Maintenance Manual

Remote Spectrum Monitor

MS27101A, 9 kHz to 6 GHz

MS27102A, 9 kHz to 6 GHz

MS27103A, 9 kHz to 6 GHz

Anritsu Company
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Part Number: 10580-00420
Revision: B
Published: February 2016

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

Warning

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

Caution

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

Safety Symbols Used on Equipment and in Manuals

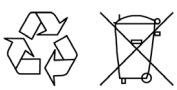
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all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

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

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

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

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



These indicate that the marked part should be recycled.

For Safety

Warning

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

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

Warning

When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. 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.

Table of Contents

Chapter 1 — General Information

1-1 Introduction

This manual provides maintenance instructions for the Anritsu MS27101A, MS27102A, and MS27103A Remote Spectrum Monitors. This manual includes:

- General information including:
  - List of recommended equipment to perform maintenance and verification testing (Table 1-1)
  - Replaceable parts list
    - MS27101A (Table 1-2)
    - MS27102A (Table 1-3)
    - MS27103A (Table 1-4)
- Performance verification procedures:
  - Chapter 2, "MS2710xA Verification"
- Assembly replacement and troubleshooting procedures:
  - Chapter 3, "Assembly Replacement"
  - Chapter 4, "Troubleshooting"
- Blank test records are included in Appendix A.
  - Copy the blank test records from Appendix A and use them to record measured values. Anritsu recommends making a copy of the blank test records to document measurements each time a performance verification is performed. Continuing to document this process each time provides a detailed history of the instrument performance.

Familiarity with the basic operation of the Remote Spectrum Monitor is assumed.

1-2 Anritsu Customer Service Centers

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

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1-3 Recommended Test Equipment

Table 1-1. Recommended Test Equipment for Maintenance and Verification

Equipment	Critical Specification	Recommended Manufacturer/Model
Synthesized Signal Generator	Frequency: 0.1 Hz to 6 GHz, Power Output: +16 dBm, Step attenuator installed	Anritsu Model MG3692A/B/C, with Options 2A, 3, 4, 22, 15x[a]
Power Meter	Power Range: –70 dBm to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 100 kHz to 6 GHz Power Range: –30 dB to +20 dB	Anritsu Model SC7400
Frequency Reference	Frequency: 10 MHz	Symmetricom RubiSource T&M
GPS Antenna	GPS Connection	Anritsu P/N 2000-1528-R
Fixed Attenuator	10 dB Attenuation	Aeroflex/Weinschel Model 44-10
Power Splitter	Frequency: DC to 6 GHz	Aeroflex/Weinschel Model 1870A
50 Ohm Termination	Frequency: DC to 6 GHz	Anritsu Model SM/PL-1
RF Coaxial Cable	Frequency: DC to 18 GHz N(m) to N(m), 50 ohm	Anritsu Model 15NN50-1.5C
Coaxial Cable	BNC(m) to BNC(m), 50 ohm	Anritsu Model 2000-1627-R
Adapter	DC to 6 GHz, K(m) to N(f)	Anritsu Model 34RKNF50
Adapter	DC to 6 GHz, N(m) to N(m)	Anritsu Model 34NN50A
Adapter	N(f) to SMA(m), for MS27103A only	Anritsu Model 1091-80-R
M25 Port Tool	Port 1 and Port 2 Replacement Tool, for MS27102A only	Anritsu Model T4461
1/4 Inch Torque Wrench	15 in-lbf setting, for MS27102A only	Any
Phillips Screw Driver	#1 Phillips Head	Any
8 mm Open Ended Wrench	8 mm	Any

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

1-4 Replaceable Parts

Table 1-2. MS27101A List of Replaceable Parts

Part Number	Description
ND82236	MS27101A Main/SPA PCB Assembly
3-76088	Left or Right Side Rail (top and bottom covers slide into these)
3-76089	Top or Bottom Cover (does not include 4 rubber feet attached to bottom cover)
3-790-587	Adhesive Rubber Foot (4) (attaches to bottom cover)
3-76090	Left or Right Handle (attaches to side rails and front cover)
3-80430	Rear Panel (includes DC plug with internal cable)
3-81812-1	Front Panel (includes power switch, Ethernet, USB, RF Input, Ext. Ref In, and GPS connectors)
3-81985	Semi Rigid Cable, SMA(m) to SMA(m) (connects RF Input to SPA)
3-510-87	RF In Port, N(f) to SMA(f) Adapter
3-81950	Front Panel Overlay

Table 1-3. MS27102A List of Replaceable Parts

Part Number	Description
ND82026	MS27102A Main/SPA PCB Assembly
ND82027	MS27102A MUX PCB Assembly (for 2-port instruments)
ND82030	MS27102A Main/SPA/MUX PCB Assembly (for 2-port instruments)
3-2000-1828	IP67 Chassis (includes top and bottom covers, plugs, internal Ethernet, DC and GPS cables)
3-790-775	IP67 Top Cover
3-790-774	IP67 Bottom Enclosure
3-790-777	RF Port Plug (single plug on back of bottom enclosure)
3-513-140	RF In Port, N(f) to SMA(f) Adapter
3-75261-5	10 MHz Reference Cable, BNC to MCX
3-806-328	GPS Cable, SMA(f) to MCX
3-806-326	DC Cable (connects SPA to DC connector on chassis)
3-81592	Port 1 to SPA Cable (for 1-port instruments)
3-81593	Port 1 to SPA Cable (for 2-port instruments)
3-81594	Port 2 to SPA Cable (for 2-port instruments)
3-81591	SPA to MUX Cable, SMA(m) to SMA(m) (for 2-port instruments)
3-67367	SPA to MUX Interface Cable, USB Type A to 1x5
3-81597	EMI Foam Block, 120 mm x 265 mm x 31 mm (for 2-port instruments)
3-806-327	Ethernet Cable Internal, 200 mm
3-553-560	Cap with Chain, N(f) Cap
3-553-561	Cap with Chain, SMA(f) Cap
3-81341	Bracket for BNC Connector of 10 MHz Reference Input
3-81599-1	Conductive Foam, 152 mm x 15 mm x 15 mm
3-81599-2	Conductive Foam, 228 mm x 15 mm x 15 mm
3-790-780	Bracket, External Mount for IP67 Chassis

Table 1-3. MS27102A List of Replaceable Parts

Part Number	Description
3-81595	Mounting Bracket Extension Set (for IP67 chassis)
3-553-559	CAT6 Cable Seal for cable OD 4.5 mm to 6.5 mm. Includes seal nut, clip, seal, body, and gasket. Allows sealed connection to IP67 chassis.
3-553-558	Seal for cable OD 6.6 mm to 8.6 mm. This is seal only and replaces seal from 3-553-559. If nut, clip, body, and gasket are needed, order both 3-553-558 and 3-553-559.
3-510-155	Power Connector Housing. Includes seal nut, clip, seal, body, locknut, housing, and O-ring. This allows the input power cables to be connected to this part, and then connected to the IP67 chassis.
3-553-557	CAT6 Module, without internal jumper. This is the internal RJ45 connector allowing an external Ethernet cable to connect to the IP67 chassis.

Table 1-4. MS27103A List of Replaceable Parts

Part Number	Description
ND82269	Main/SPA PCB
ND82270	Front Panel For 12 Port Unit (includes MUX assembly)
ND82271	Front Panel For 24 Port Unit (includes MUX assembly)
3-81677	Rear Panel for 48 VDC Unit (includes 48 VDC connector, 1 Ethernet, 2 USB, the GPS and Reference Input cables, along with a removable blanking plate for the 2nd Ethernet Option)
3-76075	Rear Panel for 110 VAC Unit (includes 1 Ethernet, 2 USB, the GPS and Reference Input cables, along with a removable blanking plate for the 2nd Ethernet Option)
3-81811	48 VDC to 12 VDC Converter (includes connection wiring)
3-81353	110/220 VAC to 12 VDC converter (includes wiring to SPA)
3-2600-27	Ethernet Switch (no cables included)
3-81967	USB Cable (connecting front panel to SPA)
3-806-332	USB Cable (connecting rear panel to SPA)
3-81969	Semi Rigid Cable (connecting SPA RF In to Front Panel, 12 port units)
3-81964	Semi Rigid Cable (connecting SPA RF In to Front Panel, 24 port units)
3-803-339	Ethernet Cable (connecting rear panel to SPA or Ethernet switch)
3-806-334	Ethernet Cable (connecting SPA to Ethernet switch)
3-75261-5	Coaxial Cable (connecting External Ref Input on Rear Panel to SPA)
3-806-316	Coaxial Cable (connecting GPS on Rear Panel to SPA)
3-81958	5 VDC Power Cable (for Ethernet Switch)
3-2400-91	Case Assembly (includes front handles, top, bottom, and side covers)

Chapter 2 — MS2710xA Verification

2-1 Frequency Accuracy Verification

The following test is used to verify the frequency accuracy of the Remote Spectrum Monitor with and without a GPS connection. This procedure can be used on the MS27101A, MS27102A, and MS27103A and will refer to the Remote Spectrum Monitor as MS2710xA.

Equipment Required

- Anritsu MG3692x Synthesized Signal Source
- 10 MHz Frequency Reference
- Anritsu 34RKNF50 Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- BNC(m) to BNC(m) Coaxial Cable
- GPS Antenna
- Anritsu 1091-80-R, N(f) to SMA(m) Adapter, needed for MS27103A models only

Procedure Without GPS Connection

1. Connect the 10 MHz Frequency Reference to the 10 MHz Ref In connector on the MG3692x Synthesized Signal Source.
2. Connect the MG3692x RF output to RF In, Port 1, on the MS2710xA.
3. Power on the 10 MHz Reference Standard, Anritsu MG3692x, and the MS2710xA. Allow the instruments to warm up for 10 minutes.
4. Set the MG3692x output to 1 GHz CW with an RF Output Level of –30 dBm.
5. On the MS2710xA, set the Reference Level to –10 dBm.
6. On the MS2710xA, set the Center Frequency to 1 GHz.
7. On the MS2710xA, set the Span to 10 kHz.
8. On the MS2710xA, set the RBW to 1 kHz and VBW to 300 Hz.
9. On the MS2710xA, set the Sweep Type to Single and Initiate a Single Sweep.
10. On the MS2710xA, use the SCPI command :FETCH:PEAK?
    - For the MS27101A, record the frequency value in Table A-1, “MS27101A Frequency Accuracy” on page A-2.
    - For the MS27102A without Option 402, record the frequency value in Table A-7, “MS27102A Frequency Accuracy” on page A-4
    - For the MS27102A with Option 402, record the frequency value in Table A-13, “MS27102A Frequency Accuracy” on page A-6
    - For the MS27103A, record the frequency value in Table A-19, “MS27103A Frequency Accuracy” on page A-8
11. Set the MG3692x frequency to 5.9 GHz.
12. Set the MS2710xA center freq to 5.9 GHz.
13. On the MS2710xA, initiate a Single Sweep.

14. On the MS2710xA, use the SCPI command :FETCH:PEAK?
    - For the MS27101A, record the frequency value in Table A-1 on page A-2.
    - For the MS27102A without Option 402, record the frequency value in Table A-7 on page A-4.
    - For the MS27102A with Option 402, record the frequency value in Table A-13 on page A-6.
    - For the MS27103A, record the frequency value in Table A-19 on page A-8.

Procedure With GPS Connection

1. Connect the 10 MHz Frequency Reference to the 10 MHz Ref In connector on the MG3692x Synthesized Signal Source.
2. Connect the MG3692x RF output to RF In, Port 1, on the MS2710xA.
3. Power on the 10 MHz Reference Standard, Anritsu MG3692x, and the MS2710xA. Allow the instruments to warm up for 10 minutes.
4. Connect the GPS Antenna to the MS2710xA, and confirm GPS coordinates are shown where the message "No GPS Fix" was previously shown prior to connecting the antenna.
5. Set the MG3692x output to 1 GHz CW with an RF Output Level of –30 dBm.
6. On the MS2710xA, set the Reference Level to –10 dBm.
7. On the MS2710xA, set the Center Frequency to 1 GHz.
8. On the MS2710xA, set the Span to 10 kHz.
9. On the MS2710xA, set the RBW to 1 kHz and VBW to 300 Hz.
10. On the MS2710xA, set the Sweep Type to Single and Initiate a Single Sweep.
11. On the MS2710xA, use the SCPI command `:FETCH:PEAK?`
    - For the MS27101A, record the frequency value in Table A-1, "MS27101A Frequency Accuracy" on page A-2.
    - For the MS27102A without Option 402, record the frequency value in Table A-7, "MS27102A Frequency Accuracy" on page A-4
    - For the MS27102A with Option 402, record the frequency value in Table A-13, "MS27102A Frequency Accuracy" on page A-6
    - For the MS27103A, record the frequency value in Table A-19, "MS27103A Frequency Accuracy" on page A-8
12. Set the MG3692x frequency to 5.9 GHz.
13. Set the MS2710xA center freq to 5.9 GHz.
14. On the MS2710xA, initiate a Single Sweep.
15. On the MS2710xA, use the SCPI command `:FETCH:PEAK?`
    - For the MS27101A, record the frequency value in Table A-1 on page A-2.
    - For the MS27102A without Option 402, record the frequency value in Table A-7 on page A-4.
    - For the MS27102A with Option 402, record the frequency value in Table A-13 on page A-6.
    - For the MS27103A, record the frequency value in Table A-19 on page A-8.

2-2 Amplitude Accuracy Verification

The following test is used to verify the amplitude accuracy of the Remote Spectrum Monitor. This procedure can be used on the MS27101A, MS27102A, and MS27103A and will refer to the Remote Spectrum Monitor as MS2710xA.

Equipment Required

- MG3692x, Synthesized Signal Source
- ML2438A, Power Meter
- SC7400, Power Sensor
- 1870A, Power Splitter
- 44-10, 10 dB Attenuator
- 34RKNF50, 50 ohm Adapter
- 34NN50A, 50 ohm Adapter
- 15NN50-1.5C, RF Coaxial Cable
- Anritsu 1091-80-R, N(f) to SMA(m) Adapter, needed for MS27103A models only

Procedure (Pre-Amp Off, –30 dBm, 0 dB Input Attenuation)

1. Power On the MG3692x, ML2438A, and MS2710xA and allow instruments to warm up for 10 minutes.
2. Connect MG3692x to the 15NN50-1.5C cable.
3. Connect the other end of the 15NN50-1.5C cable to the input of the 1870A power splitter.
4. Connect the SC7400 power sensor to the ML2438A power meter and cal/zero the sensor.
5. Connect the SC7400 directly to one of the two outputs on the 1870A power splitter.
6. Connect the other output of the 1870A power splitter to the 34NN50A and 44-10 attenuator.
7. Connect the MS2710xA RF input, port 1, to the output of the power splitter, including the 10 dB attenuator, with the 34NN50A for the MS27101A and MS27102A, or the 1091-80-R for the MS27103A.
8. Preset the MS2710xA.
9. Set the MS2710xA Sweep Mode to No FFT.
10. Set the MS2710xA Span to 10 kHz.
11. Set the MS2710xA RBW to 1 kHz and VBW to 10 Hz.
12. Set the MS2710xA Reference Level to –20 dB.
13. Set the MS2710xA Input Attenuation to 0 dB.

14. Set the MS2710xA Center Frequency to 100.5 kHz.

15. Set the cal factor of the SC7400 to 100.5 kHz.

16. Set the MG3692x to 100.5 kHz and adjust the output level so the ML2438A reads –20.0 dBm.

17. On the MS2710xA, use the SCPI command, `:FETCH:PEAK?`

- For the MS27101A, record the frequency value in Table A-2, "MS27101A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)" on page A-2.
- For the MS27102A without Option 402, record the frequency value in Table A-8, "MS27102A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)" on page A-4
- For the MS27102A with Option 402, record the frequency value in Table A-14, "MS27102A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)" on page A-6
- For the MS27103A, record the frequency value in Table A-20, "MS27103A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)" on page A-8

18. Repeat Step 14 to Step 17 for the other frequencies in the respective table.

19. For MS27102A units with Option 402, repeat this procedure for port 2, by moving the power splitter connection from port 1 to port 2 and enabling port 2 with the SCPI command `:Route:Input:Close 2`

Procedure (Pre-Amp Off, –2 dBm, 40 dB Input Attenuation)

1. Power On the MG3692x, ML2438A, and MS2710xA and allow instruments to warm up for 10 minutes.
2. Connect MG3692x to the 15NN50-1.5C cable.
3. Connect the other end of the 15NN50-1.5C cable to the input of the 1870A power splitter.
4. Connect the SC7400 power sensor to the ML2438A power meter and cal/zero the sensor.
5. Connect the SC7400 directly to one of the two outputs on the 1870A power splitter.
6. Connect the other output of the 1870A power splitter to the 44-10 attenuator.
7. Connect the MS2710xA RF input, port 1, to the output of the power splitter including the 10 dB attenuator, with the 34NN50A for the MS27101A and MS27102A, or the 1091-80-R for the MS27103A.
8. Set the MS2710xA Sweep Mode to No FFT.
9. Set the MS2710xA Span to 10 kHz.
10. Set the MS2710xA RBW to 1 kHz and VBW to 10 Hz.
11. Set the MS2710xA Reference Level to 10 dB.
12. Set the MS2710xA Input Attenuation to 40 dB.
13. Set the MS2710xA Center Frequency to 100.5 kHz.
14. Set the cal factor of the SC7400 to 100.5 kHz.
15. Set the MG3692x to 100.5 kHz, and adjust the output level so the ML2438A reads 8.0 dBm.
16. On the MS2710xA, use the SCPI command, `:FETCH:PEAK?`
    - For the MS27101A, record the frequency value in Table A-3, “MS27101A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 50 dB Input Attn.)” on page A-2.
    - For the MS27102A without Option 402, record the frequency value in Table A-9, “MS27102A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)” on page A-4
    - For the MS27102A with Option 402, record the frequency value in Table A-15, “MS27102A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)” on page A-6
    - For the MS27103A, record the frequency value in Table A-21, “MS27103A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)” on page A-8
17. Repeat Step 13 to Step 16 for the other frequencies in the respective table.
18. For MS27102A units with Option 402, repeat this procedure for port 2, by moving the power splitter connection from port 1 to port 2 and enabling port 2 with the SCPI command `:Route:Input:Close 2`

Procedure (Pre-Amp On, –50 dBm, 0 dB Input Attenuation)

1. Power On the MG3692x, ML2438A, and MS2710xA and allow instruments to warm up for 10 minutes.
2. Connect MG3692x to the 15NN50-1.5C cable.
3. Connect the other end of the 15NN50-1.5C cable to the input of the 1870A power splitter.
4. Connect the SC7400 power sensor to the ML2438A power meter and cal/zero the sensor.
5. Connect the SC7400 directly to one of the two outputs on the 1870A power splitter.
6. Connect the other output of the 1870A power splitter to the 44-10 attenuator.
7. Connect the MS2710xA RF input, port 1, to the output of the power splitter including the 10 dB attenuator, with the 34NN50A for the MS27101A and MS27102A, or the 1091-80-R for the MS27103A.
8. Set the MS2710xA Sweep Mode to No FFT.
9. Set the MS2710xA Span to 10 kHz.
10. Set the MS2710xA RBW to 1 kHz and VBW to 10 Hz.
11. Set the MS2710xA Reference Level to –40 dB.
12. Set the MS2710xA Input Attenuation to 0 dB.
13. Ensure no power is being inputted to the MS2710xA.
14. Set the MS2710xA Pre-Amp to On by placing a check mark in the box next to the Pre-Amp setting.
15. Set the MS2710xA Center Frequency to 100.5 kHz.
16. Set the cal factor of the SC7400 to 100.5 kHz.
17. Set the MG3692x to 100.5 kHz, and adjust the output level so the ML2438A reads –40.0 dBm.
18. On the MS2710xA, use the SCPI command, `FETCH:PEAK?`
    - For the MS27101A, record the frequency value in Table A-4, “MS27101A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)” on page A-3.
    - For the MS27102A without Option 402, record the frequency value in Table A-10, “MS27102A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)” on page A-5
    - For the MS27102A with Option 402, record the frequency value in Table A-16, “MS27102A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)” on page A-7
    - For the MS27103A, record the frequency value in Table A-22, “MS27103A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)” on page A-9
19. Repeat Step 15 to Step 18 for the other frequencies in the respective table.
20. For MS27102A units with Option 402, repeat this procedure for port 2 by moving the power splitter connection from port 1 to port 2, and enabling port 2 with the SCPI command `:Route:Input:Close 2`

2-3 Displayed Average Noise Level (DANL) Verification

The following test is used to verify the displayed average noise level (DANL) of the Remote Spectrum Monitor. This procedure can be used on the MS27101A, MS27102A, and MS27103A and will refer to the Remote Spectrum Monitor as MS2710xA.

Equipment Required

- Anritsu SM/PL-1, 50 ohm Termination
- Anritsu 1091-80-R, N(f) to SMA(m) Adapter, needed for MS27103A only

Procedure (With Pre Amp Off)

1. Connect the SM/PL-1 to the MS2710xA RF In, port 1 connector.
2. Turn on the MS2710xA, Preset the instrument and allow it to warm up for 10 minutes.
3. Set the MS2710xA Sweep Type to Single.
4. Set the RBW to 100 kHz and the VBW to 1 kHz.
5. Set the MS2710xA Input Attenuation to 0 dB.
6. Set the MS2710xA Detection to RMS.
7. Set the MS2710xA Reference Level to –20 dBm.
8. Ensure the Pre-Amp is turned Off.
9. Set the Start/Stop Frequency for the first measurement in the following tables:
   - For the MS27101A, Table A-5, “MS27101A DANL with Pre Amp Off” on page A-3.
   - For the MS27102A without Option 402, Table A-11, “MS27102A DANL with Pre Amp Off” on page A-5
   - For the MS27102A with Option 402, Table A-17, “MS27102A DANL with Pre Amp Off” on page A-7
   - For the MS27103A, Table A-23, “MS27103A DANL with Pre Amp Off” on page A-9
10. Initiate a Single Sweep and wait until one sweep is completed.
11. On the MS2710xA, use the SCPI command, `:FETCH:PEAK?`, to return the peak value and record in:
    - For the MS27101A, Table A-5, “MS27101A DANL with Pre Amp Off” on page A-3.
    - For the MS27102A without Option 402, Table A-11, “MS27102A DANL with Pre Amp Off” on page A-5
    - For the MS27102A with Option 402, Table A-17, “MS27102A DANL with Pre Amp Off” on page A-7
    - For the MS27103A, Table A-23, “MS27103A DANL with Pre Amp Off” on page A-9
12. Repeat Step 9 to Step 11 for the remaining start/stop frequencies in the respective table.
13. For each measured 100 kHz RBW value in the test record, convert it to the normalized 1 Hz RBW value by subtracting 50 dB.

    For example, if the marker shows a value of –100 dBm at 100 kHz RBW, the calculated value at 1 Hz RBW is –150 dBm.

    ```
    -100 dBm - 50 dB = -150 dBm
    ```

14. Enter the calculated values in the test records using the “Calculated for 1 Hz RBW” column. Use the calculated value when comparing against the specification.
15. For MS27102A units with Option 402, repeat this procedure for port 2, by moving the SM/PL-1 from port 1 to port 2 and enabling port 2 with the SCPI command `:Route:Input:Close 2`

Procedure (With Pre Amp On)

1. Connect the SM/PL-1 to the MS2710xA RF In connector.
2. Turn on the MS2710xA, Preset the instrument and allow it to warm up for 10 minutes.
3. Set the MS2710xA Sweep Type to Single.
4. Set the RBW to 100 kHz and the VBW to 1 kHz.
5. Set the MS2710xA Input Attenuation to 0 dB.
6. Set the MS2710xA Detection to RMS.
7. Set the MS2710xA Reference Level to –20 dBm.
8. Set the MS2710xA Pre Amp On by checking the box next to the Pre Amp setting.
9. Set the Start/Stop frequency for the first measurement in the following tables:
   - For the MS27101A, Table A-6, “MS27101A DANL with Pre Amp On” on page A-3.
   - For the MS27102A without Option 402, Table A-12, “MS27102A DANL with Pre Amp On” on page A-5
   - For the MS27102A with Option 402, Table A-18, “MS27102A DANL with Pre Amp On” on page A-7
   - For the MS27103A, Table A-24, “MS27103A DANL Pre Amp On” on page A-9
10. Initiate a Single Sweep and wait until one sweep is completed.
11. On the MS2710xA, use the SCPI command, `:FETCH:PEAK?`, to return the peak value and record in:
    - For the MS27101A, Table A-6, “MS27101A DANL with Pre Amp On” on page A-3.
    - For the MS27102A without Option 402, Table A-12, “MS27102A DANL with Pre Amp On” on page A-5
    - For the MS27102A with Option 402, Table A-18, “MS27102A DANL with Pre Amp On” on page A-7
    - For the MS27103A, Table A-24, “MS27103A DANL Pre Amp On” on page A-9
12. Repeat Step 9 to Step 11 for the remaining start/stop frequencies in the respective table.
13. For each measured 100 kHz RBW value in the test record, convert it to the normalized 1 Hz RBW value by subtracting 50 dB.

    For example, if the marker shows a value of –100 dBm at 100 kHz RBW, the calculated value at 1 Hz RBW is –150 dBm.

    ```
    -100 dBm - 50 dB = -150 dBm
    ```

14. Enter the calculated values in the test records using the “Calculated for 1 Hz RBW” column. Use the calculated value when comparing against the specification.
15. For MS27102A units with Option 402, repeat this procedure for port 2, by moving the SM/PL-1 from port 1 to port 2 and enabling port 2 with the SCPI command `:Route:Input:Close 2`

Chapter 3 — Assembly Replacement

This chapter provides information on how to replace the sub-assemblies within the MS2710xA. It is divided into three sections:

3-1 MS27101A Replacement Procedures

Opening the MS27101A Case

Caution	Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in Table 1-2 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.

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty. The MS27101A contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the instrument.

This procedure provides instructions for opening the MS27101A case. With the case opened, the internal assemblies can be removed and replaced as detailed in the following sections.

1. Disconnect any external cables from the MS27101A; for example, Power, Ethernet, GPS, or External Reference cables.
2. Referring to Figure 3-6, remove the 8 screws around the outside of the instrument connecting the top and bottom covers.

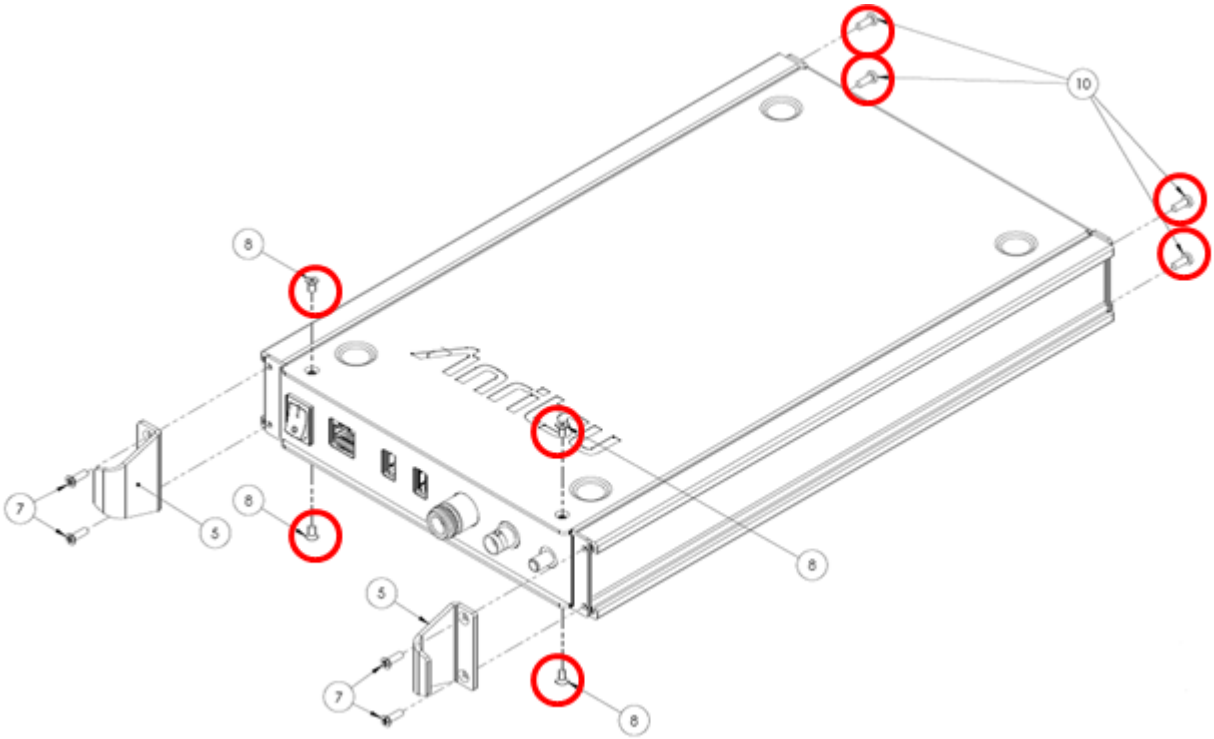

Figure 3-1. Location of 8 Screws

3. With the 8 screws from Figure 3-6 removed, the top and bottom panels can be removed by sliding them towards the rear of the unit.

Rear Panel Removal

1. Perform the steps in the previous section to open the case.
2. Referring to Figure 3-2, remove the two cables from the front power switch and the cable connector located at P5 of the SPA. The rear panel can then be removed.

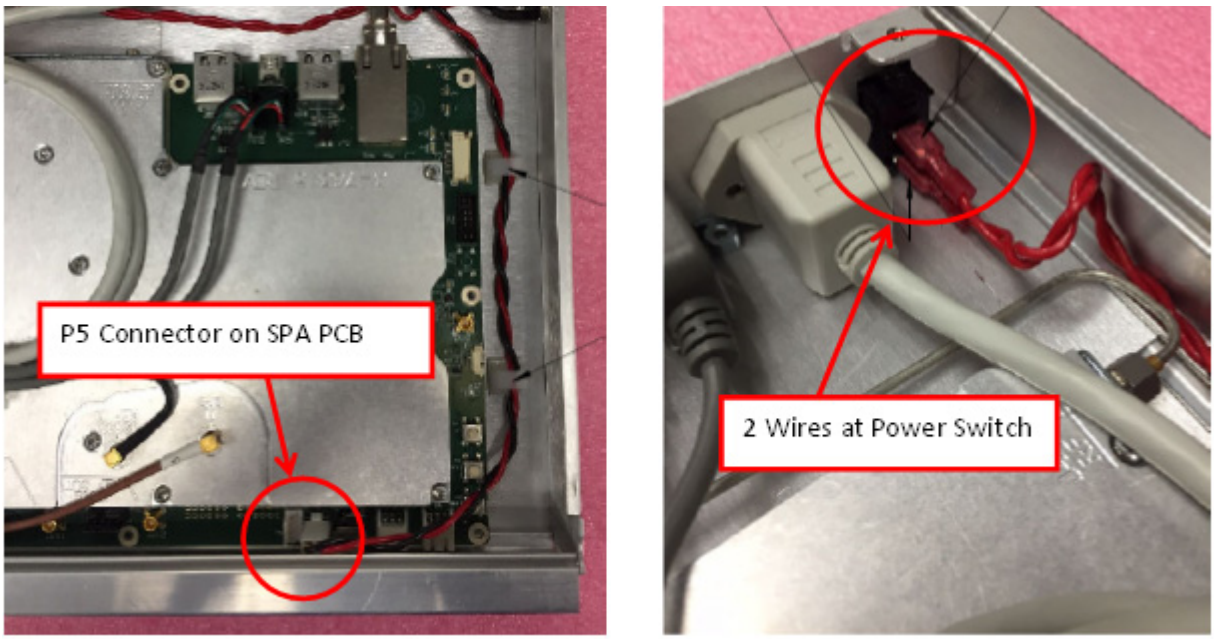

Figure 3-2. Rear Panel Cable Connections

Front Panel Removal

1. Perform the previous two sections to open the case and remove the rear panel.
2. Referring to Figure 3-3, disconnect the Ethernet, USB, RF Input, External Reference, and GPS cables.

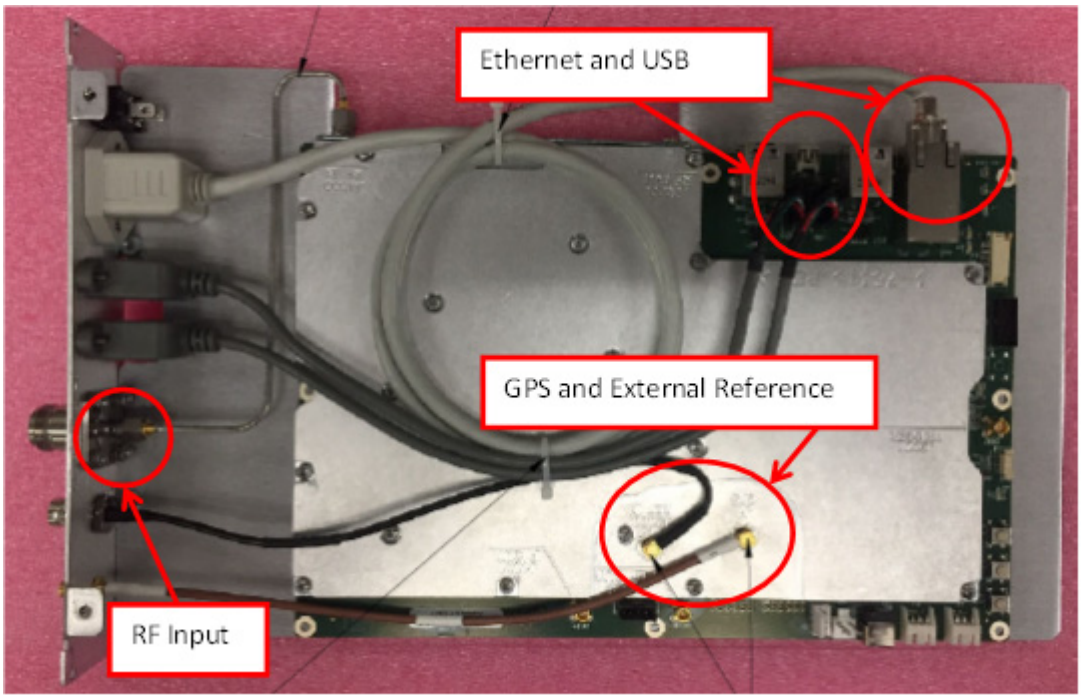

Figure 3-3. Front Panel Cable Connections

3. Referring to Figure 3-4, remove the 4 screws securing the side panels to the front panel located where the circles are shown, and remove the 2 screws securing the front panel to the SPA mounting plate from the bottom where the arrows are shown. Now the front panel can be removed.

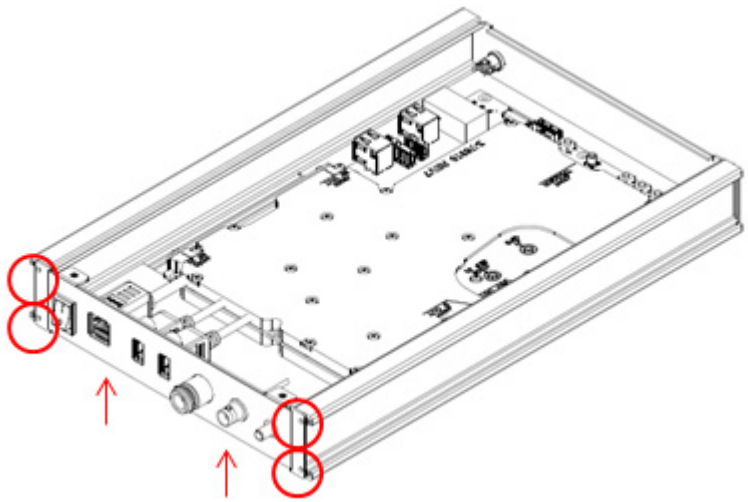

Figure 3-4. 6 Screws Securing Front Panel to Side Panels and SPA Mounting Plate

SPA PCB Replacement

1. Perform the previous three sections to open the case and remove the front and rear panels.
2. Referring to Figure 3-5, remove the semi-rigid cable connected to the RF Input of the SPA PCB. The SPA assembly is attached to a mounting plate that is included with a replacement SPA, so the mounting plate does not need to be removed from the SPA.

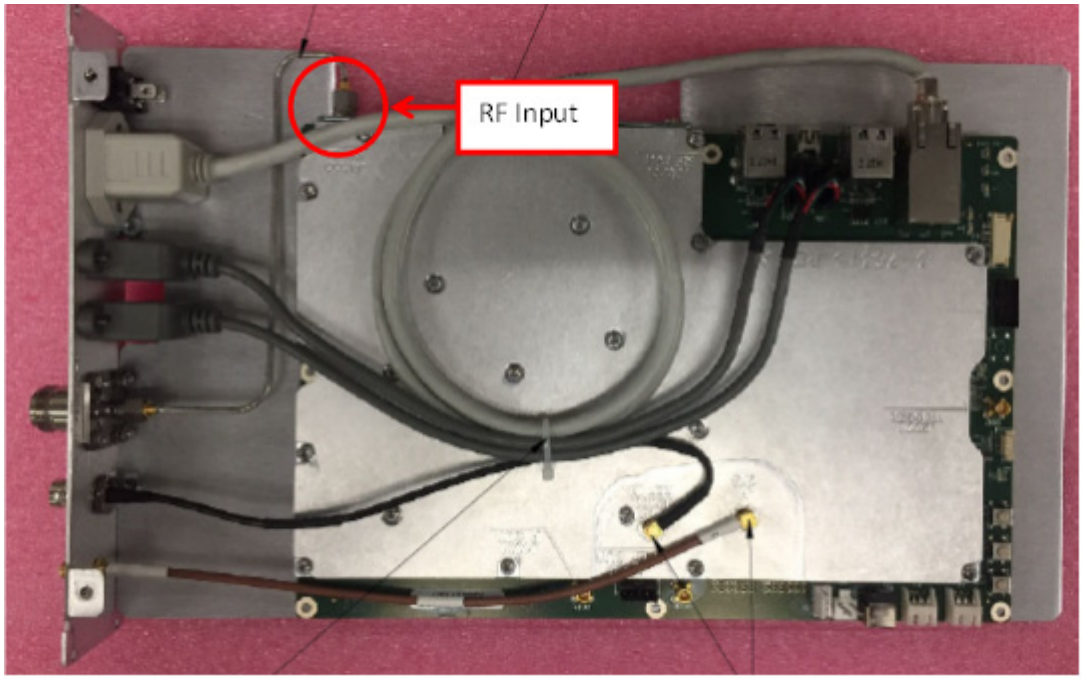

Figure 3-5. RF Input Connector

3-2 MS27102A Replacement Procedures

Opening the MS27102A Case

Caution	Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in Table 1-3 are typically the only items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without specialized training. Removing RF shields from PC boards or adjustment of screws on or near the shields may detune sensitive RF circuits and will result in degraded instrument performance. All work should be performed in a static-safe work area.

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty. The MS27102A contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the instrument.

This procedure provides instructions for opening the MS27102A case. With the case opened, the internal assemblies can be removed and replaced as detailed in the following sections.

1. Disconnect any external cables from the MS27102A; for example, Power, Ethernet, GPS, or External Reference cables.
2. Place the instrument upside down on a flat work area.
3. Referring to Figure 3-6, remove the 14 screws around the outside of the instrument connecting the top and bottom covers.

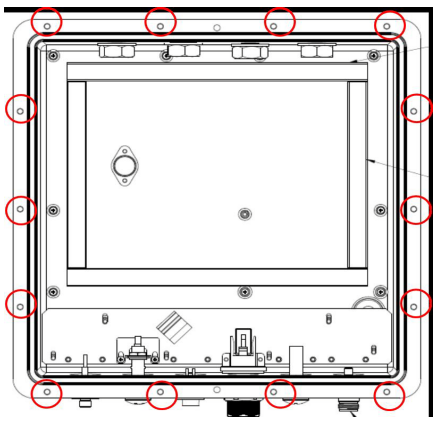

Figure 3-6. Location of 14 Screws

4. Holding both top and bottom covers together, carefully turn the instrument right side up and lift the top cover off the instrument.
5. Closing the case is the reverse of opening. Ensure all cables are properly seated and none are pinched before closing the case.

SPA PCB Replacement

This section describes the removal and replacement of the SPA PCB, which is attached to the MS27102A Bottom Case.

1. Open the case as described in the previous section.
2. Referring to Figure 3-7, disconnect the PWR, GPS (J1), and 10 MHz REF (J2000) cables from the SPA PCB.
3. Referring to Figure 3-7:
   - For 1-port instruments, disconnect the semi-rigid cable between Port 1 and the SPA PCB (REF 28). Note Figure 3-7 is showing a two port instrument, one port instruments have the semi-rigid cable from port 1 connected directly to the SPA PCB J4000 instead of the MUX PCB.
   - For 2-port instruments, disconnect the semi-rigid cables between Ports 1 and 2 to the MUX PCB (REF 28 and 29). Also, disconnect the USB cable from the SPA PCB (REF 17) so it won't interfere with the other cables during PCB removal.

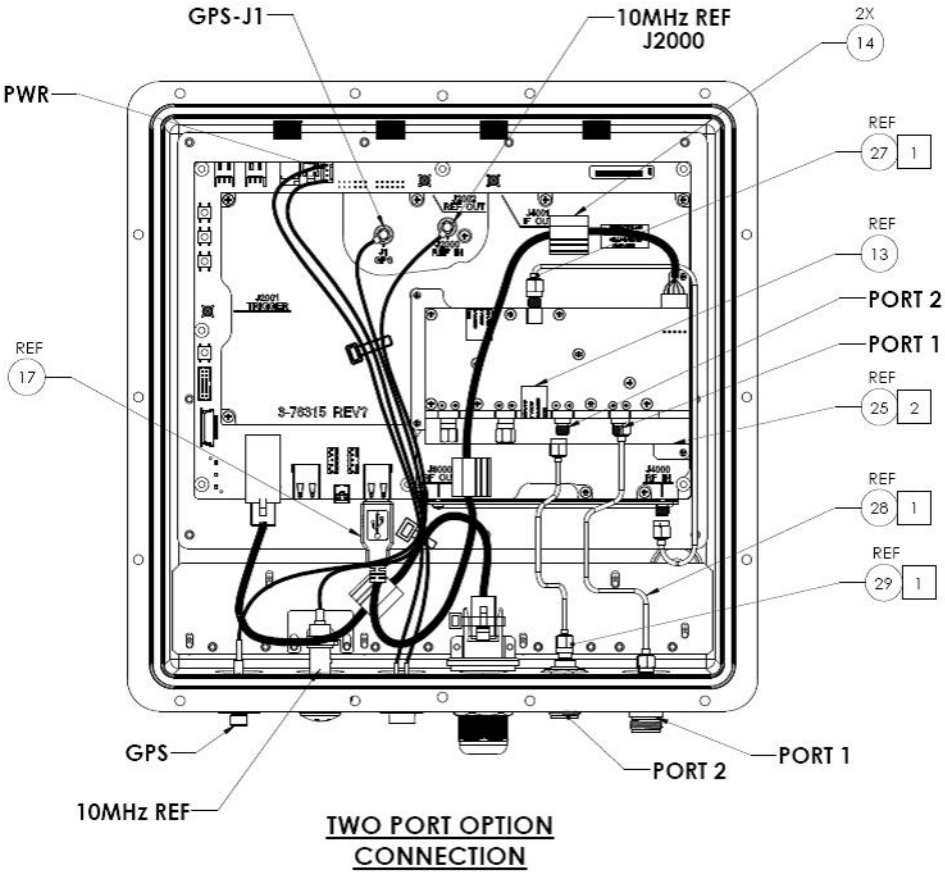

Figure 3-7. MS27102A with Top Cover Removed

4. Referring to Figure 3-8, remove the 9 screws around the outside of the SPA PCB that are holding the SPA PCB bracket to the bottom case.

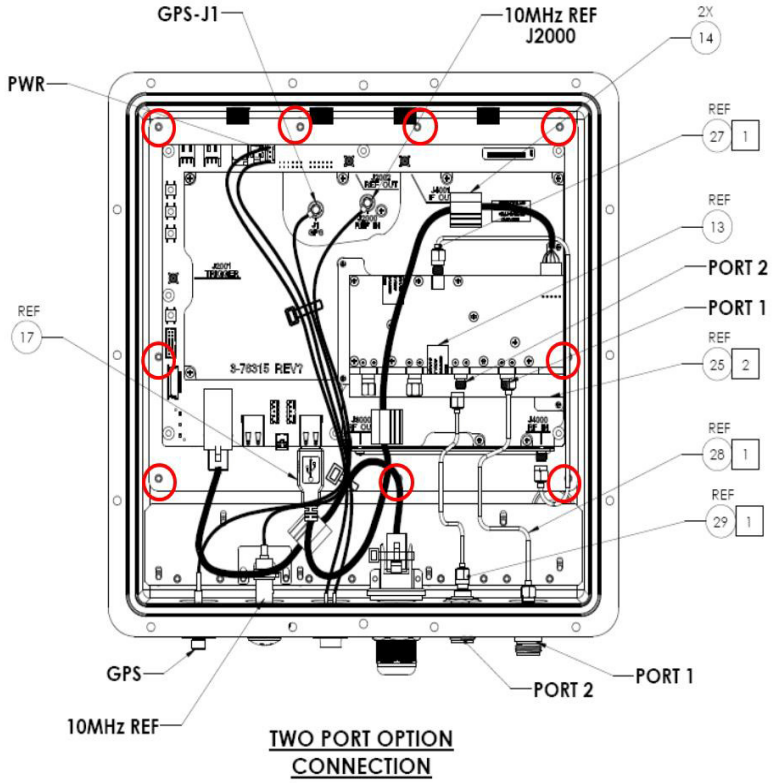

Figure 3-8. Removing the 9 Screws Connecting PCB Assemblies to the Case

5. After the screws are removed, the entire SPA PCB and MUX PCB (if installed) can be removed from the bottom case. The SPA assembly is attached to a mounting plate which is included with a replacement SPA, so the mounting plate does not need to be removed from the SPA.
6. Installation is the reverse of removal.

MUX PCB Replacement (Instruments with Option 402)

This section describes the removal of the MUX PCB from the SPA PCB.

1. Open the case and remove the SPA/MUX PCB as described in the previous sections.
2. Referring to Figure 3-9, disconnect the semi-rigid cable connecting the SPA PCB to the MUX PCB (REF 27).
3. Referring to Figure 3-9, disconnect the USB cable (REF 17) from the rear of MUX PCB. This is the 1 x 5 cable connector.
4. Referring to Figure 3-9, remove the 4 screws (circled in red) connecting the MUX PCB to the SPA PCB.
5. The MUX PCB can then be removed from the SPA PCB.
6. Installation is the reverse of removal.

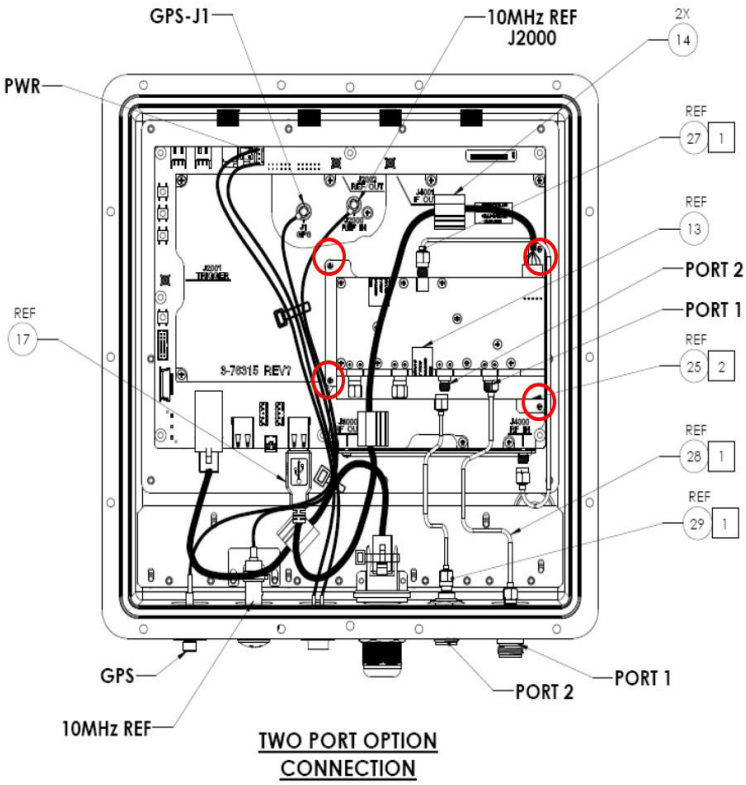

Figure 3-9. Removing the MUX PCB

MS27102A N Connector Port Replacement

This procedure provides instructions for replacing the MS27102A Port 1 and 2 N connectors.

1. Open the case as described previously.
2. Disconnect the semi-rigid cable from the Port connector being replaced.
3. Using the Anritsu T4461 (M25 Tool) and a 1/4 wrench, rotate the housing of the N to SMA adapter counter clockwise until the N connector is removed, as shown in Figure 3-10.

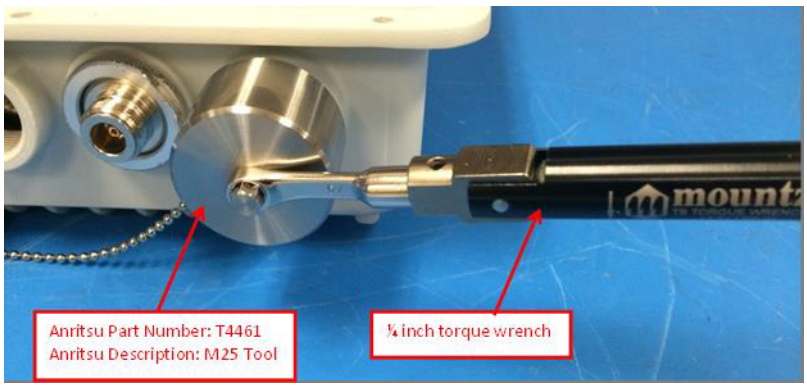

Figure 3-10. Port Replacement

4. Installation is the reverse of removal. When installing the replacement port, ensure an o-ring is installed on the port connector and tighten the port to 15 in-lbf.

3-3 MS27103A Replacement Procedures

Opening the MS27103A Case

Caution	Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in Table 1-4 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.

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty. The MS27103A contains components that can be easily damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the instrument.

This procedure provides instructions for opening the MS27103A case. With the case opened, the internal assemblies can be removed and replaced, as detailed in the following sections.

1. Disconnect any external cables from the MS27103A; for example, Power, Ethernet, GPS, or External Reference cables.
2. Referring to Figure 3-11, remove the 7 screws securing the top panel to the unit, then lift the top panel off the unit.

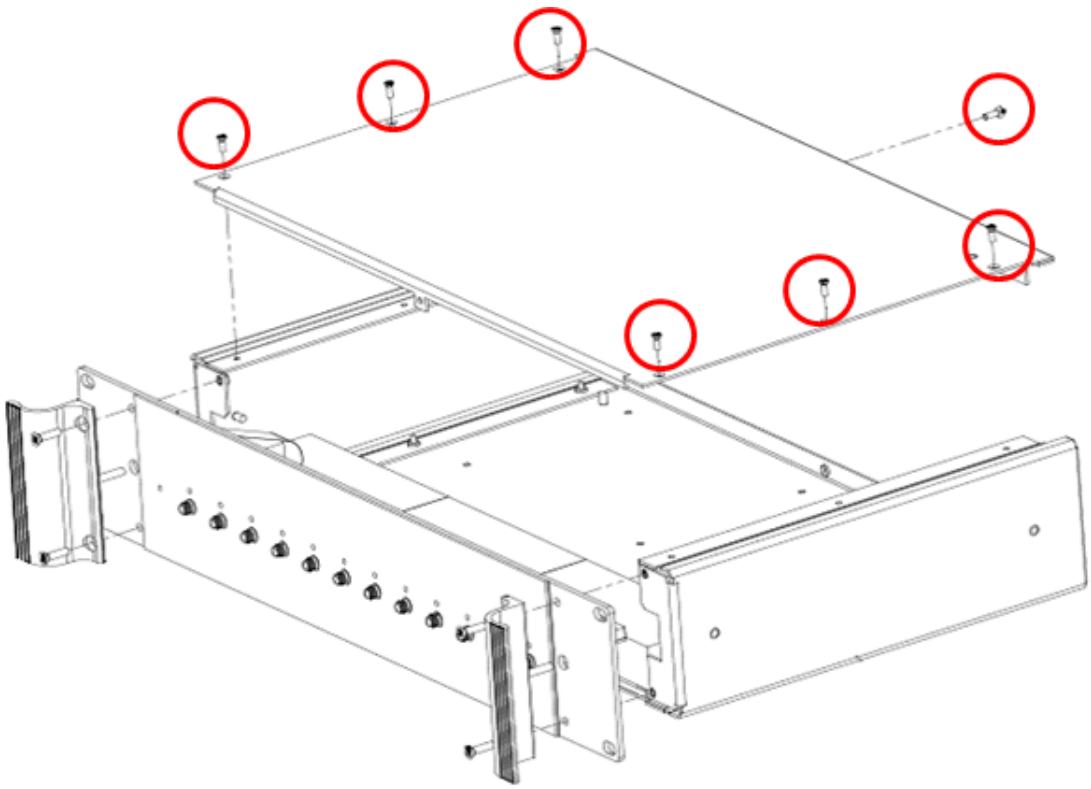

Figure 3-11. Top Panel Screws

Front Panel Removal

1. Remove the top panel as described in the previous section.
2. Referring to Figure 3-12, remove the semi-rigid RF Input and USB cable. If the MS27103A is a 24 port unit, there will be two USB cables to remove.

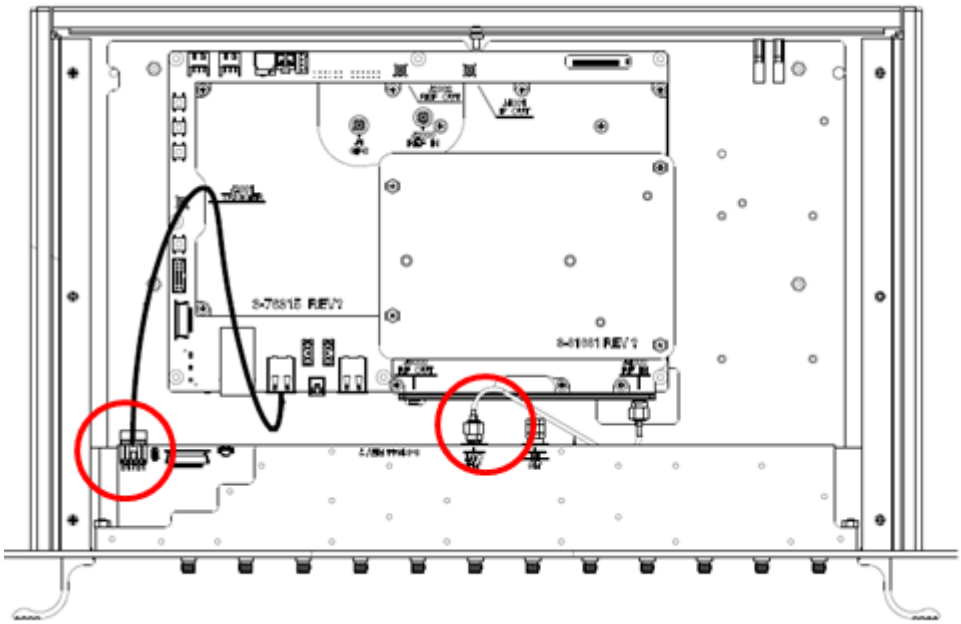

Figure 3-12. Front Panel Cables

3. Referring to Figure 3-13, remove the 4 screws securing the front panel to the side panel.
4. After cables are disconnected and the 4 screws removed carefully pull the front panel away from the unit.

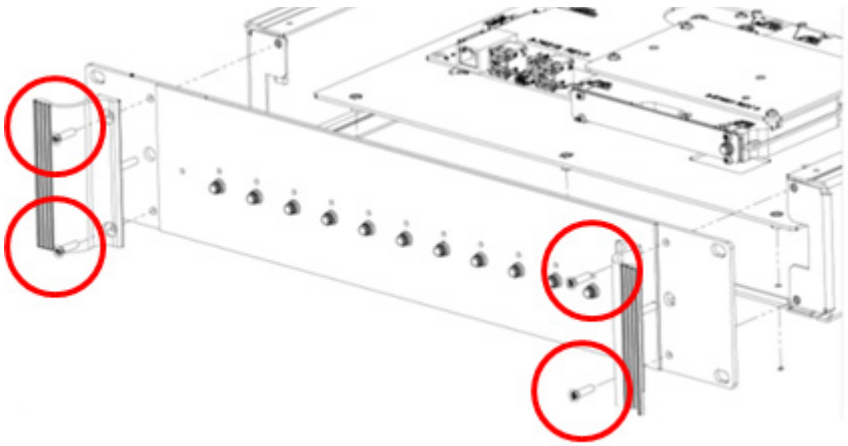

Figure 3-13. Front Panel Screws

Rear Panel Removal

1. Remove the top panel as described earlier in this section.
2. Referring to Figure 3-14, remove the GPS, External Reference, 2 USB, 1 or 2 Ethernet, and 48 volt power cables (if installed).
   - If two Ethernet ports are available, there will be an Ethernet switch and both cables should be removed from the switch, instead of the single cable connected to the SPA PCB.
   - If the main power of the unit is 110/220 VAC instead of the 48 VDC, then there will be no 48 volt power cables to disconnect.

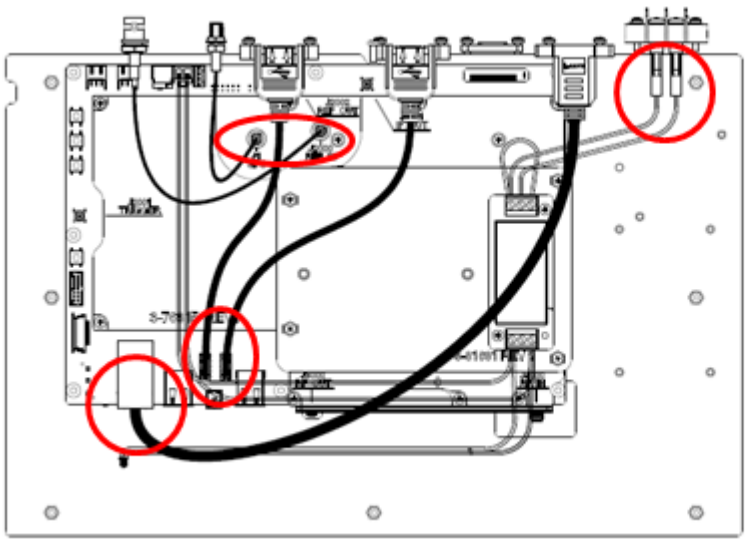

Figure 3-14. Rear Panel Cables

3. Referring to Figure 3-15, remove the 4 screws attaching the rear panel to side panels.

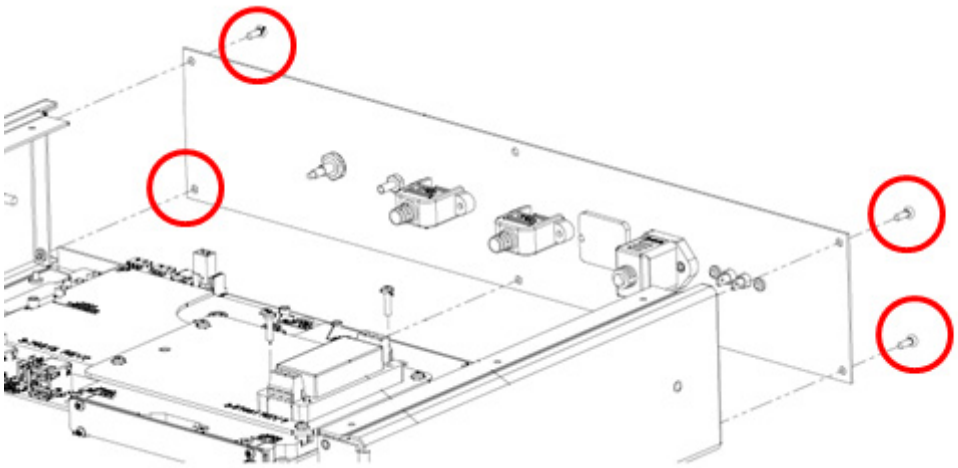

Figure 3-15. Rear Panel Screws

4. After the cables are disconnected and the 4 screws removed, carefully pull the rear panel away from the unit.

SPA PCB Replacement

1. Remove the top, front and rear panels as described in the previous sections.
2. Remove the semi-rigid cable attached to the SPA RF Input.
3. Turn the unit over, so the bottom panel is facing up.
4. Referring to Figure 3-16, remove the 9 center screws on the bottom panel while at the same time securing the SPA PCB so it doesn't drop when the final screws are removed.

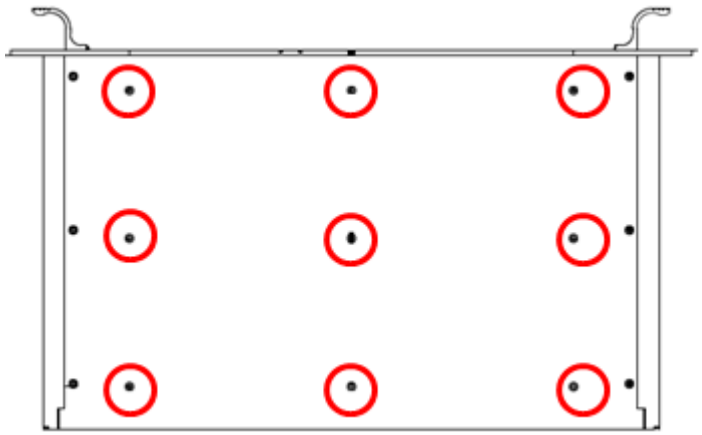

Figure 3-16. 9 Bottom Panel Screws

5. During the SPA replacement, if an Ethernet switch or DC to DC converter is present, they must be transferred from the original SPA to the new SPA. Each assembly is removed by unscrewing two mounting screws. The mounting plate for the SPA to the bottom panel and mounting plate for the Ethernet Switch and/or DC to DC converter stays attached to the SPA. Figure 3-17 shows a SPA assembly with an Ethernet switch and no DC to DC converter.

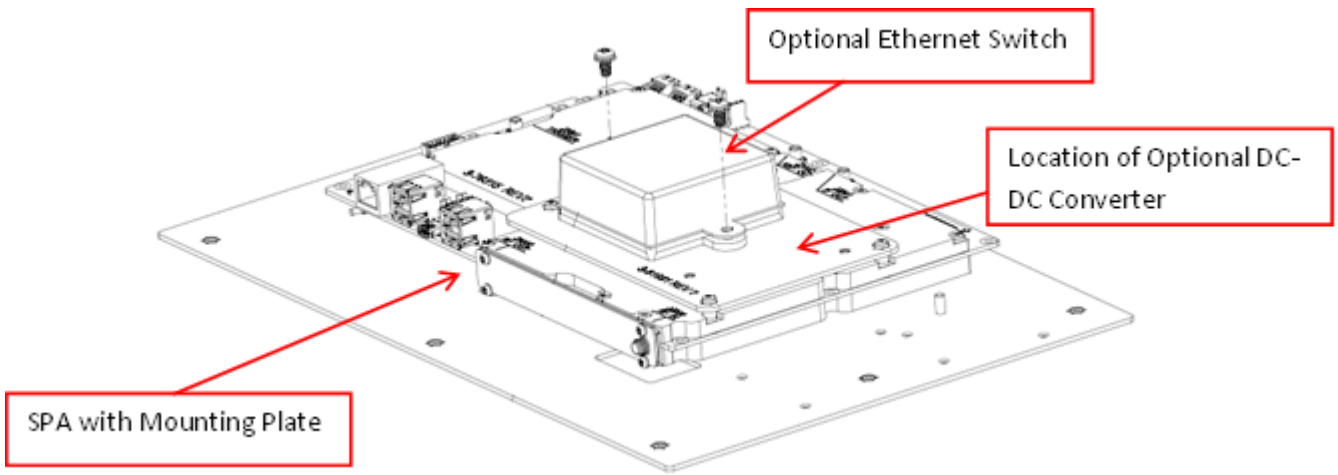

Figure 3-17. SPA Assembly with Mounting Plate and Optional Ethernet Switch

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 they are listed.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in Table 1-2, Table 1-3 and Table 1-4 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.

4-2 Communication Problems

Instrument is powered on, but the Discovery Program will not detect it:

1. Ensure the Ethernet cable is connected.
2. The Discovery Program will only detect the MS2710xA if the PC running the Discovery Program and the MS2710xA are on the same network. The MS2710xA is initially shipped with the DHCP setting set to Off and the default IP address set to 10.0.0.2. To communicate with the MS2710xA in this state, connect the MS2710xA directly to a PC with an Ethernet crossover cable, then set the PC to have a static IP setting of 10.0.0.1 and see if the MS2710xA can be detected by entering the IP address of 10.0.0.2 into a browser address bar. If so, the DHCP setting and other network settings can be set on the MS2710xA to match the network settings to which it will be connected. Refer to the Help menu for the SCPI commands to change the network settings.

4-3 Level Accuracy Problems

Measured signal is unexpectedly too high or too low:

1. For 1- port instruments, check the N connector for damage and cleanliness. Next, check the connections between the N connector and Main PCB. If the connections are good, replace the Main PCB.
2. For multi-port instruments where only one port has a level accuracy problem, check the faulty port's connector for damage and cleanliness. Next, check the faulty ports connections between the input connector and MUX to SPA connections. If the connections are good, replace the MUX PCB.
3. For 2-port instruments where both ports have a level accuracy problem, check both ports for damage, cleanliness, and proper connections. If connections are good, replace the Main/MUX PCB.

Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the Remote Spectrum Monitor. Anritsu recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process provides a detailed history of instrument performance, which can help show trends. This test record is separated into three sections, MS27101A, MS27102A and MS27103A.

A-1 Test Records for MS27101A Verification

MS27101A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-1. MS27101A Frequency Accuracy

Frequency	Meas. Value Without GPS	Specification
1 GHz	GHz	1 GHz ± 1.5 kHz (± 1.5 ppm)
5.9 GHz	GHz	5.9 GHz ± 8.85 kHz (± 1.5 ppm)
Frequency	**Meas. Value With GPS**	**Specification**
1 GHz	GHz	1 GHz ± 50 Hz (± 50 ppb)
5.9 GHz	GHz	5.9 GHz ± 295 Hz (± 50 ppb)

Table A-2. MS27101A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
10 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
100 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
3 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
5.9 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB

Table A-3. MS27101A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 50 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
10 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
100 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
3 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
5.9 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB

MS27101A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-4. MS27101A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
10 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
100 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
3 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
5.9 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB

Table A-5. MS27101A DANL with Pre Amp Off

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	100 kHz	1 kHz	dBm	dBm	≤ –145 dBm
3.301 GHz	4.1 GHz	100 kHz	1 kHz	dBm	dBm	≤ –140 dBm
4.101 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –138 dBm
5.01 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –128 dBm

Table A-6. MS27101A DANL with Pre Amp On

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	100 kHz	1 kHz	dBm	dBm	≤ –162 dBm
3.301 GHz	4.1 GHz	100 kHz	1 kHz	dBm	dBm	≤ –159 dBm
4.101 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –156 dBm
5.01 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –146 dBm

A-2 Test Records for MS27102A (Without Option 402) Verification

MS27102A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-7. MS27102A Frequency Accuracy

Frequency	Meas. Value Without GPS	Specification
1 GHz	GHz	1 GHz ± 1.5 kHz (± 1.5 ppm)
5.9 GHz	GHz	5.9 GHz ± 8.85 kHz (± 1.5 ppm)
Frequency	**Meas. Value With GPS**	**Specification**
1 GHz	GHz	1 GHz ± 50 Hz (± 50 ppb)
5.9 GHz	GHz	5.9 GHz ± 295 Hz (± 50 ppb)

Table A-8. MS27102A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
10 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
100 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
3 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
5.9 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB

Table A-9. MS27102A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
10 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
100 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
3 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
5.9 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB

Table A-10. MS27102A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Measured Reading	Specification
100.5 kHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
10 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
100 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
3 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
5.9 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB

Table A-11. MS27102A DANL with Pre Amp Off

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	100 kHz	1 kHz	dBm	dBm	≤ –145 dBm
3.301 GHz	4.1 GHz	100 kHz	1 kHz	dBm	dBm	≤ –140 dBm
4.101 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –138 dBm
5.01 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –128 dBm

Table A-12. MS27102A DANL with Pre Amp On

Start Freq	Stop Freq	RBW	VBW	Measured Value at 100 kHz RBW	Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	100 kHz	1 kHz	dBm	dBm	≤ –162 dBm
3.301 GHz	4.1 GHz	100 kHz	1 kHz	dBm	dBm	≤ –159 dBm
4.101 GHz	5.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –156 dBm
5.01 GHz	6.0 GHz	100 kHz	1 kHz	dBm	dBm	≤ –146 dBm

A-3 Test Records for MS27102A (With Option 402) Verification

MS27102A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-13. MS27102A Frequency Accuracy

Frequency	Meas. Value Without GPS	Specification
1 GHz	GHz	1 GHz ± 1.5 kHz (± 1.5 ppm)
5.9 GHz	GHz	5.9 GHz ± 8.85 kHz (± 1.5 ppm)
Frequency	**Meas. Value With GPS**	**Specification**
1 GHz	GHz	1 GHz ± 50 Hz (± 50 ppb)
5.9 GHz	GHz	5.9 GHz ± 295 Hz (± 50 ppb)

Table A-14. MS27102A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Port 2 Measured Reading	Specification
100.5 kHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
1 MHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
10 MHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
100 MHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
1 GHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
3 GHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 2.5 dB
5.9 GHz	-30 dBm	-20 dBm	0 dB	dBm	dBm	-30± 3.0 dB

Table A-15. MS27102A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Port 2 Measured Reading	Specification
100.5 kHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
1 MHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
10 MHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
100 MHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
1 GHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
3 GHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 2.5 dB
5.9 GHz	-2 dBm	10 dBm	50 dB	dBm	dBm	-2± 3.0 dB

MS27102A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-16. MS27102A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Port 2 Measured Reading	Specification
100.5 kHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
1 MHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
10 MHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
100 MHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
1 GHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
3 GHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 2.5 dB
5.9 GHz	-50 dBm	-60 dBm	0 dB	dBm	dBm	-50± 3.0 dB

Table A-17. MS27102A DANL with Pre Amp Off

Start Freq	Stop Freq	Port 1 Measured Value at 100 kHz RBW	Port 1 Calculated for 1 Hz RBW	Port 2 Measured Value at 100 kHz RBW	Port 2 Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	dBm	dBm	dBm	dBm	≤ –140 dBm
3.301 GHz	4.1 GHz	dBm	dBm	dBm	dBm	≤ –135 dBm
4.101 GHz	5.0 GHz	dBm	dBm	dBm	dBm	≤ –133 dBm
5.01 GHz	6.0 GHz	dBm	dBm	dBm	dBm	≤ –117 dBm

Table A-18. MS27102A DANL with Pre Amp On

Start Freq	Stop Freq	Port 1 Measured Value at 100 kHz RBW	Port 1 Calculated for 1 Hz RBW	Port 2 Measured Value at 100 kHz RBW	Port 2 Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	dBm	dBm	dBm	dBm	≤ –157 dBm
3.301 GHz	4.1 GHz	dBm	dBm	dBm	dBm	≤ –152 dBm
4.101 GHz	5.0 GHz	dBm	dBm	dBm	dBm	≤ –151 dBm
5.01 GHz	6.0 GHz	dBm	dBm	dBm	dBm	≤ –137 dBm

A-4 Test Records for MS27103A Verification

MS27103A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-19. MS27103A Frequency Accuracy

Frequency	Meas. Value Without GPS	Specification
1 GHz	GHz	1 GHz ± 1.5 kHz (± 1.5 ppm)
5.9 GHz	GHz	5.9 GHz ± 8.85 kHz (± 1.5 ppm)
Frequency	**Meas. Value With GPS**	**Specification**
1 GHz	GHz	1 GHz ± 50 Hz (± 50 ppb)
5.9 GHz	GHz	5.9 GHz ± 295 Hz (± 50 ppb)

Table A-20. MS27103A Amplitude Accuracy Verification (Pre Amp Off, -30 dBm, 0 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Specification
100.5 kHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
10 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
100 MHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
1 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
3 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 2.5 dB
5.9 GHz	-30 dBm	-20 dBm	0 dB	dBm	-30± 3.0 dB

Table A-21. MS27103A Amplitude Accuracy Verification (Pre Amp Off, -2 dBm, 40 dB Input Attn.)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Specification
100.5 kHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
10 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
100 MHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
1 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
3 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 2.5 dB
5.9 GHz	-2 dBm	10 dBm	50 dB	dBm	-2± 3.0 dB

MS27103A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-22. MS27103A Amplitude Accuracy Verification (Pre Amp On, -50 dBm, 0 dB Input Attn)

Frequency	Input Power Level	Reference Level	Input Atten. Level	Port 1 Measured Reading	Specification
100.5 kHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
10 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
100 MHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
1 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
3 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 2.5 dB
5.9 GHz	-50 dBm	-60 dBm	0 dB	dBm	-50± 3.0 dB

Table A-23. MS27103A DANL with Pre Amp Off

Start Freq	Stop Freq	Port 1 Measured Value at 100 kHz RBW	Port 1 Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	dBm	dBm	≤ –140 dBm
3.301 GHz	4.1 GHz	dBm	dBm	≤ –133 dBm
4.101 GHz	5.0 GHz	dBm	dBm	≤ –130 dBm
5.01 GHz	6.0 GHz	dBm	dBm	≤ –115 dBm

Table A-24. MS27103A DANL Pre Amp On

Start Freq	Stop Freq	Port 1 Measured Value at 100 kHz RBW	Port 1 Calculated for 1 Hz RBW	Specification
10 MHz	3.3 GHz	dBm	dBm	≤ –157 dBm
3.301 GHz	4.1 GHz	dBm	dBm	≤ –152 dBm
4.101 GHz	5.0 GHz	dBm	dBm	≤ –148 dBm
5.01 GHz	6.0 GHz	dBm	dBm	≤ –133 dBm

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