

Maintenance Manual

PIM Master™

MW8208A, MW8209A, MW8219A

Passive InterModulation Analyzer

MW8208A: 869 MHz to 894 MHz

MW8209A: 925 MHz to 960 MHz

MW8219A: 1930 MHz to 1930 MHz and 2110 MHz to 2155 MHz



Safety Symbols

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

Symbols Used in Manuals

Danger



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

Warning



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

Caution



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

Safety Symbols Used on Equipment and in Manuals

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



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



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



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



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



These indicate that the marked part should be recycled.

For Safety

Warning



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

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

Warning



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

Warning



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

Warning



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

Caution



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

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

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Chapter 1 — General Information

The Anritsu PIM Master is capable of producing up to 100 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields:

Warning

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.

RF power can be immediately turned off with the Emergency Stop button.

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 models MW8208A, MW8209A and MW8219A.

The information includes:

- [Chapter 1, “General Information”](#)
- [Chapter 2, “PIM Analyzer Verification”](#)
- [Chapter 3, “Troubleshooting”](#)
- [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, the following terms apply:

- PIM Master refers to models MW8208A, MW8209A and MW8219A.
- Controller refers to any of the Anritsu handheld RF and microwave instruments that are capable of controlling the PIM Master. Refer to the PIM Master Product Brochure (part number: 11410-00546) for specifications and a list of handheld instrument models that support the Passive Inter-Modulation (PIM) Analyzer and the Distance-to-PIM™ Analyzer.

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 button or main menu button) is assumed. Refer to the PIM Master User Guide (Anritsu part number: 10580-00280).

1-2 Product Description

The MW8208A, MW8209A, and MW8219A PIM Master models are portable passive inter-modulation analyzers featuring precise performance for the GSM(850 MHz), E-GSM (900 MHz), PCS, and AWS cellular frequency bands. They are 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 the Anritsu family of PIM Master compatible handheld RF instruments (refer to [Section 1-1](#)) measure the third-order, fifth-order, or seventh-order inter-modulation 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 spectrum analyzer. This provides a measurement of the overall linearity of the antenna system and the surrounding environment. PIM Analyzer Option 0419 for select models of the Anritsu family of RF handheld instruments is no longer required because the PIM Analyzer mode will be already available (as a standard feature) to the end user with the handheld instrument.

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 Anritsu handheld instrument.

Standard Features

Table 1-1. PIM Master Standard Features

Feature	MW8219A	MW8209A	MW8208A
RF Power	2 x 20 W, 2 x 30 W, 2 x 40 W	2 x 20 W, 2 x 30 W, 2 x 40 W	2 x 20 W, 2 x 30 W, 2 x 40 W
Tx Freq Band	1930 MHz to 1990 MHz 2110 MHz to 2155 MHz	925 MHz to 960 MHz	869 MHz to 894 MHz
IMD Band	1710 MHz to 1755 MHz 1850 MHz to 1910 MHz	880 MHz to 915 MHz	794 MHz to 969 MHz
IMD Orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders	3rd, 5th, or 7th orders

Options

Option 425 is the Large Wheel Option and is available for all PIM Master instruments.

Optional Accessories

Table 1-2. PIM Master Optional Accessories

Part Number	Description
2000-1637-R	PIM Master Accessory Kit With Torque Wrench (consists of MA82103A, 1091-390-R, 1091-385-R, 1091-386-R, 1091-387-R, 1091-388-R, 1091-389-R, 2000-1626-R, 67135, 01-510, 01-512, 01-513)
2000-1638-R	PIM Master Accessory Kit Without Torque Wrench (consists of MA82103A, 1091-390-R, 1091-385-R, 1091-386-R, 1091-387-R, 1091-388-R, 1091-389-R, 2000-1626-R, 67135, 01-510)
MA82103A	Low PIM Load/Termination 700 MHz to 2200 MHz, 80 W CW, 7/16 DIN(f), 50 Ω
1091-390-R	PIM Standard, $-80 \text{ dBm} \pm 3 \text{ dB}$, at 1775 MHz, 20 W, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-403-R	PIM Standard, $-80 \text{ dBm} \pm 3 \text{ dB}$, at 910 MHz, 20 W, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-385-R	Adapter, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
1091-386-R	Adapter, 7/16 DIN(f) to N(m), 50 Ω
1091-387-R	Adapter, 7/16 DIN(f) to 7/16 DIN(m), 50 Ω
1091-388-R	Adapter, 7/16 DIN(f) to 7/16 DIN(f), 50 Ω
1091-389-R	Adapter, 7/16 DIN(f) to N(f), 50 Ω
01-510	Crescent Wrench (Adjustable Spanner)
01-512	1 inch, 25 N·m, Torque wrench
01-513	1.25 inch, 25 N·m, Torque wrench

1-3 Related Documents

Other documents are available for the PIM Master at the Anritsu Web site at:

www.anritsu.com:

- PIM Master User Guide, part number: 10580-00280
- PIM Master Product Brochure, part number: 11410-00546
- Interference Troubleshooting Guide, part number: 11410-00472
- Spectrum Analyzer Measurement Guide, part number: 10580-00244

1-4 Anritsu Customer Service Centers

For the latest service and sales information in your area, please 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 1-3. Recommended Test Equipment for PIM Master Verification

Equipment	Critical Specification	Recommended Manufacturer/Model
Synthesized Signal Generator	Frequency: 0.1 Hz to 20 GHz, Power Output: +16 dBm, Step attenuator installed	Anritsu Model MG3692A or MG3692B with Options 2A, 4, 22, 15x ^a
Power Meter	Power Range: –70 to +20 dBm	Anritsu Model ML2438A
Power Sensor	Frequency: 100 kHz to 18 GHz Power Range: –67 dB to +20 dB	Anritsu Model MA2421D or SC7400 (Quantity 1)
Spectrum Analyzer	Frequency: 3 GHz Power Range: to +20 dBm	Anritsu Model MT8212E or MS2721B or MT8222A
Low PIM Load	150 W, 160 dBc PIM, 700 MHz to 2200 MHz, 50 Ω	Anritsu Model MA82103A
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
Fixed Attenuator	30 dB, 50 W, 50 Ω	Anritsu Model 3-1010-123
Adapter	K(m) to N(f), 50 Ω	Anritsu Model 34RKNF50
Adapter	N(f) to N(f), 50 Ω	Anritsu Model 34NFNF50
Adapter	7/16 DIN(f) to N(m), 50 Ω	Anritsu Model 1091-386-R
Adapter	7/16 DIN(m) to 7/16 DIN(m)	Anritsu Model 1091-385-R
PIM Test Cable	3.0 m, DC to 4 GHz, 7/16 DIN(m), 50 Ω	Anritsu Model 2000-1626-R
Torque Wrench	Open End for N Connector at 12 inch pounds	Anritsu Model 01-200
Torque Wrench	1 inch, 25 N·m (16.226 lb·ft)	Anritsu Model 01-512
Torque Wrench	1.25 inch, 25 N·m (16.226 lb·ft)	Anritsu Model 01-513
Crescent Wrench (Adjustable Spanner)	Length: 10 in (254 mm) Max Width Opening: 1.375 in (34.925 mm)	Anritsu Model 01-510
Coaxial Cable	BNC(m) to BNC(m), 50 Ω	Any or Anritsu Model 2000-1627-R
Adapter	BNC Tee Jack-Plug-Jack	Any or Amphenol 31-208

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

1-6 Replaceable Parts and Assemblies

The current service policy for these models states that the MW8208A, MW8209A and MW8219A PIM Master models are factory only repair items. No replacement parts or assemblies are currently available for these instruments.

Chapter 2 — PIM Analyzer Verification

The Anritsu PIM Master is capable of producing up to 100 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields:

Warning

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.

RF power can be immediately turned off with the Emergency Stop button.

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 MW8208A, MW8209A and MW8219A PIM Master. No separate Distance-to-PIM™ (DTP) Analyzer operational verification checks are used because the PIM Analyzer operational verification tests also validate DTP functionality. The PIM Analyzer operational verification tests consist of the following:

- [“Reference PIM Measurement” on page 2-2](#)
- [“Frequency Accuracy and Output Power” on page 2-4](#)
- [“Residual PIM Measurement” on page 2-8](#)

2-2 Reference PIM Measurement

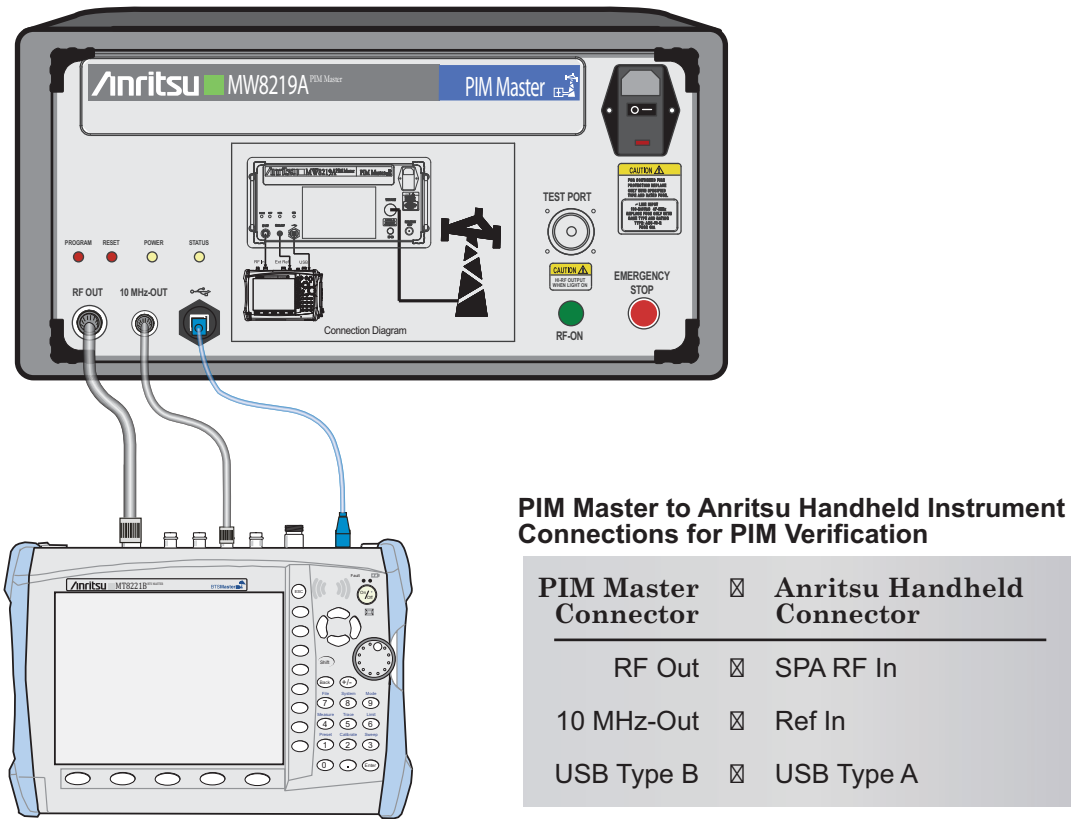
The following test is used to verify the accuracy of PIM measurements. A known PIM reference (standard) is used for verification.

Equipment Required

- Low PIM Load/Termination, Anritsu Model 1015-68-R or MA82103A
- PIM Standard, Anritsu Model 1091-390-R
- PIM Standard, Anritsu Model 1091-403-R
- Adapter, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω, Anritsu Model 1091-385-R
- PIM Master, Model MW8208A or Model MW8209A or Model MW8219A

Procedure

1. Confirm that all of the connectors are clean because any debris or contamination may cause incorrect PIM measurement results. Connect the PIM Master to the Anritsu Handheld instrument Controller as shown in [Figure 2-1](#). Models MW8208A, MW8209A, and MW8219A are tested in the same instrument configuration.



NOTE: Connector location varies among Anritsu handheld instruments.

Figure 2-1. PIM Master and Controller

2. Press the **On/Off** key to turn on the Controller.
3. Press the **Shift** key and then the **Mode** (9) key. Use the rotary knob to highlight PIM Analyzer and then press the **Enter** key to switch to PIM Analyzer mode. A dialog window displays a message that the Controller has no communication with the PIM Master, and prompts you to turn it on.

4. Turn on power to the PIM Master and allow the Controller to establish the communication link.
5. On the Controller, press the **Shift** key and then the **Preset** (1) key. Press the **Preset** submenu key to set the instrument to the factory preset state.
6. For models MW8208A and MW8209A, use the 1091-403-R PIM Standard. For model MW8219A, use the 1091-390-R PIM standard. Connect the PIM Standard to the PIM Master Test Port using the necessary torque wrench. Connect the Low PIM Termination to the PIM Standard using the DIN adapter and the necessary torque wrench. The sequence of connecting the components is important, and you must adhere to this sequence for accurate results.

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

7. On the Controller (Anritsu Handheld instrument), press the **Freq** main menu key and verify that the values for **Carrier F1** and **Carrier F2** are as indicated in the table below.

Table 2-1. Carrier Frequencies

PIM Master	Carrier F1	Carrier F2
MW8208A	871 MHz	894 MHz
MW8209A	930 MHz	950 MHz
MW8219A	1945 MHz	2115 MHz

8. On the Controller, press the **Setup** main menu key and confirm that **Output Power** is set to 20 W, that **Test Duration** is set to 20 s, that the **Normal** -> **A** key has a red indicator light, and that the **Display Type** is set to **Trace**.
9. On the Controller, press the **Measurements** main menu key, then press the **PIM** submenu key to set the instrument into the PIM Analyzer measurement mode.
10. In the **Measurements** menu, press the **Test** submenu key to initiate the test. The submenu key will have **On** underlined when the test is in progress. The test runs for 20 seconds (as set or confirmed in [Step 8](#)). Please wait until the **Test** submenu key changes to display **Off** (**Off** is underlined).
11. Note the measurement result that is displayed on the Controller. The measured result should be 123 dBc and $-80 \text{ dBm} \pm 3 \text{ dB}$.
12. Record the test results that are reported by the Controller into [Table A-1](#), “Reference PIM Measurement with -80 dBm PIM Standard” on [page A-2](#).

2-3 Frequency Accuracy and Output Power

The following test is used to verify the frequency accuracy and output power of each tone from the PIM Master. The first phase of this procedure is to characterize the “Test Component”, which consists of the Fixed Attenuator, the DIN Adapter, and the PIM Test Cable.

Component Characterization

Equipment Required

- Signal Generator, Anritsu Model MG3692x or equivalent
- Adapter, 7/16 DIN(f) to N(m), Anritsu Model 1091-386-R
- Adapter, K(m) to N(f), Anritsu Model 34RKNF50
- Adapter, N(f) to N(f), Anritsu Model 34NFN50
- Power Meter, Anritsu Model ML2438A
- Power Sensor, Anritsu Model MA2482D or equivalent
- “Test Component” from above consisting of:
 - Fixed Attenuator, 30 dB, 50 W, Anritsu Model 3-1010-123
 - Adapter, 7/16 DIN(f) to N(m), Anritsu Model 1091-386-R
 - PIM Test Cable, Anritsu Model 2000-1626-R
- PIM Master, Model MW8208A or Model MW8209A or Model MW8219A

Procedure

Follow this entire procedure for each instrument that you test.

1. Assemble the “Test Component” by connecting the Fixed Attenuator to the PIM test cable using a DIN adapter.

Caution Leave the three components (fixed attenuator, PIM test cable, and DIN adapter) 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 2-1, “Carrier Frequencies” on page 2-3](#).
3. Connect the Power Sensor directly to the Signal Generator using the K to N adapter.
4. For PIM Master, Model MW8219A, begin at [Step 5](#).
 For PIM Master, Model MW8209A, begin at [Step 12](#) by using the procedure in [Step 2](#) through [Step 11](#) with the changes noted in [Step 12](#).
 For PIM Master, Model MW8208A, begin at [Step 13](#) by using the procedure in [Step 2](#) through [Step 11](#) with the changes noted in [Step 13](#).
5. For PIM Master, Model MW8219A, set the Signal Generator to the Carrier F1 setting (1945 MHz) and adjust the level output to show 0 dBm $\pm$ 0.2 dB on the Power Meter. Record the Power Meter reading in the **Power Reading from Signal Generator** column of [Table A-2, “Test Component Characterization for MW8219A” on page A-2](#). Turn off the RF Output on the Signal Generator.
6. 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 using the second DIN adapter to the K to N adapter on the Signal Generator.
7. Turn on the RF Output of the Signal Generator. Record the Power Meter reading in the **Power Reading with Test Component** column in [Table A-2](#). Turn off the RF Output on the Signal Generator.

8. 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 this calculation in [Table A-2](#).
9. Calculate the **Expected Power Reading** by subtracting the value of Test Component Correction Factor in [Step 8](#) from 43 dBm (43 dBm – “Test Component Correction Factor” dBm). Record this calculation in [Table A-6](#), “PIM Output Tone Power Accuracy” on page A-3.
10. Repeat [Step 2](#) through [Step 9](#) using Carrier F2 as the frequency setting.
11. Remove the “Test Component” however *keep it intact to maintain test integrity* in order to continue with the next verification procedure.
12. For PIM Master, Model MW8209A, repeat [Step 2](#) through [Step 11](#) using the Carrier F1 and Carrier F2 frequencies (930 MHz and 950 MHz) for Model MW8209A and recording the test results in [Table A-3](#), “Test Component Characterization for MW8209A” on page A-2 and [Table A-6](#), “PIM Output Tone Power Accuracy” on page A-3.
13. For PIM Master, Model MW8208A, repeat [Step 2](#) through [Step 11](#) using the Carrier F1 and Carrier F2 frequencies (879 MHz and 894 MHz) for Model MW8208A and recording the test results in [Table A-4](#), “Test Component Characterization for MW8208A” on page A-2 and [Table A-6](#), “PIM Output Tone Power Accuracy” on page A-3.

Frequency Accuracy and Output Power Verification

Equipment Required

- Spectrum Analyzer, Anritsu Model MT8212E or equivalent
- BNC male to BNC male Cable, Anritsu Model 2000-1627-R
- BNC Tee Jack-Plug-Jack, Amphenol 31-208
- “Test Component” from above consisting of:
 - Fixed Attenuator, 30 dB, 50 W, 50 Ω , Anritsu Model 3-1010-123
 - Adapter, 7/16 DIN(f) to N(m), Anritsu Model 1091-386-R
 - PIM Test Cable, Anritsu Model 2000-1626-R
- PIM Master, Model MW8208A or Model MW8209A or Model MW8219A

Procedure

Follow this entire procedure for each instrument that you test.

1. Connect the BNC Tee onto the Controller Ext Ref In BNC connector. Connect the PIM Master to the Anritsu Handheld (HH) Controller as shown in [Figure 2-1 on page 2-2](#). Connect the BNC Cable from the PIM Master to the BNC Tee on the Controller and connect the second BNC cable from the HH Controller to the Ext Ref In BNC connector on the Reference Spectrum Analyzer (Ref SPA).
2. Press the **On/Off** key to turn on the Controller.
3. Press the **Shift** key and then the **Mode** (9) key. Use the rotary knob to highlight **PIM Analyzer** and then press the **Enter** key to switch to PIM Analyzer mode. A dialog window displays a message that there is no communication with the PIM Master and that you need to turn it on.
4. Turn on power to the PIM Master and allow the Controller to establish the communication process.
5. On the Controller, press the **Shift** key and then the **Preset** (1) key. Press the **Preset** submenu key to set the instrument to the factory preset state.
6. Press the **On/Off** key to turn on the Reference Spectrum Analyzer (Ref SPA).
7. 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.
8. Press the **Shift** key and then the **Preset** (1) key. Press the **Preset** submenu key to set the instrument to the factory preset state.
9. Confirm that all of the connectors are clean because any debris or contamination may cause incorrect PIM measurement results.
10. Using the “Test Component”, connect the PIM Test Cable end to the PIM Master using the necessary torque wrench. Connect the Fixed Attenuator end of the “Test Component” to the Ref SPA. The sequence of connecting the components is important, and you must adhere to this sequence for accurate results.

Caution Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.
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11. On the Controller, press the **Freq** main menu key and verify that the values for Carrier F1 and Carrier F2 are as stated in [Table 2-1, “Carrier Frequencies” on page 2-3](#) for the appropriate model.
12. On the Controller, press the **Setup** main key and confirm that the **Output Power** is set to 20 W, that **Test Duration** is set to 20 s, that the **Normal -> A** button has a red indicator light, and that the **Display Type** is set to Trace.
13. On the Ref 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. Press the **Span** main menu, then the **Span** submenu key. Enter 1, then press the kHz submenu (soft) key.

14. On the Ref SPA, 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 7, and then press the **dB/Div** submenu key. Confirm that **Auto Atten** is set to **On**.
15. On the Ref SPA, press the **BW** main menu key, then press the **RBW** submenu key. Enter 30 and then press the **Hz** submenu key. Confirm that **VBW** is set to 10 Hz.
16. On the Ref SPA, press the **Shift** key and then the **Trace** (5) key. Press the **Trace A Operations** submenu key. Press the **Max Hold -> A** submenu key.
17. On the Controller, press the **Measurements** main menu key, press the **PIM** submenu key and then press the **Test** submenu key to initiate the test. The submenu key has **On** underlined when the test is in progress. The test runs for 20 seconds. Please wait until the **Test** submenu key has **Off** underlined.
18. On the Ref 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 signal displayed. Press the **More** submenu key, the press **Counter Marker** to turn on the frequency counter marker function. Note the Marker 1 measurement results that are displayed on the Ref SPA unit.
19. Record the test results that are reported by the Ref SPA unit in [Table A-5, “PIM Output Tone Frequency Accuracy” on page A-3](#) and [Table A-6, “PIM Output Tone Power Accuracy” on page A-3](#).
20. Repeat [Step 13](#) through [Step 19](#), using the value of **Carrier F2** as the **Center Freq** setting.
21. Calculate the **Output Tone Power Differential** by subtracting the value of **Carrier F1 Measured Power** from the value of **Carrier F2 Measured Power**. Record this calculation in [Table A-6](#).

2-4 Residual PIM Measurement

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.

Equipment Required

- Low PIM Load/Termination, Anritsu Model MA82103A
- Adapter, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω , Anritsu Model 1091-385-R
- PIM Master, Model MW8208A or Model MW8209A or Model MW8219A

Procedure

Follow this entire procedure for each instrument that you test.

1. Connect the PIM Master to the Anritsu Handheld (HH) Controller as shown in [Figure 2-1 on page 2-2](#).
2. Press the **On/Off** key to turn on the Controller.
3. Press the **Shift** key and then the **Mode** (9) key. Use the rotary knob to highlight **PIM Analyzer** and then press the **Enter** key to switch to PIM Analyzer mode. A dialog window displays a message that the controller has no communication with the PIM Master and that you need to turn it on.
4. Turn on power to the PIM Master and allow the Controller to establish the communication process.
5. 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 30-minute warm up for the internal circuitry to stabilize.

6. Confirm that all the connectors are clean because any debris or contamination may cause incorrect PIM measurement results.
7. Connect the Low PIM Termination to the PIM Master using the DIN adapter and the necessary torque wrench.
8. On the Controller, press the **Freq** main menu key. Press the **Carrier F1** submenu key, enter the appropriate **Carrier F1** value from [Table 2-1, “Carrier Frequencies” on page 2-3](#), and then press the **MHz** submenu key. Press the **Carrier F2** submenu key, enter the appropriate **Carrier F2** value from [Table 2-1](#), and then press the **MHz** submenu key.
9. On the Controller, press the **Setup** submenu key, confirm that **Output Power** is set to 20 W, that **Test Duration** is set to 20 s, that the **Normal -> A** button has a red indicator light, and that the **Display Type** is set to **Trace**.
10. On the Controller, press the **Measurements** main menu key. Press the **PIM** submenu key and then press the **Test** submenu key to initiate the test. The key has **On** underlined when the test is in progress. The test runs for 20 seconds. Please wait until the **Test** key has **Off** underlined.
11. Note the measurement result that is displayed on the Controller unit. The measured result should be > -153 dBc and < -110 dBm.
12. Record the test results that are reported by the Controller in [Table A-7, “Residual PIM Measurement” on page A-4](#).

Chapter 3 — Troubleshooting

The Anritsu PIM Master™ is capable of producing up to 100 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields:

Warning

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.

RF power can be immediately turned off with the Emergency Stop button.

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. Check the line input fuse (AGC-10-R, Anritsu part number: 3-631-127).
2. The **On/Off** switch may be damaged.
3. Main PCB may have failed. Return the unit to the Factory for repair.

Unit Cannot Communicate with Handheld Controller Unit

Unit powers up, but does not communicate with the Handheld Controller Unit:

1. Confirm that the Handheld Controller does not have communication to the PIM Master. Use the **Shift + 5** key combination on the Handheld Controller to toggle communication Off and On.
2. The Handheld Controller firmware may not be up to date. Use Master Software Tools to update the Handheld Controller firmware.
3. PIM Master firmware may not be up to date. Use the PIMCode Loader tool on the PC to perform the PIM Master Firmware Update/Self-Test procedure. Refer to Chapter 1 in the PIM Master Users Guide (10580-00280).
4. Main PCB may have failed. Return the unit to the Factory for repair.

3-3 Operating Problems

PIM Self Test Fails

The HH unit Application Self Test – PIM Self Test fails:

1. The Main PCB Assembly has failed. One of the internal power rails may have failed. Return the unit to the Factory for repair.

Error Messages

1. **PIM Tester RF OFF Button Pressed** – Alerts you that the PIM Master front panel EMERGENCY STOP button has been pressed. This will turn off the PIM RF and cancel the measurement on the Controller. Measurement results may be invalid. The Controller and the PIM Master will automatically recover.
2. **PIM Tester Fault Detected. Check RF port connection** – Alerts you that there is something wrong with the PIM Test Port. Recheck your connections and run the Application Self Test – PIM Self Test.
3. **PIM RF On Max Time Reached. RF Has Been Turned Off** – Alerts you that the PIM Master has exceeded an On Time greater than allowed (~68 seconds). The unit will automatically turn RF Off. Possible communication failure between Anritsu handheld instrument and PIM unit. Disregard current measurement results and power cycle both units.
4. **Incorrect Command Sent to PIM** – Alerts you that an incorrect command has been sent to the PIM Master. Check the SCPI commands if using a programming command. The PIM Master or the HH controller firmware does not properly recognize a SCPI command.
5. **Incorrect Parameter Sent to PIM** – Alerts you that an incorrect parameter with a command has been sent to the PIM Master. Check the SCPI command parameters if using a programming command. The PIM Master or Controller firmware does not properly recognize a SCPI command parameter.
6. **PIM AMP(S) Exceeding Normal Temperature Range** – Alerts you that the PIM Master internal amplifiers have exceeded their normal temperature range.
7. **PIM UNIT Exceeding Normal Temperature Range** – Alerts you that the entire PIM Master unit is beyond the normal temperature range and degradation in measurement or signal dropout can occur.
8. **48V PIM Power Supply Voltage Out of Range** – The amplifier power supply is out of range, and degradation in measurement or signal dropout can occur.
9. **48V PIM Power Supply Fail** - This power supply failure will cause signal dropout with no PIM measurement capability.
10. **PIM EEPROM Error** - Cannot access on-board EEPROM. Measurement results may be invalid.
11. **PIM Reference LO Lock Error** - Reference LO unable to lock. Measurement results may be invalid.
12. **PIM External Reference Error** – The Anritsu handheld instrument can not lock onto the reference signal from the PIM Master and switches to its own internal frequency reference.

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

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.

The Anritsu PIM Master™ is capable of producing up to 100 Watts of RF power in the cellular communications bands. Users must take precautions to minimize exposure to these RF fields:

Warning

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.

RF power can be immediately turned off with the Emergency Stop button.

Ensure that all antennas under test are placed so that no personnel are exposed to RF levels that exceed the maximum allowable exposure.

MW82__A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

A-2 Reference PIM Measurement

Table A-1. Reference PIM Measurement with –80 dBm PIM Standard

PIM Master	PIM Frequency	Specification	Measurement Reading
MW8208A	848 MHz	123 dBc and –80 dBm $\pm$ 3 dB	dBc and dBm
MW8209A	910 MHz	123 dBc and –80 dBm $\pm$ 3 dB	dBc and dBm
MW8219A	1775 MHz	123 dBc and –80 dBm $\pm$ 3 dB	dBc and dBm

A-3 Frequency Accuracy and Output Power

Table A-2. Test Component Characterization for MW8219A

Test Component Correction Factor	Signal Generator Frequency and Power	Power Reading from Signal Generator	Power Reading with Test Component
dBm at 1945 MHz	1945 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm
dBm at 2115 MHz	2115 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm

Table A-3. Test Component Characterization for MW8209A

Test Component Correction Factor	Signal Generator Frequency and Power	Power Reading from Signal Generator	Power Reading with Test Component
dBm at 930 MHz	930 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm
dBm at 950 MHz	950 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm

Table A-4. Test Component Characterization for MW8208A

Test Component Correction Factor	Signal Generator Frequency and Power	Power Reading from Signal Generator	Power Reading with Test Component
dBm at 871 MHz	871 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm
dBm at 894 MHz	894 MHz at 0 dBm $\pm$ 0.2 dB	dBm	dBm

MW82 __A Firmware Rev: _____ Operator: _____ Date: _____
 Serial Number: _____ Options: _____

Frequency Accuracy and Output Power (continued)

Output Tone Frequency Differential

Table A-5. PIM Output Tone Frequency Accuracy

PIM Master	Tone Frequency	Specification	Measurement Reading
MW8208A	871 MHz	870.998693 MHz to 871.001307 MHz	MHz
MW8208A	894 MHz	893.998659 MHz to 894.001341 MHz	MHz
MW8209A	930 MHz	929.998605 MHz to 930.001395 MHz	MHz
MW8209A	950 MHz	949.998575 MHz to 950.001425 MHz	MHz
MW8219A	1945 MHz	1943.002918 MHz to 1947.002918 MHz	MHz
MW8219A	2115 MHz	2112.003173 MHz to 2118.003173 MHz	MHz

Output Tone Power Differential

Table A-6. PIM Output Tone Power Accuracy

PIM Master	Tone Frequency and Power	Expected Power Reading and Tolerance	Measured Value
MW8208A	871 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm
MW8208A	894 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm
MW8209A	930 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm
MW8209A	950 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm
MW8219A	1945 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm
MW8219A	2115 MHz at 43 dBm	dBm $\pm$ 1.0 dB	dBm

Serial Number: _____ Options: _____

MW82__A Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

MW82__A Firmware Rev: _____ Operator: _____ Date: _____

Serial Number: _____ Options: _____

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Anritsu prints on recycled paper with vegetable soybean oil ink.

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