Maintenance Manual

PIM Master™

MW82119B

Passive InterModulation Analyzer

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

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Safety Symbols

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

Symbols Used in Manuals

Danger

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

Warning

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

Caution

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

Safety Symbols Used on Equipment and in Manuals

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

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

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

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

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

These indicate that the marked part should be recycled.

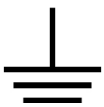
Warning

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

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

Warning

or



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

Warning

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

Caution

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

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

Warning

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

Table of Contents

Chapter 1 — General Information

Warning	The Anritsu PIM Master is capable of producing 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields: • Always terminate the PIM output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test. • Confirm that the PIM Master RF power is off after a PIM test. • Always confirm that the PIM RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors. • Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

1-1 Introduction

This manual provides maintenance instructions for Anritsu PIM Master model MW82119B.

The information includes:

- Chapter 1, “General Information”
- Chapter 2, “PIM Analyzer Verification”
- Chapter 3, “Troubleshooting”
- Chapter 4, “Battery Information”
- Chapter 5, “Assembly Replacement”
- Appendix A, “Test Records”

Note	Anritsu recommends that you make a copy of the blank test records to document the measurements each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of instrument performance, which allows you to observe trends.

Throughout this manual, PIM Master refers to model MW82119B. Familiarity with the basic operation of the front panel keys (for example, how to change measurement mode, preset the instrument, or the meaning of submenu key or main menu key) is assumed. Refer to the MW82119B PIM Master User Guide (Anritsu part number: 10580-00400).

1-2 Product Description

The MW82119B PIM Master model is a portable passive inter-modulation analyzer featuring precise performance for the LTE (600 MHz), APT (700 MHz), LTE (700 MHz), LTE 700 MHz 2-Port, LTE (800 MHz), Cellular (850 MHz), E-GSM (900 MHz), DCS (1800 MHz), UMTS (2100 MHz), LTE (2600 MHz), PCS (1900 MHz) and AWS (1700/2100 MHz) frequency bands. It is designed to accurately determine if receiver interference at a cell site is due to an inter-modulation product of two or more transmit frequencies, also known as passive inter-modulation (PIM).

The PIM Master generates two high-power tones in the transmit band of a base station, and measures the third-order, fifth-order, or seventh-order inter-modulation (IM) products in the receive band coming back down the same cable. The current standard for PIM testing offers a well-known system using two primary carriers and a calculated resulting PIM frequency, which is measured with a tuned receiver. This provides a measurement of the overall linearity of the antenna system and the surrounding environment.

In addition to PIM testing, the PIM Master also has Distance-to-PIM™ (DTP) Analyzer capability. DTP analysis offers distance information to PIM sources for cellular sites with internal PIM problems and antenna PIM problems. This DTP analysis includes the surrounding outside environment with external PIM problems. The Distance-to-PIM™ Analyzer features are displayed in the relative menus. The choice between PIM analysis and Distance-to-PIM™ analysis is made in the Measurements menu of the MW82119B.

Frequency Options (must order one, and only one)

RF Power is 20 dBm to 46 dBm for all PIM Master frequency options.

Table 1-1. PIM Master Frequency Options

Feature	Option 180	Option 194	
Tx Freq Band	1805 MHz to 1837 MHz 1857.5 MHz to 1880 MHz	Tx1 1930 MHz to 1945 MHz Tx2 1965 MHz to 1995 MHz	Tx1 1930 MHz to 1945 MHz Tx3 2110 MHz to 2155 MHz
IMD Band	1710 MHz to 1785 MHz	1850 MHz to 1910 MHz	1710 MHz to 1755 MHz
IMD Orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders in 1850 MHz to 1910 MHz Rx Band 3rd order only in 1710 MHz to 1755 MHz Rx Band	
Feature	**Option 210**	**Option 260**	**Option 600**
Tx Freq Band	2110 MHz to 2112.5 MHz 2130 MHz to 2170 MHz	2620 MHz to 2630 MHz 2650 MHz to 2690 MHz	617 MHz to 618 MHz 633 MHz to 652 MHz
IMD Band	1920 MHz to 1980 MHz 2050 MHz to 2090 MHz	2500 MHz to 2570 MHz	663 MHz to 698 MHz 1867 MHz to 1888 MHz
IMD Orders	3rd, 5th, or 7th orders in 2050 MHz to 2090 MHz Rx Band; 3rd order only in 1920 MHz to 1980 MHz Rx Band	3rd, 5th, or 7th orders	2nd, 3rd, 5th, or 7th orders
Feature	**Option 700**	**Option 701**	**Option 702**
Tx Freq Band	731 MHz to 734.5 MHz 746 MHz to 768 MHz	758 MHz to 776 MHz 788 MHz to 803 MHz	768 MHz to 776 MHz 788 MHz to 807 MHz
IMD Band	698 MHz to 717 MHz 777 MHz to 806 MHz	710 MHz to 748 MHz 825 MHz to 845 MHz	713 MHz to 738 MHz 825 MHz to 845 MHz
IMD Orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders
Feature	**Option 703**	**Option 800**	**Option 850**
Tx Freq Band	731 MHz to 734.5 MHz 746 MHz to 768 MHz	791 MHz to 795 MHz 811.5 MHz to 821 MHz	869 MHz to 871 MHz 881.5 MHz to 894 MHz
IMD Band	698 MHz to 717 MHz 777 MHz to 806 MHz	832 MHz to 862 MHz	824 MHz to 849 MHz
IMD Orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders
Feature	**Option 900**	**Option 902**	
Tx Freq Band	925 MHz to 937.5 MHz 951.5 MHz to 960 MHz	925 MHz to 937.5 MHz 951.5 MHz to 960 MHz	
IMD Band	880 MHz to 915 MHz	885 MHz to 915 MHz 1877 MHz to 1920 MHz	
IMD Orders	3rd, 5th, or 7th orders	2nd, 3rd, 5th, or 7th orders	

Other options

Table 1-2. Other Instrument Options

Option	Description
19	High Accuracy Power Meter
31	GPS Receiver (Requires GPS antenna sold separately
331	Cable and Antenna Analyzer

Optional Accessories

For a complete list of the available accessories, refer to the PIM Master MW82119B Technical Data Sheet (Anritsu part number 11410-00821). You can download a PDF copy of this document at the following URL under the Library tab:

https://www.anritsu.com/en-us/test-measurement/support/downloads/brochures-datasheets-and-catalogs/dwl19087

1-3 Related Documents

Related documents are available from the PIM Master product page under the Library tab:

https://www.anritsu.com/en-us/test-measurement/products/mw82119b:

- PIM Master Product Brochure: 11410-00821
- PIM Master User Guide: 10580-00400
- PIM Master Measurement Guide: 10580-00402
- PIM Master Programming Manual: 10580-00403
- Power Meter Measurement Guide: 10580-00240
- Cable & Antenna Analyzer Measurement Guide: 10580-00241
- PIM Master Equipment Verification Process: 11410-00726

1-4 Anritsu Customer Service Centers

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

http://www.anritsu.com/contact.asp

Choose a country for regional contact information.

1-5 Recommended Test Equipment

Table 1-3 lists the test equipment that is required for verifying and testing the PIM Master. Table 1-4 lists the test equipment that is required for verifying the optional Cable and Antenna Analyzer (Option 331).

Table 1-3. Recommended Test Equipment for PIM Master Verification

Equipment	Critical Specification	Recommended Manufacturer/Model
Synthesized Signal Generator	Frequency: 600 MHz to 3 GHz, Power Output: 0 dBm to –40 dBm	Anritsu Model MG3691C with option 2, 4, or option 5
Power Meter	Power Range: –70 dBm to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 10 MHz to 18 GHz Power Range: –67 dBm to +20 dBm	Anritsu Model MA2442D
Spectrum Analyzer	Frequency: 3 GHz Power Range: to +20 dBm	Anritsu Model MS2712E or equivalent
Low PIM Load	40 W Avg, 165 dBc PIM, 690 MHz to 2800 MHz, 50 Ω	Anritsu Model 2000-1724-R
PIM Standard	–80 dBm at 2 x 20 W, 1775 MHz	Anritsu Model 1091-390-R
PIM Standard	–80 dBm at 2 x 20 W, 910 MHz	Anritsu Model 1091-403-R
PIM Standard	–80 dBm at 2 x 20 W, 1730 MHz	Anritsu Model 1091-446-R
Fixed Attenuator	30 dB, 50 W, 50 Ω, DC-8.5 GHz	Anritsu Model 3-1010-123
Adapter	K(m) to N(f), 50 Ω	Anritsu Model 34RKNF50
Adapter	7/16 DIN(m) to N(m), 50 Ω	Anritsu Model 1091-423-R
RF Cable	1.5 m, DC to 4 GHz, 50 Ω	Anritsu Model 15NNF50-1.5C
Torque Wrench	3/4 inch Open End at 1.36 N·m (12 lbf · in)	Anritsu Model 01-200
Torque Wrench	5/16 inch Open End at 0.904 N·m (8 lbf · in)	Anritsu Model 01-201
Torque Wrench	1 inch, 25 N·m (18.439 lbf · in)	Anritsu Model 01-512-R
Torque Wrench	1.25 inch, 25 N·m (18.439 lbf · in)	Anritsu Model 01-513-R
Torque Wrench	22mm, 5 N·m (44 lbf · in)	Anritsu Model 01-528-R (Only required for frequency Opt 703)
Torque Driver, Dial Measuring	Capable of 50 Nm to 250 Nm (4 lbf · in to 20 lbf · in)	Mountz TT250 (Only for Assembly Replacement)
Crescent Wrench (Adjustable Spanner)	Max Width Opening: 34.925 mm (1.375 in)	Anritsu Model 01-510
Adapter	SMA(m) to BNC(f), 50 Ω	Pomona Model 4290 (Only required for Option 31)
GPS Terminator	BNC(m), 93 Ω, 1 W	Amphenol Model 202107 or B1004A1-ND3G-93R-0.05-1W (Only required for Option 31)

Table 1-4. Recommended Test Equipment for Cable and Antenna Analyzer (Option 331) Verification

Equipment	Critical Specification	Recommended Manufacturer/Model
Frequency Counter	Frequency: 2 GHz	Anritsu Model MF2412C with option 3
Offset Load	Frequency: DC to 3 GHz Return Loss: 6.0 ± 0.17 dB	Anritsu Model SC5237 or SC7424
Offset Load	Frequency: DC to 3 GHz Return Loss: 20.0 ± 0.5 dB	Anritsu Model SC5270 or SC7423
Open/Short	Frequency: DC to 3 GHz; Connector: N male	Anritsu Model 22N50
RF Coaxial Cable	Frequency: DC to 3 GHz Connector: N male to N male	Anritsu Model 15NN50-1.5C

Table 1-4. Recommended Test Equipment for Cable and Antenna Analyzer (Option 331) Verification

Equipment	Critical Specification	Recommended Manufacturer/Model
Load	Frequency: DC to 3 GHz Return Loss: 40 dB min.	Anritsu Model 28N50-2 or SM/PL-1

1-6 Replaceable Parts and Assemblies

The revision level of the instrument can be determined by reading the information on the Serial Number label found on the back of the instrument. If there is no mention of revision on the label, it is a Revision 1 unit. Revision 2 units will state "Revision 2". Table 1-5 shows the beginning serial numbers of Revision 2 instruments.

Table 1-5. Beginning Serial Numbers of Revision 2 Instrument

Model	Serial Number
MW82119B-0180	1519001 and later
MW82119B-0194	1702001 and later
MW82119B-0700	1525012 and later. Exceptions: 1527002, 1529008, 1529026, 1531003, 1549001 shipped as Revision 1
MW82119B-0800	1545012 and later. Exceptions: 1546007, 1545031 shipped as Revision 1
MW82119B-0850	1617005 and later. Exceptions: 1618004, 1618008 shipped as Revision 1
MW82119B-0900	1517015 and later. Exception: 1549002 shipped as Revision 1
MW82119B-0260	1634009 and later
MW82119B-0210	1714004 and later

Table 1-6. List of Replaceable Parts

Part Number	Description
ND80890<R>	MW82119B Main PCB Assembly (also called Mother Board)
ND82802<R>	MW82119B Main PCB Assembly. Units with serial number 1629044 and later. Exceptions: s/n 1630006, 1630008 and 1632011 to use ND80890
3-ND82802<R>	MW82119B Main PCB Assembly. Units with S/N ≥ 1717004
ND80834<R>	MW82119B with Option 180 Filter Assembly
3-ND80834<R>	MW82119B with Option 180 Filter Assembly Units with S/N ≥ 1717004
ND80891<R>	MW82119B with Option 180 RF Module Assembly
ND81553<R>	MW82119B with Option 180 RF Module Assembly Revision 2 instruments
3-ND81553<R>	MW82119B with Option 180 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND80892<R>	MW82119B with Option 194 Filter Assembly
3-ND82674<R>	MW82119B with Option 194 Filter Assembly Units with S/N ≥ 1717004
ND80893<R>	MW82119B with Option 194 RF Module Assembly
ND83078<R>	MW82119B with Option 194 RF Module Assembly Revision 2 Instruments
3-ND83078<R>	MW82119B with Option 194 RF Module Assembly Revision 2 Instruments Units with S/N ≥ 1717004
3-ND84125<R>	MW82119B with Option 600 Filter Assembly

Table 1-6. List of Replaceable Parts (Continued)

Part Number	Description
3-ND84126<R>	MW82119B with Option 600 RF Module Assembly
ND80838<R>	MW82119B with Option 700 Filter Assembly
3-ND80838<R>	MW82119B with Option 700 or Option 703 Filter Assembly Units with S/N ≥ 1717004
ND80359<R>	MW82119B with Option 700 RF Module Assembly
ND81716<R>	MW82119B with Option 700 RF Module Assembly Revision 2 instruments
3-ND81716<R>	MW82119B with Option 700 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND81291<R>	MW82119B with Option 701 Filter Assembly
3-ND81291<R>	MW82119B with Option 701 Filter Assembly Units with S/N ≥ 1717004
ND81293<R>	MW82119B with Option 701 RF Module Assembly
3-ND81293<R>	MW82119B with Option 701 RF Module Assembly Units with S/N ≥ 1717004
ND75352<R>	MW82119B with Option 702 Filter Assembly
ND80769<R>	MW82119B with Option 702 RF Module Assembly
ND80839<R>	MW82119B with Option 800 Filter Assembly
3-ND85266<R>	MW82119B with Option 703 RF Module Assembly
3-ND80839<R>	MW82119B with Option 800 Filter Assembly Units with S/N ≥ 1717004
ND80197<R>	MW82119B with Option 800 RF Module Assembly
ND82108<R>	MW82119B with Option 800 RF Module Assembly Revision 2 instruments
3-ND82108<R>	MW82119B with Option 800 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND80837<R>	MW82119B with Option 850 Filter Assembly
3-ND80837<R>	MW82119B with Option 850 Filter Assembly Units with S/N ≥ 1717004
ND80634<R>	MW82119B with Option 850 RF Module Assembly
ND82524<R>	MW82119B with Option 850 RF Module Assembly Revision 2 instruments
3-ND82524<R>	MW82119B with Option 850 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND80835<R>	MW82119B with Option 900 Filter Assembly
3-ND80835<R>	MW82119B with Option 900 Filter Assembly. Units with S/N ≥ 1717004
ND80882<R>	MW82119B with Option 900 RF Module Assembly
ND81574<R>	MW82119B with Option 900 RF Module Assembly Revision 2 instruments
3-ND81574<R>	MW82119B with Option 902 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND81292<R>	MW82119B with Option 902 Filter Assembly
3-ND81292<R>	MW82119B with Option 902 Filter Assembly Units with S/N ≥ 1717004
ND81294<R>	MW82119B with Option 902 RF Module Assembly
3-ND81294<R>	MW82119B with Option 902 RF Module Assembly Units with S/N ≥ 1717004
ND80841<R>	MW82119B with Option 210 Filter Assembly
3-ND80841<R>	MW82119B with Option 210 Filter Assembly Units with S/N ≥ 1717004
ND80198<R>	MW82119B with Option 210 RF Module Assembly
3-ND83259<R>	MW82119B with Option 210 RF Module Assembly Units with S/N ≥ 1717004
ND80840<R>	MW82119B with Option 260 Filter Assembly

Table 1-6. List of Replaceable Parts (Continued)

Part Number	Description
3-ND80840<R>	MW82119B with Option 260 Filter Assembly Units with S/N ≥ 1717004
ND80199<R>	MW82119B with Option 260 RF Module Assembly
ND82760<R>	MW82119B with Option 260 RF Module Assembly Revision 2 instruments
3-ND82760<R>	MW82119B with Option 260 RF Module Assembly Revision 2 instruments Units with S/N ≥ 1717004
ND75358<R>	GPS Module, Option 31
3-ND75358<R>	GPS Module, Option 31 for units with S/N ≥ 1717004
ND80918<R>	Cable and Antenna Analyzer PCB Assembly, Option 331
3-510-87	Cable and Antenna Analyzer Test Port Connector, Option 331
1091-422-R	Adapter, 7/16DIN(f) to 7/16DIN(m), 50ohm, (Connector Saver)
2000-1991-R	2-Port Loop Cable Assembly, Option 703
3-15-165	LCD Display with LED Backlight
3-15-174	LCD Display. Units with s/n 1629004 or later. Exceptions: 1630006, 1630008, 1632011
ND80480<R>	8.4in GFG Touch Screen
3-ND80480	8.4in GFG Touch Screen Units with S/N ≥ 1717004
2000-1691-R	Stylus with Coiled Tether
2000-1786-R	Soft Carrying Case
2000-1714-R	Shoulder Strap
3-80624	Battery Door
633-75	Li-ion Battery Pack
40-187-R	AC to DC Power Converter
2000-1793-R	Handle Strap
3-74999-3	Main Numeric Keypad PCB
3-71641	Main Numeric Keypad
3-72787	Speaker
3-72853	Gasket for speaker
3-72621-7	Cable, Main PCB Assembly to LCD Display
3-81880-1	Cable, Main PCB Assembly to LCD Display. Units with s/n 1629004 or later. Exceptions: 1630003, 1630008, 1632011
3-74842-2	Cable, Main PCB Assembly to Keypad PCB
3-71625-1	Cable, LCD Display to Keypad PCB
3-70675-4	Cable, LCD Display to Keypad PCB. Units with s/n 1629004 or later. Exceptions: 1630003, 1630008, 1632011
3-81743	LCD Bracket. Units with s/n 1629004 or later. Exceptions: 1630003, 1630008, 1632011
3-1030-307	760-780 MHz BP Filter, Opt 703
3-84949	Cable Assembly, 4.3-10 to SMA, Opt 703
3-84950	Cable Assembly, SMA(f) - SMA (m), Opt 703
3-76461	Top Bumper
3-85247	Top Bumper for Opt 703
3-72497	Bottom Bumper

Table 1-6. List of Replaceable Parts (Continued)

Part Number	Description
3-80747-1	Left Tilt Bail Cover
3-742-50	Left Tilt Bail Hinge
3-80738	Tilt Bail
3-742-49	Right Tilt Bail Hinge
3-80747-2	Right Tilt Bail Hinge Cover
3-80708-5	MW82119B-0180, 1800 MHz Model Label
3-80708-1	MW82119B-0194, 1900/2100 MHz Model Label
3-80708-13	MW82119B-0600, 600 MHz Model Label
3-80708-6	MW82119B-0700, 700 MHz Model Label
3-80708-12	MW82119B-0701 and MW82119B-0702, 700 MHz Model Label
3-80708-3	MW82119B-0850, 850 MHz Model Label
3-80708-14	MW82119B-0703, 2-Port 700 MHz Model Label
3-80708-4	MW82119B-0900 and MW82119B-0902, 900 MHz Model Label
3-80708-10	MW82119B-0800, 800 MHz Model Label
3-80708-7	MW82119B-0210, 2100 MHz Model Label
3-80708-8	MW82119B-0260, 2600 MHz Model Label

Chapter 2 — PIM Analyzer Verification

Warning	The Anritsu PIM Master is capable of producing 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields: • Always terminate the PIM output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test. • Confirm that the PIM Master RF power is off after a PIM test. • Always confirm that the PIM RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors. • Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

2-1 Introduction

This chapter provides the operational verification procedures for the MW82119B PIM Master. No separate Distance-to-PIM™ (DTP) or Swept PIM measurement verification checks are used because the PIM Analyzer operational verification tests also validate these functionalities.

Unless otherwise noted in the following verification tests, the MW82119B-0703 is to be tested in the single port mode configuration with the 4.3-10 to SMA loop back cable in place. The PIM Analyzer operational verification tests consist of the following:

2-2 Reference PIM Measurement

The following test is used to verify the PIM measurement functionality. A known PIM reference (standard) is used for verification.

Equipment Required

- Anritsu Model 2000-1724-R or Anritsu Model 2000-1749-R Low PIM Load
- Anritsu Model 1091-390-R, 1091-403-R, or 1091-446-R PIM Standard

Procedure

1. Confirm that all of the connectors are clean because any debris or contamination may cause incorrect PIM measurement results.
2. Press the **On/Off** key to turn on the PIM Master.
3. Press the **Shift** key and then the **Mode** (**9**) key. Use the **Up/Down** arrow keys to highlight PIM Analyzer and then press the **Enter** key to switch to PIM Analyzer mode.
4. On the PIM Master, press the **Shift** key and then the **Preset (1)** key. Press the Preset submenu key to set the instrument to the factory preset state.

Caution	Before continuing, allow a 5-minute warm up for the internal circuitry to stabilize.

5. Press the **Measurements** main menu key and confirmed PIM vs. Time is selected.
6. Press the **Freq** main menu key and set the Carrier F1 and Carrier F2 values as per Table 2-1 on page 2-3.
7. Note the values from Table 2-1, and record the Option, IM3 Frequency, and the expected test results in Table A-1, “Reference PIM Measurement with PIM Standard” on page A-2.
8. Press the **Setup** main menu key and confirm that Output Power is set to 20 W (43 dBm), and then set Test Duration to 20 s.
9. Press the **Shift** key and then the **Cal** (**2**) key. Press the START Calibration submenu key.
10. Follow the on-screen instructions provided in the popup dialog boxes. Connect the PIM Standard to the PIM Master Test Port and then the Low PIM Load to the PIM Standard. After the initial Cal phase, you will be asked to remove the PIM Standard and to install just the Low PIM Load to the test port. The Cal will proceed with the second phase and, upon completion, you will see the Calibration On display in the lower, left-hand corner.
11. Remove the Low PIM Load.
12. Connect the PIM Standard to the PIM Test Port using the necessary torque wrench. Connect the Low PIM Load to the PIM Standard using the necessary torque wrench. The sequence of connecting the components is important and you must adhere to this sequence for accurate results.
13. Press the **Measurements** main menu key to set the instrument to display the measurements menu.
14. In the Measurements menu, press the Test submenu key to initiate the test. The submenu key will turn red in color and will have Measure underlined when the test is in progress. The test runs for 20 seconds (as set or confirmed in Step 8). Wait until the Test submenu key changes to display Off (Off is underlined).
15. Note the values for PIM, record the test results in Table A-1. Expected results are shown in Table 2-1, “PIM Standard Results” on page 2-3.

Table 2-1. PIM Standard Results

PIM Standard	MW82119B with	Carrier Frequencies	IM3 Freq	Result Expected
1091-403-R (910 MHz)	**Option 600**	F1: 617 MHz F2: 640 MHz	663 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 700(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–81 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 700(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 701(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–81 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 701(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 702(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–81 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 702(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 703(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–81 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 703(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 800**	F1: 791 MHz F2: 821 MHz	851 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 850**	F1: 869 MHz F2: 894 MHz	844 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 900**	F1: 935 MHz F2: 960 MHz	910 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 902**	F1: 935 MHz F2: 960 MHz	910 MHz	–80 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 180**	F1: 1805 MHz F2: 1880 MHz	1730 MHz	–74 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 194**	F1: 1930 MHz F2: 1990 MHz	1870 MHz	–72 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 194**	F1: 1930 MHz F2: 2130 MHz	1730 MHz	–74 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 210**	F1: 2110 MHz F2: 2170 MHz	2050 MHz	–72 dBm ± 3 dB
1091-403-R (910 MHz)	**Option 260**	F1: 2620 MHz F2: 2690 MHz	2550 MHz	N/A
1091-390-R (1775 MHz)	**Option 600**	F1: 617 MHz F2: 640 MHz	663 MHz	–88 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 700(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–87 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 700(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 701(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–87 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 701(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 702(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–87 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 702(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 703(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–87 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 703(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 800**	F1: 791 MHz F2: 821 MHz	851 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 850**	F1: 869 MHz F2: 894 MHz	844 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 900**	F1: 935 MHz F2: 960 MHz	910 MHz	–86 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 902**	F1: 935 MHz F2: 960 MHz	910 MHz	–86 dBm ± 3 dB

Table 2-1. PIM Standard Results (Continued)

PIM Standard	MW82119B with	Carrier Frequencies	IM3 Freq	Result Expected
1091-390-R (1775 MHz)	**Option 180**	F1: 1805 MHz F2: 1880 MHz	1730 MHz	–80 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 194**	F1: 1930 MHz F2: 1990 MHz	1870 MHz	–78 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 194**	F1: 1930 MHz F2: 2130 MHz	1730 MHz	–80 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 210**	F1: 2110 MHz F2: 2170 MHz	2050 MHz	–78 dBm ± 3 dB
1091-390-R (1775 MHz)	**Option 260**	F1: 2620 MHz F2: 2690 MHz	2550 MHz	–75 dBm ± 3 dB
1091-446-R (1730 MHz)	**Option 600**	F1: 617 MHz F2: 640 MHz	663 MHz	–93 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 700(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–87 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 700(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–90 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 701(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–88 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 701(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–89 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 702(L)**	F1: 768 MHz F2: 803 MHz	733 MHz	–88 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 702(U)**	F1: 768 MHz F2: 803 MHz	838 MHz	–89 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 703(L)**	F1: 734 MHz F2: 757 MHz	711 MHz	–87 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 703(U)**	F1: 734 MHz F2: 757 MHz	780 MHz	–90 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 800**	F1: 791 MHz F2: 821 MHz	851 MHz	–90 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 850**	F1: 869 MHz F2: 894 MHz	844 MHz	–85 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 900**	F1: 935 MHz F2: 960 MHz	910 MHz	–85 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 902**	F1: 935 MHz F2: 960 MHz	910 MHz	–85 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 180**	F1: 1805 MHz F2: 1880 MHz	1730 MHz	–80 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 194**	F1: 1930 MHz F2: 1990 MHz	1870 MHz	–78 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 194**	F1: 1930 MHz F2: 2130 MHz	1730 MHz	–80 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 210**	F1: 2110 MHz F2: 2170 MHz	2050 MHz	–77 dBm ± 3 dB
1091-446-R (1730MHz)	**Option 260**	F1: 2620 MHz F2: 2690 MHz	2550 MHz	–73 dBm ± 3 dB

2-3 Output Power

The following test is used to verify the output power of each tone from the PIM Master. The first phase of this procedure is to characterize the Test Component consisting of a 30 dB attenuator and RF coaxial cable (see below).

Component Characterization

Equipment Required

- Anritsu Model MG3691C Signal Generator with Option 4 or Option 5 or equivalent
- Anritsu Model 34RKNF50 K(m) to N(f) Adapter
- Anritsu Model ML2438A Power Meter
- Anritsu Model MA2442D Power Sensor or equivalent
- *Test Component* consisting of:
  - Anritsu Model 3-1010-123 50 W 30 dB Fixed Attenuator
  - Anritsu Model 15NNF50-1.5C RF Coaxial Cable

Procedure

Follow this entire procedure for each instrument that you test.

1. Assemble the *Test Component* by connecting the male end of the Fixed Attenuator to the female end of the RF cable.

Caution	Keep the two components (fixed attenuator and cable in the *Test Component*) connected to each other until all of the test procedures in this section are completed.

2. Connect the Power Sensor to the Power Meter, zero the sensor, and set the calibration factor to the Carrier F1 frequency of the appropriate model in Table 2-2, “PIM Master Tx Frequency Table” on page 2-6.

Table 2-2. PIM Master Tx Frequency Table

MW82119B PIM Master	F1 Carrier Frequencies	F2 Carrier Frequencies
Option 600	F1: 617 MHz	F2: 633 MHz
Option 600	F1: 618 MHz	F2: 652 MHz
Option 700	F1: 734 MHz	F2: 756 MHz
Option 700	F1: 734.5 MHz	F2: 766 MHz
Option 701	F1: 758 MHz	F2: 788 MHz
Option 701	F1: 776 MHz	F2: 803 MHz
Option 702	F1: 768 MHz	F2: 788 MHz
Option 702	F1: 776 MHz	F2: 807 MHz
Option 703	F1: 734 MHz	F2: 756 MHz
Option 703	F1: 734.5 MHz	F2: 766 MHz
Option 800	F1: 791 MHz	F2: 889 MHz
Option 800	F1: 795 MHz	F2: 821 MHz
Option 850[a]	F1: 869 MHz	F2: 881.5 MHz
Option 850[a]	F1: 871 MHz	F2: 894 MHz
Option 900	F1: 925 MHz	F2: 951.5 MHz
Option 900	F1: 937.5 MHz	F2: 960 MHz
Option 902	F1: 925 MHz	F2: 951.5 MHz
Option 902	F1: 937.5 MHz	F2: 960 MHz
Option 180	F1: 1805 MHz	F2: 1857.5 MHz
Option 180	F1: 1837 MHz	F2: 1880 MHz
Option 194	F1: 1930 MHz	F2: 1965 MHz
Option 194	F1: 1945 MHz	F2: 1990 MHz
Option 194	F1: 1930 MHz	F2: 2110 MHz
Option 194	F1: 1945 MHz	F2: 2155 MHz
Option 210	F1: 2110 MHz	F2: 2130 MHz
Option 210	F1: 2112.5 MHz	F2: 2170 MHz
Option 260	F1: 2620 MHz	F2: 2650 MHz
Option 260	F1: 2630 MHz	F2: 2690 MHz

a.Set the unit to measure 5th order IM in the frequency menu first to allow selection of the listed frequencies.

3. Install the 34RKNF50 adapter to the Signal Generator RF output. Then connect the Power Sensor to the adapter.

4. Set the Signal Generator to the Carrier F1 setting and adjust the level output to show 0 dBm ± 0.2 dB on the Power Meter. Record the Frequency and Power Meter readings in the **Power Reading from Signal Generator** column of Table A-2, "Test Component F1 Characterization" on page A-2. Turn off the RF Output on the Signal Generator.
5. Disconnect the Power Sensor from the Signal Generator. Connect the Power Sensor to the fixed attenuator end of the *Test Component*, and connect the other end of the *Test Component* to the Signal Generator.
6. Turn on the RF Output of the Signal Generator. Record the Frequency and the Power Meter readings in the **Power Reading with Test Component** column in Table A-2. Turn off the RF Output on the Signal Generator.
7. Calculate the **Test Component Correction Factor** by subtracting the value of **Power Reading from Signal Generator** from the value of **Power Reading with Test Component**. Record the frequency and this calculation in Table A-2.
8. Calculate the **Expected Power Reading** by subtracting the value of Test Component Correction Factor in Step 7 from 20 dBm (`20 dBm – "Test Component Correction Factor" dBm`). Record the frequency and this calculation in Table A-4, "PIM Output Tone Power Accuracy" on page A-3. Calculate the **Expected Power Reading** for 43 dBm and 46 dBm and record these calculations in Table A-4, "PIM Output Tone Power Accuracy" on page A-3.
9. Repeat Step 1 through Step 8 using the next F1 Carrier as the frequency setting. Repeat for the F2 Carrier frequencies until you have all frequencies for the applicable model option. Record the frequency and calculations in Table A-3, "Test Component F2 Characterization" on page A-2.
10. Remove the *Test Component*, however ***keep it intact to maintain test integrity*** in order to continue with the next verification procedure.

Output Power Verification

Equipment Required

- Anritsu Model MS2712E Spectrum Analyzer or equivalent (SPA)
- *Test Component* consisting of:
  - Anritsu Model 3-1010-123 30 dB 50 W Fixed Attenuator
  - RF Cable, Anritsu Model 15NNF50-1.5C
- Anritsu Model 1091-423-R 7/16 DIN(m) to N(m) Low PIM Adapter

Procedure

Follow this entire procedure for each instrument that you test.

1. Press the **On/Off** key to turn on the Spectrum Analyzer (SPA).
2. Press the **Shift** key and then the **Mode** (**9**) key. Use the rotary knob to highlight Spectrum Analyzer, and then press the **Enter** key to switch to Spectrum Analyzer mode.
3. Press the **Shift** key and then the **Preset** (**1**) key. Press the Preset submenu key to set the SPA to the factory preset state.
4. Press the **Amplitude** main menu key, then press the Reference Level submenu key. Enter 20 and then press the dBm submenu key. Press the Scale submenu key, enter 10, and then press the dB/Div submenu key. Confirm that Auto Atten is set to On.
5. Press the **BW** main menu key, then press the RBW submenu key. Enter 3 and then press kHz submenu key. Press VBW submenu key and set the VBW to 1 kHz.
6. Press the **Span** main menu key, then the Span submenu key. Enter 100, then press the kHz submenu (soft) key.

7. Press the **Shift** key and then the **Trace** (**5**) key. Press the Trace A Operations submenu key. Press the Max Hold -> A submenu key.
8. Press the **On/Off** key to turn on the PIM Master.
9. Press the **Shift** key and then the **Mode** (**9**) key. Select PIM Analyzer and then press the **Enter** key to switch to PIM Analyzer mode.
10. Press the **Shift** key and then the **Preset** (**1**) key. Press the Preset submenu key to set the PIM Master to the factory preset state.
11. Confirm that all of the connectors are clean, because any debris or contamination may cause incorrect PIM measurement results.
12. Connect the 7/16 DIN(m) to N(m) Adapter to the PIM Test Port of the PIM Master using the necessary torque wrench. Connect the fixed attenuator end of the *Test Component* to the Adapter and connect the cable end of the *Test Component* to the SPA. The sequence of connecting the components is important, and you must adhere to this sequence for accurate results.
13. On the PIM Master, press the **Setup** main menu key and confirm that the Output Power is set to Low Output (20 dBm to 37 dBm) Power 20 dBm (0.1 W setting).
14. On the PIM Master, press the **Freq** main menu key and verify that the values for Carrier F1 and Carrier F2 are as stated in Table 2-2, “PIM Master Tx Frequency Table” on page 2-6 for the appropriate model.
15. On the SPA, press the **Freq** main menu key, then press the Center Freq submenu key. Enter the Carrier F1 and then press the MHz submenu key.
16. On the SPA, press the **Shift** key and then the **Trace** (**5**) key. Press the Reset Trace submenu key. Any signal that is displayed will be removed. When the screen is cleared, continue to the next step.
17. On the PIM Master, press the **Measurements** main menu key. Ensure that the PIM vs. Time measurement mode is selected. Press the Test submenu key to initiate the test. The submenu key has Measure underlined when the test is in progress. Complete the next step while the PIM Master test is in progress.
18. On the SPA, press the **Marker** main menu key, select Marker 1 and press the On submenu key. Press the Peak Search submenu key, Marker 1 should move to the peak point of the displayed signal. Press Marker Frequency to Center on the Marker submenu.
19. On the SPA, press the **Span** main menu key, then press the Zero Span submenu key.
20. Record the marker results that are reported by the spectrum analyzer in Table A-4, “PIM Output Tone Power Accuracy” on page A-3.
21. Press the Test submenu key on the PIM Master to turn off the transmitter. Press Last Span on the Spectrum Analyzer Span submenu.
22. Repeat Step 15 through Step 21, using the value of Carrier F2 as the Center Freq setting on the SPA, keeping the same output power setting until all carrier frequencies are verified.
23. On the PIM Master, press the **Setup** main menu key and confirm that the Output Power is set to High Output (37 dBm to 46 dBm) Power 43 dBm (20 W setting). Repeat Step 14 through Step 22, using the value of 43 dBm as the Power setting. Record the results in Table A-4.
24. On the PIM Master, press the **Setup** main menu key and confirm that the Output Power is set to High Output (37 dBm to 46 dBm) Power 46 dBm (40 W setting). Repeat Step 14 through Step 22, using the value of 46 dBm as the Power setting. Record the results in Table A-4.

2-4 Residual PIM Measurement (1-Port)

The following test is used to verify the residual PIM of the PIM Master. The procedure measures the internal residual PIM of the PIM Master.

Note	Clean all connectors of debris or contamination that may cause incorrect PIM measurement results.

Equipment Required

- Anritsu Model 2000-1749-R Low PIM Load
- Anritsu Model 1091-390-R, 1091-403-R, or 1091-446-R PIM Standard

Procedure

Follow this entire procedure for each instrument that you test.

1. Press the **On/Off** key to turn on the PIM Master.
2. Press the **Shift** key and then the **Mode** (**9**) key. Use the **Up/Down** arrow keys to highlight PIM Analyzer, and then press the **Enter** key to switch to PIM Analyzer mode.
3. Press the **Shift** key and then the **Preset** (**1**) key. Press the Preset submenu key to set the instrument to the factory preset state.
4. Confirm that all the connectors are clean, because any debris or contamination may cause incorrect PIM measurement results. Also ensure any DIN adapters that are used are the low PIM versions that are provided in the accessory kit.

Caution	Before continuing, allow a 5-minute warm up for the internal circuitry to stabilize.

5. Press the **Freq** main menu key. Press the Carrier F1 submenu key, enter the appropriate Carrier F1 value from Table 2-2, “PIM Master Tx Frequency Table” on page 2-6, and then press the MHz submenu key. Press the Carrier F2 submenu key, enter the appropriate Carrier F2 value from Table 2-2, and then press the MHz submenu key.
6. Press the **Setup** main menu key. Press the High Output Power submenu key. Enter the value 43.0 dBm, and then press the **Enter** key. Press the Test Duration submenu key, enter the value 20 s, and then press the **Enter** key.
7. Press the **SHIFT** key and then the **Cal** (**2**) key. Press the START Calibration submenu key.
8. Follow the on screen instructions provided in the popup dialog boxes. Connect the PIM Standard to the PIM Master Test Port and then the Low PIM Load to the PIM Standard using the Low PIM DIN adapter and the necessary torque wrench. After the initial Cal phase, you will be asked to remove the PIM Standard and to install just the Low PIM Load to the test port. The Cal will proceed with the second phase, and upon completion, you will see the Calibration On display in the lower, left-hand corner.
9. Press the **Measurements** main menu key. Press the PIM vs. Time submenu key, and then press the Test submenu key to initiate the test. The key has Measure underlined when the test is in progress. The test runs for 20 seconds.
10. While the test is running, lightly tap on the PIM load with an instrument that will not damage the surface of the assembly, such as the rubber end of an adjustable wrench. This dynamic testing demonstrates that the PIM level remains stable after vibrational stresses have been applied.
11. Wait until the Test key has Off underlined before proceeding.
12. Note the measurement result that is displayed on the PIM Master instrument. The measured peak value result should be < –117 dBm.
13. Record the test results that are reported by the Controller in Table A-5, “Residual PIM Measurement” on page A-5.

2-5 Residual PIM Measurement (2-Port, Opt 703)

Perform this test immediately following a calibration or when instructed to do so, such as when 12 hours or more have elapsed since the existing calibration was performed. Attach the Low PIM Load to the Test Port or to the end of the PIM test cable.

Note	Clean all connectors of debris or contamination that may cause incorrect PIM measurement results.

Equipment Required

- Anritsu Model 2000-1724-R or Anritsu Model 2000-1749-R Low PIM Load
- Anritsu Model 1091-390-R, 1091-403-R, or 1091-446-R PIM Standard

Set to Factory Preset

1. PIM measurement results.
2. Power on the PIM Master.
3. Press the Shift key and then the Mode (9) key.
4. Use the Up/Down arrow keys to highlight PIM Analyzer, and then press the Enter key to switch to PIM Analyzer mode.
5. Press the Shift key and then the Preset (1) key.
6. Press the Preset submenu key to set the instrument to the factory preset state.

Verify Residual PIM

1. Press Freq main menu key.
2. Press 2-Port Low Band mode to ON.
3. Press Shift key and then CAL (2) Key.
4. Press Start Cal submenu key. Follow the on screen instructions until completion of the calibration.
5. Press Measurement main menu then select Swept PIM mode.
6. Leave the two test ports terminated with Low PIM Loads.
7. Press the Measurements main menu key.
8. Press the Test submenu key to initiate the test. The key has Measure underlined and goes red when the test is in progress.
9. Verify the measurement result that is displayed on the PIM Master instrument is < –123 dBm with output power 2 x 43 dBm.
10. Record the test results that are reported by the PIM Master inTable A-5, “Residual PIM Measurement” on page A-5.
11. Press the Setup main menu key and select High output power.
12. Enter 46 dBm.
13. Repeat Step 6, Step 7, Step 8.
14. Verify the measurement result that is displayed on the PIM Master instrument is < –115 dBm with output power 2 x 46 dBm.
15. The measured dBm peak value result should be < –115 dBm with output power 2 x 46 dBm.
16. Record the test results that are reported by the PIM Master in Table A-5, “Residual PIM Measurement” on page A-5.

2-6 PIM Frequency Accuracy

Specification for PIM frequency accuracy applies to MW82119B instruments with serial number >1543013. PIM frequency accuracy is not to be confused with Option 331, VNA frequency accuracy, which applies to all MW82119B instruments with Option 331.

Specification

- Accuracy: ±1.0 ppm at 23 °C
- Stability: ±1.0 ppm from –10 °C to +55 °C, typical
- Aging: ±1.0 ppm/year aging, typical

Note	Refer to the MW82119B technical data sheet for published product specifications.

During verification, PIM frequency accuracy, stability, and aging are all summed together from the first day of manufacture through the first year. Thus the F1 frequency measured has a 3 ppm tolerance at the end of the first year. 1 ppm of aging must be added to the sum for every additional year of instrument age thereafter.

The age of the instrument can be determined by the first four digits of its serial number. For example, in serial number 1626xxx, the first two digits represent the last two digits of the year 2016, the third and fourth digits represent week 26 of that year, and the remainder is the product sequence. The example 1626xxx represents 2016, week 26, or the last week of June, 2016. If the exact day of manufacture is needed, please contact Anritsu Company.

Equipment Required

- Spectrum Analyzer to 3 GHz (SPA)
- High Powered 30 dB Fixed Attenuator (42N50A-30)
- 1091-423-R Adapter, 7/16 DIN(m) to N(m)
- 15NNF50-1.5C, Armored Extension Cable, N(m) to N(f)
- BNC cable (for 10 MHz reference signal to spectrum analyzer)

Procedure

1. Preset both the SPA and the PIM instruments.
2. Connect the SPA 10 MHz reference to the 10 MHz reference standard.
3. Connect the PIM Test Port to the SPA RF in via a high powered 30 dB attenuator.
4. Set the PIM F1 frequency shown in Table 2-3.
5. Set the SPA center frequency to the PIM F1 frequency shown in Table 2-3.
6. Set the SPA span to 100 kHz.
7. Set the SPA RBW to 100 Hz.
8. Set the SPA VBW to 10 Hz.
9. Set the SPA reference level to 10 dBm.
10. Set the SPA sweep mode to continuous.
11. Set the SPA trace type to MAX hold.
12. Return the SPA to the marker menu.
13. Set the SPA marker style to tracking.
14. Turn on PIM Tx signal and wait for the SPA to capture the complete pulse.
15. Set the SPA Marker to Peak.

16. Turn on the SPA Counter Marker Function.
17. Note the marker frequency value and record the measured value in Table A-7, "PIM Frequency Accuracy" on page A-6.

Note	If the Marker Table is enabled on the SPA and the PIM Tx is off, the value will continue to change due to the marker seeking a new peak of the noise floor at each sweep. Record the measurement frequency when the PIM Tx is on.

18. Turn off the PIM Tx signal.
19. To repeat the measurement, reset the trace on the SPA and start at Step 14.

Table 2-3. PIM F1 Frequencies

MW82119B Option	F1 Frequency (MHz)
600	617
700	731
703	731
702	768
800	791
850	869
900	927
902	927
180	1805
194	1930
210	2111
260	2660

If the PIM frequency accuracy is out of specification, the instrument will be required to be return to the factory for adjustment and or repair.

2-7 Option 31, GPS Verification

The following test verifies the GPS (Option 31) in the model MW82119B PIM Master.

GPS Option Bias-Tee Voltage Verification (Option 31)

The following test verifies the GPS Antenna Bias-Tee Voltages of Option 31 in the PIM Master.

Equipment Required for MW82119B

- Pomona Model 4290 SMA(m) to BNC(f) Adapter or equivalent
- Amphenol Model B1004A1-ND3G-93R-0.05-1W GPS Terminator or equivalent

Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the PIM Master.
2. Press the **On/Off** key to turn on the PIM Master.
3. Set the MW82119B to PIM Analyzer mode and preset the instrument.
4. Press the **Shift** key, and then the **System** (**8**) key to display the System menu.
5. Press the GPS submenu key to display the GPS menu.

3.3 V Test

6. Connect the 4290 Adapter to the GPS Antenna SMA connector.
7. Connect the GPS Terminator to the 4290 Adapter.
8. Ensure that the 3.3 V setting on the GPS Voltage submenu key is selected (underlined).
9. Turn GPS On by toggling the GPS submenu key so that the On text is underlined.
10. Press the GPS Info submenu key. Record the GPS Antenna Current reading into the "Displayed Value" column of Table 2-4, "Option 31, GPS Receiver Bias-Tee Verification and verify that it is within the expected range.

5 V Test

11. Press the **Esc** key to dismiss the GPS Info dialog box.
12. Press the GPS Voltage submenu key to select 5 V (5 V underlined).
13. Press the GPS Info submenu key. Record the GPS Antenna Current reading into the "Displayed Value" column of Table 2-4 and verify that it is within the expected range.

Table 2-4. Option 31, GPS Receiver Bias-Tee Verification

Voltage	Displayed Value	Expected Range
3.3 V	mA	32 mA ±15% (27.2 mA to 36.8 mA)
5.0 V	mA	55.6 mA ±15% (47.3 mA to 63.9 mA)

2-8 Option 331, Cable and Antenna Analyzer Verification

The following tests verify the Cable and Antenna Analyzer (Option 331) in the model MW82119B PIM Master.

Frequency Accuracy Verification

The following test verifies the CW frequency accuracy of the Cable and Antenna Analyzer in the PIM Master.

Equipment Required

- Anritsu Model MF2412C Frequency Counter or equivalent
- Anritsu Model 15NN50-1.5C RF Coaxial Cable or equivalent

Procedure

1. Turn on the Frequency Counter and press the **Preset** key.

Caution	Before continuing, allow an hour warm-up time for the Frequency Counter internal reference to stabilize.

2. Connect the external power supply (Anritsu PN 40-187-R) to the PIM Master.
3. Press the **On/Off** key to turn on the PIM Master.
4. Set the MW82119B to Cable and Antenna Analyzer mode and preset the instrument..

Caution	Before continuing, allow a 5-minute warm up for the internal circuitry of the MW82119B to stabilize.

5. Press the **Freq/Dist** main menu key and set both the Start Freq and Stop Freq to 2 GHz.
6. Connect the RF cable from the MW82119B VNA RF Out port to the Frequency Counter Input 1.
7. Press the **Sweep/Setup** main menu key, and then press the Run/Hold submenu key to set the instrument to Hold mode (Hold underlined).
8. Record the frequency reading on the Frequency Counter in Table A-6, “Cable and Analyzer Frequency Accuracy (For units with Option 331)” on page A-6.
9. Press the Run/Hold submenu key to set the instrument to Run mode.

Return Loss Measurement Accuracy Verification

The following test verifies the accuracy of return loss measurements of the Cable and Antenna Analyzer in the PIM Master.

Equipment Required

- Anritsu Model 22N50 Open/Short
- Anritsu Model 28N50-2 or Anritsu Model SM/PL-1 50 Ohm Load
- Anritsu Model SC5237 or Anritsu Model SC7424 6 dB Offset Load
- Anritsu Model SC5270 or Anritsu Model SC7423 20 dB Offset Load

Procedure

1. Connect the external power supply (Anritsu PN 40-187-R) to the PIM Master.
2. Press the **On/Off** key to turn on the PIM Master.

3. Set the MW82119B to Cable and Antenna Analyzer mode and preset the instrument..

Caution	Before continuing, allow a 5-minute warm up for the internal circuitry to stabilize.

4. Press the **Measurement** main menu key and verify that Return Loss is selected.
5. Press the **Shift** key, and then the **Cal (2)** key.
6. Press the Start Cal submenu key. Follow the instructions on the screen to perform a calibration at the VNA RF Out port.
7. After the calibration is complete, install the 20 dB offset load to the VNA RF Out port.
8. Press the **Amplitude** main menu key. Set Top to 17 dB, and Bottom to 23 dB.
9. Verify that the data display falls between 18.3 dB and 21.7 dB.
10. Press the **Marker** main menu key. Press the Marker to Peak submenu key and record the marker value. Then select the Marker to Valley submenu key and record the marker value. Record the worst case for each of the two values in Table A-7, “Return Loss Measurement Accuracy (For units with Option 331)” on page A-7.
11. Remove the 20 dB Offset Load from the VNA RF Out port and install the 6 dB Offset Load.
12. Press the **Amplitude** main menu key. Set Top to 4.0 dB and Bottom to 8.0 dB.
13. Verify that the data display falls between 4.8 dB and 7.2 dB.
14. Press the **Marker** main menu key. Press the Marker to Peak submenu key and record the marker value. Then press the Marker to Valley submenu key and record the marker value. Record the worst case for each of the two values in Table A-7.

2-9 1900 MHz Input Port Tests

The following procedure tests the functionality of the second RF input port found on the MW82119B-0600, LTE 600 MHz units.

Equipment Required

- Anritsu Model MG3691C Signal Generator with Option 2, 4, or Option 5 or equivalent
- Anritsu Model 34RKNF50 K(m) to N(f) Adapter
- Anritsu Model ML2438A Power Meter
- Anritsu Model MA2442D Power Sensor or equivalent
- Anritsu Model 34NN50A RF coaxial adapter
- Anritsu Model 2000-1724-R Low PIM load
- Test Component consisting of:
  - Anritsu Model 3-1010-123 50 W, 30 dB Fixed Attenuator
  - Anritsu Model 15NNF50-1.5C RF Coaxial Cable

Procedure

Follow this entire procedure for each instrument that you test. The following steps set up the equipment for measurement:

1. Assemble the test component by connecting the male end of the fixed attenuator to the female end of the RF cable.
2. Connect the power sensor to the power meter, zero the sensor, and then set the calibration factor to the source frequency being tested as listed in Table 2-5.
3. Install the 34RKNF50 adapter to the signal generator RF output, then connect the power sensor to the adapter.
4. Set the signal generator source frequency and then adjust the output level to show 0 dBm ±0.2 dB on the power meter. Take note of the power meter reading. Turn off the RF output of the signal generator.
5. Disconnect the power sensor from the signal generator. Connect the power sensor to the fixed attenuator end of the test component, and then connect the other end of the test component to the signal generator.
6. Turn on the RF output of the signal generator and take note of the power meter reading. Turn off the RF output of the signal generator.
7. Calculate the required signal generator output power required to attain a –80 dBm RF level at the other end of the test component by subtracting the noted reading in Step 6 from –80 dBm.
   For example: (–80 dBm) – (–30.3 dBm) = –49.7 dBm
8. Keeping the test component intact to maintain test integrity, remove the test component from the signal generator.
9. Attach the adapter and power sensor to the signal generator and set the output power to –50 dBm. Turn the RF power on and adjust the signal generator output level until the power meter reading matches the calculated value from Step 7. Turn off the signal generator RF power.

Table 2-5. Test Port Frequency Settings

F1	F2	Source Frequency	Expected Indicated level
617 MHz	633 MHz	1867 MHz	–80 dBm ±0.5 dB
617 MHz	643 MHz	1877MHz	–80 dBm ±0.5 dB
617MHz	652 MHz	1886 MHz	–80 dBm ±0.5 dB

The following steps perform the input port test:

10. Reset the MW82119B-0600 to factory default settings

11. Press **Measurement** and select PIM vs. Time.

12. Press **Frequency**, then press Rx Band Select and select 1900 MHz.

13. Set F1 to 617 MHz and F2 to 633 MHz.

14. Press **Settings** and set the set test duration to 20 seconds.

15. Attach the assembled test component from the previous section to the signal generator/adapter output, then connect the other end to adapter 34NN50A, and then attach the assembly to the 1900 MHz RF input port.

16. Attach the low PIM load to the main RF input port (this is to prevent high reflections during testing).

17. With the signal generator still set to the CW frequency of 1867 MHz, press the **RF On** key.

18. On the PIM Master press **Measurements** and then Test. Note the reading shown on the DUT and record it on the test record Table A-8.

19. Turn off the RF output on the signal generator.

20. Adjust the PIM F1 and F2 frequencies to the next values shown in Table 2-5.

21. Set signal generator frequency output to the next source frequency value listed in Table 2-5.

22. Repeat Step 18 through Step 21.

2-10 IM2 Input Port Tests

The following procedure tests the functionality of the second RF input port found on the MW82119B-0902, E-GSM 900 MHz units.

Equipment Required

- Anritsu Model MG3691C Signal Generator with Option 2, 4, or Option 5 or equivalent
- Anritsu Model 34RKNF50 K(m) to N(f) Adapter
- Anritsu Model ML2438A Power Meter
- Anritsu Model MA2442D Power Sensor or equivalent
- Anritsu Model 34NN50A RF coaxial adapter
- Anritsu Model 2000-1724-R Low PIM load
- Test Component consisting of:
  - Anritsu Model 3-1010-123 50 W 30 dB Fixed Attenuator
  - Anritsu Model 15NNF50-1.5C RF Coaxial Cable

Procedure

Follow this entire procedure for each instrument that you test. The following steps set up the equipment for measurement:

1. Assemble the test component by connecting the male end of the fixed attenuator to the female end of the RF cable.
2. Connect the power sensor to the power meter, zero the sensor, and then set the calibration factor to the source frequency being tested listed in Table 2-6.
3. Install the 34RKNF50 adapter to the signal generator RF output, then connect the power sensor to the adapter.
4. Set the signal generator to the first source frequency setting found in Table 2-6 and adjust the level output to show 0 dBm ±0.2 dB on the power meter. Take note of the power meter reading, then turn off the RF output on the signal generator.
5. Disconnect the power sensor from the signal generator. Connect the power sensor to the fixed attenuator end of the test component, and then connect the other end of the test component to the signal generator.
6. Turn on the RF output of the signal generator and take note of the power meter reading. Turn off the RF output of the signal generator.
7. Calculate the required signal generator output power required to attain a –80 dBm RF level at the other end of the test component by subtracting the noted reading in Step 6 from –80 dBm.
   For example: (–80 dBm) – (–30.3 dBm) = –49.7 dBm
8. Keeping the test component intact to maintain test integrity, remove the test component from the signal generator.
9. Attach the adapter and power sensor to the signal generator and set the output power to –50 dBm. Turn the RF power on and adjust the signal generator output level until the power meter reading matches the calculated value from Step 7. Turn off the signal generator RF power.

Table 2-6. Test Port Frequency Settings

F1	F2	Source Frequency	Expected Indicated level
925 MHz	951.5 MHz	1876.5 MHz	–80 dBm ±0.5 dB
925 MHz	967 MHz	1892 MHz	–80 dBm ±0.5 dB
925 MHz	983 MHz	1908 MHz	–80 dBm ±0.5 dB

The following steps perform the input port test:

10. Reset the MW82119B-0902 to factory default settings

11. Press **Measurement** and select PIM vs. Time.

12. Press **Frequency** and select Band IM2.

13. Set F1 to 925 MHz and F2 to 951.5 MHz.

14. Press **Settings** and set the set test duration to 20 seconds.

15. Attach the assembled test component from the previous section to the signal generator/adapter output, then connect the other end to adapter 34NN50A, and then attach the assembly to the 1900 MHz RF input port.

16. Attach the low PIM load to the main RF input port (this is to prevent high reflections during testing).

17. With the signal generator still set to the CW frequency of 1876.5 MHz, press the **RF On** key.

18. On the PIM Master, press **Measurements** and then Test. Note the reading shown on the DUT and record it on the test record Table A-9.

19. Turn off the RF output on the signal generator.

20. Adjust the PIM F2 frequencies to the next values shown in Table 2-6.

21. Set signal generator frequency output to the next source frequency value listed in Table 2-6.

22. Repeat Step 18 through Step 21.

Chapter 3 — Troubleshooting

Warning	The Anritsu PIM Master is capable of producing 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields: • Always terminate the PIM output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test. • Confirm that the PIM Master RF power is off after a PIM test. • Always confirm that the PIM RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors. • Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

3-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed. Perform the troubleshooting suggestions in the order in which they are listed.

Only qualified service personnel should replace internal assemblies.

3-2 Turn-on Problems

Unit Cannot Power Up:

Unit cannot power up. No activity occurs when the **On/Off** key is pressed:

1. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the PIM Master, but are electrically incompatible and will not charge correctly
2. Check the battery, and plug in the external power adapter (Anritsu part number: 40-187-R).
3. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
4. External power supply may have failed or be the wrong type. Verify that the output of the external adapter is approximately 12 VDC. Replace the external power supply.
5. The **On/Off** button may be damaged. Replace the keypad PCB or rubber keypad.
6. Main PCB has failed. Replace the Main PCB assembly.

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

1. Boot-up process gets stuck with “Application Running” in the bottom-left-hand corner of the display. Turn the instrument power Off, and then press the **Esc** key while pressing the **On/Off** button, holding both buttons until the Anritsu splash screen appears. This performs a factory default restart.
2. Boot-up process gets stuck at Anritsu splash screen. Using Bootstrap mode and a USB memory device that has been prepared with the current instrument firmware, perform the Load All procedure.
3. During boot-up process, the instrument stops with the message: “Failed to load touch screen calibration data. Please reboot the instrument”. Boot up the instrument in boot strap mode. The instrument will prompt you to perform a touch screen calibration.
4. Main PCB has failed. Replace the Main PCB assembly.

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

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

Boot-up Self Test fails:

1. Perform a Master Reset. Be advised that a Master Reset will delete all user-saved setups, JPEG, and measurement files. Ensure that you have backups of these before performing a Master Reset.
2. If the message relates to the RTC battery, then replace the Main PCB.
3. The Main PCB has failed. Replace the Main PCB assembly

3-3 PIM Analyzer Warning Messages

Instrument powers up, but displays a warning message:

1. **REF PLL Lock Error or RF PLL Lock Error**

   These indicate a potential hardware failure that could compromise measurements. If the failure persists, then contact your Anritsu Service Center.

2. **PIM AMP(S) Exceeding Normal Temperature Range**

   The internal PIM Master amplifiers have exceeded their normal operating temperature. This could indicate a potential hardware failure that could compromise measurements. If the failure persists, then contact your Anritsu Service Center.

3. **PIM UNIT Exceeding Normal Temperature Range**

   The entire PIM Master instrument is beyond its normal operating temperature. This could lead to a potential degradation in measurements, and signal dropout could occur. If the failure persists, then contact your Anritsu Service Center.

4. **PIM EEPROM Error**

   The PIM Master cannot access its on-board EEPROM. This could indicate a potential hardware failure that could compromise measurements. If the failure persists, then contact your Anritsu Service Center.

5. **IM OVERLOAD**

   This is a warning message that the measured signal level is approaching the saturation limit of the instrument. The actual signal level may be higher than the reported signal level under this condition. This message is displayed in PIM vs Time and Swept PIM measurement modes if PIM values exceed this saturation limit.

6. **Receiver Amplitude Low**

   This message can occur if signal amplitude degrades within the instrument. It can have an impact on overall measurement accuracy and should be an indicator to send the unit to the Anritsu Service Center for repair.

7. **Warning! High Reflection from measurement path!**

   This message alerts you when the connection to the test port produces large reflections back into the instrument. This can compromise measurement accuracy. To fix this error, check all junction connections, or remove the RF connection or component that is causing high reflection. If a cable or antenna is connected, then it could be an indication of poor RF transmission capability.

3-4 Operating Problems

RF Connector cleanliness and integrity have a big impact on measurements. Anritsu recommends that the RF connectors on the instrument and the cables be cleaned and inspected. The following procedures are recommended.

- Clean the RF connectors and center pins with a lint-free wipe or cotton swab dampened with isopropyl alcohol.
- Use a non-metallic object (such as the wooden end of a cotton swab) to push the lint-free wipe into the connector RF interface to remove metal flakes.
- Visually inspect the connectors. For precision measurements, the pins of the connectors must be unbroken and uniform in appearance. If you are unsure whether the connectors are undamaged, gauge the connectors to confirm that the dimensions are correct.
- Visually inspect the test port cables. To obtain accurate readings within instrument specifications, test port cables must be: free of metal flakes, uniform in appearance, and not stretched, kinked, dented, or broken.

PIM Self Test Fails:

The PIM Master instrument Self Test – PIM Self Test fails:

The Main PCB Assembly has failed. One of the internal power rails may have failed. Contact your Anritsu Service Center.

The PIM Master instrument Application Self Test – PIM Application Self Test fails:

The RF PCB Assembly has failed. One of the internal power rails may have failed. Contact your Anritsu Service Center.

3-5 Cable and Analyzer Problems

1. Inspect the VNA RF Out connector for damage.
2. Inspect the Open, Short, Load, and cables for damage. Verify their operation on a suitable measurement instrument.
3. Update the instrument firmware.
4. Cable and Antenna Analyzer PCB might have failed. Replace the Cable and Antenna Analyzer PCB.

3-6 Other Problems

Battery Pack Charging Problems: refer to Chapter 4, "Battery Information".

Touch Screen Issues:

1. The Touch Screen may have lost its calibration data. Perform a Touch Screen Calibration from the **System** (**8**) menu, and follow the on-screen instructions. If you cannot get into the Touch Screen calibration mode from the System menu, use **Shift** (**0**) to get into the Touch Screen calibration mode directly.
2. Check the firmware version that is installed on the instrument, and ensure that it is the latest. If not, install the latest firmware, and redo the touch screen calibration (as described previously).
3. Touch screen has been damaged or has failed. Replace the touch screen.
4. If you are in the middle of making measurements and absolutely cannot wait to replace the touch screen, then an emergency arrow mode navigation alternative is available. Select Touch Screen Calibration from the System menu (or press **Shift** (**0**) to enter the Touch Screen calibration mode) and enter **1**, and then enter **1** again. You can select the touch screen keys by using the **Arrow** keys. In the emergency arrow navigation mode, the touch screen keys are highlighted with a red border. To select that touch screen key, press the Menu button above the **Arrow** keys (on the keypad).

In the event that you see a Malfunction Error message, write it down for troubleshooting purposes.

Chapter 4 — Battery Information

4-1 General Information

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 also recommends storing the battery in a leak-proof, plastic container.

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

- The battery that is supplied with the PIM Master may need charging before use. Before using the PIM Master, the internal battery may be charged either in the instrument by using the AC-DC Adapter or the 12-Volt DC adapter, or separately in the optional Dual Battery Charger.
- Use only Anritsu approved battery packs.
- Recharge the battery only in the PIM Master or in an Anritsu approved charger.
- When the PIM Master or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours. Overcharging may shorten battery life.
- If left unused, a fully charged battery will discharge itself over time.
- Temperature extremes affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before use or charging. Refer to your Technical Data Sheet (Anritsu part number: 11410-00821).
- 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 charges 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 only for its intended purpose.

4-2 Battery Pack Removal and Replacement

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

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

1. The battery access door is located on the bottom of the PIM Master as illustrated in Figure 4-1.

Figure 4-1. Battery Access Door Location

2. With the PIM Master laying flat and face up on a stable surface, turn the battery access door retainer a quarter of a turn and pull the battery door down and away from the bottom of the instrument as shown in Figure 4-2.

Figure 4-2. Opening the Battery Access Door

3. Remove the battery access door by sliding it out of the slot in the case, as shown Figure 4-3. Slide the battery door assembly so that the battery connections can slide lengthwise away from the connector pins as you remove the door assembly.

Figure 4-3. Removing the Battery Access Door

4. With the battery access door completely removed, the battery snaps in and out of the compartment door, as illustrated in Figure 4-4. Note the battery orientation image in the cover.

Figure 4-4. Removing the Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the battery with the contacts facing the bottom of the instrument (not facing the cover plate). See Figure 4-5. The diagram inside the battery compartment is a reflected image of the battery to show how the battery connectors align with the pins inside the compartment. To avoid connector pin damage, you must not press the battery downward onto the connector pins within the battery compartment. You must position the battery door assembly so that the battery connections can slide lengthwise onto the connector pins as you seat the door assembly against the bottom of the PIM Master. The tab on the door fits into a slot located on the edge of the case, adjacent to the connector pins.

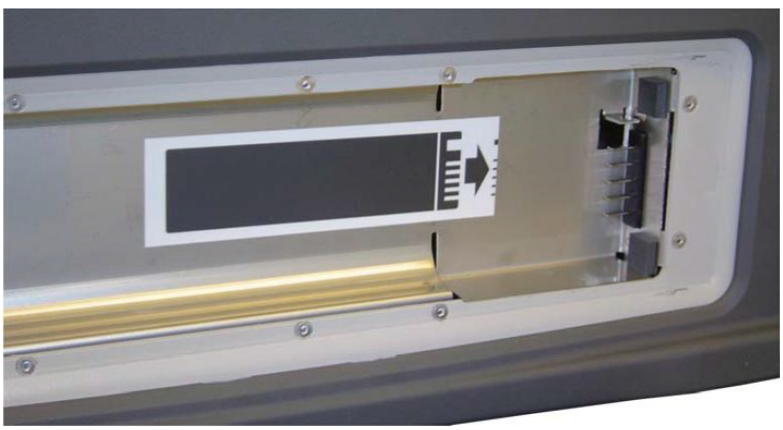


Figure 4-5. Battery Contacts and Orientation

Chapter 5 — Assembly Replacement

5-1 Introduction

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

References to "left" and "right" side of the instrument are based upon the perspective of the instrument itself. The front panel and display screen are forward, the tilt bail is to the back, the keypad is to the **right** side, and the I/O panel (USB, external power, GPS antenna) is to the **left** side.

5-2 Replaceable Parts List

Refer to Table 1-6, "List of Replaceable Parts" on page 1-5 for the list of replaceable parts. Refer to the following sections for basic replacement instructions. Replacement of the Main PCB, RF Module, or Filter Assembly within the Chassis requires a full characterization with adjustments to be performed. Adjustments are not documented in this Maintenance Manual. Contact your local Anritsu Service Center for this service.

The revision level of the instrument can be determined by reading the information on the Serial Number label found on the back of the instrument. If there is no mention of revision on the label, it is a Revision 1 unit. Revision 2 units will state "Revision 2". Table 5-1 shows the beginning serial numbers of Revision 2 instruments.

Table 5-1. Beginning Serial Numbers of Revision 2 Instrument

Model	Serial Number
MW82119B-0180	1519001 and later
MW82119B-0194	1702001 and later
MW82119B-0700	1525012 and later. Exceptions: 1527002, 1529008, 1529026, 1531003, 1549001 shipped as Revision 1
MW82119B-0800	1545012 and later. Exceptions: 1546007, 1545031 shipped as Revision 1
MW82119B-0850	1617005 and later. Exceptions: 1618004, 1618008 shipped as Revision 1
MW82119B-0900	1517015 and later. Exception: 1549002 shipped as Revision 1
MW82119B-0260	1634009 and later
MW82119B-0210	1714004 and later

Note	Many of the procedures in this section are generic, and apply to similar instruments. Photos and illustrations are representative and may show instruments other than the PIM Master MW82119B.

Caution	Only qualified personnel should open the case and replace internal assemblies. Assemblies shown in Table 1-6, "List of Replaceable Parts" on page 1-5 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 performance. All work should be performed in a static-safe work area. Do not reuse screws that have been removed. Use new screws with patch lock during assembly replacement.

5-3 Disassembly

To replace a Filter Assembly, the MW82119B must be completely disassembled. Remove parts in the following sequence:

1. Battery door and battery
2. Bottom bumper
3. Handle strap and top bumper
4. Corner brackets from bottom of case
5. Front panel
6. Top panel
7. Cover panel
8. Disconnect LCD cable from clip in left filter bracket
9. Battery panel (battery compartment)
10. Left chassis bracket
11. VNA PCB if Option 331 is configured
12. Right side bracket
13. Main PCB (motherboard)
14. RF Board
15. Chassis tray
16. Left filter bracket
17. Filter tray if Option MW82119B-0800 or MW82119B-0850

5-4 PIM Master Drawings

The following set of drawings show the basic construction of the instrument. Additional illustrations are provided with the descriptions for replacing specific parts.

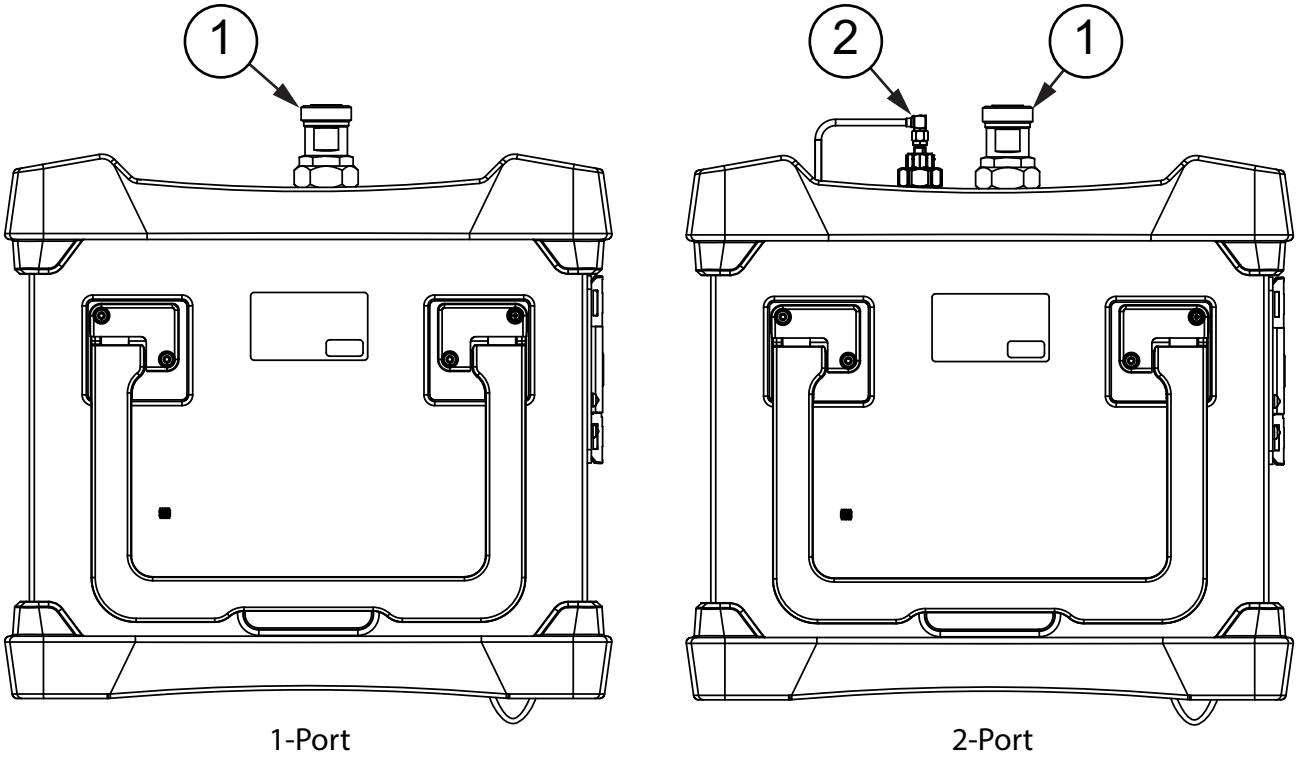


Figure 5-1. PIM Connectors

1.	PIM Test Connector (1- Port, Standard)
2.	2-Port Connector Assembly (Option 703)

Opening the Case

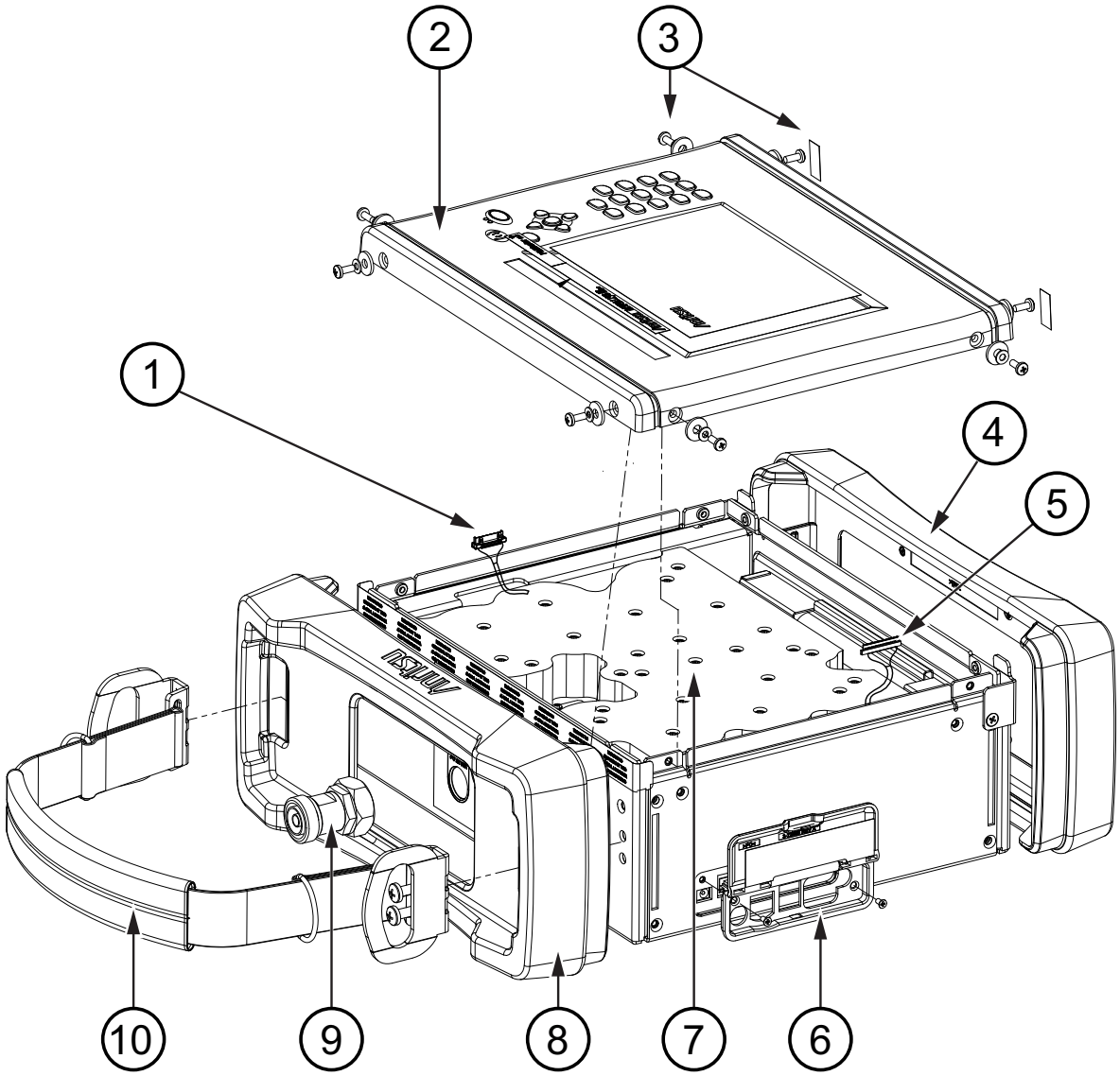


Figure 5-2. Opening the Case

1.	Keypad Cable from Main PCB
2.	Front Panel
3.	Front Panel Screws (8 total)
4.	Bottom bumper
5.	LCD Display Cable from Main PCB
6.	I/O Panel and Cover
7.	Filter
8.	Top bumper
9.	PIM Test-Port Connector Adapter
10.	Handle Strap with Brackets

Chassis Assembly with Tilt Bail

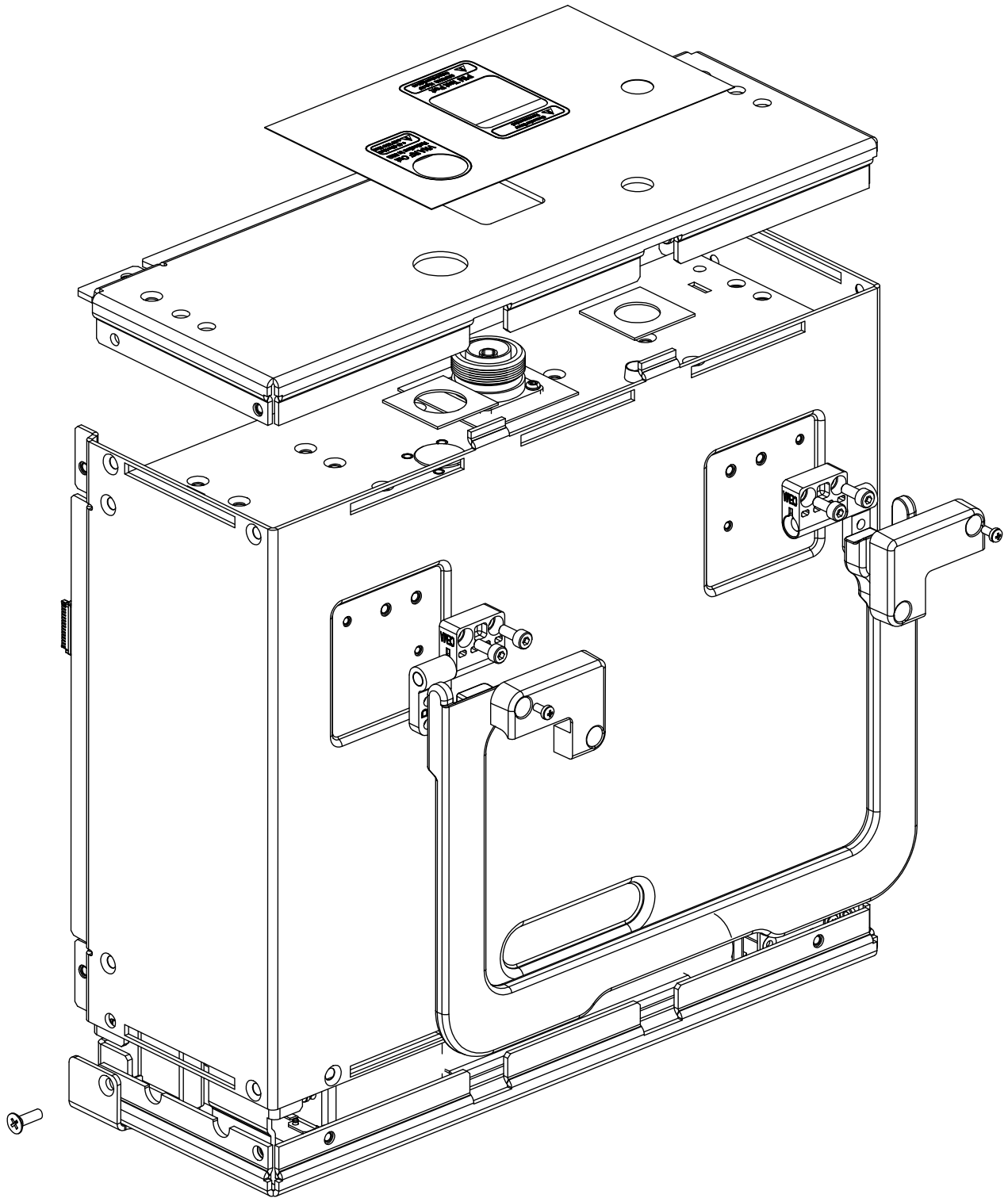
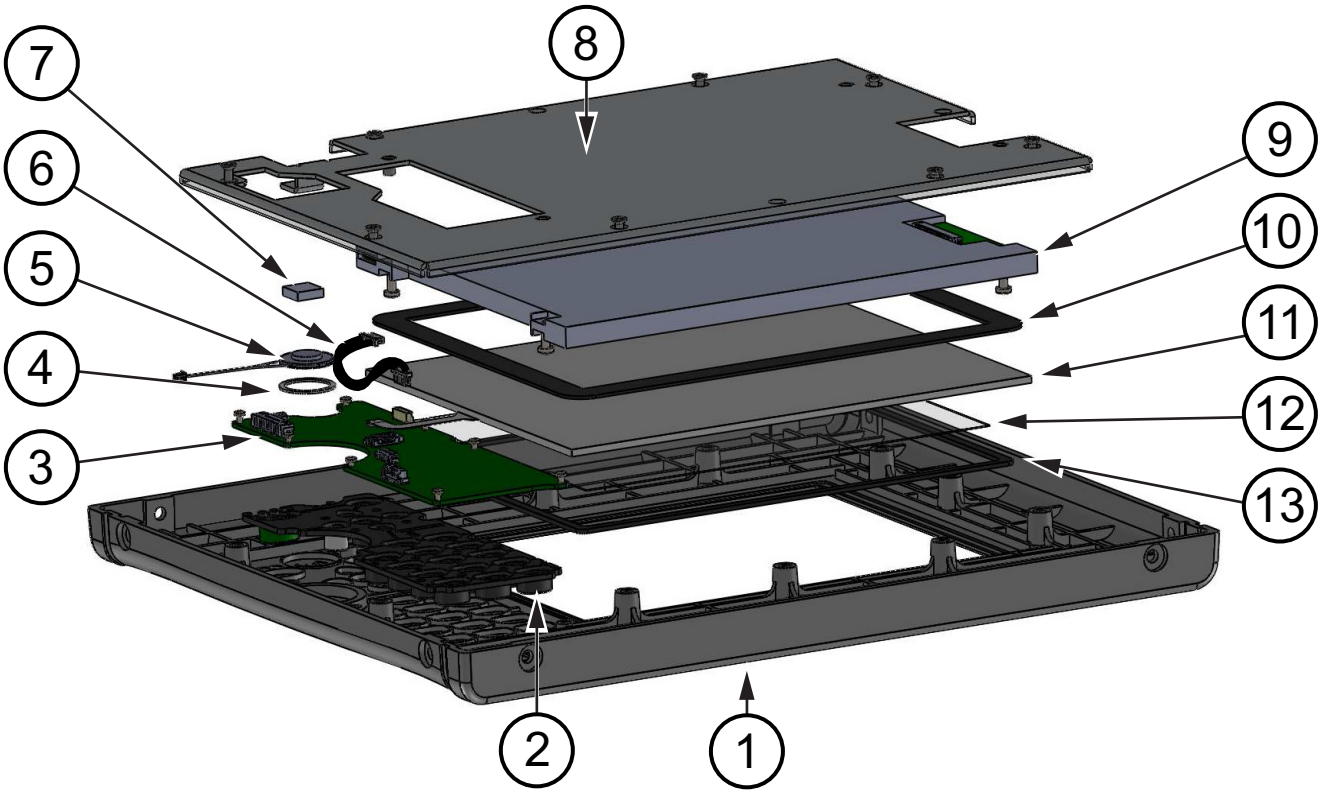


Figure 5-3. Chassis Assembly with Tilt Bail

Top Case Assembly



1.	Top Case
2.	Keypad
3.	Keypad PCB
4.	Gasket for Speaker
5.	Speaker Assembly
6.	Cable, LCD to Keypad
7.	Foam (for back of Speaker)
8.	LCD Retainer
9.	LCD Display
10.	Touch Screen Gasket
11.	Touch Screen (Display)
12.	Touch Screen Protector (Plastic Sheet)
13.	Gasket (Touch Screen to Bezel)

Figure 5-4. Top Case Assembly

Chassis Parts

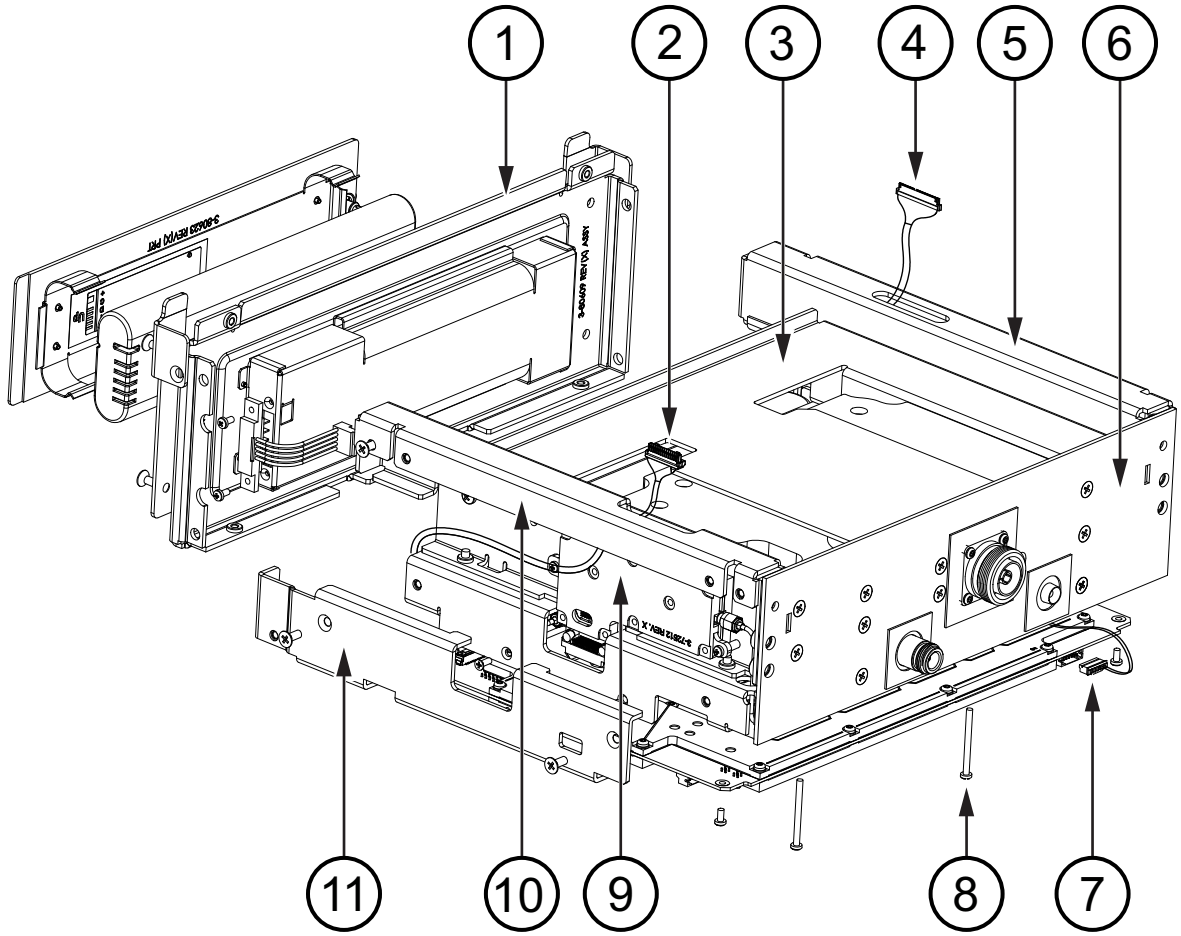


Figure 5-5. Chassis Parts

1.	Bottom Panel (Battery Compartment)
2.	Keypad Cable (connects to Motherboard)
3.	Filter Tray (Options 0800 and 0850)
4.	LCD Display Cable (connects to Motherboard)
5.	Right Side Bracket
6.	Connector Panel
7.	RF ON LED Connector (to Main PCB)
8.	M3, 35 mm Screw (1 of 4) to secure Main PCB and RF Board to Chassis Tray
9.	VNA PCB (attached to Left Filter Bracket)
10.	Left Filter Bracket
11.	Left Chassis Bracket

VNA Option

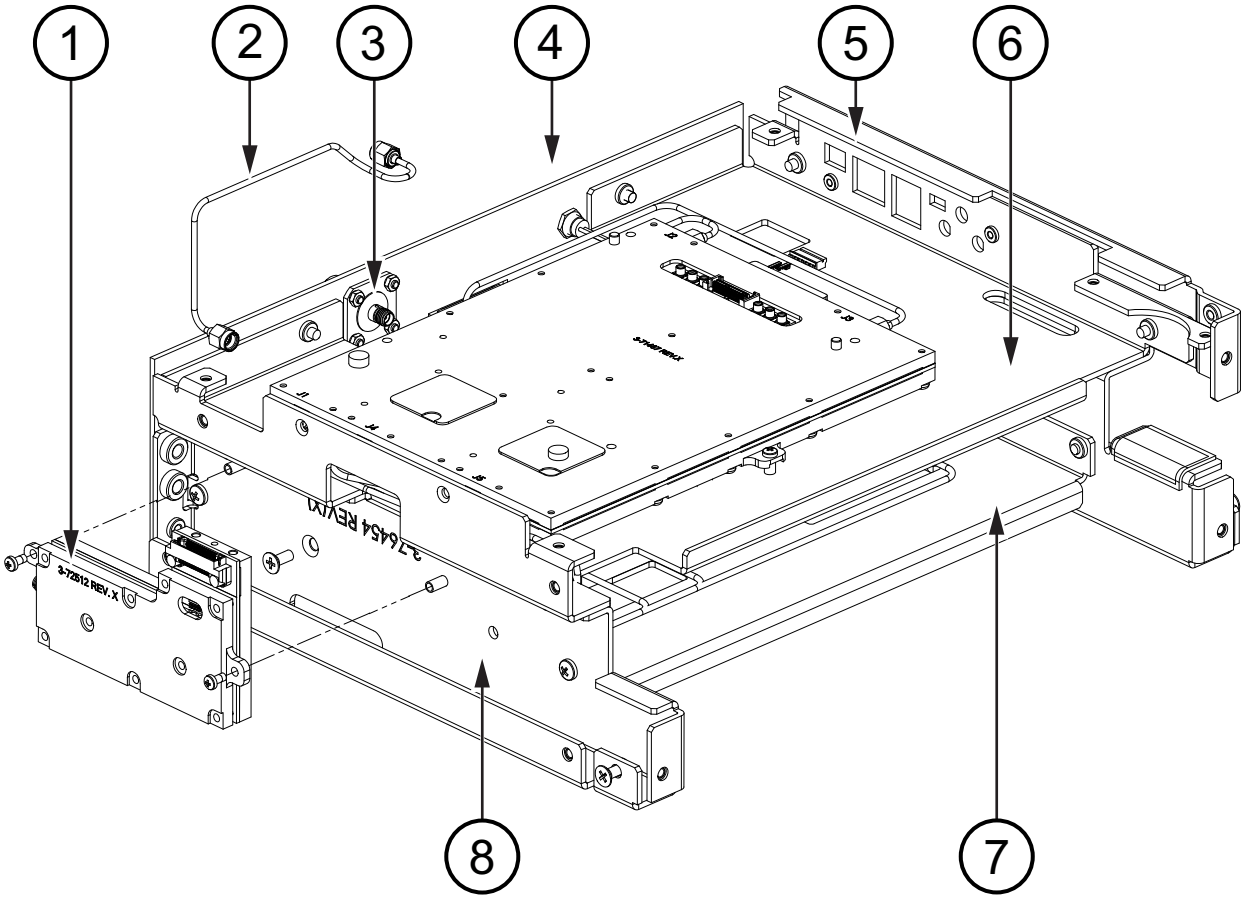


Figure 5-6. VNA Option

1.	VNA PCB
2.	VNA semi-rigid cable
3.	VNA RF Out Connector
4.	Connector Panel
5.	Right Side Bracket
6.	Chassis Tray
7.	Filter Tray (Options 0800 and 0850)
8.	Left Filter Bracket

2-Port (Option 703)

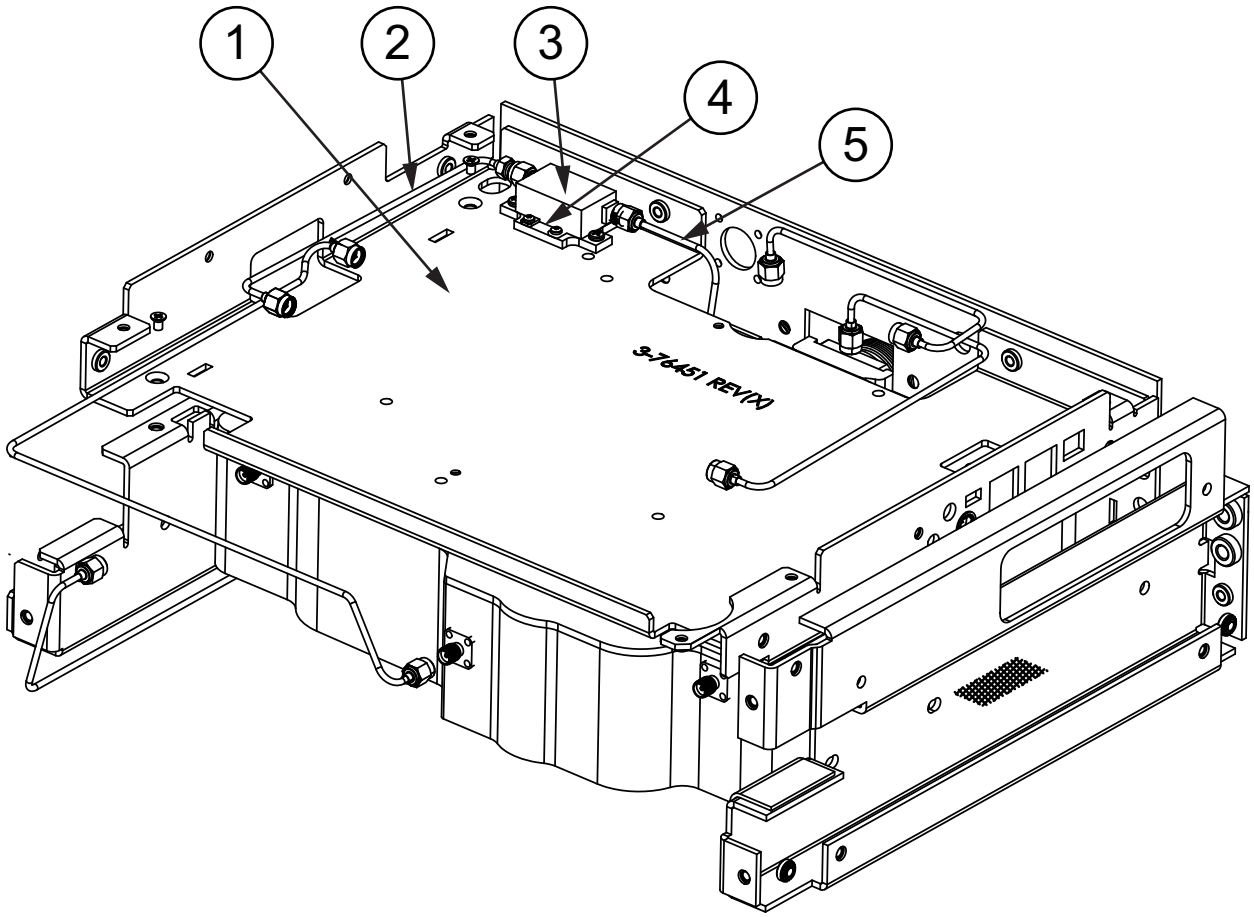


Figure 5-7. Option 703 Filter Assembly

1.	Chassis Tray
2.	Semi-Rigid Cable, RF Board out to Filter RF in.
3.	Filter (Option 703)
4.	Filter Carrier
5.	Output Cable Assembly (Option 703)

Filter, Chassis Tray, and Brackets

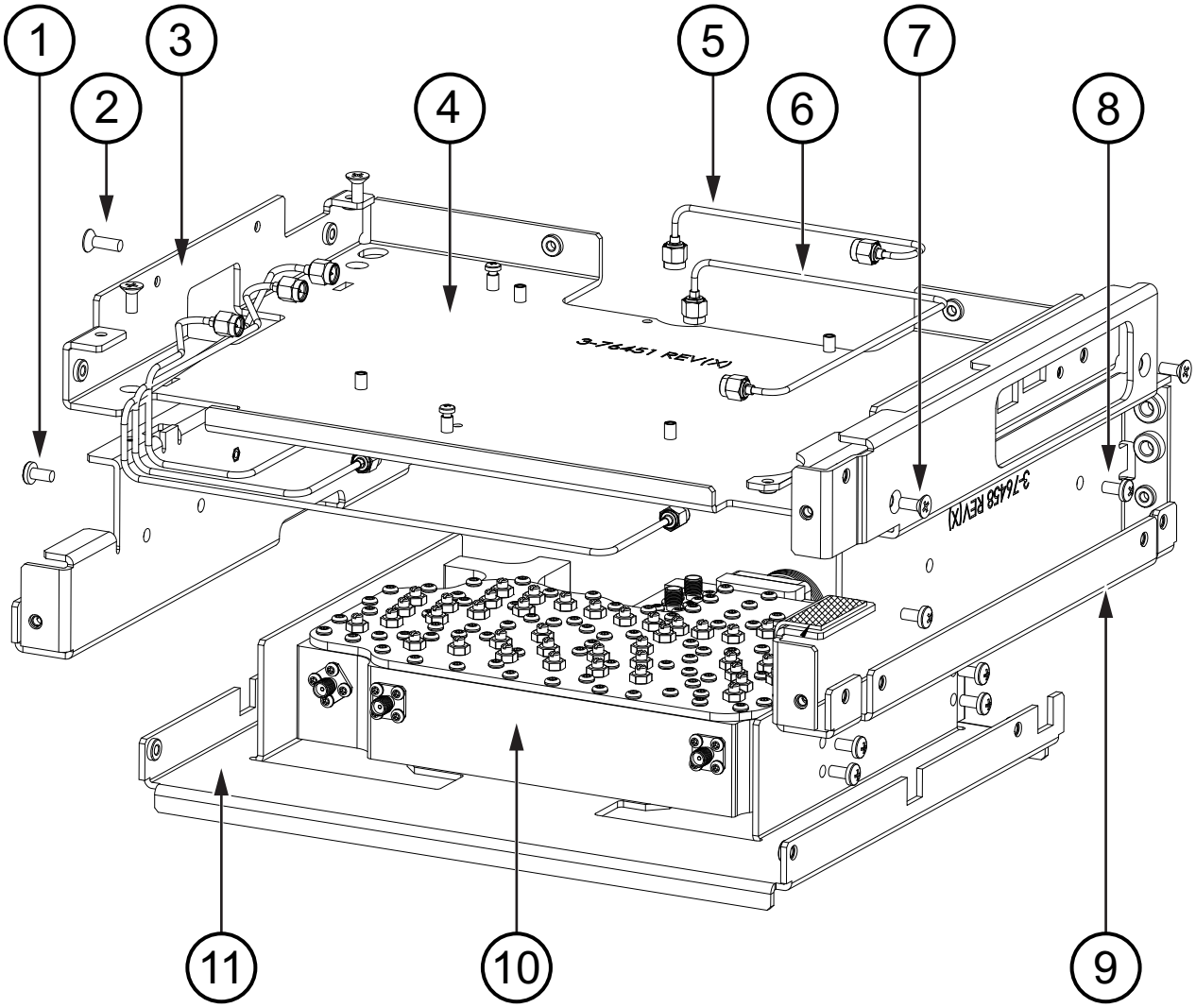


Figure 5-8. Filter, Chassis Tray, and Brackets

1.	Screws for Left Filter Bracket
2.	Screws for Left Filter Bracket
3.	Filter Bracket
4.	Chassis Tray
5.	Semi-Rigid Cable, REV on Filter and J2 on RF Board
6.	Semi-Rigid Cable, FWD on Filter and J3 on RF Board
7.	Flat Head Screws for Right Side Bracket
8.	Pan Head Screws for Right Side Bracket
9.	Right Side Bracket
10.	Filter Assembly
11.	Filter Tray (Options 0800 and 0850)

Main PCB on Chassis

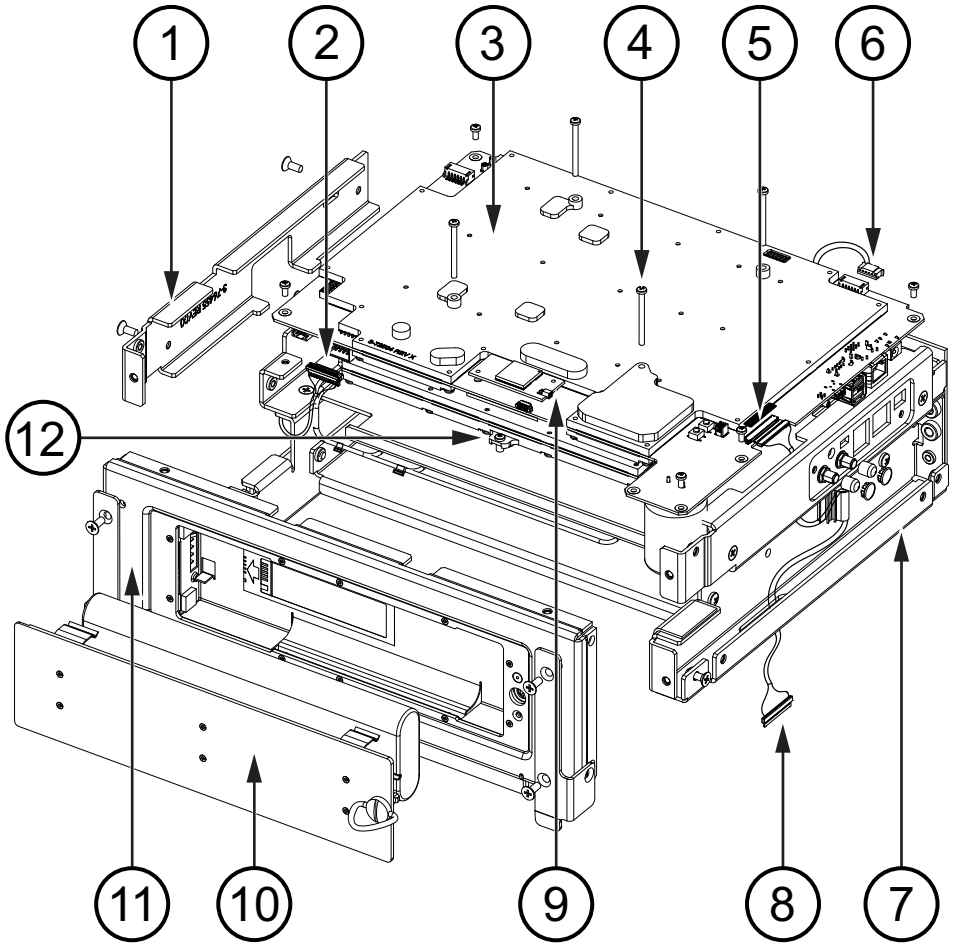


Figure 5-9. Main PCB on Chassis

1.	Left Chassis Bracket
2.	Keypad Cable (Connects to Motherboard)
3.	Main PCB (Motherboard)
4.	M3, 35 mm Screw (1 of 4) to secure Main PCB
5.	LCD Display Cable (connected to Motherboard)
6.	RF ON LED Cable (connects to Motherboard
7.	Right Side Bracket
8.	LCD Display Cable routed through Right Side Bracket (connects to LCD in Top Panel)
9.	GPS PCB on Motherboard
10.	Battery Door Assembly
11.	Bottom Panel (Battery Compartment)
12.	M3, 6 mm Screw (1 of 2) to secure RF Board to Chassis Tray (item 6 in Figure 5-6 on page 5-8)

Main PCB Attachment

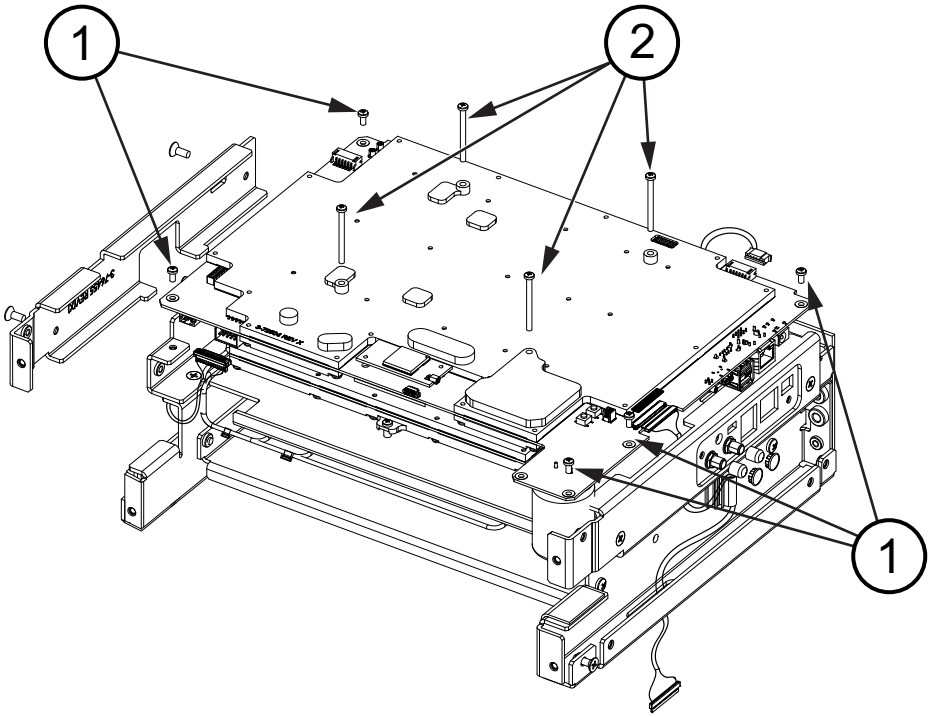


Figure 5-10. Main PCB Attachment

1.	M4, 8 mm screws, 5 places on edge of Motherboard
2.	M3, 35 mm screws, 4 places

5-5 External Parts

The items in this section can be removed without opening the PIM Master case.

Figure 5-11. Standard PIM

Top Connector Panel (1-Port)

The top connector panel is shown in Figure 5-12..

Figure 5-12. Standard PIM (1-Port)

1.	Indicator Light for RF On
2.	PIM Test Connector, 7/16 DIN, female, 50 Ω
3.	VNA RF Out Connector, Type-N, female, 50 ohms (Option 331)
4.	IM2 In Connector, Type-N, female, 50 ohms (Option 902)
5.	Strap Bracket (shown without strap), 2x

PIM Radio Frequency ON Light

This red indicator is illuminated when PIM RF output power is On.

PIM Test Connector

Type 7/16 DIN(f), 50 Ω test port connector that is used to perform PIM versus Time, Swept PIM, Noise Floor, and Distance-to-PIM (DTP) measurements.

To prevent damage to your instrument, do not use pliers or a plain wrench to tighten the DIN connector. Do not over-tighten the connector. The recommended torque is 25 N ·m (~18 lbf ·ft). To prevent rotation, secure the PIM test connector or the recommended connector saver with a wrench when attaching a test lead.

VNA RF Out Connector

VNA RF Out Connector, Type-N, female, 50 ohms (Option 331). This test port is available only on instruments with Site Master Option 331. It is used to perform Return Loss, VSWR, Cable Loss, and Distance-to-Fault (DTF) measurements. Hand tighten this connection. Do not use a wrench.

IM2 In Connector

IM2 In Connector, Type-N, female, 50 ohms (Option 902). This test port is available only with frequency Option 902. It is used to receive second order intermodulation products. Hand tighten this connection. Do not use a wrench.

Strap Bracket

The Strap Brackets holds the Handle Strap.

Top Connector Panel - 2-Port (Option 703)

The 2-port (Option 703) top connector panel is shown in Figure 5-13..

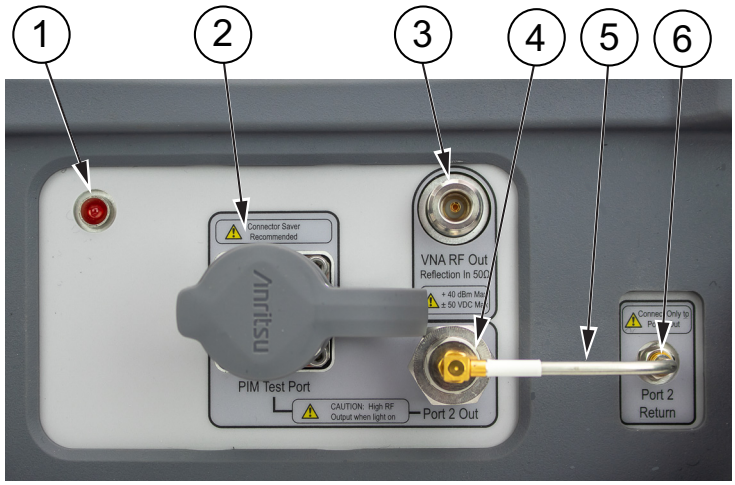


Figure 5-13. 2-Port (Option 703)

1.	Indicator Light for RF On (Red)
2.	PIM Test Port Connector with protective cap, 7/16 DIN, female, 50 Ω
3.	VNA RF Out Connector, Type-N, female, 50 Ω (Option 331)
4.	Port 2 Out Connector, 4.3-10, female, 50 Ω (Option 703)
5.	2-Port Loop Cable Assembly
6.	Port 2 Return Connector, Type SMA, female, 50 Ω (Option 703)

Port 2 Out Connector

VNA RF Out Connector, 4.3-10, female, 50 ohms (Option 703). This test port is available only on instruments with 2-Port LTE Option 703. It is used to perform Return Loss, VSWR, Cable Loss, and Distance-to-Fault (DTF) measurements. Hand tighten this connection. Do not use a wrench.

Port 2 Return Connector

Port 2 Return Connector, SMA, female, 50 ohms (Option 703). This test port is available only on instruments with 2-Port LTE Option 703. Hand tighten this connection. Do not use a wrench.

Loop Cable Assembly

Power off the PIM Master. Refer to Figure 5-13.

Remove Cable

1. Loosen both ends of the semi-rigid cable evenly. Remove cable.
2. Loosen the 4.3-10 adapter. Remove adapter.

Install Cable

1. Install the 4.3-10 connector to Port 2 Out and hand tighten.
2. Torque the 4.3-10 adapter first, using torque wrench 01-528-R, 5 N-m (44 lbf-in).
3. Install the Loop Cable Assembly (2000-1991-R) between the Port 2 Out adapter and Port 2 Return by hand tightening both ends evenly to prevent damage to the center conductors.
4. Torque the SMA connectors using torque wrench 01-201, 0.904 N-m (8 lbf-in).

Handle Strap and Brackets

The handle strap is sewn to the brackets. Each bracket is secured with 2 screws, size M6, 16 mm long. The reassembly torque is 3.2 N · m (28 lbf · in). Figure 5-14 shows a bracket with no strap in order to reveal the mounting screws.

Figure 5-14. Screws for Brackets and Handle Strap

I/O Cover Plate

Raise the connector side panel cover door and remove the 2 screws. Remove the door and attached base plate (Figure 5-15). Screw size is M3, 6 mm, flat head. Reassembly torque is 0.35 N · m (3.1 lbf · in).

Figure 5-15. Remove Door Panel

Tilt Bail

The tilt bail hinges are secured to the bail by 2 screws each. The hinges are secured to the case back by 2 screws each. The reassembly torque is 1.5 N · m (13 lbf · in). The hinge covers are secured to the case back by 2 screws each, size M3, 6 mm long. The reassembly torque is 0.7 N · m (6 lbf · in). See Figure 5-3 on page 5-5.

1. Remove the left and right tilt bail covers from the case.
2. Remove the left and right hinges from the case with the tilt bail attached.
3. If necessary, separate the tilt bail from the hinges by removing the 2 screws that secure the tilt bail to each hinge.
4. Reverse the above steps to assemble the tilt bail.
    a. Screws, hinge to tilt bail, size M4, flat head, 8 mm long (Anritsu PN: 3-905-2711). The assembly torque is 1.5 N · m (13 lbf · in).
    b. Screws, hinge to case, size M4, cap with socket head, 10 mm long (Anritsu PN: 3-905-2712). The assembly torque is 1.5 N · m (13 lbf · in).
    c. Screws, hinge covers, size M3, pan head, 6 mm long (Anritsu PN: 3-905-2639P). The assembly torque is 0.7 N · m (6 lbf · in).

Bumpers

The bumpers are removed by pulling the edge away from the case and lifting. The handle strap must be removed when removing the top bumper.

Battery Door

Remove the battery door by hand. See Figure 4-1 on page 4-2 through Figure 4-4 on page 4-4. Refer to Figure 4-4 and Figure 4-5 on page 4-4 when replacing the battery.

5-6 Opening the Case

Caution	Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. The PIM 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 are mandatory to avoid ESD damage when handling subassemblies or components found in the instrument. Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

This procedure provides instructions for opening the PIM Master case. With the case opened, the internal assemblies can be removed and replaced (as described in this chapter).

Opening the PIM Master Case

1. Place the PIM Master on a stable work surface that will not scratch or damage the instrument.
2. Remove the battery door and battery as shown in Figure 5-16.

Figure 5-16. Remove Battery Door

3. Remove the bottom bumper (Figure 5-17). Anritsu PN: 3-72497. The bumper is removed by pulling the edge away from the case and lifting.

Figure 5-17. Remove the Bottom Bumper

4. Remove the 4 screws retaining the handle strap (Figure 5-18). The handle strap part number is 2000-1793-R.

Figure 5-18. Remove the Handle Strap

Note that the handle strap includes the end brackets, which are sewn on. Figure 5-19 shows a bracket with no strap in order to reveal the mounting screws. The screw size is M6, 16 mm, pan head, and the reassembly torque is 3.2 N · m (28 lbf · in).

Figure 5-19. Handle Strap Screws

5. Remove the handle strap then the top bumper. The top bumper part number is 3-76461.
6. Remove the corner brackets from the bottom of the instrument (see item 1 in Figure 5-20). Temporarily return 2 screws to hold the bottom panel in place. The corner brackets are secured with 3 screws each, size M4, 12 mm, flat head. Reassembly torque is 1.5 N · m (13 lbf · in).
7. Remove the 8 screws retaining the front panel, 2 screws from each corner (see item 2 in Figure 5-20). The screws are size M4, 10 mm, pan head. Reassembly torque is 0.7 N · m (6 lbf · in).

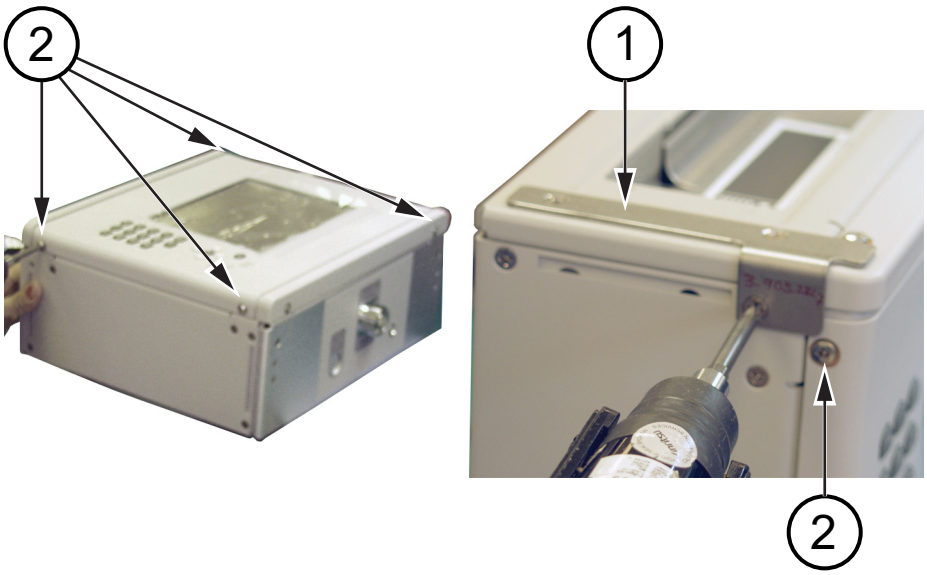


Figure 5-20. Remove the Front Panel Screws

8. Carefully raise the right (keypad side) edge of the front panel and disconnect the Keypad Cable from the connector under the front panel by pressing on the release tab of the cable connector to release it from the front panel (Figure 5-21). Note that the hand in the figure is holding the cable for identification purposes. .

Caution	DO NOT PULL the cable to release it. Pulling on the cable without pressing the release tab can damage the connector on the front panel keypad PCB or on the cable itself.

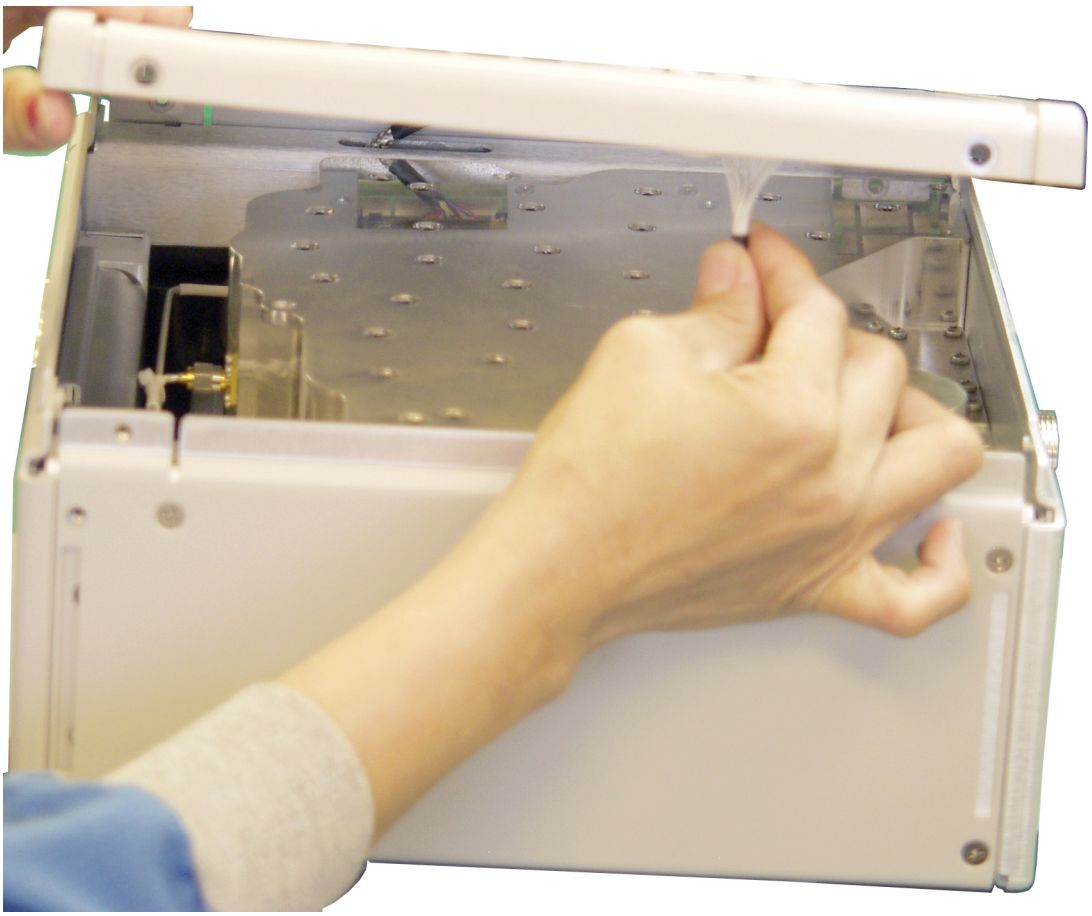


Figure 5-21. Keypad Cable Connector

9. Continue lifting the front panel and peel the Mylar tape off the LCD cable connector. Disconnect the LCD display cable from the front panel (Figure 5-22). In newer models, a second cable that connects to the LCD backlight must also be removed.

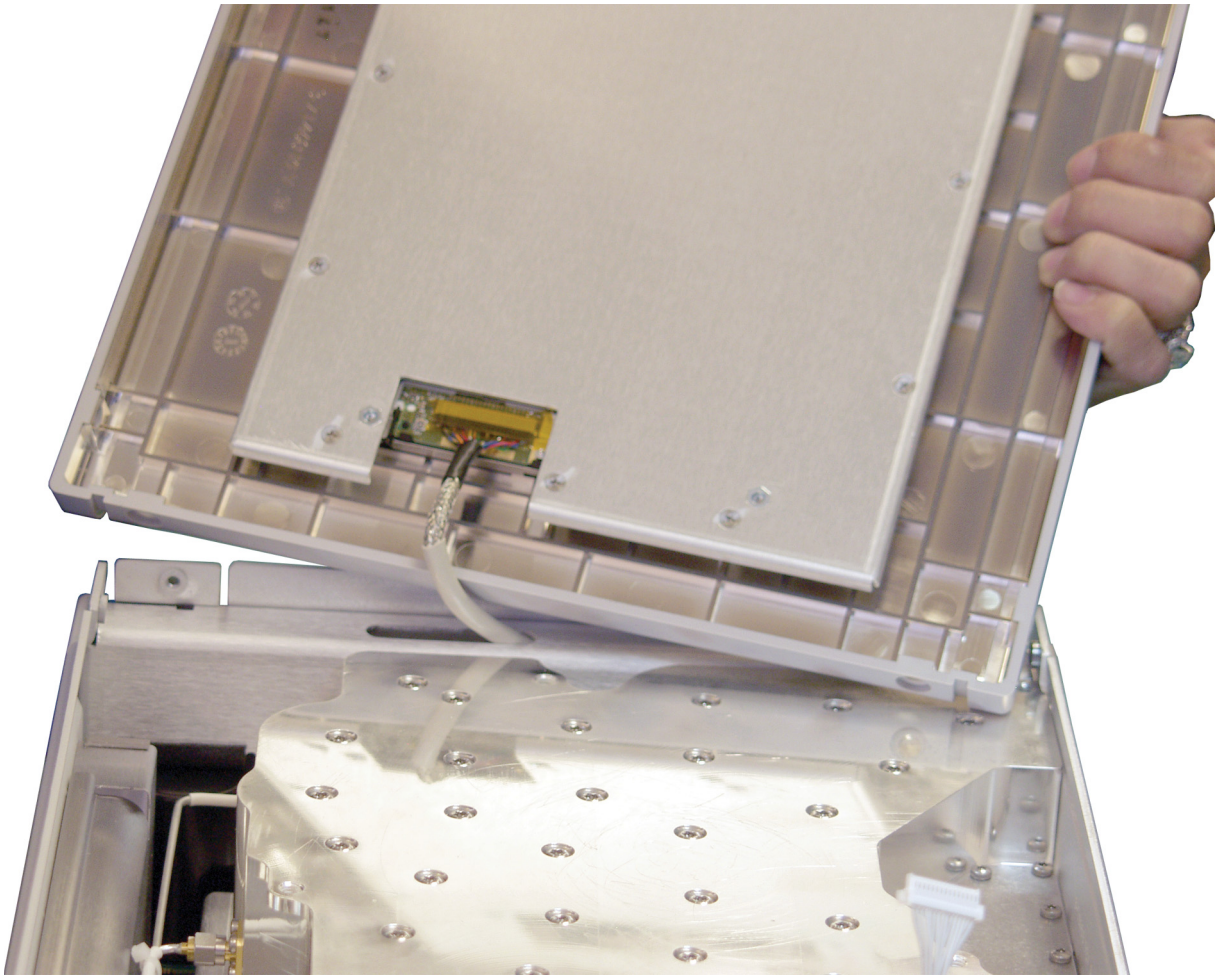


Figure 5-22. Front Panel LCD Cable Connection

10. The front panel assembly is now separated from the PIM Master bottom case.

11. Reverse the above steps to reassemble the case. New screws with patch lock must be used for reassembly.

- Screw, Anritsu PN: 3-905-2620
- Metal Washer, Anritsu PN: 900-808
- Polyurethane Washer, Anritsu PN: 3-900-938

5-7 Front Panel

These procedures allow access to the following replaceable parts and assemblies:

- 3-15-165 or 3-15-174 — LCD Display with LED Backlight
- ND80480 — 8.4 in GFG Touch Screen (3-ND80480 unit with S/N ≥ 1717004)
- 3-74999-3 — Main Numeric Keypad PCB
- 3-71641 — Main Numeric Keypad
- 3-72787 — Speaker
- 3-72853 — Gasket for Speaker

The following steps describe a complete tear down of the front panel assembly. Actual required steps depend on the part being replaced.

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

LCD Display

1. Perform procedure in "Opening the Case" on page 5-18.
2. Remove the 11 screws holding the LCD bracket to the PIM Master front panel (Figure 5-23). Reassembly torque is 0.64 N · m (5.7 lbf · in).

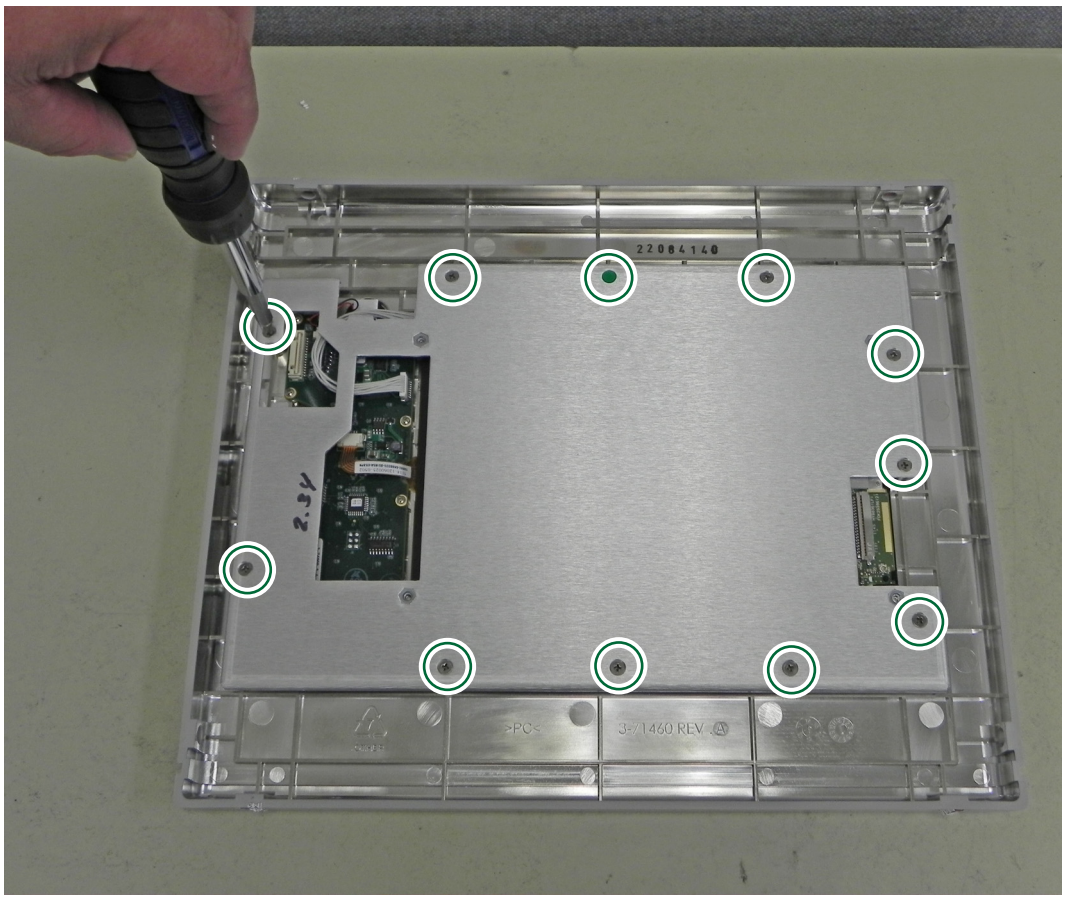


Figure 5-23. LCD Bracket Removal

3. Disconnect the LCD backlight cable from the keypad PCB (Figure 5-24).

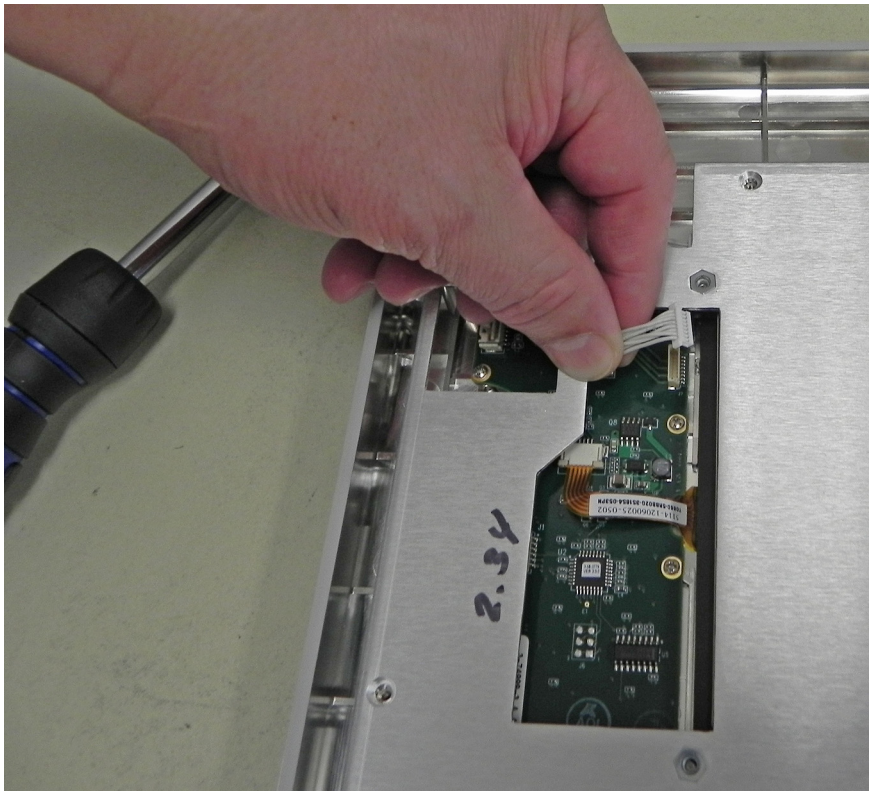


Figure 5-24. Disconnect Backlight Cable

4. Carefully lift up and remove the bracket with the LCD attached (Figure 5-25).

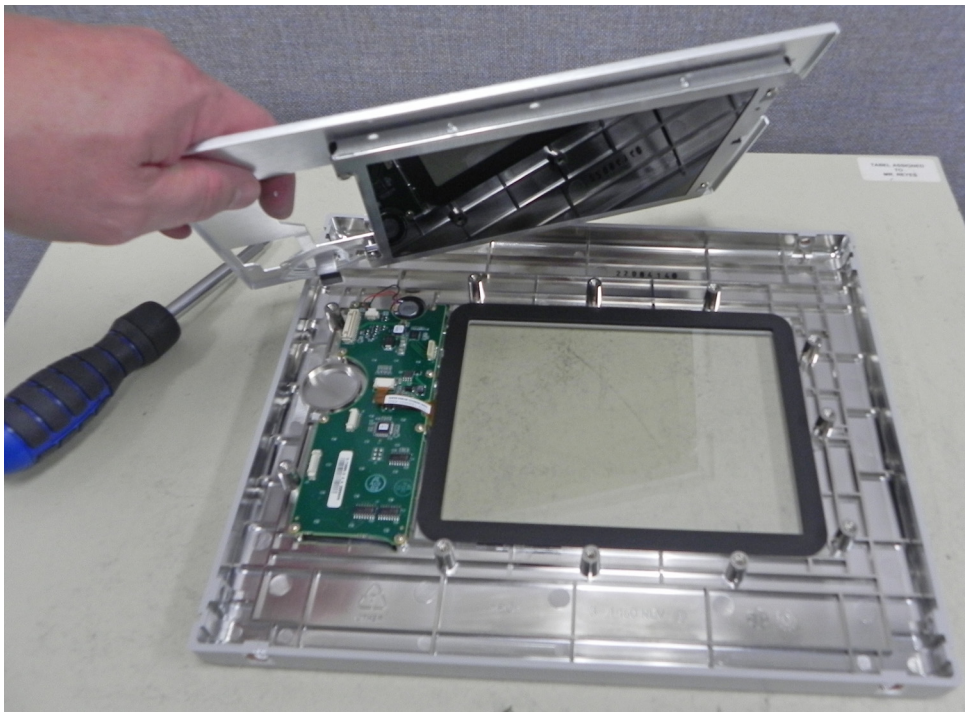
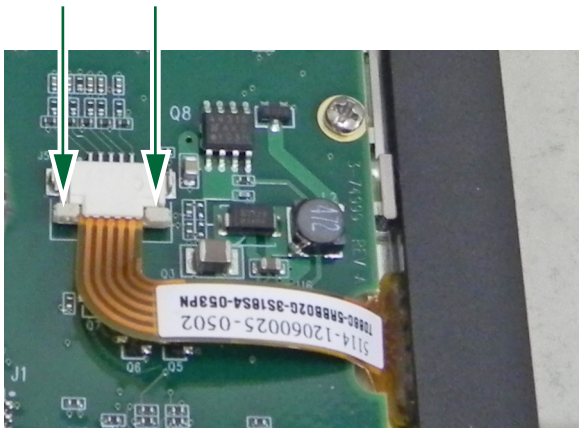


Figure 5-25. Remove LCD

Touch Screen

5. The GFG touch screen is connected to the keypad PCB with a flexi-circuit. Pull down on the side of the connector to release the flexi-circuit and then gently pull the flexi-circuit straight out(Figure 5-26).

1. Pull down on the tabs at the sides of the connector



2. Gently remove the flexture

Figure 5-26. Touchscreen Flexture Removal

6. Carefully remove the touch screen. Re-seat the gasket on the front side of the touch screen if it is displaced during removal (Figure 5-27).

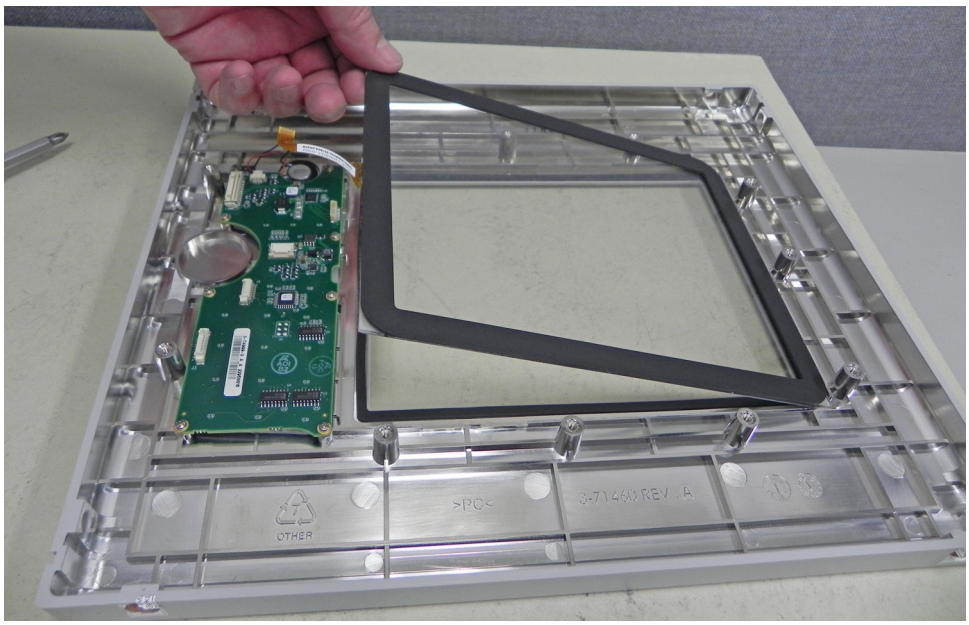


Figure 5-27. Remove Touch Screen

7. Carefully disconnect the speaker connector and remove the 8 screws holding the keypad PCB to the front panel assembly (Figure 5-28).

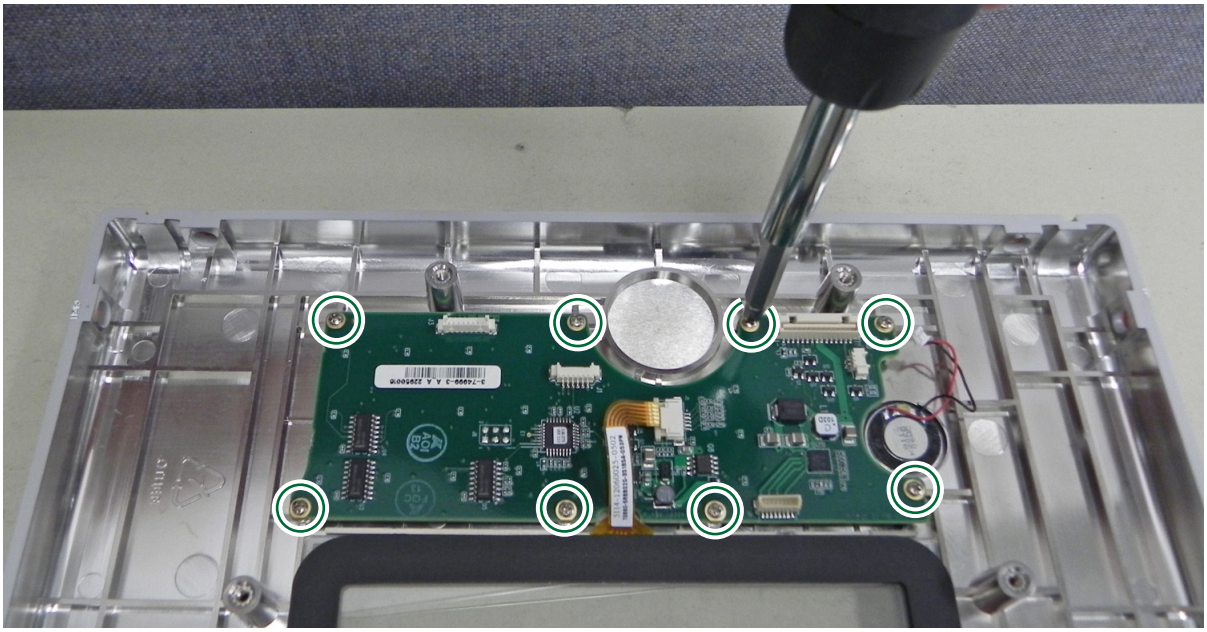


Figure 5-28. Remove Keypad PCB Screws

Keypad

8. Carefully remove the PCB to expose the rubber keypad membrane (Figure 5-29). .

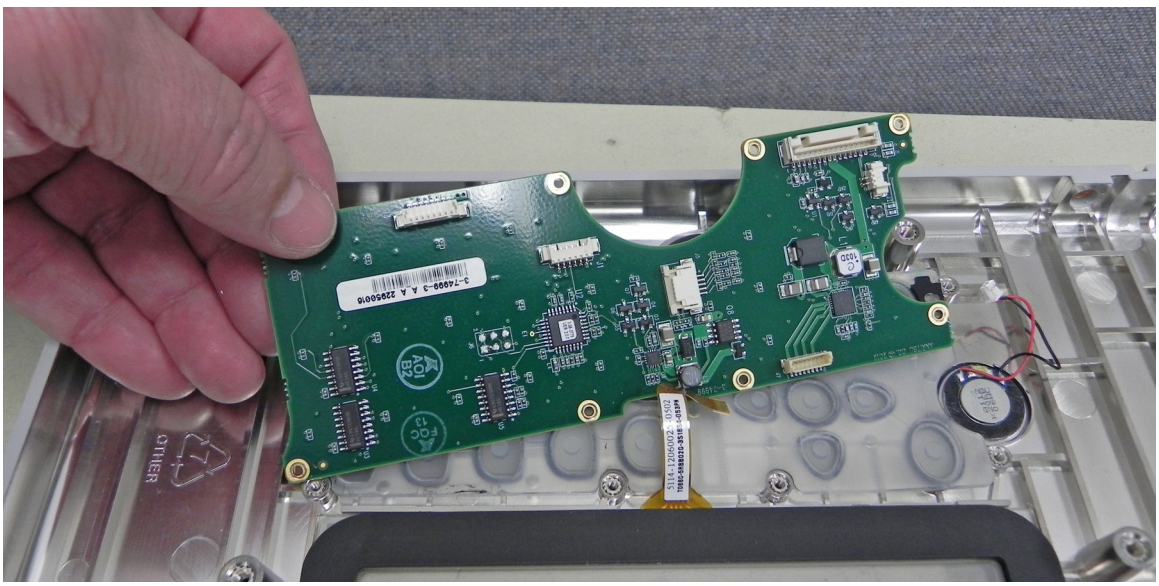


Figure 5-29. Remove Keypad PCB

9. Peal up the rubber keypad membrane (Figure 5-30).

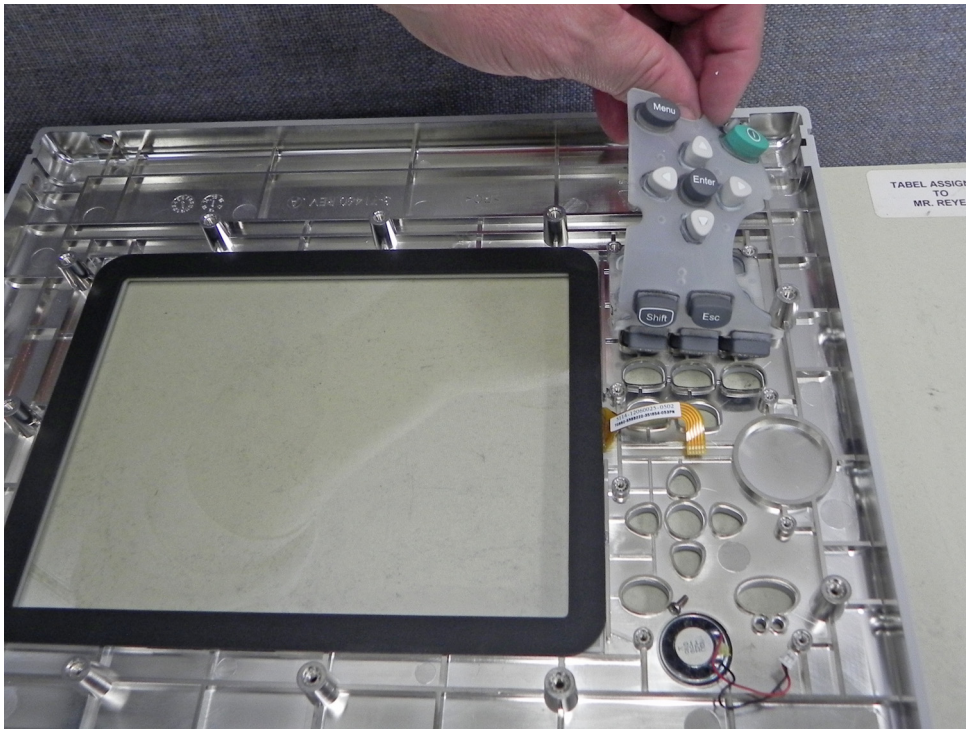


Figure 5-30. Remove Rubber Keypad Membrane

Speaker

10. Carefully pry up the speaker with a stub nosed pick. Note that the front side of the speaker has a gasket (Figure 5-31). Always replace the gasket when installing a new speaker.

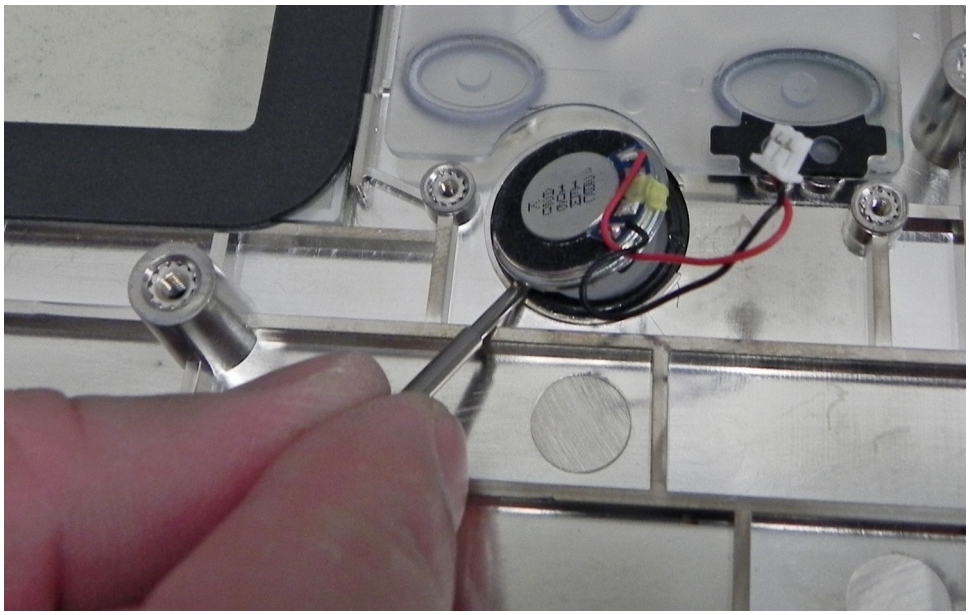


Figure 5-31. Remove Speaker

11. Remove the 4 screws holding the LCD Display to the bracket (Figure 5-32).

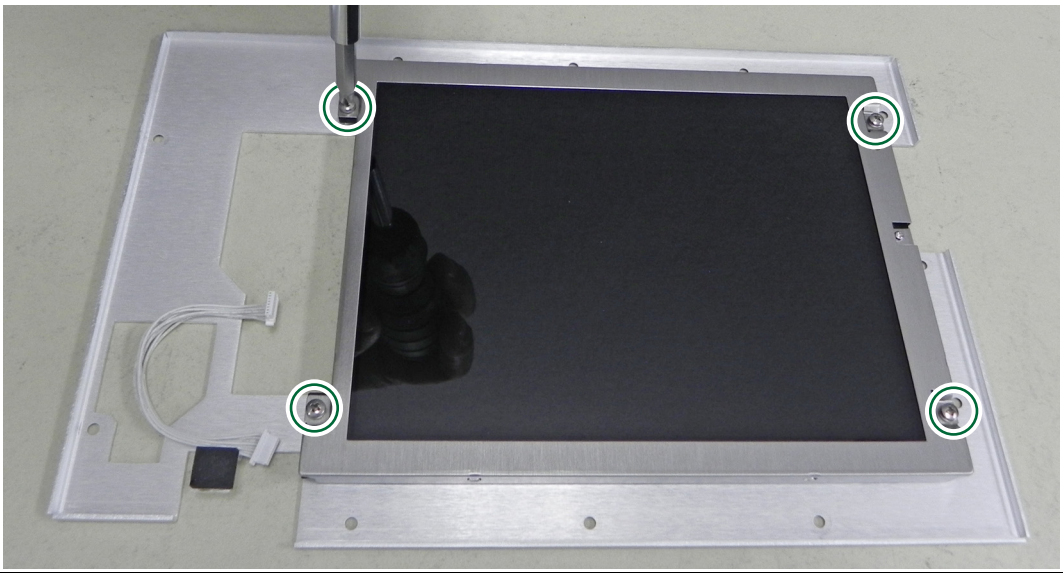


Figure 5-32. Replace LCD

12. Reverse the above steps to reassemble the front panel assembly.

Note the correct cable path shown below when reattaching the LCD bracket to the front panel (Figure 5-33).

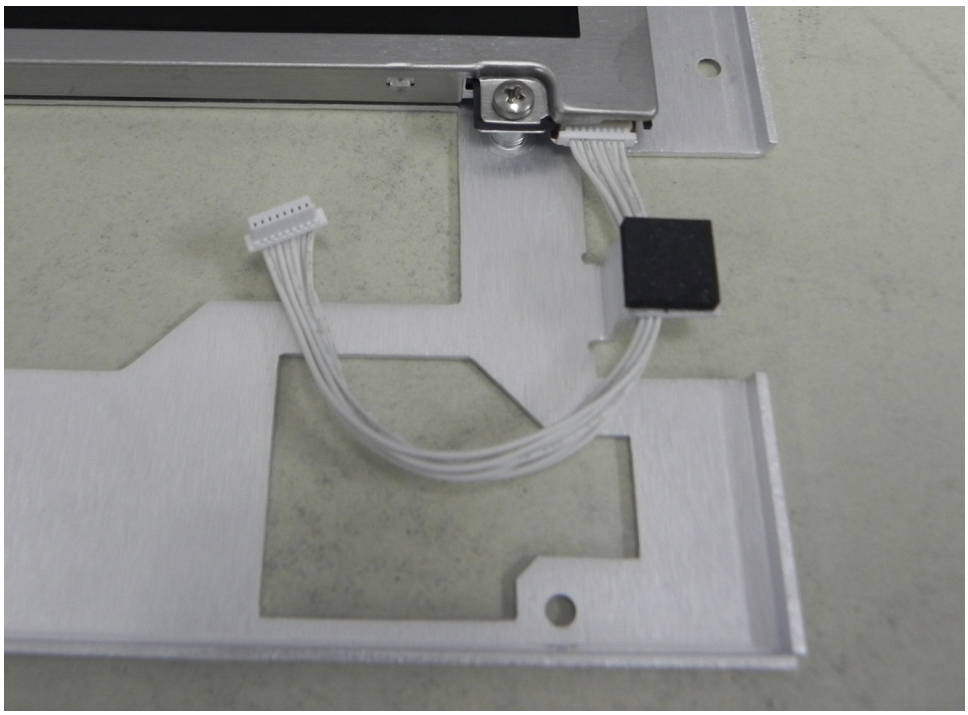


Figure 5-33. LCD Cable Path

13. Reverse the above steps to reassemble the front panel assembly.

Note	New screws with patch lock must be used for reassembly.

5-8 Chassis Assemblies

The following steps describe a complete disassembly of the chassis allowing access to the main exchangeable assemblies for removal and replacement. Actual required steps depend on the part or assembly being replaced. The main exchange assemblies, such as the Filter, RF Module, Main PCB assemblies, as well as the option 31 and 331 PCB assemblies, are listed in Table 1-6, “List of Replaceable Parts” on page 1-5.

Note	Proper routing of the cables is important for instrument performance. Note the cable routing. Replacement of the Main PCB, RF Module, or Filter Assembly requires a full characterization with adjustments to be performed. Adjustments are not documented in this Maintenance Manual. Contact your local Anritsu Service Center for this service.

5-9 Disassembling the Bottom Case

This procedure includes all of the parts that are not included in the front panel. Replacing a PIM filter assembly requires complete disassembly of the bottom case.

Before Opening the Case

Begin by removing the following parts before you remove the front panel.

Tilt Bail

1. Remove the tilt bail, as described in “Tilt Bail” on page 5-17.

I/O Cover Plate

2. Raise the connector side panel (I/O panel) cover door and remove the 2 screws. Remove the door and attached base plate (Figure 5-34). Screw size is M3, 6 mm, flat head. Reassembly torque is 0.35 N · m (3.1 lbf · in).

Figure 5-34. Remove Door Panel

Open the Case

3. Follow the procedure in “Opening the Case” on page 5-18.

Top Cover Panel

4. Remove 6 screws from top cover panel (2 screws on top, and 2 screws on each side). Lift off the panel. See Figure 5-3 on page 5-5. Screw size is M4, 8 mm, flat head. Reassembly torque is 1.5 N · m (13 lbf · in).

Outer Cover

5. Remove the remaining 8 screws from the outer cover. See Figure 5-3 on page 5-5. Screw size is M4, 8 mm, flat head. Reassembly torque is 1.5 N · m (13 lbf · in).
6. Remove the outer cover. If GPS Option 31 is installed, then carefully pry the right side of the cover away from the I/O connector panel in order to remain clear of the GPS antenna connector. If no GPS is installed, then the cover can be sprung open slightly and raised upward to slide off the instrument assembly.

Bottom Panel (Battery Compartment)

7. Turn the instrument top down and remove the temporary screws, unplug the battery cable from the motherboard, then remove the bottom panel. The reassembly torque is 1.5 N · m (13 lbf · in).

Figure 5-35. Bottom Corner Brackets

8. While removing the case bottom (item 4 in Figure 5-36), unplug the battery connector (item 5) from the motherboard (item 1). To replace or install Option 31, refer to "Replacing the GPS Module" on page 5-40.

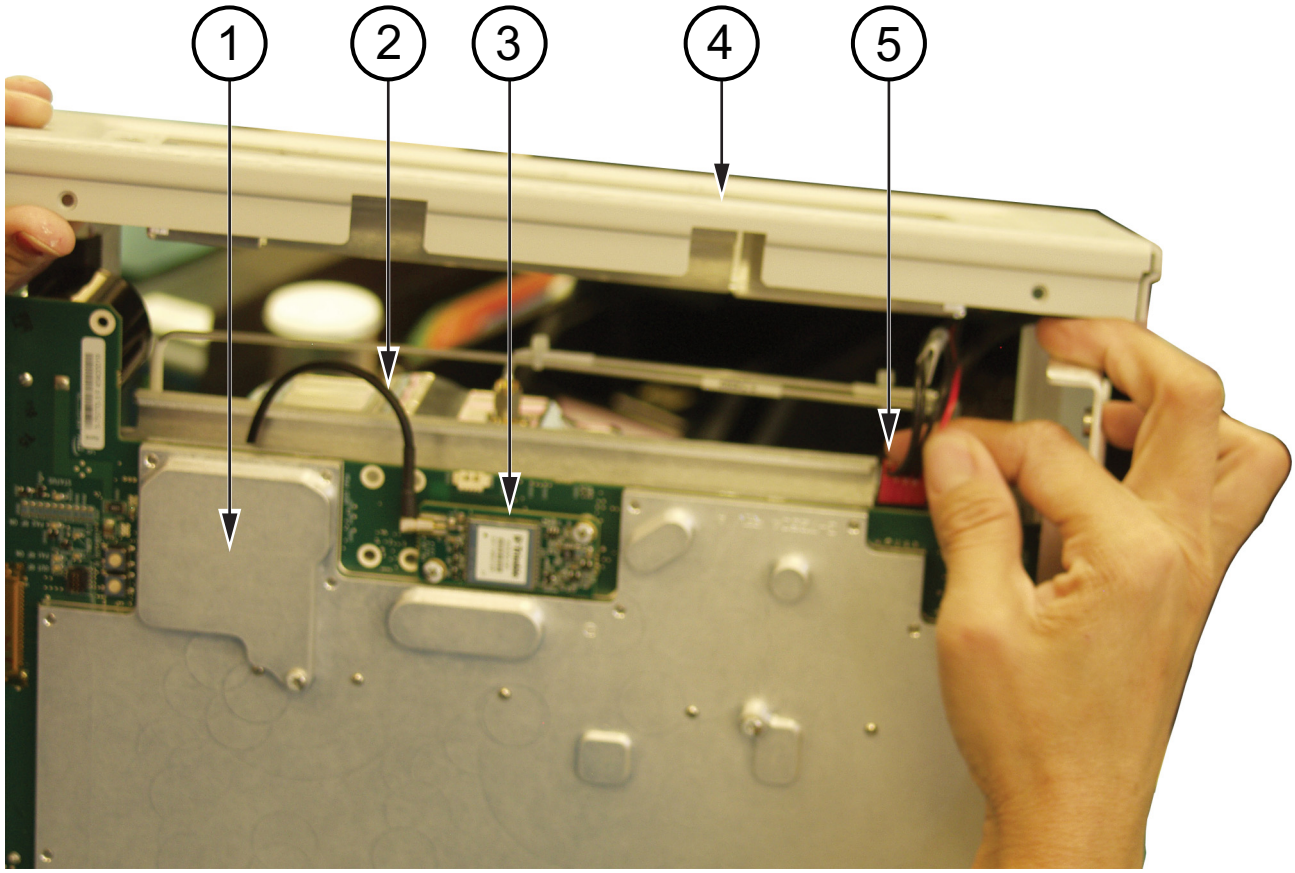


Figure 5-36. Battery Cable Connection to Motherboard

1.	Main PCB (Motherboard)
2.	GPS Antenna Cable
3.	GPS PCB
4.	Case Bottom Panel
5.	Battery Cable (Connects to Motherboard)

Left Chassis Bracket

9. Remove the left chassis bracket (item 11 in Figure 5-5 on page 5-7), which covers a motherboard screw (and also covers the VNA PCB, if installed). The narrow left chassis bracket is attached to the left filter bracket (item 10 in Figure 5-5)

10. Remove 2 screws from the left filter bracket that penetrate the edge of the motherboard.

Right Side Bracket

11. Remove 2 screws from the bracket.

Main PCB (Motherboard)

12. If VNA Option 331 is configured, then disconnect the semi-rigid cable from the VNA PCB. Remove the 2 screws holding the VNA PCB to the left filter bracket, then pull the VNA PCB away from the motherboard connection. See Figure 5-6 on page 5-8.

13. If GPS Option 31 is configured, then disconnect the GPS antenna cable from the GPS PCB. See Figure 5-43 on page 5-41.

14. Remove the five M3 x 6 screws on the perimeter (shown in Green) holding the motherboard to the chassis and the four M3 x 35 mm (shown in Red) holding the motherboard to the RF assembly (Figure 5-37). Also see Figure 5-10, "Main PCB Attachment" on page 5-12. Filter removal is not required if only the motherboard is being changed.

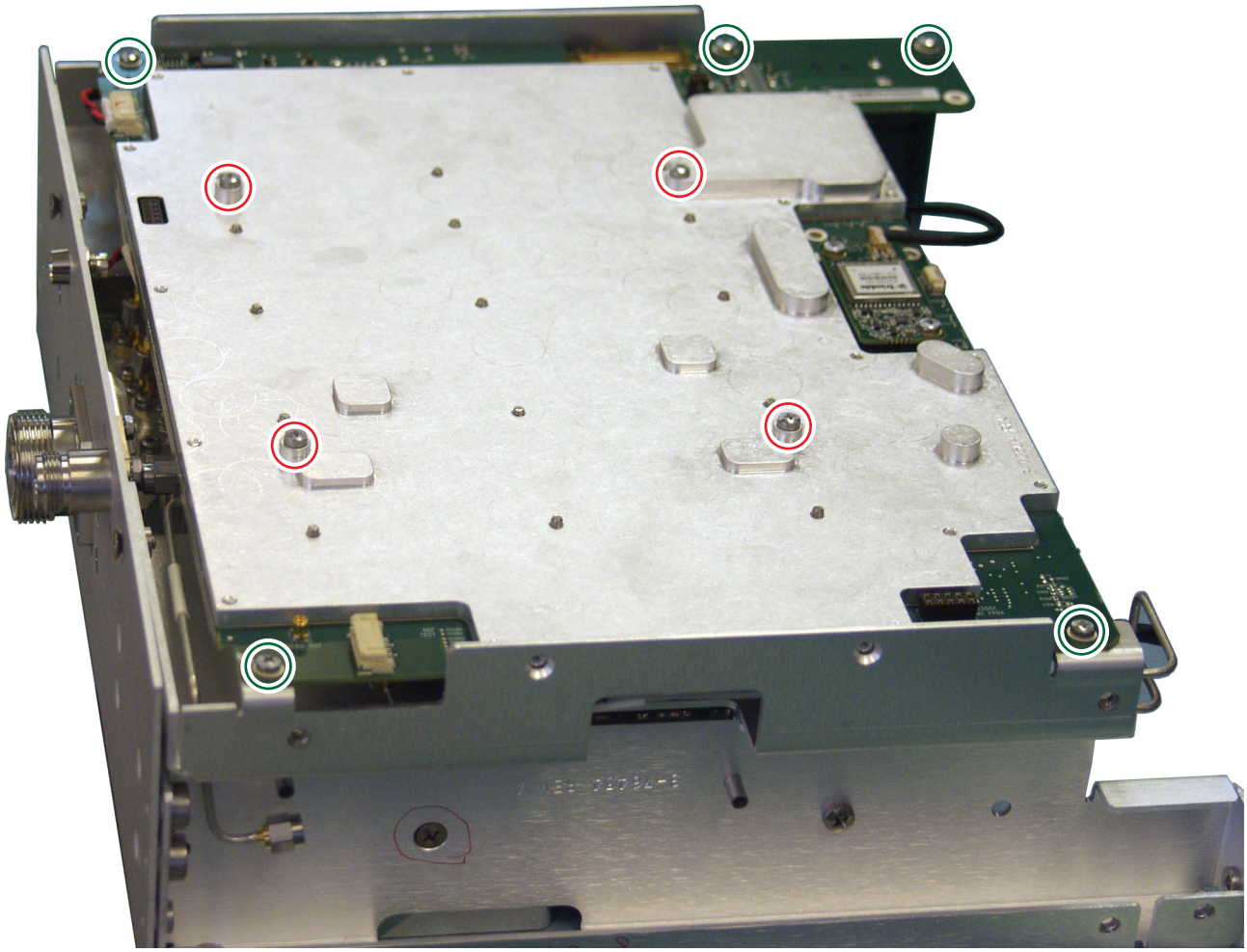


Figure 5-37. Remove and Replace Motherboard

15. Disconnect cables from the motherboard:

- LCD display cable
- Keypad cable
- LED cable for RF ON light

16. Carefully lift the motherboard by both edges to disconnect it from the RF Board.

Connector Panel

17. Disconnect the VNA cable from the connector panel.

18. Remove screws from the connector panel and lift it off the assembly.

RF Board

19. Remove the 5 semi-rigid cables from the RF board.

20. Remove the 2 screws from RF board (holding it to the chassis tray).

21. Remove the RF board.

Chassis Tray

22. Remove the screws and the chassis tray.

Left Filter Bracket

23. Remove one screw (or two screws for Option MW82119B-0700) from the bracket and remove it from the Filter Assembly.

PIM Filter

24. For options MW82119B-0800 and MW82119B-0850, remove the PIM filter assembly from the filter tray. Secure the new PIM filter assembly to the tray for reassembly.

25. For options MW82119B-0194, MW82119B-0600, MW82119B-0700, MW82119B-0701, MW82119B-0703, MW82119B-0900, MW82119B-0180, MW82119B-0210, and MW82119B-0260, no filter tray is used. Disassembly is complete.

5-10 Assembling the Bottom Case

Note	New screws with patch lock must be used for reassembly.

PIM Filter

1. Place the PIM filter assembly into the filter tray (if a filter tray is used).

Note	The design and size of the PIM filter assemblies and RF assemblies vary based on the Option number of the MW82119B. The following steps describe both assemblies. Hole patterns also vary based on MW82119B option.

Left Filter Bracket

2. Turn the filter on its side and attach the left filter bracket. Use 1 screw, size M4, 8 mm, pan head (item 1 in Figure 5-38).
3. If the model is MW82119B-0700, then an extra flat head screw is used, size M4, 10 mm, flat head (item 2 in Figure 5-38).

   The screw torque is 1.5 N · m (13 lbf · in) for both types of screw.

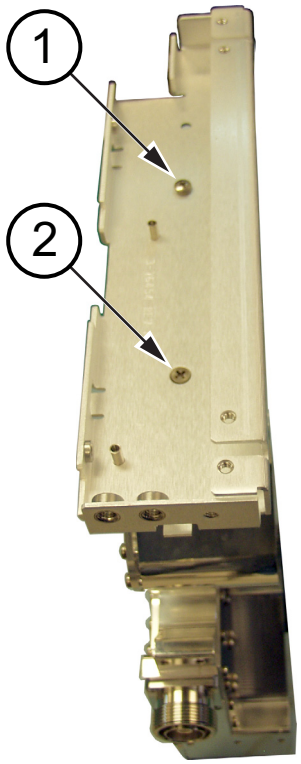


Figure 5-38. Left Filter Bracket

Chassis Tray

4. Lay the filter assembly flat and place the chassis tray on the filter and the left filter bracket. Use 2 screws size M4, 8 mm, flat head to attach the chassis tray to the left filter bracket.
   The screw torque is 1.5 N · m (13 lbf · in).

RF Board

5. Place the RF Board on the chassis tray and use alignment pins to position it on the chassis tray. The 35 mm M3 screws for the motherboard can be used for alignment. Turn each screw counterclockwise until it clicks into the threaded hole of the chassis tray, then turn clockwise a few turns to hold the RF Board in alignment.
6. Use 2 screws, size M3, 6 mm, pan head, to secure the RF Board to chassis tray. See item 2 in Figure 5-40 on page 5-37.
7. Attach the GPS antenna cable to the chassis tray (if Option 31 is configured). Hand tighten the nut on the antenna connector. No torque is specified.
8. Connect the semi-rigid cables to J2 and J3 of the RF Board, then connect them to the forward and reverse terminals of the filter. See item 1 in Figure 5-40. Torque the connections to 0.9 N · m (8 lbf · in).

   For Option MW82119B-0700 ONLY, tie wrap these cables together. See Figure 5-39.

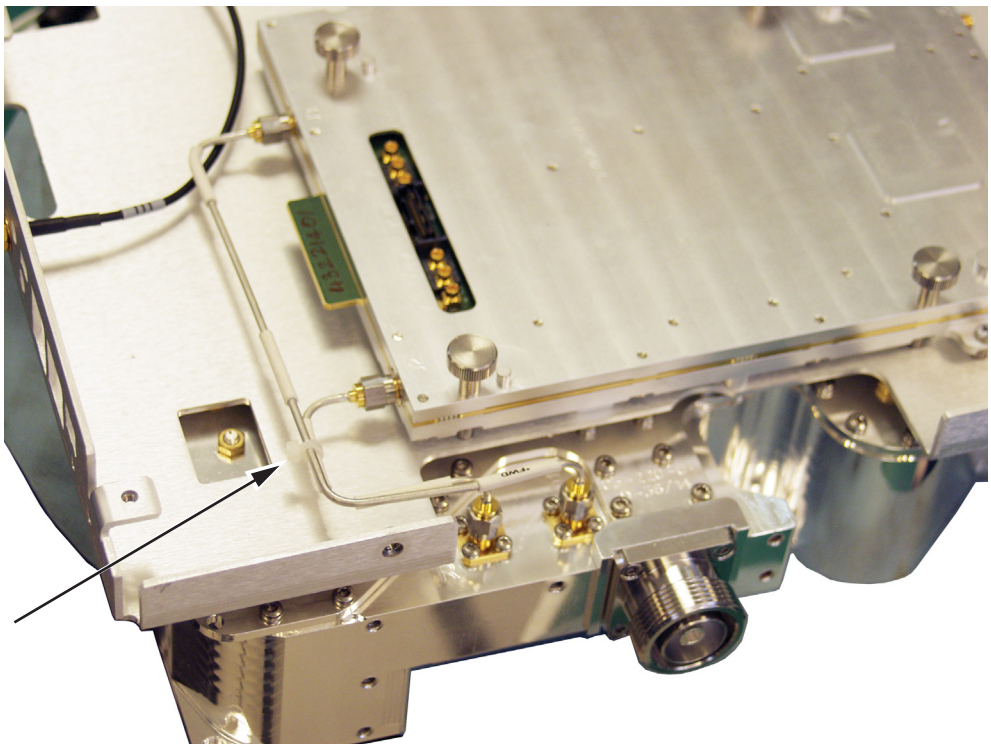


Figure 5-39. Semi-Rigid Cables from J2 and J3 Tie Wrapped

9. Connect the semi-rigid cables to J1, J4, and J5 of the RF Board, then connect them loosely to the filter. See item 1 in Figure 5-40.

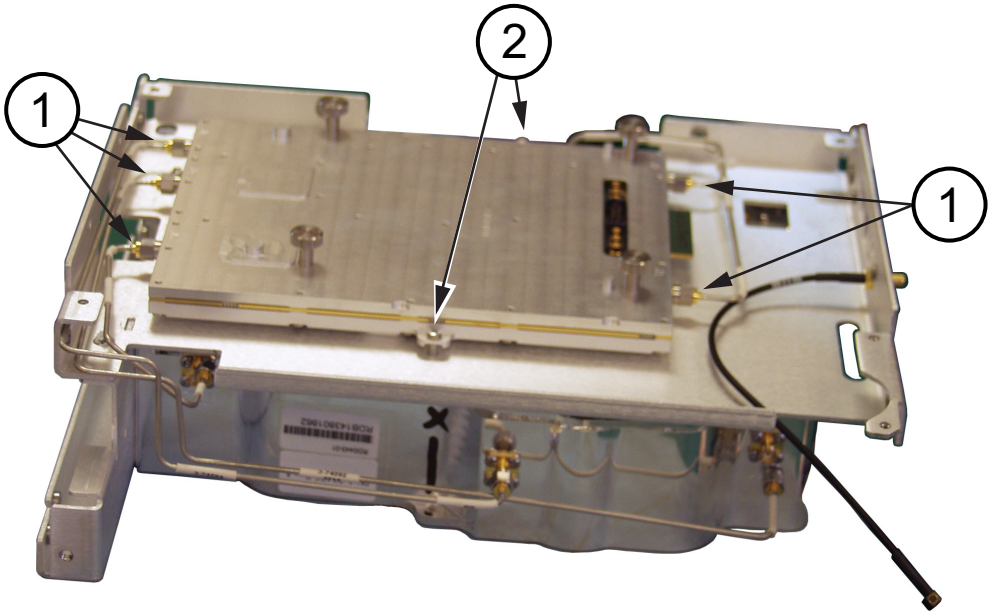


Figure 5-40. RF Board in Chassis Tray

Connector Panel

10. Secure the top connector panel with screws, size M4, 8 mm, flat head.
The screw torque is 1.5 N · m (13 lbf · in).

11. If Option 331 is configured, then attach the semi-rigid cable to the VNA RF Out connector. This cable is routed through the chassis tray and the left filter bracket. See Figure 5-6 on page 5-8.

GPS

12. If Option 31 is configured, install the GPS PCB on the motherboard. Refer to "Replacing the GPS Module" on page 5-40.

Main PCB Assembly (Motherboard)

13. Connect the LCD Display cable to the motherboard and secure it with Mylar tape.

14. Connect the keypad PCB cable to the motherboard.

15. Place the motherboard carefully on the chassis tray and use alignment pins to position it on the chassis tray. The 35 mm M3 screws for the motherboard can be used for alignment. Turn each screw counterclockwise until it clicks into the threaded hole of the chassis tray, then turn clockwise a few turns to hold the board in alignment. View the space between the motherboard and RF board to check for close contact.

16. Tighten the 4 screws to a torque of 0.7 N · m (6 lbf · in), then tighten again to a torque of 1.5 N · m (13 lbf · in). Again view the space between the motherboard and RF board to verify close contact.

17. Attach the 5 screws that hold the periphery of the motherboard to the chassis tray. Torque is 0.7 N · m (6 lbf · in).

18. Connect the RF ON LED cable to the motherboard.

19. If Option 31 is configured, connect the GPS antenna cable to the GPS PCB.

Right Side Bracket

20. Place the instrument assembly on its side with the left filter bracket down. Place the right side bracket on the assembly and secure it with 4 screws. The screws are size M4, 8 mm. Two are pan head, and two are flat head. See item 7 and item 8 in Figure 5-8 on page 5-10

Left Chassis Bracket

21. Attach 2 screws through the left filter bracket into the edge of the motherboard. Screw size is M3, 8 mm, flat head. Torque is 0.7 N · m (6 lbf · in).

22. If Option 331 is configured, then place the VNA PCB into the left filter bracket and align it with the motherboard connector. When aligned, press it into the motherboard connection and secure it with 2 screws, size M3, 6 mm, pan head. Torque is 0.7 N · m (6 lbf · in). Refer to "Replacing the VNA PCB" on page 5-42.

23. Connect the semi-rigid cable to the VNA PCB. Torque the connection to 0.9 N · m (8 lbf · in).

24. Place the left chassis bracket over the left filter bracket and secure it with 2 screws, size M4, 10 mm, flat head. Torque is 1.5 N · m (13 lbf · in).

J1, J4, J5

25. Turn the assembly top down and connect the semi-rigid cables from the RF board to the filter assembly. J1, J4, and J5 on the RF board connect to Rx1, Tx1, and Tx2 on the filter. Torque the connections to 0.9 N · m (8 lbf · in).

For Option MW82119B-0700 ONLY, tie wrap these cables together in two places. See Figure 5-41. For Option MW82119B-0703 only, attach semi-rigid cables from the RF board J1 and J4 to the filter assembly Rx1 and Tx1. Attach semi-rigid cable from RF board J5 to the small band pass filter mounted to the chassis tray above the RF PCB.

Figure 5-41. Tie Wrapping Cables for Option 700

Bottom Panel (Battery Compartment)

26. Place the bottom panel, connect the battery cable to the motherboard, and secure the panel temporarily with two screws.

Cover Panel

27. If GPS Option 31 is configured, then stretch the cover panel around the I/O side of the assembly to keep clear of the GPS antenna connector. Secure the panel with screws size M4, 8 mm, flat head. Assembly torque is 1.5 N · m (13 lbf · in). Without GPS, the cover panel can slide straight down the assembly.

Top Cover Panel

28. Place the panel on top of the assembly and secure it with 6 screws, size M4, 8 mm, flat head. Assembly torque is 1.5 N · m (13 lbf · in).

29. Add additional screws to the bottom of the cover panel.

Front Panel

30. Connect the keypad cable to the motherboard and secure it with Mylar tape.

31. Partially close the panel and connect the LCD cable to the motherboard.

32. Close the front panel and secure it with 8 screws, size M4, 10 mm, pan head. Use metal washers against the panel and add polyurethane washers over them. Torque is 0.7 N · m (6 lbf · in).

5-11 Replacing the Main PCB

Removing

1. To replace only the Main PCB (motherboard), first follow the procedure "Disassembling the Bottom Case" on page 5-30 from Step 1 on page 5-30 through Step 16 on page 5-33.

Replacing

2. To replace the Main PCB, follow the procedure "Assembling the Bottom Case" on page 5-35 from Step 13 on page 5-38 to Step 32 on page 5-39, but skip over (do not perform) Step 25 on page 5-39.

5-12 Replacing the GPS Module

To replace only the GPS PCB, first follow the procedure "Disassembling the Bottom Case" on page 5-30, from Step 1 on page 5-30 through Step 6 on page 5-31. When the cover of the bottom case is removed, you have access to the GPS PCB on the Main PCB.

Removing

1. First remove the antenna cable from the GPS PCB. The antenna cable with an MMCX(m) connector attaches to the GPS module (see Figure 5-43 on page 5-41).
2. Next, remove the GPS module (PCB). The GPS module is mounted onto the mother board with two screws (Figure 5-42).

Figure 5-42. GPS Module (Option 31) on Motherboard

3. If replacing the GPS antenna cable, then the motherboard must be removed to provide access to insert the antenna connector into the chassis tray. This requires additional disassembly from Step 7 on page 5-31 through Step 16 on page 5-33.
4. Remove and replace the antenna cable. Use a wrench to hold the inside of the SMA(f) connector and securely tighten the nut. No torque is specified.

Replacing

5. Attach the replacement GPS module to the motherboard and torque the screws. Screw size is M3, 6 mm, pan head. Reassembly torque is 0.7 N · m (6 lbf · in).
6. If the GPS antenna cable has been replaced, remount the motherboard. Follow Step 15 on page 5-38 through Step 17.
7. Connect the LCD Display cable to the motherboard and secure it with Mylar tape.
8. Connect the keypad PCB cable to the motherboard.
9. Connect the RF ON LED cable to the motherboard.

10. Attach the antenna cable MMCX(m) connector to the GPS PCB (see Figure 5-43 on page 5-41).
11. Follow the assembly procedure, starting at Step 20 on page 5-38. Skip over (do not perform) Step 25. Then continue to Step 32 on page 5-39.

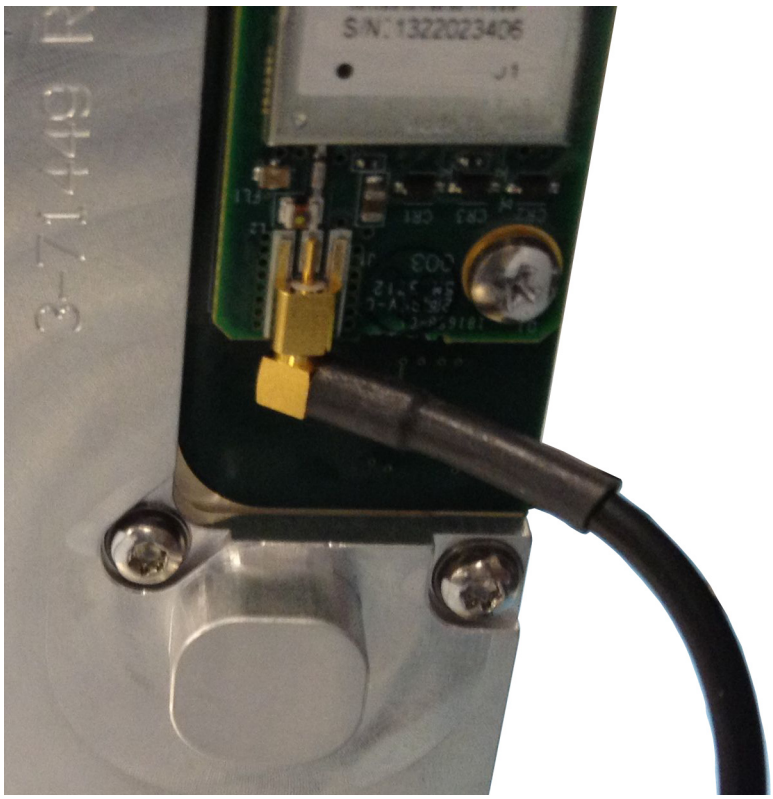


Figure 5-43. GPS Module with MMCX Cable Attached

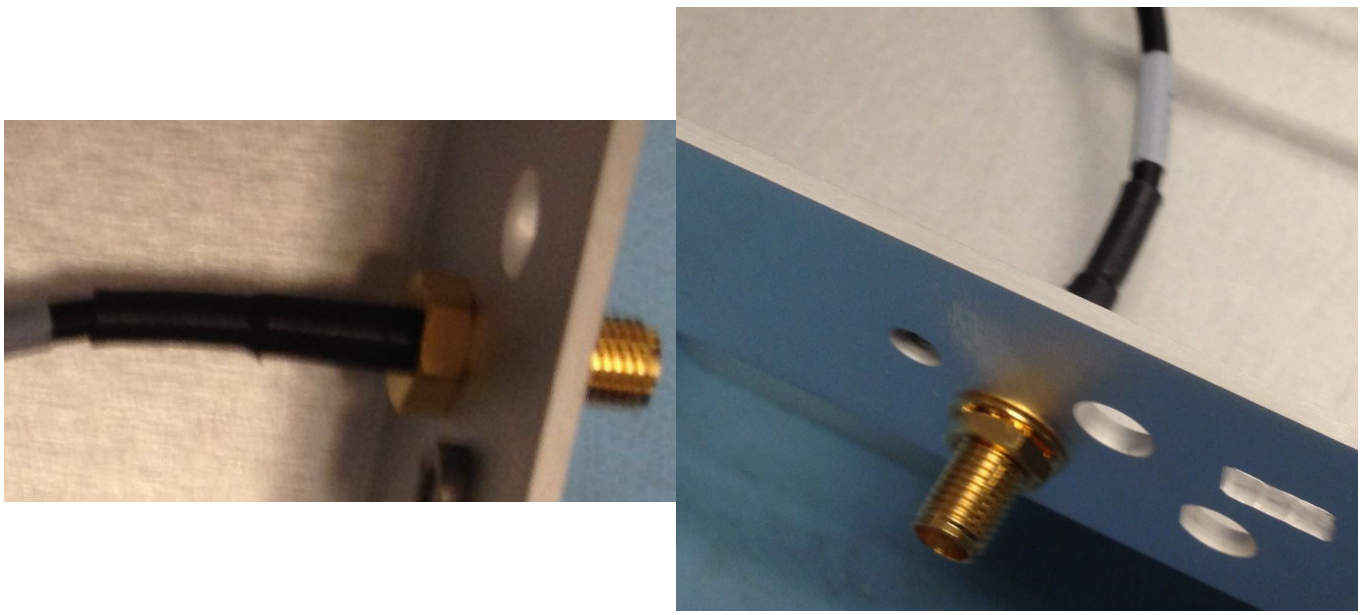


Figure 5-44. GPS SMA Connection on Connector Panel (inside and outside view)

5-13 Replacing the VNA PCB

Removing

1. To replace only the Cable and Antenna Analyzer (VNA) PCB Assembly, Option 331, first follow the procedure "Disassembling the Bottom Case" on page 5-30, from Step 1 on page 5-30 through Step 10 on page 5-32, but skip over (do not perform) Step 7 and Step 8.
2. When the cover of the bottom case is removed, you have access to the VNA PCB on the left filter bracket after you remove the left chassis bracket. Disconnect the semi-rigid cable and then remove the two screws.
3. Pull the VNA PCB away from the motherboard connection, then lift it from the left filter bracket.

4. Replace the semi-rigid cable if necessary. Disconnect it from the top connector panel and carefully extract it from the chassis tray and the left filter bracket (see Figure 5-6 on page 5-8).

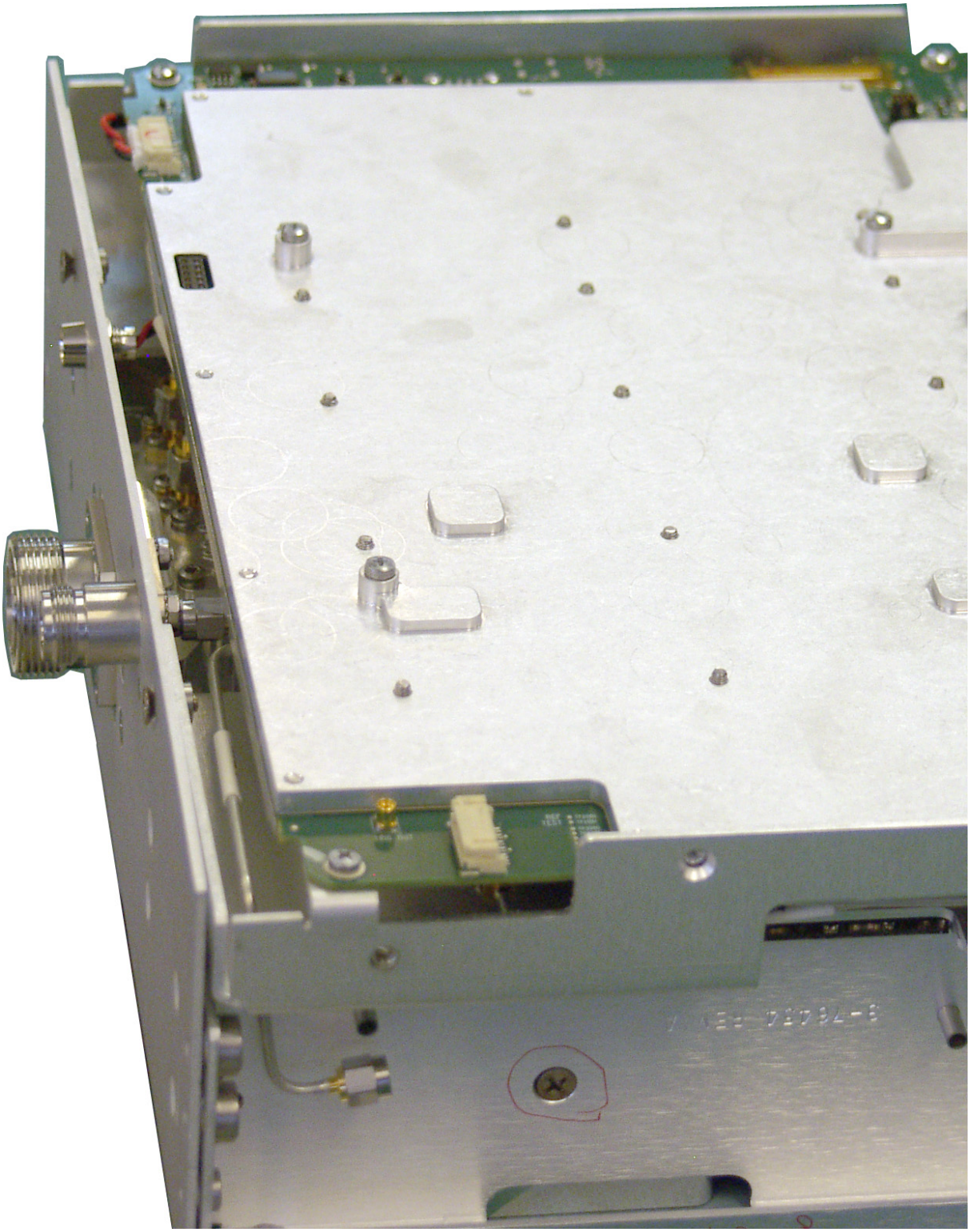


Figure 5-45. VNA Option 331 Semi-Rigid Cable Attached to VNA RF Out Connector

Replacing

5. If the semi-rigid cable was replaced, then carefully insert the new cable into the chassis tray and the left filter bracket. Attach it to the top connector panel. Tighten to 0.9 N · m (8 lbf · in).
6. To replace the VNA PCB assembly, place the assembly into the left filter bracket and carefully align its connector with the motherboard connector. Press the VNA PCB assembly into the motherboard. Refer to Step 22 and Step 23 on page 5-38.
7. Use 2 screws, size M3, 12 mm, pan head. Reassembly torque is 0.7 N · m (6 lbf · in).
8. Connect the semi-rigid cable and tighten to 0.9 N · m (8 lbf · in).
9. Place the left chassis bracket onto the left filter bracket and secure it with 2 screws, size M4, 10 mm, flat head. Reassembly torque is 1.5 N · m (13 lbf · in).
10. Continue assembly from Step 27 on page 5-39. End with Step 32 on page 5-39.

Appendix A — Test Records

A-1 Introduction

This appendix provides test records that can be used to record the performance of the PIM Master. Make a copy of the following Test Record pages and document the measured values each time performance verification is performed. Continuing to document this process with each performance verification session provides a detailed history of the instrument performance.

Warning	The Anritsu PIM Master is capable of producing up to 80 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields: • Always terminate the output port of the test equipment into a load, a loaded line, or a line that will radiate or absorb the energy before beginning a PIM test. • Confirm that the PIM Master RF power is off after a PIM test. • Always confirm that the RF power is off before disconnecting a coaxial connection, otherwise RF burns may result. Immediate burns to fingers or eyes can result from exposure to live connectors. • Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

A-2 Reference PIM Measurement

Table A-1. Reference PIM Measurement with PIM Standard

PIM Master MW82119B	IM3 Frequency	Expected Values from Table 2-1 on page 2-3	Measurement Reading
Option	MHz	dBm ± 3 dB	dBm
The below entry is used only for the second IM3 of option 700, 701, 702, 703, or 194			
Option	MHz	dBm ± 3 dB	dBm

A-3 Output Power

Table A-2. Test Component F1 Characterization

Test Component Correction Factor		Signal Generator Frequency and Power	Power Reading from Signal Generator	Power Reading with Test Component
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
The below entries are only for second F1 of option 194				
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm

Table A-3. Test Component F2 Characterization

Test Component Correction Factor		Signal Generator Frequency and Power	Power Reading from Signal Generator	Power Reading with Test Component
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
The below entries are only for second F2 of option 194				
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm
dBm at	MHz	MHz at 0 dBm ± 0.2 dB	dBm	dBm

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Output Power (continued)

Output Tone Power Accuracy

Table A-4. PIM Output Tone Power Accuracy

PIM Master MW82119B	Tone Frequency and Power	Expected Power Reading and Tolerance	Measured Value
F1 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
The below entries are used only for the second set of carriers for option 194			
F1 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 20 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 43 dBm	dBm ± 1.0 dB	dBm

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

Table A-4. PIM Output Tone Power Accuracy

PIM Master MW82119B	Tone Frequency and Power	Expected Power Reading and Tolerance	Measured Value
F1 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F1 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm
F2 Carrier	MHz at 46 dBm	dBm ± 1.0 dB	dBm

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

A-4 Residual PIM Measurement

Table A-5. Residual PIM Measurement

PIM Master MW82119B	Carrier Frequencies (F1 and F2)	Tolerance	Measurement Reading	
Option 180	1805 MHz and 1880 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 194	1930 MHz and 1990 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 194	1930 MHz and 2130 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 210	2110 MHz and 2170 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 260	2620 MHz and 2690 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 700	734 MHz and 757 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 701	768 MHz and 803 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 702	768 MHz and 803 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 703 (2-Port)	700 MHz and 717 MHz Power output: 2 x 43 dBm Power output: 2 x 46 dBm	 < –123 dBm < –115 dBm	 dBc and dBc and	 dBm dBm
Option 800	791 MHz and 821 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 850	869 MHz and 894 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 900	935 MHz and 960 MHz	< –160 dBc and < –117 dBm	dBc and	dBm
Option 902	935 MHz and 960 MHz	< –160 dBc and < –117 dBm	dBc and	dBm

Table A-6. 2-Port Residual PIM Measurement, (MW82119B-0703 only)

Power Output	Swept PIM IM3 Frequency Range	Tolerance	Measurement Reading	
2 x 43 dBm	700-717 MHz	<-123 dBm	dBc and	dBm
2 x 46 dBm	700-717 MHz	<-115 dBm	dBc and	dBm

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

A-5 PIM Frequency Accuracy

Table A-7. PIM Frequency Accuracy

MW82119B Option	F1 Frequency	Measured Value	Specification* (3 ppm)	Aging Specification
600	617 MHz		±1.851 kHz	±617 Hz
700	731 MHz		±2.193 kHz	±731 Hz
702	768 MHz		±2.304 kHz	±768 Hz
703	731 MHz		±2.193 kHz	±731 Hz
800	791 MHz		±2.373 kHz	±791 Hz
850	869 MHz		±2.607 kHz	±869 Hz
900	927 MHz		±2.781 kHz	±927 Hz
902	927 MHz		±2.781 kHz	±927 Hz
180	1805 MHz		±5.415 kHz	±1805 Hz
194	1930 MHz		±5.790 kHz	±1930 Hz
210	2111 MHz		±6.333 kHz	±2111 Hz
260	2660 MHz		±7.860 kHz	±2660 Hz

* Specification applies to instruments in their first year. Add the Aging specification value for each year of age thereafter. For example, Option 700 in its third year would equate to:
Specification + (Aging x 2) = ±3.655 kHz or 5 ppm.

A-6 Cable and Analyzer Frequency Accuracy (For units with Option 331)

Table A-8. Cable and Analyzer Frequency Accuracy

Frequency	Measured Value	Specification
2 GHz (2000 MHz)		± 6.0 kHz (± 3 ppm)*

*To account for Aging, add 2 kHz (1 ppm) per year (after the first year) to the value stated in the Specification column.

MW82119B Firmware Rev: _____ **Operator:** _____ **Date:** _____

Serial Number: _____ **Options:** _____

A-7 Return Loss Measurement Accuracy (For units with Option 331)

Table A-9. Cable and Analyzer Return Loss Measurement Accuracy (2 MHz to 3 GHz)

Return Loss	Measured Value	Specification
6 dB		–4.8 dB ≥ x ≥ –7.2 dB
20 dB		–18.3 dB ≥ x ≥ –21.7 dB

A-8 1900 MHz Input Port Tests

Table A-10. Functionality Tests

PIM Master MW82119B	Input Frequency	Expected DUT Rx Level Indication	DUT Measured Value
Option 600	1867 MHz	–80 dBm ±0.5 dB	dBm
Option 600	1877 MHz	–80 dBm ±0.5 dB	
Option 600	1886 MHz	–80 dBm ±0.5 dB	dBm

A-9 IM2 Input Port Tests

Table A-11. Functionality Tests

PIM Master MW82119B	Input Frequency	Expected DUT Rx Level Indication	DUT Measured Value
Option 902	1876.5 MHz	–80 dBm ±0.5 dB	dBm
Option 902	1892 MHz	–80 dBm ±0.5 dB	
Option 902	1908 MHz	–80 dBm ±0.5 dB	dBm

MW82119B Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

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490 Jarvis Drive
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USA
http://www.anritsu.com