

Maintenance Manual

Spectrum Master™

Model MS2721B

Handheld Spectrum Analyzer and 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, sans-serif font. The letter "A" is stylized with a diagonal slash through it.

Safety Symbols

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

Symbols Used in Manuals

Danger



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

Warning



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

Caution



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

Safety Symbols Used on Equipment and in Manuals

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



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



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



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



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



These indicate that the marked part should be recycled.

For Safety

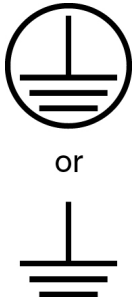
Warning



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

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

Warning



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

Warning



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

Caution



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

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

Warning



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

Table of Contents

Chapter 1—General Information

| | | |
|-----|---|-----|
| 1-1 | Introduction | 1-1 |
| 1-2 | Recommended Test Equipment | 1-1 |
| | Optional Functions Verification | 1-3 |
| 1-3 | Replaceable Parts | 1-4 |
| 1-4 | Troubleshooting | 1-6 |
| | Turn-on Problems | 1-7 |
| | Instrument cannot boot-up, no activity occurs when On/Off key is pressed: | 1-7 |
| | Instrument begins the boot process, but does not complete boot-up: | 1-7 |
| | Instrument makes normal boot-up sounds, but the display has a problem: | 1-7 |
| | Boot-up Self Test fails: | 1-7 |
| | Battery Pack Charging Problems | 1-8 |
| | Lock Error Messages | 1-8 |
| | Spectrum Analyzer Problems | 1-8 |
| 1-5 | Connector Care | 1-9 |
| | Connecting Procedure | 1-9 |
| | Disconnecting Procedure | 1-9 |
| | Connectors | 1-9 |

Chapter 2—Performance Verification 1

| | | |
|-----|--|------|
| 2-1 | Introduction | 2-1 |
| 2-2 | Spectrum Analyzer Function Verification | 2-1 |
| | Spectrum Analyzer Frequency Accuracy | 2-2 |
| | Spectrum Analyzer Internal Reference Frequency Adjustment | 2-4 |
| | Spectrum Analyzer SSB Phase Noise Verification | 2-6 |
| | Spectrum Analyzer Resolution Bandwidth Accuracy | 2-7 |
| | Spectrum Analyzer Second Harmonic Distortion | 2-9 |
| | Spectrum Analyzer Third Order Intercept (TOI) Verification | 2-11 |
| | 600 MHz TOI Test | 2-11 |
| | 3.5 GHz TOI Test | 2-15 |
| | Spectrum Analyzer Displayed Average Noise Level (DANL) | 2-17 |
| | Spectrum Analyzer Residual Spurious Response | 2-18 |
| | Residual Spurious Test with Pre Amp On | 2-18 |
| | Residual Spurious Test with Pre Amp Off | 2-18 |
| | Input Related Spurious (IRS) Signals | 2-20 |
| | 1674 MHz Input Related Spurious check: | 2-20 |
| | 1701 MHz Input Related Spurious Check: | 2-21 |
| | 2145 MHz Input Related Spurious Check: | 2-22 |
| | Spectrum Analyzer Absolute Amplitude Accuracy | 2-23 |
| | 50 MHz Amplitude Accuracy Verification | 2-24 |
| | Amplitude Accuracy Across Frequency Verification | 2-26 |
| | 9 kHz to 100 kHz Amplitude Accuracy Verification | 2-28 |
| | Spectrum Analyzer RF Input VSWR Verification | 2-32 |

Table of Contents (Continued)

Chapter 3—Performance Verification 2

| | | |
|------|---|------|
| 3-1 | Introduction | 3-1 |
| 3-2 | Optional Functions Verification | 3-1 |
| 3-3 | Tracking Generator (Option 20) Verification | 3-2 |
| | Frequency Accuracy Verification | 3-2 |
| | Power Accuracy Verification | 3-3 |
| 3-4 | ISDB-T Signal Analyzer (Option 30) Verification | 3-5 |
| | Frequency Accuracy and Residual MER Verification | 3-6 |
| | Frequency Lock Range Verification | 3-9 |
| | Level Accuracy Verification | 3-10 |
| | 1 dB Compression Level Verification | 3-16 |
| | Noise Floor Verification | 3-19 |
| | Phase Noise Verification | 3-20 |
| 3-5 | GPS Option Verification (Option 31) | 3-22 |
| 3-6 | ISDB-T SFN Analyzer (Option 32) Verification | 3-24 |
| | Introduction | 3-24 |
| | Level Accuracy Verification | 3-24 |
| | 1 dB Compression Level Verification | 3-30 |
| | Noise Floor Verification | 3-33 |
| 3-7 | GSM/GPRS/EDGE Signal Analyzer (Options 40 and 41) Verification | 3-34 |
| | GSM/GPRS/EDGE Setup | 3-34 |
| | GSM Burst Power, Frequency Error, and Phase Error Tests | 3-36 |
| | EDGE Burst Power, Frequency Error and Residual Error Tests | 3-38 |
| 3-8 | CDMA Signal Analyzer (Options 42 and 43) Verification | 3-40 |
| | CDMA Signal Analyzer Setup | 3-40 |
| | cdmaOne Channel Power, Frequency Error, Rho, and Tau Tests | 3-42 |
| | CDMA2000 Channel Power, Frequency Error, Rho and Tau Tests | 3-44 |
| 3-9 | WCDMA/HSDPA Signal Analyzer (Options 44, 45, and 65) Verification | 3-45 |
| | WCDMA Absolute Power Accuracy Verification (Option 44) | 3-45 |
| | WCDMA Occupied Bandwidth (OBW) Verification (Option 44) | 3-51 |
| | WCDMA Occupied Bandwidth Setup | 3-51 |
| | WCDMA RF Channel Power Accuracy and ACLR Verification (Option 44) | 3-53 |
| | HSDPA RF Channel Power Accuracy and ACLR Verification (Option 44) | 3-54 |
| | Error Vector Magnitude (EVM) Verification (Options 45 and 65) | 3-57 |
| | For an MS2721B with Option 65: | 3-58 |
| 3-10 | Fixed WiMAX Signal Analyzer (Options 46 and 47) Verification | 3-59 |
| | Fixed WiMAX Channel Power Accuracy Tests (Option 46) | 3-60 |
| | Fixed WiMAX Residual EVM and Frequency Error Tests (Option 47) | 3-63 |
| 3-11 | TD-SCDMA Signal Analyzer (Options 60 and 61) Verification | 3-65 |

Table of Contents (Continued)

| | | |
|------|--|-------|
| 3-12 | EVDO Signal Analyzer Option Verification (Options 62 and 63) | 3-68 |
| | EVDO Signal Analyzer Test Setup: | 3-70 |
| | 8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests | 3-70 |
| | QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests | 3-72 |
| | 16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Tests | 3-72 |
| | Idle Slot Channel Power, Frequency Error, Rho, and Tau Tests | 3-73 |
| 3-13 | DVB-T/H Signal Analyzer (Options 64 and 57) Verification | 3-74 |
| | Frequency Accuracy and Residual MER Verification | 3-74 |
| | Frequency Lock Range Verification | 3-77 |
| | Level Accuracy Verification | 3-79 |
| | 1 dB Compression Level Verification | 3-85 |
| | Noise Floor Verification | 3-91 |
| | BER Measurement Functional Check, Option 57 Only | 3-92 |
| 3-14 | Mobile WiMAX Signal Analyzer (Options 66 and 67) Verification | 3-96 |
| | Mobile WiMAX Channel Power Accuracy Tests (Option 66) | 3-97 |
| | Channel Power Accuracy (10 MHz Bandwidth and 10 ms Frame Length) | 3-98 |
| | Channel Power Accuracy (5 MHz Bandwidth and 5 ms Frame Length) | 3-100 |
| 3-15 | Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67) | 3-102 |
| | Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length) | 3-103 |
| | Residual EVM and Frequency Error (5 MHz Bandwidth and 5 ms Frame Length) | 3-104 |
| 3-16 | LTE Signal Analyzer (Options 541 and 542) Verification | 3-106 |
| | Introduction | 3-106 |
| | LTE Channel Power Accuracy Tests (Option 541) | 3-107 |
| | LTE Residual EVM and Frequency Error Tests (Option 542) | 3-111 |
| 3-17 | DVB-T/H SFN Analyzer (Option 78) Verification | 3-113 |
| | Level Accuracy Verification | 3-113 |
| | 1 dB Compression Level Verification | 3-119 |
| | Noise Floor Verification | 3-123 |

Chapter 4—Remove and Replace

| | | |
|------|--|------|
| 4-1 | Introduction | 4-1 |
| 4-2 | Remove and Replace Instructions | 4-1 |
| 4-3 | Battery Pack Removal and Replacement | 4-1 |
| | Battery Pack Information | 4-3 |
| 4-4 | Opening the MS2721B Case | 4-4 |
| 4-5 | Removal of the Spectrum Analyzer PCB | 4-6 |
| 4-6 | Removal and Replacement of the Tracking Generator (Option 20) | 4-6 |
| 4-7 | Removal of the Main PCB/LCD Assembly | 4-6 |
| 4-8 | Main PCB Assembly Replacement | 4-7 |
| 4-9 | Removal of the LCD and Backlight Driver PCB from the Main PCB | 4-7 |
| 4-10 | Main PCB Real Time Clock (RTC) Battery Removal and Replacement | 4-8 |
| 4-11 | Main (Numeric) Keypad Membrane and PCB Replacement | 4-9 |
| 4-12 | Replacing the Function Key Keypad | 4-10 |
| 4-13 | Function Key Membrane and Switchpad Replacement | 4-11 |

Table of Contents (Continued)

Appendix A—Test Records

| | |
|--|------|
| Spectrum Analyzer Frequency Accuracy | A-2 |
| Spectrum Analyzer SSB Phase Noise Verification | A-2 |
| Spectrum Analyzer Resolution Bandwidth Accuracy | A-2 |
| Spectrum Analyzer Second Harmonic Distortion | A-3 |
| Spectrum Analyzer Third Order Intercept (TOI) | A-3 |
| Spectrum Analyzer DANL | A-4 |
| Spectrum Analyzer Residual Spurious | A-5 |
| Spectrum Analyzer Input-Related Spurious Verification | A-6 |
| 50 MHz Amplitude Accuracy Verification | A-7 |
| Amplitude Accuracy Across Frequency Verification | A-8 |
| Amplitude Accuracy Across Frequency Verification (continued) | A-9 |
| Amplitude Accuracy Across Frequency Verification (continued) | A-10 |
| Amplitude Accuracy Across Frequency Verification (continued) | A-11 |
| Amplitude Accuracy Across Frequency Verification (continued) | A-12 |
| 9 kHz to 100 kHz Amplitude Accuracy Verification | A-12 |
| Spectrum Analyzer RF Input VSWR Verification | A-13 |
| Option 20 Tracking Generator | A-14 |
| Frequency Accuracy and Residual MER Verification | A-15 |
| Frequency Lock Range Verification | A-15 |
| Level Accuracy Verification (Option 30) | A-16 |
| Level Accuracy Verification | A-16 |
| 1 dB Compression Level Verification | A-16 |
| Level Accuracy Verification – Channel 13 | A-17 |
| Level Accuracy Verification – Channel 38 | A-18 |
| Level Accuracy Verification – Channel 62 | A-19 |
| ISDB-T Signal Analyzer 1 dB Compression Level with Pre Amp OFF | A-20 |
| ISDB-T Signal Analyzer 1 dB Compression Level with Pre Amp ON | A-21 |
| ISDB-T Signal Analyzer Noise Floor | A-21 |
| ISDB-T Signal Analyzer Phase Noise | A-21 |
| Level Accuracy Verification | A-23 |
| Level Accuracy Verification | A-23 |
| 1 dB Compression Level Verification | A-23 |
| Level Accuracy Verification – Channel 13 | A-24 |
| Level Accuracy Verification – Channel 38 | A-25 |
| Level Accuracy Verification – Channel 62 | A-26 |
| ISDB-T SFN Analyzer 1 dB Compression Level with Pre Amp OFF | A-27 |
| ISDB-T SFN Analyzer 1 dB Compression Level with Pre Amp ON | A-27 |
| ISDB-T SFN Analyzer Noise Floor | A-28 |
| Option 63 EVDO Demodulator | A-39 |
| DVB-T/H Signal Analyzer Frequency Accuracy | A-40 |
| DVB-T/H Signal Analyzer Residual MER | A-40 |
| DVB-T/H Signal Analyzer Frequency Lock Range | A-40 |
| DVB-T/H Signal Analyzer Level Accuracy Verification | A-41 |
| 1 dB Compression Level Verification | A-41 |
| DVB-T/H Signal Analyzer Level Accuracy Verification | A-42 |
| DVB-T/H Signal Analyzer Level Accuracy Verification | A-43 |

Table of Contents (Continued)

| | |
|--|------|
| DVB-T/H Signal Analyzer Level Accuracy Verification | A-44 |
| DVB-T/H Analyzer 1 dB Compression Level with Pre Amp OFF | A-45 |
| DVB-T/H Analyzer 1 dB Compression Level with Pre Amp ON | A-45 |
| DVB-T/H Signal Analyzer Noise Floor | A-46 |
| Mobile WiMAX Channel Power Accuracy (10 MHz BW and 10 ms Frame Length) | A-47 |
| Mobile WiMAX Channel Power Accuracy (5 MHz BW and 5 ms Frame Length) | A-48 |
| Mobile WiMAX Demodulator Option 67 | A-49 |
| LTE Channel Power Accuracy (Option 541) | A-50 |
| LTE Residual EVM and Frequency Accuracy (Option 542) | A-50 |
| DVB-T/H SFN Level Accuracy Verification (Option 78) | A-51 |
| DVB-T/H SFN Level Level Accuracy Verification (Option 78) | A-51 |
| DVB-T/H SFN Level 1 dB Compression Level Verification (Option 78) | A-51 |
| DVB-T/H SFN Level Level Accuracy Verification – Channel 21 (Option 78) | A-52 |
| DVB-T/H SFN Level Level Accuracy Verification – Channel 45 (Option 78) | A-53 |
| DVB-T/H SFN Level Level Accuracy Verification – Channel 69 (Option 78) | A-54 |
| DVB-T/H SFN Analyzer 1 dB Compression Level with Pre Amp OFF (Option 78) | A-55 |
| DVB-T/H SFN Analyzer 1 dB Compression Level with Pre Amp ON (Option 78) | A-55 |
| DVB-T/H SFN Analyzer Noise Floor (Option 78) | A-56 |

Table of Contents (Continued)

Chapter 1 — General Information

1-1 Introduction

This manual provides maintenance instructions for Anritsu Spectrum Master Model MS2721B. It provides a list of recommended test equipment, performance verification procedures, parts replacement procedures, and a replaceable parts list. [Appendix A](#) contains blank test records, which should be copied before use. Familiarity with the basic operation of the front panel keys is assumed (for example, how to change measurement mode, how to preset the instrument, or the meaning of "submenu key" and "soft key").

Caution Before making any measurement, ensure that all equipment has warmed up for at least 30 minutes.

1-2 Recommended Test Equipment

The following test equipment is recommended for use in testing and maintaining Anritsu Spectrum Master Model MS2721B. [Table 1-1](#) is a list of test equipment that is required for verifying the spectrum analyzer functions. [Table 1-2](#) is a list of test equipment that is required for verifying the functions of installed options

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

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|-----------------------------------|---|--|
| Synthesized Signal Generator | Frequency: 0.1 Hz to 20 GHz, Power Output: +16 dBm, Step attenuator installed | Anritsu Model MG3692A or MG3692B with options 2A, 4, 22, 15x ^a |
| Power Meter | Power Range: -70 to +20 dBm | Anritsu Model ML2438A |
| Power Sensor | Frequency: 100 kHz to 18 GHz Power Range: -30 to +20 dB | Anritsu Model MA2421D (Qty 2) or Anritsu Model SC7816 (Qty 2) |
| Power Sensor | Frequency: 10 MHz to 18 GHz Power Range: -67 to +20 dB | Anritsu Model MA2442D (Qty 2) |
| Vector Network Measurement System | 10 MHz to 9 GHz | Anritsu Model MS4624A, MS4624B or MS4624D |
| Type N Calibration Kit for VNMS | 10 MHz to 9 GHz | Anritsu Model 3753R |
| 50 Ohm Termination | Frequency: DC to 18 GHz | Anritsu Model 28N50-2 |
| Adapter | Frequency: DC to 20 GHz N(m)-N(m), 50 Ohm | Anritsu Model 34NN50A |
| Adapter | Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm | Anritsu Model 34RKNF50 |
| RF Coaxial Cable | Frequency: DC to 18 GHz N(m)-N(f), 50 Ohm | Anritsu Model 15NN50-1.5B (Qty 2) |
| Lowpass Filter | Frequency: 50 MHz | Anritsu Part Number 1030-96 |
| Low Frequency Cal Fixture | Frequency: 9 kHz to 100 kHz | Anritsu Part Number T3449 |
| Frequency Reference | Frequency: 10 MHz | Symmetricom RubiSource T&M |
| Signal Generator | | Agilent Model 8648D with Options 1ES and 1EA |
| Multimeter | Capable of measuring True RMS AC voltage in millivolts range | Agilent Model 34401A |
| Fixed Attenuator | 10 dB Attenuation | Aeroflex/Weinschel Model 44-10 (Qty 2) |

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

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|-------------------|-------------------------------|--|
| Fixed Attenuator | 20 dB Attenuation | Aeroflex/Weinschel Model 44-20 (Qty 2) |
| Fixed Attenuator | 6 dB Attenuation | Aeroflex/Weinschel Model 44-6 (Qty 2) |
| Fixed Attenuator | 2 dB Attenuation | Aeroflex/Weinschel Model 44-2 (Qty 2) |
| Power Splitter | Frequency: DC to 18 GHz | Aeroflex/Weinschel Model 1870A |
| Coaxial Cable | BNC(m)-to-BNC(m), 50 Ohm | Any (Qty 2) |
| Adapter | Dual Banana Plug to BNC(f) | Any |

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

Optional Functions Verification

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

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|-------------------------|---|--|
| Synthesizer | Frequency: 0.1 Hz to 20 GHz, +16 dBm power | Anritsu Model MG3692A or MG3692B with options 2A, 4, 15, and 22 ^a |
| Vector Signal Generator | Frequency: 100 kHz to 3 GHz | Anritsu Model MG3700A with Options: MG3700A-002, MG3700A-021 ^b , and Waveform Data License MX370001A and MX370108A |
| 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 |
| Frequency Reference | Frequency: 10 MHz | Symmetricom RubiSource T&M |
| 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) |
| 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)-N(f) Adapters required) |
| Adapter | Frequency: DC to 20 GHz N(m)-N(m), 50 Ohm | Maury Microwave Model 8828B Quantity: 2 each [One each required only if Anritsu Coupler and Circulator are used] |
| Adapter | Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm | Anritsu Model 34RKNF50 |
| Adapter | Frequency: DC to 20 GHz K(m)-N(f), 50 Ohm | Anritsu Model 34NN50A |
| Adapter | Frequency: 881.5 MHz BNC(m)-N(f), 50 Ohm | Midwest Microwave Model 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)-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 |
| RF Limiter | Frequency: 10 MHz to 18 GHz N(m) In, N(f) Out, 50 ohm | Anritsu Model 1N50C |
| High Power Load | DC to 18 GHz, 10 W | Aeroflex/Weinschel Model M1418 |

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

| 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 part number 1091-307 [Two SMA(m)-to-N(f) adapters required.] |
| Circulator | Frequency Range: 800 to 1000 MHz Isolation: 20 dB min. | Meca Electronics, Inc. part number CN-0.900 Alternative: Anritsu part number 1000-50 [Two SMA(m)-to-N(f) adapter and one SMA(m) to SMA(m) Adapter required.] |
| RF Coaxial Cable | Frequency: DC to 18 GHz N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-1.5B (Qty 3) |
| RF Coaxial Cable | Frequency: DC to 6 GHz N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-1.5C (Qty 3) |
| GPS Antenna | | Anritsu 2000-1410 |
| Coaxial Cable | BNC(m)-BNC(m), 50 Ohm | Any (Qty 2), or Anritsu part number 2000-1627-R |

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

b.Note that the tests in this manual require that the MG3700A has several factory custom test pattern files installed into its memory.

1-3 Replaceable Parts

Table 1-3 contains a list of parts that can be replaced in the Model MS2721B Spectrum Master.

Table 1-3. Replaceable Parts in the Model MS2721B Spectrum Master

| Part Number | Description |
|------------------|---|
| ND67985 | MS2721B Main/Spec Analyzer PCB Assembly, with Option 9 and Option 31 or Support Opt.09/31. For units with S/N < 1003000 |
| ND71298 | MS2721B Main/SPA Assembly, Support Opt.09/30/31/32/64/78. For S/N < 1003000 |
| ND71306 | MS2721B Main/SPA Assembly, Support Opt.9/31. For units with S/N > 1002999 |
| ND71308 | MS2721B Main/SPA Assembly, Support Opt.09/30/31/32/64/78. For units with S/N > 1002999 |
| ND68502 | MS2721B Main/SPA/BER Assembly, Support Opt.09/31/57. For units with S/N < 1003000 |
| ND71307 | MS2721B Main/SPA/BER Assembly, Support Opt.09/31/57. For units with S/N > 1002999 |
| ND67553 | Tracking Generator PCB (Option 20) |
| ND66821 | MS2721B Demodulation PCB (Option 9) |
| 3-790-661 | Gasket material for case edge |
| 3-15-118 | LCD Display |
| 61368 | Clear Plastic LCD Protector |
| 3-66549-3 | LCD Backlight Inverter PCB |

Table 1-3. Replaceable Parts in the Model MS2721B Spectrum Master

| Part Number | Description |
|-------------------------------|---|
| 2000-1686-R | Soft Carrying Case |
| 64126 | Case Top (excludes model ID Label and keypad items) |
| 64127 | Case Bottom |
| 65747 | Model MS2721B ID Label |
| 61379-1 | Battery Door |
| 633-44 | Li-ion Battery Pack |
| 633-75 | High Capacity Li-ion Battery Pack |
| 513-64 or 3-513-64 | Type N RF connector |
| ND64383 | Fan |
| 3-633-26 | 3V RTC Battery |
| 40-187-R | AC to DC Power Converter |
| 3-2000-1567 | Internal Compact Flash Card (512 MB) |
| 65027-3 | Main Keypad PCB |
| 61362 | Main Keypad |
| 61363-1 | Main Keyboard Bezel |
| 61361 | Soft Key Keypad |
| 61378-1 | Soft Key Bezel |
| 61333-3 | Soft Key PCB |
| 790-625 | Speaker |
| 3-410-101 | Encoder (excluding knob) |
| 61360-2 | Knob (excluding encoder) |
| 513-80 | RF connector for Tracking Generator (Option 20) |

1-4 Troubleshooting

This section describes the primary troubleshooting operations that can be performed by Anritsu Service Centers. Perform the troubleshooting suggestions in the order that they are listed. Operators of the MS2721B should refer to the User Guide for troubleshooting help.

Caution

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in the replaceable parts list are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special training. 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.

Turn-on Problems

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

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Ensure that the battery has an Anritsu label.
3. External power supply may have failed or be the wrong type. Replace the external power supply, the AC to DC Power Converter.
4. On/Off switch is damaged. Replace the keypad PCB or rubber keypad. Refer to [“Main \(Numeric\) Keypad Membrane and PCB Replacement” on page 4-9](#).
5. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly. Refer to [“Removal of the Main PCB/LCD Assembly” on page 4-6](#).

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

1. Using Master Software Tools, perform the Emergency Repair procedure, then update the system software (via the Tools menu in Master Software Tools).
2. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly. Refer to [“Removal of the Main PCB/LCD Assembly” on page 4-6](#).

Instrument makes normal boot-up sounds, but the display has a problem:

1. If the display is dim, check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB. Refer to [“Removal of the LCD and Backlight Driver PCB from the Main PCB” on page 4-7](#).
3. Replace the LCD assembly. Refer to [“Removal of the LCD and Backlight Driver PCB from the Main PCB” on page 4-7](#).
4. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly. Refer to [“Removal of the Main PCB/LCD Assembly” on page 4-6](#).

Boot-up Self Test fails:

1. Perform a Master Reset.
2. If the message relates to the RTC battery, replace the battery on the Main PCB. Refer to [“Main PCB Real Time Clock \(RTC\) Battery Removal and Replacement” on page 4-8](#).
3. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly. Refer to [“Removal of the Main PCB/LCD Assembly” on page 4-6](#).

Battery Pack Charging Problems

Refer to [“Battery Pack Information”](#) on page 4-3.

Lock Error Messages

1. This message normally appears for 2 to 3 seconds when an external 10 MHz Reference is applied. The Spectrum Analyzer PCB has failed.
2. Replace the Main/Spectrum Analyzer assembly. Refer to [“Removal of the Spectrum Analyzer PCB”](#) on page 4-6.

Spectrum Analyzer Problems

1. Inspect the Spectrum Analyzer RF In connector for damage.
2. Refer to the User Guide (Anritsu part number 10580-00175).
3. Update system software using Master Software Tools (via the Tools menu in Master Software Tools).
4. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly. Refer to [“Removal of the Main PCB/LCD Assembly”](#) on page 4-6.

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.

Connectors

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 — Performance Verification 1

2-1 Introduction

This chapter contains test procedures that can be used to verify the Spectrum Analyzer functions of Spectrum Master Model MS2721B. Blank performance verification test records are provided in [Appendix A](#). Make a copies of the blank test records and use them to record measured values.

2-2 Spectrum Analyzer Function Verification

This part of the Performance Verification chapter contains instructions to verify Spectrum Analyzer functions in the Anritsu Spectrum Master Model MS2721B. These tests include:

- [Spectrum Analyzer Frequency Accuracy](#)
- [Spectrum Analyzer Internal Reference Frequency Adjustment](#)
- [Spectrum Analyzer SSB Phase Noise Verification](#)
- [Spectrum Analyzer Resolution Bandwidth Accuracy](#)
- [Spectrum Analyzer Second Harmonic Distortion](#)
- [Spectrum Analyzer Third Order Intercept \(TOI\) Verification](#)
- [Spectrum Analyzer Displayed Average Noise Level \(DANL\)](#)
- [Spectrum Analyzer Residual Spurious Response](#)
- [Input Related Spurious \(IRS\) Signals](#)
- [Spectrum Analyzer Absolute Amplitude Accuracy](#)
- [Spectrum Analyzer RF Input VSWR Verification](#)

| |
|--|
| Note Allow all instruments to warm up to typical operating temperature before taking test readings. |
|--|

Spectrum Analyzer Frequency Accuracy

This test verifies the CW frequency accuracy of the Spectrum Analyzer in Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B

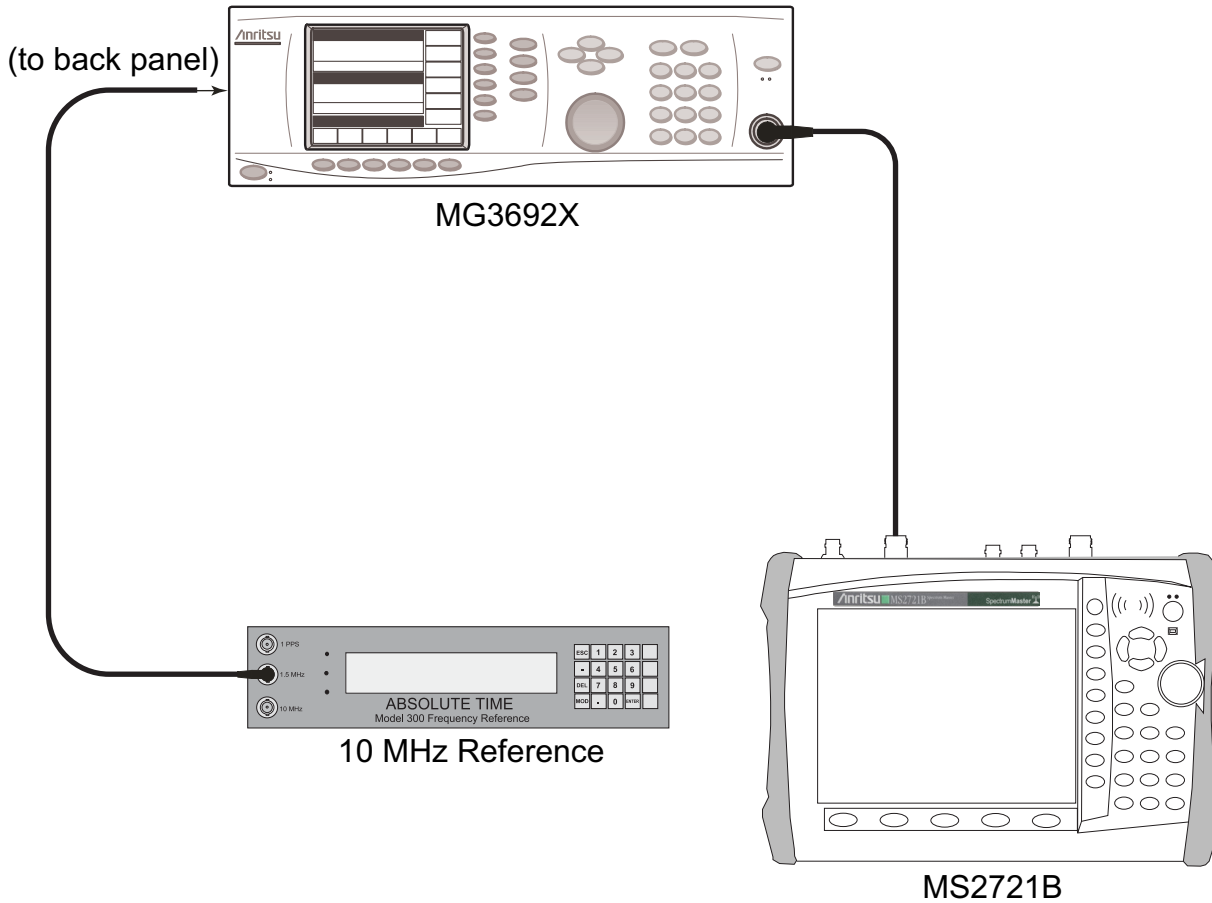


Figure 2-1. Spectrum Analyzer Frequency Accuracy Test Setup

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 Spectrum Master Model MS2721B. |
|-------------|--|

2. Connect the output of the Synthesized Signal Generator to the Spectrum Analyzer RF In port of the MS2721B.
3. On the MS2721B, change the Mode to Spectrum Analyzer. Preset the instrument.
4. Set the MG3692x output to 1 GHz CW, with an RF output level of -30 dBm.
5. On the MS2721B, press the **Amplitude** function hard key, and set the Reference Level to -10 dBm.
6. Press the **Freq** soft key and set the Center Freq to 1.0 GHz.
7. Press the **Span** soft key, set the span to 10 kHz.
8. Press the **BW** function hard key and set RBW to 100 Hz.

9. Press the VBW soft key and set to 30 Hz.
10. Press the **Marker** key, and press the Peak Search soft key.
11. Record the marker frequency in [Table A-1, “Spectrum Analyzer Frequency Accuracy” on page A-2](#) , and verify that it is within specification.
12. Set the MG3692x output to 7.0 GHz CW and set the center frequency of the MS2721B to 7.0 GHz.
13. On the MS2721B, press the **Marker** key, and press the Peak Search soft key.
14. Record the marker frequency in [Table A-1](#), and verify that it is within specification.

Note

If the instrument fails the Spectrum Analyzer Frequency Accuracy test, then perform the following Spectrum Analyzer Internal Reference Frequency Adjustment procedure. If the instrument still fails the Frequency Accuracy test after the Internal Reference Frequency adjustment has been completed, then replace the SPA PCB (refer to [“Removal of the Spectrum Analyzer PCB” on page 4-6](#)) and the Main PCB (refer to [“Removal of the Main PCB/LCD Assembly” on page 4-6](#)).

Spectrum Analyzer Internal Reference Frequency Adjustment

Use this procedure to adjust the Internal Reference Frequency only if the instrument failed the preceding Spectrum Analyzer Frequency Accuracy verification test. If the instrument still fails the Frequency Accuracy test after this Internal Reference Frequency adjustment has been completed, then replace the Main and SPA PCB assemblies (“[Removal of the Spectrum Analyzer PCB](#)” on page 4-6 and “[Removal of the Main PCB/LCD Assembly](#)” on page 4-6).

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B

Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator as shown in [Figure 2-1](#).

| |
|--|
| Note Do not connect the external 10 MHz Reference to the MS2721B. |
|--|

2. Connect the MG3692x output to the Spectrum Analyzer RF In port of the MS2721B.
3. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
4. Set the MG3692x output to 7 GHz with an RF output level of -30 dBm.
5. On the MS2721B, press the **Amplitude** function hard key and set the Reference Level to -10 dBm.
6. Set the Attenuation Level to 0 dB.
7. Press the **Freq** soft key and set the Center Frequency to 7.0 GHz.
8. Press the **Span** soft key, and enter 10 kHz.
9. Press the **BW** function hard key and set the RBW to 100 Hz.
10. Press the **VBW** soft key and set to 30 Hz.
11. Press and hold the **Shift** key and press the 4th, 6th, and 8th (below **Esc**) soft keys together (pressing all 4 keys simultaneously) in order to enter into the MS2721B Service Mode ([Figure 2-2](#))

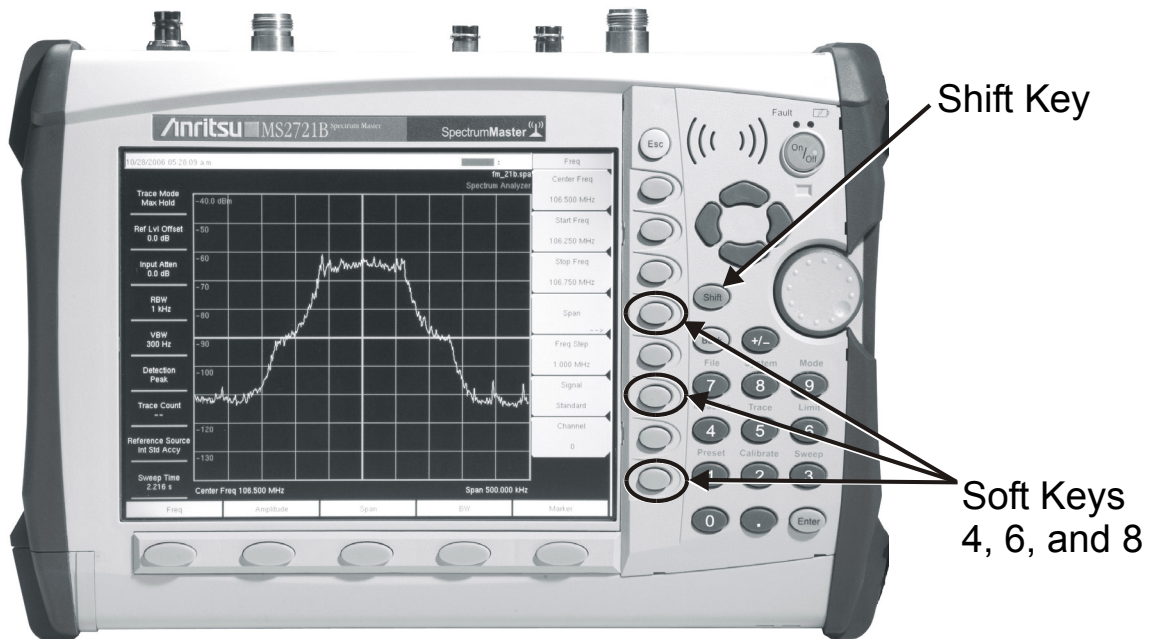


Figure 2-2. MS272xB Service Mode

12. Press the Service Menu soft key, then the APP Service soft key.
13. Press the Calibration soft key, then the 10 MHz Ref soft key.
14. Use the **Up/Down** arrow keys or the rotary knob to slowly adjust the displayed signal to the center of the display. Allow the signal to stabilize between adjustments, and repeat as necessary.
15. Turn the MS2721B OFF and then back ON to exit Service Mode.

Spectrum Analyzer SSB Phase Noise Verification

This test verifies the single sideband (SSB) phase noise of the Spectrum Analyzer in Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B

Procedure:

1. Connect the external 10 MHz Reference to the Anritsu MG3692x Synthesized Signal Generator as shown in [Figure 2-1](#).
2. Connect the output of the synthesized signal generator to the Spectrum Analyzer RF In connector of the MS2721B.
3. Set the MG3692x output to 7.09 GHz CW, with an RF output level of +13 dBm.
4. Verify that the MS272xB is in the Spectrum Analyzer mode. Preset the instrument.
5. Press the **Amplitude** function hard key, then set the Reference Level to 0 dBm.
6. Press the Atten Lvl soft key and enter 15 dB.
7. Press the Freq soft key and set the Center Frequency to 7090.05 MHz.
8. Press the Span soft key and set the span to 110 kHz.
9. Press the **BW** function hard key and set the RBW to 1 kHz.
10. Press the VBW soft key and set the VBW to 3 Hz.
11. Press the **Shift** key and then press the **Trace** (5) key.
12. Press the Trace A Operations soft key, and set the # of Averages to 7.
13. Wait until the Trace Count (left side of display) displays 7/7.
14. Press the **Marker** key and press the **Peak Search** soft key.
15. Press the Delta On/Off soft key to turn Delta ON.
16. Use the keypad to enter 10 and press the kHz soft key.
17. Subtract 30 from the dB value that is shown on the marker readout to convert the value to dBc/Hz (for example, if the marker reads –80 dB, the value becomes –110 dBc/Hz). Record the dBc/Hz value in [Table A-2, “Spectrum Analyzer SSB Phase Noise Verification”](#) on page A-2.
18. Repeat [Step 16](#) and [Step 17](#) for 20 kHz marker delta, 30 kHz marker delta, and 100 kHz marker delta.

Spectrum Analyzer Resolution Bandwidth Accuracy

This test verifies the resolution bandwidth accuracy of the Spectrum Analyzer in the Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B
- Adapter, Anritsu Model 34RKNF50 or Adapter, Anritsu Model 34NN50A

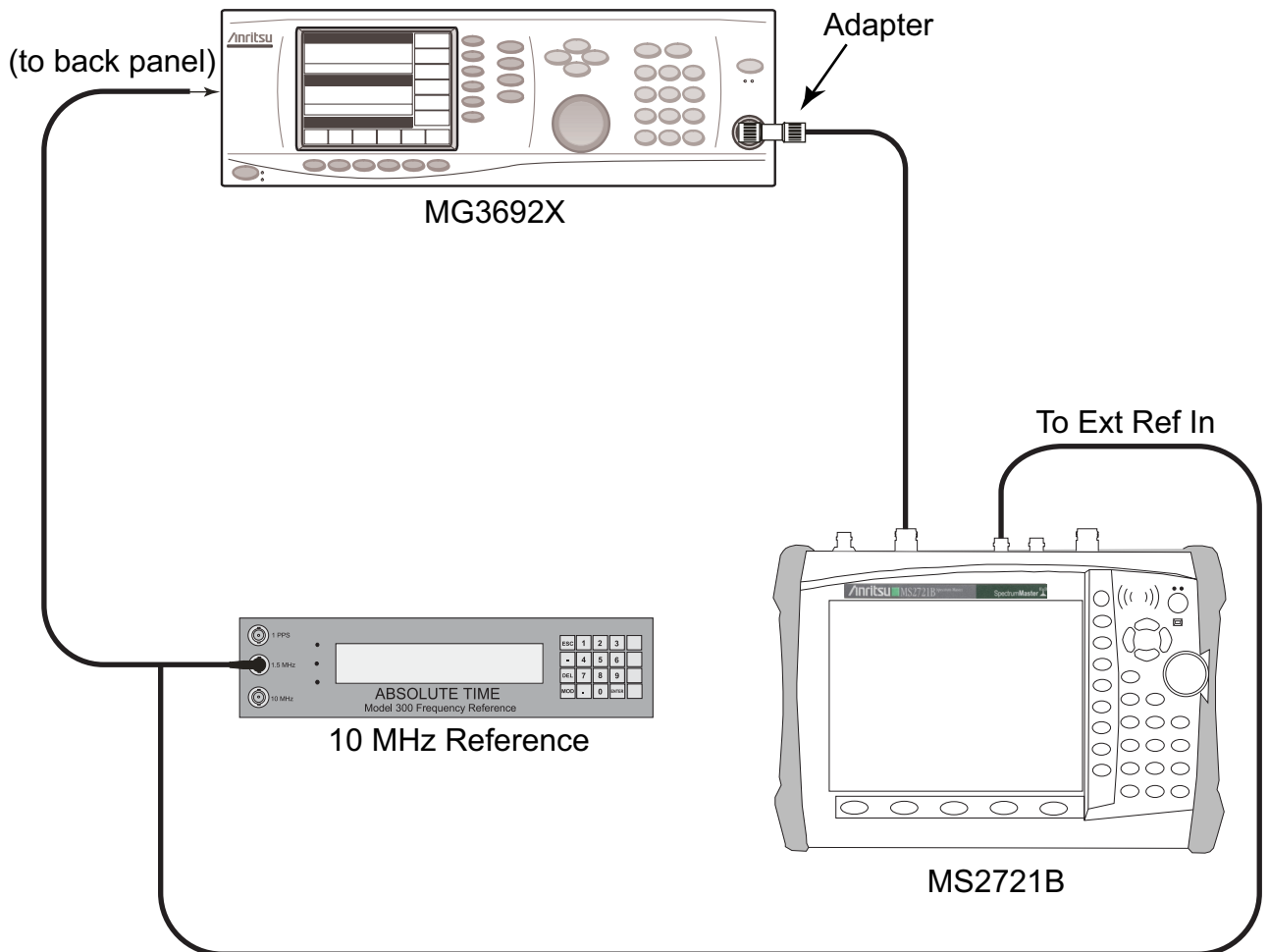


Figure 2-3. Spectrum Analyzer Resolution Bandwidth Accuracy Test Setup

Procedure:

1. Connect the external 10 MHz Reference to both the MG3692x Synthesized Signal Generator and the Spectrum Master MS2721B as shown in [Figure 2-3](#).
2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Set the MS2721B as follows:
 - Center Frequency: 1.0 GHz
 - Reference Level: -10 dBm
 - Attenuation Level: 0 dB

4. Set the MG3692x to 1 GHz CW, with an output level of -30 dBm. Apply the signal to the Spectrum Analyzer RF In connector of the MS2721B.
5. On the MS2721B, set the Span to 4.5 MHz.
6. Press the **BW** function hard key and set the RBW to 3 MHz.
7. Under the Measure menu, press OCC BW and set it to On.
8. Press the dBc soft key and enter 3.
9. Record the occupied bandwidth in [Table A-3, "Spectrum Analyzer Resolution Bandwidth Accuracy" on page A-2](#), and verify that it is within specification.
10. Repeat [Step 3](#) through [Step 6](#) for all other settings in [Table A-3](#).

Spectrum Analyzer Second Harmonic Distortion

This test verifies the second harmonic distortion of the Spectrum Analyzer in the Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Lowpass Filter, Anritsu Part Number 1030-96 (RLC Electronics)
- Spectrum Master Model MS2721B

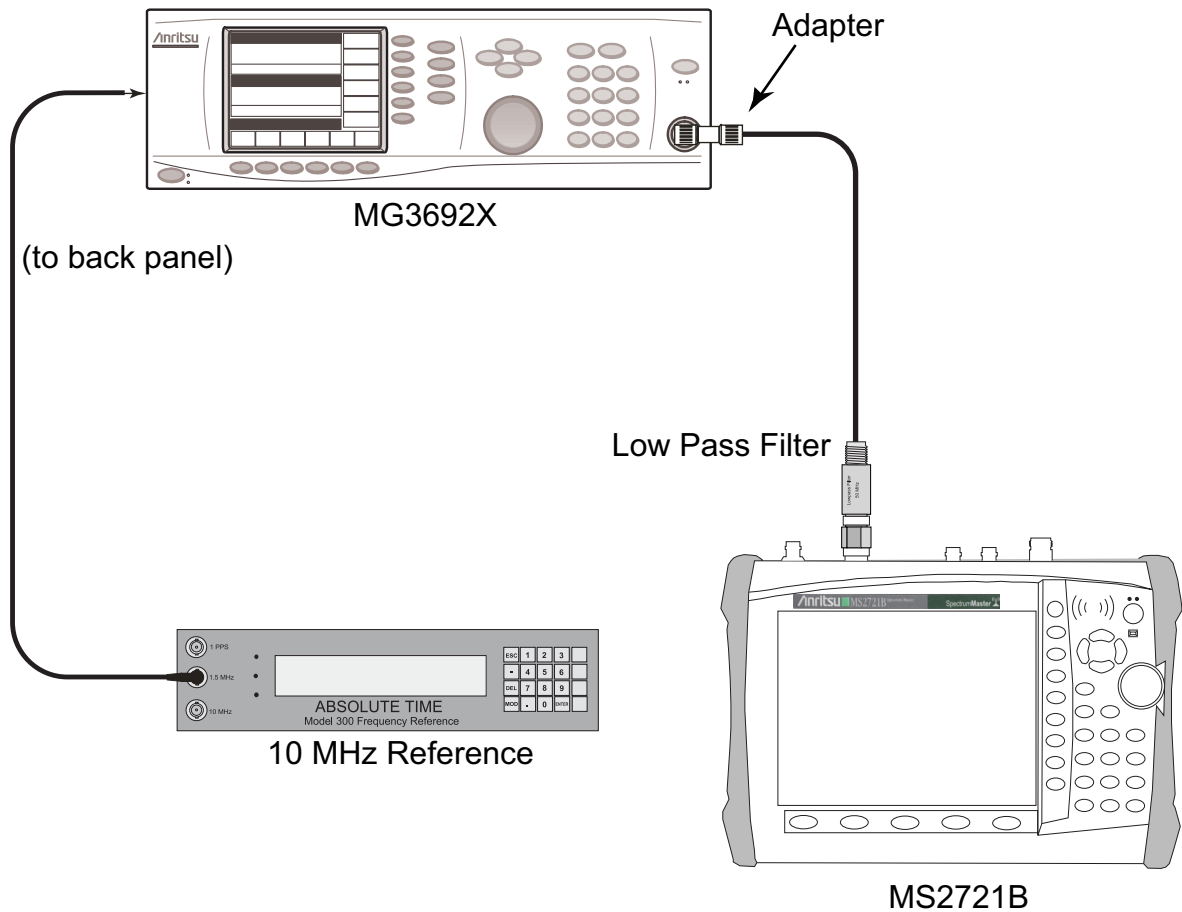


Figure 2-4. Spectrum Analyzer Second Harmonic Distortion Test Setup

Procedure:

1. Set the MG3692x Synthesized Signal Generator to 50.1 MHz CW and set the output level to -30 dBm.
2. Connect the synthesized signal generator output to the Spectrum Analyzer RF In connector of the MS2721B through the 50 MHz lowpass filter, as shown in [Figure 2-4](#).
3. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
4. Set the MS2721B as follows:
 - Center Frequency: 50.1 MHz
 - Span: 100 kHz
 - Reference Level: -20 dBm
 - Attenuation Level: 0 dB
 - RBW: 1 kHz
 - VBW: 10 Hz
 - Detection: Peak
5. Press the **Shift** key and then the **Trace** (5) key. Press Trace A Operations and set # of Averages to 5.
6. After the Trace Count displays "5/5" (left side of display), press the **Marker** key and press Peak Search.
7. Record the amplitude of the 50.1 MHz signal in the test record, [Table A-4](#), "Spectrum Analyzer Second Harmonic Distortion" on page A-3.
8. Change the Center Frequency of the MS2721B to 100.2 MHz. Do not adjust the MG3692x Synthesized Signal Generator.
9. After the Trace Count shows "5/5", press the **Marker** key and press Peak Search.
10. Record the amplitude of the signal at 100.2 MHz in [Table A-4](#).
11. Convert the values of the 50.1 MHz and 100.2 MHz signals to positive values and subtract the smaller from the larger. Record the result in [Table A-4](#), and verify that it is within specification.

Spectrum Analyzer Third Order Intercept (TOI) Verification

The following test verifies the Third Order Intercept point (also known as TOI or IP3) of the Spectrum Analyzer in the Spectrum Master Model MS2721B.

600 MHz TOI Test

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B
- Signal Generator, Agilent Model 8648D
- Power Meter, Anritsu Model ML2438A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-2
- Fixed Attenuator, Aeroflex/Weinschel Model 44-6
- Fixed Attenuator, Aeroflex/Weinschel Model 44-20
- Power Sensor, Anritsu Model MA2442D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Adapter, Anritsu Model 34NN50A

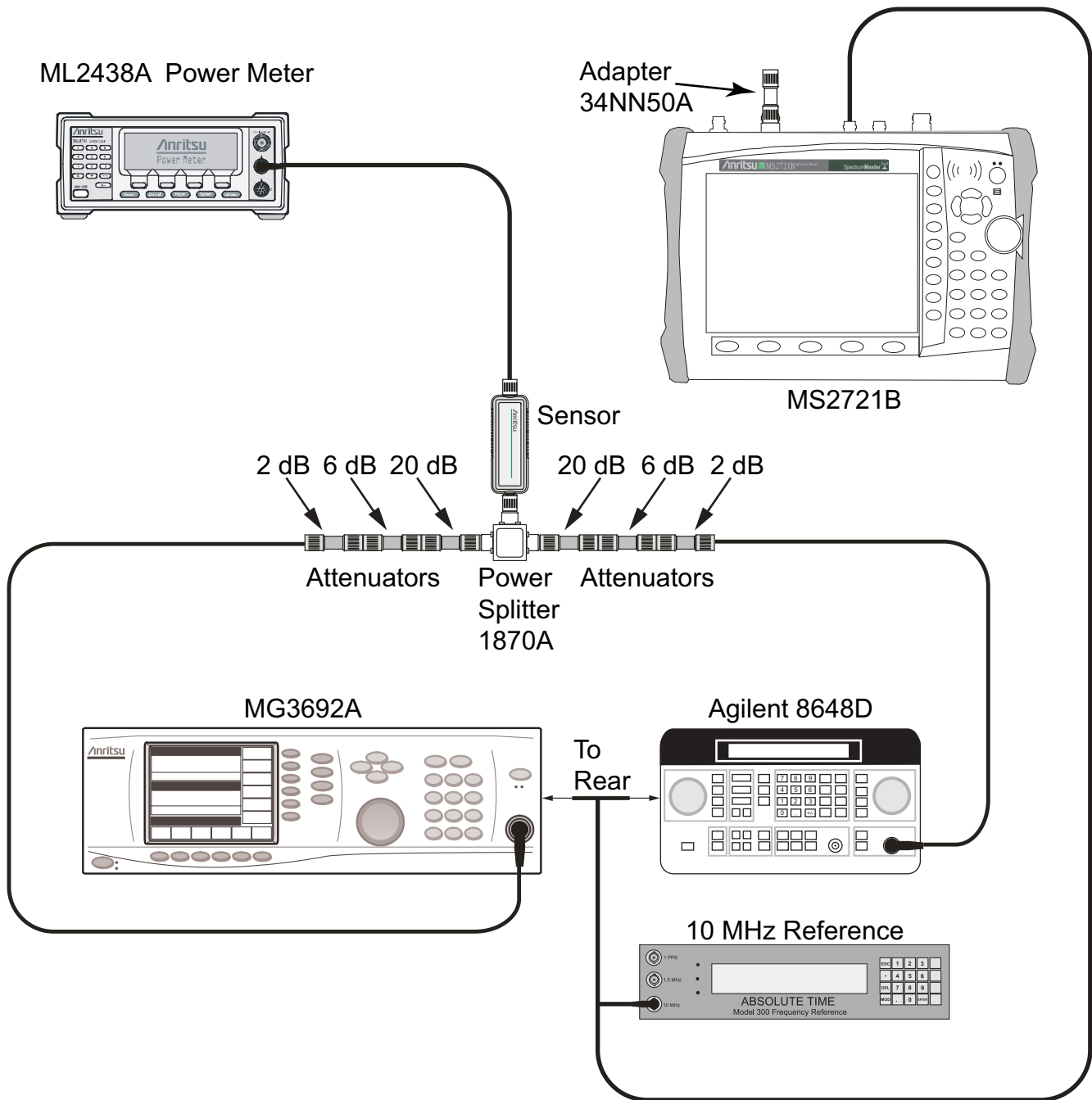


Figure 2-5. Third Order Intercept (TOI) Verification Characterization Setup

Procedure:

1. Perform Zero/Cal on the Sensor and power meter.

On the ML2438A power meter, zero the sensor and set the calibration factor of the sensor to 600 MHz.

2. Connect the equipment as shown in [Figure 2-5](#). The splitter will be used as an RF combiner (the normal RF output connections will become input connections, and the normal input connection will become the RF output connection).
3. Set the MG3692x Synthesized Signal Generator to 599.951 MHz CW, and the Agilent 8648D Signal Generator to 600.051 MHz.

4. Set the Agilent 8648D Signal Generator RF to OFF ("RF OFF" appears on the right side of the display).
5. Connect the power sensor to the splitter "output" and adjust the power of the MG3692x so that -20 dBm appears at the splitter "output" (approximately $+16$ dBm on the MG3692x).
6. Turn off the RF of the MG3692x Synthesized Signal Generator.
7. On the Agilent 8648D Signal Generator, turn on the RF and adjust the RF amplitude so that -20 dBm appears at the splitter "output" (approximately $+16$ dBm on the 8684D).
8. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
9. Set the MS2721B as follows:
 - Center Frequency: 600.151 MHz
 - Span: 100 Hz.
 - RBW: 30 Hz
 - VBW: 1 Hz
 - Reference Level: -15 dBm
 - Attenuation Level: 0 dB
 - Pre Amp: Off
10. Press the **Shift** key and the **Sweep** (3) key. Press **Detection**, and press **RMS** (a red dot appears on the label).

11. Disconnect the power sensor from the "output" of the splitter and connect the splitter "output" to the MS2721B Spectrum Analyzer RF In connector through the Anritsu Model 34NN50A adapter.

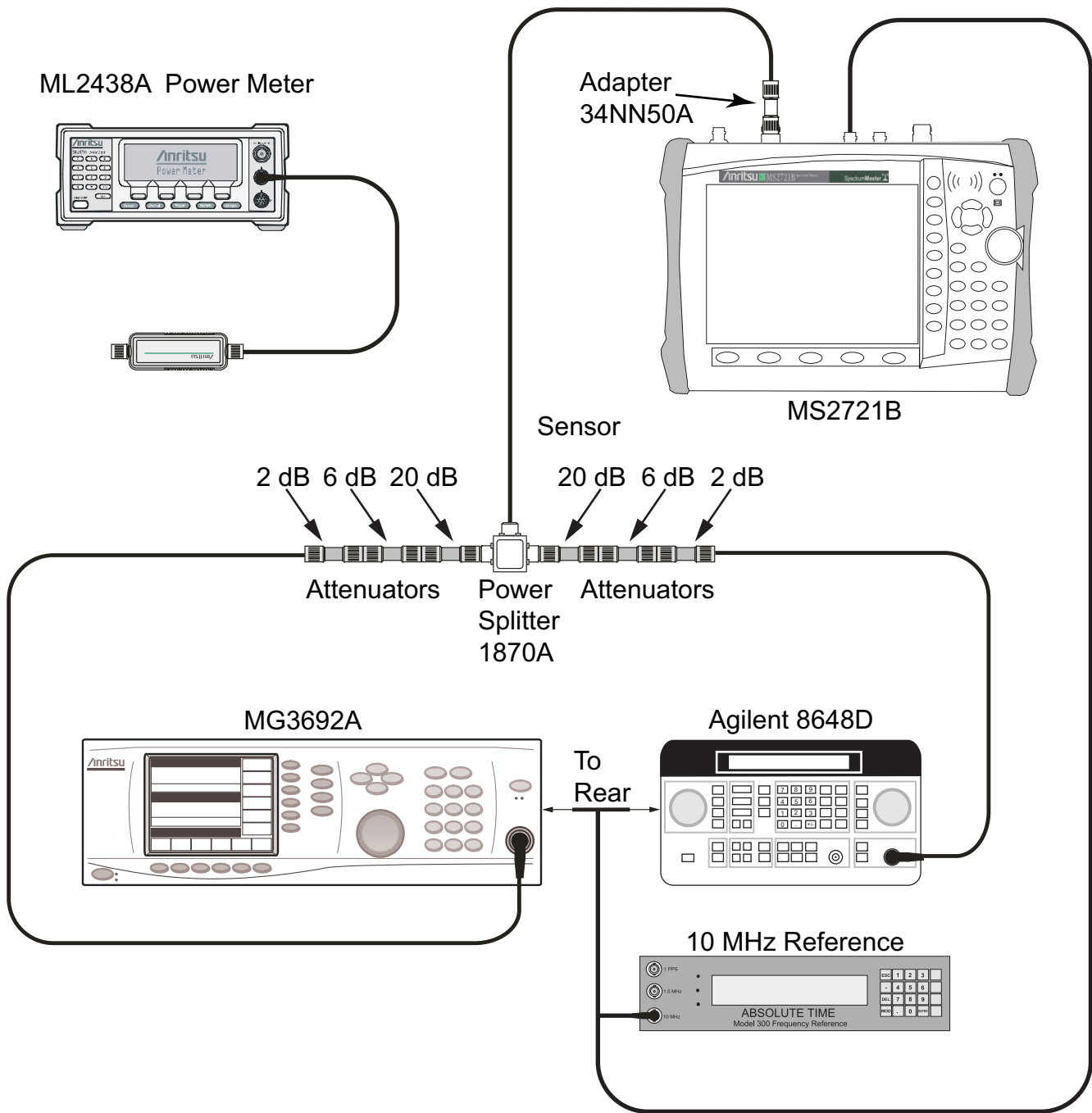


Figure 2-6. 600 MHz TOI Verification Test Setup

12. Turn on the RF of the MG3692x and the 8648D signal generator.
13. Press the **Shift** key and then the **Trace** (5) key. Press Trace A Operations, and set # of Averages to 2.
14. After two sweeps have occurred ("Trace Count 2/2" appears on the left of the display), turn on a marker and press Peak Search. Record the amplitude of the signal at 600.151 MHz in [Table A-5, "600 MHz TOI Test" on page A-3.](#)

15. Change the Center Frequency of the MS2721B to 599.851 MHz. Record the amplitude of this signal in [Table A-5](#).
16. Determine which signal is larger (signal at 599.851 MHz or signal at 600.151 MHz). Use the larger value for "**max**" to calculate the TOI for 600 MHz (refer to the following example calculation):

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

Example: Assume max = -90 dBm, then: TOI = -20 + [(-20 - (-90))/2] = +15 dBm
17. Record the 600 MHz TOI calculated measurement in [Table A-7](#), "Spectrum Analyzer Calculated Third Order Intercept" on page A-3.

3.5 GHz TOI Test

Procedure:

1. Remove the splitter "output" from the MS2721B Spectrum Analyzer RF In connector.
2. Set the MG3692x Synthesized Signal Generator to 3.499951 GHz, and the Agilent 8648D Signal Generator to 3500.051 MHz.
3. Set the Agilent 8648D Signal Generator RF to OFF ("RF OFF" appears on the right side of the display).
4. On the ML2438A power meter, set the calibration factor of the power sensor to 3.5 GHz.
5. Connect the power sensor to the splitter "output" and adjust the power of the MG3692x so that -20 dBm appears at the splitter "output" (approximately +16 dBm on the MG3692x), as shown in [Figure 2-5](#).
6. Turn off the RF of the MG3692x Synthesized Signal Generator.
7. On the Agilent 8648D Signal Generator, turn on the RF and adjust the RF amplitude so that -20 dBm appears at the splitter "output" (approximately +16 dBm on the 8684D).
8. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
9. Set the MS2721B as follows:
 - Center Frequency: 3.500151 GHz
 - Span: 100 Hz.
 - RBW: 30 Hz
 - VBW: 1 Hz
 - Reference Level: -15 dBm
 - Attenuation Level: 0 dB
 - Pre Amp: Off
 - Detection: RMS
10. Disconnect the power sensor from the "output" of the splitter and connect the splitter "output" to the MS2721B Spectrum Analyzer RF In connector through the Anritsu Model 34NN50A adapter, as shown in [Figure 2-6](#).
11. Turn on the RF of the MG3692x and of the 8648D signal generator.
12. Press the **Shift** key and then the **Trace** (5) key. Press Trace A Operations, and set # of Averages to 2.
13. After two sweeps have occurred ("Trace Count 2/2" appears on the left of the display), turn on a marker and press **Peak Search**. Record the amplitude of the signal at 3.500151 GHz in [Table A-6](#), "3.5 GHz TOI Test" on page A-3.
14. Change the Center Frequency of the MS2721B to 3.499851 GHz. Record the amplitude of this signal in [Table A-6](#).

15. Determine which signal is larger (signal at 3.499851 GHz or signal at 3.500151 GHz). Use the larger value for "max" to calculate the TOI for 3.5 GHz (refer to the following example calculation):

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

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

16. Record the 3.5 GHz TOI calculated measurement in [Table A-7, "Spectrum Analyzer Calculated Third Order Intercept"](#) on page A-3.

Spectrum Analyzer Displayed Average Noise Level (DANL)

The following test can be used to verify the Displayed Average Noise Level of the MS2721B. This test is performed using the RMS detection mode, first with Pre Amp on, then with Pre Amp off.

Required Equipment:

- Spectrum Master Model MS2721B
- 50 ohm termination, Anritsu Model 28N50-2

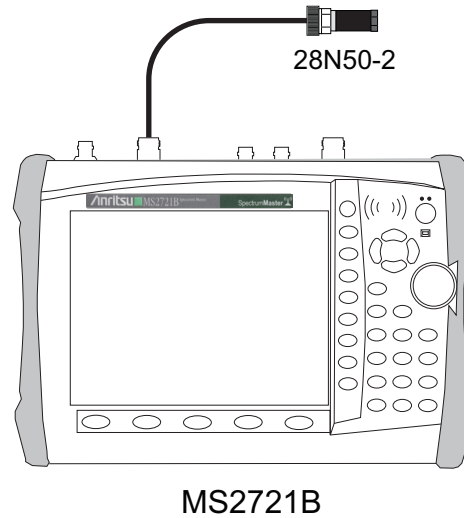


Figure 2-7. Spectrum Analyzer DANL Test Setup

Procedure:

1. Connect the 28N50-2 50 ohm termination to the MS2721B Spectrum Analyzer RF In port.
2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Press the **Amplitude** function hard key, set Attenuation Level to 0 dB, and set the Reference Level to -50 dBm.
4. Press the Pre Amp On/Off soft key to turn it ON.
5. Press the Amplitude soft key and then press Detection soft key, then press RMS (a red dot appears on the RMS label).
6. Press the **BW** function hard key and select an RBW of 100 kHz.
7. Enter the Start and Stop frequencies into the MS2721B from the first 2 columns in [Table A-8](#), “Spectrum Analyzer DANL (Pre Amp On)” on page A-4.
8. Wait until one sweep has been completed.
9. Press the **Marker** key and press Peak Search.
10. Record the Marker reading in the “Measured Power (100 k RBW)” column of [Table A-8](#).
11. Repeat [Step 7](#) through [Step 10](#) for the other frequencies in [Table A-8](#).
12. For each measured 100 kHz value in [Table A-8](#), convert the measured value to a 1 Hz RBW value by subtracting 50 dB. (For example, if the marker shows a value of -110 dBm at 100 kHz RBW, then the computed value at 1 Hz RBW is -160 dBm.) Enter the computed values in [Table A-8](#).
13. Press the **Amplitude** function hard key.
14. Set Reference Level to -20 dBm and set the Pre Amp to Off.
15. Repeat [Step 7](#) through [Step 11](#) for the Pre Amp Off measurements.
16. Enter the computed 1 Hz RBW values in [Table A-9](#).

Spectrum Analyzer Residual Spurious Response

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

- “Residual Spurious Test with Pre Amp On”
- “Residual Spurious Test with Pre Amp Off”

Required Equipment:

- Spectrum Master Model MS2721B
- 50 ohm termination, Anritsu Model 28N50-2

Residual Spurious Test with Pre Amp On

Procedure:

1. Connect the 50 ohm termination to the Spectrum Analyzer RF In connector as shown in [Figure 2-7](#).
2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Press the **Amplitude** key, then press the Reference Level soft key.
4. Use the keypad to enter -50 and press the dBm soft key.
5. Press the Atten Lvl soft key and enter 0, then press the dB soft key.
6. Ensure that the Pre Amp On/Off soft key is in the On position. If the Pre Amp is off, then press the Pre Amp On/Off soft key to turn it On.
7. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection soft key and then the Peak soft key.
8. Press the **BW** key and press the RBW soft key.
9. Use the keypad to enter 10 and press the kHz soft key.
10. Press the VBW soft key and use the keypad to enter 1, then press the kHz soft key.
11. Press the **Freq** key and press the Start Freq soft key.
12. Use the keypad to enter 100 and press the kHz soft key.
13. Press the Stop Freq soft key, enter 10 and press the MHz soft key.
14. Wait until one sweep is completed.
15. Press the **Marker** key and press the Peak Search soft key.
16. Verify that the Marker 1 amplitude reading is ≤ -100 dBm and record it in [Table A-10](#), “Spectrum Analyzer Residual Spurious (Pre Amp On)” on page A-5, if required.
17. If a spur with amplitude larger than -100 dBm occurs, then wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep was not real.
18. Repeat [Step 11](#) through [Step 16](#) for the other Start and Stop frequencies listed in [Table A-10](#).

Residual Spurious Test with Pre Amp Off

Procedure:

1. Connect the 50 ohm termination to the Spectrum Analyzer RF In connector as shown in [Figure 2-7](#).
2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Press the **Amplitude** key, then press the Reference Level soft key.
4. Use the keypad to enter -40 and press the dBm soft key.
5. Press the Atten Lvl soft key and enter 0, then press the dB soft key.

6. Ensure that the Pre Amp On/Off soft key is in the Off position. If the Pre Amp is on, then press the Pre Amp On/Off soft key to turn it Off.
7. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection soft key and then the Peak soft key.
8. Press the **Freq** key, and press the Start Freq soft key.
9. Use the keypad to enter 100 and press the kHz soft key.
10. Press the Stop Freq soft key, enter 10 and press the MHz soft key.
11. Press the **BW** key and press the RBW soft key.
12. Use the keypad to enter 3 and press the kHz soft key.
13. Press the VBW soft key and use the keypad to enter 300, then press the Hz soft key.
14. Wait until one sweep is completed.
15. Press the **Marker** key, and press the Peak Search soft key.
16. Record the Marker 1 amplitude reading in [Table A-11](#), “Spectrum Analyzer Residual Spurious (Pre Amp Off)” on [page A-5](#), if required, and verify that it is ≤ -90 dBm.
17. If a spur with amplitude larger than -90 dBm occurs, then wait another full sweep and observe whether the spur occurs at the same point on the second sweep. If the spur does not occur at the same point on the second sweep, then the spur on the first sweep was not real.
18. Repeat [Step 8](#) through [Step 16](#) for the other Start and Stop frequencies with the listed RBW and VBW in [Table A-11](#).

Input Related Spurious (IRS) Signals

The following test verifies the input related spurious signals of the Spectrum Analyzer in Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B

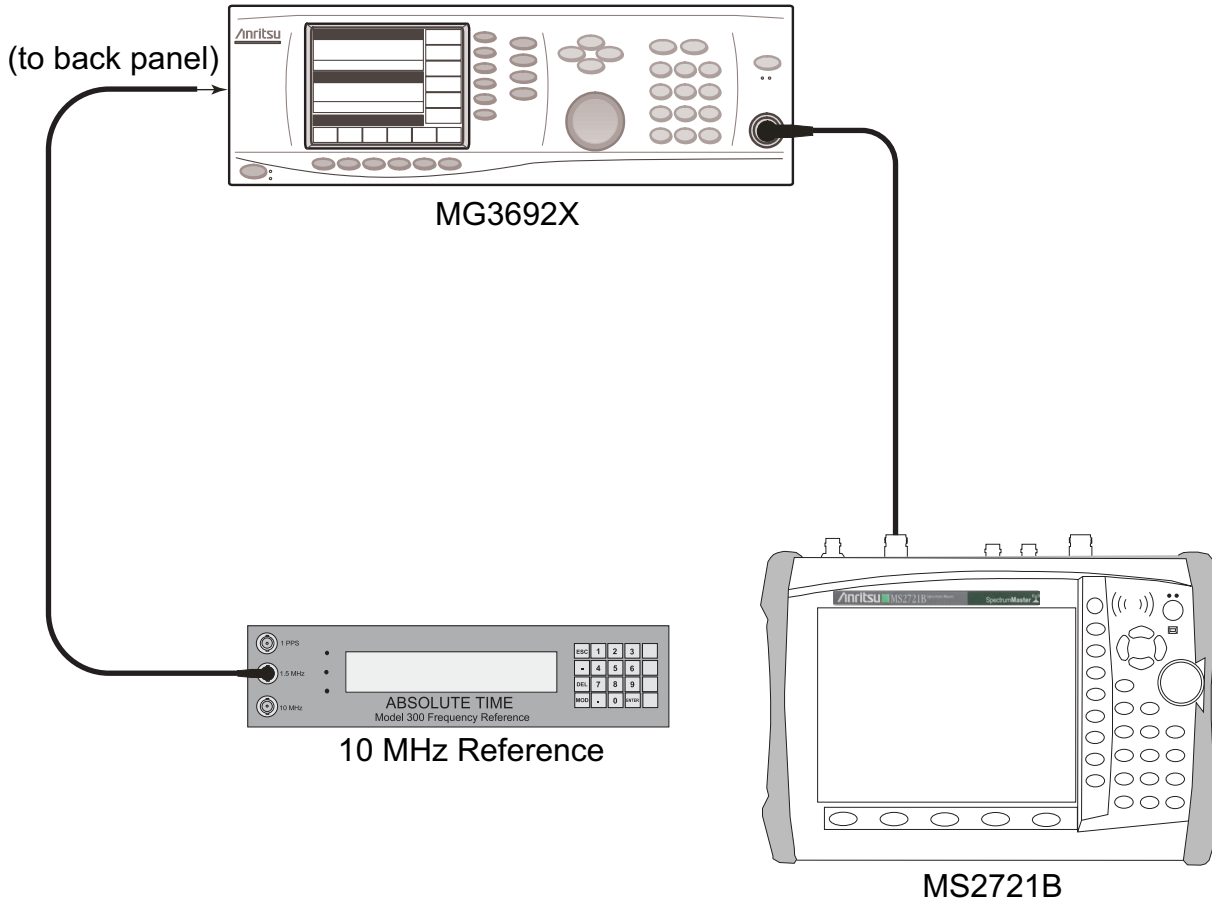


Figure 2-8. Input Related Spurious (IRS) Signals Test Setup

Procedure:

1. Connect the 10 MHz reference source to the MG3692x Synthesized Signal Generator.
2. Connect the output of the Signal Generator to the Spectrum Analyzer RF In connector.

1674 MHz Input Related Spurious check:

3. Set the MG3692x output to 1674 MHz CW, with an RF output level of -30 dBm.
4. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
5. Press the **Amplitude** key, then press the Reference Level soft key.
6. Use the keypad to enter -27 , and press the dBm soft key.
7. Press the Atten Lvl soft key and enter 0, then press the dB soft key.

8. Press the **Shift** key and then press the **Sweep** (3) key, then press the Detection soft key and then the Peak soft key.
9. Press the **Freq** key and press the Center Freq soft key.
10. Use the keypad to enter 1674 and press the MHz soft key.
11. Press the **Span** key, use the keypad to enter 2, and press the MHz soft key.
12. Press the **BW** key and press the RBW soft key.
13. Use the keypad to enter 10 and press the kHz soft key.
14. Press the VBW soft key and use the keypad to enter 1, then press the kHz soft key.
15. Wait until one sweep is completed.
16. Press the **Marker** key and press the Peak Search soft key.
17. Record the Marker 1 amplitude reading for 1674 MHz into [Table A-13, “Measured Input signal level at 1674 MHz” on page A-6](#).
18. Press the **Freq** key and press the Start Freq soft key.
19. Use the keypad to enter 100 and press the kHz soft key.
20. Press Stop Freq soft key, enter 1673 and press the MHz soft key.
21. Press the **Marker** key and press the Peak Search soft key.
22. Record the Marker 1 amplitude reading for 100 MHz into the “Measured Spur Level” column of [Table A-14, “Calculated Input signal level at 1674 MHz” on page A-6](#).
23. Calculate the input related spurious level by subtracting the Marker 1 reading in [Step 17](#) from the Marker 1 reading in [Step 22](#). Record the calculated result into the “Calculated IRS” column of [Table A-14](#).
24. Verify that the calculated result is ≤ -60 dBc.
25. Repeat [Step 18](#) through [Step 24](#), setting a start frequency of 1675 MHz and a stop frequency of 2800 MHz.

1701 MHz Input Related Spurious Check:

26. Set the MG3692x output to 1701 MHz, with an RF output level of -30 dBm.
27. On the MS2721B, press the **Freq** key and press the Center Freq soft key.
28. Use the keypad to enter 1701 and press the MHz soft key.
29. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.
30. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.
31. Wait until the Trace Count displays 5/5.
32. Press the **Marker** key, and press the Peak Search soft key.
33. Record the amplitude at 1701 MHz into [Table A-15, “Measured Input signal level at 1701 MHz” on page A-6](#).
34. Press the **Freq** key, and press the Start Freq soft key.
35. Use the keypad to enter 26, and press the MHz soft key.
36. Press Stop Freq soft key, enter 28, and press the MHz soft key.
37. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.
38. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.
39. Wait until the Trace Count displays 5/5.
40. Press the **Marker** key, and press the Peak Search soft key.

41. Record the Marker 1 amplitude reading into the “Measured Spur Level“ column of [Table A-16](#), “Calculated Input signal level at 1701 MHz” on [page A-6](#).
42. Calculate the input related spurious level by subtracting the Marker 1 value in [Step 33](#) from the Marker 1 value in [Step 41](#). Record the result into the “Calculated IRS“ column of [Table A-16](#).
43. Verify that the calculated result is ≤ -60 dBc.

2145 MHz Input Related Spurious Check:

44. Set the MG3692x output to 2145 MHz, with an RF output level of -30 dBm.
45. Press the **Freq** key, and press the Center Freq soft key.
46. Use the keypad to enter 2145, and press the MHz soft key.
47. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.
48. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.
49. Wait until the Trace Count displays 5/5.
50. Press the **Marker** key, and press the Peak Search soft key.
51. Record the amplitude at 2145 MHz into [Table A-17](#), “Measured Input signal level at 2145 MHz” on [page A-6](#)
52. Press the **Freq** key, and press the Start Freq soft key.
53. Use the keypad to enter 470, and press the MHz soft key.
54. Press Stop Freq soft key, enter 472, and press the MHz soft key.
55. Press the **Shift** key and then press the **Trace** (5) key. Press the Trace A Operations soft key.
56. Press the # of Averages soft key, use the keypad to enter 5, and then press the **Enter** key.
57. Wait until the Trace Count displays 5/5.
58. Press the **Marker** key, and press the Peak Search soft key.
59. Record the Marker 1 amplitude reading into the “Measured Spur Level“ column of [Table A-18](#), “Calculated Input signal level at 2145 MHz” on [page A-6](#).
60. Calculate the input related spurious level by subtracting the Marker 1 value in [Step 51](#) from the Marker 1 value in [Step 59](#). Record the result into the “Calculated IRS“ column of [Table A-18](#).
61. Verify that the calculated result is ≤ -60 dBc.

Spectrum Analyzer Absolute Amplitude Accuracy

The tests in this section verify the absolute amplitude accuracy of the MS2721B Spectrum Analyzer. This test has three parts:

- [50 MHz Amplitude Accuracy Verification](#)
- [Amplitude Accuracy Across Frequency Verification](#)
- [9 kHz to 100 kHz Amplitude Accuracy Verification](#)

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B
- Power Meter, Anritsu Model ML2438A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- (2) Power Sensor, Anritsu Model MA2442D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- (2) Adapter, Anritsu Model 34NN50A

50 MHz Amplitude Accuracy Verification

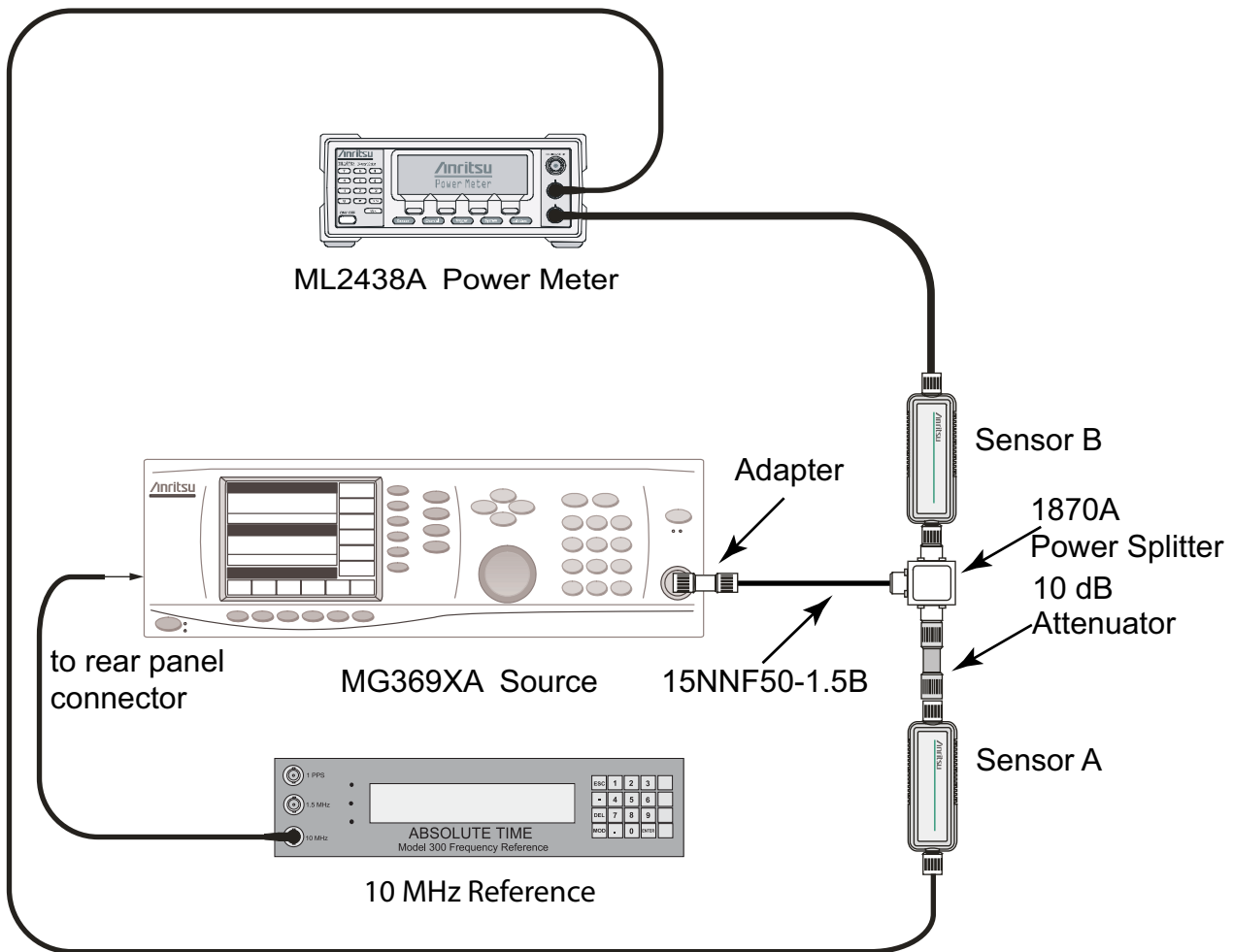


Figure 2-9. 50 MHz Amplitude Accuracy Verification Component Characterization Setup

Component Characterization:

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the 10 MHz Reference source to the 10 MHz Ref In connector of the MG3692x Synthesized Signal Generator.
3. Connect the model 1870A power splitter to the MG3692x output and connect Sensor B to one of the power splitter outputs (Refer to [Figure 2-9](#)).

50 MHz Amplitude Accuracy Verification Test Procedure:

4. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator.
5. Set the frequency of the MG3692x to 50 MHz.
6. Set the power meter to display both Channel A and Channel B. Press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Repeat for Channel B. Press the **System** key to display the power reading.
7. Adjust the power level of the MG3692x to get a reading on Sensor A that matches the power level in the first column (Test Power Level at 50 MHz) of [Table A-19, "Characterization Chart for 50 MHz Amplitude Accuracy Verification"](#) on page A-7.

8. Record the Sensor B reading in the “Required Sensor B Reading” column of [Table A-19](#).
9. Repeat [Step 7](#) and [Step 8](#) for the other power levels in the first column of [Table A-19](#) and record the Sensor B reading in the second column.

50 MHz Amplitude Accuracy Verification Procedure:

1. Connect the equipment as shown in [Figure 2-10](#), disconnecting Sensor A from the Attenuator, and connecting the MS2721B to the splitter output via the Attenuator.

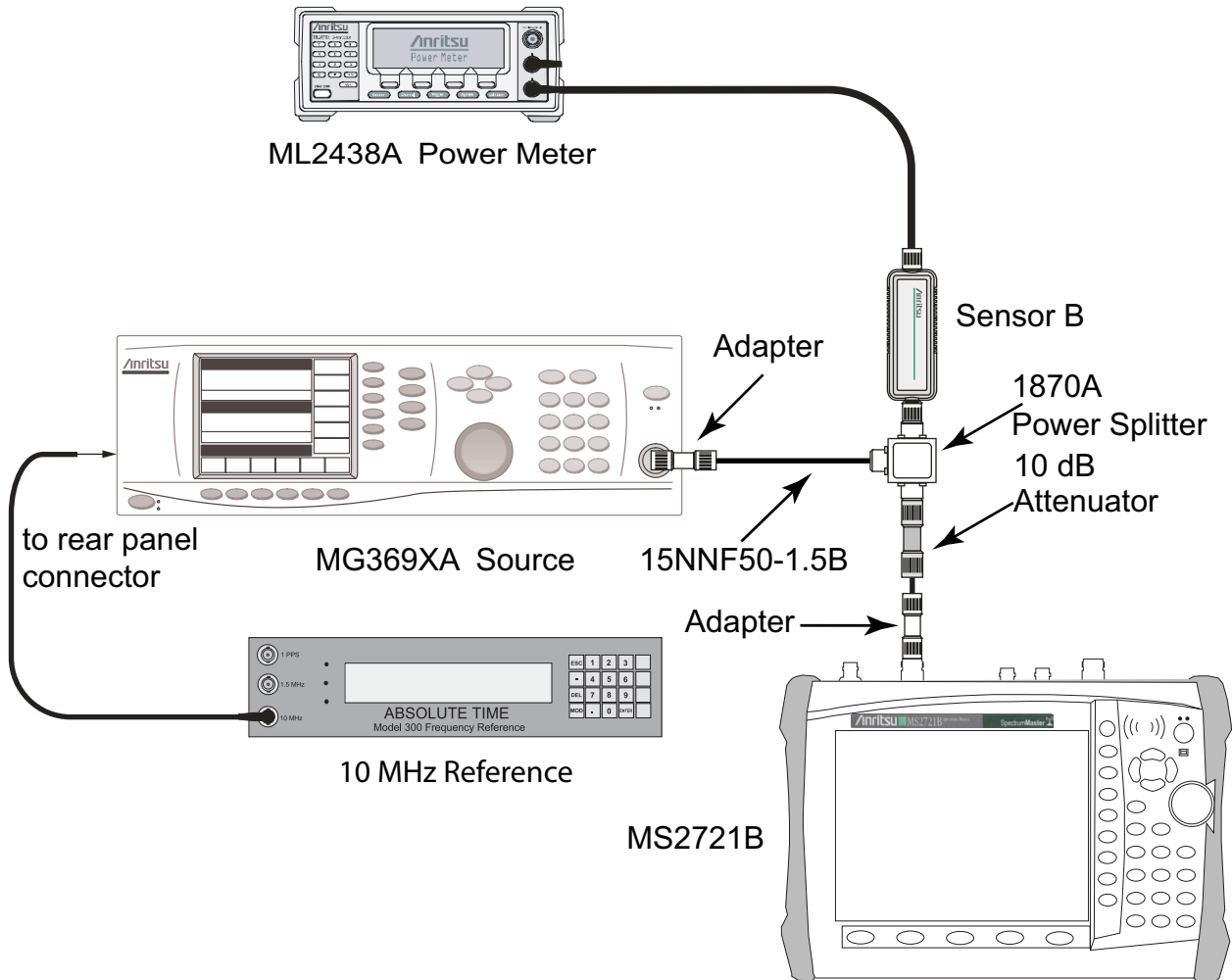


Figure 2-10. 50 MHz Amplitude Accuracy Verification Test Setup

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

2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Set the MS2721B Center Frequency to 50 MHz.
4. Set the Span to 10 kHz.
5. Press the **BW** function hard key and set the VBW to 10 Hz.

6. Set the RBW to 1 kHz.
7. Press the **Amplitude** function hard key and set the Reference Level to 10 dBm.
8. Set the Attenuation Level to 30 dB.
9. Adjust the MG3692x power level so that the power meter reading for Sensor B matches the Sensor B value that is shown in [Table A-19, “Characterization Chart for 50 MHz Amplitude Accuracy Verification”](#) on page A-7.
10. Press the **Marker** key, and press the Peak Search soft key.
11. Record the Marker 1 amplitude reading to [Table A-20, “50 MHz Amplitude Accuracy Verification”](#) on page A-7.
12. Repeat [Step 9](#) through [Step 11](#) for the other power levels in [Table A-20](#), changing Reference Level and Attenuation Level settings as required.

Amplitude Accuracy Across Frequency Verification

Component Characterization:

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the equipment as shown in [Figure 2-9](#).
3. Set the MG3692x Frequency to 10.1 MHz.
4. Set the power meter to display both Channel A and Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the MG3692x output level so that the Sensor A reading is $-2 \text{ dBm} \pm 0.1 \text{ dB}$.
6. Record the Sensor B reading into the -2 dBm column in [Table A-21, “Characterization Chart for Fixed Level with Varying Frequency, Amplitude Accuracy”](#) on page A-8.
7. Adjust the MG3692x output level so that the Sensor A reading is $-30 \text{ dBm} \pm 0.1 \text{ dB}$.
8. Record the Sensor B reading to the -30 dBm column in [Table A-21](#).
9. Repeat [Step 3](#) through [Step 8](#) for all of the frequencies that are listed in [Table A-21](#).

Procedure:

1. Connect the equipment as shown in [Figure 2-10](#).

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

2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Press the **BW** function hard key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
4. Press the **Span** soft key, set span to 10 kHz.
5. Set the MG3692x frequency to 10.1 MHz CW.
6. Set the MG3692x Output to -20 dBm .
7. Set the power meter to display Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692x as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

8. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading for -30 dBm in [Table A-21](#).
9. On the MS2721B, press the **Amplitude** function hard key, then set the Reference Level to -20 dBm.
10. Press the **Freq** function hard key, and press the **Center Freq** soft key.
11. Enter 10.1 MHz (or the next frequency).
12. Press the **Amplitude** function hard key, then set the Attenuation Level to 0 dB.
13. Press the **Marker** key, and press the **Peak Search** soft key.
14. Record the Marker 1 amplitude reading in [Table A-22](#), “[Amplitude Accuracy Across Frequency Verification at 10.1 MHz](#)” on page A-8.
15. Verify that the Marker 1 amplitude reading is within the specification.
16. Repeat [Step 12](#) to [Step 15](#) for Attenuation Levels of 5 dB, 10 dB, and 20 dB.
17. Adjust the MG3692x output power so that the power meter displays a reading that matches the Sensor B reading in [Table A-21](#) for -2 dBm.
18. On the MS2721B, press the **Amplitude** function hard key, then set the Reference Level to 10 dBm.
19. Repeat [Step 12](#) to [Step 15](#) for Attenuation Levels of 30 dB, 40 dB, 50 dB, and 60 dB.
20. Repeat [Step 5](#) to [Step 19](#) for all of the frequencies of [Table A-23](#) through [Table A-32](#).

9 kHz to 100 kHz Amplitude Accuracy Verification

Required Equipment:

- Anritsu MG3692x Synthesized Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B
- Power Meter, Anritsu Model ML2438A
- Agilent Model 34401A Digital Multimeter
- (2) Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- (2) Power Sensor, Anritsu Model MA2442D
- Power Splitter, Aeroflex/Weinschel Model 1870A
- (2) Adapter, Anritsu Model 34NN50A
- Low Frequency Cal Fixture, Anritsu Model T3449
- Coaxial Cable, BNC(m) to BNC(m), 50 ohm
- Adapter, Dual Banana Plug to BNC(f)

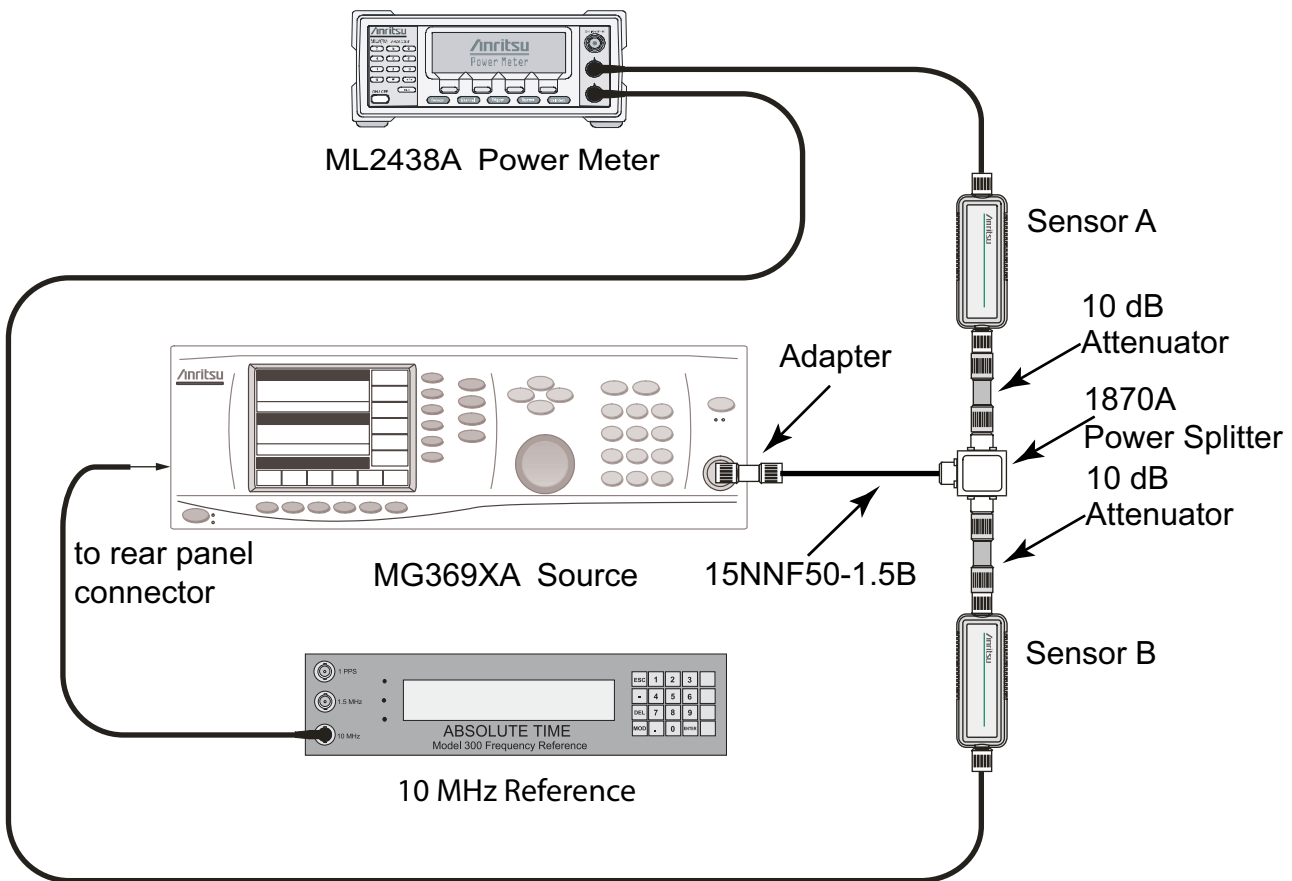


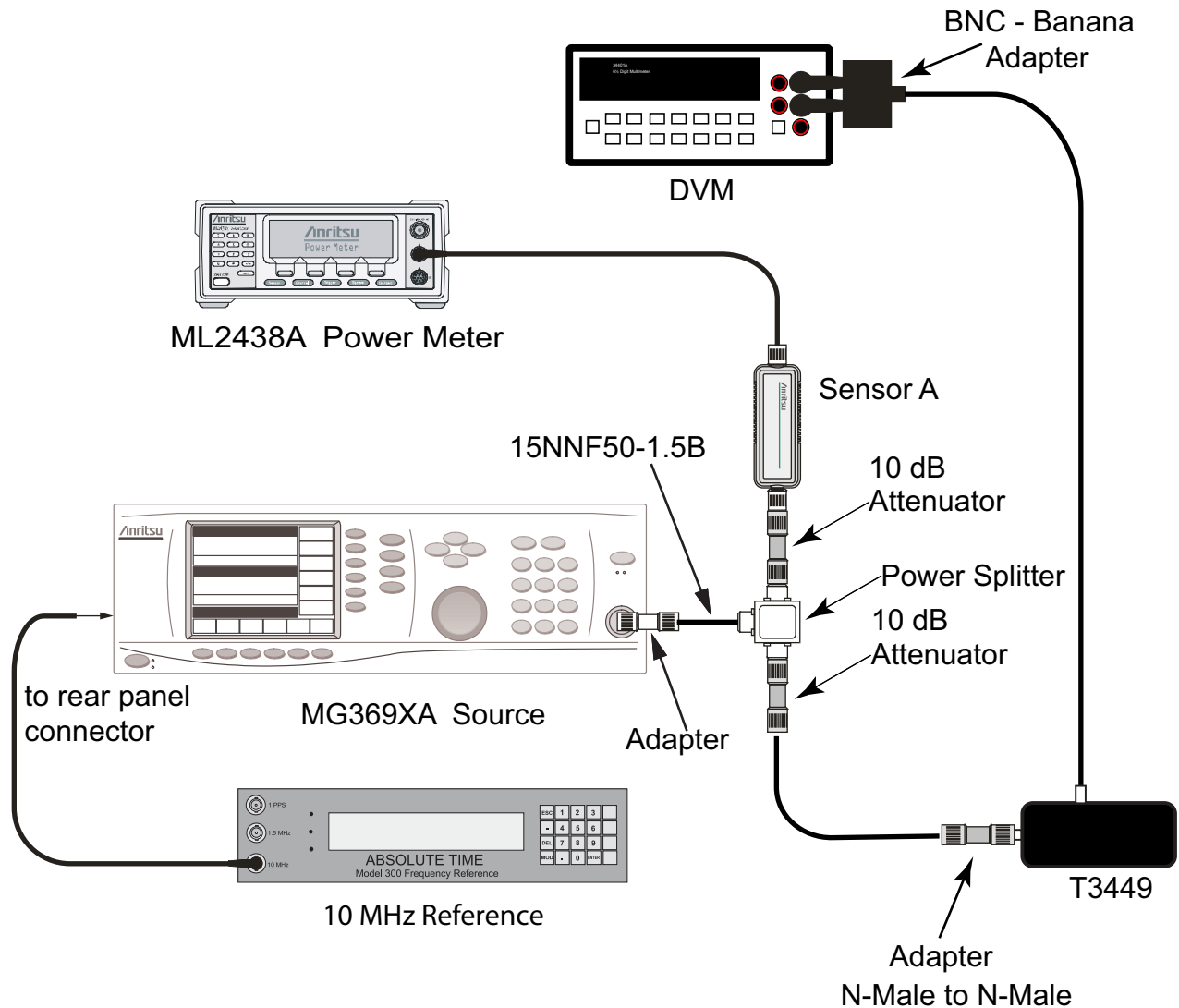
Figure 2-11. 9 kHz to 100 kHz Amplitude Accuracy Verification Component Characterization

Component Characterization:

1. Connect the equipment as shown in [Figure 2-11](#).

9 kHz to 100 kHz Amplitude Accuracy Verification Setup:

2. Set the MG3692x frequency to 100 kHz CW and the output power to approximately -5 dBm.
3. Adjust the MG3692x output power so that Power Sensor B reads -20 dBm ± 0.1 dB on the power meter.
4. Remove Power Sensor B from the splitter and Attenuator, and attach the N female end of the T3449 test fixture to the splitter (via the Attenuator) through an N male-to-N male adapter. Connect the BNC output of the T3449 to the AC voltmeter voltage input via a BNC male to BNC male coaxial cable and BNC female to banana plug adapter. Ensure that the voltmeter (DVM) is set to read AC volts.

**Figure 2-12.** 9 kHz to 100 kHz Amplitude Accuracy Verification Component Characterization

5. Set the AC voltmeter to measure AC volt rms. The measured voltage should read 23.315 mV ± 0.5 mV. Record the actual measured value to the Vm1 box in [Table A-33, “Measured VM1, \$-20\$ dBm Reference voltage at 100 kHz \(\$23.315\$ mV \$\pm 0.5\$ mV\)”](#) on page A-12.
6. While keeping the MG3692x output power unchanged, set the frequency to 95 kHz and record the measured voltage into the Vm2 column in [Table A-34, “Characterization Chart for 9 kHz to 100 kHz Amplitude Accuracy Verification”](#) on page A-12.
7. Convert the measured voltage to power in dBm by using the following formula:

$$P_{in} = 20 * \text{Log}_{10}(Vm2/Vm1) + \text{correction factor}$$

8. Enter the result in [Table A-34](#) as well as in [Table A-35](#), “9 kHz to 100 kHz Amplitude Accuracy Verification” on page A-12.
9. Repeat [Step 6](#) through [Step 8](#) for frequencies of 55 kHz and 9.5 kHz.
10. Remove the T3449 Test Fixture from the splitter.

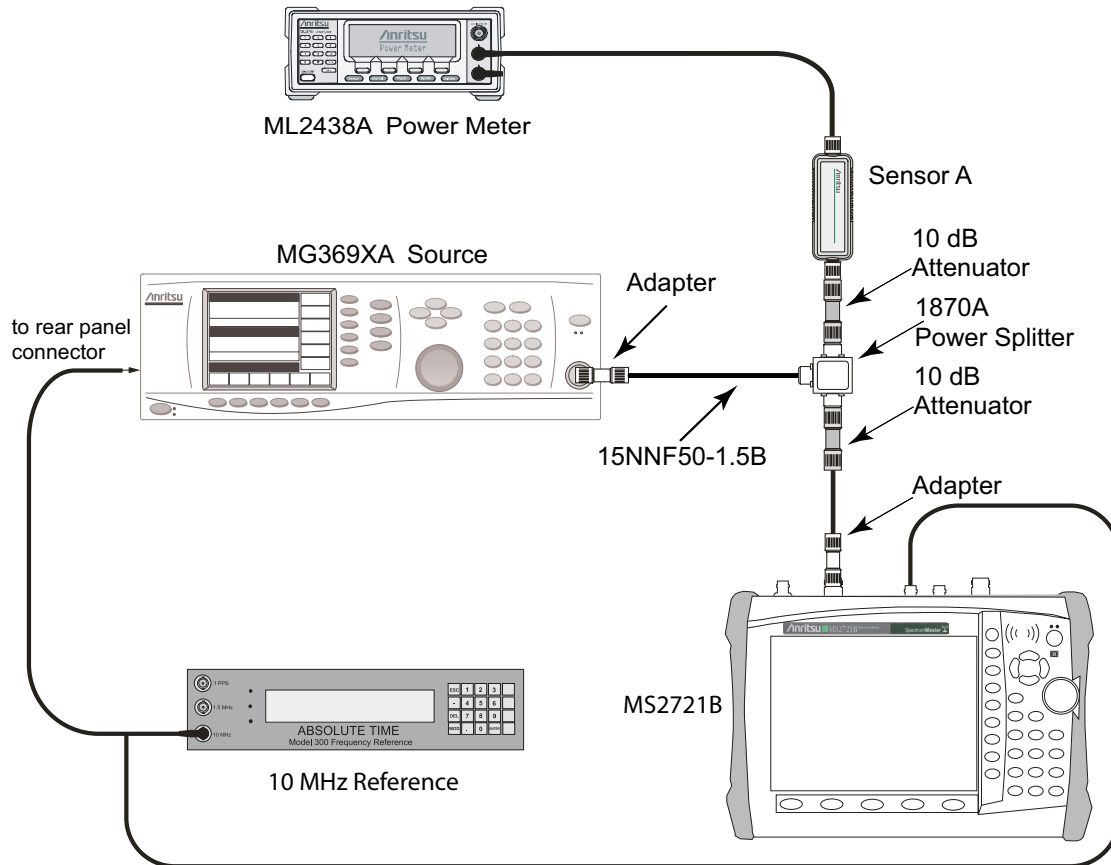


Figure 2-13. 9 kHz to 100 kHz Amplitude Accuracy Verification Test Setup

Procedure:

1. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
2. Press the **BW** function hard key. Then set the RBW to 1 kHz and the VBW to 10 Hz.
3. Press the **Span** function hard key and set span to 10 kHz.
4. Press the **Amplitude** function hard key. Then set the Reference Level to -20 dBm and set the Attenuation Level to 0 dB.
5. Connect the MS2721B to the test setup as shown in [Figure 2-13](#).
6. Set the MG3692x frequency to 9.5 kHz. Do not adjust the output power.
7. On the MS2721B, press the **Freq** function hard key, and press the Center Freq soft key.
8. Enter 9.5 kHz.
9. Press the **Marker** key, and press the Peak Search soft key.
10. Record the Marker 1 amplitude reading in [Table A-35](#), “9 kHz to 100 kHz Amplitude Accuracy Verification” on page A-12.

11. Subtract the P_{in} value from the Marker 1 reading and record to the Error column in [Table A-35](#).
12. Verify that the error is within the specification.
13. Repeat [Step 6](#) through [Step 12](#) for the other frequencies in [Table A-35](#).

Spectrum Analyzer RF Input VSWR Verification

This test verifies the Spectrum Analyzer RF Input VSWR of Spectrum Master Model MS2721B.

Required Equipment:

- Anritsu Model MS4624x Vector Network Measurement System (VNMS)
- Spectrum Master Model MS2721B
- 3753R Type N 9 GHz Calibration Kit for VNMS
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Test Port Extension Cable, Anritsu Model 15NNF50-1.5B

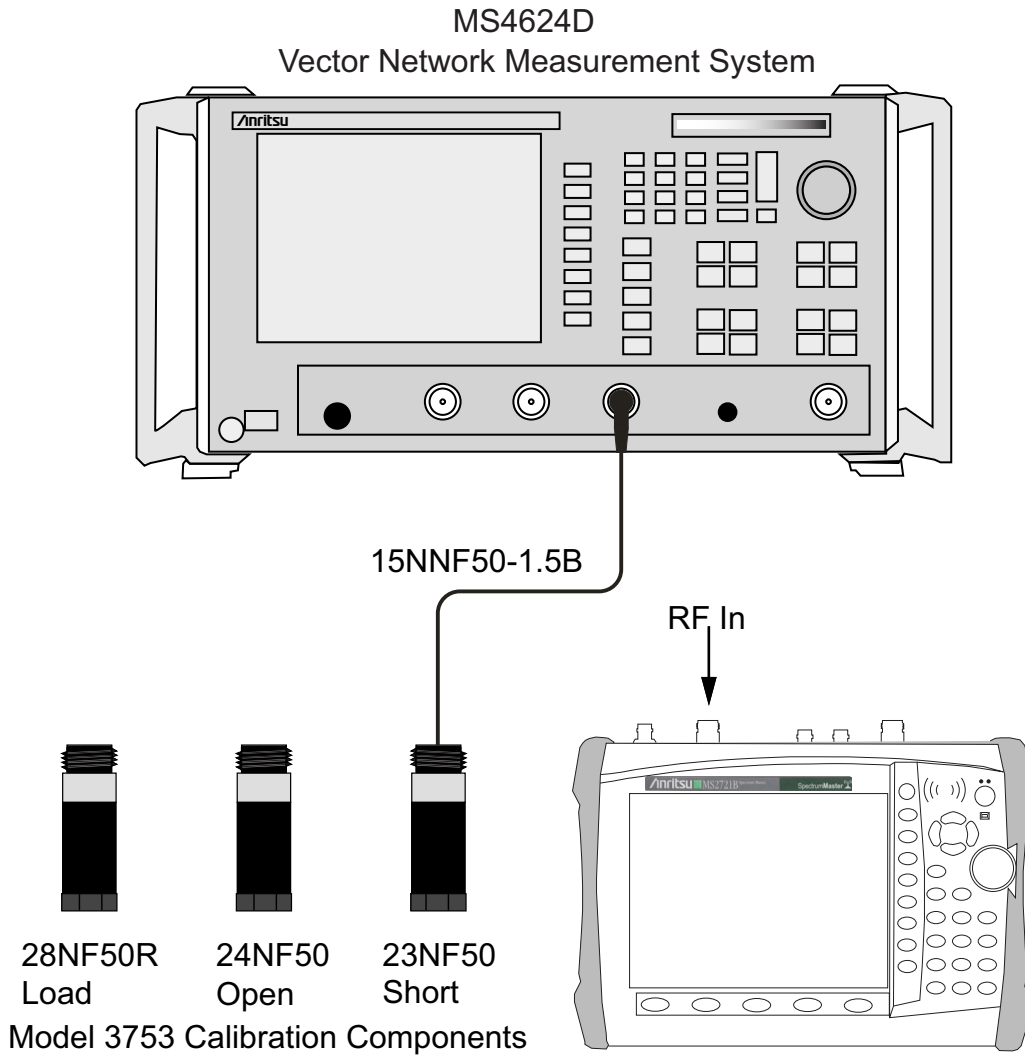


Figure 2-14. Spectrum Analyzer RF Input VSWR Verification Test Setup

Procedure:

1. Install a 15NNF50-1.5B cable on Port 1 of the MS4624x VNMS so that the test port (open end of cable) is the male connector.
2. On the VNMS, press the **Default** key and press Continue. Allow the instrument to default.
3. Press the **Freq** key. Then set the Start Frequency to 10 MHz and the Stop Frequency to 7.1 GHz.
4. Press the **CH1** key.
5. Press the **Display** key, press Display Mode, and then press Single Channel.

6. Observe the display on the MS4624x and ensure that S_{11} is displayed.
7. Press the **Cal** key and make the following selections:
Perform Cal / Manual Cal / 2 Port / Next Cal Step / Reflection Only / Port 1 Only / Normal (1601 pts max) / Next Cal Step / Port 1 Connector = Type N (M) / Start Cal.
8. Perform the calibration at the end of the cable as prompted by the VNMS, using the female components from the calibration kit.

| | |
|----------------|---|
| Caution | No adapters are inserted between the cable and female components from the calibration kit during calibration. |
|----------------|---|

9. After the calibration is complete, make sure that the LED on the **Cal** key is On.
10. Press the **Display** key. Press Graph Type, and then press SWR.
11. Press Return, then press Limits. Then turn on the Upper Limit and set it to 2.0 (x1).
12. Press the **Marker** key and then make the following selections:
 - a. Display Markers set to On.
 - b. Press Marker Readout.
 - c. Set Marker 1 to On.
13. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
14. Make the following selections on the MS2721B:
Set the Attenuation Level to 10 dB.
Set the Sweep to Single.
15. Connect the MS2721B Spectrum Analyzer RF In connector to the end of the 15NN50-1.5B cable where the calibration was performed.
16. Verify that the red measurement data falls completely under the Limit Line.
17. On the MS4624x, press the **Marker** key. Press Marker to Peak and then Marker to Max.
18. Read the maximum value of the marker on the VNMS (Vector Network Measurement System) and record it in [Table A-36, "Spectrum Analyzer RF Input VSWR Verification" on page A-13](#).
19. Change the MS2721B Attenuation Level to 20 dB (as was done in [Step 14](#)) and repeat [Step 16](#) through [Step 18](#).
20. Change the MS2721B Attenuation Level to 60 dB (as was done in [Step 14](#)) and repeat [Step 16](#) through [Step 18](#).

This completes the tests for Spectrum Analyzer mode of the MS2721B.

Chapter 3 — Performance Verification 2

3-1 Introduction

This chapter contains test procedures that can be used to verify Options that may be installed in the Spectrum Master Model MS2721B. Blank performance verification test records are provided in [Appendix A](#). Make a copies of the blank test records and use them to record measured values.

3-2 Optional Functions Verification

This part of the Performance Verification chapter contains instructions to verify the functions of options that may be installed in the Spectrum Master Model MS2721B

- [Tracking Generator \(Option 20\) Verification](#)
- [ISDB-T Signal Analyzer \(Option 30\) Verification](#)
- [ISDB-T SFN Analyzer \(Option 32\) Verification](#)
- [GPS Option Verification \(Option 31\)](#)
- [GSM/GPRS/EDGE Signal Analyzer \(Options 40 and 41\) Verification](#)
- [“CDMA Signal Analyzer \(Options 42 and 43\) Verification”](#)
- [“WCDMA/HSDPA Signal Analyzer \(Options 44, 45, and 65\) Verification”](#)
- [“Fixed WiMAX Signal Analyzer \(Options 46 and 47\) Verification”](#)
- [“TD-SCDMA Signal Analyzer \(Options 60 and 61\) Verification”](#)
- [“EVDO Signal Analyzer Option Verification \(Options 62 and 63\)”](#)
- [“DVB-T/H Signal Analyzer \(Options 64 and 57\) Verification”](#)
- [“Mobile WiMAX Signal Analyzer \(Options 66 and 67\) Verification”](#)
- [“LTE Signal Analyzer \(Options 541 and 542\) Verification”](#)
- [“DVB-T/H SFN Analyzer \(Option 78\) Verification”](#)

| |
|--|
| Note Allow all instruments to warm up to typical operating temperature before taking test readings. |
|--|

3-3 Tracking Generator (Option 20) Verification

The tests in this section verify the performance of the built-in tracking generator in the MS2721B Spectrum Master. This test section has two parts:

- [Frequency Accuracy Verification](#)
- [Power Accuracy Verification](#)

Required Equipment:

- Power Meter, Anritsu Model ML2438A
- Frequency Reference Symmetricom Rubisource T&M
- Frequency Counter, Anritsu Model MF2412B
- Power Sensor, Anritsu Model MA2442D
- Spectrum Master Model MS2721B

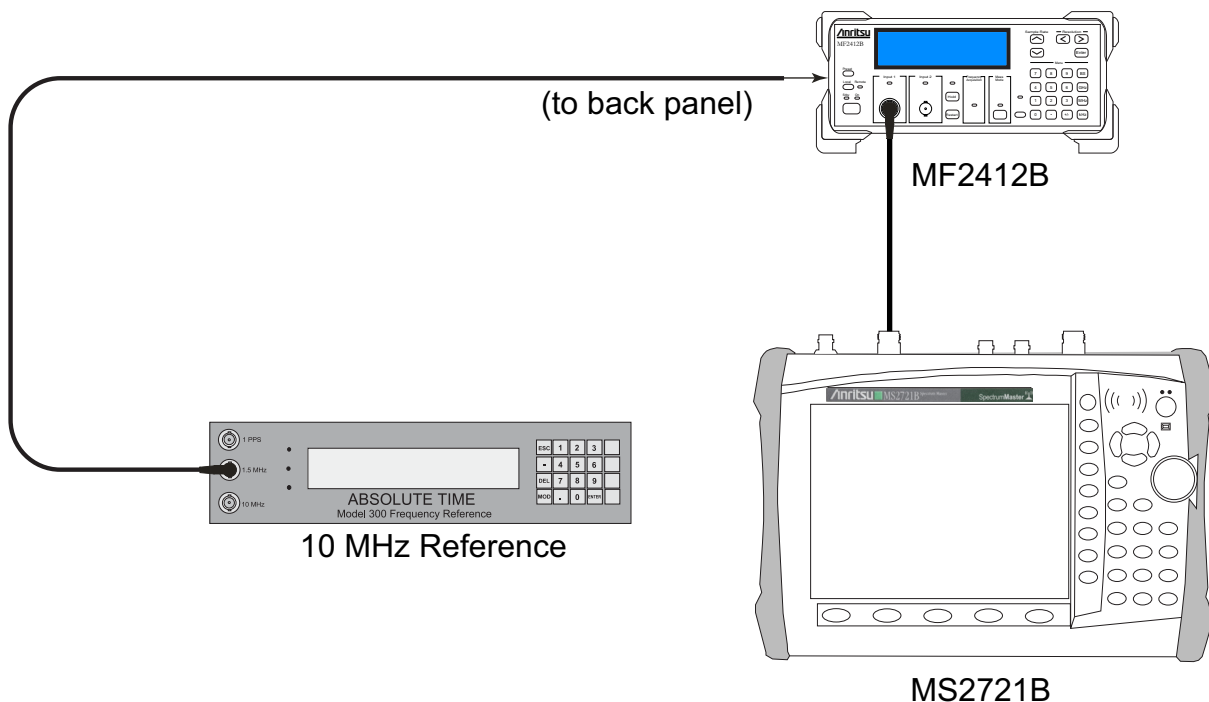


Figure 3-1. Tracking Generator Verification Characterization Setup

Frequency Accuracy Verification

1. Connect the external 10 MHz Reference to the frequency counter. Do not connect the external 10 MHz signal to the MS2721B.
2. Set the MS2721B to Spectrum Analyzer mode and then preset the instrument.
3. Set the Center Frequency to 1.0 GHz, and set the Span to 0 Hz.
4. Press **Shift**, then press the **Measure** (4) key, and then press Tracking Generator.
5. Press Track Gen to toggle the tracking generator ON.
6. Press the Output Power soft key to set the tracking generator to 0 dBm.
7. Connect the frequency counter to the Gen Output connector of the MS2721B.

8. Record the frequency of the tracking generator in the “Measured Value” column in [Table A-37](#), “Frequency Accuracy – Tracking Generator (Option 20)” on page A-14.
9. Verify that the frequency is within specification.

Power Accuracy Verification

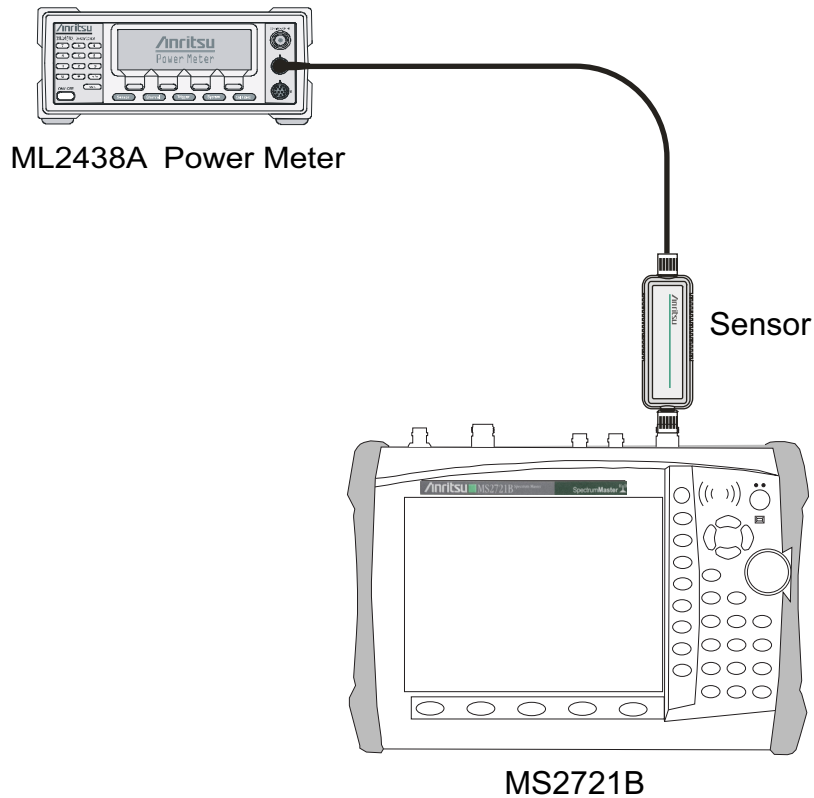


Figure 3-2. Tracking Generator Verification Test Setup

1. Install the MA2442D power sensor to the power meter and calibrate the sensor.
2. Connect the MA2442D power sensor to the Gen Output connector of the MS2721B.
3. Set the sensor calibration factor frequency to 450 MHz
4. Set the Center Frequency of the MS2721B to 450 MHz, and set the Span to 0 Hz.
5. Press **Shift**, then **Measure** (4), and press Tracking Generator.
6. Set Track Gen to ON.
7. Set the Output Power of the tracking generator to 0 dBm.
8. Record the power sensor reading into the “Measured Power” column of [Table A-38](#), “Level Accuracy 450 MHz – Tracking Generator (Option 20)” on page A-14.
9. Verify that the sensor reading is within specification.
10. Reduce the Output Power (Test Level) setting of the tracking generator to the next power level in [Table A-38](#).
11. Repeat the power measurement for every Output Power (Test Level) in [Table A-38](#).

12. Change the MS2721B Center Frequency to match the Frequency in the next test record in [Appendix A](#), which is [Table A-39, “Level Accuracy 975 MHz – Tracking Generator \(Option 20\)”](#) on page A-14.
13. Set the power sensor calibration factor frequency to the same frequency.
14. Repeat the measurements for all frequencies and power levels shown in the test records of [Table A-39](#) through [Table A-42, “Level Accuracy 7075 MHz – Tracking Generator \(Option 20\)”](#) on page A-14.

3-4 ISDB-T Signal Analyzer (Option 30) Verification

The tests in this section verify the performance of the optional ISDB-T Signal Analyzer option of the MS2721B.

The six tests are:

- [Frequency Accuracy and Residual MER Verification](#)
- [Frequency Lock Range Verification](#)
- [Level Accuracy Verification](#)
- [1 dB Compression Level Verification](#)
- [Noise Floor Verification](#)
- [Phase Noise Verification](#)

Frequency Accuracy and Residual MER Verification

The test in this section is used to verify the frequency accuracy of the MS2721B in ISDB-T Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C
- Spectrum Master Model MS2721B

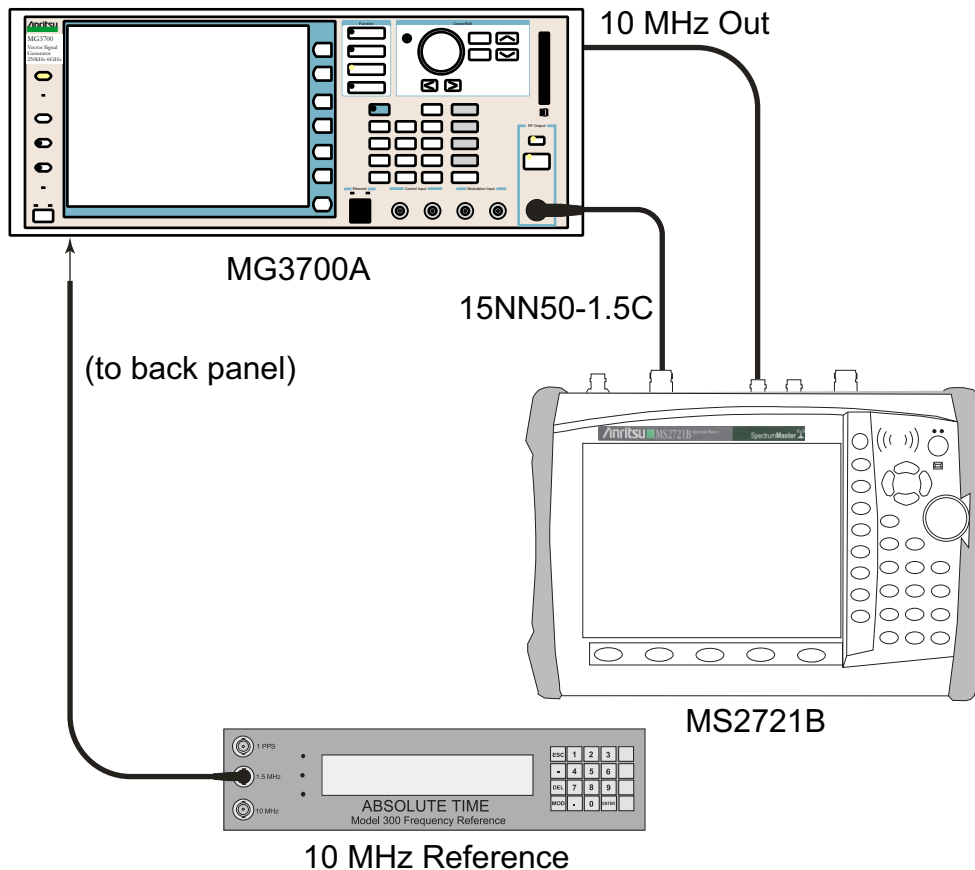


Figure 3-3. ISDB-T Option 30 — Signal Analyzer Verification Test Setup

Procedure:

1. Connect the 10 MHz Frequency Reference source to the Anritsu MG3700A and MS2721B as shown in [Figure 3-3](#).
2. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
3. Press the **Down Arrow** key to select **Yes**.
4. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Using the **Down Arrow** key, step through the selection list until the Digital_Broadcast option is highlighted.
8. Press the **Set** key.

9. Press the F6 soft key, labeled Return.
10. Press the **Set** key.
11. Using the **Down Arrow** key, step through the selection list until the Digital_Broadcast option is highlighted.
12. Press the **Set** key.
13. Using the **Down Arrow** key, step through the selection list until the ISDB-T_1layer_1ch option is highlighted.
14. Press the **Set** key.
15. Set the Frequency to 473.14285714 MHz.
16. Set the Level to -20 dBm.
17. Ensure that the **Mod On/Off** key and the **Output** key both have an illuminated LED.
18. Set the mode of the MS2721B to ISDB-T Signal Analyzer.
19. Press the **Shift** key, press the **Preset** (1) key, and then press the Preset soft key to reset the unit.
20. Ensure that Channel is set to 13.
21. Press the **Meas Selection** function hard key, then press Modulation Analysis.
22. Send the MG3700A signal into the Spectrum Analyzer RF In connector of the MS2721B.
23. On the MS2721B, press the **Frequency/Level** function hard key, and set the Reference Level to -20 dBm.
24. Press the **Meas Setup** function hard key and then the Meas Mode soft key.
25. Use the rotary knob to highlight **Average** and then press the **Enter** key.
26. Set the Average Count to 10.
27. Wait until the Average (10/10) appears at the top of the display.
28. Record the Frequency Error as shown on the MS2721B display into [Table A-43, “ISDB-T Signal Analyzer Frequency Accuracy, Option 30” on page A-15](#) in the “Pre Amp Off Frequency Error” column and the Channel 13 row.
29. Record the Total MER (Modulation Error Ratio) as shown on the MS2721B display into [Table A-44, “ISDB-T Signal Analyzer Residual MER, Option 30” on page A-15](#) in the “Total MER Pre Amp Off” column and the Channel 13 row.
30. Press the **Frequency/Level** function hard key and set the MS2721B to Channel 38.
31. Set the frequency of the MG3700A to 623.14285714 MHz.
32. Press the **Execute Measure** function hard key.
33. Wait until the Average (10/10) appears at the top of the display.
34. Record the Frequency Error as shown on the MS2721B display into [Table A-43](#) in the “Pre Amp Off Frequency Error” column and the Channel 38 row.
35. Record the Total MER as shown on the MS2721B display into [Table A-44](#) in the “Total MER Pre Amp Off” column and the Channel 38 row.
36. Set the MS2721B to Channel 62.
37. Set the frequency of the MG3700A to 767.14285714 MHz.
38. Press the **Execute Measure** function hard key.
39. Wait until the Average (10/10) appears at the top of the display.
40. Record the Frequency Error as shown on the MS2721B display into [Table A-43](#) in the “Pre Amp Off Frequency Error” column and the Channel 62 row.
41. Record the Total MER as shown on the MS2721B display into [Table A-44](#) in the Total MER Pre Amp Off column and the Channel 62 row.

42. On the MG3700A, set the Frequency to 473.14285714 MHz and the output level to -50 dBm.
43. On the MS2721B, press the **Frequency/Level** function hard key, then press the Pre Amp soft key to turn the Pre Amp ON.
44. Set the Reference Level to -50 dBm.
45. Press the **Execute Measure** function hard key.
46. Repeat the steps above from [Step 27](#) through [Step 41](#):
 - Record the Frequency Error to the “Pre Amp On Frequency Error” column in [Table A-43](#).
 - Record the Total MER to the “Total MER Pre Amp On” column in [Table A-44](#).

Frequency Lock Range Verification

The test in this section can be used to verify the frequency lock range of the MS2721B in ISDB-T Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C
- Frequency Reference Symmetricom Rubisource T&M

Procedure:

1. Connect the 10 MHz Frequency Reference source to the Anritsu MG3700A and the MS2721B as shown in [Figure 3-3, “ISDB-T Option 30 — Signal Analyzer Verification Test Setup” on page 3-6.](#)
2. On the MG3700A, press the yellow **Preset** key located on the upper left side of the instrument.
3. Press the **Down Arrow** key to select **Yes**.
4. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key, labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the ISDB-T_1layer_1ch option is highlighted.
14. Press the **Set** key.
15. Set the Frequency to 473.23285714 MHz.
16. Set the Level to -20dBm.
17. Ensure that the **Mod On/Off** key and the **Output** key both have an illuminated LED.
18. Set the mode of the MS2721B to ISDB-T Signal Analyzer. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** soft key to reset the unit.
19. Connect the MG3700A signal into the Spectrum Analyzer RF In connector of the MS2721B.
20. On the MS2721B, press the **Frequency/Level** function hard key and ensure that Channel is set to 13.
21. Set the Reference Level to -20 dBm.
22. Press the **Meas Selection** function hard key, and press the Modulation Analysis soft key.
23. Press the **Meas Setup** function hard key and then the Meas Mode soft key.
24. Use the rotary knob to highlight Average, and press the **Enter** key.
25. Press the Average Count soft key, then enter 10, and press the **Enter** key.
26. Wait until Average (10/10) appears at the top of the display.
27. Record the Frequency Error in [Table A-45, “ISDB-T Signal Analyzer Frequency Lock Range, Option 30” on page A-15.](#)
28. On the MG3700A, set the frequency to 473.05285714 MHz.
29. Press **Execute Measure** to read the new frequency.

30. Wait until Average (10/10) appears at the top of the display.

31. Record the Frequency Error in [Table A-45](#).

Level Accuracy Verification

The tests in this section verify the level accuracy of the MS2721B in ISDB-T Signal Analyzer mode.

Required Equipment:

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

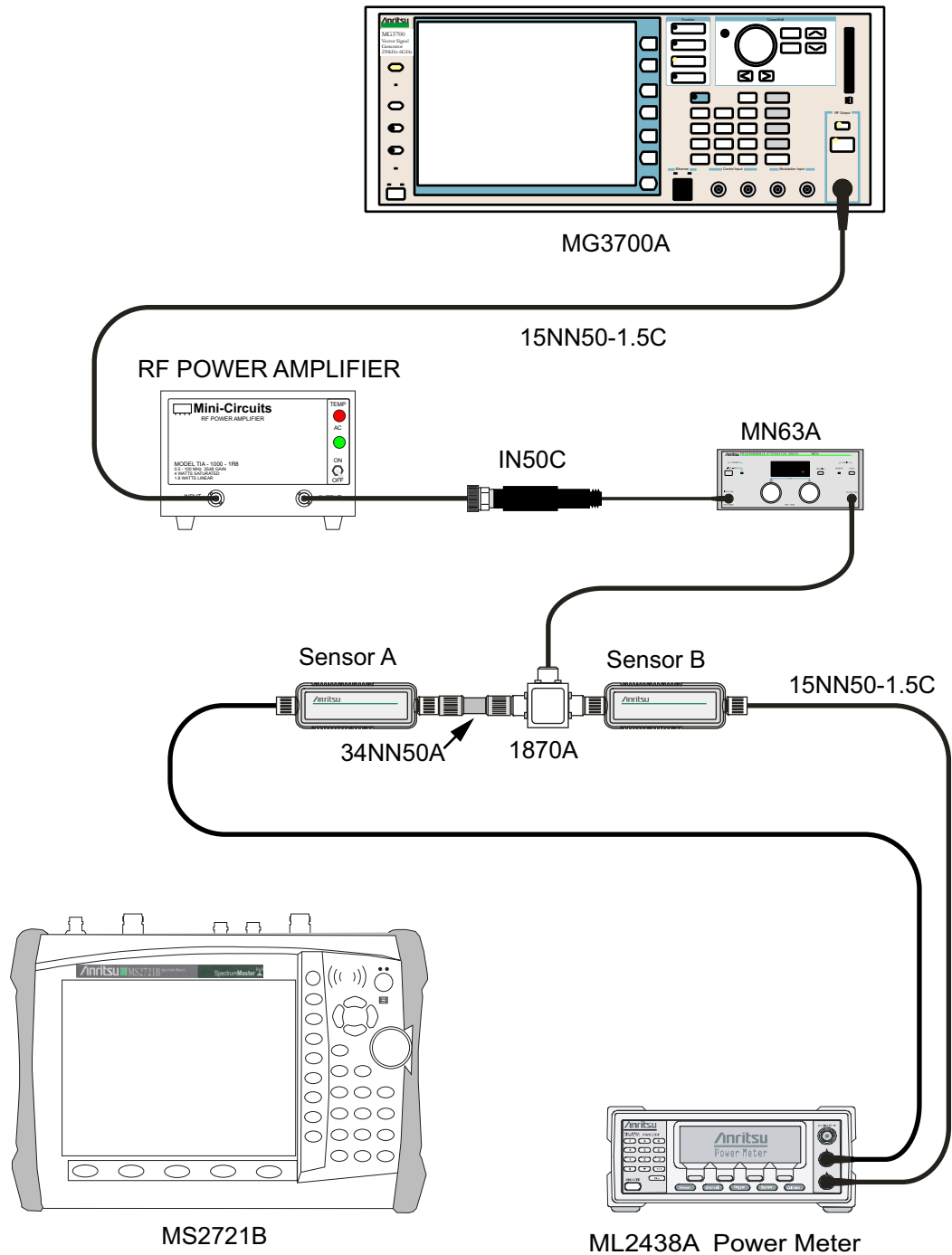


Figure 3-4. Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors

Procedure:

1. Ensure that the Power Amplifier is Off.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-4](#).
3. On the MG3700A, press the yellow **Preset** key located on the upper left side of the instrument.
4. Press the **Down Arrow** key to select Yes.

5. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Using the **Down Arrow** key, step through the selection list until the Digital_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key, labeled Return.
11. Press the **Set** key.
12. Using the **Down Arrow** key, step through the selection list until the Digital_Broadcast option is highlighted.
13. Press the **Set** key.
14. Using the **Down Arrow** key, step through the selection list until the ISDB-T_1layer_1ch option is highlighted.
15. Press the **Set** key.
16. Perform Zero/Cal on Sensor A and Sensor B of the power meter.
Set the calibration factor of both sensors to 473 MHz.
17. Set the MG3700A Frequency to 473.14285714 MHz.
18. Set the Level to -25 dBm.
19. Ensure that the **Mod On/Off key** and the **Output** key each have an illuminated LED.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A attenuator so that the Sensor A Reading is -10 dBm ± 1 dB. Record the actual "Sensor A Reading" in the "MN63A Attenuation Reading AT(-10)" column in [Table A-46, "Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\), Option 30" on page A-16.](#)
22. On the MG3700A, adjust the power level so that Power Meter Sensor A reading is -10.0 dBm ± 0.2 dB.
23. Record the following values to the appropriate columns in [Table A-46](#):
Power Meter Sensor A reading to the "Sensor A Reading" column
Power Meter Sensor B reading to the "Sensor B Reading" column
24. Subtract the Sensor A Reading from the Sensor B reading and record the result in the "DAB(-10)" column of [Table A-46](#).
$$\text{DAB}(-10) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
25. Calculate the AT(set) values for Test Levels -10 dBm through -45 dBm and record the values in the "AT(set)" column of [Table A-49, "ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 30" on page A-17.](#)
26. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N-Male to N-Male adapter as shown in [Figure 3-5](#).

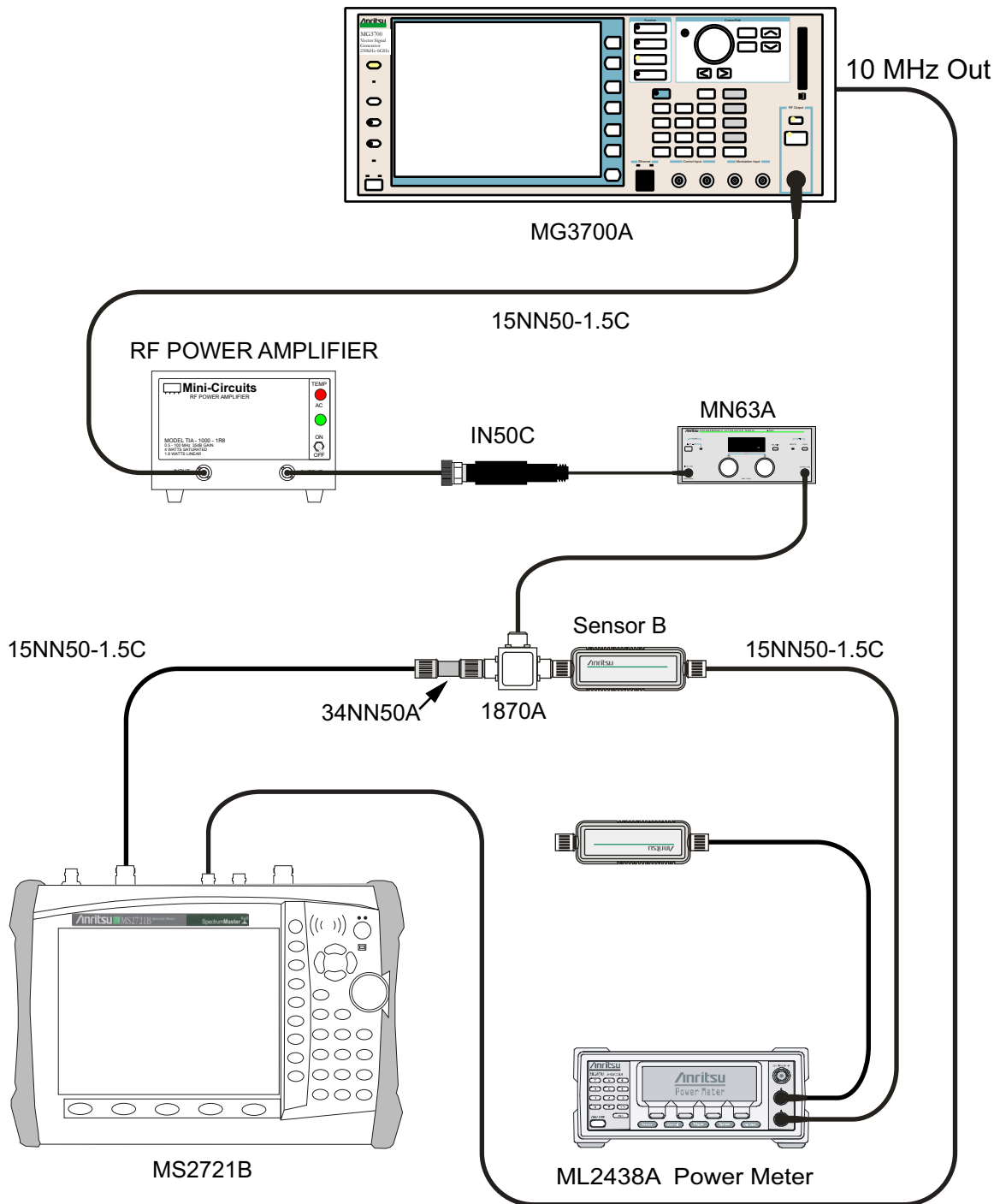


Figure 3-5. Level Accuracy Verification Setup – Sensor B Only

27. Record the new Power Meter Sensor B reading to the SB(-10) box in the “SB(-10) or SB(-50)” column in [Table A-49, “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 30”](#) on page A-17.
28. On the MS2721B, set the mode to ISDB-T Signal Analyzer and preset the unit.
29. Press the **Meas Selection** function hard key, ensure Field Strength is selected.
30. Press the **Frequency/Level** function hard key, ensure that Channel is 13 and Pre Amp is Off.

31. Change the Reference Level to -10 dBm.
32. Press the **Meas Setup** function hard key and then the Meas Mode soft key.
33. Use the **Up/Down** arrow keys to highlight **Average**, then press the **Enter** key.
34. Change the Average Count to 50 if required.
35. After Average (50/50) appears at the top of the display, record the Channel Power from the MS2721B to the “Pre Amp Off - M(Level) (dBm)” column in [Table A-49](#).
36. Calculate the Deviation using the following formula:

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

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

37. Record the result in the “Pre Amp Off - Dev (dB)” column in [Table A-49](#) and verify that it is within specification.
38. Set the MN63A attenuation to the next AT(set) value in [Table A-49](#).
39. Press the **Frequency/Level** function hard key and set the Reference Level of the MS2721B to -15 dBm.
40. After Average (50/50) appears, record the -15 dBm Channel Power from the MS2721B into the “Pre Amp Off - M(Level) (dB)” column in [Table A-49](#).
41. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
42. Record the result in the “Pre Amp Off - Dev (dB)” column in [Table A-49](#), and verify that it is within specification.
43. Set the MN63A attenuation to the next AT(set) value in [Table A-49](#).
44. Set the Reference Level of the MS2721B to -20 dBm.
45. After Average (50/50) appears, record the -20 dBm Channel Power from the MS2721B into the “Pre Amp Off - M(Level) (dB)” column in [Table A-49](#).
46. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
47. Record the result in the “Pre Amp Off - Dev (dB)” column in [Table A-49](#).
48. Press the **Frequency/Level** function hard key and set Pre Amp to On. Change Reference Level if required.
49. After Average (50/50) appears, record the -20 dBm Channel Power in the “Pre Amp On - M(Level)” column in [Table A-49](#).
50. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
51. Record the result in the “Pre Amp On -Dev (dB)” column in [Table A-49](#), and verify that it is within specification.
52. Repeat [Step 43](#) through [Step 51](#) for Test levels of -25 dBm to -45 dBm. Change Reference Level and switch Pre Amp per the “Ref Level Pre Amp On/Off” column in [Table A-49](#).
53. Turn off the Power Amplifier, disconnect the Power Splitter from the MS2721B, re-connect Sensor A to the power splitter as shown in [Figure 3-4](#), “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors” on page 3-11.
54. Set the MN63A Attenuation to 10 dB.
55. Set the MG3700A Level to -60 dBm.
56. Turn on the Power Amplifier and allow it to warm up for at least 5 minutes.

57. Adjust the MN63A Attenuator so that the Sensor A Reading is $-50 \text{ dBm} \pm 1 \text{ dB}$. Record the attenuation reading in the “MN63A Attenuation Reading AT(-50)” column in [Table A-47, “Readings for Sensor A, Sensor B, DAB\(-50\), and MN63A Attenuation AT\(-50\), Option 30”](#) on page A-16.
58. On MG3700A adjust power level so that Power Meter Sensor A Reading is $-50.0 \text{ dBm} \pm 0.2 \text{ dB}$.
59. Record the following values into the appropriate columns in [Table A-47](#):
- Power Meter Sensor A reading to the “Sensor A Reading” column
 - Power Meter Sensor B reading to the “Sensor B Reading” column
60. Subtract the Sensor A Reading from the Sensor B reading and record the calculations in the “DAB(-50)” column of [Table A-47](#).
- $$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
61. Calculate the AT(set) values for Test Levels of -55 dBm through -84 dBm and record the values in the “AT (set) (dB)” column in [Table A-49, “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 30”](#) on page A-17.
62. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N-Male to N-Male Adapter as shown in [Figure 3-5, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-13.
63. Record the new Power Meter Sensor B reading into the SB(-50) box in the “SB(-10) Or SB(-50) (dBm)” column in [Table A-49](#).
64. Repeat [Step 43](#) through [Step 51](#) for Test levels of -50 dBm to -84 dBm . Change Reference Level and switch the Pre Amp On or Off per the “Ref Level Pre Amp On/Off” column in [Table A-49](#).
65. Use the following formula to calculate Deviation (Dev):
- $$\text{Deviation} = \text{M}(\text{Level}) - \text{SB}(-50) - \text{DAB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$
66. Repeat [Step 16](#) through [Step 64](#) for a frequency of 623.14285714 MHz (Ch 38). Set the calibration factor of both Power Sensors to 623 MHz and record results in [Table A-50, “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz, Option 30”](#) on page A-18.
67. Repeat [Step 16](#) through [Step 64](#) for a frequency of 767.14285714 MHz (Ch 62). Set the calibration factor of both Power Sensors to 767 MHz and record results in [Table A-51, “ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz, Option 30”](#) on page A-19.

1 dB Compression Level Verification

The tests in this section verify that the accuracy of the MS2721B is not degraded by compression when operating in the ISDB-T Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Anritsu MN63A Programmable Attenuator
- Anritsu ML2438A Power Meter
- Anritsu MA2482D Power Sensors (2)
- Anritsu 1N50C RF Limiter
- Anritsu 34NN50A Adapter
- Anritsu 15NNF50-1.5C RF Coaxial Cables (3)
- Aeroflex/Weinschel 1870A Power Splitter
- Aeroflex/Weinschel 44-10 10 dB Fixed Attenuator
- Mini-Circuits TIA-1000-1R8 RF Power Amplifier
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)

Procedure:

1. Ensure that the Power Amplifier is Off.
2. On the Power Meter:
 - Set Low Level Averaging to Low
 - Set Averaging to Moving with 50 averages.
 - Set the Power Meter to read True RMS.
3. Perform a Zero/Cal on both sensors of the power meter.
4. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-4, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors” on page 3-11.](#)
5. On the MG3700A, press the **MOD On/Off** button to turn off Modulation.
The **MOD On/Off** button LED is Off (not illuminated).
6. Set the Level output of the MG3700A to -25 dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up at least five minutes.

473.14285714 MHz Tests

9. Set the calibration factor of both sensors to 473 MHz.
10. Set the MG3700A Frequency to 473.14285714 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is -25 dBm \pm 1 dB. Record the MN63A Attenuation reading in the “MN63A Attenuation Reading, AT(-25)” column of [Table A-48, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 30” on page A-16.](#)
12. Adjust the Level of the MG3700A so that Power Meter Sensor A reads -25.0 dBm \pm 0.05 dB. Record the Sensor A reading in the “Sensor A Reading M(Sa)” column of [Table A-48.](#)

13. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-5, “Level Accuracy Verification Setup – Sensor B Only” on page 3-13.](#)
14. Set the MS2721B to ISDB-T Signal Analyzer mode and preset the unit.
15. Press the **Meas Selection** function hard key, ensure that Field Strength is activated.
16. Ensure that the MS2721B Channel is set to 13 and Pre Amp is Off.
17. Set the Reference Level to –25 dBm.
18. Record the MS2721B Channel Power reading of MeasCP(–25) in the “Measured Value” column in [Table A-52, “ISDB-T Signal Analyzer 1 dB Compression Level Channel 13 with Pre Amp OFF, Option 30” on page A-20.](#)
19. Calculate the difference, Delta(–25), by using the following formula:

$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$
20. Record the result to the Delta column in [Table A-52.](#) Verify that the result is less than 1 dB.
21. Calculate AT(–15) using the following formula:

$$\text{AT}(-15) = \text{AT}(-25) - 10$$
22. Set the MN63A attenuation to AT(–15).

Note The Over Range message on the MS2721B is normal.

23. Record the MS2721B Channel Power reading MeasCP(–15) in the –15 dBm Test Level row of the “Measured Value” column in [Table A-52.](#)
24. Calculate the Delta at –15 dBm Input by using the following formula:

$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$
25. Record the result to the Delta column in [Table A-52.](#) Verify that it is less than 1 dB.
26. Calculate the value of AT(–50) using the following formula:

$$\text{AT}(-50) = \text{ATT}(-25) + 25$$
27. Adjust the MN63A attenuation to AT(–50).
28. Set the Reference Level on the MS2721B to –50 dBm and turn the Pre Amp On.
29. Record the MS2721B Channel Power reading, MeasCP(–50), to the –50 dBm Test Level row of the “Measured Value” column in [Table A-55, “ISDB-T Signal Analyzer 1 dB Compression Level Channel 13 with Pre Amp ON, Option 30” on page A-21.](#)
30. Calculate the Delta at –50 dBm Input, Delta(–50), by using the following formula:

$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$
31. Record the result to the Delta column in [Table A-55.](#) Verify that it is less than 1 dB.
32. Calculate the AT(–43) by using the following formula:

$$\text{AT}(-43) = \text{AT}(-25) + 18$$
33. Set the MN63A attenuation to AT(–43).

Note The Over Range message on the MS2721B is normal.

34. Record the MS2721B Channel Power reading, MeasCP(–43), in the –43 dBm Test Level row of the “Measured Value” column in [Table A-55.](#)
35. Calculate the Delta at –43 dBm Input, Delta(–43), by using the following formula:

$$\text{Delta}(-43) = M(\text{Sa}) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$

36. Record the result to the Delta column in [Table A-55](#). Verify that it is less than 1 dB.

623.14285714 MHz Tests

37. Remove the MS2721B from the test setup and re-install Sensor A to the open splitter output as shown in [Figure 3-4, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-11.
38. Set the MG3700A Frequency to 623.14285714 MHz. Ensure that the **MOD On/Off** button LED is Off (not illuminated).
39. Set the calibration factor of both sensors to 623 MHz.
40. Adjust the MN63A attenuation so that the Power Meter Sensor A reads $-25 \text{ dBm} \pm 1 \text{ dB}$. Record the MN63A attenuation readout in the “MN63A Attenuation Reading, AT(-25)” column in [Table A-48, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 30”](#) on page A-16.
41. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads $-25.0 \text{ dBm} \pm 0.05 \text{ dB}$. Record the Sensor A reading in the “Sensor A Reading, M(Sa)” column in [Table A-48](#).
42. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-5, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-13.
43. Set the MS2721B Channel to 38.
44. Set Pre Amp to Off and Reference Level to -25 dBm .
45. Repeat [Step 18](#) through [Step 36](#) for Channel 38.

767.14285714 MHz Tests

46. Remove the MS2721B from the test setup and re-install Sensor A to the open splitter output as shown in [Figure 3-4, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-11.
47. Set the MG3700A Frequency to 767.14285714 MHz. Ensure that the **MOD On/Off** button LED is OFF (not illuminated).
48. Set the calibration factor of both sensors to 767 MHz.
49. Adjust the MN63A attenuation so that Power Meter Sensor A reads $-25 \text{ dBm} \pm 1 \text{ dB}$. Record the MN63A attenuation readout in the “MN63A Attenuation Reading, AT(-25)” column in [Table A-48, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 30”](#) on page A-16.
50. Adjust the Level of the MG3700A so that Power Meter Sensor A reads $-25.0 \text{ dBm} \pm 0.05 \text{ dB}$. Record the Sensor A reading in the “Sensor A Reading, M(Sa)” column in [Table A-48](#).
51. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-5, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-13.
52. Set the MS2721B Channel to 62.
53. Set Pre Amp to OFF and Reference Level to -25 dBm .
54. Repeat [Step 18](#) through [Step 36](#) for Channel 62.

Noise Floor Verification

The tests in this section verify the noise floor of the MS2721B in ISDB-T Signal Analyzer mode.

Required Equipment:

- 50 ohm termination, Anritsu Model 28N50-2
- Spectrum Master Model MS2721B

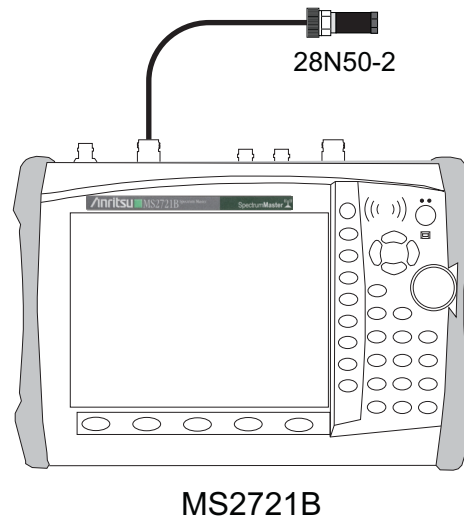


Figure 3-6. ISDB-T Option 30 – Noise Floor Verification Test Setup

Procedure:

1. Set the mode of the MS2721B to ISDB-T Signal Analyzer and preset the unit.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Press the **Meas Selection** function hard key, then press Field Strength.
4. Ensure that the Channel is set to 13 and Pre Amp is OFF.
5. Set the Reference Level to -25 dBm.
6. Press the **Meas Setup** function hard key. Change Meas Mode to Average, and leave Average Count set to 50.
7. After Average (50/50) appears, record the Channel Power into the “Measured Value” column of [Table A-58, “ISDB-T Signal Analyzer Noise Floor with Pre Amp OFF, Option 30”](#) on page A-21.
8. Set the Reference Level to -50 dBm and the Pre Amp to ON.
9. After Average (50/50) appears, record the Channel Power into the “Measured Value” column of [Table A-59, “ISDB-T Signal Analyzer Noise Floor with Pre Amp ON, Option 30”](#) on page A-21.
10. Change the channel to 38. Set the Pre Amp to OFF.
11. Repeat [Step 5](#) through [Step 9](#) for Channel 38.
12. Change the channel to 62. Set the Pre Amp to OFF.
13. Repeat [Step 5](#) through [Step 9](#) for Channel 62

Phase Noise Verification

This test verifies the phase noise of the MS2721B in the ISDB-T Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C
- Spectrum Master Model MS2721B

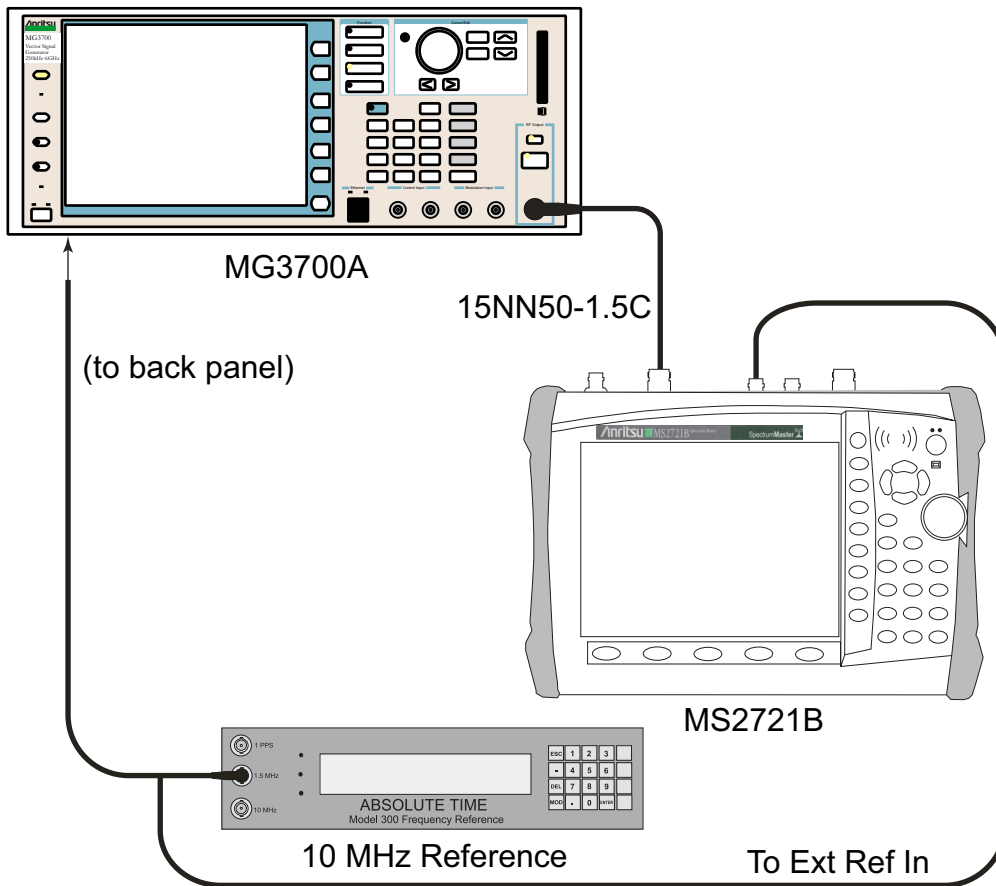


Figure 3-7. ISDB-T Option 30 — Phase Noise Verification Test Setup

Procedure:

1. Connect the 10 MHz Frequency Reference signal to the MG3700A and to the MS2721B.
2. Set the MG3700A Frequency to 473.14285714 MHz. Set the Level to -10 dBm.
3. Press the **Mod On/Off** key so that the LED is OFF (not illuminated).
4. Connect the RF signal from MG3700A into the MS2721B Spectrum Analyzer RF In port.
5. Set the mode of the MS2721B to ISDB-T Signal Analyzer and preset the unit.
6. Press the **Frequency/Level** function hard key and ensure that the unit is set to Channel 13. Change the Reference Level to -10 dBm and ensure that the Pre Amp is OFF.
7. Press the **Meas Selection** function hard key and then press the Phase Noise soft key. A red dot appears on the soft key label.

8. Press the **Meas Setup** function hard key and then the **Meas Mode** soft key. Use the **Down Arrow** key to select **Average**, and then press the **Enter** key.
9. Wait until the Average counter displays (10/10).
10. Record the 10 kHz and the 100 kHz Phase Noise readouts into the “Phase (10 kHz)” and the “Phase (100 kHz)” columns in the “Channel 13” row in [Table A-60](#), “ISDB-T Signal Analyzer Phase Noise, Option 30” on page A-21.
11. Record the Frequency Error in [Table A-60](#).
12. Set the Frequency of the MG3700A to 623.14285714 MHz and change the MS2721B Channel to 38.
13. Wait until the Average counter displays (10/10).
14. Record the 10 kHz and the 100 kHz Phase Noise readouts in the “Channel 38” row in [Table A-60](#).
15. Record the Frequency Error in [Table A-60](#).
16. Set the Frequency of the MG3700A to 767.14285714 MHz and change the MS2721B Channel to 62.
17. Wait until Average counter displays (10/10).
18. Record the 10 kHz and the 100 kHz Phase Noise readouts in the “Channel 62” row in [Table A-60](#).
19. Record the Frequency Error in [Table A-60](#).

3-5 GPS Option Verification (Option 31)

The following test verifies the operation of the GPS option in the Spectrum Master Model MS2721B.

Setup Procedure:

1. Connect the GPS antenna to the GPS Antenna connector on the MS2721B.

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

2. Press the **Shift** key and then the **System** (8) key.
3. Press the GPS soft key, then press the GPS On/Off soft key to turn 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 also displayed, next to the GPS indicator.
5. After approximately three minutes, the Reference Source indicator in the lower left-hand corner of the LCD display changes to GPS High Accuracy.

| | |
|-------------|--|
| Note | If the GPS fix is acquired by using the Anritsu 2000-1410 GPS antenna outside, then bringing the instrument inside will cause a loss of satellite tracking. A red cross will then appear on the green GPS indicator, and the Reference Source indicator will change to Int Hi Accy. The following test can be used to verify frequency accuracy to a lesser specification. |
|-------------|--|

Test Procedure:

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

| | |
|----------------|--|
| Caution | Do not connect the external 10 MHz Reference to the MS2721B Spectrum Master. |
|----------------|--|

2. Connect the output of the Synthesized Signal Generator to the Spectrum Analyzer RF In port of the MS2721B, as shown in [Figure 3-8](#).

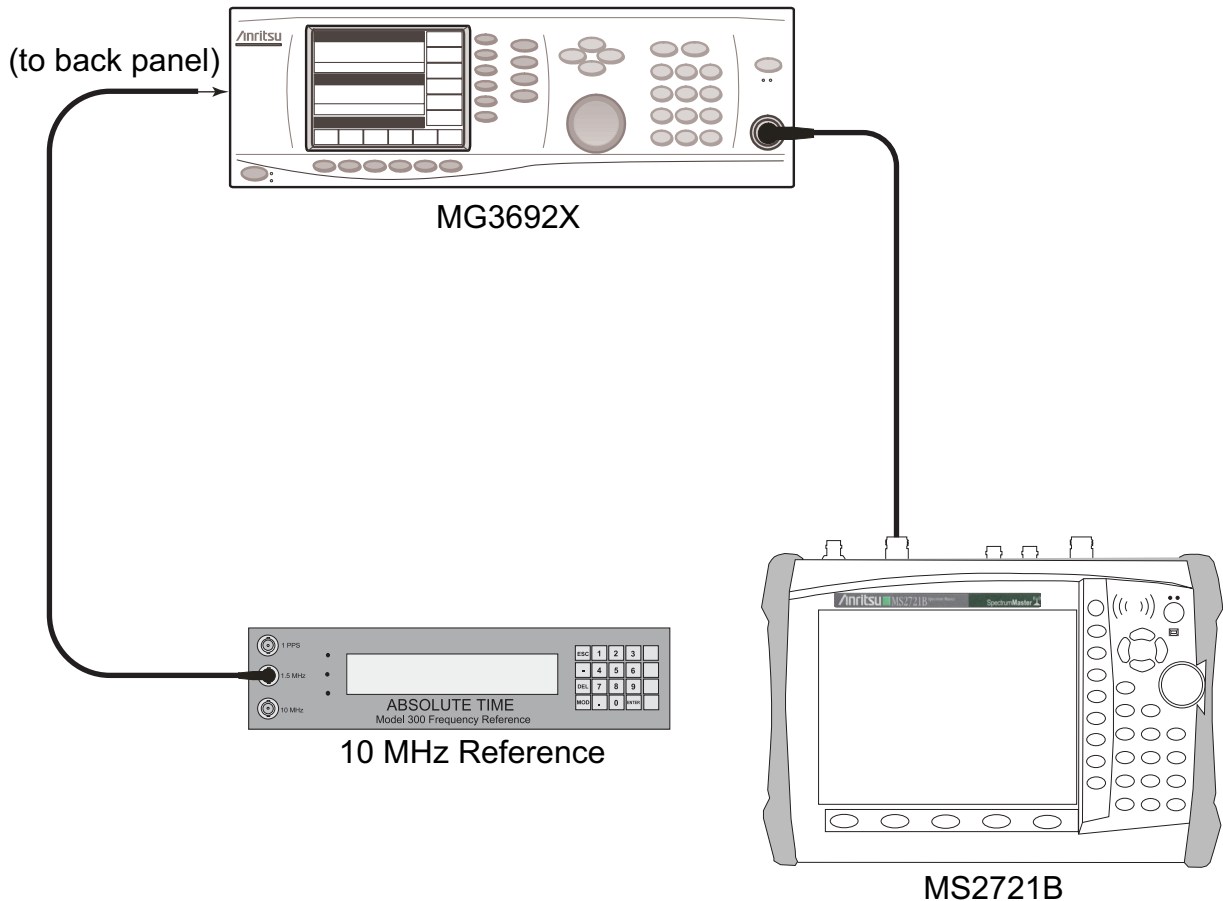


Figure 3-8. GPS Frequency Accuracy Verification Test Setup

3. On the MS2721B, change the Mode to Spectrum Analyzer and preset the instrument.
4. Set the MG3692x output to 7 GHz CW, with an RF output level of -30 dBm.
5. On the MS2721B, press the **Amplitude** function hard key, and set the Reference Level to -10 dBm.
6. Press the **Freq** function hard key and set the Center Freq to 7.0 GHz.
7. Press the **Span** function hard key, set the span to 10 kHz.
8. Press the **BW** function hard key and set RBW to 100 Hz.
9. Press the VBW soft key and set VBW to 30 Hz.
10. Press the **Marker** key, and press the Peak Search soft key.
11. Record the marker frequency in the "Measured Value" column in [Table A-75, "GPS Spectrum Analyzer Frequency Accuracy, Option 31"](#) on page A-28.
12. Subtract the marker value from 7 GHz and record the result in the "Error" column in [Table A-75](#), and verify that it is within specification.

3-6 ISDB-T SFN Analyzer (Option 32) Verification

Introduction

The tests in this section verify the performance of the optional ISDB-T SFN Analyzer option of the MS2721B. These tests include:

- [Level Accuracy Verification](#)
- [1 dB Compression Level Verification](#)
- [Noise Floor Verification](#)

Level Accuracy Verification

The tests in this section verify the level accuracy of the MS2721B in ISDB-T SFN Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Programmable Attenuator, Anritsu Model MN63A
- Power Meter, Anritsu Model ML2438A
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Power Sensor, Anritsu Model MA2482D (2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- Anritsu 1N50C RF Limiter
- Adapter, Anritsu Model 34NN50A
- Adapter, Midwest Microwave ADT-2615-NF-BNM-02 (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C (3)
- Spectrum Master Model MS2721B

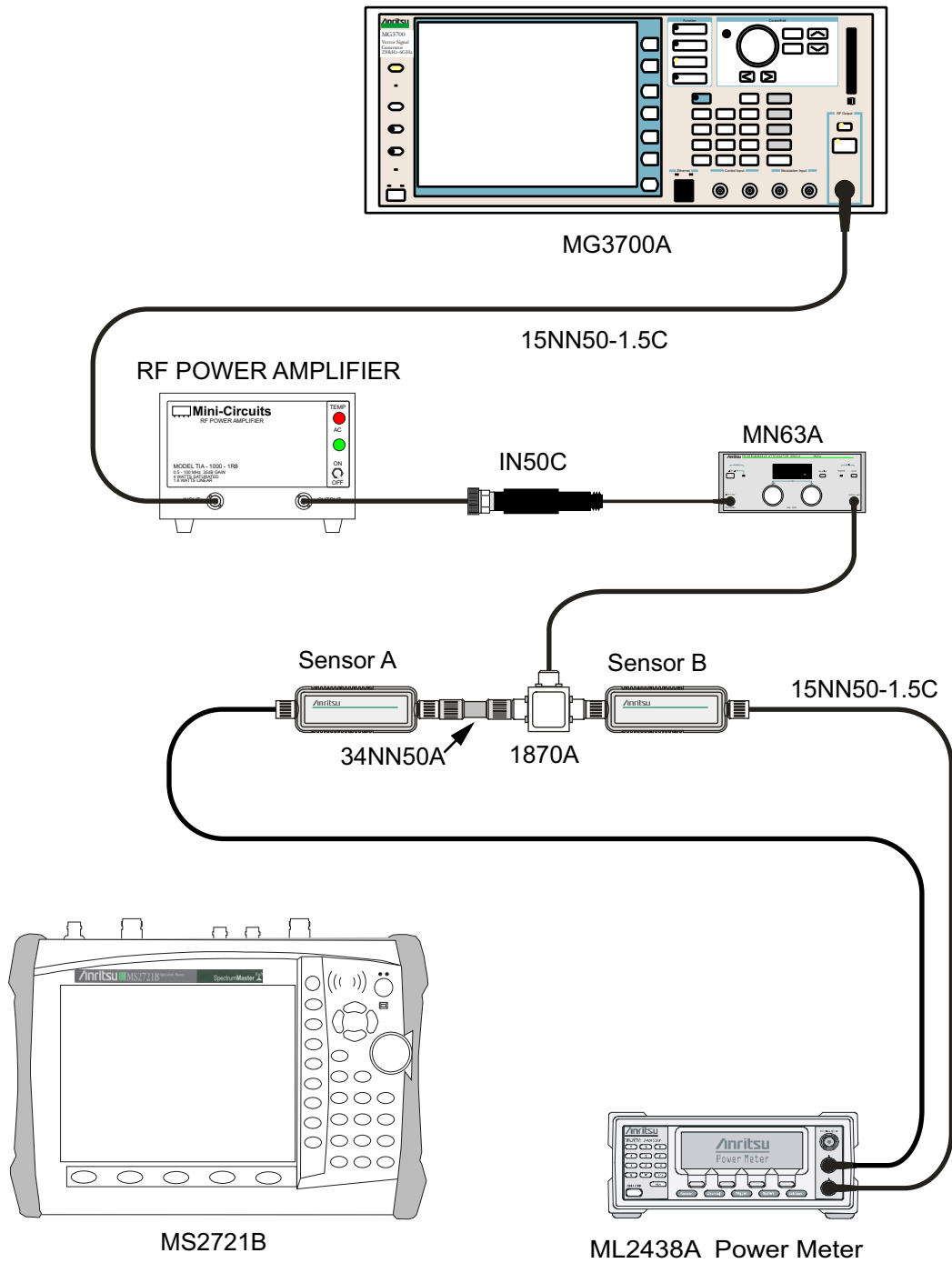


Figure 3-9. Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f) to BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-9, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-25.
3. On the MG3700A, press the yellow **Preset** key located on the upper left side of the instrument.
4. Press the **Down Arrow** key to select Yes.
5. Press the **Set** key. Note that the MG3700A has two **Set** keys, and they both do the same thing.
6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key, labeled Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
13. Press the **Set** key.
14. Use the **Down Arrow** key to step through the selection list until the ISDB-T_1layer_1ch option is highlighted.
15. Press the **Set** key.
16. Perform Zero/Cal on Sensor A and Sensor B of the power meter and set the calibration factor of both sensors to 473 MHz.
17. Set the MG3700A frequency to 473.14285714 MHz.
18. Set the Level to –25 dBm.
19. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that the Sensor A reading is –10 dBm ± 1 dBm, and record the reading in the “AT(-10)” column in [Table A-61, “Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\), Option 32”](#) on page A-23.
22. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is –10.0 dBm ± 0.2 dBm.
23. Record the following values to the appropriate columns in [Table A-61](#):
 - Power Meter Sensor A reading to the “Sensor A Reading” column
 - Power Meter Sensor B reading to the “Sensor B Reading” column
24. Subtract the value of the Sensor A Reading from the value of the Sensor B Reading and record the result in the “DAB(-10)” column of [Table A-61](#). Example calculation:
$$\text{DAB}(-10) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
25. Calculate the AT(set) values for Test Levels –10 dBm through –45 dBm and record the results in the “AT(set)” column in [Table A-64, “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 32”](#) on page A-24.
26. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) Adapter as shown in [Figure 3-10, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-27.

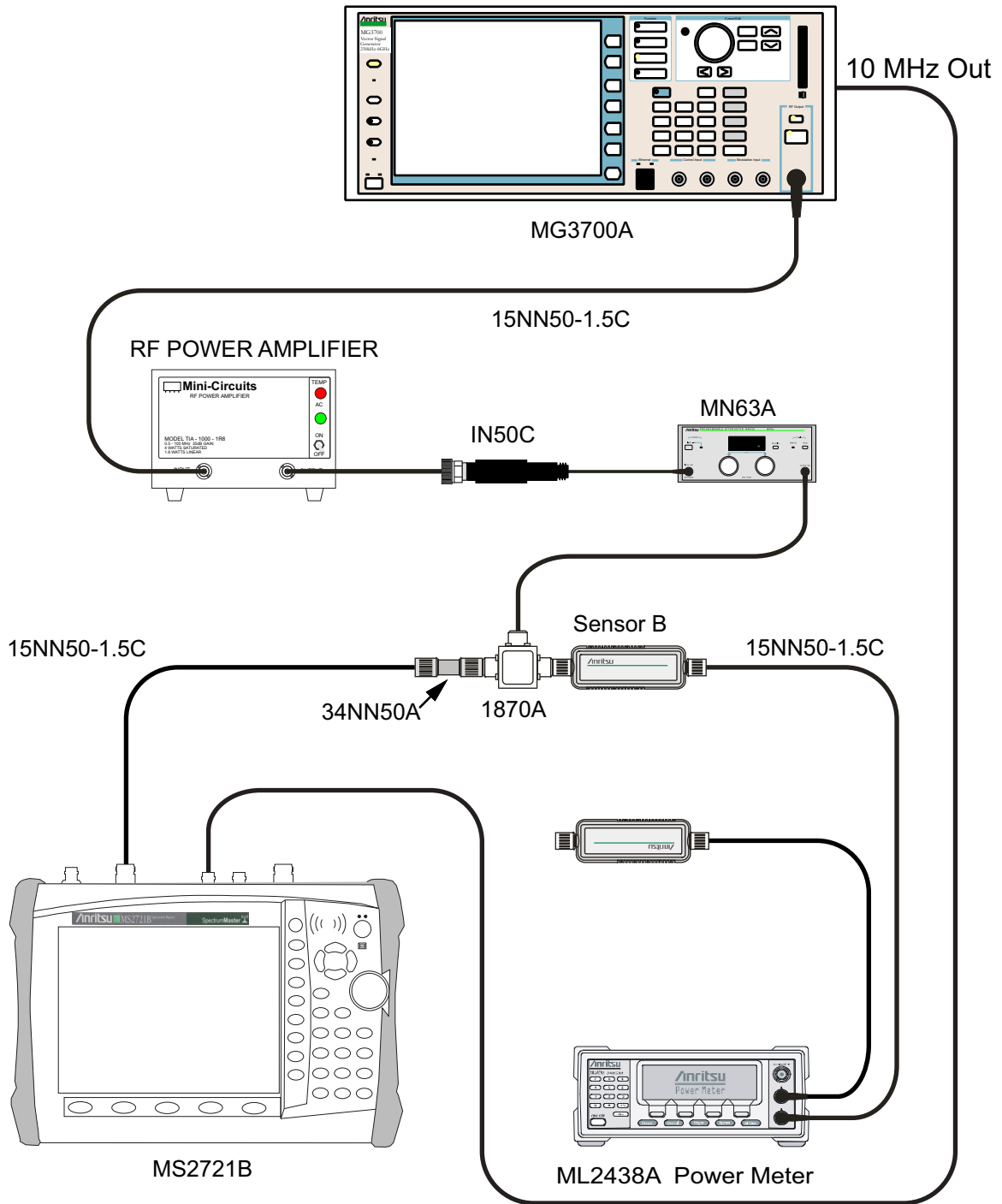


Figure 3-10. Level Accuracy Verification Setup – Sensor B Only

27. Record the new Power Meter Sensor B reading to the SB(-10) box in [Table A-64](#), “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 32” on page A-24.
28. On the MS2721B, set the mode to ISDB-T SFN Analyzer and preset the unit.
29. Press the **Meas Setup** function hard key and set Meas Mode to Single.
30. Press the **Frequency/Level** function hard key and ensure that the Channel is 13 and Preamp is OFF.

31. Change the Reference Level to -10 dBm.
32. After the data appears on the left of the display, record the -25 dBm Channel Power from the MS2721B in the “Pre Amp Off M(Level)” column in [Table A-64](#).
33. Calculate the Deviation using the following formula:

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

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

34. Record the result in the “Pre Amp Off Dev” column in [Table A-64](#), and verify that it is within specification.
35. Set the MN63A Attenuation to the next AT(set) value that is listed in [Table A-64](#).
36. Press the **Frequency/Level** function hard key and set the MS2721B Reference Level to -15 dBm.
37. After the data appears on the left of the display, record the -15 dBm Channel Power from the MS2721B in the “Pre Amp Off M(Level)” column in [Table A-64](#).
38. Calculate the Deviation by using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
39. Record the result in the “Pre Amp Off Dev” column in [Table A-64](#), and verify that it is within specification.
40. Set the MN63A Attenuation to the next AT(set) value in [Table A-64](#).
41. Set the Reference Level of the MS2721B to -20 dBm.
42. After the data appears on the left of the display, record the -20 dBm Channel Power from the MS2721B in the “Pre Amp Off M(Level)” column in [Table A-64](#).
43. Calculate the Deviation by using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
44. Record the result in the “Pre Amp Off Dev” column in [Table A-64](#), and verify that it is within specification.
45. Press the **Frequency/Level** function hard key and set Preamp to ON. Change the Reference Level if required.
46. After the data appears on the left of the display, record the -20 dBm Channel Power from the MS2721B in the “Pre Amp On M(Level)” column in [Table A-64](#).
47. Calculate the Deviation by using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
48. Record the result in the “Pre Amp On Dev” column in [Table A-64](#) and verify that it is within specification.
49. Repeat [Step 40](#) through [Step 48](#) for Test levels -25 dBm to -45 dBm. Change Reference Level and switch the Pre Amp per the “Ref Level Pre Amp Off/On” column in [Table A-64](#).
50. Turn off the Power Amplifier, disconnect the Power Splitter from the MS2721B, and re-connect Sensor A to the Power Splitter as shown in [Figure 3-9](#), “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors” on [page 3-25](#).
51. Set the MN63A Attenuation to 10 dB.
52. Set the MG3700A Level to -60 dBm.
53. Turn on the Power Amplifier and allow it to warm up for at least 5 minutes.
54. Adjust the MN63A Attenuator so that the Sensor A reading is -50 dBm \pm 1 dBm. Record the attenuation reading in [Table A-62](#), “Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 32” on [page A-23](#).

55. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is $-50.0 \text{ dBm} \pm 0.2 \text{ dBm}$.
56. Record the following values to the appropriate columns in [Table A-62](#):
Power Meter Sensor A reading to the “Sensor A Reading” column
Power Meter Sensor B reading to the “Sensor B Reading” column
57. Subtract the value of the Sensor A reading from the value of the Sensor B reading and record the result in the “DAB(-50)” column of [Table A-62](#). Example calculation:
$$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
58. Calculate the AT(set) values for Test Levels -55 dBm through -84 dBm and record the values in the AT(set) column in [Table A-64](#), “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 32” on page A-24.
59. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) Adapter, as shown in [Figure 3-10](#), “Level Accuracy Verification Setup – Sensor B Only” on page 3-27.
60. Record the new Power Meter Sensor B reading into the SB(-50) box in the the “-50” row in [Table A-64](#).
61. Repeat [Step 40](#) through [Step 51](#) for Test Levels -50 dBm to -84 dBm . Change the Reference Level and switch the Pre Amp ON or OFF per the “Ref Level Pre Amp Off/On” column in [Table A-64](#). Use the following formula to calculate Deviation:
$$\text{Deviation} = \text{M(Level)} - \text{SB}(-50) - \text{DAB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$
62. Repeat [Step 16](#) through [Step 61](#) for frequencies 623.14285714 MHz (Ch 38). Set the calibration factor of both Power Sensors to 623 MHz and record results in the Test Records ([Table A-61](#), “Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 32” on page A-23, [Table A-62](#), “Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 32” on page A-23, and [Table A-65](#), “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz, Option 32” on page A-25).
63. Repeat [Step 16](#) through [Step 61](#) for frequencies 767.14285714 MHz (Ch 62). Set the calibration factor of both Power Sensors to 767 MHz and record results in the Test Records ([Table A-61](#), “Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 32” on page A-23, [Table A-62](#), “Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 32” on page A-23, and [Table A-66](#), “ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz, Option 32” on page A-26).

1 dB Compression Level Verification

The tests in this section verify that the accuracy of the MS2721B is not degraded by compression when operating in the ISDB-T SFN Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Programmable Attenuator, Anritsu Model MN63A
- Power Meter, Anritsu Model ML2438A
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Power Sensor, Anritsu Model MA2482D (2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- Anritsu 1N50C RF Limiter
- Adapter, Anritsu Model 34NN50A
- Adapter, Midwest Microwave ADT-2615-NF-BNM-02 (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C (3)
- Spectrum Master Model MS2721B

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. On the Power Meter, set Low Level Averaging to Low and Averaging to Moving with 50 averages. Set the power meter to read True RMS.
3. Perform a Zero/Cal on both sensors that are connected to the power meter.
4. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-9, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-25.
5. On the MG3700A, press the **MOD On/Off** button to turn Modulation OFF so that the **MOD On/Off** LED is OFF (not illuminated).
6. Set the Level output of the MG3700A to -25 dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up for at least five minutes.

473.14285714 MHz Tests

9. Set the calibration factor of both sensors to 473 MHz.
10. Set the MG3700A Frequency to 473.14285714 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is -25 dBm \pm 1 dBm and record the results in the “473.14285714 MHz - Ch 13” row and the “AT(-25)” column in [Table A-63, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 32”](#) on page A-23.
12. Adjust the Level of the MG3700A so that Power Meter Sensor A reads -25.0 dBm \pm 0.05 dBm and record the results in the “Sensor A reading, M(Sa)” column of [Table A-63](#).
13. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-10, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-27.

14. Set the MS2721B to ISDB-T SFN Analyzer mode and preset the unit.
15. Press the **Meas Setup** function hard key and set Meas Mode to Single.
16. Press the **Frequency/Level** function hard key and ensure that the MS2721B Channel is set to 13 and that Pre Amp is OFF.
17. Set the Reference Level to -25 dBm.
18. Record the MS2721B Channel Power reading, MeasCP(-25), to the -25 dBm “Test Level” row and the “Measured Value” column in [Table A-67, “ISDB-T SFN Analyzer 1 dB Compression Level Channel 13 with Pre Amp OFF, Option 32” on page A-27](#).
19. Calculate the difference, Delta(-25), by using the following formula:

$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$
20. Record the result to the Delta column in [Table A-67](#), and verify that the result is less than 1 dB.
21. Calculate AT(-15) by using the following formula

$$\text{AT}(-15) = \text{AT}(-25) - 10$$
22. Set the MN63A attenuation to AT(-15).

Note The Over Range message on the MS2721B is normal.

23. Record the MS2721B Channel Power reading, MeasCP(-15), to the -15 dBm “Test Level” row of the “Measured Value” column in [Table A-67](#).
24. Calculate the Delta at -15 dBm Input by using the following formula:

$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$
25. Record the result to the Delta column in [Table A-67](#), and verify that it is less than 1 dB.
26. Calculate the value of AT(-50) by using the following formula:

$$\text{AT}(-50) = \text{ATT}(-25) + 25$$
27. Adjust the MN63A attenuation to AT(-50).
28. Set the Reference Level on the MS2721B to -50 dBm and turn Pre Amp ON.
29. Record the MS2721B Channel Power reading, MeasCP(-50), to the -50 dBm “Test Level” row of the “Measured Value” column in [Table A-70, “ISDB-T SFN Analyzer 1 dB Compression Level Channel 13 with Pre Amp ON, Option 32” on page A-27](#).
30. Calculate the Delta at -50 dBm Input, Delta(-50), by using the following formula:

$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$
31. Record the result to the Delta column in [Table A-70](#), and verify that it is less than 1 dB.
32. Calculate the AT(-43) by using the following formula:

$$\text{AT}(-43) = \text{AT}(-25) + 18$$
33. Set the MN63A attenuation to AT(-43).

Note The Over Range message on the MS2721B is normal.

34. Record the MS2721B Channel Power reading, MeasCP(-43), in the -43 dBm “Test Level” row of the “Measured Value” column in [Table A-70](#).
35. Calculate the Delta at -43 dBm Input, Delta(-43), by using the following formula:

$$\text{Delta}(-43) = M(\text{Sa}) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$
36. Record the result to the Delta column in [Table A-70](#), and verify that it is less than 1 dB.

623.14285714 MHz Tests

37. Remove the MS2721B from the test setup and re-install Sensor A to the open splitter output as shown in [Figure 3-9, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-25.
38. Set the MG3700A Frequency to 623.14285714 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
39. Set the calibration factor of both sensors to 623 MHz.
40. Adjust the MN63A attenuation so that the Power Meter Sensor A reads $-25 \text{ dBm} \pm 1 \text{ dBm}$. Record the MN63A attenuation readout to the AT(-25) column in [Table A-63, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 32”](#) on page A-23.
41. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads $-25.0 \text{ dBm} \pm 0.05 \text{ dBm}$. Record the Sensor A reading to the M(Sa) column in [Table A-63](#).
42. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-10, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-27.
43. Set the MS2721B Channel to 38.
44. Set Preamp to OFF and Reference Level to -25 dBm .
45. Repeat [Step 18](#) through [Step 36](#).

767.14285714 MHz Tests

46. Remove the MS2721B from the test setup and re-install Sensor A to the open splitter output as shown in [Figure 3-9, “Level Accuracy and 1 dB Compression Level Pretest Setup – Two Sensors”](#) on page 3-25.
47. Set the MG3700A Frequency to 767.14285714 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
48. Set the calibration factor of both sensors to 767 MHz.
49. Adjust the MN63A attenuation so that the Power Meter Sensor A reads $-25 \text{ dBm} \pm 1 \text{ dBm}$. Record the MN63A attenuation readout to the AT(-25) column in [Table A-63](#).
50. Adjust the Level of the MG3700A so that the power meter (Sensor A) reads $-25.0 \text{ dBm} \pm 0.05 \text{ dBm}$. Record the Sensor A reading to the M(Sa) column in [Table A-63](#).
51. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-10, “Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-27.
52. Set the MS2721B Channel to 62.
53. Set Preamp to OFF and Reference Level to -25 dBm .
54. Repeat [Step 18](#) through [Step 36](#).

Noise Floor Verification

The tests in this section verify the noise floor of the MS2721B in ISDB-T SFN Analyzer mode.

Required Equipment:

- 50 ohm termination, Anritsu Model 28N50-2
- Spectrum Master Model MS2721B

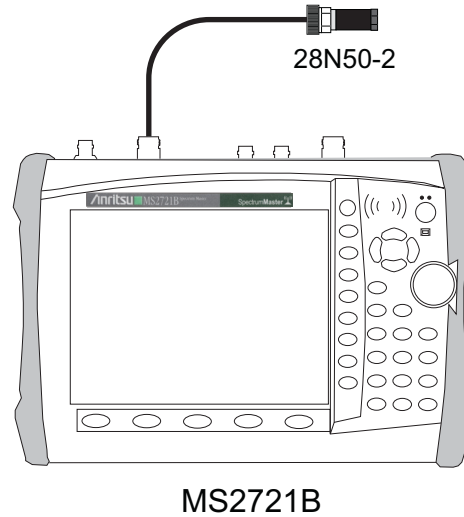


Figure 3-11. ISDB-T SFN Option 32 - Noise Floor Verification Test Setup

Procedure:

1. Set the mode of the MS2721B to ISDB-T SFN Analyzer and preset the unit.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Ensure that the Channel is set to 13 and Preamp is OFF.
4. Set the Reference Level to -25 dBm.
5. Record the Channel Power [dBm] as shown in the lower left corner of the display into [Table A-73](#), “ISDB-T SFN Analyzer Noise Floor Pre Amp OFF, Option 32” on page A-28.
6. Set Preamp to ON and change Reference Level to -50 dBm.
7. Record the Power [dBm] as shown in the lower left corner of the display into [Table A-74](#), “ISDB-T SFN Analyzer Noise Floor Pre Amp ON, Option 32” on page A-28
8. Change the channel to Channel 38, and set Preamp to OFF.
9. Repeat [Step 4](#) through [Step 7](#) for Channel 38.
10. Change the channel to Channel 62, set Preamp to OFF.
11. Repeat [Step 4](#) through [Step 7](#) for Channel 62.

3-7 GSM/GPRS/EDGE Signal Analyzer (Options 40 and 41) Verification

The tests in this section verify the optional GSM/GPRS/EDGE Signal Analyzer functions in Spectrum Master Model MS2721B. These tests include:

- [GSM Burst Power, Frequency Error, and Phase Error Tests](#)
- [EDGE Burst Power, Frequency Error and Residual Error Tests](#)

GSM/GPRS/EDGE Setup

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Adapter, Anritsu Model 34NN50A
- Spectrum Master Model MS2721B

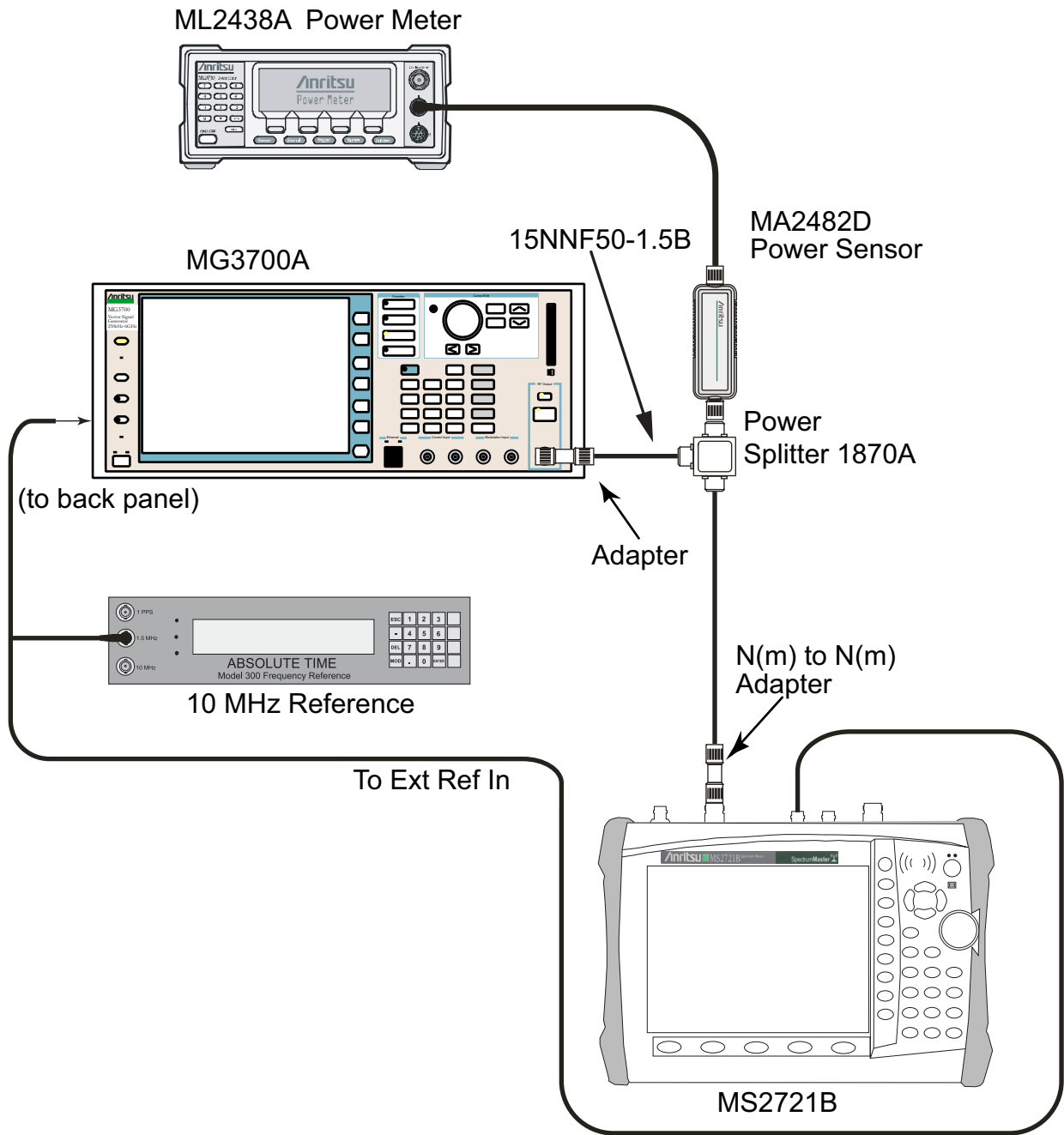


Figure 3-12. GSM/GPRS/EDGE Test Setup

Set up Procedure:

1. Connect the equipment as shown in Figure 7.
2. Calibrate the power sensor prior to connecting to the power splitter.
3. On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
4. Set the MS2721B mode to GSM/GPRS/EDGE Signal Analyzer. Preset the instrument.

GSM Burst Power, Frequency Error, and Phase Error Tests

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
2. Press the **Down Arrow** key or turn the knob to select **Yes**.
3. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
4. Press the (F1) soft key to select "Load File to Memory"
5. Press the (F1) soft key again to select "Select Package"
6. Using the **Down Arrow** key, step through the selection list until the "GSM" option is highlighted.
7. Press the **Set** key.
8. Press the (F6) soft key "Return"
9. Press the **Set** key. The "Select Package" box appears. Use the rotary knob to highlight "GSM" and press the **Set** key to select.
10. Another File List appears. Use the rotary knob to select "GsmBurst_1slot" and press the **Set** key to select.
11. Press the **MOD On/Off** key to turn on the Modulation LED and verify that 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 soft key.
14. Adjust the MG3700A output so that the power meter reads -10 dBm \pm 0.2 dB.
15. On the MS2721B, press the **Freq** function hard key and enter 850 MHz as Center Frequency.
16. Press the **Measurements** function hard key and press GSM/EDGE Summary (a red dot appears on the label).
17. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 14](#). Then record the calculated Burst Power error and the displayed value of Freq Error in [Table A-76, "At 850 MHz, -10 dBm Level, TCH Pattern, Option 40" on page A-29](#).
18. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in [Table A-84, "Phase Err RMS \(Deg\) at 850 MHz, -10 dBm Level, TCH Pattern, Option 41" on page A-31](#).
19. Verify that the measured values in [Step 17](#) and [Step 18](#) are within specifications.
20. On the MG3700A, change the selected signal pattern to "GsmBurst_8slot".
21. Adjust the Level of the MG3700A so that the power meter reads -50 dBm \pm 0.2 dB. Then wait 15 seconds to allow the MS2721B to update its measured results.
22. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 21](#). Then record the calculated Burst Power error and the displayed value of Freq Error in [Table A-77, "At 850 MHz, -50 dBm Level, TCH ALL Pattern, Option 40" on page A-29](#).
23. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in [Table A-85, "Phase Err RMS \(Deg\) at 850 MHz, -50 dBm Level, TCH ALL Pattern, Option 41" on page A-31](#).
24. Verify that the measured values in [Step 22](#) and [Step 23](#) are within specifications.
25. Change the frequency of the MG3700A to 1800 MHz.
26. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the **Freq** soft key. Use the keypad to enter 1800 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

27. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$.
28. On the MS2721B, set the Center Freq to 1800 MHz. Then wait 15 seconds to allow the MS2721B to update its measured results.
29. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 27](#). Then record the calculated Burst Power error and the displayed value of Freq Error in [Table A-78](#), “At 1800 MHz, -10 dBm Level, TCH ALL Pattern, Option 40” on page A-29.
30. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in [Table A-86](#), “Phase Err RMS (Deg) at 1800 MHz, -10 dBm Level, TCH ALL Pattern, Option 41” on page A-31.
31. Verify that the measured values in [Step 29](#) and [Step 30](#) 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 $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Then wait 15 seconds to allow the MS2721B to update its measured results.
34. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 33](#). Then record the calculated Burst Power error and the displayed value of Freq Error [Table A-79](#), “At 1800 MHz, -50 dBm Level, TCH Pattern, Option 40” on page A-29.
35. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed Phase Err RMS (deg) in [Table A-87](#), “Phase Err RMS (Deg) at 1800 MHz, -50 dBm Level, TCH Pattern, Option 41” on page A-31.
36. Verify that the measured values in [Step 34](#) and [Step 35](#) are within specifications.

EDGE Burst Power, Frequency Error and Residual Error Tests

Test Procedure:

1. Verify that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to "DL_MCS-9_1SLOT".
3. Adjust the level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$. Then wait 15 seconds to allow the MS2721B to update its measured results.
4. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 3](#). Then record the calculated Burst Power error and the displayed value of Freq Error in [Table A-80](#), "At 1800 MHz, -50 dBm Level, DL_MCS-9_1SLOT Pattern, Option 40" on page A-29.
5. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in [Table A-88](#), "EVM RMS at 1800 MHz, -50 dBm Level, DL_MCS-9_1SLOT Pattern, Option 41" on page A-31.
6. Verify that the measured values in [Step 4](#) and [Step 5](#) are within specifications.
7. On the MG3700A, change the selected pattern to "DL_MCS-9_4SLOT".
8. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Then wait 15 seconds to allow the MS2721B to update its measured results.
9. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), subtract the displayed Burst Power value from the power meter reading in [Step 8](#). Then record the calculated Burst Power error and the displayed value of Freq Error in [Table A-81](#), "At 1800 MHz, -10 dBm Level, DL_MCS-9_4SLOT Pattern, Option 40" on page A-29.
10. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) in [Table A-89](#), "EVM RMS at 1800 MHz, -10 dBm Level, DL_MCS-9_4SLOT Pattern, Option 41" on page A-31.
11. Verify that the measured values in [Step 9](#) and [Step 10](#) are within specifications.
12. Change the frequency of the MG3700A to 850 MHz.
13. On the power meter, press the Sensor key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 850 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
14. Adjust the level of the MG3700A so that the power meter reads $-50 \text{ dBm} \pm 0.2 \text{ dB}$.
15. On the MS2721B, set the Center Freq to 850 MHz. Then wait 15 seconds to allow the MS2721B to update its measured results.
16. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the displayed values of Burst Power and Freq Error into [Table A-82](#), "At 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern, Option 40" on page A-30.
17. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) into [Table A-90](#), "EVM RMS at 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern, Option 41" on page A-31.
18. Verify that the measured values in [Step 16](#) and [Step 17](#) are within specifications.
19. On the MG3700A, change the selected pattern to "DL_MCS-9_1SLOT".
20. Adjust the level of the MG3700A so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$. Then wait 15 seconds to allow the MS2721B to update its measured results.
21. For an MS2721B with Option 40 (GSM/GPRS/EDGE RF Measurements), record the displayed values of Burst Power and Freq Error into [Table A-83](#), "At 850 MHz, -10 dBm Level, DL_MCS-9_1SLOT Pattern, Option 40" on page A-30.

22. For an MS2721B with Option 41 (GSM/GPRS/EDGE Demodulator), record the displayed EVM (rms) into [Table A-91, “EVM RMS at 850 MHz, –10 dBm Level, DL_MCS-9_1SLOT Pattern, Option 41”](#) on page A-31.
23. Verify that the measured values in [Step 21](#) and [Step 22](#) are within specifications.

3-8 CDMA Signal Analyzer (Options 42 and 43) Verification

The tests in this section verify the optional CDMA Signal Analyzer functions in Spectrum Master Model MS2721B. These tests include:

- [cdmaOne Channel Power, Frequency Error, Rho, and Tau Tests](#)

CDMA Signal Analyzer Setup

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Adapter, Anritsu Model 34NN50A
- Spectrum Master Model MS2721B

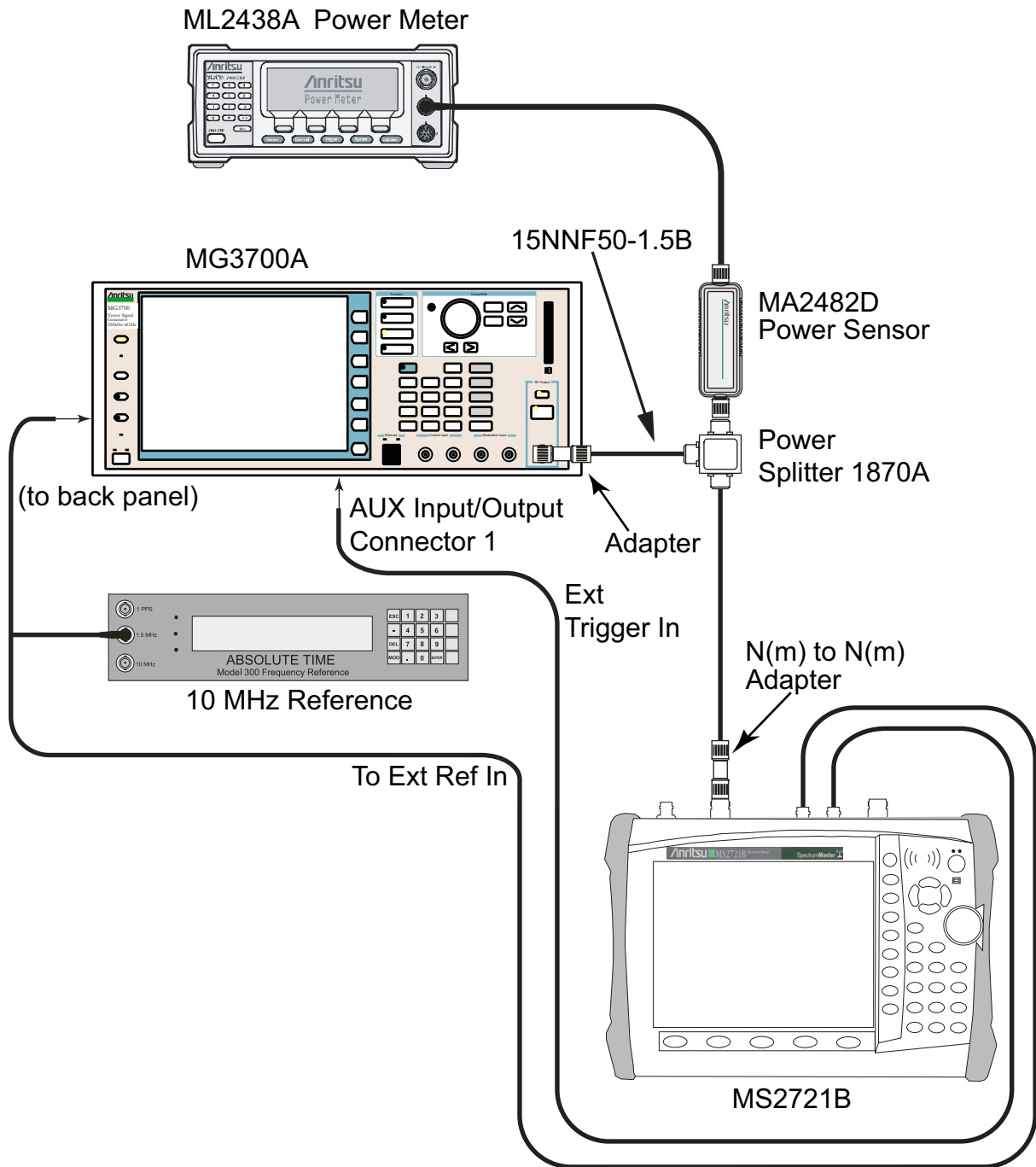


Figure 3-13. CDMA Signal Analyzer Test Setup

Set up Procedure:

1. Calibrate the power sensor prior to connecting to the power splitter.
2. On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
3. Connect the equipment as shown in [Figure 3-13](#).
4. Set the MS2721B mode to CDMA Signal Analyzer. Preset the instrument.

cdmaOne Channel Power, Frequency Error, Rho, and Tau Tests

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
2. Press the **Down Arrow** key or turn the knob to select **Yes**.
3. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
4. Press the (F1) soft key to select "Load File to Memory"
5. Press the (F1) soft key again to select "Select Package"
6. Using the **Down Arrow** key step through the selection list until the "CDMA2000" option is highlighted.
7. Press the **Set** key.
8. Press the (F6) soft key, "Return"
9. Press the **Set** key. The "Select Package" box appears. Use the rotary knob to highlight "CDMA2000" and press the **Set** key to select.
10. Another File List appears. 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 on the Modulation LED 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 soft key.
14. Adjust the MG3700A output so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the exact value in [Table A-92, "Channel Power Error at 870.03 MHz, -30 dBm Level, cdmaOne, Option 42" on page A-32.](#)
15. On the MS2721B, press the **Freq** function hard key and enter 870.03 MHz as Center Frequency.
16. Press the **Measurements** function hard key and press CDMA Summary (a red dot appears on the label).
17. Press the **Setup** function hard key and press PN Setup. Then change PN Trigger to Ext by pressing the PN Trigger soft key twice. Then wait 15 seconds to allow the MS2721B to update its measured results.
18. For an MS2721B with Option 42 (CDMA RF Measurements), record the displayed Channel Power value in [Table A-92](#) and subtract it from the power meter reading (set in [Step 14](#)). Then record the calculated Channel Power error in [Table A-92](#).

$$\text{Channel Power Error} = \text{Set Channel Power} - \text{Displayed Channel Power}$$
19. For an MS2721B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in [Table A-96, "At 870.03 MHz, -30 dBm Level, cdmaOne, Option 43" on page A-33.](#)
20. Verify that the measured values in [Step 18](#) and [Step 19](#) are within specifications.
21. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
22. Set the MG3700A Frequency to 1930.05 MHz.
23. Adjust the MG3700A output so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the exact value in [Table A-93, "Channel Power Error at 1930.05 MHz, -30 dBm Level, cdmaOne, Option 42" on page A-32.](#)
24. On the MS2721B, press the **Freq** function hard key and enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS2721B to update its measured results.
25. For an MS2721B with Option 42 (CDMA RF Measurements), record the displayed Channel Power value in [Table A-93](#) and subtract it from the power meter reading (set in [Step 23](#)). Then record the calculated Channel Power error in [Table A-93](#).

$$\text{Channel Power Error} = \text{Set Channel Power} - \text{Displayed Channel Power}$$

26. For an MS2721B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in [Table A-97, “At 1930.05 MHz, –30 dBm Level, cdmaOne, Option 43” on page A-33](#).
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 $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Then wait 15 seconds to allow the MS2721B to update its measured results. Record the exact value in [Table A-94, "Channel Power Error at 1930.05 MHz, \$-30 \text{ dBm}\$ Level, CDMA2000, Option 42"](#) on page A-32.
4. For an MS2721B with Option 42 (CDMA RF Measurements), record the displayed Channel Power value in [Table A-94](#) and subtract it from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in [Table A-94](#).

$$\text{Channel Power Error} = \text{Set Channel Power} - \text{Displayed Channel Power}$$

5. For an MS2721B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho, and Tau in [Table A-98, "At 1930.05 MHz, \$-30 \text{ dBm}\$ Level, CDMA2000, Option 43"](#) on page A-33.
 6. Verify that the measured values in [Step 4](#) and [Step 5](#) are within specifications.
 7. On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
 8. Set the MG3700A Frequency to 870.03 MHz.
 9. Adjust the MG3700A output so that the power meter reads $-30 \text{ dBm} \pm 0.2 \text{ dB}$. Record the exact value in [Table A-95, "Channel Power Error at 870.03 MHz, \$-30 \text{ dBm}\$ Level, CDMA2000, Option 42"](#) on page A-32.
 10. On the MS2721B, press the **Freq** function hard key and enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS2721B to update its measured results.
 11. For an MS2721B with Option 42 (CDMA RF Measurements), record the displayed Channel Power value in [Table A-95](#) and subtract it from the power meter reading in [Step 9](#). Then record the calculated Channel Power error in [Table A-95](#).
- $$\text{Channel Power Error} = \text{Set Channel Power} - \text{Displayed Channel Power}$$
12. For an MS2721B with Option 43 (cdmaOne and CDMA2000 1xRTT Demodulator), record the displayed Freq Error, Rho and Tau in [Table A-99, "At 870.03 MHz, \$-30 \text{ dBm}\$ Level, CDMA2000, Option 43"](#) on page A-33.
 13. Verify that the measured values in [Step 11](#) and [Step 12](#) are within specifications.

3-9 WCDMA/HSDPA Signal Analyzer (Options 44, 45, and 65) Verification

The tests in this section can be used to verify the functionality of the WCDMA/HSDPA Signal Analyzer mode of the MS2721B Spectrum Master. The tests include:

- [WCDMA Absolute Power Accuracy Verification \(Option 44\)](#)
- [WCDMA Occupied Bandwidth \(OBW\) Verification \(Option 44\)](#)
- [WCDMA RF Channel Power Accuracy and ACLR Verification \(Option 44\)](#)
- [HSDPA RF Channel Power Accuracy and ACLR Verification \(Option 44\)](#)
- [Error Vector Magnitude \(EVM\) Verification \(Options 45 and 65\)](#)

WCDMA Absolute Power Accuracy Verification (Option 44)

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

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Frequency Reference Symmetricom Rubisource T&M
- Power Meter, Anritsu Model ML2438A
- Programmable Attenuator, Anritsu Model MN63A
- Circulator
- High Power Load, Aeroflex/Weinschel Model M1418
- Coupler
- Power Sensor, Anritsu Model MA2482D (2)
- Adapter, Anritsu Model 34NN50A (2)
- Spectrum Master Model MS2721B

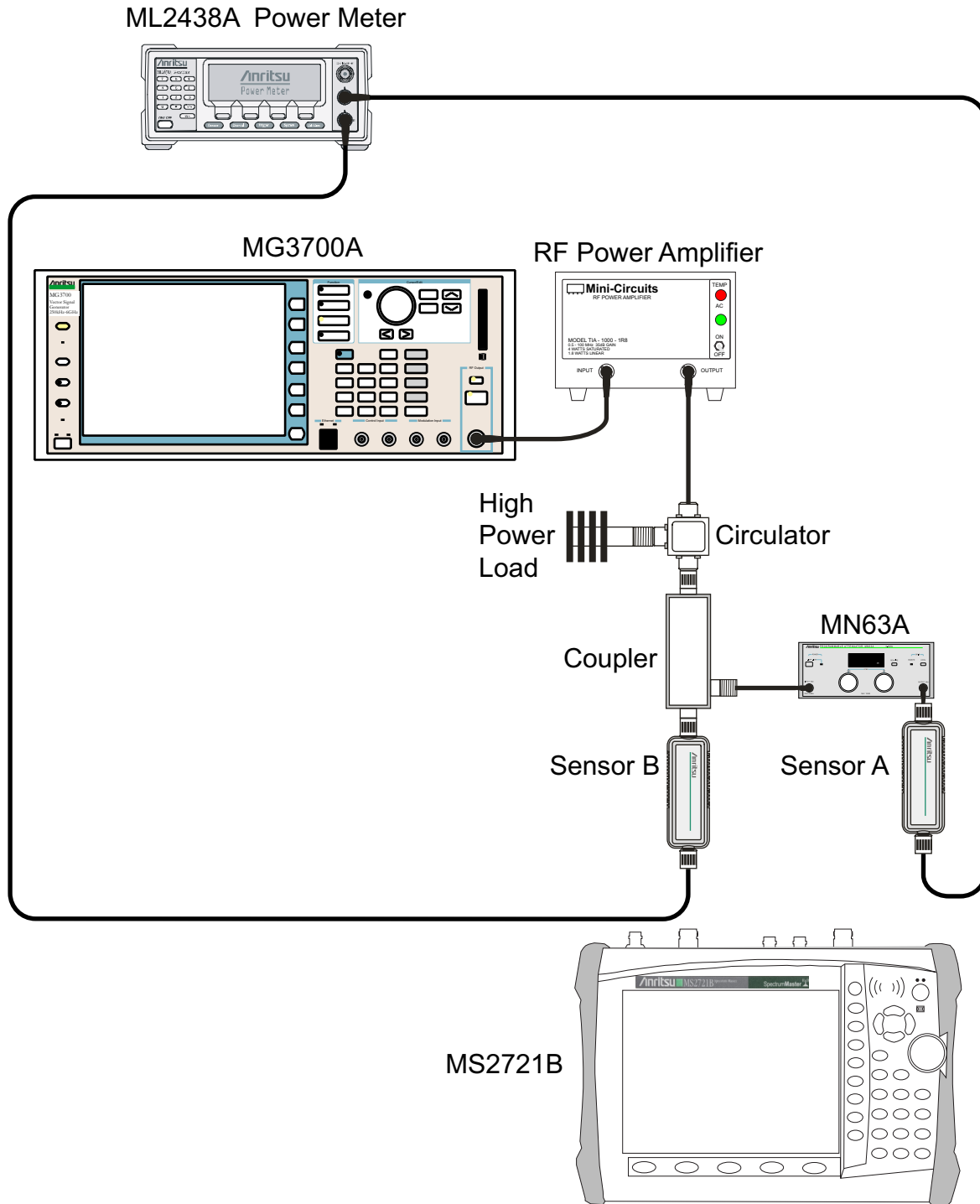


Figure 3-14. WCDMA/HSDPA Signal Analyzer Characterization Setup

WCDMA/HSDPA Signal Analyzer Setup:

1. Connect the MG3700A, RF power amplifier, attenuator, power meter, and sensors as shown in [Figure 3-14](#).
2. Turn on the MG3700A, RF amplifier, attenuator, and the power meter.
3. Connect the power sensors to the power meter and then calibrate the sensors.

4. Press the **On/Off** key to turn on the MS2721B and wait until the measurement display appears, then press the **Shift** key and press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** soft key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
8. Press the **Down Arrow** key to select **Yes**.
9. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
10. Press the (F1) soft key to select "Load File to Memory"
11. Press the (F1) soft key again to select "Select Package"
12. Using the **Down Arrow** key step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
13. Press the **Set** key.
14. Press the (F6) soft key "Return"
15. Press the **Set** key.
16. Using the **Down Arrow** key step through the selection list until the "TestModle_1_16DPCH" option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is On.
19. Press the **Frequency** key, enter 881.5 MHz, and then press the **MHZ** soft key.
20. Press the **Level** key, enter -28, and press the **dBm** soft 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-100](#), "Sensor A and Sensor B Readings Component Characterization, Option 44" on page A-34. The Sensor A reading should be approximately -20 dBm.
24. Record the Sensor B reading (PMB.10) in [Table A-100](#).
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:
$$\Delta 1 \text{ (dBm)} = (10 \text{ dBm} - \text{PMB.10})$$
26. Record the $\Delta 1$ value in [Table A-100](#).
27. Calculate the accurate value of the Sensor A reading for a 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 in [Table A-100](#).
29. Set the MN63A attenuator to 18 dB and record the Sensor A reading (PMA.18) in [Table A-100](#).
30. Calculate the accurate attenuation value (ATT.18) by using the following formula:
$$\text{ATT.18} = (\text{PMA.10} - \text{PMA.18})$$
31. Record the calculated value of ATT.18 in [Table A-100](#).
32. Turn off the RF output of the MG3700A.
33. Disconnect the coupler from Sensor B, and connect the coupler to the RF In port on the MS2721B, referring to [Figure 3-15](#).

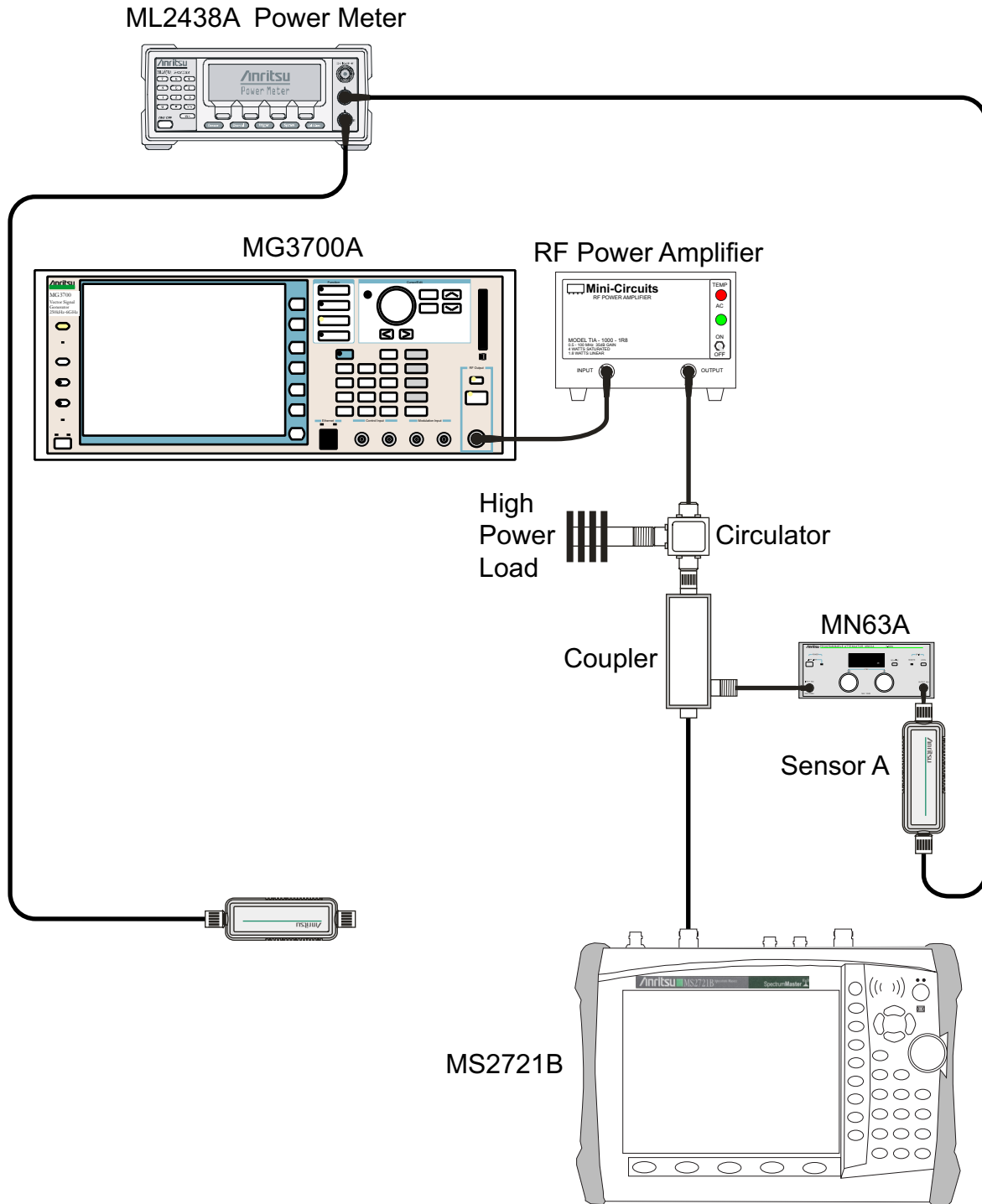


Figure 3-15. WCDMA/HSDPA Signal Analyzer Test Setup

34. Set the MN63A attenuator to 0 dB.
35. On the MS2721B, press the **Freq** function hard key, press the Center Freq soft key, enter 881.5, and then press the **Enter** key.
36. Press the **Measurements** function hard key, then the RF Measurement soft key, then the Channel Spectrum soft key.

37. On the MG3700A, turn on the RF output and use the knob to adjust power level to read the value of PMA.10C on Sensor A refer to [Table A-100](#).
38. Record the MG3700A power level setting (MG3700A.10) in [Table A-101](#), “Power Level Settings Component Characterization, Option 44” on page A-34.
39. On the MS2721B, press the **Amplitude** function hard key and then press the Adjust Range soft key.
40. Record the channel power reading in the "Measured Power" column of [Table A-102](#), “WCDMA Absolute Power Accuracy, Option 44” on page A-34.
41. Use the following formula to calculate the absolute power accuracy of the MS2721B at +10 dBm:
$$\text{Error} = \text{Measured Power} - 10$$
42. Record the calculated value in the "Error" column of [Table A-102](#), and verify that it is within 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 [Table A-100](#) and [Table A-101](#) and the following formula:
$$\text{MG3700A.28} = \text{MG3700A.10} + \text{ATT.18}$$
46. Record the calculated value in [Table A-101](#).
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-101](#).
48. On the MS2721B, press the **Amplitude** function hard key and then press the Adjust Range soft key.
49. Record the channel power reading in the "Measured Power" column of [Table A-102](#).
50. Use the following formula to calculate the absolute power accuracy of the MS2721B at +28 dBm:
$$\text{Error} = \text{Measured Power} - 28$$
51. Record the calculated value in the "Error" column of [Table A-102](#), and verify that it is within specification.
52. Turn off the RF output of the MG3700A.
53. Set the MN63A attenuator to 0 dB.
54. Set power level of the MG3700A to –38 dBm.
55. Calculate the value of the Sensor A reading (PMA–10) for –10 dBm Test Level by using the following formula:
$$\text{PMA-10} = \text{PMA.10C} - 20$$
56. Record the calculated value in [Table A-101](#).
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 MS2721B, press the **Amplitude** key and then press the Adjust Range soft key.
59. Record channel power reading in [Table A-102](#).
60. Use the following formula to calculate the absolute power accuracy of the MS2721B at –10 dBm:
$$\text{Error} = \text{Measured Power} - (-10)$$
61. Record the calculated Error value in [Table A-102](#), and verify that it is within 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 Sensor A reading (PMA-20) for -20 dBm Test Level by using the following formula:

$$PMA - 20 = PMA.10C - 30$$

66. Record the calculated value in [Table A-101](#).
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 MS2721B, press the **Amplitude** key and then press the **Adjust Range** soft key.
69. Record channel power reading in [Table A-102](#).
70. Turn off the RF output of the MG3700A.
71. Use the following formula to calculate the absolute power accuracy of the MS2721B at -20 dBm:
- $$\text{Error} = \text{Measured Power} - (-20)$$
72. Record the calculated Error value in [Table A-102](#),A and verify that it is within specification.

WCDMA Occupied Bandwidth (OBW) Verification (Option 44)

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

WCDMA Occupied Bandwidth Setup

Required Equipment:

- 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)
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master Model MS2721B

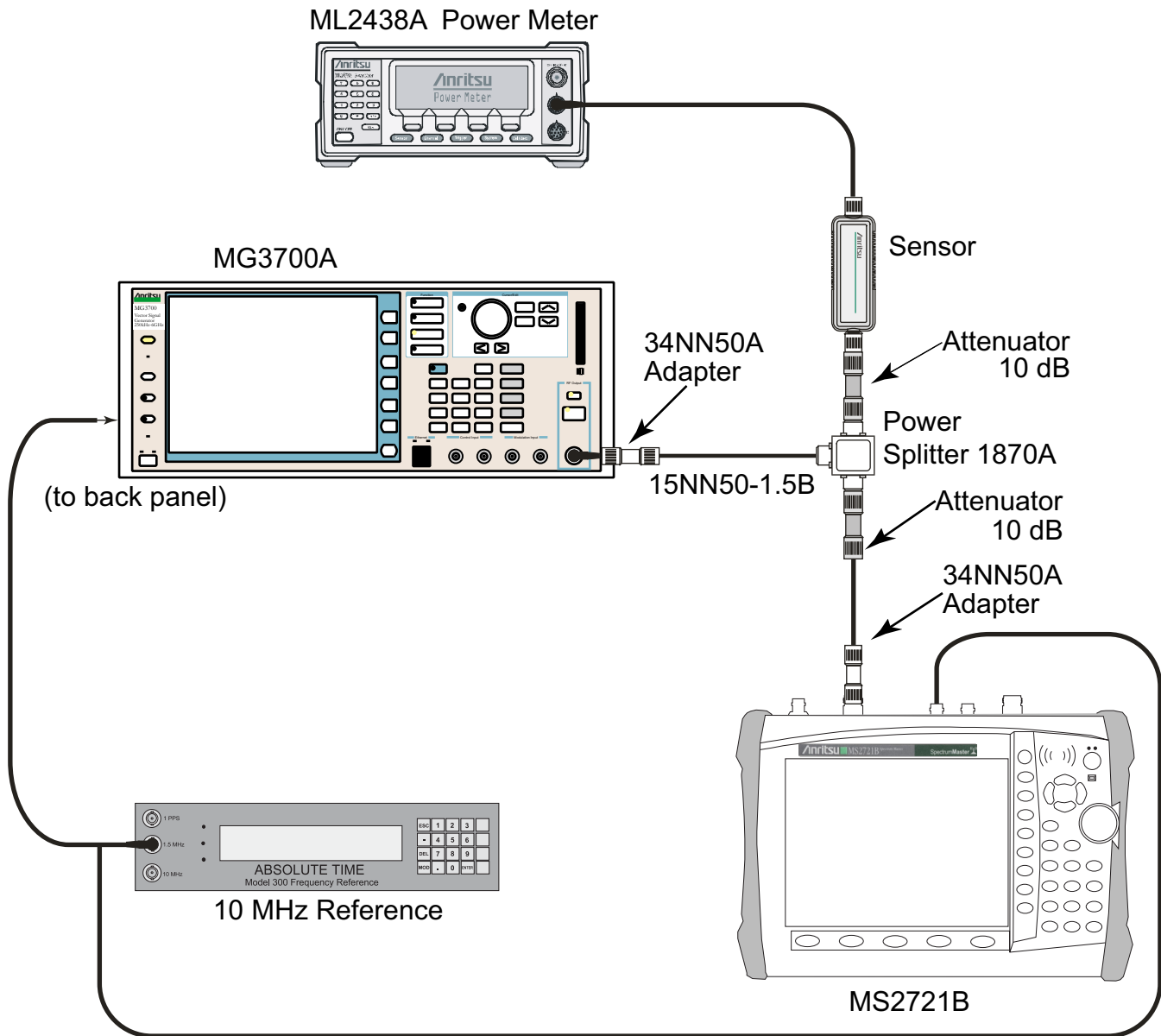


Figure 3-16. WCDMA Occupied Bandwidth Test Setup

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 3-16](#).
4. Press the **On/Off** key to turn on the MS2721B and wait until the measurement display appears, then press the **Shift** key and press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).

8. Press the **Down Arrow** key to select **Yes**.
9. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
10. Press the (F1) soft key to select "Load File to Memory"
11. Press the (F1) soft key again to select "Select Package"
12. Using the **Down Arrow** key step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
13. Press the **Set** key.
14. Press the (F6) soft key, "Return"
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the "TestModle_1_16DPCH" option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is ON.
19. Press the **Frequency** key, then enter one of the frequencies from [Table A-103, "WCDMA Occupied Bandwidth \(OBW\), Option 44" on page A-34](#) (starting with 881.5), and then press the MHz soft 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, then record the actual reading in the "Power Meter Reading" column in [Table A-103](#).
22. On the MS2721B, press the Center Freq soft key, enter one of the frequencies from [Table A-103](#) (starting with 881.5), and then press the **Enter** key.
23. Press the **Measurements** function hard key, then press the RF Measurement soft key and the Channel Spectrum soft key.
24. Press the **Amplitude** key, then press the Adjust Range soft key.
25. Record the OBW reading in the "OBW" column of [Table A-103](#), and verify that it is within $4.2 \text{ MHz} \pm 100 \text{ kHz}$.
26. Repeat [Step 19](#) through [Step 25](#) for all of the frequencies in [Table A-103](#).

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

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

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 3-16](#).
4. Press the **On/Off** key to turn on the MS2721B and wait until the measurement display appears. Press the **Shift** key and then press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
8. Press the **Down Arrow** key to select **Yes**.
9. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
10. Press the (F1) soft key to select "Load File to Memory"

11. Press the (F1) soft key again to select "Select Package"
12. Using the **Down Arrow** key step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
13. Press the **Set** key.
14. Press the (F6) soft key, "Return"
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the "TestModel_1_16DPCH" option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is ON.
19. Press the **Frequency** key, then enter 881.5 and press the MHz soft 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-104](#), "WCDMA RF Channel Power Accuracy, Option 44" on page A-34.
22. On the MS2721B, press the **Center Freq** soft key, enter 881.5, and then press the **Enter** key.
23. Press the **Measurements** function hard key, then the RF Measurement soft key and press ACLR.
24. Press the **Amplitude** function hard key, then press the Adjust Range soft key.
25. Record the measured CH 1 power in dBm to the "Measured RF Channel Power" column of [Table A-104](#).
26. Calculate the RF Channel Power Error by 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-104](#), and verify that it is within specification (± 1.25 dB).
28. Record all four measured Adjacent Channel Leakage Ratios in dB at -10 MHz Offset, -5 MHz Offset, +5 MHz Offset, and +10 MHz Offset in the "Measured ACLR" column of [Table A-105](#), "WCDMA ACLR Accuracy, Option 44" on page A-35.
29. Calculate the ACLR Error at -10 MHz and +10 MHz Offset by using the following formula:

$$\text{ACLR Error at } -10 \text{ MHz or } 10 \text{ MHz Offset} = 10 \text{ LOG}_{10} (10^{(-50/10)} + 10^{(\text{Measured_ACLR}/10)}) - (-50) \text{ dB}$$
30. Record the calculated results into the corresponding cells in the "Calculated ACLR Error" column of [Table A-105](#), and verify that it is within specification.
31. Calculate the ACLR Error at 5 MHz Offset by using the following formula:

$$\text{ACLR Error at } -5 \text{ MHz or } 5 \text{ MHz Offset} = 10 \text{ LOG}_{10} (10^{(-45/10)} + 10^{(\text{Measured_ACLR}/10)}) - (-45) \text{ dB}$$
32. Record the Calculated ACLR Error in the corresponding cells in the "Calculated ACLR Error" column of [Table A-105](#), and verify that it is within specification.
33. Repeat [Step 19](#) through [Step 32](#) for the other frequencies in [Table A-105](#).

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

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

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor according to [Figure 3-16 on page 3-52](#).
4. Press the **On/Off** key to turn on the MS2721B and wait until the measurement display appears. Then press the **Shift** key and press the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** soft key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
8. Press the **Down Arrow** key to select **Yes**.
9. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
10. Press the (F1) soft key to select "Load File to Memory"
11. Press the (F1) soft key again to select "Select Package"
12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
13. Press the **Set** key.
14. Press the (F6) soft key, "Return"
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the "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 soft 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-106, "HSDPA RF Channel Power Accuracy, Option 44" on page A-35](#).
22. On the MS2721B, press the **Freq** function hard key, press the **Center Freq** soft key, enter 2680.5, and then press the **Enter** key.
23. Press the **Measurements** function hard key, then the **RF Measurement** soft key, and press **ACLR**.
24. Press the **Amplitude** function hard key, then press the **Adjust Range** soft key.
25. Record the measured CH 1 power in dBm into the "Measured RF Channel Power" column of [Table A-106](#).
26. Calculate the RF Channel Power Error by using the following formula:

$$\text{RF Channel Power Error (dB)} = \text{Measured RF Channel Power} - 0.246 - \text{Power Meter reading}$$

27. Record calculated RF Channel Power Error value into the "RF Channel Power Error" column in [Table A-106](#), and verify that it is within specification (± 1.25 dB).
28. Record all four measured Adjacent Channel Leakage Ratios in dB at -10 MHz Offset, -5 MHz Offset, +5 MHz Offset, and +10 MHz Offset into the Measured ACLR column of [Table A-107, "HSDPA ACLR Accuracy, Option 44" on page A-35](#).
29. Calculate the ACLR Error at -10 MHz and +10 MHz Offset by using the following formula:

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

30. Record in the calculated results to the corresponding cells in the "Calculated ACLR Error" column of [Table A-107](#), and verify that they are within specification.
31. Calculate the ACLR Error at 5 MHz Offset by using the following formula:
- $$\text{ACLR Error at } -5 \text{ MHz or } +5 \text{ MHz Offset} = 10 \text{ LOG}_{10} (10^{(-45/10)} + 10^{(\text{Measured_ACLR}/10)}) - (-45) \text{ dB}$$
32. Record in the calculated results to the corresponding cells in the "Calculated ACLR Accuracy" column of [Table A-107](#), and verify that they are within specification.

Error Vector Magnitude (EVM) Verification (Options 45 and 65)

The tests in this section can be used to verify the functionality of the WCDMA or HSDPA Demodulator (or both) of the WCDMA/HSDPA Signal Analyzer in the Spectrum Master Model MS2721B.

Procedure:

1. Turn on the MG3700A Vector Signal Generator and the ML2438A power meter.
2. Connect the power sensor to the power meter and calibrate the sensor.
3. Connect the MG3700A, splitter, attenuator, power meter, and sensor as shown in [Figure 3-16 on page 3-52](#).
4. Press the **On/Off** key to turn on the MS2721B and wait until the measurement display appears. Then press the **Shift** key and the **Mode** (9) key to activate the mode selection menu.
5. Use the **Up/Down** arrow keys to select WCDMA and press the **Enter** key.
6. Press the **Shift** key, the **Preset** (1) key, and then the **Preset** soft key.
7. On the MG3700A, press the **Preset** key (Yellow key on the upper left-hand side).
8. Press the **Down Arrow** key to select **Yes**.
9. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
10. Press the (F1) soft key to select "Load File to Memory"
11. Press the (F1) soft key again to select "Select Package"
12. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
13. Press the **Set** key.
14. Press the (F6) soft key, "Return"
15. Press the **Set** key.
16. Using the **Down Arrow** key, step through the selection list until the "TestModel_4_opt" option is highlighted.
17. Press the **Set** key.
18. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is ON.
19. Press the **Frequency** key, then enter 1962.5 and press the MHz soft 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 MS2721B, press the **Freq** function hard key, press the **Center Freq** soft key, enter 1962.5, and then press the MHz soft key.
23. Press the **Measurements** function hard key, then press the **Demodulator** soft key and press the **Modulation Summary** soft key.
24. Press the **Setup** function hard key, then press the **Scrambling Code** soft key to set it to Auto.
25. Press the **Max Spreading Factor** soft key to set it to 512.
26. Press the **Amplitude** key, then press the **Adjust Range** soft key.
27. Record the EVM reading in [Table A-108, "WCDMA Error Vector Magnitude \(Test Model 4; Option 45 or Option 65\)" on page A-35](#), and verify that it is <2.5%.
28. This completes the EVM test for an MS2721B with Option 45 and the first EVM test for an MS2721B with Option 65.

For an MS2721B with Option 65:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
2. Press the **Down Arrow** key to select **Yes**.
3. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
4. Press the (F1) soft key to select "Load File to Memory"
5. Press the (F1) soft key again to select "Select Package"
6. Using the **Down Arrow** key, step through the selection list until the "W-CDMA(BS Tx test)" option is highlighted.
7. Press the **Set** key.
8. Press the (F6) soft key, "Return"
9. Press the **Set** key.
10. Using the **Down Arrow** key, step through the selection list until the "TestModel_5_8HSPDSCH" option is highlighted.
11. Press the **Set** key.
12. Press the **MOD On/Off** key and verify that the Modulation indicator on the display is ON.
13. Press the **Frequency** key, then enter 1962.5 and press the MHz soft 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 MS2721B, press the **Freq** function hard key, press the Center Freq soft key, enter 1962.5, and then press the MHz soft key.
17. Press the **Measurements** function hard key, then press the Demodulator soft key and press the Modulation Summary soft key.
18. Press the **Setup** function hard key, then press the Scrambling Code soft key to set it to Auto.
19. Press the Max Spreading Factor soft key to set it to 512.
20. Press the **Amplitude** function hard key, then press the Adjust Range soft key.
21. Record the EVM reading in [Table A-109, "HSDPA Error Vector Magnitude \(Test Model 5; Option 65\)"](#) on page A-35, and verify that it is <2.5%.
22. This completes the two EVM tests for an MS2721B with Option 65.

3-10 Fixed WiMAX Signal Analyzer (Options 46 and 47) Verification

The tests in this section verify the functionality of the Fixed WiMAX Signal Analyzer of the MS2721B Spectrum Master. These tests include:

- [Fixed WiMAX Channel Power Accuracy Tests \(Option 46\)](#)
- [Fixed WiMAX Residual EVM and Frequency Error Tests \(Option 47\)](#)

Required Equipment:

- 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)
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master Model MS2721B

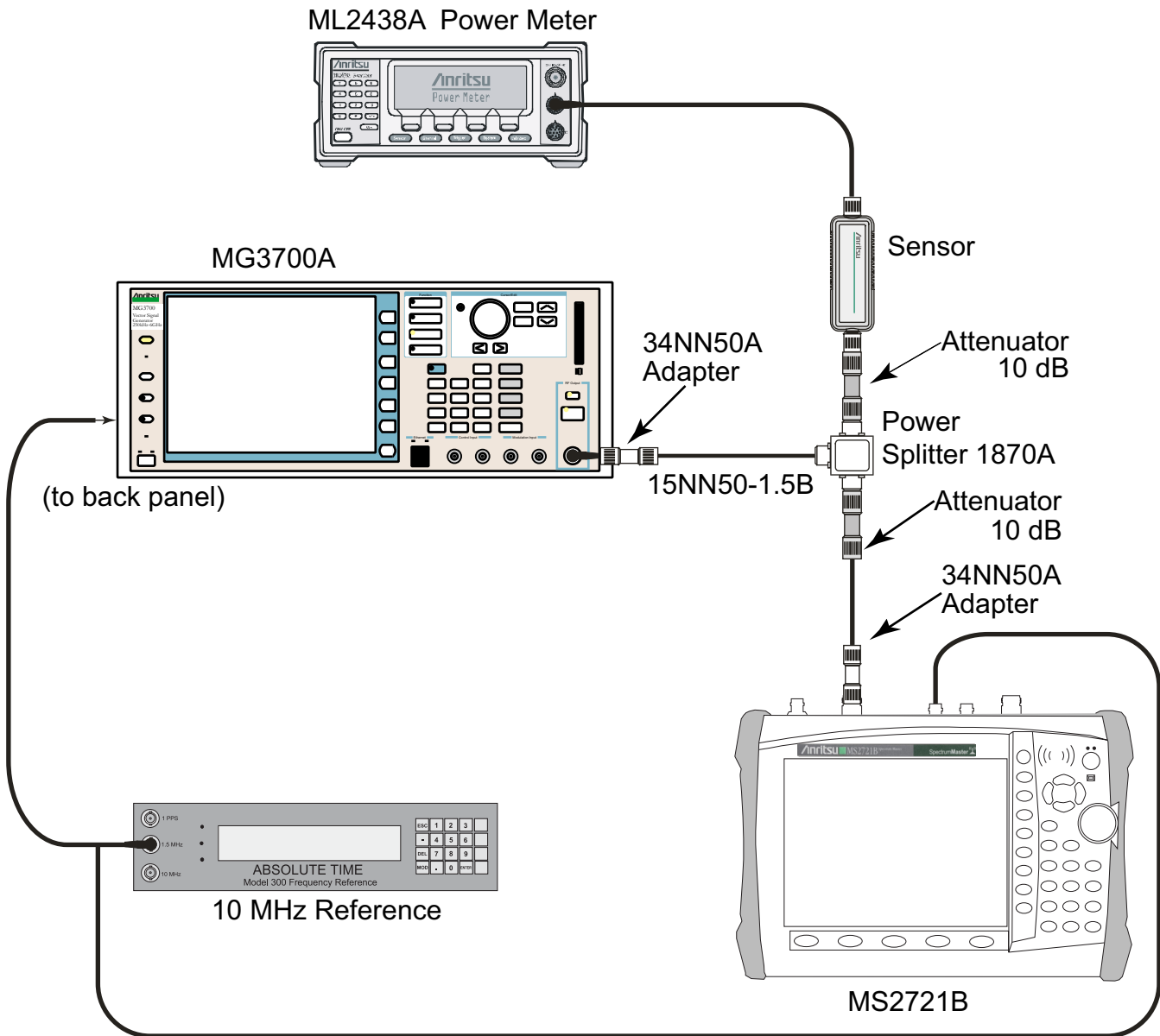


Figure 3-17. Fixed WiMAX Signal Analyzer Test Setup

Fixed WiMAX Channel Power Accuracy Tests (Option 46)

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the calibration factor frequency of the power sensor to 2600.5 MHz.
3. Connect the Power Sensor, 1870A splitter, and 10 dB attenuators (quantity 2), as shown in [Figure 3-17](#).

Fixed WiMAX Signal Analyzer Setup:

4. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key step through the selection list until "WiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key, "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "WiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "Mx10g32".
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is ON. 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 on the output.
5. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the exact reading in [Table A-110, "Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings, Option 46"](#) on page A-36.
6. Set the MS2721B to Fixed WiMax Signal Analyzer Mode and preset the instrument.
7. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key and set the Center Frequency to 2600.5 MHz
 - b. Press the **Setup** function hard key and set the Bandwidth to 10 MHz.
 - c. Press the CP Ratio soft key (under the Setup menu) and set the CP Ratio to 1/32.
 - d. Press the **Measurements** function hard key and press RF, then press Power vs Time.
8. Record the MS2721B Channel Power (RSSI) reading to the "Measured Channel Power (RSSI)" column in [Table A-111, "Fixed WiMAX Channel Power Accuracy, Option 46"](#) on page A-36.
9. Calculated the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading in [Table A-111](#) from the power meter reading in [Step 5](#) (refer to [Table A-110](#)). Record the result to the "Error" column in [Table A-111](#).
10. Verify that the error is within specification.
11. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm .
12. Record the exact MS2721B Channel Power (RSSI) reading to the "Measured Channel Power (RSSI)" column in [Table A-110](#).
13. Calculated the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading from the power meter reading in [Step 11](#) (refer to [Table A-110](#)). Record the result to the "Error" column in [Table A-111](#).
14. Verify that the error is within specification.
15. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
16. Set the MG3700A Frequency to 3600.5 MHz.
17. Change the Center Frequency of the MS2721B to 3600.5 MHz.
18. Measure the Channel Power (RSSI) both for -15 dBm and for -50 dBm , and then record the measured results and calculated errors to [Table A-111](#).

19. Verify that the errors are within specification.
20. Set the calibration factor frequency of the power sensor to 5600.5 MHz.
21. Set MG3700A Frequency to 5600.5 MHz.
22. Change the Center Frequency of MS2721B to 5600.5 MHz.
23. Repeat Step 18 and Step 19.

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

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
2. Set the calibration factor frequency of the power sensor to 2600.5 MHz.
3. Connect the Power Sensor, 1870A splitter, and 10 dB attenuators (quantity 2), as shown in [Figure 3-17 on page 3-60](#).
4. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key, step through the selection list until "WiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key, "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "WiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "Mx10g32".
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is illuminated. 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 on the output.
5. Adjust the MG3700A Level setting with the knob so that the power meter reads $-15.0 \text{ dBm} \pm 0.2 \text{ dB}$.
6. Set the MS2721B to Fixed WiMax Signal Analyzer Mode and preset the instrument.
7. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key, and set the Center Frequency to 2600.5 MHz
 - b. Press the **Setup** function hard key, and set the Bandwidth to 10 MHz.
 - c. Press the CP Ratio soft key (under the Setup menu), and set the CP Ratio to 1/32.
 - d. Press the **Measurements** function hard key, and press **Demodulator**, then press **Modulation Summary**.
8. Record the MS2721B EVM (rms) reading to the "EVM (rms)" column in [Table A-112, "Fixed WiMAX Residual EVM, Option 47" on page A-36](#).
9. Verify that the measured EVM is within specification.
10. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm .
11. Record the MS2721B EVM (rms) reading to the "EVM (rms)" column in [Table A-112](#).
12. Verify that the measured EVM is within specification.
13. Record the MS2721B Frequency Error reading in [Table A-113, "Fixed WiMAX Frequency Error, Option 47" on page A-36](#).
14. Verify that the measured Frequency Error is within specification.
15. Set the calibration factor frequency of the power sensor to 3600.5 MHz.
16. Set MG3700A Frequency to 3600.5 MHz.
17. Change the Center Frequency of the MS2721B to 3600.5 MHz.

18. Measure the EVM (rms) for both -15 dBm and -50 dBm, and then record the measured results in [Table A-112](#).
19. Verify that the measured EVM values are within specification.
20. Set the calibration factor frequency of the power sensor to 5600.5 MHz.
21. Set MG3700A Frequency to 5600.5 MHz.
22. Adjust the MG3700A Level setting with the knob so that the power meter reads -15.0 dBm \pm 0.2 dB.
23. Change the Center Frequency of MS2721B to 5600.5 MHz.
24. Record the MS2721B EVM (rms) reading to the "EVM (rms)" column in [Table A-112](#).
25. Verify that the measured EVM is within specification.
26. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads -50.0 dBm.
27. Record the MS2721B EVM (rms) reading to the "EVM (rms)" column in [Table A-112](#).
28. Verify that the measured EVM is within specification.
29. Record the MS2721B Frequency Error reading in [Table A-113](#).
30. Verify that the measured Frequency Error is within Specification.

3-11 TD-SCDMA Signal Analyzer (Options 60 and 61) Verification

The tests in this section verify the function of the optional TD-SCDMA Signal Analyzer in Spectrum Master model MS2721B.

Required Equipment:

- 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)
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C
- Coaxial Cable, BNC(m)-to-BNC(m), 50 ohm
- Spectrum Master Model MS2721B

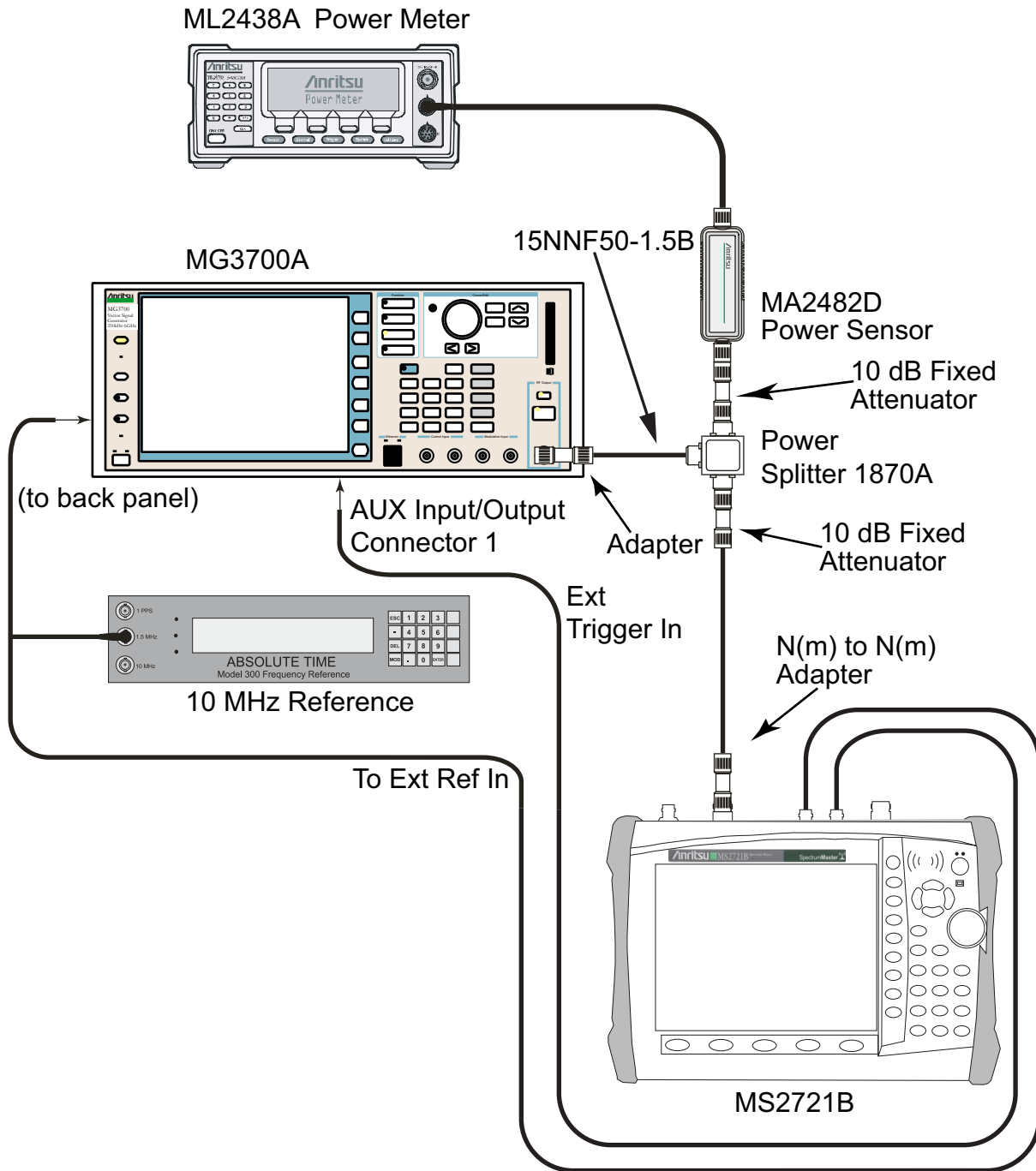


Figure 3-18. TD-SCDMA Signal Analyzer Option Verification

Procedure:

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

On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 2010 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.

2. Connect the equipment as shown in [Figure 3-18](#).
3. Set the power meter to Averaging, Moving, and 256 samples.

4. Set the MS2721B to TD-SCDMA Signal Analyzer mode and preset the unit.
5. On the MG3700A, press the **Preset** key (yellow key on the upper left hand side).
6. Press the **Down Arrow** key or turn the knob to select **Yes**.
7. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).

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

8. Press the F1 soft key to select Load File to Memory.
9. Press the F1 soft key again to select Select Package.
10. Using the **Down Arrow** key, step through the selection list until the TD-SCDMA(MX370001A) option is highlighted.
11. Press the **Set** key.
12. Press the Return (F6) soft key.
13. Press the **Set** key. The Select Package box appears. Use the rotary knob to highlight TD-SCDMA(MX370001A), and press the **Set** key to select.
14. Another file list appears. Use the rotary knob to select rmc-P-CCPCH_bs_dl, and press the **Set** key to select.
15. Press the **MOD On/Off** key to turn on the Modulation LED and verify that the “Playing” indicator in the center of the LCD is flashing.
16. Press the **Frequency** key, enter 2010 MHz.
17. Press the **Level** key, enter –20, and press the dBm soft key.
18. 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-114](#), “TD-SCDMA (at 2010 MHz, –45 dBm Level) (Option 60 or Option 61)” on page A-37.
19. On the MS2721B, press the **Freq** function hard key and the **Center Freq** soft key, then enter 2010 MHz as center frequency.
20. Press the **Measurements** function hard key and press the TD-SCDMA Summary soft key (a red dot appears on the label).
21. Press the **Setup** function hard key and press the **Trigger** soft key. Then press the **Trigger Type** soft key to toggle to Ext. Then wait 15 seconds to allow the MS2721B to update its measured results.
22. For an MS2721B with Option 60 (TD-SCDMA RF Measurements)Measurements), record the “Displayed Channel Power” into [Table A-114](#), then subtract the displayed channel power value from the power meter reading (from [Step 13](#)). Then record the calculated channel power error to [Table A-114](#).
23. For an MS2721B with Option 61 (TD-SCDMA Demodulator), record the displayed frequency error, EVM, and Tau in [Table A-114](#).
24. Verify that the measured values in [Step 22](#) and [Step 23](#) are within specifications.

3-12 EVDO Signal Analyzer Option Verification (Options 62 and 63)

The tests in this section verify the optional EVDO Signal Analyzer functions in Spectrum Master Model MS2721B. These tests include:

- [8-PSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests](#)
- [QPSK Modulation Channel Power, Frequency Error, Rho, and Tau Tests](#)
- [16-QAM Modulation Channel Power, Frequency Error, Rho, and Tau Tests](#)
- [Idle Slot Channel Power, Frequency Error, Rho, and Tau Tests](#)

Required Equipment:

- 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
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master Model MS2721B

EVDO Signal Analyzer

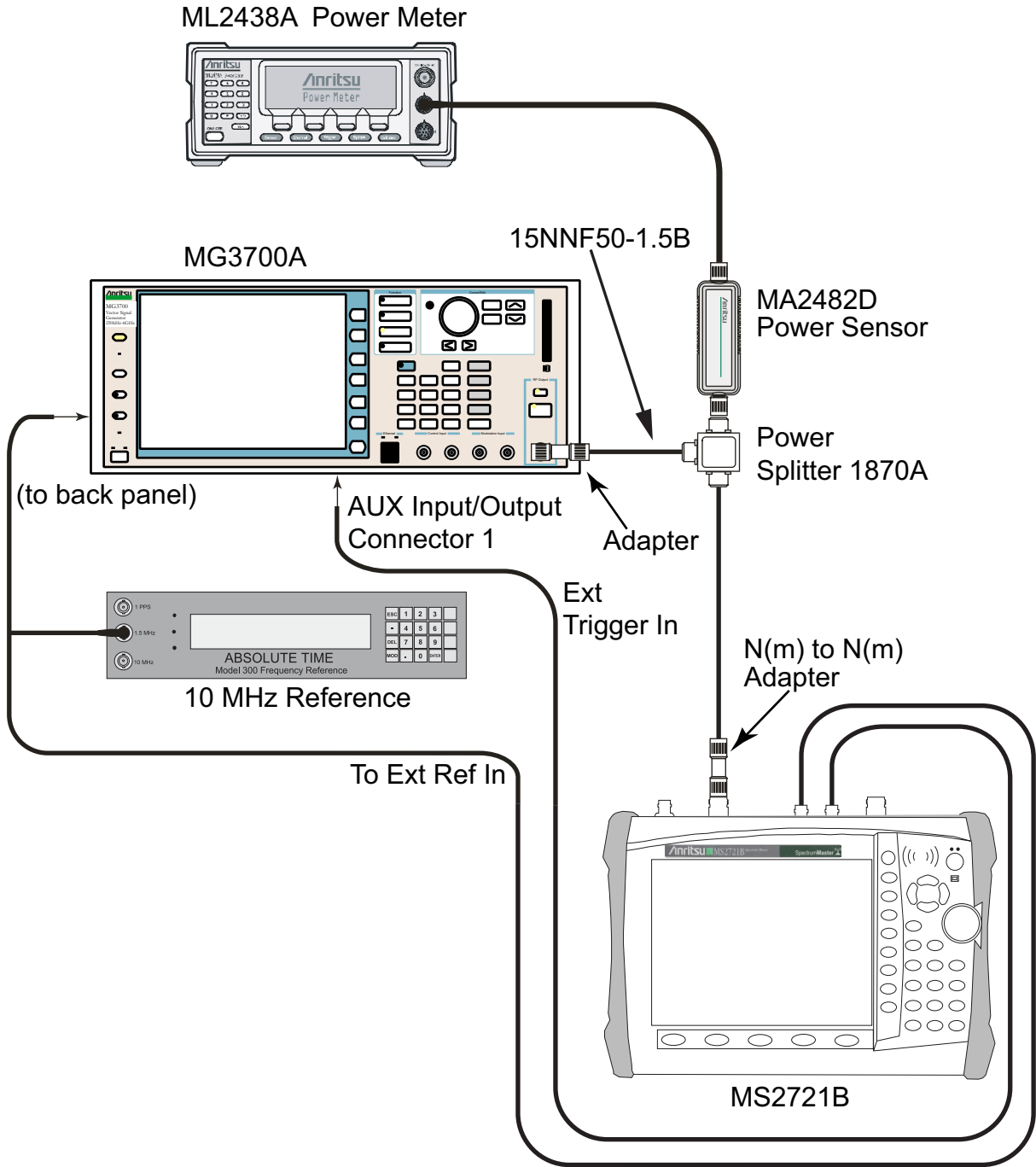


Figure 3-19. EVDO Signal Analyzer Test Setup

EVDO Signal Analyzer Test Setup:

Set up Procedure:

1. Connect the equipment as shown in [Figure 3-19](#).
2. Calibrate the power sensor prior to connecting to the power splitter.
3. On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
4. Set the MS2721B mode to EVDO Signal Analyzer. Preset the instrument.

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

Test Procedure:

1. On the MG3700A, press the **Preset** key (Yellow key on the upper left hand side).
2. Press the **Down Arrow** key or turn the knob to select **Yes**.
3. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
4. Press the (F1) soft key to select "Load File to Memory."
5. Press the (F1) soft key again to select "Select Package."
6. Using the **Down Arrow** key, step through the selection list until the "CDMA2000_1xEV-DO" option is highlighted.
7. Press the **Set** key.
8. Press the (F6) soft key, "Return."
9. Press the **Set** key. The "Select Package" box appears. Use the rotary knob to highlight "CDMA2000_1xEV-DO" and press the **Set** key to select.
10. Another File List appears. 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 on the Modulation LED, 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** soft key.
14. 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-115](#), "EVDO Channel Power Error at 870.03 MHz, -50 dBm Level, 921.6 kps 8-PSK Modulation, Option 62" on page A-37.
15. On the MS2721B, press the **Freq** function hard key, then press the **Center Freq** soft key and enter 870.03 MHz as Center Frequency.
16. Press the **Measurements** function hard key and press the **EVDO Summary** soft key (a red dot appears on the label).
17. Press the **Setup** function hard key and press the **PN Setup** soft key. Then change PN Trigger to Ext by pressing the **PN Trigger** soft key. Then wait 15 seconds to allow the MS2721B to update its measured results.
18. Record the displayed Channel Power value in [Table A-115](#).
19. For an MS2721B with Option 62 (EVDO RF Measurements), subtract the displayed MS2721B Channel Power value from the power meter reading in [Step 14](#) (refer to the following formula). Then record the calculated Channel Power error in [Table A-115](#).

$$\text{Channel Power Error} = \text{Power Meter Reading} - \text{Displayed (MS2721B) Power Reading}$$

20. For an MS2721B with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in [Table A-120, “EVDO Demodulator at 870.03 MHz, –50 dBm Level, 921.6 kps 8-PSK Modulation, Option 63”](#) on [page A-39](#).
21. Verify that the measured values in [Step 19](#) and [Step 20](#) are within specifications.

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

Test Procedure:

1. Ensure that the equipment settings are unchanged from the previous test.
2. On the MG3700A, change the selected pattern to "FWD_38_4KBPS_16SLOT".
3. On the power meter, press the **Sensor** key, the **Cal Factor** soft key, and then the **Freq** soft key. Use the keypad to enter 1930 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
4. Set the MG3700A Frequency to 1930.05 MHz.
5. Adjust the MG3700A output so that the power meter reads $0 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value (as shown on the power meter) into [Table A-116, "EVDO Channel Power Error at 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation, Option 62"](#) on page A-37.
6. On the MS2721B, press the **Frequency** function hard key and enter 1930.05 MHz as Center Frequency. Then wait 15 seconds to allow the MS2721B to update its measured results.
7. Record the displayed MS2721B Channel Power value in [Table A-116](#).
8. For an MS2721B with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 5](#). Then record the calculated Channel Power error in [Table A-116](#).
9. For an MS2721B with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in [Table A-121, "EVDO Demodulator At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation, Option 63"](#) on page A-39.
10. Verify that the measured values in [Step 8](#) and [Step 9](#) are within specifications.

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

Test Procedure:

1. Ensure that the equipment settings are unchanged from the previous test. The power sensor Cal Factor frequency should still be at 1930 MHz. The MG3700A frequency and the MS2721B 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-117, "EVDO Channel Power Error at 1930.05 MHz, -50 dBm Level, 2457.6 kps 16-QAM Modulation, Option 62"](#) on page A-38.
4. Then wait 15 seconds to allow the MS2721B to update its measured results.
5. Record the displayed MS2721B Channel Power value in [Table A-117](#).
6. For an MS2721B with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in [Table A-117](#).
7. For an MS2721B with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in [Table A-122, "EVDO Demodulator At 1930.05 MHz, -50 dBm Level, 2457.6 kps 16-QAM Modulation, Option 63"](#) on page A-39.
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, the MG3700A frequency and MS2721B 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-118, "EVDO Channel Power Error at 1930.05 MHz, -50 dBm Level, Idle Slot, Option 62"](#) on page A-38.
4. Then wait 15 seconds to allow the MS2721B to update its measured results.
5. Record the displayed MS2721B Channel Power value in [Table A-118](#).
6. For an MS2721B with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 3](#). Then record the calculated Channel Power error in [Table A-118](#).
7. For an MS2721B with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in [Table A-123, "EVDO Demodulator At 1930.05 MHz, -50 dBm Level, Idle Slot, Option 63"](#) on page A-39.
8. Verify that the measured values in [Step 6](#) and [Step 7](#) are within specifications.
9. On the power meter, press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter 870.03 MHz as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Press the **System** key to display the power reading.
10. Set the MG3700A Frequency to 870.03 MHz.
11. Adjust the MG3700A output so that the power meter reads $-10 \text{ dBm} \pm 0.2 \text{ dB}$, and record the actual value (as shown on the power meter) into [Table A-119, "EVDO Channel Power Error at 870.03 MHz, -10 dBm Level, Idle Slot, Option 62"](#) on page A-38.
12. On the MS2721B, press the **Frequency** function hard key and enter 870.03 MHz as Center Frequency. Then wait 15 seconds to allow the MS2721B to update its measured results.
13. Record the displayed MS2721B Channel Power value in [Table A-119](#).
14. For an MS2721B with Option 62 (EVDO RF Measurements), subtract the displayed Channel Power value from the power meter reading in [Step 11](#). Then record the calculated Channel Power error in [Table A-119](#).
15. For an MS2721B with Option 63 (EVDO Demodulator), record the displayed Freq Error, Rho Pilot, and Tau in [Table A-124, "EVDO Demodulator At 870.03 MHz, -10 dBm Level, Idle Slot, Option 63"](#) on page A-39.
16. Verify that the measured values in [Step 14](#) and [Step 15](#) are within specifications.

3-13 DVB-T/H Signal Analyzer (Options 64 and 57) Verification

The tests in this section verify the performance of the optional DVB-T/H Signal Analyzer option of the MS2721B. These tests include:

- [Frequency Accuracy and Residual MER Verification](#)
- [Frequency Lock Range Verification](#)
- [Level Accuracy Verification](#)
- [1 dB Compression Level Verification](#)
- [Noise Floor Verification](#)
- [BER Measurement Functional Check, Option 57 Only](#)

Frequency Accuracy and Residual MER Verification

The tests in this section verify the frequency accuracy and residual modulation error ratio (MER) of the MS2711B in DVB-T/H Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C

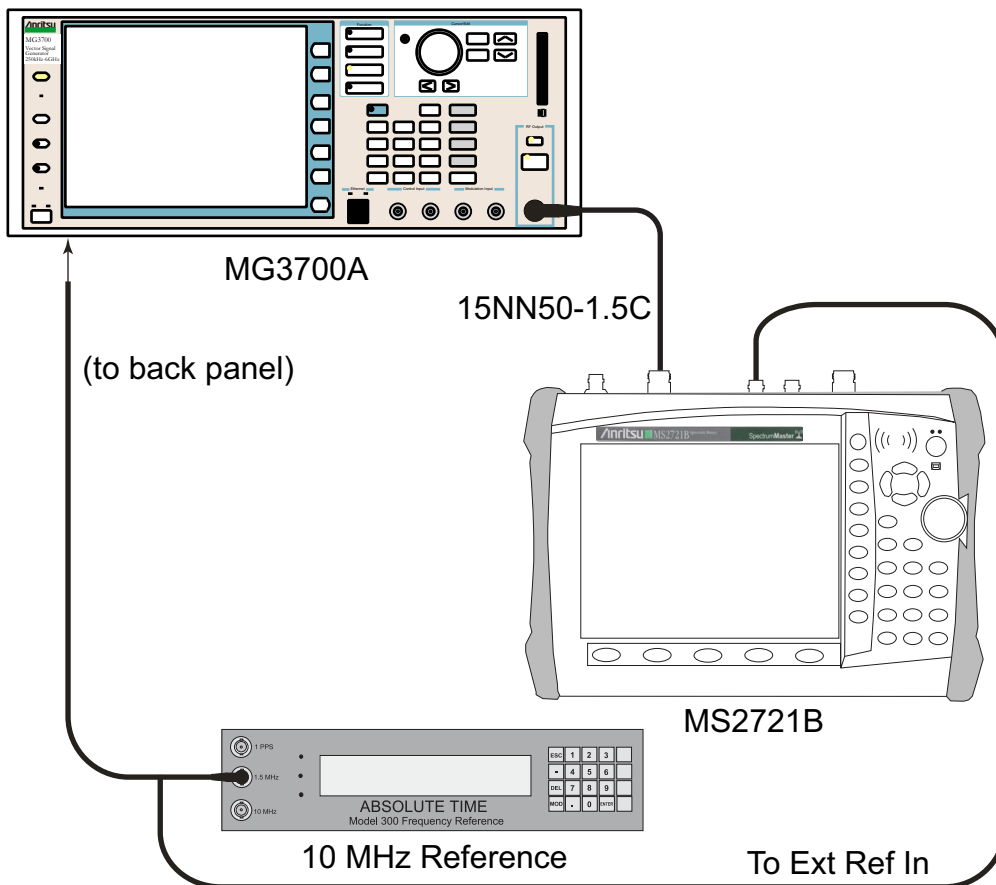


Figure 3-20. DVB-T/H Option 64 and Option 57 – Signal Analyzer Test Setup

Procedure:

1. Connect the 10 MHz External Reference signal into the MG3700A and the MS2721B as shown in [Figure 3-20](#).
2. On MG3700A, press the yellow **Preset** key on the upper left side of the instrument.
3. Press the **Down Arrow** key to select **Yes**.
4. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key, labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T_H_00 option is highlighted.
14. Press the **Set** key.
15. Set the Level to -20 dBm.
16. Set the Frequency to 470 MHz.
17. Press the Baseband key and then the More key.
18. Press the F5 soft key labeled Pattern Combination [Defined].
19. Press the **Set** key.
20. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
21. Press the **Set** key.
22. Use the **Down Arrow** key to step through the selection list until the DVB-T_H_00 option is highlighted.
23. Press the **Set** key.
24. Rotate the knob to highlight Freq Offset and use the numeric keypad to enter 4 MHz.
25. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
26. Connect the MG3700A Output to the MS2721B Spectrum Analyzer RF In connector.
27. Set the mode of the MS2721B to DVB-T/H Signal Analyzer and preset the unit.
28. Press the **Meas Selection** function hard key, then select Modulation Analysis.
29. Press the **Frequency/Level** function hard key, and set the Reference Level to -20 dBm.
30. Ensure that Channel is set to 21.
31. Press the **Meas Setup** function hard key and then the **Meas Mode** soft key.
32. Use the **Up/Down** arrow keys to highlight **Average** and press the **Enter** key.
33. Press the **Average Count** soft key, then enter 10, and press the **Enter** key.
34. Wait until Average (10/10) appears at the top of the display.
35. Record the Frequency Offset reading on the MS2721B into the “Frequency Error” column in [Table A-125, “DVB-T/H Signal Analyzer Frequency Accuracy for \$-20\$ dBm Reference Level, Option 64”](#) on page A-40.
36. Record the MER Total reading on the MS2721B in the “Total MER” column in [Table A-127, “DVB-T/H Signal Analyzer Residual MER Pre Amp OFF, Option 64”](#) on page A-40.

37. Set the MG3700A Level to -50 dBm.
38. Set the MS2721B Reference Level to -50 dBm.
39. Wait until Average (10/10) appears at the top of the display.
40. Record the Frequency Offset reading on the MS2721B into the "Frequency Error" column in [Table A-125](#), "DVB-T/H Signal Analyzer Frequency Accuracy for -20 dBm Reference Level, Option 64" on page A-40.
41. Record the MER Total reading on the MS2721B in the "Total MER" column in [Table A-128](#), "DVB-T/H Signal Analyzer Residual MER Pre Amp ON, Option 64" on page A-40.
42. Set MS2721B Pre Amp to OFF.
43. Set the MG3700A Frequency to 662 MHz and Level to -20 dBm.
44. Change the MS2721B to Channel 45, and set Reference Level to -20 dBm.
45. Repeat [Step 34](#) through [Step 41](#).
46. Set MS2721B Pre Amp to OFF.
47. Set the MG3700A Frequency to 854 MHz and Level to -20 dBm.
48. Change the MS2721B to Channel 69 and set Reference Level to -20 dBm.
49. Repeat [Step 34](#) through [Step 41](#).

Frequency Lock Range Verification

The test in this section can be used to verify the frequency lock range of the MS2721B in DVB-T/H Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C

Procedure:

1. Connect the 10 MHz Frequency Reference source to the Anritsu MG3700A and MS2721B as shown above in [Figure 3-20, “DVB-T/H Option 64 and Option 57 – Signal Analyzer Test Setup”](#) on page 3-74.
2. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
3. Press the **Down Arrow** key to select **Yes**.
4. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
5. Press the F1 soft key to select Load File to Memory.
6. Press the F1 soft key again to select Select Package.
7. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
8. Press the **Set** key.
9. Press the F6 soft key labeled Return.
10. Press the **Set** key.
11. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
12. Press the **Set** key.
13. Use the **Down Arrow** key to step through the selection list until the DVB-T_H_00 option is highlighted.
14. Press the **Set** key.
15. Set the Frequency to 474.09 MHz.
16. Set the Level to –20 dBm.
17. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
18. Set the mode of the MS2721B to DVB-T/H Signal Analyzer. Press the **Shift** key, the **Preset** (1) key, and then press the **Preset** soft key to reset the MS2721B.
19. Connect the MG3700A output signal to the Spectrum Analyzer RF In connector on the MS2721B.
20. On MS2721B, press the **Frequency/Level** function hard key and ensure that Channel is set to 21.
21. Set the Reference Level to –20 dBm.
22. Press the **Meas Selection** function hard key and press Modulation Analysis.
23. Press the **Meas Setup** function hard key and then the Meas Mode soft key.
24. Use the rotary knob to highlight **Average** and press the **Enter** key.
25. Press the Average Count soft key, then enter 10, and press the **Enter** key.
26. Wait until Average (10/10) appears at the top of the display.
27. Record the Frequency Error in the “474.09 MHz” row of [Table A-129, “DVB-T/H Signal Analyzer Frequency Lock Range, Option 64”](#) on page A-40.
28. On the MG3700A, set the frequency to 473.91 MHz.

29. Press Execute Measure. After Average (10/10) appears, record the Frequency Offset in the “473.91 MHz” row of [Table A-129](#).

Level Accuracy Verification

The tests in this section verify the level accuracy of the MS2721B in DVB-T/H Signal Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Programmable Attenuator, Anritsu Model MN63A
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Power Sensor, Anritsu Model MA2482D (2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C (3)
- Adapter, Anritsu Model 34NN50A
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)
- Anritsu 1N50C RF Limiter
- Spectrum Master Model MS2721B

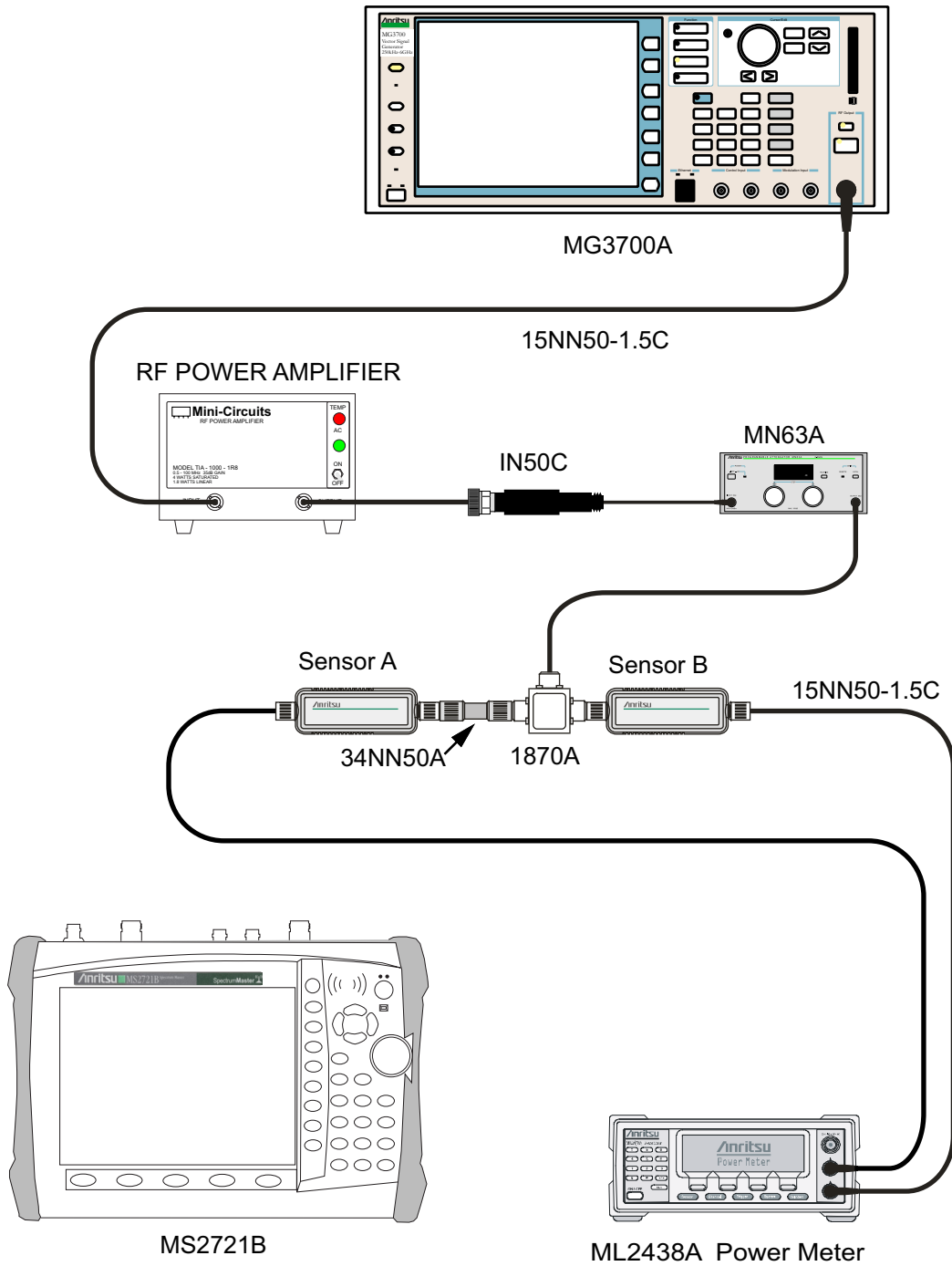


Figure 3-21. DVB-T/H Option 64 and Option 57 – Level Accuracy Verification – Two Sensors

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-21](#).

3. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
4. Press the **Down Arrow** key to select Yes.
5. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key, labeled Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
13. Press the **Set** key.
14. Use the **Down Arrow** key to step through the selection list until the DVB-T_H_00 option is highlighted.
15. Press the **Set** key.
16. Perform a Zero/Cal on Sensor A and Sensor B on the power meter. Set the calibration factor of both sensors to 474 MHz.
17. Set the MG3700A Frequency to 474 MHz.
18. Set the Level to -25 dBm.
19. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that the Sensor A reading is -10 dBm \pm 1 dBm. Record the actual attenuation reading in the “MS63A Attenuation Reading AT(-10)” column of [Table A-130](#), “[Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\), Option 64](#)” on page A-41.
22. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is -10.0 dBm \pm 0.2 dBm.
23. Record the following values to the appropriate table cells in [Table A-130](#):
 - Power Meter Sensor A reading to “Sensor A Reading”
 - Power Meter Sensor B reading to “Sensor B Reading”
24. Subtract the value of the Sensor A reading from the value of the Sensor B reading and record the result to the the “DAB (-10)” column of [Table A-130](#).
25. Calculate the AT(set) values for Test Levels -10 dBm through -45 dBm and record the values in the “AT(set) (dB)” column in [Table A-133](#), “[DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 64](#)” on page A-42.

26. Remove Sensor A from the Power Splitter, and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) adapter, as shown in Figure 3-22.

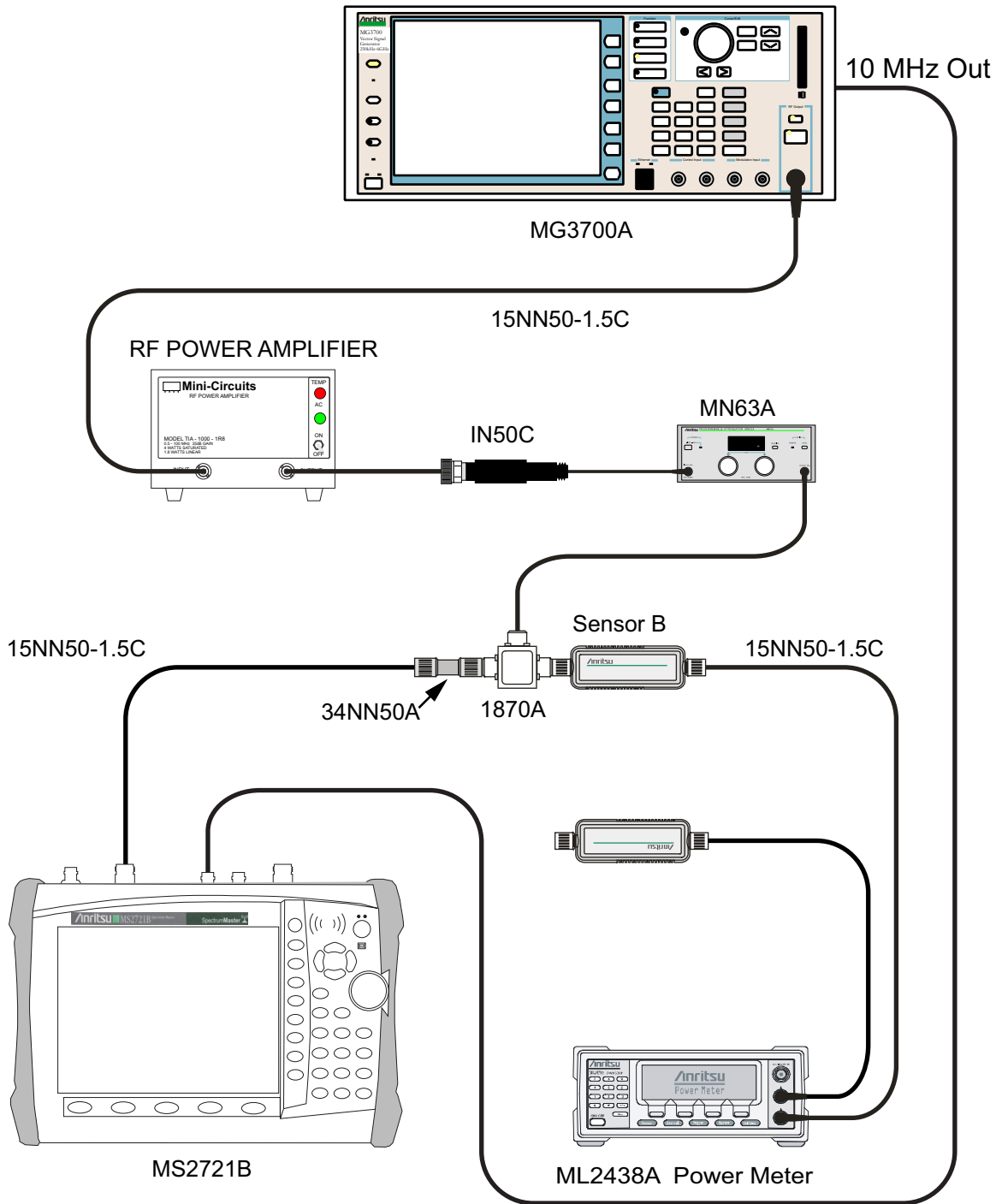


Figure 3-22. DVB-T/H Option 64 and Option 57 – Level Accuracy Verification – Sensor B Only

- 27. Record the new Power Meter Sensor B reading to the “SB(-10)” box in Table A-133.
- 28. On the MS2721B, set the mode to DVB-T/H Signal Analyzer and preset the unit.
- 29. Press the **Frequency/Level** function hard key, ensure that Channel 21 is selected and that the Pre Amp is OFF.
- 30. Change the Reference Level to -10 dBm.

31. Press the **Meas Setup** function hard key and then the Meas Mode soft key.
32. Use the **Up/Down** arrow keys to highlight Average, and press the **Enter** key.
33. Change the Average Count to 50 if required.
34. After Average (50/50) appears at the top of the display, record the Channel Power from the MS2721B to the “Pre Amp Off M(Level) (dBm)” column in [Table A-133](#).
35. Calculate the Deviation by using the following formula:

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

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

36. Record the result in the “Pre Amp Off Dev (dB)” column in [Table A-133](#), and verify that it is within specification.
 37. Set the MN63A attenuation to the next AT(set) value in [Table A-133](#).
 38. Press the **Frequency/Level** function hard key and set the Reference Level of the MS2721B to -15 dBm.
 39. After Average (50/50) appears, record the -15 dBm Channel Power from the MS2721B into the “Pre Amp Off M(Level) (dBm)” column in [Table A-133](#).
 40. Calculate the Deviation by using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
41. Record the result in the “Pre Amp Off Dev (dB)” column in [Table A-133](#), and verify that it is within specification.
 42. Set the MN63A attenuation to the next AT(set) value in [Table A-133](#).
 43. Set the Reference Level of the MS2721B to -20 dBm.
 44. After Average (50/50) appears, record the -20 dBm Channel Power from the MS2721B into the “Pre Amp Off M(Level) (dBm)” column in [Table A-133](#).
 45. Calculate the Deviation by using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
46. Record the result in the “Pre Amp Off Dev (dB)” column in [Table A-133](#), and verify that it is within specification.
 47. Press the **Frequency/Level** function hard key and set Pre Amp to ON. Change the Reference Level if required.
 48. After Average (50/50) appears, record the -20 dBm Channel Power from the MS2721B into the “Pre Amp On M(Level) (dBm)” column in [Table A-133](#).
 49. Calculate the Deviation by using the following formula:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
50. Record the result in the “Pre Amp On Dev (dB)” column in [Table A-133](#), and verify that it is within specification.
 51. Repeat [Step 42](#) through [Step 50](#) for Test levels -25 dBm to -45 dBm. Change Reference Level and switch Pre Amp per the “Ref Level Pre Amp Off/On” column in [Table A-133](#).
 52. Turn off the power amplifier, disconnect the power splitter from the MS2721B, and reconnect Sensor A to the power splitter as shown in [Figure 3-21](#), “DVB-T/H Option 64 and Option 57 – Level Accuracy Verification – Two Sensors” on page 3-80.
 53. Set the MN63A Attenuation to 10 dB.
 54. Set the MG3700A Level to -60 dBm.
 55. Turn on the power amplifier and allow it to warm up for at least 5 minutes.

56. Adjust the MN63A Attenuator so that the Sensor A reading is $-50 \text{ dBm} \pm 1 \text{ dBm}$. Record the attenuation reading in [Table A-131](#), “Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 64” on page A-41.
57. On the MG3700A, adjust the power level so that the Power Meter Sensor A reading is $-50.0 \text{ dBm} \pm 0.2 \text{ dBm}$.
58. Record the following values to the appropriate columns in [Table A-131](#):
- Power Meter Sensor A reading to the “Sensor A Reading” column
 - Power Meter Sensor B reading to the “Sensor B Reading” column
59. Subtract the value of the Sensor A reading from the value of the Sensor B reading and record the result in the “DAB(-50)” column in [Table A-131](#).
- $$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
60. Calculate the AT(set) values for Test Levels -55 dBm through -84 dBm and record the values in the AT(set) column of [Table A-133](#), “DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 64” on page A-42.
61. Remove Sensor A from the Power Splitter, and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) adapter, as shown in [Figure 3-22](#), “DVB-T/H Option 64 and Option 57 – Level Accuracy Verification – Sensor B Only” on page 3-82.
62. Record the new Power Meter Sensor B reading in the “SB(-50)” box in [Table A-133](#).
63. Repeat [Step 42](#) through [Step 50](#) for Test Levels -50 dBm to -84 dBm . Change the Reference Level and switch the Pre Amp ON or OFF per the “Ref Level Pre Amp Off/On” column in [Table A-133](#). Use the following formula to calculate Deviation:
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-50) - \text{DAB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$
64. Repeat [Step 16](#) through [Step 63](#) for frequencies 666 MHz (Ch 45) and 858 MHz (Ch 69). Set the calibration factor of both power sensors to 666 MHz or 858 MHz as required.
- For 666 MHz - Channel 45, use [Table A-134](#), “DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 45ch at 666 MHz, Option 64” on page A-43.
- For 858 MHz - Channel 69, use [Table A-135](#), “DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 69ch at 858 MHz, Option 64” on page A-44.

1 dB Compression Level Verification

The tests in this section verify the accuracy of the MS2721B is not degraded by compression when operating in the DVB-T/H Signal Analyzer mode.

Required Equipment:

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

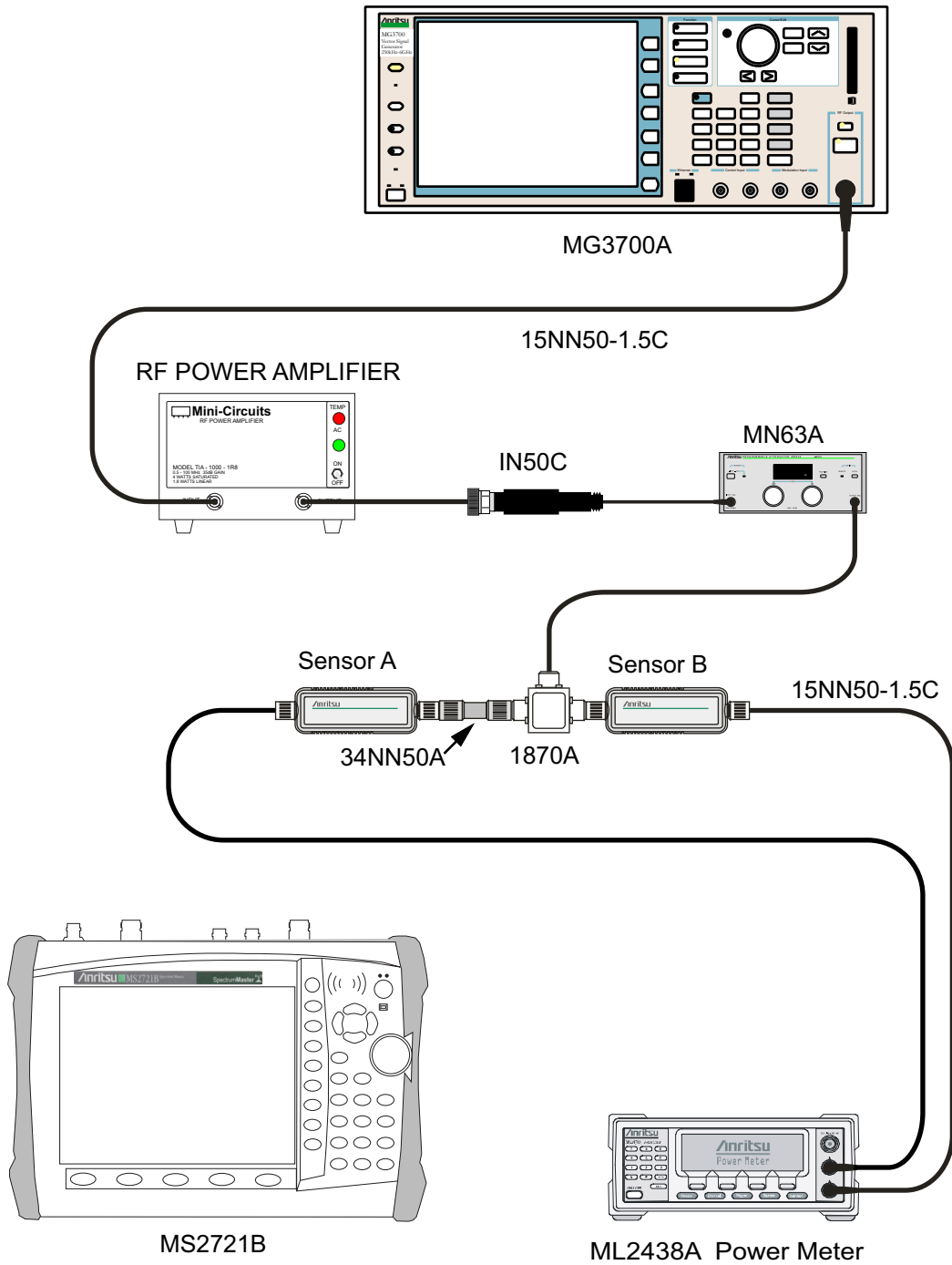


Figure 3-23. DVB-T/H Option 64 – 1 dB Compression Level Verification – Two Sensors

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. On the Power Meter, set Low Level Averaging to Low and Averaging to Moving with 50 averages. Also set the power meter to read True RMS.
3. Perform a Zero/Cal on both sensors of the power meter.

4. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-23](#).
5. On the MG3700A, press the **MOD On/Off** button to turn off Modulation, and verify that the **MOD On/Off** LED is OFF (not illuminated).
6. Set the Level output of the MG3700A to -25 dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up at least 5 minutes.

474 MHz Tests

9. Set the calibration factor of both sensors to 474 MHz.
10. Set the MG3700A Frequency to 474 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is -25 dBm \pm 1 dBm. Record the MN63A attenuation readout in [Table A-132](#), “[Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 64](#)” on page A-41.
12. Adjust the Level of the MG3700A so that the Power Meter Sensor A reads -25.0 dBm \pm 0.05 dBm. Record the Sensor A reading to the M(Sa) column in [Table A-132](#).
13. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-24](#).

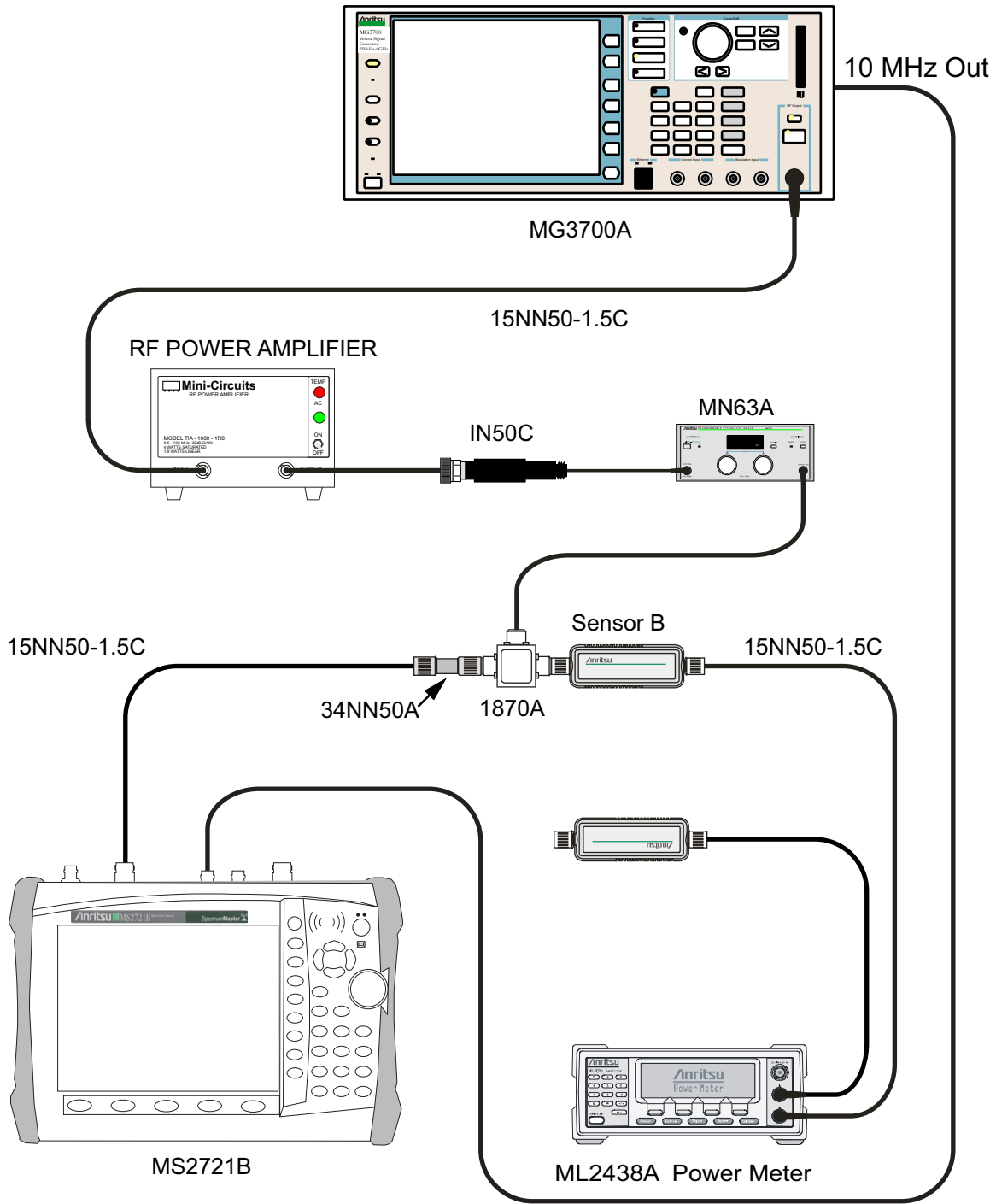


Figure 3-24. DVB-T/H Option 64 – 1 dB Compression Level Verification – Sensor B Only

14. Set the MS2721B to DVB-T/H Signal Analyzer mode and preset the unit.
15. Press the **Meas Selection** function hard key and ensure that Signal Power is activated.
16. Press the **Frequency/Level** function hard key and ensure that the MS2721B is set to Channel 21 and that the Pre Amp is OFF.
17. Set the Reference Level to -25 dBm.

18. Record the MS2721B Channel Power reading, MeasCP(–25), to the –25 dBm “Test Level” row of the “Measured Value” column in [Table A-136](#), “DVB-T/H Analyzer 1 dB Compression Level Channel 21 with Pre Amp OFF, Option 64” on page A-45.

19. Calculate the difference, Delta(–25), by using the following formula (where MeasCP(–25) is from the “Measured Value” column in [Table A-136](#), and M(Sa) is from [Table A-132](#), “Readings for Sensor A and MN63A Attenuation AT(–25), AT(–15), AT(–50), and AT(–43), Option 64” on page A-41):

$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$

20. Record the result in the Delta (Δ) column in [Table A-136](#), and verify that the result is less than 1 dB.

21. Calculate AT(–15) by using the following formula (where AT(–25) is from [Table A-132](#)):

$$\text{AT}(-15) = \text{AT}(-25) - 10$$

22. Record the AT(–15) value in [Table A-132](#).

23. Set the MN63A attenuation to AT(–15).

Note The Over Range message on the MS2721B is normal.

24. Record the MS2721B Channel Power reading, MeasCP(–15), to the –15 dBm “Test Level” row of the “Measured Value” column in [Table A-136](#), “DVB-T/H Analyzer 1 dB Compression Level Channel 21 with Pre Amp OFF, Option 64” on page A-45.

25. Calculate the Delta at –15 dBm Input by using the following formula:

$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$

26. Record the result to the Delta column in [Table A-136](#), and verify that it is less than 1 dB.

27. Calculate the value of AT(–50) by using the following formula:

$$\text{AT}(-50) = \text{AT}(-25) + 25$$

28. Record the value of AT(–50) in [Table A-132](#), “Readings for Sensor A and MN63A Attenuation AT(–25), AT(–15), AT(–50), and AT(–43), Option 64” on page A-41.

29. Adjust the MN63A attenuation to AT(–50).

30. Set the Reference Level on the MS2721B to –50 dBm and turn on the Pre Amp.

31. Record the MS2721B Channel Power reading, MeasCP(–50), to the –50 dBm “Test Level” row of the “Measured Value” column in [Table A-139](#), “DVB-T/H Analyzer 1 dB Compression Level Channel 21 with Pre Amp ON, Option 64” on page A-45.

32. Calculate the Delta at –50 dBm Input, Delta(–50), by using the following formula:

$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$

33. Record the result to the Delta column in [Table A-139](#), and verify that it is less than 1 dB.

34. Calculate the AT(–43) by using the following formula:

$$\text{AT}(-43) = \text{AT}(-25) + 18$$

35. Record the value of AT(–43) in [Table A-132](#), “Readings for Sensor A and MN63A Attenuation AT(–25), AT(–15), AT(–50), and AT(–43), Option 64” on page A-41.

36. Set the MN63A attenuation to AT(–43).

Note The Over Range message on the MS2721B is normal.

37. Record the MS2721B Channel Power reading, MeasCP(–43), in the –43 dBm “Test Level” row of the “Measured Value” column in [Table A-139](#).

38. Calculate the Delta at -43 dBm Input, $\Delta(-43)$, by using the following formula:

$$\Delta(-43) = M(Sa) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$

39. Record the result to the Delta column in [Table A-139](#), and verify that it is less than 1 dB.

666 MHz Tests

40. Remove the MS2721B from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 3-23, “DVB-T/H Option 64 – 1 dB Compression Level Verification – Two Sensors”](#) on page 3-86.
41. Set the MG3700A Frequency to 666 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
42. Set the calibration factor of both sensors to 666 MHz.
43. Adjust the MN63A attenuation so that Power Meter Sensor A reads -25 dBm \pm 1 dBm. Record the MN63A attenuation readout into the AT(-25) column in [Table A-132, “Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 64”](#) on page A-41.
44. Adjust the Level of the MG3700A so that Power Meter Sensor A reads -25.0 dBm \pm 0.05 dBm. Record the Sensor A reading into the M(Sa) column in [Table A-132](#).
45. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-24, “DVB-T/H Option 64 – 1 dB Compression Level Verification – Sensor B Only”](#) on page 3-88.
46. Set the MS2721B to Channel 45.
47. Set the Pre Amp to Off and the Reference Level to -25 dBm.
48. Repeat [Step 18](#) through [Step 39](#).

858 MHz Tests

49. Remove the MS2721B from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 3-23, “DVB-T/H Option 64 – 1 dB Compression Level Verification – Two Sensors”](#) on page 3-86.
50. Set the MG3700A Frequency to 858 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
51. Set the calibration factor of both sensors to 858 MHz.
52. Adjust the MN63A attenuation so that Power Meter Sensor A reads -25 dBm \pm 1 dBm. Record the MN63A attenuation readout into the AT(-25) column in [Table A-132, “Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 64”](#) on page A-41.
53. Adjust the Level of the MG3700A so that Power Meter Sensor A reads -25.0 dBm \pm 0.05 dBm. Record the Sensor A reading in the M(Sa) column in [Table A-132](#).
54. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-24, “DVB-T/H Option 64 – 1 dB Compression Level Verification – Sensor B Only”](#) on page 3-88.
55. Set the MS2721B to Channel 69.
56. Set the Pre Amp to OFF and the Reference Level to -25 dBm.
57. Repeat [Step 18](#) through [Step 39](#).

Noise Floor Verification

The tests in this section verify the noise floor of the MS2721B in DVB-T/H Signal Analyzer mode.

Required Equipment:

- 50 ohm termination, Anritsu Model 28N50-2
- Spectrum Master Model MS2721B

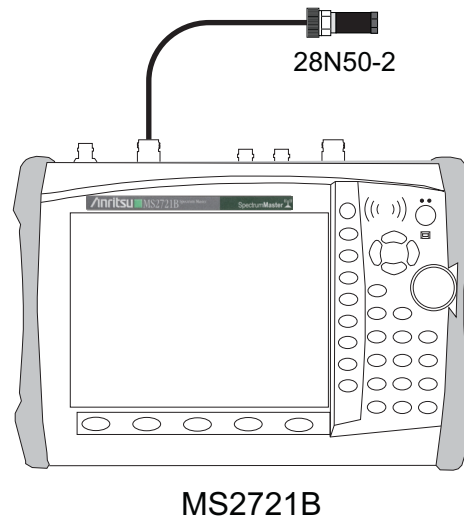


Figure 3-25. DVB-T/H Noise Floor Verification Test Setup

Procedure:

1. Set the mode of the MS2721B to DVB-T/H Analyzer and preset the unit.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Ensure that the Channel is set to 21 and that Pre Amp is OFF.
4. Press the **Meas Setup** function hard key. Change Meas Mode to Average, and leave Average Count set to 50.
5. Press the **Frequency/Level** function hard key and set the Reference Level to -25 dBm.
6. After Averages (50/50) appears at the top of the display, record the Channel Power into the “Pre Amp Off” row of [Table A-142](#), “DVB-T/H Signal Analyzer Noise Floor Pre Amp OFF, Option 64” on page A-46.
7. Set the Pre Amp to ON.
8. Set the Reference Level to -50 dBm.
9. After Averages (50/50) appears at the top of the display, record the Channel Power in [Table A-143](#), “DVB-T/H Signal Analyzer Noise Floor Pre Amp ON, Option 64” on page A-46.
10. Change the channel to Channel 45. Set Pre Amp to OFF.
11. Repeat [Step 5](#) through [Step 9](#) for Channel 45.
12. Change the channel to Channel 69. Set Pre Amp to OFF.
13. Repeat [Step 5](#) through [Step 9](#) for Channel 69.

BER Measurement Functional Check, Option 57 Only

This section provides the procedures to check the functionality of the BER measurement hardware that is included with Option 57 in the MS2721B Digital Broadcast Field Analyzer.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Anritsu MP8931A Bit Error Rate Tester
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Power Sensor, Anritsu Model MA2482D
- Adapter, Anritsu Model 34NN50A
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C
- RF Coaxial Cable, BNC-to-BNC, 75 ohm, Anritsu Model 3-806-169
- Spectrum Master Model MS2721B

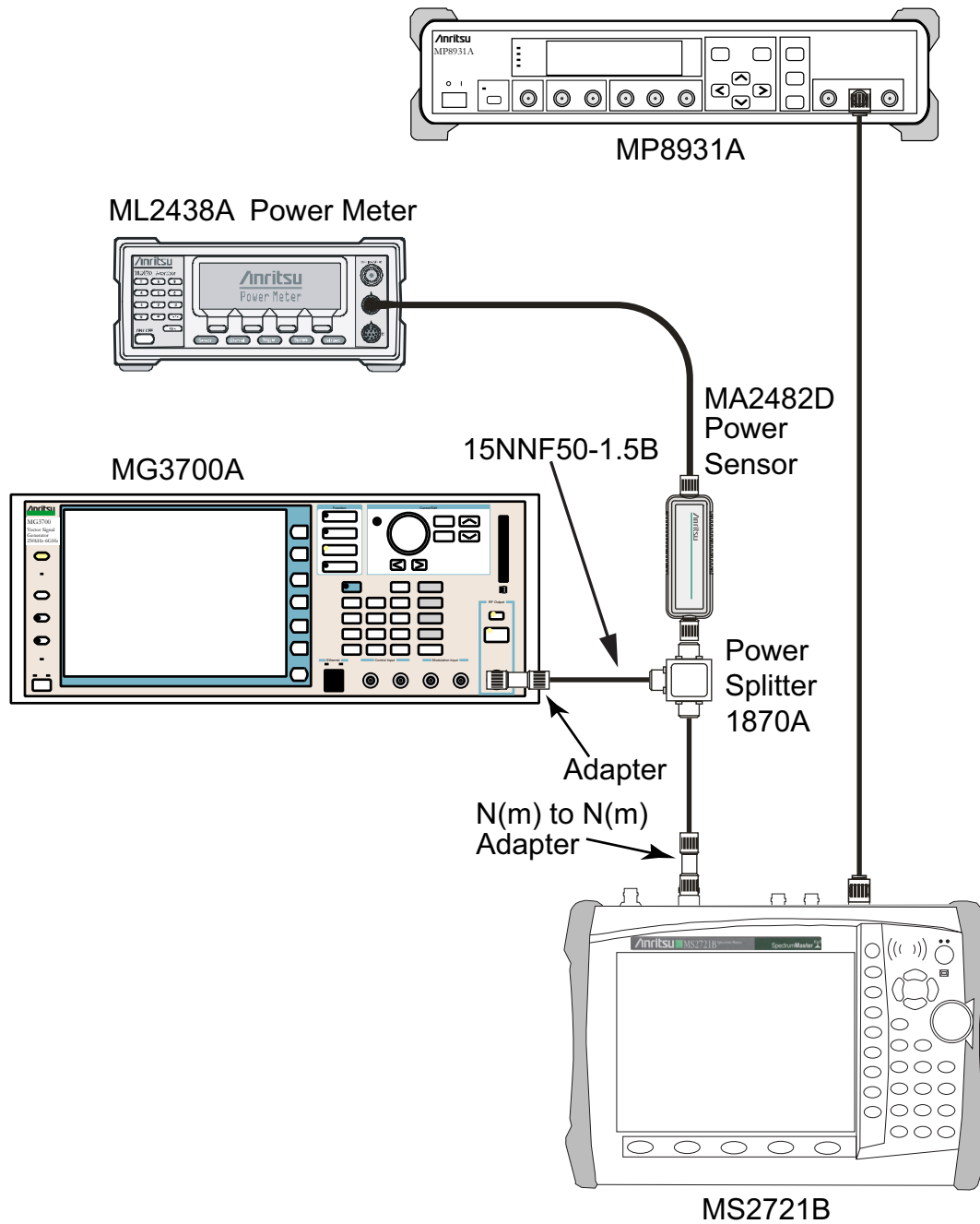


Figure 3-26. DVB-T/H BER, Option 57 – BER Functional Check Setup

Procedure:

1. Turn on the MG3700A, MP8931A, ML2438A, and the MS2721B.
2. Perform a Zero/Cal on Sensor A on the power meter. Set the calibration factor of the sensor to 474 MHz.

3. Connect the MG3700A Signal Generator, Power Splitter, Power Sensor, 34NN50A Adapter, MS2721B, and the MP8931A as shown in [Figure 3-26](#).

| | |
|-------------|--|
| Note | Use a 75 Ohm BNC cable to connect between the DVB-ASI Input connector of the MP8931A and the DVB-ASI Out connector of the MS2721B. |
|-------------|--|

4. On the MP8931A, press the **Menu** key.
5. Press the **Down Arrow** key until the triangle pointer is at **System*** on the display.
6. Press the **Right Arrow** key so that **Initialize** appears on the display.
7. Press the **Enter** key twice.
8. Press the **Menu** key and then the **Up Arrow** or **Down Arrow** keys until the triangle pointer is at **Pattern**.
9. Press the **Enter** key to select.
10. Press the **Up Arrow** or **Down Arrow** keys until the triangle pointer is at **ALL0** and then press the **Enter** key.
11. Press the **Down Arrow** key. The pointer should be at **Interface**. Then press **Enter** to select.
12. Press the **Right Arrow** key and then press the **Down Arrow** key until the pointer is at **DVB-ASI**. Press the **Enter** key to select.
13. Press the **Menu** key and then the **Up Arrow** or **Down Arrow** keys until the triangle pointer is at **DVB-ASI***. Press the **Right Arrow** key and confirm that the PKT is set to (1) + 187 + (16).
14. On the MG3700A, press the yellow **Preset** key located on the upper-left side of the instrument.
15. Press the **Down Arrow** key to select **Yes**.
16. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
17. Set the MG3700A Frequency to 474 MHz.
18. Press the **Baseband** key.
19. Press the **More** key located at the bottom of the row.
20. Press the F5 Pattern Combination soft key as required until **Edit** appears.
21. Press the **More** key.
22. Press the F3 soft key so that **Output B** appears.
23. Press the **Baseband** key and then the F1 soft key.
24. Press the F2 soft key so that **Memory A** is highlighted.
25. Press the F1 key and use the **Down Arrow** key to highlight **MS2721B-057_Inspection**.
26. Press the **Set** key.
27. Use the **Arrow** key to highlight **8M_AWGN** and press the **Set** key.
If an Overwrite question appears, answer **Yes**.
28. Press the F2 soft key so that **Memory B** is highlighted
29. Highlight **8M_8k_64QAM_2_3_ALL0** and press the **Set** key.
If an Overwrite question appears, answer **Yes**.
30. Press the F6 (Return) soft key.
31. Use the **Arrow** keys to highlight the blank line between **Pattern:[** and the small green A memory symbol.
32. Press the **Set** key.
33. Ensure that **MS2721B-057_Inspection** is highlighted and press the **Set** key.
34. Ensure that **8M_AWGN** is highlighted and press the **Set** key.

35. Use the **Arrow** keys to highlight the blank line between Pattern:[and the small violet B memory symbol.
36. Press the **Set** key.
37. Ensure that MS2721B-057_Inspection is highlighted and press the **Set** key.
38. Ensure that 8M_8k_64QAM_2_3_ALL0 is highlighted and press the **Set** key.
39. Press the **MOD On/Off** and **Output** keys so that both LEDs are **ON** (illuminated).
40. Adjust the Level so that the power meter reads $-25.0 \text{ dBm} \pm 0.2 \text{ dB}$.
41. Set the MS2721B to DVB-T/H Signal Analyzer mode and preset the unit.
42. Press the **Frequency/Level** function hard key.
43. Ensure that the Channel Map is set to UHF (Europe), and that Channel is set to 21. Ensure that Reference Level is set to -25 dBm , and Pre Amp is set to **OFF**.
44. Press the **Execute Measure** function hard key and verify that the Moving Avg value of the MER(quick) [dB] is $>27 \text{ dB}$.
45. On the MP8931A, press the **Start/Stop** key and verify that $0\text{e}-9$ is displayed. This verifies that the DVB ASI Out is functioning properly.

3-14 Mobile WiMAX Signal Analyzer (Options 66 and 67) Verification

The tests in this section verify the functionality of the Mobile WiMAX Signal Analyzer of the MS272xB Spectrum Master. These tests include:

- [Mobile WiMAX Channel Power Accuracy Tests \(Option 66\)](#)
- [Channel Power Accuracy \(10 MHz Bandwidth and 10 ms Frame Length\)](#)
- [Channel Power Accuracy \(5 MHz Bandwidth and 5 ms Frame Length\)](#)

Required Equipment:

- 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)
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NN50-1.5B
- Spectrum Master Model MS2721B

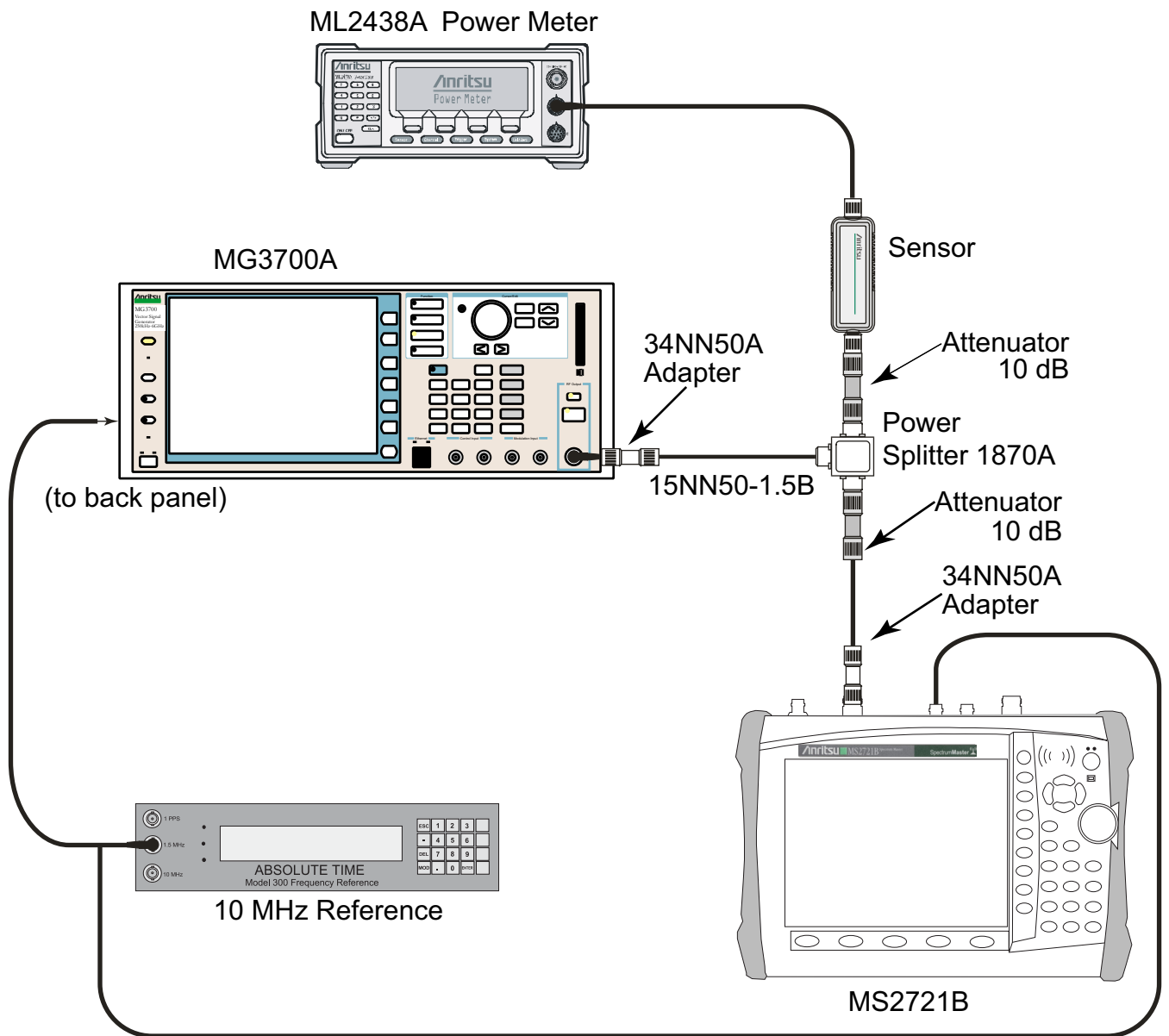


Figure 3-27. Mobile WiMAX Signal Analyzer Test Setup

Mobile WiMAX Channel Power Accuracy Tests (Option 66)

Procedure:

1. Connect the MA2482D Power Sensor to the power meter and zero the meter.
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 (2) as shown in [Figure 3-27](#).

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

1. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key step through the selection list until "mWiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key, "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "mWiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "10m1024g8_0_10_cap".
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On (illuminated). 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 on the output.
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 power meter reading in [Table A-144](#), "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -15.0 dBm) Option 66" on page A-47.
3. Set the MS2721B to Mobile WiMax Signal Analyzer Mode and preset the instrument.
4. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key and set the Center Freq to 2600.5 MHz
 - b. Press the **Setup** function hard key and set the Bandwidth to 10 MHz.
 - c. Press the **Frame Length** soft key and set the Frame Length to 10 ms.
 - d. Press the **Measurements** function hard key and press RF, then press Power vs. Time.
5. Record the MS2721B "Channel Power (RSSI)" reading in [Table A-144](#).
6. Calculate the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading from the power meter reading in [Step 2](#). Record the result in [Table A-144](#).

$$\text{Channel Power Error} = \text{Power Meter Reading} - \text{RSSI}$$
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 power meter reading in [Table A-145](#), "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -50.0 dBm) Option 66" on page A-47.
9. Record the MS2721B Channel Power (RSSI) reading in [Table A-145](#).
10. Calculate the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading from the power meter reading in [Step 8](#). Record the result in [Table A-145](#).
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 MS2721B to 3600.5 MHz.
15. Measure the Channel Power (RSSI) for both -15 dBm and -50 dBm (as in [Step 2](#) through [Step 11](#), but with the calibration factor frequency of 3600.5 MHz in [Step 4](#) part a) and record the measured results

and calculated errors in [Table A-146, “Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and –15.0 dBm\) Option 66”](#) on page A-47 and [Table A-147, “Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and –50.0 dBm\) Option 66”](#) on page A-47.

16. Verify that the errors are within specification.

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

1. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key, step through the selection list until "mWiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key, "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "mWiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "5m512g8_2_5_cap".
 - j. Press the **Set** key.
 - k. Press the **Mod On/Off** key and verify that the led is ON (illuminated). 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 on the output.
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 power meter reading in [Table A-148](#), "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -15.0 dBm) Option 66" on page A-48.
3. Set the MS2721B to Mobile WiMax Signal Analyzer Mode and preset the instrument.
4. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key and set the Center Freq to 2600.5 MHz.
 - b. Press the **Setup** function hard key and set the Bandwidth to 5 MHz.
 - c. Press the **Frame Length** soft key and set the Frame Length to 5 ms.
 - d. Press the **Measurements** function hard key and press RF, then press Power vs. Time.
5. Record the MS2721B "Channel Power (RSSI)" reading in [Table A-148](#).
6. Calculate the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading from the power meter reading in [Step 2](#). Record the result in [Table A-148](#).
$$\text{Channel Power Error} = \text{Power Meter Reading} - \text{RSSI}$$
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 power meter reading in [Table A-149](#), "Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -50.0 dBm) Option 66" on page A-48.
9. Record the MS2721B Channel Power (RSSI) reading in [Table A-149](#).
10. Calculate the Channel Power Error by subtracting the MS2721B "Channel Power (RSSI)" reading from the power meter reading in [Step 8](#). Record the result in [Table A-149](#).
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 MS2721B to 3600.5 MHz.
15. Measure the Channel Power (RSSI) for both -15 dBm and -50 dBm (as in [Step 2](#) through [Step 11](#), but with the calibration factor frequency of 3600.5 MHz in [Step 4](#) part a) and record the measured results

and calculated errors in [Table A-150, “Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and –15.0 dBm\) Option 66”](#) on page A-48 and [Table A-151, “Mobile WiMAX Channel Power Accuracy Power Error \(3600.5 MHz and –50.0 dBm\) Option 66”](#) on page A-48.

16. Verify that the error is within specification.

3-15 Mobile WiMAX Residual EVM and Frequency Error Tests (Option 67)

The tests in this section verify the performance of the WiMAX Signal Analyzer option of the MS2721B. These tests include:

- Residual EVM and Frequency Error (10 MHz Bandwidth and 10 ms Frame Length)
- Residual EVM and Frequency Error (5 MHz Bandwidth and 5 ms Frame Length)

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master Model MS2721B

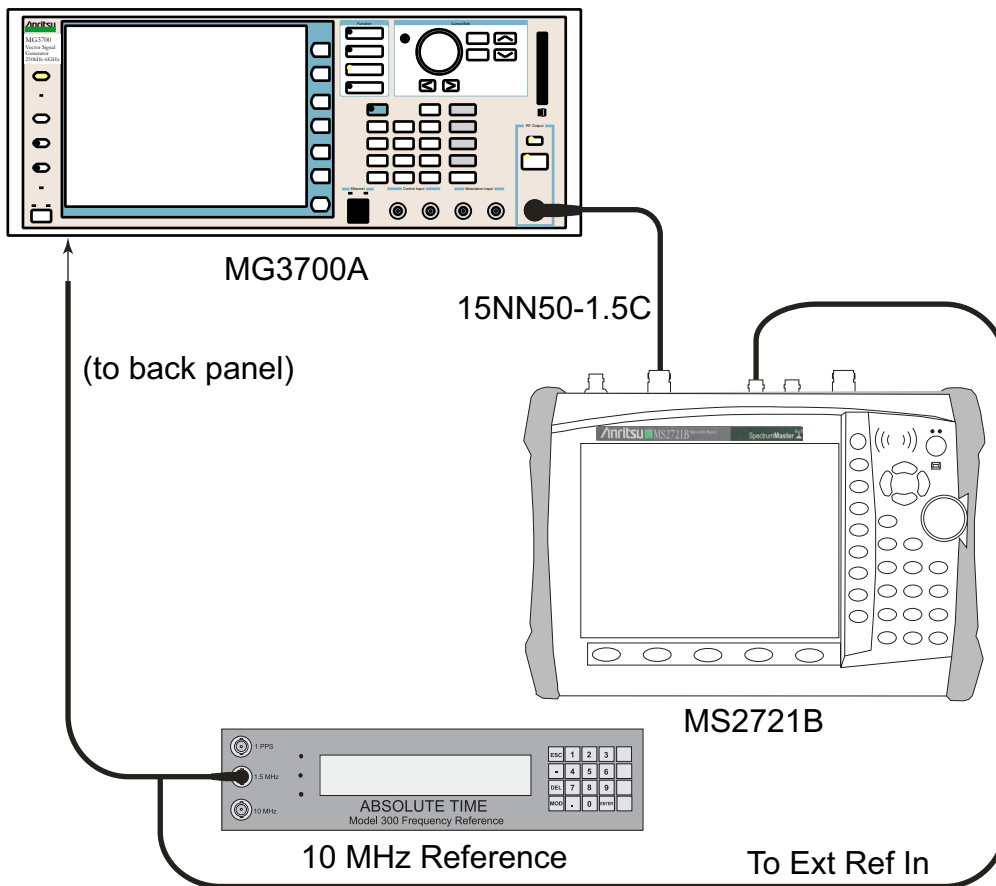


Figure 3-28. Mobile WiMAX Residual EVM – Test Setup (Option 67)

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 MS2721B as shown in [Figure 3-28](#).
2. Connect the RF Out of the MG3700A to the Spectrum Analyzer RF In connector on the MS2721B.

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 (Note that two **Set** keys are available, and they both do the same thing).
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key, step through the selection list until "mWiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key, "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "mWiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "10m1024g8_0_10_cap".
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is ON (illuminated). Ensure that the "playing" indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter –15 dBm. Turn on the output.
4. Set the MS2721B to Mobile WiMax Signal Analyzer Mode and preset the instrument.
5. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key and set the Center Freq to 2600.5 MHz
 - b. Press the **Setup** function hard key and set the Bandwidth to 10 MHz.
 - c. Press the CP Ratio G soft key (in the Setup menu) and set the CP Ratio to 1/8.
 - d. Press the Frame Length soft key and set the Frame Length to 10 ms.
 - e. Press the **Demod** soft key and set Demod to FCH.
 - f. Press the **Measurements** function hard key and press Demodulator, then press Modulation Summary.
6. Record the MS2721B EVM (rms) reading in [Table A-152, "Mobile WiMAX Residual EVM \(10 MHz Bandwidth and 10 ms Frame Length\), Option 67"](#) on page A-49.
7. Verify that the measured EVM is within specification.
8. Set the MG3700A Level to –50.0 dBm.
9. Record the MS2721B EVM (rms) reading in [Table A-152](#).
10. Verify that the measured EVM is within specification.
11. On the MS2721B, press the **Setup** function hard key and set Demod to Auto.
12. Record the MS2721B Frequency Error reading in [Table A-154, "Mobile WiMAX Frequency Error \(10 MHz Bandwidth and 10 ms Frame Length\), Option 67"](#) on page A-49.
13. Verify that the measured Frequency Error is within specification.
14. Set MG3700A Frequency to 3600.5 MHz.
15. On the MS2721B, change the Center Frequency to 3600.5 MHz.
16. Press the **Setup** function hard key and set Demod to FCH.
17. Measure the EVM (rms) for –50 dBm and then record the measured results in [Table A-152](#).
18. Verify that the measured EVM is within specification.
19. On the MS2721B, press the **Setup** function hard key and set Demod to Auto.

20. Record the MS2721B Frequency Error reading in [Table A-154](#).
21. Set the MG3700A Level to -15.0 dBm.
22. Press the **Setup** function hard key and set Demod to FCH.
23. Measure the EVM (rms) for -15 dBm and then record the measured results in [Table A-152](#).

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

1. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer yes to the question).
 - b. Press the **Set** key
 - c. Press the (F1) soft key to select "Load File to Memory"
 - d. Press the (F1) soft key again to select "Select Package"
 - e. Using the **Down Arrow** key step through the selection list until "mWiMax" is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key "Return"
 - h. Press the **Set** key. The "Select Package" list box appears. Again select "mWiMax" and press **Set**.
 - i. Another file list appears. Select (highlight) "5m512g8_2_5_cap".
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is ON (illuminated). Ensure that the "playing" indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 2600.5 MHz.
 - m. Press the **Level** key, then enter -15 dBm. Turn on the output.
2. Set the MS2721B as follows:
 - a. Press the **Freq** function hard key and set the Center Freq to 2600.5 MHz
 - b. Press the **Setup** function hard key and set the Bandwidth to 5 MHz.
 - c. Press the CP Ratio_G soft key (under the Setup menu) and set the CP Ratio to 1/8.
 - d. Press the Frame Length soft key and set the Frame Length to 5 ms.
 - e. Press the Demod soft key and set Demod to FCH.
 - f. Press the **Measurements** function hard key and press Demodulator, then press Modulation Summary.
3. Record the MS2721B EVM (rms) reading in [Table A-153](#), "Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length), Option 67" on page A-49.
4. Verify that the measured EVM is within specification.
5. Set the MG3700A Level to -50.0 dBm.
6. Record the MS2721B EVM (rms) reading in [Table A-153](#).
7. Verify that the measured EVM is within specification.
8. On the MS2721B, press the **Setup** function hard key and set Demod to Auto.
9. Record the MS2721B Frequency Error reading in [Table A-155](#), "Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length), Option 67" on page A-49.
10. Verify that the measured Frequency Error is within specification.
11. Set MG3700A Frequency to 3600.5 MHz.

12. On the MS2721B, change the Center Frequency to 3600.5 MHz.
13. Press the **Setup** function hard key and set Demod to FCH.
14. Measure the EVM (rms) for -50 dBm and then record the measured results in [Table A-153](#).
15. Verify that the measured EVM is within specification.
16. On the MS2721B, press the **Setup** function hard key and set Demod to Auto.
17. Record the MS2721B Frequency Error reading in [Table A-155](#).
18. Set the MG3700A Level to -15.0 dBm.
19. Press the **Setup** function hard key and set Demod to FCH.
20. Measure the EVM (rms) for -15 dBm and then record the measured results in [Table A-153](#).

3-16 LTE Signal Analyzer (Options 541 and 542) Verification

Introduction

The tests in this section verify the functionality of the LTE Signal Analyzer of the MS2721B Spectrum Master. Option 541 is for RF Measurements, and Option 542 is for Modulation Measurements.

Tests are presented for the following LTE options:

- Channel Power Accuracy Verification

Channel power measures the average power within the selected bandwidth and is expressed in dBm.

- Residual EVM and Frequency Error Verification

EVM is the percent of all the error vectors (between the reconstructed ideal signals and the received signals) divided by the RMS value of the ideal signals.

Frequency error is the difference between the measured carrier frequency and the specified carrier frequency. This number is only as accurate as the frequency reference that is used, and is typically only useful with a good external frequency reference or GPS.

LTE Channel Power Accuracy Tests (Option 541)

The tests in this section verify the function of Option 541 in the optional LTE Signal Analyzer in Model MS2721B Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NNF50-1.5C
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- RF Coaxial Cable, BNC-to-BNC, 75 ohm, Anritsu Model 3-806-169 (Anritsu PN 3-806-169 Coaxial Cable)
- 10 MHz Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2721B

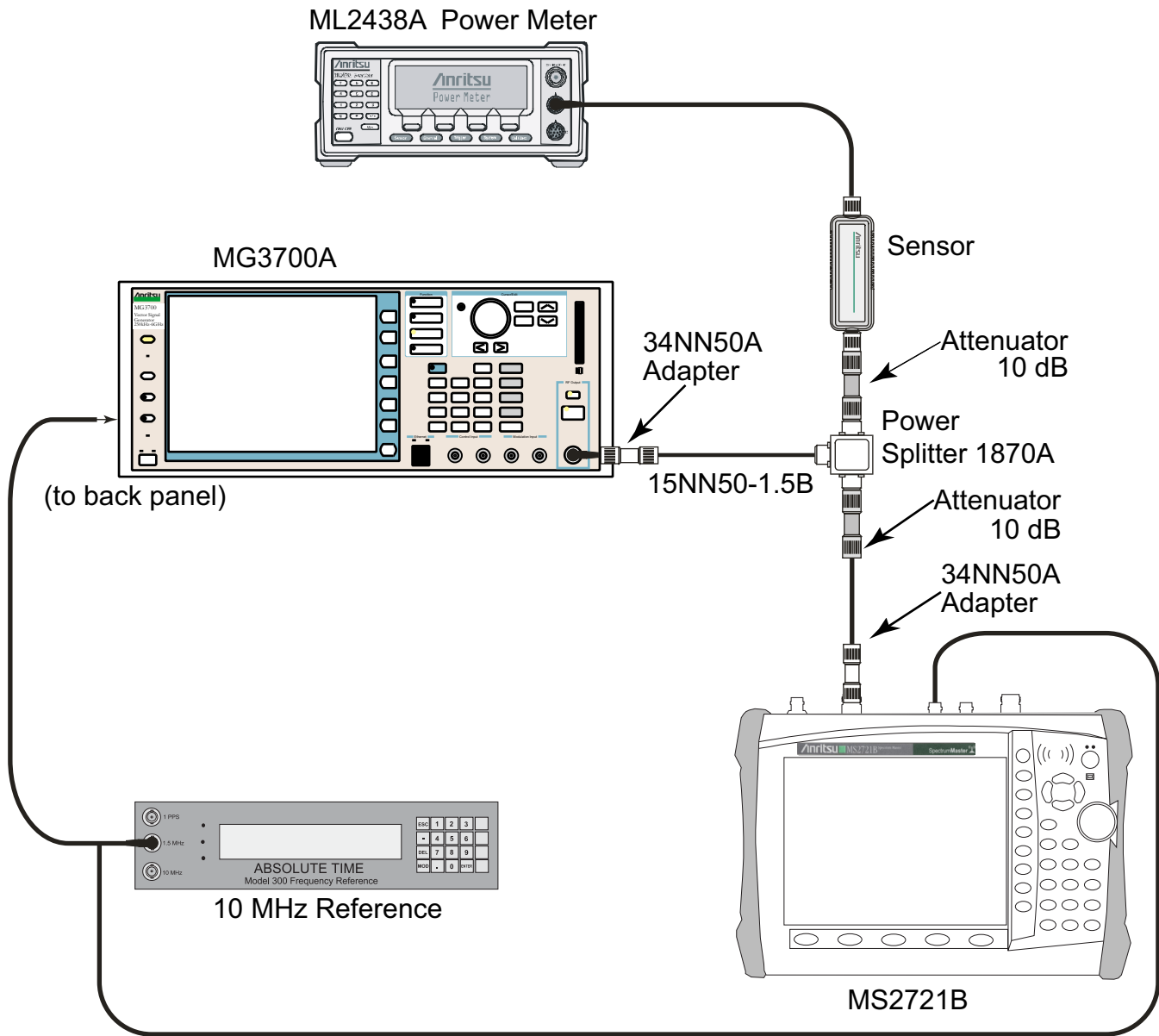


Figure 3-29. LTE Signal Analyzer Option Verification

Procedure:

1. Connect the Power Sensor, Anritsu Model MA2482D, to the power meter, and then zero the sensor.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.
3. Set the calibration factor frequency of the power sensor to 750 MHz.
4. Connect all of the test equipment as shown in [Figure 3-29](#).

Note The LTE pattern requires a Waveform Data license (Part Number MX370108A) that must be purchased.

| |
|--|
| Note Both Set keys on the MG3700A perform the same function. |
|--|

5. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer **yes** to the question).
 - b. Press the **Set** key.
 - c. Press the (F1) soft key to select Load File to Memory.
 - d. Press the (F1) soft key again to select Select Package.
 - e. Using the **Down Arrow** key, step through the selection list until LTE_DL_E-TM is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key **Return**.
 - h. Press the **Set** key. The Select Package list box is displayed. Again select LTE_DL_E-TM and then press the **Set** key.
 - i. Another file list is displayed. Select (highlight) E-TM_1-1_10M.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the playing indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the **Level** key, then enter 2 dBm.
 - n. Turn On the output.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MS2721B to LTE Signal Analyzer Mode and preset the unit.
8. Set the MS2721B as follows:
 - a. Press the **Freq** soft key and set the Center Freq to 750 MHz.
 - b. Press the **Measurements** soft key and select RF, then press Channel Spectrum.
9. Record the MS2721B Channel Power reading into [Table A-156, "LTE Channel Power Accuracy \(Only for Instruments with Option 541 Installed\)" on page A-50](#) in the column labeled Measured Channel Power (in the row labeled with Frequency 750 MHz and Input Power -10 dBm).
10. Calculate the Channel Power Error by subtracting the MS2721B Channel Power reading from the power meter reading in [Step 6](#). Record the result into [Table A-156, "LTE Channel Power Accuracy \(Only for Instruments with Option 541 Installed\)" on page A-50](#) in the column labeled Error (in the row labeled with Frequency 750 MHz and Input Power -10 dBm).
11. Verify that the error is within specification.
12. Adjust the MG3700A Level setting to approximately -33 dBm so that the power meter reads $-50.0 \text{ dBm} \pm 0.5 \text{ dB}$.
13. Record the MS2721B Channel Power reading into [Table A-156, "LTE Channel Power Accuracy \(Only for Instruments with Option 541 Installed\)" on page A-50](#) in the row labeled with Frequency 750 MHz and Input Power -50 dBm .
14. Calculate the Channel Power Error by subtracting the MS2721B Channel Power reading from the power meter reading that was recorded in [Step 13](#). Record the result into [Table A-156, "LTE Channel Power Accuracy \(Only for Instruments with Option 541 Installed\)" on page A-50](#) in the row labeled with Frequency 750 MHz and Input Power -50 dBm .
15. Verify that the error is within specification.
16. Set the calibration factor frequency of the power sensor to 2150 MHz.
17. Set MG3700A Frequency to 2100 MHz. Press the **Set** key.

18. Change the Center Frequency of the MS2721B to 2150 MHz.
19. Measure the Channel Power for -10 dBm and -50 dBm and then record the measured result and the calculated error into [Table A-156, "LTE Channel Power Accuracy \(Only for Instruments with Option 541 Installed\)"](#) on [page A-50](#) in the column labeled Measured Channel Power and in the column labeled Error (rows labeled 2150 MHz).

LTE Residual EVM and Frequency Error Tests (Option 542)

The tests in this section verify the function of Option 542 in the optional LTE Signal Analyzer in Model MS2721B Spectrum Master.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D
- Adapter, Anritsu Model 34NN50A (2)
- RF Coaxial Cable, Anritsu Model 15NNF50-1.5C
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10 (2)
- RF Coaxial Cable, BNC-to-BNC, 75 ohm, Anritsu Model 3-806-169 (Anritsu PN 3-806-169 Coaxial Cable)
- 10 MHz Frequency Reference Symmetricom Rubisource T&M
- Spectrum Master: MS2721B

Procedure:

1. Connect the Power Sensor, Anritsu Model MA2482D, to the power meter, and then zero the sensor.
2. Set the Power Meter Measurement MODE to True RMS, set Averaging MODE to Moving, and set Averaging NUMBER to 256.
3. Set the calibration factor frequency of the power sensor to 750 MHz.
4. Connect all of the test equipment as shown in [Figure 3-29](#).

| | |
|-------------|--|
| Note | The LTE pattern requires a Waveform Data license (Part Number MX370108A) that must be purchased. |
|-------------|--|

| | |
|-------------|--|
| Note | Both Set keys on the MG3700A perform the same function. |
|-------------|--|

5. Set the MG3700A as follows:
 - a. Press the yellow **Preset** button (answer **yes** to the question).
 - b. Press the **Set** key.
 - c. Press the (F1) soft key to select Load File to Memory.
 - d. Press the (F1) soft key again to select Select Package.
 - e. Using the **Down Arrow** key, step through the selection list until LTE_DL_E-TM is highlighted.
 - f. Press the **Set** key.
 - g. Press the (F6) soft key Return.
 - h. Press the **Set** key. The Select Package list box is displayed. Again select LTE_DL_E-TM and then press the **Set** key.
 - i. Another file list is displayed. Select (highlight) E-TM_3-1_10M.
 - j. Press the **Set** key.
 - k. Press the **MOD On/Off** key and verify that the LED is On. Ensure that the playing indicator is displaying the moving pattern.
 - l. Press the **Frequency** key, then enter 750 MHz.
 - m. Press the **Level** key, then enter 2 dBm.

- n. Turn On the output.
6. Adjust the MG3700A Level setting with the knob so that the power meter reads $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$.
7. Set the MS2721B to LTE Signal Analyzer Mode and preset the unit.
8. Set the MS2721B as follows:
 - a. Press the Freq soft key and set the Center Freq to 750 MHz.
 - b. Press the Measurements soft key and select Modulation Measurements.
 - c. Press the Constellation soft key.
9. Record the MS2721B Residual EVM and Frequency Error reading into [Table A-157, “LTE Residual EVM and Frequency Accuracy \(Only for Instruments with Option 542 Installed\)”](#) on page A-50.
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 MS2721B Residual EVM and Frequency Error reading into [Table A-158, “LTE Residual EVM and Frequency Accuracy \(Only for Instruments with Option 542 Installed\)”](#) on page A-50.
13. Verify that the values are within specification.
14. Set the calibration factor frequency of the power sensor to 2150 MHz.
15. Set the MG3700A Frequency to 2150 MHz. Press the **Set** key.
16. Adjust the MG3700A Level setting with the knob so that the power meter reads $-10.0 \text{ dBm} \pm 0.5 \text{ dB}$.
17. Change the Center Frequency of the MS2721B to 2150 MHz.
18. Record the MS2721B Residual EVM and Frequency Error reading into [Table A-159, “LTE Residual EVM and Frequency Accuracy \(Only for Instruments with Option 542 Installed\)”](#) on page A-50.
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 MS2721B Residual EVM and Frequency Error reading into [Table A-160, “LTE Residual EVM and Frequency Accuracy \(Only for Instruments with Option 542 Installed\)”](#) on page A-50.
22. Verify that the values are within specification.

3-17 DVB-T/H SFN Analyzer (Option 78) Verification

The tests in this section verify the performance of the optional DVB-T/H SFN Analyzer option of the MS2721B.

These tests include:

- [Level Accuracy Verification](#)
- [1 dB Compression Level Verification](#)
- [Noise Floor Verification](#)

Level Accuracy Verification

The tests in this section verify the level accuracy of the MS2721B in DVB-T/H SFN Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Programmable Attenuator, Anritsu Model MN63A
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Power Sensor, Anritsu Model MA2482D (2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C (3)
- Adapter, Anritsu Model 34NN50A
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)
- Anritsu 1N50C RF Limiter
- Spectrum Master Model MS2721B

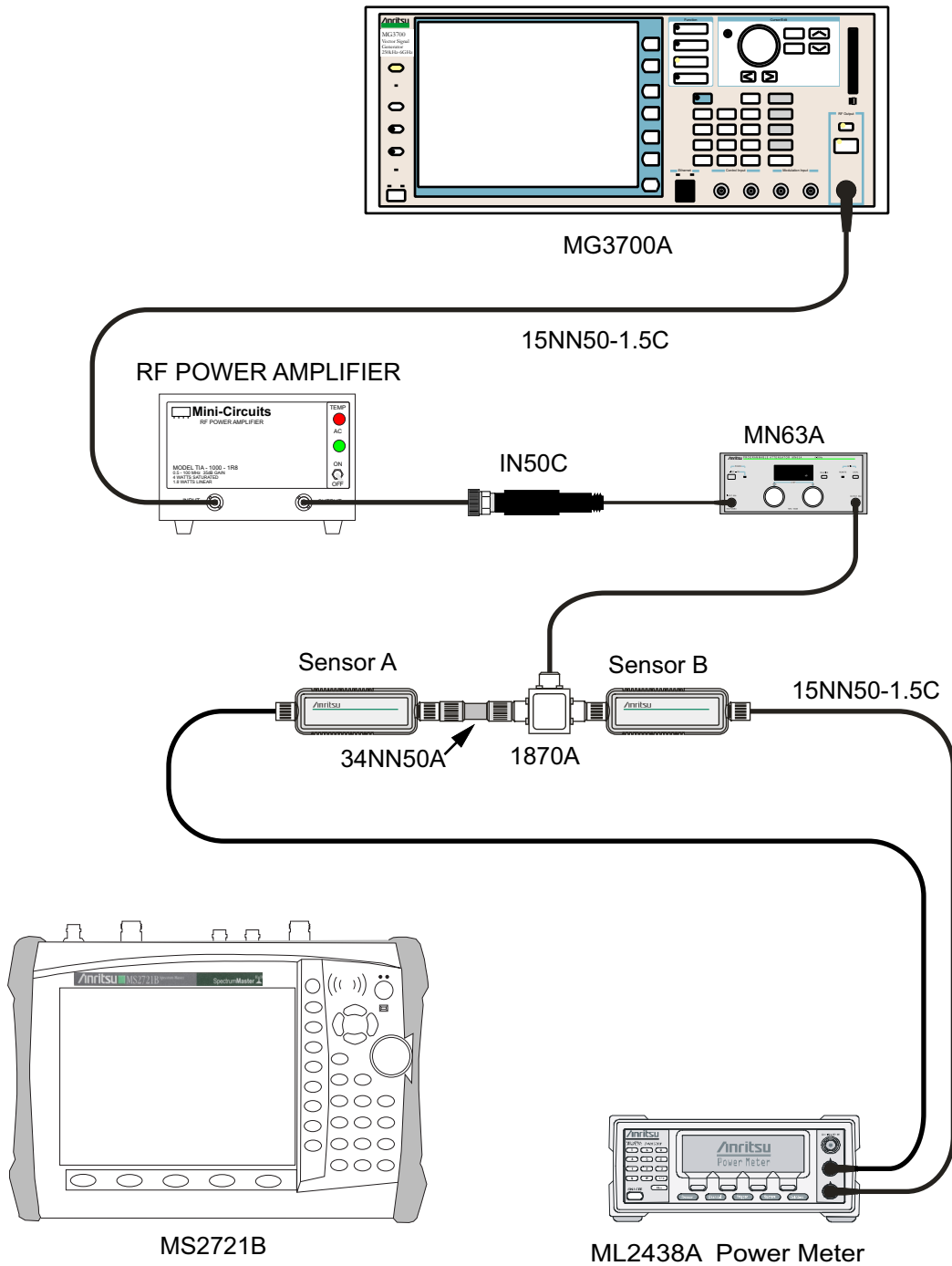


Figure 3-30. DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Two Sensors

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) Adapters, RF Limiter, MN63A Programmable Attenuator, Power Divider, Power Meter, and Power Sensors as shown in [Figure 3-30](#).

3. On the MG3700A, press the yellow **Preset** key located in the upper left side of the instrument.
4. Press the **Down Arrow** key to select Yes.
5. Press the **Set** key (Note that two **Set** keys are available, and they both do the same thing).
6. Press the F1 soft key to select Load File to Memory.
7. Press the F1 soft key again to select Select Package.
8. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
9. Press the **Set** key.
10. Press the F6 soft key, Return.
11. Press the **Set** key.
12. Use the **Down Arrow** key to step through the selection list until the Digital_Broadcast option is highlighted.
13. Press the **Set** key.
14. Use the **Down Arrow** key to step through the selection list until the DVB-T_H_00 option is highlighted.
15. Press the **Set** key.
16. Perform Zero/Cal on Sensor A and Sensor B of the power meter. Set the calibration factor of both sensors to 474 MHz.
17. Set the MG3700A Frequency to 474 MHz.
18. Set the Level to -25 dBm.
19. Ensure that the **Mod On/Off** key and the **Output** key each have an illuminated LED.
20. Turn on the power amplifier and allow it to warm up for at least 5 minutes.
21. Adjust the MN63A Attenuator so that the Sensor A reading is -10 dBm \pm 1 dB. Record the attenuation reading to the “MN63A Attenuation Reading, AT(-10)” column of [Table A-161, “Readings for Sensor A, Sensor B, DAB\(-10\), and MN63A Attenuation AT\(-10\), Option 78”](#) on page A-51.
22. On the MG3700A, adjust the power level so that Power Meter Sensor A reading is -10.0 dBm \pm 0.2 dB.
23. Record the following values to the appropriate columns of [Table A-161](#):
 - Power Meter Sensor A reading to “Sensor A Reading”
 - Power Meter Sensor B reading to “Sensor B Reading”
24. Subtract Sensor A reading from Sensor B reading and record the result to the “DAB(-10)” column of [Table A-161](#).
 - $$\text{DAB}(-10) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
25. Calculate the AT(set) values for Test Levels -10 dBm through -45 dBm and record the values to the AT(set) column in [Table A-164, “DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 78”](#) on page A-52.
26. Remove Sensor A from the Power Splitter, and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) Adapter as shown in [Figure 3-31](#).

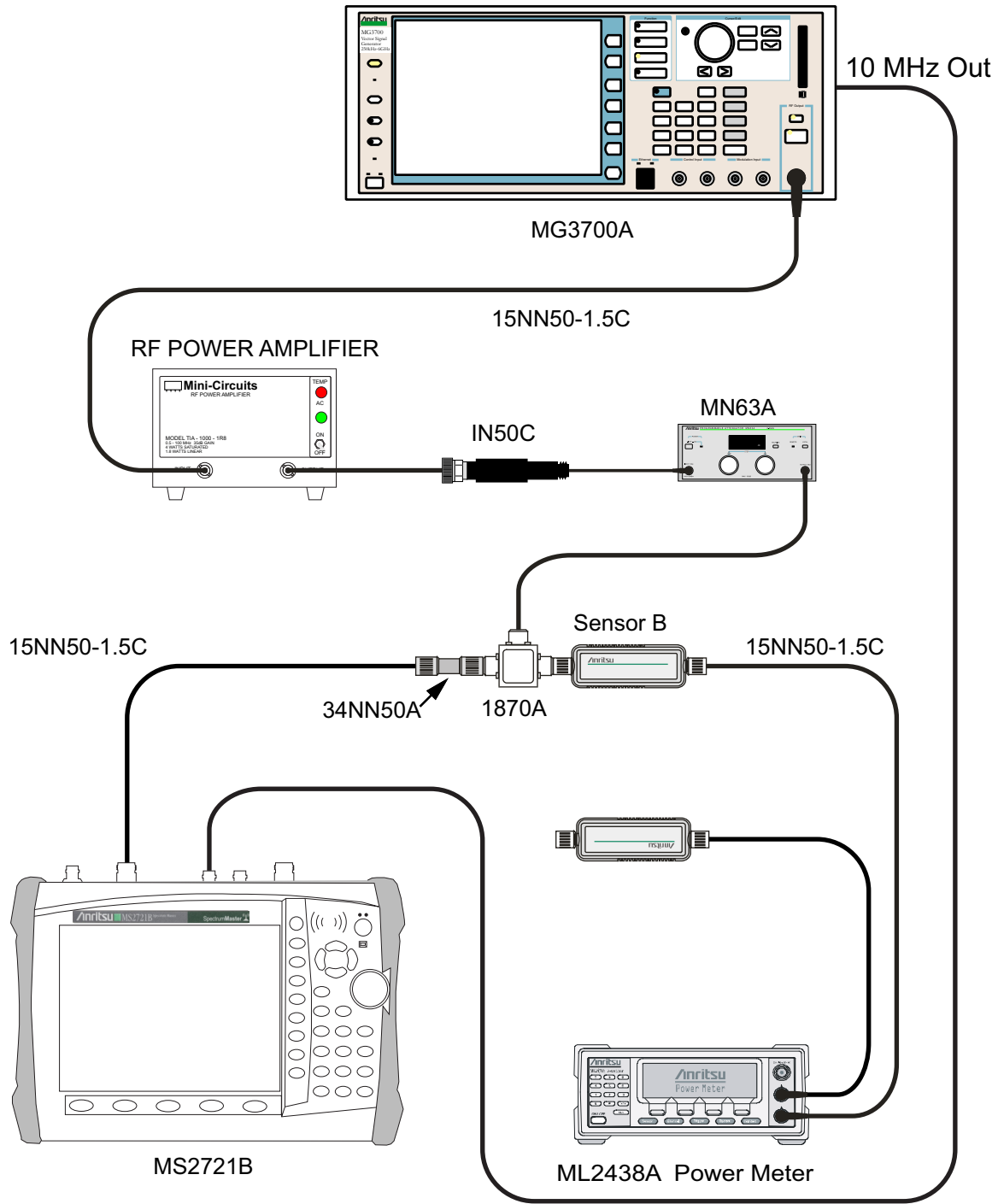


Figure 3-31. DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Sensor B Only

27. Record the new Power Meter Sensor B reading to the SB(-10) box in [Table A-164](#), “DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 78” on page A-52.
28. On the MS2721B, set the mode to DVB-T/H SFN Analyzer and preset the unit.
29. Press the **Meas Setup** function hard key and set Meas Mode to Single.
30. Press the **Frequency/Level** function hard key and ensure that Channel is 21 and Pre Amp is OFF.
31. Change the Reference Level to -10 dBm.

32. After the data appears on the left side of the display, record the -25 dBm Channel Power from the MS2721B to the “Pre Amp Off M(Level) (dBm)” column in [Table A-164](#).
33. Calculate the Deviation by using the following formula (Note that DAB(-10) and AT(-10) are from [Table A-161](#)):

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

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

34. Record the result to the “Pre Amp Off Dev (dB)” column in [Table A-164](#), and verify that it is within specification.
35. Set the MN63A attenuation to the next AT(set) value in [Table A-164](#).
36. Press the **Frequency/Level** function hard key and set the Reference Level of the MS2721B to -15 dBm.
37. After the data appears on the left side of the display, record the -15 dBm Channel Power from the MS2721B to the “Pre Amp Off M(Level) (dBm)” column in [Table A-164](#).
38. Calculate the Deviation by using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
39. Record the result to the “Pre Amp Off Dev (dB)” column in [Table A-164](#), and verify that it is within specification.
40. Set the MN63A attenuation to the next AT(set) value in [Table A-164](#).
41. Set the Reference Level of MS2721B to -20 dBm (or the Reference Level as indicated in the “Ref Level Pre Amp Off/On (dBm)” column of [Table A-164](#)).
42. After the data appears on the left side of the display, record the -20 dBm Channel Power (or the Channel Power as indicated in the “Ref Level Pre Amp Off/On (dBm)” column of [Table A-164](#)) from the MS2721B into the “Pre Amp Off M(Level) (dBm)” column in [Table A-164](#).
43. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
44. Record the result to the “Pre Amp Off Dev (dB)” column in [Table A-164](#), and verify that it is within specification.
45. Press the **Frequency/Level** function hard key and set Pre Amp to ON. Change Reference Level if required.
46. After the data appears on the left side of the display, record the -20 dBm Channel Power (or the Channel Power as indicated in the “Ref Level Pre Amp Off/On (dBm)” column of [Table A-164](#)) from the MS2721B into the “Pre Amp On M(Level) (dBm)” column in [Table A-164](#).
47. Calculate the Deviation using the following formula:

$$\text{Deviation} = \text{M(Level)} - \text{SB}(-10) - \text{DAB}(-10) - \text{AT}(-10) + \text{AT}(\text{set})$$
48. Record the result to the “Pre Amp On Dev (dB)” column in [Table A-164](#), and verify that it is within specification.
49. Repeat [Step 40](#) through [Step 48](#) for Test Levels -25 dBm to -45 dBm. Change Reference Level and switch Pre Amp per the “Ref Level Pre Amp Off/On (dBm)” column in [Table A-164](#).
50. Turn off the power amplifier, disconnect the power splitter from the MS2721B, reconnect Sensor A to the power splitter as shown in [Figure 3-30](#).
51. Set the MN63A attenuation to 10 dB.
52. Set the MG3700A Level to -60 dBm.
53. Turn on the power amplifier and allow it to warm up for at least 5 minutes.

54. Adjust the MN63A Attenuator so that the Sensor A reading is $-50 \text{ dBm} \pm 1 \text{ dBm}$. Record the attenuation reading as AT(-50) in [Table A-162, “Readings for Sensor A, Sensor B, DAB\(-50\), and MN63A Attenuation AT\(-50\), Option 78”](#) on page A-51.
55. On MG3700A adjust power level so that the Power Meter Sensor A reading is $-50.0 \text{ dBm} \pm 0.2 \text{ dBm}$.
56. Record Power Meter Sensor A reading, Power Meter Sensor B reading and MN63A Attenuation Reading in [Table A-162](#).
57. Subtract the Sensor A reading from the Sensor B reading and record the result to the “DAB(-50)” column of [Table A-162](#).
- $$\text{DAB}(-50) = \text{Sensor B Reading} - \text{Sensor A Reading}$$
58. Calculate the AT(set) values for Test Levels -55 dBm through -84 dBm and record the values to the AT(set) column in [Table A-164, “DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 78”](#) on page A-52.
59. Remove Sensor A from the Power Splitter and then connect the Power Splitter to the MS2721B Spectrum Analyzer RF In port with an N(m)-to-N(m) adapter as shown in [Figure 3-31](#).
60. Record the new Power Meter Sensor B reading to the “SB(-50)” box in [Table A-164](#).
61. Repeat [Step 40](#) through [Step 48](#) for Test levels -50 dBm to -84 dBm . Change Reference Level and switch the Pre Amp ON or OFF per the “Ref Level Pre Amp On/Off (dBm)” column in [Table A-164](#). Use the following formula to calculate Deviation (Note that DAB(-50) and AT(-50) are from [Table A-162](#)):
- $$\text{Deviation} = \text{M(Level)} - \text{SB}(-50) - \text{DAB}(-50) - \text{AT}(-50) + \text{AT}(\text{set})$$
62. Repeat [Step 16](#) through [Step 61](#) for frequencies 666 MHz (Ch 45) and 858 MHz (Ch 69). Set the calibration factor of both power sensors to 666 MHz or to 858 MHz as required.
- For 666 MHz, Channel 45, use [Table A-165, “DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 45ch at 666 MHz, Option 78”](#) on page A-53.
- For 858 MHz - Channel 69, use [Table A-166, “DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 69ch at 858 MHz, Option 78”](#) on page A-54.

1 dB Compression Level Verification

The tests in this section verify the accuracy of the MS2721B is not degraded by compression when operating in the DVB-T/H SFN Analyzer mode.

Required Equipment:

- Anritsu MG3700A Vector Signal Generator
- Power Meter, Anritsu Model ML2438A
- Programmable Attenuator, Anritsu Model MN63A
- RF Power Amplifier, Mini Circuits Model TIA-1000-1R8
- Power Sensor, Anritsu Model MA2482D (2)
- Power Splitter, Aeroflex/Weinschel Model 1870A
- Fixed Attenuator, Aeroflex/Weinschel Model 44-10
- RF Coaxial Cable, Anritsu Model 15NN50-1.5C (3)
- Adapter, Anritsu Model 34NN50A
- Midwest Microwave ADT-2615-NF-BNM-02 Adapters (2)
- Anritsu 1N50C RF Limiter
- Spectrum Master Model MS2721B

Procedure:

1. Ensure that the Power Amplifier is OFF.
2. On the Power Meter, set Low Level Averaging to “Low” and Averaging to “Moving” with 50 averages. Also set the Power Meter to read True RMS.
3. Perform a Zero/Cal on both sensors on the power meter.
4. Connect the MG3700A Signal Generator, Power Amplifier with N(f)-to-BNC(m) adapters, RF Limiter, MN63A Programmable Attenuator, Power Splitter, Power Meter, and Power Sensors as shown in [Figure 3-30, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Two Sensors” on page 3-114](#).
5. On the MG3700A, press the **MOD On/Off** button to turn off Modulation so that the **MOD On/Off** LED is OFF (not illuminated).
6. Set the Level output of the MG3700A to -25 dBm.
7. Set the MN63A attenuation to 20 dB.
8. Turn on the power amplifier and allow it to warm up at least 5 minutes.

474 MHz Tests

9. Set the calibration factor of both sensors to 474 MHz.
10. Set the MG3700A Frequency to 474 MHz.
11. Adjust the MN63A attenuation so that the Power Meter Sensor A reading is -25 dBm \pm 1 dBm, and record the MN63A attenuation readout in [Table A-163, “Readings for Sensor A and MN63A Attenuation AT\(-25\), AT\(-15\), AT\(-50\), and AT\(-43\), Option 78” on page A-51](#).
12. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-31, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Sensor B Only” on page 3-116](#).
13. Set the MS2721B to DVB-T/H SFN Analyzer mode and preset the unit.
14. Press the **Meas Setup** function hard key and set Meas Mode to Single.

15. Press the **Frequency/Level** function hard key and ensure that the MS2721B Channel is set to 21 and Pre Amp is OFF.
16. Set the Reference Level to -25 dBm.
17. Record the MS2721B Channel Power reading, MeasCP(-25), into the -25 dBm Test Level row of [Table A-167, "DVB-T/H SFN Analyzer 1 dB Compression Level Channel 21 474 MHz with Pre Amp OFF, Option 78" on page A-55.](#)
18. Calculate the difference, Delta(-25), by using the following formula:

$$\text{Delta}(-25) = M(\text{Sa}) - \text{MeasCP}(-25)$$
19. Record the result in the Delta (Δ) column in [Table A-167](#), and verify that the result is less than 1 dB.
20. Calculate AT(-15) using the following formula:

$$\text{AT}(-15) = \text{AT}(-25) - 10$$
21. Record AT(-15) in [Table A-163, "Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 78" on page A-51](#)
22. Set the MN63A attenuation to AT(-15).

Note The Over Range message on the MS2721B is normal.

23. Record the MS2721B Channel Power reading, MeasCP(-15), into the -15 dBm Test Level row of [Table A-167](#).
24. Calculate the Delta at -15 dBm Input by using the following formula:

$$\text{Delta}(-15) = M(\text{Sa}) + 10 - \text{MeasCP}(-15) + \text{Delta}(-25)$$
25. Record the result in the Delta (Δ) column in [Table A-167](#), and verify that it is less than 1 dB.
26. Calculate the value of AT(-50) by using the following formula:

$$\text{AT}(-50) = \text{AT}(-25) + 25$$
27. Record AT(-15) in [Table A-163](#)
28. Adjust the MN63A attenuation to AT(-50).
29. Set the Reference Level on the MS2721B to -50 dBm and turn the Pre Amp ON.
30. Record the MS2721B Channel Power reading, MeasCP(-50), into the -50 dBm Test Level row in [Table A-170, "DVB-T/H SFN Analyzer 1 dB Compression Level Channel 21 474 MHz with Pre Amp ON, Option 78" on page A-55.](#)
31. Calculate the Delta at -50 dBm Input, Delta(-50), by using the following formula:

$$\text{Delta}(-50) = M(\text{Sa}) - 25 - \text{MeasCP}(-50) + \text{Delta}(-25)$$
32. Record the result in the Delta (Δ) column in [Table A-170](#), and verify that it is less than 1 dB.
33. Calculate AT(-43) by using the following formula:

$$\text{AT}(-43) = \text{AT}(-25) + 18$$
34. Record AT(-15) in [Table A-163, "Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 78" on page A-51](#)
35. Set the MN63A attenuation to AT(-43).

Note The Over Range message on the MS2721B is normal.

36. Record the MS2721B Channel Power reading, MeasCP(-43), in the -43 dBm Test Level row in [Table A-170](#).

37. Calculate the Delta at -43 dBm Input, $\Delta(-43)$, by using the following formula:
- $$\Delta(-43) = M(Sa) - 18 - \text{MeasCP}(-43) + \text{Dev}(-50)$$
38. Record the result to the Delta (Δ) column in [Table A-170](#), and verify that it is less than 1 dB.

666 MHz Tests

39. Remove the MS2721B from the test setup and reinstall Sensor A to the open splitter output as shown in [Figure 3-30, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Two Sensors”](#) on page 3-114.
40. Set the MG3700A Frequency to 666 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
41. Set the calibration factor of both sensors to 666 MHz.
42. Adjust the MN63A attenuation so that Power Meter Sensor A reads -25 dBm \pm 1 dBm. Record the MN63A attenuation readout to the AT(-25) column in [Table A-163, “Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 78”](#) on page A-51.
43. Adjust the Level of the MG3700A so that Power Meter Sensor A reads -25.0 dBm \pm 0.05 dBm. Record the Sensor A reading into the M(Sa) column in [Table A-163](#).
44. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-31, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-116.
45. Set the MS2721B Channel to 45.
46. Set Pre Amp to OFF and Reference Level to -25 dBm.
47. Repeat [Step 17](#) through [Step 38](#), using [Table A-168, “DVB-T/H SFN Analyzer 1 dB Compression Level Channel 45 666 MHz with Pre Amp OFF, Option 78”](#) on page A-55, [Table A-171, “DVB-T/H SFN Analyzer 1 dB Compression Level Channel 45 666 MHz with Pre Amp ON, Option 78”](#) on page A-55, and [Table A-163, “Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 78”](#) on page A-51.

858 MHz Tests

48. Remove the MS2721B from the test setup and reinstall Sensor A to the open splitter output as shown above in [Figure 3-30, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Two Sensors”](#) on page 3-114.
49. Set the MG3700A Frequency to 858 MHz and ensure that the **Mod On/Off** LED is OFF (not illuminated).
50. Set the calibration factor of both sensors to 858 MHz.
51. Adjust the MN63A attenuation so that Power Meter Sensor A reads -25 dBm \pm 1 dBm. Record the MN63A attenuation readout to the AT(-25) column in [Table A-163, “Readings for Sensor A and MN63A Attenuation AT\(\$-25\$ \), AT\(\$-15\$ \), AT\(\$-50\$ \), and AT\(\$-43\$ \), Option 78”](#) on page A-51.
52. Adjust the Level of the MG3700A so that the Power Meter Sensor A reading is -25.0 dBm \pm 0.05 dBm. Record the Sensor A reading to the M(Sa) column in [Table A-163](#).
53. Remove Sensor A from the splitter and connect the MS2721B RF In port to the open end of the splitter using an adapter as shown in [Figure 3-31, “DVB-T/H SFN Option 78 – Level Accuracy Verification Setup – Sensor B Only”](#) on page 3-116.
54. Set the MS2721B Channel to 69.
55. Set Pre Amp to OFF and Reference Level to -25 dBm.

56. Repeat Step 17 through Step 38, using Table A-169, “DVB-T/H SFN Analyzer 1 dB Compression Level Channel 69 858 MHz with Pre Amp OFF, Option 78” on page A-55, Table A-172, “DVB-T/H SFN Analyzer 1 dB Compression Level Channel 69 858 MHz with Pre Amp ON, Option 78” on page A-55, and Table A-163, “Readings for Sensor A and MN63A Attenuation AT(−25), AT(−15), AT(−50), and AT(−43), Option 78” on page A-51.

Noise Floor Verification

The tests in this section verify the noise floor of the MS2721B in DVB-T/H SFN Analyzer mode.

Required Equipment:

- 50 ohm termination, Anritsu Model 28N50-2
- Spectrum Master Model MS2721B

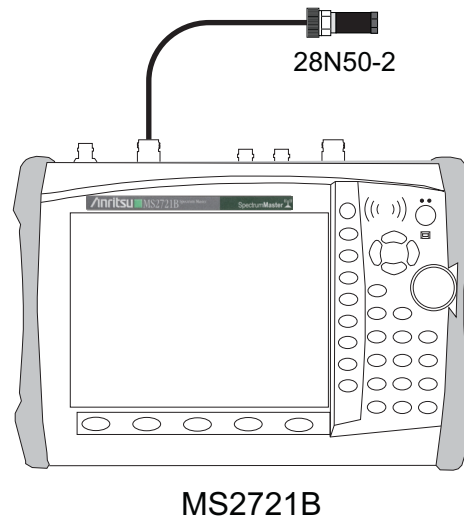


Figure 3-32.

Procedure:

1. Set the mode of the MS2721B to DVB-T/H SFN Analyzer and preset the unit.
2. Install a 50 ohm termination to the Spectrum Analyzer RF In connector.
3. Ensure that the Channel is set to 21 and the Pre Amp is OFF.
4. Set the Reference Level to -25 dBm.
5. Record the Channel Power [dBm] as shown in the lower-left corner of the display in [Table A-173](#), “DVB-T/H SFN Analyzer Noise Floor Pre Amp OFF, Option 78” on page A-56.
6. Set the Pre Amp to ON and change the Reference Level to -50 dBm.
7. Record the Power [dBm] as shown in the lower-left corner of the display in [Table A-174](#), “DVB-T/H SFN Analyzer Noise Floor Pre Amp ON, Option 78” on page A-56.
8. Change the channel to Channel 45, and set the Pre Amp to OFF.
9. Repeat [Step 4](#) through [Step 7](#) for Channel 45, using [Table A-173](#) and [Table A-174](#).
10. Change the channel to Channel 69, set Pre Amp to OFF.
11. Repeat [Step 4](#) through [Step 7](#) for Channel 69, using [Table A-173](#) and [Table A-174](#).

Chapter 4 — Remove and Replace

4-1 Introduction

Only qualified personnel should open the case and replace internal assemblies. Assemblies that are shown in the replaceable parts list are typically the only items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without specialized training.

Caution Removing RF shields from PC boards or adjusting screws on or near the shields may detune sensitive RF circuits and will result in degraded instrument performance.

Caution An Electrostatic Discharge (ESD) safe work area and proper ESD handling procedures (that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007) are mandatory to avoid ESD damage when handling subassemblies or components that are found in the MS2721B.

Additional information pertaining to ESD can be found at the ESD Association Web site:

<http://www.esda.org/s2020.html>

4-2 Remove and Replace Instructions

Note Some of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations are representative and may show instruments other than the MS2721B.

4-3 Battery Pack Removal and Replacement

This section provides instructions for removing and replacing the MS2721B battery pack.

1. With the MS2721B laying flat, face up, on a stable surface, locate the battery access door, as illustrated in [Figure 4-1](#).

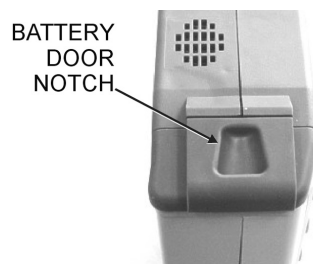


Figure 4-1. Battery Access Door Notch

2. Place a finger in the battery access door notch and push the door downward, towards the bottom of the instrument.

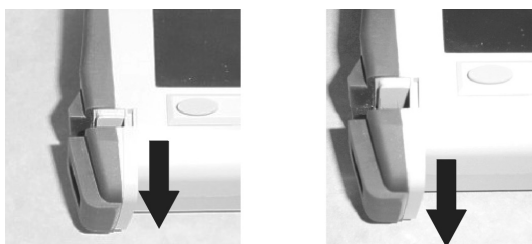


Figure 4-2. Removing the Battery Access Door

3. Remove the battery access door.
4. With the battery access door completely removed, grasp the flexible handle of the battery and pull the battery straight out of the instrument ([Figure 4-3](#)).



Figure 4-3. Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the instrument ([Figure 4-4](#)).

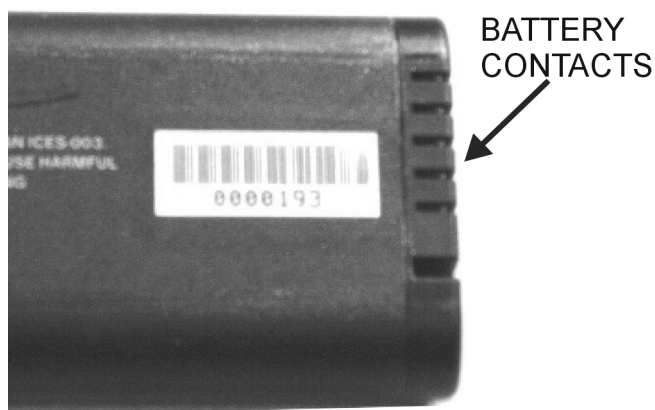


Figure 4-4. Battery Contacts

Battery Pack Information

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

- The battery pack supplied with the MS2721B may need charging before use. Before using the MS2721B, the internal battery may be charged either in the MS2721B, using either the AC-DC Adapter or the 12-Volt DC adapter, or separately in the optional Dual Battery Charger.
- Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS2721B, but are electrically incompatible and will not charge correctly.
- Recharge the battery only in the MS2721B or in an Anritsu approved charger.
- When the MS2721B 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.

4-4 Opening the MS2721B Case

This procedure provides instructions for opening the case. Except for keypad parts replacement (see instructions later in this section), the case must be opened for all maintenance operations. Part numbers for all replaceable parts are found in section “[Replaceable Parts](#)” on page 1-4.

Caution

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

Note

Before opening the case, Anritsu Company strongly recommends that all internally saved files be saved to a PC by using the Master Software Tools utility program or that they be copied to an external CF card on the MS2721B. In the event that the Main PCB needs to be replaced, this will prevent permanent loss of these files.

1. Use a Phillips screwdriver to remove the four screws that secure the two halves of the case together.

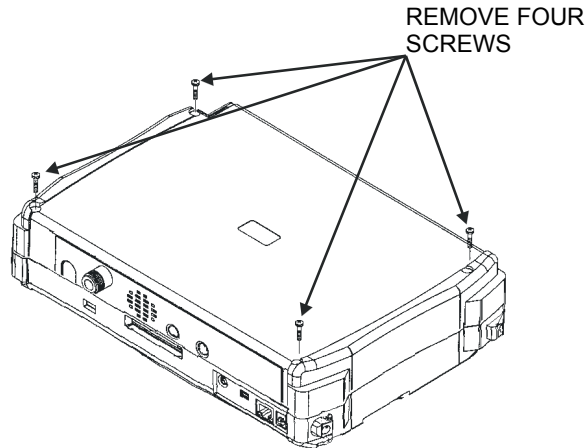


Figure 4-5. Removing the Cover Screws

2. Stand up the instrument in the normal operating position and remove the battery door by inserting a thumb into the notch and pushing downward (refer to [Section 4-3 “Battery Pack Removal and Replacement”](#) on page 4-1).
3. If the instrument has Option 31 (GPS), then use a T1451 socket to remove the special decorative nut on the RF panel.
4. Separate the two halves by about two inches. Several cables must be disconnected before the two halves can be fully separated.



Figure 4-6. Separate the Two Halves of the Case

5. Under the DC Power In connector is a ribbon cable. Disconnect either side of this ribbon cable.
6. Unplug the two RF cables (100M SPA and 37.8M IN) that are plugged into the Main PCB.
7. Unplug the Ext Ref In and Ext Trigger In cables from the Main PCB.
8. If the instrument has Option 31, then push the connector downward through the panel. The two halves of the MS2721B can now be completely separated.
9. If the instrument has Option 31, then securely tape the Option 31 connector to an RF shield on the Main PCB so that the weight of the GPS connector does not strain the GPS wire.
10. Reassembly is the reverse of disassembly.

Note

Verify that gasket material around the edge of the instrument is in good condition and pressed securely into the grooves in the covers before reassembling the instrument. If necessary, replace damaged gasket material. (For the part number, refer to [“Replaceable Parts” on page 1-4.](#))

4-5 Removal of the Spectrum Analyzer PCB

Figure 4-7 shows the spectrum analyzer PCB in the case.

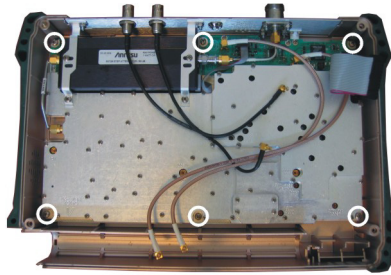


Figure 4-7. Spectrum Analyzer PCB and Retaining Screws

Remove the six larger screws around the edge of the PCB (circled in the figure) to release the board from the case. Do not remove or adjust any smaller screws that pass through the RF shields. Do not loosen or remove the step attenuator or any cables.

4-6 Removal and Replacement of the Tracking Generator (Option 20)

If Option 20 is installed, then the tracking generator module is mounted over the Spectrum Analyzer PCB. To remove the tracking generator module:

1. Remove the semi-rigid and flexible cables from the tracking generator module.
2. Remove the 8 screws that secure the tracking generator module to the SPA PCB. The screws are labeled with the letters A, B, and C engraved in the cover (four labeled A, three labeled B, and one labeled C).
3. Two RF connectors (SMP type) are located under the tracking generator module. They connect it to the SPA PCB. Carefully lift the tracking generator module straight up off of the SPA PCB.

The RF connectors may be removed by using padded-jaw or other pliers, but can be damaged by this process. Replacement RF connectors are included in the tracking generator replacement kit, but if the spectrum analyzer board is to be returned, replacement connectors are not included. Replacement RF connectors can be ordered. (Refer to [“Replaceable Parts” on page 1-4](#)).

The tracking generator exchange kit does not include the semi-rigid RF cable that is attached to the tracking generator module nor the connector panel Type N connector. Retain these items for reuse with the replacement tracking generator.

4. Installation of the replacement tracking generator is the opposite of removal. No recalibration is required.

4-7 Removal of the Main PCB/LCD Assembly

1. Push the external CF card ejector button to the IN position.
2. Unplug the cables to the fan, battery pack connector, and knob from the Main PCB.
3. Remove the 8 screws around the edge of the board to release the PCB/LCD assembly from the case.
4. Carefully lift the Main PCB/LCD assembly out of the case.

4-8 Main PCB Assembly Replacement

Replacement of the Main PCB and the Spectrum Analyzer PCB is the opposite of removal.

The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. Refer to [“Replaceable Parts” on page 1-4](#), for the correct part number for the set.

If the instrument is equipped with Option 9, then leave the Option 9 PCB on the Main PCB when returning the assembly to the factory for repair.

1. Verify that all wires of the LCD bias cable are pushed under the backlight driver PCB where they cannot interfere with the keyboard connector.
2. After replacement of the Main PCB/Spectrum Analyzer PCB assembly, the instrument serial number that is found on the outside rear (bottom) cover should be electronically saved to the Main PCB. To save the serial number:
 - a. Enter the Service Mode as shown in [Figure 2-2 on page 2-5](#).
 - b. Select Service Menu / Set External Serial #.
 - c. Using the keypad, enter the seven digit serial number, then press **Enter**.
 - d. Cycle the power to exit Service Mode.

4-9 Removal of the LCD and Backlight Driver PCB from the Main PCB

1. Using a tool such as tweezers or a knife blade, gently unplug one end of the 4 cm long LCD digital data cable (wraps around the edge of the Main PCB).
2. Unplug the 8-wire bias cable that connects between the backlight driver PCB and the Main PCB.
3. Unplug the "high voltage" wires (usually pink and white) at the connector on the backlight driver PCB.
4. Remove the 4 screws that attach the LCD to the Main PCB.
5. Remove the two screws that attach the backlight driver PCB to the Main PCB and lift off the LCD and backlight driver PCB.

4-10 Main PCB Real Time Clock (RTC) Battery Removal and Replacement

1. Refer to [Figure 4-8](#) for the location of the RTC battery (circled). Refer to [“Replaceable Parts”](#) on page 1-4 for the replacement part number.

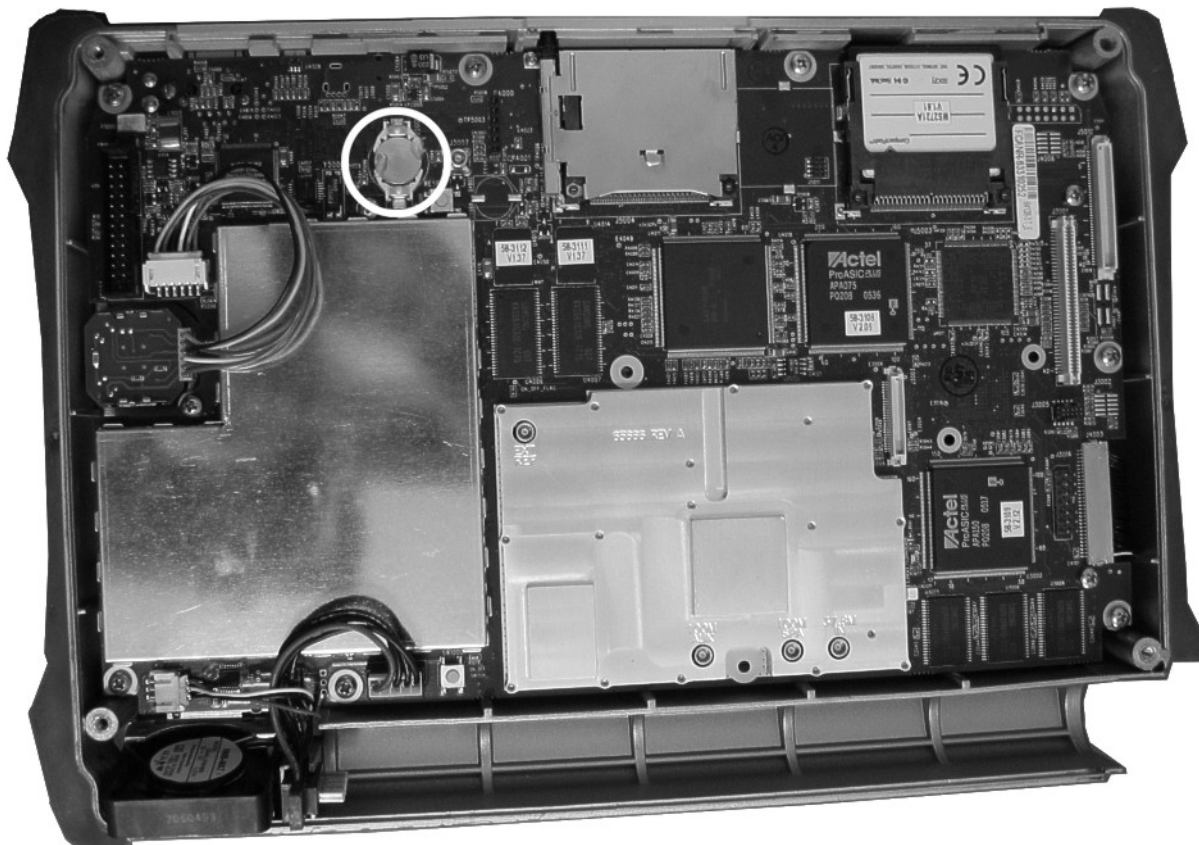


Figure 4-8. Real Time Clock (RTC) Battery

2. Remove the old battery and install the new battery with the positive (+) side facing up.
3. Apply two small drops of RTV compound bridging the top of the battery and the holder as an extra precaution to hold the battery securely.

4-11 Main (Numeric) Keypad Membrane and PCB Replacement

This procedure provides instructions for removing and replacing the main keypad (numeric) membrane and PCB. All keypad parts can be replaced without opening the MS2721B case.

1. Place the instrument face up on a protected work surface.
2. Seven locking tabs hold the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane (Figure 4-9 and Figure 4-10).



ARROWS POINT TO
FRONT BEZEL
LOCKING TAB LOCATIONS

Figure 4-9. Front Bezel



FUNCTION KEY
MEMBRANE

Figure 4-10. Function Key Membrane

3. Remove the keypad membrane by carefully lifting the speaker and pulling the membrane off of the keypad PCB.

Note The speaker is held in place by 4 locating pins on the inside of the keypad bezel. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Use care not to damage the speaker wires when removing or replacing the keypad membrane or PCB.

4-12 Replacing the Function Key Keypad

1. Disconnect the function key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad ([Figure 4-11](#)).



Figure 4-11. Function Key Keypad

2. Remove the keypad PCB, taking care not to damage the speaker wires.

3. Reverse the above steps to install the replacement assembly, with the following cautions:
 - a. Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should "snap" into position when fully closed.
 - b. Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB.
 - c. The speaker is held in place by 4 locating pins on the inside of the keypad bezel. Verify that the 4 locating pins are properly seated into the 4 corner holes of the speaker when reinstalling the bezel.
 - d. Verify that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

4-13 Function Key Membrane and Switchpad Replacement

This procedure provides instructions for replacing the function key membrane and switchpad. All keypad parts can be replaced without opening the MS2721B case.

1. Place the instrument face up on a static protected work surface.
2. Remove the keypad bezel and membrane as directed in the section immediately above.
3. Six locking tabs hold the function key bezel to the case. Using a small flat blade screwdriver or knife blade, carefully pry the function key bezel locking tabs free of the main body of the case. This will expose the function key membrane.
4. Remove the function key membrane by gently pulling the membrane up and away from the front panel (Figure 4-12).

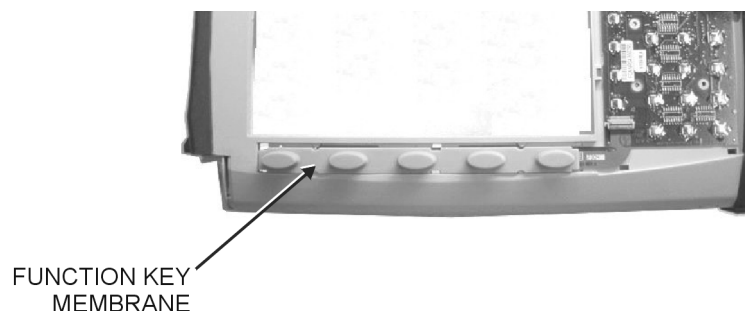


Figure 4-12. Function Key Membrane and Switchpad

5. Disconnect the function key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad.
6. Reverse the above steps to install the replacement switchpad or membrane.
7. Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should "snap" into position when fully closed.

Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the MS2721B. We recommend that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which can allow you to observe trends.

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Spectrum Analyzer Function Verification

Spectrum Analyzer Frequency Accuracy

Table A-1. Spectrum Analyzer Frequency Accuracy

| Frequency | Measured Value | Error | Specification |
|-----------|----------------|-------|---------------|
| 1 GHz | GHz | Hz | ± 1,300 Hz |
| 7 GHz | GHz | Hz | ± 9.1 kHz |

Spectrum Analyzer SSB Phase Noise Verification

Table A-2. Spectrum Analyzer SSB Phase Noise Verification

| Frequency | Measured Value | Specification |
|-----------|----------------|---------------|
| 10 kHz | dBc/Hz | -100 dBc/Hz |
| 20 kHz | dBc/Hz | -100 dBc/Hz |
| 30 kHz | dBc/Hz | -100 dBc/Hz |
| 100 kHz | dBc/Hz | -100 dBc/Hz |

Spectrum Analyzer Resolution Bandwidth Accuracy

Table A-3. Spectrum Analyzer Resolution Bandwidth Accuracy

| RBW Setting | Span | VBW | Measured Value | Specification |
|-------------|---------------|------|----------------|--------------------|
| 3 MHz | 4.5 MHz | Auto | Hz | 2.7 MHz to 3.3 MHz |
| 1 MHz | 1.5 MHz | Auto | Hz | 900 kHz to 1.1 MHz |
| 300 kHz | 450 kHz | Auto | Hz | 270 kHz to 330 kHz |
| 100 kHz | 150 kHz | Auto | Hz | 90 kHz to 110 kHz |
| 30 kHz | 45 kHz | Auto | Hz | 27 kHz to 33 kHz |
| 10 kHz | 15 kHz | Auto | Hz | 9 kHz to 11 kHz |
| 3 kHz | 4.5 kHz | Auto | Hz | 2.7 kHz to 3.3 kHz |
| 1 kHz | 2 kHz | Auto | Hz | 900 Hz to 1.1 kHz |
| 300 Hz | 450 Hz | Auto | Hz | 270 Hz to 330 Hz |
| 100 Hz | 150 Hz | Auto | Hz | 90 Hz to 110 Hz |
| 30 Hz | 50 Hz | 3 Hz | Hz | 27 Hz to 33 Hz |
| 10 Hz | 30 Hz | 3 Hz | Hz | 9 Hz to 11 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Spectrum Analyzer Second Harmonic Distortion

Table A-4. Spectrum Analyzer Second Harmonic Distortion

| Frequency | Measured Value | Second Harmonic Distortion | Specification |
|-----------|----------------|----------------------------|---------------|
| 50.1 MHz | dBm | dBc | -50 dBc max. |
| 100.2 MHz | dBm | | |

Spectrum Analyzer Third Order Intercept (TOI)

Table A-5. 600 MHz TOI Test

| Frequency | Measured Amplitude |
|-------------|--------------------|
| 600.151 MHz | dBm |
| 599.851 MHz | dBm |

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

Enter calculated TOI value in [Table A-7](#).

Table A-6. 3.5 GHz TOI Test

| Frequency | Measured Amplitude |
|--------------|--------------------|
| 3.500151 GHz | dBm |
| 3.499851 GHz | dBm |

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

Enter calculated TOI value in [Table A-7](#).

Table A-7. Spectrum Analyzer Calculated Third Order Intercept

| Third Order Intercept at | Calculated Value | Specification |
|--------------------------|------------------|---------------|
| 600 MHz | dBm | $\geq +7$ dBm |
| 3.5 GHz | dBm | $\geq +9$ dBm |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Spectrum Analyzer DANL

Table A-8. Spectrum Analyzer DANL (Pre Amp On)

| Start Frequency | Stop Frequency | RBW | VBW | Measured Power (100k RBW) | Calculated Power (1 Hz RBW) | 1 Hz Specification |
|-----------------|----------------|---------|--------|---------------------------|-----------------------------|--------------------|
| 10 MHz | 1.0 GHz | 100 kHz | 1 kHz | dBm | dBm | ≥ -161 dBm |
| 1.0 GHz | 2.2 GHz | 100 kHz | 1 kHz | dBm | dBm | ≥ -159 dBm |
| 2.2 GHz | 2.8 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -153 dBm |
| 2.8 GHz | 4.0 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -159 dBm |
| 4.0 GHz | 7.1 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -154 dBm |

Table A-9. Spectrum Analyzer DANL (Pre Amp Off)

| Start Frequency | Stop Frequency | RBW | VBW | Measured Power (100k RBW) | Calculated Power (1 Hz RBW) | 1 Hz Specification |
|-----------------|----------------|---------|--------|---------------------------|-----------------------------|--------------------|
| 10 MHz | 1.0 GHz | 100 kHz | 1 kHz | dBm | dBm | ≥ -137 dBm |
| 1.0 GHz | 2.2 GHz | 100 kHz | 1 kHz | dBm | dBm | ≥ -133 dBm |
| 2.2 GHz | 2.8 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -126 dBm |
| 2.8 GHz | 4.0 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -136 dBm |
| 4.0 GHz | 7.1 GHz | 100 kHz | 300 Hz | dBm | dBm | ≥ -127 dBm |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Spectrum Analyzer Residual Spurious

Table A-10. Spectrum Analyzer Residual Spurious (Pre Amp On)

| Start Frequency | Stop Frequency | Measured Value | Specification |
|-----------------|----------------|----------------|---------------|
| 100 kHz | 10 MHz | dBm | ≤ -100 dBm |
| 10 MHz | 1 GHz | dBm | ≤ -100 dBm |
| 1 GHz | 2 GHz | dBm | ≤ -100 dBm |
| 2 GHz | 3 GHz | dBm | ≤ -100 dBm |
| 3 GHz | 4 GHz | dBm | ≤ -100 dBm |
| 4 GHz | 5 GHz | dBm | ≤ -100 dBm |
| 5 GHz | 6 GHz | dBm | ≤ -100 dBm |
| 6 GHz | 7.1 GHz | dBm | ≤ -100 dBm |

Table A-11. Spectrum Analyzer Residual Spurious (Pre Amp Off)

| Start Frequency | Stop Frequency | RBW | VBW | Marker 1 Reading | Specification |
|-----------------|----------------|--------|--------|------------------|---------------|
| 100 kHz | 10 MHz | 3 kHz | 300 Hz | dBm | ≤ -90 dBm |
| 10 MHz | 1.0 GHz | 30 kHz | 1 kHz | dBm | ≤ -90 dBm |
| 1.0 GHz | 2.2 GHz | 10 kHz | 300 Hz | dBm | ≤ -90 dBm |
| 2.2 GHz | 2.7 GHz | 1 kHz | 300 Hz | dBm | ≤ -90 dBm |
| 2.7 GHz | 2.8 GHz | 1 kHz | 100 Hz | dBm | ≤ -90 dBm |
| 2.8 GHz | 3.199 GHz | 10 kHz | 300 Hz | dBm | ≤ -90 dBm |
| 3.2 GHz | 4.009 GHz | 30 kHz | 1 kHz | dBm | ≤ -84 dBm |
| 4.009 GHz | 5.083 GHz | 10 kHz | 300 Hz | dBm | ≤ -84 dBm |
| 5.083 GHz | 5.895 GHz | 10 kHz | 100 Hz | dBm | ≤ -84 dBm |
| 5.895 GHz | 7.1 GHz | 10 kHz | 100 Hz | dBm | ≤ -84 dBm |

Table A-12. Spectrum Analyzer Residual Spurious (Pre Amp Off) – Exceptions

| Exceptions | Frequency | Spur Level |
|------------|-------------------------------|----------------|
| | 250 MHz, 300 MHz, and 250 MHz | ≤ -85 dBm max. |
| | ~ 4010 MHz | ≤ -80 dBm max. |
| | ~ 5084 MHz | ≤ -70 dBm max. |
| | ~ 5894 MHz | ≤ -75 dBm max. |
| | ~ 7028 MHz | ≤ -80 dBm max. |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Spectrum Analyzer Input-Related Spurious Verification

Input Related Spurs for –30 dBm input at 1674 MHz

Table A-13. Measured Input signal level at 1674 MHz

| Measured Input signal level at 1674 MHz | |
|---|--|
| dBm | |

Table A-14. Calculated Input signal level at 1674 MHz

| Start Frequency | Stop Frequency | Measured Spur Level | Calculated IRS | Specification |
|-----------------|----------------|---------------------|----------------|---------------|
| 100 kHz | 1673 MHz | dBm | dBc | –60 dBc max. |
| 1675 MHz | 2800 MHz | dBm | dBc | –60 dBc max. |

Input Related Spurs for –30 dBm input at 1701 MHz

Table A-15. Measured Input signal level at 1701 MHz

| Measured Input signal level at 1701 MHz | |
|---|--|
| dBm | |

Table A-16. Calculated Input signal level at 1701 MHz

| Start Frequency | Stop Frequency | Measured Spur Level | Calculated IRS | Specification |
|-----------------|----------------|---------------------|----------------|---------------|
| 26 MHz | 28 MHz | dBm | dBc | –60 dBc max. |

Input Related Spurs for –30 dBm input at 2145 MHz

Table A-17. Measured Input signal level at 2145 MHz

| Measured Input signal level at 2145 MHz | |
|---|--|
| dBm | |

Table A-18. Calculated Input signal level at 2145 MHz

| Start Frequency | Stop Frequency | Measured Spur Level | Calculated IRS | Specification |
|-----------------|----------------|---------------------|----------------|---------------|
| 470 MHz | 472 MHz | dBm | dBc | –60 dBc max. |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Spectrum Analyzer Amplitude Accuracy Verification

50 MHz Amplitude Accuracy Verification

Table A-19. Characterization Chart for 50 MHz Amplitude Accuracy Verification

| Test Power level at 50 MHz | Required Sensor B Reading |
|----------------------------|---------------------------|
| 0 dBm | dBm |
| -4 dBm | dBm |
| -10 dBm | dBm |
| -14 dBm | dBm |
| -20 dBm | dBm |
| -24 dBm | dBm |
| -30 dBm | dBm |
| -34 dBm | dBm |
| -40 dBm | dBm |
| -44 dBm | dBm |
| -50 dBm | dBm |

Table A-20. 50 MHz Amplitude Accuracy Verification

| Input Power Level | Reference Level | Input Attenuation Level | Measured Reading | Specification |
|-------------------|-----------------|-------------------------|------------------|---------------|
| 0 dBm | 10 dBm | 30 dB | dBm | ± 1.25 dBm |
| -4 dBm | 10 dBm | 30 dB | dBm | ± 1.25 dBm |
| -10 dBm | 0 dBm | 20 dB | dBm | ± 1.25 dBm |
| -14 dBm | 0 dBm | 20 dB | dBm | ± 1.25 dBm |
| -20 dBm | -10 dBm | 10 dB | dBm | ± 1.25 dBm |
| -24 dBm | -10 dBm | 10 dB | dBm | ± 1.25 dBm |
| -30 dBm | -20 dBm | 0 dB | dBm | ± 1.25 dBm |
| -34 dBm | -20 dBm | 0 dB | dBm | ± 1.25 dBm |
| -40 dBm | -30 dBm | 0 dB | dBm | ± 1.25 dBm |
| -44 dBm | -30 dBm | 0 dB | dBm | ± 1.25 dBm |
| -50 dBm | -40 dBm | 0 dB | dBm | ± 1.25 dBm |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Spectrum Analyzer Amplitude Accuracy Verification (continued)

Amplitude Accuracy Across Frequency Verification

Table A-21. Characterization Chart for Fixed Level with Varying Frequency, Amplitude Accuracy

| Frequency | -2 dBm | -30 dBm |
|-----------|--------|---------|
| 10.1 MHz | dBm | dBm |
| 50 MHz | dBm | dBm |
| 100 MHz | dBm | dBm |
| 500 MHz | dBm | dBm |
| 1000 MHz | dBm | dBm |
| 2000 MHz | dBm | dBm |
| 3000 MHz | dBm | dBm |
| 4000 MHz | dBm | dBm |
| 5000 MHz | dBm | dBm |
| 6000 MHz | dBm | dBm |
| 7000 MHz | dBm | dBm |

Table A-22. Amplitude Accuracy Across Frequency Verification at 10.1 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

Table A-23. Amplitude Accuracy Across Frequency Verification at 50 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-24. Amplitude Accuracy Across Frequency Verification at 100 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-25. Amplitude Accuracy Across Frequency Verification at 500 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

Table A-26. Amplitude Accuracy Across Frequency Verification at 1000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-27. Amplitude Accuracy Across Frequency Verification at 2000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-28. Amplitude Accuracy Across Frequency Verification at 3000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

Table A-29. Amplitude Accuracy Across Frequency Verification at 4000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.25 dB |
| -30 dBm | 5 dB | dBm | ± 1.25 dB |
| -30 dBm | 10 dB | dBm | ± 1.25 dB |
| -30 dBm | 20 dB | dBm | ± 1.25 dB |
| -2 dBm | 30 dB | dBm | ± 1.25 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-30. Amplitude Accuracy Across Frequency Verification at 5000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.75 dB |
| -30 dBm | 5 dB | dBm | ± 1.75 dB |
| -30 dBm | 10 dB | dBm | ± 1.75 dB |
| -30 dBm | 20 dB | dBm | ± 1.75 dB |
| -2 dBm | 30 dB | dBm | ± 1.75 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

Table A-31. Amplitude Accuracy Across Frequency Verification at 6000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.75 dB |
| -30 dBm | 5 dB | dBm | ± 1.75 dB |
| -30 dBm | 10 dB | dBm | ± 1.75 dB |
| -30 dBm | 20 dB | dBm | ± 1.75 dB |
| -2 dBm | 30 dB | dBm | ± 1.75 dB |
| -2 dBm | 40 dB | dBm | ± 1.75 dB |
| -2 dBm | 50 dB | dBm | ± 1.75 dB |
| -2 dBm | 60 dB | dBm | ± 1.75 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Amplitude Accuracy Across Frequency Verification (continued)

Table A-32. Amplitude Accuracy Across Frequency Verification at 7000 MHz

| Input Power | Attenuation Level | Marker 1 Reading | Specification |
|-------------|-------------------|------------------|---------------|
| -30 dBm | 0 dB | dBm | ± 1.75 dB |
| -30 dBm | 5 dB | dBm | ± 1.75 dB |
| -30 dBm | 10 dB | dBm | ± 1.75 dB |
| -30 dBm | 20 dB | dBm | ± 1.75 dB |
| -2 dBm | 30 dB | dBm | ± 1.75 dB |
| -2 dBm | 40 dB | dBm | ± 2 dB |
| -2 dBm | 50 dB | dBm | ± 2 dB |
| -2 dBm | 60 dB | dBm | ± 3 dB |

9 kHz to 100 kHz Amplitude Accuracy Verification

Characterization Charts

Table A-33. Measured VM1, -20 dBm Reference voltage at 100 kHz (23.315 mV ± 0.5 mV)

| Measured VM1 |
|--------------|
| mV |

Table A-34. Characterization Chart for 9 kHz to 100 kHz Amplitude Accuracy Verification

| Frequency | Measured VM2 | Correction Factor | Calculated P _{in} |
|-----------|--------------|-------------------|----------------------------|
| 9.5 kHz | mV | 0.047 dB | dBm |
| 55 kHz | mV | 0.002 dB | dBm |
| 95 kHz | mV | 0.000 dB | dBm |

Test Results

Table A-35. 9 kHz to 100 kHz Amplitude Accuracy Verification

| At Freq | Calculated P _{in} | Marker 1 Reading | Error | Specification |
|---------|----------------------------|------------------|-------|---------------|
| 9.5 kHz | dBm | dBm | dB | ± 1.5 dB |
| 55 kHz | dBm | dBm | dB | ± 1.5 dB |
| 95 kHz | dBm | dBm | dB | ± 1.5 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

Spectrum Analyzer RF Input VSWR Verification

Table A-36. Spectrum Analyzer RF Input VSWR Verification

| Attenuation VSWR | VNMS Marker Reading | Specification |
|------------------|---------------------|---------------|
| 10 dB | | $\leq 2.0:1$ |
| 20 dB | | $\leq 2.0:1$ |
| 60 dB | | $\leq 2.0:1$ |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 20 Tracking Generator

Table A-37. Frequency Accuracy – Tracking Generator (Option 20)

| Frequency | Measured Value | Specification |
|-----------|----------------|---------------|
| 1 GHz | GHz | ± 1300 Hz |

Table A-38. Level Accuracy 450 MHz – Tracking Generator (Option 20)

| Test Level | Measured Power | Error | Specification |
|------------|----------------|-------|---------------|
| 0 dBm | dBm | dB | ± 1.5 dB |
| -19.5 dBm | dBm | dB | ± 1.5 dB |
| -40 dBm | dBm | dB | ± 1.5 dB |

Table A-39. Level Accuracy 975 MHz – Tracking Generator (Option 20)

| Test Level | Measured Power | Error | Specification |
|------------|----------------|-------|---------------|
| 0 dBm | dBm | dB | ± 1.5 dB |
| -19.5 dBm | dBm | dB | ± 1.5 dB |
| -40 dBm | dBm | dB | ± 1.5 dB |

Table A-40. Level Accuracy 2975 MHz – Tracking Generator (Option 20)

| Test Level | Measured Power | Error | Specification |
|------------|----------------|-------|---------------|
| 0 dBm | dBm | dB | ± 1.5 dB |
| -19.5 dBm | dBm | dB | ± 1.5 dB |
| -40 dBm | dBm | dB | ± 1.5 dB |

Table A-41. Level Accuracy 4975 MHz – Tracking Generator (Option 20)

| Test Level | Measured Power | Error | Specification |
|------------|----------------|-------|---------------|
| 0 dBm | dBm | dB | ± 1.5 dB |
| -19.5 dBm | dBm | dB | ± 1.5 dB |
| -40 dBm | dBm | dB | ± 1.5 dB |

Table A-42. Level Accuracy 7075 MHz – Tracking Generator (Option 20)

| Test Level | Measured Power | Error | Specification |
|------------|----------------|-------|---------------|
| 0 dBm | dBm | dB | ± 1.5 dB |
| -19.5 dBm | dBm | dB | ± 1.5 dB |
| -40 dBm | dBm | dB | ± 1.5 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification

Frequency Accuracy and Residual MER Verification

Table A-43. ISDB-T Signal Analyzer Frequency Accuracy, Option 30

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

Table A-44. ISDB-T Signal Analyzer Residual MER, Option 30

| Channel | Frequency | Total MER Pre Amp Off | Spec. | Total MER Pre Amp On | Spec. |
|---------|------------------|-----------------------|---------|----------------------|---------|
| 13 | 473.14285714 MHz | dB | ≥ 42 dB | dB | ≥ 37 dB |
| 38 | 623.14285714 MHz | dB | ≥ 42 dB | dB | ≥ 37 dB |
| 62 | 767.14285714 MHz | dB | ≥ 42 dB | dB | ≥ 37 dB |

Frequency Lock Range Verification

Table A-45. ISDB-T Signal Analyzer Frequency Lock Range, Option 30

| Channel | Frequency | Measured Frequency Error | Specification |
|---------|------------------|--------------------------|---------------|
| 13 | 473.14285714 MHz | Hz | ± 0.3 Hz |
| 13 | 473.14285714 MHz | Hz | ± 0.3 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Level Accuracy Verification (Option 30)

Table A-46. Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 30

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

Level Accuracy Verification

Table A-47. Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 30

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

1 dB Compression Level Verification

Table A-48. Readings for Sensor A and MN63A Attenuation AT(-25), AT(-15), AT(-50), and AT(-43), Option 30

| Frequency (Channel) | Sensor A Reading, M(Sa) | MN63A Attenuation Reading, AT(-25) | MN63A Attenuation Reading, AT(-15) | MN63A Attenuation Reading, AT(-50) | MN63A Attenuation Reading, AT(-43) |
|--------------------------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 473.14285714 MHz (Ch 13) | | | | | |
| 623.14285714 MHz (Ch 38) | | | | | |
| 767.14285714 MHz (Ch 62) | | | | | |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification (continued)

Level Accuracy Verification – Channel 13

Table A-49. ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 30

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification (continued)

Level Accuracy Verification – Channel 38

Table A-50. ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz, Option 30

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification (continued)

Level Accuracy Verification – Channel 62

Table A-51. ISDB-T Signal Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz, Option 30

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification (continued)

ISDB-T Signal Analyzer 1 dB Compression Level with Pre Amp OFF

Table A-52. ISDB-T Signal Analyzer 1 dB Compression Level Channel 13 with Pre Amp OFF, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-53. ISDB-T Signal Analyzer 1 dB Compression Level Channel 38 with Pre Amp OFF, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-54. ISDB-T Signal Analyzer 1 dB Compression Level Channel 62 with Pre Amp OFF, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T Signal Analyzer Option 30 Verification (continued)

ISDB-T Signal Analyzer 1 dB Compression Level with Pre Amp ON

Table A-55. ISDB-T Signal Analyzer 1 dB Compression Level Channel 13 with Pre Amp ON, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-56. ISDB-T Signal Analyzer 1 dB Compression Level Channel 38 with Pre Amp ON, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-57. ISDB-T Signal Analyzer 1 dB Compression Level Channel 62 with Pre Amp ON, Option 30

| Test Level | Reference Level | Measured Value | Delta | Specification |
|------------|-----------------|----------------|-------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

ISDB-T Signal Analyzer Noise Floor

Table A-58. ISDB-T Signal Analyzer Noise Floor with Pre Amp OFF, Option 30

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|------------------|-----------|----------------|----------------|
| 13 | 473.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 38 | 623.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 62 | 767.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |

Table A-59. ISDB-T Signal Analyzer Noise Floor with Pre Amp ON, Option 30

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|------------------|-----------|----------------|----------------|
| 13 | 473.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 38 | 623.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 62 | 767.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |

ISDB-T Signal Analyzer Phase Noise

Table A-60. ISDB-T Signal Analyzer Phase Noise, Option 30

| Channel | Frequency (MHz) | at 10 kHz Offset (dBc/Hz) | Phase (10 kHz) | at 100 kHz Offset (dBc/Hz) | Phase (100 kHz) | Freq Error Spec. | Freq Error |
|---------|-----------------|---------------------------|----------------|----------------------------|-----------------|------------------|------------|
| 13 | 473.14285714 | ≤ -103 | dBc/Hz | ≤ -105 | dBc/Hz | ± 0.2 Hz | Hz |

Table A-60. ISDB-T Signal Analyzer Phase Noise, Option 30

| Channel | Frequency (MHz) | at 10 kHz Offset (dBc/Hz) | Phase (10 kHz) | at 100 kHz Offset (dBc/Hz) | Phase (100 kHz) | Freq Error Spec. | Freq Error |
|----------------|------------------------|----------------------------------|-----------------------|-----------------------------------|------------------------|-------------------------|-------------------|
| 38 | 623.14285714 | ≤ -103 | dBc/Hz | ≤ -105 | dBc/Hz | ± 0.2 Hz | Hz |
| 62 | 767.14285714 | ≤ -103 | dBc/Hz | ≤ -105 | dBc/Hz | ± 0.2 Hz | Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification

Level Accuracy Verification

Table A-61. Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 32

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

Level Accuracy Verification

Table A-62. Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 32

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

1 dB Compression Level Verification

Table A-63. Readings for Sensor A and MN63A Attenuation AT(-25), AT(-15), AT(-50), and AT(-43), Option 32

| Frequency (Channel) | Sensor A Reading, M(Sa) | MN63A Attenuation Reading, AT(-25) | MN63A Attenuation Reading, AT(-15) | MN63A Attenuation Reading, AT(-50) | MN63A Attenuation Reading, AT(-43) |
|--------------------------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 473.14285714 MHz (Ch 13) | | | | | |
| 623.14285714 MHz (Ch 38) | | | | | |
| 767.14285714 MHz (Ch 62) | | | | | |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification (continued)

Level Accuracy Verification – Channel 13

Table A-64. ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 13ch at 473.14285714 MHz, Option 32

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification (continued)

Level Accuracy Verification – Channel 38

Table A-65. ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 38ch at 623.14285714 MHz, Option 32

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification (continued)

Level Accuracy Verification – Channel 62

Table A-66. ISDB-T SFN Analyzer Level Accuracy Measurement Channel = 62ch at 767.14285714 MHz, Option 32

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification (continued)

ISDB-T SFN Analyzer 1 dB Compression Level with Pre Amp OFF

Table A-67. ISDB-T SFN Analyzer 1 dB Compression Level Channel 13 with Pre Amp OFF, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-68. ISDB-T SFN Analyzer 1 dB Compression Level Channel 38 with Pre Amp OFF, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-69. ISDB-T SFN Analyzer 1 dB Compression Level Channel 62 with Pre Amp OFF, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

ISDB-T SFN Analyzer 1 dB Compression Level with Pre Amp ON

Table A-70. ISDB-T SFN Analyzer 1 dB Compression Level Channel 13 with Pre Amp ON, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-71. ISDB-T SFN Analyzer 1 dB Compression Level Channel 38 with Pre Amp ON, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-72. ISDB-T SFN Analyzer 1 dB Compression Level Channel 62 with Pre Amp ON, Option 32

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

ISDB-T SFN Analyzer Option 32 Verification (continued)

ISDB-T SFN Analyzer Noise Floor

Table A-73. ISDB-T SFN Analyzer Noise Floor Pre Amp OFF, Option 32

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|------------------|-----------|----------------|----------------|
| 13 | 473.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 38 | 623.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 62 | 767.14285714 MHz | -25 dBm | dBm | ≤ -70 dBm |

Table A-74. ISDB-T SFN Analyzer Noise Floor Pre Amp ON, Option 32

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|------------------|-----------|----------------|----------------|
| 13 | 473.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 38 | 623.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 62 | 767.14285714 MHz | -50 dBm | dBm | ≤ -94 dBm |

Option 31 GPS Receiver

Table A-75. GPS Spectrum Analyzer Frequency Accuracy, Option 31

| Test Level | Measured Value | Error | Specification |
|------------|----------------|-------|--|
| 7 GHz | GHz | Hz | ± 4.75 Hz (w/GPS Hi Accy) or ± 9.5 Hz (W/Int Hi Accy) |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 40 GSM/GPRS/EDGE RF Measurements

Table A-76. At 850 MHz, –10 dBm Level, TCH Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-77. At 850 MHz, –50 dBm Level, TCH ALL Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-78. At 1800 MHz, –10 dBm Level, TCH ALL Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-79. At 1800 MHz, –50 dBm Level, TCH Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-80. At 1800 MHz, –50 dBm Level, DL_MCS-9_1SLOT Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-81. At 1800 MHz, –10 dBm Level, DL_MCS-9_4SLOT Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 40 GSM/GPRS/EDGE RF Measurements (continued)

Table A-82. At 850 MHz, -50 dBm Level, DL_MCS-9_4SLOT Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

Table A-83. At 850 MHz, -10 dBm Level, DL_MCS-9_1SLOT Pattern, Option 40

| | Measured Value | Specification |
|-------------------|----------------|---------------|
| Burst Power Error | dB | ± 1.5 dB |
| Frequency Error | Hz | ± 10 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 41 GSM/GPRS/EDGE Demodulator

Table A-84. Phase Err RMS (Deg) at 850 MHz, –10 dBm Level, TCH Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| Deg | ≤ 1 Deg |

Table A-85. Phase Err RMS (Deg) at 850 MHz, –50 dBm Level, TCH ALL Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| Deg | ≤ 1 Deg |

Table A-86. Phase Err RMS (Deg) at 1800 MHz, –10 dBm Level, TCH ALL Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| Deg | ≤ 1 Deg |

Table A-87. Phase Err RMS (Deg) at 1800 MHz, –50 dBm Level, TCH Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| Deg | ≤ 1 Deg |

Table A-88. EVM RMS at 1800 MHz, –50 dBm Level, DL_MCS-9_1SLOT Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| % | ≤ 2.5% |

Table A-89. EVM RMS at 1800 MHz, –10 dBm Level, DL_MCS-9_4SLOT Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| % | ≤ 2.5% |

Table A-90. EVM RMS at 850 MHz, –50 dBm Level, DL_MCS-9_4SLOT Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| % | ≤ 2.5% |

Table A-91. EVM RMS at 850 MHz, –10 dBm Level, DL_MCS-9_1SLOT Pattern, Option 41

| Measured Value | Specification |
|----------------|---------------|
| % | ≤ 2.5% |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 42 CDMA RF Measurements

Table A-92. Channel Power Error at 870.03 MHz, -30 dBm Level, cdmaOne, Option 42

| Power Meter Setting | Displayed Channel Power | Calculated Channel Power | Specification |
|---------------------|-------------------------|--------------------------|---------------|
| | | | $\leq 2.5\%$ |

Table A-93. Channel Power Error at 1930.05 MHz, -30 dBm Level, cdmaOne, Option 42

| Power Meter Setting | Displayed Channel Power | Calculated Channel Power | Specification |
|---------------------|-------------------------|--------------------------|---------------|
| | | | $\leq 2.5\%$ |

Table A-94. Channel Power Error at 1930.05 MHz, -30 dBm Level, CDMA2000, Option 42

| Power Meter Setting | Displayed Channel Power | Calculated Channel Power | Specification |
|---------------------|-------------------------|--------------------------|---------------|
| | | | $\leq 2.5\%$ |

Table A-95. Channel Power Error at 870.03 MHz, -30 dBm Level, CDMA2000, Option 42

| Power Meter Setting | Displayed Channel Power | Calculated Channel Power | Specification |
|---------------------|-------------------------|--------------------------|---------------|
| | | | $\leq 2.5\%$ |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 43 cdmaOne and CDMA2000 1xRTT Demodulator

Table A-96. At 870.03 MHz, -30 dBm Level, cdmaOne, Option 43

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

Table A-97. At 1930.05 MHz, -30 dBm Level, cdmaOne, Option 43

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

Table A-98. At 1930.05 MHz, -30 dBm Level, CDMA2000, Option 43

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

Table A-99. At 870.03 MHz, -30 dBm Level, CDMA2000, Option 43

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 44 WCDMA and HSDPA RF Measurements

Table A-100. Sensor A and Sensor B Readings Component Characterization, Option 44

| 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-101. Power Level Settings Component Characterization, Option 44

| Frequency | MG3700A.10 Setting | MG3700A.28 Setting | PMA-10 | PMA-20 |
|-----------|--------------------|--------------------|--------|--------|
| 881.5 MHz | dBm | dBm | dBm | dBm |

Table A-102. WCDMA Absolute Power Accuracy, Option 44

| 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 |

Table A-103. WCDMA Occupied Bandwidth (OBW), Option 44

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

Table A-104. WCDMA RF Channel Power Accuracy, Option 44

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 44 WCDMA and HSDPA RF Measurements (continued)

Table A-105.WCDMA ACLR Accuracy, Option 44

| Frequency/Offset | Measured ACLR | Calculated ACLR Error | Specification |
|------------------|---------------|-----------------------|---------------|
| 881.5/-10 MHz | dB | dB | ± 0.8 dB |
| 881.5/-5 MHz | dB | dB | ± 0.8 dB |
| 881.5/+5 MHz | dB | dB | ± 0.8 dB |
| 881.5/+10 MHz | dB | dB | ± 0.8 dB |
| 1962.5/-10 MHz | dB | dB | ± 0.8 dB |
| 1962.5/-5 MHz | dB | dB | ± 0.8 dB |
| 1962.5/+5 MHz | dB | dB | ± 0.8 dB |
| 1962.5/+10 MHz | dB | dB | ± 0.8 dB |
| 2680.5/-10 MHz | dB | dB | ± 0.8 dB |
| 2680.5/-5 MHz | dB | dB | ± 0.8 dB |
| 2680.5/+5 MHz | dB | dB | ± 0.8 dB |
| 2680.5/+10 MHz | dB | dB | ± 0.8 dB |

Table A-106.HSDPA RF Channel Power Accuracy, Option 44

| Frequency | Power Meter Reading | Measured RF Channel Power | RF Channel Power Accuracy | Specification |
|------------|---------------------|---------------------------|---------------------------|---------------|
| 2680.5 MHz | dBm | dBm | dB | ± 1.25 dB |

Table A-107.HSDPA ACLR Accuracy, Option 44

| Frequency/Offset | Measured ACLR | Calculated ACLR Error | Specification |
|------------------|---------------|-----------------------|---------------|
| 2680.5/-10 MHz | dB | dB | ± 1.0 dB |
| 2680.5/-5 MHz | dB | dB | ± 1.0 dB |
| 2680.5/+5 MHz | dB | dB | ± 1.0 dB |
| 2680.5/+10 MHz | dB | dB | ± 1.0 dB |

Option 45 WCDMA Demodulator and Option 65 WCDMA/HSDPA Demodulator

Table A-108.WCDMA Error Vector Magnitude (Test Model 4; Option 45 or Option 65)

| Frequency | EVM | Specification |
|------------|-----|---------------|
| 1962.5 MHz | % | ± 2.5% |

Table A-109.HSDPA Error Vector Magnitude (Test Model 5; Option 65)

| Frequency | EVM | Specification |
|------------|-----|---------------|
| 1962.5 MHz | % | ± 2.5% |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 46 Fixed WiMAX RF Measurements

Table A-110.Fixed WiMAX Channel Power Accuracy Adjusted MG3700A Level Settings, Option 46

| 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-111.Fixed WiMAX Channel Power Accuracy, Option 46

| 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 |

Option 47 Fixed WiMAX Demodulator

Table A-112.Fixed WiMAX Residual EVM, Option 47

| Frequency | Power | BW | EVM (RMS) | Specification |
|------------|---------|--------|-----------|---------------|
| 2600.5 MHz | -15 dBm | 10 MHz | % | ≤ 3.5% |
| 2600.5 MHz | -50 dBm | 10 MHz | % | ≤ 3.5% |
| 3600.5 MHz | -15 dBm | 10 MHz | % | ≤ 3.5% |
| 3600.5 MHz | -50 dBm | 10 MHz | % | ≤ 3.5% |
| 5600.5 MHz | -15 dBm | 10 MHz | % | ≤ 3.5% |
| 5600.5 MHz | -50 dBm | 10 MHz | % | ≤ 3.5% |

Table A-113.Fixed WiMAX Frequency Error, Option 47

| Frequency | Power | Frequency Error | Specification |
|------------|---------|-----------------|---------------|
| 2600.5 MHz | -50 dBm | Hz | ± 10 Hz |
| 5600.5 MHz | -50 dBm | Hz | ± 10 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 60 or Option 61 TD-SCDMA Signal Analyzer Option Verification

Table A-114.TD-SCDMA (at 2010 MHz, -45 dBm Level) (Option 60 or Option 61)

| Measurement Type | Measured Value | Specification |
|-------------------------|----------------|------------------|
| Power Meter Reading | dBm | -45 dBm ± 0.5 dB |
| Displayed Channel Power | dBm | -45 dBm ± 0.5 dB |
| Channel Power Error | dB | ± 1.0 dB |
| EVM | % | < 3% |
| Frequency Error | Hz | ± 20 Hz |
| Tau | µs | ± 0.1 µs |

Option 62 EVDO RF Measurements

Table A-115.EVDO Channel Power Error at 870.03 MHz, -50 dBm Level, 921.6 kps 8-PSK Modulation, Option 62

| Measurement Type | Measured Value | Specification |
|--------------------------------|----------------|------------------|
| Power Meter Reading | dBm | -50 dBm ± 0.2 dB |
| MS2721B Power Reading | dBm | -50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ± 1.0 dB |

Table A-116.EVDO Channel Power Error at 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation, Option 62

| Measurement Type | Measured Value | Specification |
|--------------------------------|----------------|----------------|
| Power Meter Reading | dBm | 0 dBm ± 0.2 dB |
| MS2721B Power Reading | dBm | 0 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ± 1.0 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 62 EVDO RF Measurements (continued)

Table A-117.EVDO Channel Power Error at 1930.05 MHz, –50 dBm Level, 2457.6 kps 16-QAM Modulation, Option 62

| Measurement Type | Measured Value | Specification |
|--------------------------------|----------------|------------------|
| Power Meter Reading | dBm | –50 dBm ± 0.2 dB |
| MS2721B Power Reading | dBm | –50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ± 1.0 dB |

Table A-118.EVDO Channel Power Error at 1930.05 MHz, –50 dBm Level, Idle Slot, Option 62

| Measurement Type | Measured Value | Specification |
|--------------------------------|----------------|------------------|
| Power Meter Reading | dBm | –50 dBm ± 0.2 dB |
| MS2721B Power Reading | dBm | –50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ± 1.0 dB |

Table A-119.EVDO Channel Power Error at 870.03 MHz, –10 dBm Level, Idle Slot, Option 62

| Measurement Type | Measured Value | Specification |
|--------------------------------|----------------|------------------|
| Power Meter Reading | dBm | –50 dBm ± 0.2 dB |
| MS2721B Power Reading | dBm | –50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ± 1.0 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Option 63 EVDO Demodulator

Table A-120.EVDO Demodulator at 870.03 MHz, –50 dBm Level, 921.6 kps 8-PSK Modulation, Option 63

| | Measured Value | Specification |
|-----------------|----------------|----------------------|
| Frequency Error | Hz | ± 20 Hz |
| Rho Pilot | | $0.99 \leq x \leq 1$ |
| Tau | μ s | ± 1 μ s |

Table A-121.EVDO Demodulator At 1930.05 MHz, 0 dBm Level, 38.4 kps QPSK Modulation, Option 63

| | Measured Value | Specification |
|-----------------|----------------|----------------------|
| Frequency Error | Hz | ± 20 Hz |
| Rho Pilot | | $0.99 \leq x \leq 1$ |
| Tau | μ s | ± 1 μ s |

Table A-122.EVDO Demodulator At 1930.05 MHz, –50 dBm Level, 2457.6 kps 16-QAM Modulation, Option 63

| | Measured Value | Specification |
|-----------------|----------------|----------------------|
| Frequency Error | Hz | ± 20 Hz |
| Rho Pilot | | $0.99 \leq x \leq 1$ |
| Tau | μ s | ± 1 μ s |

Table A-123.EVDO Demodulator At 1930.05 MHz, –50 dBm Level, Idle Slot, Option 63

| | Measured Value | Specification |
|-----------------|----------------|----------------------|
| Frequency Error | Hz | ± 20 Hz |
| Rho Pilot | | $0.99 \leq x \leq 1$ |
| Tau | μ s | ± 1 μ s |

Table A-124.EVDO Demodulator At 870.03 MHz, –10 dBm Level, Idle Slot, Option 63

| | Measured Value | Specification |
|-----------------|----------------|----------------------|
| Frequency Error | Hz | ± 20 Hz |
| Rho Pilot | | $0.99 \leq x \leq 1$ |
| Tau | μ s | ± 1 μ s |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer

DVB-T/H Signal Analyzer Frequency Accuracy

Table A-125.DVB-T/H Signal Analyzer Frequency Accuracy for –20 dBm Reference Level, Option 64

| Channel | Reference Level | Frequency Error | Specification |
|---------|-----------------|-----------------|---------------|
| 21 | –20 dBm | Hz | ± .03 Hz |
| 45 | –20 dBm | Hz | ± .03 Hz |
| 69 | –20 dBm | Hz | ± .03 Hz |

Table A-126.DVB-T/H Signal Analyzer Frequency Accuracy for –50 dBm Reference Level, Option 64

| Channel | Reference Level | Frequency Error | Specification |
|---------|-----------------|-----------------|---------------|
| 21 | –50 dBm | Hz | ± .03 Hz |
| 45 | –50 dBm | Hz | ± .03 Hz |
| 69 | –50 dBm | Hz | ± .03 Hz |

DVB-T/H Signal Analyzer Residual MER

Table A-127.DVB-T/H Signal Analyzer Residual MER Pre Amp OFF, Option 64

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

Table A-128.DVB-T/H Signal Analyzer Residual MER Pre Amp ON, Option 64

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

DVB-T/H Signal Analyzer Frequency Lock Range

Table A-129.DVB-T/H Signal Analyzer Frequency Lock Range, Option 64

| Channel | Frequency | Measured Frequency Error | Specification |
|---------|------------|--------------------------|---------------|
| 21 | 474.09 MHz | Hz | ± 0.3 Hz |
| 21 | 473.91 MHz | Hz | ± 0.3 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Signal Analyzer Level Accuracy Verification

Table A-130. Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 64

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

Table A-131. Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 64

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

1 dB Compression Level Verification

Table A-132. Readings for Sensor A and MN63A Attenuation AT(-25), AT(-15), AT(-50), and AT(-43), Option 64

| Frequency (Channel) | Sensor A Reading, M(Sa) | MN63A Attenuation Reading, AT(-25) | MN63A Attenuation Reading, AT(-15) | MN63A Attenuation Reading, AT(-50) | MN63A Attenuation Reading, AT(-43) |
|---------------------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 474 MHz (Ch 21) | | | | | |
| 666 MHz (Ch 45) | | | | | |
| 858 MHz (Ch 69) | | | | | |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Signal Analyzer Level Accuracy Verification

Table A-133.DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 64

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Signal Analyzer Level Accuracy Verification

Table A-134.DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 45ch at 666 MHz, Option 64

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Signal Analyzer Level Accuracy Verification

Table A-135.DVB-T/H Signal Analyzer Level Accuracy Measurement Channel = 69ch at 858 MHz, Option 64

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Analyzer 1 dB Compression Level with Pre Amp OFF

Table A-136.DVB-T/H Analyzer 1 dB Compression Level Channel 21 with Pre Amp OFF, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-137.DVB-T/H Analyzer 1 dB Compression Level Channel 45 with Pre Amp OFF, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-138.DVB-T/H Analyzer 1 dB Compression Level Channel 69 with Pre Amp OFF, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

DVB-T/H Analyzer 1 dB Compression Level with Pre Amp ON

Table A-139.DVB-T/H Analyzer 1 dB Compression Level Channel 21 with Pre Amp ON, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-140.DVB-T/H Analyzer 1 dB Compression Level Channel 45 with Pre Amp ON, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-141.DVB-T/H Analyzer 1 dB Compression Level Channel 69 with Pre Amp ON, Option 64

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 64 DVB-T/H Signal Analyzer (continued)

DVB-T/H Signal Analyzer Noise Floor

Table A-142.DVB-T/H Signal Analyzer Noise Floor Pre Amp OFF, Option 64

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|-----------|-----------|----------------|----------------|
| 21 | 474 MHz | -25 dBm | dBm | ≤ -69 dBm |
| 45 | 666 MHz | -25 dBm | dBm | ≤ -69 dBm |
| 69 | 858 MHz | -25 dBm | dBm | ≤ -69 dBm |

Table A-143.DVB-T/H Signal Analyzer Noise Floor Pre Amp ON, Option 64

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|-----------|-----------|----------------|----------------|
| 21 | 474 MHz | -50 dBm | dBm | ≤ -93 dBm |
| 45 | 666 MHz | -50 dBm | dBm | ≤ -93 dBm |
| 69 | 858 MHz | -50 dBm | dBm | ≤ -93 dBm |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 66 Mobile WiMAX RF Measurements

Mobile WiMAX Channel Power Accuracy (10 MHz BW and 10 ms Frame Length)

Table A-144. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –15.0 dBm) Option 66

| | Measured or Calculated Value | Specification |
|--------------------------------------|------------------------------|------------------|
| Power Meter Reading | dBm | –15 dBm ± 0.2 dB |
| MS272xB Reading Channel Power (RSSI) | dBm | –15 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ±1.5 dB |

Table A-145. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and –50.0 dBm) Option 66

| | Measured or Calculated Value | Specification |
|--------------------------------------|------------------------------|------------------|
| Power Meter Reading | dBm | –50 dBm ± 0.2 dB |
| MS272xB Reading Channel Power (RSSI) | dBm | –50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ±1.5 dB |

Table A-146. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –15.0 dBm) Option 66

| | Measured or Calculated Value | Specification |
|--------------------------------------|------------------------------|------------------|
| Power Meter Reading | dBm | –15 dBm ± 0.2 dB |
| MS272xB Reading Channel Power (RSSI) | dBm | –15 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ±1.5 dB |

Table A-147. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and –50.0 dBm) Option 66

| | Measured or Calculated Value | Specification |
|--------------------------------------|------------------------------|------------------|
| Power Meter Reading | dBm | –50 dBm ± 0.2 dB |
| MS272xB Reading Channel Power (RSSI) | dBm | –50 dBm ± 0.2 dB |
| Calculated Channel Power Error | dB | ±1.5 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

Option 66 Mobile WiMAX RF Measurements (continued)

Mobile WiMAX Channel Power Accuracy (5 MHz BW and 5 ms Frame Length)

Table A-148. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -15.0 dBm) Option 66

| | Measured Value | Specification |
|--------------------------------|----------------|----------------------|
| Power Meter Reading | dBm | -15 dBm \pm 0.2 dB |
| MS272xB Reading | dBm | -15 dBm \pm 0.2 dB |
| Calculated Channel Power Error | dB | \pm 1.5 dB |

Table A-149. Mobile WiMAX Channel Power Accuracy Power Error (2600.5 MHz and -50.0 dBm) Option 66

| | Measured Value | Specification |
|--------------------------------|----------------|----------------------|
| Power Meter Reading | dBm | -50 dBm \pm 0.2 dB |
| MS272xB Reading | dBm | -50 dBm \pm 0.2 dB |
| Calculated Channel Power Error | dB | \pm 1.5 dB |

Table A-150. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -15.0 dBm) Option 66

| | Measured Value | Specification |
|--------------------------------|----------------|----------------------|
| Power Meter Reading | dBm | -15 dBm \pm 0.2 dB |
| MS272xB Reading | dBm | -15 dBm \pm 0.2 dB |
| Calculated Channel Power Error | dB | \pm 1.5 dB |

Table A-151. Mobile WiMAX Channel Power Accuracy Power Error (3600.5 MHz and -50.0 dBm) Option 66

| | Measured Value | Specification |
|--------------------------------|----------------|----------------------|
| Power Meter Reading | dBm | -50 dBm \pm 0.2 dB |
| MS272xB Reading | dBm | -50 dBm \pm 0.2 dB |
| Calculated Channel Power Error | dB | \pm 1.5 dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Mobile WiMAX Demodulator Option 67

Table A-152. Mobile WiMAX Residual EVM (10 MHz Bandwidth and 10 ms Frame Length), Option 67

| Frequency | Power | BW | EVM (RMS) | Specification |
|------------|---------|--------|-----------|---------------|
| 2600.5 MHz | -15 dBm | 10 MHz | % | ≤ 3.0% |
| 2600.5 MHz | -50 dBm | 10 MHz | % | ≤ 3.0% |
| 3600.5 MHz | -15 dBm | 10 MHz | % | ≤ 3.0% |
| 3600.5 MHz | -50 dBm | 10 MHz | % | ≤ 3.0% |

Table A-153. Mobile WiMAX Residual EVM (5 MHz Bandwidth and 5 ms Frame Length), Option 67

| Frequency | Power | BW | EVM (RMS) | Specification |
|------------|---------|-------|-----------|---------------|
| 2600.5 MHz | -15 dBm | 5 MHz | % | ≤ 3.0% |
| 2600.5 MHz | -50 dBm | 5 MHz | % | ≤ 3.0% |
| 3600.5 MHz | -15 dBm | 5 MHz | % | ≤ 3.0% |
| 3600.5 MHz | -50 dBm | 5 MHz | % | ≤ 3.0% |

Table A-154. Mobile WiMAX Frequency Error (10 MHz Bandwidth and 10 ms Frame Length), Option 67

| Frequency | Power | Frequency Error | Specification |
|------------|---------|-----------------|---------------|
| 2600.5 MHz | -50 dBm | Hz | ± 10 Hz |
| 3600.5 MHz | -50 dBm | Hz | ± 10 Hz |

Table A-155. Mobile WiMAX Frequency Error (5 MHz Bandwidth and 5 ms Frame Length), Option 67

| Frequency | Power | Frequency Error | Specification |
|------------|---------|-----------------|---------------|
| 2600.5 MHz | -50 dBm | Hz | ± 10 Hz |
| 3600.5 MHz | -50 dBm | Hz | ± 10 Hz |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

LTE Signal Analyzer Option Verification (Option 541 and Option 542)

LTE Channel Power Accuracy (Option 541)

Table A-156. LTE Channel Power Accuracy (Only for Instruments with Option 541 Installed)

| Frequency | Input Power | Measured Channel Power | Error | Specification |
|-----------|-------------|------------------------|-------|---------------|
| 750 MHz | -10 dBm | dBm | dB | ± 1.5 dB |
| 750 MHz | -50 dBm | dBm | dB | ± 1.5 dB |
| 2150 MHz | -10 dBm | dBm | dB | ± 1.5 dB |
| 2150 MHz | -50 dBm | dBm | dB | ± 1.5 dB |

LTE Residual EVM and Frequency Accuracy (Option 542)

Table A-157. LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

| 750 MHz at -10 dBm | Specification | Measured Value |
|--------------------|---------------|----------------|
| Frequency Error | ± 10 Hz | Hz |
| EVM (rms) | < 2.5% | % |

Table A-158. LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

| 750 MHz at -50 dBm | Specification | Measured Value |
|--------------------|---------------|----------------|
| Frequency Error | ± 10 Hz | Hz |
| EVM (rms) | < 2.5% | % |

Table A-159. LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

| 2150 MHz at -10 dBm | Specification | Measured Value |
|---------------------|---------------|----------------|
| Frequency Error | ± 10 Hz | Hz |
| EVM (rms) | < 2.5% | % |

Table A-160. LTE Residual EVM and Frequency Accuracy (Only for Instruments with Option 542 Installed)

| 2150 MHz at -50 dBm | Specification | Measured Value |
|---------------------|---------------|----------------|
| Frequency Error | ± 10 Hz | Hz |
| EVM (rms) | < 2.5% | % |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification

DVB-T/H SFN Level Accuracy Verification (Option 78)

Table A-161. Readings for Sensor A, Sensor B, DAB(-10), and MN63A Attenuation AT(-10), Option 78

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

DVB-T/H SFN Level Level Accuracy Verification (Option 78)

Table A-162. Readings for Sensor A, Sensor B, DAB(-50), and MN63A Attenuation AT(-50), Option 78

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

DVB-T/H SFN Level 1 dB Compression Level Verification (Option 78)

Table A-163. Readings for Sensor A and MN63A Attenuation AT(-25), AT(-15), AT(-50), and AT(-43), Option 78

| Frequency (Channel) | Sensor A Reading, M(Sa) | MN63A Attenuation Reading, AT(-25) | MN63A Attenuation Reading, AT(-15) | MN63A Attenuation Reading, AT(-50) | MN63A Attenuation Reading, AT(-43) |
|---------------------|-------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 474 MHz (Ch 21) | | | | | |
| 666 MHz (Ch 45) | | | | | |
| 858 MHz (Ch 69) | | | | | |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification (continued)

DVB-T/H SFN Level Level Accuracy Verification – Channel 21 (Option 78)

Table A-164.DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 21ch at 474 MHz, Option 78

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification (continued)

DVB-T/H SFN Level Level Accuracy Verification – Channel 45 (Option 78)

Table A-165.DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 45ch at 666 MHz, Option 78

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification (continued)

DVB-T/H SFN Level Level Accuracy Verification – Channel 69 (Option 78)

Table A-166.DVB-T/H SFN Analyzer Level Accuracy Measurement Channel = 69ch at 858 MHz, Option 78

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

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification (continued)

DVB-T/H SFN Analyzer 1 dB Compression Level with Pre Amp OFF (Option 78)

Table A-167.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 21 474 MHz with Pre Amp OFF, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-168.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 45 666 MHz with Pre Amp OFF, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-169.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 69 858 MHz with Pre Amp OFF, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -25 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |
| -15 dBm | -25 dBm | dBm | dB | $\Delta < 1$ dB |

DVB-T/H SFN Analyzer 1 dB Compression Level with Pre Amp ON (Option 78)

Table A-170.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 21 474 MHz with Pre Amp ON, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-171.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 45 666 MHz with Pre Amp ON, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

Table A-172.DVB-T/H SFN Analyzer 1 dB Compression Level Channel 69 858 MHz with Pre Amp ON, Option 78

| Test Level | Reference Level | Measured Value | Delta (Δ) | Specification |
|------------|-----------------|----------------|--------------------|-----------------|
| -50 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |
| -43 dBm | -50 dBm | dBm | dB | $\Delta < 1$ dB |

MS2721B Firmware Revision: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

DVB-T/H SFN Analyzer Option 78 Verification (continued)

DVB-T/H SFN Analyzer Noise Floor (Option 78)

Table A-173. DVB-T/H SFN Analyzer Noise Floor Pre Amp OFF, Option 78

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|-----------|-----------|----------------|----------------|
| 21 | 474 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 45 | 666 MHz | -25 dBm | dBm | ≤ -70 dBm |
| 69 | 858 MHz | -25 dBm | dBm | ≤ -70 dBm |

Table A-174. DVB-T/H SFN Analyzer Noise Floor Pre Amp ON, Option 78

| Channel | Frequency | Ref Level | Measured Value | Specification |
|---------|-----------|-----------|----------------|----------------|
| 21 | 474 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 45 | 666 MHz | -50 dBm | dBm | ≤ -94 dBm |
| 69 | 858 MHz | -50 dBm | dBm | ≤ -94 dBm |

Anritsu



Anritsu prints on recycled paper with vegetable soybean oil ink.

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