

Maintenance Manual

BTS Master™ MT8220T

The High Performance Handheld Base Station Analyzer

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

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Safety Symbols

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

Symbols Used in Manuals

Danger



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

Warning



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

Caution



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

Safety Symbols Used on Equipment and in Manuals

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



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



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



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



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



These indicate that the marked part should be recycled.

For Safety

Warning



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

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

Warning



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.

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Chapter 1 — General Information

1-1 Introduction

This manual provides maintenance instructions for Anritsu BTS Master Models MT8220T. The manual includes:

- General information in this chapter, including:
 - Lists of necessary test equipment to perform verification testing (Table 1-1, Table 1-2, Table 1-3, and Table 1-4)
 - Replaceable parts list (Table 1-5)
- Performance verification procedures:
 - Chapter 2, “Spectrum Analyzer Verification”
 - Chapter 3, “Cable and Antenna Analyzer Verification”
 - Chapter 4, “Power Meter Verification”
 - Chapter 5, “GPS Receiver Verification ”
 - Chapter 6, “Options Verification ”
- Battery pack information (Chapter 7, “Battery Information”)
- Parts replacement procedures (Chapter 8, “Assembly Replacement”)
- Troubleshooting problems (Chapter 9, “Troubleshooting”)
- Blank test records are included in Appendix A.
 - Copy the blank test records from Appendix A and use them to record measured values. These test records form a record of the performance of your 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 it is performed provides a detailed history of instrument performance, which can allow you to observe trends.

Familiarity with the basic operation of the front panel keys (for example, how to change measurement mode, preset the unit, or the meaning of soft key or submenu) is assumed.

Caution Before making any measurement, verify that all equipment has warmed up for at least 30 minutes.
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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 BTS Master Model MT8220T. [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 Cable and Antenna Analyzer. [Table 1-3](#) is a list of test equipment that is required for verifying the Power Meter. [Table 1-4](#) 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
Signal Generator	Frequency: 0.1 Hz to 20 GHz, Power Output: +16 dBm, Step attenuator installed	Anritsu Model MG3692C with Options 2A, 3, 4, 15A, 22
Power Meter	Power Range: -70 dBm to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 100 kHz to 18 GHz Power Range: -30 dB to +20 dB	Anritsu Model MA2421D (Qty 2) or SC7816 (Qty 2)
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -67 dB to +20 dB	Anritsu Model MA2442D or SC7400-1 (Qty 2)
50 Ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
Adapter	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Anritsu Model 34RKNF50
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(f), 50 ohm	Anritsu Model 15NNF50-1.5B (Qty 2)
Lowpass Filter	Frequency: 50 MHz	Anritsu Part Number 1030-96
Frequency Reference	Frequency: 10 MHz	Symmetricom RubiSource T&M
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10 (Qty 2)
Fixed Attenuator	20 dB Attenuation	Aeroflex/Weinschel Model 44-20 (Qty 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Coaxial Cable	BNC(m) to BNC(m), 50 ohm	Any (Qty 2) Anritsu Model 2000-1627-R

a. MG3692C models require Option 15A to achieve power of +16 dBm at 3.5 GHz.

Table 1-2. Test Equipment Required for Cable and Antenna Analyzer Verification

Instrument	Critical Specification	Recommended Manufacturer/Model
Frequency Counter	Frequency: 2 GHz	Anritsu Model MF2412B
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(f), 50 ohm	Anritsu Model 15NNF50-0.6B
Open/Short	Frequency: DC to 18 GHz	Anritsu Model 22N50
Termination	Frequency: DC to 18 GHz Return Loss: 40 dB min.	Anritsu Model 28N50-2
Termination	Frequency: DC to 18 GHz Return Loss: 40 dB min.	Anritsu Model 28NF50-2
6 dB Offset Termination	Frequency: DC to 6.0 GHz	Anritsu Model SC7424
20 dB Offset Termination	Frequency: DC to 6.0 GHz	Anritsu Model SC7423
Adapter	Frequency: DC to 20 GHz N(m) to N(m)	Anritsu Model 34NN50A

Table 1-3. Test Equipment Required for Power Meter Verification

Instrument	Critical Specification	Recommended Manufacturer/Model
Signal Generator	Frequency: 0.1 Hz to 20 GHz Power Output to +13 dBm	Anritsu Model MG3692C with options 2A, 3, 4, 22, 15A ^a
Power Meter	Power Range: -70 to +20 dBm	Anritsu Dual Channel Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -67 to +20 dB	Anritsu Model MA2442D or SC7400-1 (quantity 2)
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
Adapter	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Anritsu Model 34NN50A
Adapter	Frequency: DC to 20 GHz K(m) to N(f), 50 ohm	Anritsu Model 34RKNF50
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-0.6B
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M

a. Option 15A is required for MG3692C models to achieve power of +13 dBm.

Table 1-4. Test Equipment Required for Verifying Options (1 of 2)

Instrument	Critical Specification	Recommended Manufacturer/Model
Synthesizer	Frequency: 0.1 Hz to 20 GHz, +16 dBm power	Anritsu Model MG3692C with options 2A, 3, 4, 15A, and 22 ^a
Vector Signal Generator	Frequency: 100 kHz to 6 GHz	Anritsu Model MG3700A with Options MG3700A-002, MG3700A-011, MG3700A-021 and Waveform licenses MX370001A, MX370108A and MX370110A.
Power Meter	Power Range: -70 to + 20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: -60 to +20 dBm	Anritsu Model MA2482D with Option 1 (Qty 2)
Frequency Counter	Frequency: 20 GHz	Anritsu Model MF2412B
Programmable Attenuator	Frequency: DC to 2 GHz Attenuation: 100 dB (1 dB and 10 dB steps)	Anritsu Model MN63A
Fixed Attenuator	Frequency Range: DC to 18 GHz Attenuation: 10 dB	Aeroflex/Weinschel Model 44-10 (Qty 2)
Fixed Attenuator	Frequency Range: DC to 18 GHz Attenuation: 6 dB	Aeroflex/Weinschel Model 44-6 (Qty 2)
Power Splitter	Frequency: DC to 18 GHz	Aeroflex/Weinschel Model 1870A
RF Power Amplifier	Frequency: 100 to 1000 MHz Gain: 35 dB min	Mini Circuits Model TIA-1000-1R8 (Qty 2) BNC(m) to N(f) Adapters required
Adapter	Frequency: DC to 20 GHz N(m) to N(m), 50 ohm	Maury Microwave Model 8828B (Qty 2) One each required only if Anritsu Coupler and Circulator are used
Adapter	Frequency: DC to 20 GHz K(m) to N(f), 50 ohm	Anritsu Model 34RKNF50
Adapter	Frequency: 881.5 MHz BNC(m) to N(f), 50 ohm	ADT-2615-NF-BNM-02 (Qty 2)
Adapter	Frequency: 881.5 MHz SMA(m) to N(f), 50 ohm	Midwest Microwave Model ADT-2582-NF-SMM-02 (Qty 4) Required only if Anritsu Coupler and Circulator are used.
Adapter	Frequency: 881.5 MHz SMA(m) to SMA(m), 50 ohm	Midwest Microwave Model ADT-2594-MM-SMA-02 Required only if Anritsu Coupler and Circulator are used.
50 Ohm Termination	Frequency: DC to 18 GHz	Anritsu Model 28N50-2
High Power Load	DC to 18 GHz, 10W	Aeroflex/Weinschel Model M1418

Table 1-4. Test Equipment Required for Verifying Options (2 of 2)

Instrument	Critical Specification	Recommended Manufacturer/Model
Coupler	Frequency: 881.5 MHz Coupling Factor: 30 dB	Midwest Microwave Model CPW-5140-30-NNN-05 or CPW-5141-30-NNN-05 Alternative: Anritsu pn: 1091-307 Two SMA(m) to N(f) adapters required.
Circulator	Frequency Range: 800 to 1000 MHz Isolation: 20 dB min	Meca Electronics, Inc. pn: CN-0.900 Alternative: Anritsu pn: 1000-50 Two SMA(m) to N(f) adapters and one SMA(m) to SMA(m) adapter required.
RF Coaxial Cable	Frequency: DC to 6 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-1.5C (Qty 3)
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-0.6B
GPS Antenna		Anritsu 2000-1528-R
Coaxial Cable	BNC(m) to BNC(m), 50 ohm	Anritsu Model 2000-1627-R (Qty 2)
Adapter	SMA to BNC(f)	Pomona 4290 or equivalent
Adapter	GPS Terminator	Amphenol B1004A1-ND3G-93R-0.05-1W or equivalent

1-4 Replaceable Parts

Table 1-5. List of Replaceable Parts

Part Number	Description
ND75900	MT8220T Main PCB Assembly ^b
ND75905	MT8220T Spectrum Analyzer/Vector Signal Generator PCB Assembly, for units with out Option 23 ^b
ND75906	MT8220T Spectrum Analyzer/Vector Signal Generator PCB Assembly, for units with Option 23 ^b
ND75314	GPS Module
3-15-165	LCD Display with LED Backlight
ND80480	Touch Screen with Gasket and Protection (replaced ND73867)
2000-1685-R	Soft Carrying Case
3-790-661	Gasket material for Case edge
3-71650-4	Top Case Only (excludes model ID Label, LCD, Touch screen, rotary switch, speaker and keypad items)
3-61365-4	Bottom Case Only (excludes all tilt bail components)
3-65314	Plastic Left & Right Tilt Bail Holders (set)
3-65316	Tilt Bail Stand (Metal)
3-65684	Tilt Bail Clip
2000-1520-R	USB Memory Drive
3-61379-4	Battery Door
3-75835	Model MT8220T ID Label
513-64	Type N RF connector (SMA plug to N Jack) 4-hole flange (RF out)
3-67146	SMA to N 2-hole flange (RF In)
3-513-80	RF Adapter SMP Jack(F)-Jack(F) [for mating VSG to SPA]
ND70948	Fan Assembly
40-187-R	AC to DC Power Converter
633-75	Li-ion Battery Pack 7.5 Ah
3-74999-3	Main Keypad PCB
3-71641	Main Keypad (Rubber Membrane)
ND75321	Speaker Assy with Gaskets
3-410-103	Rotary Encoder (excludes knob)
3-61360-2	Encoder Knob (excludes encoder)
3-61470	Handle Hand Strap
3-61571	Plastic Ring Holder (for Hand Strap)
ND81761	CPRI Assembly, Option 750
ND82072	CPRI Assembly, Option 751
ND70324	Mezzanine Board
3-803-136	CPRI to Mezzanine Cable
ND81876	Tilt Bail, Plastic Assembly
ND81877	Wide Case Bottom with gasket only (excludes all tilt bail components)
3-67151-4	Wide Battery Door, Black

b. When ordering the Main or Spectrum Analyzer/VSG 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** (Shift-8) / Status display.

1-5 Connector Care

Visually inspect connectors for general wear, for cleanliness, and for damage such as bent pins or connector rings. Repair or replace damaged connectors immediately. Dirty connectors can limit the accuracy of your measurements. Damaged connectors can damage the instrument. Connection of cables carrying an electrostatic potential, excess power, or excess voltage can damage the connector or the instrument or both. Connection of cables with inadequate torque settings can affect measurement accuracy. Over torquing connectors can damage the cable, the connector, the instrument, or all of these items.

Connecting Procedure

1. Carefully align the connectors.

The male connector center pin must slip concentrically into the contact fingers of the female connector.

2. Push connectors straight together. Do not twist or screw them together.
3. To tighten, turn the connector nut, not the connector body. Major damage can occur to the center conductor and to the outer conductor if the connector body is twisted.
4. If you use a torque wrench, then initially tighten by hand so that approximately 1/8 turn or 45 degrees of rotation remains for the final tightening with the torque wrench.

Relieve any side pressure on the connection (such as from long or heavy cables) in order to assure consistent torque. Use an open-end wrench to keep the connector body from turning while tightening with the torque wrench.

Do not over torque the connector.

Disconnecting Procedure

1. If a wrench is needed, then use an open-end wrench to keep the connector body from turning while loosening with a second wrench.
2. Complete the disconnection by hand, turning only the connector nut.
3. Pull the connectors straight apart without twisting or bending.

Connector Types

The following torque specifications may apply to the connectors on your instrument. To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the Type-N connector. Do not overtighten the connector.

Type-N

The recommended torque is 12 lbf•in to 15 lbf•in (1.36 N•m to 1.70 N•m).

Type-K

The recommended torque is 8 lbf•in (0.9 N•m or 90 N•cm).

Type SMA

The recommended torque is 8 lbf•in (0.9 N•m or 90 N•cm).

Chapter 2 — Spectrum Analyzer Verification

2-1 Introduction

This chapter describes the verification process for the spectrum analyzer options in the MT8220T BTS Master. Verification tests that are associated with other instrument options are described in [Chapter 6](#).

The following tests are in this chapter:

- “Frequency Accuracy Verification” on page 2-1
- “Single Side Band (SSB) Phase Noise Verification” on page 2-5
- “Spurious Response (Second Harmonic Distortion) Verification” on page 2-7
- “Input Related Spurious (IRS) Signals Verification” on page 2-9
- “Resolution Bandwidth Accuracy Verification” on page 2-12
- “Spectrum Analyzer Absolute Amplitude Accuracy Verification” on page 2-13
- “Residual Spurious Response Verification” on page 2-23
- “Displayed Average Noise Level (DANL)” on page 2-25

2-2 Frequency Accuracy Verification

The following test is used to verify the CW frequency accuracy of the Spectrum Analyzer in the MT8220T BTS Master.

Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Procedure

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

Note Do not connect the external 10 MHz Reference to the BTS Master.

2. Turn on the 10 MHz Reference Standard and the Anritsu MG3692X Signal Generator.
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 BTS Master.
5. Turn on the BTS Master.

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

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** soft key to reset the instrument to the default starting conditions.
8. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.
9. Press the **Amplitude** soft key and then press the **Reference Level** soft key.
10. Use the keypad to enter -10 and select the **dBm** soft key.
11. Press the **Span** soft key, use the keypad to enter 10, and then select the **kHz** soft key.
12. Press the **BW** soft key and select the **RBW** soft key.
13. Use the keypad to enter 100 and select the **Hz** soft key.
14. Press the **VBW** soft key, use the keypad to enter 30, and then select the **Hz** soft key.
15. Press the **Freq** soft key and select the **Center Freq** soft key.
16. Use the keypad to enter 1 and select the **GHZ** soft key.
17. Press the **Marker** soft key, select the **More** soft key, turn Counter Marker On, press the **Back** soft key, and select the **Peak Search** soft key.
18. Verify that the marker frequency is within specification and record in [Table A-1, "Spectrum Analyzer Frequency Accuracy"](#).
19. Set the MG3692X frequency to 7 GHz.
20. Set the MT8220T center freq to 7 GHz.
21. Press the **Marker** soft key, select the **More** soft key, turn Counter Marker On, press the **Back** soft key, and select the **Peak Search** soft key.
22. Verify that the marker frequency is within specification and record in [Table A-1](#).
23. If either measurement fails or if the measurement is > 20 % of expected value, then perform the procedure in [Section 2-3 "Internal Reference Frequency Adjustment"](#) on page 2-3.

2-3 Internal Reference Frequency Adjustment

Use this procedure to adjust the frequency if the unit fails the Spectrum Analyzer Frequency Accuracy verification test or if the measurement is > 20 % of expected value measured in [Section 2-2 “Frequency Accuracy Verification”](#) on page 2-1.

Note This procedure requires MT8220T firmware greater than v1.06.

Equipment Required

- Anritsu MG3692x Synthesized Signal Source with options 2A, 3, 4, 22 and 15A
- Frequency Reference Symmetricom Rubisource T&M
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Procedure

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

Note Do not connect the external 10 MHz Reference to the BTS Master.

2. Connect the output of the MG3692x Synthesized Signal Source to the **RF In** connector of the BTS Master.
3. Connect the external power supply (Anritsu part number 40-168-R) to the BTS Master.
4. Press the **ON/OFF** key to turn on the BTS Master.
5. Press the **Shift** key, the **Preset** (1) key, and then press **Preset** to reset the instrument to the default starting conditions.
6. Turn on the 10 MHz reference source and the Anritsu MG3692x Synthesized Signal Source.
7. On the MG3692x Synthesized Signal Source press the **System** key, then press the key below **Reset** to reset the instrument to the default starting conditions.
8. Set the MG3692x output to 7 GHz with an RF output level of –30 dBm.

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

9. Press the **Shift** key, then the **Sweep** (3) key, and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to *Performance Sweep* mode.
10. Press the **Amplitude**, then press **Reference Level** and use the keypad to enter **–10**, and then press **dBm**.
11. Press **Atten Lvl**, then use the keypad to enter **0**, and then press **dB**.
12. Press **Freq**, then press **Center Freq** and use the keypad to enter **7**, and then press **GHz**.
13. Press **Span**, then use the keypad to enter **10**, and then press **kHz**.
14. Press **BW**, then touch **RBW** and use the keypad to enter **100**, and press **Hz**.
15. Press **VBW**, then use the keypad to enter **30**, and then press **Hz**.
16. Press and hold the **Shift** key and then press the **9**, **5**, and **3** keys at the same time to enter the BTS Master System Service Mode.

Note If the above procedure does not work, verify that the MT8220T's firmware is greater than V1.06.

17. Press **Frequency Calibration** and then press 10 MHz Ref.
18. Use the **Up** and **Down** arrow keys or the rotary knob to slowly adjust the displayed signal to the center of the display. Allow the signal to stabilize between adjustments. Repeat this step as necessary.

Note For large changes, enter the value using the number pad, then press Decimal.
--

19. Power cycle the BTS Master to exit System Service Mode.

Note If the unit fails the Spectrum Analyzer Frequency Accuracy adjustment, replace the SPA PCB assembly.
--

2-4 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 MT8220T BTS Master.

Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable

Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Signal Generator.
2. Turn on the 10 MHz reference source and the Anritsu MG3692X Signal Generator.
3. Set the MG3692X output to 7.09 GHz CW, with an RF output level of +13 dBm.
4. Connect the output of the MG3692X Signal Generator to the RF In connector of the BTS Master.
5. Turn on the BTS 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** soft key to reset to the default starting conditions.
8. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.
9. Press the **Amplitude** soft key, then press the **Reference Level** soft key.
10. Use the keypad to enter 0 and select the **dBm** soft key.
11. Press the **Atten Lvl** soft key, use the keypad to enter 15 and press the **dB** soft key.
12. Press the **Freq** soft key and select the **Center Freq** soft key.
13. Use the keypad to enter 7.090050 and press the **GHz** soft key.
14. Press the **Span** soft key, use the keypad to enter 110, and select the **kHz** soft key.
15. Press the **BW** soft key and select the **RBW** soft key.
16. Use the keypad to enter 1 and select the **kHz** soft key.
17. Press the **VBW** soft key and use the keypad to enter 3, then select the **Hz** soft key.
18. Press the **Shift** key and then press the **Trace** (5) key, then select the **Trace A Operations** soft key.
19. Press the **# of Average** soft key, use the keypad to enter 3, then press the **Enter** key.
20. Wait until the Trace Count displays “3/3”.
21. Press the **Marker** key and select the **Peak Search** soft key.
22. Press the **Delta On/Off** soft key to turn Delta On.
23. Use the keypad to enter 10 and press the **kHz** soft key.
24. Enter the measured value into [Table A-2, “Spectrum Analyzer SSB Phase Noise Verification”](#).
25. Subtract 30 dB from the average value and verify that the result is less than -100 dBc/Hz (for 10, 20 and 30 kHz Offset) or -102 dBc/Hz (for 100 kHz offset) and record the Calculated Value results in the test records. Use [Table A-2](#).

For example: -70 dBm measured $- 30$ dB = -100 dBc/Hz

26. Press the Delta On/Off soft key to turn Delta Off.
27. Repeat Step 18 through Step 26 for 20 kHz, 30 kHz and 100 kHz Delta values. Enter the test results and calculations in the appropriate rows of [Table A-2](#).

2-5 Spurious Response (Second Harmonic Distortion) Verification

The following test is used to verify the input related spurious response of the spectrum analyzer in the MT8220T BTS Master.

Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 Ohm Adapter or equivalent
- Anritsu 15NN50-1.5B RF Coaxial Cable
- 50 MHz Low Pass Filter (Anritsu part number 1030-96)
- BNC male to BNC male Coaxial Cable

Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Signal Generator.
2. Turn on the 10 MHz reference source and the Anritsu MG3692X Signal Generator.
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 BTS Master RF In with the coaxial cable.
5. Turn on the BTS 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** soft key to reset to the default starting conditions.
8. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.
9. Press the **Amplitude** soft key and then press the **Reference Level** soft key.
10. Use the keypad to enter -27 and press the **dBm** soft key.
11. Press the **Atten Lvl** soft key and enter 0, then press the **dB** soft key.
12. Press the **Detection** soft key, and then the **Peak** soft key.
13. Press the **Freq** soft key and select the **Center Freq** soft key.
14. Use the keypad to enter 50.1 and press the **MHz** soft key.
15. Press the **Span** soft key, use the keypad to enter 100, and select the **kHz** soft key.
16. Press the **BW** soft key and select the **RBW** soft key.
17. Use the keypad to enter 1 and select the **kHz** soft key.
18. Press the **VBW** soft key. Use the keypad to enter 10 and then select the **Hz** soft key.
19. Press the **Shift** key and then press the **Trace** (5) key, then select the **Trace A Operations** soft key.
20. Press the **# of Average** soft key, use the keypad to enter 3 and then press the **Enter** key.
21. Wait until the Trace Count displays "3/3".
22. Press the **Marker** key and select the **Peak Search** soft key.
23. Record the amplitude for 50.1 MHz. Use [Table A-3, "Spectrum Analyzer Spurious Response \(Second Harmonic Distortion\)"](#).
24. Press the **Freq** soft key and select the **Center Freq** soft key.

25. Use the keypad to enter 100.2 and press the MHz soft key.
26. Press the **Shift** key and then press the **Trace** (5) key, then select the Trace A Operations soft key.
27. Press the **# of Average** soft key, use the keypad to enter 3 and then press the **Enter** key.
28. Wait until the Trace Count displays “3/3”.
29. Press the **Marker** key and select the **Peak Search** soft key.
30. Record the amplitude for 100.2 MHz in the test records. Use [Table A-3](#).
31. Calculate the 2nd Harmonic level in dBc by subtracting the 50.1 MHz amplitude from the 100.2 MHz amplitude using this formula:
Second Harmonic Level Amplitude @ 100.2 MHz = 100.2 MHz amplitude – 50.1 MHz amplitude = _____ dBc
32. Verify that the calculated Second Harmonic Level is ≤ -50 dBc and record in the test records. Use [Table A-3](#).

2-6 Input Related Spurious (IRS) Signals Verification

The following test is used to verify the input related spurious signals of the spectrum analyzer in the MT8220T at different frequencies.

Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 Ohm Adapter or equivalent
- Anritsu 15NN50-1.5B RF Coaxial Cable or equivalent
- BNC male to BNC male Coaxial Cable

Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Signal Generator.
2. Connect the output of the Anritsu MG3692X Signal Generator to the MT8220T RF In.
3. Set the MG3692X RF Output Level to -30 dBm.
4. Turn on the MT8220T.
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** soft key to reset to the default starting conditions.
7. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.

1672 MHz Input Related Spurious Check

8. Set the MG3692X frequency to 1672 MHz CW.
9. On the MT8220T, press the **Amplitude** key and then press the **Reference Level** soft key.
10. Use the keypad to enter -27 and press the **dBm** soft key.
11. Press the **Atten Lvl** soft key and enter 0, then press the **dB** soft key.
12. Press **Detection** soft key and then the **Peak** soft key.
13. Press the **Freq** soft key and select the **Center Freq** soft key.
14. Use the keypad to enter 1672 and select the **MHz** soft key.
15. Press the **Span** soft key, use the keypad to enter 2, and select the **MHz** soft key.
16. Press the **BW** soft key and select the **RBW** soft key.
17. Use the keypad to enter 10 and select the **kHz** soft key.
18. Press the **VBW** soft key. Use the keypad to enter 1 and then select the **kHz** soft key.
19. Wait until one sweep is completed.
20. Press the **Marker** soft key and select the **Peak Search** soft key.
21. Record the Marker 1 amplitude reading for 1672 MHz. Use the **1672 MHz** row of [Table A-4, "Spectrum Analyzer Input Related Spurious \(IRS\) Signals"](#).

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

22. Press the **Freq** soft key and select the **Start Freq** soft key.

23. Use the keypad to enter 150 and select the kHz soft key.
24. Press Stop Freq soft key, enter 1671 and press the MHz soft key. Wait until one sweep is completed.
25. Press the Marker soft key and select the Peak Search soft key.
26. Record the Marker 1 amplitude reading to the test record. Use the **150 kHz to 1671 MHz** row of [Table A-4](#).
27. Calculate the input related spurious level and verify that it is ≤ -40 dBc using the following formula and record it in the test records. Use the **1672 MHz** row of [Table A-4](#).
$$\text{Input Related Spurious} = \text{Marker 1 Reading} - \text{Amplitude Reading for 1672 MHz}$$
28. Repeat Step 22 through Step 27 setting a start frequency of 1673 MHz and a stop frequency of 2800 MHz and record the results in the **1673 MHz to 2800 MHz Measured Value** row of [Table A-4](#).

1675 MHz Input Related Spurious Check

29. Set the MG3692X frequency to 1675 MHz CW.
30. On the MT8220T, press the Freq soft key and select the Center Freq soft key.
31. Use the keypad to enter 1675 and select the MHz soft key.
32. Press the Span soft key, use the keypad to enter 2, and select the MHz soft key.
33. Press the **Trace** (5) key, then select the Trace A Operations soft key.
34. Press the **# of Average** soft key, use the keypad to enter 5 and then press the **Enter** key.
35. Wait until the Trace Count displays "5/5".
36. Press the Marker soft key and select the Peak Search soft key.
37. Record the amplitude at 1675 MHz to the test records. Use the **1675 MHz** row of [Table A-4](#).
38. Press the Freq soft key and select the Start Freq soft key.
39. Use the keypad to enter 2 and select the MHz soft key.
40. Press Stop Freq soft key, enter 4 and press the MHz soft key.
41. Press the **Shift** key and then press the **Trace** (5) key, then select the Trace A Operations soft key.
42. Press the **# of Average** soft key, use the keypad to enter 5 and then press the **Enter** key.
43. Wait until the Trace Count displays "5/5".
44. Press the **Marker** key and select the Peak Search soft key.
45. Record the Marker 1 amplitude reading to the test records. Use the **1675 MHz** row of [Table A-4](#).
46. Calculate the input related spurious level using the formula below, verify that it is ≤ -60 dBc, and record it in the test records. Use the **1675 MHz** row of [Table A-4](#).

$$\text{Input Related Spurious} = \text{Marker 1 reading} - \text{Amplitude reading for 1675 MHz}$$

3608 MHz Input Related Spurious Check

47. Set the MG3692X frequency to 3608 MHz CW.
48. On the MT8220T, press the Freq soft key and select the Center Freq soft key.
49. Use the keypad to enter 3608 and select the MHz soft key.
50. Press the Span soft key, use the keypad to enter 2, and select the MHz soft key.
51. Press the **Shift** key and then press the **Trace** (5) key, then select the Trace A Operations soft key.
52. Press the **# of Average** soft key, use the keypad to enter 5 and then press the **Enter** key.
53. Wait until the Trace Count displays "5/5".
54. Press the Marker soft key and select the Peak Search soft key.

55. Record the amplitude at 3608 MHz in the test records. Use the **3608 MHz** row of [Table A-4](#).
56. Press the Freq soft key and select the Start Freq soft key.
57. Use the keypad to enter **5489** and select the MHz soft key.
58. Press Stop Freq soft key, enter **5491** and press the MHz soft key.
59. Press the **Shift** key and then press the **Trace (5)** key, then select the Trace A Operations soft key.
60. Press the # of Average soft key, use the keypad to enter **5** and then press the **Enter** key.
61. Wait until the Trace Count displays “5/5”.
62. Press the Marker soft key and select the Peak Search soft key.
63. Record the Marker 1 amplitude reading in the test records. Use the **3608 MHz** row of [Table A-4](#).
64. Calculate the input related spurious level using the formula below, record the results in the test records and verify that it is ≤ -60 dBc. Use the **3608 MHz** row of [Table A-4](#).
Input Related Spurious = Marker 1 Reading – Amplitude Reading for 3608 MHz

5208 MHz Input Related Spurious Check

65. Set the MG3692X frequency to 5208 MHz CW.
66. On the MT8220T, press the Freq soft key and select the Center Freq soft key.
67. Use the keypad to enter **5208** and select the MHz soft key.
68. Press the Span soft key, use the keypad to enter **2**, and select the MHz soft key.
69. Press the **Shift** key and then press the **Trace (5)** key, then select the Trace A Operations soft key.
70. Press the # of Average soft key, use the keypad to enter **5** and then press the **Enter** key.
71. Wait until the Trace Count displays “5/5”.
72. Press the Marker soft key and select the Peak Search soft key.
73. Record the amplitude at 5208 MHz in the test records. Use the **5208 MHz** row of [Table A-4](#).
74. Press the Freq soft key and select the Start Freq soft key.
75. Use the keypad to enter **7089** and select the MHz soft key.
76. Press Stop Freq soft key, enter **7091** and press the MHz soft key.
77. Press the **Shift** key and then press the **Trace (5)** key, then select the Trace A Operations soft key.
78. Press the # of Average soft key, use the keypad to enter **5** and then press the **Enter** key.
79. Wait until the Trace Count displays “5/5”.
80. Press the Marker soft key and select the Peak Search soft key.
81. Record the Marker 1 amplitude reading in the test records. Use the **5208 MHz** row of [Table A-4](#).
82. Calculate the input related spurious level using the formula below, record the results in the test records and verify that it is ≤ -60 dBc. Use the **5208 MHz** row of [Table A-4](#).
Input Related Spurious = Marker 1 Reading – Amplitude Reading for 3608 MHz

2-7 Resolution Bandwidth Accuracy Verification

The following test is used to verify the resolution bandwidth accuracy of the spectrum analyzer in the MT8220T BTS Master.

Equipment Required

- Anritsu MG3692X Signal Generator
- 10 MHz Reference Standard
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Procedure

1. Connect the 10 MHz reference source to the Anritsu MG3692X Signal Generator and the MT8220T BTS 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 Signal Generator to the MT8220T Spectrum Analyzer RF In.
4. Turn on the MT8220T BTS 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** soft key to reset to the default starting conditions.
7. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.
8. Press the **Amplitude** soft key and then press the **Reference Level** soft key.
9. Use the keypad to enter -10 and press the **dBm** soft key.
10. Press the **Atten Lvl** soft key and enter 0, then press the **dB** soft key.
11. Press the **Scale** soft key and enter 10, then press **dB/div** soft key.
12. Press the **Freq** soft key and select the **Center Freq** soft key.
13. Use the keypad to enter 1 and select the **GHz** soft key.

RBW Test

14. Press the **Span** soft 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"](#).
15. Press the **BW** soft key and select the **RBW** soft key.
16. Use the keypad to enter 3 and select the **MHz** soft 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 and then press the **Power and Bandwidth** soft key, then press the **OCC BW** soft key.
19. Press the **dBc** soft key and enter 3, then press the **Enter** key.
20. Press the **OCC BW On/Off** soft 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 and record in [Table A-5](#).

2-8 Spectrum Analyzer Absolute Amplitude Accuracy Verification

The tests in the following two sections verify the absolute amplitude accuracy of the Spectrum Analyzer in the MT8220T BTS Master. The two parts of this test are “50 MHz Amplitude Accuracy Verification” immediately below and “Amplitude Accuracy Across Frequency Verification” on page 2-16.

50 MHz Amplitude Accuracy Verification

Equipment Required

- Anritsu MG3692X Signal Generator
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D or SC7400-1 High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 Ohm Adapter
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator

Setup

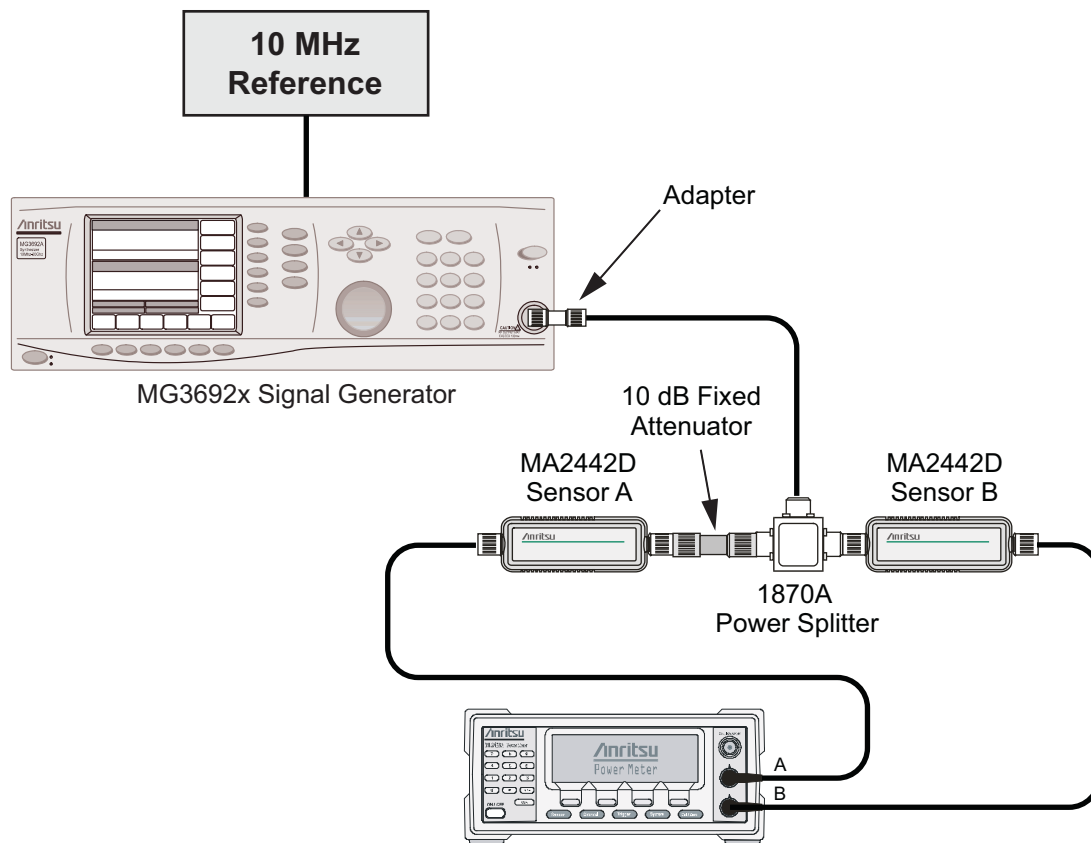


Figure 2-1. Absolute Amplitude Accuracy Verification Pretest Setup

Test Setup Components Characterization

1. Turn on the ML2438A Power Meter, the MG3692X Signal Generator, and the MT8220T BTS 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 cal 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 @ 50 MHz** column of [Table A-6, “Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy Setup Table”](#).
7. Record the Sensor B reading in the **Required Sensor B Reading** column of [Table A-6](#).
8. Repeat Step 7 and Step 8 for the other input levels from -4 dBm to -50 dBm.

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

Measuring the Unit for 50 MHz Amplitude Accuracy

1. Remove Sensor A, add the adapter and connect it to the Spectrum Analyzer RF In connector of the MT8220T BTS Master as shown in [Figure 2-2](#).

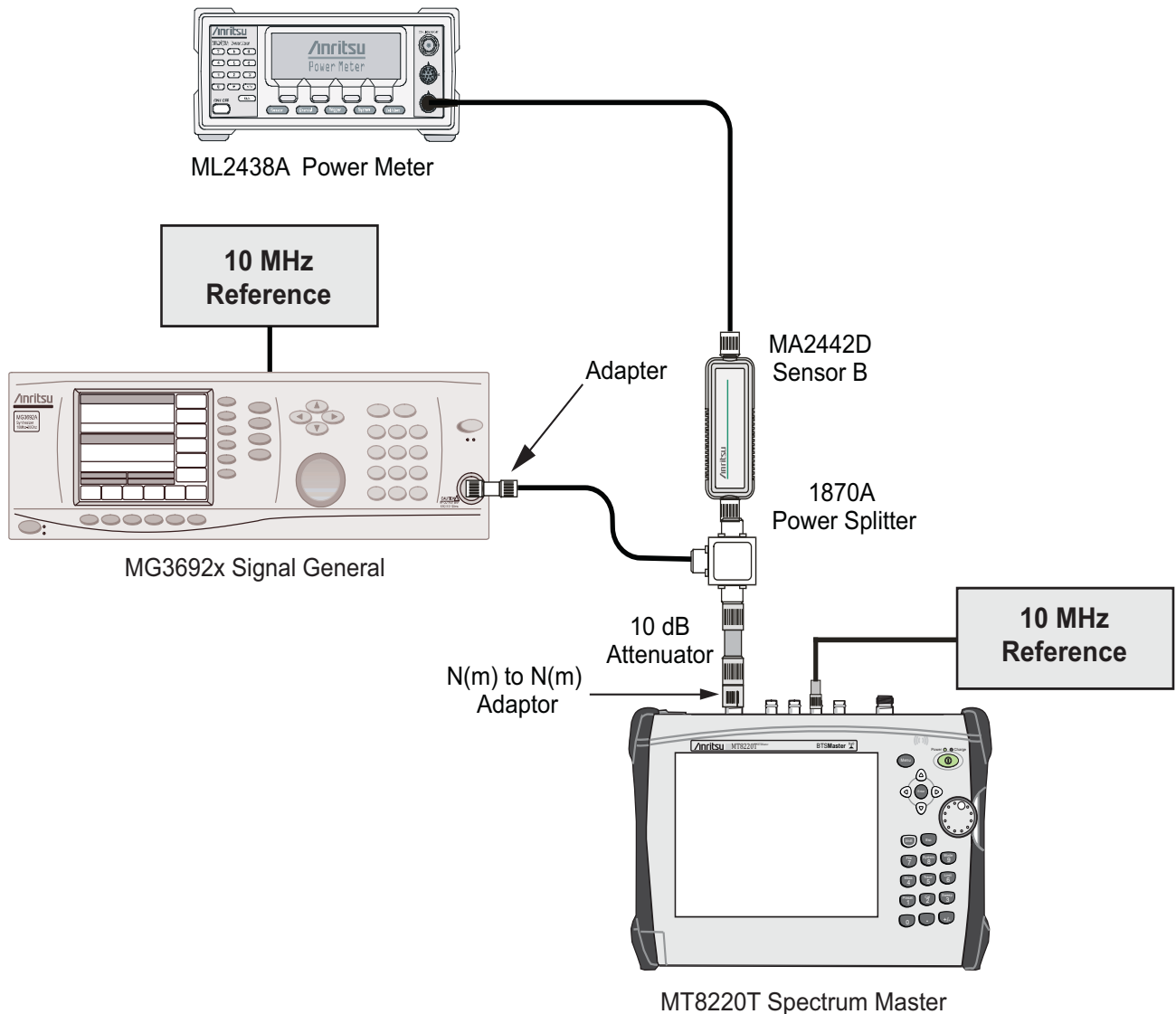


Figure 2-2. Absolute Amplitude Accuracy Verification Test Setup

2. On the MT8220T, 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 soft key to reset to the default starting conditions.
4. Press the **Shift** key and then the **Sweep** (3) key, and then press the Sweep Mode soft key. Select the Performance soft key to set the instrument to Performance Sweep mode.
5. Press the Freq soft key and select the Center Freq soft key.
6. Use the keypad to enter 50 and select the MHz soft key.
7. Press the BW soft key and the RBW soft key.
8. Use the keypad to enter 1 and select the kHz soft key.

9. Press the VBW soft key and use the keypad to enter 10, then select the Hz soft key.
10. Press the Span soft key, use the keypad to enter 10, and select the kHz soft key.
11. Press the Amplitude soft key and then press the Reference Level soft key.
12. Use the keypad to enter 10 and press the dBm soft key.
13. Press the Atten Lvl soft key and enter 30, then press the dB soft 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 soft key and select the Peak Search soft key.
16. Record the Marker 1 amplitude reading in the **0 dBm** row of [Table A-7](#), “[Spectrum Analyzer 50 MHz Absolute Amplitude Accuracy](#)”.
17. Verify that the Marker 1 amplitude reading is within the specification.
18. Repeat Step 13 through Step 16 for the other power level settings. Refer to [Table A-6](#) for Required Sensor B Readings. Use [Table A-7](#) to record test results.

Amplitude Accuracy Across Frequency Verification

This procedure is the second test used to verify the absolute amplitude accuracy of the Spectrum Analyzer in the MT8220T BTS Master. The first procedure test was described above in “[50 MHz Amplitude Accuracy Verification](#)” on page 2-13.

Equipment Required

- Anritsu MG3692X Signal Generator
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D or SC7400-1 High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 Ohm Adapter
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator

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](#).

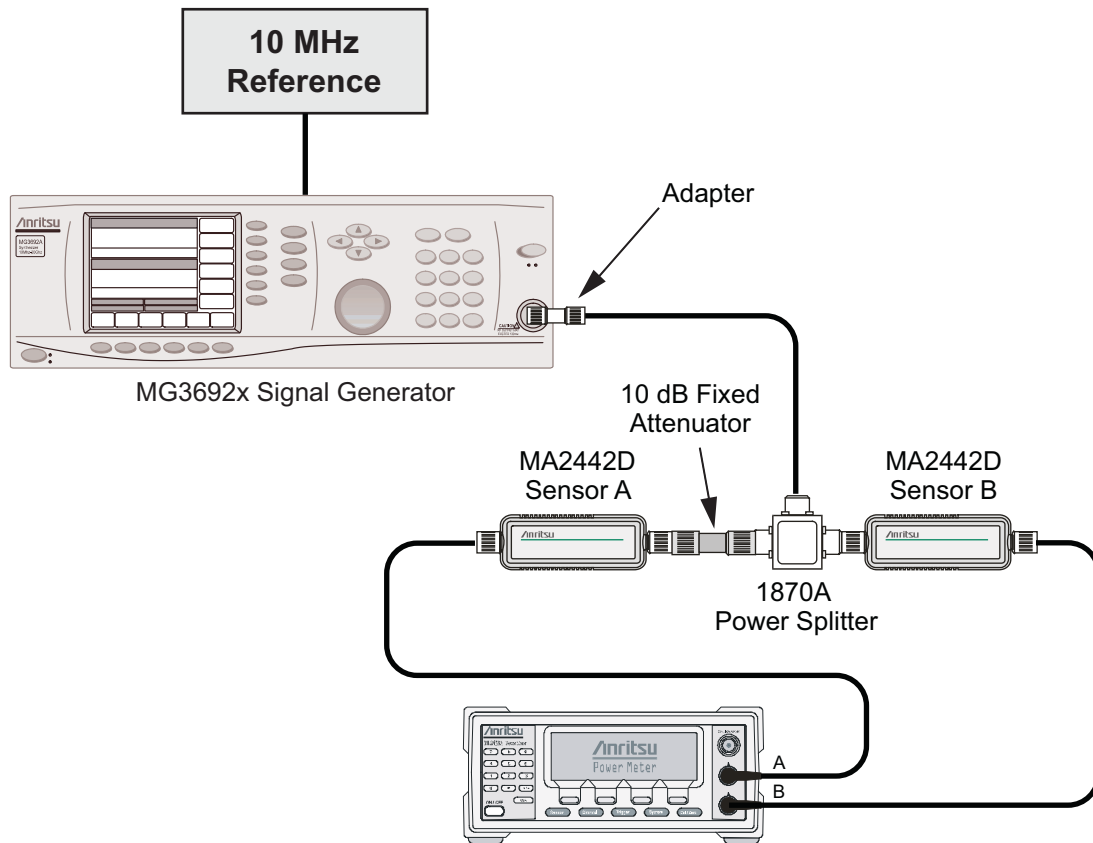


Figure 2-3. Fixed Level with Varying Frequency Setup

3. Set the MG3692x frequency to 150 kHz.
4. Set the power meter to display both Channel A and 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 cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the MG3692x output level so that Sensor A reading is $-2 \text{ dBm} \pm 0.1 \text{ dB}$.
6. Record the Sensor B reading to the -2 dBm column of [Table A-8](#), “[Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency Setup Table](#)”.
7. Adjust the MG3692x output level so that Sensor A reading is $-30 \text{ dBm} \pm 0.1 \text{ dB}$.
8. Record the Sensor B reading to the -30 dBm column of [Table A-8](#).
9. Repeat Steps 3 through 8 for all the frequencies listed in [Table A-8](#).

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

Setup

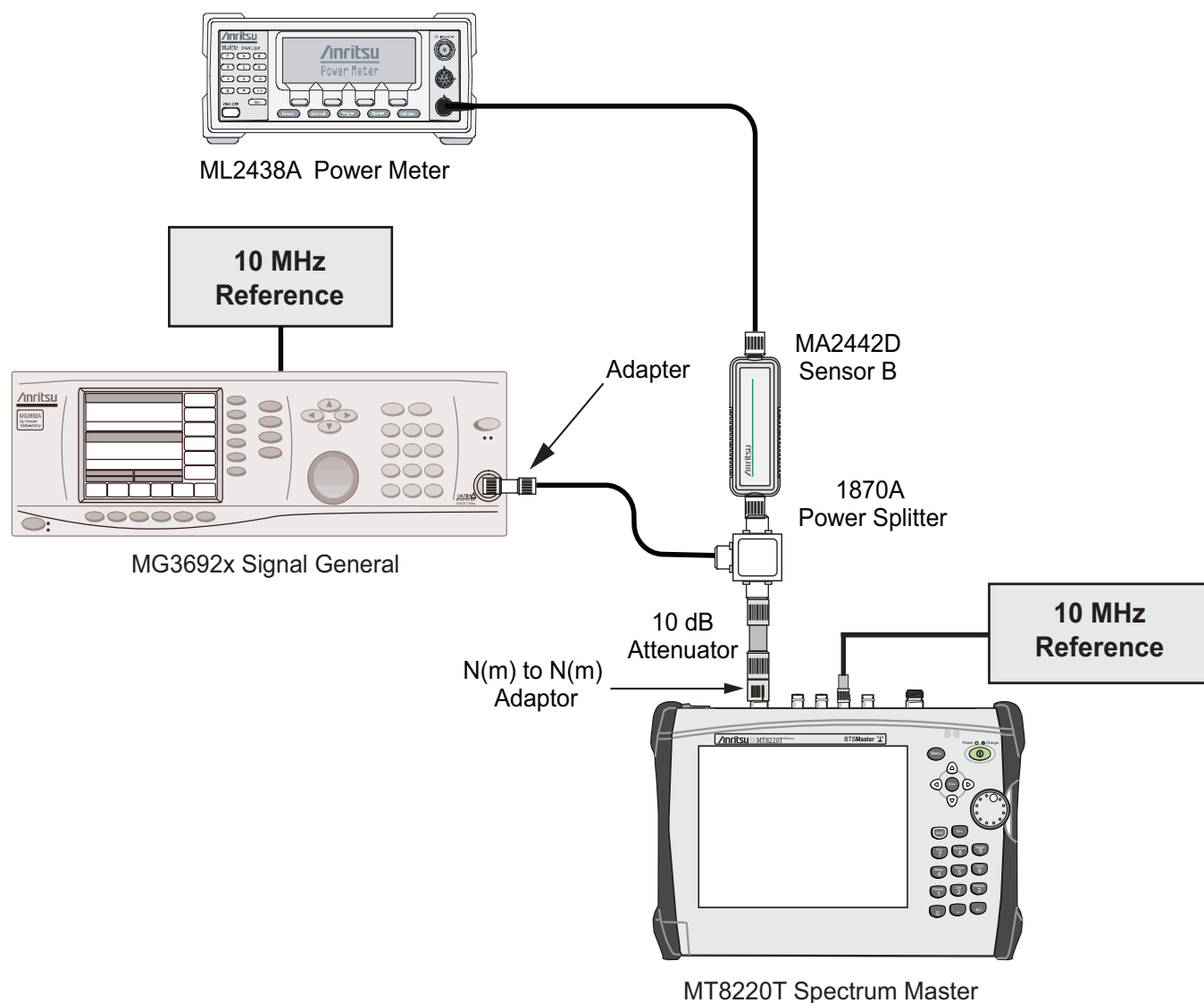


Figure 2-4. Absolute Amplitude Accuracy Across Frequency Verification Test Setup

Measuring Amplitude Accuracy Across Frequency

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

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

2. Set the MT8220T to Spectrum Analyzer mode and then preset the unit.
3. Press the **Shift** key and then the **Sweep** (3) key. and then press the Sweep Mode soft key. Select the Performance soft key to set the instrument to Performance Sweep mode.
4. Press the **BW** soft key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
5. Press the **Span** soft key, set span to 10 kHz.
6. Set the MG3692x frequency to 10.1 MHz CW.
7. Set the MG3692x Output to -20 dBm.

8. Set the power meter to display Channel B. Press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
9. Adjust the MG3692x output power so that the power meter displays a reading which matches the Sensor B reading for -30 dBm in [Table A-8](#).
10. On the MT8220T, press the **Amplitude** soft key, then set the Reference Level to -20 dBm.
11. Press the **Freq** soft key and select the **Center Freq** soft key.
12. Enter 10.1 MHz (or the next frequency).
13. Press the **Amplitude** soft key, then set the **Atten Lvl** to 0 dB.
14. Press the **Marker** key and select the **Peak Search** soft key.
15. Record the Marker 1 amplitude reading in [Table A-9](#), “[Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency \(1 Of 3\)](#)”.
16. Verify that the Marker 1 amplitude reading is within the specification.
17. Repeat Step 12 to Step 15 for **Atten Lvl** of 5 dB, 10 dB and 20 dB.
18. Adjust the MG3692x output power so that the power meter displays a reading which matches the Sensor B reading on the characterization chart for -2 dBm.
19. On the MT8220T, press the **Amplitude** soft key, then set the Reference Level to 10 dBm.
20. Repeat Steps 12 to Step 15 for **Atten Lvl** of 30 dB, 40 dB, 50 dB and 60 dB.
21. Repeat Steps 5 to Step 19 for all the frequencies in the test records in [Table A-9](#).

Pre-Amp Accuracy Across Frequency Verification

This procedure is the third test used to verify the absolute amplitude accuracy of the Spectrum Analyzer in the MT8220T BTS Master.

Equipment Required

- Anritsu MG3692X Signal Generator
- Anritsu ML2438A Dual Channel Power Meter
- Anritsu MA2442D or SC7400-1 High Accuracy Power Sensors (2)
- Anritsu 34NN50A 50 Ohm Adapter
- Anritsu 34RKNF50 50 Ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Aeroflex/Weinschel 44-20 20 dB Fixed Attenuator

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 2-5](#).

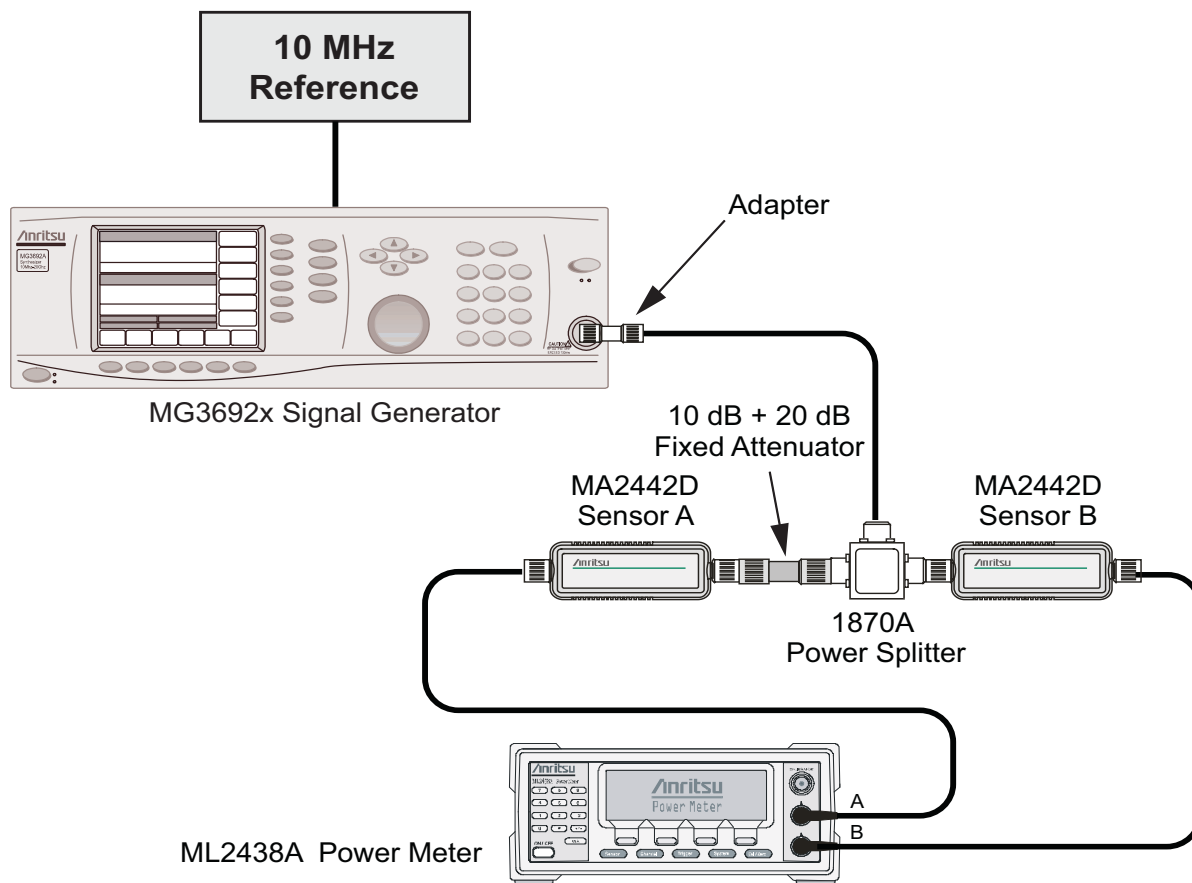


Figure 2-5. Pre-Amp Fixed Level with Varying Frequency Setup

3. Set the MG3692x frequency to 150 kHz.
4. Set the power meter to display both Channel A and 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 cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the MG3692x output level so that Sensor A reading is $-80 \text{ dBm} \pm 0.1 \text{ dB}$.
6. Record the Sensor B reading to the -50 dBm column of [Table A-12](#), "Spectrum Analyzer Pre-Amp Accuracy Across Frequency Setup Table".
7. Adjust the MG3692x output level so that Sensor A reading is $-90 \text{ dBm} \pm 0.1 \text{ dB}$.
8. Record the Sensor B reading to the -60 dBm column of [Table A-12](#).
9. Repeat Steps 3 through 8 for all the frequencies listed in [Table A-12](#).

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

Setup

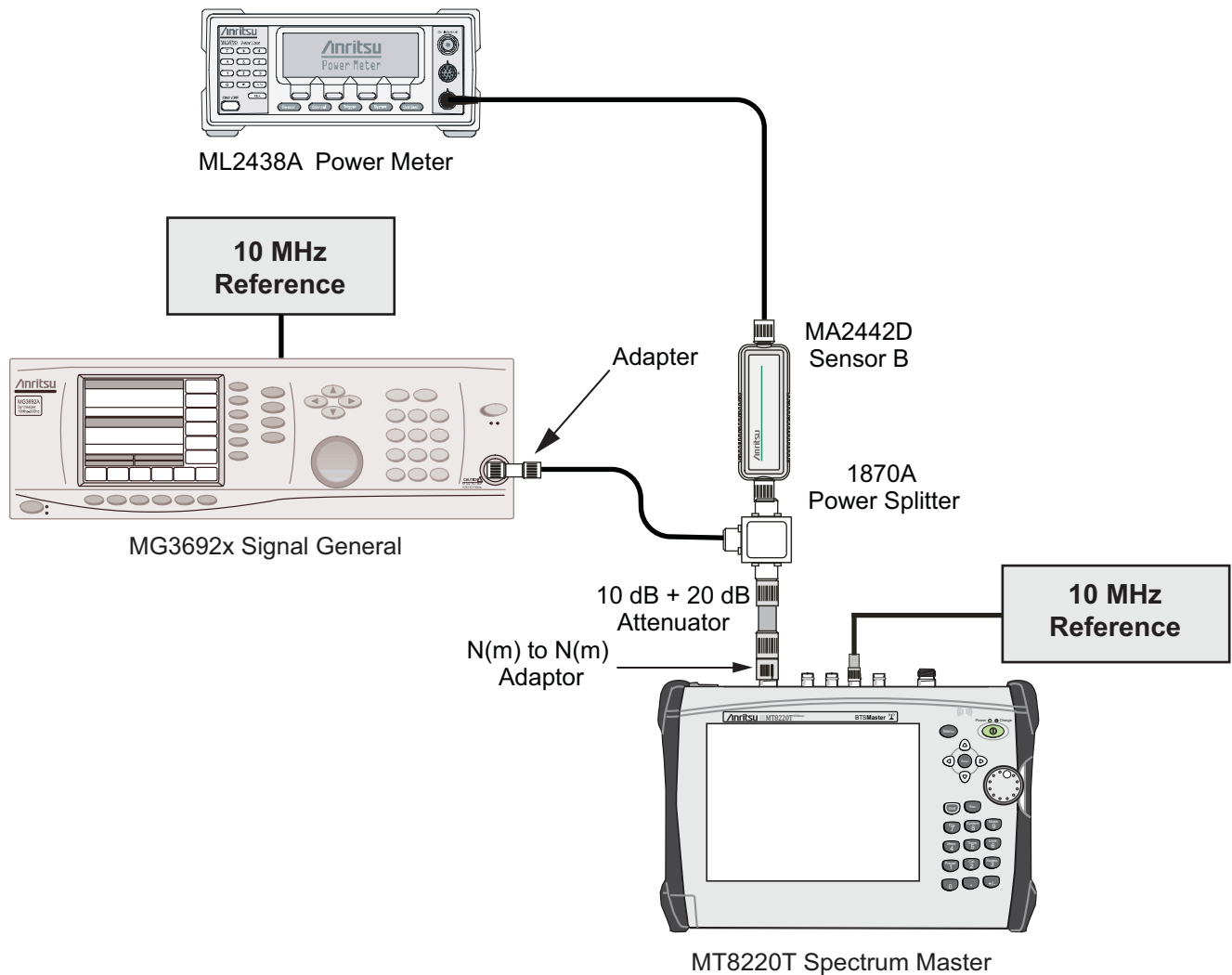


Figure 2-6. Pre-Amp Accuracy Across Frequency Verification Test Setup

Measuring Amplitude Accuracy Across Frequency

1. Connect the equipment as shown in [Figure 2-6](#).

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

2. Set the MT8220T to Spectrum Analyzer mode and then preset the unit.
3. Press the **Shift** key and then the **Sweep (3)** key. and then press the Sweep Mode soft key. Select the Performance soft key to set the instrument to Performance Sweep mode.
4. Press the BW soft key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
5. Press the Span soft key, set span to 10 kHz.
6. Set the MG3692x frequency to 150 kHz CW.

7. Set the MG3692x Output to -50 dBm.
8. Set the power meter to display Channel B. Press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor cal factor. Press the **System** key to display the power reading.
9. Adjust the MG3692x output power so that the power meter displays a reading which matches the Sensor B reading for -80 dBm in [Table A-12](#).
10. On the MT8220T, press the **Amplitude** soft key, then set the Reference Level to -50 dBm.
11. Press the **Freq** soft key and select the **Center Freq** soft key.
12. Enter 150 kHz (or the next frequency).
13. Press the **Amplitude** soft key, then set the **Atten Lvl** to 0 dB.
14. Press the **Marker** key and select the **Peak Search** soft key.
15. Record the Marker 1 amplitude reading in [Table A-13](#), “[Spectrum Analyzer Pre-Amp Accuracy Across Frequency](#)”.
16. Verify that the Marker 1 amplitude reading is within the specification.
17. Repeat Step 13 to Step 15 for **Atten Lvl** of 10 dB.
18. Adjust the MG3692x output power so that the power meter displays a reading which matches the Sensor B reading on the characterization chart for -90 dBm.
19. Repeat Steps 13 to Step 17 for the -90 dB level in the test records in [Table A-13](#).
20. Repeat Steps 5 to Step 19 for all the frequencies in the test records in [Table A-13](#).

2-9 Residual Spurious Response Verification

The following two tests are used to verify the residual spurious response of the Spectrum Analyzer of the MT8220T BTS Master and is performed using the positive peak detection mode. The two parts to this test are the “Residual Spurious Response Test with Preamp Off” immediately below and “Residual Spurious Response Test with Preamp On” on page 2-24.

Residual Spurious Response Test with Preamp Off

Equipment Required

- Anritsu 28N50-2 50 Ohm Termination

Procedure

1. Connect the 50 Ohm Termination to the MT8220T Spectrum Analyzer RF In.
2. Press the **On/Off** key to turn on the MT8220T BTS Master.
3. On the MT8220T:
 - 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 soft key to reset the instrument to the default starting conditions.
5. Press the **Shift** key and then the **Sweep** (3) key. and then press the Sweep Mode soft key. Select the Performance soft key to set the instrument to Performance Sweep mode.
6. Press the Amplitude soft key, then press the Reference Level soft key.
7. Use the keypad to enter -40 and press the dBm soft key.
8. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
9. Make sure that the Pre Amp On/Off soft key is in the Off position.
 - If the preamp is on, press the Pre Amp On/Off soft key to turn it off.
10. Press the Detection soft key and then the Peak soft key.
11. Press the Freq soft key and select the Start Freq soft key.
12. Use the keypad to enter 150 and select the kHz soft key.
13. Press the Stop Freq soft key, enter 1.0 and press the GHz soft key.
14. Press the BW soft key and select the RBW soft key.
15. Use the keypad to enter 10 and select the kHz soft key.
16. Press the VBW soft key, use the keypad to enter 30 and then select the kHz soft key.
17. Wait until one sweep is completed.
18. Press the Marker soft key and select the Peak Search soft key.
19. Verify that the Marker 1 amplitude reading is within specification.

Note

If a spur larger than -90 dBm appears, 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-14, “Spectrum Analyzer Residual Spurious with Preamp Off”](#).

21. Repeat Step 10 through Step 19 for the other frequency band settings in [Table A-14](#).

Residual Spurious Response Test with Preamp On

Equipment Required

- Anritsu 28N50-2 50 Ohm Termination

Procedure

1. Connect the 50 Ohm Termination to the MT8220T Spectrum Analyzer RF In.
2. Press the **On/Off** key to turn on the MT8220T BTS Master.
3. On the MT8220T, 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** soft key to reset the instrument to the default starting conditions.
5. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.
6. Make sure that the **Pre Amp On/Off** soft key is in the **On** position.
7. If the preamp is off, press the **Pre Amp On/Off** soft key to turn it on.

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

8. Press the **Amplitude** soft key, then press the **Reference Level** soft key.
9. Use the keypad to enter -50 and press the **dBm** soft key.
10. Press the **Atten Lvl** soft key and enter 0 , then press the **dB** soft key.
11. Press the **Detection** soft key and then the **Peak** soft key.
12. Press the **BW** soft key and select the **RBW** soft key.
13. Use the keypad to enter 10 and select the **kHz** soft key.
14. Press the **VBW** soft key and use the keypad to enter 1 , then select the **kHz** soft key.
15. Press the **Freq** soft key and select the **Start Freq** soft key.
16. Use the keypad to enter 150 and select the **kHz** soft key.
17. Press the **Stop Freq** soft key, enter 10 and press the **MHz** soft key.
18. Wait until one sweep is completed.
19. Press the **Marker** soft key and select the **Peak Search** soft key.
20. Record the “Marker 1 amplitude” reading in the test records and verify that it is within specification. Use [Table A-15](#), “Spectrum Analyzer Residual Spurious with Preamp On”.
21. Repeat Step 14 through Step 20 for the other Start and Stop frequencies and record in [Table A-15](#).

Note	<p>If a spur larger than -100 dBm appears, wait another full sweep and observe whether the spur re-appears at the same point on the second sweep.</p> <p>If the spur does not appear at the same point on the second sweep, then the spur on the first sweep was not real.</p>
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2-10 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 MT8220T BTS 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 MT8220T Spectrum Analyzer RF In.
2. Press the **On/Off** key to turn on the MT8220T BTS Master.
3. On the MT8220TMT8220T, 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** soft key to reset the instrument to the default starting conditions.
5. Press the **Shift** key and then the **Sweep** (3) key. and then press the **Sweep Mode** soft key. Select the **Performance** soft key to set the instrument to Performance Sweep mode.

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

6. Press the **Amplitude** soft key, then press the **Reference Level** soft key.
7. Use the keypad to enter **-50** and press the **dBm** soft key.
8. Press the **Atten Lvl** soft key and enter **0**, then press the **dB** soft key.
9. Make sure that the **Preamp** is **Off**.
10. Press the **Detection** soft key and then the **RMS** soft key.
11. Press the **BW** soft key and select the **RBW** soft key.
12. Use the keypad to enter **100** and select the **kHz** soft key.
13. Select the **VBW** soft key.
14. Use the keypad to enter **1** and select the **kHz** soft key.
15. Press the **Freq** soft key and select the **Start Freq** soft key.
16. Use the keypad to enter **3** and select the **MHz** soft key.
17. Press the **Stop Freq** soft key, enter **1** and press the **GHz** soft key.
18. Wait until one sweep is completed.
19. Press the **Marker** soft key and then select **Peak Search** soft key.
20. Record the Marker reading to the test records. Use the **Measured Value @ 100 kHz RBW** column of [Table A-16, "Spectrum Analyzer DANL with Pre Amp Off"](#).

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 14 through Step 19 for the other frequency settings in [Table A-16](#). Change the VBW setting as indicated in the VBW column of [Table A-16](#).

22. For each measured 100 kHz RBW value in the test record, convert it to 1 Hz RBW value by subtracting 50 dB.
$$-110 \text{ dBm} - 50 \text{ dB} = -160 \text{ dBm}$$

For example, if the marker shows a value of -110 dBm at 100 kHz RBW, the calculated value at 1 Hz RBW is -160 dBm .
23. Enter the calculated values in the test records. Use the **Calculated for 1 Hz RBW** column of [Table A-16](#).
24. Verify that the calculated value is less than or equal to the value in the Specification column of [Table A-16](#).
25. Press the **Amplitude** soft key, press the **Preamplifier On/Off** soft key to turn the preamp on.
26. Repeat Step 10 through Step 23.
27. Record the Marker reading and calculated value in the test record using [Table A-17](#), “**Spectrum Analyzer DANL with Pre Amp On**”.

Chapter 3 — Cable and Antenna Analyzer Verification

3-1 Introduction

These tests verify that the Cable and Antenna Analyzer of the Model MT8220T BTS Master is functional. The functional tests include:

- “[Frequency Accuracy Verification](#)”
- “[Return Loss Accuracy Verification](#)” on page 3-2
- “[System Dynamic Range Verification](#)” on page 3-3

3-2 Frequency Accuracy Verification

The following test is used to verify the frequency accuracy of the RF source in the MT8220T in Cable and Antenna Analyzer mode.

Equipment Required

- Spectrum Analyzer, Anritsu Model MS2720T
- RF Coaxial Cable, Anritsu Model 15NNF50-0.6B

Procedure

1. Verify that the MT8220T is in Cable and Antenna Analyzer mode and preset the unit.
2. Verify that no external 10 MHz reference is connected to the MT8220T.
3. Press **Shift** then the **Sweep** key.
4. Verify that the RF Immunity is set to High.
5. Press the **Freq/Dist** key and set both the Start Freq and Stop Freq to 2 GHz.
6. Connect the RF cable from the MT8220T VNA Reflection RF Out to the Reference SPA RF Input.
7. Setup the reference SPA as follows:
 1. CF= 2 GHz
 2. Span = 10 kHz
 3. RBW = 300 Hz
 4. VBW = 100 Hz
 5. Auto Attenuation = On
 6. Trace = Max Hold
8. Measure the frequency of the left and right most flat spots, make sure they are within the 6 kHz spec from the 2 GHz center frequency.
9. Record the frequency data in [Table A-18](#), “[VNA Frequency Accuracy](#)”.

3-3 Return Loss Accuracy Verification

The following test can be used to verify the accuracy of return loss measurements. Measurement calibration of MT8220T in Cable and Antenna Analyzer mode is required for this test.

Equipment Required

- Open/Short, Anritsu Model 22N50
- Termination, Anritsu Model 28N50-2
- 6 dB Offset Termination, Anritsu Model SC7424
- 20 dB Offset Termination, Anritsu Model SC7423

Procedure

1. Verify that the MT8220T is in Cable and Antenna Analyzer mode and preset the unit.
2. Press the **Measurement** key, then press the Return Loss soft key.
3. Press the **Shift** key, then press the **Calibrate** (2) key. Verify that Cal Type is set to 1-Port and Cal Power is High.
4. Press the Start Cal soft key. Follow the instructions on the screen to perform a calibration.
5. After the calibration is complete, install the 20 dB offset termination.
6. Press the **Amplitude** key, set Top to 17 dB, and Bottom to 23 dB.
7. Verify that the data display falls between 18.4 dB and 21.6 dB.
8. Press the **Marker** key and select the Marker to Peak soft key. Record the marker value, then select the Marker to Valley soft key and record the marker value. Record the worst case of the two values in [Table A-19, "VNA Return Loss Accuracy Verification"](#).
9. Remove the 20 dB offset and install the 6 dB offset.
10. Press the **Amplitude** key, set Top to 4.0 dB, and set Bottom to 8.0 dB.
11. Verify that the data display falls between 5 dB and 7 dB.
12. Press the **Marker** key and select the Marker to Peak soft key. Record the marker value, then select the Marker to Valley soft key and record the marker value. Record the worst case of the two values in [Table A-19](#).

3-4 System Dynamic Range Verification

The following test can be used to verify the system dynamic range. Measurement calibration of the MT8220T in Cable and Antenna Analyzer mode is required.

Equipment Required

- Open/Short, Anritsu Model 22N50
- Termination, Anritsu Model 28N50-2
- Termination, Anritsu Model 28NF50-2
- Adapter N(m) to N(m), Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NNF50-0.6B

Procedure

1. Verify that the MT8220T is in Cable and Antenna Analyzer mode and preset the unit.
2. Press the **Measurement** key, then select 2-Port Gain (a red dot will appear on the selected item).
3. Press the **Shift** key, then press the **Sweep** (3) key.
4. Verify that RF Immunity is set to High
5. Press the **Shift** key, then press the **Calibrate** (2) key.
6. Verify that the Cal Type is set to 2-Port and the Output Power is set to High.
7. Press the Start Cal soft key and follow the on screen instructions to perform an OSL-THRU-ISOL calibration.
8. After the calibration is complete, disconnect one end of the cable and connect loads so that both the VNA Reflection port and VNA RF In port are terminated.
9. Press **Shift, Sweep**, and select Averaging Smoothing. Set Averaging Factor to 25.
10. Press the **Amplitude** key and set the Bottom to -125 dB and the Top to -75 dB.
11. Press **Shift, Limit** (6), and set the Limit to On.
12. Select Single Limit and set the limit to -85 dB.
13. Press the Multi-Segment Edit soft key.
14. Ensure the left most point is selected (highlighted in red), select Next Point Left if necessary and verify that the Point Frequency is set to 400 MHz.
15. Ensure the Point Value is -100 dB if not select Point Value and enter -100 dB.
16. Select Add Point, select Point Frequency, and enter 2.8 GHz.
17. Select Point Value and enter -100 dB.
18. Select Add Point, select Point Frequency, and enter 2.8001 GHz.
19. Select Point Value and enter -90 dB.
20. Select Add Point and select Point Frequency and enter 4.00 GHz.
21. Select Point Value and enter -90 dB.
22. Select Add Point, select Point Frequency, and enter 4.0001 GHz.
23. Select Point Value and enter -85 dB.
24. Select Next Point Right and verify Point Frequency is 6.00 GHz, and the Point Value is at -85 dB.
25. Press **Shift, Sweep**, and select Averaging Smoothing. Set Averaging to On and select Restart.

26. Verify that when the Average Count reaches 25 the display of the system dynamic range is below the limit lines (the data will be unstable, but should remain below the limit lines.)
27. Use a marker to find the maximum peak of each frequency band and enter the value in dB in [Table A-20](#), “VNA System Dynamic Range Verification.”

Chapter 4 — Power Meter Verification

4-1 Power Meter Level Accuracy

The following test verifies the level accuracy of the MT8220T Power Meter function in the MT8220T.

Equipment Required

- Signal Generator, Anritsu Model MG3692x with options 2A, 4, 22, 15⁽²⁾
- Power Meter, Anritsu Dual Channel Model ML2438A
- Power Sensor, Anritsu Model MA2442D or SC7400-1 (quantity 2)
- Fixed Attenuator 10 dB, Aeroflex/Weinschel Model 44-10
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Adapter N(m) to N(m), Anritsu Model 34NN50A
- Adapter K(m) to N(f), Anritsu Model 34RKNF50
- RF Coaxial Cable, Anritsu Model 15NN50-0.6B

(2) Option 15 is required for MG3692A models to achieve power of +13 dBm. MG3692B models do not require option 15.

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 MG3692x output and sensor B to one of the power splitter outputs (Figure 4-1).

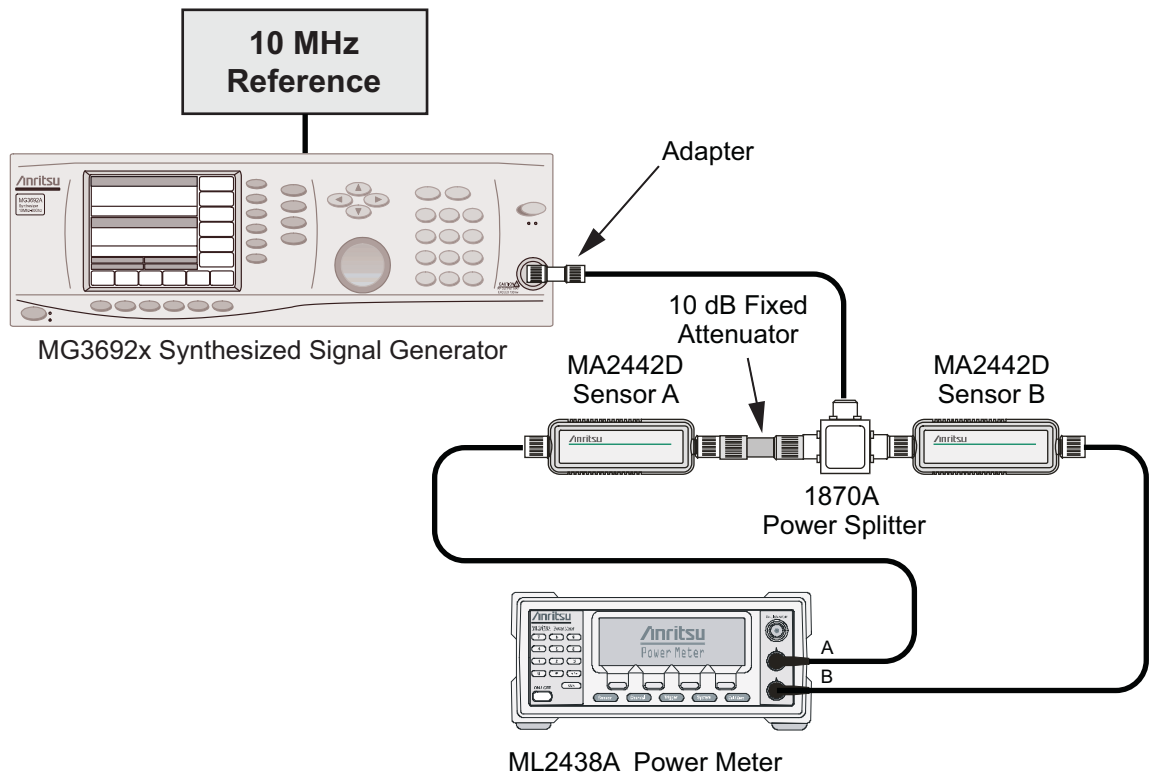


Figure 4-1. Power Meter Measurement Accuracy

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 Channels A and 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 cal factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the power level of the MG3692x to get a reading on sensor A that matches the power level (within ± 0.1 dB) in the first column of [Table A-21, “Characterization Chart for Power Meter Verification”](#) on page A-15.
6. Record the sensor B reading in the **Required Sensor B Reading** column of [Table A-21](#).
7. Repeat Steps 5 and 6 for the other power level in the first column of [Table A-21](#), recording the Sensor B reading in the second column.
8. Repeat the above steps for the next input frequency.

Power Meter Measurement Accuracy Procedure

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

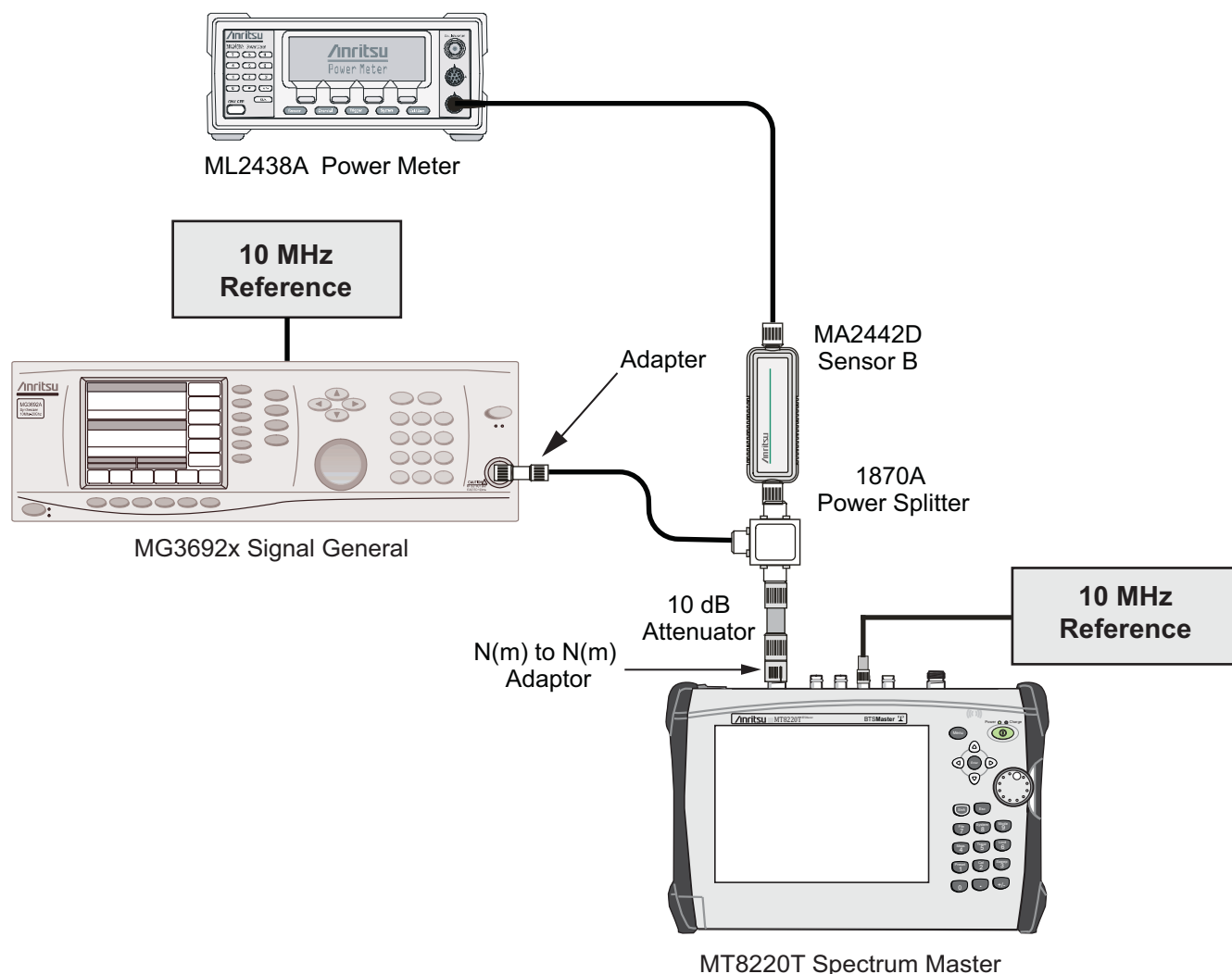


Figure 4-2. Power Meter Measurement Accuracy

2. Verify that the MT8220T is in the Power Meter mode and preset the unit.
3. Set the MT8220T span to 3 MHz.
4. Set the MT8220T center frequency to 50 MHz.
5. Adjust the MG3692x power so that the power meter sensor B matches the sensor B value shown in the [Table A-21](#).
6. Record the reading on the MT8220T display in [Table A-22, “Internal Power Meter Accuracy Verification”](#) on page A-15.
7. Repeat steps 4 to 6 for the next test power level in [Table A-21](#).
8. Repeat steps 4 to 6 for the next test frequency in the [Table A-21](#).

Chapter 5 — GPS Receiver Verification

5-1 Introduction

This chapter describes the verification process for the GPS receiver that is standard for the MT8220T BTS Master. The following tests are in this chapter:

- [“GPS Frequency Accuracy Verification” on page 5-2](#)
- [“GPS Bias-Tee Voltage Verification” on page 5-4](#)

5-2 GPS Frequency Accuracy Verification

The following test verifies the Spectrum Analyzer Frequency Accuracy with GPS in the model MT8220T BTS Master.

Equipment Required for MT8220T

- Anritsu MG3692x Synthesized Signal Source
- Frequency Reference Symmetricom Rubisource T&M
- Anritsu 34RKNF50 50 ohm Adapter
- Anritsu 15NN50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable
- GPS Antenna, Anritsu 2000-1528-R

Setup

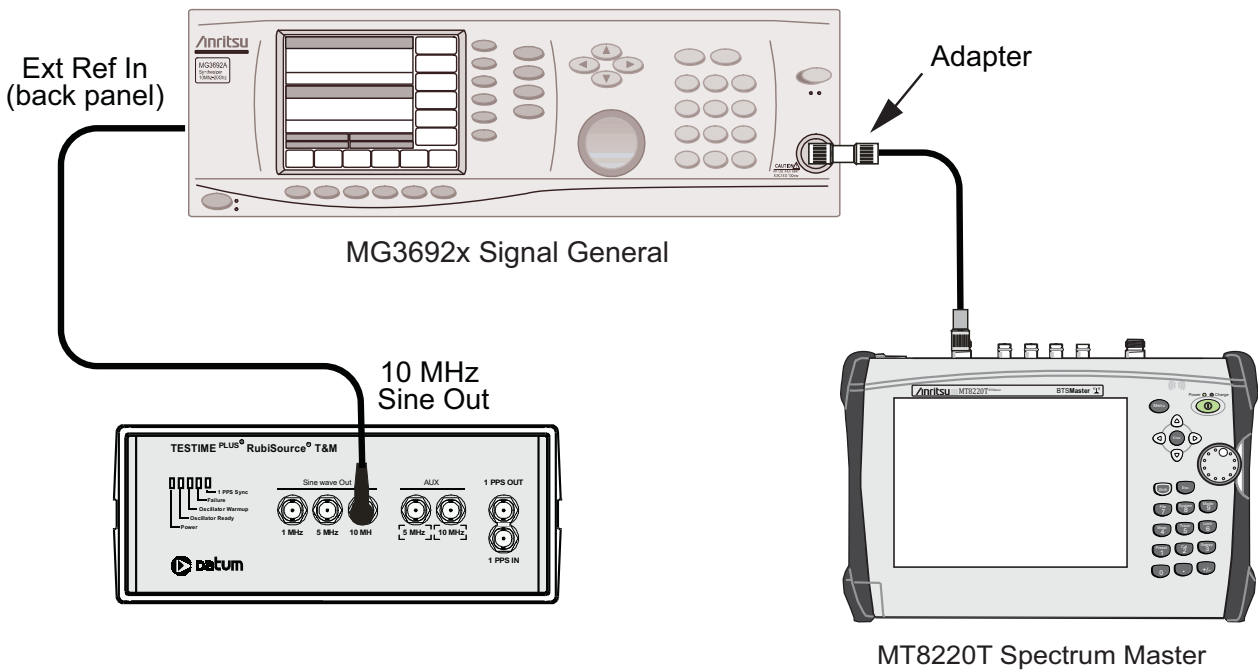


Figure 5-1. Frequency Accuracy Verification by Synthesized Signal Generator

Setup Procedure

1. Connect the GPS antenna to the GPS Antenna connector on the MT8220T.

Note If a fixed GPS antenna is not available, the Anritsu 2000-1528-R GPS antenna can be used for this test. Ensure that the Anritsu 2000-1528-R GPS antenna is in a direct line of sight relationship to the satellites or that the antenna is placed outside with no obstructions.

2. Press the **Shift** key and then the **System** (8) key.
3. Press the GPS 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. The latitude and the longitude are displayed next to the GPS indicator.
5. After about three minutes, the Reference Source indicator in the lower left corner of the LCD display changes to *GPS High Accy*.
6. If the GPS fix is acquired using the Anritsu 2000-1528-R GPS antenna outside, then bringing the instrument inside causes a loss of satellite tracking. A red cross appears on the green GPS indicator, and the Reference Source indicator changes to *Int Hi Accy*.

Note The following test can be used to verify frequency accuracy to either specification.

Test Procedure

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

Note Do not connect the external 10 MHz Reference to the MT8220T BTS Master.

2. Connect the output of the Synthesized Signal Generator to the Spectrum Analyzer RF In of the MT8220T, as shown in [Figure 5-1](#).
3. On the MT8220T, change the mode to **Spectrum Analyzer** and preset the instrument.
4. Select Sweep (Shift-3), select Sweep Mode, select Performance.
5. Set the MG3692x output to 7 GHz CW, with an RF output level of -30 dBm.
6. On the MT8220T, press the **Amplitude** main menu key, and set the Ref Lvl to -10 dBm.
7. Press the **Freq** main menu key and set the Center Freq to 7.0 GHz.
8. Press the **Span** main menu key and set the Span to 10 kHz.
9. Press the **BW** main menu key and set RBW to 100 Hz.
10. Press the VBW submenu key and set VBW to 30 Hz.
11. Press the **Marker** main menu key, press the **More** submenu key, then set Counter Marker to On and press the Back key.
12. Press the **Peak Search** submenu key.
13. Note the Reference Source display and use the appropriate row to record the data in the following steps.
14. Record the marker frequency into the “Measured Value” column of [Table A-23, “GPS Receiver”](#) on [page A-16](#).
15. Subtract the marker value from 7 GHz, record the result into the Error column of [Table A-23](#), and verify that it is within specification.
16. If the value of Reference Source indicates *GPS High Accuracy*, then remove the GPS antenna and wait until the Reference Source indicates *Int Hi Accy* and repeat [Step 11](#) through [Step 15](#) if necessary.

5-3 GPS Bias-Tee Voltage Verification

The following test verifies the GPS Antenna Bias-Tee Voltages in the model MT8220T BTS Master.

Equipment Required for MT8220T

- 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 40-168-R) to the MT8220T BTS Master.
2. Press the **On/Off** key to turn on the MT8220T.
3. Set the MT8220T to Spectrum Analyzer mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (3) 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. Ensure the 3.3V 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. Select the GPS Info submenu key. Record the GPS Antenna Current reading in the “Measured Current Value” column of [Table A-24, “GPS Receiver Bias-Tee Verification” on page A-16](#) and verify that it is within specification.

5V Test

10. Press the **Escape** key to dismiss the GPS Info dialog box.
11. Press the GPS Voltage submenu key and select 5V.
12. Select the GPS Info submenu key. Record the GPS Antenna Current reading in the “Measured Current Value” column of [Table A-24](#) and verify that it is within specification.

Chapter 6 — Options Verification

6-1 Introduction

This chapter describes the verification process for all of the options that are available for the MT8220T BTS Master. The following tests are in this chapter:

- “Option 10, Bias Tee Verification” on page 6-2
- “Option 880, GSM/GPRS/EDGE Signal Analyzer Verification” on page 6-5
- “Option 881 WCDMA/HSDPA Signal Analyzer Verification” on page 6-10
- “Option 882, TDSCDMA Signal Analyzer Verification” on page 6-21
- “Option 883, LTE Signal Analyzer Verification” on page 6-23
- “Option 883, TD-LTE Signal Analyzer Verification” on page 6-27
- “Option 884, CDMA Signal Analyzer Verification” on page 6-32
- “Option 884, EVDO Signal Analyzer Verification” on page 6-35
- “Option 885, Fixed WiMAX Signal Analyzer Verification” on page 6-39
- “Option 885, Mobile WiMAX Signal Analyzer Verification” on page 6-43

6-2 Option 10, Bias Tee Verification

This test verifies that the optional Bias Tee in the Cable and Antenna Analyzer of the Model MT8220T BTS Master is functional. These tests include:

- “[Low Current Test Verification](#)”
- “[High Current Test Verification](#)” on page 6-3
- “[Fault Verification](#)” on page 6-4

Low Current Test Verification

The tests in this section verify the Bias-Tee Option 10 low current operation of the MT8220T in Cable and Antenna Analyzer 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 MT8220T BTS Master.
2. Press the **On/Off** key to turn on the MT8220T.
3. Set the MT8220T to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **System** (8) key, press the Applications Options soft key.

Low Current Test

1. Press the **Bias Tee Voltage** soft 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** soft key to turn the Bias Tee On.
4. Record the Voltage and Current readings displayed on the left side of the screen in the **105 Ohm Load Low Current** section of [Table A-25](#), “[Option 10 Bias-Tee](#). Verify the voltage and current readings are within the specifications.
5. Press the **Bias Tee On/Off** soft key to turn the Bias Tee Off.
6. Repeat Steps 3 through Step 5, entering each of the voltage settings listed in the **105 Ohm Load Low Current** section of [Table A-25](#).

High Current Test Verification

The tests in this section verify the Bias-Tee Option 10 high current operation of the MT8220T in Cable and Antenna Analyzer mode.

Equipment Required

- Anritsu 40-187-R External Power Supply
- Anritsu T3377 105 Ohm load
- Anritsu T2904 40 Ohm Load
- Anritsu T3536 78 Ohm Load

Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the MT8220T BTS Master.
2. Press the **On/Off** key to turn on the MT8220T.
3. Set the MT8220T to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **System** (8) key, press the Applications Options soft key.

High Current Test

1. Press the **Bias Tee Voltage** soft key and verify the voltage setting is 15 V, confirm that the **Current** soft key is set to High.
2. Connect the Anritsu T3377 105 Ohm load to the RF In test port.
3. Press the **Bias Tee On/Off** soft key to turn the Bias Tee On.
4. Record the Voltage and Current readings displayed on the left side of the screen in the **105 Ohm Load High Current** section of [Table A-25](#). Verify the voltage and current readings are within the specifications.
5. Press the **Bias Tee On/Off** soft key to turn the Bias Tee Off. Disconnect the Anritsu T3377 105 Ohm load and connect the Anritsu T2904 40 Ohm load to the RF In port.
6. Select the **Bias Tee Voltage** soft key and enter 15 V.
7. Press the **Bias Tee On/Off** soft key to turn the Bias Tee On.
8. Record the Voltage and Current readings displayed on the left side of the screen in **40 Ohm Load High Current** section of [Table A-25](#). Verify the voltage and current readings are within the specifications.
9. Press the **Bias Tee On/Off** soft key to turn the Bias Tee Off. Disconnect the Anritsu T2904 40 Ohm load and connect the Anritsu T3536 78 Ohm load to the RF In port.
10. Select the **Bias Tee Voltage** soft key and enter 32 V.
11. Press the **Bias Tee On/Off** soft key to turn the Bias Tee On.
12. Record the Voltage and Current readings displayed on the left side of the screen in the **78 Ohm Load High Current** section of [Table A-25](#). Verify the voltage and current readings are within the specifications.
13. Press the **Bias Tee On/Off** soft key to turn the Bias Tee Off.

Fault Verification

The tests in this section verify the Bias-Tee Option 10 fault condition of the MT8220T in Cable and Antenna Analyzer mode.

Equipment Required

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

Procedure

1. Connect the external power supply (Anritsu PN 40-168-R) to the MT8220T BTS Master.
2. Press the **On/Off** key to turn on the MT8220T.
3. Set the MT8220T to Cable and Antenna Analyzer mode and preset the unit.
4. Press the **Shift** key, and then the **System** (8) key, press the Applications Options soft key.

Fault Test

5. Press the Bias Tee soft key and confirm that the Current soft key is set to Low.
6. Select the Bias Tee Voltage soft 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 soft key to turn the Bias Tee On.
9. Verify that the instrument indicates a “Bias-T Fault Condition” and makes a clicking sound and the Bias Tee current reading displayed on the left side of the screen is 0 mA.
10. Press the Bias Tee On/Off soft key to turn the Bias Tee Off.

6-3 Option 880, GSM/GPRS/EDGE Signal Analyzer Verification

The tests in this section verify the optional GSM/GPRS/EDGE Signal Analyzer functions in Model MT8220T BTS Master.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable
- Power Splitter, Aeroflex/Weinschel Model 1870A

Setup

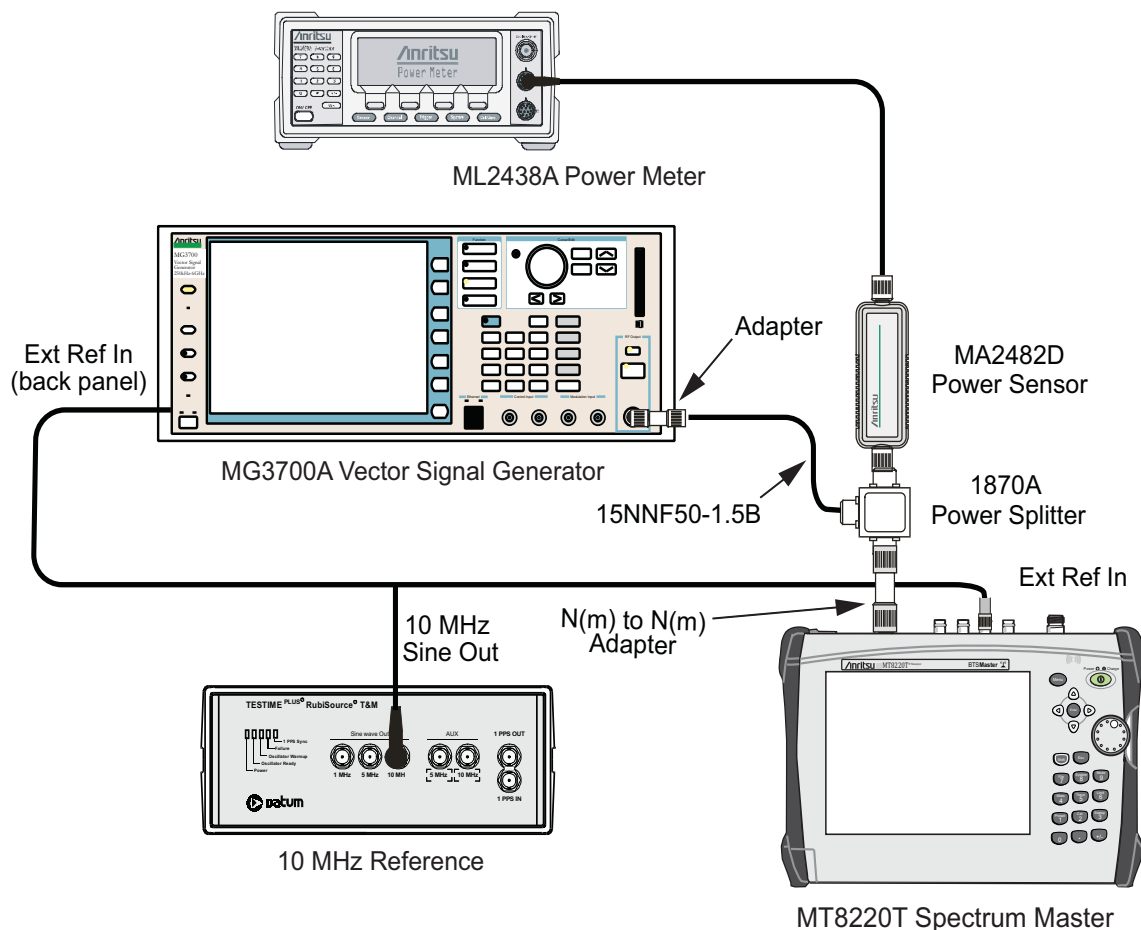


Figure 6-1. GSM/GPRS/EDGE, Test Setup

Set up Procedure

1. Zero the power sensor prior to connecting to the power splitter.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to **256**.
3. Connect the equipment as shown in [Figure 6-1](#)
4. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the **Freq** submenu 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.
5. Set the MT8220T mode to GSM/GPRS/EDGE Signal Analyzer. Preset the instrument.

GSM Burst Power, Frequency Error, and Phase Error Tests

Test Procedure

1. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
2. Press the **Down Arrow** key, or turn the knob to press **Yes**.
3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
4. Press the (F1) submenu key to select “Load File to Memory”.
5. Press the (F1) submenu key again to select “Select Package”.
6. Using the **Down Arrow** key, step through the selection list until the GSM option is highlighted.
7. Press the **Set** key.
8. Press the (F6) submenu key, **Return**.
9. Press the **Set** key. The Select Package box appears. Use the rotary knob to highlight GSM and press the **Set** key to select.
10. Another File List appears. Use the rotary knob to select GsmBurst_1slot, and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn on the Modulation LED, and verify the Playing indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, and enter 850 MHz.
13. Press the **Level** key, enter -10 , and press the **dBm** key.
14. Adjust the MG3700A output so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-26, “RF Measurements, At 850 MHz, \$-10 \text{ dBm}\$ Level, GsmBurst_1slot Pattern \(GSM\)”](#) on page A-18.
15. On the MT8220T, press the **Freq** main menu key and enter 850 MHz as Center Freq.
16. Press the **Measurements** main menu key, and press GSM/EDGE Summary (a red dot is displayed on the label).
17. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-26](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 14](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-26](#).
18. Record the displayed Phase Err RMS (deg) into [Table A-34, “Demodulation, At 850 MHz, \$-10 \text{ dBm}\$ Level, GsmBurst_1slot Pattern \(GSM\)”](#) on page A-21.
19. Verify that the measured values in [Step 17](#) and [Step 18](#) are within specifications.
20. On the MG3700A, change the selected signal pattern to GsmBurst_8slot.

21. Adjust the Level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-27, “RF Measurements, At 850 MHz, \$-50 \text{ dBm}\$ Level, GsmBurst_8slot Pattern \(GSM\)”](#) on page A-18. Then wait 15 seconds to allow the MT8220T to update its measured results.
22. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-27](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 21](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-27](#).
23. Record the displayed Phase Err RMS (deg) into [Table A-35, “Demodulation1, At 850 MHz, \$-50 \text{ dBm}\$ Level, GsmBurst_8slot Pattern \(GSM\)”](#) on page A-21.
24. Verify that the measured values in [Step 22](#) and [Step 23](#) are within specifications.
25. Change the frequency of MG3700A to 1800 MHz.
26. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu. Use the keypad to enter 1800 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
27. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-28, “RF Measurements, At 1800 MHz, \$-10 \text{ dBm}\$ Level, GsmBurst_8slot Pattern \(GSM\)”](#) on page A-19.
28. On the MT8220T, set the Center Freq to 1800 MHz. Then wait 15 seconds to allow the MT8220T to update its measured results.
29. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-28](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 27](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-28](#).
30. Record the displayed Phase Err RMS (deg) into [Table A-36, “Demodulation, At 1800 MHz, \$-10 \text{ dBm}\$ Level, GsmBurst_8slot Pattern \(GSM\)”](#) on page A-21.
31. Verify that the measured values in [Step 29](#) or [Step 30](#) or both are within specifications.
32. On the MG3700A, change the selected pattern to GsmBurst_1slot.
33. Adjust the level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-29, “RF Measurements, At 1800 MHz, \$-50 \text{ dBm}\$ Level, GsmBurst_1slot Pattern \(GSM\)”](#) on page A-19. Then wait 15 seconds to allow the MT8220T to update its measured results.
34. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-29](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 33](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-29](#).
35. Record the displayed Phase Err RMS (deg) into [Table A-37, “Demodulation, At 1800 MHz, \$-50 \text{ dBm}\$ Level, GsmBurst_1slot Pattern \(GSM\)”](#) on page A-21.
36. Verify that the measured values in [Step 34](#) or [Step 35](#) or both are within specifications.

EDGE Burst Power, Frequency Error and Residual Error Tests

Test Procedure

1. Verify that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to EdgeBurst_4slot.
3. Adjust the level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-30, “RF Measurements, At 1800 MHz, \$-50 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-19. Then wait 15 seconds to allow the MT8220T to update its measured results.
4. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-30](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 3](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-30](#).
5. Record the displayed EVM(rms) into [Table A-38, “Demodulation, At 1800 MHz, \$-50 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-21.
6. Verify that the measured values in [Step 4](#) and [Step 5](#) are within specifications.
7. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-31, “RF Measurements, At 1800 MHz, \$-10 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-19. Then wait 15 seconds to allow the MT8220T to update its measured results.
8. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-31](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 7](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-31](#).
9. Record the displayed EVM(rms) into [Table A-39, “Demodulation, At 1800 MHz, \$-10 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-21.
10. Verify that the measured values in [Step 8](#) and [Step 9](#) are within specifications.
11. Change the frequency of MG3700A to 850 MHz.
12. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu 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.
13. Adjust the level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-32, “RF Measurements, At 850 MHz, \$-50 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-20.
14. On the MT8220T, set the Center Freq to 850 MHz. Then wait 15 seconds to allow the MT8220T to update its measured results.
15. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-32](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 13](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-32](#).
16. Record the displayed EVM(rms) into [Table A-40, “Demodulation, At 850 MHz, \$-50 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-22.
17. Verify that the measured values in [Step 15](#) and [Step 16](#) are within specifications.
18. On the MG3700A, change the selected pattern to EdgeBurst_1slot.
19. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted power reading into the “Adjusted Output Power” row of [Table A-33, “RF Measurements, At 850 MHz, \$-10 \text{ dBm}\$ Level, EdgeBurst_4slot Pattern \(EDGE\)”](#) on page A-20. Then wait 15 seconds to allow the MT8220T to update its measured results.

20. Record the measured “Burst Power” value into the “Displayed Burst Power” row of [Table A-33](#), then subtract the “Displayed Burst Power” value from the “Adjusted Output Power” reading that was obtained in [Step 19](#). Then record the “Calculated Burst Power Error” and the displayed value of “Frequency Error” into [Table A-33](#).
21. Record the displayed EVM(rms) into [Table A-41](#), “Demodulation, At 850 MHz, –10 dBm Level, EdgeBurst_4slot Pattern (EDGE)” on page A-22
22. Verify that the measured values in [Step 20](#) and [Step 21](#) are within specifications.

6-4 Option 881 WCDMA/HSDPA Signal Analyzer Verification

The tests in this section can be used to verify the functionality of the WCDMA/HSDPA Signal Analyzer mode of the MT8220T BTS Master. The tests include:

- “WCDMA Absolute Power Accuracy Verification ”
- “WCDMA Occupied Bandwidth (OBW) Verification ” on page 6-15
- “WCDMA RF Channel Power Accuracy ” on page 6-17
- “HSDPA RF Channel Power Accuracy ” on page 6-18
- “Error Vector Magnitude (EVM) Verification ” on page 6-19

WCDMA Absolute Power Accuracy Verification

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

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Mini Circuits Model TIA10001R8 RF Power Amplifier
- Programmable Attenuator, Anritsu Model MN63A
- Circulator (refer to [Table 1-4 on page 1-4](#))
- High Power Load, Aeroflex/Weinschel Model M1418
- Coupler (refer to [Table 1-4](#))
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D or SC7400 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

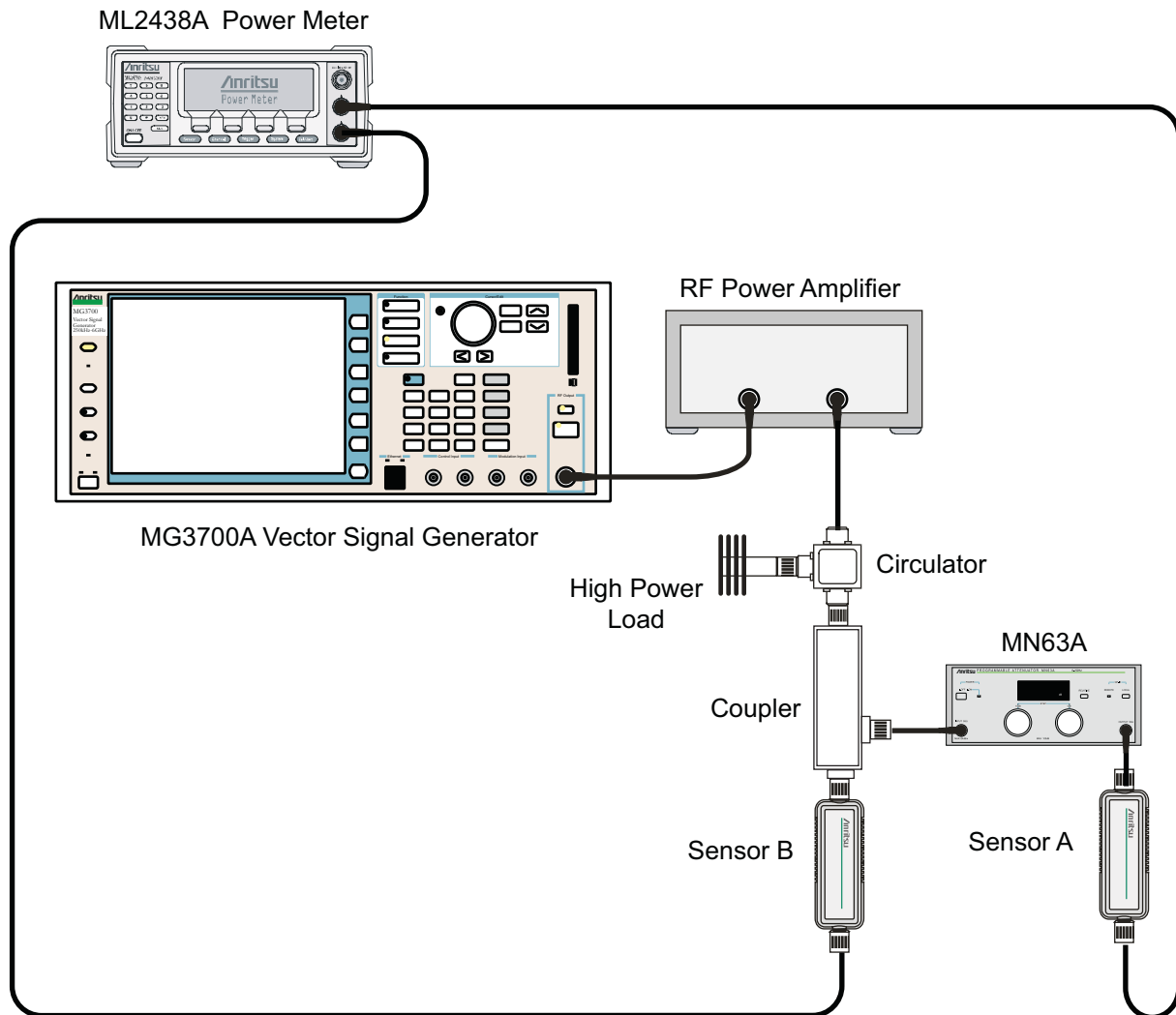


Figure 6-2. WCDMA/HSDPA Signal Analyzer, Characterization Setup

Procedure

1. Connect the MG3700A, RF power amplifier, circulator, load, coupler, and programmable attenuator as shown in [Figure 6-2](#).
2. Turn on the MG3700A, RF amplifier, attenuator, and the power meter.
3. Connect the power sensors to the power meter and then zero the sensors. Then connect the sensors as shown in [Figure 6-2](#).
4. Press the **On/Off** key to turn on the MT8220T 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 corner).
8. Press the **Down Arrow** key to select Yes.
9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

10. Press the (F1) submenu key to select “Load File to Memory”.
11. Press the (F1) submenu key again to select “Select Package”.
12. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the (F6) submenu key, Return.
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the TestModel_1_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, enter 881.5, then press the **MHz** key.
20. Press the **Level** key, enter -28, and press the **dBm** key.
21. Use the knob to adjust the power level so that Sensor B reads +10 dBm.
22. Set the MN63A attenuator to 0 dB.
23. Record the Sensor A reading (PMA.10) in [Table A-42, “RF Measurements, Sensor A and Sensor B Readings, Components Characterization”](#) on page A-23. This should be approximately -20 dBm.
24. Record the Sensor B reading (PMB.10) in [Table A-42](#).
25. Calculate Delta 1 ($\Delta 1$), which is the error of the coupler output port deviation from ideal + 10 dBm, by using the following formula:
$$\text{Delta 1 (dBm)} = (10 \text{ dBm} - \text{PMB.10})$$
26. Record the Delta 1 ($\Delta 1$) value in [Table A-42](#).
27. Calculate the accurate value of the Sensor A reading for coupler port output of +10 dBm (PMA.10C) by using the following formula:
$$\text{PMA.10C} = \text{PMA.10} + \Delta 1$$
28. Record the calculated value (PMA.10C) in [Table A-42](#).
29. Set the MN63A attenuator to 18 dB, and record the Sensor A reading (PMA.18) in [Table A-42](#).
30. Calculate the accurate attenuation value by using the following formula:
$$\text{ATT.18} = (\text{PMA.10} - \text{PMA.18})$$
31. Record the calculated value (ATT.18) in [Table A-42](#).
32. Turn off the RF output of the MG3700A.
33. Disconnect the coupler from Sensor B and connect the coupler to the MT8220T, refer to [Figure 6-3 on page 6-13](#).
34. Set the MN63A attenuator to 0 dB.
35. On the MT8220T, press the Center Freq submenu key, enter 881.5, and then press the **Enter** key.
36. Press the **Measurements** main menu key, then the RF Measurement submenu key, then the 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 (refer to [Table A-42](#)).
38. Record the MG3700A power level setting (MG3700A.10) in [Table A-43, “RF Measurements, Power Level Setting, Components Characterization”](#) on page A-23.

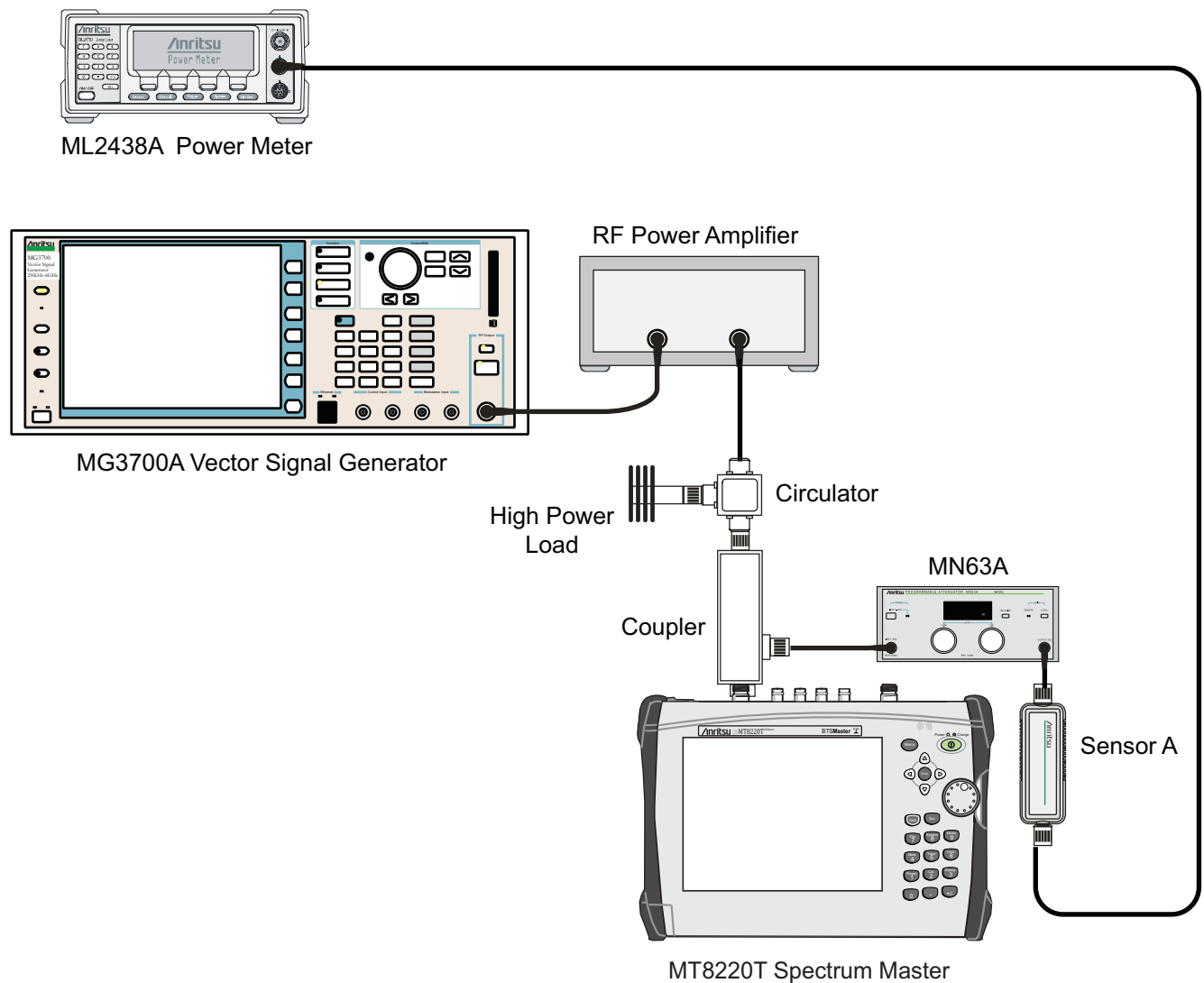


Figure 6-3. WCDMA/HSDPA Signal Analyzer, Test Setup for BTS Master

39. On the MT8220T, press the **Amplitude** main menu key and then press the Adjust Range submenu key.
40. Record the channel power reading into the “Measured Power” column of [Table A-44, “RF Measurements, WCDMA Absolute Power Accuracy”](#) on page A-23.
41. Use the following formula to calculate the Error value for the absolute power accuracy of the MT8220T at +10 dBm:

$$\text{Error} = \text{Measured Power} - 10$$
42. Record the calculated Error value into the “Error” column of [Table A-44](#), and verify that it is within the listed specification.
43. Turn Off the RF output of the MG3700A.
44. Set the MN63A attenuator to 18 dB.
45. Calculate the value of the MG3700A setting (MG3700A.28) for +28 dBm Test Level by using the following formula:

$$\text{MG3700A.28} = \text{MG3700A.10} + \text{ATT.18}$$

46. Record the calculated value (MG3700A.28) in [Table A-44](#), “RF Measurements, WCDMA Absolute Power Accuracy” on page A-23.
47. On the MG3700A, turn on the RF output and use the knob to adjust power level to the recorded MG3700A.28 value in [Table A-44](#).
48. On the MT8220T, 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 [Table A-44](#).
50. Use the following formula to calculate the absolute power accuracy of the MT8220T at +28 dBm:
$$\text{Error} = \text{Measured Power} - 28$$
51. Record the calculated value in the “Error” column of [Table A-44](#), and verify that it is within the listed specification.
52. Turn off the RF output of the MG3700A.
53. Set the MN63A attenuator to 0 dB.
54. Set power level of the MG3700A to -38 dBm.
55. Calculate the value of the Sensor A reading (PMA - 10) for -10 dBm Test Level by using the following formula:
$$\text{PMA}-10 = \text{PMA}.10\text{C}-20$$
56. Record the calculated value (PMA - 10) 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 MT8220T, 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 [Table A-44](#).
60. Use the following formula to calculate the absolute power accuracy of the MT8220T at -10 dBm:
$$\text{Error} = \text{Measured Power} - (-10)$$
61. Record the calculated value in the “Error” column of [Table A-44](#), and verify that it is within the listed specification.
62. Turn Off the RF output of the MG3700A.
63. Set the MN63A attenuator to 0 dB.
64. Decrease power level of the MG3700A by 10 dB.
65. Calculate the value of the Sensor A reading (PMA - 20) for -20 dBm Test Level by using the following formula:
$$\text{PMA}-20 = \text{PMA}.10\text{C}-30$$
66. Record the calculated value (PMA - 20) in [Table A-44](#).
67. Turn on the RF output and use the knob to adjust power level to read the value of PMA - 20 on Sensor A.
68. On the MT8220T, press the **Amplitude** main menu key and then press the Adjust Range submenu key.
69. Record channel power reading in the “Measured Power” column of [Table A-44](#).
70. Turn off the RF output of the MG3700A.
71. Use the following formula to calculate the absolute power accuracy of MT8220T at -20 dBm:
$$\text{Error} = \text{Measured Power} - (-20)$$
72. Record the calculated value in the “Error” column of [Table A-44](#), and verify that it is within the listed specification.

WCDMA Occupied Bandwidth (OBW) Verification

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

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D or SC7400
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

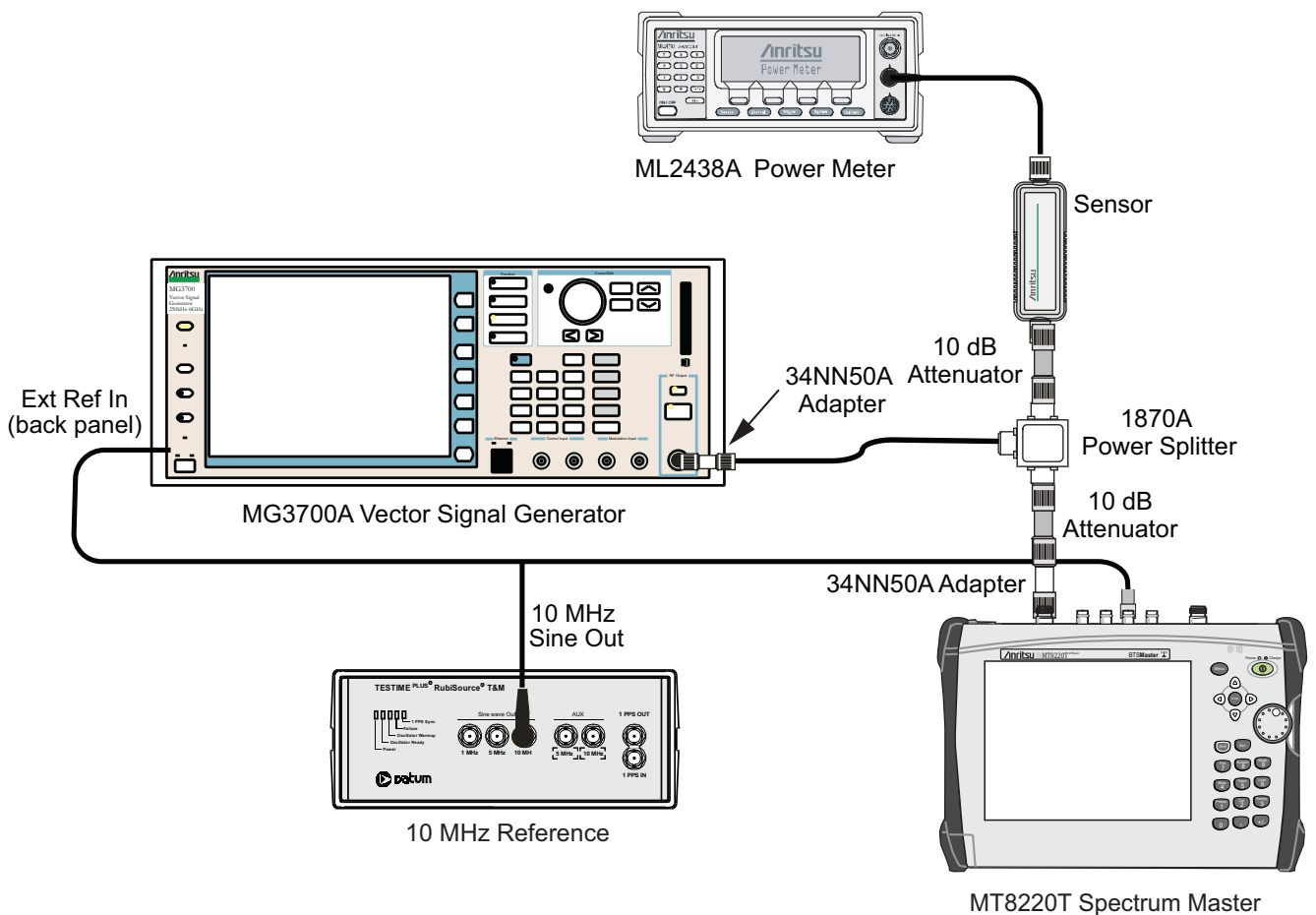


Figure 6-4. WCDMA Occupied Bandwidth, Test Setup

Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 6-4](#).
4. Press the **On/Off** key to turn on the MT8220T 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 corner).
8. Press the **Down Arrow** key to select Yes.
9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
10. Press the (F1) submenu key to select “Load File to Memory”.
11. Press the (F1) submenu key again to select “Select Package”.
12. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the (F6) submenu key, Return.
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the TestModel_1_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, then enter the frequencies from [Table A-45](#), “RF Measurements, WCDMA Occupied Bandwidth (OBW)” on page A-23, starting with 881.5, and press the **MHz** key.
20. Press the **Level** key, then enter -2, and press the **dBm** key.
21. Use the knob to adjust the power level so that the power meter reads -20 dBm. Record the reading in the “Power Meter Reading” column of [Table A-45](#).
22. On MT8220T, press the Center Freq submenu key, and enter the frequencies from [Table A-45](#), starting with 881.5 MHz, then press the **Enter** key.
23. Press the **Measurements** main menu key, then the RF Measurement submenu key, and press Channel Spectrum submenu key.
24. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
25. Record the OBW reading in the “OBW” column of [Table A-45](#) and verify that it is within $4.2 \text{ MHz} \pm 100 \text{ kHz}$.
26. Repeat [Step 19](#) through [Step 25](#) for the other frequencies in [Table A-45](#).

WCDMA RF Channel Power Accuracy

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

Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and zero the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 6-4](#).
4. Press the **On/Off** key to turn on the MT8220T and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
8. Press the **Down Arrow** key to select Yes.
9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
10. Press the (F1) submenu key to select “Load File to Memory”.
11. Press the (F1) submenu key again to select “Select Package”.
12. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the (F6) submenu key, Return.
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the TestModel_1_16DPCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key, and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, then enter 881.5, and press the **MHz** key.
20. Press the **Level** key, then enter -2, and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm, and record the Power Meter reading in the “Power Meter Reading” column of [Table A-46](#), “RF Measurements, WCDMA RF Channel Power Accuracy” on page A-24.
22. On the MT8220T, 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 press ACLR.
24. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power into the “Measured RF Channel Power” column of [Table A-46](#).
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 Channel Power Error” column of [Table A-46](#), and verify that it is within specifications (± 1.25 dB).
28. Repeat [Step 19](#) through [Step 27](#) for the other frequencies.

HSDPA RF Channel Power Accuracy

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

Procedure

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and zero the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 6-4](#).
4. Press the **On/Off** key to turn on the MT8220T, and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
8. Press the **Down Arrow** key to select Yes.
9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
10. Press the (F1) submenu key to select “Load File to Memory”.
11. Press the (F1) submenu key again to select “Select Package”.
12. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the (F6) submenu key, Return.
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the TestModel_5_8HSPDSCH option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, then enter 2680.5, and press the **MHz** key.
20. Press the **Level** key, then enter -2, and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm, and record the Power Meter reading in the “Power Meter Reading” column of [Table A-47](#), “RF Measurements, HSDPA RF Channel Power Accuracy” on page A-24.
22. On the MT8220T, press the Center Freq submenu key, enter 2680.5, and then press the **Enter** key.
23. Press the **Measurements** main menu key, then the RF Measurement submenu key, and press ACLR.
24. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
25. Record the measured CH 1 power in dBm to 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 into the “RF Channel Power Error” column in [Table A-47](#) and verify that it is within specifications (± 1.25 dB).

Error Vector Magnitude (EVM) Verification

The tests in this section can be used to verify the functionality of the WCDMA Demodulator or the HSDPA Demodulator (or both) of the WCDMA/HSDPA Signal Analyzer in the MT8220T BTS Master.

WCDMA EVM 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 zero the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 6-4](#).
4. Press the **On/Off** key to turn on the MT8220T, and wait until the measurement display appears. Then press the **Shift** key, and then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA, and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset submenu key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
8. Press the **Down Arrow** key to select Yes.
9. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
10. Press the (F1) submenu key to select “Load File to Memory”.
11. Press the (F1) submenu key again to select “Select Package”.
12. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
13. Press the **Set** key.
14. Press the (F6) submenu key, Return.
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the TestModel_4_opt option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, then enter 1962.5, and press the **MHz** key.
20. Press the **Level** key, then enter -2, and press the **dBm** key.
21. Use the knob to adjust the power meter to read -20 dBm.
22. On the MT8220T, press the **Center Freq** main menu, enter 1962.5, and then press the MHz submenu key.
23. Press the **Measurements** main menu key, then press the Demodulator submenu key and press the Modulation Summary submenu key.
24. Press the **Setup** main menu key, ensure the Scrambling Code is set to Auto, press the key to toggle it between Auto and Manual.
25. Press the Max Spreading Factor submenu key to set it to 512.
26. Press the **Amplitude** main menu key, then press the Adjust Range submenu key.
27. Record the EVM reading into [Table A-48](#), “Demodulation, WCDMA Error Vector Magnitude (Test Model 4)” on [page A-25](#) and verify that it is within $\pm 2.5\%$.

HSDPA EVM Verification Procedure

1. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
2. Press the **Down Arrow** key to select Yes.
3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).

4. Press the (F1) submenu key to select “Load File to Memory”.
5. Press the (F1) submenu key again to select “Select Package”.
6. Using the **Down Arrow** key, step through the selection list until the WCDMA(BS Tx test) option is highlighted.
7. Press the **Set** key.
8. Press the (F6) submenu key, **Return**.
9. Press the **Set** key.
10. Using the **Down Arrow** key, step through the selection list until the TestModel_5_8HSPDSCH option is highlighted.
11. Press the **Set** key.
12. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
13. Press the **Frequency** key, then enter 1962.5, and press the **MHz** key.
14. Press the **Level** key, then enter -2, and press the **dBm** key.
15. Use the knob to adjust the power meter to read -20 dBm.
16. On the MT8220T, press the **Center Freq** submenu key, enter 1962.5, and then press the **MHz** submenu key.
17. Press the **Measurements** main menu key, then press the **Demodulator** submenu key, and press the **Modulation Summary** submenu key.
18. Press the **Setup** main menu key, then press the **Scrambling Code** is set to Auto, press the key to toggle it between Auto and Manual.
19. Press the **Max Spreading Factor** submenu key to set it to 512.
20. Press the **Amplitude** main menu key, then press the **Adjust Range** submenu key.
21. Record the EVM reading into [Table A-49, “Demodulation, HSDPA Error Vector Magnitude \(Test Model 5\)”](#) on page A-25 and verify that it is within 2.5%.

6-5 Option 882, TDSCDMA Signal Analyzer Verification

The tests in this section verify the function of the optional TDSCDMA Signal Analyzer in Models MT8220T BTS Master. Option 882 is TDSCDMA RF measurements and TDSCDMA Demodulator measurements.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

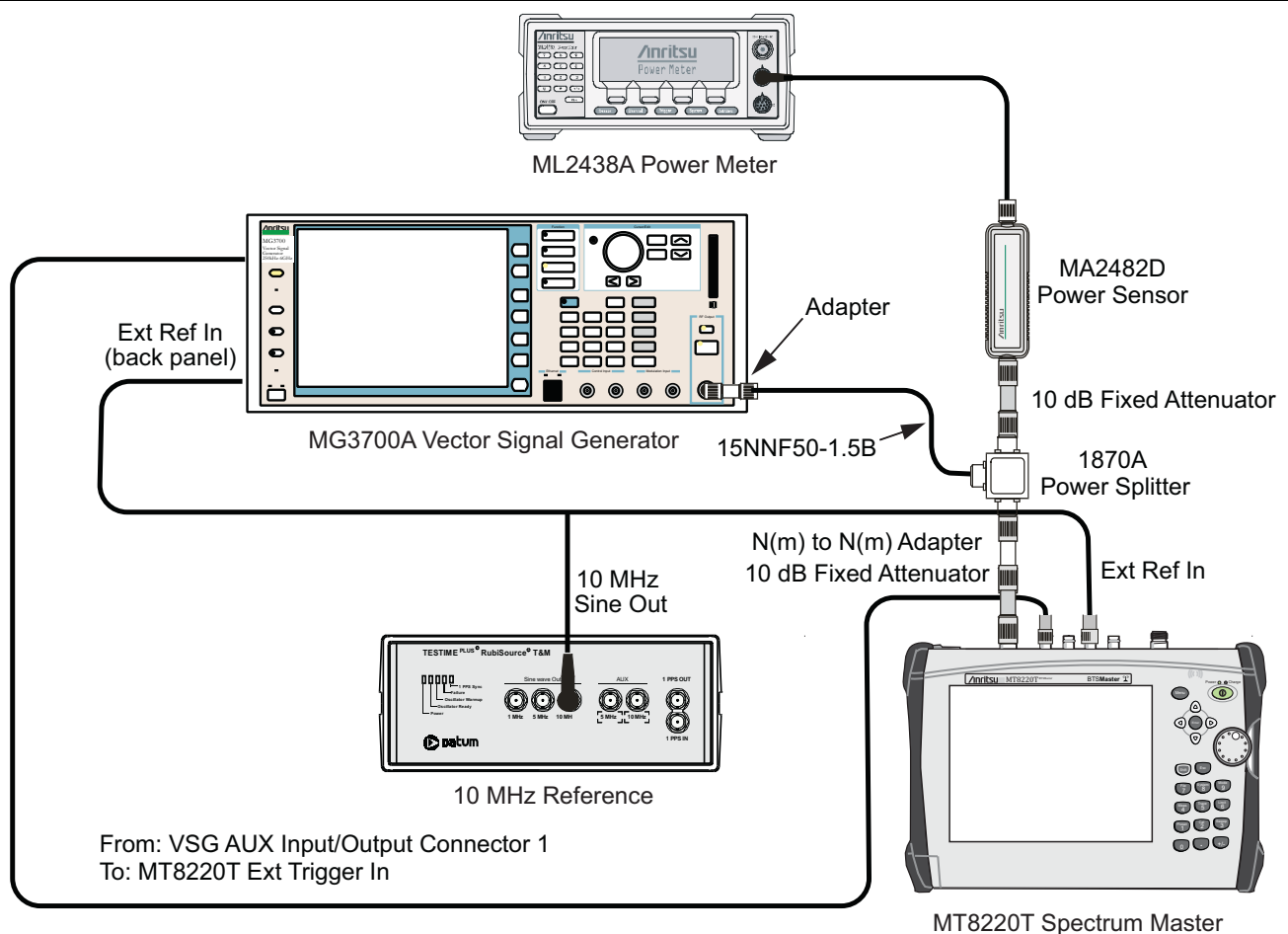


Figure 6-5. TDSCDMA Signal Analyzer Verification, Test Setup

Setup Procedure

1. Zero the power sensor prior to connecting to the power splitter.
2. Connect the equipment as shown in [Figure 6-5](#).
3. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu 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 MT8220T to TDSCDMA Signal Analyzer mode and Preset the instrument.

TDSCDMA Channel Power, Frequency Error, EVM, and Tau Test Procedure

Note The TDSCDMA 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 corner).
7. Press the **Down Arrow** key or turn the knob to select **Yes**.
8. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
9. Press the (F1) submenu key to select “Load File to Memory”.
10. Press the (F1) submenu key again to select “Select Package”.
11. Press the **Down Arrow** key to step through the selection list until the TDSCDMA(MX370001A) option is highlighted.
12. Press the **Set** key.
13. Press the Return (F6) submenu key.
14. Press the **Set** key. The Select Package dialog box appears. Use the rotary knob to highlight TDSCDMA(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 is flashing in the center of the LCD.
17. Press the **Frequency** key and enter 2010 MHz.
18. Press the **Level** key, enter -20, and press the dBm key.
19. Adjust the MG3700A output so that the power meter reads $-45 \text{ dBm} \pm 0.5 \text{ dB}$, and record the actual reading into the “Power Meter Reading” row of [Table A-50](#), “[Option 882, TDSCDMA \(at 2010 MHz, -45 dBm Level\)](#)” on [page A-26](#).
20. On the MT8220T, press the **Freq** main menu key, then press the Center Freq submenu key and enter 2010 MHz as center frequency.
21. Press the **Measurements** main menu key and press the TDSCDMA Summary submenu key (a red dot is displayed on the label).
22. Press the **Setup** hard key and press the Trigger submenu key. Then change Trigger Type to Ext by pressing the Trigger Type submenu key twice (or until Ext is underlined). Then wait 15 seconds to allow the MT8220T to update its measured results.
23. Record the “Displayed Channel Power” into [Table A-50](#), then subtract the “Displayed Channel Power” value from the “Power Meter Reading” in [Step 19](#). Then record the “Calculated Channel Power Error” into [Table A-50](#).
24. Record the Displayed Frequency Error and Tau into [Table A-50](#).
25. Verify that the measured values in [Step 23](#) or [Step 24](#) (or both) are within specifications.

6-6 Option 883, LTE Signal Analyzer Verification

The tests in this section verify the functionality of the FD-LTE Signal Analyzer of the MT8220T BTS Master. There are tests for LTE Channel Power Accuracy Tests and Frequency Error Tests

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

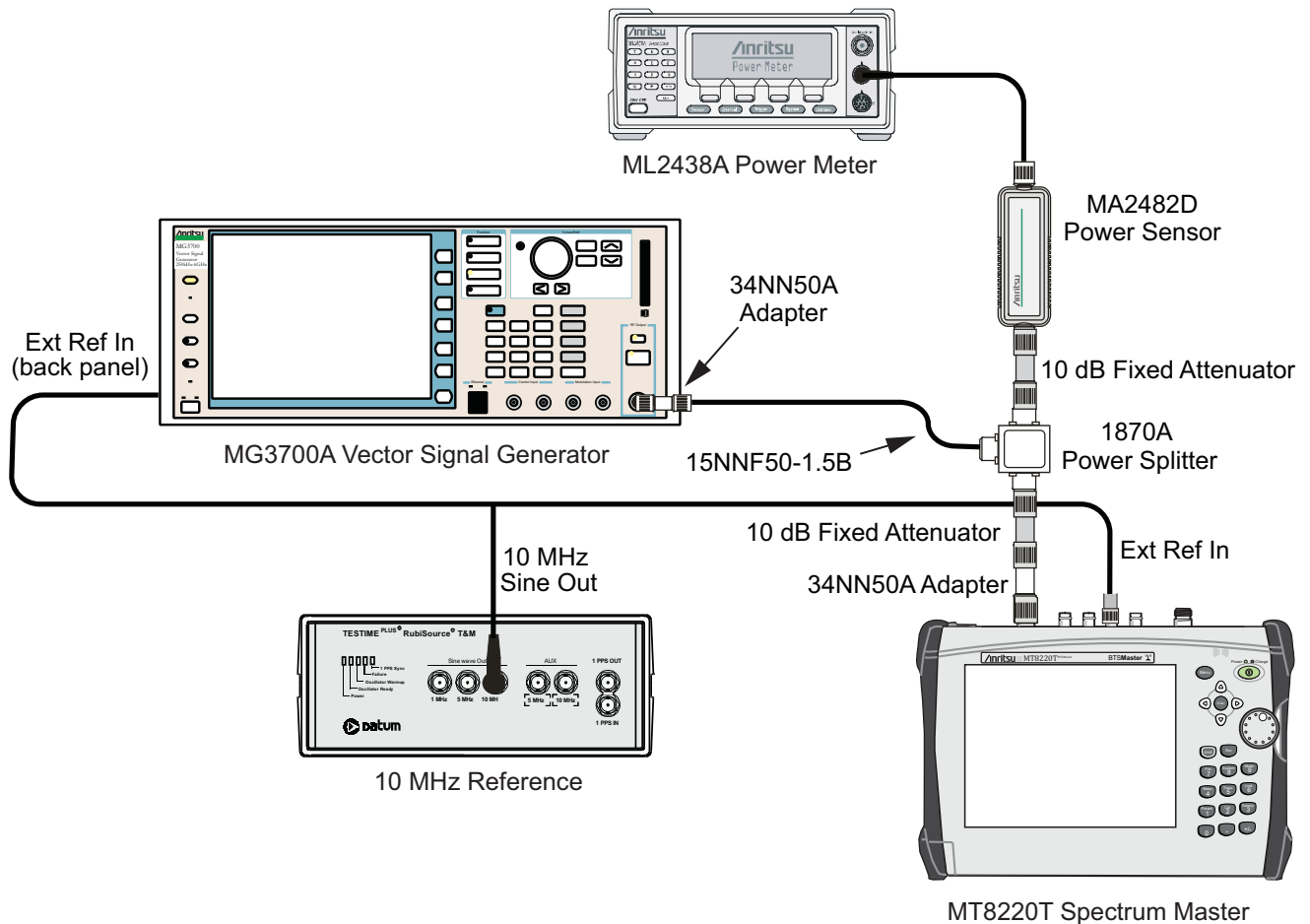


Figure 6-6. LTE Signal Analyzer Verification

LTE Channel Power Accuracy Tests

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MT8220T.

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 6-6](#).

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. Note: Both **Set** keys on the MG3700A perform the same function.
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key “Return”
 - h. Press the **Set** key. The “Select Package” list box will appear. Again select LTE_DL_E-TM and then the **Set** key.
 - i. Another file list will appear. Select (highlight) E-TM_3-1_10M.
 - j. Press the **Set** key.
 - k. Press the MOD On/Off key and verify that the LED is on. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the **Level** key, then enter 2 dBm.
 - n. Turn the output on.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MT8220T to LTE Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq to 750 MHz.
 - b. Press the **Measurements** main menu key and select RF, then select Channel Spectrum.
9. Record the MT8220T Channel Power reading into the column labeled “Measured Channel Power” (row labeled 750 MHz, -15 dBm) in [Table A-51, “RF Measurements, LTE Channel Power Accuracy” on page A-27](#).
10. Calculate the Channel Power Error by subtracting the MT8220T “Channel Power” reading from the power meter reading in [Step 6](#). Record the result into the test record in the column labeled “Error” (row labeled 750 MHz, -15 dBm) in [Table A-51](#).
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 MT8220T Channel Power reading into the test record in the column labeled “Measured Channel Power” (row labeled 750 MHz, –50 dBm) in [Table A-51](#).
14. Calculate the Channel Power Error by subtracting the MT8220T “Channel Power” reading from the power meter reading that was recorded in [Step 12](#). Record the result into the test record in the column labeled “Error” (row labeled 750 MHz, –50 dBm) in [Table A-51](#).
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2150 MHz.
17. Set MG3700A Frequency to 2150 MHz. Press the **Set** key.
18. Change the Center Frequency of the MT8220T to 2150 MHz.
19. Measure the Channel Power for –10 dBm and –50 dBm and then record the measured result and the calculated error into the test record in the column labeled “Measured Channel Power” and in the column labeled “Error” (rows labeled 2150 MHz) in [Table A-51](#).
20. Press the **Setup** main menu key and set the BW to 20 MHz then repeat [Step 5a](#) through [Step 19](#) using the E-TM_3-1_20M pattern for [Step 5i](#).

LTE Frequency Error Tests

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MT8220T BTS Master.

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, 10 dB attenuators (quantity 2), as shown in [Figure 6-6](#).

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. Note: Both **Set** keys on the MG3700A perform the same function.
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key “Return”
 - h. Press the **Set** key. The “Select Package” list box will appear. Again select LTE_DL_E-TM and **Set**.
 - i. Another file list will appear. Select (highlight) E-TM_3-1_10M.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the Level key, then enter 2 dBm.
 - n. Turn the output On.

6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MT8220T to LTE Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq to 750 MHz.
 - b. Press the **Measurements** main menu key and select Modulation.
 - c. Press the Constellation submenu key.
9. Record the MT8220T Frequency Error reading into the section “750 MHz, -15 dBm ” in [Table A-52, “Demodulation, LTE Frequency Accuracy” on page A-28](#).
10. Verify that the values are within specification.
11. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$.
12. Record the MT8220T Frequency Error reading into the section “750 MHz, -50 dBm ” in [Table A-52](#).
13. Verify that the values are within specification.
14. Set the calibration factor frequency of the power sensor to 2150 MHz.
15. Set MG3700A Frequency to 2150 MHz. Press the **Set** key.
16. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.5 \text{ dB}$.
17. Change the Center Frequency of the MT8220T to 2150 MHz.
18. Record the MT8220T Frequency Error reading into the section “2150 MHz, -15 dBm ” in [Table A-52](#).
19. Verify that the values are within specification.
20. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$.
21. Record the MT8220T Frequency Error reading into the section “2150 MHz, -50 dBm ” in [Table A-52](#).
22. Verify that the values are within specification.
23. Press the **Setup** main menu key and set the BW to 20 MHz then repeat [Step 5](#) Substep [a](#) through [Step 22](#) using the E-TM_3-1_20M pattern for [Step 5](#) Substep [i](#).

6-7 Option 883, TD-LTE Signal Analyzer Verification

The tests in this section verify the functionality of the TD-LTE Signal Analyzer of the MT8220T BTS Master. Tests are established for TD-LTE Channel Power Accuracy and Frequency Error.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-6 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

TD-LTE Channel Power Accuracy Tests

The tests in this section verify the function of the optional TD-LTE Signal Analyzer in Model MT8220T.

Setup

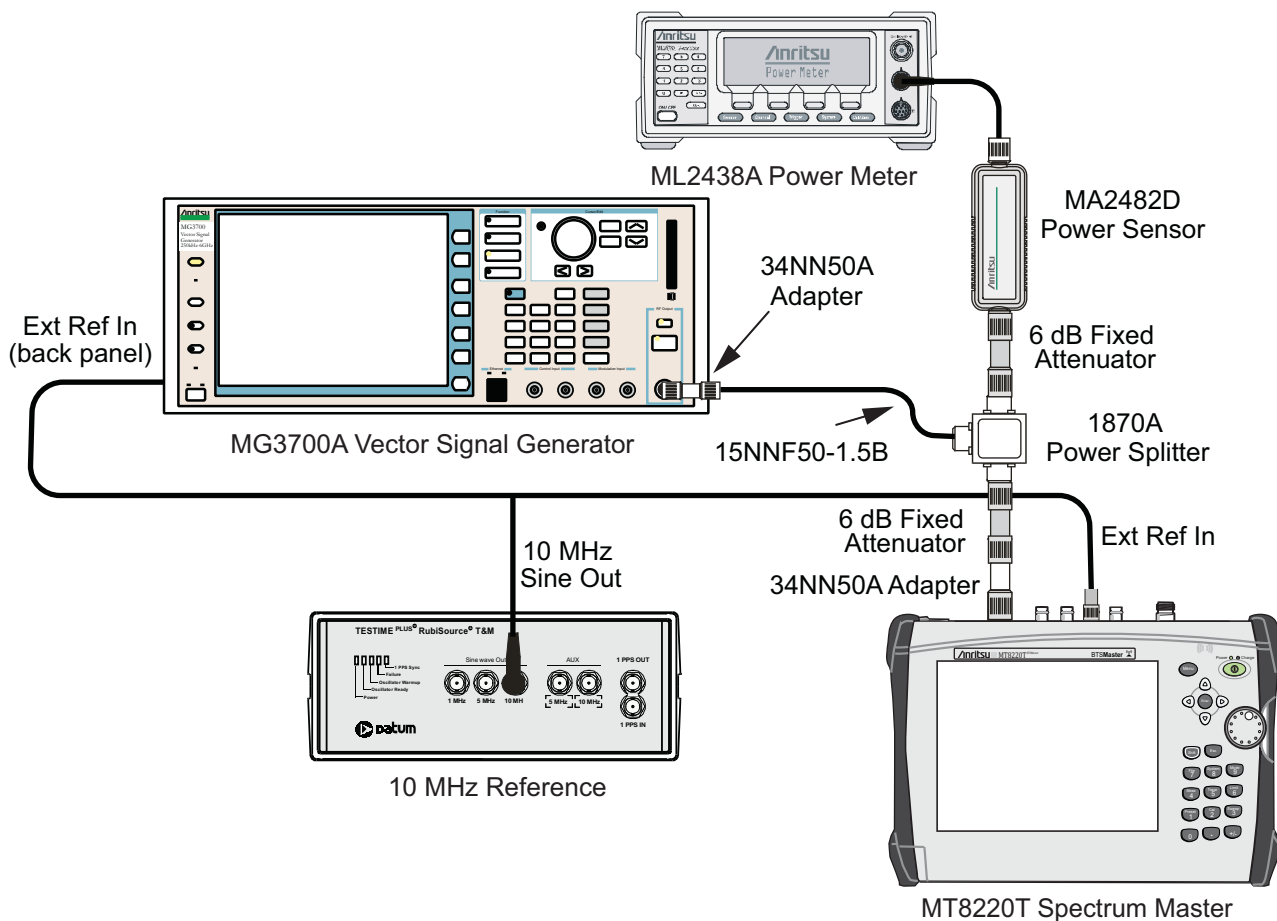


Figure 6-7. TD-LTE Signal Analyzer Verification

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, 6 dB attenuators (quantity 2), as shown in [Figure 6-7](#).

Note The TD-LTE pattern requires a Waveform Data license MX370110A 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. **Note:** Both **Set** keys on the MG3700A perform the same function.
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key “Return”.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select LTE_TDD and then the **Set** key.
 - i. Another file list is displayed. 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. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the **Level** key, then enter 2 dBm.
 - n. Turn on the output.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-12.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MT8220T to TD-LTE Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq to 750 MHz.
 - b. Press the **Measurements** main menu key and select RF, then select Channel Spectrum.
9. Record the MT8220T Channel Power reading into the column labeled “Measured Channel Power” (row labeled 750 MHz, -12 dBm) in [Table A-53, “RF Measurements, TD-LTE Channel Power Accuracy” on page A-29](#).
10. Calculate the Channel Power Error by subtracting the MT8220T “Channel Power” reading from the power meter reading in [Step 6](#). Record the result into the test record in the column labeled “Error” (row labeled 750 MHz, -12 dBm) in [Table A-53](#).
11. Verify that the error is within specification.
12. Adjust the MG3700A Level setting to approximately -18 dBm so that the power meter reads $-30.0 \text{ dBm} \pm 0.5 \text{ dB}$.
13. Record the MT8220T Channel Power reading into the test record in the column labeled “Measured Channel Power” (row labeled 750 MHz, -30 dBm) in [Table A-53](#).
14. Calculate the Channel Power Error by subtracting the MT8220T “Channel Power” reading from the power meter reading that was recorded in [Step 12](#). Record the result into the test record in the column labeled “Error” (row labeled 750 MHz, -30 dBm) in [Table A-53](#).
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2350 MHz.
17. Set MG3700A Frequency to 2350 MHz. Press the **Set** key.
18. Change the Center Frequency of the MT8220T to 2350 MHz.
19. Measure the Channel Power for -12 dBm and -30 dBm and then record the measured result and the calculated error into the test record in the column labeled “Measured Channel Power” and in the column labeled “Error” (rows labeled 2350 MHz) in [Table A-53](#).

20. Press the **Setup** main menu key and set the BW to 20 MHz. Then repeat [Step 5 Substep a](#) through [Step 19](#) by using the TDLTE-E-TM-1-1_20M pattern for [Step 5 Substep i](#).

TD-LTE Frequency Error Tests

The tests in this section verify the function of the optional LTE Signal Analyzer in Model MT8220T BTS Master.

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, 6 dB attenuators (quantity 2), as shown in [Figure 6-7](#).

Note The TD-LTE pattern requires a Waveform Data license MX370110A 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. **Note:** Both **Set** keys on the MG3700A perform the same function.
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key “Return”.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select LTE_TDD and **Set**.
 - i. Another file list is displayed. 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. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the Level key, then enter 2 dBm.
 - n. Turn on the output.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-12.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MT8220T to TD-LTE Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq to 750 MHz.
 - b. Press the **Measurements** main menu key and select Modulation.
 - c. Press the Constellation submenu key.
9. Record the MT8220T Frequency Error reading into the section “750 MHz, -12 dBm ” in [Table A-54](#), “Demodulation, TD-LTE Frequency Accuracy” on page A-30.
10. Verify that the values are within specification.
11. Adjust the MG3700A Level setting to approximately -15 dBm so that the power meter reads $-30.0 \text{ dBm} \pm 0.5 \text{ dB}$.

12. Record the MT8220T Frequency Error reading into the section “750 MHz, –30 dBm” in [Table A-54](#).
13. Verify that the values are within specification.
14. Set the calibration factor frequency of the power sensor to 2350 MHz.
15. Set MG3700A Frequency to 2350 MHz. Press the **Set** key.
16. Adjust the MG3700A Level setting with the knob so that the power meter reads $-12.0 \text{ dBm} \pm 0.5 \text{ dB}$.
17. Change the Center Frequency of the MT8220T to 2350 MHz.
18. Record the MT8220T Frequency Error reading into the section “2350 MHz, –12 dBm” in [Table A-54](#).
19. Verify that the values are within specification.
20. Adjust the MG3700A Level setting to approximately -18 dBm so that the power meter reads $-30.0 \text{ dBm} \pm 0.5 \text{ dB}$.
21. Record the MT8220T Frequency Error reading into the section “2350 MHz, –30 dBm” in [Table A-54](#).
22. Verify that the values are within specification.
23. Press the **Setup** main menu key and set the BW to 20 MHz. Then repeat [Step 5](#) Substep [a](#) through [Step 22](#) by using the TDLTE-E-TM-3-3_20M pattern for [Step 5](#) Substep [i](#).

6-8 Option 884, CDMA Signal Analyzer Verification

The tests in this section verify the optional CDMA Signal Analyzer functions in Model MT8220T BTS Master.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model SC7400
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable
- Power Splitter, Aeroflex/Weinschel Model 1870A

Setup

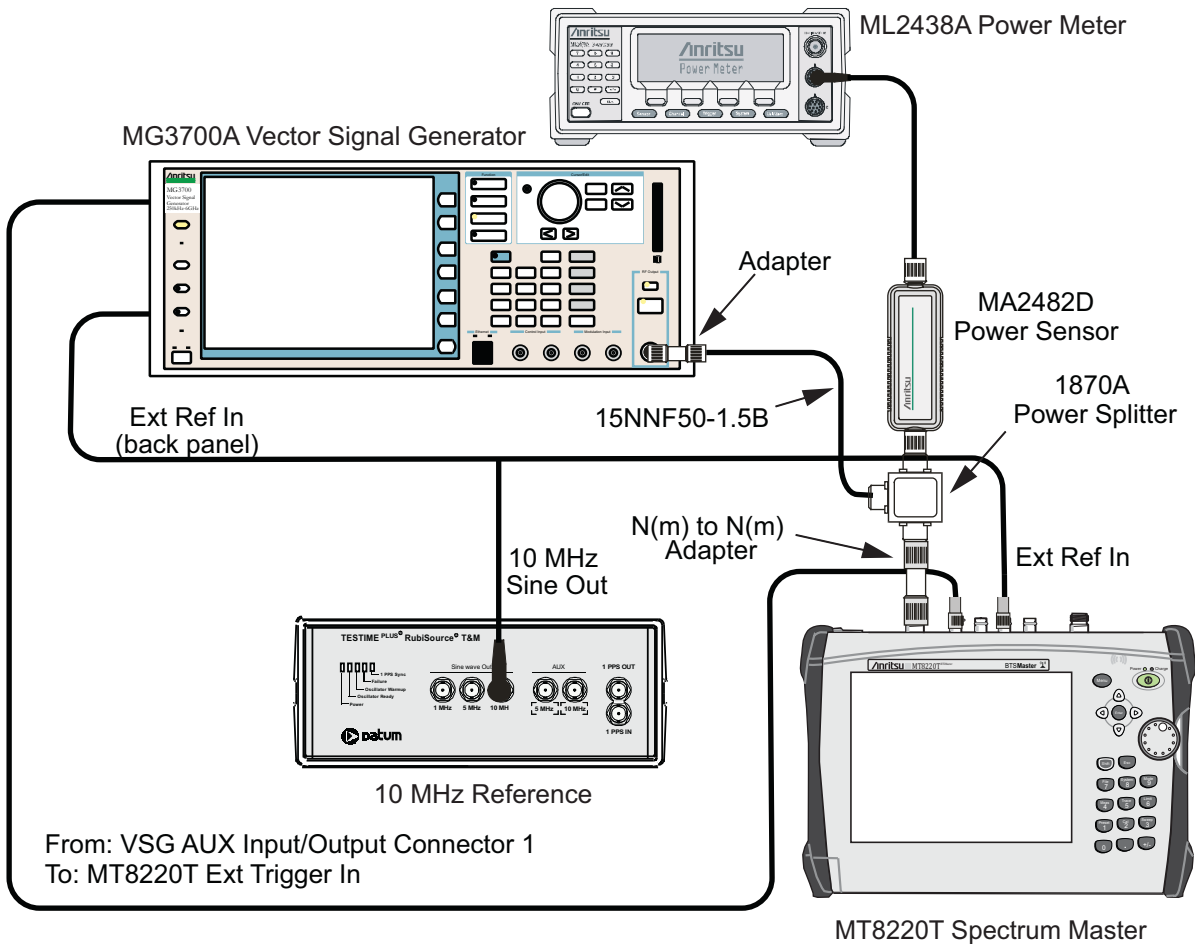


Figure 6-8. CDMA Signal Analyzer, Test Setup

Set up Procedure

1. Zero the power sensor prior to connecting it to the power splitter.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.

3. Connect the equipment as shown in [Figure 6-8](#).
4. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu 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.
5. Set the MT8220T mode to CDMA Signal Analyzer. Preset the instrument.

cdmaOne Channel Power, Frequency Error, Rho and Tau Tests

Test Procedure

1. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
2. Press the **Down Arrow** key or turn the knob to select **Yes**.
3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
4. Press the (F1) submenu key to select “Load File to Memory”.
5. Press the (F1) submenu key again to select “Select Package”.
6. Using the **Down Arrow** key, step through the selection list until the CDMA2000 option is highlighted.
7. Press the **Set** key.
8. Press the (F6) submenu key **Return**.
9. Press the **Set** key. The “Select Package” box is displayed. Use the rotary knob to highlight CDMA2000 and press the **Set** key to select.
10. Another File List is displayed. Use the rotary knob to select FWD_RC1-2_9channel and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn the Modulation LED On and verify that the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, enter 870.03 MHz.
13. Press the **Level** key, enter -30, and press the **dBm** key.
14. Adjust the MG3700A output so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted “Power Meter Reading” into [Table A-55](#), “RF Measurements, At 870.03 MHz, -30 dBm Level, cdmaOne” on page A-31.
15. On the MT8220T, press the **Freq** main menu key and enter 870.03 MHz as Center Freq.
16. Press the **Measurements** main menu key and press CDMA Summary (a red dot is displayed on the label).
17. Press the **Setup** main menu key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger submenu key twice. Wait 15 seconds to allow the MT8220T to update its measured results.
18. Record the “Channel Power Value” into [Table A-55](#), and subtract the displayed “Channel Power Value” from the adjusted “Power Meter Reading” in [Step 14](#). Then record the calculated “Channel Power Error” into [Table A-55](#).
19. Record the displayed Freq Error, Rho, and Tau into [Table A-59](#), “Demodulation, At 870.03 MHz, -30 dBm Level, cdmaOne” on page A-32.
20. Verify that the measured values in [Step 18](#) and [Step 19](#) are within specifications.
21. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
22. Set the MG3700A Frequency to 1930.05 MHz.
23. Adjust the MG3700A output so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted “Power Meter Reading” into [Table A-56](#), “RF Measurements, At 1930.05 MHz, -30 dBm Level, cdmaOne” on page A-31.

24. On the MT8220T, press the **Freq** main menu key, and enter 1930.05 MHz as Center Freq. Then wait 15 seconds to allow the MT8220T to update its measured results.
25. Record the “Channel Power Value” into [Table A-56](#), and subtract the displayed “Channel Power Value” from the adjusted “Power Meter Reading” in [Step 23](#). Then record the calculated “Channel Power Error” into [Table A-56](#).
26. Record the displayed Freq Error, Rho, and Tau into [Table A-60](#), “Demodulation, At 1930.05 MHz, –30 dBm Level, cdmaOne” on page A-32.
27. Verify that the measured values in [Step 25](#) and [Step 26](#) are within specifications.

CDMA2000 Channel Power, Frequency Error, Rho and Tau Tests

Test Procedure

1. Verify that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to “FWD_RC3-5_9channel”.
3. Adjust the level of the MG3700A so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted “Power Meter Reading” into [Table A-57](#), “RF Measurements, At 1930.05, –30 dBm Level, CDMA2000” on page A-31. Then wait 15 seconds to allow the MT8220T to update its measured results.
4. Record the “Channel Power Value” into [Table A-57](#), and subtract the displayed “Channel Power Value” from the adjusted “Power Meter Reading” in [Step 3](#). Then record the calculated “Channel Power Error” into [Table A-57](#).
5. Record the displayed Freq Error, Rho and Tau into [Table A-61](#), “Demodulation, At 1930.05 MHz, –30 dBm Level, CDMA2000” on page A-32.
6. Verify that the measured values in [Step 4](#) and [Step 5](#) are within specifications.
7. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu 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 $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the adjusted “Power Meter Reading” into [Table A-58](#), “RF Measurements, At 870.03 MHz, –30 dBm Level, CDMA2000” on page A-31.
10. On the MT8220T, press the **Freq** main menu key, and enter 870.03 MHz as Center Freq. Then wait 15 seconds to allow the MT8220T to update its measured results.
11. Record the “Channel Power Value” into [Table A-58](#), and subtract the displayed “Channel Power Value” from the adjusted “Power Meter Reading” in [Step 9](#). Then record the calculated “Channel Power Error” into [Table A-58](#).
12. Record the displayed Freq Error, Rho and Tau into [Table A-62](#), “Demodulation, At 870.03 MHz, –30 dBm Level, CDMA2000” on page A-32.
13. Verify that the measured values in [Step 11](#) and [Step 12](#) are within specifications.

6-9 Option 884, EVDO Signal Analyzer Verification

The tests in this section verify the optional EVDO Signal Analyzer functions in Model MT8220T BTS Master.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

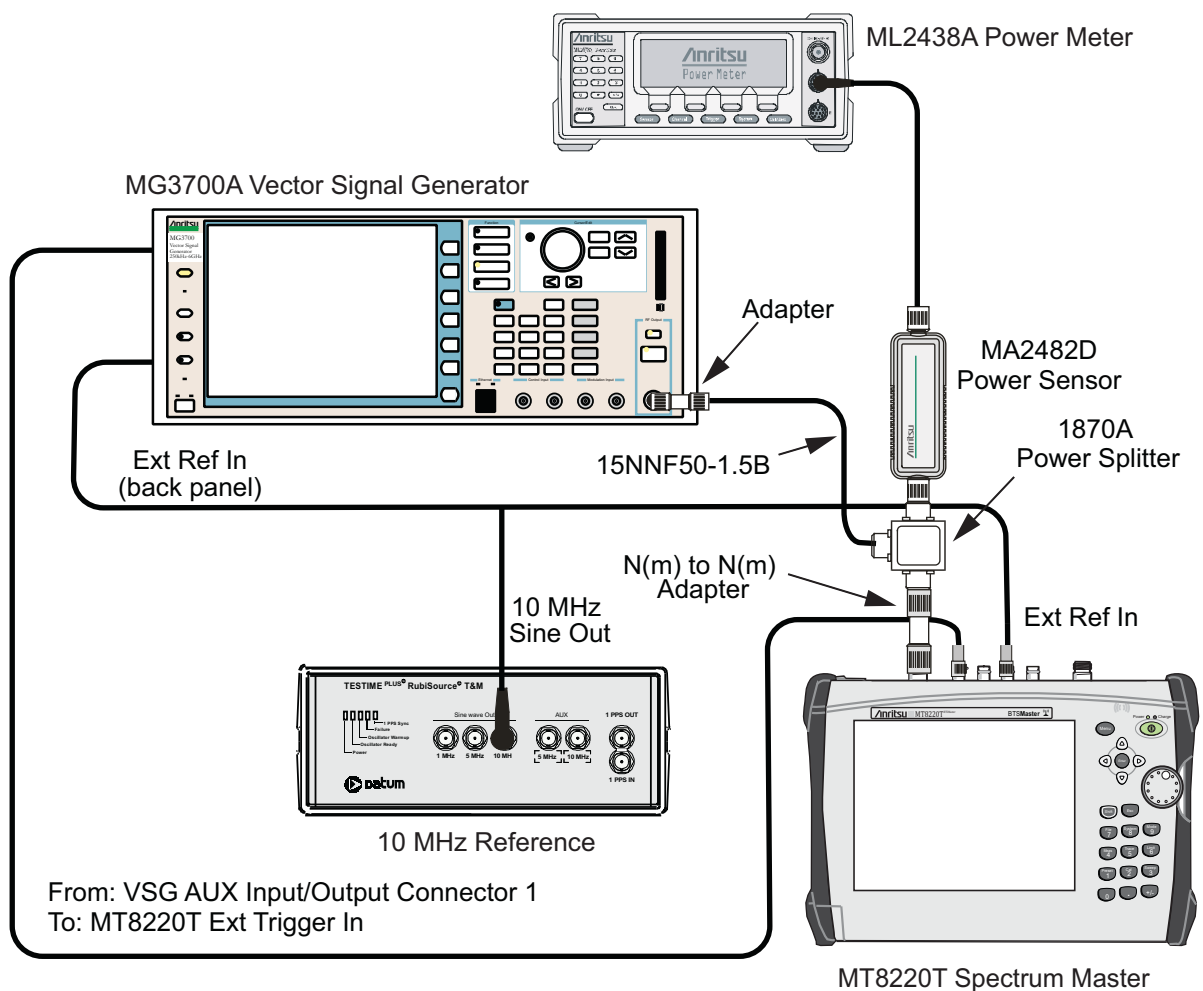


Figure 6-9. EVDO Signal Analyzer, Test Setup

Set up Procedure

1. Zero the power sensor prior to connecting to the power splitter.
2. Connect the equipment as shown in [Figure 6-9](#).
3. On the power meter, press the **Sensor** key, the **Cal Factor** submenu key, and then the **Freq** submenu 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 MT8220T mode to EVDO Signal Analyzer. Preset the instrument.

8PSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure

1. On the MG3700A, press the **Preset** key (Yellow key on the upper-left corner).
2. Press the **Down Arrow** key or turn the knob to select **Yes**.
3. Press the **Set** key (Note that two Set keys are available, and they both do the same thing).
4. Press the (F1) submenu key to select “Load File to Memory”.
5. Press the (F1) submenu key again to select “Select Package”.
6. Using the **Down Arrow** key, step through the selection list until the **CDMA2000_1xEVDO** option is highlighted.
7. Press the **Set** key.
8. Press the (F6) submenu key, **Return**.
9. Press the **Set** key. The **Select Package** box is displayed. Use the rotary knob to highlight **CDMA2000_1xEVDO** and press the **Set** key to select.
10. Another File List is displayed. Use the rotary knob to select **FWD_921_6KBPS_2SLOT** and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn the Modulation LED On, and verify that the “Playing” indicator in the center of the LCD is flashing.
12. Press the **Frequency** key, and enter 870.03 MHz.
13. Press the **Level** key, enter -30, and press the **dBm** key.
14. Adjust the MG3700A output so that the power meter reads -50 dBm ± 0.2 dB, and record the actual value as shown on the power meter into [Table A-63, “RF Measurements, At 870.03 MHz, -50 dBm Level, 921.6 kps 8PSK Modulation”](#) on page A-33.
15. On the MT8220T, press the **Freq** main menu key, and enter 870.03 MHz as **Center Freq**.
16. Press the **Measurements** main menu key, and press **EVDO Summary** (a red dot is displayed on the label).
17. Press the **Setup** main menu key and press **PN Setup**. Then change **PN Trigger** to **Ext** by pressing the **PN Trigger** submenu key twice. Then wait 15 seconds to allow the MT8220T to update its measured results.
18. Record the “MT8220T Reading”, the displayed Channel Power value, into [Table A-63](#).
19. Subtract the “MT8220T Reading” of displayed Channel Power value from the “Power Meter Reading” in [Step 14](#). Then record the “Calculated Channel Power Error” into [Table A-63](#).
20. Record the displayed **Freq Error**, **Rho Pilot** and **Tau** into [Table A-68, “Demodulation, At 870.03 MHz, -50 dBm Level, 921.6 kps 8PSK Modulation”](#) on page A-34.
21. Verify that the measured values in [Step 19](#) and [Step 20](#) are within specifications.

QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure

1. Ensure that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to FWD_38_4KBPS_16SLOT.
3. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu 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 $0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-64, “RF Measurements, At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation” on page A-33.](#)
6. On the MT8220T, press the **Freq** main menu key and enter 1930.05 MHz as Center Freq. Then wait 15 seconds to allow the MT8220T to update its measured results.
7. Record the “MT8220T Reading”, the displayed Channel Power value, into [Table A-64.](#)
8. Subtract the “MT8220T Reading” of displayed Channel Power value from the “Power Meter Reading” in [Step 5.](#) Then record the “Calculated Channel Power Error” into [Table A-64.](#)
9. Record the displayed Freq Error, Rho Pilot and Tau into [Table A-69, “Demodulation, At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation” on page A-34.](#)
10. Verify that the measured values in [Step 8](#) and [Step 9](#) are within specifications.

16QAM Modulation Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, and the MG3700A frequency and MT8220T 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 $-50 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-65, “RF Measurements, At 1930.05 MHz, -50 dBm Level, 2457.6 kps 16QAM Modulation” on page A-33.](#)
4. Then wait 15 seconds to allow the MT8220T to update its measured results.
5. Record the “MT8220T Reading”, the displayed Channel Power value, into [Table A-65.](#)
6. Subtract the “MT8220T Reading” of displayed Channel Power value from the “Power Meter Reading” in [Step 3.](#) Then record the “Calculated Channel Power Error” into [Table A-65.](#)
7. Record the displayed Freq Error, Rho Pilot and Tau into [Table A-70, “Demodulation, At 1930.05 MHz, -50 dBm Level, 2457.6 kps 16QAM Modulation” on page A-35.](#)
8. Verify that the measured values in [Step 6](#) and [Step 7](#) are within specifications.

Idle Slot Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz, and the MG3700A frequency and MT8220T 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 $-50 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-66, “RF Measurements, At 1930.05 MHz, \$-50 \text{ dBm}\$ Level, Idle Slot” on page A-33](#)
4. Then wait 15 seconds to allow the MT8220T to update its measured results.
5. Record the “MT8220T Reading”, the displayed Channel Power value, into [Table A-66](#).
6. Subtract the “MT8220T Reading” of displayed Channel Power value from the “Power Meter Reading” in [Step 3](#). Then record the “Calculated Channel Power Error” into [Table A-66](#).
7. Record the displayed Freq Error, Rho Pilot and Tau into [Table A-71, “Demodulation, At 1930.05 MHz, \$-50 \text{ dBm}\$ Level, Idle Slot” on page A-35](#).
8. Verify that the measured values in [Step 6](#) and [Step 7](#) are within specifications.
9. On the power meter, press the **Sensor** key, the Cal Factor submenu key, and then the Freq submenu key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
10. Set the MG3700A Frequency to 870.03 MHz.
11. Adjust the MG3700A output so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-67, “RF Measurements, At 870.03 MHz, \$-10 \text{ dBm}\$ Level, Idle Slot” on page A-34](#).
12. On the MT8220T, press the **Freq** main menu key, and enter 870.03 MHz as Center Freq. Then wait 15 seconds to allow the MT8220T to update its measured results.
13. Record the MT8220T displayed Channel Power value into [Table A-67](#).
14. Subtract the “MT8220T Reading” of displayed Channel Power value from the “Power Meter Reading” in [Step 11](#). Then record the “Calculated Channel Power Error” into [Table A-67](#).
15. Record the displayed Freq Error, Rho Pilot and Tau into [Table A-72, “Demodulation, At 870.03 MHz, \$-10 \text{ dBm}\$ Level, Idle Slot” on page A-35](#).
16. Verify that the measured values in [Step 14](#) and [Step 15](#) are within specifications.

6-10 Option 885, Fixed WiMAX Signal Analyzer Verification

The tests in this section verify the functionality of the Fixed WiMAX Signal Analyzer of the MT8220T.

Fixed WiMAX Channel Power Accuracy Tests

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

Setup

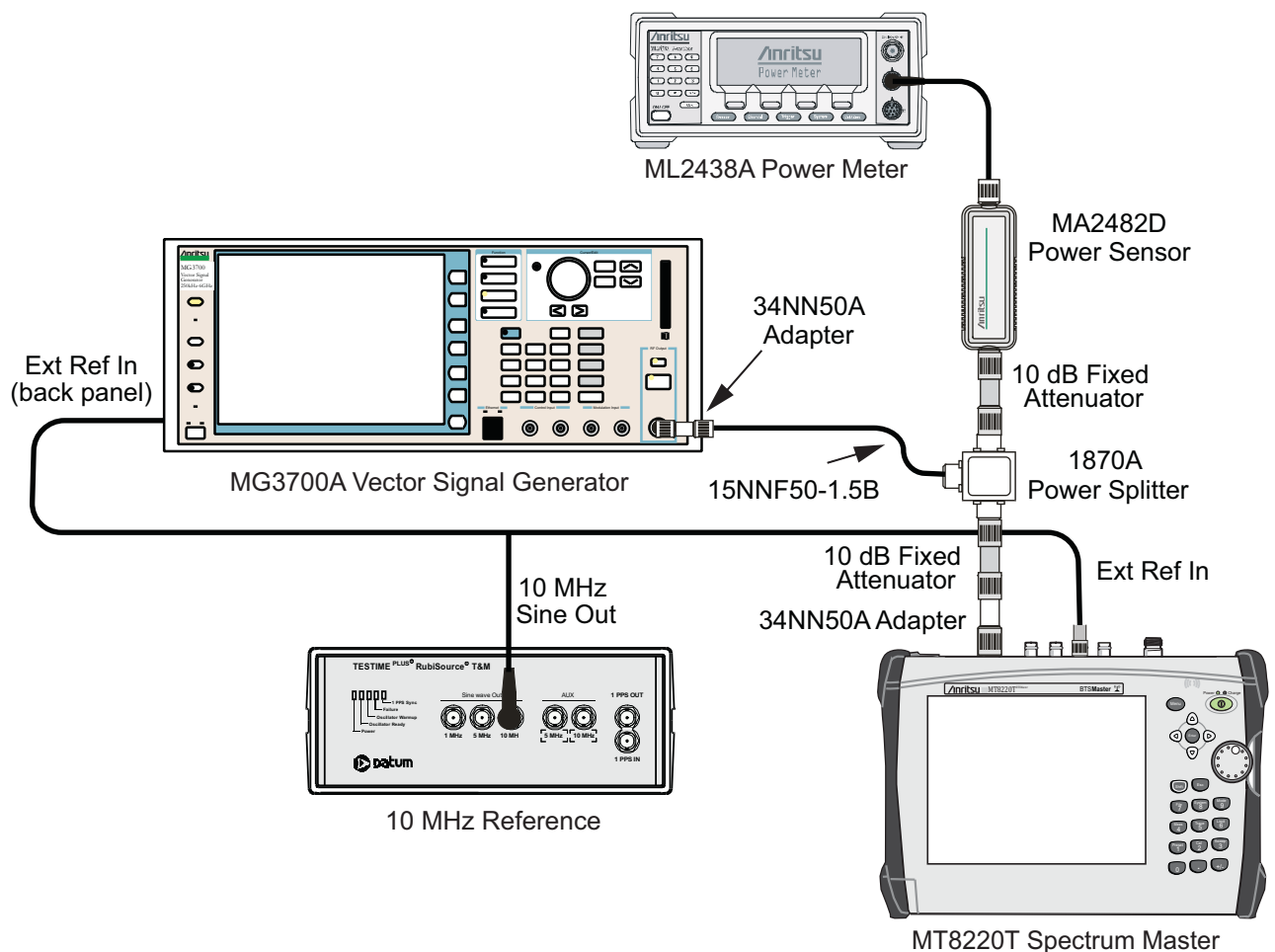


Figure 6-10. Fixed WiMAX Signal Analyzer, Test Setup

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, and 10 dB attenuators (quantity 2) as shown in [Figure 6-10](#).
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) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu key again to select “Select Package”.
 - e. Using the **Down Arrow** key, step through the selection list until WiMAX is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) submenu key, **Return**.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select WiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) Mx10g32.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter 2 dBm. Turn the output On.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual power meter reading into the “Input Power Reading” column of [Table A-73](#), “RF Measurements, Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings” on page A-36.
7. Set the MT8220T to Fixed WiMAX Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu and set the Center Freq 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 (under the **Setup** main menu key) and set the CP Ratio to 1/32.
 - d. Press the **Measurements** main menu key and press RF Measurements, then press Power vs. Time.
9. Record the MT8220T Channel Power (RSSI) reading into the “Measured Channel Power (RSSI)” column in [Table A-74](#), “RF Measurements, Fixed WiMAX Channel Power Accuracy” on page A-36.
10. Calculate the Channel Power Error by subtracting the MT8220T “Measured Channel Power (RSSI)” reading from the power meter reading in [Step 6 \(Table A-73\)](#). Record the result into the “Error” column in [Table A-74](#).
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 , and record the actual power meter reading into the “Input Power Reading” column of [Table A-73](#).
13. Record the MT8220T Channel Power (RSSI) reading into the “Measured Channel Power (RSSI)” column in [Table A-74](#).
14. Calculate the Channel Power Error by subtracting the MT8220T “Measured Channel Power (RSSI)” reading from the power meter reading in [Step 12 \(Table A-73\)](#). Record the result to the “Error” column 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 MG3700A frequency to 3600.5 MHz.
18. Change the center frequency of the MT8220T to 3600.5 MHz.
19. Repeat [Step 6](#) through [Step 15](#) using the 3600.5 MHz setting.
20. Verify that the errors are within specification.
21. Set the calibration factor frequency of the power sensor to 5600.5 MHz.
22. Set MG3700A frequency to 5600.5 MHz.
23. Change the center frequency of the MT8220T to 5600.5 MHz.
24. Repeat [Step 6](#) through [Step 15](#) using the 5600.5 MHz setting.

Fixed WiMAX Residual EVM and Frequency Error Tests

Procedure

1. Connect the 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 Power Sensor, 1870A splitter, and 10 dB attenuators as shown in [Figure 6-10](#).
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) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu key again to select “Select Package”.
 - e. Using the **Down Arrow** key, step through the selection list until WiMAX is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) submenu key, **Return**.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select WiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) Mx10g32.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter 2 dBm. Turn the output On.
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 MT8220T to Fixed WiMAX Signal Analyzer mode and Preset the instrument.
8. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq 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 (under the **Setup** main menu key) and set the CP Ratio to 1/32.
 - d. Press the **Measurements** main menu key, and press **Demodulator**, then press **Modulation Summary**.

9. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-75](#), “Demodulation, Fixed WiMAX Residual EVM” on page A-37.
10. Verify that the measured EVM is within specification.
11. Adjust the MG3700A Level setting to approximately -13 dBm so that the power meter reads -30.0 dBm \pm 0.2 dB.
12. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-75](#).
13. Verify that the measured EVM is within specification.
14. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm \pm 0.2 dB.
15. Record the MT8220T Frequency Error reading into [Table A-76](#), “Demodulation, Fixed WiMAX Frequency Error” on page A-37.
16. Verify that the measured Frequency Error is within specification.
17. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
18. Set MG3700A frequency to 3600.5 MHz.
19. Change the center frequency of MT8220T to 3600.5 MHz.
20. Measure the EVM (rms) for both -15 dBm and -30 dBm, and then record the measured results into [Table A-75](#).
21. Verify that the measured EVM is within specification.
22. Set the calibration factor frequency of the power sensor to 5600.5 MHz.
23. Set MG3700A Frequency to 5600.5 MHz.
24. Adjust the MG3700A Level setting with the knob so that the power meter reads -15.0 dBm \pm 0.2 dB.
25. Change the center frequency of the MT8220T to 5600.5 MHz.
26. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-75](#).
27. Verify that the measured EVM is within specification.
28. Adjust the MG3700A Level setting to approximately -13 dBm so that the power meter reads -30.0 dBm \pm 0.2 dB.
29. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-75](#).
30. Verify that the measured EVM is within specification.
31. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm \pm 0.2 dB.
32. Record the MT8220T Frequency Error reading into [Table A-76](#).
33. Verify that the measured Frequency Error is within Specification.

6-11 Option 885, Mobile WiMAX Signal Analyzer Verification

Mobile WiMAX Channel Power Accuracy Tests

The tests in this section verify the functionality of the Mobile WiMAX Signal Analyzer of the MT8220T BTS Master.

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

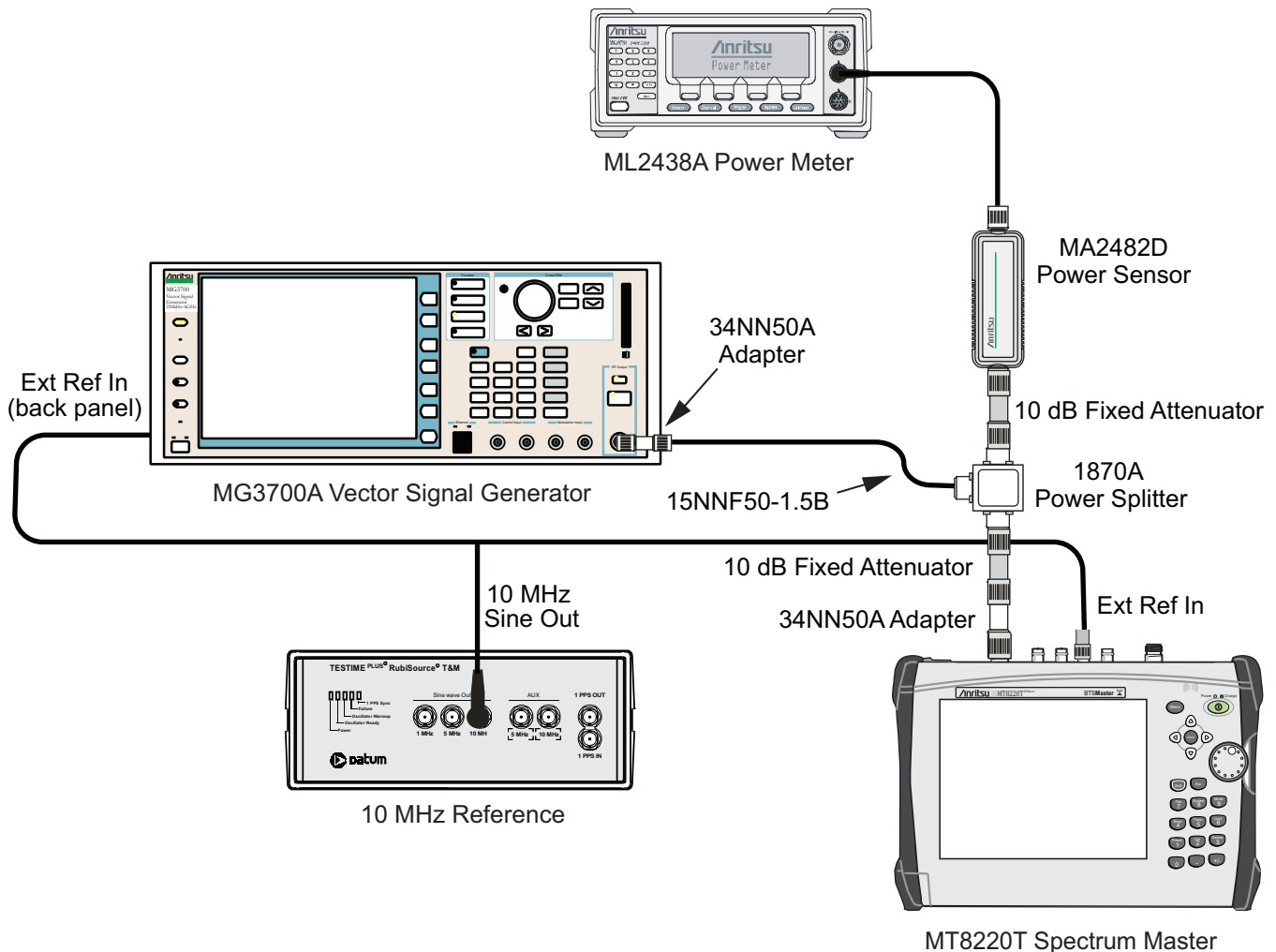


Figure 6-11. Mobile WiMAX Channel Power Accuracy Test Setup

Setup

1. Connect the Power Sensor to the power meter and zero the sensor.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to **256**.
3. Set the calibration factor frequency of the power sensor to 2600.5 MHz.
4. Connect all of the test equipment as shown in [Figure 6-11](#).

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

Procedure

1. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key, Return.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select mWiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) “10m1024g8_0_10_cap”.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter 2 dBm. Turn the output On.
2. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-77, “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error \(2600.5 MHz and \$-15.0 \text{ dBm}\$ \)”](#) on page A-38.
3. Set the MT8220T to Mobile WiMAX Signal Analyzer mode and Preset the instrument.
4. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq 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, press RF, and then press Power vs. Time.
5. Record the “MT8220T Reading”, the displayed Channel Power (RSSI) value, into [Table A-77](#).
6. Calculate the Channel Power Error by subtracting the “MT8220T reading” from the “Power Meter Reading” in [Step 2](#). Record the result into [Table A-77](#).
7. Verify that the error is within specification.
8. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads $-50.0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value as shown on the power meter into [Table A-78, “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error \(2600.5 MHz and \$-50.0 \text{ dBm}\$ \)”](#) on page A-38.
9. Record the “MT8220T Reading”, the displayed Channel Power (RSSI) value, into [Table A-78](#).

10. Calculate the Channel Power Error by subtracting the “MT8220T Reading” of Channel Power (RSSI) from the “Power Meter Reading” in [Step 8](#). Record the “Calculated Channel Power Error” into [Table A-78](#).
11. Verify that the error is within specification.
12. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
13. Set MG3700A Frequency to 3600.5 MHz.
14. Change the center frequency of MT8220T to 3600.5 MHz.
15. Measure the Channel Power (RSSI) for both –15 dBm and –50 dBm, and then record the measured results and calculated errors into [Table A-79](#), “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –15.0 dBm)” on page A-38 and [Table A-80](#), “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –50.0 dBm)” on page A-38.
16. Verify that the errors are within specification.

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

Procedure

1. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key, **Return**.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select mWiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) 5m512g8_2_5_cap.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter 2 dBm. Turn the output On.
2. Adjust the MG3700A Level setting with the knob so that the power meter reads –15.0 dBm ± 0.2 dB, and record the actual value as shown on the power meter into [Table A-81](#), “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –15.0 dBm)” on page A-39.
3. Set the MT8220T to Mobile WiMAX Signal Analyzer mode and preset the instrument.
4. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq 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, press RF, then press Power vs. Time.
5. Record the “MT8220T Reading”, the displayed Channel Power (RSSI) value, into [Table A-81](#).
6. Calculate the Channel Power Error by subtracting the “MT8220T reading” from the “Power Meter Reading” in [Step 2](#). Record the result into [Table A-81](#).

7. Verify that the error is within specification.
8. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm \pm 0.2 dB, and record the actual value as shown on the power meter into [Table A-82, “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error \(2600.5 MHz and \$-50.0\$ dBm\)”](#) on page A-39.
9. Record the “MT8220T Reading”, the displayed Channel Power (RSSI) value, into [Table A-82](#).
10. Calculate the Channel Power Error by subtracting the “MT8220T Reading” of Channel Power (RSSI) from the “Power Meter Reading” in [Step 8](#). Record the “Calculated Channel Power Error” into [Table A-82](#).
11. Verify that the error is within specification.
12. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
13. Set MG3700A Frequency to 3600.5 MHz.
14. Change the Center Frequency of MT8220T to 3600.5 MHz.
15. Measure the Channel Power (RSSI) for both -15 dBm and -50 dBm, and then record the measured results and calculated errors into [Table A-83, “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and \$-15.0\$ dBm\)”](#) on page A-39 and [Table A-84, “RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and \$-50.0\$ dBm\)”](#) on page A-39.
16. Verify that the errors are within specification.

Mobile WiMAX Residual EVM and Frequency Error Tests

Equipment Required for MT8220T

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Anritsu 34NN50A 50 ohm Adapter (2)
- Anritsu 15NNF50-1.5B RF Coaxial Cable
- BNC male to BNC male Coaxial Cable

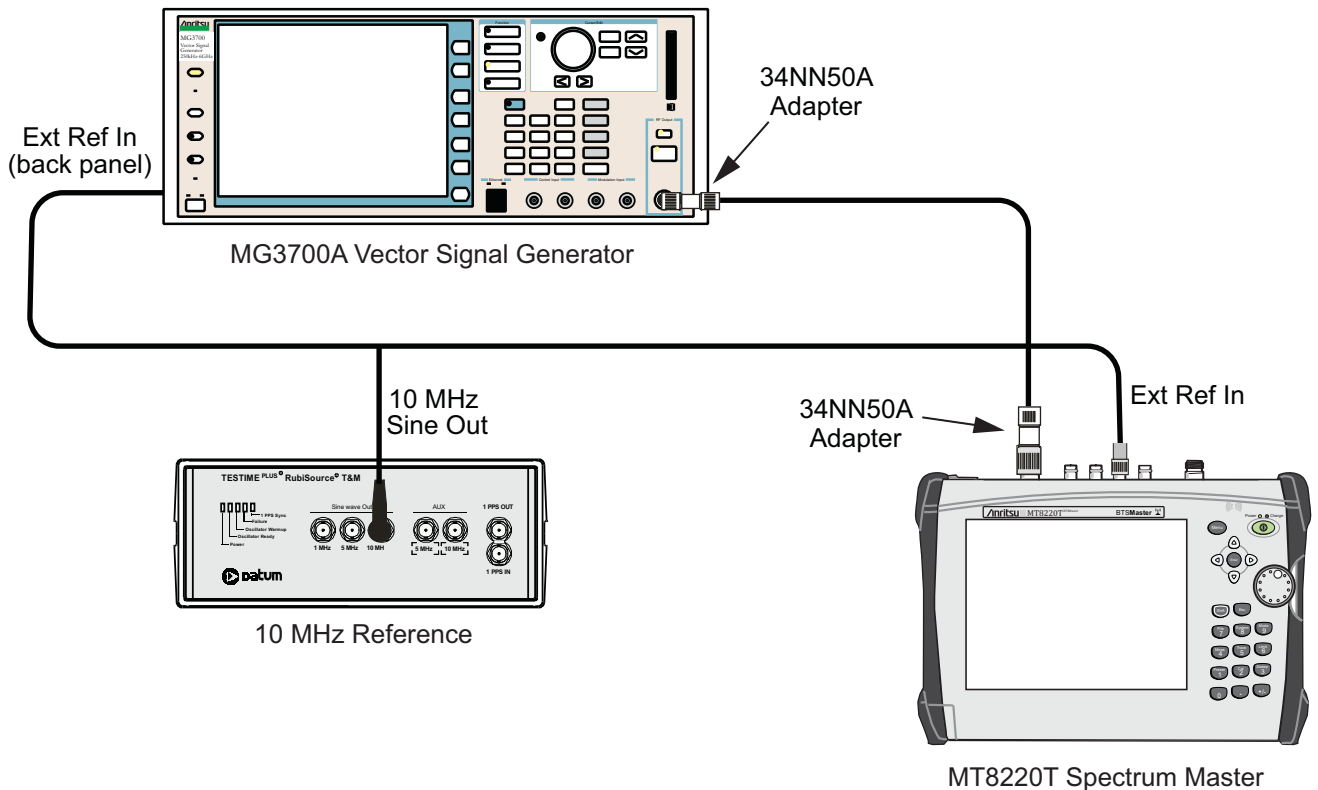


Figure 6-12. Mobile WiMAX Residual EVM Test Setup

Setup Procedure

1. Connect the 10 MHz Reference to the 10 MHz/5 MHz Ref Input of the MG3700A and the Ext Ref In of the MT8220T as shown in [Figure 6-12](#).
2. Connect the RF Out of the MG3700A to the Spectrum Analyzer RF In connector of the MT8220T.

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

3. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key, **Return**.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select mWiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) 10m1024g8_0_10_cap.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter 2 dBm. Turn the output On then adjust the level until the power meter reads $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$.
4. Set the MT8220T to Mobile WiMAX Signal Analyzer mode and Preset the instrument.
5. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq 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 (under the **Setup** main menu key) and set the CP Ratio 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 press Demodulator, then press Modulation Summary.
6. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-85, “Demodulation, Mobile WiMAX Residual EVM \(10 MHz Bandwidth and 10 ms Frame Length\)”](#) on page A-40.
7. Verify that the measured EVM is within specification.
8. Adjust the MG3700A Level until the power meter reads $-30.0 \text{ dBm} \pm 0.2 \text{ dB}$.
9. Record the MT8220T EVM (rms) reading into the “EVM (rms)” column in [Table A-85](#).
10. Verify that the measured EVM is within specification.
11. On the MT8220T, press the **Setup** main menu key, and set Demod to Auto.
12. Adjust the MG3700A Level until the power meter reads $-50.0 \text{ dBm} \pm 0.2 \text{ dB}$.
13. Record the MT8220T frequency error reading to the “Frequency Error” column in [Table A-86, “Demodulation, Mobile WiMAX Frequency Error \(10 MHz Bandwidth and 10 ms Frame Length\)”](#) on page A-40.
14. Verify that the measured Frequency Error is within specification.
15. Set MG3700A Frequency to 3600.5 MHz.
16. On the MT8220T, change the Center Frequency to 3600.5 MHz.
17. Press the **Setup** main menu key and set Demod to FCH.

18. Measure the EVM(rms) for both -15 dBm and -30 dBm, and then record the measured results into [Table A-86](#).
19. Verify that the measured EVM is within specification.
20. Repeat [Step 11](#) through [Step 14](#) to measure the Frequency Error at 3600.5 MHz.

Residual EVM and Frequency Error (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) submenu key to select “Load File to Memory”.
 - d. Press the (F1) submenu 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) submenu key, Return.
 - h. Press the **Set** key. The “Select Package” list box is displayed. Again select mWiMAX and press **Set**.
 - i. Another file list is displayed. Select (highlight) 5m512g8_2_5_cap.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the “Playing” indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter -15 dBm adjust the level until the power meter reads -15 dBm \pm 0.2 dB. Turn the output On.
22. Set the MT8220T as follows:
 - a. Press the **Freq** main menu key and set the Center Freq to 2600.5 MHz.
 - b. Press the **Setup** main menu key and set the Bandwidth to 5 MHz.
 - c. Press the CP Ratio submenu key (under the **Setup** main menu key) and set the CP Ratio 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, press Demodulator, then press Modulation Summary.
23. Repeat [Step 6](#) through [Step 20](#), recording the results into [Table A-87](#), “Demodulation, Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)” on page A-40 and [Table A-88](#), “Demodulation, Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)” on page A-40.

Chapter 7 — Battery Information

7-1 General Information

The following information relates to the care and handling of the Anritsu 633-75 battery pack and Lithium-Ion batteries.

- The battery supplied with the BTS Master may need charging before use. Before using the BTS Master, the internal battery may be charged either in the unit using the AC-DC Adapter (40-174-R) or the 12-Volt DC adapter (806-62), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the BTS Master or in an Anritsu approved charger.
- When the BTS 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.

7-2 Battery Pack Removal and Replacement

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

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

1. Locate the battery access door illustrated in [Figure 7-1](#).



Figure 7-1. Battery Access Door Location and Finger Notch

2. With the BTS Master laying flat and face up on a stable surface, grab the battery access door notch and pull the battery door down towards the bottom of the instrument as shown in [Figure 7-2](#).



Figure 7-2. Opening the Battery Access Door

3. Remove the battery access door as shown [Figure 7-3](#).

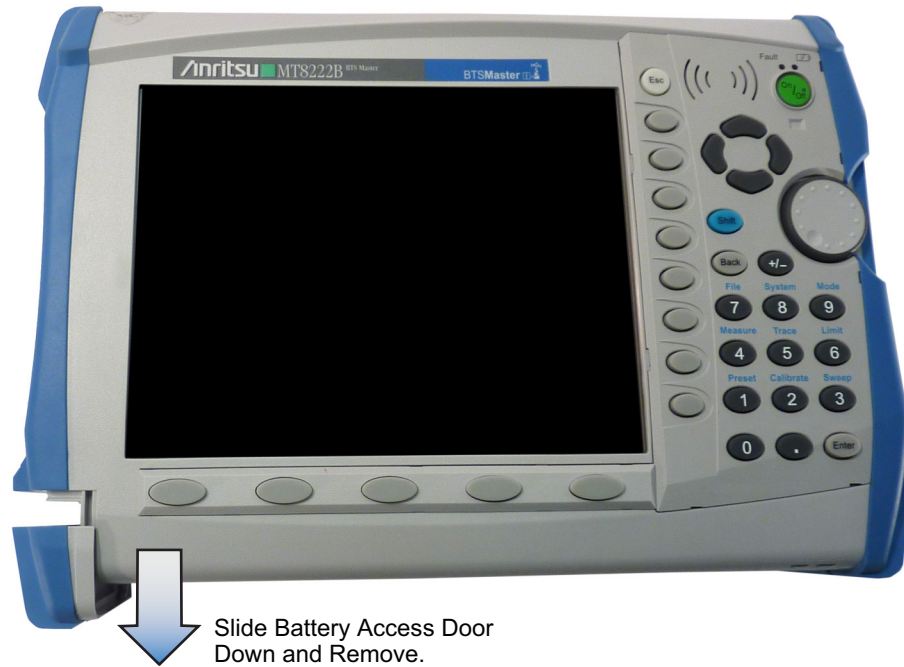


Figure 7-3. Removing the Battery Access Door

4. With the battery access door completely removed, grasp the battery lanyard and pull the battery straight out of the unit, as illustrated in [Figure 7-4](#).



Figure 7-4. Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the battery with the contacts facing the bottom of the unit, refer to [Figure 7-5](#).

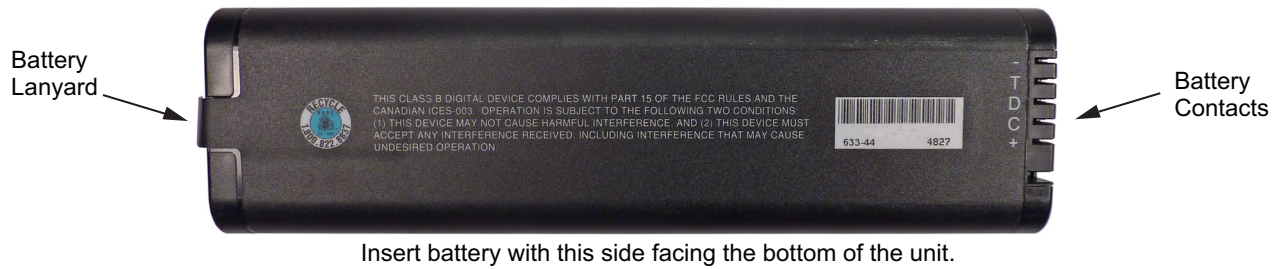


Figure 7-5. Battery Contacts and Orientation

Chapter 8 — Assembly Replacement

8-1 Introduction

This chapter describes opening and closing the BTS Master case along with basic parts replacement steps. The sections are as follows:

- [“Replaceable Parts List” on page 8-1](#)
- [“Opening the BTS Master Case” on page 8-1](#)
- [“SPA and VSG Module Assembly Replacement ” on page 8-5](#)
- [“Main PCB Assembly Replacement” on page 8-7](#)
- [“GPS Module Replacement ” on page 8-9](#)
- [“Fan Assembly Replacement ” on page 8-9](#)
- [“LCD Assembly Replacement ” on page 8-9](#)
- [“Keypad Membrane and Main Keypad PCB Replacement ” on page 8-12](#)
- [“Touch Screen Replacement ” on page 8-14](#)

8-2 Replaceable Parts List

Refer to [Table 1-5, “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 show instruments other than the BTS Master.

Caution

Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in [Table 1-5](#) are typically the only items that may be replaced. As they are highly fragile, items that must be soldered may not be replaced without specialized training.

Removing RF shield from PC boards or adjustment of screws on or near the shields may detune sensitive RF circuits and will result in degraded performance. All work should be performed in a static-safe work area.

8-3 Opening the BTS Master Case

Caution

Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument.

The BTS Master contains components that can easily be 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.

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

This procedure provides instructions for opening the BTS 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 7-2 “Battery Pack Removal and Replacement”](#) on page 7-2.
2. Place the BTS Master face down on a stable work surface that will not scratch the display.
3. Use a Phillips screwdriver to remove the four screws securing the two halves of the BTS Master case together ([Figure 8-1](#)).

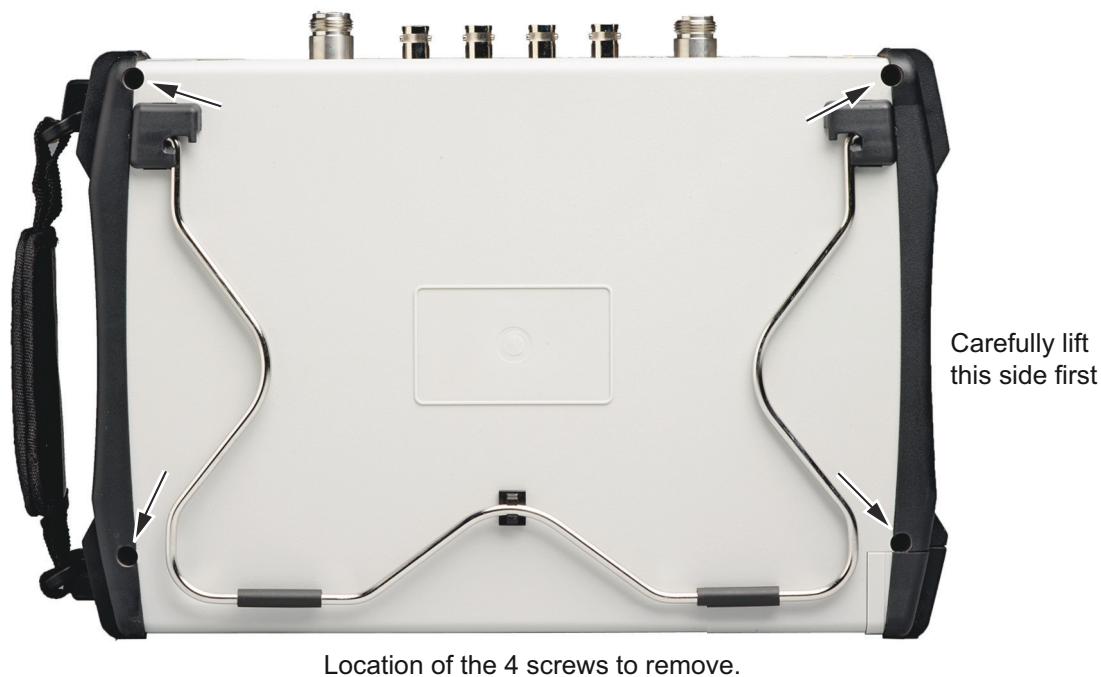


Figure 8-1. Remove the Four Screws

4. Carefully lift up on the side of the case shown and begin to separate the two halves.

Caution

Do not force or pull the two halves of the case apart completely, there are delicate cables attached between the two halves that must be disconnected first. Refer to [Figure 8-2](#) and [Figure 8-3](#).
Note the position and routing of the cables, they should be similarly routed when the unit is reassembled.

- Partially open the case and carefully disconnect the ribbon cable that connects the Spectrum Analyzer Assembly to the Main PCB Assembly. The cable is attached between the two sides of the BTS Master.

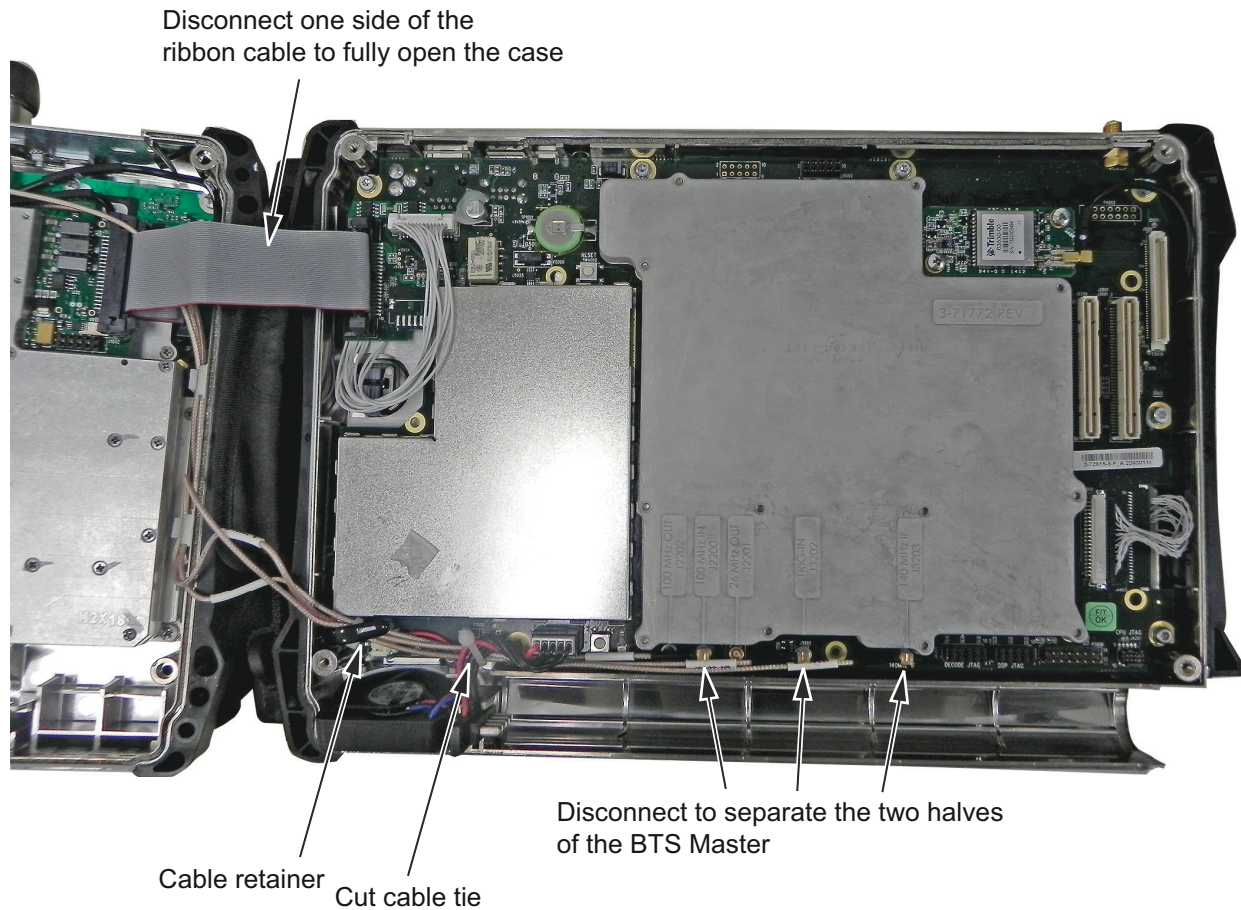


Figure 8-2. Disconnect the Cables Between the Two Halves of the BTS Master

- The BTS Master can now be fully opened and laid flat.
- Carefully disconnect the 3 connectors at the bottom of the Main PCB Assembly. Note the cable routing in the cable retainer and the location where each cable is connected.
- The two halves of the instrument can now be safely separated ([Figure 8-3](#)). Refer to the following sections of this chapter to remove and replace specific components of the instrument.

Note Proper routing of the cables is important for instrument performance. Note the cable routing.

- Reverse the above steps to reassemble the case.

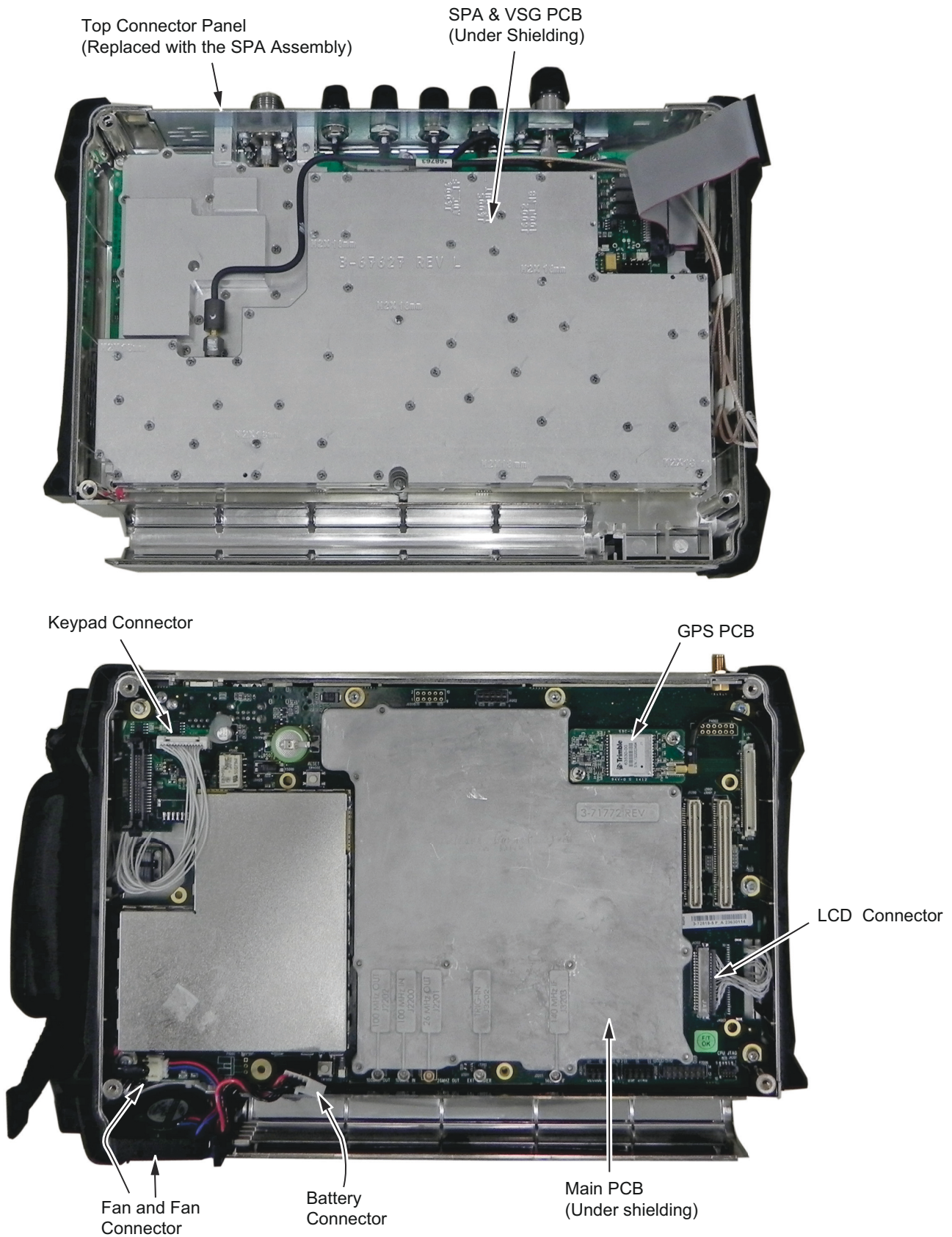


Figure 8-3. SPA Analyzer PCB Assembly (Top) and Main PCB Assembly (Bottom)

8-4 SPA and VSG Module Assembly Replacement

This procedure provides instructions for removing and replacing the Spectrum Analyzer (SPA) and Vector Signal Generator (VSG) Module Assembly as a single entity. The Vector Signal Generator Module Assembly is mounted on top of the Spectrum Analyzer Module Assembly which are located in the back half of the case and includes the Top Connector Panel.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Use a Phillips screwdriver to remove the six screws securing the Spectrum Analyzer Module Assembly to the back half of the instrument case ([Figure 8-4](#)).

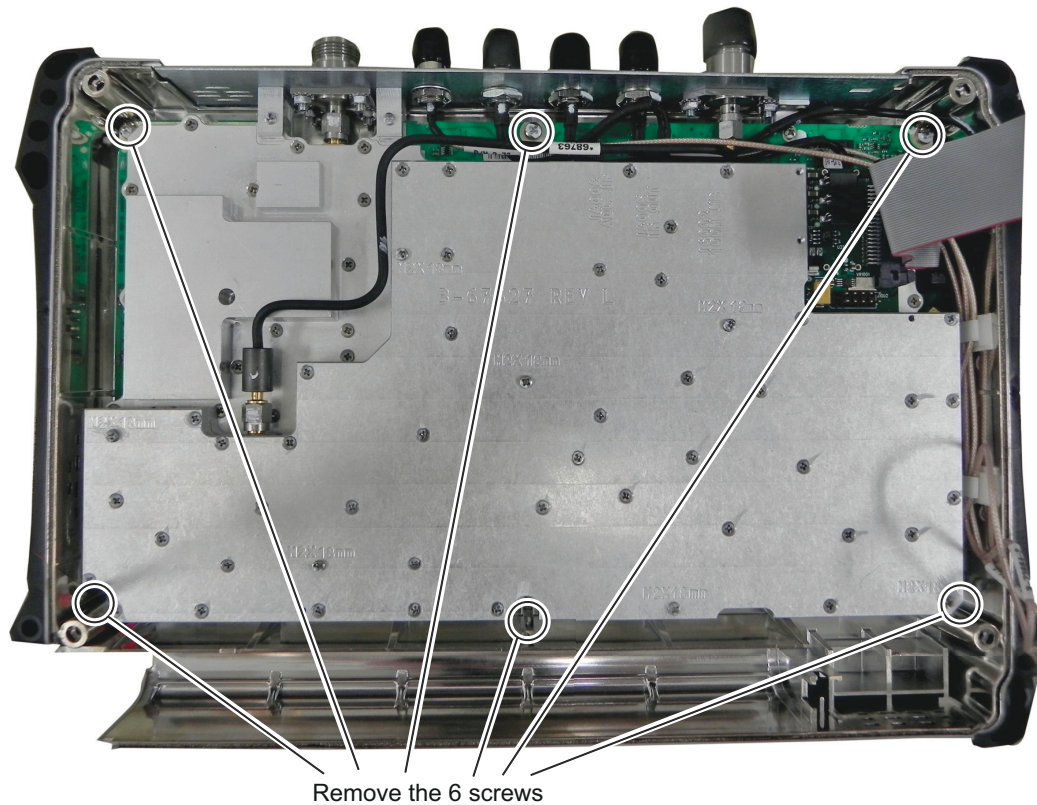


Figure 8-4. Spectrum Analyzer and Vector Signal Generator Module Assembly

3. Carefully lift up the SPA/VSG Module Assembly and attached top connector panel to complete removal of the SPA/VSG Module Assembly.

4. Release the cables from the retaining clips when removing the module.([Figure 8-5](#)).

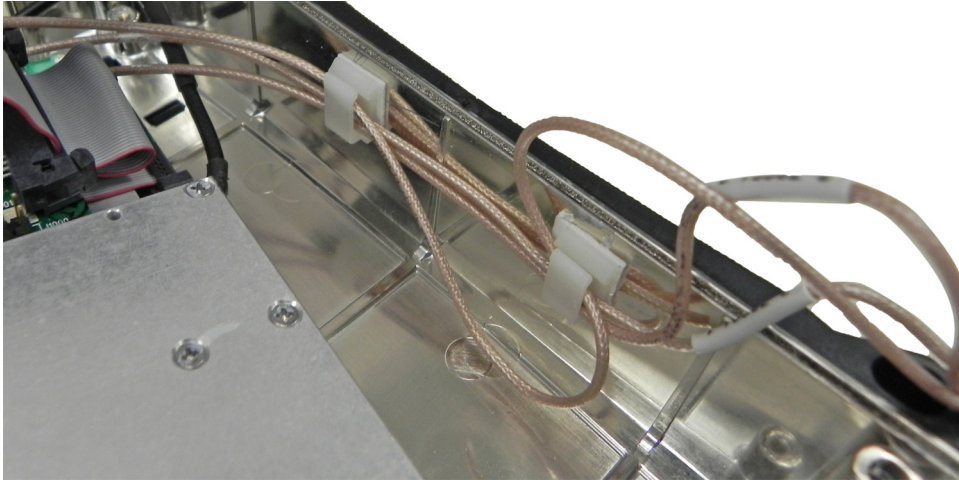


Figure 8-5. Spectrum Analyzer and Vector Signal Generator PCB Assembly

5. Reverse the above steps to install the new SPA/VSG Module Assembly.

Note	There is an RF gasket material between the two halves of the case, and in the connector panel grooves. Take care not to remove or damage this material when removing or replacing the Spectrum Analyzer Module and connector panel assembly.
-------------	--

8-5 Main PCB Assembly Replacement

This procedure provides instructions for replacing the Main PCB assembly. The Main PCB assembly is located in the front panel half of the instrument.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the GPS PCB cable from the Main PCB. Reattach and reroute the cable on the replacement Main PCB Assembly.
3. Disconnect the Fan connector on the Main PCB Assembly ([Figure 8-6](#)).
4. Disconnect the Keypad connector on the Main PCB Assembly.
5. Disconnect the Battery connector on the Main PCB Assembly.
6. Disconnect the LCD connector on the Main PCB Assembly.

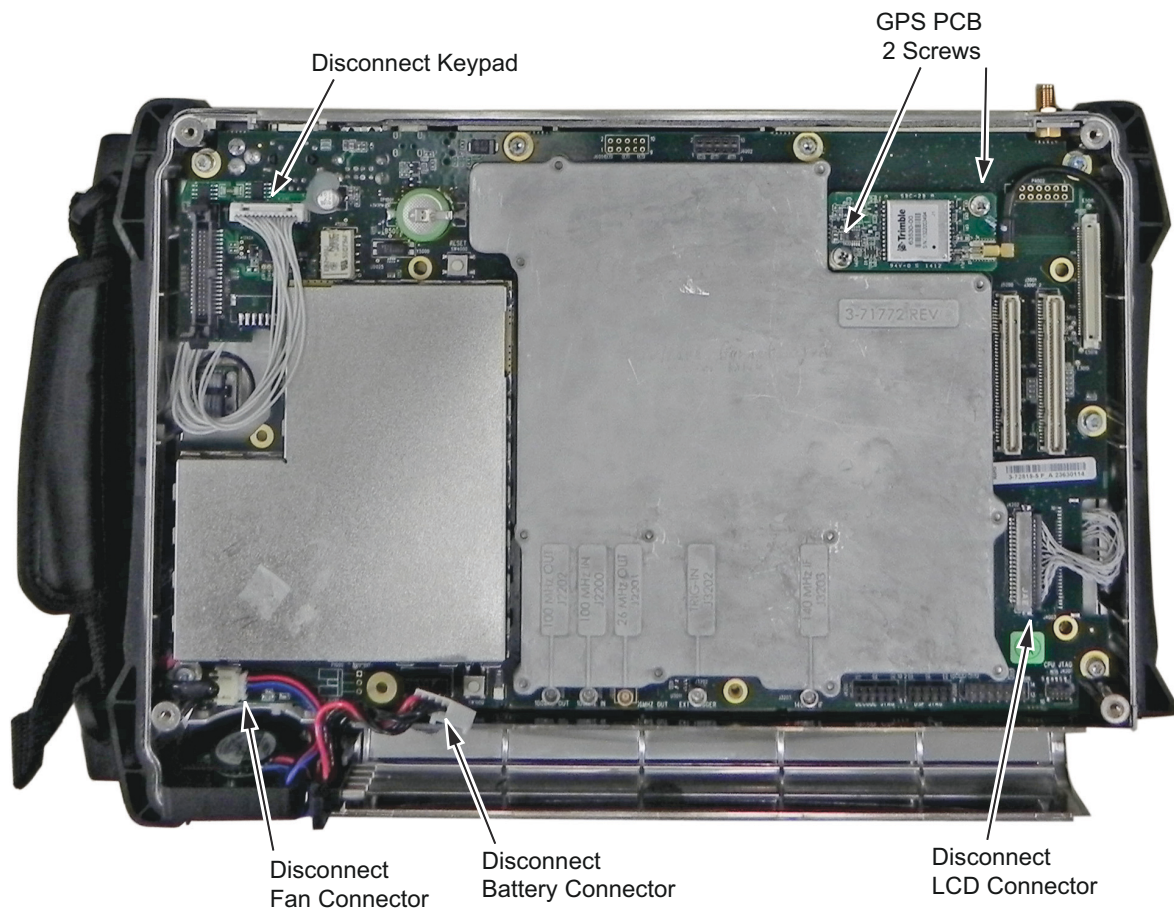


Figure 8-6. Disconnect the Cable Connectors on the Main PCB Assembly

7. Remove the 7 Torx (T10) screws retaining the Main PCB Assembly to the BTS Master case (Figure 8-7).

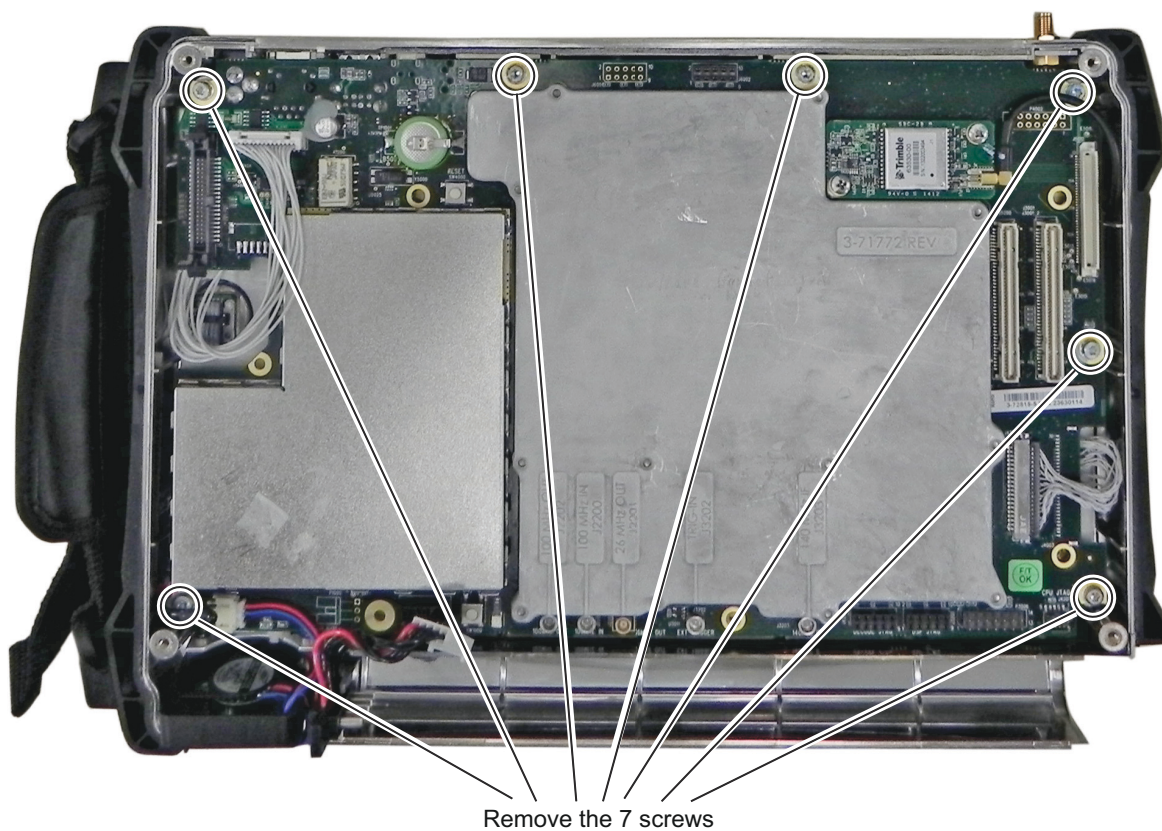


Figure 8-7. Remove the 7 Screws Retaining the Main PCB Assembly

8. Pull the Main PCB assembly out of the Front Panel section.
9. Replacement is the reverse of removal.

8-6 GPS Module Replacement

Although the GPS module is standard on every unit, this procedure provides instructions for removing and replacing the GPS module from the BTS Master.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the SMA cable attached to the side of the GPS module.
3. Remove the 2 screws securing the GPS Module to the Main PCB Assembly.
4. Carefully lift straight up on the GPS module to remove it. The back of the GPS module is directly connected to the Main PCB Assembly.
5. Replacement is the reverse of the removal. If you need to replace the GPS cable assembly continue with the following steps.
6. Remove the SMA cable attached to the side of the GPS module.
7. Remove the Main PCB assembly from the front panel as described in [Section 8-5 “Main PCB Assembly Replacement”](#).
8. Use a 5/16 inch wrench (~ 8 mm) to remove the nut and washer holding the GPS SMA connector to the front case.
9. Pull the GPS SMA connector out of the hole in the front case.
10. Replacement is the reverse of the removal. Torque the SMA connector nut to 7.5 in/lbs (0.85 Nm).

8-7 Fan Assembly Replacement

This procedure provides instructions for removing and replacing the Fan Assembly from the BTS Master.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the fan cable assembly attached to the Main PCB Assembly.
3. Remove the 2 screws securing the Fan Assembly to the top case .
4. Carefully tilt and lift out the Fan Assembly module to remove it.
5. Replacement is the reverse of the removal.

8-8 LCD Assembly Replacement

This procedure provides instructions for removing and replacing the Liquid Crystal Display (LCD) once the Main PCB assembly has been separated from the BTS Master.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the Main PCB assembly from the front panel as described in [Section 8-5 “Main PCB Assembly Replacement”](#).

3. Remove the 6 Torx screws securing the LCD Bracket to the front case.

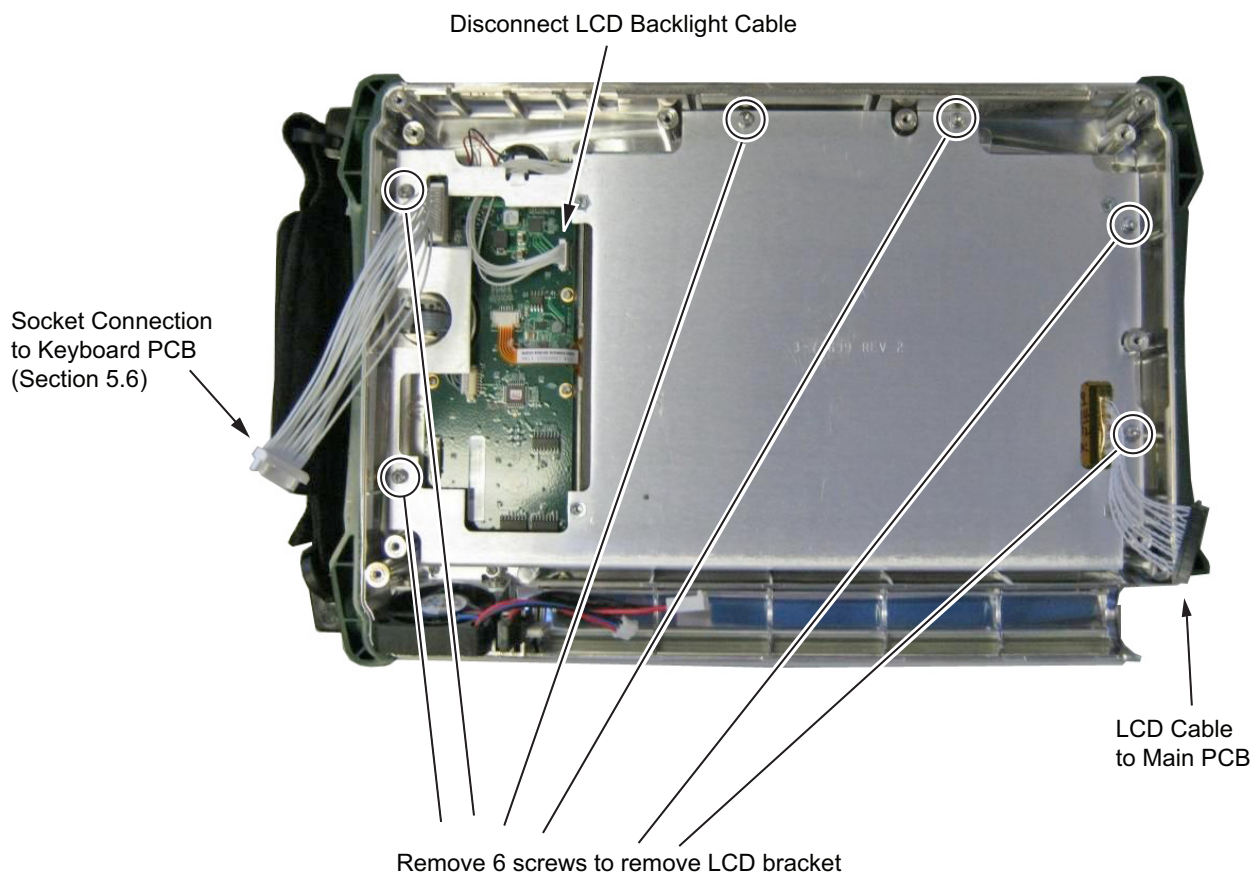


Figure 8-8. Remove LCD Bracket Screws

5. Remove the LCD bracket assembly and turn the LCD bracket assembly.

6. Remove the four screws securing the LCD Display to the bracket assembly (Figure 8-9).

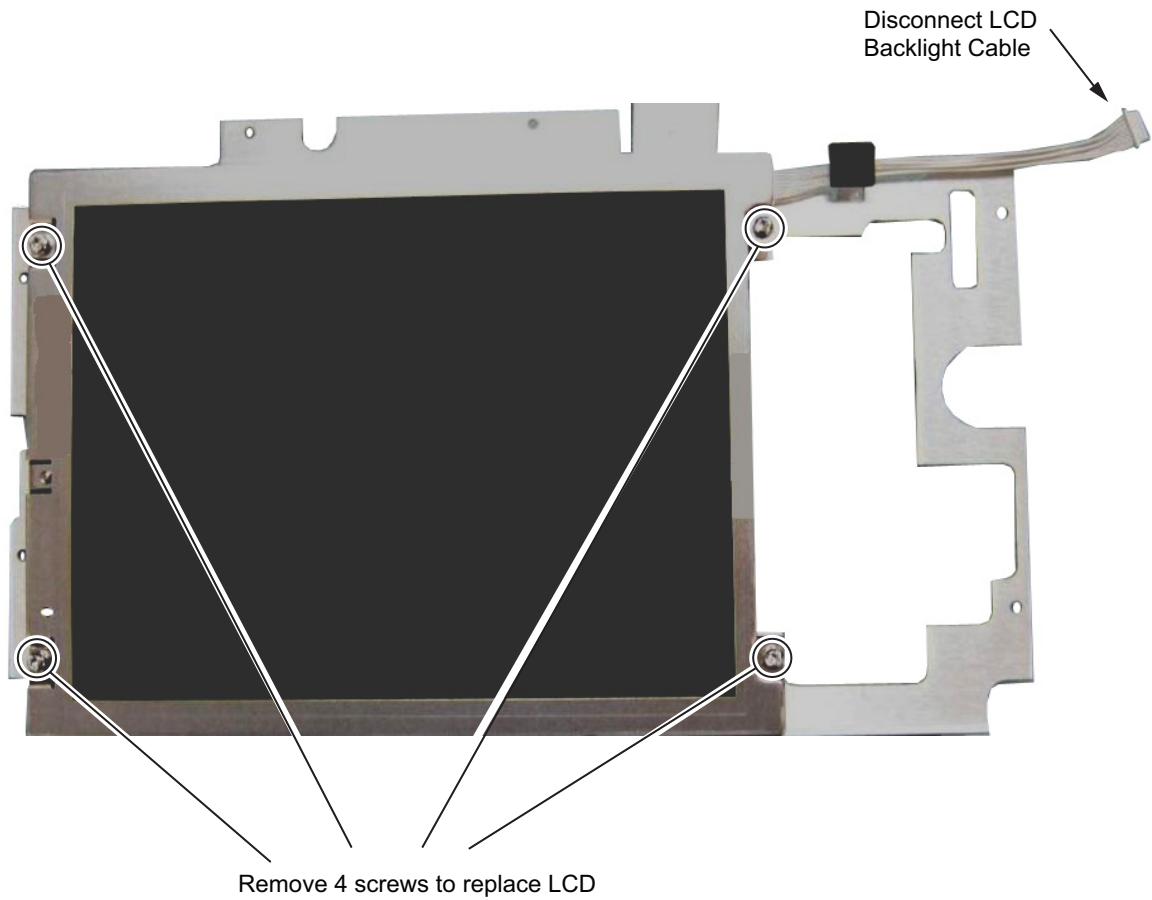


Figure 8-9. Replacing the LCD

7. Carefully remove the LCD, and disconnect the LCD backlight cable and the LCD cable from the LCD.
8. 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 assembly is reattached to the front panel.

8-9 Keypad Membrane and Main Keypad PCB Replacement

This procedure provides instructions for removing and replacing the keypad membrane and PCB.

Note The keypad PCB and membrane can be replaced without opening the BTS Master case.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the Main PCB assembly from the front panel as described in [Section 8-5 “Main PCB Assembly Replacement”](#).
3. Remove the LCD bracket assembly from the front panel as described in [Section 8-8 “LCD Assembly Replacement”](#).

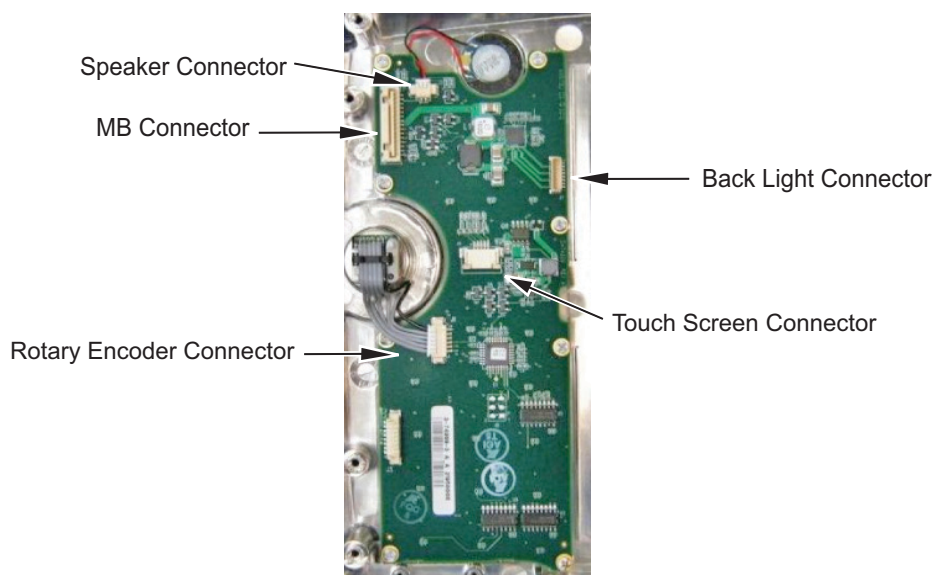


Figure 8-10. Keypad PCB Connectors

4. Remove the Rotary Encoder, Speaker, Touch Screen and Main Board connectors from the Keypad PCB. Note that the Touch Screen connector has two locking tabs that must be pulled down (out) before removing the connector from the Keypad PCB. See [Figure 8-12](#) for Touch Screen cable connection.

- Remove the 8 screws securing the Keypad PCB to the front panel and carefully lift it out. The rubber Keypad Membrane is located under the Keypad PCB (Figure 8-11).

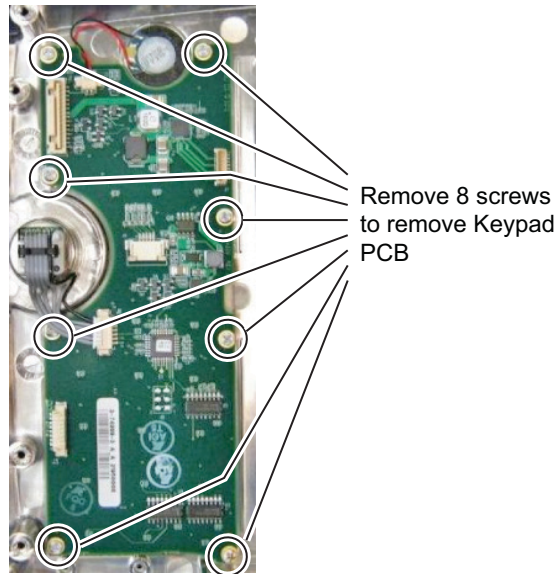


Figure 8-11. Keypad PCB

- Reverse the above steps to install the replacement assembly, with the following cautions:

Pull tabs down to remove Touch Screen cable

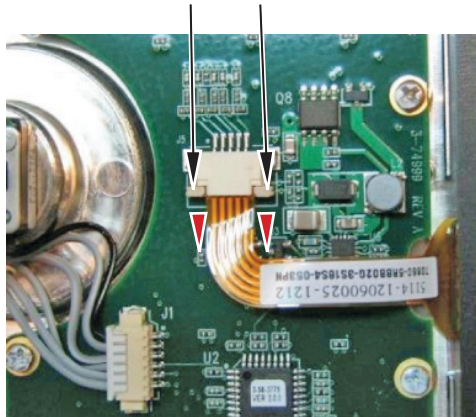


Figure 8-12. Keypad Touch Screen Connector

- Carefully close the locking tab on connector J5 to secure the flexible Touch Screen connection. The tab should “snap” into position when fully closed.
- 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 an instrument, 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 re boot the instrument.” If this message is displayed, power off the instrument and simultaneously holding down the **Shift-4-0** keys while pressing the power on button. Now the instrument will boot up in bootstrap mode and prompt you to perform a touch-screen calibration. After following the on-screen calibration directions, power the instrument off and it will boot up correctly on the next power on cycle.
- If the Keypad PCB was replaced with a PCB that has touch screen calibration data, the instrument will boot up correctly, but the touch-screen calibration data will be invalid. Perform a touch-screen calibration by pressing the **Shift** key and then the **0** key, follow the on-screen directions.

8-10 Touch Screen Replacement

This procedure provides instructions for replacing the touch screen.

1. Open the case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. Remove the Main PCB assembly from the front panel as described in [Section 8-5 “Main PCB Assembly Replacement”](#).
3. Remove the LCD bracket assembly from the front panel as described in [Section 8-8 “LCD Assembly Replacement”](#).
4. Remove the touch screen flex circuit connector 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 8-12](#).

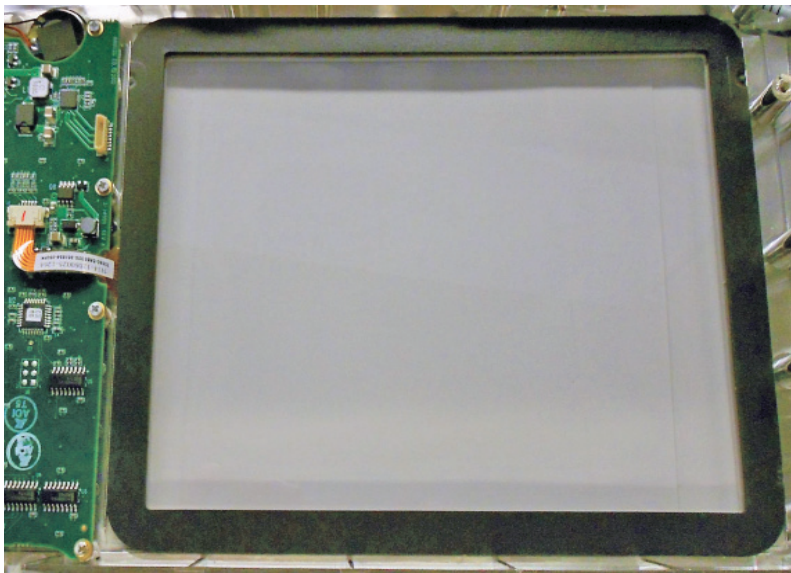


Figure 8-13. Touch Screen

5. Pull the flex circuit out of the connector housing.
6. Remove the touch screen from the bezel by pulling it straight up. (You may push the touch screen up from the front of the front case to help get it off the gasket material on the bezel.)
7. Reverse the above steps to install the replacement touch screen.
 - Carefully close the locking tab on connector J2 to secure the flexible switch pad connection. The tab should “snap” into position when fully closed.
 - Perform a touch screen calibration by pressing the **Shift** key and then the **0** key, follow the on-screen directions.

8-11 CPRI Option 750 or 751 Assembly Removal

1. Open the instrument case as described in [Section 8-3 “Opening the BTS Master Case”](#).

Note The CPRI module shown in the photos in this procedure may vary in appearance from the module installed in your instrument; however, the procedure applies to both Option 750 and 751.

2. See [Figure 8-14](#) and [Figure 8-15](#) for the following key items:

- CPRI Assembly (1)
- Mezzanine Assembly (6)
- High speed cable (5) that is connected from the CPRI Assembly (1) to the middle connector of the Mezzanine Assembly (6).

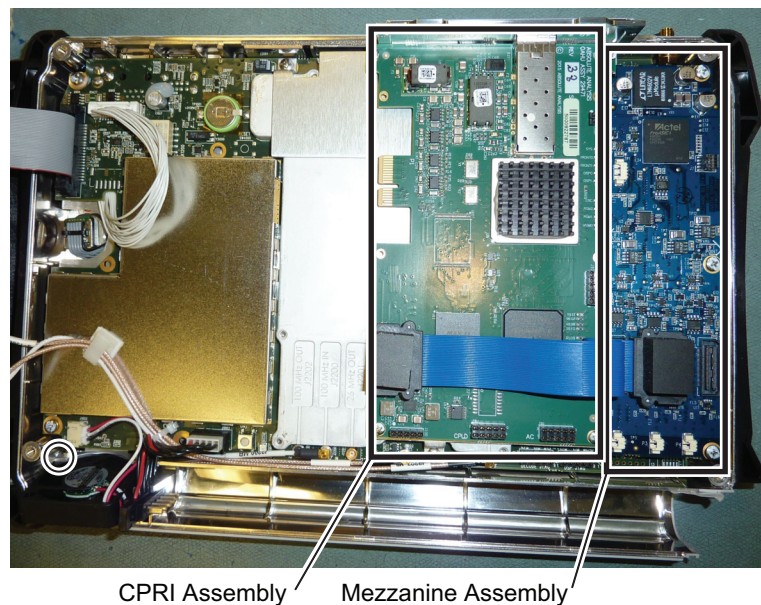


Figure 8-14. CPRI and Mezzanine Assemblies

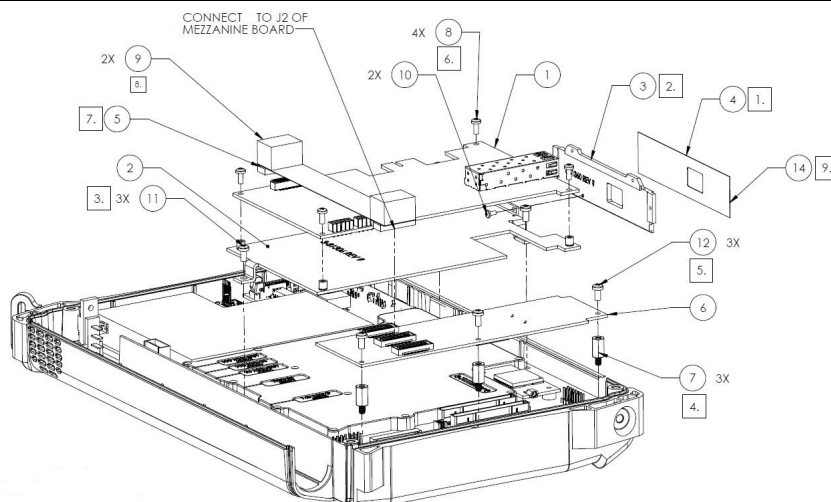


Figure 8-15. CPRI Assembly (1) and Mezzanine Assemblies (6)

3. Remove the CPRI to Mezzanine ribbon cable (make sure to save the foam pads (9)).

4. Remove the four screws (8) holding the CPRI assembly to the bracket.
5. Reverse the above steps to install the replacement assembly, ensuring to install the cable foam pads (9).

8-12 Mezzanine Assembly Removal

1. Open the instrument case as described in [Section 8-3 “Opening the BTS Master Case”](#).
2. See [Figure 8-16](#) and [Figure 8-17](#) for the following key items:
 - CPRI Assembly (1)
 - Mezzanine Assembly (6)
 - High speed cable (5) that is connected from the CPRI Assembly (1) to the middle connector of the Mezzanine Assembly (6).

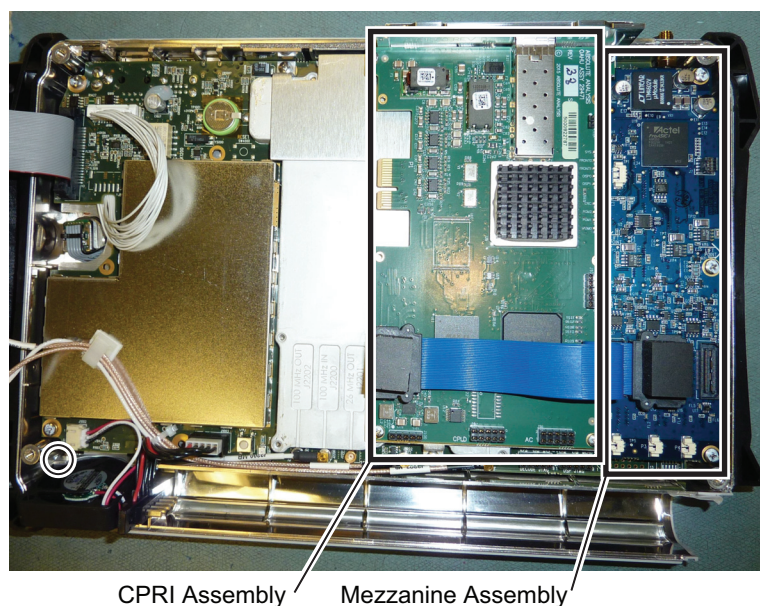


Figure 8-16. CPRI and Mezzanine Assemblies

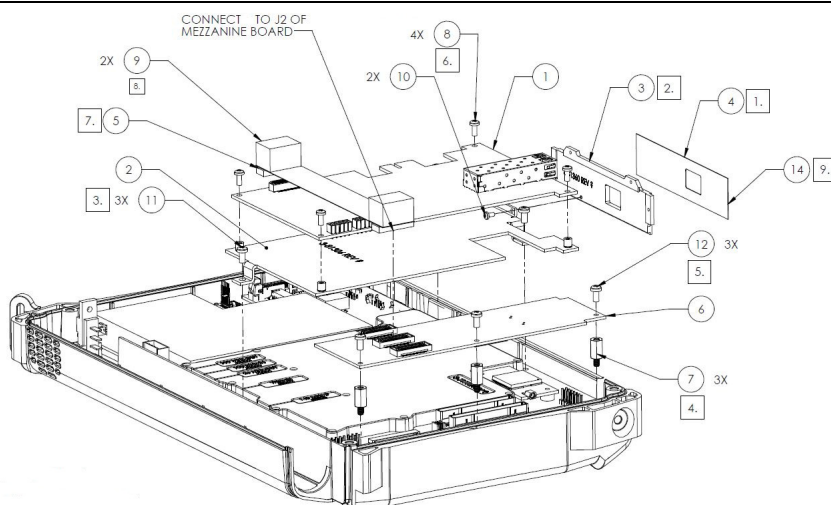


Figure 8-17. CPRI Assembly (1) and Mezzanine Assemblies (6)

3. Remove CPRI to Mezzanine cable (make sure to save the foam pads (9)).

4. Remove the three screws (12) holding the Mezzanine assembly (6) to the top panel.
5. Reverse the above steps to install the replacement assembly, ensuring to install the cable foam pads (9).

Chapter 9 — Troubleshooting

9-1 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 MT8220T should refer to the User Guide for troubleshooting help.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in [Table 1-5, “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.

9-2 Turn-on Problems

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

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MT8220T, 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. On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. Main PCB has failed. Replace the Main PCB assembly.

Unit begins the boot process, but does not complete boot-up:

1. Boot up process gets stuck with “Application Running” on the bottom left hand corner, power the unit off and press the Esc key while pressing the Power on switch. This performs a factory defaults restart.
2. Boot up process gets stuck at “Anritsu” splash screen, using Bootstrap mode and a USB memory device prepared with the current instrument firmware, perform the Load All procedure.
3. During boot-up process, the instrument stops with the message: “Failed to load touch screen calibration data. Please reboot the instrument”. Boot up the instrument in boot strap mode, the instrument will prompt you to perform a touch screen calibration.
4. Main PCB has failed. Replace the Main PCB assembly.

Unit 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 LCD assembly.
3. The Main PCB has failed. Replace the Main PCB assembly.

Boot-up Self Test fails:

1. Perform a Master Reset. Be advised that a Master Reset will delete all user saved setups, jpgs and measurement files, ensure you have backups of these before performing a Master Reset.

If the message relates to the RTC battery, replace the Main PCB.

2. The Main PCB has failed. Replace the Main PCB assembly

9-3 Other Problems

Battery Pack Charging Problems: refer to [Chapter 7, “Battery Information”](#).

Touch Screen Issues:

1. The Touch Screen may have lost its calibration data. Perform a Touch Screen Calibration from the System(Shift-8) menu.
2. Check the firmware version installed on the instrument and ensure it is the latest. If not install the latest firmware and re-do the touch screen calibration as described above.
3. Touch screen has been damaged or has failed, replace the touch screen.

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 SPA/VSG 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 a USB memory device prepared with the current instrument firmware via the System(Shift-8), System Options, Reset menu.
4. Spectrum Analyzer PCB has failed. Replace the SPA/VSG assembly.

Cable and Antenna Analyzer Problems:

1. Inspect the VNA RF In and VNA Reflection connectors for damage.
2. Inspect the Open, Short, Load and cable(s) for damage. Verify their operation on a suitable measurement instrument.
3. Refer to the User Guide.
4. Update system software using a USB memory device prepared with the current instrument firmware via the System(Shift-8), System Options, Reset menu.
5. VNA module has failed. Replace the SPA/VSG assembly.

Other Issues:

1. Perform a Factory Defaults Reset first, if issue is still present then perform a Master Reset. Be advised that a Master Reset will delete all user saved setups, jigs and measurement files, ensure you have backups of these before performing a Master Reset.
2. Refer to the User Guide.
3. Update system software using a USB memory device prepared with the current instrument firmware via the System(Shift-8), System Options, Reset menu.
4. Replace the Main PCB assembly.

Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the MT8220T. Anritsu recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which can allow you to observe trends.

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

A-1 Test Records for Spectrum Analyzer Verification

Table A-1. Spectrum Analyzer Frequency Accuracy

Frequency	Measured Value	Specification (Typical)
1 GHz	GHz	± 1300 Hz (± 1.3 ppm)
7 GHz	GHz	± 9.1 kHz (± 1.3 ppm)

Table A-2. Spectrum Analyzer SSB Phase Noise Verification

Frequency	Measured Value	Calculated Value	Specification
10 kHz	dBm	dBc/Hz	≤ -100 dBc/Hz
20 kHz	dBm	dBc/Hz	≤ -100 dBc/Hz
30 kHz	dBm	dBc/Hz	≤ -100 dBc/Hz
100 kHz	dBm	dBc/Hz	≤ -102 dBc/Hz

Table A-3. Spectrum Analyzer Spurious Response (Second Harmonic Distortion)

Frequency	Measured Value	2nd Harmonic Distortion	Specification
50.1 MHz	dBm		
100.2 MHz	dBm	dBc	≤ -50 dBc

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-4. Spectrum Analyzer Input Related Spurious (IRS) Signals

Amplitude Reading at 1672 MHz _____ dBm			
Frequency	Measured Values	Calculated IRS	Specification
150 kHz to 1671 MHz	dBm	dBc	≤ -40 dBc
1673 MHz to 2800 MHz	dBm	dBc	≤ -40 dBc
Amplitude Reading at 1675 MHz _____ dBm			
Frequency	Measured Values	Calculated IRS	Specification
2 MHz to 4 MHz	dBm	dBc	≤ -60 dBc
Amplitude Reading at 3608 MHz _____ dBm			
Frequency	Measured Values	Calculated IRS	Specification
5489 MHz to 5491 MHz	dBm	dBc	≤ -60 dBc
Amplitude Reading at 5208 MHz _____ dBm			
Frequency	Measured Values	Calculated IRS	Specification
7089 MHz to 7091 MHz	dBm	dBc	≤ -60 dBc

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-5. Spectrum Analyzer Resolution Bandwidth Accuracy

BW Setting	Span	VBW	Lower Limit	Measured Values	Upper Limit
3 MHz	6 MHz	300 kHz	2.7 MHz	Hz	3.3 MHz
1 MHz	2 MHz	100 kHz	900 kHz	Hz	1.1 MHz
300 kHz	600 kHz	30 kHz	270 kHz	Hz	330 kHz
100 kHz	200 kHz	10 kHz	90 kHz	Hz	110 kHz
30 kHz	60 kHz	3 kHz	27 kHz	Hz	33 kHz
10 kHz	20 kHz	1 kHz	9 kHz	Hz	11 kHz
3 kHz	6 kHz	300 Hz	2.7 kHz	Hz	3.3 kHz
1 kHz	2 kHz	100 Hz	900 Hz	Hz	1.1 kHz
300 Hz	600 Hz	30 Hz	270 Hz	Hz	330 Hz
100 Hz	200 Hz	10 Hz	90 Hz	Hz	110 Hz
30 Hz	60 Hz	3 Hz	27 Hz	Hz	33 Hz
10 Hz	20 Hz	1 Hz	9 Hz	Hz	11 Hz
3 Hz	10 Hz	1 Hz	2.7 Hz		3.3 Hz
1 Hz	10 Hz	1 Hz	0.9 Hz		1.1 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

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

Test Power Level @ 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

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

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	±1.25 dB
-4 dBm	10 dBm	30 dB	dBm	±1.25 dB
-10 dBm	0 dBm	20 dB	dBm	±1.25 dB
-14 dBm	0 dBm	20 dB	dBm	±1.25 dB
-20 dBm	-10 dBm	10 dB	dBm	±1.25 dB
-24 dBm	-10 dBm	10 dB	dBm	±1.25 dB
-30 dBm	-20 dBm	0 dB	dBm	±1.25 dB
-34 dBm	-20 dBm	0 dB	dBm	±1.25 dB
-40 dBm	-30 dBm	0 dB	dBm	±1.25 dB
-44 dBm	-30 dBm	0 dB	dBm	±1.25 dB
-50 dBm	-40 dBm	0 dB	dBm	±1.25 dB

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

Frequency	Required Sensor B reading for -2dBm @ Attenuator output	Required Sensor B reading for -30 dBm @ Attenuator output
150 kHz	dBm	dBm
10.1 MHz	dBm	dBm
50 MHz	dBm	dBm
100 MHz	dBm	dBm
500 MHz	dBm	dBm
1000 MHz	dBm	dBm
2000 MHz	dBm	dBm
3000 MHz	dBm	dBm
4000 MHz	dBm	dBm
5000 MHz	dBm	dBm
6000 MHz	dBm	dBm
7000 MHz	dBm	dBm

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-9. Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency (1 Of 3)

Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)	Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)
0.150	-30	0		±1.50	7.5	-30	0		±1.50
	-30	5		±1.50		-30	5		±1.50
	-30	10		±1.50		-30	10		±1.50
	-30	20		±1.50		-30	20		±1.50
	-2	30		±1.50		-2	30		±1.50
	-2	40		±1.50		-2	40		±1.50
	-2	50		±1.50		-2	50		±1.50
	-2	60		±1.50		-2	60		±1.50
10.1	-30	0		±1.25	50	-30	0		±1.25
	-30	5		±1.25		-30	5		±1.25
	-30	10		±1.25		-30	10		±1.25
	-30	20		±1.25		-30	20		±1.25
	-2	30		±1.25		-2	30		±1.25
	-2	40		±1.75		-2	40		±1.75
	-2	50		±1.75		-2	50		±1.75
	-2	60		±1.75		-2	60		±1.75
100	-30	0		±1.25	500	-30	0		±1.25
	-30	5		±1.25		-30	5		±1.25
	-30	10		±1.25		-30	10		±1.25
	-30	20		±1.25		-30	20		±1.25
	-2	30		±1.25		-2	30		±1.25
	-2	40		±1.75		-2	40		±1.75
	-2	50		±1.75		-2	50		±1.75
	-2	60		±1.75		-2	60		±1.75

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Table A-10. Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency(2 of 3)

Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)	Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)
1000	-30	0		±1.25	2000	-30	0		±1.25
	-30	5		±1.25		-30	5		±1.25
	-30	10		±1.25		-30	10		±1.25
	-30	20		±1.25		-30	20		±1.25
	-2	30		±1.25		-2	30		±1.25
	-2	40		±1.75		-2	40		±1.75
	-2	50		±1.75		-2	50		±1.75
	-2	60		±1.75		-2	60		±1.75
3000	-30	0		±1.25	4000	-30	0		±1.25
	-30	5		±1.25		-30	5		±1.25
	-30	10		±1.25		-30	10		±1.25
	-30	20		±1.25		-30	20		±1.25
	-2	30		±1.25		-2	30		±1.25
	-2	40		±1.75		-2	40		±1.75
	-2	50		±1.75		-2	50		±1.75
	-2	60		±1.75		-2	60		±1.75
5000	-30	0		±1.75	6000	-30	0		±1.75
	-30	5		±1.75		-30	5		±1.75
	-30	10		±1.75		-30	10		±1.75
	-30	20		±1.75		-30	20		±1.75
	-2	30		±1.75		-2	30		±1.75
	-2	40		±1.75		-2	40		±1.75
	-2	50		±1.75		-2	50		±1.75
	-2	60		±1.75		-2	55		±1.75

MT8220T Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Table A-11. Spectrum Analyzer Absolute Amplitude Accuracy Across Frequency(3 of 3)

Freq (MHZ)	Input Power (dBm)	Atten. Level	Marker 1 Reading (dB)	Spec (dB)	Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)
7000	-30	0		±1.75					
	-30	5		±1.75					
	-30	10		±1.75					
	-30	20		±1.75					
	-2	30		±1.75					
	-2	40		±2.00					
	-2	50		±2.00					
	-2	60		±3.00					

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Table A-12. Spectrum Analyzer Pre-Amp Accuracy Across Frequency Setup Table

Frequency	Required Sensor B reading for -80dBm @ Attenuator output	Required Sensor B reading for -90 dBm @ Attenuator output
150 kHz	dBm	dBm
7.5 MHz	dBm	dBm
10.1 MHz	dBm	dBm
50 MHz	dBm	dBm
100 MHz	dBm	dBm
500 MHz	dBm	dBm
1000 MHz	dBm	dBm
2000 MHz	dBm	dBm
3000 MHz	dBm	dBm
4000 MHz	dBm	dBm
5000 MHz	dBm	dBm
6000 MHz	dBm	dBm
7000 MHz	dBm	dBm

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-13. Spectrum Analyzer Pre-Amp Accuracy Across Frequency

Freq (MHZ)	Input Power (dBm)	Atten. Level	Marker 1 Reading (dB)	Spec (dB)	Freq (MHZ)	Input Power (dBm)	Attn. Level	Marker 1 Reading (dB)	Spec (dB)
0.150	-80	0		±1.50	7.5	-80	0		±1.50
	-80	10		±1.50		-80	10		±1.50
	-90	0		±1.50		-90	0		±1.50
	-90	10		±1.50		-90	10		±1.50
10.1	-80	0		±1.50	50	-80	0		±1.50
	-80	10		±1.50		-80	10		±1.50
	-90	0		±1.50		-90	0		±1.50
	-90	10		±1.50		-90	10		±1.50
100	-80	0		±1.50	500	-80	0		±1.50
	-80	10		±1.50		-80	10		±1.50
	-90	0		±1.50		-90	0		±1.50
	-90	10		±1.50		-90	10		±1.50
1000	-80	0		±1.50	2000	-80	0		±1.50
	-80	10		±1.50		-80	10		±1.50
	-90	0		±1.50		-90	0		±1.50
	-90	10		±1.50		-90	10		±1.50
3000	-80	0		±1.50	4000	-80	0		±1.50
	-80	10		±1.50		-80	10		±1.50
	-90	0		±1.50		-90	0		±1.50
	-90	10		±1.50		-90	10		±1.50
5000	-80	0		±1.75	6000	-80	0		±1.75
	-80	10		±1.75		-80	10		±1.75
	-90	0		±1.75		-90	0		±1.75
	-90	10		±1.75		-90	10		±1.75
7000	-80	0		±1.75					
	-80	10		±1.75					
	-90	0		±1.75					
	-90	10		±1.75					

A-1 Test Records for Spectrum Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-14. Spectrum Analyzer Residual Spurious with Preamp Off

Start Freq.	Stop Freq.	RBW	VBW	Measured Values	Specification
150 kHz	1.0 GHz	10 kHz	30 kHz	dBm	≤ -90 dBm
1.0 GHz	2.2 GHz	30 kHz	3 kHz	dBm	≤ -90 dBm
2.2 GHz	3.199 GHz	3 kHz	3 kHz	dBm	≤ -90 dBm
3.199 GHz	3.201 GHz	10 kHz	1 kHz	dBm	≤ -70 dBm
3.201 GHz	7.1 GHz	30 kHz	3 kHz	dBm	≤ -84 dBm

Exceptions:

Frequency	Spur Level
~ 3200 MHz	-70 dBm max.

Table A-15. Spectrum Analyzer Residual Spurious with Preamp On

Start Freq.	Stop Freq.	Measured Values	Specification
150 kHz	10 MHz	dBm	≤ -100 dBm
10 MHz	49 MHz	dBm	≤ -100 dBm
49 MHz	51 MHz	dBm	≤ -95 dBm
51 MHz	99 MHz	dBm	≤ -100 dBm
99 MHz	101 MHz	dBm	≤ -95 dBm
101 MHz	149 MHz	dBm	≤ -100 dBm
149 MHz	151 MHz	dBm	≤ -95 dBm
151 MHz	1.0 GHz	dBm	≤ -100 dBm
1.0 GHz	2.0 GHz	dBm	≤ -100 dBm
2.0 GHz	3.0 GHz	dBm	≤ -100 dBm
3.0 GHz	4.0 GHz	dBm	≤ -100 dBm
4.0 GHz	5.0 GHz	dBm	≤ -100 dBm
5.0 GHz	6.0 GHz	dBm	≤ -100 dBm
6.0 GHz	7.1 GHz	dBm	≤ -100 dBm

Exceptions:

Frequency	Spur Level
50, 100, and 150 MHz	-95 dBm max.

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Table A-16. 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
3 MHz	1.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ -137 dBm
1 GHz	2.2 GHz	100 kHz	1 kHz	dBm	dBm	≤ -133 dBm
2.2 GHz	4.0 GHz	100 kHz	300 kHz	dBm	dBm	≤ -133 dBm
4.0 GHz	7.1 GHz	100 kHz	300 kHz	dBm	dBm	≤ -130 dBm

Table A-17. 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
3 MHz	1.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ -161 dBm
1 GHz	2.2 GHz	100 kHz	1 kHz	dBm	dBm	≤ -159 dBm
2.2 GHz	4.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ -156 dBm
4.0 GHz	7.1 GHz	100 kHz	300 kHz	dBm	dBm	≤ -154 dBm

A-2 Test Records for Cable and Antenna Analyzer Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

A-2 Test Records for Cable and Antenna Analyzer Verification

Table A-18. VNA Frequency Accuracy

Frequency	Measured Value	Specification
2 GHz (2000 MHz) Left Edge	MHz	$\pm 6.0 \text{ kHz } (\pm 3 \text{ ppm})$
2 GHz (2000 MHz) Right Edge	MHz	$\pm 6.0 \text{ kHz } (\pm 3 \text{ ppm})$

Table A-19. VNA Return Loss Accuracy Verification

Frequency	Measured Value	Specification
6 dB	dB	$-5.16 \text{ dB} \leq x \leq -6.94 \text{ dB}$
20 dB	dB	$-18.48 \text{ dB} \leq x \leq -21.52 \text{ dB}$

Table A-20. VNA System Dynamic Range Verification

Frequency	Measured Value	Specification
400 MHz to 2.8 GHz	dB	$\leq -100 \text{ dB}$
>2.8 GHz to 4 GHz	dB	$\leq -90 \text{ dB}$
> 4 GHz to 6 GHz	dB	$\leq -85 \text{ dB}$

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

A-3 Test Records for Power Meter Verification

Table A-21. Characterization Chart for Power Meter Verification

Test Power Level @ 50 MHz	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm
Test Power Level @ 7000 MHz	Required Sensor B Reading
0 dBm	dBm
-50 dBm	dBm

Table A-22. 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
7.0 GHz	0 dBm	dBm	± -1.75 dB
	-50 dBm	dBm	± -1.75 dB

A-4 Test Records for GPS Receiver Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

A-4 Test Records for GPS Receiver Verification

Table A-23. GPS Receiver

Frequency	Measured Value	Error	Specification
Spectrum Analyzer Frequency Accuracy with GPS High Frequency Accuracy			
7.0 GHz	GHz	Hz	± 175 Hz (± 25 ppb)
Spectrum Analyzer Frequency Accuracy with Internal High Frequency Accuracy			
7.0 GHz	GHz	Hz	± 350 Hz (± 50 ppb)

Table A-24. GPS Receiver Bias-Tee Verification

Voltage Setting	Measured Value	Specification
3.3 V	mA	32 mA ± 15 % (27.2 mA to 36.8 mA)
5.0 V	mA	55.6 mA ± 15 % (47.3 mA to 63.9 mA)

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

A-5 Test Records for Options Verification

Option 10 Bias-Tee

Table A-25. Option 10 Bias-Tee

Voltage Setting	Measured Values		Voltage Specification	Current Specification
105 Ohm Load, Low Current				
12 V	V	mA	11.0 V to 12.75 V	85 mA to 145 mA
18 V	V	mA	17.3 V to 18.7 V	142 mA to 202 mA
24 V	V	mA	23.0 V to 25.0 V	199 mA to 259 mA
105 Ohm Load, High Current				
15 V	V	mA	14.0 V to 15.6 V	113 mA to 173 mA
40 Ohm Load, High Current				
15 V	V	mA	14.0 V to 15.6 V	325 mA to 425 mA
78 Ohm Load, High Current				
32 V	V	mA	30.5 V to 33.5 V	375 mA to 445 mA

MT8220T Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 880, GSM/GPRS/EDGE RF Measurements

Table A-26. RF Measurements, At 850 MHz, -10 dBm Level, GsmBurst_1slot Pattern (GSM)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	-10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

Table A-27. RF Measurements, At 850 MHz, -50 dBm Level, GsmBurst_8slot Pattern (GSM)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	-10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 880, GSM/GPRS/EDGE RF Measurements (Continued)

Table A-28. RF Measurements, At 1800 MHz, –10 dBm Level, GsmBurst_8slot Pattern (GSM)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	–10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

Table A-29. RF Measurements, At 1800 MHz, –50 dBm Level, GsmBurst_1slot Pattern (GSM)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	–10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

Table A-30. RF Measurements, At 1800 MHz, –50 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	–10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

Table A-31. RF Measurements, At 1800 MHz, –10 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	–10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 880, GSM/GPRS/EDGE RF Measurements (Continued)

Table A-32. RF Measurements, At 850 MHz, -50 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	-10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

Table A-33. RF Measurements, At 850 MHz, -10 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Adjusted Output Power	dBm	-10 dBm ± 0.2 dB
Displayed Burst Power	dBm	
Calculated Burst Power Error	dBm	± 1.5 dB
Frequency Error	Hz	± 10 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 880, GSM/GPRS/EDGE Demodulator

Table A-34. Demodulation, At 850 MHz, –10 dBm Level, GsmBurst_1slot Pattern (GSM)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-35. Demodulation1, At 850 MHz, –50 dBm Level, GsmBurst_8slot Pattern (GSM)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-36. Demodulation, At 1800 MHz, –10 dBm Level, GsmBurst_8slot Pattern (GSM)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-37. Demodulation, At 1800 MHz, –50 dBm Level, GsmBurst_1slot Pattern (GSM)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-38. Demodulation, At 1800 MHz, –50 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-39. Demodulation, At 1800 MHz, –10 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

A-5 Test Records for Options Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

Option 880, GSM/GPRS/EDGE Demodulator (Continued)

Table A-40. Demodulation, At 850 MHz, -50 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

Table A-41. Demodulation, At 850 MHz, -10 dBm Level, EdgeBurst_4slot Pattern (EDGE)

Measurement	Measured Value	Specification
Phase Err RMS (Deg)	Deg	≤ 1 Deg

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 881 WCDMA and HSDPA RF Measurements

Table A-42. RF Measurements, Sensor A and Sensor B Readings, Components Characterization

Frequency	PMA.10	PMB.10	Delta 1 ($\Delta 1$)	PMA.10C	PMA.18	ATT.18
881.5 MHz	dBm	dBm	dBm	dBm	dBm	dB

Table A-43. RF Measurements, Power Level Setting, Components Characterization

Frequency	MG3700A.10 Setting	MG3700A.28 Setting	PMA – 10	PMA – 20
881.5 MHz	dBm	dBm	dBm	dBm

Table A-44. RF Measurements, WCDMA Absolute Power Accuracy

Test Level	Measured Power	Error	Specification
+28 dBm	dBm	dB	± 1.25 dB
+10 dBm	dBm	dB	± 1.25 dB
-10 dBm	dBm	dB	± 1.25 dB
-20 dBm	dBm	dB	± 1.25 dB
Test Level	dBm	dB	± 1.25 dB

Table A-45. RF Measurements, WCDMA Occupied Bandwidth (OBW)

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

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 881 WCDMA and HSDPA RF Measurements (Continued)

Table A-46. RF Measurements, WCDMA RF Channel Power Accuracy

Frequency	Power Meter Reading	Measured RF Channel Power	RF Channel Power Error	Specification
881.5 MHz	dBm	dBm	dBm	± 1.25 dBm max
1962.5 MHz	dBm	dBm	dBm	± 1.25 dBm max
2680.5 MHz	dBm	dBm	dBm	± 1.25 dBm max

Table A-47. RF Measurements, HSDPA RF Channel Power Accuracy

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

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 881 WCDMA and HSDPA RF Measurements (Continued)

Table A-48. Demodulation, WCDMA Error Vector Magnitude (Test Model 4)

Frequency	EVM	Specification
1962.5 MHz	%	± 2.5%

Table A-49. Demodulation, HSDPA Error Vector Magnitude (Test Model 5)

Frequency	EVM	Specification
1962.5 MHz	%	± 2.5%

A-5 Test Records for Options Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

Option 882, TDSCDMA Signal Analyzer Verification

Table A-50. Option 882, TDSCDMA (at 2010 MHz, -45 dBm Level)

Measurement Type	Measured Value	Specification
Power Meter Reading	dBm	-45 dBm ± 0.5 dB
Displayed Channel Power	dBm	
Calculated Channel Power Error	dB	± 1.5 dB
Frequency Error	Hz	± 10 Hz
Tau	µs	± 0.2 µs

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 883 LTE Measurements

Table A-51. RF Measurements, LTE Channel Power Accuracy

Frequency (MHz)	Input Power (dBm)	Measured Channel Power	Error	Specification
For 10 MHz BW, Pattern E-TM_3-1_10M				
750	-15	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-15	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB
For 20 MHz BW, Pattern E-TM_3-1_20M				
750	-15	dBm	dB	± 1.5 dB
750	-50	dBm	dB	± 1.5 dB
2150	-15	dBm	dB	± 1.5 dB
2150	-50	dBm	dB	± 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 883, LTE Measurements

Table A-52. Demodulation, LTE Frequency Accuracy

Measurement	Measured Value	Specification
For 10 MHz BW, Pattern E-TM_3-1_10M		
750 MHz at -15 dBm		
Frequency Error	Hz	± 10 Hz
750 MHz at -50 dBm		
Frequency Error	Hz	± 10 Hz
2150 MHz at -15 dBm		
Frequency Error	Hz	± 10 Hz
2150 MHz at -50 dBm		
Frequency Error	Hz	± 10 Hz
For 20 MHz BW, Pattern E-TM_3-1_20M		
750 MHz at -15 dBm		
Frequency Error	Hz	± 10 Hz
750 MHz at -50 dBm		
Frequency Error	Hz	± 10 Hz
2150 MHz at -15 dBm		
Frequency Error	Hz	± 10 Hz
2150 MHz at -50 dBm		
Frequency Error	Hz	± 10 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 883 TD-LTE Measurements

Table A-53. RF Measurements, TD-LTE Channel Power Accuracy

Frequency (MHz)	Input Power (dBm)	Measured Channel Power	Error	Specification
For 10 MHz BW, Pattern TDLTE-E-TM_1-1_10M				
750	-12	dBm	dB	± 1.5 dB
750	-30	dBm	dB	± 1.5 dB
2350	-12	dBm	dB	± 1.5 dB
2350	-30	dBm	dB	± 1.5 dB
For 20 MHz BW, Pattern TDLTE-E-TM_1-1_20M				
750	-12	dBm	dB	± 1.5 dB
750	-30	dBm	dB	± 1.5 dB
2350	-12	dBm	dB	± 1.5 dB
2350	-30	dBm	dB	± 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 883, TD-LTE Measurements

Table A-54. Demodulation, TD-LTE Frequency Accuracy

Measurement	Measured Value	Specification
For 10 MHz BW, Pattern TDLTE-E-TM_1-1_10M		
750 MHz at -12 dBm		
Frequency Error	Hz	± 10 Hz
750 MHz at -30 dBm		
Frequency Error	Hz	± 10 Hz
2350 MHz at -12 dBm		
Frequency Error	Hz	± 10 Hz
2350 MHz at -30 dBm		
Frequency Error	Hz	± 10 Hz
For 20 MHz BW, Pattern TDLTE-E-TM_1-1_20M		
750 MHz at -12 dBm		
Frequency Error	Hz	± 10 Hz
750 MHz at -30 dBm		
Frequency Error	Hz	± 10 Hz
2350 MHz at -12 dBm		
Frequency Error	Hz	± 10 Hz
2350 MHz at -30 dBm		
Frequency Error	Hz	± 10 Hz

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 884 CDMA RF Measurements

Table A-55. RF Measurements, At 870.03 MHz, –30 dBm Level, cdmaOne

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–30 dBm ± 0.2 dB
Channel Power Value	dBm	
Channel Power Error	dBm	± 1.5 dB

Table A-56. RF Measurements, At 1930.05 MHz, –30 dBm Level, cdmaOne

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–30 dBm ± 0.2 dB
Channel Power Value	dBm	
Channel Power Error	dBm	± 1.5 dB

Table A-57. RF Measurements, At 1930.05, –30 dBm Level, CDMA2000

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–30 dBm ± 0.2 dB
Channel Power Value	dBm	
Channel Power Error	dBm	± 1.5 dB

Table A-58. RF Measurements, At 870.03 MHz, –30 dBm Level, CDMA2000

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–30 dBm ± 0.2 dB
Channel Power Value	dBm	
Channel Power Error	dBm	± 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 884 cdmaOne and CDMA2000 1xRTT Demodulator

Table A-59. Demodulation, At 870.03 MHz, -30 dBm Level, cdmaOne

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

Table A-60. Demodulation, At 1930.05 MHz, -30 dBm Level, cdmaOne

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

Table A-61. Demodulation, At 1930.05 MHz, -30 dBm Level, CDMA2000

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

Table A-62. Demodulation, At 870.03 MHz, -30 dBm Level, CDMA2000

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 884, EVDO RF Measurements

Table A-63. RF Measurements, At 870.03 MHz, -50 dBm Level, 921.6 kps 8PSK Modulation

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-50 dBm \pm 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	\pm 1.5 dB

Table A-64. RF Measurements, At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation

Measurement	Measured Value	Specification
Power Meter Reading	dBm	0 dBm \pm 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	\pm 1.5 dB

Table A-65. RF Measurements, At 1930.05 MHz, -50 dBm Level, 2457.6 kps 16QAM Modulation

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-50 dBm \pm 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	\pm 1.5 dB

Table A-66. RF Measurements, At 1930.05 MHz, -50 dBm Level, Idle Slot

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-50 dBm \pm 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	\pm 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 884, EVDO RF Measurements (Continued)

Table A-67. RF Measurements, At 870.03 MHz, –10 dBm Level, Idle Slot

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–10 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Option 884 EVDO Demodulator

Table A-68. Demodulation, At 870.03 MHz, –50 dBm Level, 921.6 kps 8PSK Modulation

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho Pilot		$0.99 \leq x \leq 1$
Tau	µs	± 1 µs

Table A-69. Demodulation, At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho Pilot		$0.99 \leq x \leq 1$
Tau	µs	± 1 µs

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 884 EVDO Demodulator (Continued)

Table A-70. Demodulation, At 1930.05 MHz, -50 dBm Level, 2457.6 kps 16QAM Modulation

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho Pilot		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

Table A-71. Demodulation, At 1930.05 MHz, -50 dBm Level, Idle Slot

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho Pilot		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

Table A-72. Demodulation, At 870.03 MHz, -10 dBm Level, Idle Slot

Measurement	Measured Value	Specification
Frequency Error	Hz	± 10 Hz
Rho Pilot		$0.99 \leq x \leq 1$
Tau	μ s	± 1 μ s

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 885 Fixed WiMAX RF Measurements

Table A-73. RF Measurements, Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings

Frequency	Input Power Setting	Input Power Reading
2600.5 MHz	-15 dBm	dBm
2600.5 MHz	-50 dBm	dBm
3600.5 MHz	-15 dBm	dBm
3600.5 MHz	-50 dBm	dBm
5600.5 MHz	-15 dBm	dBm
5600.5 MHz	-50 dBm	dBm

Table A-74. RF Measurements, 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

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 885 Fixed WiMAX Demodulator

Table A-75. Demodulation, Fixed WiMAX Residual EVM

Frequency	Power	BW	EVM (RMS)	Specification
2600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
2600.5 MHz	-30 dBm	10 MHz	%	≤ 3.5%
3600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
3600.5 MHz	-30 dBm	10 MHz	%	≤ 3.5%
5600.5 MHz	-15 dBm	10 MHz	%	≤ 3.5%
5600.5 MHz	-30 dBm	10 MHz	%	≤ 3.5%

Table A-76. Demodulation, Fixed WiMAX Frequency Error

Frequency	Power	Frequency Error	Specification
2600.5 MHz	-50 dBm	Hz	± 182.035 Hz (± 0.07 ppm)
5600.5 MHz	-50 dBm	Hz	± 392.035 Hz (± 0.07 ppm)

A-5 Test Records for Options Verification

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

Option 885 Mobile WiMAX RF Measurements

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

Table A-77. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -15.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-15 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-78. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -50.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-50 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-79. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -15.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-15 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-80. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -50.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	-50 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 885 Mobile WiMAX RF Measurements (Continued)

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

Table A-81. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –15.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–15 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-82. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –50.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–50 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-83. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –15.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–15 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

Table A-84. RF Measurements, Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –50.0 dBm)

Measurement	Measured Value	Specification
Power Meter Reading	dBm	–50 dBm ± 0.2 dB
MT8220T Reading	dBm	
Calculated Channel Power Error	dB	± 1.5 dB

MT8220T Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 885 Mobile WiMAX Demodulator

Table A-85. Demodulation, Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length)

Frequency	Power	BW	EVM (rms)	Specification
2600.5 MHz	-15 dBm	10 MHz	%	≤ 3.0 %
2600.5 MHz	-30 dBm	10 MHz	%	≤ 3.0 %
3600.5 MHz	-15 dBm	10 MHz	%	≤ 3.0 %
3600.5 MHz	-30 dBm	10 MHz	%	≤ 3.0 %

Table A-86. Demodulation, Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)

Frequency	Power	Frequency Error	Specification
2600.5 MHz	-50 dBm	Hz	± 52.01 Hz (± 0.02 ppm)
5600.5 MHz	-50 dBm	Hz	± 112.01 Hz (± 0.02 ppm)

Table A-87. Demodulation, Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length)

Frequency	Power	BW	EVM (rms)	Specification
2600.5 MHz	-15 dBm	10 MHz	%	≤ 3.0%
2600.5 MHz	-30 dBm	10 MHz	%	≤ 3.0%
3600.5 MHz	-15 dBm	10 MHz	%	≤ 3.0%
3600.5 MHz	-30 dBm	10 MHz	%	≤ 3.0%

Table A-88. Demodulation, Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

Frequency	Power	Frequency Error	Specification
2600.5 MHz	-50 dBm	Hz	± 52.01 Hz (± 0.02 ppm)
5600.5 MHz	-50 dBm	Hz	± 112.01 Hz (± 0.02 ppm)

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Anritsu Company
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA
<http://www.anritsu.com>