**Maintenance Manual**

# VNA Master
# Model MS203xA

## Vector Network Analyzer

Anritsu Company
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Morgan Hill, CA 95037-2809
USA

P/N: 10580-00168
Revision: B
Printed: December 2008

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|---|---|---|---|---|---|---|
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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.

**Warning**

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

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

**Warning**

or

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

**Warning**


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

**Warning**


Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

**Caution**

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

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

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## Chapter 4—Troubleshooting



## Appendix A—Test Records



## Appendix B—Test Fixture Schematics

# Chapter 1 — General Information

## 1-1 Introduction

This manual provides maintenance instructions for the Model MS2034A and Model MS2036A VNA Master. It provides performance verification procedures, battery pack information, 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, preset the unit, or the meaning of "soft key"). Refer to the VNA Master user guide (Anritsu part number 10580-00166).

| | |
|---|---|
| **Note** | Before making any measurement, verify that that all equipment has warmed up for at least 30 minutes. |

## 1-2 Required Test Equipment for Performance Verification

The following equipment is required for the "Spectrum Analyzer Verification", "Power Meter Verification", "Vector Network Analyzer Functions", and "Options Verification" tests that are described in Chapter 2, "Performance Verification". Each test section has a table that lists the specific equipment (from this list) that is required for that test.

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|---|---|---|
| Synthesized Signal Source | Frequency: 0.1 Hz to 20 GHz<br>Power Output to +13 dBm | Anritsu Model MG3692A or MG3692B with the following options[a]: 2A, 4, 22, 15 |
| Power Meter | Power Range: –70 to + 20 dBm | Anritsu Dual Channel Model ML2438A |
| Power Sensor | Frequency: 10 MHz to 18 GHz<br>Power Range: –67 to +20 dB | Anritsu Model MA2442D (quantity 2) |
| RF Detector | Frequency: 10 MHz to 20 GHz | Anritsu Model 560-7N50B |
| Frequency Reference | Frequency: 10 MHz | Symmetricom Model RubiSource T&M |
| Frequency Counter | Frequency: 2 GHz | Anritsu Model MF2412B |
| Fixed Attenuator | 10 dB Attenuation | Aeroflex/Weinschel Model 44-10 (quantity 2) |
| GPS Antenna | | Anritsu Part Number 2000-1410 |
| VNA Master External Power Supply | | Anritsu Part Number 40-168-R |
| Test Fixture, High Current Load | Resistance: 40 Ohm<br>Power: 5 Watts | Anritsu Model T2904 |
| Test Fixture, Low Current Load | Resistance: 105 Ohm<br>Power: 1 Watts | Anritsu Model T3377 |
| Power Splitter | Frequency: DC to 18 GHz | Aeroflex/Weinschel Model 1870A |
| Adapter | Frequency: DC to 20 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 34NN50A |
| Adapter | Frequency: DC to 20 GHz<br>K(m)-N(f), 50 Ohm | Anritsu Model 34RKNF50 |
| Open/Short | | Anritsu Model 22N50 |
| 50 Ohm Termination (N male) | Frequency: DC to 18 GHz<br>Return Loss: 40 dB minimum | Anritsu Model 28N50-2 |
| 50 Ohm Termination (N female) | Frequency: DC to 18 GHz<br>Return Loss: 40 dB minimum | Anritsu Model 28NF50-2 |
| 6 dB Offset Termination | | Anritsu Model SC7424 |
| 20 dB Offset Termination | | Anritsu Model SC7423 |
| RF Coaxial Cable | Frequency: DC to 18 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-0.6B |
| RF Coaxial Cable | Frequency: DC to 6 GHz<br>N(m)-N(m) | Anritsu Model 15NN50-1.5C |
| Coaxial Cable | BNC(m) to BNC(m), 50 Ohm | any |
| Vector Network Analyzer | Frequency: 10 MHz to 9 GHz | Anritsu Model MS4624B |
| Calibration Kit | N Connector | Anritsu 3753R |

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

## 1-3 Replaceable Parts

To ensure that the correct options are provided on the replacement unit when ordering a Main/Spectrum Analyzer PCB Assembly, all options that are installed in your instrument must be declared on the order. The installed options are listed on a label on the top of the MS203xA and can also be viewed in the System/Status display.

| Part Number | Description |
|---|---|
| ND66453 | MS2034A Main/Spectrum Analyzer PCB Assembly for Serial Numbers <0737000 |
| ND66454 | MS2034A Main/Spectrum Analyzer PCB Assembly, with Option 31 for Serial Numbers <0737000 |
| ND66455 | MS2036A Main/Spectrum Analyzer PCB Assembly for Serial Numbers <0737000 |
| ND66456 | MS2036A Main/Spectrum Analyzer PCB Assembly, with Option 31 for Serial Numbers <0737000 |
| ND66124 | VNA Module Exchange Assembly for Serial Numbers <0806000 |
| ND66432 | Power Monitor (Option 5) Exchange Assembly |
| ND68045 | MS2034A Main/Spectrum Analyzer PCB Assembly, support Option 31, for Serial Numbers >0737000 |
| ND68046 | MS2036A Main/Spectrum Analyzer PCB Assembly, support Option 31, for Serial Numbers >0737000 |
| ND68536 | VNA Module Assembly, for Serial Numbers >0806000 |
| 3-15-118 | LCD Display |
| 61368 | Clear plastic LCD protector |
| 2000-1346 | LCD Backlight Inverter PCB |
| 65681 | Soft Carrying Case |
| 64126-2 | Case Top (excludes model ID Label and keypad items) |
| 65680-2 | Case Bottom (excludes tilt bail) |
| 65686 | Model MS2034A ID Label |
| 65687 | Model MS2036A ID Label |
| 64146-2 | Battery Door |
| 633-44 | Li-ion Battery Pack |
| ND64383 | Fan |
| 3-633-26 | 3v RTC Battery |
| 40-168-R | AC to DC Power Converter |
| 3-2000-1500 | Internal Compact Flash Card (256 MB) |
| 65027-3 | Main Keypad PCB |
| 61362 | Main Keypad |
| 61363-1 | Main Keyboard Bezel |
| 61361 | Softkeys Keypad |
| 61378-1 | Softkey Bezel |
| 61333-3 | Softkey PCB |
| 790-625 | Speaker |
| 3-410-101 | Encoder (excluding knob) |
| 61360-2 | Encoder Knob (excluding encoder) |

# Chapter 2 — Performance Verification

## 2-1 Introduction

This chapter provides procedures to verify performance, and 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, preset the unit, or the meaning of "soft key").

| | |
|---|---|
| **Note** | Before making any measurement, verify that that all equipment has warmed up for at least 30 minutes. |

## 2-2 Performance Verification

The sections below contain tests that can be used to verify the performance of the Model MS203xA. Section "Spectrum Analyzer Verification" contains instructions to verify the Spectrum Analyzer functions, Section "Power Meter Verification" contains instructions to verify the Power Meter function, Section "Vector Network Analyzer Functions" contains instructions to verify the Vector Network Analyzer functions, and Section "Options Verification" contains instructions to verify Options. Each Section begins with a list of required equipment applicable to that section. Copy the appropriate blank test record in Appendix A and use it to record measured values.

# 2-3 Spectrum Analyzer Verification

**Required Equipment:**

**Table 2-1.** Equipment Required for Spectrum Analyzer Verification

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|---|---|---|
| Synthesized Signal Source | Frequency: 0.1 Hz to 20 GHz<br>Power Output to +13 dBm | Anritsu Model MG3692A or MG3692B with the following options[a]: 2A, 4, 22, 15 |
| Power Meter | Power Range: –70 to + 20 dBm | Anritsu Dual Channel Model ML2438A |
| Power Sensor | Frequency: 10 MHz to 18 GHz<br>Power Range: –67 to +20 dB | Anritsu Model MA2442D (quantity 2) |
| Frequency Reference | Frequency: 10 MHz | Symmetricom Model RubiSource T&M |
| Fixed Attenuator | 10 dB Attenuation | Aeroflex/Weinschel Model 44-10 (quantity 2) |
| Power Splitter | Frequency: DC to 18 GHz | Aeroflex/Weinschel Model 1870A |
| Adapter | Frequency: DC to 20 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 34NN50A |
| Adapter | Frequency: DC to 20 GHz<br>K(m)-N(f), 50 Ohm | Anritsu Model 34RKNF50 |
| 50 Ohm Termination | Frequency: DC to 18 GHz | Anritsu Model 28N50-2 |
| RF Coaxial Cable | Frequency: DC to 18 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-0.6B |
| Coaxial Cable | BNC(m) to BNC(m), 50 Ohm | any |
| Vector Network Analyzer | Frequency: 10 MHz to 9 GHz | Anritsu Model MS4624B |
| Calibration Kit | N Connector | Anritsu 3753R |

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

## Spectrum Analyzer RF Input VSWR Check

This test verifies that the Spectrum Analyzer RF Input meets VSWR specification.

**Procedure:**

1. Connect a 15NN50-0.6B cable to Port 1 of VNA MS4624B.
2. Perform a Reflection Only calibration at the open end of the cable using the 3753R Calibration Kit. Set the Test Port Connector Type to N male.
3. Change the MS4624B display to S11 Single Channel and SWR.
4. Connect the open end of the cable to the Spectrum Analyzer RF In connector.
5. Use a Marker to find the maximum value, and record the marker reading into the “Measured Value” column in Table A-1, “Spectrum Analyzer RF Input VSWR”, in Appendix A.

## Spectrum Analyzer Frequency Accuracy

This test verifies the Frequency Accuracy of the Spectrum Analyzer.

**Procedure:**

1. Connect the external 10 MHz Reference to the Anritsu MG3692X Synthesized Signal Source.
2. Do not connect the external 10 MHz Reference to the MS203xA.
3. Connect the output of the synthesizer to the Spectrum Analyzer RF In of the MS203xA.
4. On the MS203xA, change the Mode to Spectrum Analyzer and Preset the unit.

5. Set the MG3692A or MG3692B output to 1 GHz CW, with an RF output level of −30 dBm.
6. On the MS203xA, press the **Amplitude** key, and set the Reference Level to −10 dBm.
7. Press the **Freq** key and set the Center Freq to 1.0 GHz.
8. Press the **Span** key, set the span to 10 kHz.
9. Press the **BW** key and set RBW to 100 Hz.
10. Press the VBW soft key and set to 30 Hz.
11. On the MS203xA, press the **Marker** key, and press the Peak Search soft key.
12. Record the marker frequency in Table A-2, "Spectrum Analyzer Frequency Accuracy" in Appendix A. Verify that it is within specification.
13. For MS2036A, continue to next step. For MS2034A, go to the next section.
14. Set the synthesizer for 7.0 GHz and set the center frequency of the MS2036A to 7.0 GHz.
15. On the MS2036A, press the **Marker** key, and press the Peak Search soft key.
16. Record the marker frequency in Table A-2 in Appendix A. Verify that it is within specification.

If the unit fails the Spectrum Analyzer Frequency Accuracy test, then perform the Spectrum Analyzer Internal Reference Frequency Adjustment procedure in the following section. If the unit still fails the Frequency Accuracy test after the Internal Reference Frequency adjustment has been completed, then replace the PCB assembly.

## Spectrum Analyzer Internal Reference Frequency Adjustment

Use this procedure to adjust the frequency if the unit fails the Spectrum Analyzer Frequency Accuracy verification test in the previous section.

**Procedure:**

1. Connect the external 10 MHz Reference to the Anritsu MG3692A or MG3692B Synthesized Signal Source. Do not connect the external 10 MHz Reference to the MS203xA.
2. Connect the output of the synthesizer to the Spectrum Analyzer RF In of the MS203xA.
3. On the MS203xA, Verify that the unit is in the Spectrum Analyzer mode and Preset the unit.
4. Set the MG3692A or MG3692B output to 1 GHz with an RF output level of –30 dBm.
5. On the MS203xA, press the **Amplitude** key and set the Reference Level to –10 dBm.
6. Set the Atten Lvl to 0 dB.
7. Press the **Freq** key and set the Center Freq to 1.0 GHz.
8. Press the **Span** key, use the keypad to enter 10, and press the kHz soft key.
9. Press the **BW** key and set the RBW to 100Hz.
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 in order to enter into the MS203xA Service Mode (Figure 2-1).


**Figure 2-1.** MS203xA 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 MS203xA Off, and then back On, to exit Service Mode.

## Spectrum Analyzer SSB Phase Noise Verification

This test can be used to verify the single side band phase noise of the MS203xA.

**Procedure:**

1. Connect the external 10 MHz Reference to the Anritsu MG3692A or MG3692B Synthesized Signal Source.
2. Connect the output of the synthesizer to the Spectrum Analyzer RF In connector of the MS203xA.
3. Set the MG3692A or MG3692B output to 900 MHz CW, with an RF output level of +3 dBm.
4. Verify that the MS203xA is in the Spectrum Analyzer mode. Preset the unit.
5. Press the **Amplitude** key, then set the Reference Level to 0 dBm.
6. Press the Atten Lvl soft key, enter 15 dB.
7. Press the **Freq** key and set the Center Freq to 900 MHz.
8. Press the **Span** key, set to 210 kHz.
9. Press the **BW** key and set the RBW to 1 kHz.
10. Press the VBW soft key set to 3 Hz.
11. Press the **Shift** key and then press the **Trace** (5) key.
12. Press Trace A Operations, and set the # of Averages to 7.
13. Wait until the Trace Count (left side of display) displays 7/7.
14. Press the **Marker** key and press the Peak Search soft key.
15. Press the Delta On/Off soft key to turn Delta On.
16. Use the keypad to enter **10** and press the kHz soft key.
17. Subtract 30 from the dB value shown on the marker readout to convert the value to dBc/Hz (for example, if the marker reads –80 dB, then the value becomes –110 dBc/Hz. Record the dBc/Hz value in Table A-3, "Spectrum Analyzer SSB Phase Noise Verification" in Appendix A.
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 checks the accuracy of the resolution bandwidth settings.

1. Connect the external 10 MHz Reference to both the MG3692x synthesized Source and to the MS203xA VNA Master.
2. Verify that the mode of the MS203xA is set to Spectrum Analyzer. Preset the unit.
3. Set the MS203xA as follows:
   a. Center Frequency: 1.0 GHz
   b. Reference Level: −10 dBm
   c. Attenuation Level: 0 dB
4. Set the MG3692A or MG3692B to 1 GHz, with an output level of −30 dBm. Apply the signal to the spectrum analyzer input of the MS203xA.
5. Set the **Span** of the MS203xA to 4.5 MHz.
6. Press the **BW** 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-4, "Spectrum Analyzer Resolution Bandwidth Accuracy" in Appendix A and verify it is within specification.
10. Repeat Step 5 through Step 9 for all other settings on the test record.

## Spectrum Analyzer Displayed Average Noise Level (DANL)

The following test can be used to verify the Displayed Average Noise Level of the MS203xA. This test is performed using the RMS detection mode, with pre-amp on.

**Procedure:**

1. Connect the 50 Ohm termination to the MS203xA Spectrum Analyzer RF In.
2. Verify that the MS203xA is in the Spectrum Analyzer mode. Preset the unit.
3. Press the **Amplitude** key and set Atten Lvl to 0 dB.
4. Press the Reference Level soft key and set to −50 dBm.
5. Press the Pre-amp On/Off soft key to turn it On.
6. Press the **Shift** key and then press the **Sweep** (3) key, then press Detection, then press RMS.
7. Press the **BW** key. Select RBW of 100 kHz, and select VBW according to the test record in Table A-5, "Spectrum Analyzer DANL (Pre-Amp on)" in Appendix A
8. Enter the Start and Stop frequencies (press the **Freq** key) from Table A-5 in Appendix A.
9. Wait until 1 sweep has completed.
10. Press the **Marker** key and press the Peak Search soft key.
11. Record the Marker reading in the "Measured dBm (100 kHz)" column of Table A-5.
12. Repeat Step 8 through Step 11 for the other frequencies on the list. For each measured 100 kHz value in Table A-5, convert this to 10 Hz RBW value by subtracting 40 dB. For example, if the marker shows a value of −110 dBm at 100 kHz RBW, the computed value at 10 Hz RBW is −150 dBm.) Enter the computed values or −174 dBm, whichever is higher, in Table A-5.

## Spectrum Analyzer Absolute Amplitude Accuracy

The tests in this section verify the level accuracy of the MS203xA Spectrum Analyzer. This test has two parts:

- "Amplitude Accuracy Across Frequency Verification"
- "50 MHz Amplitude Accuracy Verification"

## Amplitude Accuracy Across Frequency Verification

### Amplitude Accuracy Across Frequency Verification Setup Procedure:

1. Connect both MA2442D power sensors to the power meter and calibrate the sensors.
2. Connect the model 1870A power splitter to the MG3692A or MG3692B output and Sensor B to one of the power splitter outputs (Refer to Figure 2-2).
3. Install the 10 dB Fixed Attenuator to the other power splitter output and then connect Sensor A to the end of the Attenuator.

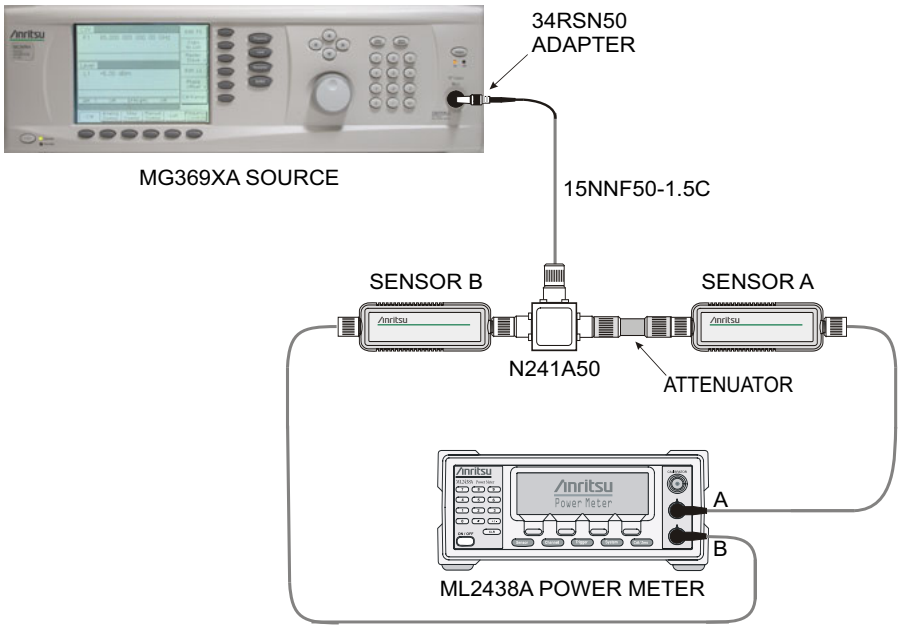


**Figure 2-2.** Component Characterization

4. Set the frequency of the MG3692A or MG3692B to the first (then to the next) frequency in Table A-6, "Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart" in Appendix A.
5. Set the Model ML2438A power meter to display both Channel A and Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692A or MG3692B 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.
6. Adjust the power level of the MG3692A or MG3692B so that Sensor A reads –2.0 dBm.
7. Record the Sensor B reading in the –2 dBm column in Table A-6.
8. Repeat Step 4 through Step 7 for all the frequencies in Table A-6.
9. Repeat Step 4 through Step 7 for a power level of –30.0 dBm, and record those values in the –30 dBm column of Table A-6.
10. Remove Sensor A from the attenuator output, install the 34NN50A adapter to the end of the Attenuator, and connect the splitter/attenuator fixture to the MS203xA as shown in Figure 2-3. To maintain test setup integrity, do not disconnect Sensor B, the power splitter, or the fixed attenuator.

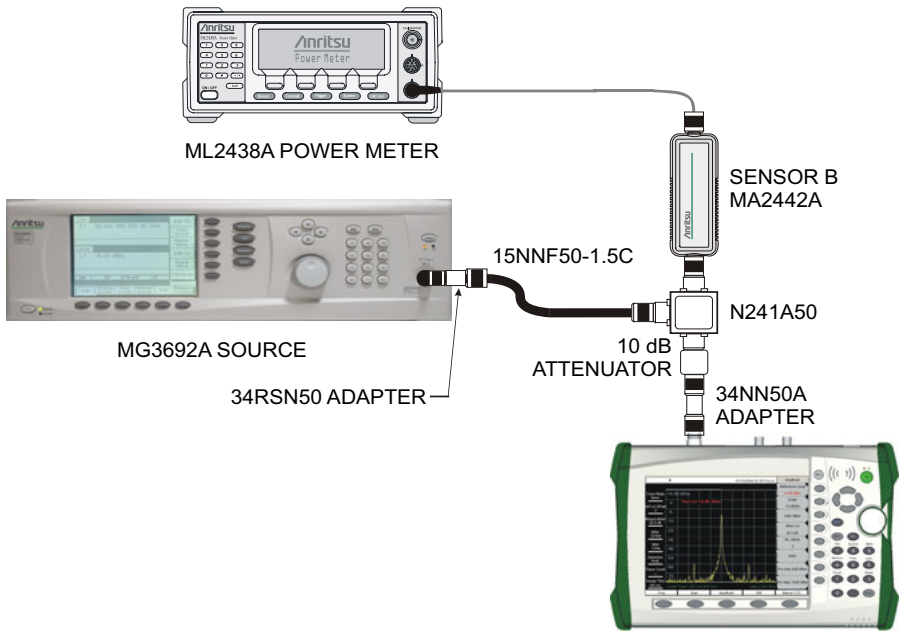


**Figure 2-3.** Test Setup for Amplitude Accuracy Across Frequency Verification

### Amplitude Accuracy Across Frequency Verification Test Procedure:

Use Table A-6, "Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart" on page A-4 to complete the Amplitude Accuracy Across Frequency Verification test record as follows:

1. Verify that the MS203xA is in the Spectrum Analyzer mode. Preset the unit.
2. On the MS203xA, press the **Amplitude** key and then set the Reference Level to –20 dBm.
3. Set the Atten Lvl to 0 dB.
4. Press the **BW** key and set the RBW to 1 kHz.
5. Set the VBW to 10 Hz.
6. Press the **Span** key and set span to 10 kHz.
7. Press the **Freq** key and press the Center Freq soft key.
8. Enter 50 MHz (or the next frequency).
9. Set the Model ML2438A 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 MG3692A or MG3692B 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 MG3692A or MG3692B output to match the frequency in the preceding step.
11. Adjust the MG3692A or MG3692B power level so that the Sensor B for the power meter displays the Sensor B reading in Table A-6, "Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart" for –30 dBm.
12. Press the **Marker** key and press the Peak Search soft key.
13. Record the Marker 1 amplitude reading in the "Measured Value" column in Table A-7, "Measured Values for –30 dBm, 0 dB Attenuation" in Appendix A.
14. Verify that the Marker 1 amplitude reading is within the specification.

**15.** Repeat Step 7 to Step 14 for the other frequencies in column 1 of the Amplitude Accuracy Across Frequency Verification tables (Table A-7 through Table A-11).

**16.** Set the MS203xA Atten Lvl to 5 dB and repeat Step 7 to Step 14. Record the Marker 1 amplitude reading in the "Measured Value" column in Table A-8, "Measured Values for –30 dBm, 5 dB Attenuation".

**17.** Set the MS203xA Atten Lvl to 10 dB and repeat Steps 7 to Step 14. Record the Marker 1 amplitude reading in the "Measured Value" column in Table A-9, "Measured Values for –30 dBm, 10 dB Attenuation".

**18.** Set the MS203xA Atten Lvl to 20 dB and repeat Steps 7 to Step 14. Record the Marker 1 amplitude reading in the "Measured Value" column in Table A-10, "Measured Values for –30 dBm, 20 dB Attenuation".

**19.** Set the MS203xA Reference Level to 10 dBm and the Atten Lvl to 30 dB.

**20.** Repeat Step 7 to Step 14, but adjust the MG3692A or MG3692B power level so that the Sensor B of the power meter displays the Sensor B reading in Table A-6, "Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart" for –2 dBm. Record the Marker 1 amplitude reading in the "Measured Value" column in Table A-11, "Measured Values for –2 dBm, 30 dB Attenuation".

## 50 MHz Amplitude Accuracy Verification

### 50 MHz Amplitude Accuracy Verification Setup:

1. Connect both MA2442D power sensors to the Model ML2438A power meter and calibrate the sensors.
2. Set the frequency of the MG3692A or MG3692B to 50 MHz.
3. Connect the equipment as shown in Figure 2-2 on page 2-7.
4. Set the power meter to display both Channel A and Channel B.
5. Press the **Sensor** key, the Cal Factor soft key, then the Freq soft key and use the keypad to enter the value matching the frequency of MG3692A or MG3692B 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.
6. Adjust the power level of the MG3692A or MG3692B to get a reading on Sensor A that matches the power level in the first column of Table A-12, "Characterization Chart for 50 MHz Amplitude Accuracy Verification" in Appendix A.
7. Record the Sensor B reading in the "Required Sensor B Reading" column in Table A-12.
8. Repeat Step 6 and Step 7 for the other power levels in the first column of Table A-12, recording the Sensor B reading in the second column.

### 50 MHz Amplitude Accuracy Verification Test Procedure:

1. Connect the equipment as shown in Figure 2-3 on page 2-8.
2. Verify that the MS203xA is in the Spectrum Analyzer mode. Preset the unit.
3. Press the **Freq** key and set the MS203xA Center Frequency to 50 MHz.
4. Press the **BW** key and set the RBW to 1 kHz.
5. Set the VBW to 10 Hz.
6. Press the **Span** key and set the span to 10 kHz.
7. Press the **Amplitude** key and set the Reference Level to 10 dBm.
8. Set the Atten Lvl to 30 dB.
9. Adjust the MG3692A or MG3692B power so that the power meter Sensor B matches the Sensor B value that is shown in Table A-12.
10. Press the **Marker** key and press the Peak Search soft key.
11. Record the Marker 1 amplitude reading in Table A-13, "50 MHz Amplitude Accuracy Verification" in Appendix A.
12. Repeat Step 9 through Step 11 for the other power level settings. Change Reference Level and Atten Lvl as indicated in Table A-13.

# 2-4 Power Meter Verification

**Required Equipment**

**Table 2-2.** Equipment Required for Power Meter Verification

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|---|---|---|
| Synthesized Signal Source | Frequency: 0.1 Hz to 20 GHz<br>Power Output to +13 dBm | Anritsu Model MG3692A or MG3692B with options: 2A, 4, 22, 15[a] |
| Power Meter | Power Range: –70 dBm to +20 dBm | Anritsu Dual Channel Model ML2438A |
| Power Sensor | Frequency: 10 MHz to 18 GHz<br>Power Range: –67 to +20 dB | Anritsu Model MA2442D (quantity 2) |
| Fixed Attenuator | 10 dB Attenuation | Aeroflex/Weinschel Model 44-10 |
| Power Splitter | Frequency: DC to 18 GHz | Aeroflex/Weinschel Model 1870A |
| Adapter | Frequency: DC to 20 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 34NN50A |
| Adapter | Frequency: DC to 20 GHz<br>K(m)-N(f), 50 Ohm | Anritsu Model 34RKNF50 |
| RF Coaxial Cable | Frequency: DC to 18 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-0.6B |

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

## Power Meter Measurement Accuracy

The tests in this section verify the level accuracy of the MS203xA Power Meter function.

**Component Characterization:**

1. Connect both MA2442D power sensors to the Model ML2438A power meter and calibrate the sensors.
2. Connect the model 1870A power splitter to the MG3692A or MG3692B output and connect Sensor B to one of the power splitter outputs (Refer to Figure 2-2).
3. Install the 10 dB Fixed Attenuator to the other power splitter output, and then connect Sensor A to the end of the Attenuator.

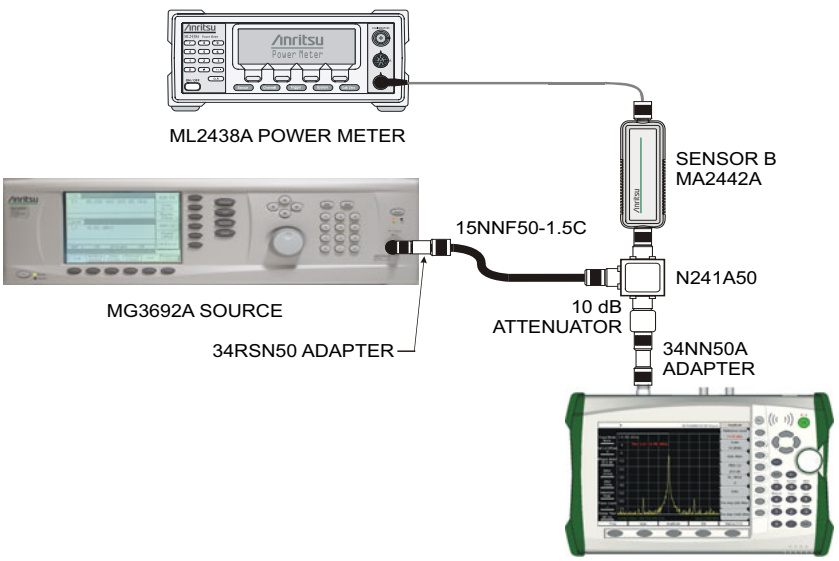


**Figure 2-4.** MS203xA Power Meter Level Accuracy

4. Set the Model ML2438A power meter to display both Channel A and Channel B. Press the **Sensor** key, the Cal Factor soft key, and then the Freq soft key. Use the keypad to enter the value matching the frequency of MG3692A or MG3692B as the input signal frequency, which sets the power meter to the proper power sensor calibration factor. Repeat for Channel B. Press the **System** key to display the power reading.
5. Adjust the power level of the MG3692A or MG3692B to get a reading on Sensor A that matches the power level in the first column of Table A-14, "Characterization Chart for Test Power Level at 50 MHz" in Appendix A.
6. Record the Sensor B reading in the "Required Sensor B Reading" column in Table A-14.
7. Repeat Step 5 and Step 6 for the other power level in the first column of Table A-14, recording the Sensor B reading in the second column of the table.
8. Repeat Step 5 through Step 7 for the next input frequencies (3885.1 MHz for MS2034A and 7000 MHz for MS2036A). Use Table A-16, "Characterization Chart for Test Power Level at 3885.1 MHz" and Table A-18, "Characterization Chart for Test Power Level at 7000 MHz" in Appendix A.

**Procedure:**

1. Connect the equipment as shown in Figure 2-4.
2. Verify that the MS203xA is in the Power Meter mode. Preset the unit.
3. Set the MS203xA Span to 3 MHz.
4. Set the MS203xA Center Frequency to 50 MHz.
5. Adjust the MG3692A or MG3692B power so that the power meter value for Sensor B matches the first Sensor B value that is shown in Table A-14, "Characterization Chart for Test Power Level at 50 MHz".
6. Record the reading on the MS203xA display in Table A-15, "Input Power Level at 50 MHz" in Appendix A.
7. Repeat Step 4 through Step 6 for the next test power level in Table A-14 and Table A-15.
8. Repeat Step 4 through Step 7 for the next test frequencies. Use Table A-16, "Characterization Chart for Test Power Level at 3885.1 MHz" and Table A-17, "Input Power Level at 3885.1 MHz". Then use Table A-18, "Characterization Chart for Test Power Level at 7000 MHz" and Table A-19, "Input Power Level at 7000 MHz".

# 2-5 Vector Network Analyzer Functions

**Required Equipment**

**Table 2-3.** Equipment Required for Vector Network Analyzer Functions

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|---|---|---|
| Frequency Counter | Frequency: 2 GHz | Anritsu Model MF2412B |
| Open/Short | | Anritsu Model 22N50 |
| Termination (N male) | Frequency: DC to 18 GHz<br>Return Loss: 40 dB minimum | Anritsu Model 28N50-2 |
| Termination (N female) | Frequency: DC to 18 GHz<br>Return Loss: 40 dB minimum | Anritsu Model 28NF50-2 |
| RF Coaxial Cable | Frequency: DC to 18 GHz<br>N(m)-N(m), 50 Ohm | Anritsu Model 15NN50-0.6B |
| Coaxial Cable | BNC(m) to BNC(m), 50 Ohm | any |
| 6 dB Offset Termination | | Anritsu Model SC7424 |
| 20 dB Offset Termination | | Anritsu Model SC7423 |

## Frequency Accuracy

The following test can be used to verify the CW frequency accuracy of the RF source in the MS203xA.

**Procedure:**

1. Verify that the MS203xA is in Vector Network Analyzer mode. Preset the unit.
2. Verify that that no external 10 MHz reference is connected to the MS203xA.
3. Press **Shift**, **Sweep** (3).
4. Verify that the RF Immunity is set to Normal.
5. Press the **Freq/Dist** key and set the Center Frequency to 2.0 GHz, and the Span to 0 Hz.
6. Connect the RF cable from the MS203xA VNA Reflection RF Out to the Frequency Counter.
7. Turn on the Frequency Counter and press the **Preset** key.
8. Record the frequency data in Table A-20, "VNA Frequency Accuracy" in Appendix A.

## Return Loss Verification Accuracy

The following test can be used to verify the accuracy of return loss measurements. Measurement calibration of the MS203xA is required for this test.

**Procedure:**

1. Verify that the MS203xA is in Vector Network Analyzer mode. Preset the unit.
2. Press the **Measurement** key, then press the S11 Reflection soft key.
3. Press the Log Magnitude soft key (a red dot will appear on that label).
4. Press **Shift**, then **Calibrate** (2).
5. Press the Start Cal soft key. Follow the instructions on the screen to perform a calibration. (Connect the RF components directly onto the VNA Reflection RF Out connector).
6. After the calibration is complete, install the 6 dB offset termination.
7. Press the **Scale** key, change Reference Value to 6 dB, and change Resolution per Div to 1 dB.
8. Select the Limits menu, turn the Upper Limit On and set it to 5.05 dB.

9. Turn the Lower Limit On and set it to 6.95 dB. Note that the MS203xA rounds off the value on the display to one decimal place (for example, xx.x).
10. Verify that the data display falls between the Limit Lines.
11. Press the **Marker** key to activate the marker menu.
12. Press Peak Search and record the MARKER 1 readout value.
13. Press Valley Search and record the MARKER 1 readout value.
14. Record the MARKER 1 value that has the larger delta from the Reference Value into the "Measured Value" column in Table A-21, "VNA Return Loss Accuracy" in Appendix A.
15. Remove the 6 dB offset termination and install the 20 dB termination.
16. Press the **Scale** key, Change Reference Value to 20 dB.
17. Select the Limits menu, turn the Upper Limit On and set it to 18.39 dB.
18. Turn the Lower Limit On and set it to 21.61 dB.
19. Verify that the data display falls between the Limit Lines.
20. Press the **Marker** key to activate the marker menu.
21. Press Peak Search and record the MARKER 1 readout value.
22. Press Valley Search and record the MARKER 1 readout value.
23. Record the MARKER 1 value that has the larger delta from the Reference Value in Table A-21.

## System Dynamic Range

The following test can be used to verify the system dynamic range. Measurement calibration of the MS203xA is required for this test.

**Procedure 2 MHz to 10 MHz:**

1. Verify that the MS203xA is in Vector Network Analyzer mode. Preset the unit.
2. Install an N male to N male cable to the VNA Reflection RF Out connector. Leave the other end of the cable unconnected.
3. Press the **Freq/Dist** key and set the Stop Frequency to 10 MHz.
4. Press the **Measurement** key, then press S21 Tramsmission.
5. Verify that Log Magnitude is selected (red dot appears on the label).
6. Press the **Shift** key, then press the **Sweep** (3) key.
7. Set RF Immunity to High
8. Press the **Shift** key, then press the **Calibrate** (2) key.
9. Verify that the Cal Type is set to 2-Port and the Cal Power is set to High.
10. Press the Start Cal soft key and follow the on screen instructions to perform the calibration.
11. After the Calibration is complete, disconnect one end of the cable and connect Loads so that both the VNA Reflection RF Out and VNA RF In Port are terminated.
12. Press **Shift**, **Sweep** (3), and press Averaging. Verify that Averaging is set to Off.
13. Press the **Scale** key and set Resolution per Div to 10 dB, and set Reference Value to −60 dB.
14. Press **Shift**, **Limit** (6), and set the Upper Limit to On.
15. Press the Limit Edit soft key.
16. Press Move Limit and set the limit to −70 dB.
17. Verify that the entire RF trace falls under the limit line.
18. Press the **Marker** key to activate the marker menu.

19. Press Peak Search and record the MARKER 1 readout value into the "Measured Value" column in Table A-22, "VNA System Dynamic Range — MS2034A" or Table A-23, "VNA System Dynamic Range — MS2036A" in Appendix A.

**Procedure 10 MHz to 3.0 GHz:**

1. Verify that the MS203xA is in Vector Network Analyzer mode. Preset the unit.
2. Press the **Freq/Dist** key and set the Start Frequency to 10 MHz and the Stop Frequency to 3.0 GHz.
3. Repeat Step 8 through Step 19 in section "Procedure 2 MHz to 10 MHz:" with the upper limit set to −80 dB.

**Procedure 3.0 GHz to 4.0 GHz or 5.5 GHz:**

1. Verify that the MS203xA is in Vector Network Analyzer mode. Preset the unit.
2. Press the **Freq/Dist** key and set the Start Frequency to 3 GHz and set the Stop Frequency to 4 GHz if testing VNA Master model MS2034A (or set Stop Frequency to 5.5 GHz if testing VNA Master model MS2036A).
3. Repeat Step 8 through Step 16 in section "Procedure 2 MHz to 10 MHz:" with the upper limit set to −70 dB.
4. Verify that the entire trace falls under the limit line.
5. Press the **Marker** key to activate the marker menu.
6. Press Peak Search and record the MARKER 1 readout value into the "Measured Value" column in Table A-22, "VNA System Dynamic Range — MS2034A" or Table A-23, "VNA System Dynamic Range — MS2036A".
7. The System Dynamic Range test is complete if the unit is model MS2034A. Continue with the next section for model MS2036A.

**Procedure 5.5 GHz to 6.0 GHz:**

1. Verify that the MS2036A is in Vector Network Analyzer mode. Preset the unit.
2. Press the **Freq/Dist** key and set the Start Frequency to 5.5 GHz and the Stop Frequency to 6.0 GHz.
3. Repeat Step 8 through Step 16 in section "Procedure 2 MHz to 10 MHz:" with the upper limit set to −65 dB.
4. Verify that the entire RF trace falls under the limit line.
5. Press the **Marker** key to activate the marker menu.
6. Press Peak Search and record the MARKER 1 readout value into the "Measured Value" column in Table A-23, "VNA System Dynamic Range — MS2036A".

# 2-6 Options Verification

**Required Equipment**

**Table 2-4.** Equipment Required for Options Verification

| Instrument | Critical Specification | Recommended Manufacturer/Model |
|---|---|---|
| Synthesized Signal Source | Frequency: 0.1 Hz to 20 GHz<br>Power Output to +13 dBm | Anritsu Model MG3692A or MG3692B with options: 2A, 4, 22, 15[a] |
| RF Detector (for Option 5) | Frequency: 10 MHz to 20 GHz | Anritsu Model 560-7N50B |
| Power Meter (for Option 5) | Power Range: –70 dBm to + 20 dBm | Anritsu Dual Channel Model ML2438A |
| Power Sensor (for Option 5) | Frequency: 10 MHz to 18 GHz<br>Power Range: –67 to +20 dB | Anritsu Model MA2442D (quantity 2) |
| Power Splitter (for Option 5) | Frequency: DC to 18 GHz | Aeroflex/Weinschel Model 1870A |
| RF Coaxial Cable (for Option 5) | Frequency: DC to 6 GHz<br>N(m)-N(m) | Anritsu Model 15NN50-1.5C |
| Test Fixture (for Option 10) | Resistance: 40 Ohm<br>Power: 5 Watts | Anritsu Model T2904 |
| Test Fixture (for Option 10) | Resistance: 105 Ohm<br>Power: 1 Watt | Anritsu Model T3377 |
| GPS Antenna (for Option 31) | | Anritsu part number 2000-1410 |

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

## Power Monitor (Option 5) Verification

If the Power Monitor (Option 5) is installed in the MS203xA, the following test can be used to verify the accuracy of the power measurements.

**Procedure:**

1. Set the MS203xA to Power Monitor mode. Preset the unit.
2. Install the 560-7N50B detector to the MS203xA.
3. Set the MG3692A or MG3692B output to 1.0 GHz.
4. Connect the power sensor to the Model ML2438A power meter and calibrate the sensor.
5. Connect the equipment as shown in Figure 2-5.

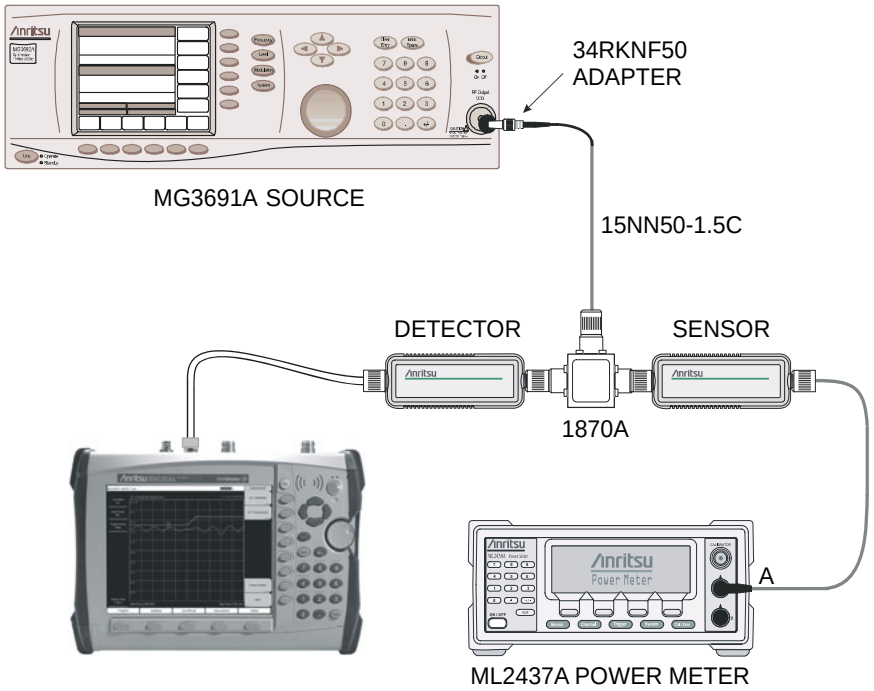


**Figure 2-5.** Power Monitor (Option 5) Verification

6. On the Model ML2438A power meter, set the Sensor calibration factor for 1 GHz.
7. On the MG3692A or MG3692B press the **Level** key, then adjust the power level so that the power meter reads –40.0 dBm.
8. Verify that the MS203xA reading is within the tolerance shown in Table A-24, "Option 5 Power Monitor Accuracy Verification" in Appendix A.
9. Repeat Step 7 and Step 8 for the other power level settings that are shown in the first column of Table A-24.

## Bias Tee (Option 10) Verification

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

**Equipment Required:**

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

**Procedure:**

1. Connect the external power supply (Anritsu part number 40-168-R) to the VNA Master.
2. Press the **On/Off** key to turn on the VNA Master.
3. Press the **Shift** key, the **Preset** (1) key, and then the Preset soft key to reset the instrument to the default starting conditions.

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

4. Press the **Shift** key, and then the **Sweep** (3) key.

## Low Current Test

1. Press the Bias Tee soft key and then the Bias Tee Voltage soft key. Verify that the Bias Tee voltage is set to 12.0 V and that the Current soft key is set to Low.
2. Press the Bias Tee On/Off soft key to turn the Bias Tee On.
3. Connect the 105 Ohm load to the RF In test port.
4. Verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in Table 2-5.
5. Set the Bias Tee voltage to each of the values in Table 2-5 and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in Table 2-5.

**Table 2-5.** Bias Tee Verification, 105 Ohm Load, Low Current

| Voltage Setting | Voltage Specification | Current Specification |
|---|---|---|
| 12.0 V | ± 0.5 V | 85 mA to 145 mA |
| 15.0 V | ± 0.6 V | 113 mA to 173 mA |
| 18.0 V | ± 0.7 V | 142 mA to 202 mA |
| 21.0 V | ± 0.8 V | 172 mA to 230 mA |
| 24 V | ± 1.0 V | 199 mA to 259 mA |

## High Current Test

1. Press the Current soft key to set the Bias Tee current to High.
2. Set the Bias Tee voltage to 12.0 V and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in Table 2-6.

Set the Bias Tee voltage to 15.0 V and verify that the voltage and current readings that are displayed on the left side of the screen are within the specifications that are shown in Table 2-6.

**Table 2-6.** Bias Tee Verification, 105 Ohm Load, High Current

| Voltage Setting | Voltage Specification | Current Specification |
|---|---|---|
| 12.0 V | ± 0.5 V | 85 mA to 145 mA |
| 15.0 V | ± 0.6 V | 113 mA to 173 mA |

3. Disconnect the 105 Ohm load and connect the 40 Ohm load to the RF In port.
4. Set the Bias Tee voltage to 12.0 V and verify the voltage and current readings displayed on the left side of the screen are within the specifications shown in Table 2-7.

Set the Bias Tee voltage to 15.0 V and verify the voltage and current readings displayed on the left side of the screen are within the specifications shown in Table 2-7.

**Table 2-7.** Bias Tee Verification, 40 Ohm Load, High Current

| Voltage Setting | Voltage Specification | Current Specification |
|---|---|---|
| 12.0 V | ± 0.5 V | 250 mA to 350 mA |
| 15.0 V | ± 0.6 V | 325 mA to 425 mA |

## Fault Test

1. Press the Current soft key and set the Bias Tee current to Low.
2. Set the Bias Tee voltage to 15.0 V.
3. Connect the 40 Ohm load to the RF In port.
4. Verify that the instrument makes a clicking sound and the Bias Tee current reading displayed on the left side of the screen is 0 mA.

## GPS (Option 31) Verification

The following test can be used to verify the operation of the GPS option.

**Procedure:**

1. Connect the GPS antenna to the GPS Antenna connector on the MS203xA.

| | |
|---|---|
| **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 the antenna must be placed outdoors without any obstructions. |

2. Press the **Shift** key and then the **System** (8) key.
3. Press the GPS soft key, then press the GPS On/Off soft key to turn the GPS On.
4. When the GPS fix is acquired, the GPS indicator at the top of the LCD display turns green. The latitude and the longitude are displayed next to the GPS indicator.
5. Wait for approximately 3 minutes after the Reference Source indicator in the lower-left-hand corner of the LCD display has changed to GPS High Accuracy.

| Note | If a GPS fix is acquired by using the Anritsu 2000-1410 antenna outdoors, then bringing the instrument indoors will cause a loss of the satellite tracking. When the loss occurs, a red cross appears on the green GPS indicator, and the Reference Source indicator changes to Int Hi Accy. The following test will therefore verify frequency to a lesser specification. |
|---|---|

6. Connect the external 10 MHz Reference to the Anritsu MG3692x but not to the MS203xA.
7. Connect the output of the MG3692x to the Spectrum Analyzer RF In of the MS203xA.
8. On the MS203xA, change mode to Spectrum Analyzer and preset the MS203xA.
9. Set the MG3692x output to 3.9 GHz CW, with an RF output level of –30 dBm.
10. On the MS203xA, press the **Amplitude** key, and set the reference level to –10 dBm.
11. Press the **Freq** key and set the center frequency to 1 GHz.
12. Press the **Span** key and set the span to 10 kHz.
13. Press the **BW** key and set RBW to 100 Hz.
14. Press the VBW soft key and set VBW to 30 Hz.
15. Press the **Marker** key, and press the Peak Search soft key.
16. Record the marker frequency in the "Measured Value" column of Table A-25, "Option 31 GPS Receiver Verification - Spectrum Analyzer Frequency Accuracy" in Appendix A.
17. Subtract the marker value from 3.9 GHz , record the result in the Error column of Table A-25, and verify that it is within specification.

# Chapter 3 — Remove and Replace Instructions

## 3-1 Introduction

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.

## 3-2 Battery Pack Information

The following information relates to the care and handling of the Anritsu 633-44 battery pack and Lithium-Ion batteries in general.

- The 633-44 battery pack that is supplied with the MS203xA may need charging before use. Before using the MS203xA, the internal battery may be charged either in the MS203XA, using the AC-DC Adapter (40-168) or the 12-Volt DC adapter (806-141), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS203xA, but are electrically incompatible and will not charge correctly.
- Recharge the battery only in the MS203xA or in an Anritsu approved charger.
- When the MS203xA 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.
- A fully charged battery will discharge itself over time if left unused.
- Temperature extremes affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before either 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 extremely hot or cold places reduces 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.

## Battery Pack Removal and Replacement

This section provides instructions for the removal and replacing the MS203xA battery pack.

Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations that are used are representative and may show instruments other than the MS203xA.

1. With the MS203xA laying flat, face up, on a stable surface, locate the battery access door, as illustrated in Figure 3-1.

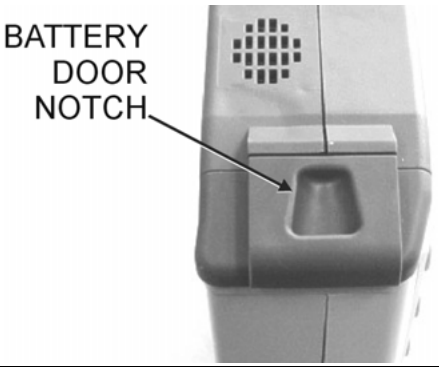


**Figure 3-1.** Battery Access Door Notch

2. Place a finger in the battery access door notch and push the door down towards the bottom of the instrument, as illustrated in Figure 3-2.

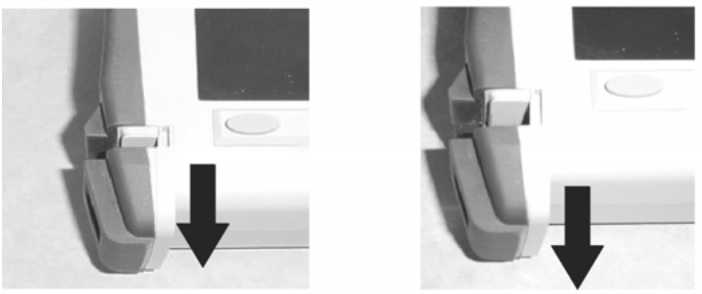

**Figure 3-2.** Removing the Battery Access Door

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

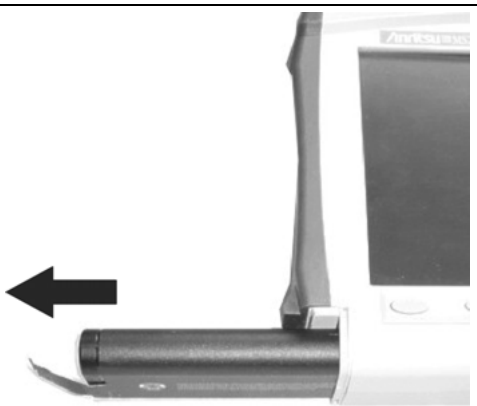

**Figure 3-3.** Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the unit (Figure 3-4).

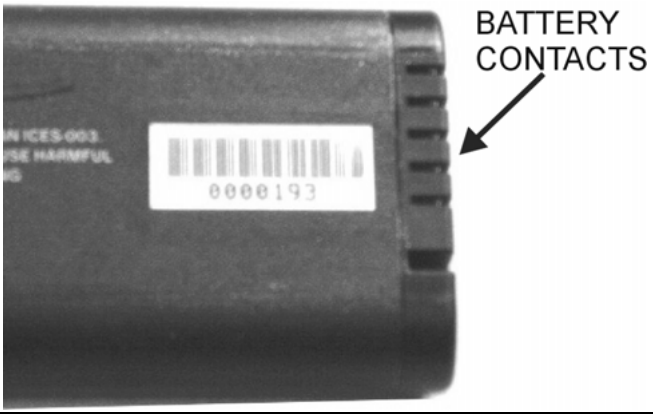


**Figure 3-4.** Battery Contacts

## 3-3 Opening the MS203xA Case

This procedure provides instructions for opening the MS203xA case. Except for keypad parts replacement (refer to sections later in this chapter), the case must be opened for all maintenance operations.

Ensure that all work is performed at a static-safe work area. Part numbers for all replaceable parts are found in Chapter 1.

Before opening the case, Anritsu Company strongly recommends that all internally saved files be saved to a PC using the Master Software Tools utility program or be copied to an external CF card on the MS203xA. In the event that the Main PCB needs to be replaced, this will prevent permanent loss of these files.

### To open the MS203xA case:

1. On the RF connector panel, remove the 4 small Phillips-head screws surrounding the Spectrum Analyzer RF In connector.
2. Remove the battery door and battery as shown in Figure 3-1 and Figure 3-2.
3. Place the MS203xA face down.
4. Use a Phillips screwdriver to remove the four screws securing the 2 halves of the MS203xA case together (Figure 3-5).

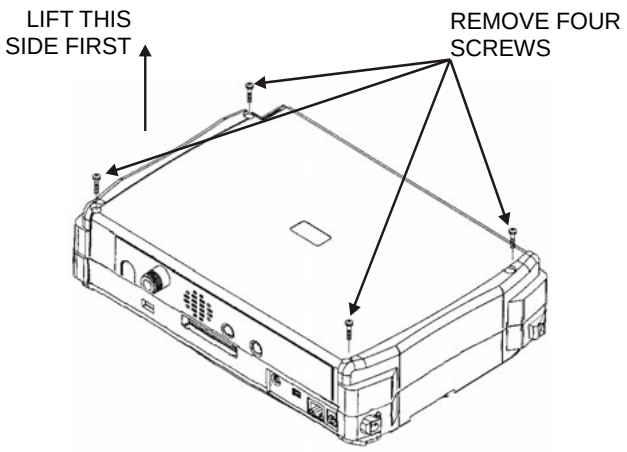


**Figure 3-5.** Remove the Four Screws

5. Remove the 4 small screws surrounding the SPA RF In connector.

6. Stand the unit up in the normal operating position and separate the 2 halves by about 2 inches. Three cables must be disconnected before the 2 halves can be separated:


**Figure 3-6.** Separating the Case

7. Under the VNA RF In connector is a 7 cm long ribbon cable. Disconnect either side of this ribbon cable.
8. Unplug the two RF cables that are plugged into the top of the Spectrum Analyzer PCB (refer to Figure 3-6). The 2 halves of the MS203xA can now be completely separated.

## 3-4 Removing the Spectrum Analyzer PCB

1. The Spectrum Analyzer PCB is attached to the case bottom cover and can be removed from the case cover by removing the 6 larger screws around the edge of the PCB (refer to Figure 3-7). Do not loosen or remove any smaller size screws from the Spectrum Analyzer assembly.

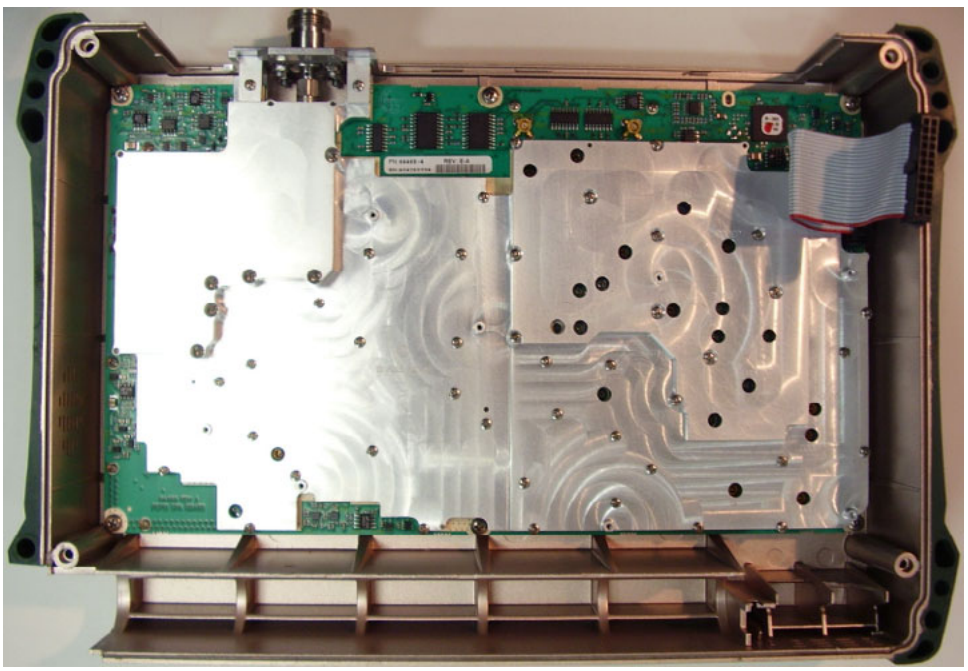

**Figure 3-7.** Spectrum Analyzer PCB

## 3-5 Removing the VNA Module

1. The VNA module, Main PCB, and LCD are mounted together (in that order) and mounted to the case top cover. To continue with disassembly, the VNA module must first be disconnected from the Main PCB (refer to Figure 3-8).

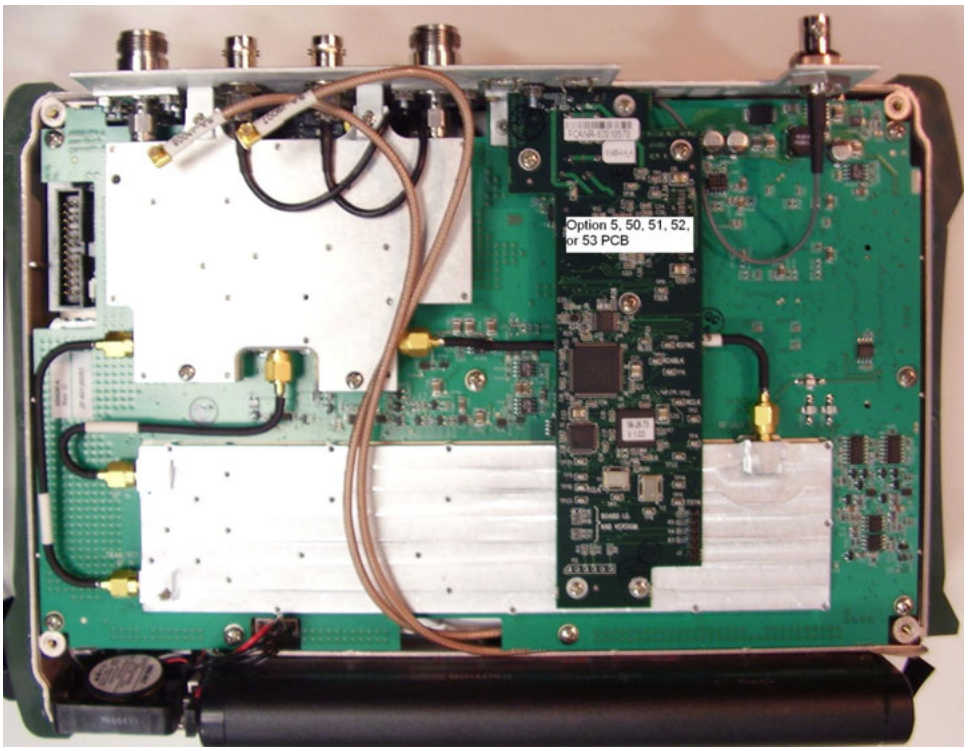


**Figure 3-8.** VNA Module

2. If the unit is fitted with Option 5, then the small PCB is mounted on the VNA module, which will need to be removed. If the VNA module is to be replaced, then the Option 5 PCB should not be returned to the factory with the VNA module.
3. If the unit has Option 31 (GPS), then use a T1451 socket to remove the decorative nut on the RF panel. Securely tape the Option 31 connector to an RF shield on the VNA module so that the weight of the GPS connector does not strain the GPS wire.
4. After removing the Option 5 PCB, use a 7 mm wrench to hold the standoffs under the 7 mounting screws that attach the VNA board. Remove all 9 screws that are holding the VNA module to the Main PCB (refer to Figure 3-8).
5. Unplug all snap-in RF cables that hold the module to the Main PCB and lift off the VNA module. Do not remove any RF cables that have a wrench-type connector. There are no replaceable parts on the VNA module except the Option 5 board.
6. Replacement of the VNA module and Option 5 PCB is the opposite of removal.

## 3-6 Removing the Main PCB/LCD Assembly

1. Make note of the cable locations and routing. Unplug all snap-in RF cables. Push the external CF card ejector button to the in position. Using a 7 mm wrench, remove the 7 standoffs that hold the Main PCB in the case. Because of the thread locking compound that is used, these standoffs may be somewhat difficult to remove.
2. Unplug the cables to the fan, the battery pack connector, and the knob from the Main PCB. Lift the Main PCB/LCD assembly out of the case.

## 3-7 Removing 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). Unplug the 8-wire bias cable that connects between the backlight driver PCB and the Main PCB. Unplug the high voltage wires at the connector on the backlight driver PCB.
2. Remove the 4 screws that attach the LCD to the Main PCB. Remove the 2 screws that attach the backlight driver PCB to the Main PCB.
3. Lift off the LCD and backlight driver PCB.

### Replacement

Replacement is the opposite of removal. Before installing the Main PCB/LCD assembly into the case, ensure all wires of the LCD bias cable are pushed under the backlight driver PCB where they cannot interfere with the keyboard connector.

| Note | The Main PCB assembly and the Spectrum Analyzer module are always replaced as a set. Refer to Section "Replaceable Parts" in Chapter 1 for the correct part number for the set. |
|---|---|

## 3-8 Main PCB Real Time Clock (RTC) Battery Removal and Replacement

Refer to Figure 3-9 for the location of this battery. Refer to the parts list in Chapter 1 for the battery part number.

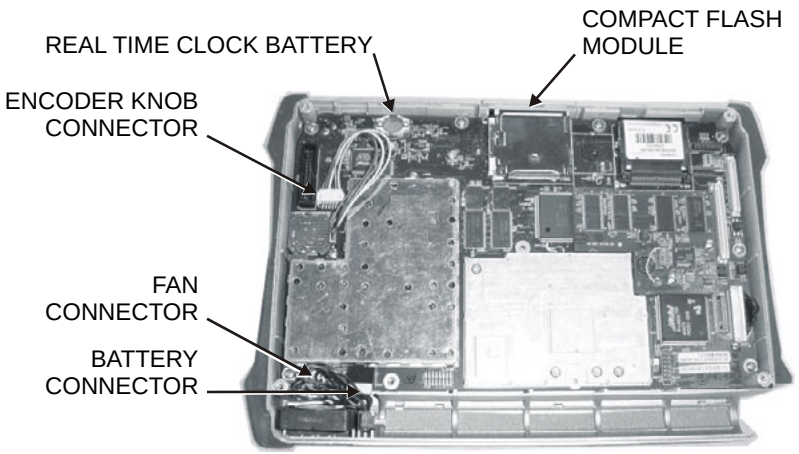


**Figure 3-9.** RTC Battery Location

1. Carefully remove the old battery.
2. Install the new battery with positive side (+) facing up.
3. Apply 2 small drops of RTV compound bridging the top of the battery and the holder in order to hold the battery secure.

## 3-9 Main Keypad Membrane and PCB Replacement

This procedure provides instructions for removing and replacing the main keypad (on the right of the LCD) membrane and PCB. All keypad parts can be replaced without opening the MS203xA case.

1. Place the instrument face up on a protected work surface.
2. Eight locking tabs hold the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane (Figure 3-10 and Figure 3-11).


**Figure 3-10.** Front Bezel

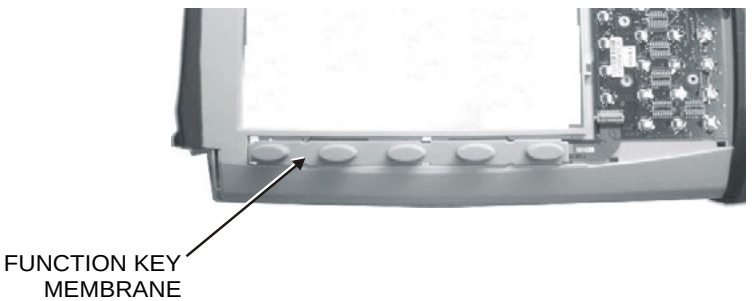


**Figure 3-11.** Function Key Membrane

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

## 3-10 Replacing the Function Key Keypad

1. Disconnect the function key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad (Figure 3-12).

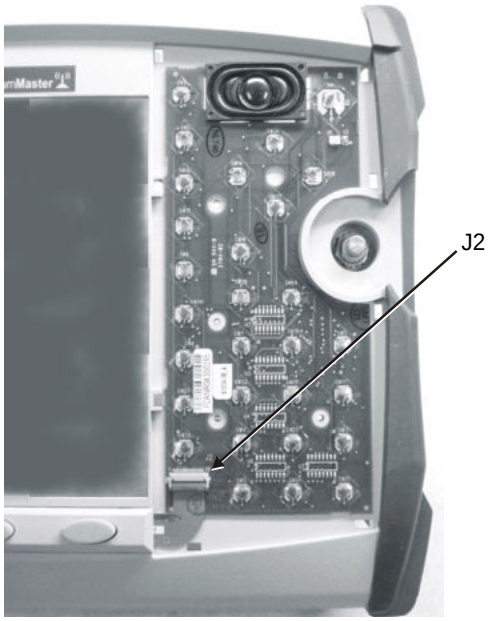


**Figure 3-12.** Connector J2 between the Keypad and the Flexible Switchpad

2. Remove the keypad PCB, taking care not to damage the speaker wires.
3. Reverse the above steps to install the replacement assembly, with the following cautions:
   - **a.** Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should "snap" into position when fully closed.
   - **b.** Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB.
   - **c.** The speaker is held in place by four locating pins on the inside of the keypad bezel. Verify that the four locating pins are properly seated into the four corner holes of the speaker when reinstalling the bezel.
   - **d.** Verify that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

## 3-11 Function Key Membrane and Switchpad Replacement

This procedure provides instructions for replacing the function key membrane and switchpad. All keypad parts can be replaced without opening the MS203xA 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 3-13).

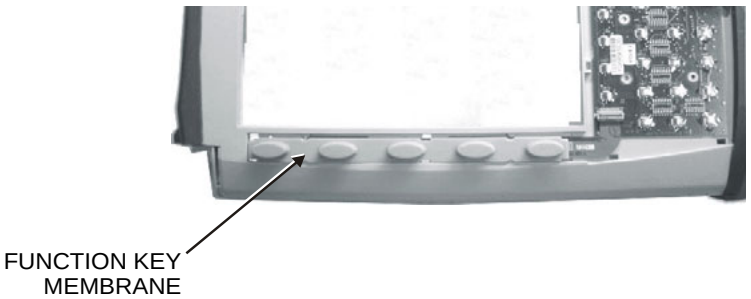


**Figure 3-13.** Function Key Membrane

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 (Figure 3-12).
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.

# Chapter 4 — Troubleshooting

## 4-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu Service Centers. Perform the troubleshooting suggestions in the order in which they are listed. Operators of the MS203xA should refer to the User Guide (Anritsu part number 10580-00166) for troubleshooting help.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies that are shown in the replaceable parts list are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special training. Removal of RF shields from PC boards or adjustment of screws on or near the RF shields will detune sensitive RF circuits and will result in degraded instrument performance.

## 4-2 Turn-on Problems

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

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS203xA, but are electrically incompatible and will not charge correctly.
3. External power supply may have failed or be the wrong type. Replace the external power supply.
4. On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

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

1. Using Master Software Tools, perform the Emergency Repair procedure, then update the system software (via the Tools menu).
2. Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

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

1. If the display is dim, check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB.
3. Replace the LCD assembly.
4. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly.

### Boot-up Self Test fails:

1. Perform a Master Reset.

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

2. The Main PCB has failed. Replace the Main PCB/Spectrum Analyzer assembly

## 4-3 Battery Pack Charging Problems

Refer to Section "Battery Pack Information" on page 3-1

## 4-4 Operating Problems

### Lock Error Messages:

1. This message normally appears for 2 to 3 seconds when an external 10 MHz Reference is applied.
2. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

### Option 5, Power Monitor, Problems:

1. Verify correct operation of RF detector (for a list of suitable detectors, refer to the User Guide, Anritsu part number 10580-00166).
2. Replace the Option 5 PCB. No recalibration is required.

### Spectrum Analyzer Problems:

1. Inspect the Spectrum Analyzer RF In connector for damage.
2. Refer to the User Guide (Anritsu part number 10580-00166).
3. Update system software using Master Software Tools (via Tools menu).
4. Spectrum Analyzer PCB has failed. Replace the Main/Spectrum Analyzer assembly.

### Cable and Antenna Analyzer Problems:

1. Inspect the VNA RF In and VNA Reflection connectors for damage.
2. Inspect the Open, Short, Load, and cables for damage. Verify their operation on a suitable measurement instrument.
3. Refer to the User Guide (Anritsu part number 10580-00166).
4. Update system software using Master Software Tools (via Tools menu).
5. VNA module has failed. Replace the VNA module. No recalibration is required.

### Other Problems:

1. Perform a Master Reset.
2. Refer to the User Guide (Anritsu part number 10580-00166).
3. Update system software using Master Software Tools (via Tools menu).
4. Replace the Main PCB/Spectrum Analyzer assembly.

# Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the Anritsu VNA Master models MS2034A and MS2036A. Anritsu Company recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed will provide a detailed history of the performance of your instrument.

**MS203xA Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

# A-1 Spectrum Analyzer RF Input VSWR

**Table A-1.** Spectrum Analyzer RF Input VSWR

| Measured Value | Specification |
|---|---|
| | 2.0 max |

# A-2 Spectrum Analyzer Frequency Accuracy

**Table A-2.** Spectrum Analyzer Frequency Accuracy

| Frequency | Measured Value | Specification (typical) |
|---|---|---|
| 1 GHz | GHz | ± 300 Hz |
| (MS2036A only) 7 GHz | GHz | ± 2.1 kHz |

# A-3 Spectrum Analyzer SSB Phase Noise Verification

**Table A-3.** 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 | –102 dBc/Hz |

**MS203xA Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

## A-4 Spectrum Analyzer Resolution Bandwidth Accuracy

**Table A-4.** 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 |

## A-5 Spectrum Analyzer DANL (Pre-Amp on)

**Table A-5.** Spectrum Analyzer DANL (Pre-Amp on)

| Frequency | RBW | VBW | Measured dBm (100 kHz RBW) | Calculated dBm (10 Hz RBW) | 10 Hz Specification |
|---|---|---|---|---|---|
| 10 MHz to 1.0 GHz | 100 kHz | 1 kHz | dBm | dBm | ≤ –151 dBm |
| >1 GHz to 2.2 GHz | 100 kHz | 1 kHz | dBm | dBm | ≤ –149 dBm |
| >2.2 GHz to 2.8 GHz | 100 kHz | 300 Hz | dBm | dBm | ≤ –143 dBm |
| >2.8 GHz to 4.0 GHz | 100 kHz | 300 Hz | dBm | dBm | ≤ –149 dBm |
| (MS2036A only) >4.0 GHz to 7.1 GHz | 100 kHz | 300 Hz | dBm | dBm | ≤ –144 dBm |

**MS203xA** **Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

**Amplitude Accuracy Across Frequency Verification**

# A-6 Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart

This chart is a characterization of the system components which should be completed before any data is recorded in the test records in Table A-7, Table A-8, Table A-9, Table A-10, and Table A-11. Change the synthesizer frequency and fill in the blanks for the −2 dBm column first, then change the frequencies and fill out the chart on the −30 dBm column. The characterization chart information will be used later to fill out the test records for measured dBm values.

**Table A-6.** Spectrum Analyzer Absolute Amplitude Accuracy Characterization Chart

| Frequency | Sensor B Reading at −2 dBm | Sensor B Reading at −30 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 (MS2036A only) | dBm | dBm |
| 6000 MHz (MS2036A only) | dBm | dBm |
| 7000 MHz (MS2036A only) | dBm | dBm |

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

# A-7 Spectrum Analyzer Absolute Amplitude Accuracy Measured Values

## Measured Values for –30 dBm, 0 dB Attenuation

**Table A-7.** Measured Values for –30 dBm, 0 dB Attenuation

| Frequency | Measured Value | Specification |
|---|---|---|
| 50 MHz | dBm | ± 1.25 dB |
| 100 MHz | dBm | ± 1.25 dB |
| 500 MHz | dBm | ± 1.25 dB |
| 1000 MHz | dBm | ± 1.25 dB |
| 2000 MHz | dBm | ± 1.25 dB |
| 3000 MHz | dBm | ± 1.25 dB |
| 4000 MHz | dBm | ± 1.25 dB |
| **(below for MS2036A only)** | | |
| 5000 MHz | dBm | ± 1.75 dB |
| 6000 MHz | dBm | ± 1.75 dB |
| 7000 MHz | dBm | ± 1.75 dB |

## Measured Values for –30 dBm, 5 dB Attenuation

**Table A-8.** Measured Values for –30 dBm, 5 dB Attenuation

| Frequency | Measured Value | Specification |
|---|---|---|
| 50 MHz | dBm | ± 1.25 dB |
| 100 MHz | dBm | ± 1.25 dB |
| 500 MHz | dBm | ± 1.25 dB |
| 1000 MHz | dBm | ± 1.25 dB |
| 2000 MHz | dBm | ± 1.25 dB |
| 3000 MHz | dBm | ± 1.25 dB |
| 4000 MHz | dBm | ± 1.25 dB |
| **(below for MS2036A only)** | | |
| 5000 MHz | dBm | ± 1.75 dB |
| 6000 MHz | dBm | ± 1.75 dB |
| 7000 MHz | dBm | ± 1.75 dB |

**MS203xA** **Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

# SPA Absolute Amplitude Accuracy Measured Values (continued)

## Measured Values for –30 dBm, 10 dB Attenuation

**Table A-9.** Measured Values for –30 dBm, 10 dB Attenuation

| Frequency | Measured Value | Specification |
|---|---|---|
| 50 MHz | dBm | ± 1.25 dB |
| 100 MHz | dBm | ± 1.25 dB |
| 500 MHz | dBm | ± 1.25 dB |
| 1000 MHz | dBm | ± 1.25 dB |
| 2000 MHz | dBm | ± 1.25 dB |
| 3000 MHz | dBm | ± 1.25 dB |
| 4000 MHz | dBm | ± 1.25 dB |
| **(below for MS2036A only)** | | |
| 5000 MHz | dBm | ± 1.75 dB |
| 6000 MHz | dBm | ± 1.75 dB |
| 7000 MHz | dBm | ± 1.75 dB |

## Measured Values for –30 dBm, 20 dB Attenuation

**Table A-10.** Measured Values for –30 dBm, 20 dB Attenuation

| Frequency | Measured Value | Specification |
|---|---|---|
| 50 MHz | dBm | ± 1.25 dB |
| 100 MHz | dBm | ± 1.25 dB |
| 500 MHz | dBm | ± 1.25 dB |
| 1000 MHz | dBm | ± 1.25 dB |
| 2000 MHz | dBm | ± 1.25 dB |
| 3000 MHz | dBm | ± 1.25 dB |
| 4000 MHz | dBm | ± 1.25 dB |
| **(below for MS2036A only)** | | |
| 5000 MHz | dBm | ± 1.75 dB |
| 6000 MHz | dBm | ± 1.75 dB |
| 7000 MHz | dBm | ± 1.75 dB |

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

## SPA Absolute Amplitude Accuracy Measured Values (continued)

## Measured Values for –2 dBm, 30 dB Attenuation

**Table A-11.** Measured Values for –2 dBm, 30 dB Attenuation

| Frequency | Measured Value | Specification |
|---|---|---|
| 50 MHz | dBm | ± 1.25 dB |
| 100 MHz | dBm | ± 1.25 dB |
| 500 MHz | dBm | ± 1.25 dB |
| 1000 MHz | dBm | ± 1.25 dB |
| 2000 MHz | dBm | ± 1.25 dB |
| 3000 MHz | dBm | ± 1.25 dB |
| 4000 MHz | dBm | ± 1.25 dB |
| **(below for MS2036A only)** | | |
| 5000 MHz | dBm | ± 1.75 dB |
| 6000 MHz | dBm | ± 1.75 dB |
| 7000 MHz | dBm | ± 1.75 dB |

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

**50 MHz Amplitude Accuracy Verification**

## Characterization Chart for 50 MHz Amplitude Accuracy Verification

**Table A-12.** 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 |

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

## A-8 50 MHz Amplitude Accuracy Verification

**Table A-13. 50 MHz Amplitude Accuracy Verification**

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

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

# A-9 Power Meter Measurement Accuracy

## Input Power Level at 50 MHz

**Table A-14.** Characterization Chart for Test Power Level at 50 MHz

| Test Power Level at 50 MHz | Required Sensor B Reading |
|---|---|
| 0 dBm | dBm |
| −50 dBm | dBm |

**Table A-15.** Input Power Level at 50 MHz

| Input Power Level | Specification | Measured |
|---|---|---|
| 0 dBm | ± 1.25 dB | dBm |
| −50 dBm | ± 1.5 dB | dBm |

## Input Power Level at 3885.1 MHz

**Table A-16.** Characterization Chart for Test Power Level at 3885.1 MHz

| Test Power Level at 3885.1 MHz[a] | Required Sensor B Reading |
|---|---|
| 0 dBm | dBm |
| −50 dBm | dBm |

a.MS2034A Only

**Table A-17.** Input Power Level at 3885.1 MHz[a]

| Input Power Level | Specification | Measured |
|---|---|---|
| 0 dBm | ± 1.25 dB | dBm |
| −50 dBm | ± 1.5 dB | dBm |

a.Frequency point at 3885.1 MHz for MS2034A only.

**MS203xA Firmware Revision: _____ Operator: _____ Date: _____**

**Serial Number: _____ Options: _____**

# Power Meter Measurement Accuracy (continued)

## Input Power Level at 7000 MHz

**Table A-18.** Characterization Chart for Test Power Level at 7000 MHz

| Test Power Level at 7000 MHz[a] | Required Sensor B Reading |
|---|---|
| 0 dBm | dBm |
| −50 dBm | dBm |

a.MS2036A Only

**Table A-19.** Input Power Level at 7000 MHz[a]

| Input Power Level | Specification | Measured |
|---|---|---|
| 0 dBm | ± 1.75 dB | dBm |
| −50 dBm | ± 1.75 dB | dBm |

a.Frequency point at 7000 MHz for MS2036A only.

**MS203xA Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

## A-10 VNA Frequency Accuracy

**Table A-20.** VNA Frequency Accuracy

| Frequency Reading @ 2.0 GHz | Specification |
|---|---|
| | ± 50 kHz |

## A-11 VNA Return Loss Accuracy

**Table A-21.** VNA Return Loss Accuracy

| Parameter | Specification | Measured Value |
|---|---|---|
| Return Loss 6 dB Offset | 6 dB ± 0.95 | dB |
| Return Loss 20 dB Offset | 20 dB ± 1.61 | dB |

**MS203xA Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

## A-12 VNA System Dynamic Range — MS2034A

**Table A-22.** VNA System Dynamic Range — MS2034A

| Frequency | Specification | Measured Value |
|---|---|---|
| 2 MHz to 10 MHz | 70 dB | dB |
| 10 MHz to 3 GHz | 80 dB | dB |
| 3 GHz to 4 GHz | 70 dB | dB |

## A-13 VNA System Dynamic Range — MS2036A

**Table A-23.** VNA System Dynamic Range — MS2036A

| Frequency | Specification | Measured Value |
|---|---|---|
| 2 MHz to 10 MHz | 70 dB | dB |
| 10 MHz to 3 GHz | 80 dB | dB |
| 3 GHz to 5.5 GHz | 70 dB | dB |
| 5.5 GHz to 6 GHz | 65 dB | dB |

## A-14 Option 5 Power Monitor Accuracy Verification

**Table A-24.** Option 5 Power Monitor Accuracy Verification

| Power Level on ML Meter | Measured Value on MS203xA | Error | Specification |
|---|---|---|---|
| –40.0 dBm | dBm | dB | ±1.0 dB |
| –21.0 dBm | dBm | dB | ±1.0 dB |
| –7.0 dBm | dBm | dB | ±1.0 dB |
| 0.0 dBm | dBm | dB | ±1.0 dB |
| +13.0 dBm | dBm | dB | ±1.0 dB |

**MS203xA** **Firmware Revision:** _____ **Operator:** _____ **Date:** _____

**Serial Number:** _____ **Options:** _____

# A-15 Option 31 GPS Receiver Verification - Spectrum Analyzer Frequency Accuracy

**Table A-25.** Option 31 GPS Receiver Verification - Spectrum Analyzer Frequency Accuracy

| Frequency | Measured Value | Error | Specification |
|---|---|---|---|
| 3.9 GHz | GHz | Hz | ±2.7 Hz (with GPS High Accuracy) or ±5.3 Hz (with Internal High Accuracy) |

# Appendix B — Test Fixture Schematics

The following schematic diagrams are provided for those who wish to build their own test fixtures for the Option 10 verification test. The part numbers that are referenced in the schematic diagrams are Anritsu part numbers.

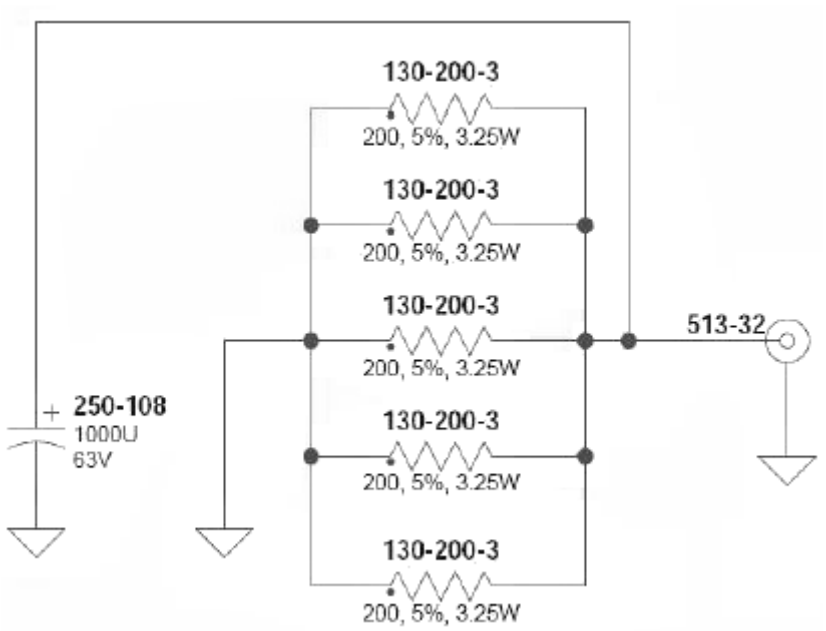


**Figure B-1.** Anritsu Model T2904 High Current Test Fixture (for Option 10)

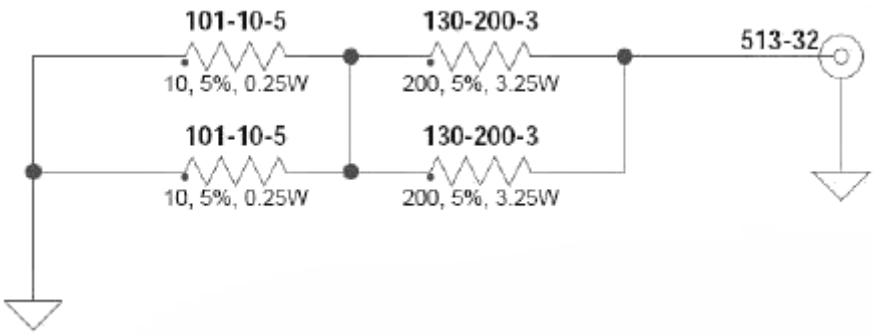


**Figure B-2.** Anritsu Model T3377 Low Current Test Fixture (for Option 10)

Anritsu

Printed on Recycled Paper with Vegetable Soybean Oil Ink

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