat Step 11 through Step 16 for the other Start and Stop frequencies that are listed in Table A-12.

Residual Spurious Test with Preamp Off

Procedure:

1. Connect the 50 ohm termination (Figure 2-7) to the Spectrum Analyzer RF In connector.

2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

3. Press the **Amplitude** key, then press the Reference Level soft key.

4. Use the keypad to enter −40 and press the dBm soft key.

5. Press the Atten Lvl soft key and enter 0, then press the dB soft key.

6. Ensure that the Pre Amp On/Off soft key is in the Off position. If the preamp is On, then press the Pre Amp On/Off soft key to turn it Off.

7. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection and the Peak soft keys.

8. Press the **Freq** key and press the Start Freq soft key.

9. Use the keypad to enter 9, and press the kHz soft key.

10. Press the Stop Freq soft key, enter 100, and press the kHz soft key.

11. Press the **BW** key and press the RBW soft key.

12. Use the keypad to enter 3, and press the kHz soft key.

13. Press the VBW soft key and use the keypad to enter 300, then press the Hz soft key.

14. Wait until one sweep is completed.

15. Press the **Marker** key and press the Peak Search soft key.

16. Record the Marker 1 amplitude reading and verify that it is ≤ −90 dBm in Table A-13, "Spectrum Analyzer Residual Spurious (Preamp Off)" on page A-5.

Note	If a spur with 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.

17. Repeat Step 8 through Step 16 for the other Start and Stop frequencies with the RBW and VBW as listed in Table A-13 and verify that the readings are within the listed specifications.

Input Related Spurious (IRS) Signals

The following test verifies the input related spurious signals of the Spectrum Analyzer in Model MS2723B or MS2724B Spectrum Master.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2723B or MS2724B
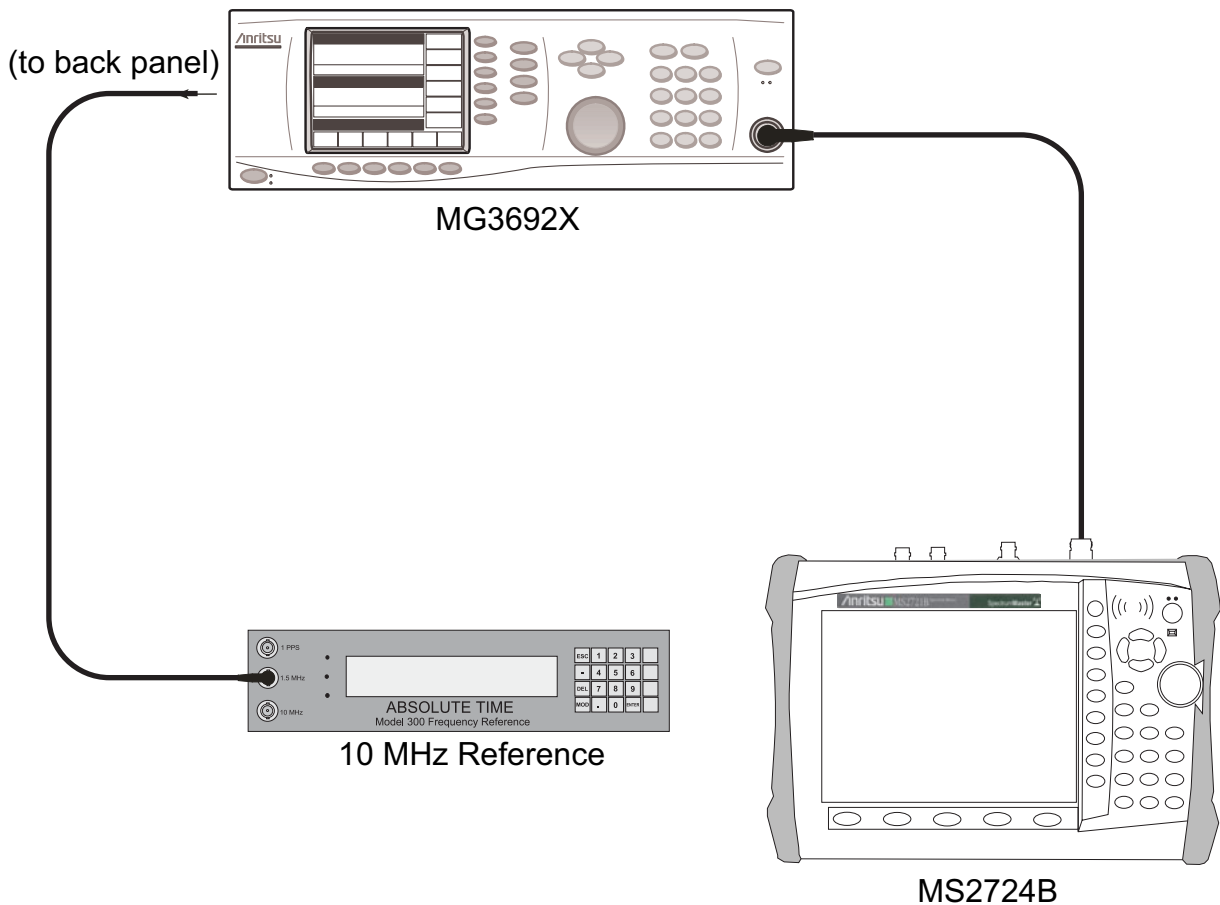
Figure 2-8.   Input Related Spurious Signals – Test Setup

Procedure:

   1. Connect the 10 MHz reference source to the MG3692x Synthesized Signal Generator.

   2. Connect the output of the Signal Generator to the Spectrum Analyzer RF In connector.

1000 MHz Input Related Spurious check:

   3. Set the MG3692x output to 1000 MHz CW, with an RF output level of −30 dBm.

   4. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

   5. Press the **Amplitude** key, then press the Reference Level soft key.

   6. Use the keypad to enter **−27**, and press the dBm soft key.

   7. Press the Atten Lvl soft key and enter 0, then press the dB soft key.

   8. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection and the Peak soft keys.

9. Press the **Freq** key and press the Center Freq soft key.

10. Use the keypad to enter 1000, and press the MHz soft key.

11. Press the **Span** key, use the keypad to enter 2, and press the MHz soft key.

12. Press the **BW** key and press the RBW soft key.

13. Use the keypad to enter 1, and press the kHz soft key.

14. Press the VBW soft key and use the keypad to enter 100, then press the Hz soft key.

15. Wait until one sweep is completed.

16. Press the **Marker** key and press the Peak Search soft key.

17. Record the Marker 1 amplitude reading for 1000 MHz into the "Measured Spur Level" column of Table A-14, "Measured Input Signal Level at 1000 MHz" on page A-6.

18. Press the **Freq** key and press the Start Freq soft key.

19. Use the keypad to enter 719, and press the MHz soft key.

20. Press Stop Freq soft key, enter 721, and press the MHz soft key.

21. Press the **Marker** key and press the Peak Search soft key.

22. Record the Marker 1 amplitude reading into the "Measured Spur Level" column of Table A-14.

23. Calculate the input related spurious level by subtracting the Marker 1 reading in Step 17 from the Marker 1 reading in Step 22. Record the result into the "Calculated IRS" column of Table A-14.

24. Verify that the calculated result is ≤ −60 dBc.

3275 MHz Input Related Spurious Check:

25. Set the MG3692x output to 3275 MHz, with an RF output level of −30 dBm.

26. On the MS2723B or MS2724B, press the **Freq** key and press the Center Freq soft key.

27. Use the keypad to enter 3275, and press the MHz soft key.

28. Press the **BW** key and press the RBW soft key.

29. Use the keypad to enter 10, and press the kHz soft key.

30. Press the VBW soft key and use the keypad to enter 1, then press the kHz soft key.

31. Wait until one sweep is completed.

32. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

33. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

34. Wait until the Trace Count displays 5/5.

35. Press the **Marker** key and press the Peak Search soft key.

36. Record the amplitude at 3275 MHz into the "Measured Spur Level" column of Table A-15, "Measured Input Signal Level at 3275 MHz" on page A-6.

37. Press the **Freq** key and press the Start Freq soft key.

38. Use the keypad to enter 2425, and press the MHz soft key.

39. Press Stop Freq soft key, enter 3274, and press the MHz soft key.

40. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

41. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

42. Wait until the Trace Count displays 5/5.

43. Press the **Marker** key and press the Peak Search soft key.

44. Record the Marker 1 amplitude reading into the "Measured Spur Level" column of Table A-15.

45. Calculate the input related spurious level by subtracting the Marker 1 reading in Step 36 from the Marker 1 reading in Step 44. Record the result into the "Calculated IRS" column of Table A-15.

46. Verify that the calculated result is ≤ −50 dBc.

47. Repeat Step 37 through Step 46, setting a start frequency of 3276 MHz and a stop frequency of 4125 MHz.

8000 MHz Input Related Spurious Check:

48. Set the MG3692x output to 8000 MHz, with an RF output level of −30 dBm.

49. Press the **Freq** key and press the Center Freq soft key.

50. Use the keypad to enter 8000, and press the MHz soft key.

51. Press the **BW** key and press the RBW soft key.

52. Use the keypad to enter 1, and press the kHz soft key.

53. Press the VBW soft key and use the keypad to enter 100, then press the Hz soft key.

54. Wait until one sweep is completed.

55. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

56. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

57. Wait until the Trace Count displays 5/5.

58. Press the **Marker** key and press the Peak Search soft key.

59. Record the amplitude at 8000 MHz into the "Measured Spur Level" column of Table A-16, "Measured Input Signal Level at 8000 MHz" on page A-6

60. Press the **Freq** key and press the Start Freq soft key.

61. Use the keypad to enter 7719, and press the MHz soft key.

62. Press Stop Freq soft key, enter 7721, and press the MHz soft key.

63. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

64. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

65. Wait until the Trace Count displays 5/5.

66. Press the **Marker** key and press the Peak Search soft key.

67. Record the Marker 1 amplitude reading into the "Measured Spur Level" column of Table A-16.

68. Calculate the input related spurious level by subtracting the Marker 1 reading in Step 59 from the Marker 1 reading in Step 67. Record the result into the "Calculated IRS" column of Table A-16.

69. Verify that the calculated result is ≤ −60 dBc.

15000 MHz Input Related Spurious Check (for MS2724B only):

70. Set the MG3692x output to 15000 MHz, with an RF output level of −30 dBm.

71. Press the **Freq** key and press the Center Freq soft key.

72. Use the keypad to enter 15000, and press the MHz soft key.

73. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

74. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

75. Wait until the Trace Count displays 5/5.

76. Press the **Marker** key and press the Peak Search soft key.

77. Record the amplitude at 15000 MHz into the "Measured Spur Level" column of Table A-17, "Measured Input Signal Level at 15000 MHz" on page A-6

78. Press the **Freq** key and press the Start Freq soft key.

79. Use the keypad to enter 14719, and press the MHz soft key.

80. Press Stop Freq soft key, enter 14721, and press the MHz soft key.

81. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.

82. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.

83. Wait until the Trace Count displays 5/5.

84. Press the **Marker** key and press the Peak Search soft key.

85. Record the Marker 1 amplitude reading into the "Measured Spur Level" column of Table A-17.

86. Calculate the input related spurious level by subtracting the Marker 1 reading in Step 77 from the Marker 1 reading in Step 85. Record the result into the "Calculated IRS" column of Table A-17.

87. Verify that the calculated result is ≤ −60 dBc.

Spectrum Analyzer Absolute Amplitude Accuracy

The tests in this section verify the absolute amplitude accuracy of the MS2723B or MS2724B Spectrum Analyzer. This test has three parts:

- "50 MHz Amplitude Accuracy Verification."
- "Amplitude Accuracy Across Frequency Verification"
- "9 kHz to 100 kHz Amplitude Accuracy Verification."

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- (2) Power Sensor, Anritsu Model MA2442D
- Power Sensor, Anritsu Model MA2421D or Power Sensor, Model SC7816
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- Spectrum Master: MS2723B or MS2724B
- (2) Adapter, Anritsu Model 34NN50A
- Adapter, Dual Banana Plug to BNC(f)
- Adapter, BNC to BNC
- Coaxial Cable, BNC(m) to BNC(m), 50 ohm
- Low Frequency Cal Fixture, Anritsu Model T3449

50 MHz Amplitude Accuracy Verification.
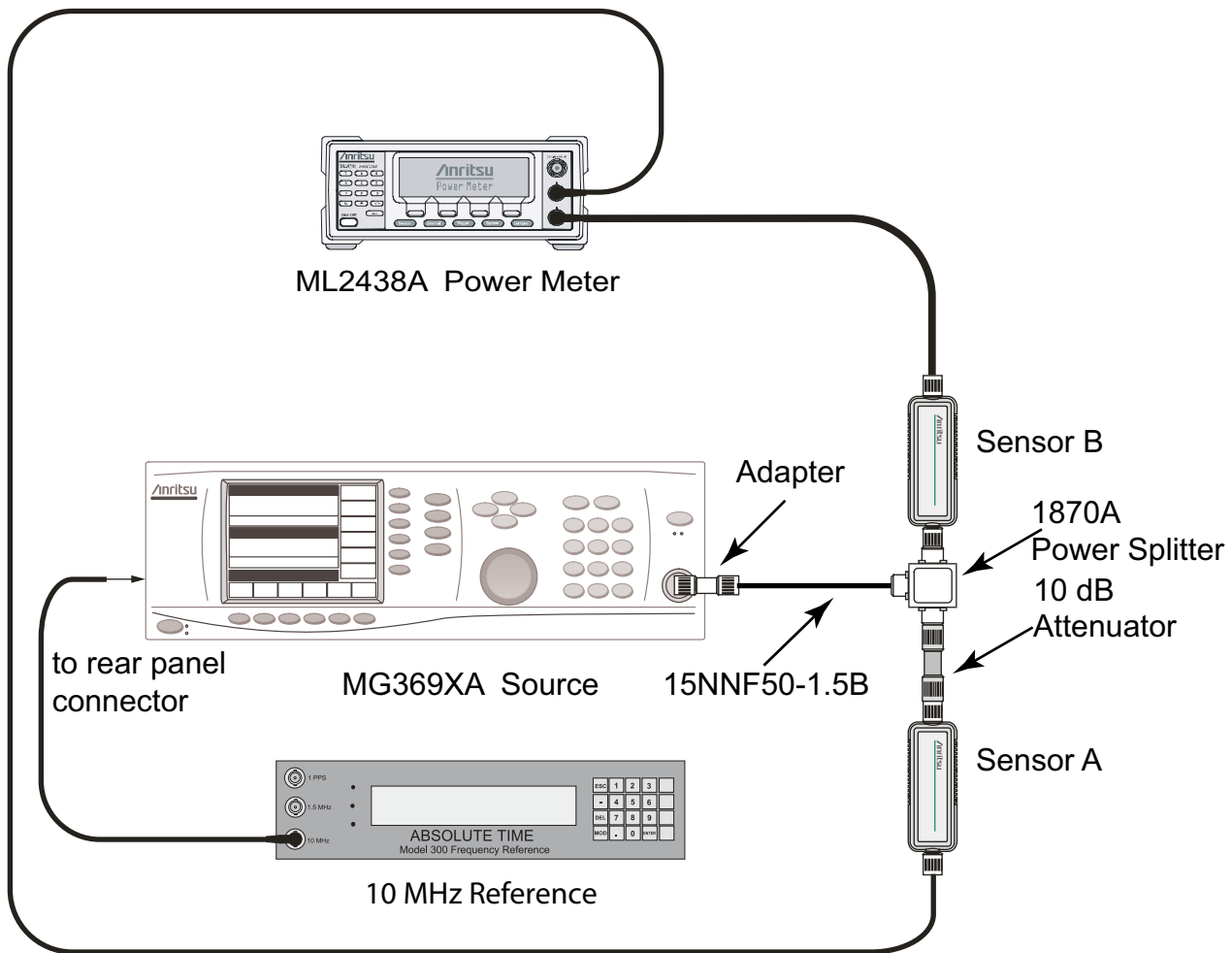
Figure 2-9.   50 MHz Amplitude Accuracy Verification – Component Characterization Setup

Component Characterization:

1. Connect both MA2442D power sensors to the power meter, and then calibrate the sensors.

2. Connect the 10 MHz Reference source to the 10 MHz Ref In connector of the MG3692x Synthesized Signal Generator.

3. Connect the Model 1870A power splitter to the MG3692x output via the 34NN50A adapter, and connect Sensor B to one of the power splitter output connections (refer to Figure 2-9).

4. Install the 10 dB Fixed Attenuator to the other power splitter output, and then connect Sensor A to the end of the Attenuator.

5. Set the frequency of the MG3692x to 50 MHz.

6. Set the power meter to display both Channel A and Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Repeat for Channel B. Press the **System** key to display the power reading.

7. Adjust the power level of the MG3692x to get a reading on Sensor A that matches the test power level in the first column of Table A-18, "Characterization Chart for 50 MHz Amplitude Accuracy Verification" on page A-7.

8. Record the Sensor B reading in the "Required Sensor B Reading" column of Table A-18.

9. Repeat Step 7 and Step 8 for the other power levels in the first column of Table A-18, and record the Sensor B readings in the second column.

Procedure:

1. Connect the equipment as shown in Figure 2-10, "50 MHz Amplitude Accuracy Verification – Test Setup" on page 2-23, disconnecting Sensor A from the Attenuator, and connecting the RF In port of the MS2723B or MS2724B to the splitter output via the Attenuator.
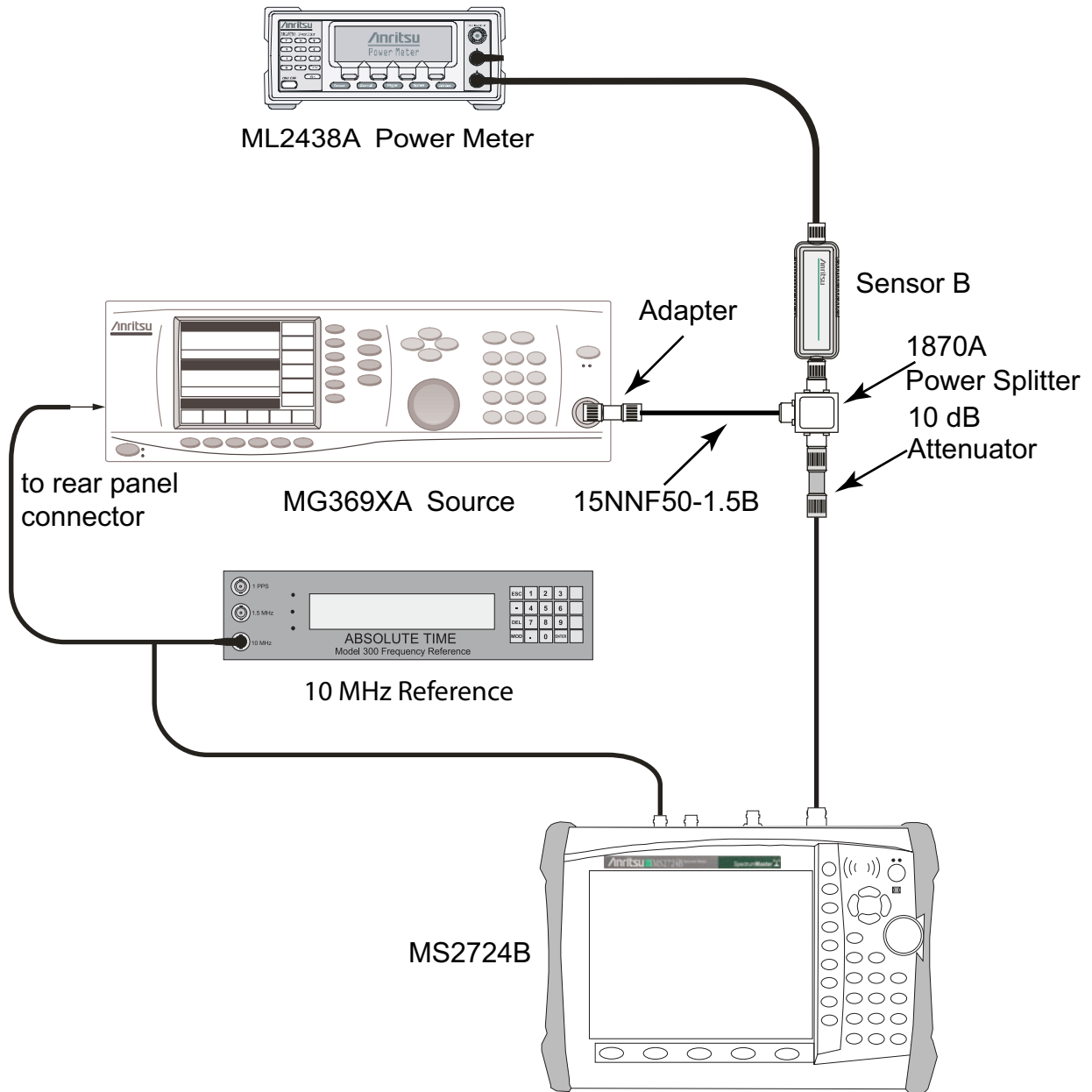
Figure 2-10. 50 MHz Amplitude Accuracy Verification – Test Setup

Note	To maintain test setup integrity, do not disconnect Sensor B, the power splitter, or the fixed attenuator.

2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

3. Set the MS2723B or MS2724B Center Frequency to 50 MHz.

4. Set the Span to 10 kHz.

5. Press the BW soft key and set the VBW to 10 Hz.

6. Set the RBW to 1 kHz.

7. Press the Amplitude soft key and set the Reference Level to 10 dBm.

8. Set the Atten Lvl to 30 dB.

9. Adjust the MG3692x power level so that the power meter Sensor B matches the Sensor B value (Required Sensor B Reading) that is shown on the characterization chart (Table A-18) that was used in the previous section, "Component Characterization:".

10. Press the **Marker** key and press the Peak Search soft key.

11. Record the Marker 1 amplitude reading into the "Measured Reading" column of Table A-19 on page A-7.

12. Repeat Step 9 through Step 11 for the other power levels in Table A-19. Change "Reference Level" and "Atten Lvl" settings as required (as shown in Table A-19).

Amplitude Accuracy Across Frequency Verification

Component Characterization:.
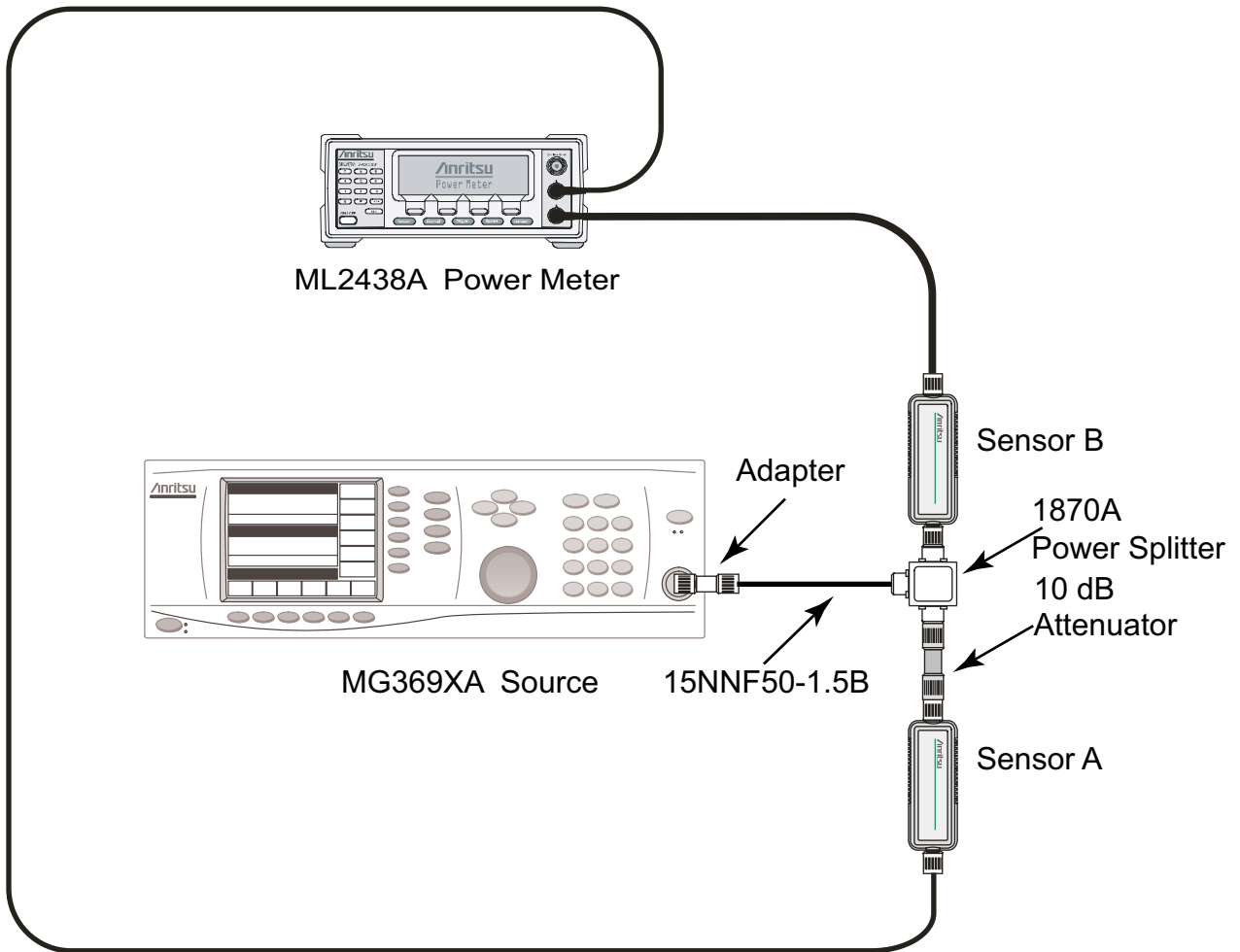
Figure 2-11.   Fixed Level with Varying Frequency – Component Characterization Setup

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.

2. Connect the equipment as shown in Figure 2-11

3. Set the MG3692x Frequency to 10.1 MHz.

4. Set the power meter to display both Channel A and Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Repeat for Channel B. Press the **System** key to display the power reading.

5. Adjust the MG3692x output level so that the Sensor A reading is −2 dBm ± 0.1 dB.

6. Record the Sensor B reading into the −2 dBm column in Table A-20, "Characterization Chart for Fixed Level with Varying Frequency" on page A-8.

7. Adjust the MG3692x output level so that the Sensor A reading is −30 dBm ± 0.1 dB.

8. Record the Sensor B reading into the −30 dBm column in Table A-20.

9. Repeat Step 3 through Step 8 for all of the frequencies that are listed in Table A-20.

Test Setup
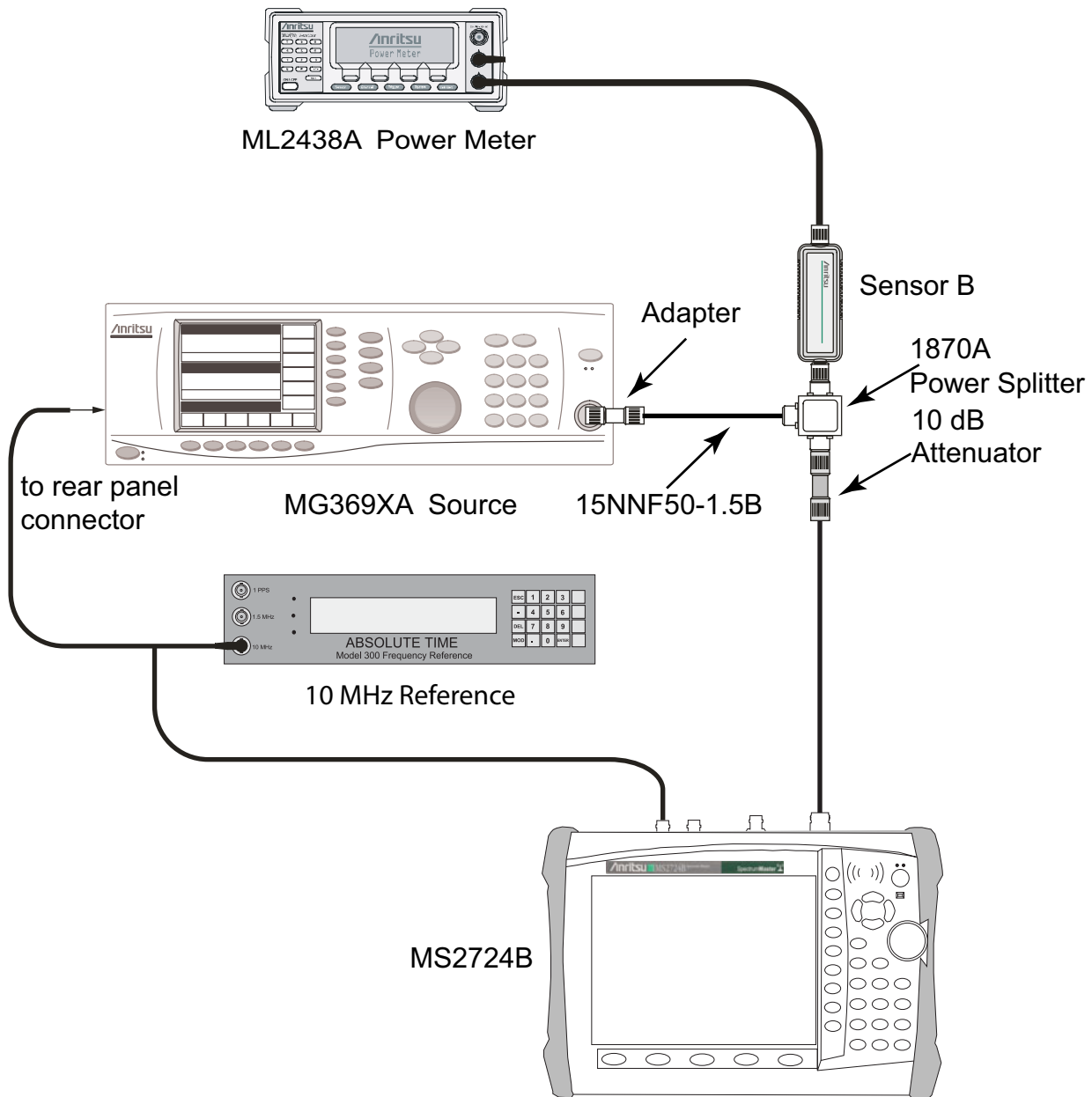
Figure 2-12. Fixed Level with Varying Frequency – Test Setup

Procedure:

   1. Connect the equipment as shown in Figure 2-12.

Note	To maintain test setup integrity, **Do Not Disconnect** Sensor B, the power splitter, or the fixed attenuator.

   2. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the Spectrum Master.

   3. Press the BW soft key. Then set the RBW to 1 kHz, and set the VBW to 10 Hz.

   4. Press the Span soft key, set span to 10 kHz.

   5. Set the MG3692x frequency to 10.1 MHz CW.

6. Set the MG3692x Output to −20 dBm.

7. Set the power meter to display Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

8. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading for −30 dBm in Table A-20, "Characterization Chart for Fixed Level with Varying Frequency" on page A-8.

9. On the MS2723B or MS2724B, press the Amplitude soft key, then set the Reference Level to −20 dBm.

10. Press the Freq soft key and press the Center Freq soft key.

11. Enter 10.1 MHz (or the next frequency).

12. Press the Amplitude soft key, then set the Atten Lvl to 0 dB.

13. Press the **Marker** key and press the Peak Search soft key.

14. Record the Marker 1 amplitude reading (in units of dBm) into Table A-21, "Verification at 10.1 MHz, Specification = ± 1.3 dBm" on page A-9.

15. Verify that the Marker 1 amplitude reading is within the specification.

16. Repeat Step 12 to Step 15 for Attenuation Levels of 5 dB, 10 dB, and 20 dB.

17. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading for −2 dBm in Table A-20.

18. On the MS2723B or MS2724B, press the Amplitude soft key, then set the Reference Level to 10 dBm.

19. Repeat Step 12 to Step 15 for Attenuation Levels of 30 dB, 40 dB, 50 dB, and 60 dB.

20. Repeat Step 5 to Step 19 (in units of dBm) for all of the frequencies in Table A-22 through Table A-42.

9 kHz to 100 kHz Amplitude Accuracy Verification.
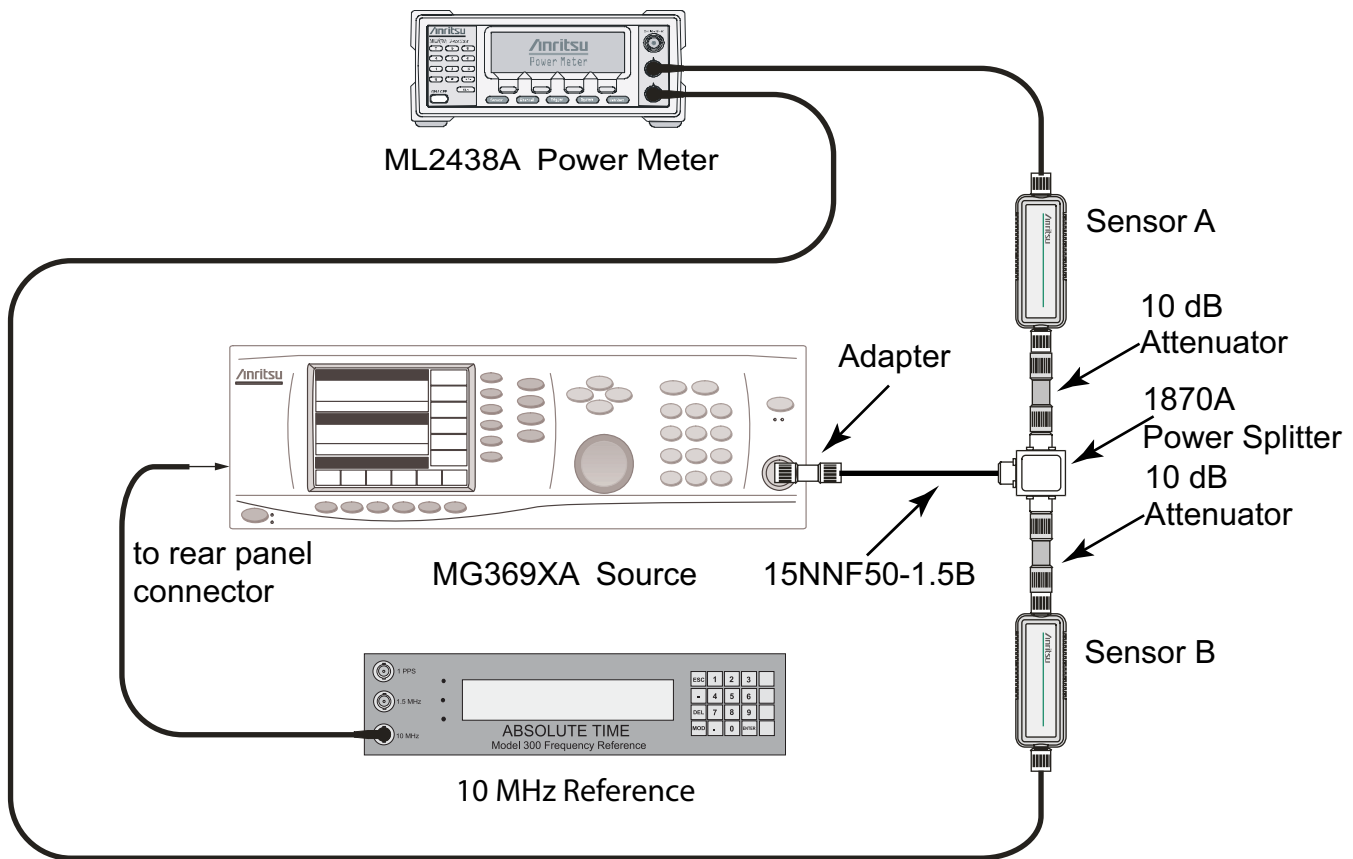
Figure 2-13. 9 kHz to 100 kHz Amplitude Accuracy Verification – Characterization Setup 1

Test Setup Component Characterization:

1. Connect the equipment as shown in Figure 2-13.

2. Set the MG3692x frequency to 100 kHz CW, and set output power to approximately –5 dBm.

3. Adjust the MG3692x output power so that Power Sensor B reads –20 dBm ± 0.1 dB on the power meter.

Note that the Power Sensors must be either Anritsu Model MA2421D (now obsolete) or Model SC7816, because these sensors are specified down to 100 kHz.

4. Remove Power Sensor B from Port 2, and attach the N female end of the T3449 test fixture to Port 2 through an N male to N male adapter. The BNC output of the T3449 should also be connected to the AC voltmeter voltage input via a BNC male to BNC male coaxial cable and a BNC female to banana plug adapter. Ensure that the voltmeter (DVM) is set to read AC Volts (refer to Figure 2-14).
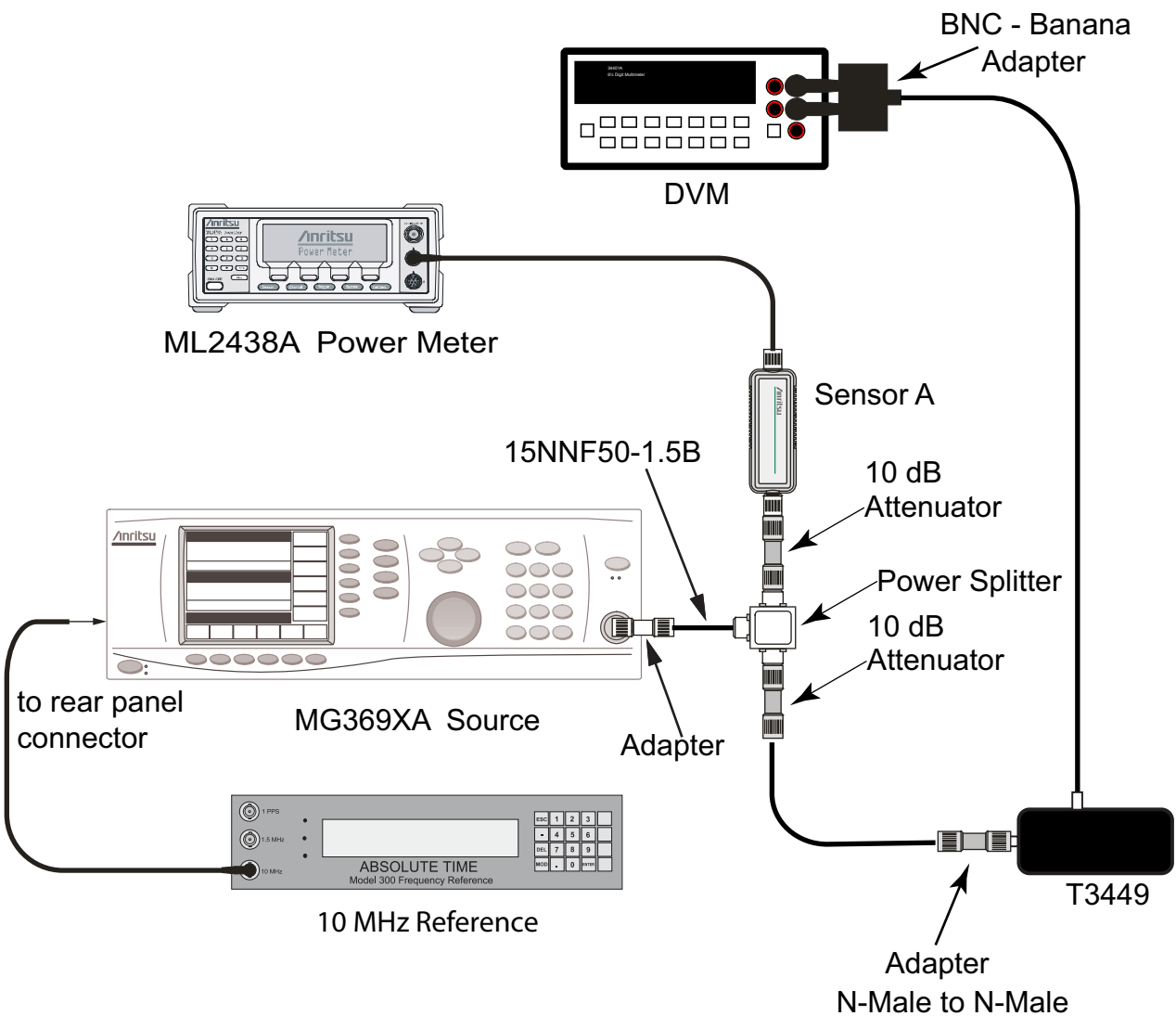
Figure 2-14.   9 kHz to 100 kHz Amplitude Accuracy Verification – Characterization Setup 2

5. Set the AC voltmeter to measure AC Volts rms. The measured voltage should read 23.315 mV ± 0.5 mV. Record the measured value in the VM1 table, Table A-43, "VM1, −20 dBm Reference voltage at 100 kHz (23.315 mV ± 0.5 mV)" on page A-20.

6. While keeping the MG3692x output power unchanged, set the frequency to 95 kHz and record the measured voltage into the "Measured VM2" column in Table A-44, "Characterization Chart for 9 kHz to 100 kHz Amplitude Accuracy Verification" on page A-20.

7. Convert the measured voltage to power in dBm by using the following formula:

$P_{in} = (20Log_{10}(VM2/VM1) + \text{correction factor})$

8. Enter the result in units of dBm into the characterization chart (Table A-44) as well as into the test record (Table A-45, "9 kHz to 100 kHz Amplitude Accuracy Verification" on page A-20).

9. Repeat Step 6 through Step 8 for frequencies of 55 kHz and 9.5 kHz.

10. Remove the T3449 Test Fixture from Port 2.
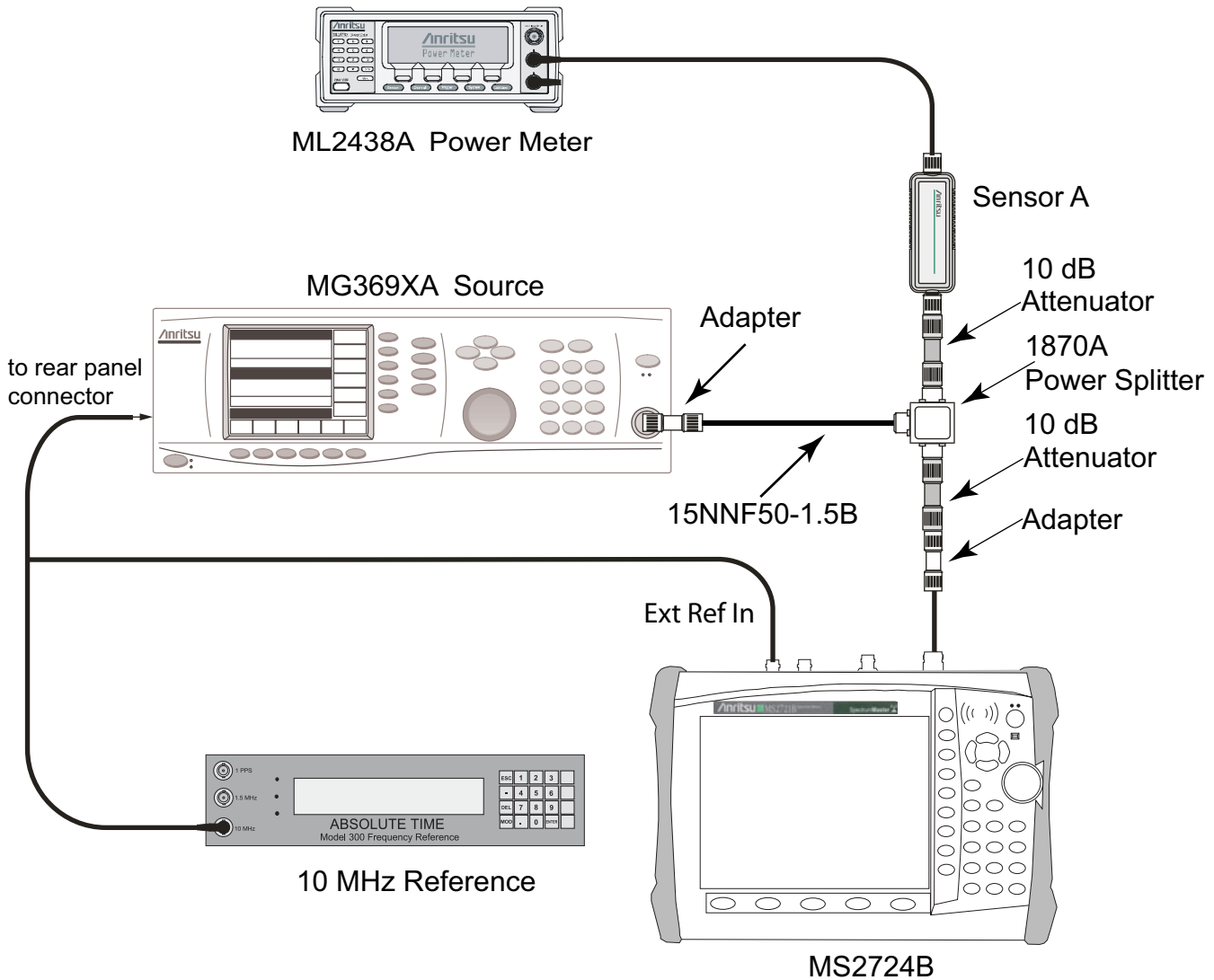
Figure 2-15. 9 kHz to 100 kHz Amplitude Accuracy Verification – Test Setup

Procedure:

1. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

2. Press the BW soft key. Then set the RBW to 1 kHz, and set the VBW to 10 Hz.

3. Press the Span soft key, and set span to 10 kHz.

4. Press the Amplitude soft key. Then set the Reference Level to –20 dBm, and set the Atten Lvl to 0 dB.

5. Connect the MS2723B or MS2724B to the test setup as shown in Figure 2-15.

6. Set the MG3692x frequency to 9.5 kHz. **Do not adjust** the output power.

7. On the MS2723B or MS2724B, press the Freq soft key and press the Center Freq soft key.

8. Enter 9.5 kHz.

9. Press the **Marker** key and press the Peak Search soft key.

10. Record the Marker 1 amplitude reading (in units of dBm) into Table A-45, "9 kHz to 100 kHz Amplitude Accuracy Verification" on page A-20.

11. Subtract the P_{in} value from the Marker 1 reading, and record the result (in units of dBm) into the Error column in Table A-45.

12. Verify that any error is within the listed specification.

13. Repeat Step 6 through Step 12 for all of the frequencies (in units of dBm) in Table A-45.

Spectrum Analyzer RF Input VSWR Verification

This test verifies the Spectrum Analyzer RF Input VSWR of Model MS2723B or MS2724B Spectrum Master.

Required Equipment:

- Vector Network Analyzer, Anritsu Model 37x47A, B, C, or D
- Type N Calibration Kit, Anritsu Model 3653
- Test Port Converter, Anritsu Model 34UN50
- Spectrum Master: : MS2723B or MS2724B
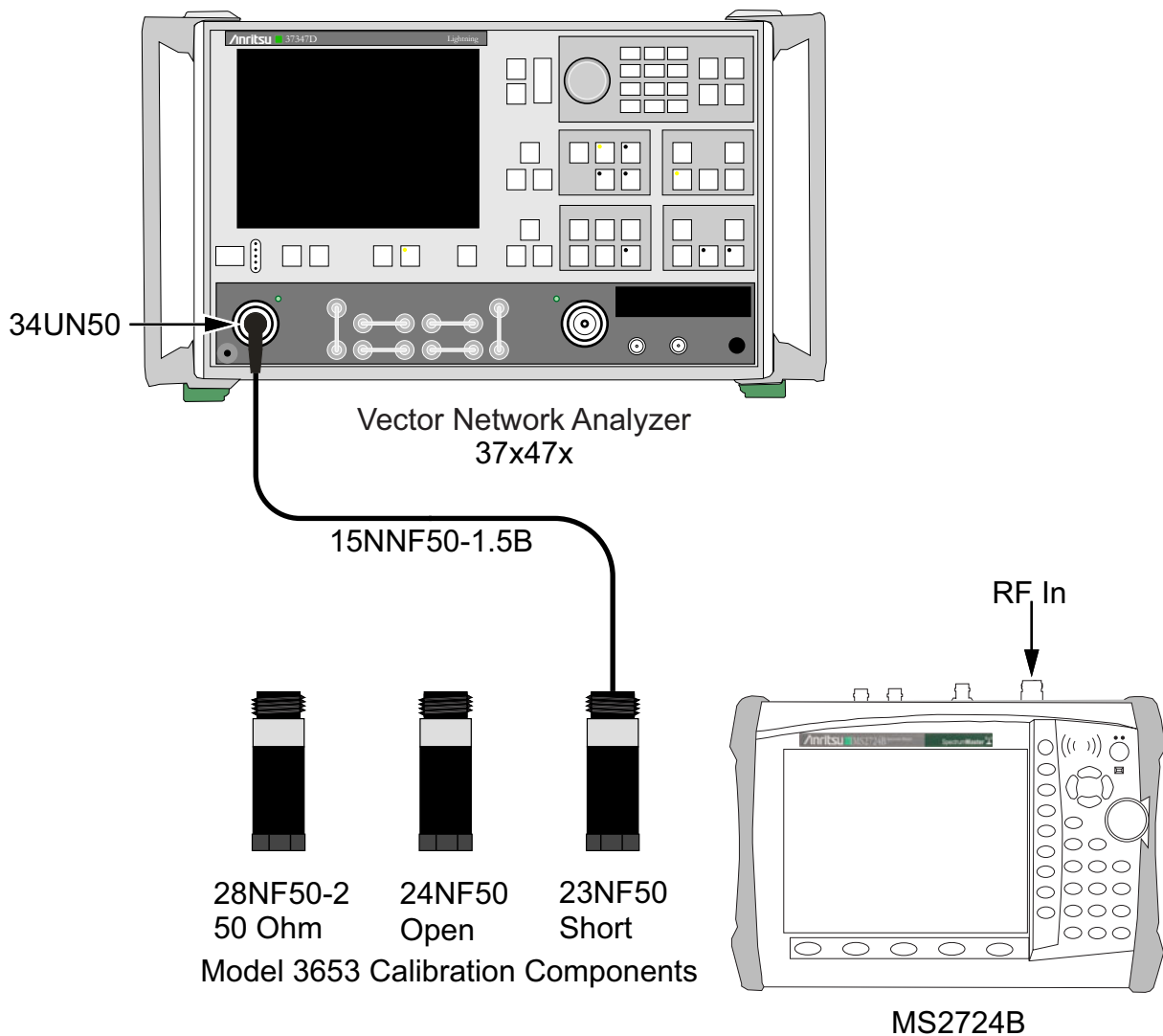
Figure 2-16. Spectrum Analyzer RF Input VSWR Verification – Test Setup

Procedure:

1. On the Anritsu Model 37x47x VNA, remove the 34UK50 and install an Anritsu Model 34UN50 test port converter on Port 1. Install a 15NNF50-1.5B cable on Port 1 of the Model 37x47 VNA so that the test port (open end of cable) is the male connector.

2. On the VNA, Press the **Default** key and press Continue. Allow the instrument to default.

3. Press the **Freq** key. Then set the Start Frequency to 40 MHz, and set the Stop Frequency to 13 GHz for the MS2723B (or to 18 GHz for the MS2724B).

4. Press the **CH1** key, the **Channel Menu** key, and press Single Channel.

5. Press the **Graph Type** key and press SWR.

6. Press the **Set Scale** key and set the Resolution to 0.5 (x1). Set the Reference Value to 1.5 (x1).

7. Under the Limits key, turn the Upper Limit On and set it to 1.5 (x1).

8. Under the Marker Menu key, set Marker 1 to On.

9. Under the Marker Readout Functions menu, press Markers on Active Channel, and press **Enter**. Both marker frequency and data readout should be visible.

10. Insert the floppy disk from the Cal Kit into the floppy drive of the VNA.

11. Press the **Utility Menu** key and press Cal Component Utilities, then press Install Kit Information from Floppy Disk. Allow the file to load from the disk.

12. Press the Begin Cal key and make the following selections:

```
Next Cal Step / Reflection Only / Port 1 Only / Normal (1601 pts max) /
Next Cal Step / Port 1 Connector = Type N (M) / Start Cal.
```

13. Perform the calibration at the end of the cable as prompted by the VNA, using the female components from the calibration kit.

Note	During calibration, no adapters should be inserted between the cable and the female components from the calibration kit.

14. After the calibration is complete, make sure that the LED on the Apply Cal key is On.

15. Press Return and then Limits. Turn the Upper Limit On and set it to 2.0 (x1).

16. Press the **Marker** key and then make the following selections:

>   Display Markers set to ON
>
>   Press Marker Readout
>
>   Set Marker 1 to ON

17. Set the MS2723B or MS2724B to Spectrum Analyzer mode and then preset the instrument.

18. Make the following selections on the MS2723B or MS2724B:

>   Set the Atten Lvl to 10 dB.
>
>   Set the Sweep to Single.

19. Connect the MS2723B or MS2724B Spectrum Analyzer RF In connector to the end of the 15NN50-1.5B cable where the calibration was performed.

20. Verify that the red measurement data falls completely under the Limit Line.

21. On the Anritsu Model 37x47x VNA, press the **Marker** key. Press Marker to Peak and then Marker to Max.

22. Read the maximum value and record it into Table A-46, "Spectrum Analyzer RF Input VSWR Verification" on page A-21.

23. Change the MS2723B or MS2724B Atten Lvl to 20 dB and repeat Step 20 through Step 22.

24. Change the MS2723B or MS2724B Atten Lvl to 60 dB and repeat Step 20 through Step 22.

This completes the tests for the Spectrum Analyzer mode of the MS2723B or MS2724B.

2-3   Optional Functions Verification

Introduction

The remaining test procedures are for testing instrument options.

2-4   GPS Option Verification (Option 31)

The following test verifies the operation of the GPS option in the model MS2723B or MS2724B
Spectrum Master.

Required Equipment:

- Spectrum Master: MS2723B or MS2724B

- GPS Antenna, Anritsu 2000-1410

- Anritsu MG3692x Synthesized Signal Generator

- Frequency Reference Symmetricom Rubisource T&M

Setup Procedure:

1. Connect the GPS antenna to the GPS Antenna connector on the MS2723B or MS2724B.

Note	If no fixed GPS antenna is available, the Anritsu 2000-1410 GPS antenna can be used for this test. Ensure that the Anritsu 2000-1410 GPS antenna is in a direct line-of-sight relationship to the satellites or that the antenna is placed outside with no obstructions.

2. Press the **Shift** key and then the **System** (8) key.

3. Press the GPS soft key, then press the GPS On/Off soft key to turn the GPS On.

4. When the GPS fix is acquired, the GPS indicator at the top of the LCD display turns green. The latitude and the longitude are displayed next to the GPS indicator.

5. After about three minutes, the Reference Source indicator in the lower left-hand corner of the LCD display will change to GPS High Accuracy.

6. If the GPS fix is acquired using the Anritsu 2000-1410 GPS antenna outside, then bringing the instrument inside will cause a loss of satellite tracking. A red cross will appear on the green GPS indicator, and the Reference Source indicator will change to Int Hi Accy.

The following test can be used to verify frequency accuracy to a lesser specification.
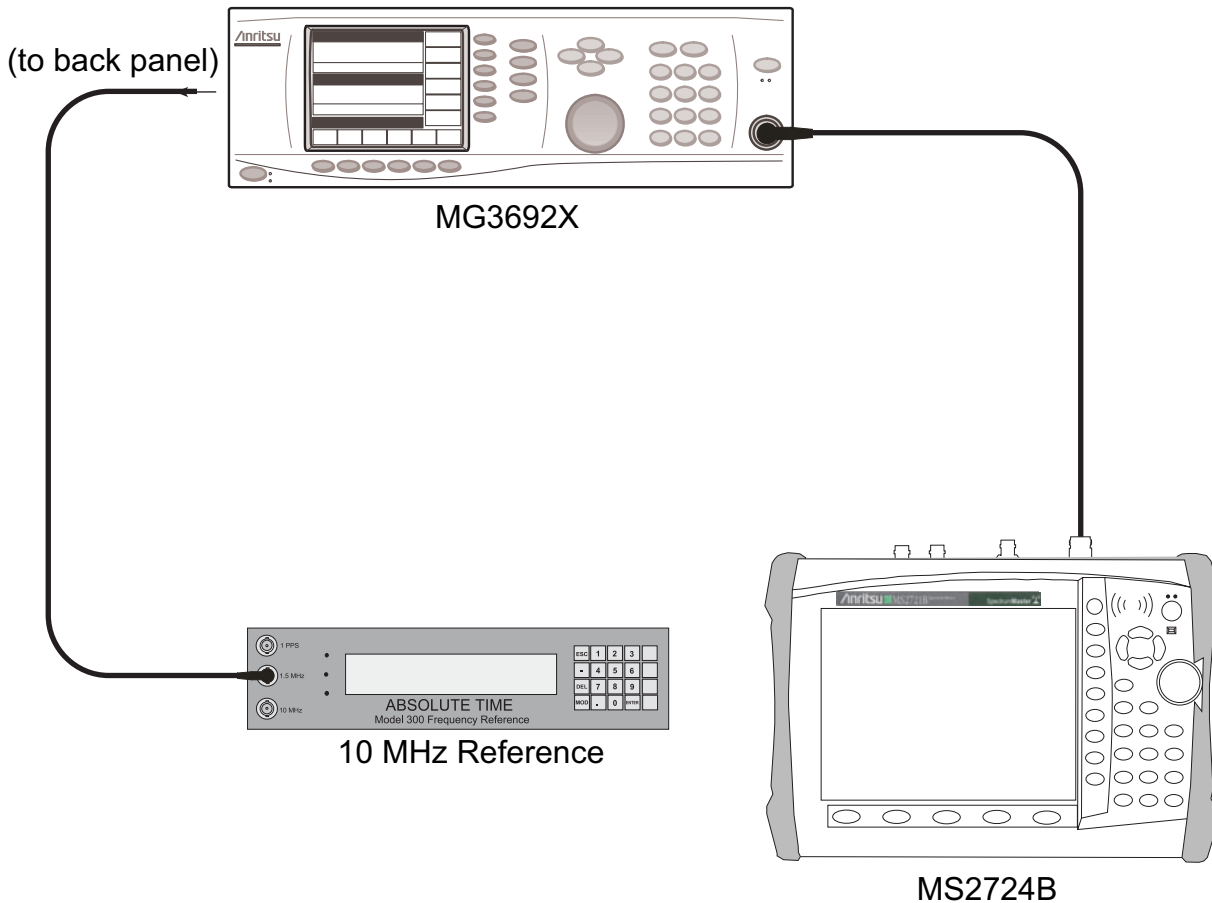
Figure 2-17. Frequency Accuracy Verification by Synthesized Signal Generator

Test Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator.

Note	Do not connect the external 10 MHz Reference to the MS2723B or MS2724B Spectrum Master.

2. Connect the output of the Synthesized Signal Generator to the Spectrum Analyzer RF In of the MS2723B or MS2724B, as shown in .

3. On the MS2723B or MS2724B, change the Mode to Spectrum Analyzer and preset the instrument.

4. Set the MG3692x output to 7 GHz CW, with an RF output level of −30 dBm.

5. On the MS2723B or MS2724B, press the Amplitude soft key, and set the Reference Level to −10 dBm.

6. Press the Freq soft key and set the Center Freq to 7.0 GHz.

7. Press the Span soft key and set the span to 10 kHz.

8. Press the BW soft key and set RBW to 100 Hz.

9. Press the VBW soft key and set VBW to 30 Hz.

10. Press the **Marker** key, and press the Peak Search soft key.

11. Record the marker frequency into the Measured Value column of .

12. Subtract the marker value from 7 GHz, record the result into the Error column of Table A-47, and verify that it is within specification.

2-5   GSM/GPRS/EDGE Signal Analyzer Option Verification

(Option 40 or Option 41 or both)

The tests in this section verify the optional GSM/GPRS/EDGE Signal Analyzer functions in Model MS2723B or MS2724B Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
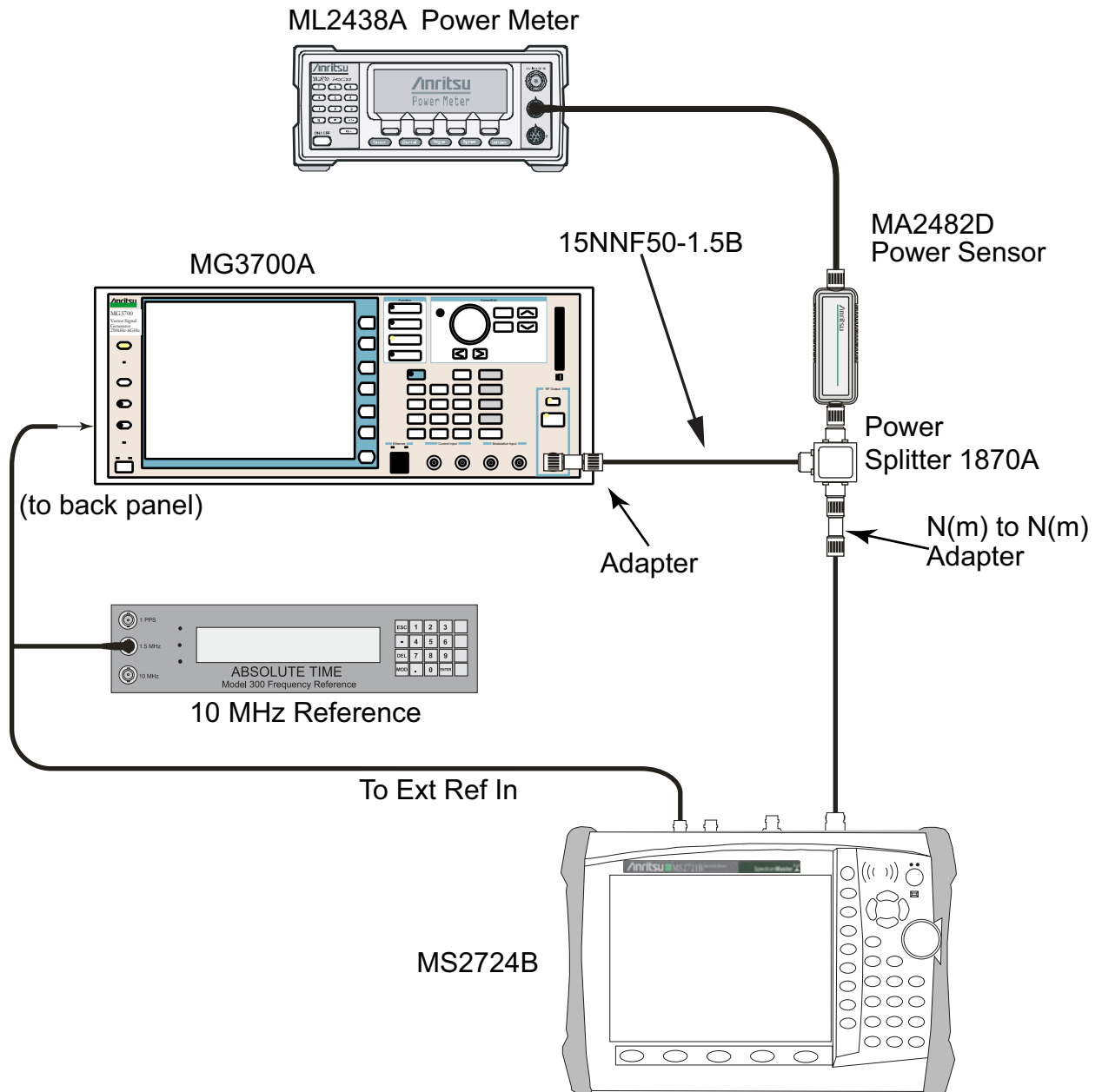
Figure 2-18. GSM/GPRS/EDGE – Test Setup

Set up Procedure:

1. Connect the equipment as shown in .

2. Calibrate the power sensor prior to connecting to the power splitter.

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 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

4. Set the MS2723B or MS2724B mode to GSM/GPRS/EDGE Signal Analyzer. Preset the instrument.

GSM Burst Power, Frequency Error and Phase Error Tests

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

2. Press the **Down Arrow** key, or turn the knob to press Yes.

3. Press the Set key (Note that two Set keys are available, and they both do the same thing).

4. Press the (F1) soft key to select "Load File to Memory"

5. Press the (F1) soft key again to select "Select Package"

6. Using the **Down Arrow** key, step through the selection list until the GSM option is highlighted.

7. Press the Set key.

8. Press the (F6) soft key, Return

9. Press the Set key. The Select Package box appears. Use the rotary knob to highlight GSM and press the Set key to select.

10. Another File List appears. Use the rotary knob to select "GsmBurst_1slot", and press the Set key to select.

11. Press the **MOD On/Off** key to turn the Modulation LED On, and verify the Playing indicator in the center of the LCD is flashing.

12. Press the **Frequency** key, and enter 850 MHz.

13. Press the **Level** key, enter −10, and press the **dBm** key.

14. Adjust the MG3700A output so that the power meter reads −10 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-48, "At 850 MHz, −10 dBm Level, TCH Pattern (GSM)" on page A-22.

15. On the MS2723B or MS2724B, press the Frequency soft key and enter 850 MHz as Center Frequency.

16. Press the Measurements soft key, and press GSM/EDGE Summary (a red dot is displayed on the label).

17. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-48, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 14. Then record the "Calculated Burst Power Error" and the displayed value of Frequency Error into Table A-48.

18. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into Table A-56, "At 850 MHz, −50 dBm Level, TCH Pattern (GSM)" on page A-24.

19. Verify that the measured values in Step 17 and Step 18 are within specifications.

20. On the MG3700A, change the selected signal pattern to "GsmBurst_8slot".

21. Adjust the Level of the MG3700A so that the power meter reads −50 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-49, "At 850 MHz, −50 dBm Level, TCH ALL Pattern (GSM)" on page A-22. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

22. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-49, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 21. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-49.

23. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into Table A-57, "At 850 MHz, −10 dBm Level, TCH ALL Pattern (GSM)" on page A-24.

24. Verify that the measured values in Step 22 and Step 23 are within specifications.

25. Change the frequency of MG3700A to 1800 MHz.

26. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 1800 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

27. Adjust the level of the MG3700A so that the power meter reads −10 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-50, "At 1800 MHz, −10 dBm Level, TCH ALL Pattern (GSM)" on page A-22.

28. On the MS2723B or MS2724B, set the Center Freq to 1800 MHz. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

29. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-50, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 27. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-50.

30. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into Table A-58, "At 1800 MHz, −50 dBm Level, TCH ALL Pattern (GSM)" on page A-24.

31. Verify that the measured values in Step 29 or Step 30 or both are within specifications.

32. On the MG3700A, change the selected pattern to "GsmBurst_1slot".

33. Adjust the level of the MG3700A so that the power meter reads −50 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-51, "At 1800 MHz, −50 dBm Level, TCH Pattern (GSM)" on page A-22. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

34. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-51, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 33. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-51.

35. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into Table A-59, "At 1800 MHz, −10 dBm Level, TCH Pattern (GSM)" on page A-24.

36. Verify that the measured values in Step 34 or Step 35 or both are within specifications.

EDGE Burst Power, Frequency Error and Residual Error Tests

Test Procedure:

1. Verify that the equipment settings are unchanged from the previous test.

2. On the MG3700A, change the selected pattern to "DL_MCS-9_1SLOT".

3. Adjust the level of the MG3700A so that the power meter reads −50 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-52, "At 1800 MHz, −50 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)" on page A-23. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

4. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-52, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 3. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-52.

5. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) into Table A-60, "At 1800 MHz, −50 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)" on page A-25.

6. Verify that the measured values in Step 4 and Step 5 are within specifications.

7. On the MG3700A, change the selected pattern to "DL_MCS-9_4SLOT".

8. Adjust the level of the MG3700A so that the power meter reads –10 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-53, "At 1800 MHz, –10 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)" on page A-23. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

9. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-53, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 8. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-53.

10. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) into Table A-61, "At 1800 MHz, –10 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)" on page A-25.

11. Verify that the measured values in Step 9 and Step 10 are within specifications.

12. Change the frequency of MG3700A to 850 MHz.

13. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

14. Adjust the level of the MG3700A so that the power meter reads –50 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-54, "At 850 MHz, –50 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)" on page A-23.

15. On the MS2723B or MS2724B, set the Center Freq to 850 MHz. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

16. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-54, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 14. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-54.

17. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) into Table A-62, "At 850 MHz, –50 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)" on page A-25.

18. Verify that the measured values in Step 9 and Step 10 are within specifications.

19. On the MG3700A, change the selected pattern to "DL_MCS-9_1SLOT".

20. Adjust the level of the MG3700A so that the power meter reads –10 dBm ± 0.2 dB. Record the adjusted power reading into the "Adjusted Output Power" row of Table A-55, "At 850 MHz, –10 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)" on page A-23. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

21. For MS2723B or MS2724B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the measured value into the "Displayed Burst Power" row of Table A-55, then subtract the "Displayed Burst Power" value from the "Adjusted Output Power" reading that was obtained in Step 14. Then record the "Calculated Burst Power Error" (in units of watt) and the displayed value of Frequency Error into Table A-55.

22. For MS2723B or MS2724B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM(rms) into Table A-63, "At 850 MHz, –10 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)" on page A-25.

23. Verify that the measured values in Step 21 and Step 22 are within specifications.

2-6   CDMA Signal Analyzer Option Verification

(Option 42 or Option 43 or both)

The tests in this section verify the optional CDMA Signal Analyzer functions in Model MS2723B or MS2724B Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B
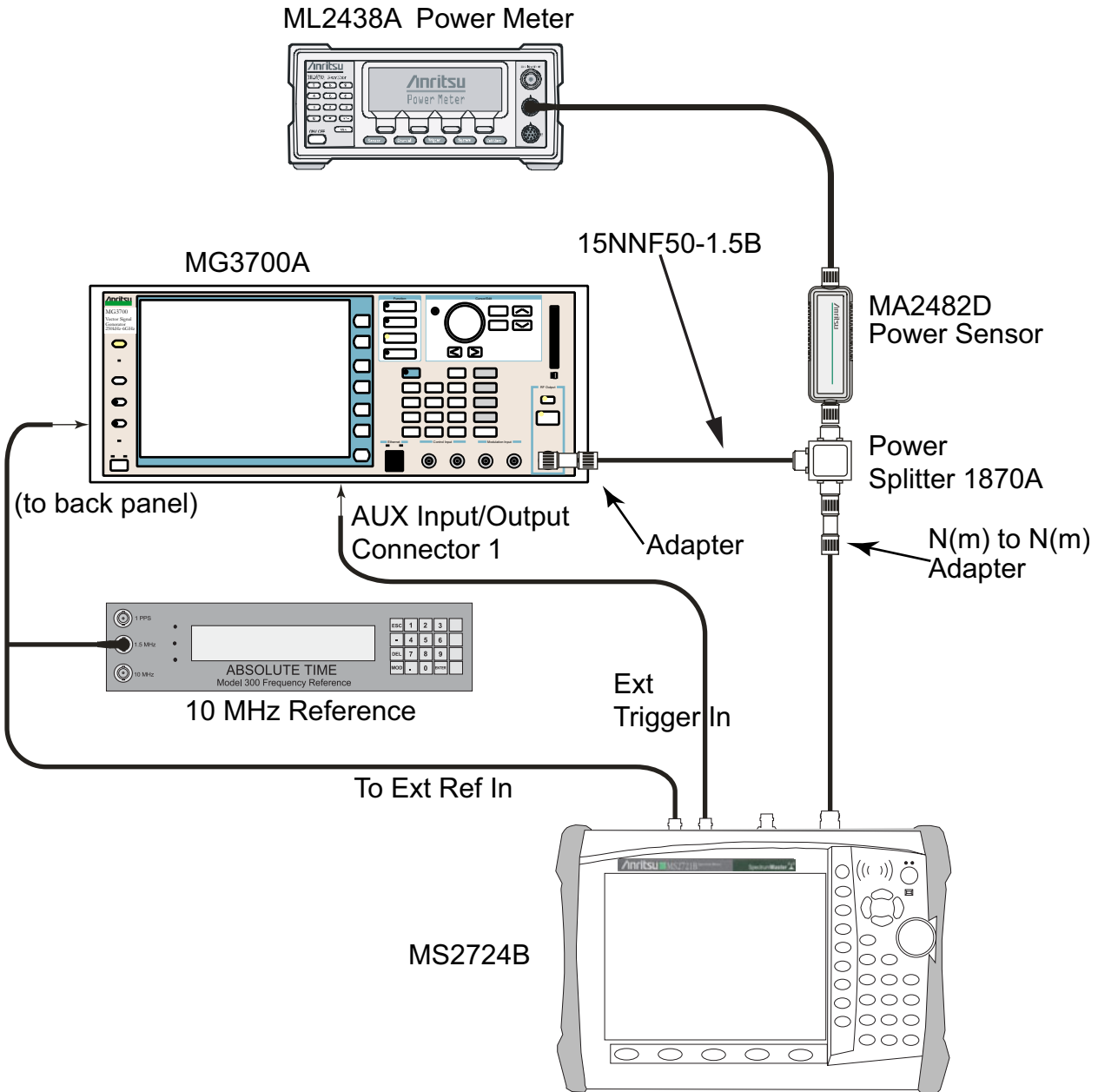
Figure 2-19. CDMA Signal Analyzer – Test Setup

Set up Procedure:

1. Connect the equipment as shown in Figure 2-19.

2. Calibrate the power sensor prior to connecting it to the power splitter.

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 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

4. Set the MS2723B or MS2724B mode to CDMA Signal Analyzer. Preset the instrument.

cdmaOne Channel Power, Frequency Error, Rho and Tau Tests

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

2. Press the **Down Arrow** key or turn the knob to select Yes.

3. Press the Set key (Note that two Set keys are available, and they both do the same thing).

4. Press the (F1) soft key to select "Load File to Memory"

5. Press the (F1) soft key again to select "Select Package"

6. Using the **Down Arrow** key, step through the selection list until the "CDMA2000" option is highlighted.

7. Press the Set key.

8. Press the (F6) soft key "Return"

9. Press the Set key. The "Select Package" box is displayed. Use the rotary knob to highlight "CDMA2000" and press the Set key to select.

10. Another File List is displayed. Use the rotary knob to select "FWD_RC1-2_9channel" and press the Set key to select.

11. Press the **MOD On/Off** key to turn the Modulation LED On and verify that the "Playing" indicator in the center of the LCD is flashing.

12. Press the Frequency key, enter 870.03 MHz.

13. Press the **Level** key, enter −30, and press the **dBm** key.

14. Adjust the MG3700A output so that the power meter reads −30 dBm ± 0.2 dB. Record the adjusted "Power Meter Reading" into Table A-64, "At 870.03 MHz, −30 dBm Level, cdmaOne" on page A-26.

15. On the MS2723B or MS2724B, press the Frequency soft key and enter 870.03 MHz as Center Frequency.

16. Press the Measurements soft key and press CDMA Summary (a red dot is displayed on the label).

17. Press the Setup soft key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger soft key twice. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

18. For MS2723B or MS2724B with Option 42 (CDMA RF Measurements), record the "Channel Power Value" into Table A-64, and subtract the displayed "Channel Power Value" from the adjusted "Power Meter Reading" in Step 14. Then record the calculated "Channel Power Error" (in units of dBm) into Table A-64.

19. For MS2723B or MS2724B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau into Table A-68, "At 870.03 MHz, −30 dBm Level, cdmaOne" on page A-27.

20. Verify that the measured values in Step 18 and Step 19 are within specifications.

21. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

22. Set the MG3700A Frequency to 1930.05 MHz.

23. Adjust the MG3700A output so that the power meter reads −30 dBm ± 0.2 dB. Record the adjusted "Power Meter Reading" into Table A-65, "At 1930.05 MHz, −30 dBm Level, cdmaOne" on page A-26.

24. On the MS2723B or MS2724B, press the Frequency soft key, and enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

25. For MS2723B or MS2724B with Option 42 (CDMA RF Measurements), record the "Channel Power Value" (in units of watt) into Table A-65, and subtract the displayed "Channel Power Value" from the adjusted "Power Meter Reading" in Step 23. Then record the calculated "Channel Power Error" (in units of watt) into Table A-65.

26. For MS2723B or MS2724B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau into Table A-69, "At 1930.05 MHz, −30 dBm Level, cdmaOne" on page A-27.

27. Verify that the measured values in Step 25 and Step 26 are within specifications.

CDMA2000 Channel Power, Frequency Error, Rho and Tau Tests

Test Procedure:

1. Verify that the equipment settings are unchanged from the previous test.

2. On the MG3700A, change the selected pattern to "FWD_RC3-5_9channel".

3. Adjust the level of the MG3700A so that the power meter reads −30 dBm ± 0.2 dB. Record the adjusted "Power Meter Reading" into Table A-66, "At 1930.05 MHz, −30 dBm Level, CDMA2000" on page A-26. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

4. For MS2723B or MS2724B with Option 42 (CDMA RF Measurements), record the "Channel Power Value" (in units of watt) into Table A-66, and subtract the displayed "Channel Power Value" from the adjusted "Power Meter Reading" in Step 3. Then record the calculated "Channel Power Error" (in units of watt) into Table A-66.

5. For MS2723B or MS2724B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau into Table A-70, "At 1930.05 MHz, −30 dBm Level, CDMA2000" on page A-27.

6. Verify that the measured values in Step 4 and Step 5 are within specifications.

7. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

8. Set the MG3700A Frequency to 870.03 MHz.

9. Adjust the MG3700A output so that the power meter reads −30 dBm ± 0.2 dB. Record the adjusted "Power Meter Reading" into Table A-67, "At 870.03 MHz, −30 dBm Level, CDMA2000" on page A-26.

10. On the MS2723B or MS2724B, press the Frequency soft key, and enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

11. For MS2723B or MS2724B with Option 42 (CDMA RF Measurements), record the "Channel Power Value" (in units of watt) into Table A-67, and subtract the displayed "Channel Power Value" from the adjusted "Power Meter Reading" in Step 9. Then record the calculated "Channel Power Error" (in units of watt) into Table A-67.

12. For MS2723B or MS2724B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau into Table A-71, "At 870.03 MHz, −30 dBm Level, CDMA2000" on page A-27.

13. Verify that the measured values in Step 11 and Step 12 are within specifications.

2-7   WCDMA/HSDPA Signal Analyzer Option Verification

(Option 44, Option 45, Option 65, or a combination of these options)

The tests in this section can be used to verify the functionality of the WCDMA/HSDPA Signal Analyzer mode of the MS2723B or MS2724B Spectrum Master. The tests include:

- "WCDMA Absolute Power Accuracy Verification (Option 44)"
- "WCDMA Occupied Bandwidth (OBW) Verification (Option 44)"
- "WCDMA RF Channel Power Accuracy and ACLR Verification (Option 44)"
- "HSDPA RF Channel Power Accuracy and ACLR Verification (Option 44)"
- "Error Vector Magnitude (EVM) Verification (Option 45 or Option 65)"

WCDMA Absolute Power Accuracy Verification (Option 44)

This test verifies the WCDMA absolute power accuracy in WCDMA/HSDPA Signal Analyzer Mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Mini Circuits Model TIA-1000-1R8 RF Power Amplifier
- Power Meter, Anritsu Model ML2438A
- Programmable Attenuator, Anritsu Model MN63A
- Circulator (refer to Table 1-2 on page 1-2 for options)
- High Power Load, Aeroflex/Weinschel Model M1418
- Coupler (refer to Table 1-2 on page 1-2 for options)
- (2) Power Sensor, Anritsu Model MA2482D
- (2) Adapter, Anritsu Model 34NN50A
- Spectrum Master: MS2723B or MS2724B

ML2438A Power Meter
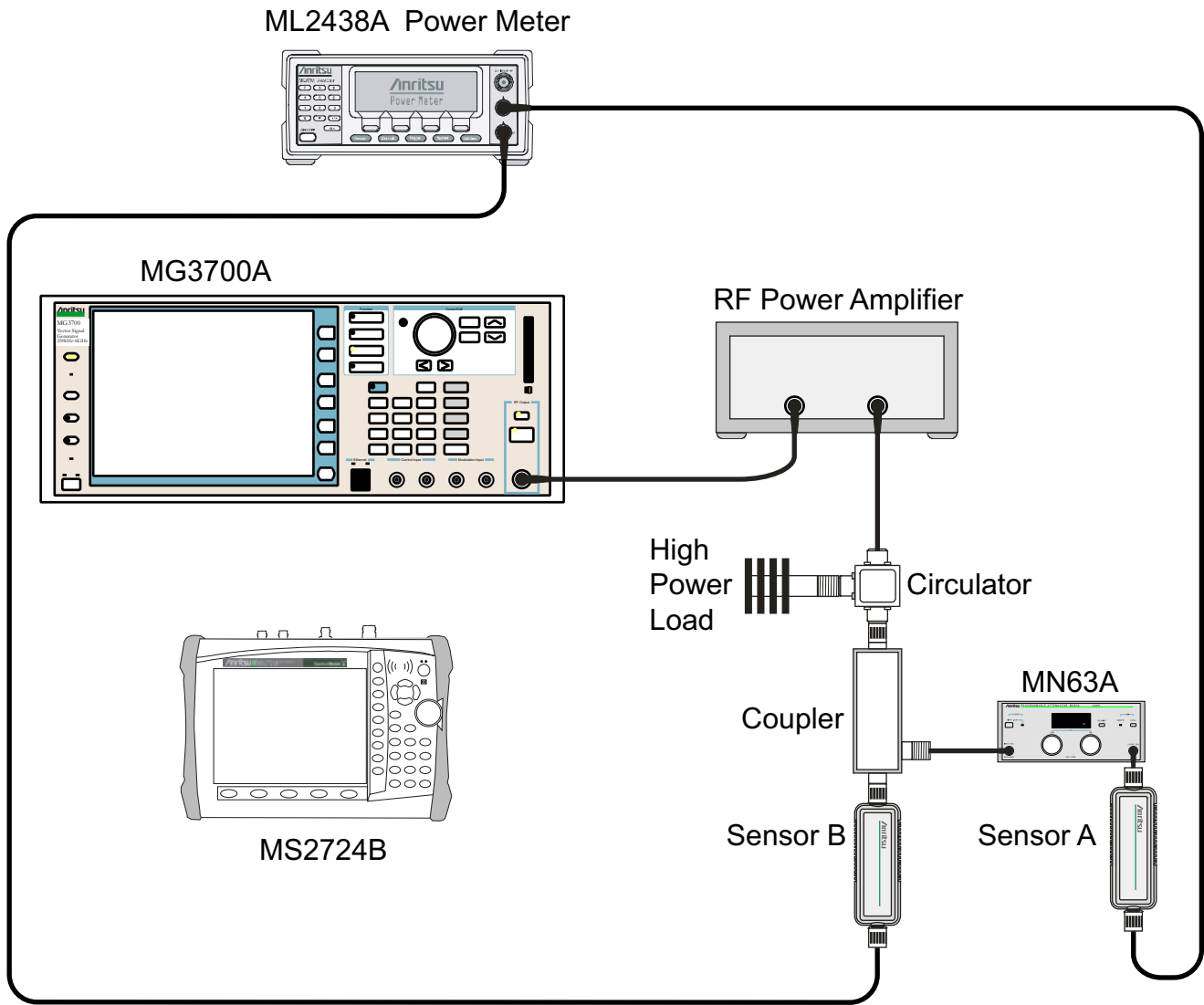
**Figure 2-20.** WCDMA/HSDPA Signal Analyzer –   Characterization Setup

Procedure:

1. Connect the MG3700A, RF power amplifier, circulator, load, coupler, and programmable attenuator as shown in Figure 2-20.

2. Turn on the MG3700A, RF amplifier, attenuator, and the power meter.

3. Connect the power sensors to the power meter and then calibrate the sensors. Then connect the sensors as shown in Figure 2-20.

4. Press the **On/Off** key to turn on the MS2723B or MS2724B and wait until the measurement display appears. Then press the **Shift** key, and press the **Mode** (9) key to activate the mode selection menu.

5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.

6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.

7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

8. Press the **Down Arrow** key to select Yes.

9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) soft key to select "Load File to Memory"

11. Press the (F1) soft key again to select "Select Package'

12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

13. Press the **Set** key.

14. Press the (F6) soft key, Return.

15. Press the **Set** key.

16. Using the **Down Arrow** key, step through the selection list until the "TestModle_1_16DPCH" option is highlighted.

17. Press the **Set** key.

18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.

19. Press the **Frequency** key, enter 881.5 MHz, then press the **MHz** key.

20. Press the **Level** key, enter –28, and press the **dBm** key.

21. Use the knob to adjust the power level so that Sensor B reads +10 dBm.

22. Set the MN63A attenuator to 0 dB.

23. Record the Sensor A reading (PMA.10) in Table A-72, "Sensor A and Sensor B Readings, Components Characterization" on page A-28. This should be approximately –20 dBm.

24. Record the Sensor B reading (PMB.10) in Table A-72.

25. Calculate Delta 1 (Δ1), which is the error of the coupler output port deviation from ideal + 10 dBm, by using the following formula:

    Delta 1 (dBm) = (10 dBm – PMB.10)

26. Record the Delta 1 (Δ1) value in Table A-72.

27. Calculate the accurate value of the Sensor A reading for coupler port output of +10 dBm (PMA.10C) by using the following formula:

    PMA.10C = PMA.10 + Δ1

28. Record the calculated value (PMA.10C) in Table A-72.

29. Set the MN63A attenuator to 18 dB, and record the Sensor A reading (PMA.18) in Table A-72.

30. Calculate the accurate attenuation value by using the following formula:

    ATT.18 = (PMA.10 – PMA.18)

31. Record the calculated value (ATT.18) in Table A-72.

32. Turn off the RF output of the MG3700A.

33. Disconnect the coupler from Sensor B and connect the coupler to the MS2723B or MS2724B, referring to Figure 2-21, "WCDMA/HSDPA Signal Analyzer – Test Setup for Spectrum Master" on page 2-48.
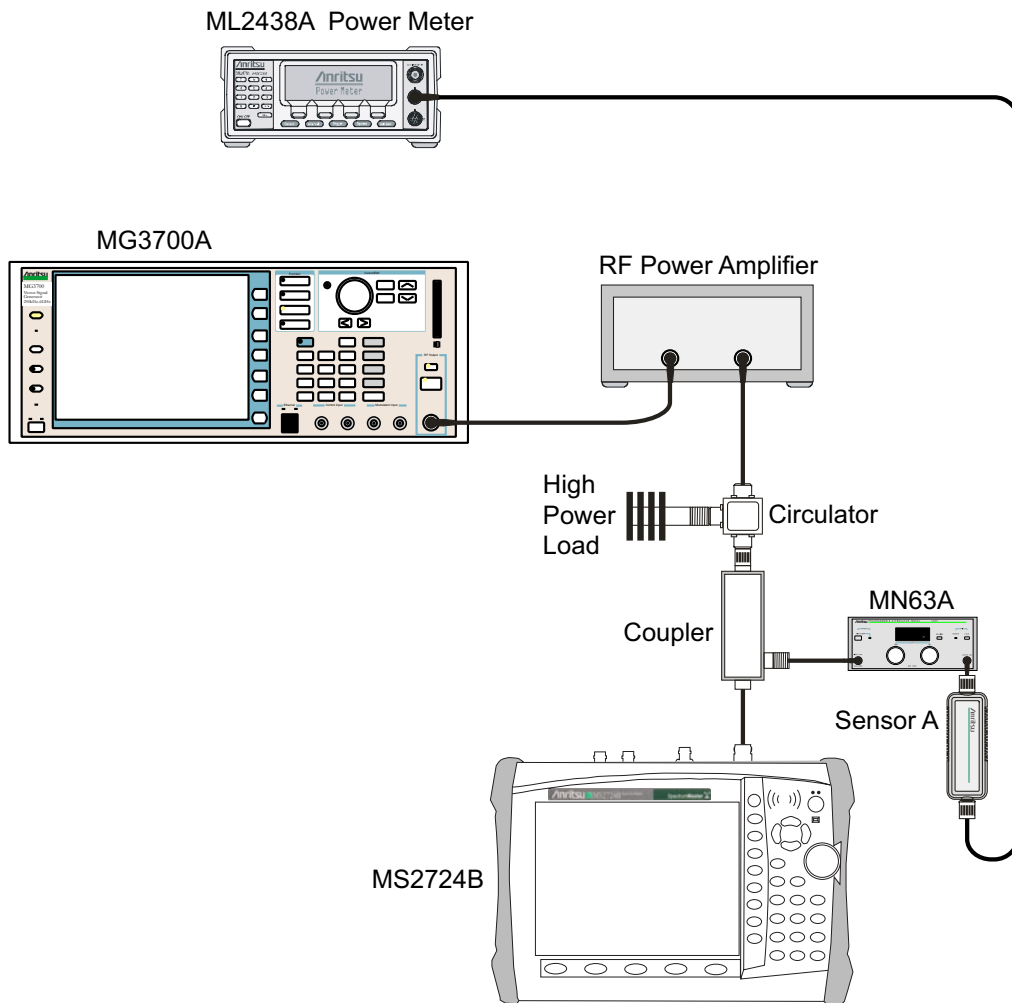
Figure 2-21. WCDMA/HSDPA Signal Analyzer – Test Setup for Spectrum Master

34. Set the MN63A attenuator to 0 dB.

35. On the MS2723B or MS2724B, press the Center Freq soft key, enter 881.5, and then press the **Enter** key.

36. Press the Measurements soft key, then the RF Measurement soft key, then the Spectrum soft key.

37. On the MG3700A, turn on the RF output and use the knob to adjust power level to read the value of PMA.10C on Sensor A (refer to Table A-72).

38. Record the MG3700A power level setting (MG3700A.10) in Table A-73, "Power Level Setting, Components Characterization" on page A-28.

39. On the MS2723B or MS2724B, press the **Amplitude** key and then press the Adjust Range soft key.

40. Record the channel power reading into the "Measured Power" column of Table A-74, "WCDMA Absolute Power Accuracy" on page A-28.

41. Use the following formula to calculate the Error value for the absolute power accuracy of the MS2723B or MS2724B at +10 dBm:

```
Error = Measured Power −10
```

42. Record the calculated Error value into the "Error" column of Table A-74, "WCDMA Absolute Power Accuracy" on page A-28, and verify that it is within the listed specification.

43. Turn off the RF output of the MG3700A.

44. Set the MN63A attenuator to 18 dB.

45. Calculate the value of the MG3700A setting (MG3700A.28) for +28 dBm Test Level by using the following formula:

```
MG3700A.28 = MG3700A.10 + ATT.18
```

46. Record the calculated value (MG3700A.28) in Table A-73, "Power Level Setting, Components Characterization" on page A-28.

47. On the MG3700A, turn on the RF output and use the knob to adjust power level to the recorded MG3700A.28 value in Table A-73.

48. On the MS2723B or MS2724B, press the **Amplitude** key and then press the Adjust Range soft key.

49. Record channel power reading in the "Measured Power" column of Table A-74.

50. Use the following formula to calculate the absolute power accuracy of the MS2723B or MS2724B at +28 dBm:

```
Error = Measured Power −28
```

51. Record the calculated value in the "Error" column of Table A-74 in units of watt, and verify that it is within the listed specification.

52. Turn off the RF output of the MG3700A.

53. Set the MN63A attenuator to 0 dB.

54. Set power level of the MG3700A to −38 dBm.

55. Calculate the value of the Sensor A reading (PMA − 10) for −10 dBm Test Level by using the following formula:

```
PMA−10 = PMA.10C −20
```

56. Record the calculated value (PMA − 10) in Table A-73.

57. Turn on the RF output and use the knob to adjust power level to read the value of PMA − 10 on Sensor A.

58. On the MS2723B or MS2724B, press the **Amplitude** key and then press the Adjust Range soft key.

59. Record channel power reading in the "Measured Power" column of Table A-74.

60. Use the following formula to calculate the absolute power accuracy of the MS2723B or MS2724B at −10 dBm:

```
Error = Measured Power − (−10)
```

61. Record the calculated value in the "Error" column of Table A-74, and verify that it is within the listed specification.

62. Turn off the RF output of the MG3700A.

63. Set the MN63A attenuator to 0 dB.

64. Decrease power level of the MG3700A by 10 dB.

65. Calculate the value of the Sensor A reading (PMA − 20) for −20 dBm Test Level by using the following formula:

```
PMA−20 = PMA.10C − 30
```

66. Record the calculated value (PMA − 20) in Table A-73.

67. Turn on the RF output and use the knob to adjust power level to read the value of PMA − 20 on Sensor A.

68. On the MS2723B or MS2724B, press the **Amplitude** key and then press the Adjust Range soft key.

69. Record channel power reading in the "Measured Power" column of Table A-74, "WCDMA Absolute Power Accuracy" on page A-28.

70. Turn off the RF output of the MG3700A.

71. Use the following formula to calculate the absolute power accuracy of MS2723B or MS2724B at −20 dBm:

```
Error = Measured Power - (-20)
```

72. Record the calculated value in the "Error" column of Table A-74, "WCDMA Absolute Power Accuracy" on page A-28, and verify that it is within the listed specification.

WCDMA Occupied Bandwidth (OBW) Verification (Option 44)

The tests in this section can be used to verify the WCDMA occupied bandwidth in WCDMA/HSDPA Signal Analyzer Mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- (2) Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master: MS2723B or MS2724B

ML2438A Power Meter

Sensor

MG3700A

34NN50A
Adapter

Attenuator
10 dB

Power
Splitter 1870A

15NN50-1.5B

(to back panel)

Attenuator
10 dB

34NN50A
Adapter

ABSOLUTE TIME
Model 300 Frequency Reference

10 MHz Reference

MS2724B
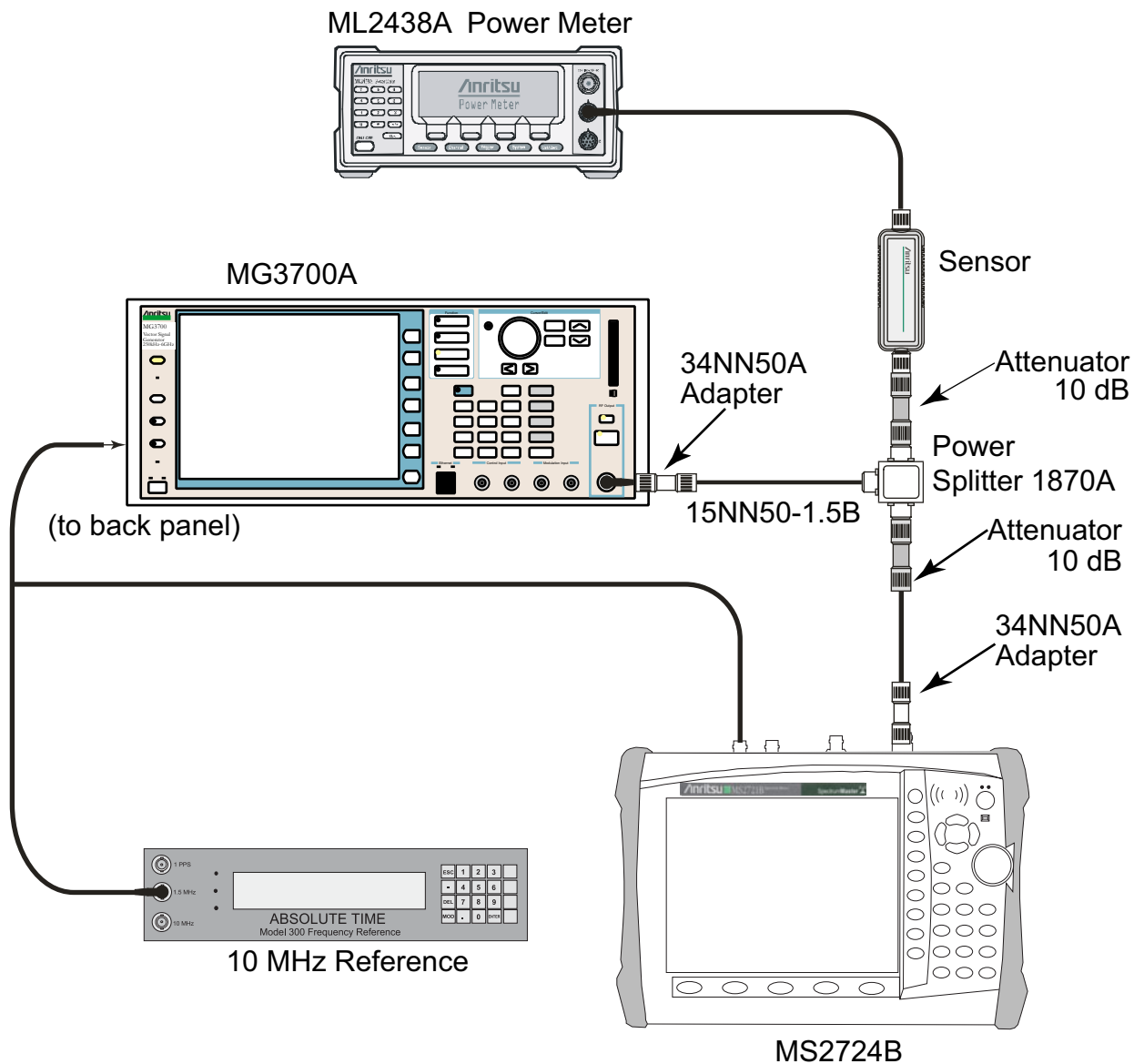
Figure 2-22. WCDMA Occupied Bandwidth – Test Setup

Procedure:

   1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.

   2. Connect the power sensor to the power meter and calibrate the sensor.

   3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in Figure 2-22, "WCDMA Occupied Bandwidth – Test Setup" on page 2-51.

   4. Press the **On/Off** key to turn on the MS2723B or MS2724B and wait until the measurement display appears. Then press the **Shift** key then press the **Mode** (9) key to activate the mode selection menu.

   5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.

   6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.

   7. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).

8. Press the **Down Arrow** key to select Yes.

9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) soft key to select "Load File to Memory"

11. Press the (F1) soft key again to select "Select Package"

12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

13. Press the **Set** key.

14. Press the (F6) soft key, Return.

15. Press the **Set** key.

16. Using the **Down Arrow** key, step through the selection list until the "TestModle_1_16DPCH" option is highlighted.

17. Press the **Set** key.

18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.

19. Press the **Frequency** key, then enter the frequencies from Table A-75, "WCDMA Occupied Bandwidth (OBW)" on page A-28, starting with 881.5, and press the **MHz** key.

20. Press the **Level** key, then enter −2, and press the **dBm** key.

21. Use the knob to adjust the power level so that the power meter reads −20 dBm. Record the reading in the "Power Meter Reading" column of Table A-75.

22. On MS2723B or MS2724B, press the Center Frequency soft key, and enter frequencies from Table A-75, starting with 881.5, then press the **Enter** key.

23. Press the Measurements soft key, then the RF Measurement soft key, and press Channel Spectrum soft key.

24. Press the **Amplitude** key, then press the Adjust Range soft key.

25. Record the OBW reading in the "OBW" column of Table A-75 and verify that it is within 4.2 MHz ± 100 kHz.

26. Repeat Step 19 through Step 25 for the other frequencies in Table A-75.

WCDMA RF Channel Power Accuracy and ACLR Verification (Option 44)

The tests in this section can be used to verify the WCDMA RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Accuracy in WCDMA/HSDPA Signal Analyzer Mode.

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.

2. Connect the power sensor to the power meter and calibrate the sensor.

3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in Figure 2-22, "WCDMA Occupied Bandwidth – Test Setup" on page 2-51.

4. Press the **On/Off** key to turn on the MS2723B or MS2724B and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.

5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.

6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.

7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

8. Press the **Down Arrow** key to select Yes.

9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) soft key to select "Load File to Memory".

11. Press the (F1) soft key again to select "Select Package".

12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

13. Press the **Set** key.

14. Press the (F6) soft key, Return.

15. Press the **Set** key.

16. Using the **Down Arrow** key, step through the selection list until the "TestModel_1_16DPCH" option is highlighted.

17. Press the **Set** key.

18. Press the **MOD On/Off** key, and verify that the Modulation indicator on the display is On.

19. Press the **Frequency** key, then enter 881.5, and press the **MHz** key.

20. Press the **Level** key, then enter **–2**, and press the **dBm** key.

21. Use the knob to adjust the power meter to read **–20 dBm**, and record the Power Meter reading in the "Power Meter Reading" column of Table A-76, "WCDMA RF Channel Power Accuracy" on page A-28.

22. On the MS2723B or MS2724B, press the Center Frequency soft key, enter 881.5, and then press the **Enter** key.

23. Press the Measurements soft key, then the RF Measurement soft key, and press ACLR.

24. Press the **Amplitude** key, then press the Adjust Range soft key.

25. Record the measured CH 1 power into the "Measured RF Channel Power" column of Table A-76.

26. Calculate the RF Channel Power Error using the following formula:

```
RF Channel Power Error (dB) =
Measured RF Channel Power – 0.246 – Power Meter reading
```

27. Record calculated value to the "RF Channel Power Error" column of Table A-76, and verify that it is within specifications (± 1.25 dB).

28. Record all four measured Adjacent Channel Leakage Ratios in dB at −10 MHz Offset, −5 MHz Offset, 5 MHz Offset, and 10 MHz Offset into the "Measured ACLR" column of Table A-77, "WCDMA ACLR Accuracy" on page A-29.

29. Calculate the ACLR Error at −10 MHz and +10 MHz Offset using the following formula:

```
ACLR Error at –10 or 10 MHz Offset =
```
$$10 \; LOG_{10}(10^{(-50/10)} + 10^{(Measured\_ACLR/10)}) - (-50) \; dB$$

30. Record the calculated results into the corresponding cells in the "Calculated ACLR Error" column in Table A-77 and verify that it is within specification.

31. Calculate the ACLR Error at −5 MHz Offset and +5 MHz Offset by using the following formula:

```
ACLR Error at –5 or 5 MHz Offset =
```
$$10 \; LOG_{10}(10^{(-45/10)} + 10^{(Measured\_ACLR/10)}) - (-45) \; dB$$

32. Record the calculated results into the corresponding cells in Table A-77 and verify that they are within specification.

33. Repeat Step 19 through Step 32 for the other frequencies.

HSDPA RF Channel Power Accuracy and ACLR Verification (Option 44)

The tests in this section can be used to verify the RF Channel Power Accuracy and Adjacent Channel Leakage Ratio (ACLR) Accuracy for HSDPA signals in WCDMA/HSDPA Signal Analyzer Mode.

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.

2. Connect the power sensor to the power meter and calibrate the sensor.

3. Connect the MG3700A, splitter, attenuator, power meter, and sensor according to Figure 2-22, "WCDMA Occupied Bandwidth − Test Setup" on page 2-51.

4. Press the **On/Off** key to turn on the MS2723B or MS2724B, and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.

5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.

6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.

7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

8. Press the **Down Arrow** key to select Yes.

9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) soft key to select "Load File to Memory"

11. Press the (F1) soft key again to select "Select Package"

12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

13. Press the **Set** key.

14. Press the (F6) soft key, Return.

15. Press the **Set** key.

16. Using the **Down Arrow** key, step through the selection list until the "TestModel_5_8HSPDSCH" option is highlighted.

17. Press the **Set** key.

18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.

19. Press the **Frequency** key, then enter 2680.5, and press the **MHz** key.

20. Press the **Level** key, then enter **–2**, and press the **dBm** key.

21. Use the knob to adjust the power meter to read **–20 dBm**, and record the Power Meter reading in the "Power Meter Reading" column of Table A-78, "HSDPA RF Channel Power Accuracy" on page A-29.

22. On the MS2723B or MS2724B, press the Center Frequency soft key, enter 2680.5, and then press the **Enter** key.

23. Press the Measurements soft key, then the RF Measurement soft key, and press ACLR.

24. Press the **Amplitude** key, then press the Adjust Range soft key.

25. Record the measured CH 1 power in dBm to the "Measured RF Channel Power" column of Table A-78.

26. Calculate the RF Channel Power Error using the following formula:

    ```
    RF Channel Power Error (dB) =
    Measured RF Channel Power – 0.246 – Power Meter reading
    ```

27. Record the calculated value into the "RF Channel Power Error" column in Table A-78 and verify that it is within specifications (± 1.25 dB).

28. Record all four measured Adjacent Channel Leakage Ratios in dB at −10 MHz Offset, −5 MHz Offset, 5 MHz Offset, and 10 MHz Offset in the "Measured ACLR" column of Table A-79, "HSDPA ACLR Accuracy" on page A-29.

29. Calculate the ACLR Error at −10 MHz Offset and 10 MHz Offset using the following formula:

    $$\text{ACLR Error at } -10 \text{ or } 10 \text{ MHz Offset} =$$
    $$10 \, \text{LOG}_{10}(10^{(-50/10)} + 10^{(\text{Measured\_ ACLR}/10)}) - (-50) \text{ dB}$$

30. Record in the calculated results to the corresponding cells in the "Calculated ACLR Error" column of Table A-79 and verify that it is within specification.

31. Calculate the ACLR Error at −5 MHz Offset and +5 MHz Offset by using the following formula:

```
ACLR Error at −5 or 5 MHz Offset =
10 LOG₁₀(10^(−45/10) + 10^(Measured_ACLR/10)) − (−45) dB
```

32. Record in the calculated results to the corresponding cells in the "Calculated ACLR Error" column of Table A-79 and verify that it is within specification.

Error Vector Magnitude (EVM) Verification (Option 45 or Option 65)

The tests in this section can be used to verify the functionality of the WCDMA Demodulator or the HSDPA Demodulator (or both) of the WCDMA/HSDPA Signal Analyzer in the MS2723B or the MS2724B Spectrum Master.

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.

2. Connect the power sensor to the power meter and calibrate the sensor.

3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in Figure 2-22, "WCDMA Occupied Bandwidth – Test Setup" on page 2-51.

4. Press the **On/Off** key to turn on the MS2723B or MS2724B, and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.

5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.

6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.

7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

8. Press the **Down Arrow** key to select Yes.

9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) soft key to select "Load File to Memory".

11. Press the (F1) soft key again to select "Select Package".

12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

13. Press the **Set** key.

14. Press the (F6) soft key, Return.

15. Press the **Set** key.

16. Using the **Down Arrow** key, step through the selection list until the "TestModel_4_opt" option is highlighted.

17. Press the **Set** key.

18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.

19. Press the **Frequency** key, then enter 1962.5, and press the **MHz** key.

20. Press the **Level** key, then enter −2, and press the **dBm** key.

21. Use the knob to adjust the power meter to read −20 dBm.

22. On the MS2723B or MS2724B, press the Center Frequency soft key, enter 1962.5, and then press the MHz soft key.

23. Press the Measurements soft key, then press the Demodulator soft key and press the Modulation Summary soft key.

24. Press the Setup soft key, then press the Auto Scrambling soft key to turn it On.

25. Press the Max Spreading Factor soft key to set it to 512.

26. Press the **Amplitude** key, then press the Adjust Range soft key.

27. Record the EVM reading into Table A-80, "WCDMA Error Vector Magnitude (Test Model 4; Option 45 or Option 65)" on page A-30 and verify that it is within ±2.5%.

28. This completes the EVM test for MS2723B or MS2724B with Option 45 and the first EVM test for MS2723B or MS2724B with Option 65.

For MS2723B or MS2724B with Option 65:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

2. Press the **Down Arrow** key to select Yes.

3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

4. Press the (F1) soft key to select "Load File to Memory".

5. Press the (F1) soft key again to select "Select Package".

6. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.

7. Press the **Set** key.

8. Press the (F6) soft key, Return.

9. Press the **Set** key.

10. Using the **Down Arrow** key, step through the selection list until the "TestModel_5_8HSPDSCH" option is highlighted.

11. Press the **Set** key.

12. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.

13. Press the **Frequency** key, then enter 1962.5, and press the **MHz** key.

14. Press the **Level** key, then enter −2, and press the **dBm** key.

15. Use the knob to adjust the power meter to read −20 dBm.

16. On the MS2723B or MS2724B, press the Center Frequency soft key, enter 1962.5, and then press the MHz soft key.

17. Press the Measurements soft key, then press the Demodulator soft key, and press the Modulation Summary soft key.

18. Press the Setup soft key, then press the Auto Scrambling soft key to turn it On.

19. Press the Max Spreading Factor soft key to set it to 512.

20. Press the **Amplitude** key, then press the Adjust Range soft key.

21. Record the EVM reading into Table A-81, "HSDPA Error Vector Magnitude (Test Model 5; Option 65)" on page A-30 and verify that it is within ±2.5%.

22. This completes the two EVM tests for MS2723B or MS2724B with Option 65.

2-8   Fixed WiMAX Signal Analyzer Verification

(Option 46 or Option 47 or both)

The tests in this section verify the functionality of the Fixed WiMAX Signal Analyzer of the MS2723B or MS2724B Spectrum Master.

Fixed WiMAX Channel Power Accuracy Tests (Option 46)

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master: MS2723B or MS2724B

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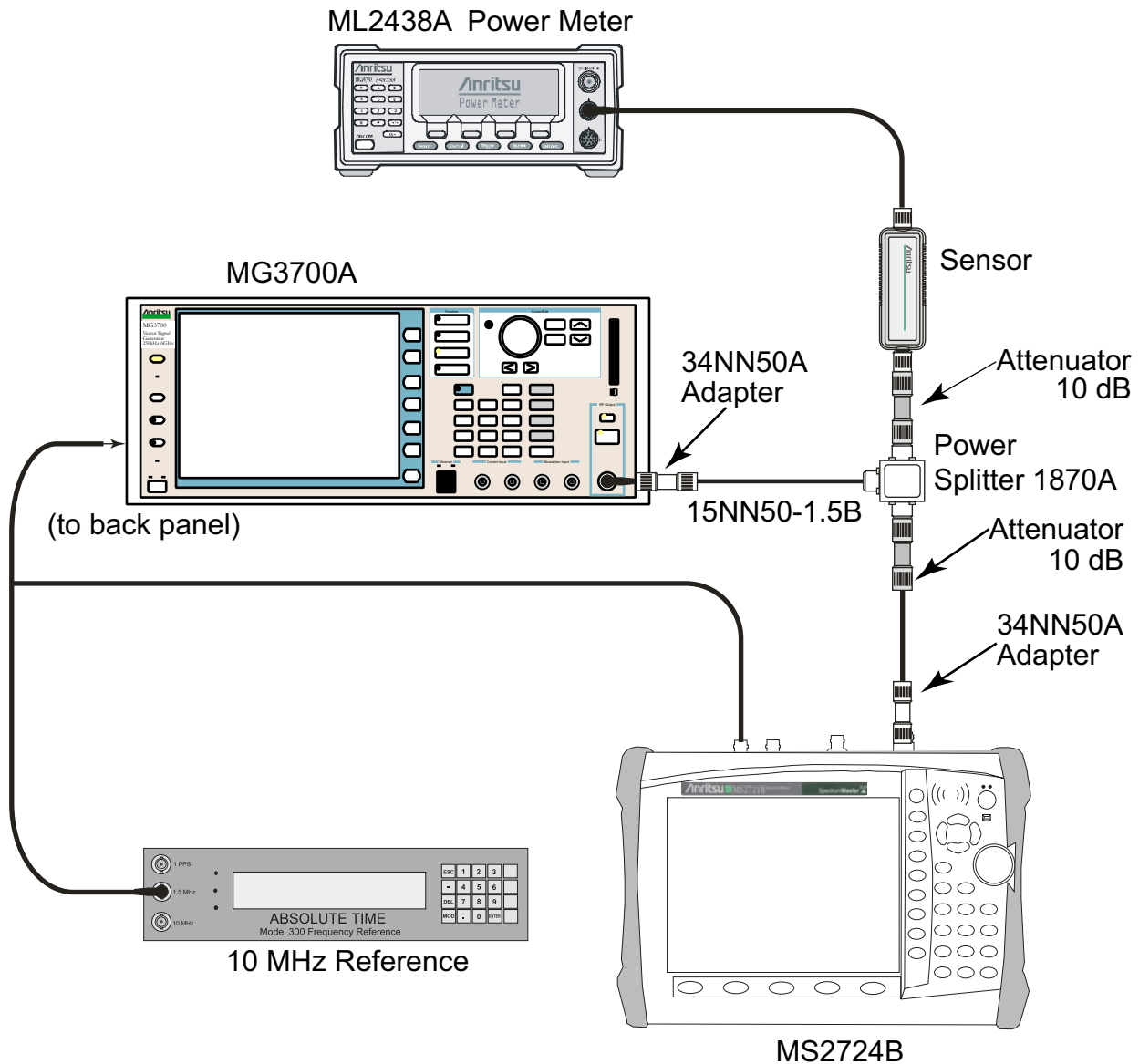
Figure 2-23. Fixed WiMAX Signal Analyzer – Test Setup

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.

2. Set the calibration factor frequency of the power sensor to 2600.5 MHz.

3. Connect the Power Sensor, 1870A splitter, and 10 dB attenuators (quantity 2) as shown in Figure 2-23, "Fixed WiMAX Signal Analyzer – Test Setup" on page 2-58

4. Set the MG3700A as follows:

   a. Press the yellow **Preset** button (answer yes to the question).

   b. Press the **Set** key.

   c. Press the (F1) soft key to select "Load File to Memory".

   d. Press the (F1) soft key again to select "Select Package".

    e. Using the **Down Arrow** key, step through the selection list until "WiMAX" is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key, Return.

    h. Press the **Set** key. The "Select Package" list box is displayed. Again select "WiMAX" and press **Set**.

    i. Another file list is displayed. Select (highlight) "Mx10g32".

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "playing" indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 2600.5 MHz.

    m. Press the **Level** key, then enter 2 dBm. Turn the output On.

5. Adjust the MG3700A Level setting with the knob so that the power meter reads −15.0 dBm ± 0.2 dB, and record the actual power meter reading into the "Input Power Reading" column of Table A-82, "Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings" on page A-31.

6. Set the MS2723B or MS2724B to Fixed WiMAX Signal Analyzer Mode and preset the instrument.

7. Set the MS2723B or MS2724B as follows:

    a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

    b. Press the Setup soft key and set the Bandwidth to 10 MHz.

    c. Press the CP Ratio soft key (under the Setup soft key) and set the CP Ratio to 1/32.

    d. Press the Measurements soft key and press RF, then press Power vs. Time.

8. Record the MS2723B or MS2724B Channel Power (RSSI) reading into the "Measured Channel Power (RSSI)" column in Table A-83, "Fixed WiMAX Channel Power Accuracy" on page A-31.

9. Calculate the Channel Power Error by subtracting the MS2723B or MS2724B "Measured Channel Power (RSSI)" reading from the power meter reading in Step 5 (Table A-82). Record the result into the "Error" column in Table A-83.

10. Verify that the error is within specification.

11. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm, and record the actual power meter reading into the "Input Power Reading" column of Table A-82.

12. Record the MS2723B or MS2724B Channel Power (RSSI) reading into the "Measured Channel Power (RSSI)" column in Table A-83.

13. Calculate the Channel Power Error by subtracting the MS2723B or MS2724B "Measured Channel Power (RSSI)" reading from the power meter reading in Step 11 (Table A-82). Record the result to the "Error" column in Table A-83.

14. Verify that the error is within specification.

15. Set the calibration factor frequency of the power sensor to 3600.5 MHz.

16. Set MG3700A Frequency to 3600.5 MHz.

17. Change the Center Frequency of MS2723B or MS2724B to 3600.5 MHz.

18. Measure the Channel Power (RSSI) for both −15 dBm and −50 dBm (recording actual values into Table A-82), and then record the measured results and the calculated errors into Table A-83.

19. Verify that the errors are within specification.

20. Set the calibration factor frequency of the power sensor to 5600.5 MHz.

21. Set MG3700A Frequency to 5600.5 MHz.

22. Change the Center Frequency of the MS2723B or MS2724B to 5600.5 MHz.

23. Repeat Step 18 and Step 19.

Fixed WiMAX Residual EVM and Frequency Error Tests (Option 47)

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the sensor.

2. Set the calibration factor frequency of the power sensor to 2600.5 MHz.

3. Connect the Power Sensor, 1870A splitter, and 10 dB attenuators as shown in Figure 2-23, "Fixed WiMAX Signal Analyzer – Test Setup" on page 2-58.

4. Set the MG3700A as follows:

    a. Press the yellow **Preset** button (answer yes to the question).

    b. Press the **Set** key

    c. Press the (F1) soft key to select "Load File to Memory".

    d. Press the (F1) soft key again to select "Select Package".

    e. Using the **Down Arrow** key, step through the selection list until "WiMAX" is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key, Return.

    h. Press the **Set** key. The "Select Package" list box is displayed. Again select "WiMAX" and press **Set**.

    i. Another file list is displayed. Select (highlight) "Mx10g32".

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "Playing" indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 2600.5 MHz.

    m. Press the **Level** key, then enter 2 dBm. Turn the output On.

5. Adjust the MG3700A Level setting with the knob so that the power meter reads −15.0 dBm ± 0.2 dB.

6. Set the MS2723B or MS2724B to Fixed WiMAX Signal Analyzer Mode and preset the instrument.

7. Set the MS2723B or MS2724B as follows:

    a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

    b. Press the Setup soft key and set the Bandwidth to 10 MHz.

    c. Press the CP Ratio soft key (under the Setup soft key) and set the CP Ratio to 1/32.

    d. Press the Measurements soft key, and press Demodulator, then press Modulation Summary.

8. Record the MS2723B or MS2724B EVM (rms) reading into the "EVM (rms)" column in Table A-84, "Fixed WiMAX Residual EVM" on page A-32.

9. Verify that the measured EVM is within specification.

10. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm.

11. Record the MS2723B or MS2724B EVM (rms) reading into the "EVM (rms)" column in Table A-84.

12. Verify that the measured EVM is within specification.

13. Record the MS2723B or MS2724B Frequency Error reading into Table A-85, "Fixed WiMAX Frequency Error" on page A-32.

14. Verify that the measured Frequency Error is within specification.

15. Set the calibration factor frequency of the power sensor to 3600.5 MHz.

16. Set MG3700A Frequency to 3600.5 MHz.

17. Change the Center Frequency of MS2723B or MS2724B to 3600.5 MHz.

18. Measure the EVM (rms) for both −15 dBm and −50 dBm, and then record the measured results into Table A-84.

19. Verify that the measured EVM is within specification.

20. Set the calibration factor frequency of the power sensor to 5600.5 MHz.

21. Set MG3700A Frequency to 5600.5 MHz.

22. Adjust the MG3700A Level setting with the knob so that the power meter reads −15.0 dBm ± 0.2 dB.

23. Change the Center Frequency of MS2723B or MS2724B to 5600.5 MHz.

24. Record the MS2723B or MS2724B EVM (rms) reading into the "EVM (rms)" column in Table A-84.

25. Verify that the measured EVM is within specification.

26. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm.

27. Record the MS2723B or MS2724B EVM (rms) reading into the "EVM (rms)" column in Table A-84.

28. Verify that the measured EVM is within specification.

29. Record the MS2723B or MS2724B Frequency Error reading into Table A-85.

30. Verify that the measured Frequency Error is within Specification.

2-9   TD-SCDMA Signal Analyzer Option Verification

(Option 60 or Option 61 or both)

The tests in this section verify the function of the optional TD-SCDMA Signal Analyzer in Models MS2723B and MS2724B Spectrum Master.

- Option 60 is TD-SCDMA RF Measurements
- Option 61 is TD-SCDMA Demodulator

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- (2) Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master: MS2723B or MS2724B
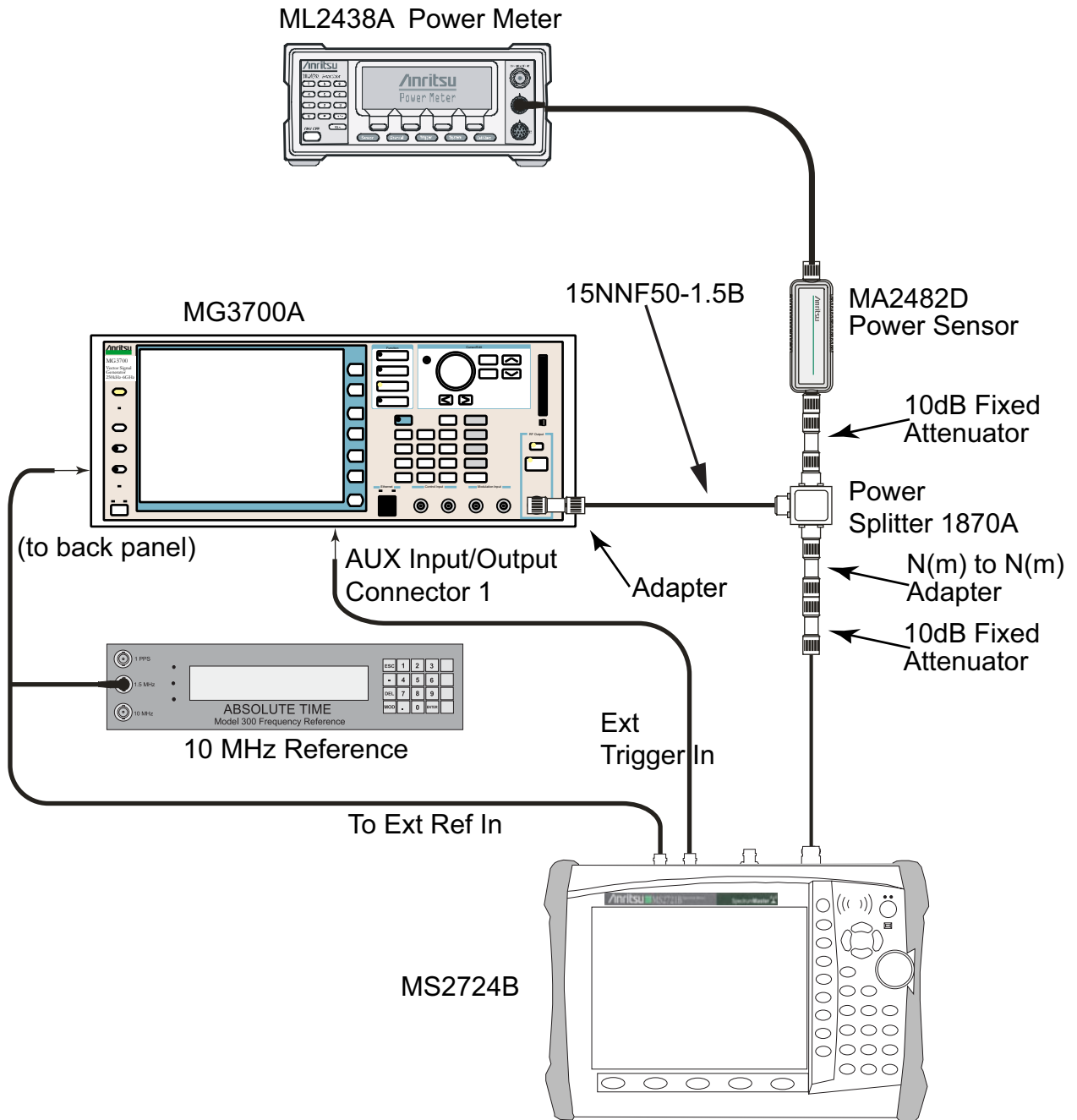
Figure 2-24. TD-SCDMA Signal Analyzer Option Verification – Test Setup

Setup Procedure:

1. Connect the equipment as shown in Figure 2-24.

2. Calibrate the power sensor prior to connecting to the power splitter.

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 2010 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

4. Set the power meter to Averaging, Moving, and 256 samples.

5. Set the MS272xB to TD-SCDMA Signal Analyzer mode and preset the instrument.

TD-SCDMA Channel Power, Frequency Error, EVM, and Tau Test Procedure:

Note	The TD-SCDMA pattern requires a Waveform Data license (MX370001A) that must be purchased.

1. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).

2. Press the **Down Arrow** key or turn the knob to select Yes.

3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

4. Press the F1 soft key to select Load File to Memory.

5. Press the F1 soft key again to select Select Package.

6. Press the **Down Arrow** key to step through the selection list until the TD-SCDMA(MX370001A) option is highlighted.

7. Press the **Set** key.

8. Press the Return (F6) soft key.

9. Press the **Set** key. The Select Package dialog box appears. Use the rotary knob to highlight **TD-SCDMA(MX370001A)** and press the **Set** key to select.

10. Another file list appears. Use the rotary knob to select **rmc-P-CCPCH_bs_dl** and press the **Set** key to select.

11. Press the **MOD On/Off** key to turn the Modulation LED On and verify that the "Playing" indicator is flashing in the center of the LCD.

12. Press the **Frequency** key and enter 2010 MHz.

13. Press the **Level** key, enter −20, and press the **dBm** key.

14. Adjust the MG3700A output so that the power meter reads −45 dBm ±0.5 dB, and record the actual reading into the "Power Meter Reading" row of Table A-86, "TD-SCDMA (at 2010 MHz, −45 dBm Level)" on page A-32.

15. On the MS272xB, press the **Freq** hard key, then press the Center Freq soft key and enter 2010 MHz as center frequency.

16. Press the **Measurements** hard key and press the TD-SCDMA Summary soft key (a red dot is displayed on the label).

17. Press the **Setup** hard key and press the Trigger soft key. Then change Trigger Type to Ext by pressing the Trigger Type soft key twice (or until Ext is underlined). Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

18. For an MS2723B or MS2724B with Option 60 (TD-SCDMA RF Measurements), record the "Displayed Channel Power" into Table A-86, then subtract the "Displayed Channel Power" value from the "Power Meter Reading" in Step 14. Then record the "Calculated Channel Power Error" into Table A-86.

19. For an MS2723B or MS2724B with Option 61 (TD-SCDMA Demodulator), record the Displayed Frequency Error, EVM, and Tau into Table A-86.

20. Verify that the measured values in Step 18 or Step 19 (or both) are within specifications.

2-10   EV-DO Signal Analyzer Option Verification

(Option 62 or Option 63 or both)

The tests in this section verify the optional EV-DO Signal Analyzer functions in Model MS2723B or MS2724B Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master: MS2723B or MS2724B
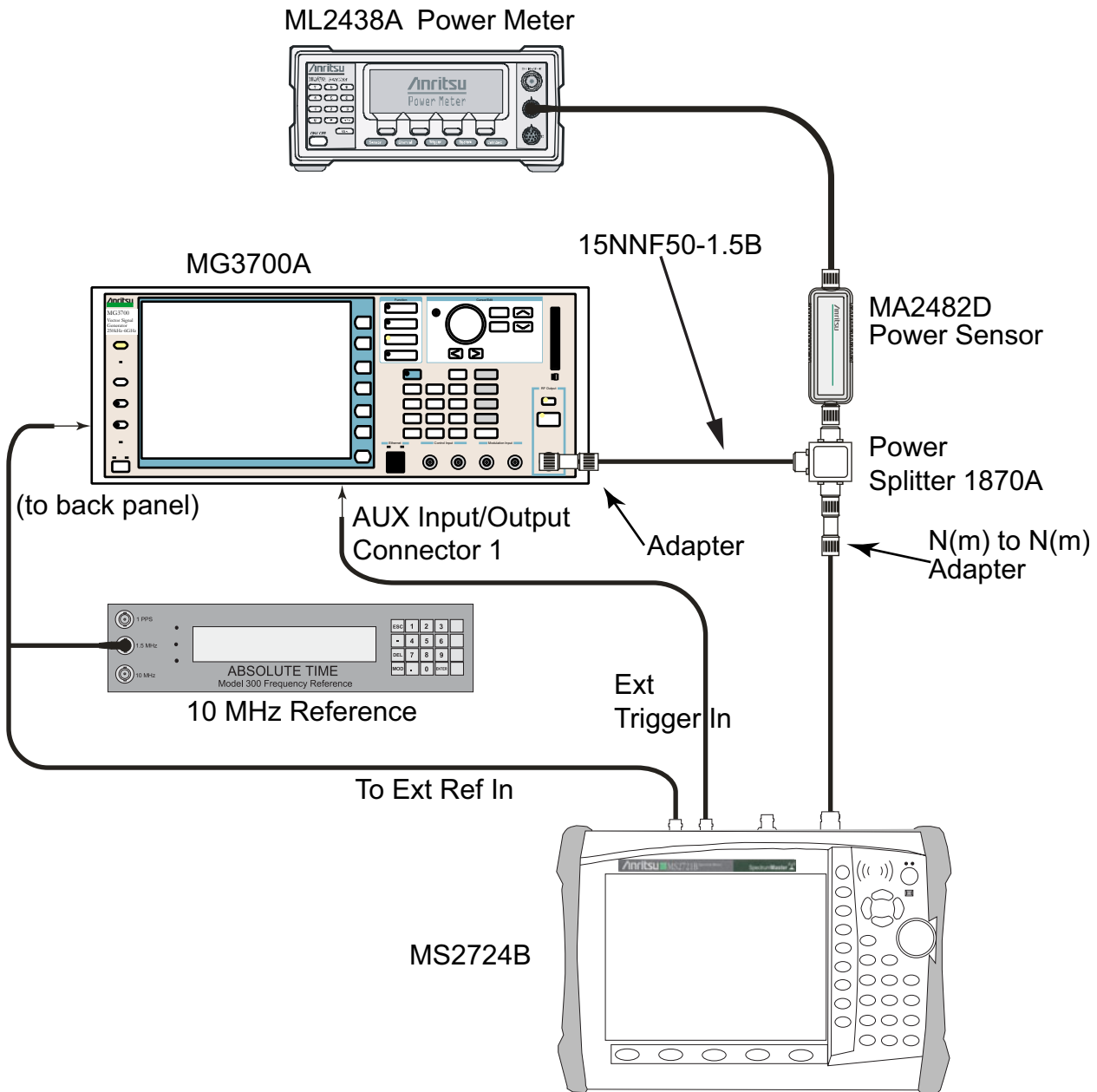
Figure 2-25. EV-DO Signal Analyzer – Test Setup

Set up Procedure:

1. Connect the equipment as shown in Figure 2-25.

2. Calibrate the power sensor prior to connecting to the power splitter.

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 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

4. Set the MS2723B or MS2724B mode to EV-DO Signal Analyzer. Preset the instrument.

8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

2. Press the **Down Arrow** key or turn the knob to select Yes.

3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

4. Press the (F1) soft key to select "Load File to Memory".

5. Press the (F1) soft key again to select "Select Package".

6. Using the **Down Arrow** key, step through the selection list until the "CDMA2000_1xEV-DO" option is highlighted.

7. Press the **Set** key.

8. Press the (F6) soft key, Return.

9. Press the **Set** key. The "Select Package" box is displayed. Use the rotary knob to highlight "CDMA2000_1xEV-DO" and press the **Set** key to select.

10. Another File List is displayed. Use the rotary knob to select "FWD_921_6KBPS_2SLOT" and press the **Set** key to select.

11. Press the **MOD On/Off** key to turn the Modulation LED On, and verify that the "Playing" indicator in the center of the LCD is flashing.

12. Press the **Frequency** key, and enter 870.03 MHz.

13. Press the **Level** key, enter **–**30, and press the **dBm** key.

14. Adjust the MG3700A output so that the power meter reads –50 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-87, "At 870.03 MHz, –50 dBm Level, 921.6 kps 8-PSK Modulation" on page A-33.

15. On the MS2723B or MS2724B, press the Frequency soft key, and enter 870.03 MHz as Center Frequency.

16. Press the Measurements soft key, and press EV-DO Summary (a red dot is displayed on the label).

17. Press the Setup soft key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger soft key twice. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

18. Record the "MS272xB Reading", the displayed Channel Power value, into Table A-87.

19. For MS2723B or MS2724B with Option 62 (EV-DO RF Measurements), subtract the "MS272xB Reading" of displayed Channel Power value from the "Power Meter Reading" in Step 14. Then record the "Calculated Channel Power Error" into Table A-87.

20. For MS2723B or MS2724B with Option 63 (EV-DO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau into Table A-92, "At 870.03 MHz, –50 dBm Level, 921.6 kps 8-PSK Modulation" on page A-35.

21. Verify that the measured values in Step 19 and Step 20 are within specifications.

QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure:

1. Ensure that the equipment settings are unchanged from the previous test.

2. On the MG3700A, change the selected pattern to "FWD_38_4KBPS_16SLOT".

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 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

4. Set the MG3700A Frequency to 1930.05 MHz.

5. Adjust the MG3700A output so that the power meter reads 0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-88, "At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation" on page A-33.

6. On the MS2723B or MS2724B, press the Frequency soft key and enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

7. Record the "MS272xB Reading", the displayed Channel Power value, into Table A-88.

8. For MS2723B or MS2724B with Option 62 (EV-DO RF Measurements), subtract the "MS272xB Reading" of displayed Channel Power value from the "Power Meter Reading" in Step 5. Then record the "Calculated Channel Power Error" into Table A-88.

9. For MS2723B or MS2724B with Option 63 (EV-DO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau into Table A-93, "At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation" on page A-35.

10. Verify that the measured values in Step 8 and Step 9 are within specifications.

16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure:

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, and the MG3700A frequency and MS2723B or MS2724B Center Frequency should still be at 1930.05 MHz.

2. On the MG3700A, change the selected pattern to "FWD_2457_6KBPS_1SLOT."

3. Adjust the MG3700A output so that the power meter reads −50 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-89, "At 1930.05 MHz, −50 dBm Level, 2457.6 kps 16-QAM Modulation" on page A-33.

4. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

5. Record the "MS272xB Reading", the displayed Channel Power value, into Table A-89.

6. For MS2723B or MS2724B with Option 62 (EV-DO RF Measurements), subtract the "MS272xB Reading" of displayed Channel Power value from the "Power Meter Reading" in Step 3. Then record the "Calculated Channel Power Error" into Table A-89.

7. For MS2723B or MS2724B with Option 63 (EV-DO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau into Table A-94, "At 1930.05 MHz, −50 dBm Level, 2457.6 kps 16-QAM Modulation" on page A-35.

8. Verify that the measured values in Step 6 and Step 7 are within specifications.

Idle Slot Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure:

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, and the MG3700A frequency and MS2723B or MS2724B Center Frequency should still be at 1930.05 MHz.

2. On the MG3700A, change the selected pattern to "FWD_IDLE".

3. Adjust the MG3700A output so that the power meter reads −50 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-90, "At 1930.05 MHz, −50 dBm Level, Idle Slot" on page A-34.

4. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

5. Record the "MS272xB Reading", the displayed Channel Power value, into Table A-90.

6. For MS2723B or MS2724B with Option 62 (EV-DO RF Measurements), subtract the "MS272xB Reading" of displayed Channel Power value from the "Power Meter Reading" in Step 3. Then record the "Calculated Channel Power Error" into Table A-90.

7. For MS2723B or MS2724B with Option 63 (EV-DO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau into Table A-95, "At 1930.05 MHz, −50 dBm Level, Idle Slot" on page A-35.

8. Verify that the measured values in Step 6 and Step 7 are within specifications.

9. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

10. Set the MG3700A Frequency to 870.03 MHz.

11. Adjust the MG3700A output so that the power meter reads −10 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-91, "At 870.03 MHz, −10 dBm Level, Idle Slot" on page A-34.

12. On the MS2723B or MS2724B, press the Frequency soft key, and enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS2723B or MS2724B to update its measured results.

13. Record the MS272xB displayed Channel Power value into Table A-91.

14. For MS2723B or MS2724B with Option 62 (EV-DO RF Measurements), subtract the "MS272xB Reading" of displayed Channel Power value from the "Power Meter Reading" in Step 11. Then record the "Calculated Channel Power Error" into Table A-91.

15. For MS2723B or MS2724B with Option 63 (EV-DO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau into Table A-96, "At 870.03 MHz, −10 dBm Level, Idle Slot" on page A-35.

16. Verify that the measured values in Step 14 and Step 15 are within specifications.

2-11   Mobile WiMAX Signal Analyzer Verification

(Option 66 or Option 67 or both)

The tests in this section verify the functionality of the Mobile WiMAX Signal Analyzer of the MS272xB Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- (2) Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- (2) Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master: MS2723B or MS2724B

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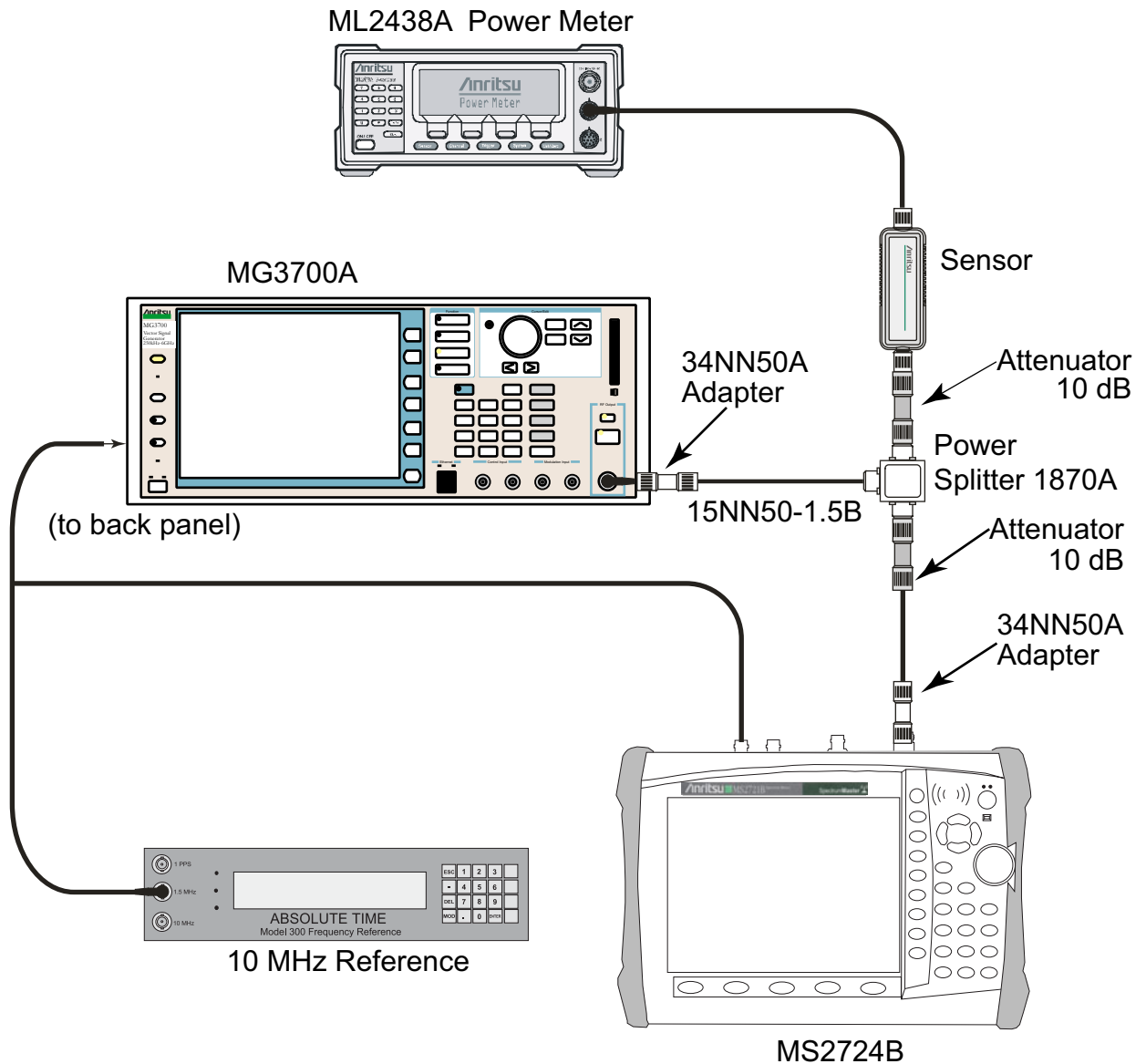
Figure 2-26. Mobile WiMAX Signal Analyzer – Test Setup

Mobile WiMAX Channel Power Accuracy Tests (Option 66)

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the sensor.

2. Set the Power Meter Measurement MODE to "True RMS", set Averaging MODE to "Moving", and set Averaging NUMBER to "256".

3. Set the calibration factor frequency of the power sensor to 2600.5 MHz.

4. Connect all of the test equipment as shown in

Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length)

Procedure:

1. Set the MG3700A as follows:

    a. Press the yellow **Preset** button (answer yes to the question).

    b. Press the **Set** key

    c. Press the (F1) soft key to select "Load File to Memory".

    d. Press the (F1) soft key again to select "Select Package".

    e. Using the **Down Arrow** key, step through the selection list until "mWiMAX" is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key, Return.

    h. Press the **Set** key. The "Select Package" list box is displayed. Again select "mWiMAX" and press **Set**.

    i. Another file list is displayed. Select (highlight) "10m1024g8_0_10_cap".

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "Playing" indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 2600.5 MHz.

    m. Press the **Level** key, then enter 2 dBm. Turn the output On.

2. Adjust the MG3700A Level setting with the knob so that the power meter reads −15.0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-97, "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −15.0 dBm)" on page A-36.

3. Set the MS272xB to Mobile WiMAX Signal Analyzer Mode and preset the instrument.

4. Set the MS272xB as follows:

    a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

    b. Press the Setup soft key and set the Bandwidth to 10 MHz.

    c. Press the Frame Length soft key and set the Frame Length to 10 ms.

    d. Press the Measurements soft key, press RF, and then press Power vs. Time.

5. Record the "MS272xB Reading", the displayed Channel Power (RSSI) value, into Table A-97.

6. Calculate the Channel Power Error by subtracting the "MS272xB reading" in Step 5 from the "Power Meter Reading" in Step 2. Record the result into Table A-97.

7. Verify that the error is within specification.

8. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-98, "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −50.0 dBm)" on page A-36.

9. Record the "MS272xB Reading", the displayed Channel Power (RSSI) value, into Table A-98.

10. Calculate the Channel Power Error by subtracting the "MS272xB Reading" of Channel Power (RSSI) in Step 9 from the "Power Meter Reading" in Step 8. Record the "Calculated Channel Power Error" into Table A-98.

11. Verify that the error is within specification.

12. Set the calibration factor frequency of the power sensor to 3600.5 MHz.

13. Set MG3700A Frequency to 3600.5 MHz.

14. Change the Center Frequency of MS272xB to 3600.5 MHz.

15. Measure the Channel Power (RSSI) for both –15 dBm and –50 dBm, and then record the measured results and calculated errors into Table A-99, "Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –15.0 dBm)" on page A-36 and Table A-100, "Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –50.0 dBm).

16. Verify that the errors are within specification.

Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)

Procedure:

1. Set the MG3700A as follows:

    a. Press the yellow **Preset** button (answer yes to the question).

    b. Press the **Set** key

    c. Press the (F1) soft key to select "Load File to Memory".

    d. Press the (F1) soft key again to select "Select Package".

    e. Using the **Down Arrow** key, step through the selection list until "mWiMAX" is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key, Return.

    h. Press the **Set** key. The "Select Package" list box is displayed. Again select "mWiMAX" and press **Set**.

    i. Another file list is displayed. Select (highlight) "5m512g8_2_5_cap".

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "Playing" indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 2600.5 MHz.

    m. Press the **Level** key, then enter 2 dBm. Turn the output On.

2. Adjust the MG3700A Level setting with the knob so that the power meter reads –15.0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-101, "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –15.0 dBm)" on page A-37.

3. Set the MS272xB to Mobile WiMAX Signal Analyzer Mode and preset the instrument.

4. Set the MS272xB as follows:

    a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

    b. Press the Setup soft key and set the Bandwidth to 5 MHz.

    c. Press the Frame Length soft key and set the Frame Length to 5 ms.

    d. Press the Measurements soft key, press RF, then press Power vs. Time.

5. Record the "MS272xB Reading", the displayed Channel Power (RSSI) value, into Table A-101.

6. Calculate the Channel Power Error by subtracting the "MS272xB reading" in Step 5 from the "Power Meter Reading" in Step 2. Record the result into Table A-101.

7. Verify that the error is within specification.

8. Adjust the MG3700A Level setting to approximately –33 dBm so that the power meter reads –50.0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into Table A-102, "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –50.0 dBm)" on page A-37.

9. Record the "MS272xB Reading", the displayed Channel Power (RSSI) value, into Table A-102.

10. Calculate the Channel Power Error by subtracting the "MS272xB Reading" of Channel Power (RSSI) in Step 9 from the "Power Meter Reading" in Step 8. Record the "Calculated Channel Power Error" into Table A-102.

11. Verify that the error is within specification.

12. Set the calibration factor frequency of the power sensor to 3600.5 MHz.

13. Set MG3700A Frequency to 3600.5 MHz.

14. Change the Center Frequency of MS272xB to 3600.5 MHz.

15. Measure the Channel Power (RSSI) for both -15 dBm and -50 dBm, and then record the measured results and calculated errors into Table A-103, "Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -15.0 dBm)" on page A-37 and Table A-104, "Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -50.0 dBm).

16. Verify that the errors are within specification.

2-12   Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67)

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2723B or MS2724B
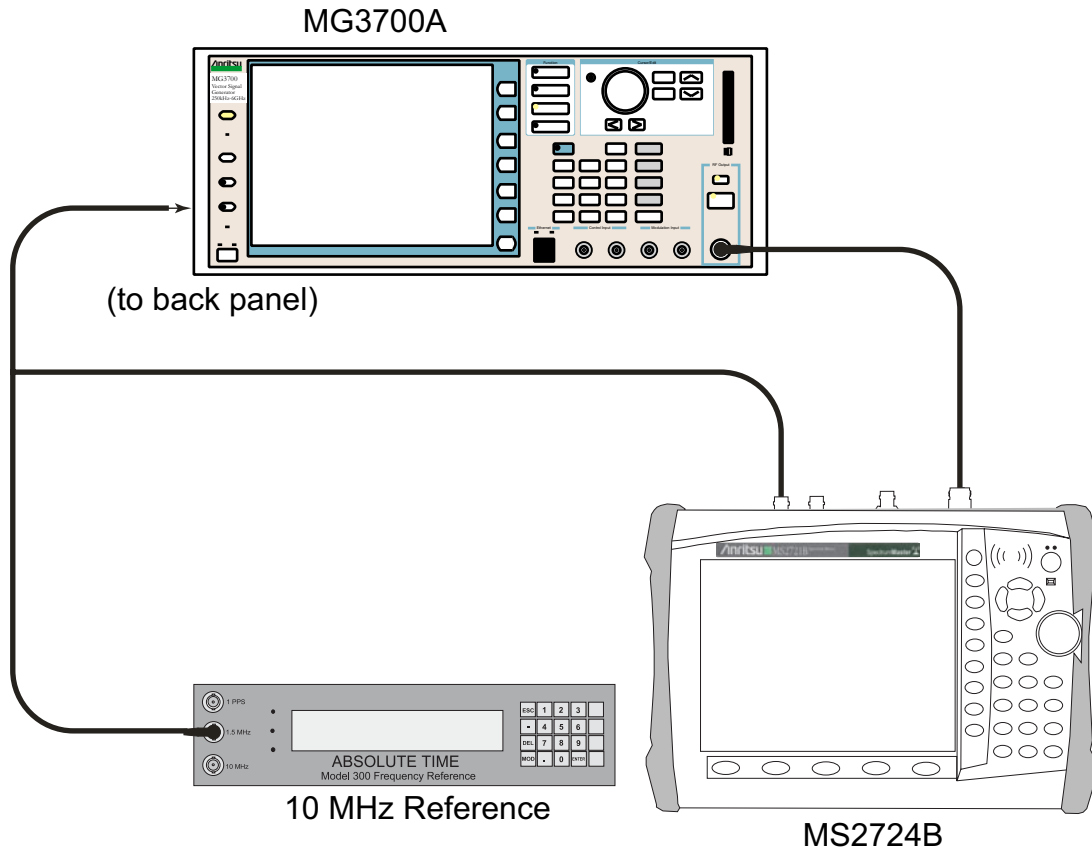
Figure 2-27. Mobile WiMAX Residual EVM – Test Setup

Procedure:

1. Connect the 10 MHz Reference to the 10 MHz/5 MHz Ref Input of the MG3700A and the Ext Ref In of the MS272xB as shown in Figure 2-27.

2. Connect the RF Out of the MG3700A to the Spectrum Analyzer RF In connector of the MS272xB.

Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

3. Set the MG3700A as follows:

    a. Press the yellow **Preset** button (answer yes to the question).

    b. Press the **Set** key

    c. Press the (F1) soft key to select "Load File to Memory".

    d. Press the (F1) soft key again to select "Select Package".

    e. Using the **Down Arrow** key, step through the selection list until "mWiMAX" is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key, Return.

    h. Press the **Set** key. The "Select Package" list box is displayed. Again select "mWiMAX" and press **Set**.

    i. Another file list is displayed. Select (highlight) "10m1024g8_0_10_cap".

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "playing" indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 2600.5 MHz.

    m. Press the **Level** key, then enter −15 dBm. Turn the output On.

4. Set the MS272xB to Mobile WiMAX Signal Analyzer Mode and preset the instrument.

5. Set the MS272xB as follows:

    a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

    b. Press the Setup soft key and set the Bandwidth to 10 MHz.

    c. Press the CP Ratio soft key (under the Setup soft key) and set the CP Ratio to 1/8.

    d. Press the Frame Length soft key and set the Frame Length to 10 ms.

    e. Press the Demod soft key and set Demod to FCH.

    f. Press the Measurements soft key and press Demodulator, then press Modulation Summary.

6. Record the MS272xB EVM (rms) reading into the "EVM (rms)" column in Table A-105, "Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length)" on page A-38.

7. Verify that the measured EVM is within specification.

8. Set the MG3700A Level to −50.0 dBm.

9. Record the MS272xB EVM (rms) reading into the "EVM (rms)" column in Table A-105.

10. Verify that the measured EVM is within specification.

11. On the MS272xB, press the Setup soft key, and set Demod to Auto.

12. Record the MS272xB frequency error reading to the "Frequency Error" column in Table A-106, "Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)" on page A-38.

13. Verify that the measured Frequency Error is within specification.

14. Set MG3700A Frequency to 3600.5 MHz.

15. On the MS272xB, change the Center Frequency to 3600.5 MHz.

16. Press the Setup soft key and set Demod to FCH.

17. Measure the EVM(rms) for both −15 dBm and −50 dBm, and then record the measured results into Table A-105.

18. Verify that the measured EVM is within specification.

19. Repeat Step 11 through Step 13 to measure the Frequency Error at 3600.5 MHz.

Residual EVM and Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

20. Set the MG3700A as follows:

   a. Press the yellow **Preset** button (answer yes to the question).

   b. Press the **Set** key

   c. Press the (F1) soft key to select "Load File to Memory".

   d. Press the (F1) soft key again to select "Select Package".

   e. Using the **Down Arrow** key, step through the selection list until "mWiMAX" is highlighted.

   f. Press the **Set** key.

   g. Press the (F6) soft key, Return.

   h. Press the **Set** key. The "Select Package" list box is displayed. Again select "mWiMAX" and press **Set**.

   i. Another file list is displayed. Select (highlight) "5m512g8_2_5_cap".

   j. Press the **Set** key.

   k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the "Playing" indicator is displaying the moving pattern.

   l. Press the **Frequency** key, then enter 2600.5 MHz.

   m. Press the **Level** key, then enter −15 dBm. Turn the output On.

21. Set the MS272xB as follows:

   a. Press the Freq soft key and set the Center Freq to 2600.5 MHz.

   b. Press the Setup soft key and set the Bandwidth to 5 MHz.

   c. Press the CP Ratio soft key (under the Setup soft key) and set the CP Ratio to 1/8.

   d. Press the Frame Length soft key and set the Frame Length to 5 ms.

   e. Press the Demod soft key and set Demod to FCH.

   f. Press the Measurements soft key, press Demodulator, then press Modulation Summary.

22. Repeat Step 6 through Step 19, recording the results into Table A-107, "Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)" on page A-38 and Table A-108, "Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)" on page A-38.

2-13   LTE Signal Analyzer Option 541 or Option 542 (or both) Verification

Introduction

The tests in this section verify the functionality of the LTE Signal Analyzer of the MS272xB Spectrum Master.

Option 541 is for RF Measurements, and Option 542 is for Modulation Measurements.

Tests are presented for the following LTE options:

- Channel Power Accuracy Verification

  Channel power measures the average power within the selected bandwidth and is expressed in dBm.

- Residual EVM and Frequency Error Verification

  EVM is the percent of all the error vectors (between the reconstructed ideal signals and the received signals) divided by the RMS value of the ideal signals.

  Frequency error is the difference between the measured carrier frequency and the specified carrier frequency. This number is only as accurate as the frequency reference that is used, and is typically only useful with a good external frequency reference or GPS.

2-14   LTE Channel Power Accuracy Tests (Option 541)

The tests in this section verify the function of Option 541 in the optional LTE Signal Analyzer in Model MS272xB Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NNF50-1.5C
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Coaxial Cable, BNC to BNC, 75 ohm (Anritsu PN 3-806-169 Coaxial Cable)
- 10 MHz Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2723B or MS2724B
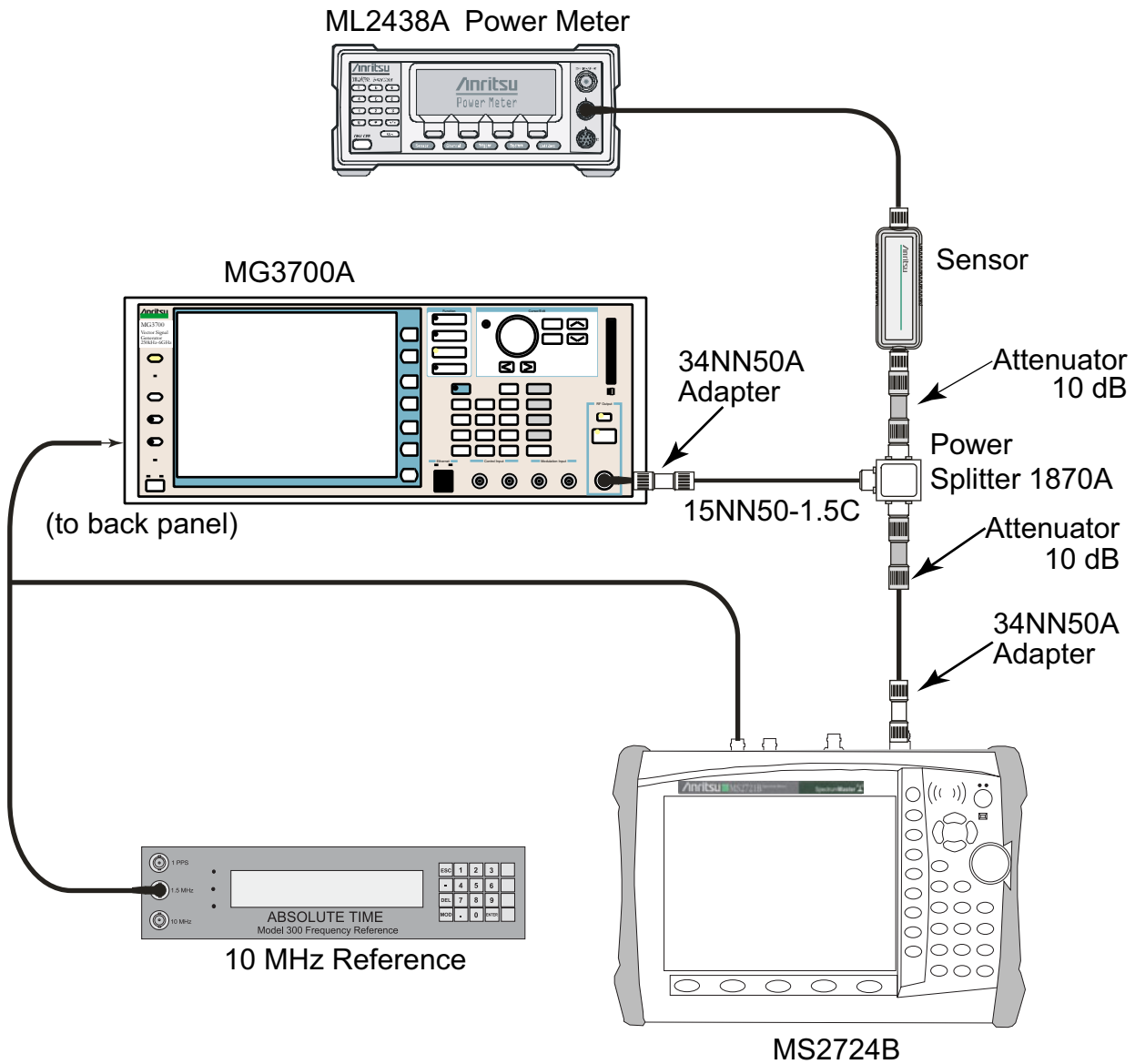
Figure 2-28. LTE Signal Analyzer Option Verification

Procedure:

1. Connect the Power Sensor, Anritsu Model MA2482D, to the power meter, and then zero the sensor.

2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.

3. Set the calibration factor frequency of the power sensor to 750 MHz.

4. Connect all of the test equipment as shown in Figure 2-28.

Note	The LTE pattern requires a Waveform Data license (Part Number MX370108A) that must be purchased.

Note	Both **Set** keys on the MG3700A perform the same function.

5. Set the MG3700A as follows:

    a. Press the yellow **Preset** button (answer yes to the question).

    b. Press the **Set** key.

    c. Press the (F1) soft key to select Load File to Memory.

    d. Press the (F1) soft key again to select Select Package.

    e. Using the **Down Arrow** key, step through the selection list until LTE_DL_E-TM is highlighted.

    f. Press the **Set** key.

    g. Press the (F6) soft key Return.

    h. Press the **Set** key. The Select Package list box is displayed. Again select LTE_DL_E-TM and then press the **Set** key.

    i. Another file list is displayed. Select (highlight) E-TM_1-1_10M.

    j. Press the **Set** key.

    k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the playing indicator is displaying the moving pattern.

    l. Press the **Frequency** key, then enter 750 MHz.

    m. Press the **Level** key, then enter 2 dBm.

    n. Turn On the output.

6. Adjust the MG3700A Level setting with the knob so that the power meter reads −10.0 dBm ± 0.5 dB.

7. Set the MS272xB to LTE Signal Analyzer Mode and preset the unit.

8. Set the MS272xB as follows:

    a. Press the Freq soft key and set the Center Freq to 750 MHz.

    b. Press the Measurements soft key and select RF, then press Channel Spectrum.

9. Record the MS272xB Channel Power reading into Table A-109, "LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)" on page A-39 in the column labeled Measured Channel Power (in the row labeled with Frequency 750 MHz and Input Power −10 dBm).

10. Calculate the Channel Power Error by subtracting the MS272xB Channel Power reading from the power meter reading in Step 6. Record the result into Table A-109, "LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)" on page A-39 in the column labeled Error (in the row labeled with Frequency 750 MHz and Input Power −10 dBm).

11. Verify that the error is within specification.

12. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm ± 0.5 dB.

13. Record the MS272xB Channel Power reading into Table A-109, "LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)" on page A-39 in the row labeled with Frequency 750 MHz and Input Power −50 dBm.

14. Calculate the Channel Power Error by subtracting the MS272xB Channel Power reading from the power meter reading that was recorded in Step 13. Record the result into Table A-109, "LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)" on page A-39 in the row labeled with Frequency 750 MHz and Input Power −50 dBm).

15. Verify that the error is within specification.

16. Set the calibration factor frequency of the power sensor to 2150 MHz.

17. Set MG3700A Frequency to 2100 MHz. Press the **Set** key.

18. Change the Center Frequency of the MS272xB to 2150 MHz.

19. Measure the Channel Power for −10 dBm and −50 dBm and then record the measured result and the calculated error into Table A-109, "LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)" on page A-39 in the column labeled Measured Channel Power and in the column labeled Error (rows labeled 2150 MHz).

2-15   LTE Residual EVM and Frequency Error Tests (Option 542)

The tests in this section verify the function of Option 542 in the optional LTE Signal Analyzer in Model MS272xB Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NNF50-1.5C
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Coaxial Cable, BNC to BNC, 75 ohm (Anritsu PN 3-806-169 Coaxial Cable)
- 10 MHz Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2723B or MS2724B

Procedure:

1. Connect the Power Sensor, Anritsu Model MA2482D, to the power meter, and then zero the sensor.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.
3. Set the calibration factor frequency of the power sensor to 750 MHz.
4. Connect all of the test equipment as shown in Figure 2-28.

Note	The LTE pattern requires a Waveform Data license (Part Number MX370108A) that must be purchased.

Note	Both **Set** keys on the MG3700A perform the same function.

5. Set the MG3700A as follows:

   a. Press the yellow **Preset** button (answer yes to the question).

   b. Press the **Set** key.

   c. Press the (F1) soft key to select Load File to Memory.

   d. Press the (F1) soft key again to select Select Package.

   e. Using the **Down Arrow** key, step through the selection list until LTE_DL_E-TM is highlighted.

   f. Press the **Set** key.

   g. Press the (F6) soft key Return.

   h. Press the **Set** key. The Select Package list box is displayed. Again select LTE_DL_E-TM and then press the **Set** key.

   i. Another file list is displayed. Select (highlight) E-TM_3-1_10M.

   j. Press the **Set** key.

   k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the playing indicator is displaying the moving pattern.

   l. Press the **Frequency** key, then enter 750 MHz.

   m. Press the **Level** key, then enter 2 dBm.

   n. Turn On the output.

6. Adjust the MG3700A Level setting with the knob so that the power meter reads −10.0 dBm ± 0.5 dB.

7. Set the MS272xB to LTE Signal Analyzer Mode and preset the unit.

8. Set the MS272xB as follows:

   a. Press the Freq soft key and set the Center Freq to 750 MHz.

   b. Press the Measurements soft key and select Modulation Measurements.

   c. Press the Constellation soft key.

9. Record the MS272xB Residual EVM and Frequency Error reading into Table A-110, "LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)" on page A-39.

10. Verify that the values are within specification.

11. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm ± 0.5 dB.

12. Record the MS272xB Residual EVM and Frequency Error reading into Table A-111, "LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)" on page A-39.

13. Verify that the values are within specification.

14. Set the calibration factor frequency of the power sensor to 2150 MHz.

15. Set the MG3700A Frequency to 2150 MHz. Press the **Set** key.

16. Adjust the MG3700A Level setting with the knob so that the power meter reads −10.0 dBm ± 0.5 dB.

17. Change the Center Frequency of the MS272xB to 2150 MHz.

18. Record the MS272xB Residual EVM and Frequency Error reading into Table A-112, "LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)" on page A-39.

19. Verify that the values are within specification.

20. Adjust the MG3700A Level setting to approximately −33 dBm so that the power meter reads −50.0 dBm ± 0.5 dB.

21. Record the MS272xB Residual EVM and Frequency Error reading into Table A-113, "LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)" on page A-39.

22. Verify that the values are within specification.

Chapter 3 — Removal and Replacement

3-1   Remove and Replace Instructions

Note	Some of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations are representative and may show instruments other than the Models MS2723B and MS2724B.

3-2   Battery Pack Removal and Replacement

This section provides instructions for the removing and replacing the MS2723B or MS2724B battery pack.

1. With the MS2723B or MS2724B laying flat and face up on a stable surface, locate the battery access door, as illustrated in Figure 3-1.
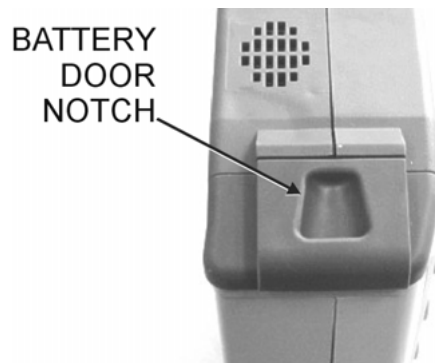
Figure 3-1.   Battery Access Door Notch

2. Place a finger in the battery access door notch and push the door down towards the bottom of the instrument, as illustrated in Figure 3-2.
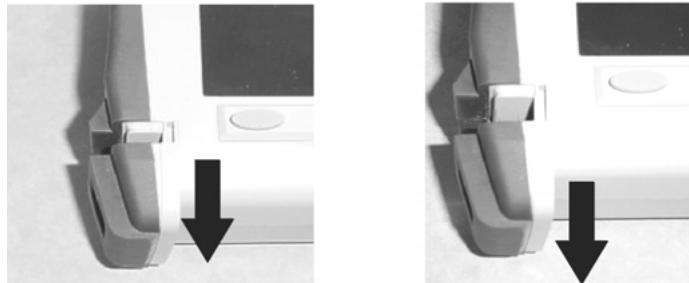
Figure 3-2.   Removing the Battery Access Door

3. Remove the battery access door.

4. With the battery access door completely removed, grasp the flexible handle of the battery and pull the battery straight out of the instrument (Figure 3-3).

Figure 3-3.   Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the instrument (Figure 3-4).
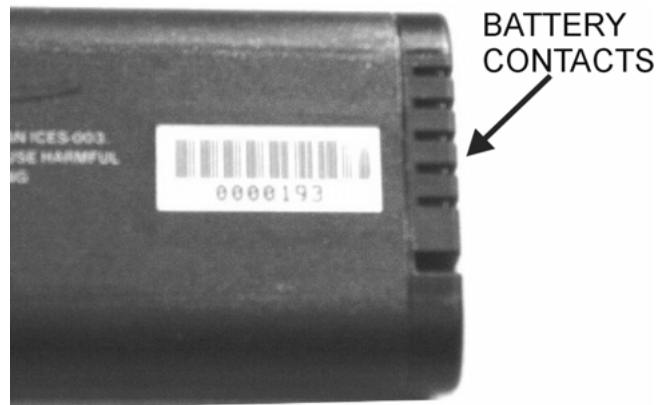
Figure 3-4.   Battery Contacts

Battery Pack Information

The following information relates to the care and handling of the Anritsu 633-44 battery pack and Lithium-Ion batteries in general.

- The 633-44 battery pack supplied with the MS2723B or MS2724B may need charging before use. Before using the Spectrum Master, the internal battery may be charged in the Spectrum Master, using either the AC-DC Adapter (40-168) or the 12 Volt DC adapter (806-141), or may be charged separately in the optional Dual Battery Charger (2000-1374).

- Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS2723B or MS2724B, but are electrically incompatible and will not charge correctly.

- Recharge the battery only in the MS2723B or MS2724B or in an Anritsu approved charger.

- When the Spectrum Master or the charger is not in use, disconnect it from the power source.

- Do not charge batteries for longer than 24 hours. Overcharging may shorten battery life.

- If left unused, a fully charged battery will discharge itself over time.

- Temperature extremes affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before use or charging.

- Discharge the battery from time to time in order 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 chargings becomes noticeably shorter than normal.

- Never use a damaged or worn out charger or battery.

- Storing the battery in extremely 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.

3-3   Opening the MS272xB Spectrum Master Case

This procedure provides instructions for opening the case. Except for keypad parts replacement (Section 3-9 "Main (Numeric) Keypad Membrane and PCB Replacement"), the case must be opened for all maintenance operations. Part numbers for all replaceable parts are found in Table 1-3, "List of Replaceable Parts" on page 1-4.

Caution	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. All work should be performed in a static-safe work area.

Note	Before opening the case, Anritsu Company strongly recommends that all internally-saved files be saved to a PC by using the Master Software Tools utility program or be copied to an external CF card on the MS272xB. In the event that the Main PCB needs to be replaced, this recommended action will prevent permanent loss of these files.

1. Use a Phillips screwdriver to remove the four screws that secure the two halves of the case together.
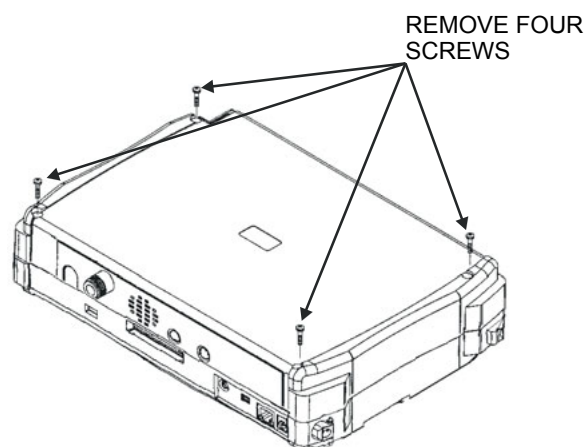
Figure 3-5.   Separating the Two Halves of the Case

2. Stand the instrument up in the normal operating position and remove the battery door by inserting a thumb into the notch and pushing downward (refer to Section 3-2 "Battery Pack Removal and Replacement").

3. If the instrument has Option 31 (GPS), then use a T1451 socket to remove the special decorative nut on the RF panel.

4. Separate the two halves by about two inches. Several cables must be disconnected before the two halves can be fully separated.

Figure 3-6.   MS272xB Case Halves Partially Separated

5. Under the DC Power In connector is a ribbon cable. Disconnect either end of this ribbon cable.

6. Unplug the two RF cables (100M SPA and 37.8M IN) plugged into the Main PCB.

7. Unplug the Ext Ref In and Ext Trigger In cables from the Main PCB.

8. If the instrument has Option 31, then push the connector downward through the panel.

The two halves of the MS272xB can now be completely separated.

9. If the instrument has Option 31, then securely tape the Option 31 connector to an RF shield on the Main PCB so that the weight of the GPS connector does not strain the GPS wire.

10. Reassembly is the reverse of disassembly.

Note	Before reassembling the Spectrum Master, verify that gasket material around the edge of the Spectrum Master is in good condition and is pressed securely into the grooves in the covers. If necessary, replace damaged gasket material. (For the part number, refer to Table 1-3, "List of Replaceable Parts" on page 1-4).

3-4   Removal of the Spectrum Analyzer PCB

Note	The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. Refer to Table 1-3, "List of Replaceable Parts" on page 1-4 for the correct part number for the set.

Figure 3-7 shows the spectrum analyzer PCB in the case.
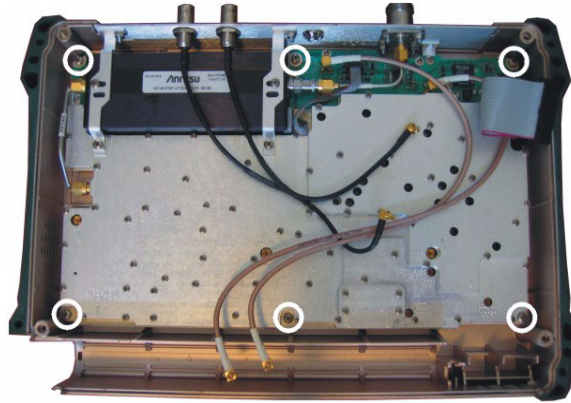
Figure 3-7.   Spectrum Analyzer PCB Inside Case

Remove the six larger screws around the edge of the PCB (highlighted in Figure 3-7) to release the board from the case.

Caution	Do not remove or adjust any smaller screws that pass through the RF shields. Do not loosen or remove the step attenuator or any cables.

3-5   Removal of the Main PCB/LCD Assembly

Note	The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. Refer to Table 1-3, "List of Replaceable Parts" on page 1-4 for the correct part number for the set. If the instrument is equipped with Option 9, then leave the Option 9 PCB on the Main PCB when returning the assembly to the factory for repair.

1. Push the external CF card ejector button to the "in" position.

2. Unplug (from the Main PCB) the cables to the fan, battery pack connector, and knob.

3. Remove the eight screws around the edge of the board to release the PCB/LCD assembly from the case. Lift the Main PCB/LCD assembly out of the case.

3-6   Main PCB Assembly Replacement

Replacement of the Main PCB and the Spectrum Analyzer PCB is the opposite of removal.

Note	The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. Refer to Table 1-3, "List of Replaceable Parts" on page 1-4 for the correct part number for the set.

1. Verify that all wires of the LCD bias cable are pushed under the backlight driver PCB where they cannot interfere with the keyboard connector.

   2. After replacement of the Main PCB/Spectrum Analyzer PCB assembly, the instrument serial number that is found on the outside rear (bottom) cover must be electronically saved to the Main PCB. To save the serial number:

      a. Enter the Service Mode as shown in Figure 2-2 on page 2-4.

      b. Select Service Menu / Set External Serial #.

      c. Using the keypad, enter the seven digit serial number, then press **Enter**.

      d. Cycle the power to exit Service Mode.

3-7   Removal of the LCD and Backlight Driver PCB from the Main PCB

   1. Using a tool such as tweezers or a knife blade, gently unplug one end of the 4 cm long LCD digital data cable (which wraps around the edge of the Main PCB).

   2. Unplug the 8-wire bias cable that connects between the backlight driver PCB and the Main PCB.

   3. Unplug the "high-voltage" wires (usually pink and white) at the connector on the backlight driver PCB.

   4. Remove the four screws that attach the LCD to the Main PCB.

   5. Remove the two screws that attach the backlight driver PCB to the Main PCB, and lift off the LCD and backlight driver PCB.

3-8   Main PCB Real Time Clock (RTC) Battery Removal and Replacement

   1. Refer to Figure 3-8 for the location of the RTC battery (circled). Refer to the parts list in Table 1-3, "List of Replaceable Parts" on page 1-4 for the replacement part number.
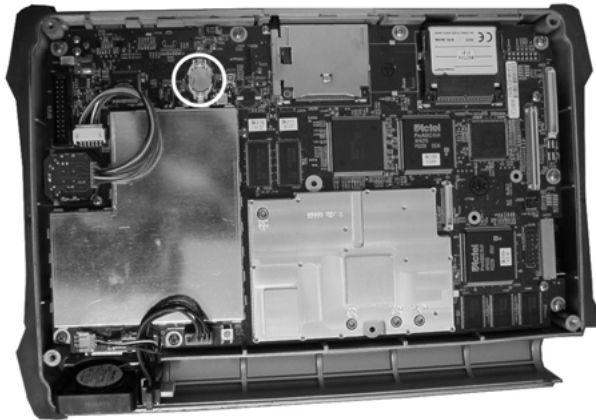
Figure 3-8.   Real Time Clock (RTC) Battery

   2. Remove the old battery, and install the new battery with the positive (+) side facing up.

   3. Apply two small drops of RTV compound bridging the top of the battery and the holder as an extra precaution to hold the battery securely.

3-9   Main (Numeric) Keypad Membrane and PCB Replacement

This procedure provides instructions for removing and replacing the main keypad (numeric) membrane and PCB. All keypad parts can be replaced without opening the MS272xB case.

   1. Place the instrument face up on a protected work surface.

2. Seven locking tabs hold the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane (Figure 3-9 and Figure 3-10).

ARROWS POINT TO
FRONT BEZEL
LOCKING TAB LOCATIONS
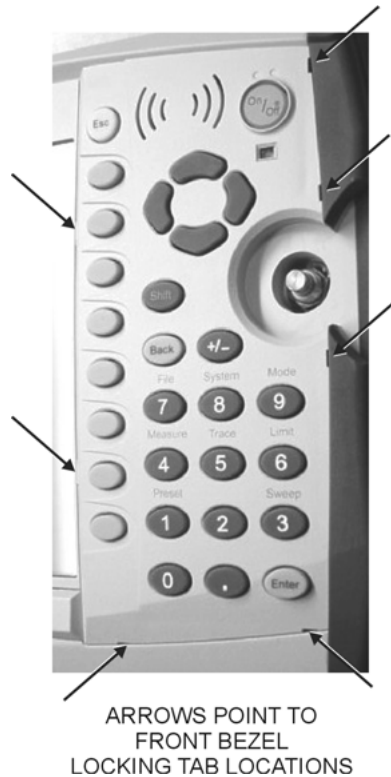
Figure 3-9.   Front Bezel Locking Tabs

Figure 3-10. Function Key Membrane

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

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

3-10   Replacing the Function Key Keypad

1. Disconnect the function key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad (Figure 3-11).
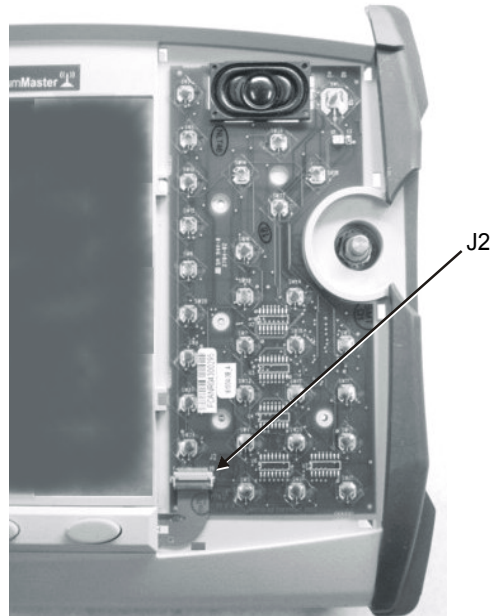
Figure 3-11. Function Key Keypad and Connector J2

2. Remove the keypad PCB, taking care not to damage the speaker wires.

3. Reverse the above steps to install the replacement assembly, with the following cautions:

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

    b. Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB.

    c. The speaker is held in place by four locating pins on the inside of the keypad bezel. Verify that the four locating pins are properly seated into the four corner holes of the speaker when reinstalling the bezel.

    d. Verify that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

3-11   Function Key Membrane and Switchpad Replacement

This procedure provides instructions for replacing the function key membrane and switchpad. All keypad parts can be replaced without opening the MS272xB case.

1. Place the instrument face up on a static-protected work surface.

2. Remove the keypad bezel and membrane as directed in Section 3-10 "Replacing the Function Key Keypad".

3. Six locking tabs hold the function key bezel to the case. Using a small flat blade screwdriver or knife blade, carefully pry the function key bezel locking tabs free of the main body of the case. This will expose the function key membrane.

4. Remove the function key membrane by gently pulling the membrane up and away from the front panel (Figure 3-12).
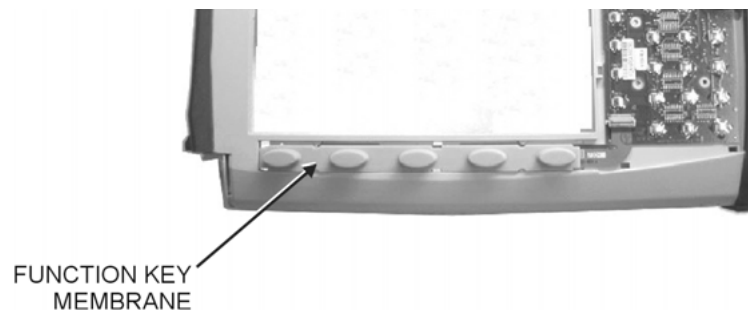
Figure 3-12. Function Key Membrane and Switchpad

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

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

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

Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the Models MS2723B and MS2724B. We recommend 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 provides a detailed history of instrument performance, which can allow you to observe trends.

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Spectrum Analyzer Function Verification

Table A-1. Spectrum Analyzer Frequency Accuracy

Frequency	Measured Value	Error	Specification
1 GHz	GHz	Hz	± 300 Hz
12 GHz	GHz	Hz	± 3.6 kHz
19 GHz (MS2724B only)	GHz	Hz	± 5.7 kHz

Table A-2. Spectrum Analyzer 2.0 GHz SSB Phase Noise Verification

Frequency	Measured Value	Specification
10 kHz	dBc/Hz	−95 dBc/Hz
20 kHz	dBc/Hz	−95 dBc/Hz
30 kHz	dBc/Hz	−95 dBc/Hz
100 kHz	dBc/Hz	−97 dBc/Hz
1000 kHz	dBc/Hz	−105 dBc/Hz
10 MHz	dBc/Hz	−120 dBc/Hz

Table A-3. Spectrum Analyzer 3.44 GHz SSB Phase Noise Verification

Frequency	Measured Value	Specification
10 kHz	dBc/Hz	−95 dBc/Hz
20 kHz	dBc/Hz	−95 dBc/Hz
30 kHz	dBc/Hz	−95 dBc/Hz
100 kHz	dBc/Hz	−97 dBc/Hz
1000 kHz	dBc/Hz	−105 dBc/Hz
10 MHz	dBc/Hz	−120 dBc/Hz

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Spectrum Analyzer Function Verification (continued)

Table A-4. Spectrum Analyzer 3.46 GHz SSB Phase Noise Verification

Frequency	Measured Value		Specification
10 kHz		dBc/Hz	−95 dBc/Hz
20 kHz		dBc/Hz	−95 dBc/Hz
30 kHz		dBc/Hz	−95 dBc/Hz
100 kHz		dBc/Hz	−97 dBc/Hz
1000 kHz		dBc/Hz	−105 dBc/Hz
10 MHz		dBc/Hz	−120 dBc/Hz

Table A-5. Spectrum Analyzer 12.0 GHz SSB Phase Noise Verification

Frequency	Measured Value		Specification
10 kHz		dBc/Hz	−95 dBc/Hz
20 kHz		dBc/Hz	−95 dBc/Hz
30 kHz		dBc/Hz	−95 dBc/Hz
100 kHz		dBc/Hz	−97 dBc/Hz
1000 kHz		dBc/Hz	−105 dBc/Hz
10 MHz		dBc/Hz	−120 dBc/Hz

Table A-6. Spectrum Analyzer 19.0 GHz SSB Phase Noise Verification (MS2724B only)

Frequency	Measured Value		Specification
10 kHz		dBc/Hz	−95 dBc/Hz
20 kHz		dBc/Hz	−95 dBc/Hz
30 kHz		dBc/Hz	−95 dBc/Hz
100 kHz		dBc/Hz	−97 dBc/Hz
1000 kHz		dBc/Hz	−105 dBc/Hz
10 MHz		dBc/Hz	−120 dBc/Hz

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   Options: _____

Spectrum Analyzer Function Verification (continued)

Table A-7. Spectrum Analyzer Resolution Bandwidth Accuracy

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

Table A-8. Spectrum Analyzer Second Harmonic Distortion

Frequency	Measured Value		Second Harmonic Distortion	Specification
50.1 MHz		dBm	— — — — — — — — — — — — —	
100.2 MHz		dBm	dBc	−50 dBc max

Table A-9. Spectrum Analyzer Third Order Intercept

Third Order Intercept at Center Frequency	Measured Value		Specification
2400.151 MHz		dBm	≥ +12 dBm
2399.851 MHz		dBm	≥ +12 dBm
Calculated TOI at 2400 MHz		dBm	≥ +12 dBm

Table A-10. Spectrum Analyzer DANL (Preamp On)

Frequency Start / Stop	RBW	VBW	Measured dBm (100 kHz RBW)		Calculated dBm (1 Hz RBW)		1 Hz Specification
10 MHz to 1.0 GHz	100 kHz	1 kHz		dBm		dBm	≥ −159 dBm
>1.0 GHz to 3.0 GHz	100 kHz	1 kHz		dBm		dBm	≥ −156 dBm
>3.0 GHz to 4.0 GHz	100 kHz	300 Hz		dBm		dBm	≥ −154 dBm

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   Options: _____

Spectrum Analyzer Function Verification (continued)

Table A-11. Spectrum Analyzer DANL (Preamp Off)

Frequency Start / Stop	RBW	VBW	Measured dBm (100 kHz RBW)	Calculated dBm (1 Hz RBW)	1 Hz Specification
10 MHz to 4.0 GHz	100 kHz	1 kHz	dBm	dBm	≥ −139 dBm
>4.0 GHz to 10.0 GHz	100 kHz	1 kHz	dBm	dBm	≥ −136 dBm
>10.0 GHz to 13.0 GHz	100 kHz	300 Hz	dBm	dBm	≥ −130 dBm
>13.0 GHz to 20.0 GHz	100 kHz	300 Hz	dBm	dBm	≥ −136 dBm

Table A-12. Spectrum Analyzer Residual Spurious (Preamp On)

Start Freq	Stop Freq	Measured Values (Marker 1)	Specification
100 kHz	10 MHz	dBm	≤ −100 dBm
10 MHz	1 GHz	dBm	≤ −100 dBm
1 GHz	2 GHz	dBm	≤ −100 dBm
2 GHz	3 GHz	dBm	≤ −100 dBm
3 GHz	4 GHz	dBm	≤ −100 dBm

Table A-13. Spectrum Analyzer Residual Spurious (Preamp Off)

Start Freq	Stop Freq	RBW	VBW	Measured Values (Marker 1)	Specification
9 kHz	100 kHz	300 Hz	30 Hz	dBm	≤ −90 dBm
100 kHz	10 MHz	3 kHz	300 Hz	dBm	≤ −90 dBm
10 MHz	2 GHz	100 kHz	10 kHz	dBm	≤ −90 dBm
2 GHz	3.675 GHz	30 kHz	3 kHz	dBm	≤ −90 dBm
3.675 GHz	5.35 GHz	30 kHz	3 kHz	dBm	≤ −90 dBm
5.35 GHz	7.65 GHz	10 kHz	3 kHz	dBm	≤ −90 dBm
7.65 GHz	9.2 GHz	3 kHz	300 Hz	dBm	≤ −90 dBm
9.2 GHz	11.1 GHz	1 kHz	100 Hz	dBm	≤ −90 dBm
11.1 GHz	12.5 GHz	3 kHz	100 Hz	dBm	≤ −90 dBm
12.5 GHz	13 GHz	1 kHz	100 Hz	dBm	≤ −90 dBm
13 GHz	15.5 GHz	10 kHz	1 kHz	dBm	≤ −85 dBm
15.5 GHz	16 GHz	10 kHz	1 kHz	dBm	≤ −85 dBm
16 GHz	17 GHz	10 kHz	1 kHz	dBm	≤ −85 dBm
17 GHz	18.5 GHz	10 kHz	1 kHz	dBm	≤ −85 dBm
18.5 GHz	20 GHz	10 kHz	1 kHz	dBm	≤ −85 dBm

Models **Firmware Revision:** _____ **Operator:** _____ **Date:** _____
MS2723B
MS2724B

Serial Number: _____ **Options:** _____

Spectrum Analyzer Input-Related Spurious Verification

Input Related Spurs for −30 dBm Input at 1000 MHz

Table A-14. Measured Input Signal Level at 1000 MHz

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
1000 MHz Center Frequency		dBm		
719 MHz	721 MHz	dBm	dBc	≤ −60 dBc

Input Related Spurs for −30 dBm Input at 3275 MHz

Table A-15. Measured Input Signal Level at 3275 MHz

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
3275 MHz Center Frequency		dBm		
2425 MHz	3274 MHz	dBm	dBc	≤ −50 dBc
3276 MHz	4125 MHz	dBm	dBc	≤ −50 dBc

Input Related Spurs for −30 dBm Input at 8000 MHz

Table A-16. Measured Input Signal Level at 8000 MHz

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
8000 MHz Center Frequency		dBm		
7719 MHz	7721 MHz	dBm	dBc	≤ −60 dBc

Input Related Spurs for −30 dBm Input at 15000 MHz

Table A-17. Measured Input Signal Level at 15000 MHz

Start Freq	Stop Freq	Measured Spur Level	Calculated IRS	Specification
15000 MHz Center Frequency		dBm		
14719 MHz	14721 MHz	dBm	dBc	≤ −60 dBc

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Spectrum Analyzer Absolute Amplitude Accuracy Verification

50 MHz Amplitude Accuracy Verification

Table A-18. Characterization Chart for 50 MHz Amplitude Accuracy Verification

Test Power Level at 50 MHz	Required Sensor B Reading
0 dBm	dBm
−4 dBm	dBm
−10 dBm	dBm
−14 dBm	dBm
−20 dBm	dBm
−24 dBm	dBm
−30 dBm	dBm
−34 dBm	dBm
−40 dBm	dBm
−44 dBm	dBm
−50 dBm	dBm

Table A-19. 50 MHz Amplitude Accuracy Verification, Specification = ± 1.25 dBm

Input Power Level	Reference Level	Input Atten. Level	Measured Reading
0 dBm	10 dBm	30 dB	dBm
−4 dBm	10 dBm	30 dB	dBm
−10 dBm	0 dBm	20 dB	dBm
−14 dBm	0 dBm	20 dB	dBm
−20 dBm	−10 dBm	10 dB	dBm
−24 dBm	−10 dBm	10 dB	dBm
−30 dBm	−20 dBm	0 dB	dBm
−34 dBm	−20 dBm	0 dB	dBm
−40 dBm	−30 dBm	0 dB	dBm
−44 dBm	−30 dBm	0 dB	dBm
−50 dBm	−40 dBm	0 dB	dBm

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification

Characterization Chart

Table A-20. Characterization Chart for Fixed Level with Varying Frequency

Frequency	−2 dBm	−30 dBm
10.1 MHz	dBm	dBm
50 MHz	dBm	dBm
100 MHz	dBm	dBm
500 MHz	dBm	dBm
1000 MHz	dBm	dBm
2000 MHz	dBm	dBm
3000 MHz	dBm	dBm
4000 MHz	dBm	dBm
5000 MHz	dBm	dBm
6000 MHz	dBm	dBm
7000 MHz	dBm	dBm
8000 MHz	dBm	dBm
9000 MHz	dBm	dBm
10000 MHz	dBm	dBm
11000 MHz	dBm	dBm
12000 MHz	dBm	dBm
13000 MHz	dBm	dBm
14000 MHz	dBm	dBm
15000 MHz	dBm	dBm
16000 MHz	dBm	dBm
17000 MHz	dBm	dBm
18000 MHz	dBm	dBm

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

10.1 MHz, 50 MHz, 100 MHz, 500 MHz, 1000 MHz, 2000 MHz, 3000 MHz, 4000 MHz

Table A-21. Verification at 10.1 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

10.1 MHz, **50 MHz**, 100 MHz, 500 MHz, 1000 MHz, 2000 MHz, 3000 MHz, 4000 MHz

Table A-22. Verification at 50 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

10.1 MHz, 50 MHz, **100 MHz**, 500 MHz, 1000 MHz, 2000 MHz, 3000 MHz, 4000 MHz

Table A-23. Verification at 100 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

10.1 MHz, 50 MHz, 100 MHz, **500 MHz**, 1000 MHz, 2000 MHz, 3000 MHz, 4000 MHz

Table A-24. Verification at 500 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

10.1 MHz, 50 MHz, 100 MHz, 500 MHz, **1000 MHz**, 2000 MHz, 3000 MHz, 4000 MHz

Table A-25. Verification at 1000 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

10.1 MHz, 50 MHz, 100 MHz, 500 MHz, 1000 MHz, **2000 MHz**, 3000 MHz, 4000 MHz

Table A-26. Verification at 2000 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

| Models | Firmware Revision: _____ | Operator: _____ | Date: _____ |

Models
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

10.1 MHz, 50 MHz, 100 MHz, 500 MHz, 1000 MHz, 2000 MHz, **3000 MHz**, 4000 MHz

Table A-27. Verification at 3000 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

10.1 MHz, 50 MHz, 100 MHz, 500 MHz, 1000 MHz, 2000 MHz, 3000 MHz, **4000 MHz**

Table A-28. Verification at 4000 MHz, Specification = ± 1.3 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, 9000 MHz, 10000 MHz, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-29. Verification at 5000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

5000 MHz, **6000 MHz**, 7000 MHz, 8000 MHz, 9000 MHz, 10000 MHz, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-30. Verification at 6000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

| Models | Firmware Revision: _____ | Operator: _____ | Date: _____ |

MS2723B
MS2724B

Serial Number: _____   Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

5000 MHz, 6000 MHz, **7000 MHz**, 8000 MHz, 9000 MHz, 10000 MHz, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-31. Verification at 7000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

5000 MHz, 6000 MHz, 7000 MHz, **8000 MHz**, 9000 MHz, 10000 MHz, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-32. Verification at 8000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, **9000 MHz**, 10000 MHz, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-33. Verification at 9000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, 9000 MHz, **10000 MHz**, 11000 MHz, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-34. Verification at 10000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models Firmware Revision: _____ Operator: _____ Date: _____

MS2723B

MS2724B

Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, 9000 MHz, 10000 MHz, **11000 MHz**, 12000 MHz, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-35. Verification at 11000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, 9000 MHz, 10000 MHz, 11000 MHz, **12000 MHz**, 13000 MHz

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-36. Verification at 12000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

5000 MHz, 6000 MHz, 7000 MHz, 8000 MHz, 9000 MHz, 10000 MHz, 11000 MHz, 12000 MHz, **13000 MHz**

Specification = ± 2.7 dB for MS2723B and, ± 2.8 dB for MS2724B

Table A-37. Verification at 13000 MHz, Specification = ± 2.7 dBm (MS2723B), ± 2.8 dBm (MS2724B)

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

14000 MHz, 15000 MHz, 16000 MHz, 17000 MHz, 18000 MHz

Specification = ± 2.8 dB

Table A-38. Verification at 14000 MHz, Specification = ± 2.8 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models Firmware Revision: _____ Operator: _____ Date: _____
MS2723B
MS2724B

Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

14000 MHz, **15000 MHz**, 16000 MHz, 17000 MHz, 18000 MHz

Table A-39. Verification at 15000 MHz, Specification = ± 2.8 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

14000 MHz, 15000 MHz, **16000 MHz,** 17000 MHz, 18000 MHz

Table A-40. Verification at 16000 MHz, Specification = ± 2.8 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Amplitude Accuracy Across Frequency Verification (continued)

14000 MHz, 15000 MHz, 16000 MHz, **17000 MHz**, 18000 MHz

Table A-41. Verification at 17000 MHz, Specification = ± 2.8 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

14000 MHz, 15000 MHz, 16000 MHz, 17000 MHz, **18000 MHz**

Table A-42. Verification at 18000 MHz, Specification = ± 2.8 dBm

Input Power	Atten Lvl	Marker 1 Reading
−30 dBm	0 dB	dBm
−30 dBm	5 dB	dBm
−30 dBm	10 dB	dBm
−30 dBm	20 dB	dBm
−2 dBm	30 dB	dBm
−2 dBm	40 dB	dBm
−2 dBm	50 dB	dBm
−2 dBm	60 dB	dBm

Models	Firmware Revision: _____	Operator: _____	Date: _____

**Models
MS2723B
MS2724B**

Serial Number: _____   **Options:** _____

9 kHz to 100 kHz Amplitude Accuracy Verification

Characterization Charts

Table A-43. VM1, −20 dBm Reference voltage at 100 kHz (23.315 mV ± 0.5 mV)

mV

Table A-44. Characterization Chart for 9 kHz to 100 kHz Amplitude Accuracy Verification

Frequency	Measured VM2	Correction Factor	Calculated P_{in}
9.5 kHz	mV	0.047 dB	dBm
55 kHz	mV	0.002 dB	dBm
95 kHz	mV	0.000 dB	dBm

Test Results

Table A-45. 9 kHz to 100 kHz Amplitude Accuracy Verification

At Freq	P_{in}	Marker 1 Reading	Error	Specification
9.5 kHz	dBm	dBm	dB	± 1.5 dB
55 kHz	dBm	dBm	dB	± 1.5 dB
95 kHz	dBm	dBm	dB	± 1.5 dB

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Spectrum Analyzer RF Input VSWR Verification

Table A-46. Spectrum Analyzer RF Input VSWR Verification

Attenuation	Maximum Value	Specification
10 dB		2.0:1
20 dB		2.0:1
60 dB		2.0:1

Option 31 GPS Receiver

Table A-47. Spectrum Analyzer Frequency Accuracy for GPS

Frequency	Measured Value	Error	Specification
7 GHz	GHz	Hz	± 4.75 Hz (w/GPS Hi Accy)
			or
			± 9.5 Hz (w/Int Hi Accy)

Models Firmware Revision: _____ Operator: _____ Date: _____
MS2723B
MS2724B

Serial Number: _____ Options: _____

Option 40 GSM/GPRS/EDGE RF Measurements

Table A-48. At 850 MHz, −10 dBm Level, TCH Pattern (GSM)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-49. At 850 MHz, −50 dBm Level, TCH ALL Pattern (GSM)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-50. At 1800 MHz, −10 dBm Level, TCH ALL Pattern (GSM)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-51. At 1800 MHz, −50 dBm Level, TCH Pattern (GSM)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Models Firmware Revision: _____ Operator: _____ Date: _____
MS2723B
MS2724B

Serial Number: _____ Options: _____

Option 40 GSM/GPRS/EDGE RF Measurements (continued)

Table A-52. At 1800 MHz, −50 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)

	Measured Value		Specification
Adjusted Output Power		dB	−50 dBm ± 0.2 dB
Displayed Burst Power		dB	−50 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-53. At 1800 MHz, −10 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-54. At 850 MHz, −50 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)

	Measured Value		Specification
Adjusted Output Power		dB	−50 dBm ± 0.2 dB
Displayed Burst Power		dB	−50 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Table A-55. At 850 MHz, −10 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)

	Measured Value		Specification
Adjusted Output Power		dB	−10 dBm ± 0.2 dB
Displayed Burst Power		dB	−10 dBm ± 0.2 dB
Calculated Burst Power Error		dB	±1.5 dB
Frequency Error		Hz	±10 Hz

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Option 41 GSM/GPRS/EDGE Demodulator

Table A-56. At 850 MHz, −50 dBm Level, TCH Pattern (GSM)

	Measured Value		Specification
Phase Err RMS (Deg)		Deg	≤ 1 Deg

Table A-57. At 850 MHz, −10 dBm Level, TCH ALL Pattern (GSM)

	Measured Value		Specification
Phase Err RMS (Deg)		Deg	≤ 1 Deg

Table A-58. At 1800 MHz, −50 dBm Level, TCH ALL Pattern (GSM)

	Measured Value		Specification
Phase Err RMS (Deg)		Deg	≤ 1 Deg

Table A-59. At 1800 MHz, −10 dBm Level, TCH Pattern (GSM)

	Measured Value		Specification
Phase Err RMS (Deg)		Deg	≤ 1 Deg

Models **Firmware Revision:** _____ **Operator:** _____ **Date:** _____
MS2723B
MS2724B

Serial Number: _____ **Options:** _____

Option 41 GSM/GPRS/EDGE Demodulator (continued)

Table A-60. At 1800 MHz, −50 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)

	Measured Value	Specification
EVM RMS	%	± 2.5%

Table A-61. At 1800 MHz, −10 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)

	Measured Value	Specification
EVM RMS	%	± 2.5%

Table A-62. At 850 MHz, −50 dBm Level, DL_MCS-9_4SLOT Pattern (EDGE)

	Measured Value	Specification
EVM RMS	%	± 2.5%

Table A-63. At 850 MHz, −10 dBm Level, DL_MCS-9_1SLOT Pattern (EDGE)

	Measured Value	Specification
EVM RMS	%	± 2.5%

Models
MS2723B   Firmware Revision: _____   Operator: _____   Date: _____
MS2724B

Serial Number: _____   Options: _____

Option 42 CDMA RF Measurements

Table A-64. At 870.03 MHz, −30 dBm Level, cdmaOne

	Measured Value		Specification
Power Meter Reading		dBm	−30 dBm ± 0.2 dB
Channel Power Value		dBm	−30 dBm ± 1.7 dB
Channel Power Error		dBm	±1.5 dB

Table A-65. At 1930.05 MHz, −30 dBm Level, cdmaOne

	Measured Value		Specification
Power Meter Reading		dBm	−30 dBm ± 0.2 dB
Channel Power Value		dBm	−30 dBm ± 1.7 dB
Channel Power Error		dBm	±1.5 dB

Table A-66. At 1930.05 MHz, −30 dBm Level, CDMA2000

	Measured Value		Specification
Power Meter Reading		dBm	−30 dBm ± 0.2 dB
Channel Power Value		dBm	−30 dBm ± 1.7 dB
Channel Power Error		dBm	±1.5 dB

Table A-67. At 870.03 MHz, −30 dBm Level, CDMA2000

	Measured Value		Specification
Power Meter Reading		dBm	−30 dBm ± 0.2 dB
Channel Power Value		dBm	−30 dBm ± 1.7 dB
Channel Power Error		dBm	±1.5 dB

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Option 43 cdmaOne and CDMA2000 1xRTT Demodulator

Table A-68. At 870.03 MHz, −30 dBm Level, cdmaOne

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-69. At 1930.05 MHz, −30 dBm Level, cdmaOne

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-70. At 1930.05 MHz, −30 dBm Level, CDMA2000

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-71. At 870.03 MHz, −30 dBm Level, CDMA2000

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho			$0.99 \leq x \leq 1$
Tau		us	±1 us

Models
MS2723B
MS2724B

Firmware Revision: _____   Operator: _____   Date: _____

Serial Number: _____   Options: _____

Option 44 WCDMA and HSDPA RF Measurements

WCDMA/HSDPA Signal Analyzer Option Verification

(Option 44, Option 45, Option 65, or a combination)

Table A-72. Sensor A and Sensor B Readings, Components Characterization

Frequency	PMA.10	PMB.10	Delta 1 (Δ1)	PMA.10C	PMA.18	ATT.18
881.5 MHz	dBm	dBm	dBm	dBm	dBm	dB

Table A-73. Power Level Setting, Components Characterization

Frequency	MG3700A.10 Setting	MG3700A.28 Setting	PMA $-$ 10	PMA $-$ 20
881.5 MHz	dBm	dBm	dBm	dBm

Table A-74. WCDMA Absolute Power Accuracy

Test Level	Measured Power	Error	Specification
+28 dBm	dBm	dB	± 1.25 dB
+10 dBm	dBm	dB	± 1.25 dB
−10 dBm	dBm	dB	± 1.25 dB
−20 dBm	dBm	dB	± 1.25 dB
Test Level	dBm	dB	± 1.25 dB

Table A-75. WCDMA Occupied Bandwidth (OBW)

Frequency	Power Meter Reading	OBW	Specification
881.5 MHz	dBm	MHz	4.2 MHz ± 100 kHz
1962.5 MHz	dBm	MHz	4.2 MHz ± 100 kHz
2680.5 MHz	dBm	MHz	4.2 MHz ± 100 kHz

Table A-76. WCDMA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Error	Specification
881.5 MHz	dBm	dBm	dBm	± 1.25 dBm max
1962.5 MHz	dBm	dBm	dBm	± 1.25 dBm max
2680.5 MHz	dBm	dBm	dBm	± 1.25 dBm max

Models　Firmware Revision: _____　Operator: _____　Date: _____
MS2723B
MS2724B

Serial Number: _____　Options: _____

Option 44 WCDMA and HSDPA RF Measurements (continued)

Table A-77. WCDMA ACLR Accuracy

Frequency/Offset	Measured ACLR	Calculated ACLR Error	Specification
881.5 / −10 MHz			± 0.8 dB
881.5 / −5 MHz			± 0.8 dB
881.5 / 5 MHz			± 0.8 dB
881.5 / 10 MHz			± 0.8 dB
1962.5 / −10 MHz			± 0.8 dB
1962.5 / −5 MHz			± 0.8 dB
1962.5 / 5 MHz			± 0.8 dB
1962.5 / 10 MHz			± 0.8 dB
2680.5 / −10 MHz			± 1.0 dB
2680.5 / −5 MHz			± 1.0 dB
2680.5 / 5 MHz			± 1.0 dB
2680.5 / 10 MHz			± 1.0 dB

Table A-78. HSDPA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Error	Specification
2680.5 MHz				± 1.25 dB max

Table A-79. HSDPA ACLR Accuracy

Frequency/Offset	Measured ACLR	Calculated ACLR Error	Specification
2680.5 / −10 MHz			± 1.0 dB
2680.5 / −5 MHz			± 1.0 dB
2680.5 / 5 MHz			± 1.0 dB
2680.5 / 10 MHz			± 1.0 dB

| **Models**
MS2723B
MS2724B | **Firmware Revision:** _____ | **Operator:** _____ | **Date:** _____ |

Serial Number: _____   **Options:** _____

Option 45 WCDMA Demodulator and Option 65 WCDMA/HSDPA Demodulator

Table A-80. WCDMA Error Vector Magnitude (Test Model 4; Option 45 or Option 65)

Frequency	EVM		Specification
1962.5 MHz		%	±2.5%

Table A-81. HSDPA Error Vector Magnitude (Test Model 5; Option 65)

Frequency	EVM		Specification
1962.5 MHz		%	±2.5%

Models Firmware Revision: _____ Operator: _____ Date: _____
MS2723B
MS2724B

Serial Number: _____ Options: _____

Option 46 Fixed WiMAX RF Measurements

Table A-82. Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings

Frequency	Input Power Setting	Input Power Reading
2600.5 MHz	**−15 dBm**	dBm
2600.5 MHz	**−50 dBm**	dBm
3600.5 MHz	**−15 dBm**	dBm
3600.5 MHz	**−50 dBm**	dBm
5600.5 MHz	**−15 dBm**	dBm
5600.5 MHz	**−50 dBm**	dBm

Table A-83. Fixed WiMAX Channel Power Accuracy

Frequency	Input Power	Measured Channel Power (RSSI)	Error	Specification
2600.5 MHz	−15 dBm	dBm	dB	± 1.5 dB
2600.5 MHz	−50 dBm	dBm	dB	± 1.5 dB
3600.5 MHz	−15 dBm	dBm	dB	± 1.5 dB
3600.5 MHz	−50 dBm	dBm	dB	± 1.5 dB
5600.5 MHz	−15 dBm	dBm	dB	± 1.5 dB
5600.5 MHz	−50 dBm	dBm	dB	± 1.5 dB

Models   Firmware Revision: _____   Operator: _____   Date: _____
MS2723B
MS2724B

Serial Number: _____   Options: _____

Option 47 Fixed WiMAX Demodulator

Table A-84. Fixed WiMAX Residual EVM

Frequency	Power	BW)	EVM (RMS)		Specification
2600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
2600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%
5600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
5600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%

Table A-85. Fixed WiMAX Frequency Error

Frequency	Power	Frequency Error		Specification
2600.5 MHz	−50 dBm		Hz	±10 Hz
5600.5 MHz	−50 dBm		Hz	±10 Hz

TD-SCDMA Signal Analyzer Option Verification

(For Spectrum Master models with Option 60 or Option 61)

Table A-86. TD-SCDMA (at 2010 MHz, −45 dBm Level)

Measurement Type	Measured Value		Specification
Power Meter Reading		dBm	−45 dBm ± 0.5 dB
Displayed Channel Power		dBm	−45 dBm ± 0.5 dB
Calculated Channel Power Error		dB	± 1.0 dB
EVM		%	< 3%
Frequency Error		Hz	± 20 Hz
Tau		us	± 0.1 us

| Models | Firmware Revision: _____ | Operator: _____ | Date: _____ |

Models
MS2723B
MS2724B

Serial Number: _____   Options: _____

Option 62 EV-DO RF Measurements

Table A-87. At 870.03 MHz, −50 dBm Level, 921.6 kps 8-PSK Modulation

	Measured Value		Specification
Power Meter Reading		dBm	−50 dBm ± 0.2 dB
MS272xB Reading		dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error		dB	±1.5 dB

Table A-88. At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation

	Measured Value		Specification
Power Meter Reading		dBm	0 dBm ± 0.2 dB
MS272xB Reading		dBm	0 dBm ± 0.2 dB
Calculated Channel Power Error		dB	±1.5 dB

Table A-89. At 1930.05 MHz, −50 dBm Level, 2457.6 kps 16-QAM Modulation

	Measured Value		Specification
Power Meter Reading		dBm	−50 dBm ± 0.2 dB
MS272xB Reading		dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error		dB	±1.5 dB

Models   **Firmware Revision:** _____   **Operator:** _____   **Date:** _____
MS2723B
MS2724B

Serial Number: _____   **Options:** _____

Option 62 EV-DO RF Measurements (continued)

Table A-90. At 1930.05 MHz, −50 dBm Level, Idle Slot

	Measured Value	Specification
Power Meter Reading	dBm	−50 dBm ± 0.2 dB
MS272xB Reading	dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-91. At 870.03 MHz, −10 dBm Level, Idle Slot

	Measured Value	Specification
Power Meter Reading	dBm	−10 dBm ± 0.2 dB
MS272xB Reading	dBm	−10 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Models	**Firmware Revision:** _____	**Operator:** _____	**Date:** _____
MS2723B			
MS2724B			

Serial Number: _____ **Options:** _____

Option 63 EV-DO Demodulator

Table A-92. At 870.03 MHz, −50 dBm Level, 921.6 kps 8-PSK Modulation

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho Pilot			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-93. At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho Pilot			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-94. At 1930.05 MHz, −50 dBm Level, 2457.6 kps 16-QAM Modulation

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho Pilot			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-95. At 1930.05 MHz, −50 dBm Level, Idle Slot

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho Pilot			$0.99 \leq x \leq 1$
Tau		us	±1 us

Table A-96. At 870.03 MHz, −10 dBm Level, Idle Slot

	Measured Value		Specification
Frequency Error		Hz	±20 Hz
Rho Pilot			$0.99 \leq x \leq 1$
Tau		us	±1 us

Models	Firmware Revision: _____	Operator: _____	Date: _____
MS2723B			
MS2724B			

Serial Number: _____   Options: _____

Option 66 Mobile WiMAX RF Measurements

Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length)

Table A-97. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −15.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−15 dBm ± 0.2 dB
MS272xB Reading	dBm	−15 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-98. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −50.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−50 dBm ± 0.2 dB
MS272xB Reading	dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-99. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and −15.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−15 dBm ± 0.2 dB
MS272xB Reading	dBm	−15 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-100. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and −50.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−50 dBm ± 0.2 dB
MS272xB Reading	dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

| Models | Firmware Revision: _____ | Operator: _____ | Date: _____ |

MS2723B
MS2724B

Serial Number: _____   Options: _____

Option 66 Mobile WiMAX RF Measurements

Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)

Table A-101. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −15.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−15 dBm ± 0.2 dB
MS272xB Reading	dBm	−15 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-102. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and −50.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−50 dBm ± 0.2 dB
MS272xB Reading	dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-103. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and −15.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−15 dBm ± 0.2 dB
MS272xB Reading	dBm	−15 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Table A-104. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and −50.0 dBm)

	Measured Value	Specification
Power Meter Reading	dBm	−50 dBm ± 0.2 dB
MS272xB Reading	dBm	−50 dBm ± 0.2 dB
Calculated Channel Power Error	dB	±1.5 dB

Models **Firmware Revision:** _____ **Operator:** _____ **Date:** _____
MS2723B
MS2724B

Serial Number: _____ **Options:** _____

Option 67 Mobile WiMAX Demodulator

Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

Table A-105. Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length)

Frequency	Power	BW	EVM (rms)		Specification
2600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
2600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%

Table A-106. Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

Frequency	Power	Frequency Error		Specification
2600.5 MHz	−50 dBm		Hz	±10 Hz
3600.5 MHz	−50 dBm		Hz	±10 Hz

Residual EVM and Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

Table A-107. Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)

Frequency	Power	BW	EVM (rms)		Specification
2600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
2600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−15 dBm	10 MHz		%	≤ 3.5%
3600.5 MHz	−50 dBm	10 MHz		%	≤ 3.5%

Table A-108. Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

Frequency	Power	Frequency Error		Specification
2600.5 MHz	−50 dBm		Hz	±10 Hz
3600.5 MHz	−50 dBm		Hz	±10 Hz

| Models
MS2723B
MS2724B | Firmware Revision: _____ | Operator: _____ | Date: _____ |

Serial Number: _____   Options: _____

LTE Signal Analyzer Option Verification (Option 541 and Option 542)

Table A-109.LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)

Frequency	Input Power	Measured Channel Power	Error	Specification
750 MHz	−10 dBm	dBm	dB	± 1.5 dB
750 MHz	−50 dBm	dBm	dB	± 1.5 dB
2150 MHz	−10 dBm	dBm	dB	± 1.5 dB
2150 MHz	−50 dBm	dBm	dB	± 1.5 dB

Table A-110.LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

750 MHz at −10 dBm	Specification	Measured Value
Frequency Error	± 10 Hz	Hz
EVM (rms)	< 2.5%	%

Table A-111.LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

750 MHz at −50 dBm	Specification	Measured Value
Frequency Error	± 10 Hz	Hz
EVM (rms)	< 2.5%	%

Table A-112.LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

2150 MHz at −10 dBm	Specification	Measured Value
Frequency Error	± 10 Hz	Hz
EVM (rms)	< 2.5%	%

Table A-113.LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

2150 MHz at −50 dBm	Specification	Measured Value
Frequency Error	± 10 Hz	Hz
EVM (rms)	< 2.5%	%

Appendix B — Troubleshooting

B-1   Introduction

This appendix includes additional problem-solving assistance for the maintenance and repair of Anritsu Spectrum Master Models MS2723B MS2724B.

B-2   Troubleshooting

This section describes the primary troubleshooting operations that can be performed by Anritsu Service Centers. Perform the troubleshooting suggestions in the order in which they are listed. Operators of the MS272xB should refer to the User Guide (Anritsu part number 10580-00175) for troubleshooting assistance.

Caution	Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies that are shown in the replaceable parts list are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special 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.

B-3   Turn-on Problems

Instrument cannot boot-up, no activity occurs when On/Off key is pressed:

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Ensure that the battery has an Anritsu label.
3. External power supply may have failed or be the wrong type. Replace the external power supply.
4. On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

Instrument begins the boot process, but does not complete boot-up:

1. Using Master Software Tools, perform the Emergency Repair procedure, then update the system software (via the Tools menu in Master Software Tools).
2. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

Instrument makes normal boot-up sounds, but the display has a problem:

1. If the display is dim, then check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB.
3. Replace the LCD assembly.
4. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

Boot-up Self Test fails:

1. Perform a Master Reset.
2. If the message relates to the RTC battery, then replace the battery on the Main PCB.
3. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

B-4   Battery Pack Charging Problems

Refer to "Battery Pack Removal and Replacement" on page 3-1.

B-5   Lock Error Messages

1. This message normally appears for 2 to 3 seconds when an external 10 MHz Reference is applied.

2. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

B-6   Spectrum Analyzer Problems

1. Inspect the Spectrum Analyzer RF In connector for damage.

2. Refer to the User Guide.

3. Update the system software using Master Software Tools (via Tools menu).

4. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly

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