Maintenance Manual

Site Master™ MS2085A/MS2089A

Handheld Spectrum Analyzer and Cable & Antenna Analyzer

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Chapter 1 — General Information

1-1 Introduction

This manual provides the recommended test equipment and tools, replaceable parts list, verification procedures, part replacement procedures, maintenance instructions, and test record templates for the MS2085A/89A Anritsu Site Master.

Familiarity with the basic operation is assumed (for example, how to change measurement modes, preset the instrument, and set up measurements).

This manual includes:

- General information including:
  - Required Test Equipment and Tools listed in Table 1-2 on page 1-2 and Table 1-4 on page 1-3.
  - Replaceable Parts listed in Table 1-5 on page 1-3.
- Performance verification procedures included in Chapter 2, "Spectrum Analyzer Verification".
- Assembly replacement and troubleshooting procedures:
  - Chapter 5, "Assembly Replacement"
  - Chapter 6, "Troubleshooting"
- Blank test records are included in Appendix B.
  - Copy the blank test records from Appendix B 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.

Note	The MS2085A/89A performance verification procedures are provided in Chapter 2 and Chapter 5. Test records templates are provided in Appendix B. Copy the test records templates and use them to record the measured values obtained when verifying the performance of the MS2085A/89A. The measurement values taken and documented provide a record of the performance of your instrument. Anritsu recommends that you make a copy of the test records to document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance.

Additional Documentation

Table 1-1. Related Manuals

Document Part Number	Description
10100-00069	Important Product Information, Compliance, and Safety Notices
11410-02906	Site Master™ MS2085A/89A Technical Data Sheet
10580-00499	Site Master MS2085A/89A User Guide
10580-00502	Site Master MS2085A/89A Programming Manual

Updates, if any, can be downloaded from the Library tab on the Anritsu product page:

https://www.anritsu.com/en-us/test-measurement/products/ms208xa

1-2 Contacting Anritsu

To contact Anritsu, visit the following URL and select the services in your region:

http://www.anritsu.com/contact-us

1-3 Required Test Equipment and Tools

Table 1-2 and Table 1-3 provide a list of the test equipment used for the performance verification tests of the instrument. The test equipment is critical in making accurate measurements. In some cases, you may substitute certain test equipment having the same critical specifications as the test equipment indicated in the test equipment list.

Table 1-4 provides the list of tools that may be required to remove the screws and nuts of the instrument.

Table 1-2. MS2089A Required Test Equipment

Instrument / Component	Critical Specification	Recommended Manufacturer / Model
Synthesizer	9 kHz to 20 GHz, K(m) Output Connector	Anritsu MG36221A
Power Sensor, Qty 2	DC to 18 GHz, N(m) Input Connector	Rohde and Schwarz, NRP18T
Termination	50 Ω, K(f) Connector	Anritsu 28KF50
Low Pass Filter	50 MHz	Mini-Circuits, NLP-50
10 MHz Reference	10 MHz	Datum / 9390-6000
Power Splitter, Qty 2	DC to 18 GHz, All N(f) Connectors	Weinschel 1870A
Adapter	SMA(m) to BNC(f)	Anritsu 2000-2054-R
Adapter	DC to 18 GHz, N(f) to K(f)	34NFKF50
Adapter	DC to 18 GHz, N(m) to N(m)	34NN50A
Attenuator, Qty 3	0.05 GHz to 18 GHz, N(m) to N(f), 10 dB	Weinschel 44-10
Attenuator, Qty 1	N Type, 30 dB	Weinschel WA2-34-34
Coaxial Cable	BNC(m) to BNC(m)	Pomona
RF Coaxial Cable, Qty 1	N Type	Anritsu 15NN50-1.5C
Offset Termination	N Type, 6 dB	Anritsu SC5905
Offset Termination	N Type, 20 dB	Anritsu SC5906

Table 1-3. MS2085A/89A Required Test Equipment

Instrument / Component	Critical Specification	Recommended Manufacturer / Model
Open/Short	DC to 18 GHz, N type, 50Ω	Anritsu 22N50
Termination	DC to 18 GHz, N type, 50Ω	Anritsu 28NF50-2
Offset Termination	N Type, 6 dB	Anritsu SC5905
Offset Termination	N Type, 20 dB	Anritsu SC5906

Table 1-4. Required Tools

Tools	Specification
Wrench	5/16”
Torx Screwdriver	T10
Torx Screwdriver	T 20
Phillips Screwdriver	#1
Phillips Screwdriver	#2
Nut Driver	5.5 mm
Hex Socket Driver	6 mm (1/4”)

1-4 Replaceable Parts

The MS2085A/89A replacement parts and their description are listed below in Table 1-5.

Table 1-5. List of Replaceable Parts

Part Number	Description
3-ND87804	MS2085A Main/CAA Assembly
3-ND87805	MS2085A 2-Port Transmission Assembly
3-ND87806	MS2089A SPA Assembly
3-ND87807	MS2089A Main/CAA Assembly
3-ND87055	LCD Top Case Assembly
3-ND87259	Battery Door
3-85716-1-0	Bottom Case
3-ND88099	Connector Panel
3-ND87260	Fan Assembly
3-ND87341	Tilt Bail Assembly
3-806-195	Battery Cable
3-85721	Battery Shroud
3-ND87340	Wi-Fi Antenna
633-79	Li-Ion Battery
3-513-100	RF Input Port
2000-2074-R	Extended Power Pack
3-74842-3	Keypad Cable
3-806-415	Shielded LCD Cable
3-85093	Stand-Offs
3-85719	Left Bumper
3-85720	Right Bumper
3-87616-4	MS2085A Model Label 4 GHz
3-87616-6	MS2085A Model Label 6 GHz
3-87617-4	MS2089A Model Label 4 GHz
3-87617-6	MS2089A Model Label 6 GHz

Chapter 2 — Spectrum Analyzer Verification

2-1 Introduction

This chapter provides the verification procedures for the MS2089A Site Master. Verification tests that are associated with other instrument options are described in Chapter 5, "Assembly Replacement". Record the measurement results in the test record templates provided in Appendix B, "MS2089A Test Records".

This chapter includes the following performance verification procedures:

PASS/FAIL Determination for Instrument Key Parameter Performance Tests

Figure 2-1 shows the rule that is used to determine the pass/fail status of test results that are associated with warranted specifications.

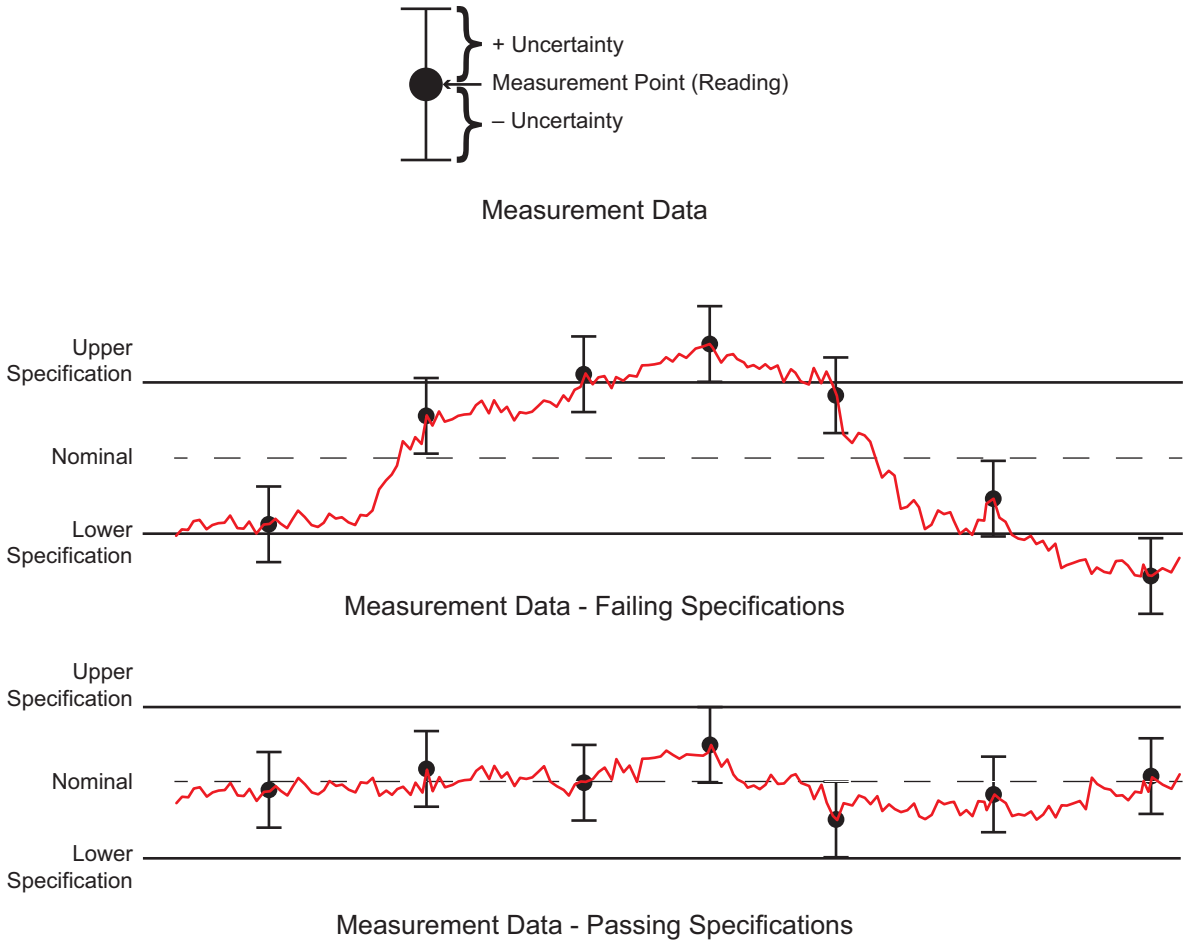

Figure 2-1. Pass/Fail Determination

The measurement uncertainty listed in each test record includes the best estimate of the errors contributed by the measurement, test equipment, standards, and other correction factors (for example, calibration factors and mismatch error) based on the suggested equipment, the equipment setup, and the prescribed test procedure. Most of the uncertainties are type-B per ISO/IEC Guide 98-3, Guide to the Expression of Uncertainty in Measurement (GUM).

2-2 Frequency Accuracy

Use the following procedures to verify the frequency accuracy of the MS2089A, without and with GNSS connection. Record the results in the test records provided in Appendix B

There are two procedures involved in verifying the frequency accuracy:

- "Without GNSS Connection"
- "With GNSS Connection (Option 31)"

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

Without GNSS Connection

Use the following procedures to verify the frequency accuracy of the MS2089A without GNSS connection.

Equipment Required

- Anritsu MG36221A Synthesizer
- Anritsu 15NN50-1.5C RF Coaxial Cable
- Anritsu 34NFKF50 K(f) to N(f) Adapter
- 10 MHz Frequency Reference
- BNC(m) to BNC(m) Coaxial Cable
- SMA(m) to BNC(f) Adapter

Procedure

1. Connect the external 10 MHz frequency reference to the MG36221A.

Note	Do not connect the 10 MHz Reference to the MS2089A.

2. Connect the MG36221A RF Out to the MS2089A RF In.
3. Set the MG36221A RF output as follows:
    - Power Level: –30 dBm
    - CW Frequency: 1 GHz
4. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
5. Set the MS2089A parameters as follows:
    - Center Frequency: 1 GHz
    - Span: 10 kHz
    - Reference Level: –10 dBm
    - RBW: 30 Hz
    - VBW: 3 Hz
6. Enable Marker 1 and perform a Peak Search. Record the marker frequency in Table B-1, "MS2089A Spectrum Analyzer Frequency Accuracy (without GNSS)" on page B-1. Calculate the error by subtracting 1 GHz from the measured value and record the error in Table B-1 on page B-1.

With GNSS Connection (Option 31)

Use this procedure to verify the frequency accuracy of the MS2089A. Record the results in the test records provided in Appendix B.

Equipment Required

- Anritsu MG36221A Synthesizer
- 10 MHz Frequency Reference
- Anritsu 34NFKF50 Adapter
- Anritsu 15NN50-1.5C RF Coaxial Cable
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial Cable
- GNSS antenna

Procedure

1. Connect the external 10 MHz Reference to the MG36221A.

Note	Do not connect the 10 MHz Reference to the MS2089A.

2. Connect the MG36221A RF Out to the MS2089A RF In.
3. Set the MG36221A RF output as follows:
   - Power Level: –30 dBm
   - CW Frequency: 3 GHz
4. Connect the GNSS antenna to the MS2085A/89A, and confirm GNSS coordinates are shown where the message “No GNSS Fix” was shown prior to connecting the antenna.
5. Set the MS2085A/89A parameters as follows:
   - Center Frequency: 3 GHz for MS2089A
   - Span: 10 kHz
   - Reference Level: –10 dBm
   - RBW: 30 kHz
   - VBW: 3 Hz
   - SWEEP ONCE
6. Enable Marker 1 and perform a Peak Search. Record the marker frequency in Table B-2, “MS2089A Option 31, GNSS Frequency Accuracy” on page B-1. Calculate the error by subtracting 1 GHz from the measured value and record the error in Table B-2 on page B-1.

2-3 Amplitude Accuracy

The tests in the following sections verify the amplitude accuracy of MS2089A, and record the results in the corresponding test records included in Appendix B.

There are five procedures involved in verifying the amplitude accuracy. The first procedure is used to characterize the components involved in the test setups. The second and third procedures will be used to verify absolute amplitude accuracy. The fourth and fifth procedures are used to verify amplitude accuracy across frequency:

- "Absolute Amplitude Accuracy"
- "Absolute Amplitude Accuracy at 50 MHz – Preamplifier Off"
- "Absolute Amplitude Accuracy at 50 MHz – Preamplifier On"
- "Amplitude Accuracy – Preamplifier Off"
- "Amplitude Accuracy – Preamplifier On"

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

Absolute Amplitude Accuracy

Before any amplitude accuracy tests are performed, the Component Characterization is required.

Use the following procedure to populate the Characterization Chart for 50 MHz Amplitude Accuracy Verification table in Appendix B.

Equipment Required

- Anritsu MG36221A Synthesizer
- Weinschel 1870 Power Splitter
- Weinschel 44-10 Attenuator
- Rohde and Schwarz NRP18T Power Sensor, Qty 2
- Anritsu 15NN50-1.5C Coaxial cable
- Anritsu 34NFKF50 Adapter
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial cable
- 10 MHz Frequency Reference
- Rohde and Schwarz NRPV free software

Procedure

1. Zero both NPR18T Power sensors.
2. Connect the 10 MHz Reference source to the MG36221A Synthesizer.
3. Connect the 34NFKF50 adapter to the output of the MG36221A.
4. Connect the MG36221A to the 1870 power splitter via the 15NN50-1.5C cable.
5. Attach the 44-10 attenuator directly to the splitter.
6. Connect one NRP18T to the end of the Fixed Attenuator (Sensor A) and the other NRP18T to the open leg of the splitter (Sensor B).
7. Set MG36221A frequency to 50 MHz.
8. Set each NPR18T sensor to display both Channel A and Channel B using NRPV. Set each sensor to 50 MHz and cal factor will automatically be set. Use the keypad to enter the value matching the

frequency of MG36221A as the input signal frequency, which sets the power sensors to the proper power sensor calibration factor.

9. Adjust the power level of the MG36221A to get a reading on Sensor A that matches the test power level in the first column of Table B-3, "Characterization Chart" on page B-1.

10. Record the Sensor B reading in the Required Sensor B Reading column of Table B-3.

11. Repeat Step 9 and Step 10 for the other power levels in the first column of Table B-3, and record the Sensor B readings.

Absolute Amplitude Accuracy at 50 MHz – Preamplifier Off

Use the following procedure to verify the absolute amplitude accuracy of the MS2089A. Record the results in the test record provided in Appendix B.

Equipment Required

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

- Anritsu MG36221A Synthesizer
- Weinschel 1870 Power Splitter
- Weinschel 44-10 Attenuator
- Rohde and Schwarz NRP18T Power Sensor
- Anritsu 15NN50-1.5C Coaxial cable
- Anritsu 34NN50A Adapter
- Anritsu 34NFKF50 Adapter
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial cable
- 10 MHz Frequency Reference

Procedure

1. Connect the external 10 MHz Reference to both the MG36221A and the MS2089A.
2. Connect the K(f) side of the 34NFKF50 adapter to the MG36221A RF Out connector.
3. Connect the 15NN50-1.5C cable to the 34NFKF50 adapter.
4. Connect the 15NN50-1.5C to the input of the splitter.
5. Connect the NRP18T directly to the output of the power splitter.
6. Connect the Anritsu 34NN50A adapter to the output of the power splitter and N (f) side of the 10 dB attenuator.
7. Connect the RF input of the MS2089A to the 10 dB attenuator.
8. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > PRESET MODE).
9. Set the MS2089A parameters as follows:
    - Center Frequency: 50 MHz
    - Span: 10 kHz
    - Reference Level: 10 dBm
    - Attenuation Level: 30 dB
    - Preamp: Off
    - RBW:1 kHz
    - VBW: 10 Hz
    - Detector Type: Peak
10. Adjust the MG36221A power level so that the Sensor B matches the required Sensor B value as shown in Table B-3 on page B-1.
11. Perform a marker peak search and record the amplitude in Table B-4, “MS2089A Absolute Amplitude Accuracy at 50 MHz (Preamplifier Off)” on page B-2.
12. Repeat steps 14 to Step 16 for each Input Power Level in Table B-4 on page B-2, change the REF LEVEL and ATTEN LEVEL settings as required for other power levels inTable B-4 and Table B-5.

Absolute Amplitude Accuracy at 50 MHz – Preamplifier On

Use the following procedure to verify the absolute amplitude accuracy of the MS2089A. Record the results in the test record provided in Appendix B.

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

Equipment Required

- Anritsu MG36221A Synthesizer
- Weinschel 1870 Power Splitter
- Weinschel 44-10 Attenuator
- Rohde and Schwarz NRP18T Power Sensor
- Anritsu 15NN50-1.5C Coaxial cable
- Anritsu 34NN50A Adapter
- Anritsu 34NFKF50
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial cable
- 10 MHz Frequency Reference

Procedure

1. Connect the external 10 MHz Reference to both the MG36221A and the MS2089A.
2. Connect the K(f) side of the 34NFKF50 adapter to the MG36221A RF Out connector.
3. Connect the 15NN50-1.5C cable to the 34NFKF50 adapter.
4. Connect the 15NN50-1.5C to the input of the splitter.
5. Connect the NRP18T directly to the output of the power splitter.
6. Connect the Anritsu 34NN50A adapter to the output of the power splitter and N (f) side of the 10 dB attenuator.
7. Connect the 10 dB attenuator to RF In of the MS2089A.
8. Select SPECTRUM ANALYZER mode and preset the instrument (PRESET > PRESET MODE).
9. Set the MS2089A parameters as follows:
    - Center Frequency: 50 MHz
    - Span: 10 kHz
    - Reference Level: 10 dBm
    - Attenuation Level: 30 dB
    - Preamp: On
    - RBW:1 kHz
    - VBW: 10 Hz
    - Detector Type: Peak
10. Adjust the MG36221A power level so that the Sensor B matches the required Sensor B value as shown in Table B-3 on page B-1.
11. Perform a marker peak search and record the amplitude in Table B-5, “MS2089A Absolute Amplitude Accuracy at 50 MHz (Preamplifier On)” on page B-3.

12. Repeat steps 14 to Step 16 for each Input Power Level in Table B-5 on page B-3, change the REF LEVEL and ATTEN LEVEL settings as required for other power levels inTable B-4 and Table B-5.

Amplitude Accuracy – Preamplifier Off

Use the following procedure to verify the amplitude accuracy of the MS2089A with preamplifier off.

Equipment Required

- Anritsu MG36221A Synthesizer
- Weinschel 1870 Power Splitter
- Weinschel 44-10 Attenuator
- Rohde and Schwarz NRP18T Power Sensor, Qty 2
- Anritsu 15NN50-1.5C Coaxial cable
- Anritsu 34NN50A Adapter
- Anritsu 34NFKF50 Adapter
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial cable
- 10 MHz Frequency Reference
- Rohde and Schwarz NRPV free software

Procedure

1. Connect the external 10 MHz Reference to both the MG36221A and MS2089A.

2. Connect the K(f) side of the 34NFKF50 adapter to the MG36221A RF Out connector.

3. Connect the 15NN50-1.5C cable to the 34NFKF50 adapter.

4. Connect the MG36221A RF Out to the input of the splitter.

5. Connect the NRP18T directly to one output of the splitter.

6. Connect the Anritsu 34NN50A adapter to the output of the power splitter and N (f) side of the 10 dB attenuator.

7. Connect the RF input of the MS208xA to the 10 dB attenuator.

8. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > PRESET MODE).

9. Set the MS2089A parameters as follows:

- Span: 10 kHz
- Reference Level: 10 dBm
- Attenuation Level: 30 dB
- Preamp: Off
- RBW:1 kHz
- VBW: 10 Hz
- Detector Type: Peak

10. Using the Rohde and Schwarz Power Viewer software, set the signal frequency to 50 MHz.

11. On the MG36221A, press RF ON.

12. On the MG36221A, set the frequency to 50 MHz.

13. Adjust the NRP18T power level to +10.0 dBm. (The power level reading of MG36221A should be approximately +16 dBm.)

14. Set the MS2089A center frequency to 50 MHz.

15. Perform a marker peak search and record the amplitude in Table B-6, "MS2089A Power Level Accuracy (Preamplifier Off)" on page B-4

16. Adjust the Reference Level and Attenuation Level on the MS2089A for the other values in Table B-6, "MS2089A Power Level Accuracy (Preamplifier Off)" on page B-4

17. Adjust the Power Level on the MG36221A for the other power levels in Table B-6, "MS2089A Power Level Accuracy (Preamplifier Off)" on page B-4, and record results for each measurement.

18. Repeat this procedure for the other frequencies using the tables listed below:

- Table B-7, "MS2089A-0706 Power Level Accuracy (Preamplifier Off)" on page B-4 for all frequency options.

Amplitude Accuracy – Preamplifier On

Use the following procedure to verify the amplitude accuracy of the MS2089A with the preamplifier on. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu MG36221A Synthesizer
- Weinschel 1870 Power Splitter
- Weinschel 44-10 Attenuator
- Rohde and Schwarz NRP18T Power Sensor, Qty 2
- Anritsu 15NN50-1.5C Coaxial cable
- Anritsu 34NN50A Adapter
- Anritsu 34NFKF50 Adapter
- SMA(m) to BNC(f) Adapter
- BNC(m) to BNC(m) Coaxial cable
- 10 MHz Frequency Reference
- Rohde and Schwarz NRPV free software

Procedure

1. Connect the external 10 MHz Reference to both the MG36221A and MS2089A.
2. Connect the K(f) side of the 34NFKF50 adapter to the MG36221A RF Out connector.
3. Connect the 15NN50-1.5C cable to the 34NFKF50 adapter.
4. Connect the MG36221A RF Out to the input of the splitter.
5. Connect the NRP18T directly to one output of the splitter.
6. Connect the Anritsu 34NN50A adapter to the output of the power splitter and N (f) side of the 10 dB attenuator.
7. Connect the RF input of the MS208xA to the 10 dB attenuator.
8. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > PRESET MODE).
9. Set the MS2089A parameters as follows:
    - Span: 10 kHz
    - Reference Level: 10 dBm
    - Attenuation Level: –40 dB
    - Preamp: Off
    - RBW:1 kHz
    - VBW: 10 Hz
    - Detector Type: Peak
10. Using the Rohde and Schwarz Power Viewer software, set the signal frequency to 50 MHz.
11. On the MG36221A, press RF ON.
12. On the MG36221A, set the frequency to 50 MHz.
13. Adjust the NRP18T power level to +10.0 dBm. (The power level reading of MG36221A should be approximately +16 dBm.)
14. Set the MS2089A center frequency to 50 MHz.

15. Perform a marker peak search and record the amplitude in Table B-8, "MS2089A Power Level Accuracy (Preamplifier On)" on page B-5

16. Adjust the Reference Level and Attenuation Level on the MS2089A for the other values in Table B-8, "MS2089A Power Level Accuracy (Preamplifier On)" on page B-5

17. Adjust the Power Level on the MG36221A for the other power levels in Table B-8, "MS2089A Power Level Accuracy (Preamplifier On)" on page B-5, and record results for each measurement.

18. Repeat this procedure for the other frequencies using the tables listed below:

- Table B-9, "MS2089A-0706 Power Level Accuracy (Preamplifier On)" on page B-5 for all frequency options.

2-4 Single Side Band (SSB) Phase Noise

Use the following procedure to verify the single side-band (SSB) phase noise of the MS2089A. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu MG36221A
- 34NFKF50 Adapter, K(f) to N(f)
- SMA(m) to BNC(f) Adapter
- Anritsu 15NN50-1.5C Coaxial Cable, N(m) to N(m)
- 10 MHz Frequency Reference
- BNC(m) to BNC(m) coaxial cable

Procedure

1. Connect the external 10 MHz Reference to both the MG36221A and MS2089A.
2. Connect the MG36221A RF Out to the MS2089A RF In using the 34NFKF50 adapter.
3. Set the MG36221A to output frequency to 1.0 GHz.
4. Set the MG36221A to output power to –2 dBm.
5. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
6. Set the MS2089A parameters as follows:
    - Reference Level: 0 dBm
    - Input Attenuation: 15 dB
    - Preamplifier: Off
    - RBW: 1 kHz
    - VBW: 3 Hz
    - Detector Type: Peak
    - Averages: 3
    - Sweep Points: 601
7. 10 kHz and 100 kHz Offset Settings:
    - Center Frequency: 1000.05 MHz
    - Span: 110 kHz
8. In the Sweep menu, turn off Continuous Sweep, and choose Sweep to three and allow it to finish.
9. In the Marker menu, use the Peak Search menu to set Marker 1 to the peak at 1 GHz. Exit the Peak Search menu and set the Marker Mode to Delta. Enter a frequency value of 10 kHz, so a marker is on the peak at 1 GHz and the delta marker is 10 kHz away. Record the difference in level between the peak at 1 GHz and the noise level 10 kHz away at 1000.010 MHz in Table B-10, "MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz" on page B-6. Then subtract another 30 dB and record this as the 10 kHz Offset Measured Value reading in Table B-10 on page B-6.

    For example: –80 dBc measured – 30 dB = –110 dBc/Hz
10. Change the Delta Frequency from 10 kHz to 100 kHz and record the difference in level between the peak at 1 GHz and the noise level 100 kHz away at 1000.100 MHz in Table B-10, "MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz" on page B-6. Then subtract another 30 dB and record this as the 100 kHz Offset Measured Value reading in Table B-10, "MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz" on page B-6.

For example: –80 dBc measured – 30 dB = –110 dBc/Hz

11. Change the Center Frequency to 1000.545 MHz and the Span to 1.1 MHz. Run the sweep of three averages and allow it to finish. Using Delta Markers, measure the difference in level between the peak at 1 GHz and the noise level 1 MHz away at 1001.0 MHz in Table B-10, "MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz" on page B-6. Then subtract another 30 dB and record this as the 1 MHz Offset Measured Value reading in Table B-10 on page B-6.

For example: –85 dBc measured – 30 dB = –115 dBc/Hz

12. Change the Center Frequency to 1005.495 MHz and the Span to 11 MHz. Run the sweep of 3 averages and allow it to finish. Using Delta Markers, measure the difference in levels between the peak at 1 GHz and the noise level 10 MHz away at 1010 MHz in Table B-10, "MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz" on page B-6. Then subtract another 30 dB and record this as the 10 MHz Offset Measured Value reading in Table B-10 on page B-6.

For example: –100 dBc measured –30 dB = –130 dBc/Hz

2-5 Second Harmonic Distortion

Use the following procedure to verify the second harmonic distortion of the MS2089A. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu MG36221A Synthesizer
- Min-Circuits NLP-50 Low Pass Filter
- Anritsu 15NN50-1.5C RF Cable
- 10 MHz Frequency Reference
- BNC(m) to BNC(m) Coaxial Cable
- Ruggedized 34NFK50 Adapter, K(f) to N(f)
- SMA(m) to BNC(f) Adapter

Procedure

1. Connect the 10 MHz reference to the MG36221A and MS2089A.
2. Connect the 34NFKF50 adapter to the output of the MG36221A.
3. Connect the MG36221A to the input of the low pass filter via the 15NN50-1.5C coaxial cable.
4. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
5. Set the MS2089A parameters as follows:
   - Center frequency: 50.1 MHz
   - Span: 100 kHz
   - Reference Level: –20 dBm
   - Attenuation Level: 0 dB
   - Preamplifier: Off
   - RBW: 1 kHz
   - VBW: 10 Hz
6. Set the MG36221A frequency to 50.1 MHz and adjust the level so the MS2089A shows –30 dBm at 50.1 MHz. Record this value in Table B-11, “MS2089A Second Harmonic Distortion” on page B-6
7. Set the MS2089A Center Frequency to 100.2 MHz, perform a peak search, and record this value in Table B-11 on page B-6.
8. Subtract 50.1 MHz value from the 100.2 MHz value and record this as the Second Harmonic Distortion in Table B-11 on page B-6.

   For example, if the 50.1 MHz value is –30 dBm and the 100.2 MHz value is –90 dBm, then:

   –90 dBm – (–30 dBm) = –60 dBc

2-6 Displayed Average Noise Level (DANL)

Use the following procedures to verify the Displayed Average Noise Level (DANL) of the MS2089A. Record the results in the test records provided in Appendix B.

There are two procedures involved in verifying the DANL of MS2089A:

- "DANL – Preamplifier Off"
- "DANL – Preamplifier On"

DANL – Preamplifier Off

Use the following procedure to verify the Displayed Average Noise Level (DANL) of the MS2089A with preamplifier off.

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

Equipment Required

- Anritsu 28N50-2 Termination

MS2089A Procedure

1. Attach the Termination to the RF input of the MS2089A.
2. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
3. Set the MS2089A parameters as follows:
    - Start Frequency: 10 MHz
    - Stop Frequency: 2 GHz
    - Reference Level: –20 dBm
    - Input Attenuation: 0 dB
    - Preamplifier: Off
    - RBW: 1 MHz
    - VBW: 1 kHz
    - VBW Type: Logarithmic
    - Detector Type: RMS/Avg
    - Sweep Points: 551
    - Continuous: Toggle Off
    - Press Sweep Once.
4. Using the Marker menu, choose Peak Search, subtract 60 dB from the measurement, and record the power level in Table B-12, "MS2089A Displayed Average Noise Level (Preamplifier Off)" on page B-6.
5. Change the start frequency to 3 GHz and stop frequency to 4 GHz and repeat Step 3 and Step 4 to record the power level in Table B-12, "MS2089A Displayed Average Noise Level (Preamplifier Off)" on page B-6.

DANL – Preamplifier On

Use the following procedure to verify the Displayed Average Noise Level (DANL) of the MS2089A with the Preamplifier On. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu 28N50-2 Termination

MS2089A Procedure

1. Attach the Termination to the RF input of the MS2089A.
2. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
3. Set the MS2089A parameters as follows:
   - Start Frequency: 10 MHz
   - Stop Frequency: 2 GHz
   - Reference Level: –50 dBm
   - Attenuation Level: 0 dB
   - Preamplifier: On
   - RBW: 1 MHz
   - VBW: 1 kHz
   - VBW Type: Logarithmic
   - Detector Type: RMS/Avg
   - Sweep Points: 551
   - Continuous: Toggle Off
   - Press Sweep Once.
4. Using the Marker menu, choose Peak Search, subtract 60 dB from the measurement, and record the power level in Table B-13, “MS2089A Displayed Average Noise Level (Preamplifier On)” on page B-6.
5. Change the start frequency to 2 GHz and stop frequency to 4 GHz and repeat Step 3 and Step 4 to record the power level in Table B-13, “MS2089A Displayed Average Noise Level (Preamplifier On)” on page B-6.

2-7 Residual Spurs

Use the following procedures to verify the Residual Spurs of the MS2089A with the preamplifier off and preamplifier on. Residual spurs are tested in multiple bands, record the results in the test records provided in Appendix B.

There are two procedures involved in verifying the Residual Spurs:

- "Residual Spurs – Preamplifier On"
- "Residual Spurs – Preamplifier Off"

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

Residual Spurs – Preamplifier On

Use the following procedure to verify the Residual Spurs of the MS2089A with the Preamplifier On. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu 28N50-2 Termination

MS2089A Procedure

1. Attach the Termination to the RF input of the MS2089A.
2. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
3. Set the MS2089A parameters as follows:
    - Start Frequency: >10 MHz
    - Stop Frequency: 500 MHz
    - Reference Level: –50 dBm
    - Attenuation Level: 0 dB
    - Preamplifier: On
    - RBW: 300 Hz
    - VBW: 100 Hz
    - Sweep Points: 601
    - Continuous: Toggle off
    - Press Sweep Once.
4. Using the Marker menu, choose Peak Search and record the power level in Table B-14, "MS2089A Residual Spurs (Preamplifier On)" on page B-7.

Residual Spurs – Preamplifier Off

Use the following procedure to verify the Residual Spurs of the MS2089A with the Preamplifier Off and Record the results in the test records provided in Appendix B.

Equipment Required

- Anritsu 28N50-2 Termination

MS2089A Procedure

1. Attach the Termination to the RF input of the MS2089A.
2. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
3. Set the MS2089A parameters as follows:
    - Start Frequency: 10 MHz
    - Stop Frequency: 500 MHz
    - Reference Level: –50 dBm
    - Attenuation Level: 0 dB
    - Preamplifier: Off
    - RBW: 300 Hz
    - VBW: 100 Hz
    - Sweep Points: 601
    - Continuous: Toggle off
    - Press Sweep Once.
4. Using the Marker menu, choose Peak Search and record the power level in Table B-15, “MS2089A Residual Spurs (Preamplifier Off)” on page B-7.
5. Change the Start Frequency to 3 GHz and Stop Frequency to 4 GHz.
6. Repeat Step 3 and Step 4 and record the power level in Table B-15, “MS2089A Residual Spurs (Preamplifier Off)” on page B-7.

2-8 Input Related Spurious

Use the following procedure to verify the Input Related Spurious of the MS2089A. Record the results in the test records provided in Appendix B.

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

Equipment Required

- Anritsu MG36221A Synthesizer
- Anritsu 34NFKF50 Adapter
- Anritsu 15NNF50-1.5C RF Cable
- 10 MHz Frequency Reference
- BNC(m) to BNC(m) Coaxial Cable
- SMA(m) to BNC(f) Adapter

MS2089A Procedure

1. Connect the 10 MHz Reference to the MG36221A and MS2089A.
2. Connect the output of the MG36221A to the RF In of the MS2089A via the 34NFKF50 adapter.
3. Set the MS2089A to spectrum analyzer mode and preset the instrument (PRESET > Preset Mode).
4. Set the MS2089A parameters as follows:
    - Center Frequency: 742 MHz
    - Span: 100 kHz
    - Reference Level: –30 dBm
    - Attenuation Level: 0 dB
    - Preamplifier: Off
    - RBW: 1 kHz
    - VBW: 10 Hz
5. Set the MG36221A frequency to 742 MHz, and set power level so –30 dBm is read on the MS2089A at 742 MHz. Record the highest spur level in Table B-16, “MS2089A Input Related Spurs” on page B-8.
6. Change the center frequency of the MS2089A to 3500.5 MHz and record the highest spur level in Table B-16, “MS2089A Input Related Spurs” on page B-8.

Chapter 3 — Cable and Antenna Analyzer Verification

3-1 Return Loss Accuracy Verification

The following test is used to verify the accuracy of return loss measurements on the MS2085A/89A in Cable and Antenna Analyzer mode.

Equipment Required

- Open/Short Frequency: DC to 18 GHz Anritsu Model 22N50
- Termination Frequency: DC to 18 GHz, Return Loss: 40 dB min. Anritsu Model 28N50-2
- 6 dB Offset Termination Frequency: DC to 6.0 GHz Anritsu Model SC5905
- 20 dB Offset Termination Frequency: DC to 6.0 GHz Anritsu Model SC5906

Procedure

1. Verify that the MS2085A/89A is in Cable and Antenna Analyzer (CAA) mode and preset the unit.
2. Go to Measure > Measurement, and select the Return Loss.
3. Go to Calibration > Start Cal. Follow the instructions on the screen to perform a calibration
4. After the calibration is complete, install the 20 dB offset termination.
5. From the main menu select Amplitude, set Top to 18 dB, and Bottom to 22 dB.
6. Verify that the trace is between 18.3 dB and 21.7 dB.
7. From the main menu select Marker > Marker Search and select the Peak. Record the marker value, then select the Valley and record the marker value. Record the worst case of the two values in Table A-2, "MS2085A/89A CAA Return Loss Accuracy Verification.
8. Remove the 20 dB offset and install the 6 dB offset.
9. Go Amplitude menu, set Top to 4.0 dB, and set Bottom to 8.0 dB.
10. Verify that the trace is between 4.8 dB and 7.2 dB.
11. From the main menu select Marker > Marker Search and select the Peak. Record the marker value, then select the Valley and record the marker value. Record the worst case of the two values in Table A-2, "MS2085A/89A CAA Return Loss Accuracy Verification.

Chapter 4 — Battery Information

4-1 General Information

This chapter provides the care and handling information of the Anritsu 633-79 Lithium-Ion batteries.

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

Warning

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

4-2 Battery Pack Removal and Replacement

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

1. Locate the battery access door on the left side of the unit.
2. Push in and slide the battery access door to remove the battery access door.
3. Pull straight out on the lanyard to remove the battery pack from the instrument.
4. After inserting the new battery pack, press the battery access door to secure it

Note	When inserting the battery, the battery contacts should face up and slide in first. If the battery door does not close tightly, it means that the battery may have been inserted incorrectly.

Figure 4-1. Battery Access Door Location and Removal

5. With the battery access door removed, grasp the battery lanyard and pull the battery straight out of the unit as illustrated in Figure 4-2.

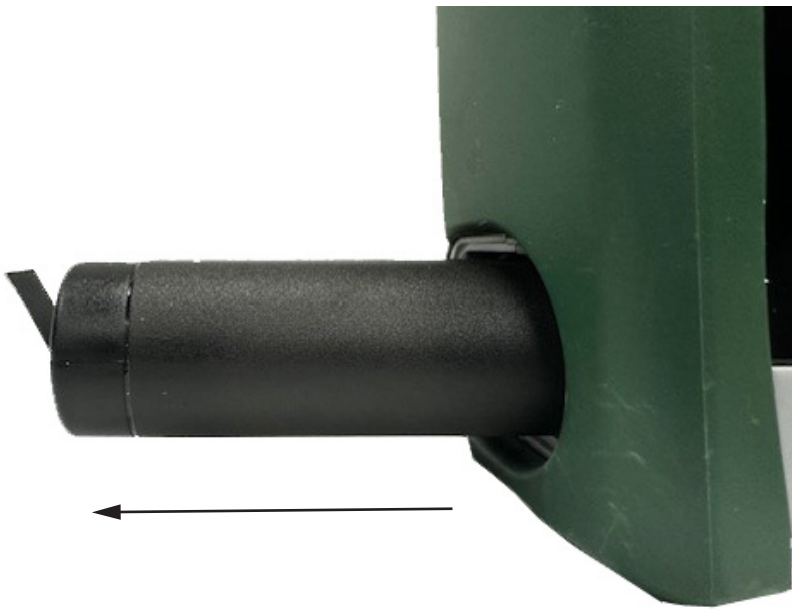

Figure 4-2. Removing the Battery

Chapter 5 — Assembly Replacement

5-1 Introduction

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

5-2 Replaceable Parts List

Refer to Table 1-5, "List of Replaceable Parts" on page 1-3 for the list of replacement parts.
Refer to the following sections for basic replacement instructions.

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. All work should be performed in a static-safe work area. Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in Table 1-5 are typically the only items that may be replaced. The assemblies are highly fragile, items that must be soldered may not be replaced without specialized training. The Site Master contains components that can easily be damaged by electrostatic discharge (ESD). An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling sub-assemblies or components found in the instrument. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

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

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

5-3 Battery Pack Removal and Replacement

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

1. Locate the battery access door on the left side of the unit.
2. Remove the battery door tab by sliding it to the left. See Figure 5-1.

Figure 5-1. Battery Access Door Removal

3. With the battery access door removed, grab the battery lanyard and pull the battery straight out of the unit as illustrated in Figure 5-2.

Figure 5-2. Removing the Battery

5-4 Bumpers Removal

The procedure below provides instructions for removing the bumpers of the instrument:

1. Remove the left and right bumpers by pulling them outward from the bottom. See Figure 5-3.

Figure 5-3. Pulling of Side Bumpers

2. Detach the bumpers completely by lifting them upwards to remove from the unit. See Figure 5-4.

Figure 5-4. Side Bumpers Removal

5-5 Rear Case Removal

The procedure below provides instructions for removing the rear case of the instrument:

1. Remove the battery as shown in Section 5-3 “Battery Pack Removal and Replacement” on page 5-2.
2. Remove the side bumpers as shown in Section 5-4 “Bumpers Removal” on page 5-3.
3. Using a T10 Torx screwdriver, remove the nine screws from the back of the instrument as shown in Figure 5-5.

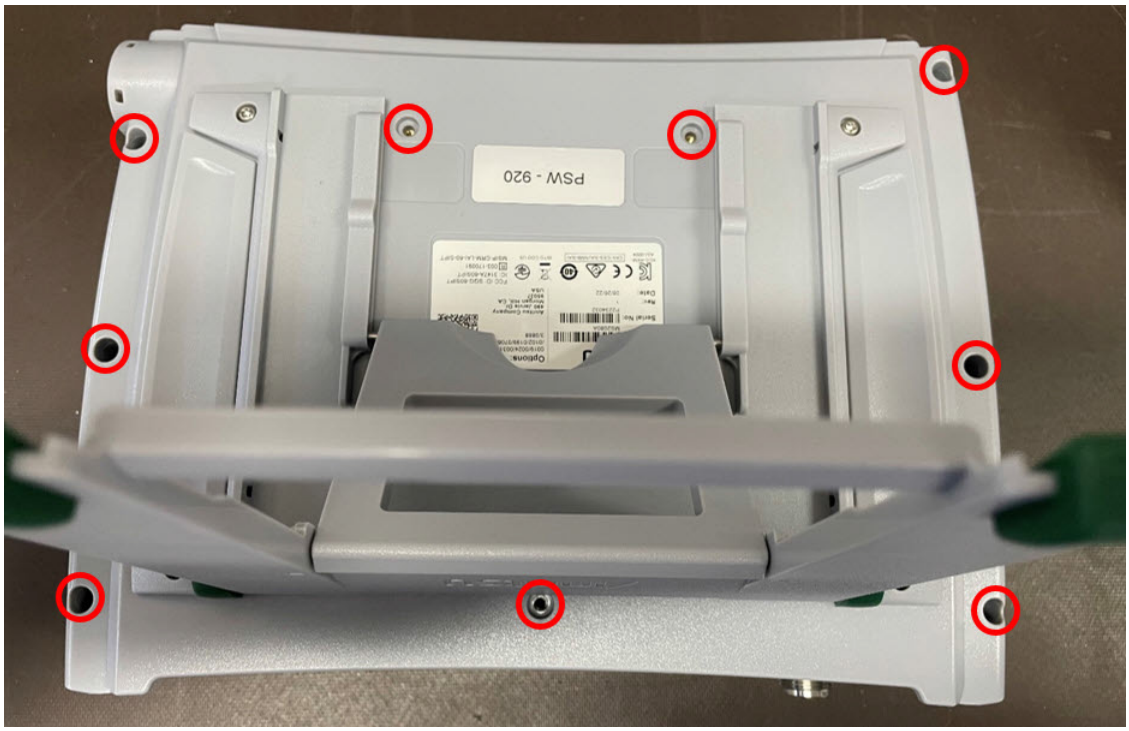

Figure 5-5. Rear Case Removal

4. With all screws removed, place the instrument face down on a stable flat work surface.
5. Gently pull the rear case apart from the front case.

5-6 Touchscreen/LCD Removal

This procedure provides instructions to replace LCD touchscreen. With the rear case removed as shown in Section 5-5 “Rear Case Removal” on page 5-4, the internal assemblies can be removed and replaced as explained below:

1. Remove the battery access door and the battery as described in Section 5-3 “Battery Pack Removal and Replacement” on page 5-2.
2. Remove the rear case as described in Section 5-5 “Rear Case Removal” on page 5-4.
3. Remove the five Torx screws securing the Main PCB and SPA PCB assemblies using a T20 Torx driver. See Figure 5-6.

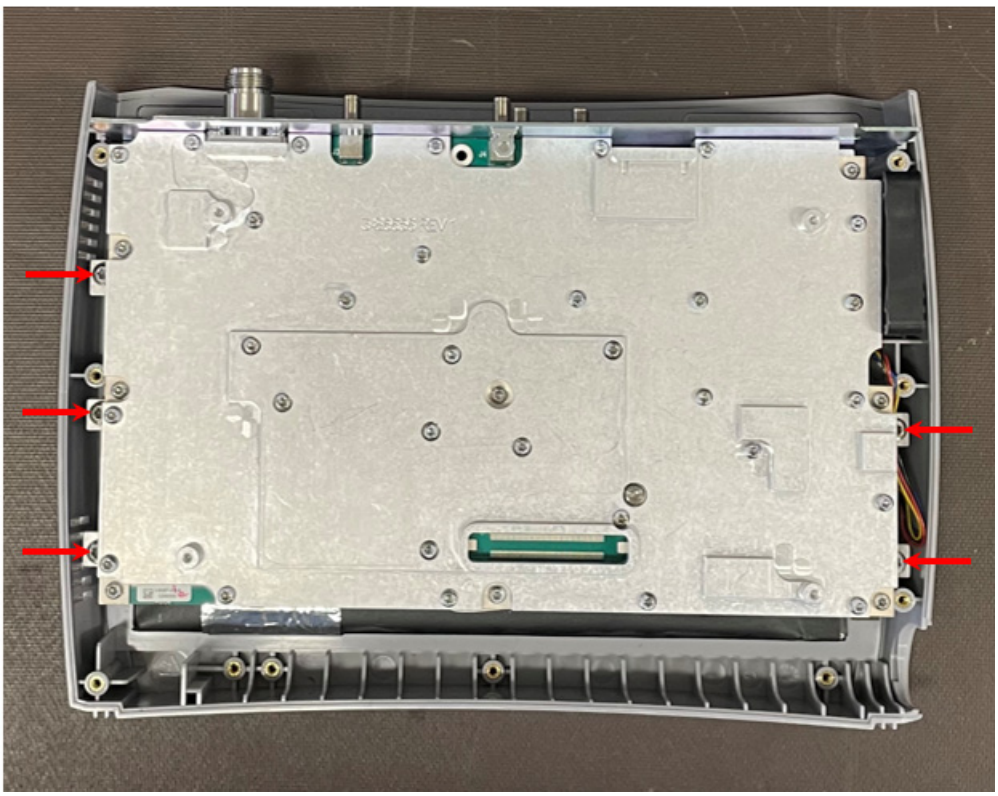

Figure 5-6. Main PCB/SPA PCB Removal

4. Remove the Torx screw on the top connector panel using a T10 screw driver. See Figure 5-7.

Figure 5-7. Top Panel Removal

5. Remove the three Torx screws securing the battery shroud using a T10 Torx screw driver. See Figure 5-8.

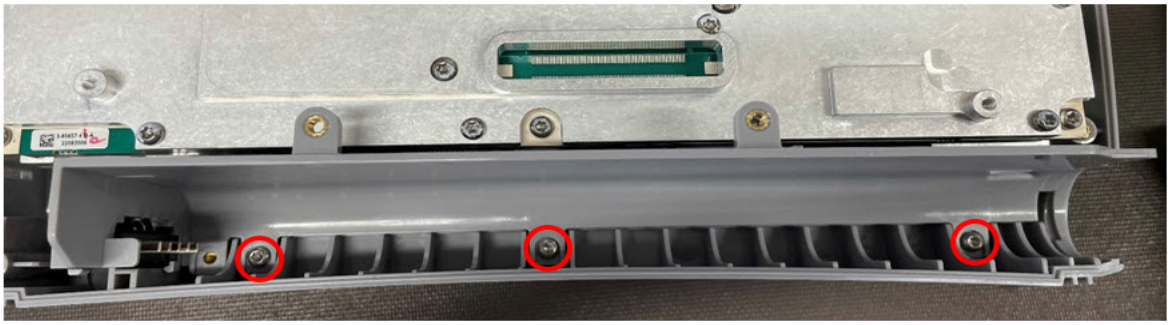

Figure 5-8. Battery Shroud Removal

6. Disconnect the battery cable and remove the battery shroud. See Figure 5-9.

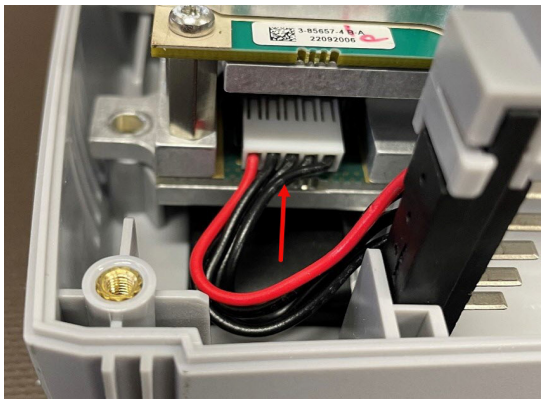

Figure 5-9. Battery Cable Removal

7. Carefully tilt the Main PCB/SPA PCB assembly to view the display cable. See Figure 5-10.

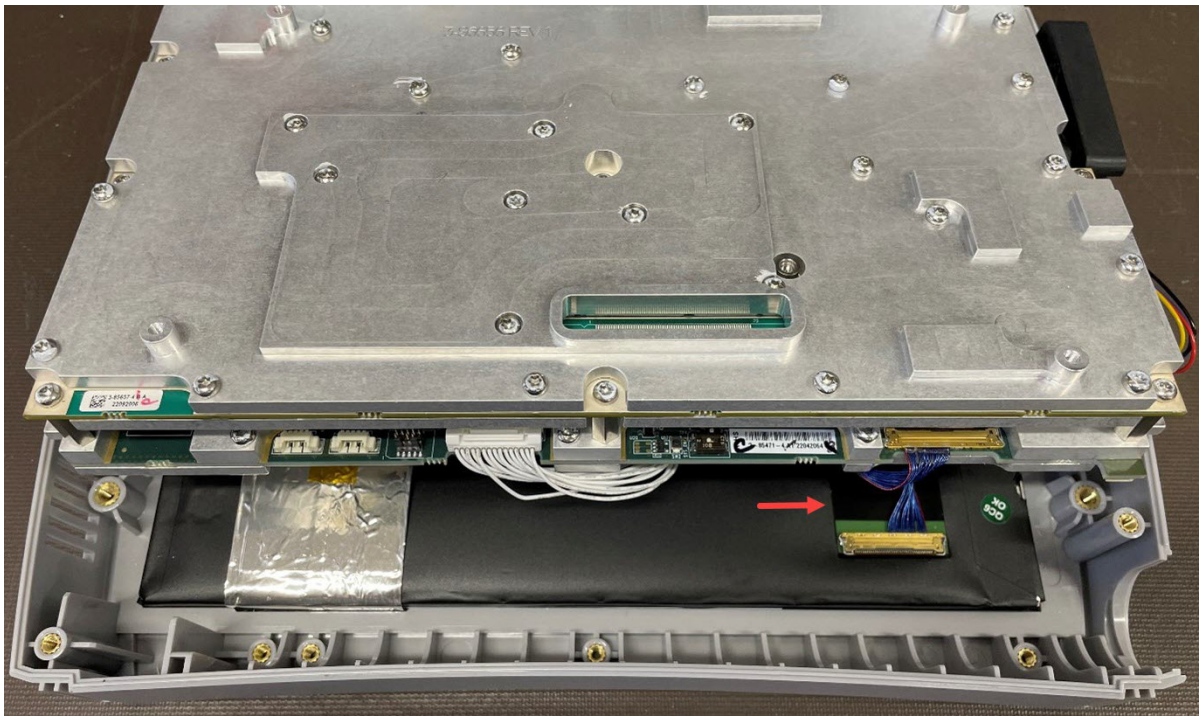

Figure 5-10. Display Cable

8. Release the locking connector by slowing lifting the metal flap upwards to disconnect the display cable. See Figure 5-11.

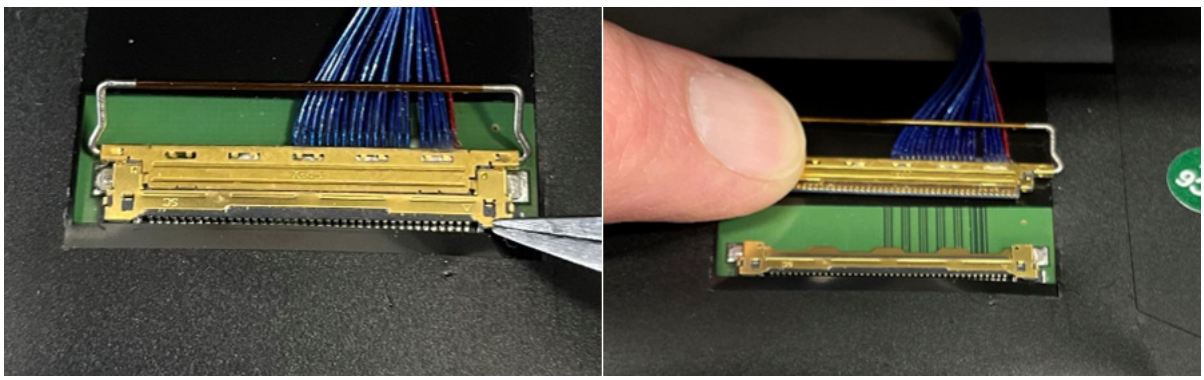

Figure 5-11. Display Cable Removal

9. Carefully tilt the Main PCB/SPA PCB assembly to remove the two Wi-Fi antennas. Release the Wi-Fi Antennas by carefully prying the end slots using a straight screw driver. See Figure 5-12.

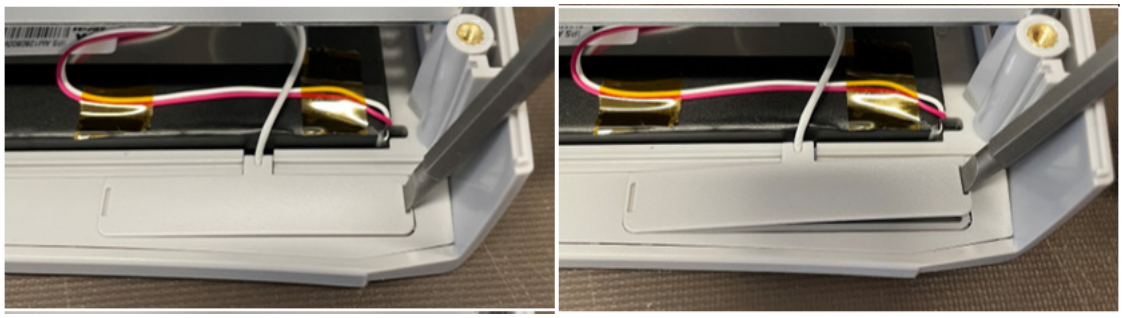

Figure 5-12. Releasing the Wi-Fi antennas

10. Carefully tilt the Main PCB/SPA PCB assembly to remove the keypad cable connector by slightly pressing it at the ends and disconnecting it from the LCD top case assembly. See Figure 5-13.

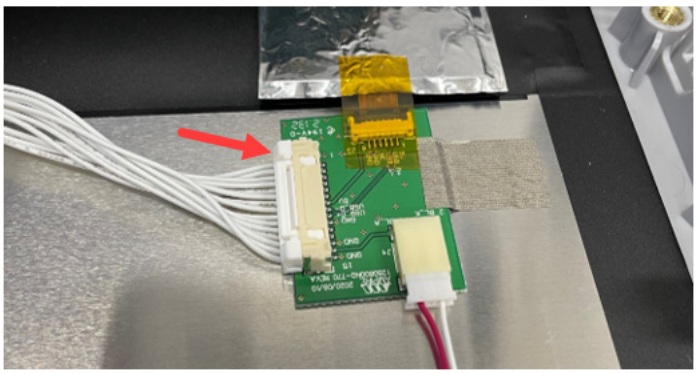

Figure 5-13. Disconnecting Keypad Cable Connector

11. The Touchscreen/LCD Display is permanently installed into the Top Case.

5-7 SPA PCB Assembly Removal

1. Remove the four nuts along with four lock washers from the SMA ports on the top connector panel using a 5/16" wrench. See Figure 5-14.

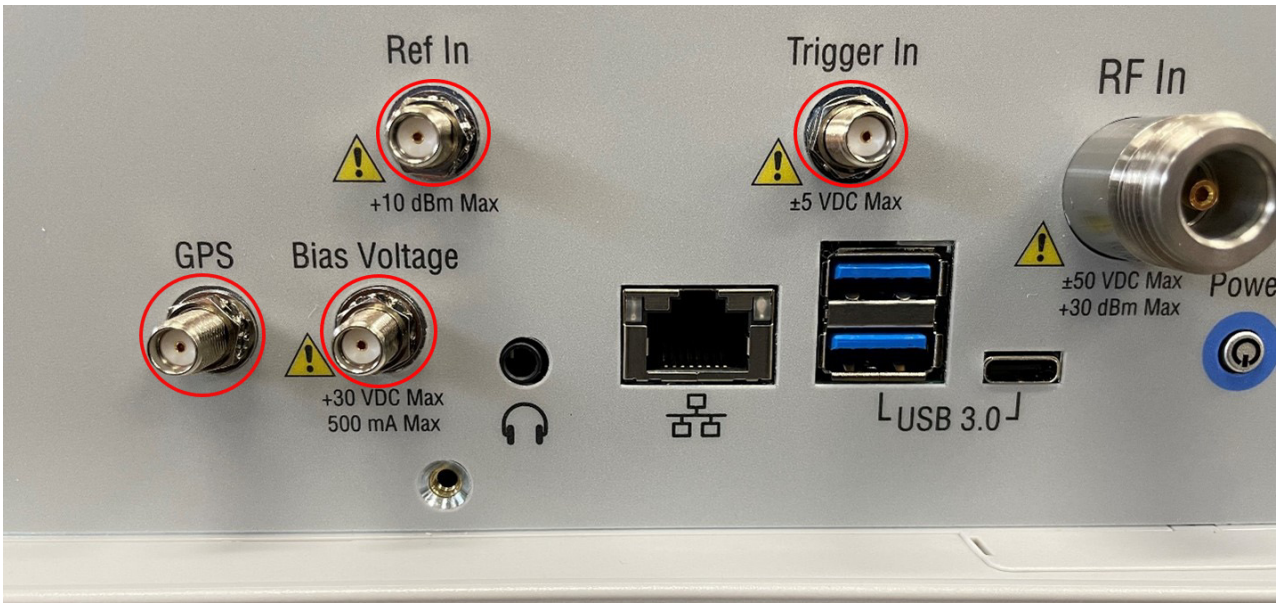

Figure 5-14. SPA PCB Removal

2. Remove the two Torx screws using T10 Torx driver from the brackets on the Main PCB. See Figure 5-15.
3. Remove the top panel from the SPA and motherboard PC assemblies.

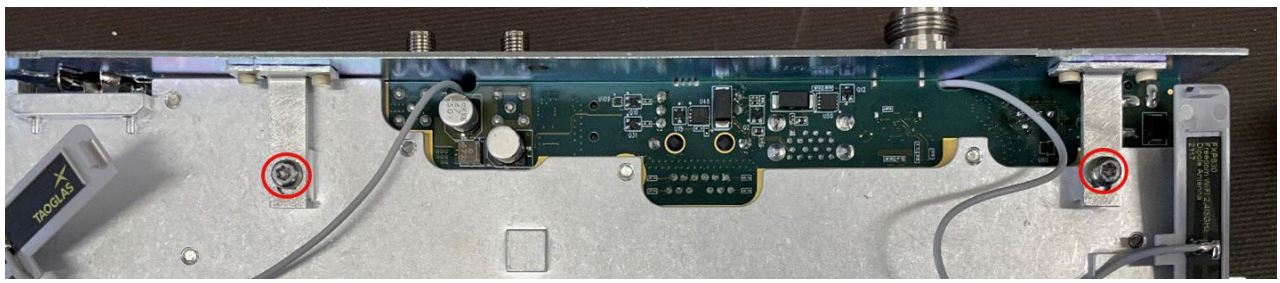

Figure 5-15. SPA PCB Removal

4. Remove the eight Torx screws securing the SPA PCB Assembly to the Main PCB using a T10 Torx driver. See Figure 5-16.

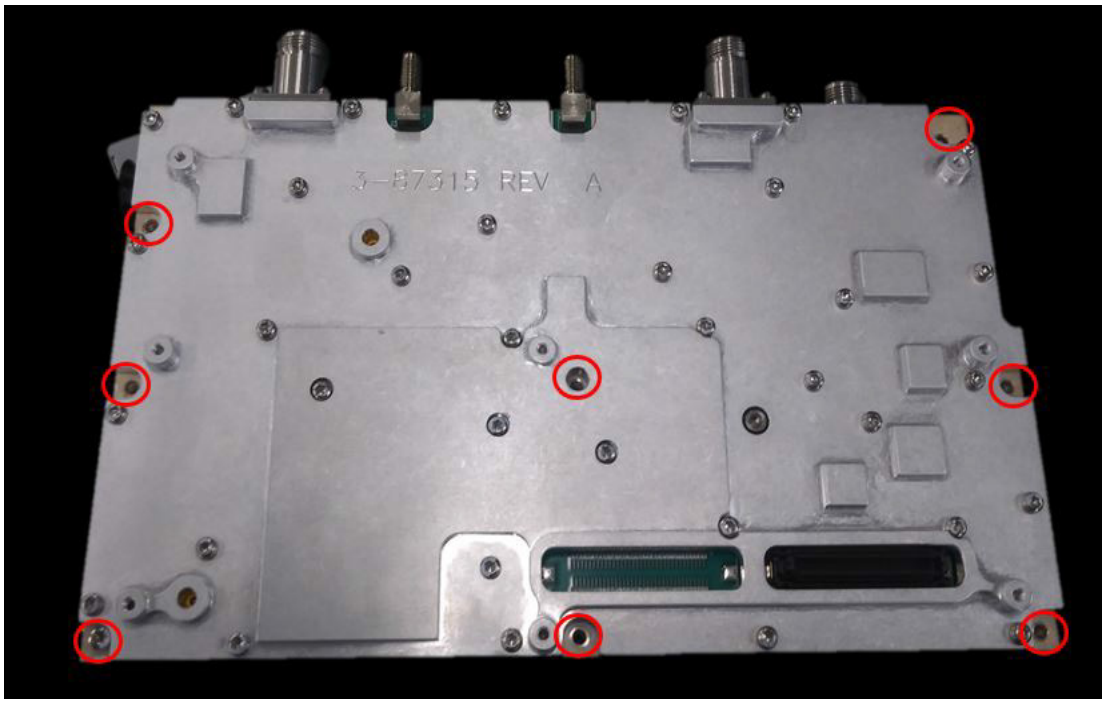

Figure 5-16. SPA PCB Removal: Torx Screws

5-8 Main PCB Removal

The semi-rigid cable connecting the RF input adapter and the step attenuator on the SPA PCB is normally a part of the SPA PCB Assembly, which may be replaced independently.

1. Carefully remove the two Wi-Fi cables, the keypad cable, and shielded LCD cable connected to the Main PCB.
2. Remove the eight stand-offs using 6 mm hex socket driver to remove the Main PCB. See Figure 5-17.

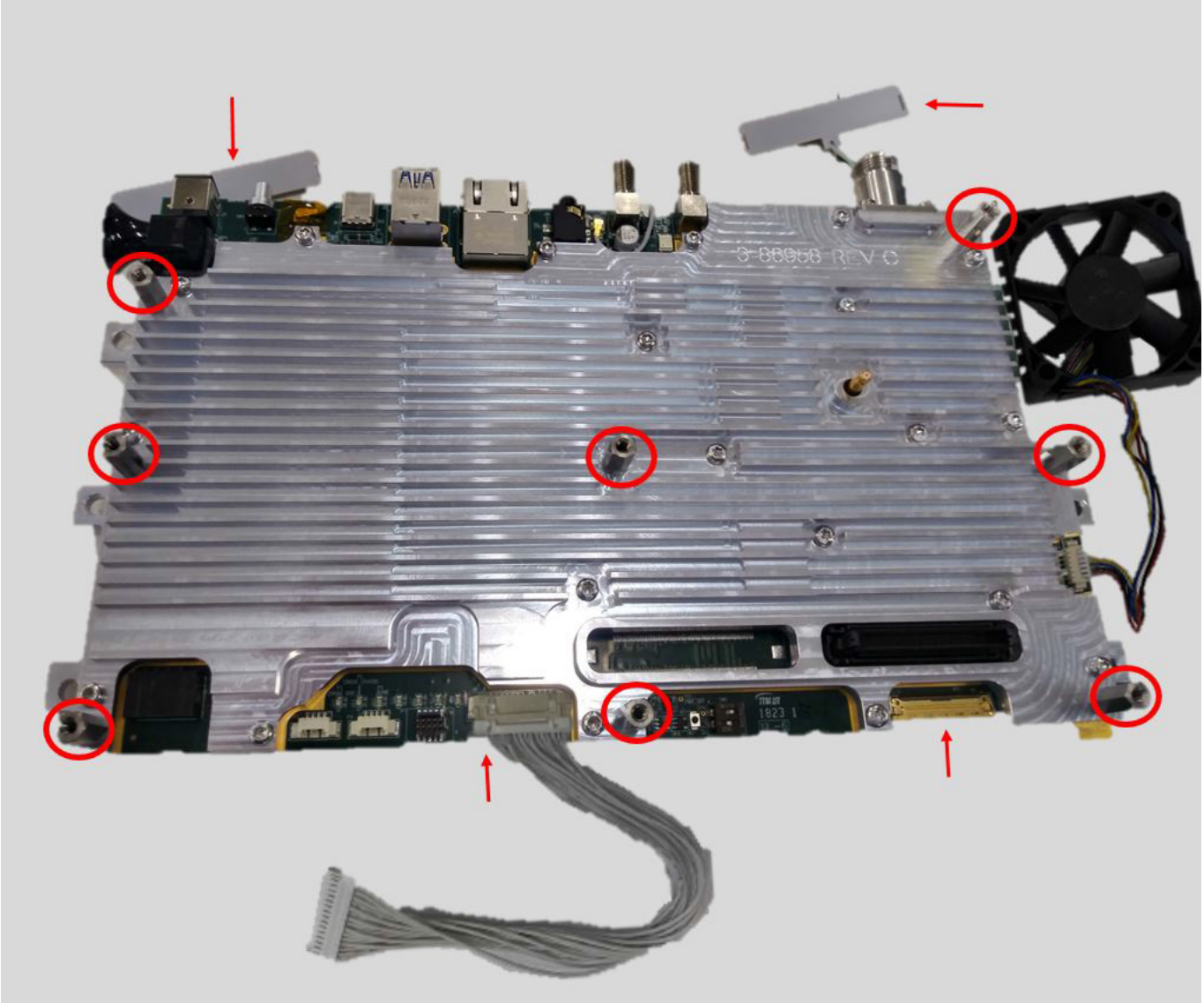

Figure 5-17. Main PCB Removal

5-9 Fan Assembly Removal

The fan assembly sits in a slot in the front case and is plugged into the Main PCB.

1. Carefully disconnect the harness and lift the fan assembly out of the case. See Figure 5-18.

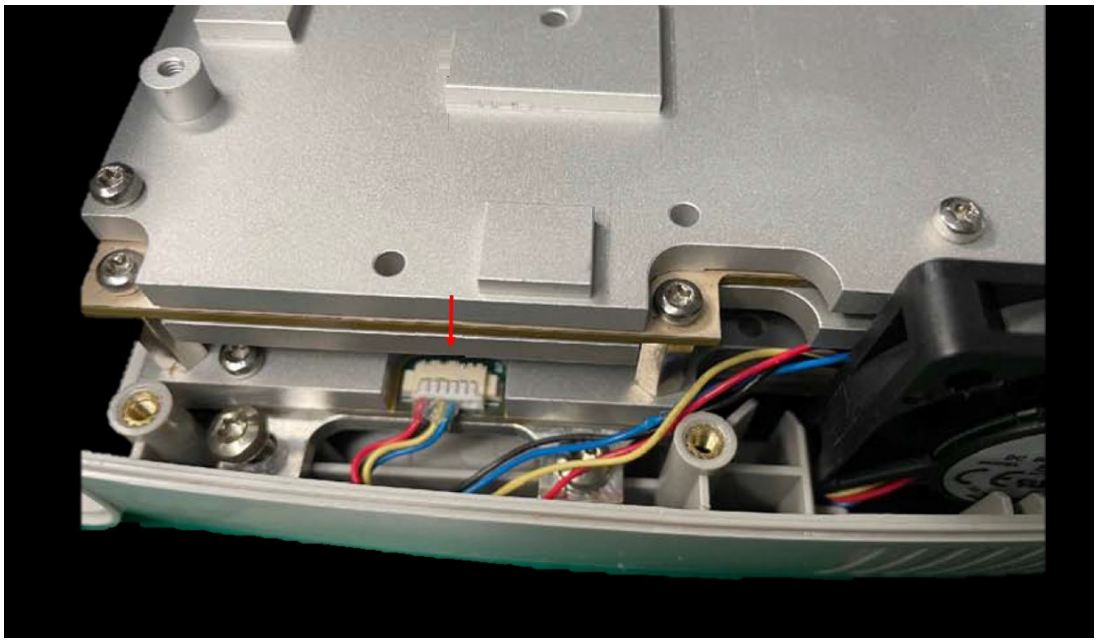

Figure 5-18. Fan Assembly Removal

5-10 RF Input Adapter Removal

The RF input adapter consists of four T10 Torx screws that are secured to the SPA PCB Assembly. Follow the steps below to remove the RF input adapter:

1. Using T10 Torx screw driver remove the four screws to carefully pull the RF input adapter straight off the SPA PCB assembly. See Figure 5-19.

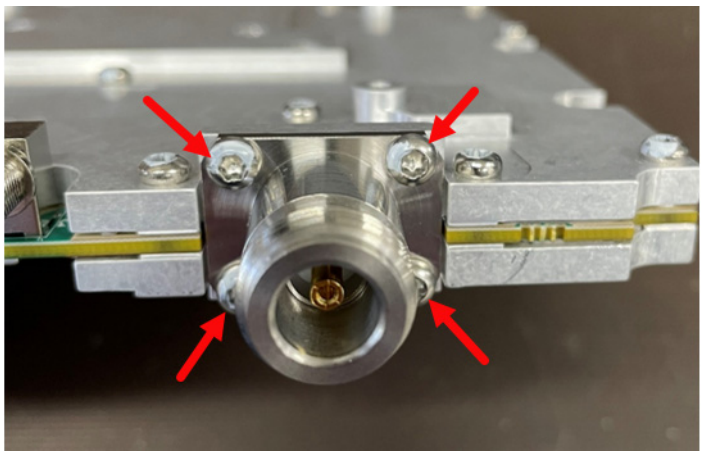

Figure 5-19. RF Input Adapter Removal

5-11 Reassembling the Unit

Reassembling the unit is simply a process done in the reverse order of the removal procedure. Use caution while reassembling all the parts together:

1. Ensure to carefully align the cables of the Wi-Fi antenna into the littles grooves of the Main PCB to prevent the Wi-Fi antenna cables from being smashed or crimped. See Figure 5-20.

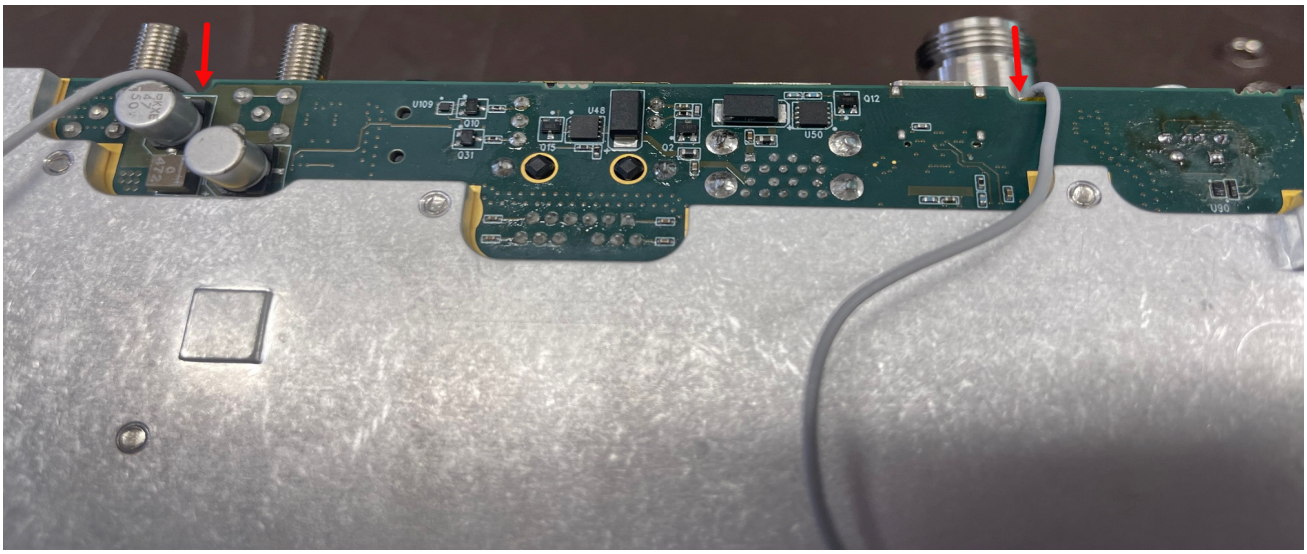

Figure 5-20. Reassembling the unit

2. Make sure that the label of the fan assembly faces outwards while fitting it into the LCD top case assembly. See Figure 5-18.
3. Use caution as not to cripple the fan assembly harness in between while securing the Main PCB/SPA assembly onto the LCD Top case assembly. See Figure 5-18.

Chapter 6 — Troubleshooting

6-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu service centers. Perform the troubleshooting suggestions in the order they are listed.

Only qualified Anritsu personnel should replace internal assemblies. Major subassemblies shown in Table 1-5 are typically the items that may be replaced. Because they are highly fragile, items that must be soldered may not be replaced without special training. Removal of RF shields from PC boards or adjustment of screws on or near the shields will detune sensitive RF circuits and will result in degraded instrument performance.

6-2 Level Accuracy Problems

Measured signal is unexpectedly too high or too low:

1. Check the N connector for damage and cleanliness.
2. Check the connections between the N connector and Main PCB.
3. If the connections are good, replace the SPA PCB.

Appendix A — MS2085A/89A Test Records

This appendix provides test records that can be used to record the performance of the MS2085A. Anritsu recommends that you make a copy of the following test record pages and document the measurements each time a Performance Verification is performed. Continuing to document this process each time provides a detailed history of the instrument's performance, allowing for trends to be observed.

MS2085A Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

A-1 Test Records for Cable and Antenna Analyzer Verification

Table A-1. MS2085A/89A CAA Frequency Accuracy

Frequency	Measured Value	Error	Measurement Uncertainty	Specification
1 GHz	GHz	Hz	250 Hz (0.25 ppm)	± 300 Hz (0.3 ppm)

Table A-2. MS2085A/89A CAA Return Loss Accuracy Verification

Return Loss	Measured Value	Specification
Start Frequency = 0.005 MHz, Stop Frequency = 4 GHz or 6 GHz		
6 dB	dB	–4.8 dB ≥ x ≥ –7.2 dB
20 dB	dB	–18.3 dB ≥ x ≥ –21.7 dB

Appendix B — MS2089A Test Records

B-1 Introduction

This appendix provides the test record templates to record the performance of the MS2085A/89A Site Master. Anritsu recommends that you make a copy of the following test record pages and document the measurements each time a performance verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance.

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

B-2 Test Records for Spectrum Analyzer Verification

Table B-1. MS2089A Spectrum Analyzer Frequency Accuracy (without GNSS)

Frequency	Measured Value	Error	Measurement Uncertainty	Specification
1 GHz	GHz	Hz	250 Hz (0.25 ppm)	± 300 Hz (0.3 ppm)

Table B-2. MS2089A Option 31, GNSS Frequency Accuracy

Frequency	Measured Value	Error	Measurement Uncertainty	Specification
3 GHz	GHz	Hz	45 Hz (15 ppb)	± 750 Hz (25 ppb)

Table B-3. Characterization Chart

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

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

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Table B-4. MS2089A Absolute Amplitude Accuracy at 50 MHz (Preamplifier Off)

Frequency	Input Attenuation	Reference Level	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
50 MHz	20 dB	0 dBm	–10 dBm	-20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
50 MHz	20 dB	0 dBm	–14 dBm	–24 dBm	dBm	0.25 dB	–24 dBm ±1.0 dB
50 MHz	20 dB	–10 dBm	–18 dBm	–28 dBm	dBm	0.25 dB	–28 dBm ±1.0 dB
50 MHz	20 dB	–10 dBm	–20 dBm	–30 dBm	dBm	0.25 dB	–30 dBm ±1.0 dB
50 MHz	20 dB	–10 dBm	–24 dBm	–34 dBm	dBm	0.25 dB	–34 dBm ±1.0 dB
50 MHz	20 dB	–10 dBm	–30 dBm	–38 dBm	dBm	0.25 dB	–38 dBm ±1.0 dB
50 MHz	20 dB	–20 dBm	–20 dBm	–40 dBm	dBm	0.25 dB	–40 dBm ±1.0 dB
50 MHz	30 dB	0 dBm	0 dBm	–10 dBm	dBm	0.25 dB	–10 dBm ±1.0 dB
50 MHz	30 dB	0 dBm	0 dBm	–14 dBm	dBm	0.25 dB	–14 dBm ±1.0 dB
50 MHz	30 dB	–10 dBm	–8 dBm	–18 dBm	dBm	0.25 dB	–18 dBm ±1.0 dB

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table B-5. MS2089A Absolute Amplitude Accuracy at 50 MHz (Preamplifier On)

Frequency	Input Attenuation	Reference Level	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
50 MHz	0 dB	–30 dBm	–36 dBm	–46 dBm	dBm	0.25 dB	–46 dBm ±1.0 dB
50 MHz	0 dB	–40 dBm	–40 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
50 MHz	0 dB	–40 dBm	–44 dBm	–54 dBm	dBm	0.25 dB	–54 dBm ±1.0 dB
50 MHz	0 dB	–40 dBm	–48 dBm	–58 dBm	dBm	0.25 dB	–58 dBm ±1.0 dB
50 MHz	0 dB	–50 dBm	–52 dBm	–62 dBm	dBm	0.25 dB	–62 dBm ±1.0 dB
50 MHz	0 dB	–50 dBm	–56 dBm	–66 dBm	dBm	0.25 dB	–66 dBm ±1.0 dB
50 MHz	0 dB	–60 dBm	–60 dBm	–70 dBm	dBm	0.25 dB	–70 dBm ±1.0 dB

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table B-6. MS2089A Power Level Accuracy (Preamplifier Off)

Frequency	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
9 kHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
10 MHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
507 MHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
1.004 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
1.430 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
1.572 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
2.353 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
2.779 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
3.560 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
3.986 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
3.9931 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
3.9999 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB

Table B-7. MS2089A-0706 Power Level Accuracy (Preamplifier Off)

Frequency	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
4.0001 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
4.206 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
4.561 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
4.987 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.342 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.626 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.987 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.988 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.995 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
5.999 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB
3.9999 GHz	–10 dBm	–20 dBm	dBm	0.25 dB	–20 dBm ±1.0 dB

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table B-8. MS2089A Power Level Accuracy (Preamplifier On)

Frequency	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
100 kHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
10 MHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
150 MHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
1 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
2 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
3 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
3.999 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB

Table B-9. MS2089A-0706 Power Level Accuracy (Preamplifier On)

Frequency	NRP18T Power Level	MS2089A Expected Power Level	MS2089A Measured Power Level	Measurement Uncertainty	Specification
4.001 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
4.500 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
5.000 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB
5.500 GHz	–10 dBm	–50 dBm	dBm	0.25 dB	–50 dBm ±1.0 dB

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

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Table B-10. MS2089A Spectral Purity - SSB Phase Noise Offset from 1 GHz

Frequency	Measured Delta with 1 kHz RBW	Calculated Value (Measured - 30 dB)	Measurement Uncertainty	Specification (For Calculated Value)
10 kHz	dBc	dBc/Hz	0.24 dB	-93 dBc/Hz max
100 kHz	dBc	dBc/Hz	0.27 dB	-95 dBc/Hz max
1 MHz	dBc	dBc/Hz	0.16 dB	-120 dBc/Hz max

Table B-11. MS2089A Second Harmonic Distortion

Center Frequency	Measured Value	Second Harmonic Distortion (100.2 Meas Value – 50.1 Meas Value)	Measurement Uncertainty	Specification
50 MHz	dBm	dBc	1.0 dB	–65 dBc max

Table B-12. MS2089A Displayed Average Noise Level (Preamplifier Off)

Start Frequency	Stop Frequency	RBW	VBW	Measured Value – 60 dB	Measurement Uncertainty	Specification
10 MHz	2 GHz	1 MHz	1 kHz	dBm	0.46 dB	–142 dBm max
2 GHz	4 GHz	1 MHz	1 kHz	dBm	0.53 dB	–140 dBm max
4 GHz	5 GHz	1 MHz	1 kHz	dBm	0.54 dB	–137 dBm max
5 GHz	6 GHz	1 MHz	1 kHz	dBm	0.54 dB	–133 dBm max

Table B-13. MS2089A Displayed Average Noise Level (Preamplifier On)

Start Frequency	Stop Frequency	RBW	VBW	Measured Value – 60 dB	Measurement Uncertainty	Specification
10 MHz	2 GHz	1 MHz	1 kHz	dBm	0.50 dB	–161 dBm max
2 GHz	4 GHz	1 MHz	1 kHz	dBm	0.56 dB	–160 dBm max
4 GHz	5 GHz	1 MHz	1 kHz	dBm	0.58 dB	–157 dBm max
5 GHz	6 GHz	1 MHz	1 kHz	dBm	0.58 dB	–152 dBm max

Table B-14. MS2089A Residual Spurs (Preamplifier On)

Start Frequency	Stop Frequency	RBW	VBW	Measured Value	Measurement Uncertainty	Specification
10 MHz	500 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
500 MHz	1000 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
1000 MHz	1500 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
1500 MHz	2500 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
2500 MHz	3000 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
3000 MHz	4000 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
4000 MHz	5000 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max
5000 MHz	6000 MHz	300 Hz	100 Hz	dBm	1.0 dB	<–110 dBm, max

Table B-15. MS2089A Residual Spurs (Preamplifier Off)

Start Frequency	Stop Frequency	RBW	VBW	Measured Value	Measurement Uncertainty	Specification
10 MHz	500 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
500 MHz	1000 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
1000 MHz	1500 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
1500 MHz	2500 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
2500 MHz	3000 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
3000 MHz	4000 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
4000 MHz	5000 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max
5000 MHz	6000 MHz	300 Hz	100 Hz	dBm	1.25 dB	<–110 dBm, max

MS2089A **Firmware Rev:** _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table B-16. MS2089A Input Related Spurs

Measured Input Signal (742 MHz)	Measured Spur (3500.5 MHz)	Calculated IRS (Input Signal – Spur)	Measurement Uncertainty	Specification
dBm	dBm	dBc	0.17 dB	< –70 dBc

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