

**Maintenance Manual**

# **Spectrum Master™**

**Handheld Spectrum Analyzer**

**MS2711E, 9 kHz to 3 GHz**

**MS2712E, 9 kHz to 4 GHz**

**MS2713E, 9 kHz to 6 GHz**

The Anritsu logo is located in the bottom right corner of the page. It consists of the word "Anritsu" in a bold, sans-serif font. The letter "A" is stylized with a diagonal slash through it.



## A Safety Symbols

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

### Symbols Used in Manuals

#### Danger



This indicates a risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

#### Warning



This indicates a risk from a hazardous condition or procedure that could result in light-to-severe injury or loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

#### Caution



This indicates a risk from a hazardous procedure that could result in loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

### 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



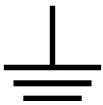
Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

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



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.

### Warning



This equipment is supplied with a rechargeable battery that could potentially leak hazardous compounds into the environment. These hazardous compounds present a risk of injury or loss due to exposure. Anritsu Company recommends removing the battery for long-term storage of the instrument and storing the battery in a leak-proof, plastic container. Follow the environmental storage requirements specified in the product data sheet.

# Table of Contents

---

## Chapter 1—General Information

1-1	Introduction . . . . .	1-1
1-2	Anritsu Customer Service Centers . . . . .	1-1
1-3	Recommended Test Equipment . . . . .	1-2
1-4	Replaceable Parts . . . . .	1-6

## Chapter 2—Spectrum Analyzer Verification

2-1	Introduction . . . . .	2-1
2-2	Frequency Accuracy Verification and Adjustment . . . . .	2-2
2-3	Single Side Band (SSB) Phase Noise Verification . . . . .	2-4
2-4	Spurious Response (Second Harmonic Distortion) Verification . . . . .	2-6
2-5	Resolution Bandwidth Accuracy Verification . . . . .	2-8
	RBW Test . . . . .	2-8
2-6	Spectrum Analyzer Absolute Amplitude Accuracy Verification . . . . .	2-9
	50 MHz Amplitude Accuracy Verification . . . . .	2-9
	Amplitude Accuracy Across Frequency Verification . . . . .	2-13
2-7	Residual Spurious Response Verification . . . . .	2-17
	Residual Spurious Response Test with Pre Amp Off . . . . .	2-17
	Residual Spurious Response Test with Pre Amp On . . . . .	2-18
2-8	Displayed Average Noise Level (DANL) . . . . .	2-20
2-9	Third Order Intercept (TOI) Verification . . . . .	2-22

## Chapter 3—Option Verification

3-1	Introduction . . . . .	3-1
3-2	Bias Tee Verification, Option 10 . . . . .	3-2
	Low Current Test Verification . . . . .	3-2
	High Current Test Verification . . . . .	3-3
	Fault Verification . . . . .	3-4
3-3	Tracking Generator Verification, Option 20 . . . . .	3-5
3-4	2-Port Transmission Verification, Option 21 . . . . .	3-6
3-5	Power Meter Level Accuracy, Option 29 . . . . .	3-7
3-6	ISDB-T and BER Verification, Options 30 and 79 . . . . .	3-10
	Introduction . . . . .	3-10
	Frequency Accuracy Verification . . . . .	3-11
	Frequency Lock Range Verification . . . . .	3-12
	Level Accuracy Verification . . . . .	3-14
	Displayed Average Noise Level (DANL) Verification . . . . .	3-17
	Phase Noise Verification . . . . .	3-17
	BER Measurement Functional Check, Option 79 Only . . . . .	3-19
3-7	GPS Verification, Option 31 . . . . .	3-21
	Frequency Accuracy Verification . . . . .	3-21
	GPS Antenna Bias Tee Verification . . . . .	3-22

## Table of Contents (Continued)

---

3-8	ISDB-T SFN Verification, Option 32	3-23
	Introduction	3-23
	Level Accuracy Verification	3-24
	Displayed Average Noise Level (DANL) Verification	3-28
3-9	GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880	3-29
	GSM Signal Analyzer Option Verification	3-29
	EDGE Burst Power, Frequency Error, and Residual Error Tests	3-32
3-10	CDMA Signal Analyzer Verification, Option 42/43/884	3-34
	cdmaOne Channel Power, Frequency Error, Rho, and Tau Verification	3-34
	CDMA2000 Channel Power, Frequency Error, Rho, and Tau Verification	3-37
3-11	WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881	3-38
	WCDMA Absolute Power Accuracy Verification (Option 44 or 881)	3-38
	WCDMA Occupied Bandwidth (OBW) Verification (Option 44 or 881)	3-43
	WCDMA RF Channel Power Accuracy (Option 44 or 881)	3-46
	HSDPA RF Channel Power Accuracy (Option 44 or 881)	3-47
	Error Vector Magnitude (EVM) Verification (Option 65 or 881)	3-49
3-12	Fixed WiMAX Signal Analyzer Verification, Option 46/47/885	3-51
	Fixed WiMAX Signal Analyzer Option Verification (Option 46 or 885)	3-51
	Fixed WiMAX Signal Analyzer Option Verification (Option 47 or 885)	3-54
3-13	TD-SCDMA Signal Analyzer Verification, Option 60/61/882	3-56
3-14	EVDO Signal Analyzer Verification, Option 62/63/884	3-59
	8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification	3-60
	QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification	3-61
	16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Verification	3-62
	Idle Slot Channel Power, Frequency Error, Rho and Tau Verification	3-62
3-15	DVB-T/H Signal Analyzer Verification, Option 64, 57	3-64
	Frequency Accuracy and Residual MER Verification	3-64
	Frequency Lock Range Verification	3-66
	Level Accuracy Verification	3-67
	Displayed Average Noise Level (DANL) Verification	3-72
	BER Measurement Functional Check, Option 57 Only	3-73
3-16	DVB-T/H SFN Verification, Option 78	3-77
	Introduction	3-77
	Level Accuracy Verification	3-77
	Displayed Average Noise Level (DANL) Verification	3-79
3-17	Mobile WiMAX Signal Analyzer Verification, Options 66/67/885	3-80
	Mobile WiMAX Channel Power Accuracy Tests (Option 66 or 885)	3-80
	Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67 or 885)	3-84
3-18	LTE Signal Analyzer Verification, Options 541/542/883	3-87
	LTE Channel Power Accuracy Tests (Option 541 or 883)	3-88
	LTE Frequency Error Tests (Option 542 or 883)	3-90
3-19	TD-LTE Signal Analyzer Verification, Options 551/552/883	3-92
	TD-LTE Channel Power Accuracy Tests (Option 551 or 883)	3-93
	TD-LTE Frequency Error Tests (Option 552 or 883)	3-95

# Table of Contents (Continued)

---

## Chapter 4—Battery Information

4-1	Introduction . . . . .	4-1
4-2	Battery Pack Removal and Replacement . . . . .	4-2

## Chapter 5—Assembly Replacement

5-1	Introduction . . . . .	5-1
5-2	Replaceable Parts List . . . . .	5-2
5-3	Opening the Spectrum Master Case . . . . .	5-3
5-4	PCB Assembly Removal. . . . .	5-5
5-5	SPA Assembly Replacement . . . . .	5-7
5-6	SPA and MB N Connector Replacement . . . . .	5-8
5-7	GPS (Option 31) Replacement. . . . .	5-9
5-8	Option Assembly Replacement . . . . .	5-10
5-9	Motherboard/SPA PCB Assembly Replacement . . . . .	5-10
5-10	Fan Assembly Replacement . . . . .	5-11
5-11	LCD Assembly Replacement . . . . .	5-12
5-12	LCD Backlight PCB Removal and Replacement . . . . .	5-14
5-13	Keypad and Keypad PCB Replacement . . . . .	5-15
5-14	Touch Screen Replacement . . . . .	5-16

## Chapter 6—Troubleshooting

6-1	Introduction. . . . .	6-1
6-2	Turn-on Problems. . . . .	6-1
6-3	Other Problems. . . . .	6-2

## Appendix A—Test Records

A-1	Test Records for Spectrum Analyzer Verification. . . . .	A-2
	<a href="#">Frequency Accuracy Verification and Adjustment</a> . . . . .	A-2
	<a href="#">Single Side Band (SSB) Phase Noise Verification</a> . . . . .	A-2
	<a href="#">Spurious Response (Second Harmonic Distortion) Verification</a> . . . . .	A-2
	<a href="#">Resolution Bandwidth Accuracy Verification</a> . . . . .	A-3
	<a href="#">Spectrum Analyzer Absolute Amplitude Accuracy Verification</a> . . . . .	A-5
	<a href="#">Residual Spurious Response Verification</a> . . . . .	A-11
	<a href="#">Displayed Average Noise Level (DANL)</a> . . . . .	A-12
	<a href="#">Third Order Intercept (TOI) Verification</a> . . . . .	A-12

## Table of Contents (Continued)

---

A-2	Test Records for Options Verification .....	A-13
	Bias Tee Verification, Option 10 .....	A-13
	Tracking Generator Verification, Option 20 .....	A-13
	2-Port Transmission Verification, Option 21 .....	A-13
	Power Meter Level Accuracy, Option 29 .....	A-14
	ISDB-T and BER Verification, Options 30 and 79 .....	A-15
	GPS Verification, Option 31 .....	A-20
	ISDB-T SFN Verification, Option 32 .....	A-20
	GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880 .....	A-27
	CDMA Signal Analyzer Verification, Option 42/43/884 .....	A-29
	WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881 .....	A-31
	Fixed WiMAX Signal Analyzer Verification, Option 46/47/885 .....	A-33
	TD-SCDMA Signal Analyzer Verification, Option 60/61/882 .....	A-34
	EVDO Signal Analyzer Verification, Option 62/63/884 .....	A-34
	DVB-T/H Signal Analyzer Verification, Option 64, 57 .....	A-36
	DVB-T/H SFN Verification, Option 78 .....	A-42
	DVB-T/H SFN Verification, Option 78 .....	A-43
	Mobile WiMAX Signal Analyzer Verification, Options 66/67/885 .....	A-44
	LTE Signal Analyzer Verification, Options 541/542/883 .....	A-47
	TD-LTE Signal Analyzer Verification, Options 551/552/883 .....	A-48



# Chapter 1 — General Information

## 1-1 Introduction

This manual provides maintenance instructions for Anritsu Spectrum Master Models MS2711E, MS2712E, and MS2713E.

This manual includes:

- General information in this chapter, including:
  - Lists of necessary test equipment to perform verification testing
    - [Table 1-1, “Test Equipment Required for Verifying Spectrum Analyzer Functions”](#)
    - [Table 1-2, “Test Equipment Required for Verifying Options”](#)
  - Replaceable parts list ([Table 1-3](#))
- Performance verification procedures:
  - [Chapter 2, “Spectrum Analyzer Verification”](#)
  - [Chapter 3, “Option Verification”](#)
- Battery pack information ([Chapter 4, “Battery Information”](#))
- Parts replacement procedures ([Chapter 5, “Assembly Replacement”](#))
- Blank test records are included in [Appendix A](#).
  - Copy the blank test records from [Appendix A](#) and use to record measured values. These test records form a record of the performance of the instrument. Anritsu recommends that you make a copy of the blank test records to document the measurements each time a Performance Verification is performed. Continuing to document this process each time provides a detailed history of the instrument’s performance, allowing trends to be observed.

Familiarity with the basic operation of the front panel keys (for example, how to change measurement mode, preset the instrument, or the meaning of submenu key or **main menu** key) is assumed. Note that submenu key and **Soft Key** are synonymous, and that **main menu** key and **Function Hard Key** are synonymous.

<b>Caution</b> Before making any measurement, verify that all equipment has warmed up for at least 30 minutes.
--

## 1-2 Anritsu Customer Service Centers

For the latest service and sales information in your area, please visit the following URL:

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

Choose a country for regional contact information.

## 1-3 Recommended Test Equipment

The following test equipment is recommended for use in testing and maintaining Anritsu Spectrum Master Models MS2711E, MS2712E and MS2713E. [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 Option: Step attenuator installed	Anritsu Model MG3692A/B/C (quantity 2) with Option 2A, Option 3, Option 4, Option 22, Option 15x <sup>a</sup>
Power Meter	Power Range: -70 dBm to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -67 dB to +20 dB	Anritsu Model MA2442D (quantity 2)
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Fixed Attenuator	Attenuation: 10 dB Connector: N(m) to N(f)	Aeroflex/Weinschel Model 44-10
Fixed Attenuator	Attenuation: 2 dB Connector: N(m) to N(f)	Aeroflex/Weinschel Model 44-2 (quantity 2)
Fixed Attenuator	Attenuation: 6 dB Connector: N(m) to N(f)	Aeroflex/Weinschel Model 44-6 (quantity 2)
Fixed Attenuator	Attenuation: 20 dB Connector: N(m) to N(f)	Aeroflex/Weinschel Model 44-20 (quantity 2)
Low Pass Filter	50 MHz Low Pass Filter	Anritsu Model 1030-96
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Adapter	Frequency: DC to 20 GHz Connector: N(m) to N(m) Impedance: 50 ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz Connector: K(m) to N(f) Impedance: 50 ohm	Anritsu Model 34RKNF50
50 ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
RF Coaxial Cable	Frequency: DC to 18 GHz Connector: N(m) to N(m) Impedance: 50 ohm	Anritsu Model 15NN50-1.5C
RF Coaxial Cable	Connector: BNC(m) to BNC(m) Impedance: 50 ohm	Anritsu 2000-1627-R (quantity 2)

a. 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.

**Table 1-2.** Test Equipment Required for Verifying Options (1 of 3)

<b>Instrument</b>	<b>Critical Specification</b>	<b>Recommended Manufacturer/Model</b>
Test Fixture (For Option 10)	40 ohm Load	Anritsu Model T2904
Test Fixture (For Option 10)	78 ohm Load	Anritsu Model T3536
Test Fixture (For Option 10)	105 ohm Load	Anritsu Model T3377
Torque Wrench (For Option 20)	Type: Open End, Break Over Size: 13/16 inch Preset Torque: 12 lbf·in	Mountz 06004C-099
Calibration Cable Fixture (For Option 20)	3 dB, DC to 18 GHz, attenuators	806-244-R factory calibration cable <sup>a</sup> (which combines Fixed Attenuator and RF Coaxial Cable)
50 ohm Termination (For Options: 21, 30, 32, 64)	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
50 ohm Termination (For Option 21)	Frequency: DC to 18 GHz	Anritsu Model 28NF50-2
RF Coaxial Cable (For Option 21)	Frequency: DC to 18 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-1.0B
Frequency Reference (For Options: 29, 30, 31, 40, 41, 42, 43, 44, 46, 47, 60, 61, 65, 66, 67, 79, 541, 542, 551, 552, 88x)	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Vector Signal Generator (For Options: 30, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 79, 541, 542, 551, 552, 88x)	Frequency: 100 kHz to 3 GHz	Anritsu Model MG3700A with Options MG3700A-002 and MG3700A-021  b. Waveform licenses for TD-SCDMA (MX370001A), LTE (MX370108A) and TD-LTE (MX370110A) are required and must be purchased.
Power Meter (For Options: 29, 30, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 541, 542, 551, 552, 88x)	Power Range: –70 to +20 dBm	Anritsu Model ML2438A
Power Sensor (For Option 29)	Frequency: 10 MHz to 18 GHz Power Range: -67 to +20 dBm	Anritsu Model MA2442D (quantity 2)
Power Sensor (For Options: 30, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 541, 542, 551, 552, 88x)	Frequency: 10 MHz to 18 GHz Power Range: –60 to +20 dBm	Anritsu Model MA2482D with Option 1 (quantity 2)

**Table 1-2.** Test Equipment Required for Verifying Options (2 of 3)

<b>Instrument</b>	<b>Critical Specification</b>	<b>Recommended Manufacturer/Model</b>
Programmable Attenuator (For Options: 30, 32, 44, 64, 65, 881)	Frequency: DC to 2 GHz Attenuation: 100 dB (1 dB and 10 dB steps)	Anritsu Model MN63A
RF Power Amplifier (For Options: 30, 32, 44, 64, 65, 881)	Frequency: 100 to 1000 MHz Gain: 35 dB min	Mini Circuits Model TIA-1000-1R8 (quantity 2 BNC(m) to N(f) Adapters required)
Adapter (For Options: 30, 32, 44, 64, 65, 881)	Frequency: 881.5 MHz BNC(m) to N(f), 50 ohm	Midwest Microwave ADT-2615-NF-BNM-02 (quantity 2)
Adapter (For Options: 29, 30, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 541, 542, 551, 552, 88x)	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Anritsu Model 34NN50A (quantity 2)
RF Limiter (For Options: 30, 32, 44, 64, 65, 881)	Connector: N(m) to N(f)	Anritsu Model 1N50C
Power Splitter (For Options: 29, 30, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 541, 542, 551, 552, 88x)	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Fixed Attenuator (For Options: 29, 30, 32, 44, 46, 47, 60, 61, 65, 66, 67, 541, 542, 551, 552, 88x)	Frequency: DC to 18 GHz Attenuation: 10 dB Connector: N(m) to N(f)	Aeroflex/Weinschel Model 44-10 (quantity 2)
RF Coaxial Cable (For Options: 29, 30, 31, 32, 40, 41, 42, 43, 44, 46, 47, 57, 60, 61, 62, 63, 64, 65, 66, 67, 79, 541, 542, 551, 552, 88x)	Frequency: DC to 6 GHz Connector: N(m) to N(m) Impedance: 50 ohm	Anritsu Model 15NN50-1.5C (quantity 3)
RF Coaxial Cable (For Options: 29, 30, 31, 40, 41, 42, 43, 44, 46, 47, 60, 61, 62, 63, 65, 66, 67, 79, 541, 542, 551, 552, 88x)	Connector: BNC(m) to BNC(m) Impedance: 50 ohm	Anritsu 2000-1627-R (quantity 3)
Synthesizer (For Option 31)	Frequency: 0.1 Hz to 20 GHz Power Output: +16 dBm	Anritsu Model MG3692A or MG3692B with Options 2A, 4, 15, and 22 <sup>b</sup>
Adapter (For Option 29, 31)	Frequency: DC to 20 GHz Connector: K(m) to N(f) Impedance: 50 ohm	Anritsu Model 34RKNF50
Adapter (For Option 31)	Connector: SMA to BNC(f)	Pomona 4290 or equivalent
Terminator (For Option 31)	GPS Terminator	Amphenol B1004A1-ND3G-93R-0.05-1W or equivalent

**Table 1-2.** Test Equipment Required for Verifying Options (3 of 3)

<b>Instrument</b>	<b>Critical Specification</b>	<b>Recommended Manufacturer/Model</b>
GPS Antenna (For Option 31)		Anritsu 2000-1528-R
High Power Load (For Options: 44, 65, 881)	Frequency: DC to 18 GHz Power rating: 10 W	Aeroflex/Weinschel Model M1418
Coupler (For Options: 44, 65, 881)	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 (For Options: 44, 65, 881)	Frequency: 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.]
Adapter (For Options: 44, 65, 881)	Frequency: DC to 20 GHz Connector: N(m) to N(m) Impedance: 50 ohm	Maury Microwave Model 8828B quantity 2 [One each required only if Anritsu Coupler and Circulator are used]
Adapter (For Options: 44, 65, 881)	Frequency: 881.5 MHz Connector: SMA(m) to N(f) Impedance: 50 ohm	Midwest Microwave Model ADT-2582-NF-SMM-02 (quantity 4) [Required only if Anritsu Coupler and Circulator are used.]
Adapter (For Options: 44, 65, 881)	Frequency: 881.5 MHz Connector: SMA(m) to SMA(m) Impedance: 50 ohm	Midwest Microwave Model ADT-2594-MM-SMA-02 [Required only if Anritsu Coupler and Circulator are used.]
Bit Error Rate Tester (For Option 57)	DVB ASI Input	Anritsu MP8931A
RF Coaxial Cable (For Option 57)	Connector: BNC(m) to BNC(m) Impedance: 75 ohm	Anritsu 3-806-169

a. Attenuators are pre-torqued to cable and covered by heat shrink tubing.

b. Option 15 is required for MG3692A models to achieve power of +13 dBm. MG3692B models do not require Option 15.

## 1-4 Replaceable Parts

**Table 1-3.** List of Replaceable Parts (1 of 5)

Part Number	Description	
ND72135	MS2711E MB PCB Assembly <sup>a</sup> Units without Option 21, non-locking connector	s/n < 1220025
ND73154	MS2711E MB/VNA PCB Assembly <sup>a</sup> Units with Option 21, non-locking connector	s/n < 1220025
ND74907	MS2711E MB/SPA PCB Assembly <sup>a</sup> Units without Option 20, locking connector	1220024 < s/n < 1550000
ND74877	MS2711E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 20, locking connector	1220024 < s/n < 1603000
ND82175	MS2711E MB/SPA PCB Assembly <sup>a</sup> Units without Option 20	s/n > 1550000
ND82174	MS2711E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 20	s/n > 1603000
ND73179	MS2711E SPA Assembly Units without Option 20	
ND70938	MS2712E MB PCB Assembly <sup>a</sup> Units without Option 9/Option 21	s/n < 1126099
ND73206	MS2712E MB PCB Assembly <sup>a</sup> Units without Option 9/Option 21	1126098 < s/n < 1147088
ND71330	MS2712E MB/VNA PCB Assembly <sup>a</sup> Units without Option 9 and with Option 21	s/n < 1126099
ND73210	MS2712E MB/VNA PCB Assembly <sup>a</sup> Units without Option 9 and with Option 21	1126098 < s/n < 1147088
ND71332	MS2712E MB/SPA PCB Assembly <sup>a</sup> Units with Option 9 and without Option 21	s/n < 1126099
ND73208	MS2712E MB/SPA PCB Assembly <sup>a</sup> Units with Option 9 and without Option 21	1126098 < s/n < 1147088
ND71334	MS2712E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 9/Option 21	s/n < 1126099
ND73212	MS2712E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 9/Option 21	1126098 < s/n < 1147088
ND74521	MS2712E MB PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units without Option 9/21/57/79	1147088 < s/n < 1220025
ND74523	MS2712E MB/SPA PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units with Option 9 and without Options 21/57/79	1147088 < s/n < 1220025
ND74525	MS2712E MB/VNA PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units without Option 9/57/79 and with Option 21	1147088 < s/n < 1220025
ND74527	MS2712E MB/VNA/SPA PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units with Option 9/21 and without Option 57/79	1147088 < s/n < 1220025
ND74538	MS2712E MB/SPA/BER PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units without Option 21 and with Option 57/79	s/n < 1220025
ND74536	MS2712E MB/VNA/SPA/BER PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units with Option 21/57/79	s/n < 1220025
ND74896	MS2712E MB/SPA PCB Assembly, 20 MHZ IF BW <sup>a</sup> Units without Option 20/57/79, locking connector	1220024 < s/n < 1602000

Table 1-3. List of Replaceable Parts (2 of 5)

Part Number	Description
ND74549	MS2712E MB/VNA/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20 and without Option 57/79, locking connector 1220024 < s/n < 1604015
ND74898	MS2712E MB/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 20 and with Option 57/79, locking connector 1220024 < s/n < 1602000
ND74875	MS2712E MB/VNA/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20/57/79, locking connector 1220024 < s/n < 1604015
ND82176	MS2712E MB/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 20/57/79 s/n > 1602000
ND82177	MS2712E MB/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 20 and with Option 57/79 s/n > 1602000
ND82178	MS2712E MB/VNA/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20 and without Option 57/79 s/n > 1604014
ND82179	MS2712E MB/VNA/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20/57/79 s/n > 1604014
ND70941	MS2713E MB PCB Assembly <sup>a</sup> Units without Option 9/21 s/n < 1129023 except 1124036, 1126029, 1127029, 1128007
ND73207	MS2713E MB PCB Assembly <sup>a</sup> Units without Option 9/21 1129022 < s/n < 1147088 and 1124036, 1126029, 1127029, 1128007
ND71331	MS2713E MB/VNA PCB Assembly <sup>a</sup> Units without Option 9 and with Option 21 s/n < 1129023 except 1124036, 1126029, 1127029, 1128007
ND73211	MS2713E MB/VNA PCB Assembly <sup>a</sup> Units without Option 9 and with Option 21 1129022 < s/n < 1147088 and 1124036, 1126029, 1127029, 1128007
ND71333	MS2713E MB/SPA PCB Assembly <sup>a</sup> Units with Option 9 and without Option 21 s/n < 1129023 except 1124036, 1126029, 1127029, 1128007
ND73209	MS2713E MB/SPA PCB Assembly <sup>a</sup> Units with Option 9 and without Option 21) 1129022 < s/n < 1147088 and 1124036, 1126029, 1127029, 1128007
ND71335	MS2713E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 9/21 s/n < 1129023 except 1124036, 1126029, 1127029, 1128007
ND73213	MS2713E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 9/21 1129022 < s/n < 1147088 and 1124036, 1126029, 1127029, 1128007
ND74522	MS2713E MB PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 9/21/57/79 1147088 < s/n < 1220025
ND74524	MS2713E MB/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 9 and without Option 21/57/79 1147088 < s/n < 1220025
ND74526	MS2713E MB/VNA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 9/57/79 and with Option 21 1147088 < s/n < 1220025

**Table 1-3.** List of Replaceable Parts (3 of 5)

Part Number	Description
ND74528	MS2713E MB/VNA/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 9/21 and without Option 57/79 1147088 < s/n < 1220025
ND74539	MS2713E MB/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 21 and with Option 57/79 s/n < 1220025
ND74537	MS2713E MB/VNA/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 21/57/79 s/n < 1220025
ND74897	MS2713E MB/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 20/57/79 1220024 < s/n < 1602000
ND74874	MS2713E MB/VNA/SPA PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20 and without Option 57/79 1220024 < s/n < 1603122
ND74899	MS2713E MB/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units without Option 20 and with Option 57/79 1220024 < s/n < 1602000
ND74876	MS2713E MB/VNA/SPA/BER PCB Assembly, 20 MHz IF BW <sup>a</sup> Units with Option 20/57/79 1220024 < s/n < 1603122
ND82180	MS2713E MB/SPA PCB Assembly <sup>a</sup> Units without Option 20/57/79 s/n > 1602000
ND82181	MS2713E MB/SPA/BER PCB Assembly <sup>a</sup> Units without Option 20 and with Option 57/79 s/n > 1602000
ND82182	MS2713E MB/VNA/SPA PCB Assembly <sup>a</sup> Units with Option 20 and without Option 57/79 s/n > 1603121
ND82183	MS2713E MB/VNA/SPA/BER PCB Assembly <sup>a</sup> Units with Option 20/57/79 s/n > 1603121
ND70942	MS2712E/13E SPA Assembly Units without Option 9 Units with MB ND70938 through ND71331
ND73214	MS2712E/13E SPA Assembly Units without Option 9 Units with MB ND73206 through ND73211
ND74529	MS2712E/13E SPA, 20 MHz IF BW Units without Option 9 Units with MB ND74521 through ND74526
3-73262	Model MS2711E ID Label
3-67304-3	Model MS2712E ID Label
3-67304-4	Model MS2713E ID Label
ND70320	GPS Module (Option 31)
ND72101	Ethernet PCB Assembly (Option 411)
ND82421	CPRI PCB Assy (Option 751)
3-15-147	LCD Display for units with Inverter PCB (unit s/n less than 1329107, plus unit s/n's 1330061, 1330078, 1331104, 1331105, 1331106, 1331108, 1331113, 1331121, 1332090, 1332098)



**Table 1-3.** List of Replaceable Parts (4 of 5)

Part Number	Description
3-15-165	LCD Display for: MS2711E with option 20, 1329106 < s/n < 1603001 MS2711E without option 20, 1329106 < s/n <1550054 MS2712E with option 20, 1329106 < s/n < 1604014 MS2712E and MS2713E without option 20, 1329106 < s/n < 1602000 MS2713E with option 20, 1329106 < s/n < 1603121 The following exceptions use p/n 3-15-147: unit s/n's 1330061, 1330078, 1331104, 1331105, 1331106, 1331108, 1331113, 1331121, 1332090, 1332098)
3-15-174	LCD Display for: MS2711E with option 20, unit s/n > 1603001 MS2711E without option 20, unit s/n >1550054 MS2712E with option 20, unit s/n > 1604014 MS2712E and MS2713E without option 20, unit s/n > 1602000 MS2713E with option 20, unit s/n > 1603121
3-68567-3	Inverter PCB Assembly for LCD Backlight
2000-1654-R	Soft Carrying Case
ND73191	Front Case with Gasket (excludes Model ID label, LCD, touch screen, encoder, and keypad assemblies.)
ND74508	Front Case Kit (includes Keypad PCB, Rubber Keypad, Keypad Washers, Keypad Screws, Encoder, Encoder Knob, Speaker Assy with gaskets)
ND73199	Back Case (Excludes Tilt Bale)
ND73201	Battery Door
633-75	7500 mAH Li-Ion Battery Pack
3-513-100	RF In Connector and RF Out Connector
40-187-R	AC to DC Power Converter
3-410-103	Encoder (excluding knob)
3-61360-2	Knob (excluding encoder)
ND73200	Tilt Bail Assy
ND81940	Fan Assembly
ND75294	Main Numeric Keypad PCB (Non-Locking connector)
ND75295	Main Numeric Keypad PCB (Locking connector)
3-72773	Rubber Keypad
3-72767	Keypad Washer
3-905-2744	Keypad Screw
ND73192	Speaker
3-69770-1	Top Bumper (Green)
3-69771-1	Bottom Bumper (Green)
3-72758	Vent 1 (Fan Vent, above battery door)
3-72759	Vent 2 (Intake Vent, top vent on keypad side)

**Table 1-3.** List of Replaceable Parts (5 of 5)

<b>Part Number</b>	<b>Description</b>
3-72760	Vent 3 (Battery Vent, bottom vent on keypad side)
3-72771	Cable, Keypad to Main PCB, 15cm, non-locking connectors
3-74842-3	Cable, Keypad to Main PCB, 15cm, locking connectors
3-72770	Cable, Keypad to Inverter PCB, 6cm
3-71625-1	Cable, LCD to Keypad, units with LCD Display 3-15-165
3-70675-1	Cable, LCD to Keypad, units with LCD Display 3-15-174
3-72621-4	Cable, LCD to Main PCB, units with LCD Display 3-15-147 and 3-15-165
3-70674-4	Cable, LCD to Main PCB, units with LCD Display 3-15-174
3-803-110	Cable, Ribbon, 2x20, Main to SPA PCB
3-806-197	Cable, MMCX-MMCX, DSP to SPA PCB, units without BER
3-68764-3	Cable, MMCX-MMCX, 205mm, J1 to J6, units with BER
3-68764-4	Cable, MMCX-MMCX, 215mm, J2 to J3, units with BER
3-68764-5	Cable, MMCX-MMCX, 215mm, J4 to J4, units with BER
3-68764-6	Cable, MMCX-MMCX, 225mm, J61 to J5, units with BER
ND80480	Touch Screen with Protective Film
2000-1797-R	Protective Film (Touch Screen not included)

a. When ordering the Main 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 and shown in the System / Status display.

# Chapter 2 — Spectrum Analyzer Verification

## 2-1 Introduction

This chapter contains descriptions of the following verification tests:

- “Frequency Accuracy Verification and Adjustment” on page 2-2
- “Single Side Band (SSB) Phase Noise Verification” on page 2-4
- “Spurious Response (Second Harmonic Distortion) Verification” on page 2-6
- “Resolution Bandwidth Accuracy Verification” on page 2-8
- “Spectrum Analyzer Absolute Amplitude Accuracy Verification” on page 2-9
- “Residual Spurious Response Verification” on page 2-17
- “Displayed Average Noise Level (DANL)” on page 2-20
- “Third Order Intercept (TOI) Verification” on page 2-22

## 2-2 Frequency Accuracy Verification and Adjustment

The following procedure is used to verify and adjust the frequency accuracy of the Spectrum Analyzer in the Spectrum Master. Adjustment to the frequency accuracy can be performed on units using Application Package version 1.56 or greater.

### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cable

### Procedure

1. Connect the 10 MHz Reference source to the Anritsu MG3692X Synthesized Signal Source.

<b>Note</b> Do not connect the external 10 MHz Reference to the Spectrum Master.
--

2. Turn on the 10 MHz Reference Standard and the Anritsu MG3692X Synthesized Signal Source.
3. Set the MG3692X output to 1 GHz CW, with an RF Output Level of  $-30$  dBm.
4. Connect the output of the source to the RF In of the Spectrum Master.
5. Turn on the Spectrum Master.
6. Press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
7. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** submenu key to reset the instrument to the default starting conditions.
8. Press the **Shift** key, then the **Sweep** (3) key, then the **Sweep Mode** submenu key, and then press the **Performance** submenu key.
9. Press the **Amplitude** main menu and then press the **Reference Level** submenu key.
10. Use the keypad to enter  $-10$  and press the **dBm** submenu key.
11. Press the **Span** submenu key, use the keypad to enter 10, and press the **KHz** submenu key.
12. Press the **BW** submenu key and press the **RBW** submenu key.
13. Use the keypad to enter 100 and press the **Hz** submenu key.
14. Press the **VBW** submenu key, use the keypad to enter 30 and then press the **Hz** submenu key.
15. Press the **Freq** main menu key and press the **Center Freq** submenu key.
16. Use the keypad to enter 1 and press the **GHz** submenu key.
17. Press the **Marker** main menu, then the **More** submenu key. Set Counter Marker to On, press the **Back** submenu key, and then press the **Peak Search** submenu key.

<b>Note</b> Without the Counter Marker On, the frequency resolution does not allow viewing to kHz accuracy.
---

18. Verify that the marker frequency is  $1 \text{ GHz} \pm 1.5 \text{ kHz}$  ( $\pm 1.5 \text{ ppm}$ ). If the marker frequency is within the specification, record in [Table A-1, "Spectrum Analyzer Frequency Accuracy" on page A-2](#), skip [Step 19](#) through [Step 21](#), and proceed to [Step 22](#). If the marker frequency is outside the specification, proceed to the next step for adjustment.

<b>Note</b>	The following steps to adjust the frequency accuracy can be performed on instruments with Application Package 1.56 or greater. The Application Package version can be found in the System > Status menu as "Package Version".
-------------	---

19. Perform [Step 19](#) through [Step 21](#) only if the previous step is out of specification. Press and hold the **Shift** key while simultaneously pressing the 9-5-3 keys all at once. Three quick beeps sound, and a **Frequency Calibration** soft key is displayed.
20. Press the **Frequency Calibration** soft key. The 10 MHz Ref DAC number will be shown and can be adjusted to bring the marker frequency within specification. Larger DAC numbers will decrease the measured frequency, and smaller DAC numbers will increase the measured frequency.
21. Adjust the DAC number by entering a new DAC value and pressing the **Decimal** soft key. The instrument will take a few seconds to update, and then the peak can be remeasured using **Marker**, **Peak Search**. The System menu returns the **Frequency Calibration** soft key if readjustment is necessary. Continue adjusting the DAC value until the peak search marker value is within specification. After the instrument is adjusted, turn the instrument power off and back on to remove the **Frequency Calibration** menu. Record the marker frequency in [Table A-1, "Spectrum Analyzer Frequency Accuracy" on page A-2](#).
22. Set the MG3692X frequency to 2.9 GHz for the MS2711E, to 3.9 GHz for the MS2712E, or to 5.9 GHz for the MS2713E.
23. Set the MS271xE center frequency to 2.9 GHz for the MS2711E, to 3.9 GHz for the MS2712E, or to 5.9 GHz for the MS2713E.
24. Press the **Marker** main menu key, then the **More** submenu key. Turn **Counter Marker** to Off and then back On, press the **Back** submenu key, and then press the **Peak Search** submenu key.
25. Verify that the marker frequency is  $2.9 \text{ GHz} \pm 4.35 \text{ kHz}$  for the MS2711E,  $3.9 \text{ GHz} \pm 5.85 \text{ kHz}$  for the MS2712E, or  $5.9 \text{ GHz} \pm 8.85 \text{ kHz}$  for the MS2713E ( $\pm 1.5 \text{ ppm}$ ). Record the results in [Table A-1](#).

<b>Note</b>	If the instrument fails the <a href="#">Section 2-2 "Frequency Accuracy Verification and Adjustment"</a> then contact your local Anritsu Service Center ( <a href="http://www.anritsu.com/Contact.asp">http://www.anritsu.com/Contact.asp</a> ).
-------------	--

## 2-3 Single Side Band (SSB) Phase Noise Verification

This test is used to verify the single side band (SSB) phase noise of the spectrum analyzer in the MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cable

### Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Synthesized Signal Source.
2. Turn on the 10 MHz reference source and the Anritsu MG3692X Synthesized Signal Source.
3. Set the MG3692X output to 1.00 GHz CW, with an RF output level of +0 dBm.
4. Connect the output of the MG3692X Synthesized Signal Source to the RF In connector of the Spectrum Master.
5. Turn on the Spectrum Master.
6. Press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
7. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset to the default starting conditions.
8. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
9. Press the **Amplitude** main menu key, then press the Reference Level submenu key.
10. Use the keypad to enter 0 and press the dBm submenu key.
11. Press the Atten Lvl submenu key, use the keypad to enter 15, and press the dB submenu key.
12. Press the **Freq** main menu key and press the Center Freq submenu key.
13. Use the keypad to enter 1.00 and press the GHz submenu key.
14. Press the Span submenu key, use the keypad to enter 110, and press the kHz submenu key.
15. Press the BW submenu key and press the RBW submenu key.
16. Use the keypad to enter 1 and press the kHz submenu key.
17. Press the VBW submenu key and use the keypad to enter 3, then press the Hz submenu key.
18. Press the **Shift** key and then press the **Trace** (5) key, then press the Trace A Operations submenu key.
19. Press the # of Averages submenu key, use the keypad to enter 7, then press the **Enter** key.
20. Wait until the Trace Count displays “7/7”.
21. Press the **Marker** key and press the Peak Search submenu key.
22. Press the Delta On/Off submenu key to turn Delta On.
23. Use the keypad to enter 10 and press the kHz submenu key.
24. Enter the measured value in [Table A-2, “Spectrum Analyzer SSB Phase Noise Verification for MS2711E”](#) on page A-2 or [Table A-3, “Spectrum Analyzer SSB Phase Noise Verification for MS2712E and MS2713E”](#) on page A-2 based on the Spectrum Master model.
25. Subtract 30 dB from the average value, and record the Calculated Value results in [Table A-2](#) or [Table A-3](#)

For example:  $-70 \text{ dBc measured} - 30 \text{ dB} = -100 \text{ dBc/Hz}$

26. Repeat [Step 23](#) through [Step 25](#) for 100 kHz (set Span to 220 kHz) and 1 MHz offset (set Span to 2.04 MHz). Enter the test results and calculations in the appropriate rows of [Table A-2](#) or [Table A-3](#).

## 2-4 Spurious Response (Second Harmonic Distortion) Verification

The following test is used to verify the input related spurious response of the spectrum analyzer in the MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 ohm Adapter or equivalent
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 1030-96 50 MHz Low Pass Filter
- Anritsu 2000-1627-R RF Coaxial Cable

### Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Synthesized Signal Source.
2. Turn on the 10 MHz reference source and the Anritsu MG3692X Synthesized Signal Source.
3. Set the MG3692X output to 50.1 MHz CW, with an RF Output Level of -30 dBm.
4. Connect one end of the 50 MHz Low Pass Filter to the output of the source and the other end to the Spectrum Master RF In with the coaxial cable.
5. Turn On the Spectrum Master.
6. Press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
7. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset to the default starting conditions.
8. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
9. Press the **Amplitude** main menu key, and then press the Reference Level submenu key.
10. Use the keypad to enter -27 and press the dBm submenu key.
11. Press the **Atten Lvl** submenu key and enter 0. Then press the dB submenu key.
12. Press the **Freq** main menu key and press the Center Freq submenu key.
13. Use the keypad to enter 50.1 and press the MHz submenu key.
14. Press the **Span** submenu key, use the keypad to enter 100, and press the kHz submenu key.
15. Press the **BW** submenu key and press the RBW submenu key.
16. Use the keypad to enter 1 and press the kHz submenu key.
17. Press the **VBW** submenu key. Use the keypad to enter 10 and then press the Hz submenu key.
18. Press the **Amplitude** main menu key.
19. Press the Detection submenu key, and then the Peak submenu key.
20. Press the **Shift** key and then press the **Trace** (5) key, then press the Trace A Operations submenu key.
21. Press the **# of Averages** submenu key, use the keypad to enter 5 and then press the **Enter** key.
22. Wait until the Trace Count displays "5/5".
23. Press the **Marker** key and press the Peak Search submenu key.
24. Record the amplitude for 50.1 MHz. Use [Table A-4, "Spectrum Analyzer Spurious Response \(Second Harmonic Distortion\)" on page A-2](#).
25. Press the **Freq** main menu key and press the Center Freq submenu key.
26. Use the keypad to enter 100.2 and press the MHz submenu key.



27. Press the **Shift** key and then press the **Trace** (5) key, then press the Trace A Operations submenu key.
28. Press the # of **Averages** submenu key, use the keypad to enter 5 and then press the **Enter** key.
29. Wait until the Trace Count displays "5/5".
30. Press the **Marker** key and press the **Peak Search** submenu key.
31. Record the amplitude for 100.2 MHz in the test records. Use [Table A-4](#).
32. Calculate the second Harmonic level in dBc by subtracting the 50.1 MHz amplitude from the 100.2 MHz amplitude using the following formula:  
  
Second Harmonic Level Amplitude at 100.2 MHz =  
100.2 MHz amplitude - 50.1 MHz amplitude = \_\_\_\_\_ dBc
33. Verify that the calculated Second Harmonic Level is  $\leq -56$  dBc and record in the test records. Use [Table A-4](#).

## 2-5 Resolution Bandwidth Accuracy Verification

The following test is used to verify the resolution bandwidth accuracy of the spectrum analyzer in the MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cable

### Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Synthesized Signal Source and the MS271xE Spectrum Master.
2. Turn on the MG3692X, set the frequency to 1 GHz CW and level to  $-30$  dBm.
3. Connect the output of the Anritsu MG3692X Synthesized Signal Source to the MS271xE Spectrum Analyzer RF In.
4. Turn on the MS271xE Spectrum Master.
5. Press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset to the default starting conditions.
7. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
8. Press the **Amplitude** main menu key and then press the Reference Level submenu key.
9. Use the keypad to enter  $-10$  and press the dBm submenu key.
10. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
11. Press the Scale submenu key and enter 10, then press dB/div submenu key.
12. Press the **Freq** main menu key and then press the Center Freq submenu key.
13. Use the keypad to enter 1 and press the GHz submenu key.

### RBW Test

14. Press the Span submenu key. Use the keypad to enter the span listed in the test records. Refer to the **Span** column of [Table A-5, "Spectrum Analyzer Resolution Bandwidth Accuracy"](#) on page A-3.
15. Press the BW submenu key and press the RBW submenu key.
16. Use the keypad to enter 3 and press the MHz submenu key.
17. Set the VBW from the value listed in the test records. Refer to the **VBW** column of [Table A-5](#).
18. Press the **Shift** key, press the **Measure** (4) key, press the Power and Bandwidth soft key and then press the OCC BW submenu key.
19. Press the dBc submenu key and enter 3, then press the **Enter** key.
20. Press the OCC BW On/Off submenu key to turn on occupied bandwidth.
21. Record the OCC BW reading in the test records. Use the **Measured Value** column of [Table A-5](#).
22. Verify that the OCC BW reading frequency is within 10% of the RBW.
23. Repeat [Step 14](#) through [Step 22](#) for the other settings that are valid for the instrument being tested and record in [Table A-5](#).

## 2-6 Spectrum Analyzer Absolute Amplitude Accuracy Verification

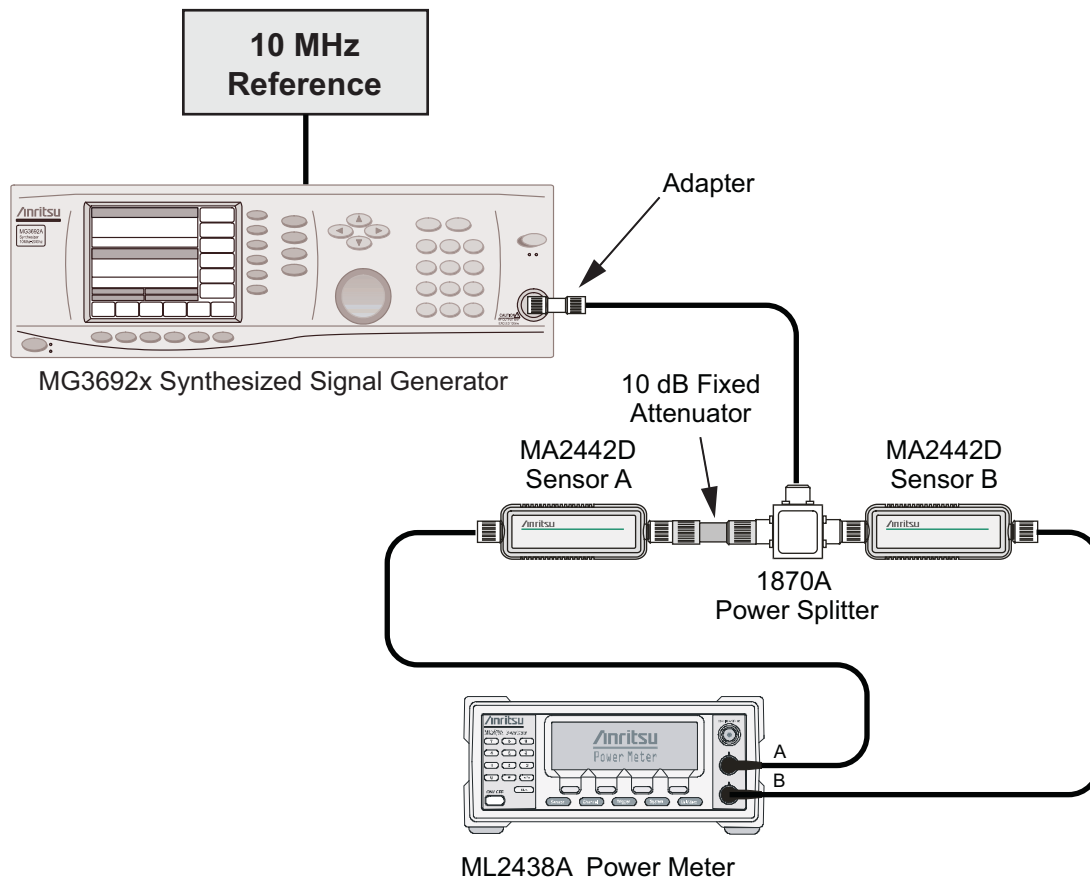
The tests in the following two sections verify the absolute amplitude accuracy of the Spectrum Analyzer in the MS271xE Spectrum Master. The two parts of this test are [“50 MHz Amplitude Accuracy Verification”](#) immediately below and [“Amplitude Accuracy Across Frequency Verification”](#) on page 2-13.

### 50 MHz Amplitude Accuracy Verification

#### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 ohm Adapter
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Anritsu 2000-1627-R RF Coaxial Cable
- 10 MHz Reference Standard

## Setup



**Figure 2-1.** Absolute Amplitude Accuracy Verification Pretest Setup

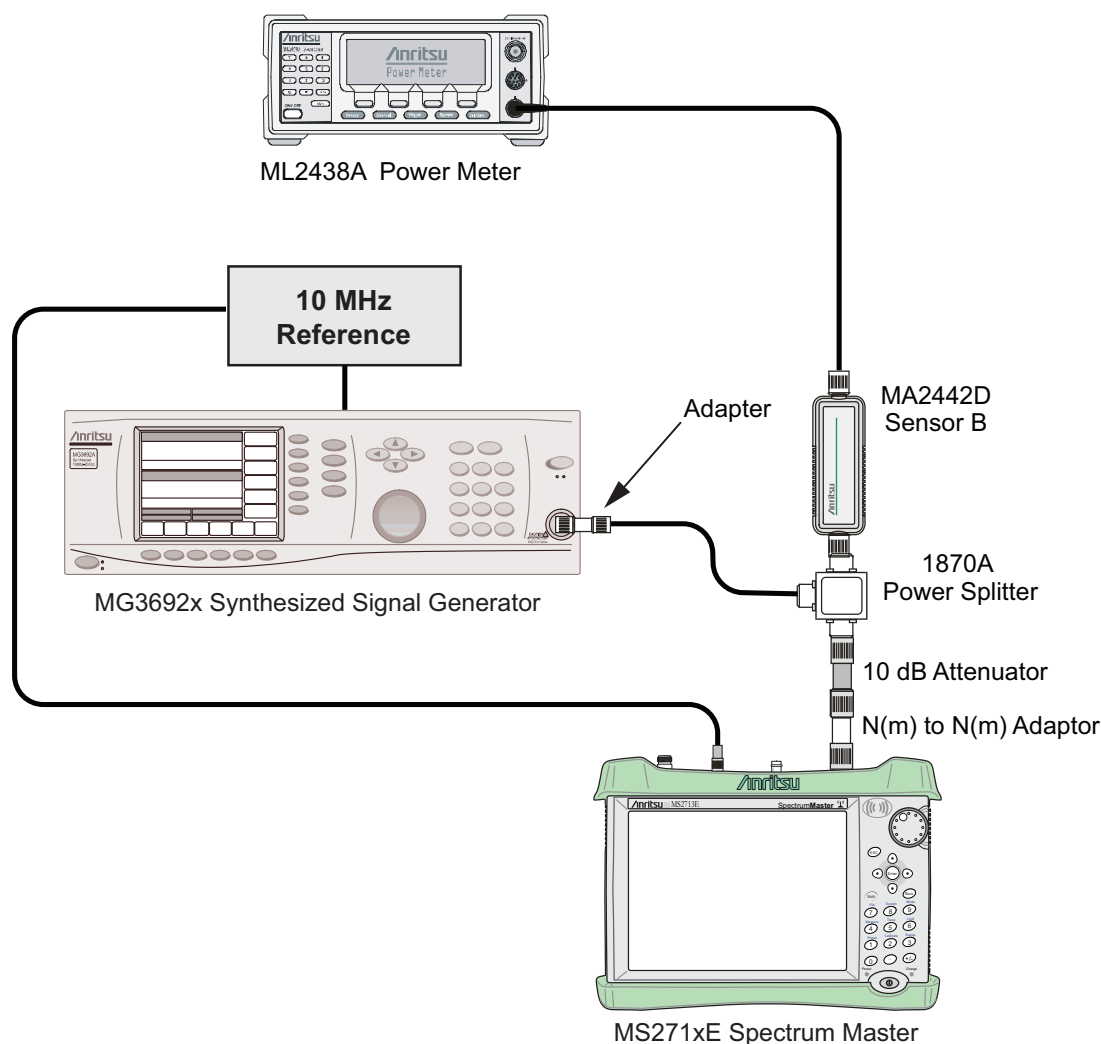
**Test Setup Components Characterization**

1. Turn on the ML2438A Power Meter, the MG3692X Signal Source, and the MS271xE Spectrum Master.
2. On the power meter, press the **Channel** soft key, the **Setup** soft key, and then the **Channel** soft key to display Channel 2 Setup menu.
  - a. Press the **Input** key twice to set the Input Configuration to B.
  - b. Press the **Sensor** key to display both Sensor A and Sensor B readings.
  - c. Connect the power sensors to the power meter and calibrate the sensors.
  - d. Connect the Power Splitter to the MG3692X Output and Sensor B to one of the Power Splitter Outputs.
3. Install the 10 dB Fixed Attenuator to the other Power Splitter Output and then connect Sensor A to the end of the attenuator as shown in [Figure 2-1, “Absolute Amplitude Accuracy Verification Pretest Setup”](#).
4. Set the MG3692X to a frequency of 50 MHz.
5. On the Power Meter, press the **Sensor** key, the **cal factor** soft key, and then the **Freq** soft key.
  - a. Use the keypad to enter 50 MHz as the input signal frequency. Do this for both Sensor A and Sensor B, which sets the power meter to the proper power sensor calibration factor.
  - b. Press the **Sensor** key on the power meter to display the power reading.
6. Starting with 0 dBm, adjust the power level of the MG3692x to get a reading on Sensor A that matches the power level in the **Test Power Level at 50 MHz** column of [Table A-6, “Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy Setup Table”](#) on page A-5.
7. Record the Sensor B reading in the **Required Sensor B Reading** column of [Table A-6](#).
8. Repeat [Step 6](#) and [Step 7](#) for the other input levels from -4 dBm to -50 dBm.

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

### Measuring the Instrument for 50 MHz Amplitude Accuracy

1. Remove Sensor A, add the adapter, and connect it to the Spectrum Analyzer RF In connector of the MS271xE Spectrum Master as shown in [Figure 2-2](#).



**Figure 2-2.** Absolute Amplitude Accuracy Verification Test Setup

2. On the MS271xE, press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
3. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset to the default starting conditions.
4. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
5. Press the **Freq** main menu key and press the Center Freq submenu key.
6. Use the keypad to enter 50 and press the MHz submenu key.
7. Press the BW submenu key and the RBW submenu key.
8. Use the keypad to enter 1 and press the kHz submenu key.
9. Press the VBW submenu key and use the keypad to enter 10, then press the Hz submenu key.
10. Press the Span submenu key, use the keypad to enter 10, and press the kHz submenu key.

11. Press the **Amplitude** main menu and then press the Reference Level submenu key.
12. Use the keypad to enter 10 and press the dBm submenu key.
13. Press the Atten Lvl submenu key and enter 30, then press the dB submenu key.
14. Adjust the source power so that the power meter displays the corresponding desired Sensor B reading as recorded for 0 dBm in the **Required Sensor B Reading** column of [Table A-6](#).
15. Press the **Marker** main menu and press the Peak Search submenu key.
16. Record the Marker 1 amplitude reading in the **0 dBm** row of [Table A-7](#), “[Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy](#)” on page A-5.
17. Verify that the Marker 1 amplitude reading is within the specification.
18. Repeat [Step 14](#) through [Step 17](#) for the other power level settings. Refer to [Table A-6](#) for Required Sensor B Readings. Use [Table A-7](#) to record test results. The last two power measurements are with the pre-amp turned on, to ensure pre-amp functionality. MS2711E's without the pre-amp (option 8) will skip the last two measurement.

## Amplitude Accuracy Across Frequency Verification

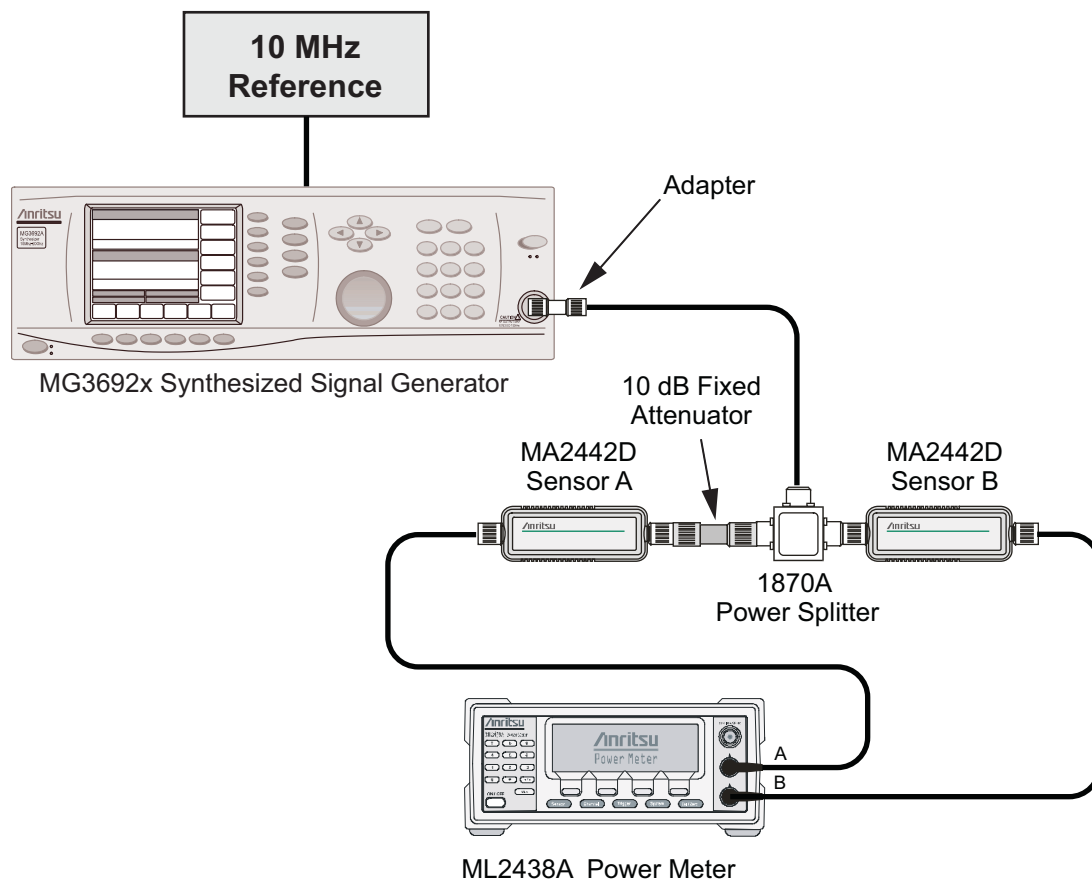
This procedure is the second test used to verify the absolute amplitude accuracy of the Spectrum Analyzer in the MS271xE Spectrum Master. The first procedure test was described in “[50 MHz Amplitude Accuracy Verification](#)” on page 2-9.

### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 ohm Adapter
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Anritsu 2000-1627-R RF Coaxial Cable
- 10 MHz Reference Standard

### Test Setup Component Characterization

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the equipment as shown in [Figure 2-3](#).



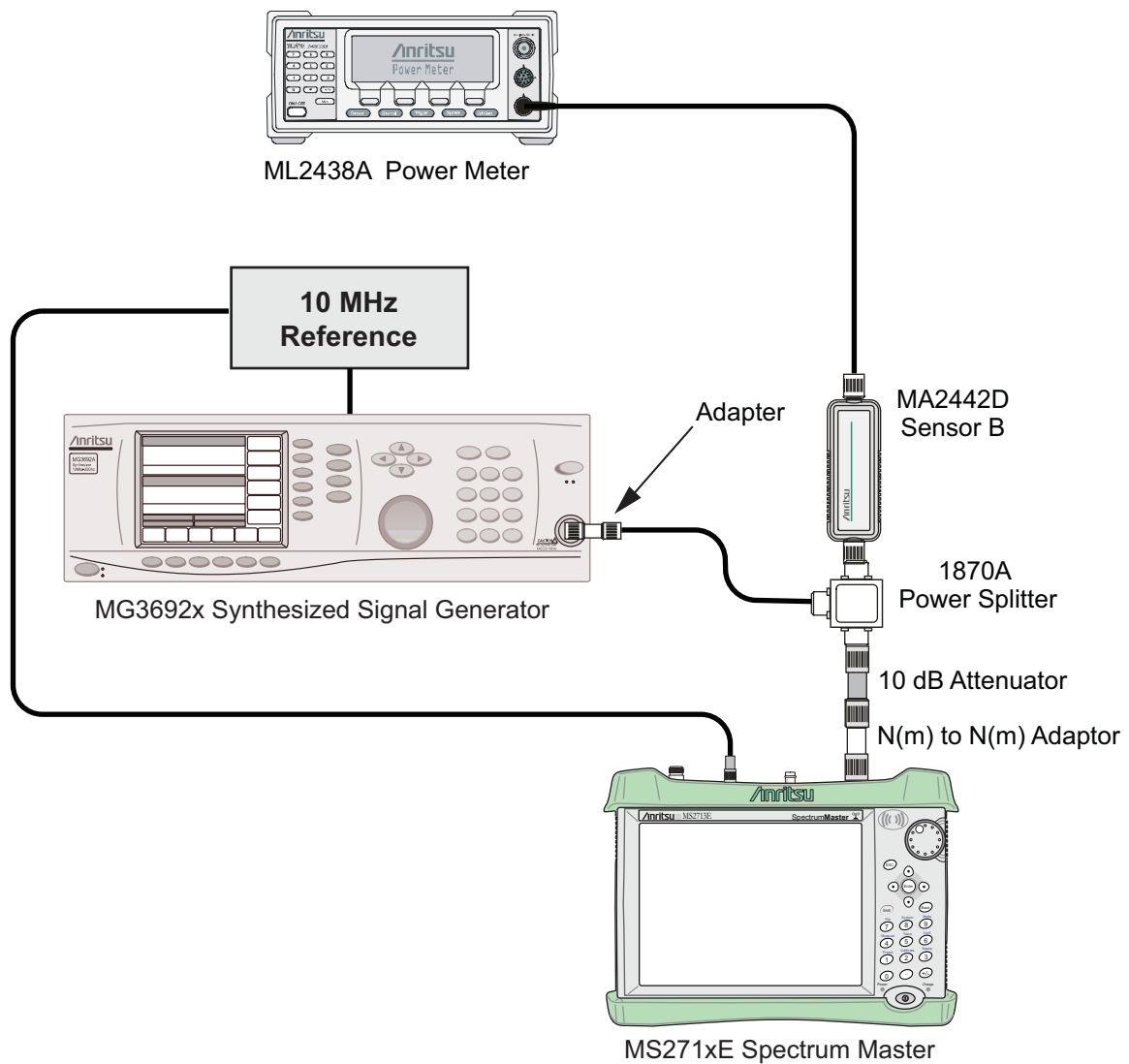
**Figure 2-3.** Fixed Level with Varying Frequency Setup

3. 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.
4. Set the MG3692x frequency to 10.1 MHz and adjust the level so that the Sensor A reading is  $-2 \text{ dBm} \pm 0.1 \text{ dB}$ .
5. Record the Sensor B reading to the **-2 dBm** column of [Table A-8](#), “[Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency Setup Table](#)” on page A-6.
6. Adjust the MG3692x output level so that the Sensor A reading is  $-30 \text{ dBm} \pm 0.1 \text{ dB}$ .
7. Record the Sensor B reading to the **-30 dBm** column of [Table A-8](#).
8. Adjust the MG3692x output level so that the Sensor A reading is  $-50 \text{ dBm} \pm 0.1 \text{ dB}$ .
9. Record the Sensor B reading to the **-50 dBm** column of [Table A-8](#).
10. Repeat [Step 2](#) through [Step 9](#) for all the frequencies listed in [Table A-8](#).

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



## Setup



**Figure 2-4.** Absolute Amplitude Accuracy Across Frequency Verification Test Setup

### Measuring Amplitude Accuracy Across Frequency

1. Connect the equipment as shown in [Figure 2-4](#).

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

2. Set the MS271xE to Spectrum Analyzer mode and then preset the instrument.
3. Press the **Shift** key, then the **Sweep** (3) key, then the **Sweep Mode** submenu key, and then press the **Performance** submenu key.
4. Press the **BW** submenu key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
5. Press the **Span** submenu key, set span to 10 kHz.
6. Press the **Freq** soft key and set the Center Frequency to 10.1 MHz
7. Press the **Amplitude** soft key and set the Reference Level to -40 dBm and turn the Pre-Amp On.

8. Set the Attenuation Level to 15 dB.
9. 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 the 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.
10. Set the MG3692x frequency to 10.1 MHz CW.
11. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading for -50 dBm in [Table A-8 on page A-6](#).
12. On the MS271xE, press the **Marker** key and select Peak Search.
13. Record the Marker 1 amplitude reading in [Table A-9, "Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency" on page A-7](#).
14. Verify that the Marker 1 amplitude reading is within the specification.
15. Repeat [Step 6](#) through [Step 14](#) for other frequencies, input power, reference level, attenuation and pre-amp settings in [Table A-9](#).

## 2-7 Residual Spurious Response Verification

The following two tests are used to verify the residual spurious response of the Spectrum Analyzer of the MS271xE Spectrum Master and is performed using the positive peak detection mode.

The two parts to this test are:

- “Residual Spurious Response Test with Pre Amp Off”
- “Residual Spurious Response Test with Pre Amp On” on page 2-18.

### Residual Spurious Response Test with Pre Amp Off

#### Equipment Required

- Anritsu 28N50-2 50 ohm Termination

#### Procedure

1. Connect the 50 ohm Termination to the MS271xE Spectrum Analyzer RF In connector.
2. Press the **On/Off** key to turn on the MS271xE Spectrum Master.
3. On the MS271xE:
  - a. Press the **Shift** key and then the **Mode** (9) key.
  - b. Rotate the knob to highlight **Spectrum Analyzer** and then press the **Enter** key to switch to Spectrum Analyzer mode.
4. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** submenu key to reset the instrument to the default starting conditions.
5. Press the **Shift** key, then the **Sweep** (3) key, then the **Sweep Mode** submenu key, and then press the **Performance** submenu key.
6. Press the **Amplitude** main menu, then press the **Reference Level** submenu key.
7. Use the keypad to enter  $-40$  and press the **dBm** submenu key.
8. Press the **Atten Lvl** submenu key and enter 0, then press the **dB** submenu key.
9. Make sure that the **Pre Amp On/Off** submenu key is in the **Off** position.

If the preamp is on, then press the **Pre Amp On/Off** submenu key to turn it Off.
10. Press the **Amplitude** main menu, then press the **Detection** submenu key, and then the **Peak** soft key.
11. Press the **Freq** main menu key and press the **Start Freq** submenu key.
12. Use the keypad to enter 10 and press the **MHZ** submenu key.
13. Press the **Stop Freq** submenu key, enter 50, and press the **MHZ** submenu key.
14. Press the **BW** submenu key and press the **RBW** submenu key.
15. Use the keypad to enter 1 and press the **KHZ** submenu key.
16. Press the **VBW** submenu key, use the keypad to enter 300, and then press the **HZ** submenu key.
17. Wait until one sweep is completed.
18. Press the **Marker** main menu and press the **Peak Search** submenu key.
19. Verify that the Marker 1 amplitude reading is less than  $-90$  dBm.

**Note**

If a spur larger than  $-90$  dBm appears, then wait another full sweep and observe whether the spur re-appears at the same point on the second sweep.

If the spur does not appear at the same point on the second sweep, then the spur on the first sweep was not real.

20. Record the “Marker 1 amplitude” reading to [Table A-10, “Spectrum Analyzer Residual Spurious with Pre Amp Off” on page A-11.](#)
21. Repeat [Step 11](#) through [Step 20](#) for the other frequency band settings in [Table A-10](#) as applicable to the instrument under test.

## Residual Spurious Response Test with Pre Amp On

<b>Note</b>	This test is not applicable for MS2711E instruments that do not have Option 8 (Preamplifier) installed.
-------------	---

### Equipment Required

- Anritsu 28N50-2 50 ohm Termination

### Procedure

1. Connect the 50 ohm Termination to the MS271xE Spectrum Analyzer RF In connector.
2. Press the **On/Off** key to turn On the MS271xE Spectrum Master.
3. On the MS271xE, press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset the instrument to the default starting conditions.

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

5. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
6. Press the **Amplitude** main menu, then press the Reference Level submenu key.
7. Use the keypad to enter  $-50$  and press the dBm submenu key.
8. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
9. Make sure that the Pre Amp On/Off submenu key is in the On position. If the Pre Amp is Off, then press the Pre Amp On/Off submenu key to turn it On.
10. Press the **Amplitude** main menu key, then press the Detection submenu key, and then the Peak soft key.
11. Press the BW submenu key and press the RBW submenu key.
12. Use the keypad to enter 10 and press the kHz submenu key.
13. Press the VBW submenu key and use the keypad to enter 1, then press the kHz submenu key.
14. Press the **Freq** main menu key and press the Start Freq submenu key.
15. Use the keypad to enter 10 and press the MHz submenu key.
16. Press the Stop Freq submenu key, enter 1 and press the GHz submenu key.
17. Wait until one sweep is completed.
18. Press the **Marker** main menu and press the Peak Search submenu key.
19. Record the “**Marker 1 amplitude**” reading in the test records and verify that it is less than  $-90$  dBm. Use [Table A-11, “Spectrum Analyzer Residual Spurious with Pre Amp On” on page A-11.](#)

20. Repeat [Step 14](#) through [Step 19](#) for the other Start and Stop frequencies as applicable for the instrument under test, and record the results in [Table A-11](#).

**Note**

If a spur larger than  $-90$  dBm appears, then wait another full sweep and observe whether the spur re-appears at the same point on the second sweep.

If the spur does not appear at the same point on the second sweep, then the spur on the first sweep was not real.

## 2-8 Displayed Average Noise Level (DANL)

The following test is used to verify the Displayed Average Noise Level (DANL) of the spectrum analyzer systems in the MS271xE Spectrum Master. This test is performed using the RMS detection mode.

### Equipment Required

- Anritsu 28N50-2 50 ohm Termination

### Procedure

1. Connect the 50 ohm Termination to the MS271xE Spectrum Analyzer RF In connector.
2. Press the **On/Off** key to turn on the MS271xE Spectrum Master.
3. On the MS271xE, press the **Shift** key and then the **Mode** (9) key. Rotate the knob to highlight Spectrum Analyzer and then press the **Enter** key to switch to Spectrum Analyzer mode.
4. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key to reset the instrument to the default starting conditions.

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

5. Press the **Shift** key, then the **Sweep** (3) key, then the Sweep Mode submenu key, and then press the Performance submenu key.
6. Press the **Amplitude** main menu, then press the Reference Level submenu key.
7. Use the keypad to enter  $-20$  and press the dBm submenu key.
8. Press the Atten Lvl submenu key and enter 0, then press the dB submenu key.
9. Make sure that the Pre Amp is Off.
10. Press the **Amplitude** main menu key, then press the Detection submenu key, and then the RMS/AVG soft key.
11. Press the BW submenu key and press the RBW submenu key.
12. Use the keypad to enter 100 and press the kHz submenu key.
13. press the VBW submenu key.
14. Use the keypad to enter 1 and press the kHz submenu key.
15. Press the **Freq** main menu key and press the Start Freq submenu key.
16. Use the keypad to enter 10 and press the MHz submenu key.
17. Press the Stop Freq submenu key, enter 2.4, and press the GHz submenu key.
18. Wait until one sweep is completed.
19. Press the **Marker** main menu and then press Peak Search submenu key.
20. Record the Marker reading to the test records. Use the **Measured Value at 100 kHz RBW** column of [Table A-12](#), “Spectrum Analyzer DANL with Pre Amp Off” on page A-12.

**Note** The noise floor consists of totally random signals where a spur is a fixed spike of varying amplitude that is always visible.

21. Repeat [Step 15](#) through [Step 20](#) for the other frequency settings in [Table A-12](#) that are applicable for the instrument under test. Change the VBW setting as indicated in the **VBW** column of [Table A-12](#).

22. For each measured 100 kHz RBW value in the test record, convert it to 1 Hz RBW value by subtracting 50 dB.

$$-100 \text{ dBm} - 50 \text{ dB} = -150 \text{ dBm}$$

For example, if the marker shows a value of  $-100 \text{ dBm}$  at 100 kHz RBW, then the calculated value at 1 Hz RBW is  $-150 \text{ dBm}$ .

23. Enter the calculated values in the test records. Use the **Calculated for 1 Hz RBW** column of [Table A-12](#).
24. Verify that the calculated value is less than or equal to the value in the **Specification** column of [Table A-12](#).

<b>Note</b>	<a href="#">Step 25</a> through <a href="#">Step 29</a> are not applicable for MS2711E instruments that do not have Option 8 (Preamplifier) installed.
-------------	--

25. Press the **Amplitude** main menu, then press the Reference Level submenu key.
26. Use the keypad to enter  $-50$  and press the dBm submenu key.
27. Press the Pre Amp On/Off submenu key to turn the preamp On.
28. Repeat [Step 11](#) through [Step 24](#).
29. Record the Marker reading and calculated value in the test record using [Table A-13](#), “Spectrum Analyzer DANL with Pre Amp On” on page A-12.

## 2-9 Third Order Intercept (TOI) Verification

The following test verifies the Third Order Intercept point (also known as TOI or IP<sub>3</sub>) of the Spectrum Analyzer in the MS271xE

### Equipment Required

- Anritsu MG3692x Synthesizer (Qty 2)
- Anritsu ML2438A Power Meter
- Anritsu MA2442D Power Sensor
- Fixed Attenuator, Aeroflex/Weinschel Model 44-2 (Qty 2)
- Fixed Attenuator, Aeroflex/Weinschel Model 44-6 (Qty 2)
- Fixed Attenuator, Aeroflex/Weinschel Model 44-20 (Qty 2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Adapter, Anritsu Model 34NN50A
- Frequency Reference Symmetricom Rubisource T&M
- Anritsu 2000-1627-R RF Coaxial Cable (Qty 2)

### Procedure for 800 MHz TOI

1. Connect the 10 MHz Reference from the frequency reference to the 10 MHz Reference Inputs of the two MG3692x synthesizers and the MS271xE.
2. Zero/Cal the MA2442D Power Sensor, and set the calibration factor of the sensor to 800 MHz.
3. Connect the MA2442D Power Sensor to the input of the 1870A splitter.
4. Connect the 28 dB of Attenuation to each output side of the 1870A splitter.
5. Connect one MG3692x to one 28 dB attenuator and connect the other MG3692x to the other 28 dB attenuator. (The normal RF output connections will become input connections, and the normal input connection will become the RF output connection.)
6. Set one MG3692x to 799.951 MHz and set the other to 800.051 MHz.
7. Turn the RF Output of one MG3692x Off and turn On the other RF Output. Set the level of the MG3692x that is On so that the MA2442D sensor reads -20 dBm.
8. Turn Off the MG3692x that is On, and turn On the one that is Off. Set the level so that the MA2442D reads -20 dBm.
9. Disconnect the MA2442D from the splitter, and connect the splitter to the MS271xE RF In port using the 34NN50A adapter.
10. Turn On the RF Output of the Synthesizer that is off, so that both MG3692x Synthesizers are On.
11. Press the **On/Off** key to turn  $O_n$  the MS271xE Spectrum Master.

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

12. Put MS271xE into SPA Mode and Preset the instrument.
13. Using the Frequency menu, set the Center Frequency to 799.851 MHz and the Span to 100 Hz.
14. Using the BW menu, set the RBW to 10 Hz and VBW to 1 Hz.
15. Using the Amplitude menu set the Reference Level to -15 dBm, ensure that the Pre-Amp is Off, set Attenuation Level to 10 dB, and choose the Detection sub-menu and press RMS/Avg.
16. Using the Marker menu, press **Peak Search** and write down the level value.
17. Using the Frequency menu, set the Center Frequency to 800.151 MHz.
18. Using the Marker menu, press **Peak Search** and write down the level value.



19. Choose the larger of the two values from [Step 16](#) and [Step 18](#), and put this value into the following equation as the “max” variable.

$$\text{TOI} = -20 + [(-20 - \text{max}) / 2] \text{ dBm}$$

20. Record the maximum value and the calculated TOI value in the test record using [Table A-14](#), “Third Order Intercept (TOI) Verification” on [page A-12](#).

### Procedure for 2400 MHz TOI

1. Connect the 10 MHz Reference from the frequency reference to the 10 MHz Reference Inputs of the two MG3692x synthesizers and the MS271xE.
2. Zero/Cal the MA2442D Power Sensor, and set the calibration factor of the sensor to 2400 MHz.
3. Connect the MA2442D Power Sensor to the input of the 1870A splitter.
4. Connect the 28 dB of Attenuation to each output side of the 1870A splitter.
5. Connect one MG3692x to one 28 dB attenuator and connect the other MG3692x to the other 28 dB attenuator. (The normal RF output connections will become input connections, and the normal input connection will become the RF output connection.)
6. Set one MG3692x to 2399.951 MHz, and set the other to 2400.051 MHz.
7. Turn Off the RF Output of one MG3692x, and turn On the other RF Output. Set the level of the MG3692x that is On so that the MA2442D sensor reads –20 dBm.
8. Turn Off the MG3692x that is on, and turn On the one that is off, and set the level so that the MA2442D reads –20 dBm.
9. Disconnect the MA2442D from the splitter, and connect the splitter to the MS271xE’s RF In port using the 34NN50A adapter.
10. Turn On the RF Output of the Synthesizer that is off, so that both MG3692x Synthesizers are On.
11. Press the **On/Off** key to turn on the MS271xE Spectrum Master.

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

12. Put MS271xE into SPA Mode and Preset the instrument.
  13. Using the Frequency menu, set the Center Frequency to 2399.851 MHz and the Span to 100 Hz.
  14. Using the BW menu, set the RBW to 10 Hz and VBW to 1 Hz.
  15. Using the Amplitude menu, set the Reference Level to –15 dBm, ensure that the Pre-Amp is Off, set Attenuation Level to 10 dB, and then choose the Detection sub-menu and press RMS/Avg.
  16. Using the Marker menu, press **Peak Search** and write down the level value.
  17. Using the Frequency menu, set the Center Frequency to 2400.151 MHz.
  18. Using the Marker menu, press **Peak Search**, and write down the level value.
  19. Choose the larger of the two values from [Step 16](#) and [Step 18](#) and put this value into the following equation as the “max” variable.
- $$\text{TOI} = -20 + [(-20 - \text{max}) / 2] \text{ dBm}$$
20. Record the maximum value and calculated TOI value in the test record using [Table A-14](#).



# Chapter 3 — Option Verification

## 3-1 Introduction

This chapter describes the verification process for options that are available for the MS271xE Spectrum Master.

The following verification tests are included:

- “Bias Tee Verification, Option 10” on page 3-2
- “Tracking Generator Verification, Option 20” on page 3-5
- “2-Port Transmission Verification, Option 21” on page 3-6
- “Power Meter Level Accuracy, Option 29” on page 3-7
- “ISDB-T and BER Verification, Options 30 and 79” on page 3-10
- “GPS Verification, Option 31” on page 3-21
- “ISDB-T SFN Verification, Option 32” on page 3-23
- “GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880” on page 3-29
- “CDMA Signal Analyzer Verification, Option 42/43/884” on page 3-34
- “WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881” on page 3-38
- “Fixed WiMAX Signal Analyzer Verification, Option 46/47/885” on page 3-51
- “TD-SCDMA Signal Analyzer Verification, Option 60/61/882” on page 3-56
- “EVDO Signal Analyzer Verification, Option 62/63/884” on page 3-59
- “DVB-T/H Signal Analyzer Verification, Option 64, 57” on page 3-64
- “DVB-T/H SFN Verification, Option 78” on page 3-77
- “Mobile WiMAX Signal Analyzer Verification, Options 66/67/885” on page 3-80
- “LTE Signal Analyzer Verification, Options 541/542/883” on page 3-87
- “TD-LTE Signal Analyzer Verification, Options 551/552/883” on page 3-92

## 3-2 Bias Tee Verification, Option 10

This test verifies that the Bias Tee option in the Spectrum Master is functional. These tests include:

- “[Low Current Test Verification](#)”
- “[High Current Test Verification](#)” on page 3-3
- “[Fault Verification](#)” on page 3-4

### Low Current Test Verification

The tests in this section verify the Bias Tee Option 10 low current operation of the MS271xE in Transmission Measurement mode.

#### Equipment Required

- Anritsu 40-187-R External Power Supply
- Anritsu T3377 105 ohm Load

#### Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the MS271xE Spectrum Master.
2. Press the **On/Off** key to turn On the MS271xE.
3. Set the MS271xE to Transmission Measurement mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (8) key, then press the Applications Options submenu key.

#### Low Current Test

1. Press the **Bias Tee Voltage** submenu key and change voltage from 15 V to 12 V and confirm that the **Current** soft key is set to Low.
2. Connect the Anritsu T3377 105 ohm load to the RF In test port.
3. Press the **Bias Tee On/Off** submenu key to turn On the Bias Tee.
4. Record the Voltage and Current readings that are displayed on the left side of the screen into the **105 ohm Load Low Current** section of [Table A-15, “Option 10 Bias-Tee” on page A-13](#). Verify that the voltage and current readings are within the specification.
5. Press the **Bias Tee On/Off** submenu key to turn Off the Bias Tee.
6. Repeat [Step 3](#) through [Step 5](#), entering each of the voltage settings that are listed in the **105 ohm Load Low Current** section of [Table A-15](#).

## High Current Test Verification

The tests in this section verify the Bias Tee Option 10 high current operation of the MS271xE in Transmission Measurement mode.

### Equipment Required

- Anritsu 40-187-R External Power Supply
- Anritsu T2904 40 ohm Load
- Anritsu T3536 78 ohm Load

### Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the MS271xE Spectrum Master.
2. Press the **On/Off** key to turn On the MS271xE.
3. Set the MS271xE to Transmission Measurement mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (8) key, then press the Applications Options submenu key.

### High Current Test

1. Press the **Bias Tee Voltage** submenu key and verify that the voltage setting is 15 V, confirm that the **Current** soft key is set to High.
2. Connect the Anritsu T2904 40 ohm load to the RF In test port.
3. Press the **Bias Tee On/Off** submenu key to turn On the Bias Tee.
4. Record the Voltage and Current readings that are displayed on the left side of the screen into the **40 ohm Load High Current** section of [Table A-15](#). Verify that the voltage and current readings are within the specification.
5. Press the **Bias Tee On/Off** submenu key to turn Off the Bias Tee. Disconnect the Anritsu T2904 40 ohm load, and connect the Anritsu T3536 78 ohm load to the RF In port.
6. press the **Bias Tee Voltage** submenu key and enter 32 V.
7. Press the **Bias Tee On/Off** submenu key to turn On the Bias Tee.
8. Record the Voltage and Current readings that are displayed on the left side of the screen into the **78 ohm Load High Current** section of [Table A-15](#). Verify that the voltage and current readings are within the specification.
9. Press the **Bias Tee On/Off** submenu key to turn Off the Bias Tee.

## Fault Verification

The tests in this section verify the Bias Tee Option 10 fault condition of the MS271xE in Transmission Measurement mode.

### Equipment Required

- Anritsu 40-187-R External Power Supply
- Anritsu T2904 40 ohm Load

### Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the MS271xE Spectrum Master.
2. Press the **On/Off** key to turn On the MS271xE.
3. Set the MS271xE to Transmission Measurement mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (8) key, then press the Applications Options submenu key.

### Fault Test

5. Press the Bias Tee submenu key and confirm that the Current submenu key is set to Low.
6. Press the Bias Tee Voltage submenu key and enter 32 V.
7. Connect the Anritsu T2904 40 ohm load to the RF In port.
8. Press the Bias Tee On/Off submenu key to turn On the Bias Tee.
9. Verify that the instrument indicates a “**Bias-T Fault Condition**” and makes a clicking sound, and that the Bias Tee current reading is displayed on the left side of the screen is 0 mA.
10. Press the Bias Tee On/Off submenu key to turn Off the Bias Tee.

### 3-3 Tracking Generator Verification, Option 20

The following test can be used to verify the performance of the Tracking Generator Option. Measurement calibration of the MS271xE in Spectrum Analyzer mode is required, and Option 20 must be installed.

#### Equipment Required

- Coaxial Cable Fixture with embedded 3 dB attenuators, 806-244-R
- Mountz 06004C-099 torque wrench

#### Procedure

1. Install Coaxial Cable with 3 dB (or greater) attenuators at the RF Out port and RF In port. Anritsu part number 806-244-R (Coaxial Cable with embedded 3 dB attenuators) can be used for this step.
2. Install the Calibration Cable fixture between the RF Out port and RF In port. Torque the attenuators of part number 806-244-R to 12 lbf·in with a torque wrench.
3. Verify that the MS271xE is in Spectrum Analyzer mode, and preset the instrument.
4. Press the **Freq** main menu key, and set the Start Freq to 500 kHz.
5. Press the **Shift** key, then press the **Measure** (4) key.
6. Press the **Generator** submenu key and then set the Output Power to -5 dBm.
7. Set the Generator Output to On.
8. Set the Generator Mode to Tracking.
9. Press the **Settings** submenu key and then the Enhanced Generator Power Accuracy submenu key.
10. Press the Enhanced Accuracy Calibration submenu key, and then press the **Enter** key to start the calibration.
11. After the calibration is complete, press the **Back** submenu key.
12. Set the Power Statistics to On.
13. Read the Maximum Power value and Minimum Power value from the Tracking Generator Summary table on the bottom of the LCD display.
14. Divide the difference of the Maximum Power value and Minimum Power value by two.  
$$(\text{Max} - \text{Min}) / 2$$
15. Record the result to [Table A-16, "Option 20, Tracking Generator Verification" on page A-13](#).

## 3-4 2-Port Transmission Verification, Option 21

The following test can be used to verify the system dynamic range. Measurement calibration of the MS271xE in Transmission mode and Option 21 is required.

### Equipment Required

- Anritsu 28N50-2 50 ohm Termination
- Anritsu 28NF50-2 50 ohm Termination
- Anritsu 15NN50-1.0B RF Coaxial Cable

### Procedure

1. Connect RF Coaxial Cable between the RF Out (Reflection In) and RF In ports. Torque the connectors to 12 lbf·in with a torque wrench
2. Verify that the MS271xE is in Transmission Measurement mode and preset the instrument.
3. Press the **Shift** key, then press the **Sweep** (3) key.
4. Verify that High Dynamic Range is set to On.
5. Verify that the Output Power is set to High.
6. Press the **Measure** (4) key.
7. Press the **Start Cal** submenu key and follow the on screen instructions to perform the calibration.
8. After the calibration is complete, disconnect the cable from the RF In port and connect loads so that both the cable and RF In port are terminated.
9. Press the **Sweep** main menu key, and press **Averaging**. Verify that **Averaging Off** is selected, indicated by the red dot in the top right-hand corner.
10. Press the **Amplitude** main menu key and set the Top to  $-50$  dB and the Scale to 10 dB/div.
11. Press **Shift**, then **Limit** (6), and set the Limit to On.
12. Press the Multi-Segment Edit submenu key and set the Frequency to 2 MHz.
13. Press the **Amplitude** main menu key and set the value to  $-80$  dB.
14. Press **Add Point**, then press **Frequency**, and enter 3.0 GHz for the MS2711E, or enter 4.0 GHz for the MS2712E and MS2713E.
15. Press the **Amplitude** main menu key and set the value to  $-80$  dB.
16. Perform the following steps for MS2713E instruments only:
  - a. Press **Add Point**, press **Frequency**, and enter 4.01 GHz.
  - b. Press the **Amplitude** main menu key and set the value to  $-70$  dB.
  - c. Press **Add Point**, then press **Frequency** and enter 6.00 GHz.
  - d. Press the **Amplitude** main menu key and set the value to  $-70$  dB.
17. Verify that the trace is below the limit line (the data will be unstable, but should remain below the limit lines.)
18. Use a marker to find the maximum peak of each frequency band and enter the values in dBm in [Table A-17, “Option 21, Dynamic Range Verification” on page A-13.](#)



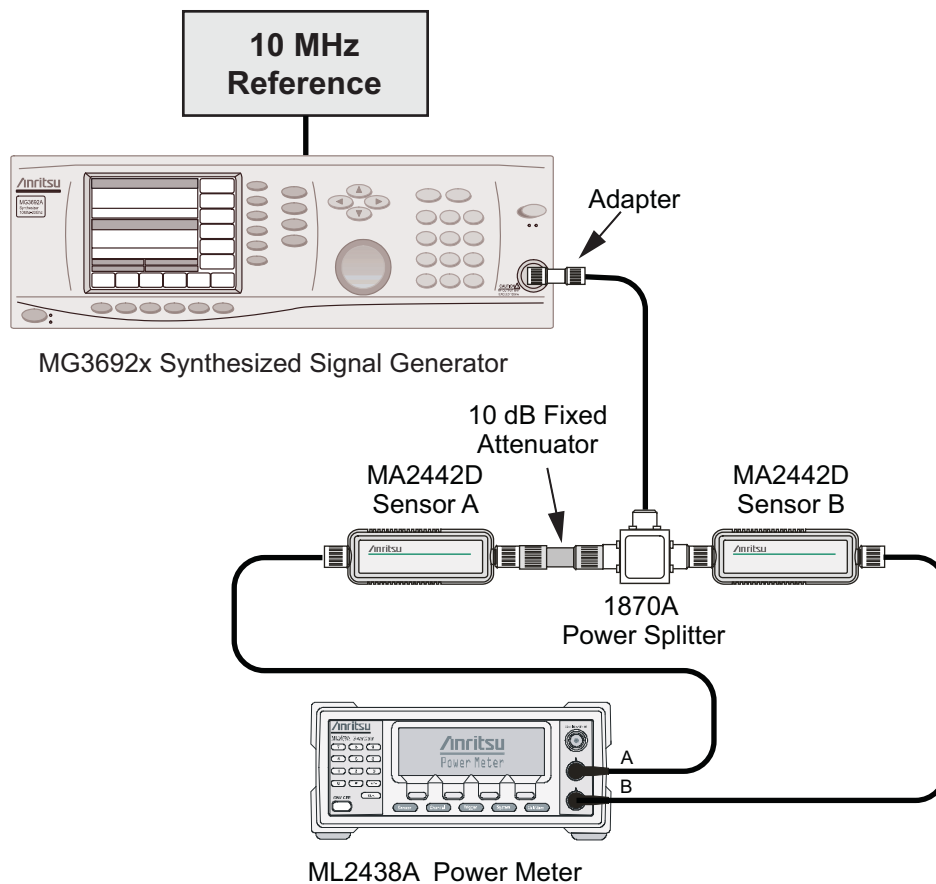
### 3-5 Power Meter Level Accuracy, Option 29

The following test verifies the level accuracy of the optional Power Meter function in the MS271xE.

#### Equipment Required

- Anritsu MG3692X Synthesized Signal Source
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 ohm Adapter
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- 10 MHz Reference Standard

#### Setup



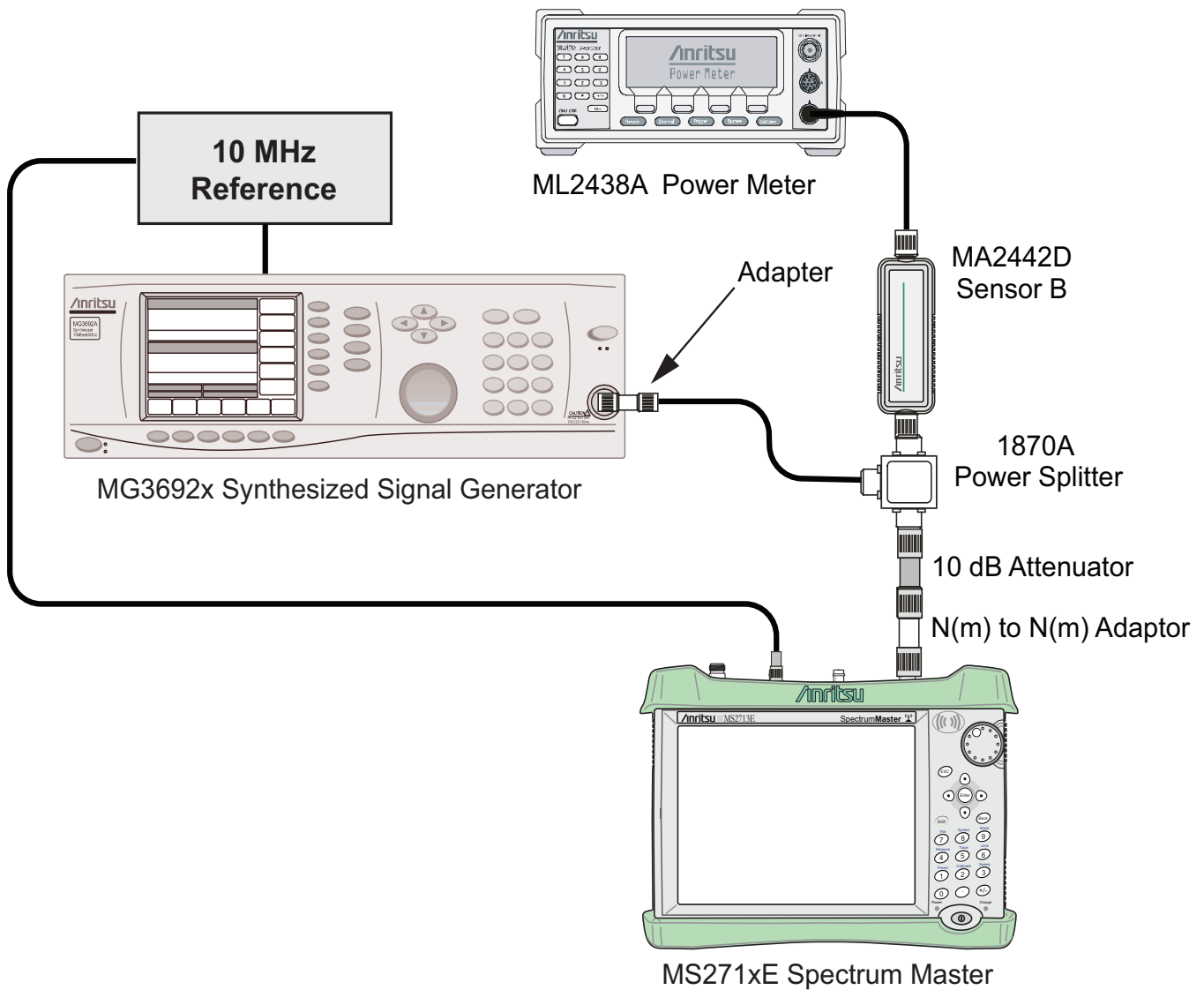
**Figure 3-1.** Power Meter Measurement Accuracy

**Procedure Component Characterization**

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the model 1870A power splitter to the MG3692A/B output, and connect Sensor B to one of the power splitter outputs as shown in [Figure 3-1 on page 3-7](#).
3. Install the 10 dB Fixed Attenuator to the other power splitter output, and then connect Sensor A to the end of the Attenuator.
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 MG3692A/B 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 power level of the MG3692A/B to get a reading on Sensor A that matches the power level (within  $\pm 0.1$  dB) in the first column of [Table A-18, “Characterization Chart for Power Meter Verification” on page A-14](#).
6. Record the Sensor B reading in the **Required Sensor B Reading** column of [Table A-18](#).
7. Repeat [Step 5](#) and [Step 6](#) for the other power level in the first column of [Table A-18](#), recording the Sensor B reading in the second column.
8. Repeat [Step 4](#) through [Step 7](#), for the next input frequency.

## Power Meter Measurement Accuracy Procedure

1. Connect the equipment as shown in [Figure 3-2](#).



**Figure 3-2.** Power Meter Measurement Accuracy

2. Verify that the MS271xE is in the Power Meter mode and preset the instrument.
3. Set the MS271xE span to 3 MHz.
4. Set the MS271xE center frequency to 50 MHz.
5. Adjust the MG3692A/B power so that the power meter Sensor B matches the Sensor B value shown in [Table A-18](#).
6. Record the reading on the MS271xE display in [Table A-19](#), “Internal Power Meter Accuracy Verification” on page A-14.
7. Repeat [Step 5](#) and [Step 6](#) for the next test power level in [Table A-18](#).
8. Repeat [Step 4](#) through [Step 6](#) for the next test frequency in [Table A-18](#).

## 3-6 ISDB-T and BER Verification, Options 30 and 79

### Introduction

The tests in this section verify the performance of the optional ISDB-T Signal Analyzer option of the MS271xE. These tests include:

- [“Frequency Accuracy Verification” on page 3-11](#)
- [“Frequency Lock Range Verification” on page 3-12](#)
- [“Level Accuracy Verification” on page 3-14](#)
- [“Displayed Average Noise Level \(DANL\) Verification” on page 3-17](#)
- [“Phase Noise Verification” on page 3-17](#)
- [“BER Measurement Functional Check, Option 79 Only” on page 3-19](#)

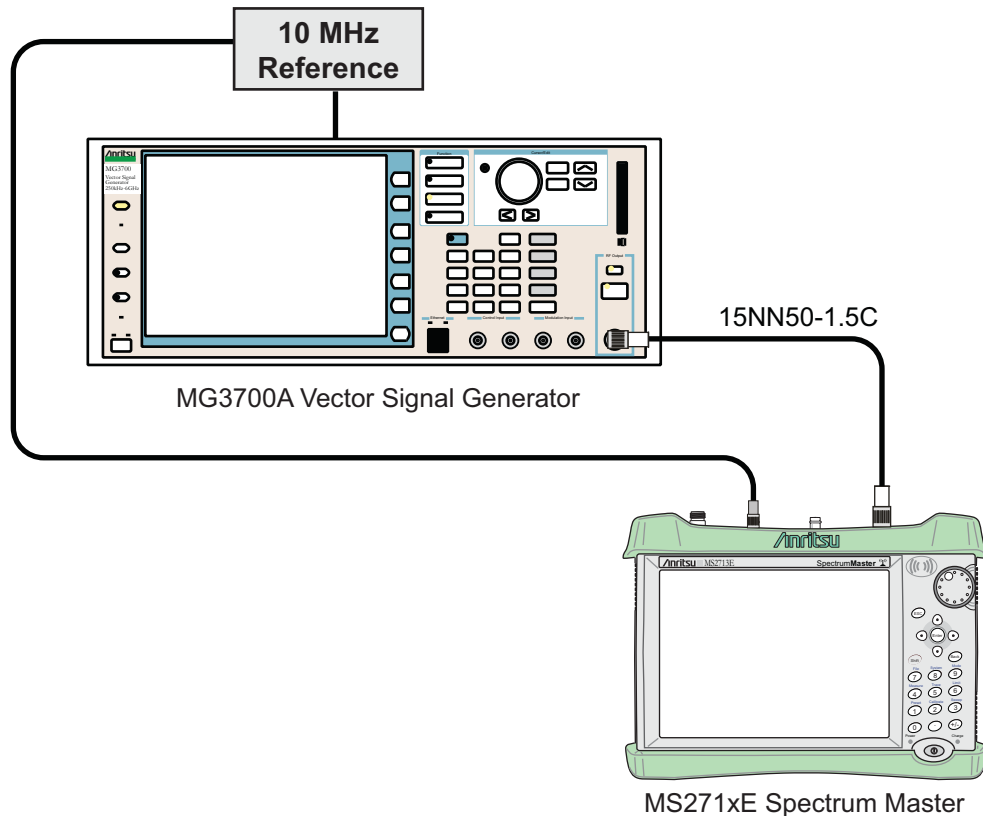
### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cables (3)
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Anritsu 28N50-2 Termination
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)
- 10 MHz Reference Standard

## Frequency Accuracy Verification

The test in this section can be used to verify the frequency accuracy of the MS271xE in ISDB-T Signal Analyzer mode.

### Setup



**Figure 3-3.** ISDB-T Signal Analyzer Test Setup

### Procedure

1. Connect the equipment as shown in [Figure 3-3](#).
2. On MG3700A press the **Preset** key (Yellow key on the upper-left hand side)
3. Press the **Down Arrow** key to select Yes.
4. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

5. Press the (F1) soft key to select Load File to Memory.
6. Press the (F1) soft key again to select Select Package.
7. Using the **Down Arrow** key, step through the selection list until the **Digital\_Broadcast** option is highlighted.
8. Press the **Set** key.
9. Press the (F6) soft key (Return).
10. Press the **Set** key.

11. Using the **Down Arrow** key, then step through the selection list until the **Digital\_Broadcast** option is highlighted.
12. Press the **Set** key.
13. Using the **Down Arrow** key, step through the selection list until the **ISDB-T\_1layer\_1ch** option is highlighted.
14. Press the **Set** key.
15. Set the frequency to 473.14285714 MHz.
16. Set the level to -20 dBm.
17. Confirm that the **Modulation On/Off** key and the Output key both have LEDs On.
18. Set the mode of the MS271xE to **ISDB-T Signal Analyzer**. Press the **Shift** key, then the **Preset (1)** key, and then press the **Preset** submenu key to reset the instrument.
19. Confirm that the Channel is set to 13.
20. Press the **Meas Selection** submenu key, then press **Modulation Analysis**.
21. On the MS271xE, press the **Frequency/Level** submenu key, and set the Reference Level to -20dBm.
22. Press the **Meas Setup** submenu key and then the **Meas Mode** submenu key.
23. Use the rotary knob to highlight “**Average**” and then press the **Enter** key.
24. Set the Average Count to 10.
25. Wait until the Average (10/10) appears at the top of the display.
26. Record the frequency error as shown on the MS271xE display into [Table A-20, “ISDB-T Signal Analyzer Frequency Accuracy” on page A-15](#).
27. Using the **Frequency/Level** menu, set the MS271xE to Channel 38.
28. Set the frequency of the MG3700A to 623.14285714 MHz.
29. Press the **Execute Measure** main menu key.
30. Wait until the Average (10/10) appears at the top of the display.
31. Record the frequency error as shown on the MS271xE display into [Table A-20](#).
32. Set the MS271xE to Channel 62.
33. Set the frequency of the MG3700A to 767.14285714 MHz.
34. Press the **Execute Measure** main menu key.
35. Wait until the Average (10/10) appears at the top of the display.
36. Record the frequency error as shown on the MS271xE display into [Table A-20](#).
37. On the MG3700A, set the frequency to 473.14285714 MHz and the output level to -50 dBm.
38. On the MS271xE, press the **Frequency/Level** main menu key, then press the **Pre Amp** submenu key to turn Pre Amp On.
39. Set the Reference Level to -50dBm and change the channel to 13.
40. Press the **Execute Measure** main menu key.
41. Repeat [Step 25](#) through [Step 36](#) and record the results in [Table A-20](#).

## Frequency Lock Range Verification

The test in this section can be used to verify the frequency lock range of the MS271xE in ISDB-T Signal Analyzer mode.

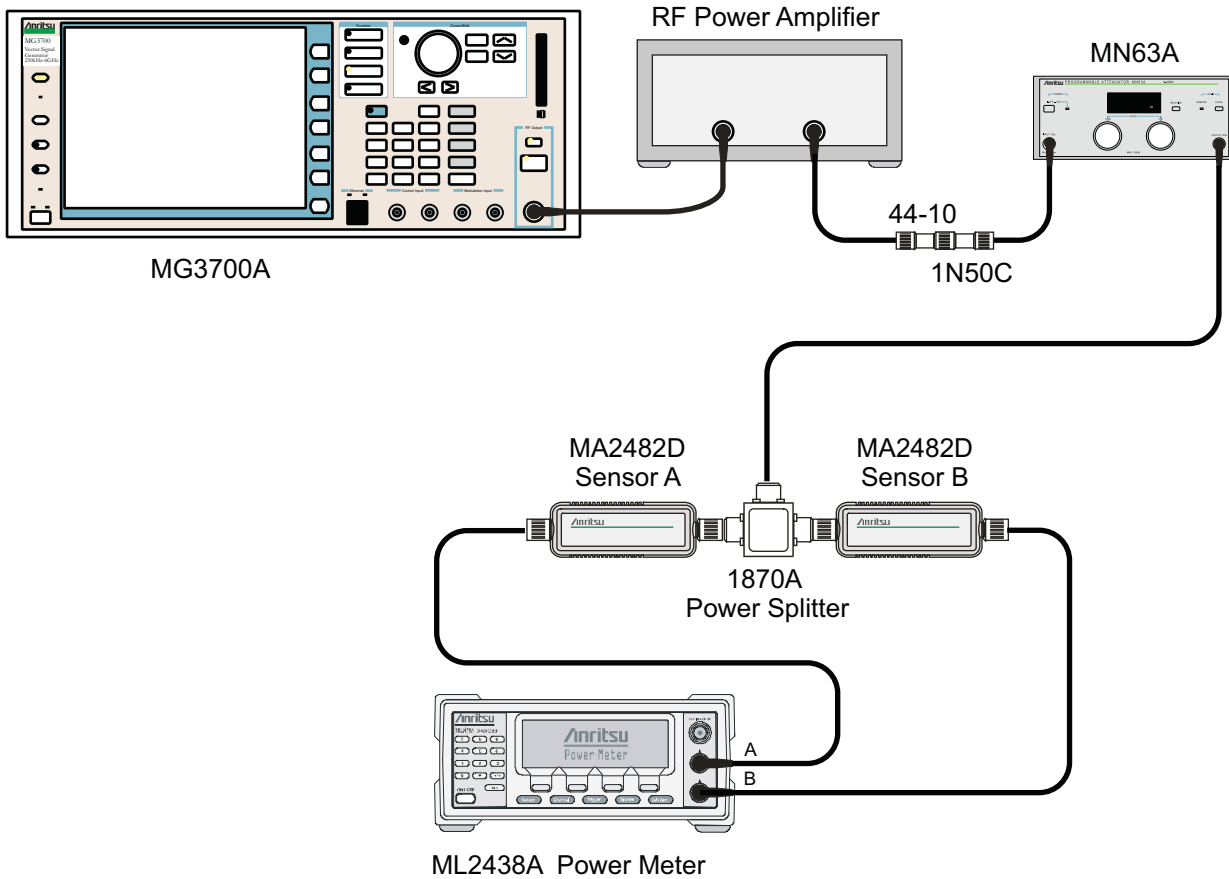
**Procedure**

1. Connect the equipment as shown in [Figure 3-3 on page 3-11](#).
2. Preset the MG3700A.
3. Load the “**ISDB-T\_1layer\_1ch**” pattern on the MG3700A. Refer to “[Frequency Accuracy Verification on page 3-11](#)” if needing help on loading patterns.
4. Set the frequency to 473.23285714 MHz.
5. Set the level to –20 dBm.
6. Confirm that the **Modulation On/Off** key and the **Output** key both have LEDs On.
7. Set the mode of the MS271xE to **ISDB-T Signal Analyzer**. Press the **Shift** key and the **Preset** (1) key, and then press the **Preset** submenu key to preset the instrument.
8. On the MS271xE, press the **Frequency/Level** main menu key and confirm that Channel is set to 13.
9. Set the Reference Level to –20 dBm.
10. Press the **Meas Selection** main menu key and press **Modulation Analysis**.
11. Press the **Meas Setup** main menu key and then the **Meas Mode** submenu key.
12. Use the rotary knob to highlight **Average** and press the **Enter** key.
13. Press the **Average Count** submenu key, then enter 10, and press the **Enter** key.
14. Wait until **Average (10/10)** appears at the top of the display.
15. Record the Frequency Error into [Table A-21, “ISDB-T Signal Analyzer Frequency Lock Range” on page A-15](#).
16. On the MG3700A, set the frequency to 473.05285714 MHz.
17. Press **Execute Measure** to read the new frequency.
18. Wait until **Average (10/10)** appears at the top of the display.
19. Record the frequency error into [Table A-21](#).

## Level Accuracy Verification

The tests in this section verify the level accuracy of the MS271xE in ISDB-T Signal Analyzer mode.

### Setup



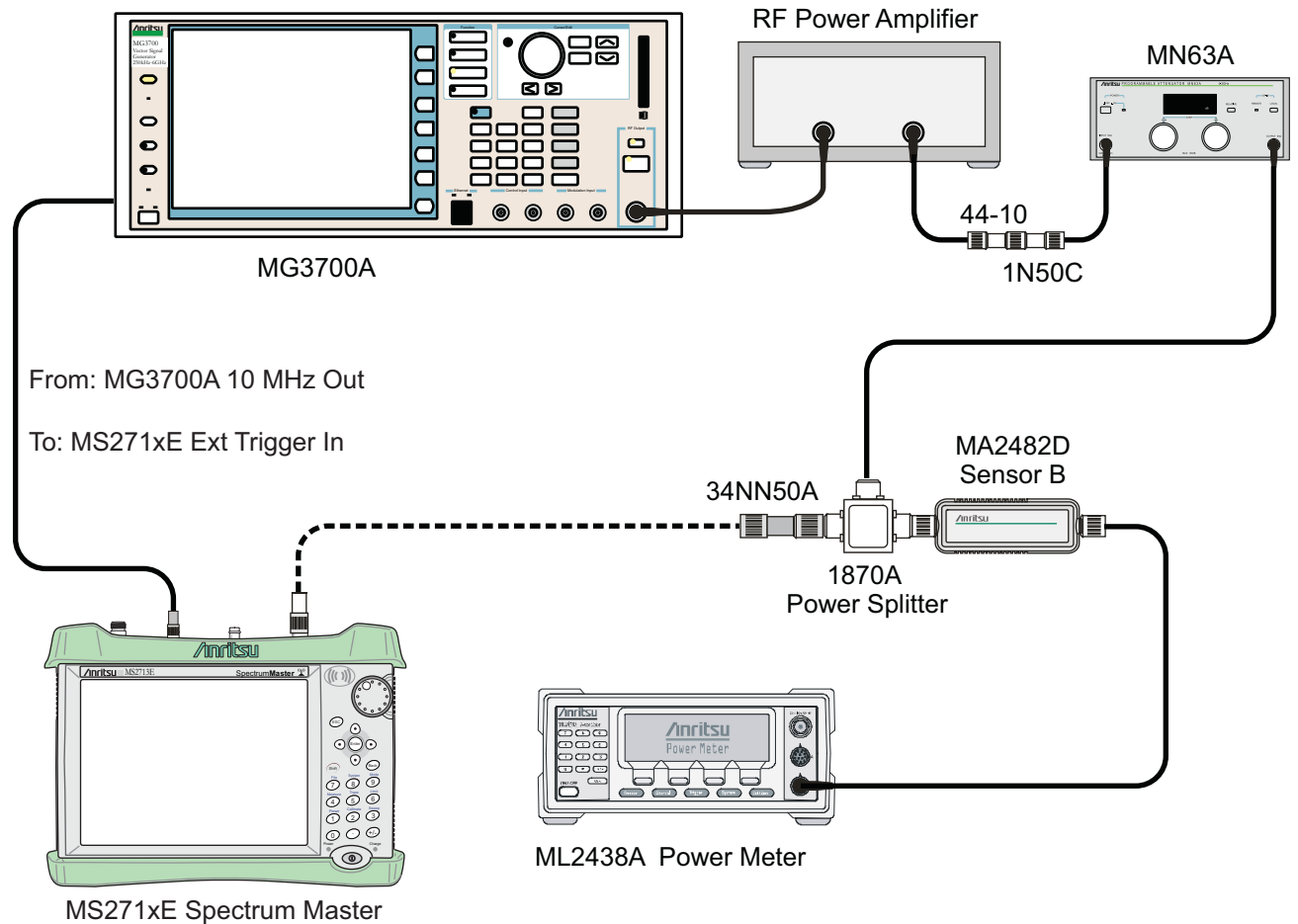
**Figure 3-4.** ISDB-T Level Accuracy Pre-test Setup

### Procedure

1. Perform a Zero/Cal on Sensor A and Sensor B of the power meter. Set the calibration factor on both sensors to 473 MHz.
2. Confirm that the Power Amplifier is Off.
3. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-4](#).
4. Preset the MG3700A.
5. Load the “ISDB-T\_1layer\_1ch” pattern on the MG3700A. Refer to [“Frequency Accuracy Verification” on page 3-11](#) if needing help on loading patterns.
6. Set the MG3700A frequency to 473.14285714 MHz.
7. Set the MG3700A level to  $-25$  dBm.
8. Confirm that the **Modulation On/Off** key and the **Output** key both have LEDs On.
9. Turn On the power amplifier and allow it to warm up for at least 5 minutes.
10. Adjust the MN63A attenuator so that the Sensor A reading is  $-10$  dBm  $\pm$  1 dB. Record the attenuation reading in the AT(-10) column of [Table A-22, “Level Accuracy Verification, AT\(-10\)” on page A-15](#).



11. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is  $-10.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
12. Record Power Meter Sensor A reading and Sensor B reading in [Table A-22](#).
13. Subtract Sensor A reading from Sensor B reading and record the result in the  $\Delta AB(-10)$  column of [Table A-22](#).
14. Calculate the AT(set) values for Test Levels  $-10 \text{ dBm}$  through  $-45 \text{ dBm}$  and record the values to the AT(set) column of [Table A-24](#), “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz” on page A-16.
15. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS271xE Spectrum Analyzer RF In with an N male to N male adapter as shown in [Figure 3-5](#).



**Figure 3-5.** ISDB-T Level Accuracy Post-test Setup

16. Record the new Power Meter Sensor B reading to the **SB(-10)** box in [Table A-24](#).
17. On MS271xE, set the mode to ISDB-T Signal Analyzer and preset the instrument.
18. Press the **Meas Selection** main menu key, confirm Field Strength is selected.
19. Press the **Frequency/Level** main menu key. Ensure that the Channel is 13 and the Pre Amp is Off.
20. Change the Reference Level to  $-10 \text{ dBm}$ .
21. Press the **Meas Setup** main menu key and then the Meas Mode submenu key.
22. Use **Up/Down** arrow keys to highlight Average and then press the **Enter** key.
23. Change the Average Count to 50.

24. After Average (50/50) appears at the top of the display, record the Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp Off** in [Table A-24](#).
25. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

**Note** Because AT(-10) is the same as AT(set), then  $[- \text{AT}(-10) + \text{AT}(\text{set})] = 0$

26. Record the result into the **Dev** column under **Pre Amp Off** in [Table A-24](#) and verify that it's within specification.
27. Set the MN63A attenuation to the next **AT(set)** value in [Table A-24](#).
28. Press the **Frequency/Level** main menu key and set the Reference Level of the MS271xE to -15 dBm.
29. After Average (50/50) appears, record the -15 dBm channel power from the MS271xE into the **M(Level)** column under **Pre Amp Off** in [Table A-24](#).
30. Calculate the Deviation using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
31. Record the result to the **Dev** column under **Pre Amp Off** in [Table A-24](#) and verify that it's within specification.
32. Set the MN63A attenuation to the next **AT(set)** value in [Table A-24](#).
33. Set the Reference Level of MS271xE to -20 dBm.
34. After Average (50/50) appears, record the -20 dBm Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp Off** in [Table A-24](#).
35. Calculate the Deviation using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
36. Record the result in the **Dev** column under **Pre Amp Off** in [Table A-24](#) and verify that it's within specification.
37. Press the **Frequency/Level** main menu key and set Pre Amp to On. Change the Reference Level if required.
38. After Average (50/50) appears, record the -20 dBm Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp On** in [Table A-24](#).
39. Calculate the Deviation using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
40. Record the result to the **Dev** column under **Pre Amp On** in [Table A-24](#) and verify that it's within specification.
41. Repeat [Step 32](#) through [Step 40](#) for test levels -25 dBm to -45 dBm. Change Reference Level and switch Pre Amp per the **Pre Amp On** or **Pre Amp Off** columns in the test record.
42. Turn **Off** the power amplifier, disconnect the power splitter from the MS271xE, and re-connect Sensor A to the power splitter as shown in [Figure 3-4 on page 3-14](#).
43. Set the MN63A attenuation to 10 dB.
44. Set the MG3700A level to -60 dBm.
45. Turn **On** the power amplifier and allow it to warm up for at least 5 minutes.
46. Adjust the MN63A attenuator so that the Sensor A reading is -50 dBm  $\pm$  1 dB. Record the attenuation reading in [Table A-23, "Level Accuracy Verification, AT\(-50\)" on page A-15](#) as **AT(-50)**.
47. On the MG3700A, adjust power level so that the Power Meter Sensor A reading is -50.0 dBm  $\pm$  0.2 dB.
48. Record Power Meter Sensor A and Sensor B readings in [Table A-23](#).

49. Subtract Sensor A reading from Sensor B reading and record the result in the  $\Delta AB(-50)$  column of [Table A-23](#).
50. Calculate the  $AT(\text{set})$  values for test levels  $-55$  dBm through  $-84$  dBm and record the values into the  $AT(\text{set})$  column in [Table A-24](#).
51. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS271xE Spectrum Analyzer RF In with an N male-to-N male adapter.
52. Record the new Power Meter Sensor B reading into the  $SB(-50)$  box in [Table A-24](#).
53. Repeat [Step 32](#) through [Step 40](#) for Test levels  $-50$  dBm to  $-84$  dBm. Change Reference Level and switch Pre Amp per the **Pre Amp On** or **Pre Amp Off** columns in the test record. Use the following formula to calculate Deviation:
 
$$\text{Deviation} = M(\text{Level}) - SB(-50) - \Delta AB(-50) - AT(-50) + AT(\text{set})$$
54. Repeat [Step 5](#) through [Step 53](#) for frequencies 623.14285714 MHz (Ch 38) and 767.14285714 MHz (Ch 62). Set the calibration factor of both power sensors to 623 MHz or 767 MHz as required.
55. Record the results in [Table A-25](#), “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz” on page A-17 and [Table A-26](#), “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz” on page A-18.

### Displayed Average Noise Level (DANL) Verification

The tests in this section verify the noise floor of the MS271xE in ISDB-T Signal Analyzer mode.

#### Procedure

1. Set the mode of the MS271xE to ISDB-T Signal Analyzer and preset the instrument.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Press the **Meas Selection** main menu key, then press Field Strength.
4. Press the **Frequency/Level** main menu key and confirm the channel is set to 13 and Pre Amp is Off.
5. Set the Reference Level to  $-25$  dBm.
6. Press the **Meas Setup** main menu key. Change Meas Mode to **Average** and leave Average Count set to 50.
7. After Average (50/50) appears, record the Channel Power in [Table A-27](#), “ISDB-T Signal Analyzer DANL with Pre Amp Off” on page A-19.
8. Set the Reference Level to  $-50$  dBm and the Pre Amp to On.
9. After Average (50/50) appears, record the Channel Power in [Table A-28](#), “ISDB-T Signal Analyzer DANL with Pre Amp On” on page A-19.
10. Change the channel to 38. Set the Pre Amp to Off.
11. Repeat [Step 5](#) through [Step 9](#) for Channel 38
12. Change the channel to 62. Set the Pre Amp to Off.
13. Repeat [Step 5](#) through [Step 9](#) for Channel 62.

### Phase Noise Verification

This test verifies the phase noise of the MS271xE in the ISDB-T Signal Analyzer mode.

1. Connect the 10 MHz Frequency Reference signal to the MG3700A and the MS271xE.
2. Set the MG3700A frequency to 473.14285714 MHz. Set the level to  $-10$  dBm.
3. Press the **Mod On/Off** key so that the LED is Off.
4. Input the RF signal from MG3700A into the MS271xE Spectrum Analyzer RF In.

5. Set the mode of the MS271xE to **ISDB-T Signal Analyzer** and preset the instrument.
6. Press the **Frequency/Level** main menu key and confirm that the instrument is set to Channel 13. Change the Reference Level to  $-10$  dBm and ensure that the Pre Amp is Off.
7. Press the **Meas Selection** main menu key and press Phase Noise (red dot appears on label).
8. Press the **Meas Setup** main menu key and then the Meas Mode submenu key. Use the **Down Arrow** key to select **Average** and press the **Enter** key.
9. Wait until Average counter displays (10/10).
10. Record the 10 kHz and the 100 kHz phase noise readouts in [Table A-29](#), “ISDB-T Signal Analyzer Phase Noise” on page A-19.
11. Record the Frequency Error in [Table A-29](#).
12. Set the frequency of the MG3700A to 623.14285714 MHz and change the MS271xE Channel to 38.
13. Wait until Average counter displays (10/10).
14. Record the 10 kHz and the 100 kHz phase noise readouts in [Table A-29](#).
15. Record the Frequency Error in [Table A-29](#).
16. Set the frequency of the MG3700A to 767.14285714 MHz and change the MS271xE Channel to 62.
17. Wait until Average counter displays (10/10).
18. Record the 10 kHz and the 100 kHz phase noise readouts in [Table A-29](#).
19. Record the Frequency Error in [Table A-29](#).

## BER Measurement Functional Check, Option 79 Only

This section provides the procedures to check the functionality of the BER measurement hardware that is included with Option 79 in the Spectrum Master ISDB-T Analyzer.

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

### Procedure:

1. Turn on the MG3700A and Spectrum Master.
2. Connect the MG3700A Signal Generator and Spectrum Master as shown in [Figure 3-3 on page 3-11](#).
3. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
4. Press the **Down Arrow** key to select **Yes**.
5. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
6. Set the MG3700A Frequency to 473.142857 MHz.
7. Press the **Baseband** key.
8. Press the **More** key located at the bottom of the row.
9. Press the F5 Pattern Combination soft key as required until Edit appears.
10. Press the **More** key.
11. Press the F3 soft key so that **Output B** appears.
12. Press the **Baseband** key and then the F1 soft key.
13. Press the F2 soft key so that **Memory A** is highlighted.
14. Press the F1 key and use the **Down Arrow** key to highlight **Digital\_Broadcast**.
15. Press the **Set** key.
16. Use the **Arrow** key to highlight **ISDBT\_6M\_AWGN** and press the **Set** key. If an Overwrite question appears, answer **Yes**.
17. Press the F2 soft key so that **Memory B** is highlighted
18. Highlight **ISDBT\_3\_LAYER** and press the **Set** key. If an Overwrite question appears, answer **Yes**.
19. Press the F6 (Return) soft key.
20. Use the **Arrow** keys to highlight the blank line between **Pattern:[** and the small green **A** memory symbol.
21. Press the **Set** key.
22. Ensure that **Digital\_Broadcast** is highlighted and press the **Set** key.
23. Ensure that **ISDBT\_6M\_AWGN** is highlighted and press the **Set** key.
24. Use the **Arrow** keys to highlight the blank line between **Pattern:[** and the small violet **B** memory symbol.
25. Press the **Set** key.
26. Ensure that **Digital\_Broadcast** is highlighted and then press the **Set** key.
27. Ensure that **ISDBT\_3\_LAYER** is highlighted and then press the **Set** key.
28. Press the **MOD On/Off** and **Output** keys so that both LEDs are ON (illuminated).
29. Adjust the Level so that the MG3700A reads  $-25.0$  dBm.

30. Set the Spectrum Master to **ISDB-T Signal Analyzer** mode and preset the instrument.
31. Ensure that the Channel is set to 13, press Auto Reference Level, and ensure that the Pre Amp is set to Off.
32. Press the **Meas Selection** main menu key, then choose BER. Press the Stop Measurement soft key.
33. To verify option 79 is functional, press the **Start Measurement** main menu key and verify that the Signal Sync turns from Unlocked to Locked.

## 3-7 GPS Verification, Option 31

This test verifies that the GPS option of the Spectrum Master is functional.

### Frequency Accuracy Verification

The test in this section verifies the frequency accuracy of the spectrum analyzer with GPS enabled for the MS271xE.

#### Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1528-R GPS Antenna
- Anritsu 2000-1627-R RF Coaxial Cable

#### Procedure

1. Connect the GPS antenna to the GPS Antenna connector on the MS271xE. On the MS271xE, change the mode to Spectrum Analyzer and preset the instrument.

#### Note

If a fixed GPS antenna is not available, then the Anritsu 2000-1528-R GPS antenna can be used for this test.

Confirm that the Anritsu 2000-1528-R GPS antenna is in direct line-of-sight relationship to the satellites by placing the antenna outside without any obstructions.

2. Press the **Shift** key and then the **System** key.
3. Press the GPS submenu key, then press the GPS On/Off submenu key to turn On the GPS.
4. When the GPS fix is acquired, the GPS indicator at the top of the LCD display turns green.
5. The latitude and the longitude are also displayed next to the GPS indicator.
6. Wait for approximately three minutes after the Reference Source indicator in the lower left-hand corner of the LCD display has changed to **GPS High Accuracy**.

#### Note

If GPS fix is acquired using the Anritsu 2000-1528-R GPS antenna placed outside, then bringing the instrument inside causes loss of satellite tracking. A red cross appears on the green GPS indicator, and the Reference Source indicator changes to "Int Std Accy". The following test will verify frequency accuracy to a lesser specification.

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

**Caution** Do not connect the external 10 MHz Reference to the MS271xE Spectrum Master.

8. Connect the output of the Signal Generator to the Spectrum Analyzer RF In of the MS271xE.
9. Set the MG3692x output to 2.9 GHz CW, with an RF output level of  $-30$  dBm.
10. On the MS271xE, press the **Amplitude** key, and set the Reference Level to  $-10$  dBm.
11. Press the **Freq** main menu key and set the center frequency to 2.9 GHz.
12. Press the **Span** main menu key and set the span to 10 kHz.

13. Press the **BW** main menu key and set RBW to 100 Hz.
14. Press the VBW submenu key and set to 30 Hz.
15. Press the **Marker** main menu key, and then press the **Peak Search** submenu key.
16. Note the Reference Source value, and use the appropriate row to record the data in the following steps.
17. Record the marker frequency in the **Measured Value** column of [Table A-30, “Option 31 GPS Receiver” on page A-20](#).
18. Subtract the marker value from 2.9 GHz and record the result in the **Error** column of [Table A-30](#). Verify that it's within specification.
19. If the value of Reference Source indicates **GPS High Accuracy**, then remove the GPS antenna and wait until the Reference Source indicates “**Int Std Accy**”, and then repeat [Step 16](#) through [Step 18](#).

## GPS Antenna Bias Tee Verification

The tests in this section verify the GPS Antenna Bias Tee Voltages of Option 31 in the MS271xE.

### Equipment Required

- Adapter SMA to BNC(f), Pomona 4290 or equivalent
- Adapter GPS Terminator, Amphenol B1004A1-ND3G-93R-0.05-1W or equivalent

### Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the MS271xE Spectrum Master.
2. Press the **On/Off** key to turn On the MS271xE.
3. Set the MS271xE to **Spectrum Analyzer** mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (3) key. Then press the **GPS** submenu key.

### 3.3 V Test

5. Connect the 4290 Adapter to the GPS Antenna SMA connector.
6. Connect the GPS Terminator to the 4290 Adapter.
7. Confirm that the 3.3 V setting on the **GPS Voltage** submenu key is selected (underlined)
8. Turn GPS On by toggling the **GPS** submenu key so that the **On** text is underlined.
9. Press the **GPS Info** submenu key. Record the GPS Antenna Current reading into the **Measured Value** column of [Table A-31, “Option 31 GPS Receiver Bias-Tee Verification” on page A-20](#). Verify that it's within specification.

### 5 V Test

10. Press the **Escape** key (**Esc**) to dismiss the **GPS Info** dialog.
11. Press the **GPS Voltage** submenu key to select 5 V.
12. Press the **GPS Info** submenu key. Record the GPS Antenna Current reading into the **Measured Value** column of [Table A-31](#). Verify that it's within specification.



## 3-8 ISDB-T SFN Verification, Option 32

### Introduction

The tests in this section verify the performance of the optional ISDB-T SFN Analyzer option of the MS271xE. These tests include:

- [“Level Accuracy Verification” on page 3-24](#)
- [“Displayed Average Noise Level \(DANL\) Verification” on page 3-28](#)

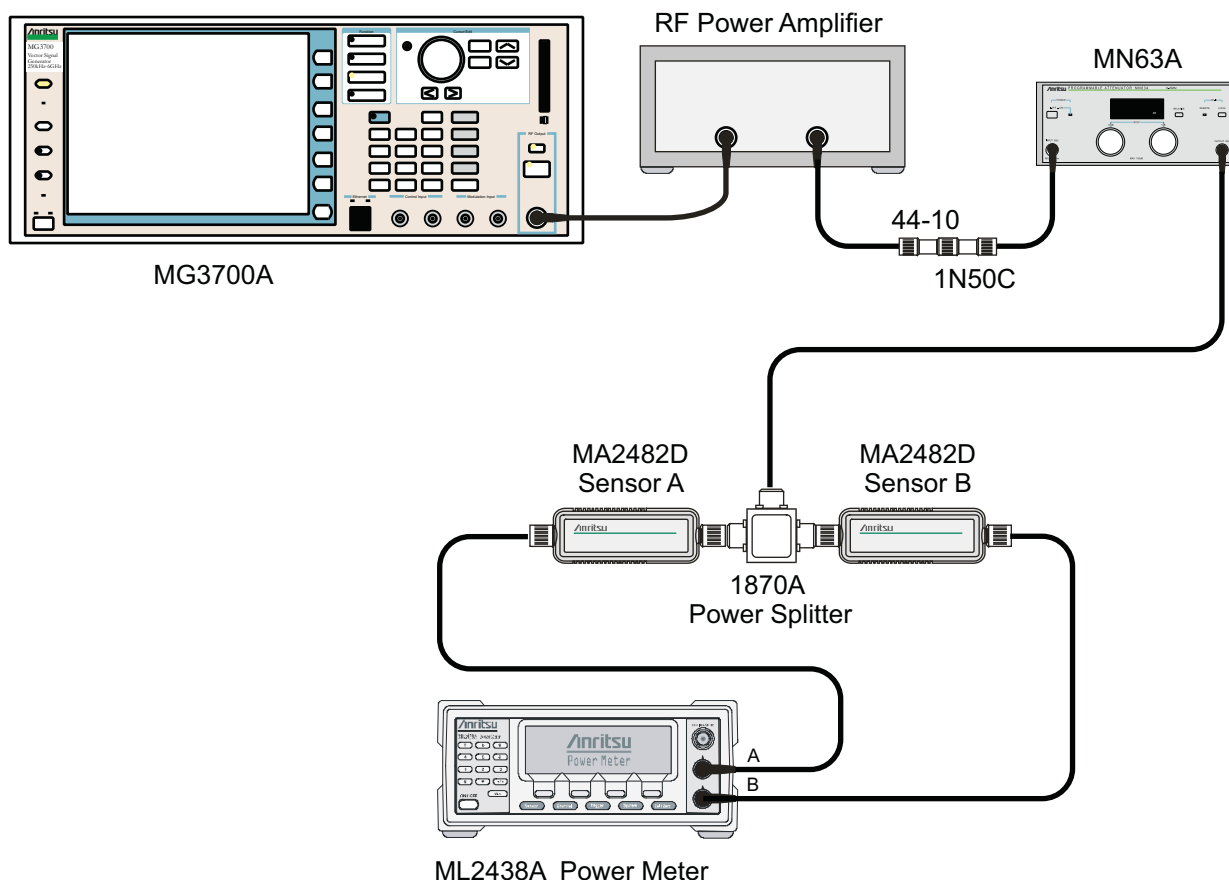
### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cables (3)
- Anritsu 28N50-2 Termination
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

## Level Accuracy Verification

The tests in this section verify the level accuracy of the MS271xE in **ISDB-T SFN Signal Analyzer** mode.

### Setup



**Figure 3-6.** ISDB-T SFN Level Accuracy Pre-test Setup

### Procedure

1. Confirm that the Power Amplifier is Off.
2. Perform a Zero/Cal on Sensor A and Sensor B of the power meter. Set the calibration factor of both sensors to 473 MHz.
3. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-6](#).
4. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
5. Press the **Down Arrow** key to select Yes.
6. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

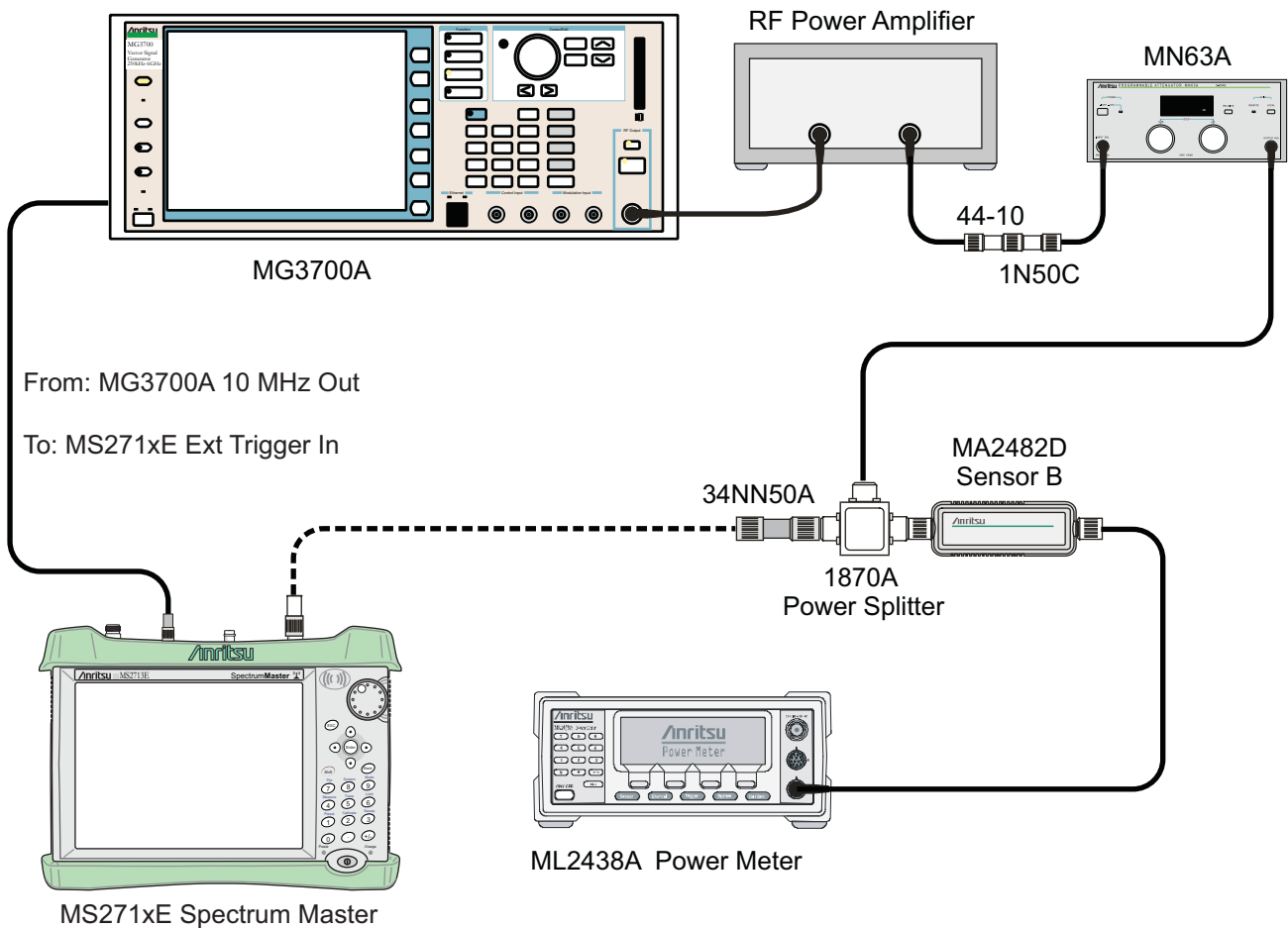
7. Press the (F1) soft key to select “**Load File to Memory**”.
8. Press the (F1) soft key again to select “**Select Package**”.

9. Using the **Down Arrow** key, step through the selection list until the “**Digital\_Broadcast**” option is highlighted.
10. Press the **Set** key.
11. Press the (F6) soft key (Return).
12. Press the **Set** key.
13. Using the **Down Arrow** key step through the selection list until the **Digital\_Broadcast** option is highlighted.
14. Press the **Set** key.
15. Using the **Down Arrow** key, step through the selection list until the **ISDB-T\_1layer\_1ch** option is highlighted.
16. Press the **Set** key.
17. Set the MG3700A frequency to 473.14285714 MHz.
18. Set the level to –25 dBm.
19. Confirm that the **Modulation On/Off** key and the **Output** key both have LEDs ON.
20. Turn On the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A attenuator so that the Sensor A reading is –10 dBm ± 1 dB. Record the attenuation reading into the **AT(–10)** column in [Table A-32, “ISDB-T SFN Level Accuracy Verification, AT\(–10\)” on page A-20](#).
22. On the MG3700A, adjust power level so that the Power Meter Sensor A reading is –10.0 dBm ± 0.2 dB.
23. Record the Power Meter Sensor A and Sensor B readings in [Table A-32](#).
24. Subtract Sensor A reading from Sensor B reading and record the result in the **ΔAB(–10)** column of [Table A-32](#).
25. Calculate the **AT(set)** values for Test Levels –10 dBm through –45 dBm and record the values in the **AT(set)** column of [Table A-33, “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz” on page A-21](#).
26. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS271xE Spectrum Analyzer RF In with an N male-to-N male adapter as shown in [Figure 3-7 on page 3-26](#).
27. Record the new Power Meter Sensor B reading into the **SB(–10)** box in [Table A-33](#).
28. On the MS271xE, set the mode to **ISDB-T SFN Signal Analyzer** and preset the instrument.
29. Press the **Meas Setup** main menu key, and change the mode to Continuous.
30. Press the **Frequency/Level** main menu key, and confirm that Channel is 13 and that Pre Amp is Off.
31. Change the Reference Level to –10 dBm.
32. After the Measuring percentage gets to 100%, record the Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp Off** in [Table A-33](#).
33. Calculate the Deviation using the following formula:  

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$

**Note** Because AT(–10) is the same as AT(set),  $[- \text{AT}(-10) + \text{AT}(\text{set})] = 0$

34. Record the result into the **Dev** column under **Pre Amp Off** in [Table A-33](#) and verify that it’s within specification.
35. Set the MN63A attenuation to the next **AT(set)** value in [Table A-33](#).



**Figure 3-7.** ISDB-T SFN Level Accuracy Post-test Setup

36. Press the **Frequency/Level** main menu key and set the Reference Level of MS271xE to  $-15$  dBm.
37. After the Measuring percentage gets to 100%, record the  $-15$  dBm Channel Power from the MS271xE to the **M(Level)** column under **Pre Amp Off** in [Table A-33](#).
38. Calculate the Deviation using the following formula:  

$$\text{Deviation} = M(\text{Level}) - SB(-10) - \Delta AB(-10) - AT(-10) + AT(\text{set})$$
39. Record the result into the Dev column under **Pre Amp Off** in [Table A-33](#) and verify that it's within specification.
40. Set the MN63A attenuation to the next **AT(set)** value in [Table A-33](#).
41. Set the Reference Level of the MS271xE to  $-20$  dBm.
42. After the Measuring percentage gets to 100%, record the  $-20$  dBm Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp Off** in [Table A-33](#).
43. Calculate the Deviation using the following formula:  

$$\text{Deviation} = M(\text{Level}) - SB(-10) - \Delta AB(-10) - AT(-10) + AT(\text{set})$$
44. Record the result to the **Dev** column under **Pre Amp Off** in [Table A-33](#) and verify that it's within specification.
45. Press the **Frequency/Level** main menu key and set Pre Amp to On. Change Reference Level if required.

46. After the Measuring percentage gets to 100%, record the –20 dBm Channel Power from the MS271xE into the **M(Level)** column under **Pre Amp On** in [Table A-33](#).
47. Calculate the Deviation using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \Delta\text{AB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
48. Record the result to the **Dev** column under **Pre Amp On** in [Table A-33](#) and verify that it's within specification.
49. Repeat [Step 40](#) through [Step 48](#) for Test Levels –25 dBm to –45 dBm. Change Reference Level and switch Pre Amp per the **Pre Amp On** and **Pre Amp Off** columns in [Table A-33](#).
50. Turn Off the power amplifier, disconnect the power splitter from the MS271xE, and re-connect Sensor A to the power splitter as shown in [Figure 3-6](#) on [page 3-24](#).
51. Set the MN63A attenuation to 10 dB.
52. Set the MG3700A level to –60 dBm.
53. Turn On the power amplifier and allow it to warm up for at least 5 minutes.
54. Adjust the MN63A attenuator so that the Sensor A reading is –50 dBm ± 1 dB. Record the attenuation reading as **AT(–50)** in [Table A-34](#), “ISDB-T SFN Level Accuracy Verification, AT(–50)” on [page A-22](#).
55. On the MG3700A, adjust power level so that the Power Meter Sensor A reading is –50.0 dBm ± 0.2 dB.
56. Record Power Meter Sensor A and Sensor B readings in [Table A-34](#).
57. Subtract Sensor A reading from Sensor B reading and record the result in the **ΔAB(–50)** column of [Table A-34](#).
58. Calculate the **AT(set)** values for Test Levels –55 dBm through –84 dBm and record the values into the **AT(set)** column in [Table A-33](#).
59. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS271xE Spectrum Analyzer RF In with an N male-to-N male adapter.
60. Record the new Power Meter Sensor B reading into the **SB(–50)** box in [Table A-33](#).
61. Repeat [Step 40](#) through [Step 48](#) for Test levels –50 dBm to –84 dBm. Change Reference Level and switch Pre Amp On or Off per the **Pre Amp On** or **Pre Amp Off** column in [Table A-33](#). Use the following formula to calculate Deviation:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-50) - \Delta\text{AB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$
62. Repeat [Step 17](#) through [Step 61](#) for frequencies 623.14285714 MHz (Ch 38) and 767.14285714 MHz (Ch 62). Set the calibration factor of both power sensors to 623 MHz or to 767 MHz, as required.
63. Record the results in [Table A-35](#), “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz” on [page A-23](#) and [Table A-36](#), “ISDB-T SFN Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz” on [page A-24](#).

## Displayed Average Noise Level (DANL) Verification

The tests in this section verify the DANL of the MS271xE in ISDB-T SFN Signal Analyzer mode.

### Equipment Required

- Anritsu 28N50-2 50 ohm Termination

### Procedure

1. Set the mode of the MS271xE to **ISDB-T SFN Signal Analyzer** and preset the instrument.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Confirm that the channel is set to 13 and the Pre Amp is Off.
4. Set the Reference Level to  $-25$  dBm.
5. Press the **Meas Setup** main menu key. Change Meas Mode to Continuous.
6. After Measuring percentage gets to 100%, record the Channel Power into [Table A-37, “ISDB-T SFN Analyzer DANL with Pre Amp Off” on page A-25](#).
7. Set the Reference Level to  $-50$  dBm and the Pre Amp to On.
8. After Average (50/50) appears, record the Channel Power into [Table A-38, “ISDB-T SFN Analyzer DANL with Pre Amp On” on page A-25](#).
9. Change the channel to 38. Set the Pre Amp to Off.
10. Repeat [Step 4](#) through [Step 8](#) for Channel 38
11. Change the channel to 62. Set the Pre Amp to Off.
12. Repeat [Step 4](#) through [Step 8](#) for Channel 62.

## 3-9 GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880

The tests in this section verify that the optional GSM/GPRS/EDGE Signal Analyzer functions correctly in the Spectrum Master. There are tests for the following:

- [“GSM Signal Analyzer Option Verification”](#)
- [“EDGE Burst Power, Frequency Error, and Residual Error Tests”](#) on page 3-32

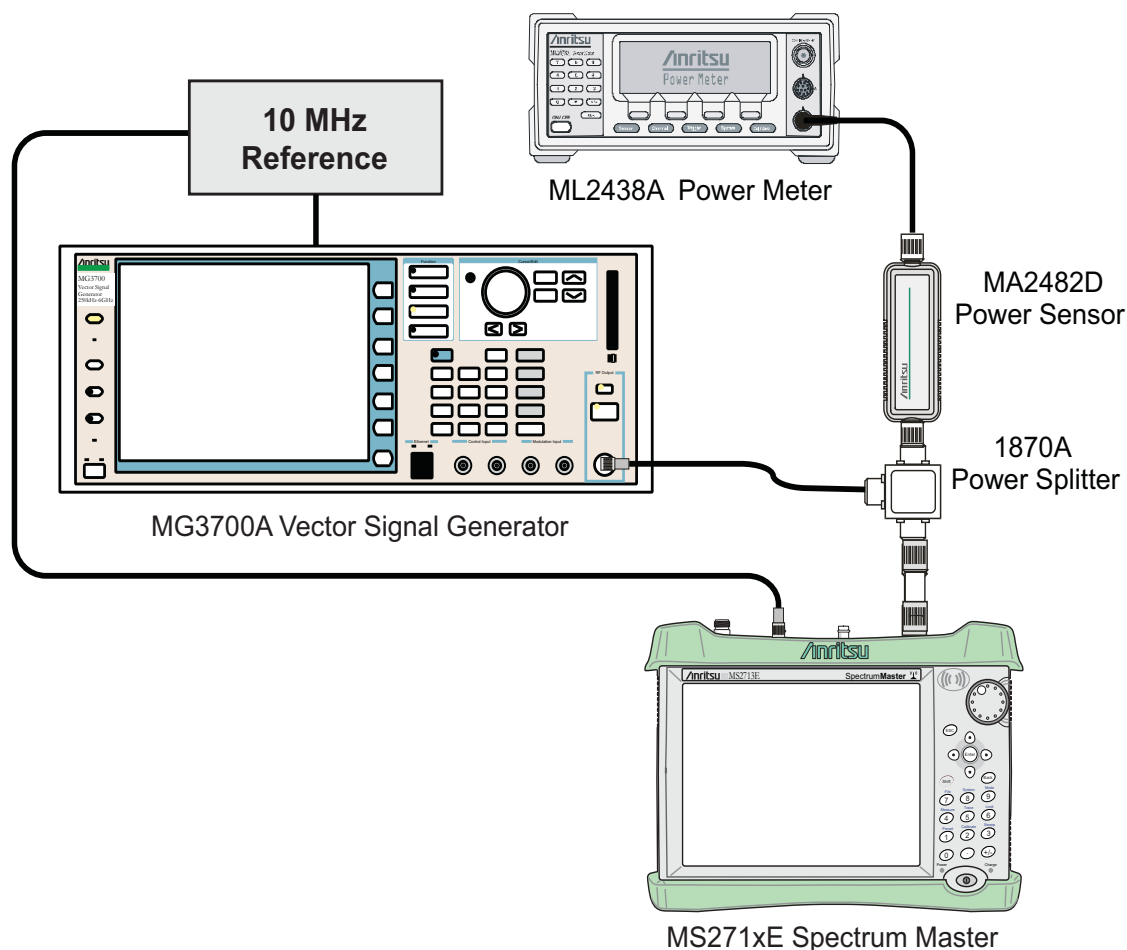
### GSM Signal Analyzer Option Verification

The tests in this section verify the function of the optional GSM Signal Analyzer in Model MS271xE Spectrum Master.

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel 1870A Power Splitter
- 10 MHz Reference Standard

## Setup



**Figure 3-8.** GSM/EDGE Signal Analyzer Option Verification

### Procedure

1. Calibrate the power sensor prior to connecting to the power splitter.
2. Connect the equipment as shown in [Figure 3-8](#).
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. On the power meter, press the **Sensor** key and the **Mode** soft key until **Measurement MODE** is **Mod average**. Press the **System** key to display the power reading.
5. Set the MS271xE mode to **GSM/GPRS/EDGE Signal Analyzer**. Press **Shift** and then press **Preset (1)** to preset the MS271xE.
6. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
7. Press the **Down Arrow** key, or turn the knob to select **Yes**.
8. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

9. Press the **(F1)** soft key to select **Load File to Memory**.



10. Press the (F1) soft key again to select **Select Package**.
11. Using the **Down Arrow** key, step through the selection list until the “**GSM**” option is highlighted.
12. Press the **Set** key.
13. Press the (F6) soft key (Return).
14. Press the **Set** key. The **Select Package** box appears. Use the rotary knob to highlight **GSM** and press the **Set** key to select.
15. Another File List appears. Use the rotary knob to select **GsmBurst\_1slot** and press the **Set** key to select.
16. Press the **MOD On/Off** key to turn On the Modulation LED, and verify that the “**Playing**” indicator in the center of the LCD is flashing.
17. Press the **Frequency** key and enter 850 MHz.
18. Press the **Level** key, enter  $-10$ , and press the dBm submenu key.
19. Adjust the MG3700A output so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
20. On the MS271xE, press the **Freq** main menu key, then the Center Freq submenu key and enter 850 MHz as the Center Frequency.
21. Press the **Measurements** main menu key and then press GSM/EDGE Summary (a red dot appears on the key label when the measurement is selected).
22. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 9.2 dB. Then subtract the resulting value from the power meter reading in [Step 19](#). Then record the calculated Burst Power error and the displayed value of Freq Error into section **At 850 MHz,  $-10 \text{ dBm}$  Level, TCH Pattern** in [Table A-39, “Option 40/880 GSM/GPRS/EDGE RF Measurements”](#) on page A-27.
23. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into section **At 850 MHz,  $-10 \text{ dBm}$  Level, TCH Pattern** in [Table A-40, “Option 41/880 GSM/GPRS/EDGE Demodulator”](#) on page A-28.
24. Verify that the measured values in [Step 22](#) or [Step 23](#) (or both) are within specification.
25. On the MG3700A, change the selected signal pattern to **GsmBurst\_8slot**.
26. Adjust the Level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.
27. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 0.2 dB. Then subtract the resulting value from the power meter reading in [Step 26](#). Then record the calculated Burst Power error and the displayed value of Freq Error into section **At 850 MHz,  $-50 \text{ dBm}$  Level, TCH ALL Pattern** in [Table A-39 on page A-27](#)”.
28. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) into section **At 850 MHz,  $-50 \text{ dBm}$  Level, TCH ALL Pattern** in [Table A-40 on page A-28](#)”.
29. Verify that the measured values in [Step 27](#) or [Step 28](#) (or both) are within specification.
30. Change the frequency of the MG3700A to 1800 MHz.
31. 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.
32. Adjust the level of the MG3700A so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
33. On the MS271xE, set the Center Frequency to 1800 MHz. Then wait 15 seconds to allow the MS271xE to update its measured results.
34. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 0.2 dB. Then subtract the resulting value from the power meter

- reading in [Step 32](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 1800 MHz, -10 dBm Level, TCH ALL Pattern** in [Table A-39](#).
35. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in section **At 1800 MHz, -10 dBm Level, TCH ALL Pattern** in [Table A-40](#).
  36. Verify that the measured values in [Step 34](#) or [Step 35](#) (or both) are within specification.
  37. On the MG3700A, change the selected pattern to GsmBurst\_1slot.
  38. Adjust the level of the MG3700A so that the power meter reads  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.
  39. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 9.2 dB. Then subtract the resulting value from the power meter reading in [Step 38](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 1800 MHz, -50 dBm Level, TCH Pattern** in [Table A-39](#).
  40. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in section **At 1800 MHz, -50 dBm Level, TCH Pattern** in [Table A-40](#).
  41. Verify that the measured values in [Step 39](#) or [Step 40](#) (or both) are within specification.

## EDGE Burst Power, Frequency Error, and Residual Error Tests

The tests in this section verify the function of the optional GSM Signal Analyzer in Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

### Procedure

1. Confirm that the equipment settings are unchanged from the previous test. Refer to [Figure 3-8 on page 3-30](#).
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  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.
4. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 9 dB. Then subtract the resulting value from the power meter reading in [Step 3](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 1800 MHz, -50 dBm Level, DL\_MCS-9\_1SLOT Pattern** in [Table A-39](#).
5. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in section **At 1800 MHz, -50 dBm Level, DL\_MCS-9\_1SLOT Pattern** in [Table A-40](#).
6. Verify that the measured values in [Step 4](#) or [Step 5](#) (or both) are within specification.
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  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.

9. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 3 dB. Then subtract the resulting value from the power meter reading in [Step 8](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 1800 MHz, -10 dBm Level, DL\_MCS-9\_4SLOT Pattern** in [Table A-39](#).
10. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in section **At 1800 MHz, -10 dBm Level, DL\_MCS-9\_4SLOT Pattern** in [Table A-40](#).
11. Verify that the measured values in [Step 9](#) or [Step 10](#) (or both) are within specification.
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  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
15. On the MS271xE, set the Center Frequency to 850 MHz. Then wait 15 seconds to allow the MS271xE to update its measured results.
16. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 3 dB. Then subtract the resulting value from the power meter reading in [Step 14](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 850 MHz, -50 dBm Level, DL\_MCS-9\_4SLOT Pattern** in [Table A-39](#).
17. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in section **At 850 MHz, -50 dBm Level, DL\_MCS-9\_4SLOT Pattern** in [Table A-40](#).
18. Verify that the measured values in [Step 16](#) or [Step 17](#) (or both) are within specification.
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  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.
21. For an MS271xE with Option 40 or 880 (GSM/GPRS/EDGE RF Measurements), take the displayed Burst Power value and subtract an offset of 9 dB. Then subtract the resulting value from the power meter reading in [Step 20](#). Then record the calculated Burst Power error and the displayed value of Freq Error in section **At 850 MHz, -10 dBm Level, DL\_MCS-9\_1SLOT Pattern** in [Table A-39](#).
22. For an MS271xE with Option 41 or 880 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in section **At 850 MHz, -10 dBm Level, DL\_MCS-9\_1SLOT Pattern** in [Table A-40](#).
23. Verify that the measured values in [Step 21](#) or [Step 22](#) (or both) are within specification.

## 3-10 CDMA Signal Analyzer Verification, Option 42/43/884

The tests in this section verify the optional CDMA Signal Analyzer functions in Anritsu Model MS271xE Spectrum Master. There are tests for the following:

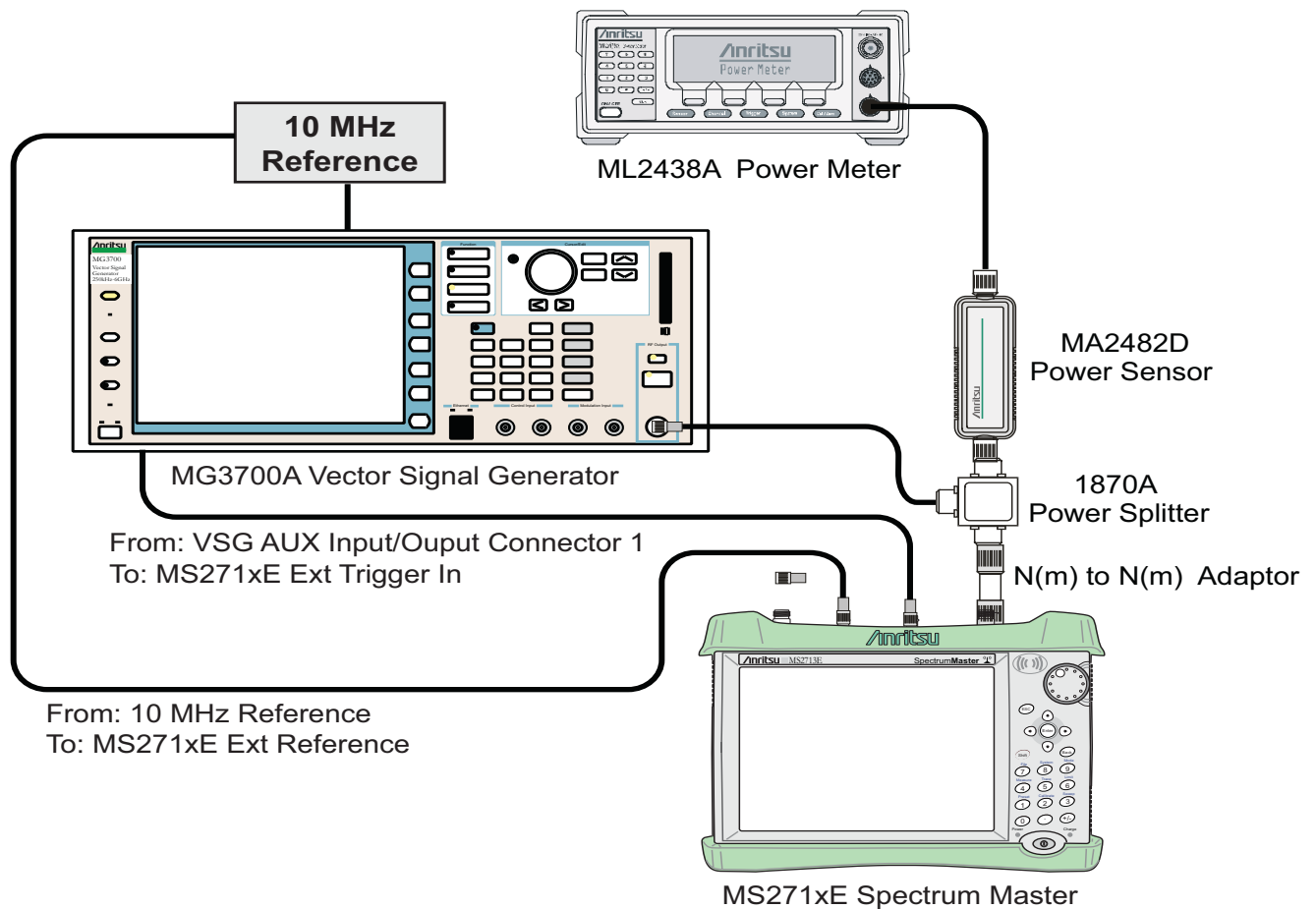
- [“cdmaOne Channel Power, Frequency Error, Rho, and Tau Verification”](#)
- [“CDMA2000 Channel Power, Frequency Error, Rho, and Tau Verification”](#)

### cdmaOne Channel Power, Frequency Error, Rho, and Tau Verification

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (3)
- 10 MHz Reference Standard

## Setup



**Figure 3-9.** CDMA Signal Analyzer Option Verification

### Procedure

1. Calibrate the power sensor prior to connecting to the power splitter.
2. Connect the equipment as shown in [Figure 3-9](#).
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 870.3 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 MS271xE mode to CDMA Signal Analyzer. Press **Shift** and press **Preset** (1) to preset the MS271xE.
5. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
6. Press the **Down Arrow** key or turn the knob to select **Yes**.
7. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

8. Press the (F1) soft key to select **Load File to Memory**.
9. Press the (F1) soft key again to select **Select Package**.
10. Using the **Down Arrow** key, step through the selection list until the **"CDMA2000"** option is highlighted.

11. Press the **Set** key.
12. Press the (F6) soft key (Return).
13. Press the **Set** key. The Select Package box appears. Use the rotary knob to highlight “CDMA2000” and press the **Set** key to select.
14. Another File List appears. Use the rotary knob to select “FWD\_RC1-2\_9channel”, and press the **Set** key to select.
15. Press the **MOD On/Off** key to turn On the Modulation LED, and verify that the “Playing” indicator in the center of the LCD is flashing.
16. Press the **Frequency** key, enter 870.03 MHz.
17. Press the **Level** key, enter –30, and press the dBm submenu key.
18. Adjust the MG3700A output so that the power meter reads –30 dBm ± 0.2 dB.
19. On the MS271xE, press the **Frequency** main menu key, then press the Center Freq submenu key and enter 870.03 MHz as Center Frequency.
20. Press the **Measurements** main menu key and press CDMA Summary (a red dot will appear on the label).
21. Press the **Setup** main menu key and then press the PN Setup submenu key. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Then wait 15 seconds to allow the MS271xE to update its measured results.
22. For an MS271xE with Option 42 or 884 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 18](#). Then record the calculated Channel Power error in section **At 870.03 MHz, –30 dBm Level, cdmaOne** in [Table A-41, “Option 42/884 CDMA RF Measurements” on page A-29](#).
23. For an MS271xE with Option 43 or 884 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in section **At 870.03 MHz, –30 dBm Level, cdmaOne** in [Table A-42, “Option 43/884 cdmaOne and CDMA2000 1xRTT Demodulator” on page A-30](#).
24. Verify that the measured values in [Step 22](#) or [Step 23](#) (or both) are within specification.
25. 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.
26. Set the MG3700A frequency to 1930.05 MHz.
27. Adjust the MG3700A output so that the power meter reads –30 dBm ± 0.2 dB.
28. On the MS271xE, press the **Frequency** main menu key, then press the Center Freq submenu key and enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS271xE to update its measured results.
29. For an MS271xE with Option 42 or 884 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 27](#). Then record the calculated Channel Power error in the test record in section **At 1930.05 MHz, –30 dBm Level, cdmaOne** in [Table A-41 on page A-29](#).
30. For an MS271xE with Option 43 or 884 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in section **At 1930.05 MHz, –30 dBm Level, cdmaOne** in [Table A-42 on page A-30](#).
31. Verify that the measured values in [Step 29](#) or [Step 30](#) (or both) are within specification.

## CDMA2000 Channel Power, Frequency Error, Rho, and Tau Verification

The tests in this section verify the function of the optional CDMA Signal Analyzer in Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (3)
- 10 MHz Reference Standard

### Procedure

1. Confirm that the equipment settings are unchanged from the previous test. Refer to [Figure 3-9 on page 3-35](#).
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  $-30 \text{ dBm} \pm 0.2 \text{ dB}$ . Then wait 15 seconds to allow the MS271xE to update its measured results.
4. For an MS271xE with Option 42 or 884 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in section **At 1930.05 MHz, -30 dBm Level, CDMA2000** in [Table A-41, “Option 42/884 CDMA RF Measurements” on page A-29](#).
5. For an MS271xE with Option 43 or 884 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in section **At 1930.05 MHz, -30 dBm Level, CDMA2000** in [Table A-42, “Option 43/884 cdmaOne and CDMA2000 1xRTT Demodulator” on page A-30](#).
6. Verify that the measured values in [Step 4](#) or [Step 5](#) (or both) are within specification.
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  $-30 \text{ dBm} \pm 0.2 \text{ dB}$ .
10. On the MS271xE, press the **Frequency** main menu key, then press the Center Freq submenu key and enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS271xE to update its measured results.
11. For an MS271xE with Option 42 or 884 (CDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 9](#). Then record the calculated Channel Power error in section **At 870.03 MHz, -30 dBm Level, CDMA2000** in [Table A-41](#).
12. For an MS271xE with Option 43 or 884 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau into the test record in section **At 870.03 MHz, -30 dBm Level, CDMA2000** in [Table A-42](#).
13. Verify that the measured values in [Step 11](#) or [Step 12](#) (or both) are within specification.

## 3-11 WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881

The tests in this section verify the optional WCDMA Signal Analyzer functions in Anritsu Model MS271xE Spectrum Master. There are tests for the following:

- “WCDMA Absolute Power Accuracy Verification (Option 44 or 881)”
- “WCDMA Occupied Bandwidth (OBW) Verification (Option 44 or 881)” on page 3-43
- “WCDMA RF Channel Power Accuracy (Option 44 or 881)” on page 3-46
- “HSDPA RF Channel Power Accuracy (Option 44 or 881)” on page 3-47
- “Error Vector Magnitude (EVM) Verification (Option 65 or 881)” on page 3-49

### WCDMA Absolute Power Accuracy Verification (Option 44 or 881)

This test verifies the WCDMA absolute power accuracy in WCDMA/HSDPA Signal Analyzer Mode in the Model MS271xE Spectrum Master.

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Mini Circuits Model TIA-1000-1R8 RF Power Amplifier
- Meca Electronic CN-0.900 or Anritsu 1000-50 Circulator
- Aeroflex/Weinschel Model M1418 High Power Load
- Midwest Microwave CPW-5140-30-NNN-05 or Anritsu 1091-307 Coupler
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu Model MN63A Programmable Attenuator



## Setup

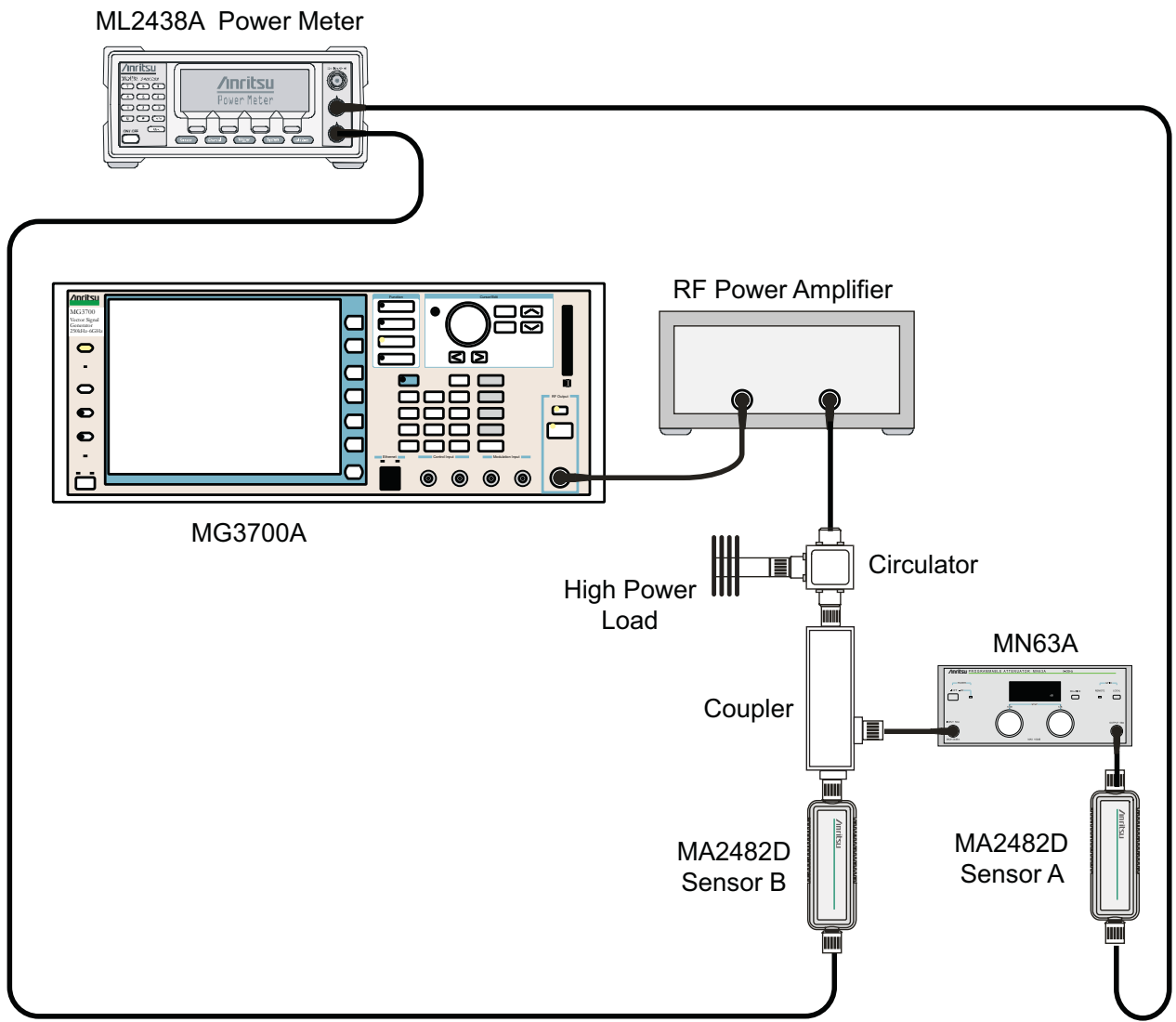


Figure 3-10. WCDMA Signal Analyzer Option Verification (Setup 1)

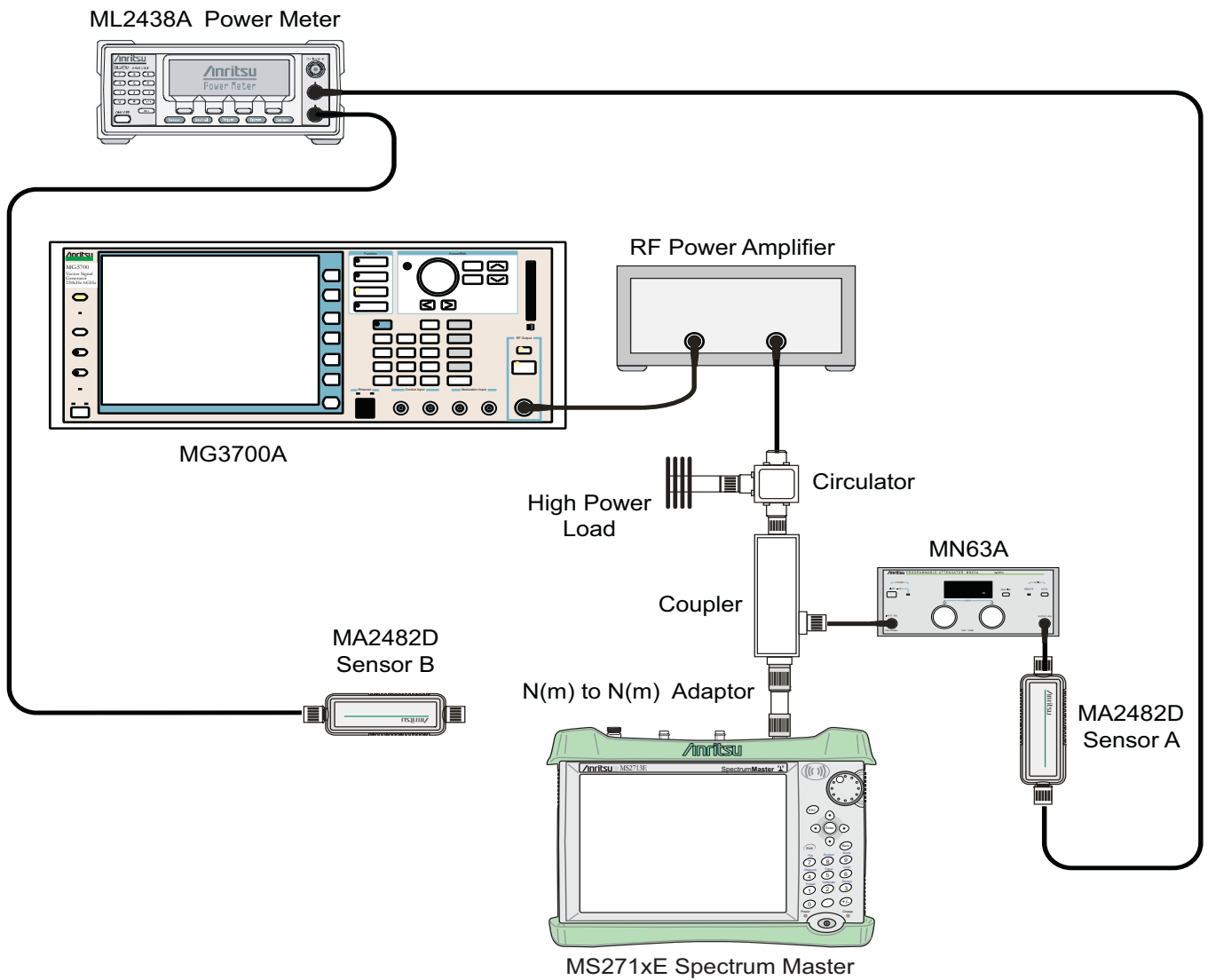
## Procedure

1. Connect the power sensors to the power meter and then calibrate the sensors.
2. Connect the MG3700A, RF power amplifier, attenuator, power meter, and sensors as shown in [Figure 3-10](#).
3. Turn on the MG3700A, RF amplifier, attenuator, and power meter.
4. Press the **On/Off** key to turn on the MS271xE 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 then press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu 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.

<b>Note</b> The MG3700A has two <b>Set</b> keys, and they both have the same function.
--

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. The Select Package list box appears. Again select W-CDMA(BS Tx test) and then press the **Set** key.
16. Another file list appears. 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, enter 881.5 MHz, then press the MHz submenu key.
20. Press the **Level** key, enter -28, and press the dBm submenu 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-43](#), “[Option 44/881, Sensor A and Sensor B Reading Components Characterization Table](#)” on page A-31. This should be approximately -20 dBm.
24. Record the Sensor B reading (**PMB.10**) in [Table A-43](#).
25. Calculate Delta 1, which is the error of the coupler output port deviation from ideal +10 dBm using the following formula:  
$$\text{Delta 1 (dBm)} = (10 \text{ dBm} - \text{PMB.10})$$
26. Record the Delta 1 value in [Table A-43](#).
27. Calculate the accurate value of Sensor A reading for coupler port output of +10 dBm (**PMA.10C**) using the following formula:  
$$\text{PMA.10C} = \text{PMA.10} + \Delta 1$$
28. Record the calculated value in [Table A-43](#).
29. Set the MN63A attenuator to 10 dB and record Sensor A reading (**PMA.20**) in [Table A-43](#).
30. Calculate the accurate attenuation value using the following formula:  
$$\text{ATT.10} = (\text{PMA.10} - \text{PMA.20})$$
31. Record the calculated value in [Table A-43](#).
32. Turn Off the RF output of the MG3700A.
33. Disconnect the coupler from Sensor B, and connect the coupler to the MS271xE SPA RF In connector. Refer to [Figure 3-11](#).



**Figure 3-11.** WCDMA Signal Analyzer Option Verification (Setup 2)

34. Set the MN63A attenuator to 0 dB.
35. On the MS271xE press the **Center Freq** submenu key, enter 881.5, and then press the **MHz** submenu key.
36. Press the **Measurements** main menu key, then the **RF Measurement** submenu key, then the **Channel Spectrum** submenu 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.
38. Record the MG3700A power level setting (**MG3700A.10**) in [Table A-44, “Option 44/881, Power Level Setting Components Characterization Table”](#) on page A-31.
39. On the MS271xE, press the **Amplitude** main menu key, and then press the **Adjust Range** submenu key.
40. Record the channel power reading in the **Measured Power** column of the **+10 dBm** row of [Table A-45, “Option 44/881, WCDMA Absolute Power Accuracy”](#) on page A-31.
41. Use the following formula to calculate the absolute power accuracy of the MS271xE at +10 dBm:

$$\text{Error} = \text{Measured Power} - 10$$

42. Record the calculated value in the **Error** column of the **+10 dBm** row of [Table A-45](#) and verify that it's within specification.
43. Turn Off the RF output of the MG3700A.
44. Set the MN63A attenuator to 10 dB.
45. Calculate the value of the MG3700A setting (**MG3700A.20**) for +20 dBm Test Level using the following formula:
 
$$\text{MG3700A.20} = \text{MG3700A.10} + \text{ATT.10}$$
46. Record the calculated value in [Table A-44](#).
47. On the MG3700A, turn On the RF output and use the knob to adjust power level to the recorded **MG3700A.20** value in the [Table A-44](#).
48. On the MS271xE, press the **Amplitude** main menu key, and then press the **Adjust Range** submenu key.
49. Record channel power reading in the **Measured Power** column of the **+20 dBm** row of [Table A-45](#).
50. Use the following formula to calculate the absolute power accuracy of the MS271xE at +20 dBm:
 
$$\text{Error} = \text{Measured Power} - 20$$
51. Record the calculated value in the **Error** column of the **+20 dBm** row of [Table A-45](#) and verify that it's within 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 Sensor A reading (**PMA.10**) for **-10 dBm** Test Level using the following formula:
 
$$\text{PMA.10} = \text{PMA.10C} - 30$$
56. Record the calculated value in [Table A-44](#).
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 MS271xE, press the **Amplitude** main menu key, and then press the **Adjust Range** submenu key.
59. Record channel power reading in the **Measured Power** column of the **-10 dBm** row of [Table A-45](#).
60. Use the following formula to calculate the absolute power accuracy of the MS271xE at **-10 dBm**:
 
$$\text{Error} = \text{Measured Power} - (-10)$$
61. Record the calculated value in the **Error** column of the **-10 dBm** row of [Table A-45](#) and verify that it's within specification.
62. Turn Off the RF output of the MG3700A.
63. Decrease power level of the MG3700A by 10 dB.
64. Calculate the value of Sensor A reading (**PMA.20**) for **-20 dBm** Test Level using the following formula:
 
$$\text{PMA.20} = \text{PMA.10C} - 30$$
65. Record the calculated value in [Table A-44](#).
66. Turn On the RF output and use the knob to adjust power level to read the value of **PMA.20** on Sensor A.
67. On the MS271xE, press the **Amplitude** main menu key, and then press the **Adjust Range** submenu key.
68. Record channel power reading in the **Measured Power** column of the **-20 dBm** row of [Table A-45](#).
69. Turn Off the RF output of the MG3700A.
70. Use the following formula to calculate the absolute power accuracy of MS271xE at **-20 dBm**:
 
$$\text{Error} = \text{Measured Power} - (-20)$$
71. Record the calculated value in the **Error** column of the **-20 dBm** row of [Table A-45](#) and verify that it's within specification.

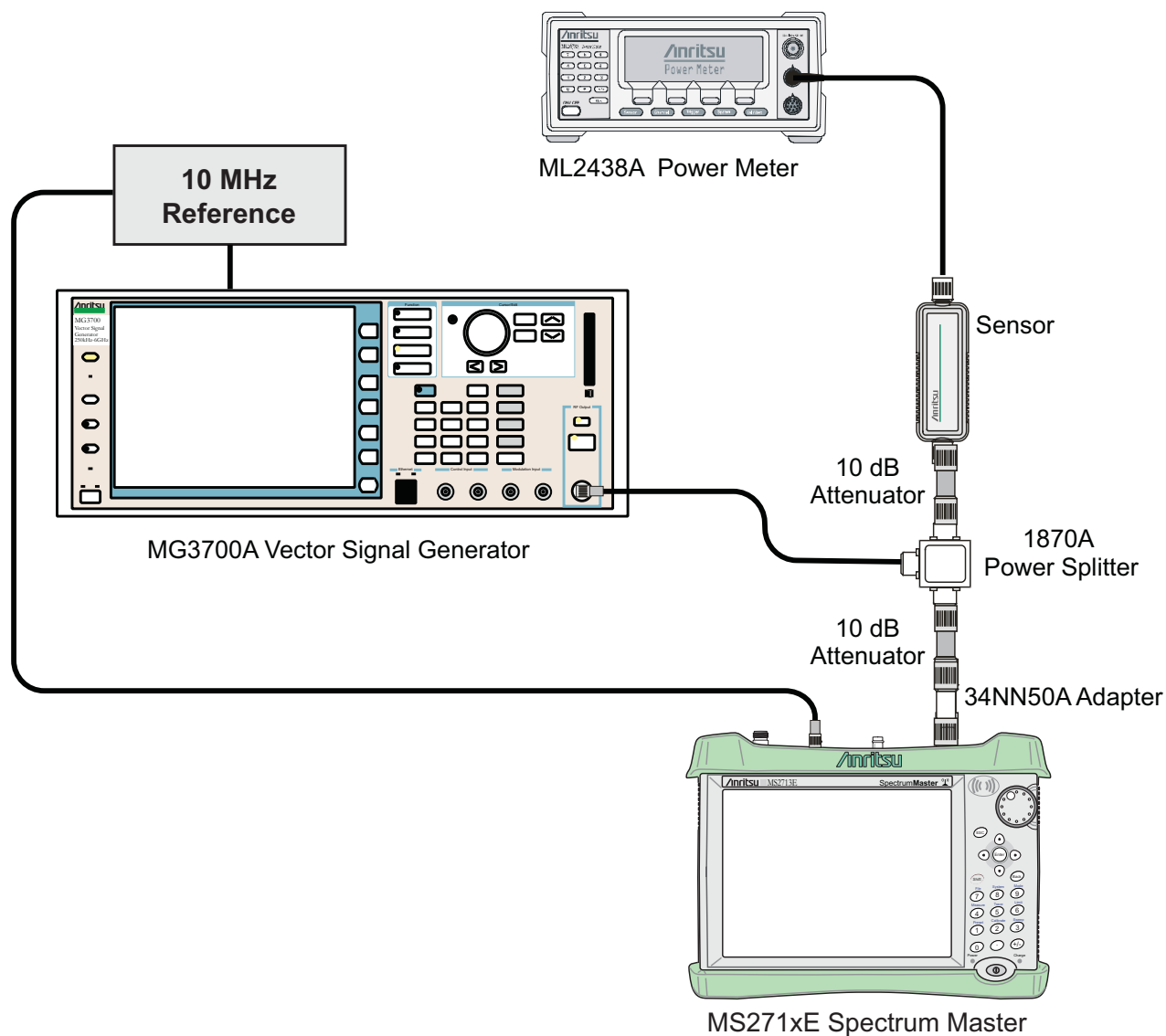
## WCDMA Occupied Bandwidth (OBW) Verification (Option 44 or 881)

The tests in this section verify the function of the WCDMA occupied bandwidth in WCDMA/HSDPA Signal Analyzer Mode on Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)
- 10 MHz Reference Standard

## Setup



**Figure 3-12.** WCDMA Occupied Bandwidth (OBW) Verification

### 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 3-12](#).
4. Press the **On/Off** key to turn On the MS271xE 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 submenu 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.

<b>Note</b> The MG3700A has two <b>Set</b> keys, and they both have the same function.
--

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. The Select Package list box appears. Again select W-CDMA(BS Tx test) and then press the **Set** key.
16. Another file list appears. 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 the frequencies from the WCDMA Occupied Bandwidth (OBW) [Table A-46](#), “Option 44/881, WCDMA Occupied Bandwidth (OBW)” on page A-31 starting with 881.5, and press the MHz submenu key.
20. Press the **Level** key, then enter -2 and press the dBm submenu 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-46](#).
22. On the MS271xE, press the **Center Freq** submenu key, enter frequencies from [Table A-46](#) starting with 881.5, and then press the **Enter** key.
23. Press the **Measurements** main menu key, then the RF Measurement submenu key, and then press the Channel Spectrum soft key.
24. Press the **Amplitude** key, then press the Adjust Range submenu key.
25. Record the OBW reading in the **OBW** column of [Table A-46](#) and verify that it is within specification.
26. Repeat [Step 19](#) through [Step 25](#) for the other frequencies that are listed in [Table A-46](#).

## WCDMA RF Channel Power Accuracy (Option 44 or 881)

The tests in this section verify the function of the WCDMA RF Channel Power Accuracy in WCDMA/HSDPA Signal Analyzer Mode on Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)
- 10 MHz Reference Standard

### 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 3-12](#).
4. Press the **On/Off** key to turn On the MS271xE 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 submenu 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.

<b>Note</b> The MG3700A has two <b>Set</b> keys, and they both have the same function.
--

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. The Select Package list box appears. Again select W-CDMA(BS Tx test) and then press the **Set** key.
16. Another file list appears. 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 submenu key.
20. Press the **Level** key, then enter -2 and press the dBm submenu 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-47](#), “Option 44/881, WCDMA RF Channel Power Accuracy” on page A-31.
22. On the MS271xE, press the Center Freq submenu key, enter 881.5, and then press the **Enter** key.
23. Press the **Measurements** main menu key, then the RF Measurement submenu key, and then press the ACLR. submenu key
24. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power in dBm in the **Measured RF Channel Power** column of [Table A-47](#).
26. Calculate the RF Channel Power Error using the following formula:  
$$\text{RF Channel Power Error (dB)} = \text{Measured RF Channel Power} - 0.246 - \text{Power Meter reading}$$
27. Record the calculated value to the **RF CH Power Error** column of [Table A-47](#) and verify that it's within specification.
28. Repeat [Step 19](#) through [Step 27](#) for the other frequencies and offsets that are listed in [Table A-47](#).

### HSDPA RF Channel Power Accuracy (Option 44 or 881)

The tests in this section verify the function of the RF Channel Power Accuracy for HSDPA signal in WCDMA/HSDPA Signal Analyzer Mode on Model MS271xE Spectrum Master.

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)
- 10 MHz Reference Standard

#### 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 3-12](#).
4. Press the **On/Off** key to turn On the MS271xE 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 submenu 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. The MG3700A has two **Set** keys, and they both have the same function.
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. The Select Package list box appears. Again select **W-CDMA(BS Tx test)** and then press the **Set** key.
16. Another file list appears. 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 submenu key.
20. Press the **Level** key, then enter -2 and press the dBm submenu 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-48, "Option 44/881, HSDPA RF Channel Power Accuracy" on page A-32](#).
22. On the MS271xE, press the **Freq** main menu key, then the Center Freq submenu key, enter 2680.5, and then press the MHz submenu key.
23. Press the **Measurements** main menu key, then the RF Measurement submenu key. Then press the ACLR submenu key.
24. Press the **Amplitude** key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power in dBm to the **Measured RF Channel Power** column [Table A-48](#).
26. Calculate the RF Channel Power Error using the following formula:  
$$\text{RF Channel Power Error (dB)} = \text{Measured RF Channel Power} - 0.246 - \text{Power Meter reading}$$
27. Record calculated value to the **RF CH Power Accuracy** column of [Table A-48](#) and verify that it's within specification.

## Error Vector Magnitude (EVM) Verification (Option 65 or 881)

The tests in this section can be used to verify the functionality of the WCDMA and/or HSDPA Demodulator of the WCDMA/HSDPA Signal Analyzer Mode on Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- Aeroflex/Weinschel Model 44-10 Attenuator (2)
- 10 MHz Reference Standard

### 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 3-12](#).
4. Press the **On/Off** key to turn on the MS271xE 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** submenu 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.

<b>Note</b> The MG3700A has two <b>Set</b> keys, and they both have the same function.
--

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. The Select Package list box appears. Again select W-CDMA(BS Tx test) and then press the **Set** key.
16. Another file list appears. 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 submenu key.
20. Press the **Level** key, then enter -2 and press the dBm submenu key.

21. Use the knob to adjust the power meter to read  $-20$  dBm.
22. On the MS271xE, press the Center Freq submenu key, enter 1962.5 and then press the MHz submenu key.
23. Press the **Measurements** main menu key, then press the Demodulator submenu key, and then press the Modulation Summary submenu key.
24. Press the Setup submenu key, then press the Auto Scrambling submenu key to turn it On.
25. Press the Max Spreading Factor submenu key to set it to 512.
26. Press the **Amplitude** key, then press the Adjust Range submenu key.
27. Record the EVM reading in [Table A-49, “Option 65/881, WCDMA Error Vector Magnitude \(Test Model 4\)”](#) on page A-32 and verify that it’s within specification.
28. This completes the EVM test for MS271xE with Option 45 and the first EVM test for an MS271xE with Option 65.
29. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
30. Press the **Down Arrow** key to select Yes.
31. Press the **Set** key. The MG3700A has two **Set** keys, and they both have the same function.
32. Press the (F1) soft key to select Load File to Memory.
33. Press the (F1) soft key again to select Select Package.
34. Using the **Down Arrow** key, step through the selection list until the W-CDMA(BS Tx test) option is highlighted.
35. Press the **Set** key.
36. Press the (F6) soft key (Return).
37. Press the **Set** key. The Select Package list box appears. Again select W-CDMA(BS Tx test) and then press the **Set** key.
38. Another file list appears. Using the **Down Arrow** key, step through the selection list until the TestModel\_5\_8HSPDSCH option is highlighted.
39. Press the **Set** key.
40. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
41. Press the **Frequency** key, then enter 1962.5 and press the MHz submenu key.
42. Press the **Level** key, then enter  $-2$  and press the dBm submenu key.
43. Use the knob to adjust the power meter to read  $-20$  dBm.
44. On the MS271xE, press the Center Freq submenu key, enter 1962.5, and then press the MHz submenu key.
45. Press the **Measurements** main menu key, then press the Demodulator submenu key, and then press the Modulation Summary submenu key.
46. Press the **Setup** main menu key, and verify that the Scrambling Code is set to Auto.
47. Verify that the Max Spreading Factor submenu key is set to 512.
48. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
49. Record the EVM reading in [Table A-50, “Option 65/881, HSDPA Error Vector Magnitude \(Test Model 5\)”](#) and verify that it’s within specification.

This completes the two EVM tests for MS271xE with Option 65 or 881.

## 3-12 Fixed WiMAX Signal Analyzer Verification, Option 46/47/885

The tests in this section verify the performance of the optional Fixed WiMAX Signal Analyzer of the MS271xE Spectrum Master. Verification tests are as follows:

- [“Fixed WiMAX Signal Analyzer Option Verification \(Option 46 or 885\)”](#)
- [“Fixed WiMAX Signal Analyzer Option Verification \(Option 47 or 885\)” on page 3-54](#)

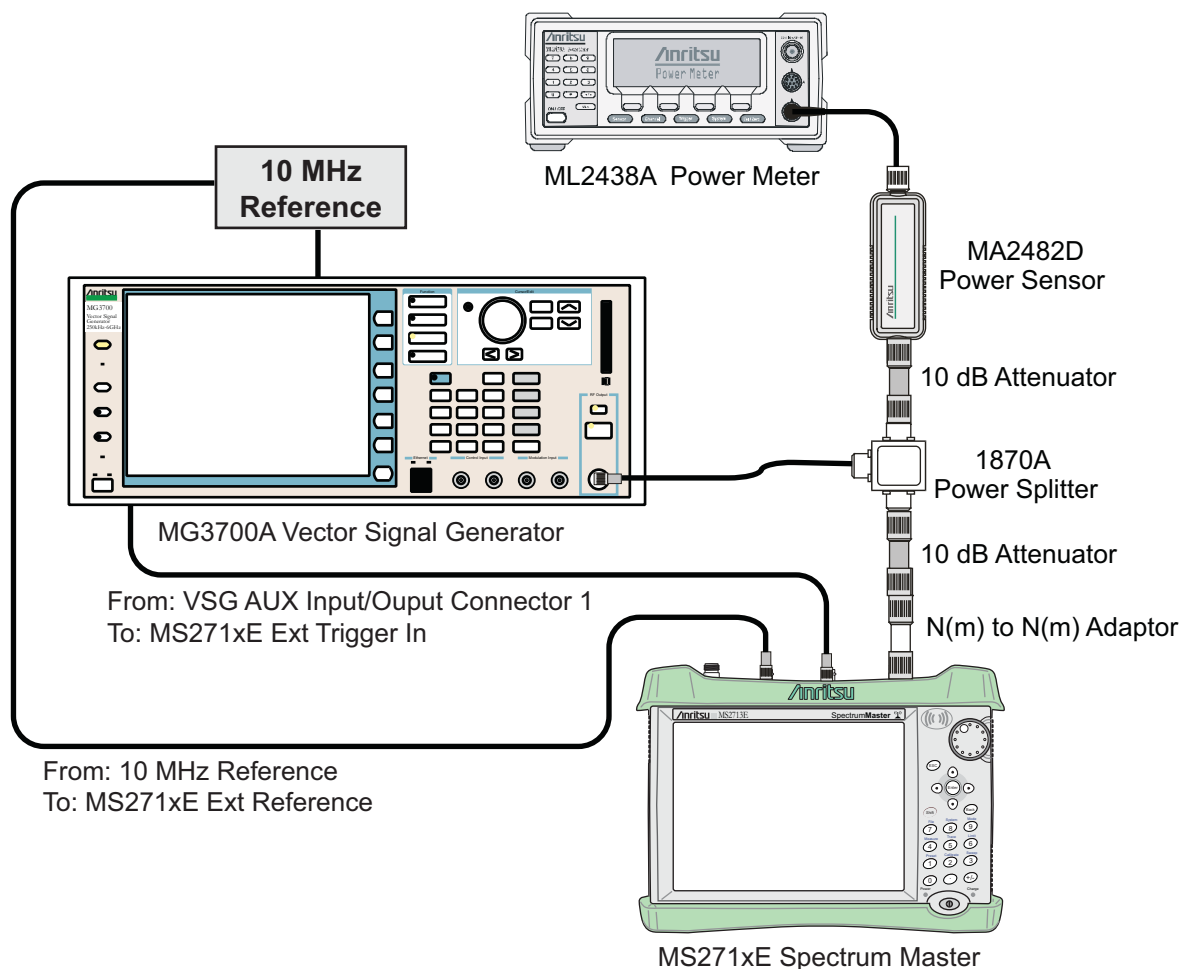
### Fixed WiMAX Signal Analyzer Option Verification (Option 46 or 885)

The tests in this section verify the Channel Power Accuracy of the optional Fixed WiMAX Signal Analyzer in Model MS271xE Spectrum Master.

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

## Setup



**Figure 3-13.** Fixed WiMAX Signal Analyzer Option Verification

### 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 equipment as shown in [Figure 3-13](#).
4. Set the MG3700A as follows:
  - a. Press the yellow **Preset** key (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 Return (F6) soft key.
  - h. Press the **Set** key. The Select Package list box appears. Again select WiMax and the **Set** key.
  - i. Another file list appears. Select (highlight) Mx10g32.
  - j. Press the **Set** key.

- k. Press the **MOD On/Off** key and verify that the LED is On. Confirm 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  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
6. Set the MS271xE to Fixed WiMax Signal Analyzer mode and preset the instrument.
7. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key and set the center frequency to 2600.5 MHz.
  - b. Press the **Setup** main menu key, and set the Bandwidth to 10 MHz.
  - c. Press the CP Ratio submenu key (in the **Setup** menu) and set the CP Ratio to 1/32.
  - d. Press the **Measurements** main menu key and then press the RF Measurements submenu key. Then press the Power vs Time submenu key.
8. Record the MS271xE Channel Power (RSSI) reading in the **Measured Channel Power (RSSI)** column of [Table A-51, “Option 46/885, Fixed WiMAX Channel Power Accuracy” on page A-33](#).
9. Calculate the Channel Power Error by subtracting the MS271xE Channel Power (RSSI) reading from the power meter reading in [Step 5](#). Record the result in the **Error** column of [Table A-51](#).
10. Verify that the error is within specification.
11. Adjust the MG3700A level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm}$ .
12. Record the MS271xE Channel Power (RSSI) reading in the **Measured Channel Power (RSSI)** column of [Table A-51](#).
13. Calculate the Channel Power Error by subtracting the MS271xE Channel Power (RSSI) reading from the power meter reading in [Step 11](#). Record the result to the **Error** column of [Table A-51](#).
14. Verify that the error is within specification.
15. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
16. Set the MG3700A frequency to 3600.5 MHz.
17. Change the MS271xE center frequency to 3600.5 MHz.
18. Measure the Channel Power (RSSI) for both  $-15 \text{ dBm}$  and  $-50 \text{ dBm}$ , and then record the measured result and calculated error in [Table A-51 on page A-33](#).
19. Verify that the error is within specification.
20. Set the calibration factor frequency of the power sensor to 5600.5 MHz.
21. Set the MG3700A frequency to 5600.5 MHz.
22. Change the MS271xE center frequency to 5600.5 MHz.
23. Repeat [Step 18](#) and [Step 19](#).

## Fixed WiMAX Signal Analyzer Option Verification (Option 47 or 885)

The tests in this section verify the Residual EVM and Frequency Error of the optional Fixed WiMAX Signal Analyzer in Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

### 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 equipment as shown in [Figure 3-13](#).
4. Set the MG3700A as follows:
  - a. Press the yellow **Preset** key (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 Return (F6) soft key.
  - h. Press the **Set** key. The Select Package list box appears. Again select WiMax and press the **Set** key.
  - i. Another file list appears. Select (highlight) Mx10g32.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is on. Confirm 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 On the output.
5. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
6. Set the MS271xE to Fixed WiMax Signal Analyzer mode and preset the instrument.
7. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key and set the center frequency to 2600.5 MHz.
  - b. Press the **Setup** main menu key and set the Bandwidth to 10 MHz.
  - c. Press the CP Ratio submenu key (in the **Setup** menu) and set the CP Ratio to 1/32.
  - d. Press the **Measurements** main menu key and then press the Demodulator submenu key. Then press the Modulation Summary submenu key.



8. Record the MS271xE EVM(rms) reading in [Table A-52, “Option 47/885, Fixed WiMAX Residual EVM” on page A-33](#).
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  $\pm$  0.2 dB.
11. Record the MS271xE EVM(rms) reading in [Table A-52](#).
12. Verify that the measured EVM is within specification.
13. Record the MS271xE Freq Error reading in [Table A-53, “Option 47/885, Fixed WiMAX Frequency Error” on page A-33](#).
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 the MG3700A frequency to 3600.5 MHz.
17. Change the center frequency of the MS271xE to 3600.5 MHz.
18. Measure the EVM(rms) for both  $-15$  dBm and  $-50$  dBm, and record the measured results in [Table A-52](#).
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 the MG3700A frequency to 5600.5 MHz.
22. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0$  dBm  $\pm$  0.2 dBm.
23. Change the center frequency of the MS271xE to 5600.5 MHz.
24. Record the MS271xE EVM(rms) reading in [Table A-52](#).
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  $\pm$  0.2 dB.
27. Record the MS271xE EVM(rms) reading in [Table A-52](#).
28. Verify that the measured EVM is within specification.
29. Record the MS271xE frequency error reading in [Table A-53](#).
30. Verify that the measured frequency error is within specification.

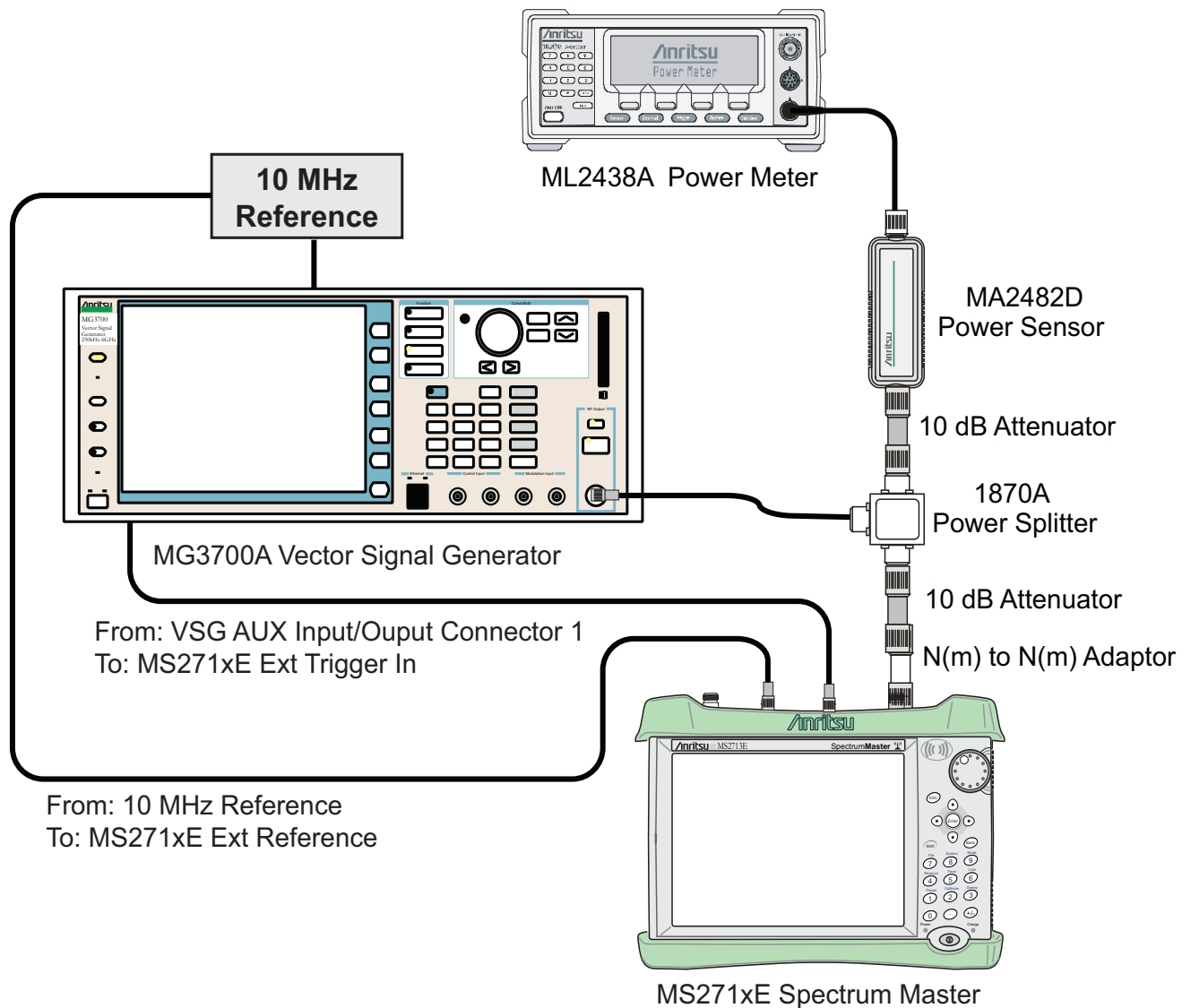
## 3-13 TD-SCDMA Signal Analyzer Verification, Option 60/61/882

The tests in this section verify the performance of the optional TD-SCDMA Signal Analyzer option of the MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (3)
- 10 MHz Reference Standard

## Setup



**Figure 3-14.** TD-SCDMA Signal Analyzer Option Verification

### Procedure

1. Calibrate the power sensor prior to connecting to the power splitter.
2. Connect the equipment as shown in [Figure 3-14](#).
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 MS271xE to **TD-SCDMA Signal Analyzer** mode and preset the instrument.

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

6. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
7. Press the down arrow key or turn the knob to select **Yes**.

8. Press the **Set** key. Both **Set** keys on the MG3700A perform the same function.
9. Press the F1 submenu key to select Load File to Memory.
10. Press the F1 submenu key again to select Select Package.
11. Using the down arrow key step through the selection list until the TD-SCDMA(MX370001A) option is highlighted.
12. Press the **Set** key.
13. Press the Return (F6) soft key.
14. Press the **Set** key. The Select Package box appears. Use the rotary knob to highlight TD-SCDMA(MX370001A) and press the **Set** key to select.
15. Another file list appears. Use the rotary knob to select rmc-P-CCPCH\_bs\_dl and press the **Set** key to select.
16. 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.
17. Press the **Frequency** key, and enter 2010 MHz.
18. Press the **Level** key, enter -20, and press the dBm submenu key.
19. Adjust the MG3700A output so that the power meter reads -45 dBm ± 0.5 dB.
20. On the MS271xE, press the **Frequency** main menu key, then press the Center Freq submenu key, and then enter 2010 MHz as center frequency.
21. Press the **Measurements** main menu key and then press the TD-SCDMA Summary submenu key (a red dot appears on the key label when active).
22. Press the **Setup** main menu key and then press the Trigger submenu key. Then change Trigger Type to Ext by pressing the Trigger Type submenu key twice. Then wait 15 seconds to allow the MS271xE to update its measured results.
23. For an MS271xE with Option 60 or 882 (TD-SCDMA RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 19](#). Then record the calculated Channel Power Error in [Table A-54](#), “[Option 60/61/882 TD-SCDMA Verification \(at 2010 MHz, -45 dBm Level, TD-SCDMA\)](#)” on page A-34.
24. For an MS271xE with Option 61 or 882 (TD-SCDMA Demodulator), record the displayed Freq Error and Tau values in [Table A-54](#).
25. Verify that the measured values in [Step 23](#) or [Step 24](#) (or both) are within specification.

### 3-14 EVDO Signal Analyzer Verification, Option 62/63/884

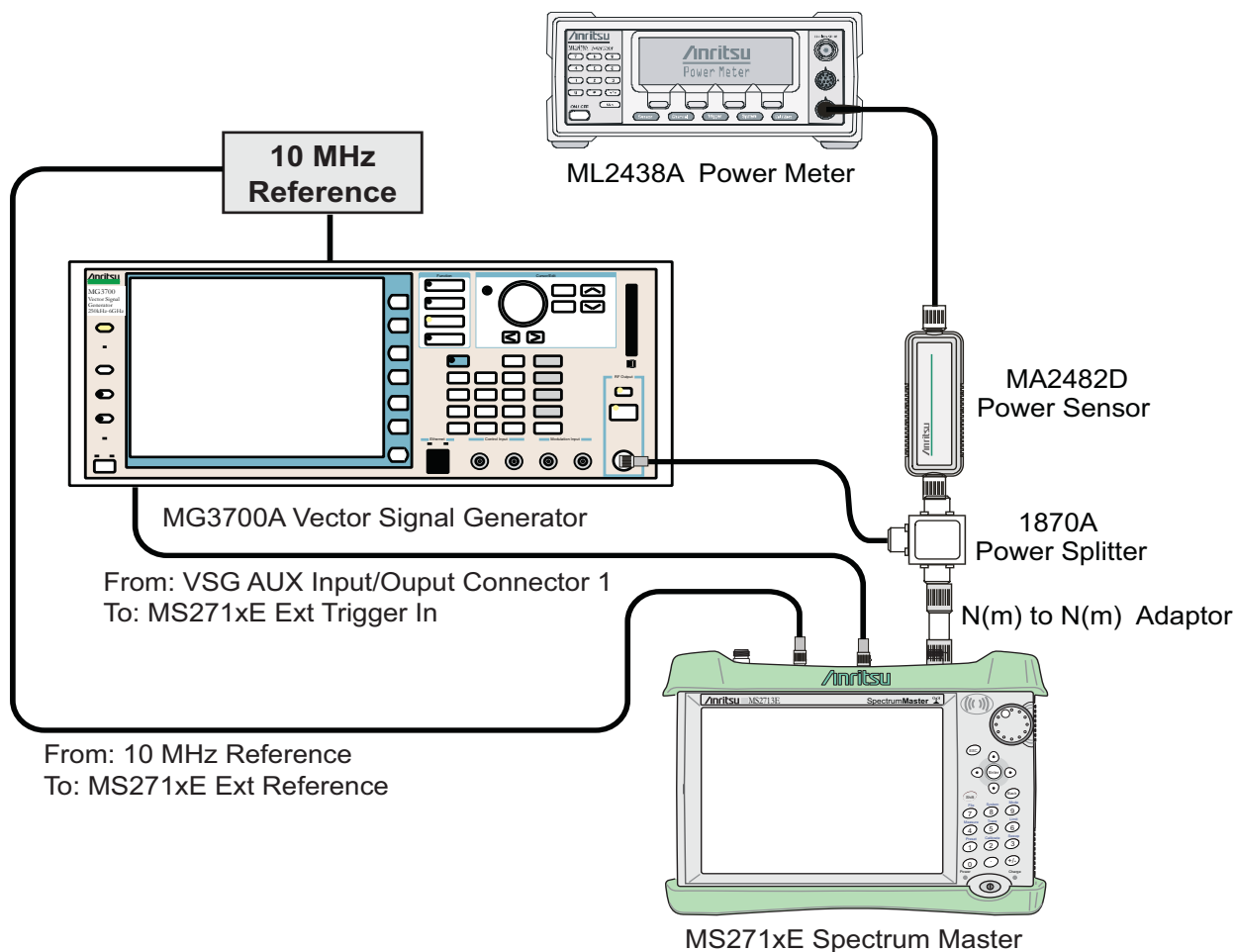
The tests in this section verify the optional EVDO Signal Analyzer functions in Anritsu Model MS271xE Spectrum Master. Verification tests are as follows:

- “8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification” on page 3-60
- “QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification” on page 3-61
- “16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Verification ” on page 3-62
- “Idle Slot Channel Power, Frequency Error, Rho and Tau Verification” on page 3-62

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu 2000-1627-R RF Coaxial Cables (3)
- 10 MHz Reference Standard

## Setup



**Figure 3-15.** EVDO Signal Analyzer Option Verification

### 8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification

The tests in this section verify the function of the optional EVDO Signal Analyzer in the Model MS271xE Spectrum Master.

#### Procedure

1. Calibrate the power sensor.
2. Connect the equipment as shown in [Figure 3-15](#).
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 MS271xE mode to EVDO Signal Analyzer. Preset the instrument.
5. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
6. Press the **Down Arrow** key or turn the knob to select Yes.
7. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

8. Press the (F1) soft key to select Load File to Memory.
9. Press the (F1) soft key again to select Select Package.
10. Using the **Down Arrow** key, step through the selection list until the CDMA2000\_1xEV-DO option is highlighted.
11. Press the **Set** key.
12. Press the (F6) soft key (Return).
13. Press the **Set** key. The Select Package box appears. Use the rotary knob to highlight CDMA2000\_1xEVDO and press the **Set** key to select.
14. Another File List appears. Use the rotary knob to select FWD\_921\_6KBPS\_2SLOT and press the **Set** key to select.
15. 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.
16. Press the **Frequency** key, and enter 870.03 MHz.
17. Press the **Level** key, enter -40, and press the dBm submenu key.
18. Adjust the MG3700A output so that the power meter reads -50 dBm ± 0.2 dB.
19. On the MS271xE, press the **Freq** main menu key, then press the Center Freq submenu key, and enter 870.03 MHz as Center Frequency.
20. Press the **Measurements** main menu key, and then press the EVDO Summary submenu key (a red dot appears on the key label when active).
21. Press the **Setup** main menu key and then press the PN Setup submenu key. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Then wait 15 seconds to allow the MS271xE to update its measured results.
22. For an MS271xE with Option 62 or 884 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 18](#). Then record the calculated Channel Power Error into the **At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation** section of [Table A-55](#), “[Option 62/884, EVDO RF Measurements](#)” on page A-34.
23. For an MS271xE with Option 63 or 884 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in the **870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation** section of [Table A-56](#), “[Option 63/884, EVDO Demodulator](#)” on page A-35.
24. Verify that the measured values in [Step 22](#) or [Step 23](#) (or both) are within specification.

## QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Verification

The tests in this section verify the function of the optional EVDO Signal Analyzer in Model MS271xE Spectrum Master.

### Procedure

1. Confirm 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.
6. On the MS271xE, press the **Frequency** main menu key, then press the Center Freq submenu key, and then enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS271xE to update its measured results.

7. For an MS271xE with Option 62 or 884 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 5](#). Then record the calculated Channel Power error to the **At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation** section of [Table A-55, “Option 62/884, EVDO RF Measurements”](#) on page A-34.
8. For an MS271xE with Option 63 or 884 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau to the **At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation** section of [Table A-56, “Option 63/884, EVDO Demodulator”](#) on page A-35.
9. Verify that the measured values in [Step 7](#) or [Step 8](#) (or both) are within specification.

## 16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Verification

The tests in this section verify the function of the optional EVDO Signal Analyzer in Model MS271xE Spectrum Master.

### Procedure

1. Confirm that the equipment settings are unchanged from the previous test. The power sensor calibration factor frequency should still be at 1930 MHz, and the MG3700A frequency and MS271xE 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  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
4. Wait 15 seconds to allow the MS271xE to update its measured results.
5. For an MS271xE with Option 62 or 884 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in the **At 1930.05 MHz,  $-50 \text{ dBm}$  Level, 2457.6kps 16-QAM Modulation** section of [Table A-55](#).
6. For an MS271xE with Option 63 or 884 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in the **At 1930.05 MHz,  $-50 \text{ dBm}$  Level, 2457.6kps 16-QAM Modulation** section of [Table A-56](#).
7. Verify that the measured values in [Step 5](#) or [Step 6](#) (or both) are within specification.

## Idle Slot Channel Power, Frequency Error, Rho and Tau Verification

The tests in this section verify the function of the optional EVDO Signal Analyzer in Model MS271xE Spectrum Master.

### Procedure

1. Confirm that the equipment settings are unchanged from the previous test. The power sensor calibration factor frequency should still be at 1930 MHz, and the MG3700A frequency and MS271xE 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  $-50 \text{ dBm} \pm 0.2 \text{ dB}$ .
4. Then wait 15 seconds to allow the MS271xE to update its measured results.
5. For an MS271xE with Option 62 or 884 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in the **At 1930.05 MHz,  $-50 \text{ dBm}$  Level, IDLE SLOT** section of [Table A-55, “Option 62/884, EVDO RF Measurements”](#) on page A-34.
6. For an MS271xE with Option 63 or 884 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in the **At 1930.05 MHz,  $-50 \text{ dBm}$  Level, IDLE SLOT** section of [Table A-56, “Option 63/884, EVDO Demodulator”](#) on page A-35.
7. Verify that the measured values in [Step 5](#) or [Step 6](#) (or both) are within specification.



8. 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.
9. Set the MG3700A frequency to 870.03 MHz.
10. Adjust the MG3700A output so that the power meter reads  $-10 \text{ dBm} \pm 0.2 \text{ dB}$ .
11. On the MS271xE, press the **Frequency** main menu key, then press the **Center Freq** submenu key, and then enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS271xE to update its measured results.
12. For an MS271xE with Option 62 or 884 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 10](#). Then record the calculated Channel Power error in the **At 870.03 MHz, -10 dBm Level, IDLE SLOT** section of [Table A-55](#).
13. For an MS271xE with Option 63 or 884 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in the **At 870.03 MHz, -10 dBm Level, IDLE SLOT** section of [Table A-56](#).
14. Verify that the measured values in [Step 12](#) or [Step 13](#) (or both) are within specification.

## 3-15 DVB-T/H Signal Analyzer Verification, Option 64, 57

The tests in this section verify the performance of the optional DVB-T/H Signal Analyzer option of the Spectrum Master. Verification tests are as follows:

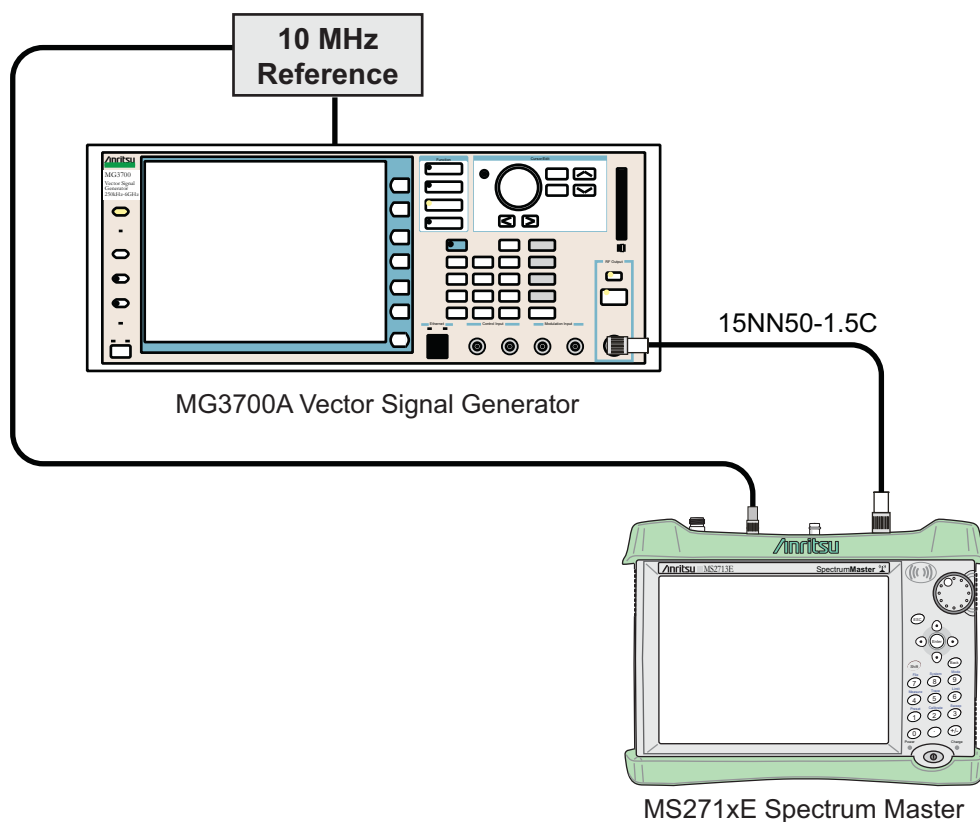
- “Frequency Accuracy and Residual MER Verification” on page 3-64
- “Frequency Lock Range Verification” on page 3-66
- “Level Accuracy Verification” on page 3-67
- “Displayed Average Noise Level (DANL) Verification” on page 3-72
- “BER Measurement Functional Check, Option 57 Only” on page 3-73

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

### Frequency Accuracy and Residual MER Verification

The tests in this section verify the frequency accuracy and residual modulation error ratio (MER) of the Spectrum Master in DVB-T/H Signal Analyzer mode.



**Figure 3-16.** Frequency Accuracy and Residual MER Verification

**Procedure**

1. Connect the 10 MHz External Reference signal into the MG3700A and Spectrum Master as shown in [Figure 3-16 on page 3-64](#).
2. On MG3700A, press the yellow **Preset** key on the upper-left side of the instrument.
3. Press the **Down Arrow** key to select Yes.
4. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key, labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
14. Press the **Set** key.
15. Set the Level to  $-20$  dBm.
16. Set the Frequency to 470 MHz.
17. Press the **Baseband** key and then the **More** key.
18. Press the F5 soft key, labeled Pattern Combination [Defined].
19. Press the **Set** key.
20. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
21. Press the **Set** key.
22. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
23. Press the **Set** key.
24. Rotate the knob to highlight Freq Offset, and use the numeric keypad to enter 4 MHz.
25. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
26. Connect the MG3700A Output to the Spectrum Master's RF In connector.
27. Set the mode of the Spectrum Master to **DVB-T/H Signal Analyzer** and preset the instrument.
28. Press the **Measurements** hard key, then the Modulation Analysis soft key, and then press the Composite View soft key.
29. Press the **Amplitude** hard key, and set the Reference Level to  $-20$  dBm.
30. Press the **Frequency** hard key then the Signal Standard soft key and choose Digital Terrestrial TV UHF (Europe). Ensure that the Channel is set to 21.
31. Press the **Shift** and **Sweep** (3) hard keys and then press the Meas Mode soft key.
32. Use the **Up/Down arrow** keys to highlight Moving Average and press the **Enter** key.
33. Press the Average Count soft key, then enter 10, and press the **Enter** key.
34. Wait until Average (10/10) appears at the top of the display.

35. Record the Frequency Offset reading on the Spectrum Master into the “Frequency Error” column in Table A-57, “Option 64, DVB-T/H Signal Analyzer, Frequency Accuracy for –20 dBm Reference Level” on page A-36.
36. Record the MER Total reading on the Spectrum Master in the “Total MER” column in Table A-59, “Option 64, DVB-T/H Signal Analyzer, Residual MER Pre Amp OFF” on page A-36
37. Set the MG3700A Level to –50 dBm.
38. On the Spectrum Master, turn On the Pre Amp by pressing the **Amplitude** hard key and then pressing the Pre Amp soft key. Press the Reference Level soft key and set the Reference Level to –50 dBm.
39. Wait until Average (10/10) appears at the top of the display.
40. Record the Frequency Offset reading on the Spectrum Master into the “Frequency Error” column in Table A-58, “Option 64, DVB-T/H Signal Analyzer, Frequency Accuracy for –50 dBm Reference Level” on page A-36.
41. Record the MER Total reading on the Spectrum Master into the “Total MER” column in Table A-60, “Option 64, DVB-T/H Signal Analyzer, Residual MER Pre Amp On” on page A-36.
42. Set Spectrum Master Pre Amp to Off.
43. Set the MG3700A Frequency to 662 MHz and Level to –20 dBm.
44. Change the Spectrum Master to Channel 45, and set Reference Level to –20 dBm.
45. Repeat Step 34 through Step 41.
46. Set Spectrum Master Pre Amp to Off.
47. Set the MG3700A Frequency to 854 MHz and Level to –20 dBm.
48. Change the Spectrum Master to Channel 69 and set Reference Level to –20 dBm.
49. Repeat Step 34 through Step 41.

## Frequency Lock Range Verification

The test in this section can be used to verify the frequency lock range of the Spectrum Master in DVB-T/H Signal Analyzer mode.

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Frequency Reference

### Procedure:

1. Connect the 10 MHz Frequency Reference source to the Anritsu MG3700A and Spectrum Master as shown above in Figure 3-16 on page 3-64.
2. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
3. Press the **Down Arrow** key to select **Yes**.
4. Press the **Set** key (Note that two Set keys are available, and they both do the same thing.)
5. Press the F1 soft key to select Load file to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
8. Press the **Set** key.

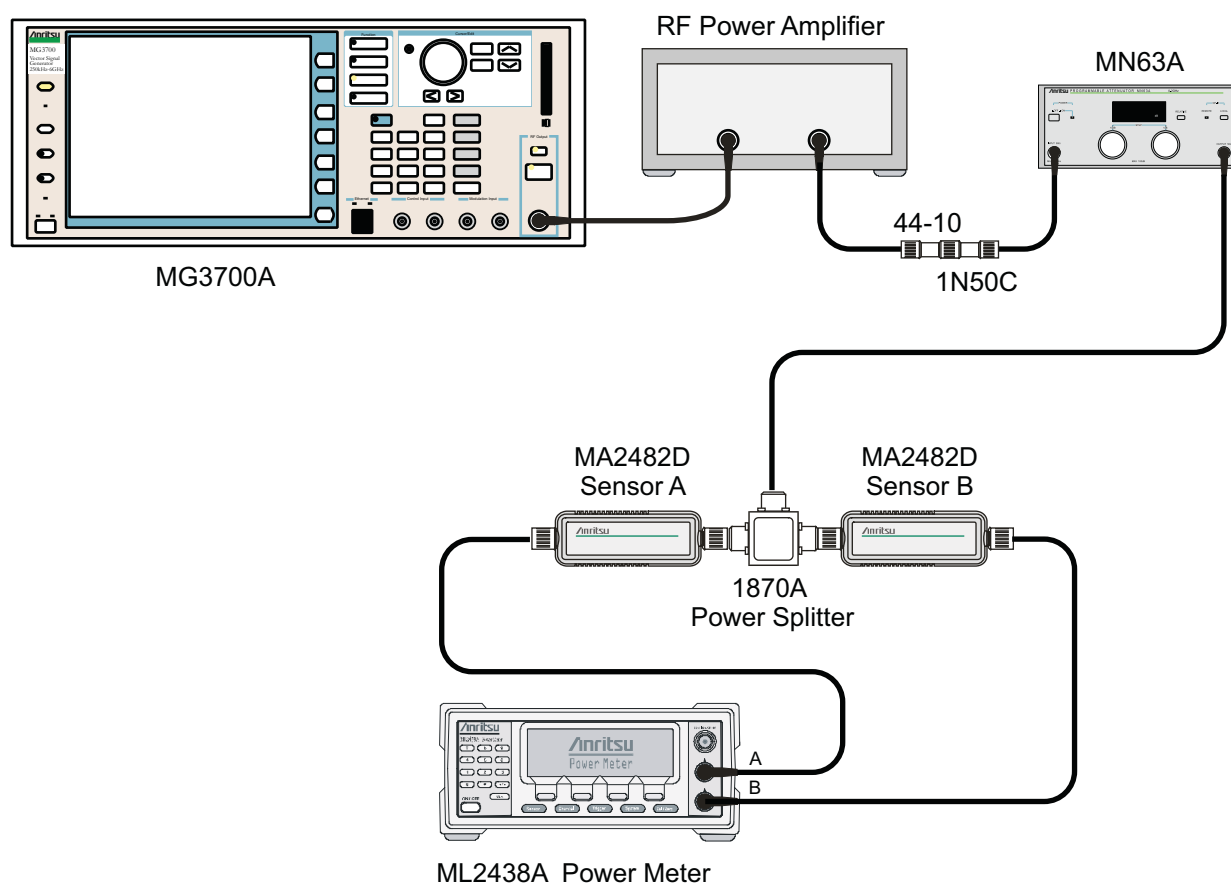
9. Press the F6 soft key, labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
14. Press the **Set** key.
15. Set the Frequency to 474.09 MHz.
16. Set the Level to -20 dBm.
17. Ensure the **Mod On/Off** key and the **Output** key each have an illuminated LED.
18. Set the mode of the Spectrum Master to **DVB-T/H Signal Analyzer**. Press the **Shift** key and the **Preset (1)** key, and then press the **Preset** soft key to reset the Spectrum Master.
19. Connect the MG3700A output signal to the Spectrum Analyzer RF In connector on the Spectrum Master.
20. On the Spectrum Master, press the **Frequency** hard key, then the **Signal Standard** soft key, and then choose Digital Terrestrial TV UHF (Europe) and ensure that Channel is set to 21.
21. Press the **Amplitude** hard key and set the Reference Level to -20 dBm.
22. Press the **Measurements** hard key, then press the **Modulation Analysis** soft key, and then press the **Composite View** soft key.
23. Press the **Shift - Sweep (3)** hard keys and then the **Meas Mode** soft key.
24. Use the rotary knob to highlight **Moving Average** and press the **Enter** key.
25. Press the **Average Count** soft key, then enter 10, and press the **Enter** key.
26. Wait until Average (10/10) appears at the top of the display.
27. Record the Frequency Error in the “**474.09 MHz**” row of [Table A-61, “Option 64, DVB-T/H Signal Analyzer, Frequency Lock Range” on page A-37](#).
28. On the MG3700A, set the frequency to 473.91 MHz.
29. Press **Execute Measure**. After Average (10/10) appears, record the Frequency Offset in the “**473.91 MHz**” row of [Table A-61, “Option 64, DVB-T/H Signal Analyzer, Frequency Lock Range” on page A-37](#).

## Level Accuracy Verification

The tests in this section verify the level accuracy of the Spectrum Master in DVB-T/H Signal Analyzer mode.

### Equipment Required:

- Anritsu MG3700A Vector Signal Generator
- Anritsu Model ML2438A Power Meter
- Anritsu Model MN63A Programmable Attenuator
- Mini Circuits Model TIA-1000-1R8 RF Power Amplifier
- Anritsu Model MA2482D Power Sensors (2)
- Aeroflex/Weinschel Model 1870A Power Splitter
- Aeroflex/Weinschel Model 44-10 Fixed Attenuator
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C RF Coaxial Cables (3)
- Anritsu Model 34NN50A Adapter
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)
- Anritsu 1N50C RF Limiter

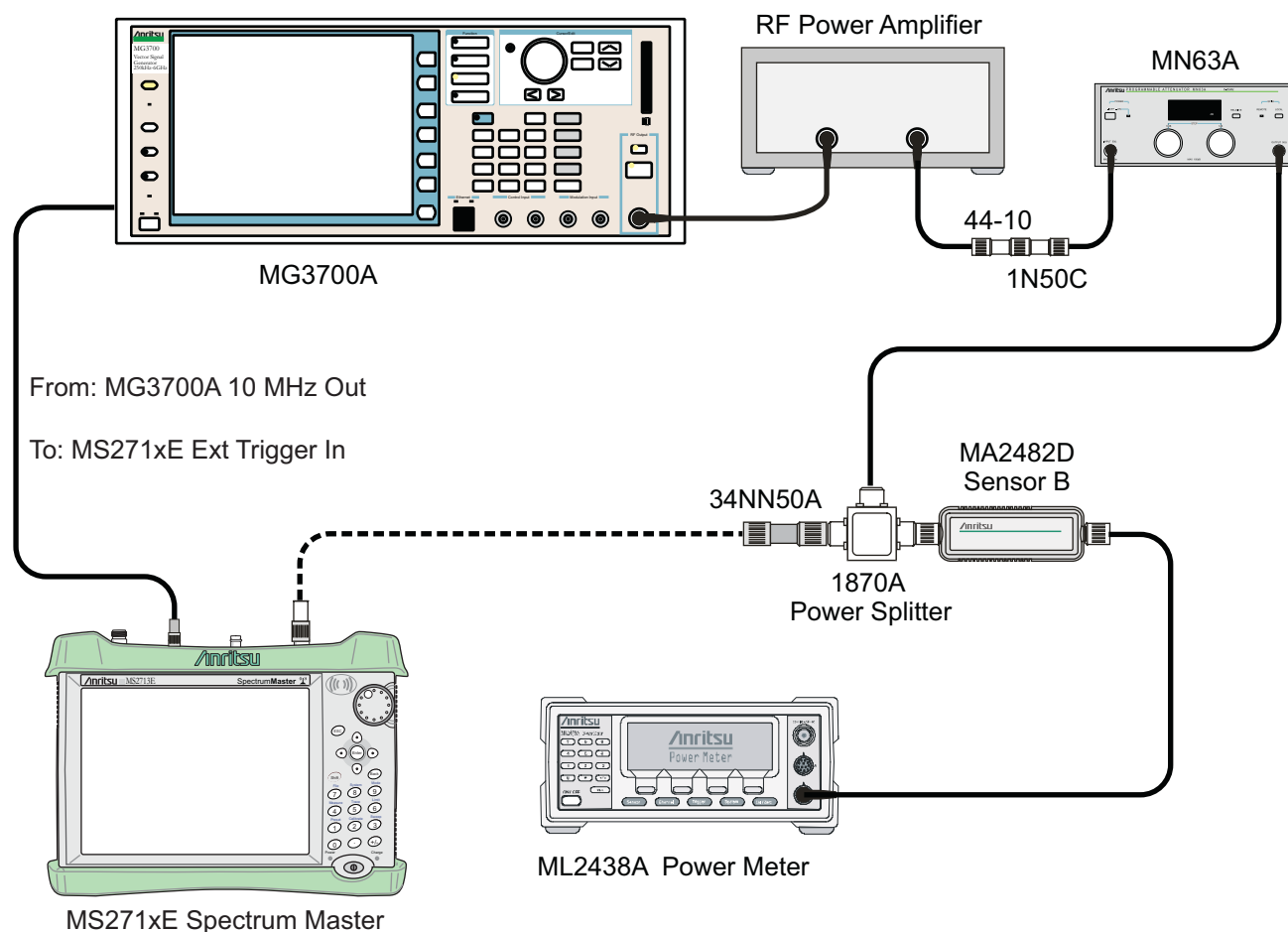


**Figure 3-17.** Level Accuracy Verification Setup

**Procedure:**

1. Ensure that the Power Amplifier is Off.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-17 on page 3-68](#)
3. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
4. Press the **Down Arrow** key to select Yes.
5. Press the **Set** key (Note that two Set keys are available, and they both do the same thing.)
6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key, labeled Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital\_Broadcast option is highlighted.
13. Press the **Set** key.

14. Use the **Down Arrow** key to step through the selection list until the DVB-T\_H\_00 option is highlighted.
15. Press the **Set** key.
16. Perform a Zero/Cal on Sensor A and Sensor B on the power meter. Set the calibration factor of both sensors to 474 MHz.
17. Set the MG3700A Frequency to 474 MHz.
18. Set the Level to  $-25$  dBm.
19. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
20. Turn On the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that the Sensor A reading is  $-10$  dBm  $\pm$  1 dBm. Record the actual attenuation reading in [Table A-62, “Option 64, DVB-T/H Signal Analyzer, Level Accuracy Verification, -10” on page A-37](#)
22. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is  $-10.0$  dBm  $\pm$  0.2 dBm.
23. Record the following values into the appropriate table cells in [Table A-62](#):
  - Power Meter Sensor A reading to “**Sensor A Reading**”
  - Power Meter Sensor B reading to “**Sensor B Reading**”
24. Subtract the value of the Sensor A reading from the value of the Sensor B reading and record the result into the “**DAB (-10)**” column of [Table A-62](#).
25. Calculate the **AT(set)** values for Test Levels  $-10$  dBm through  $-45$  dBm and record the values into the “**AT(set) (dB)**” column in [Table A-64, “Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 21 at 474 MHz” on page A-38](#).



**Figure 3-18.** Level Accuracy Verification

26. Remove Sensor A from the Power Splitter, and then connect the Power Splitter to the Spectrum Master RF In port with the N(m)-to-N(m) adapter, as shown in [Figure 3-18 on page 3-70](#).
27. Record the new Power Meter Sensor B reading to the “SB(-10)” box in [Table A-64 on page A-38](#).
28. On the Spectrum Master, set the mode to **DVB-T/H Signal Analyzer** and preset the instrument.
29. Press the **Frequency** hard key, then the **Signal Standard** soft key, and choose **Digital Terrestrial TV UHF (Europe)**. Ensure that **Channel 21** is selected and that the **Pre Amp** is **Off**.
30. Change the **Reference Level** to **-10 dBm**.
31. Press the **Shift - Sweep (3)** hard keys, then choose **Meas Mode**.
32. Use the **Up/Down** arrow keys to highlight **Moving Average**, and press the **Enter** key.
33. Change the **Average Count** to **50** if required.
34. After **Average (50/50)** appears at the top of the display, record the **Channel Power** from the Spectrum Master into the “**Pre Amp Off M(Level) (dBm)**” column in [Table A-64 on page A-38](#).
35. Calculate the **Deviation** by using the following formula:

$$\text{Deviation} = M(\text{Level}) - SB(-10) - DAB(-10) - AT(-10) + AT(\text{set})$$

**Note:** Because  $AT(-10)$  is the same as  $AT(\text{set})$ , the value of  $[-AT(-10) + AT(\text{set})]$  is equal to zero.



36. Record the result in the “**Pre Amp Off Dev (dB)**” column in [Table A-64 on page A-38](#), and verify that it’s within specification.
37. Set the MN63A attenuation to the next **AT(set)** value in [Table A-64](#).
38. Press the **Amplitude** hard key and set the Reference Level of the Spectrum Master to –15 dBm.
39. After Average (50/50) appears, record the –15 dBm Channel Power from the Spectrum Master into the “**Pre Amp Off M(Level) (dBm)**” column in [Table A-64](#)
40. Calculate the Deviation by using the following formula:  

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
41. Record the result into the “**Pre Amp Off Dev (dB)**” column in [Table A-64](#), and verify that it’s within specification.
42. Set the MN63A attenuation to the next **AT(set)** value in [Table A-64](#).
43. Set the Reference Level of the Spectrum Master to –20 dBm.
44. After Average (50/50) appears, record the –20 dBm Channel Power from the Spectrum Master into the “**Pre Amp Off M(Level) (dBm)**” column in [Table A-64](#)
45. Calculate the Deviation by using the following formula:  

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
46. Record the result into the “**Pre Amp Off Dev (dB)**” column in [Table A-64](#), and verify that it’s within specification.
47. Press the **Amplitude** hard key and set Pre Amp to On. Change the Reference Level if required.
48. After Average (50/50) appears, record the –20 dBm Channel Power from the Spectrum Master into the “**Pre Amp On M(Level) (dBm)**” column in [Table A-64](#).
49. Calculate the Deviation by using the following formula:  

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
50. Record the result into the “**Pre Amp On Dev (dB)**” column in [Table A-64](#), and verify that it’s within specification.
51. Repeat [Step 42](#) through [Step 50](#) for Test levels –25 dBm to –45 dBm. Change Reference Level and switch Pre Amp per the “**Ref Level Pre Amp Off/On**” column in [Table A-64](#).
52. Turn Off the power amplifier, disconnect the power splitter from the Spectrum Master, and reconnect Sensor A to the power splitter as shown in [Figure 3-17 on page 3-68](#).
53. Set the MN63A Attenuation to 10 dB.
54. Set the MG3700A Level to –60 dBm.
55. Turn On the power amplifier and allow it to warm up for at least 5 minutes.
56. Adjust the MN63A Attenuator so that the Sensor A reading is –50 dBm ± 1 dBm. Record the attenuation reading into [Table A-63, “Option 64, DVB-T/H Signal Analyzer, Level Accuracy Verification, –50” on page A-37](#).
57. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is –50.0 dBm ± 0.2 dBm.
58. Record the following values into the appropriate columns in [Table A-63](#):  
 Power Meter Sensor A reading to the “**Sensor A Reading**” column  
 Power Meter Sensor B reading to the “**Sensor B Reading**” column
59. Subtract the value of the Sensor A reading from the value of the Sensor B reading and record the result into the “**DAB(–50)**” column in [Table A-63 on page A-37](#).  

$$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$

60. Calculate the **AT(set)** values for Test Levels –55 dBm through –84 dBm and record the values into the **AT(set)** column of [Table A-64 on page A-38](#).
61. Remove Sensor A from the Power Splitter, and then connect the Power Splitter to the Spectrum Master RF In port with the N(m)-to-N(m) adapter, as shown in [Figure 3-18 on page 3-70](#).
62. Record the new Power Meter Sensor B reading into the “**SB(–50)**” box in [Table A-64](#).
63. Repeat [Step 42](#) through [Step 50](#) for Test Levels –50 dBm to –84 dBm. Change the Reference Level and switch the Pre Amp On or Off per the “**Ref Level Pre Amp Off/On**” column in [Table A-64](#). Use the following formula to calculate Deviation:
 
$$\text{Deviation} = M(\text{Level}) - SB(-50) - DAB(-50) - AT(-50) + AT(\text{set})$$
64. Repeat [Step 16](#) through [Step 63](#) for frequencies 666 MHz (Ch 45) and 858 MHz (Ch 69). Set the calibration factor of both power sensors to 666 MHz or to 858 MHz as required.
 

For 666 MHz - Channel 45, use [Table A-65, “Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 45 at 666 MHz” on page A-39](#).

For 858 MHz - Channel 69, use [Table A-66, “Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 69 at 858 MHz” on page A-40](#).

### Displayed Average Noise Level (DANL) Verification

The tests in this section verify the DANL of the Spectrum Master in DVB-T/H Signal Analyzer mode.

#### Equipment Required:

- Anritsu 28N50-2 50 ohm termination

#### Procedure:

1. Set the mode of the Spectrum Master to DVB-T/H Analyzer and preset the instrument.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Press the **Frequency** hard key and choose a Signal Standard of Digital Terrestrial TV UHF (Europe). Ensure that the Channel is set to 21 and the Pre Amp is Off.
4. Press the **Shift** and **Sweep** (3) hard keys. Change Meas Mode to Moving Average, and leave Average Count set to 50.
5. Press the **Amplitude** hard key and set the Reference Level to –25 dBm.
6. After Averages (50/50) appears at the top of the display, record the Channel Power into the “**Pre Amp Off**” row of [Table A-67, “Option 64, DVB-T/H Signal Analyzer, DANL, Pre Amp OFF” on page A-41](#).
7. Set the Pre Amp to On.
8. Set the Reference Level to –50 dBm.
9. After Averages (50/50) appears at the top of the display, record the Channel Power in [Table A-68, “Option 64, DVB-T/H Signal Analyzer, DANL, Pre Amp ON” on page A-41](#).
10. Change the channel to Channel 45. Set Pre Amp to Off, and set Reference Level to –25 dBm.
11. Repeat [Step 5](#) through [Step 9](#) for Channel 45.
12. Change the channel to Channel 69. Set Pre Amp to Off, and set Reference Level to –25 dBm.
13. Repeat [Step 5](#) through [Step 9](#) for Channel 69.

## BER Measurement Functional Check, Option 57 Only

This section provides the procedures to check the functionality of the BER measurement hardware included with Option 57 in the Spectrum Master Digital Broadcast Analyzer.

### Equipment Required:

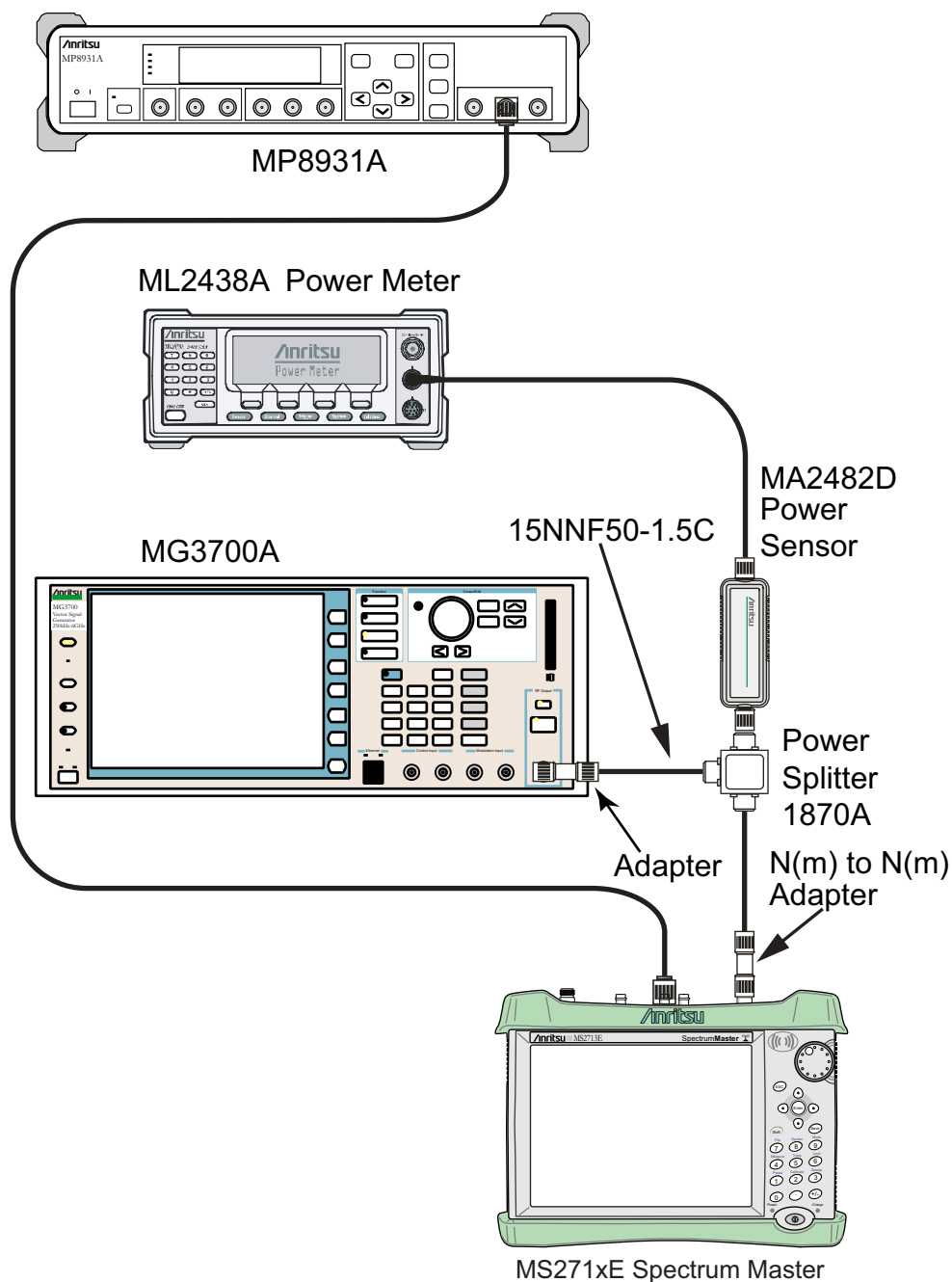
- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MP8931A Bit Error Rate Tester
- Aeroflex/Weinschel 1870A Power Splitter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 3-806-169 RF Coaxial Cable, BNC-to-BNC, 75 ohm

### Procedure:

1. Turn on the MG3700A, MP8931A, ML2438A, and the Spectrum Master.
2. Perform a Zero/Cal on Sensor A on the power meter. Set the calibration factor of the sensor to 474 MHz.
3. Connect the MG3700A Signal Generator, Power Splitter, Power Sensor, 34NN50A Adapter, Spectrum Master, and the MP8931A as shown in [Figure 3-19 on page 3-74](#).

**Note**

Use a 75 ohm BNC cable to connect between the DVB-ASI Input connector of the MP8931A and the DVB-ASI Out connector of the Spectrum Master.



**Figure 3-19.** DVB-T/H BER, Option 57 – BER Functional Check Setup

4. On the MP8931A, press the **Menu** key.
5. Press the **Down Arrow** key until the triangle pointer is at System\* on the display.
6. Press the **Right Arrow** key so that Initialize appears in the display.
7. Press the **Enter** key twice.
8. Press the **Menu** key and then the **Up Arrow** or **Down Arrow** key until the triangle pointer is at Pattern.
9. Press the **Enter** key to select.

10. Press the **Up Arrow** or **Down Arrow** key until the triangle pointer is at ALL0, and then press the **Enter** key.
11. Press the **Down Arrow** key. When the pointer is at Interface, press **Enter** to select.
12. Press the **Right Arrow** key and then press the **Down Arrow** key until the pointer is at DVB-ASI. Press the **Enter** key to select.
13. Press the **Menu** key and then the **Up Arrow** or **Down Arrow** key until the triangle pointer is at DVB-ASI\*. Press the **Right Arrow** key and confirm that the PKT is set to (1) + 187 + 16).
14. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
15. Press the **Down Arrow** key to select Yes.
16. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
17. Set the MG3700A Frequency to 470 MHz.
18. Press the **Baseband** key.
19. Press the **More** key, located at the bottom of the row.
20. Press the F5 Pattern Combination soft key as required until Edit appears.
21. Press the **More** key.
22. Press the F3 soft key so that Output B appears.
23. Press the **Baseband** key and then the F1 soft key.
24. Press the F2 soft key so that Memory A is highlighted.
25. Press the F1 key and use the **Down Arrow** key to highlight **MS8911B-057\_Inspection**.
26. Press the **Set** key.
27. Use the **Arrow** key to highlight 8M\_AWGN, and press the **Set** key. If an Overwrite question appears, then answer Yes.
28. Press the F2 soft key so that Memory B is highlighted
29. Highlight 8M\_8k\_64QAM\_2\_3\_ALL0 and press the **Set** key. If an Overwrite question appears, then answer Yes.
30. Press the F6 (Return) soft key.
31. Use the **Arrow** keys to highlight the blank line between Pattern:[ and the small green A memory symbol.
32. Press the **Set** key.
33. Ensure that MS8911B-057\_Inspection is highlighted and press the **Set** key.
34. Ensure that 8M\_AWGN is highlighted and press the **Set** key.
35. Use the **Arrow** keys to highlight the blank line between Pattern:[ and the small violet B memory symbol.
36. Press the **Set** key.
37. Ensure that MS8911B-057\_Inspection is highlighted and press the **Set** key.
38. Ensure that 8M\_8k\_64QAM\_2\_3\_ALL0 is highlighted and press the **Set** key.
39. Use the **Arrow** keys to highlight the Frequency Offset and enter 4 MHz.
40. Press the **MOD On/Off** and **Output** keys so that both LEDs are On (illuminated).
41. Adjust the Level so that the power meter reads  $-25.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
42. Set the Spectrum Master to DVB-T/H Signal Analyzer mode and preset the instrument.
43. Press the **Frequency** hard key, then press Signal Standard and select Digital Terrestrial TV UHF (Europe).
44. Ensure that the Channel is set to 21, change the Reference Level to  $-25 \text{ dBm}$ , and ensure the Pre Amp is set to Off.

45. Press the **Measurements** hard key then press BER. Verify that the Moving Avg value of **MER(quick) [dB]** is > 27 dB.
46. On the MP8931A, press the **Start/Stop** key and verify that  $0e-9$  is displayed. This verifies that the DVB ASI Out is functioning properly.

## 3-16 DVB-T/H SFN Verification, Option 78

### Introduction

The tests in this section verify the performance of the optional DVB-T/H SFN Analyzer option of the MS271xE. These tests include:

- [“Level Accuracy Verification” on page 3-77](#)
- [“Displayed Average Noise Level \(DANL\) Verification” on page 3-79](#)

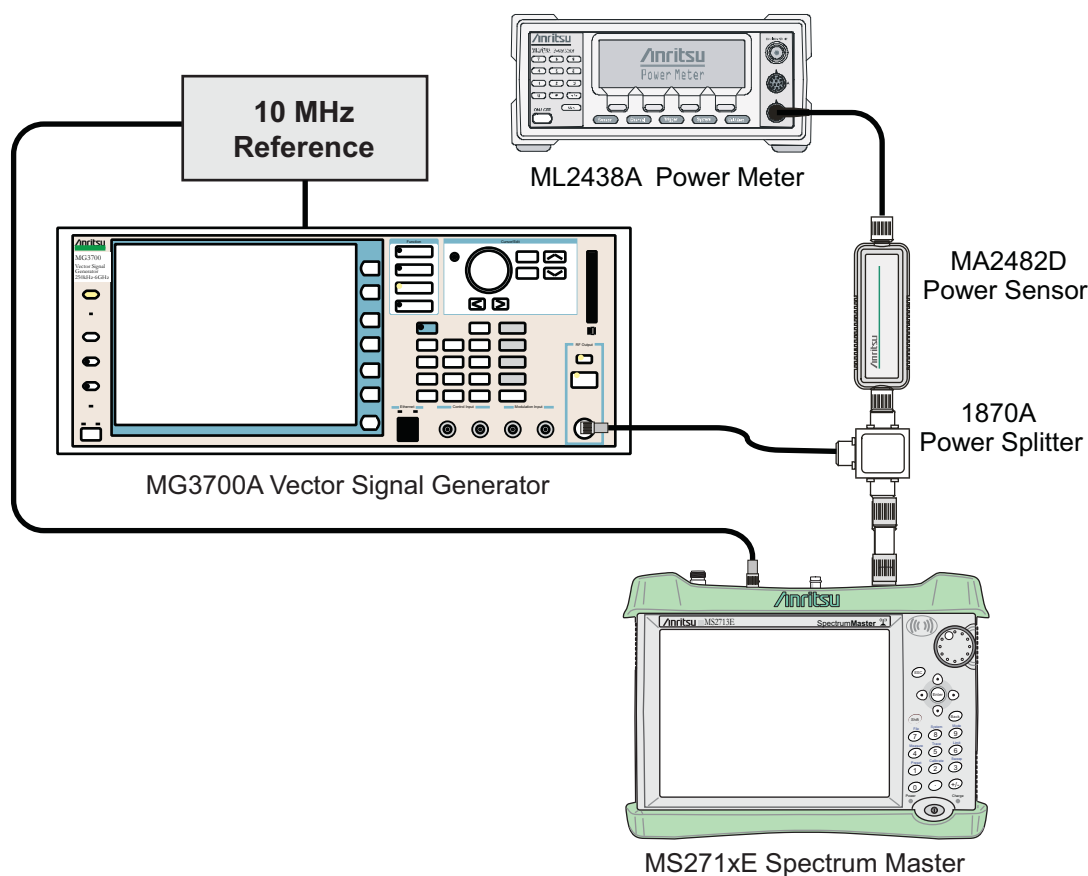
### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- 50 Ohm Terminator

### Level Accuracy Verification

The tests in this section verify the level accuracy of the MS271xE in DVB-T/H SFN Signal Analyzer mode.

## Setup



**Figure 3-20.** DVB-T/H SFN Level Accuracy Setup

### Procedure

1. Perform a Zero/Cal on Sensor B of the power meter. Set the calibration factor of the sensor to 474 MHz.
2. Connect the MG3700A Signal Generator, Power Splitter, Power Meter, and Power Sensors as shown in Figure 3-20.
3. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
4. Press the **Down Arrow** key to select **Yes**.
5. Press the **Set** key.

**Note** The MG3700A has two **Set** keys, and they both have the same function.

6. Press the (F1) soft key to select **“Load File to Memory”**.
7. Press the (F1) soft key again to select **“Select Package”**.
8. Using the **Down Arrow** key, step through the selection list until the **“Digital\_Broadcast”** option is highlighted.
9. Press the **Set** key.
10. Press the F6 (Return) soft key.
11. Press the **Set** key.



12. Using the **Down Arrow** key, step through the selection list until the “**Digital\_Broadcast**” option is highlighted.
13. Press the **Set** key.
14. Using the **Down Arrow** key, step through the selection list until the “**DVB-T\_H\_00**” option is highlighted.
15. Press the **Set** key.
16. Set the MG3700A frequency to 474 MHz.
17. Confirm that the **Modulation On/Off** key and the **Output** key both have LEDs On.
18. On the MS271xE, set the mode to **DVB-T/H SFN Analyzer** and preset the instrument.
19. Press the **Setup** main menu key, and change the Meas Mode to Continuous.
20. Press the **Frequency** main menu key and set the Center Frequency to 474 MHz.
21. Set the level on the MG3700A so Sensor B reads  $-10$  dBm  $\pm$  0.2 dBm.
22. Press the **Amplitude** main menu key and set the Reference Level to  $-10$  dBm and ensure Pre Amp is Off.
23. After the Measuring percentage gets to 100%, record the Channel Power from the MS271xE into the **Measured Level** column under **Pre Amp Off** in [Table A-69, “Option 78, DVB-T/H SFN, Level Accuracy for Channel 21, 474 MHz” on page A-41](#).
24. Repeat steps 21 through 23 for the other test levels in [Table A-69](#) for Pre Amp Off.
25. Press the **Amplitude** main menu key and turn the Pre Amp On.
26. Set the Reference Level to  $-10$  dB.
27. Set the level on the MG3700A so Sensor B reads  $-10$  dBm  $\pm$  0.2 dBm.
28. After the Measuring percentage gets to 100%, record the Channel Power from the MS271xE into the **Measured Level** column under **Pre Amp On** in [Table A-69](#).
29. Repeat steps 26 through 28 for the other test levels in [Table A-69](#) for Pre Amp On.
30. Repeat steps 1 through 29 for frequency 666 MHz and record results in [Table A-70, “Option 78, DVB-T/H SFN, Level Accuracy for Channel 45, 666 MHz” on page A-42](#).
31. Repeat steps 1 through 29 for frequency 858 MHz and record results in [Table A-71, “Option 78, DVB-T/H SFN, Level Accuracy for Channel 69, 858 MHz” on page A-42](#).

## Displayed Average Noise Level (DANL) Verification

The tests in this section verify the DANL of the MS271xE in DVB-T/H SFN Signal Analyzer mode.

### Procedure

1. Set the mode of the MS271xE to **DVB-T/H SFN Signal Analyzer** and preset the instrument.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Confirm that the Pre Amp is Off.
4. Set the Reference Level to  $-25$  dBm.
5. Press the **Setup** main menu key. Change Meas Mode to Continuous.
6. After Measuring percentage gets to 100%, record the Channel Power in [Table A-72, “Option 78, DVB-T/H SFN Analyzer DANL with Pre Amp Off” on page A-42](#).
7. Repeat for the other frequencies in [Table A-72](#).
8. Set the Reference Level to  $-50$  dBm and the Pre Amp to On.
9. Set the Frequency to 474 MHz.

10. After Average (50/50) appears, record the Channel Power in [Table A-73, “Option 78, DVB-T/H SFN Analyzer DANL with Pre Amp On” on page A-43.](#)
11. Repeat for the other frequencies in [Table A-73.](#)

### 3-17 Mobile WiMAX Signal Analyzer Verification, Options 66/67/885

The tests in this section verify the functionality of the Mobile WiMAX Signal Analyzer of the MS271xE. Verification tests are as follows:

- [“Mobile WiMAX Channel Power Accuracy Tests \(Option 66 or 885\)”](#)
- [“Mobile WiMAX Residual EVM and Frequency Error Tests \(Option 67 or 885\)” on page 3-84](#)

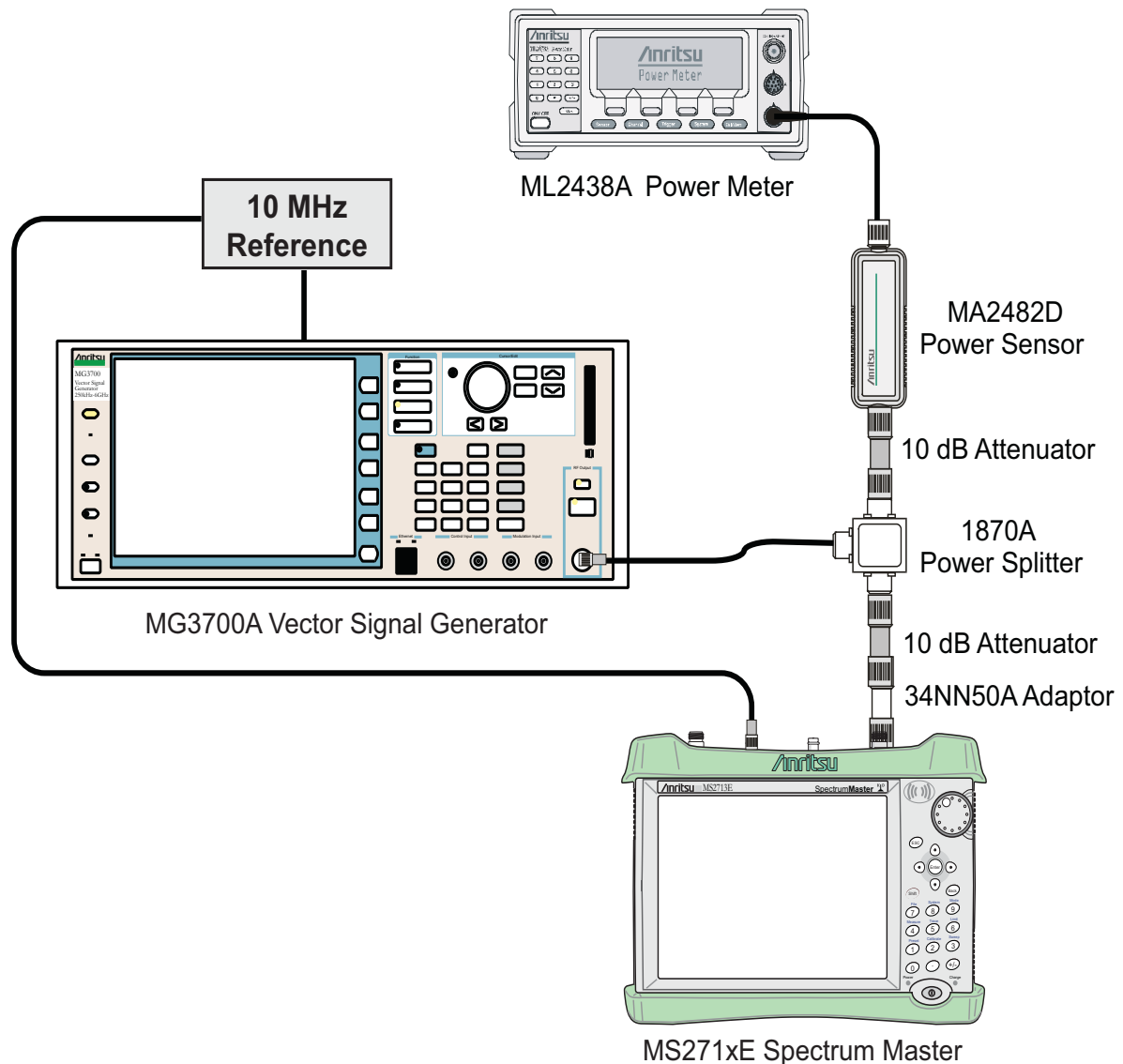
#### Mobile WiMAX Channel Power Accuracy Tests (Option 66 or 885)

The tests in this section verify the function of the optional Mobile WiMAX Signal Analyzer in Model MS271xE Spectrum Master.

#### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (3)
- 10 MHz Reference Standard

## Setup



**Figure 3-21.** Mobile WiMAX Signal Analyzer Option Verification

### 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 the equipment as shown in [Figure 3-21](#).

### Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length)

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 “**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 appears. Again select mWiMax and press **Set**.
  - i. Another file list appears. 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. Confirm 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.
6. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
  7. Set the MS271xE to **Mobile WiMax Signal Analyzer** mode and preset the instrument.
  8. Set the MS271xE as follows:
    - a. Press the **Freq** main menu key, press the **Center Freq** submenu key, and set the Center Frequency to 2600.5 MHz.
    - b. Press the **Setup** main menu key and set the Bandwidth to 10 MHz.
    - c. Press the **Frame Length** submenu key and set the Frame Length to 10 ms.
    - d. Press the **Measurements** main menu key and press the **RF Measurements** submenu key. Then press **Power vs Time**.
  9. Record the MS271xE Channel Power (RSSI) reading in the **Measured Channel Power (RSSI)** column, **2600.5 MHz, -15 dBm** row of [Table A-74, “Option 66/885, Mobile WiMAX Channel Power Accuracy \(10 MHz Bandwidth and 10 ms Frame Length\)”](#) on page A-44.
  10. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power (RSSI)**” reading from the power meter reading in [Step 6](#). Record the result into the test record in the **Error** column, **2600.5 MHz, -15 dBm** row of [Table A-74](#).
  11. Verify that the error is within specification.
  12. Adjust the MG3700A level setting to approximately  $-33 \text{ dBm}$  so that the power meter reads  $-50.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
  13. Record the MS271xE Channel Power (RSSI) reading in the **2600.5 MHz, -50 dBm** row of [Table A-74](#).
  14. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power (RSSI)**” reading from the power meter reading recorded in [Step 13](#). Record the result in [Table A-74](#).
  15. Verify that the error is within specification.
  16. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
  17. Set the MG3700A frequency to 3600.5 MHz.
  18. Change the MS271xE center frequency to 3600.5 MHz.
  19. Measure the Channel Power (RSSI) for both  $-15 \text{ dBm}$  and  $-50 \text{ dBm}$  and then record the measured result and calculated error in [Table A-74](#).
  20. Verify that the error is within specification.

### Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)

21. 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 appears. Again select mWiMax and press **Set**.
  - i. Another file list appears. 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. Confirm 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.
22. Set the calibration factor frequency of the power sensor to 2600.5 MHz.
23. Adjust the MG3700A level setting with the knob so that the power meter reads  $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$ .
24. Set the MS271xE to **Mobile WiMax Signal Analyzer** mode and preset the instrument.
25. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, press the Center Freq submenu key, and set the Center Frequency to 2600.5 MHz.
  - b. Press the **Setup** main menu key, and set the Bandwidth to 5 MHz.
  - c. Press the Frame Length submenu key and set the Frame Length to 5 ms.
  - d. Press the **Measurements** main menu key and press the RF Measurements submenu key. Then press Power vs Time.
26. Repeat [Step 9](#) through [Step 20](#), recording the results into the test record in [Table A-75](#), “[Option 66/885, Mobile WiMAX Channel Power Accuracy \(5 MHz Bandwidth and 5 ms Frame Length\)](#)” on page A-44.

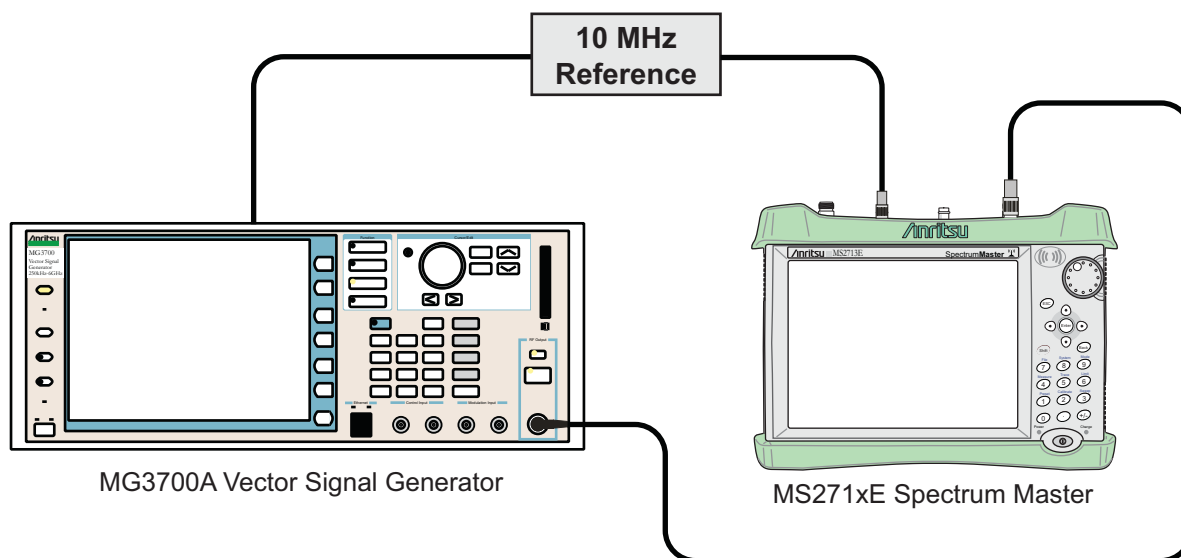
## Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67 or 885)

The tests in this section verify the function of the optional Mobile WiMAX Signal Analyzer in Model MS271xE Spectrum Master.

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

### Setup



**Figure 3-22.** Mobile WiMAX Residual EVM and Frequency Error Test Setup

### Procedure

1. Connect the equipment as shown in [Figure 3-22](#).

### Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

2. 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 appears. Again select mWiMax and press Set.
  - i. Another file list appears. 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. Confirm 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.
3. Set the MS271xE to **Mobile WiMax Signal Analyzer** mode and preset the instrument.
4. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, press the **Center Freq** submenu key, and set the Center Frequency to 2600.5 MHz.
  - b. Press the **Setup** main menu key and set the Bandwidth to 10 MHz.
  - c. In the **Setup** menu, verify that the CP Ratio is set to 1/8.
  - d. Press the **Frame Length** submenu key and set the Frame Length to 10 ms.
  - e. Press the **Demod** submenu key and set Demod to FCH.
  - f. Press the **Measurements** main menu key and then press the **Demodulator** submenu key. Then press the **Modulation Summary** submenu key.
5. Record the MS271xE EVM (rms) reading into the **2600.5 MHz, –15 dBm** row of [Table A-76, “Option 67/885, Mobile WiMAX Residual EVM \(10 MHz Bandwidth and 10 ms Frame Length\)”](#) on page A-44.
6. Verify that the measured EVM is within specification.
7. Set the MG3700A level to –50.0 dBm.
8. Record the MS271xE EVM (rms) reading in the **2600.5 MHz, –50 dBm** row of [Table A-76](#).
9. Verify that the measured EVM is within specification.
10. On the MS271xE, press the **Setup** main menu key, and then press the **Demod** submenu key to set Demod to Auto.
11. Record the MS271xE Freq Error reading into the **2600.5 MHz, –50 dBm** row of [Table A-77, “Option 67/885, Mobile WiMAX Frequency Error \(10 MHz Bandwidth and 10 ms Frame Length\)”](#) on page A-44.
12. Verify that the measured Freq Error is within specification.
13. Set the MG3700A frequency to 3600.5 MHz.
14. On the MS271xE, change the Center Frequency to 3600.5 MHz.
15. Press the **Setup** main menu key, and then press the **Demod** submenu key to set Demod to FCH.
16. Measure the EVM (rms) for both –15 dBm and –50 dBm and then record the measured results in [Table A-76](#).
17. Verify that the measured EVM is within specification.
18. Repeat [Step 10](#) through [Step 12](#) to measure the Frequency Error at –50 dBm, and record the results in [Table A-77](#).

### Residual EVM and Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

19. 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 appears. Again select mWiMax and press **Set**.
  - i. Another file list appears. 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. Confirm that the “**playing**” indicator is displaying the moving pattern.
  - l. Press the **Frequency** key, then enter 2600.5 MHz.
20. Press the **Level** key, then enter –15 dBm. Turn the output On.
21. Set the MS271xE as follows:
- a. Press the **Freq** main menu key, press the **Center Freq** submenu key, and set the Center Frequency to 2600.5 MHz.
  - b. Press the **Setup** main menu key and set the Bandwidth to 5 MHz.
  - c. In the **Setup** menu, verify that the CP Ratio is set to 1/8.
  - d. Press the **Frame Length** submenu key and set the Frame Length to 5 ms.
  - e. Press the **Demod** submenu key and set Demod to FCH.
  - f. Press the **Measurements** main menu key and then press the **Demodulator** submenu key. Then press the **Modulation Summary** submenu key.
22. Record the MS271xE EVM (rms) in [Table A-78, “Option 67/885, Mobile WiMAX Residual EVM \(5 MHz Bandwidth and 5 ms Frame Length\)”](#) and the Frequency Error readings in [Table A-79, “Option 67/885, Mobile WiMAX Frequency Error \(5 MHz Bandwidth and 5 ms Frame Length\)”](#).
23. Repeat [Step 19](#) through [Step 22](#), using the different frequencies and power levels within [Table A-78](#) and [Table A-79](#).



## 3-18 LTE Signal Analyzer Verification, Options 541/542/883

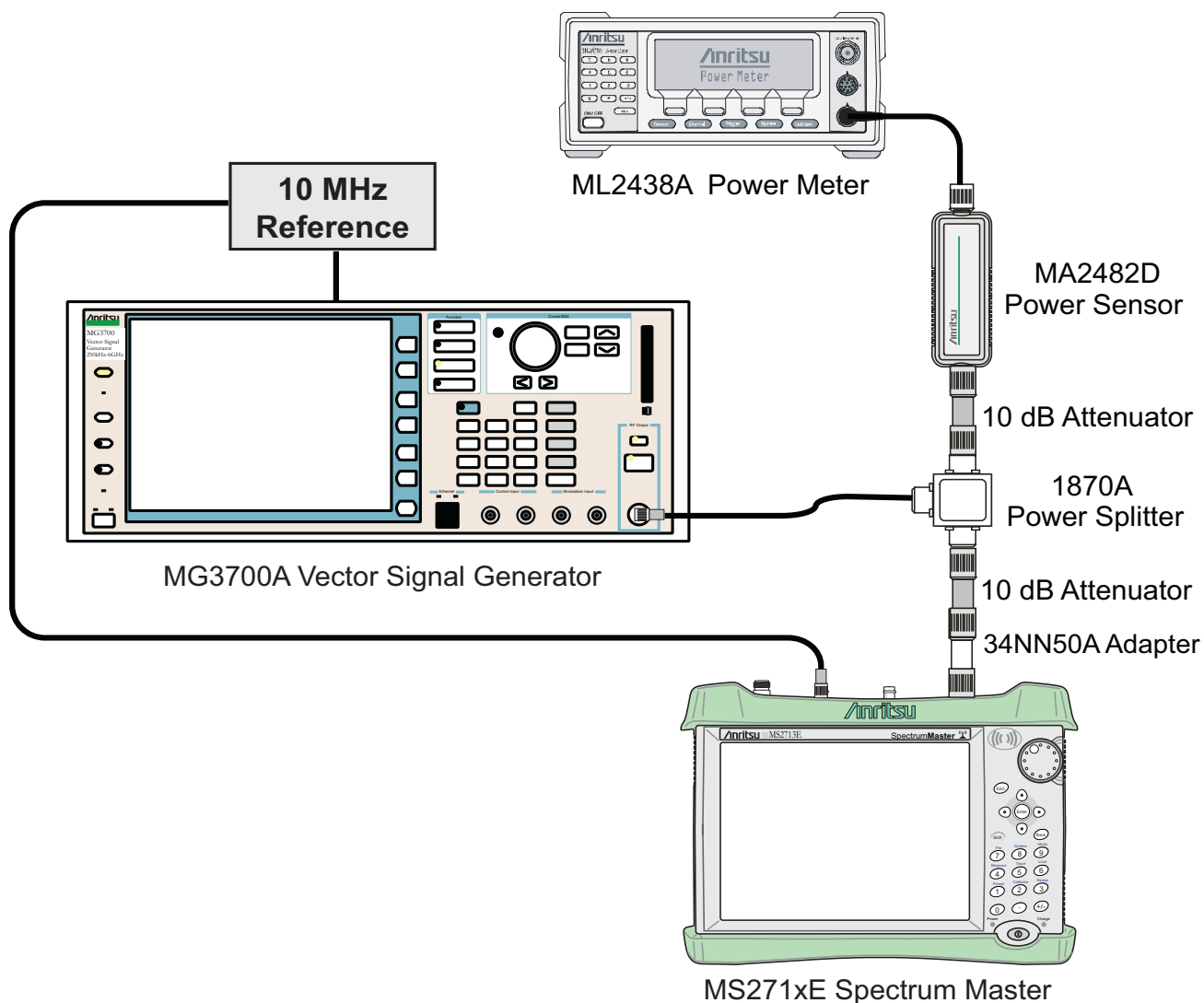
The tests in this section verify the functionality of the LTE Signal Analyzer of the MS271xE Spectrum Master. There are tests for the following:

- [“LTE Channel Power Accuracy Tests \(Option 541 or 883\)” on page 3-88](#)
- [“LTE Frequency Error Tests \(Option 542 or 883\)” on page 3-90](#)

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

## Procedure



**Figure 3-23.** LTE Signal Analyzer Option Verification

### LTE Channel Power Accuracy Tests (Option 541 or 883)

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MS271xE Spectrum Master.

**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 750 MHz.
4. Connect the equipment as shown in [Figure 3-23](#).

**Note** The LTE pattern requires a Waveform Data license MX370108A that must be purchased.

5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

- 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 appears. Again select LTE\_DL\_E-TM and then press the **Set** key.
  - i. Another file list appears. 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. Confirm 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 –3 dBm.
  - n. Turn the output On.
6. Adjust the MG3700A level setting with the knob so that the power meter reads –20.0 dBm ± 0.5 dB.
7. Set the MS271xE to **LTE Signal Analyzer** mode and preset the instrument.
8. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, then press the Center Freq submenu key and set the Center Frequency to 750 MHz.
  - b. Press the **Measurements** main menu key and then press the RF submenu key. Then press the Channel Spectrum submenu key.
9. Record the MS271xE Channel Power reading in the **750 MHz, –20 dBm** row, **Measured Channel Power** column of [Table A-80, “Option 541/883, LTE Channel Power Accuracy” on page A-47](#).
10. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power**” reading from the power meter reading in [Step 6](#). Record the result in the **750 MHz, –20 dBm** row, **Error** column of [Table A-80](#).
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 MS271xE Channel Power reading in the **750 MHz, –50 dBm** row, **Measured Channel Power** column of [Table A-80](#).
14. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power**” reading from the power meter reading that was recorded in [Step 13](#). Record the result in the **750 MHz, –50 dBm** row, **Error** column of [Table A-80](#).
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2150 MHz.
17. Set the MG3700A frequency to 2150 MHz. Press the **Set** key.
18. Change the MS271xE center frequency to 2150 MHz.

19. Measure the Channel Power for  $-20$  dBm and  $-50$  dBm and then record the measured result in the **Measured Channel Power** column and the calculated error in the **Error** column of [Table A-80](#).
20. Verify that the error is within specification.
21. For instruments with 20 MHz IF BW Available, which can be seen within the System Status window, repeat [Step 3](#) through [Step 20](#) using the 20 MHz pattern, E-TM\_1-1\_20M.

### LTE Frequency Error Tests (Option 542 or 883)

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MS271xE Spectrum Master.

<b>Note</b> The LTE pattern requires a Waveform Data license MX370108A that must be purchased.
--

#### 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 750 MHz.
4. Connect the equipment as shown in [Figure 3-23](#).
5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer **yes** to the question).
  - b. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

- 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 appears. Again select LTE\_DL\_E-TM and press **Set**.
  - i. Another file list appears. 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. Confirm 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  $-3$  dBm.
  - n. Turn the output On.
6. Adjust the MG3700A level setting with the knob so that the power meter reads  $-20.0$  dBm  $\pm 0.5$  dB.
7. Set the MS271xE to **LTE Signal Analyzer** mode and preset the instrument.

8. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, then press the Center Freq submenu key and set the Center Frequency to 750 MHz.
  - b. Press the **Measurements** main menu key and then press the Modulation submenu key.
  - c. Press the Constellation submenu key.
9. Record the MS271xE Frequency Error reading in the **750 MHz, -20 dBm** section of [Table A-81](#), “Option 542/883, Frequency Accuracy” on page A-47.
10. Verify that the value is 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 MS271xE Frequency Error reading into the **750 MHz, -50 dBm** section of [Table A-81](#).
13. Verify that the value is 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 -20.0 dBm ± 0.5 dB.
17. Change the MS271xE center frequency to 2150 MHz.
18. Record the MS271xE Frequency Error reading into the **2150 MHz, -20 dBm** section of [Table A-81](#).
19. Verify that the value is 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 MS271xE Frequency Error reading in the **2150 MHz, -50 dBm** section of [Table A-81](#).
22. Verify that the value is within specification.
23. For instruments with 20 MHz IF BW Available, which can be seen within the System Status window, repeat [Step 3](#) through [Step 22](#) using the 20 MHz pattern, E-TM\_3-1\_20M.

## 3-19 TD-LTE Signal Analyzer Verification, Options 551/552/883

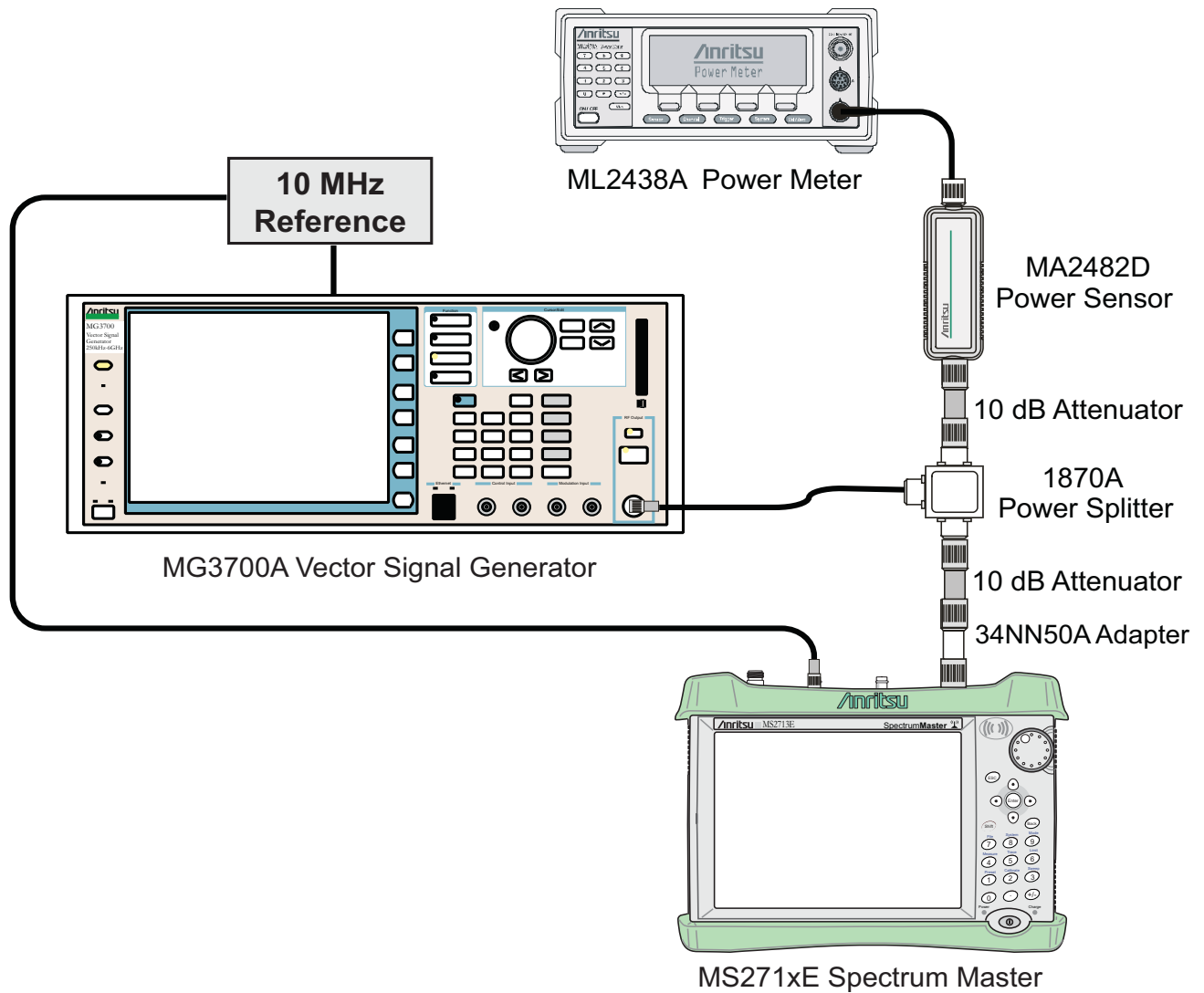
The tests in this section verify the functionality of the TD-LTE Signal Analyzer of the MS271xE Spectrum Master. There are tests for the following:

- [“TD-LTE Channel Power Accuracy Tests \(Option 551 or 883\)” on page 3-93](#)
- [“TD-LTE Frequency Error Tests \(Option 552 or 883\)” on page 3-95](#)

### Equipment Required

- Anritsu MG3700A Vector Signal Generator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensor
- Anritsu 34NN50A Adapter (2)
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator (2)
- Anritsu 2000-1627-R RF Coaxial Cables (2)
- 10 MHz Reference Standard

## Procedure



**Figure 3-24.** TD-LTE Signal Analyzer Option Verification

### TD-LTE Channel Power Accuracy Tests (Option 551 or 883)

The tests in this section verify the function of the optional TD-LTE Signal Analyzer in Model MS271xE Spectrum Master.

**Note** The TD-LTE pattern requires a Waveform Data license MX370110A that must be purchased.

#### 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 750 MHz.
4. Connect the equipment as shown in [Figure 3-24](#).

5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer **yes** to the question).
  - b. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

- 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\_TDD**” is highlighted.
  - f. Press the **Set** key.
  - g. Press the (F6) soft key (Return).
  - h. Press the **Set** key. The Select Package list box appears. Again select LTE\_TDD and then press the **Set** key.
  - i. Another file list appears. Select (highlight) TDLTE-E-TM-1-1\_10M.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is On. Confirm 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 –3 dBm.
  - n. Turn the output On.
6. Adjust the MG3700A level setting with the knob so that the power meter reads  $-20.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
7. Set the MS271xE to **TD-LTE Signal Analyzer** mode and preset the instrument.
8. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, then press the Center Freq submenu key and set the Center Frequency to 750 MHz.
  - b. Press the **Measurements** main menu key and then press the RF submenu key, then press Channel Spectrum.
9. Record the MS271xE Channel Power reading in the **750 MHz, –20 dBm** row, **Measured Channel Power** column of [Table A-82, “Option 551/883, TD-LTE Channel Power Accuracy” on page A-48](#).
10. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power**” reading from the power meter reading in [Step 6](#). Record the result in the **750 MHz, –20 dBm** row, **Error** column of [Table A-82](#).
11. Verify that the error is within specification.
12. Adjust the MG3700A level setting to approximately –33 dBm so that the power meter reads  $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$ .
13. Record the MS271xE Channel Power reading in the **750 MHz, –50 dBm** row, **Measured Channel Power** column of [Table A-82](#).
14. Calculate the Channel Power Error by subtracting the MS271xE “**Channel Power**” reading from the power meter reading that was recorded in [Step 13](#). Record the result in the **750 MHz, –50 dBm** row, **Error** column of [Table A-82](#).
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2150 MHz.
17. Set the MG3700A frequency to 2150 MHz. Press the **Set** key.
18. Change the MS271xE center frequency to 2150 MHz.



19. Measure the Channel Power for  $-20$  dBm and  $-50$  dBm and then record the measured result in the **Measured Channel Power** column and the calculated error in the **Error** column of [Table A-82](#).
20. Verify that the error is within specification.
21. For instruments with 20 MHz IF BW Available, which can be seen within the System Status window, repeat [Step 3](#) through [Step 20](#) using the 20 MHz pattern, **TDLTE-E-TM\_1-1\_20M**.

### TD-LTE Frequency Error Tests (Option 552 or 883)

The tests in this section verify the function of the optional TD-LTE Signal Analyzer in Model MS271xE Spectrum Master.

<b>Note</b> The TD-LTE pattern requires a Waveform Data license MX370110A that must be purchased.
---

#### 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 750 MHz.
4. Connect the equipment as shown in [Figure 3-24 on page 3-93](#).
5. Set the MG3700A as follows:
  - a. Press the yellow **Preset** button (answer yes to the question).
  - b. Press the **Set** key.

<b>Note</b> Both <b>Set</b> keys on the MG3700A perform the same function.
--

- 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\_TDD is highlighted.
  - f. Press the **Set** key.
  - g. Press the (F6) soft key (Return).
  - h. Press the **Set** key. The Select Package list box appears. Again select LTE\_TDD and press **Set**.
  - i. Another file list appears. Select (highlight) TDLTE-E-TM\_3-3\_10M.
  - j. Press the **Set** key.
  - k. Press the **MOD On/Off** key and verify that the LED is On. Confirm 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  $-3$  dBm.
  - n. Turn the output On.
6. Adjust the MG3700A level setting with the knob so that the power meter reads  $-20.0$  dBm  $\pm$  0.5 dB.
  7. Set the MS271xE to TD-LTE Signal Analyzer mode and preset the instrument.

8. Set the MS271xE as follows:
  - a. Press the **Freq** main menu key, press the Center Freq submenu key, and set the Center Frequency to 750 MHz.
  - b. Press the **Measurements** main menu key and then press the Modulation submenu key.
  - c. Press the Constellation submenu key.
9. Record the MS271xE Frequency Error reading in the **750 MHz, -20 dBm** section of [Table A-83](#), “Option 552/883, TD-LTE Frequency Accuracy” on page A-48.
10. Verify that the value is 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 MS271xE Frequency Error reading into the **750 MHz, -50 dBm** section of [Table A-83](#).
13. Verify that the value is 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 -20.0 dBm ± 0.5 dB.
17. Change the MS271xE center frequency to 2150 MHz.
18. Record the MS271xE Frequency Error reading into the **2150 MHz, -20 dBm** section of [Table A-83](#).
19. Verify that the value is 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 MS271xE Frequency Error reading in the **2150 MHz, -50 dBm** section of [Table A-83](#).
22. Verify that the value is within specification.
23. For instruments with 20 MHz IF BW available, which can be seen within the System Status window, repeat [Step 3](#) through [Step 22](#) using the 20 MHz pattern, **TDLTE-E-TM\_3-3\_20M**.

# Chapter 4 — Battery Information

## 4-1 Introduction

The following information relates to the care and handling of the Anritsu battery pack and Lithium-Ion batteries in general.

- The battery supplied with the Spectrum Master may need charging before use. Before using the instrument, the internal battery may be charged either in the instrument, using either the AC-DC Adapter (40-187-R) or the 12-Volt DC adapter (806-141-R), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the Spectrum Master or in an Anritsu approved charger.
- When the Spectrum Master or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours; overcharging may shorten battery life.
- If left unused a fully charged battery will discharge itself over time.
- Temperature extremes affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.
- Discharge the battery from time to time to improve battery performance and battery life.
- The battery can be charged and discharged hundreds of times, but it will eventually wear out.
- The battery may need to be replaced when the operating time between charging becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.
- Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.
- Never short-circuit the battery terminals.
- Do not drop, mutilate or attempt to disassemble the battery.
- Do not dispose of batteries in a fire!
- Batteries must be recycled or disposed of properly. Do not place batteries in household garbage.
- Always use the battery for its intended purpose only.

### Warning

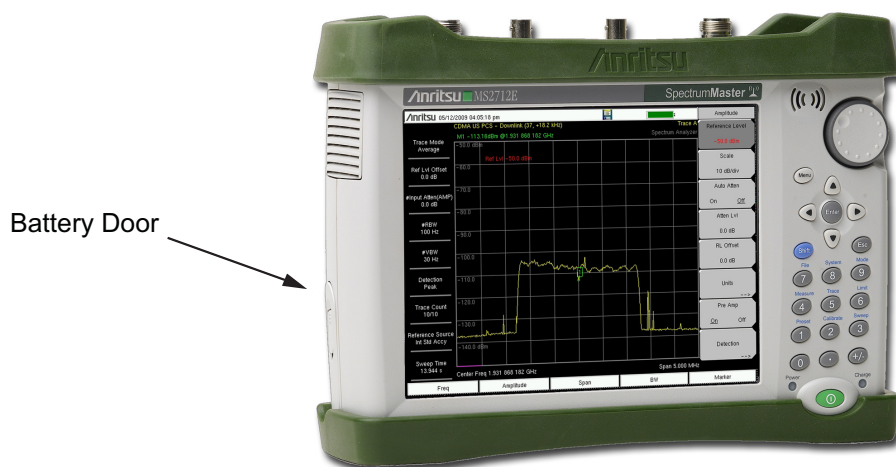


This equipment is supplied with a rechargeable battery that could potentially leak hazardous compounds into the environment. These hazardous compounds present a risk of injury or loss due to exposure. Anritsu Company recommends removing the battery for long-term storage of the instrument and storing the battery in a leak-proof, plastic container. Follow the environmental storage requirements specified in the product data sheet.

## 4-2 Battery Pack Removal and Replacement

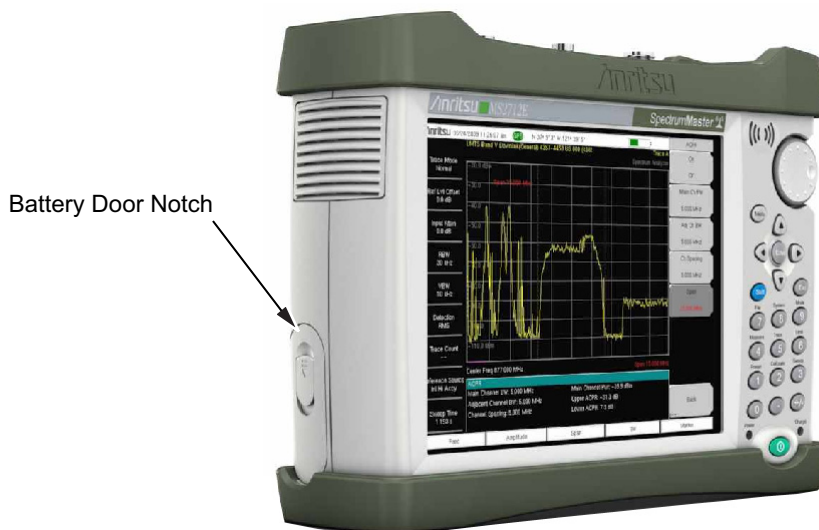
This section provides instructions for the removal and replacement of the Spectrum Master battery pack.

1. Locate the battery access door illustrated in [Figure 4-1](#).



**Figure 4-1.** Battery Access Door Location

2. Place a finger in the battery access door notch and push the door latch down towards the bottom of the instrument, as illustrated in [Figure 4-2](#).



**Figure 4-2.** Battery Access Door Notch

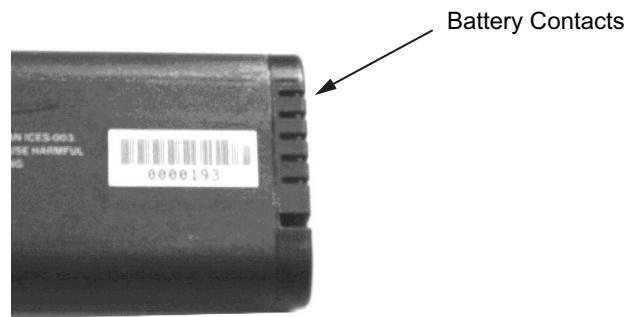
3. Remove the battery access door, the top will pop out a bit and then pull it up out of the access enclosure.

4. With the battery access door completely removed, grasp the battery lanyard and pull the battery straight out of the instrument, as illustrated in [Figure 4-3](#).



**Figure 4-3.** 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 front of the instrument, as illustrated in [Figure 4-4](#).



**Figure 4-4.** Battery Contacts



# Chapter 5 — Assembly Replacement

## 5-1 Introduction

This chapter provides replacement procedures for the Spectrum Master. The sections are as follows:

- [Section 5-2 “Replaceable Parts List” on page 5-2](#)
- [Section 5-3 “Opening the Spectrum Master Case” on page 5-3](#)
- [Section 5-4 “PCB Assembly Removal” on page 5-5](#)
- [Section 5-5 “SPA Assembly Replacement” on page 5-7](#)
- [Section 5-6 “SPA and MB N Connector Replacement” on page 5-8](#)
- [Section 5-7 “GPS \(Option 31\) Replacement” on page 5-9](#)
- [Section 5-8 “Option Assembly Replacement”](#)
- [Section 5-9 “Motherboard/SPA PCB Assembly Replacement” on page 5-10](#)
- [Section 5-10 “Fan Assembly Replacement ” on page 5-11](#)
- [Section 5-11 “LCD Assembly Replacement” on page 5-12](#)
- [Section 5-12 “LCD Backlight PCB Removal and Replacement ” on page 5-14](#)
- [Section 5-13 “Keypad and Keypad PCB Replacement ” on page 5-15](#)
- [Section 5-14 “Touch Screen Replacement ” on page 5-16](#)

## 5-2 Replaceable Parts List

Refer to [Table 1-3, “List of Replaceable Parts”](#) on page 1-6 for the list of replaceable parts. Refer to the following sections for basic replacement instructions.

**Note** Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations used are representative and may not match your instrument.

**Caution** Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in [Table 1-3](#) 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 adjustment of 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.



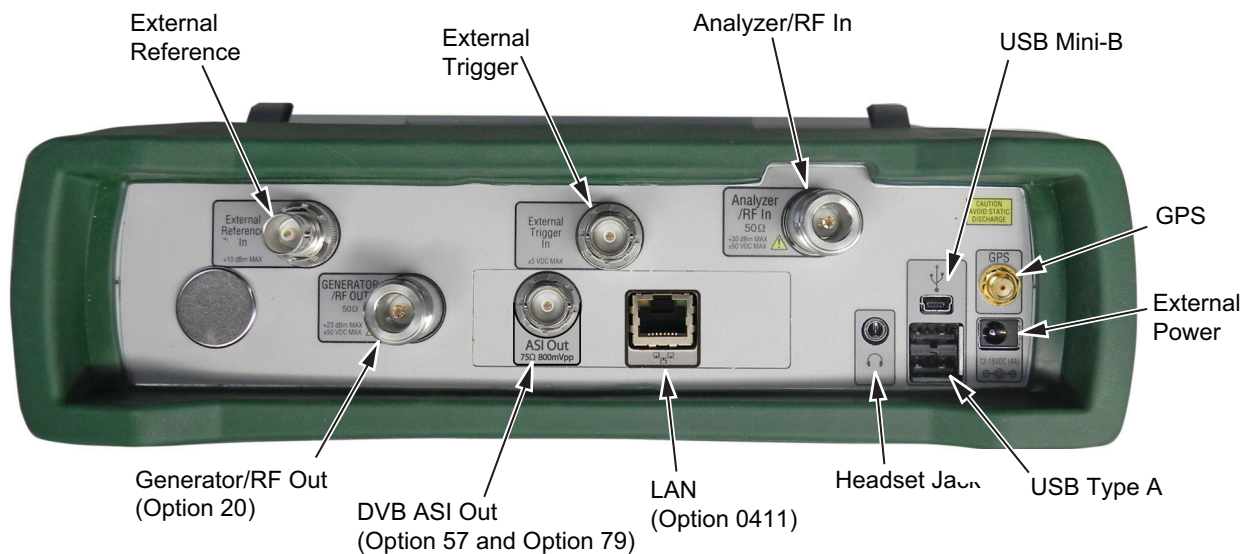
### 5-3 Opening the Spectrum Master Case

Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. Repair of damage that is caused by electrostatic discharge is not covered under warranty.

**Caution** The Spectrum Master contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the instrument.

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

1. Remove the battery door and battery as shown in [Section 4-2 “Battery Pack Removal and Replacement” on page 4-2](#).
2. Remove the top and bottom bumpers ([Figure 5-1](#)) to expose the screw holes on the back of the instrument.



**Figure 5-1.** Top Bumper

In [Figure 5-1](#), both the Ethernet LAN (Option 0411) connector and the BER DVB ASI Out connector (Option 57 or Option 79) are shown, but they cannot both be installed at the same time. These options are mutually exclusive because the PCB's occupy the same area within the case.

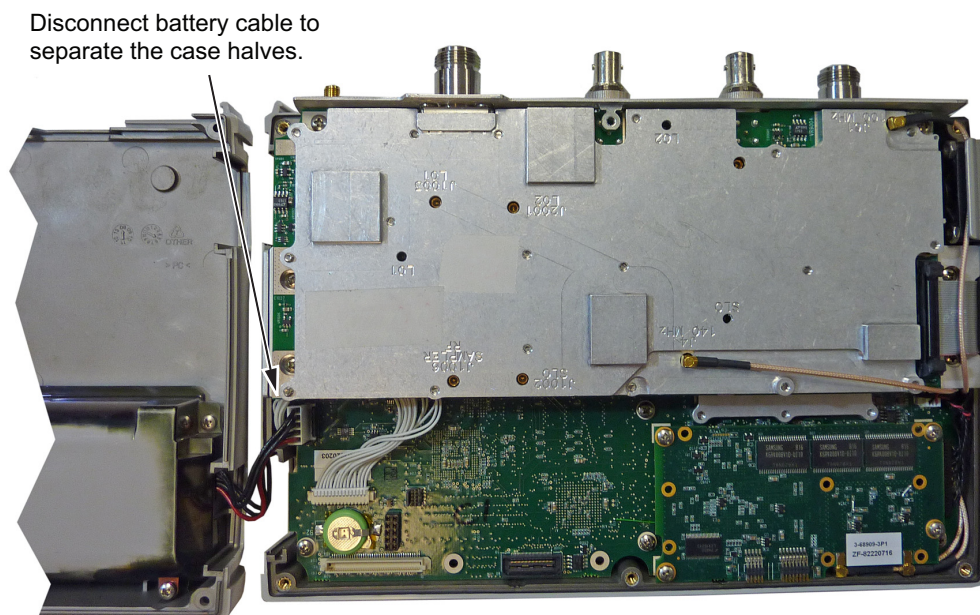
3. Place the Spectrum Master face down on a stable work surface that will not scratch the display.

4. Use a Phillips screwdriver to remove the six screws securing the two halves of the Spectrum Master case together (Figure 5-2).



**Figure 5-2.** Remove the Six Screws

5. Carefully lift up on the side of the case indicated above and begin to separate the two halves.
6. Lay the Spectrum Master flat and remove the battery connector cable between the two halves (Figure 5-3).



**Figure 5-3.** Spectrum Master Opened 180 Degrees

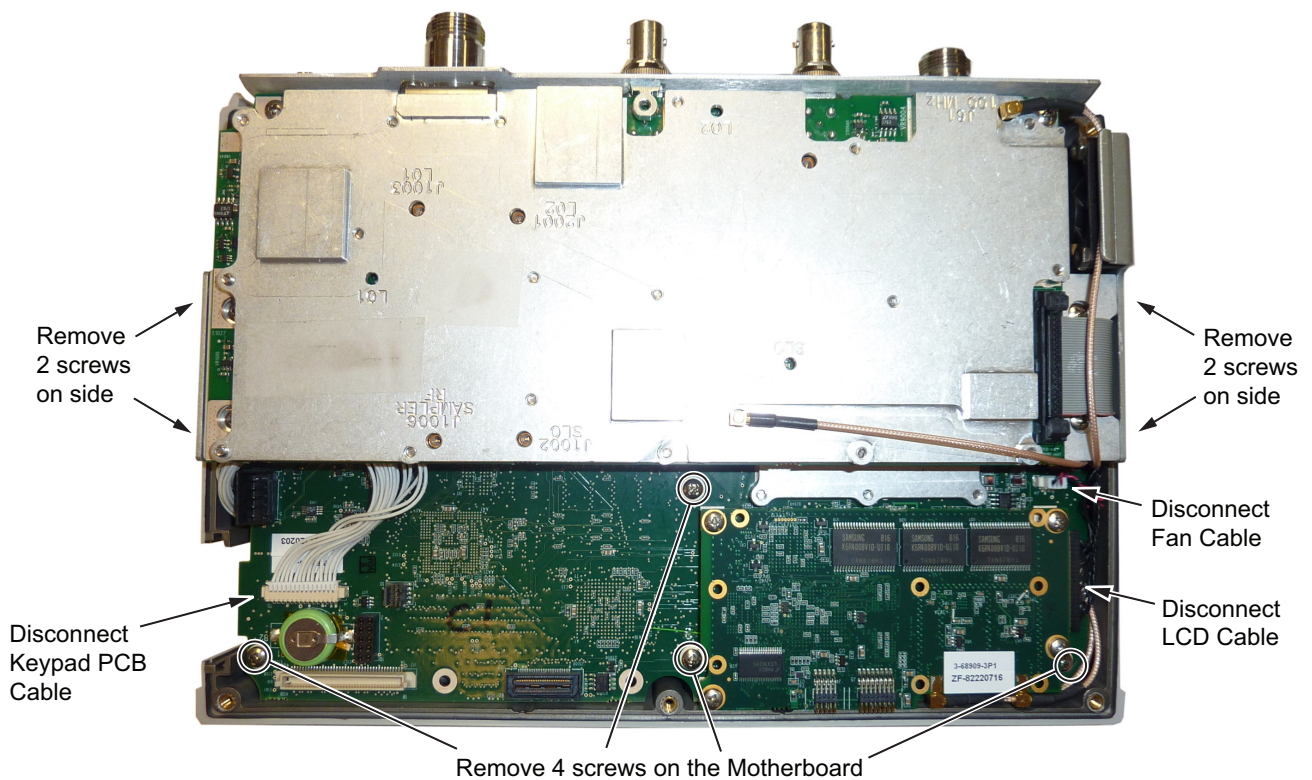
7. Closing the case is the reverse of opening. Ensure that all cables are properly seated and that none are pinched when closing the case. The torque setting for the 6 case screws is 7.5 lbf · in (0.85 N · m).

## 5-4 PCB Assembly Removal

**Note** Procedures in this section are generic, and apply to many similar instruments. Photos and illustrations of assemblies are representative, actual assemblies may vary.

This procedure provides instructions to remove the Motherboard/SPA assembly from the Spectrum Master Case.

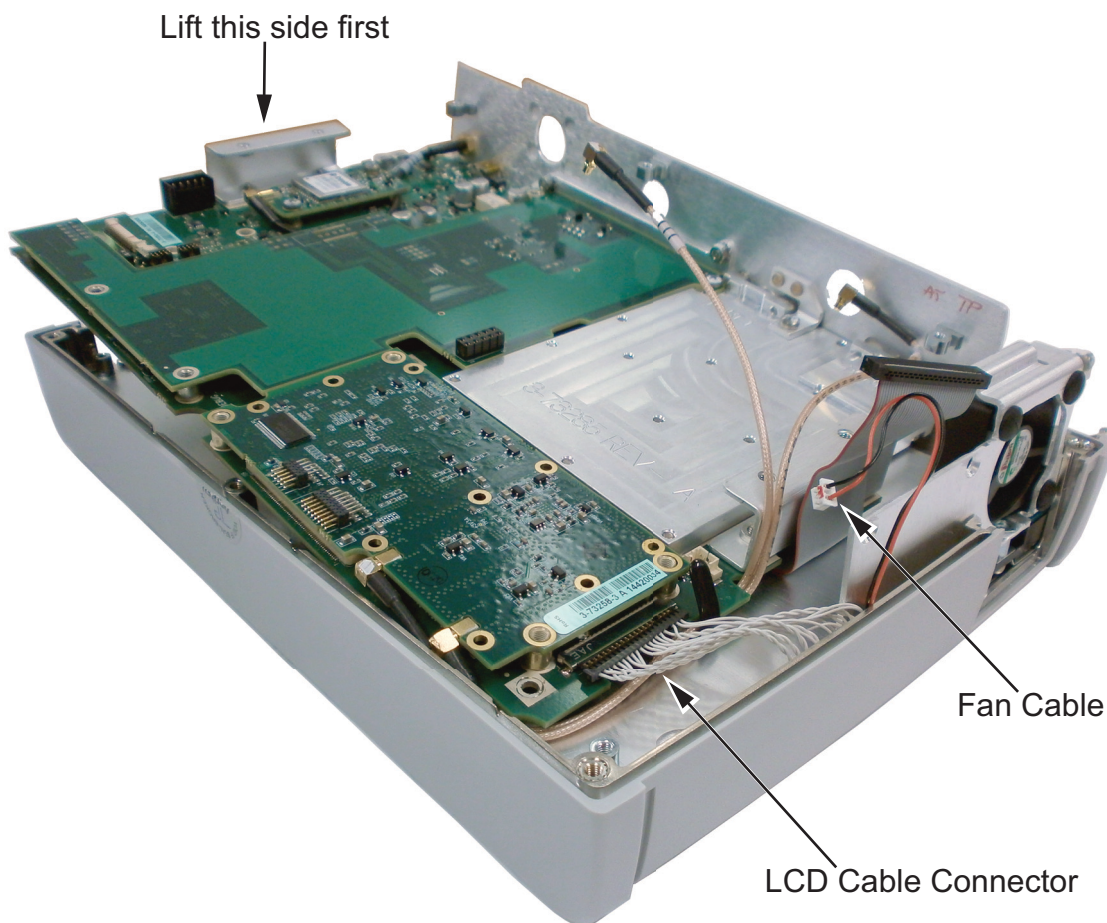
1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Disconnect the keypad PCB cable, the fan assembly cable, and the LCD cable.
3. Use a Phillips screwdriver to remove the 8 screws securing the assemblies to the case ([Figure 5-4](#)).



**Figure 5-4.** Removing the PCB Assembly out of the Case

**Note** The MMCX cable attached to SPA connector J61 (100 MHz) is shown passing above the SPA PCB ribbon cable. It must be routed under the ribbon cable, not as shown in [Figure 5-4](#).

4. After the screws are removed, the entire assembly (including the top connector panel) can slide out of the case.
  - a. First lift the assembly from side with the Keypad PCB Cable and move the assembly upward and away from LCD Cable side as shown in [Figure 5-5 on page 5-6](#). In this figure, the SPA PCB has been removed, but the method for disconnecting the LCD Cable remains the same.
  - b. Remove any tape from the LCD Cable connector. Then grasp all of the connector wires and gently tug the connector loose. Replace the tape during reassembly.



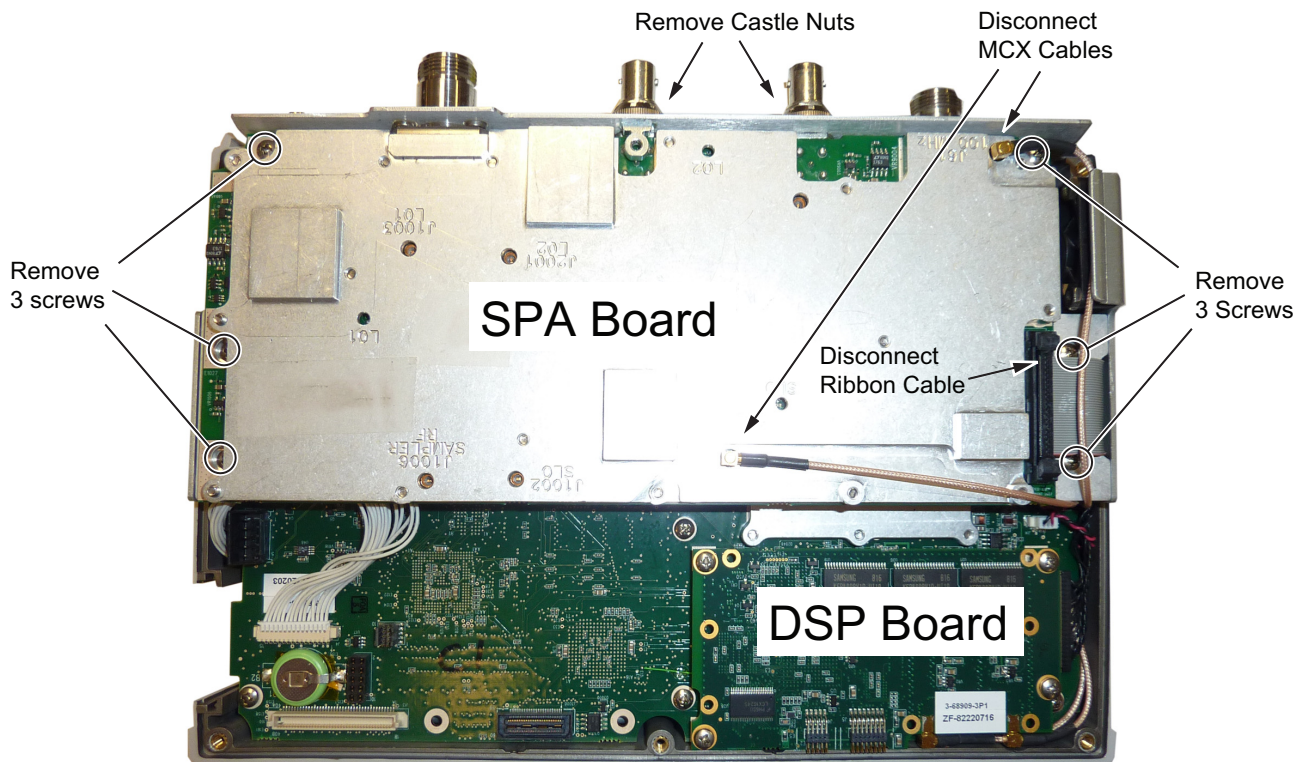
**Figure 5-5.** Removing Mother Board from Case

5. Installation is the reverse of removal. During installation ensure that the Keypad PCB cable and all other cables are properly seated at both ends. Also take care to properly fit the connector panel into the grooves in the top of the case and confirm that none of the cables will be pinched when the back case is replaced. The torque setting for the 8 screws securing the PCB assembly to the front case is 7.5 lbf · in (0.85 N · m).

## 5-5 SPA Assembly Replacement

This procedure provides instructions to remove the SPA assembly.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the castle nuts from the External Reference connector and the External Trigger connector ([Figure 5-6](#)).
4. Disconnect the ribbon cable.
5. Remove the 2 MCX connectors between the SPA and DSP assemblies.
6. Remove the 6 screws retaining the SPA assembly.
7. Slide the SPA assembly out of the top panel.
8. Installation is the reverse of removal. Torque the six screws to 7.5 lbf · in (0.85 N · m).



**Figure 5-6.** Removing the SPA Assembly

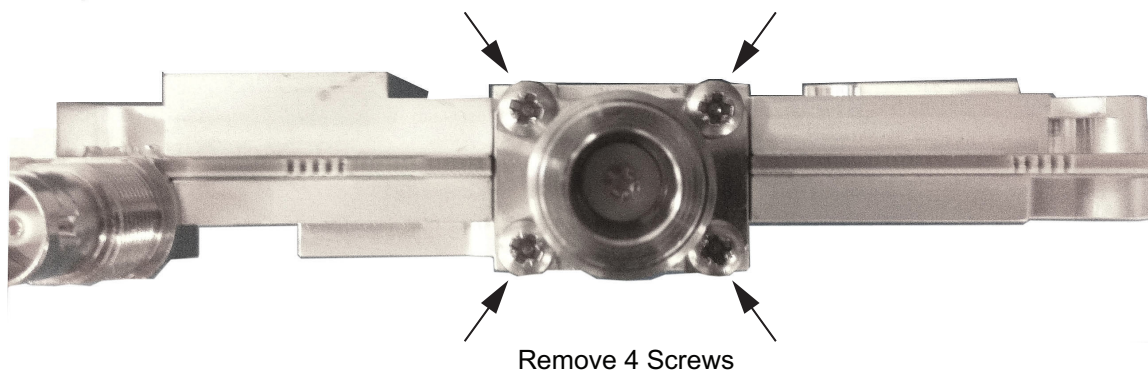
**Note**

The MMCX cable attached to SPA connector J61 (100 MHz) is shown passing above the SPA PCB ribbon cable. It must be routed under the ribbon cable, not as shown in [Figure 5-6](#).

## 5-6 SPA and MB N Connector Replacement

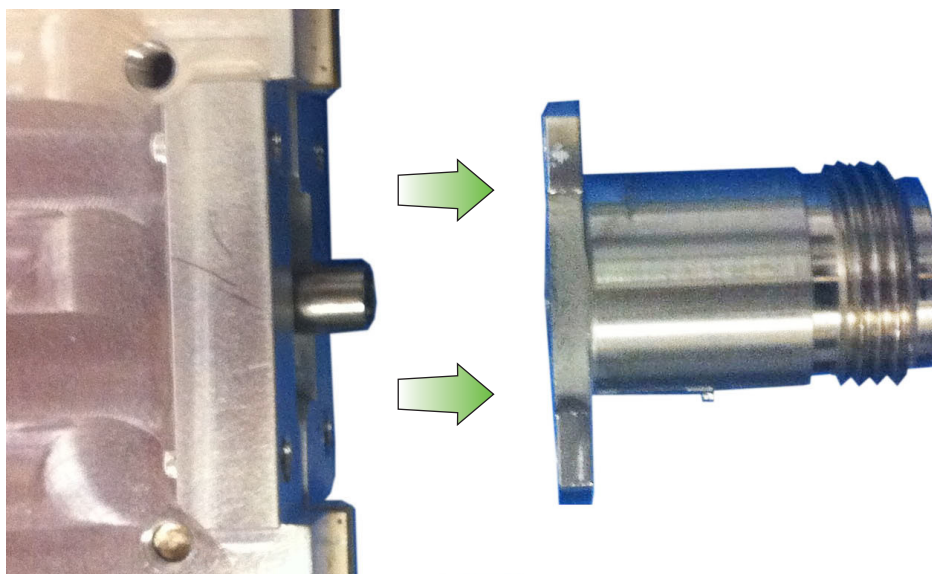
This procedure provides instructions to replace the N connector attached to the SPA or MB assembly (if installed).

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the SPA assembly as described in [Section 5-5 “SPA Assembly Replacement”](#).
4. If removing the MB N connector, remove the top plate from the MB.
5. Remove the four screws attaching the N connector to the shield ([Figure 5-7](#)).



**Figure 5-7.** Remove 4 Screws

6. Disconnect the N connector from the SPA or MB by gently pulling the N connector away from the SPA or MB ([Figure 5-8](#)).



**Figure 5-8.** Remove N Connector from SPA or MB

7. Installation is the reverse of removal. The torque setting for the screws is 7.5 lbf · in (0.85 N · m).

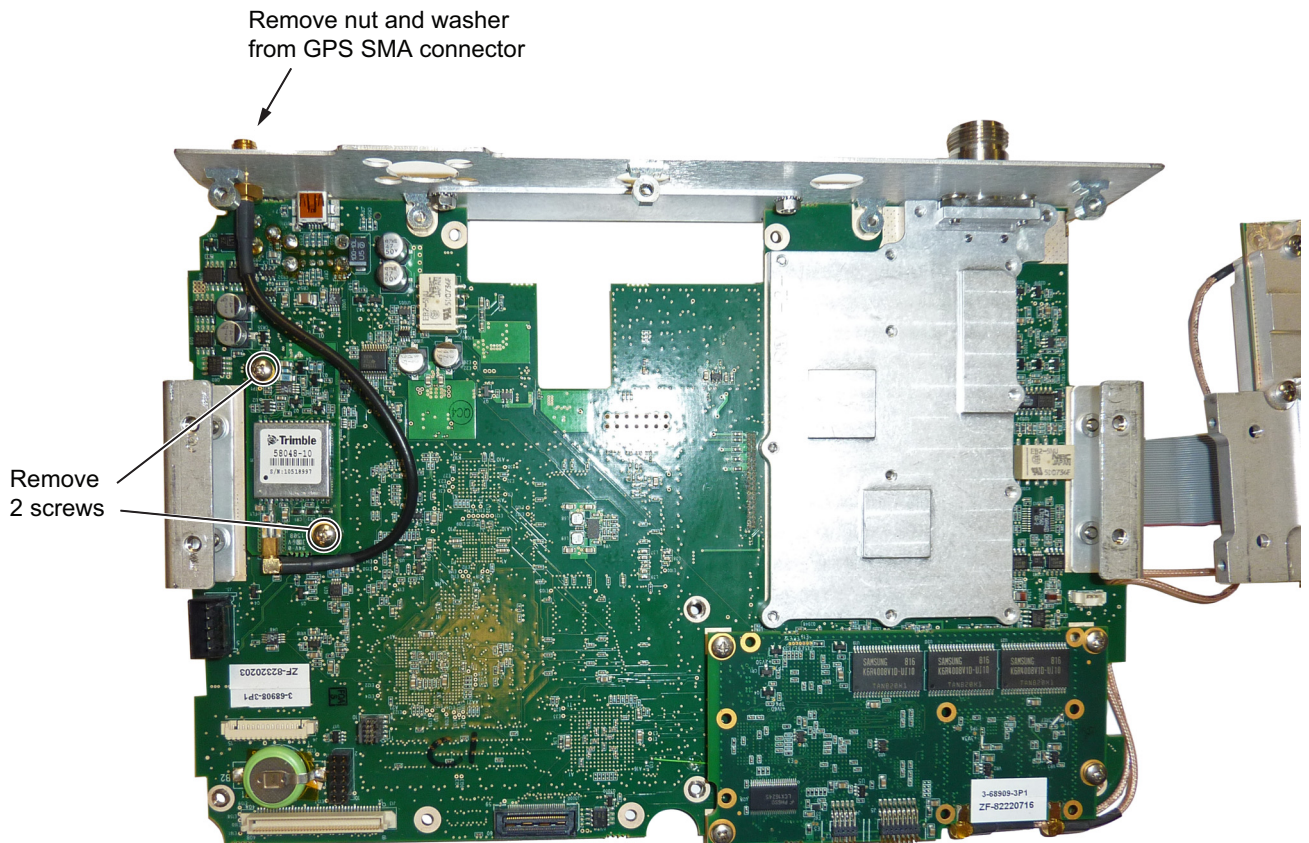
## 5-7 GPS (Option 31) Replacement

This procedure provides instructions for removing and replacing the GPS assembly.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the SPA board as described in [Section 5-5 “SPA Assembly Replacement”](#).

**Note** The SPA to DSP cables and the DSP PCB do not need to be removed when replacing the GPS Module. Remove the screws securing the SPA to the bracket and move the SPA to the side.

4. Use a 5/16-inch wrench to remove the nut and washer from the GPS SMA connector. Push the connector through the top panel.
5. Remove the 2 screws retaining the GPS PCB to the Motherboard.
6. Carefully lift straight up on the GPS PCB to remove. The back of the GPS PCB board is directly connected to the Motherboard.
7. Installation is the reverse of removal. Use two 5/16-inch ( $\approx 8$  mm) wrenches to tighten the GPS Antenna SMA connector to the top connector panel. Torque the nut to 7.5 lbf · in (0.85 N · m). Torque the two PCB screws to 7.5 lbf · in (0.85 N · m).

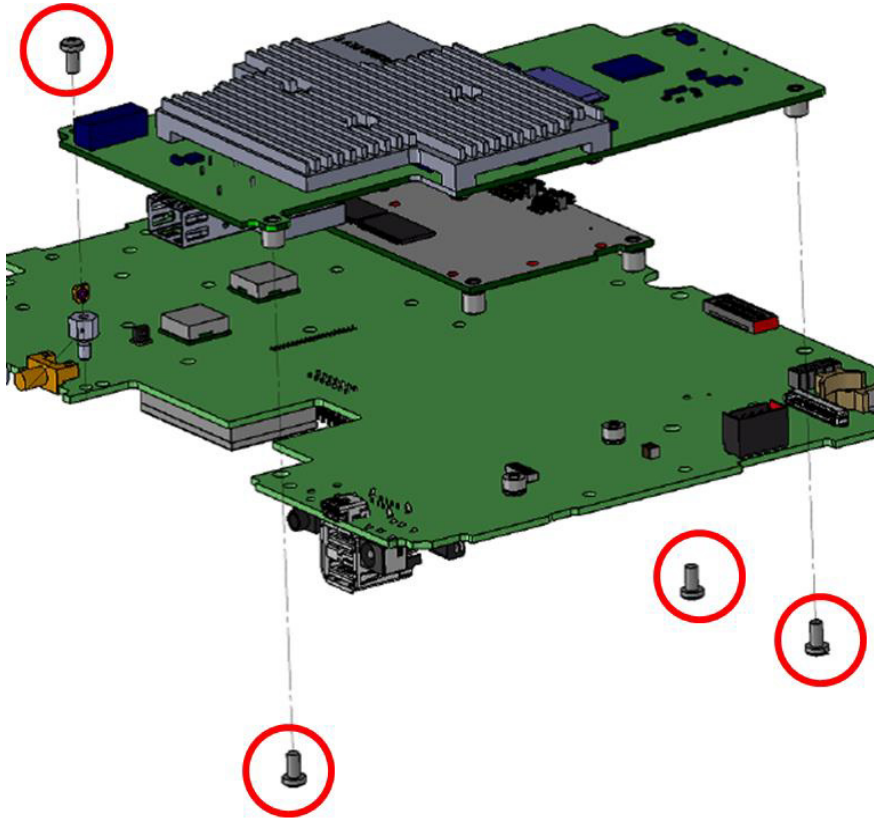


**Figure 5-9.** Removing the GPS Module from the Motherboard (SPA PCB already removed)

## 5-8 Option Assembly Replacement

This procedure provides instructions to replace the Ethernet (Option 411) or CPRI (Option 751) assembly.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the SPA PCB as described in [Section 5-5 “SPA Assembly Replacement”](#).
4. Remove the screws securing the Option PCB to the Main PCB as shown in [Figure 5-10](#).



**Figure 5-10.** Remove Screws Securing Option PCB to Main PCB

5. Installation is the reverse of removal.

## 5-9 Motherboard/SPA PCB Assembly Replacement

This procedure provides instructions for removing and replacing the Motherboard/SPA assembly.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the SPA PCB as described in [Section 5-5 “SPA Assembly Replacement”](#).
4. Remove the GPS PCB (if installed) as described in [Section 5-7 “GPS \(Option 31\) Replacement”](#)
5. Remove the Option PCB (if installed) as described in [Section 5-8 “Option Assembly Replacement”](#).

<b>Note</b>	When ordering the Main/SPA PCB assembly, all options installed on the instrument must be stated on the order.
-------------	---

6. Installation is the reverse of removal.

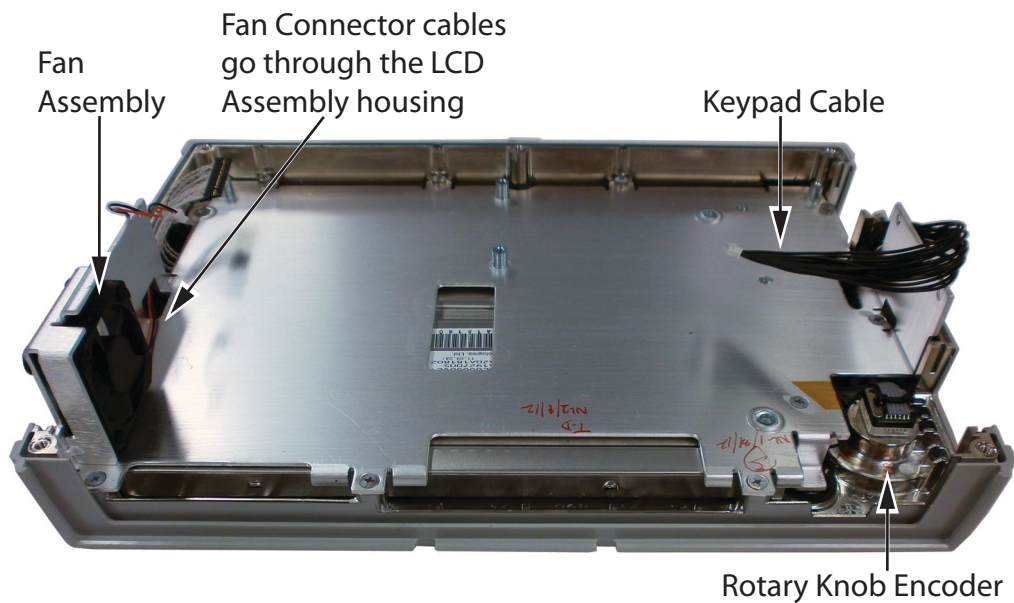


## 5-10 Fan Assembly Replacement

This procedure provides instructions to replace the fan assembly.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. The fan is attached to the LCD housing by either three screws or three rubber mounts. If screws are used, remove the screws to remove the fan and re-use the existing screws to secure the replacement fan. If rubber mounts are used, cut the rubber mounts in order to remove the fan, and new rubber mounts will be included with the replacement fan assembly. Refer to ([Figure 5-11](#)).

**Note** The fan connector cable is routed through the LCD housing



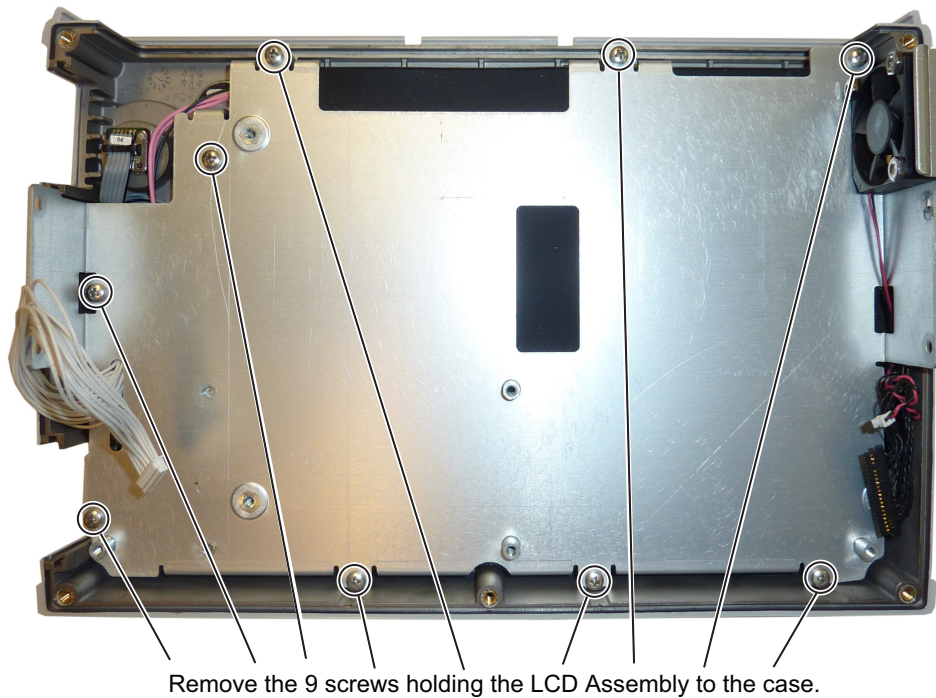
**Figure 5-11.** Front Panel Showing Fan Assembly

4. Reverse the above steps to install the replacement fan assembly.

## 5-11 LCD Assembly Replacement

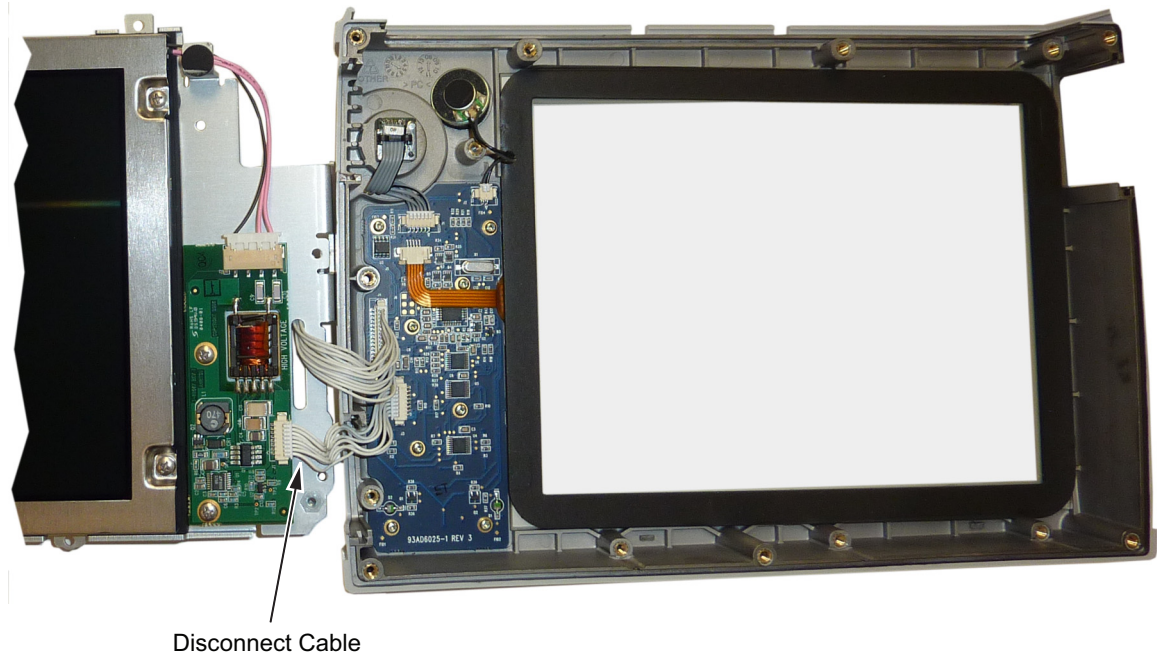
This procedure provides instructions to replace the liquid crystal display (LCD).

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Remove the 9 screws connecting the LCD assembly to the front half of the case ([Figure 5-12](#)).



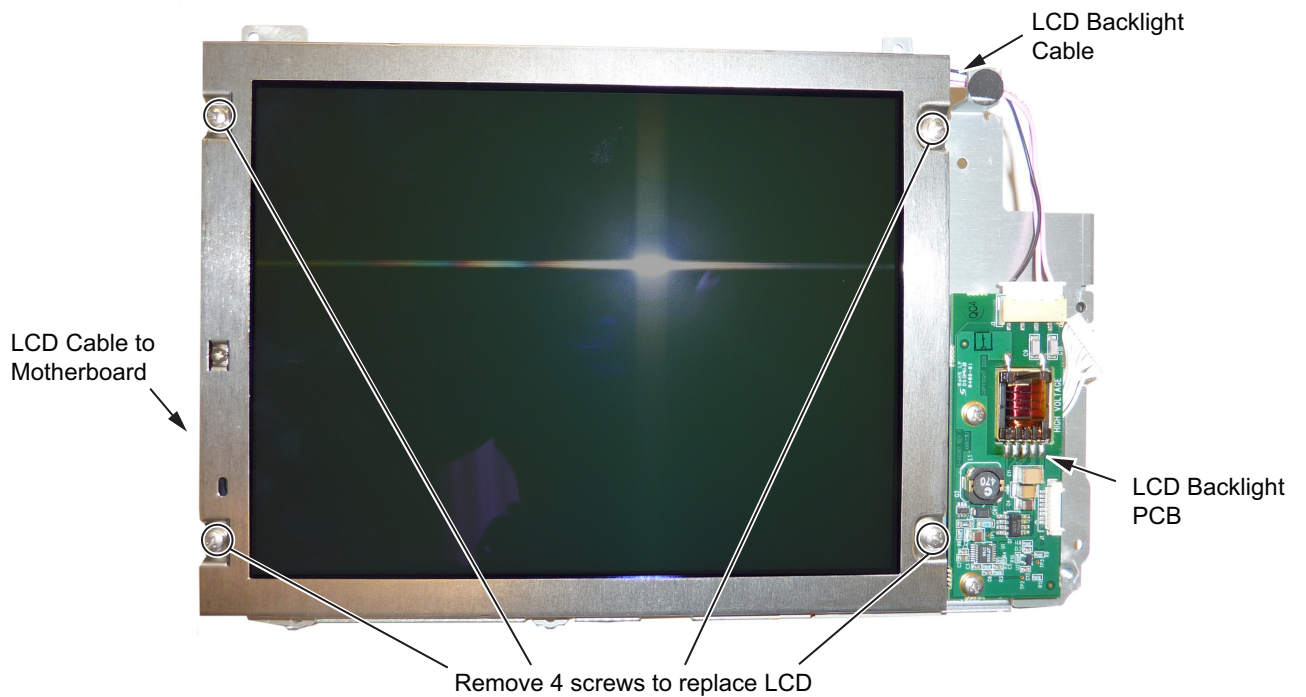
**Figure 5-12.** Removing the LCD Assembly

- Turn the LCD assembly over and disconnect the front half of the case from the LCD assembly (Figure 5-13).



**Figure 5-13.** Replacing the LCD Assembly

- Use a Phillips screwdriver to remove the four screws securing the LCD to the housing (Figure 5-14).



**Figure 5-14.** Replacing the LCD

- Disconnect the LCD backlight cable from the LCD backlight PCB.

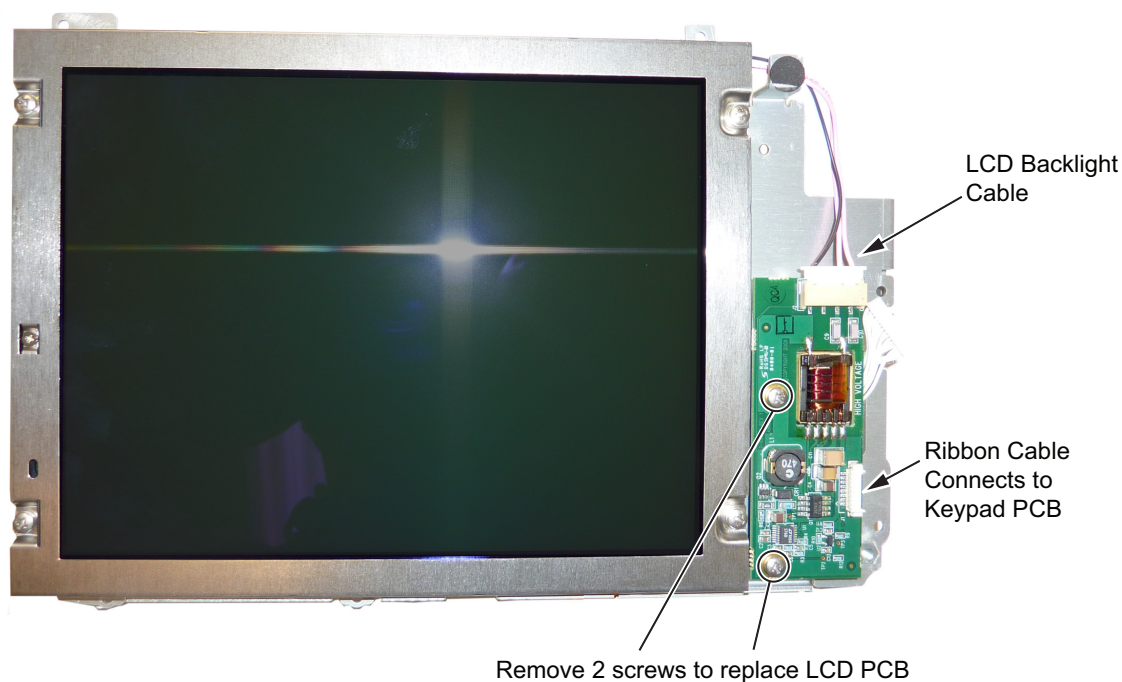
7. Disconnect the LCD cable from the side of the LCD.
8. Carefully remove the LCD.
9. Reverse the above steps to install the replacement LCD.

**Note** Pay attention to the routing of the LCD Backlight Cable. The cable must be positioned so it is not pinched when the instrument is reassembled.

## 5-12 LCD Backlight PCB Removal and Replacement

This procedure provides instructions to replace the Spectrum Master LCD backlight PCB. (Newer units will not have this PCB.)

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Perform Step 1 through Step 4 of [Section 5-11 “LCD Assembly Replacement”](#).
4. Disconnect the LCD backlight cable from the LCD backlight PCB.
5. Use a Phillips screw driver to remove the two screws securing the LCD backlight PCB to the LCD bracket ([Figure 5-15](#)).



**Figure 5-15.** Replacing the LCD PCB

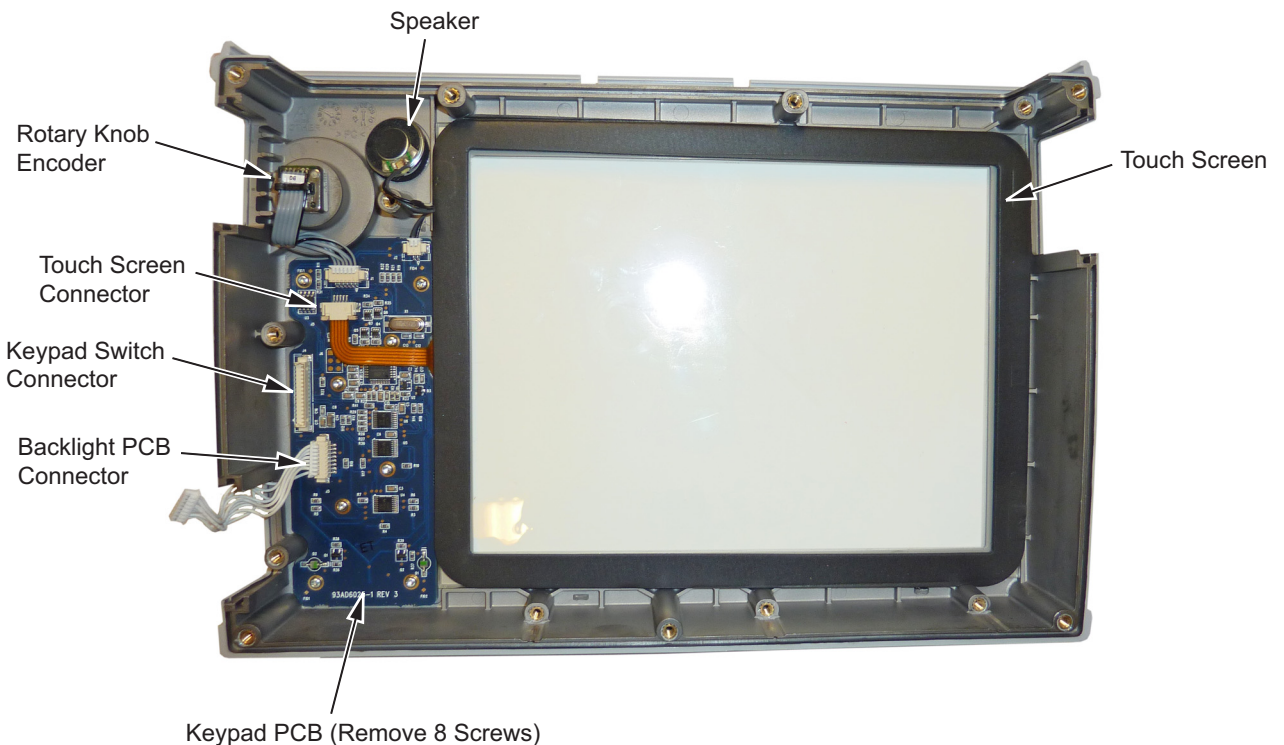
6. Carefully remove the LCD Backlight PCB.
7. Reverse the above steps to install the replacement LCD backlight PCB.

**Note** Pay attention to the routing of the LCD Backlight Cable. The cable must be positioned so it is not pinched when the instrument is reassembled.

## 5-13 Keypad and Keypad PCB Replacement

This procedure provides instructions to replace the rubber keypad and the keypad PCB.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Perform Step 1 through Step 4 of [Section 5-11 “LCD Assembly Replacement”](#).
4. Remove the 8 screws and the cables attached to the keypad PCB allowing removal of the keypad PCB ([Figure 5-16](#)). The rubber keypad is located under the keypad PCB.



**Figure 5-16.** Front Panel Keypad Bezel

5. Reverse the above steps to install the replacement rubber keypad and/or keypad PCB.
6. The keypad PCB stores the touch screen calibration data. If the keypad PCB is replaced, then a touch screen calibration must be performed. If no touch screen calibration data is stored in the new keypad PCB when powering on a unit, it will stay at the boot up screen with the Anritsu logo shown and a message at the bottom of the screen stating:

Failed to load touch screen calibration data. Please reboot the instrument.

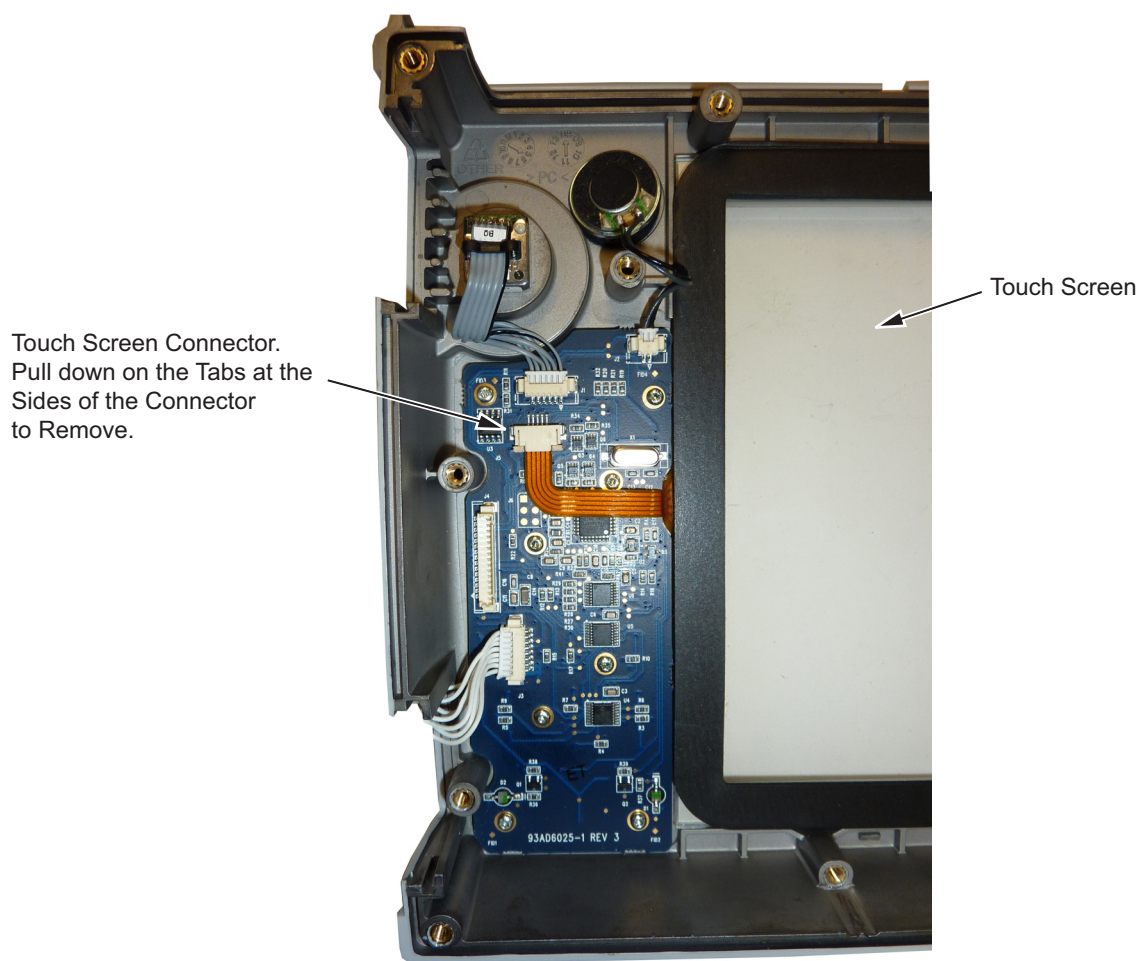
If this message is displayed, power off the unit and power the unit on in bootstrap mode by pressing and holding down the **Shift - 4 - 0** keys while pressing the power on button. Now the unit will boot up in bootstrap mode and prompt you to perform a touch-screen calibration. After following the on-screen calibration directions, power the unit off and it will boot up correctly on the next power cycle.

7. If the keypad PCB was replaced with a PCB having touch screen calibration data, the instrument will boot up properly, but the touch-screen calibration data may no be accurate. Perform a touch-screen calibration by pressing the **Shift** key and then **0** key, and follow the on-screen calibration directions.

## 5-14 Touch Screen Replacement

This procedure provides instructions to replace the touch screen.

1. Open the case as described in [Section 5-3 “Opening the Spectrum Master Case”](#).
2. Remove the PCB assembly from the front panel as described in [Section 5-4 “PCB Assembly Removal”](#).
3. Perform Step 1 through Step 4 of [Section 5-11 “LCD Assembly Replacement”](#).
4. Remove the touch screen flex circuit cable from the keypad PCB by pulling the tabs on each side of the connector away from the connector and in the direction of the flex circuit. Refer to [Figure 5-17](#).
5. Pull the touch screen cable out of the connector housing.
6. Remove the touch screen from the bezel by pulling it straight up.



**Figure 5-17.** Replacing the Touch Screen

7. Reverse the above steps to install the replacement touch screen.
8. Perform a touch screen calibration by pressing the **Shift** key and then the **0** key, and follow the on-screen calibration directions.

# Chapter 6 — Troubleshooting

## 6-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu Service Centers. Perform the troubleshooting suggestions in the order they are listed. Operators of the MS271xE should refer to the User Guide for troubleshooting help.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in [Table 1-3, “List of Replaceable Parts” on page 1-6](#) 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. Removal of RF shields from PC boards or adjustment of screws on or near the shields will detune sensitive RF circuits and will result in degraded instrument performance.

## 6-2 Turn-on Problems

### **Instrument cannot boot-up, no activity occurs when the On/Off key is pressed:**

1. Battery may be fully discharged. Confirm the battery is installed into the instrument and connect the AC to DC converter (Anritsu part number 40-187-R) to the instrument allowing the battery to charge.
2. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS271xE, but are electrically incompatible and will not charge correctly.
3. External power supply may have failed or be the wrong type. Replace the external power supply.
4. The On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. The 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).
2. During the boot-up process, the instrument stops with the message:  
Failed to load touch screen calibration data. Please reboot the instrument.
  - a. Power the instrument off and boot up in boot strap mode (hold down the **Shift - 4 - 0** keys while pressing the power on button).
  - b. In boot strap mode, the instrument prompts you to perform a touch screen calibration. Follow the on-screen directions until the touch screen calibration is complete, and then power cycle the instrument.
  - c. Once the instrument boots up, ensure the firmware version is 1.30 or greater. If not, load the latest firmware and perform a touch screen calibration.
3. 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, check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB.
3. Replace the LCD assembly.
4. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

**Boot-up Self Test fails:**

1. Perform a Master Reset.
2. Check that the date and time are correct.
3. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly

## 6-3 Other Problems

**Touch Screen Problems:****Instrument boots correctly, but the touch screen will not react.**

1. **The touch screen may have lost its calibration data. Press Shift then 0 to enter the touch screen calibration procedure. Follow the on-screen directions.**
2. Check the firmware version installed on the instrument and ensure it is version 1.30 or greater. If not, install the latest firmware version and redo the touch screen calibration as described in Step 1.
3. **Replace the touch screen.**

**Battery Pack Charging Problems:**

Refer to [Chapter 4, "Battery Information"](#).

**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.

**Spectrum Analyzer Problems:**

1. Inspect the Spectrum Analyzer RF In connector for damage.
2. Refer to the User Guide.
3. Update system software using Master Software Tools (via Tools menu).
4. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

**Other Issues:**

1. Perform a Master Reset.
2. Refer to the User Guide.
3. Update system software using Master Software Tools (via Tools menu).
4. Replace the Main PCB/Spectrum Analyzer assembly.



# Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the MS2711E, MS2712E and MS2713E Spectrum Masters. Anritsu Company recommends that you make a copy of the following test record pages and document the measurements each time that a Performance Verification is performed. Continuing to document this process each time that it is performed provides a detailed history of instrument performance, allowing trends to be observed.

## A-1 Test Records for Spectrum Analyzer Verification

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-1 Test Records for Spectrum Analyzer Verification

### Frequency Accuracy Verification and Adjustment

Table A-1. Spectrum Analyzer Frequency Accuracy

Frequency	Measured Value	Deviation	Specification
1 GHz (All instruments)	GHz	kHz	$\pm 1.5$ kHz ( $\pm 1.5$ ppm)
2.9 GHz (MS2711E only)	GHz	kHz	$\pm 4.35$ kHz ( $\pm 1.5$ ppm)
3.9 GHz (MS2712E only)	GHz	kHz	$\pm 5.85$ kHz ( $\pm 1.5$ ppm)
5.9 GHz (MS2713E only)	GHz	kHz	$\pm 8.85$ kHz ( $\pm 1.5$ ppm)

### Single Side Band (SSB) Phase Noise Verification

Table A-2. Spectrum Analyzer SSB Phase Noise Verification for MS2711E

Frequency	Measured Value	Calculated Value	Specification
10 kHz	dBc/Hz	dBc/Hz	$\leq -90$ dBc/Hz
100 kHz	dBc/Hz	dBc/Hz	$\leq -95$ dBc/Hz
1 MHz	dBc/Hz	dBc/Hz	$\leq -105$ dBc/Hz

Table A-3. Spectrum Analyzer SSB Phase Noise Verification for MS2712E and MS2713E

Frequency	Measured Value	Calculated Value	Specification
10 kHz	dBc/Hz	dBc/Hz	$\leq -100$ dBc/Hz
100 kHz	dBc/Hz	dBc/Hz	$\leq -105$ dBc/Hz
1 MHz	dBc/Hz	dBc/Hz	$\leq -115$ dBc/Hz

### Spurious Response (Second Harmonic Distortion) Verification

Table A-4. Spectrum Analyzer Spurious Response (Second Harmonic Distortion)

Frequency	Measured Value	2nd Harmonic Distortion	Specification
50.1 MHz			
100.2 MHz		dBc	$\leq -56$ dBc

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Spectrum Analyzer Verification (continued)

### Resolution Bandwidth Accuracy Verification

**Table A-5.** Spectrum Analyzer Resolution Bandwidth Accuracy

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

**Following settings are not valid for the MS2711E**

30 Hz	50 Hz	3 Hz	27 Hz	Hz	33 Hz
10 Hz	30 Hz	3 Hz	9 Hz	Hz	11 Hz

**Following settings are used only for instruments with 20 MHz IF BW Available (found in System Status menu)**

3 Hz	10 Hz	1 Hz	2.7 Hz	Hz	3.3 Hz
1 Hz	10 Hz	1 Hz	0.9 Hz	Hz	1.1 Hz

**A-1 Test Records for Spectrum Analyzer Verification**

---

**MS271\_E** Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Spectrum Analyzer Verification (continued)

### Spectrum Analyzer Absolute Amplitude Accuracy Verification

**Table A-6.** Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy Setup Table

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-7.** Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy

Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
0 dBm	10 dBm	30 dB	dBm	$\pm 1.25$ dB
-4 dBm	10 dBm	30 dB	dBm	$\pm 1.25$ dB
-10 dBm	0 dBm	20 dB	dBm	$\pm 1.25$ dB
-14 dBm	0 dBm	20 dB	dBm	$\pm 1.25$ dB
-20 dBm	-10 dBm	10 dB	dBm	$\pm 1.25$ dB
-24 dBm	-10 dBm	10 dB	dBm	$\pm 1.25$ dB
-30 dBm	-20 dBm	0 dB	dBm	$\pm 1.25$ dB
-34 dBm	-20 dBm	0 dB	dBm	$\pm 1.25$ dB
-40 dBm	-30 dBm	0 dB	dBm	$\pm 1.25$ dB
-44 dBm	-30 dBm	0 dB	dBm	$\pm 1.25$ dB
-50 dBm	-40 dBm	0 dB	dBm	$\pm 1.25$ dB
Turn Pre-Amp On (for the below measurement) MS2711E's without Pre-Amp (option 8) skip below measurement				
-44 dBm	-40 dBm	10 dB	dBm	$\pm 1.25$ dB
-50 dBm	-45 dBm	5 dB	dBm	$\pm 1.25$ dB

## A-1 Test Records for Spectrum Analyzer Verification

---

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Spectrum Analyzer Verification (continued)

#### Spectrum Analyzer Absolute Amplitude Accuracy Verification

Table A-8. Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency Setup Table

Frequency	Required Sensor B reading for -2 dBm at Attenuator output	Required Sensor B reading for -30 dBm at Attenuator output	Required Sensor B reading for -50 dBm @ Attenuator output
10.1 MHz	dBm	dBm	dBm
50 MHz	dBm	dBm	dBm
100 MHz	dBm	dBm	dBm
500 MHz	dBm	dBm	dBm
1000 MHz	dBm	dBm	dBm
2000 MHz	dBm	dBm	dBm
2990 MHz	dBm	dBm	dBm
3990 MHz	dBm	dBm	dBm
5000 MHz	dBm	dBm	dBm
5990 MHz	dBm	dBm	dBm

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Spectrum Analyzer Verification (continued)

### Spectrum Analyzer Absolute Amplitude Accuracy Verification

**Table A-9.** Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency (1 of 4)

Freq (MHZ)	Input Power (dBm)	Reference Level Setting (dBm)	Atten. Level Setting (dB)	Pre-Amp Setting	Marker 1 Reading (dBm)	Spec (dB)
10.1	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25
50	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25

## A-1 Test Records for Spectrum Analyzer Verification

**Table A-9.** Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency (2 of 4)

Freq (MHZ)	Input Power (dBm)	Reference Level Setting (dBm)	Atten. Level Setting (dB)	Pre-Amp Setting	Marker 1 Reading (dBm)	Spec (dB)
100	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25
500	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25
1000	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25



**Table A-9.** Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency (3 of 4)

Freq (MHZ)	Input Power (dBm)	Reference Level Setting (dBm)	Atten. Level Setting (dB)	Pre-Amp Setting	Marker 1 Reading (dBm)	Spec (dB)
2000	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25
2990	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25
3990 (MS2712E and MS2713E Only)	-50	-40	15	On		± 1.25
	-30	-20	0	Off		± 1.25
	-30	-20	5	Off		± 1.25
	-30	-20	10	Off		± 1.25
	-30	-20	20	Off		± 1.25
	-2	0	30	Off		± 1.25
	-2	0	40	Off		± 1.25
	-2	0	50	Off		± 1.25
	-2	0	55	Off		± 1.25

## A-1 Test Records for Spectrum Analyzer Verification

**Table A-9.** Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency (4 of 4)

Freq (MHZ)	Input Power (dBm)	Reference Level Setting (dBm)	Atten. Level Setting (dB)	Pre-Amp Setting	Marker 1 Reading (dBm)	Spec (dB)
5000 (MS2713E Only)	-50	-40	15	On		± 1.50
	-30	-20	0	Off		± 1.50
	-30	-20	5	Off		± 1.50
	-30	-20	10	Off		± 1.50
	-30	-20	20	Off		± 1.50
	-2	0	30	Off		± 1.50
	-2	0	40	Off		± 1.50
	-2	0	50	Off		± 1.50
	-2	0	55	Off		± 1.50
5990 (MS2713E Only)	-50	-40	15	On		± 1.50
	-30	-20	0	Off		± 1.50
	-30	-20	5	Off		± 1.50
	-30	-20	10	Off		± 1.50
	-30	-20	20	Off		± 1.50
	-2	0	30	Off		± 1.50
	-2	0	40	Off		± 1.50
	-2	0	50	Off		± 1.50
	-2	0	55	Off		± 1.50

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Spectrum Analyzer Verification (continued)****Residual Spurious Response Verification****Table A-10.** Spectrum Analyzer Residual Spurious with Pre Amp Off

Start Freq.	Stop Freq.	RBW	VBW	Measured Values	Specification
10 MHz	50 MHz	1 kHz	300 Hz	dBm	$\leq -90$ dBm
50 MHz	2.0 GHz	3 kHz	10 kHz	dBm	$\leq -90$ dBm
2.0 GHz	3.0 GHz	1 kHz	1 kHz	dBm	$\leq -90$ dBm
3.0 GHz	4.0 GHz	1 kHz	1 kHz	dBm	$\leq -90$ dBm
4.0 GHz	5.0 GHz	1 kHz	3 kHz	dBm	$\leq -90$ dBm
5.0 GHz	5.2 GHz	1 kHz	1 kHz	dBm	$\leq -90$ dBm
5.2 GHz	5.7 GHz	300 Hz	3 kHz	dBm	$\leq -90$ dBm
5.7 GHz	5.9 GHz	300 Hz	3 kHz	dBm	$\leq -90$ dBm
5.9 GHz	6.0 GHz	1 kHz	100 Hz	dBm	$\leq -90$ dBm

**Table A-11.** Spectrum Analyzer Residual Spurious with Pre Amp On

Start Freq.	Stop Freq.	Measured Values	Specification
10 MHz	1.0 GHz	dBm	$\leq -90$ dBm
1.0 GHz	3.0 GHz	dBm	$\leq -90$ dBm
3.0 GHz	4.0 GHz	dBm	$\leq -90$ dBm
4.0 GHz	6.0 GHz	dBm	$\leq -90$ dBm

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Spectrum Analyzer Verification (continued)

### Displayed Average Noise Level (DANL)

**Table A-12.** Spectrum Analyzer DANL with Pre Amp Off

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	2.4 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -141$ dBm
2.4 GHz	3.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -137$ dBm
3.0 GHz	4.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -137$ dBm
4.0 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -134$ dBm
5.0 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -126$ dBm

**Note** Table A-13 is not applicable for MS2711E instruments without Option 8 (Preamplifier) installed.

**Table A-13.** Spectrum Analyzer DANL with Pre Amp On

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	2.4 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -157$ dBm
2.4 GHz	3.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -154$ dBm
3.0 GHz	4.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -154$ dBm
4.0 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -150$ dBm
5.0 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	$\leq -143$ dBm

### Third Order Intercept (TOI) Verification

**Table A-14.** Third Order Intercept (TOI) Verification

Frequency	Measured Max Value	Calculated TOI $\text{TOI} = -20 + [(-20 - \text{max}) / 2]$	Specification
800 MHz	dBm	dBm	$\geq 16$ dBm
2400 MHz	dBm	dBm	$\geq 20$ dBm

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## A-2 Test Records for Options Verification

### Bias Tee Verification, Option 10

Table A-15. Option 10 Bias-Tee

Voltage Setting	Measured Voltage	Measured Current	Voltage Specification	Current Specification
<b>105 ohm Load, Low Current</b>				
12 V	V	mA	$12 \pm 1.2$ V	85 mA to 145 mA
18 V	V	mA	$18 \pm 1.8$ V	142 mA to 202 mA
24 V	V	mA	$24 \pm 2.4$ V	199 mA to 259 mA
<b>40 ohm Load, High Current</b>				
15 V	V	mA	$15 \pm 1.5$ V	325 mA to 425 mA
<b>78 ohm Load, High Current</b>				
32 V	V	mA	$32 \pm 3.2$ V	370 mA to 450 mA

### Tracking Generator Verification, Option 20

Table A-16. Option 20, Tracking Generator Verification

Frequency Range	Measured Value	Specification
500 kHz to 3 GHz (for MS2711E)		dB $\pm 1.0$ dB max
500 kHz to 4 GHz (for MS2712E)		dB $\pm 1.0$ dB max
500 kHz to 6 GHz (for MS2713E)		dB $\pm 1.0$ dB max

### 2-Port Transmission Verification, Option 21

Table A-17. Option 21, Dynamic Range Verification

Frequency Range	Measured Value	Specification
2 MHz to 3 GHz (for MS2711E)		dB $\leq 80$ dB
2 MHz to 4 GHz (for MS2712E and MS2713E)		
4.01 GHz to 6 GHz (for MS2713E)		dB $\leq 70$ dB

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Options Verification (Continued)

### Power Meter Level Accuracy, Option 29

**Table A-18.** Characterization Chart for Power Meter Verification

Test Power Level at 50 MHz	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm
Test Power Level at 2900 MHz (For MS2711E only)	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm
Test Power Level at 3900 MHz (For MS2712E only)	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm
Test Power Level at 5900 MHz (For MS2713E only)	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm

**Table A-19.** Internal Power Meter Accuracy Verification

Frequency	Input Power	Measured Values	Specification
50 MHz	0 dBm	dBm	± 1.25 dB
	-50 dBm	dBm	± 1.25 dB
2.9 GHz (MS2711E only)	0 dBm	dBm	± 1.25 dB
	-50 dBm	dBm	± 1.25 dB
3.9 GHz (MS2712E only)	0 dBm	dBm	± 1.25 dB
	-50 dBm	dBm	± 1.25 dB
5.9 GHz (MS2713E only)	0 dBm	dBm	± 1.50 dB
	-50 dBm	dBm	± 1.50 dB

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

**Test Records for Options Verification (Continued)**

**ISDB-T and BER Verification, Options 30 and 79**

**Table A-20.** ISDB-T Signal Analyzer Frequency Accuracy

Channel	Frequency	Ref Level	Pre Amp Off Freq Error	Spec.	Ref Level	Pre Amp On Freq Error	Spec.
13	473.14285714 MHz	-20 dBm	Hz	± 0.3 Hz	-50 dBm	Hz	± 0.3 Hz
38	623.14285714 MHz	-20 dBm	Hz	± 0.3 Hz	-50 dBm	Hz	± 0.3 Hz
62	767.14285714 MHz	-20 dBm	Hz	± 0.3 Hz	-50 dBm	Hz	± 0.3 Hz

**Table A-21.** ISDB-T Signal Analyzer Frequency Lock Range

Channel	Frequency	Measured Frequency Error	Specification
13	473.23285714 MHz	Hz	90,000 ± 0.3 Hz
13	473.05285714 MHz	Hz	-90,000 ± 0.3 Hz

**Table A-22.** Level Accuracy Verification, AT(-10)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	ΔAB(-10)	MN63A Attenuation Reading, AT(-10)
473.14285714 MHz (Ch 13)				
623.14285714 MHz (Ch 38)				
767.14285714 MHz (Ch 62)				

**Table A-23.** Level Accuracy Verification, AT(-50)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	ΔAB(-50)	MN63A Attenuation Reading, AT(-50)
473.14285714 MHz (Ch 13)				
623.14285714 MHz (Ch 38)				
767.14285714 MHz (Ch 62)				

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

#### ISDB-T and BER Verification, Options 30 and 79 (continued)

**Table A-24.** ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0



MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)**

**ISDB-T and BER Verification, Options 30 and 79 (continued)**

**Table A-25.** ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**ISDB-T and BER Verification, Options 30 and 79 (continued)**

**Table A-26.** ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****ISDB-T and BER Verification, Options 30 and 79 (continued)****Table A-27.** ISDB-T Signal Analyzer DANL with Pre Amp Off

Channel	Frequency	Ref Level	Measured Value	Specification
13	473.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm
38	623.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm
62	767.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm

**Table A-28.** ISDB-T Signal Analyzer DANL with Pre Amp On

Channel	Frequency	Ref Level	Measured Value	Specification
13	473.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm
38	623.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm
62	767.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm

**Table A-29.** ISDB-T Signal Analyzer Phase Noise

Channel	Frequency (MHz)	Spec. at 10 kHz Offset (dBc / Hz)	Measured Phase Noise (10 kHz offset) (dBc/Hz)	Spec. at 100 kHz Offset (dBc/Hz)	Measured Phase Noise (100 kHz offset) (dBc/Hz)	Freq Error Spec.	Freq Error
13	473.14285714	$\leq -100$	dBc/Hz	$\leq -105$	dBc/Hz	$\pm 0.2$ Hz	Hz
38	623.14285714	$\leq -100$	dBc/Hz	$\leq -105$	dBc/Hz	$\pm 0.2$ Hz	Hz
62	767.14285714	$\leq -100$	dBc/Hz	$\leq -105$	dBc/Hz	$\pm 0.2$ Hz	Hz

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****GPS Verification, Option 31****Table A-30.** Option 31 GPS Receiver

Frequency	Measured Value	Error	Specification
<b>Spectrum Analyzer Frequency Accuracy with GPS High Frequency Accuracy</b>			
2.9 GHz	GHz	Hz	$\pm 145 \text{ Hz } (\pm 50 \text{ ppb})$
<b>Spectrum Analyzer Frequency Accuracy with Internal Standard Frequency Accuracy</b>			
2.9 GHz	GHz	Hz	$\pm 4.35 \text{ kHz } (\pm 1.5 \text{ ppm})$

**Table A-31.** Option 31 GPS Receiver Bias-Tee Verification

Voltage Setting	Measured Value	Specification
3.3 V	mA	$32 \text{ mA } \pm 15\% (27.2 \text{ mA to } 36.8 \text{ mA})$
5.0 V	mA	$55.6 \text{ mA } \pm 15\% (47.3 \text{ mA to } 63.9 \text{ mA})$

**ISDB-T SFN Verification, Option 32****Table A-32.** ISDB-T SFN Level Accuracy Verification, AT(-10)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	$\Delta AB(-10)$	MN63A Attenuation Reading, AT(-10)
473.14285714 MHz (Ch 13)				
623.14285714 MHz (Ch 38)				
767.14285714 MHz (Ch 62)				

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**ISDB-T SFN Verification, Option 32 (continued)**

**Table A-33.** ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Options Verification (continued)

### ISDB-T SFN Verification, Option 32 (continued)

Table A-34. ISDB-T SFN Level Accuracy Verification, AT(-50)

Frequency (Channel)	Sensor A Reading	Sensor B Reading	$\Delta AB(-50)$	MN63A Attenuation Reading, AT(-50)
473.14285714 MHz (Ch 13)				
623.14285714 MHz (Ch 38)				
767.14285714 MHz (Ch 62)				

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)**

**ISDB-T SFN Verification, Option 32 (continued)**

**Table A-35.** ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**ISDB-T SFN Verification, Option 32 (continued)**

**Table A-36.** ISDB-T SFN Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0



MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****ISDB-T SFN Verification, Option 32 (continued)****Table A-37.** ISDB-T SFN Analyzer DANL with Pre Amp Off

Channel	Frequency	Ref Level	Measured Value	Specification
13	473.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm
38	623.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm
62	767.14285714 MHz	-25 dBm	dBm	$\leq -70$ dBm

**Table A-38.** ISDB-T SFN Analyzer DANL with Pre Amp On

Channel	Frequency	Ref Level	Measured Value	Specification
13	473.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm
38	623.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm
62	767.14285714 MHz	-50 dBm	dBm	$\leq -90$ dBm

**A-2 Test Records for Options Verification**

---

**MS271\_E Firmware Revision:** \_\_\_\_\_ **Operator:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

## Test Records for Options Verification (continued)

### GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880

Table A-39. Option 40/880 GSM/GPRS/EDGE RF Measurements

Error Type	Measured Value	Specification
<b>At 850 MHz, -10 dBm Level, TCH Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 850 MHz, -50 dBm Level, TCH ALL Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 1800 MHz, -10 dBm Level, TCH ALL Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 1800 MHz, -50 dBm Level, TCH Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 850 MHz, -10 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 1800 MHz, -10 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
<b>At 1800 MHz, -50 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
Burst Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****GSM/GPRS/EDGE Signal Analyzer Verification, Options 40/41/880 (continued)****Table A-40.** Option 41/880 GSM/GPRS/EDGE Demodulator

Measurement	Measured Value	Specification
<b>At 850 MHz, -10 dBm Level, TCH Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 850 MHz, -50 dBm Level, TCH ALL Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 1800 MHz, -10 dBm Level, TCH ALL Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 1800 MHz, -50 dBm Level, TCH Pattern</b>		
Phase Err RMS (Deg)	Deg	≤ 1 Deg
<b>At 850 MHz, -10 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 1800 MHz, -10 dBm Level, DL_MCS-9_4SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%
<b>At 1800 MHz, -50 dBm Level, DL_MCS-9_1SLOT Pattern</b>		
EVM RMS	%	≤ 2.5%

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## Test Records for Options Verification (continued)

### CDMA Signal Analyzer Verification, Option 42/43/884

**Table A-41.** Option 42/884 CDMA RF Measurements

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -30 dBm Level, cdmaOne</b>		
Channel Power		dB ± 1.5 dB
<b>At 1930.05 MHz, -30 dBm Level, cdmaOne</b>		
Channel Power		dB ± 1.5 dB
<b>At 870.03 MHz, -30 dBm Level, CDMA2000</b>		
Channel Power		dB ± 1.5 dB
<b>At 1930.05 MHz, -30 dBm Level, CDMA2000</b>		
Channel Power		dB ± 1.5 dB

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**CDMA Signal Analyzer Verification, Option 42/43/884 (continued)**

**Table A-42.** Option 43/884 cdmaOne and CDMA2000 1xRTT Demodulator

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -30 dBm Level, cdmaOne</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -30 dBm Level, cdmaOne</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 870.03 MHz, -30 dBm Level, CDMA2000</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -30 dBm Level, CDMA2000</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s

MS271\_E Firmware Rev: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_ Options: \_\_\_\_\_

## Test Records for Options Verification (continued)

### WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881

**Table A-43.** Option 44/881, Sensor A and Sensor B Reading Components Characterization Table

Frequency	PMA.10 (dBm)	PMB.10 (dBm)	$\Delta 1$ (dBm)	PMA.10C (dBm)	PMA.20 (dBm)	ATT.10 (dB)
881.5 MHz						

**Table A-44.** Option 44/881, Power Level Setting Components Characterization Table

Frequency	MG3700A.10 Setting (dBm)	MG3700A.20 Setting (dBm)	PMA.10 (dBm)	PMA.20 (dBm)
881.5 MHz				

**Table A-45.** Option 44/881, WCDMA Absolute Power Accuracy

Test Level	Measured Power	Error	Specification
+20 dBm	dBm	dB	$\pm 1.25$ dB
+10 dBm	dBm	dB	$\pm 1.25$ dB
-10 dBm	dBm	dB	$\pm 1.25$ dB
-20 dBm	dBm	dB	$\pm 1.25$ dB

**Table A-46.** Option 44/881, WCDMA Occupied Bandwidth (OBW)

Frequency	Power Meter Reading	OBW	Specification
881.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz
1962.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz
2680.5 MHz	dBm		4.2 MHz $\pm$ 100 kHz

**Table A-47.** Option 44/881, WCDMA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Error	Specification
881.5 MHz				$\pm 1.25$ dB
1962.5 MHz				$\pm 1.25$ dB
2680.5 MHz				$\pm 1.25$ dB

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

#### WCDMA/HSDPA Signal Analyzer Verification, Option 44/65/881 (continued)

**Table A-48.** Option 44/881, HSDPA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Accuracy	Specification
2680.5 MHz				± 1.25 dB max

**Table A-49.** Option 65/881, WCDMA Error Vector Magnitude (Test Model 4)

Frequency (MHz)	Measured Value	Specification
1962.5	EVM %	≤ 2.5%

**Table A-50.** Option 65/881, HSDPA Error Vector Magnitude (Test Model 5)

Frequency (MHz)	Measured Value	Specification
1962.5	EVM %	≤ 2.5%



MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****Fixed WiMAX Signal Analyzer Verification, Option 46/47/885****Table A-51.** Option 46/885, 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

**Table A-52.** Option 47/885, 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-53.** Option 47/885, Fixed WiMAX Frequency Error

Frequency	Power	Frequency Error	Specification
2600.5 MHz	-50 dBm	Hz	± 182 Hz
5600.5 MHz	-50 dBm	Hz	± 392 Hz

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Options Verification (continued)

### TD-SCDMA Signal Analyzer Verification, Option 60/61/882

**Table A-54.** Option 60/61/882 TD-SCDMA Verification (at 2010 MHz, -45 dBm Level, TD-SCDMA)

Measurement	Measured Value	Specification
Channel Power (Error)		± 1.5 dB
Frequency Error		± 10 Hz
Tau		± 0.2 μs

### EVDO Signal Analyzer Verification, Option 62/63/884

**Table A-55.** Option 62/884, EVDO RF Measurements

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 1930.05 MHz, -50 dBm Level, Idle Slot</b>		
Channel Power Error	dB	± 1.5 dB
<b>At 870.03 MHz, -10 dBm Level, Idle Slot</b>		
Channel Power Error	dB	± 1.5 dB

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****EVDO Signal Analyzer Verification, Option 62/63/884****Table A-56.** Option 63/884, EVDO Demodulator

Measurement	Measured Value	Specification
<b>At 870.03 MHz, -50 dBm Level, 921.6kps 8-PSK Modulation</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, 0 dBm Level, 38.4kps QPSK Modulation</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -50 dBm Level, 2457.6kps 16-QAM Modulation</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 1930.05 MHz, -50 dBm Level, Idle Slot</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s
<b>At 870.03 MHz, -10 dBm Level, Idle Slot</b>		
Frequency Error	Hz	$\pm 10$ Hz
Rho		$0.99 \leq x \leq 1$
Tau	$\mu$ s	$\pm 1$ $\mu$ s

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

#### DVB-T/H Signal Analyzer Verification, Option 64, 57

**Table A-57.** Option 64, DVB-T/H Signal Analyzer, Frequency Accuracy for –20 dBm Reference Level

Channel	Reference Level	Frequency Error	Specification
21	–20 dBm	Hz	± 0.3 Hz
45	–20 dBm	Hz	± 0.3 Hz
69	–20 dBm	Hz	± 0.3 Hz

**Table A-58.** Option 64, DVB-T/H Signal Analyzer, Frequency Accuracy for –50 dBm Reference Level

Channel	Reference Level	Frequency Error	Specification
21	–50 dBm	Hz	± 0.3 Hz
45	–50 dBm	Hz	± 0.3 Hz
69	–50 dBm	Hz	± 0.3 Hz

**Table A-59.** Option 64, DVB-T/H Signal Analyzer, Residual MER Pre Amp OFF

Channel	Total MER	Specification
21	dB	≥ 42 dB
45	dB	≥ 42 dB
69	dB	≥ 42 dB

**Table A-60.** Option 64, DVB-T/H Signal Analyzer, Residual MER Pre Amp On

Channel	Total MER	Specification
21	dB	≥ 37 dB
45	dB	≥ 37 dB
69	dB	≥ 37 dB

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**DVB-T/H Signal Analyzer Verification, Option 64, 57**

**Table A-61.** Option 64, DVB-T/H Signal Analyzer, Frequency Lock Range

Channel	Frequency	Measured Frequency Offset	Specification
21	474.09 MHz	Hz	90 kHz ± 0.3 Hz
21	473.91 MHz	Hz	-90 kHz ± 0.3 Hz

**Table A-62.** Option 64, DVB-T/H Signal Analyzer, Level Accuracy Verification, -10

Frequency (Channel)	Sensor A Reading	Sensor B Reading	DAB(-10)	MN63A Attenuation Reading, AT(-10)
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

**Table A-63.** Option 64, DVB-T/H Signal Analyzer, Level Accuracy Verification, -50

Frequency (Channel)	Sensor A Reading	Sensor B Reading	DAB(-50)	MN63A Attenuation Reading, AT(-50)
474 MHz (Ch 21)				
666 MHz (Ch 45)				
858 MHz (Ch 69)				

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

#### DVB-T/H Signal Analyzer Verification, Option 64, 57

**Table A-64.** Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 21 at 474 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)**

**DVB-T/H Signal Analyzer Verification, Option 64, 57**

**Table A-65.** Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 45 at 666 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

**DVB-T/H Signal Analyzer Verification, Option 64, 57**

**Table A-66.** Option 64, DVB-T/H Signal Analyzer, Level Accuracy Measurement, Channel = 69 at 858 MHz

Test Level (dBm)	AT(set) (dB)	SB(-10) or SB(-50) (dBm)	Input Level (dBm)	Ref Level Pre Amp Off / On (dBm)	Pre Amp Off		Pre Amp On		Spec (dB)
					M(Level) (dBm)	Dev (dB)	Pre Amp On M(Level) (dBm)	Dev (dB)	
-10	AT(-10) =			-10 / NA			- NA -	- NA -	± 2.0
-15	AT(-10) + 5 =	- NA -		-15 / NA			- NA -	- NA -	± 2.0
-20	AT(-10) + 10 =	- NA -		-20 / -20					± 2.0
-25	AT(-10) + 15 =	- NA -		-25 / -20					± 2.0
-30	AT(-10) + 20 =	- NA -		-25 / -30					± 2.0
-35	AT(-10) + 25 =	- NA -		-25 / -30					± 2.0
-40	AT(-10) + 30 =	- NA -		-25 / -40					± 2.0
-45	AT(-10) + 35 =	- NA -		-25 / -40					± 2.0
-50	AT(-50) =			-25 / -50					± 2.0
-55	AT(-50) + 5 =	- NA -		-25 / -50					± 2.0
-60	AT(-50) + 10 =	- NA -		-25 / -50					± 2.0
-65	AT(-50) + 15 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-70	AT(-50) + 20 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-75	AT(-50) + 25 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-80	AT(-50) + 30 =	- NA -		NA / -50	- NA -	- NA -			± 2.0
-84	AT(-50) + 34 =	- NA -		NA / -50	- NA -	- NA -			± 2.0



MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****DVB-T/H Signal Analyzer Verification, Option 64, 57****Table A-67.** Option 64, DVB-T/H Signal Analyzer, DANL, Pre Amp OFF

Channel	Frequency	Ref Level	Measured Value	Specification
21	474 MHz	-25 dBm	dBm	$\leq -69$ dBm
45	666 MHz	-25 dBm	dBm	$\leq -69$ dBm
69	858 MHz	-25 dBm	dBm	$\leq -69$ dBm

**Table A-68.** Option 64, DVB-T/H Signal Analyzer, DANL, Pre Amp ON

Channel	Frequency	Ref Level	Measured Value	Specification
21	474 MHz	-50 dBm	dBm	$\leq -89$ dBm
45	666 MHz	-50 dBm	dBm	$\leq -89$ dBm
69	858 MHz	-50 dBm	dBm	$\leq -89$ dBm

**Table A-69.** Option 78, DVB-T/H SFN, Level Accuracy for Channel 21, 474 MHz

Test Level (dBm)	Ref Level Pre Amp Off (dBm)	Pre Amp Off	Ref Level Pre Amp On (dBm)	Pre Amp On	Specification (dBm)
		Measured Level (dBm)		Measured Level (dBm)	
-10	-10		-10		$-10 \pm 2.0$
-20	-10		-10		$-20 \pm 2.0$
-30	-10		-10		$-30 \pm 2.0$
-40	-10		-10		$-40 \pm 2.0$

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

### Test Records for Options Verification (continued)

#### DVB-T/H SFN Verification, Option 78

**Table A-70.** Option 78, DVB-T/H SFN, Level Accuracy for Channel 45, 666 MHz

Test Level (dBm)	Ref Level Pre Amp Off (dBm)	Pre Amp Off	Ref Level Pre Amp On (dBm)	Pre Amp On	Specification (dBm)
		Measured Level (dBm)		Measured Level (dBm)	
-10	-10		-10		-10 ± 2.0
-20	-10		-10		-20 ± 2.0
-30	-10		-10		-30 ± 2.0
-40	-10		-10		-40 ± 2.0

**Table A-71.** Option 78, DVB-T/H SFN, Level Accuracy for Channel 69, 858 MHz

Test Level (dBm)	Ref Level Pre Amp Off (dBm)	Pre Amp Off	Ref Level Pre Amp On (dBm)	Pre Amp On	Specification (dBm)
		Measured Level (dBm)		Measured Level (dBm)	
-10	-10		-10		-10 ± 2.0
-20	-10		-10		-20 ± 2.0
-30	-10		-10		-30 ± 2.0
-40	-10		-10		-40 ± 2.0

**Table A-72.** Option 78, DVB-T/H SFN Analyzer DANL with Pre Amp Off

Frequency	Ref Level	Measured Value	Specification
474 MHz	-25 dBm	dBm	≤ -69 dBm
666 MHz	-25 dBm	dBm	≤ -69 dBm
858 MHz	-25 dBm	dBm	≤ -69 dBm

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****DVB-T/H SFN Verification, Option 78****Table A-73.** Option 78, DVB-T/H SFN Analyzer DANL with Pre Amp On

Frequency	Ref Level	Measured Value	Specification
474 MHz	-50 dBm	dBm	$\leq -89$ dBm
666 MHz	-50 dBm	dBm	$\leq -89$ dBm
858 MHz	-50 dBm	dBm	$\leq -89$ dBm

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****Mobile WiMAX Signal Analyzer Verification, Options 66/67/885****Table A-74.** Option 66/885, Mobile WiMAX Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length)

Frequency (MHz)	Input Power (dBm)	Measured Channel Power (RSSI)	Error	Specification
2600.5	-15	dBm	dB	± 1.5 dB
2600.5	-50	dBm	dB	± 1.5 dB
3600.5	-15	dBm	dB	± 1.5 dB
3600.5	-50	dBm	dB	± 1.5 dB

**Table A-75.** Option 66/885, Mobile WiMAX Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length)

Frequency (MHz)	Input Power (dBm)	Measured Channel Power (RSSI)	Error	Specification
2600.5	-15	dBm	dB	± 1.5 dB
2600.5	-50	dBm	dB	± 1.5 dB
3600.5	-15	dBm	dB	± 1.5 dB
3600.5	-50	dBm	dB	± 1.5 dB

**Table A-76.** Option 67/885, Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length)

Frequency (MHz)	Power (dBm)	BW (MHz)	EVM (rms)	Specification
2600.5	-15	10	%	≤ 3.0%
2600.5	-50	10	%	≤ 3.0%
3600.5	-15	10	%	≤ 3.0%
3600.5	-50	10	%	≤ 3.0%

**Table A-77.** Option 67/885, Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

Frequency (MHz)	Power (dBm)	Freq Error	Specification
2600.5	-50	Hz	± 52.01 Hz
3600.5	-50	Hz	± 72.01 Hz

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Test Records for Options Verification (continued)****Mobile WiMAX Signal Analyzer Verification, Options 66/67/885****Table A-78.** Option 67/885, Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)

Frequency (MHz)	Power (dBm)	BW (MHz)	EVM (rms)	Specification
2600.5	-15	5	%	≤ 3.0%
2600.5	-50	5	%	≤ 3.0%
3600.5	-15	5	%	≤ 3.0%
3600.5	-50	5	%	≤ 3.0%

**Table A-79.** Option 67/885, Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

Frequency (MHz)	Power (dBm)	Freq Error	Specification
2600.5	-50	Hz	± 52.01 Hz
3600.5	-50	Hz	± 72.01 Hz

**A-2 Test Records for Options Verification**

---

**MS271\_E Firmware Revision:** \_\_\_\_\_ **Operator:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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

## Test Records for Options Verification (continued)

### LTE Signal Analyzer Verification, Options 541/542/883

**Table A-80.** Option 541/883, LTE Channel Power Accuracy

Frequency (MHz)	Input Power (dBm)	Measured Channel Power	Error	Specification
<b>10 MHz IF BW, Pattern E-TM_1-1_10M</b>				
750	-20	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-20	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB
<b>20 MHz IF BW, Pattern E-TM_1-1_20M (Only for instruments with 20 MHz IF BW Available)</b>				
750	-20	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-20	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB

**Table A-81.** Option 542/883, Frequency Accuracy

Measurement	Frequency Error	Specification
<b>10 MHz IF BW, Pattern E-TM_3-1_10M</b>		
750 MHz at -20 dBm	Hz	± 10 Hz
750 MHz at -50 dBm	Hz	± 10 Hz
2150 MHz at -20 dBm	Hz	± 10 Hz
2150 MHz at -50 dBm	Hz	± 10 Hz
<b>20 MHz IF BW, Pattern E-TM_3-1_20M (Only for instruments with 20 MHz IF BW Available)</b>		
750 MHz at -20 dBm	Hz	± 10 Hz
750 MHz at -50 dBm	Hz	± 10 Hz
2150 MHz at -20 dBm	Hz	± 10 Hz
2150 MHz at -50 dBm	Hz	± 10 Hz

MS271\_E Firmware Revision: \_\_\_\_\_ Operator: \_\_\_\_\_ Date: \_\_\_\_\_

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

## Test Records for Options Verification (continued)

### TD-LTE Signal Analyzer Verification, Options 551/552/883

**Table A-82.** Option 551/883, TD-LTE Channel Power Accuracy

Frequency (MHz)	Input Power (dBm)	Measured Channel Power	Error	Specification
<b>10 MHz IF BW, Pattern TDLTE-E-TM_1-1_10M</b>				
750	-20	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-20	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB
<b>20 MHz IF BW, Pattern TDLTE-E-TM_1-1_20M (Only for instruments with 20 MHz IF BW Available)</b>				
750	-20	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-20	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB

**Table A-83.** Option 552/883, TD-LTE Frequency Accuracy

Measurement	Frequency Error	Specification
<b>10 MHz IF BW, Pattern TDLTE-E-TM_3-3_10M</b>		
750 MHz at -20 dBm	Hz	± 10 Hz
750 MHz at -50 dBm	Hz	± 10 Hz
2150 MHz at -20 dBm	Hz	± 10 Hz
2150 MHz at -50 dBm	Hz	± 10 Hz
<b>20 MHz IF BW, Pattern TDLTE-E-TM_3-3_20M (Only for instruments with 20 MHz IF BW Available)</b>		
750 MHz at -20 dBm	Hz	± 10 Hz
750 MHz at -50 dBm	Hz	± 10 Hz
2150 MHz at -20 dBm	Hz	± 10 Hz
2150 MHz at -50 dBm	Hz	± 10 Hz









# Anritsu



Anritsu utilizes recycled paper and environmentally conscious inks and toner.

Anritsu Company  
490 Jarvis Drive  
Morgan Hill, CA 95037-2809  
USA