Product Brochure/Technical Data Sheet

PIM Master™ MW82119A

40 Watts Battery-operated Passive Intermodulation Analyzer

Featuring Distance-to-PIM™ (DTP)
The Fastest Way to Pinpoint the Source of PIM

LTE 700 700 MHz	LTE 800 800 MHz	Cellular Band 850 MHz	E-GSM Band 900 MHz	DCS Band 1800 MHz
PCS Band 1900 MHz	PCS/AWS Bands 1900/2100 MHz	UMTS Band 2100 MHz	LTE 2600 2600 MHz	

PIM Master™ Overview

PIM Master MW82119A 40 Watts, Battery-operated

Ideal solution for tower mounted Radio Head installations

PIM Master™ Introduction

Anritsu Company introduces the first battery-operated high power Passive Intermodulation (PIM) testing solution for the major wireless standards in use around the world. PIM is a form of interference generated by passive components that are normally thought of as linear such as connectors, cable assemblies, filters and antennas. However, when subject to high RF power levels found in cellular systems, these devices can generate spurious signals that increase the receiver noise floor and reduce site performance.

The PIM Master accurately measures PIM performance by injecting two CW test tones into the antenna feed network and recording the magnitude of the 3rd, 5th, or 7th order intermodulation products falling in the receive band of the system. The MW82119A is able to perform the following measurements enabling test technicians to quickly find and eliminate PIM problems found at the cell site:

- PIM versus Time
- Noise Floor
- Swept PIM
- Distance-to-PIM™ (DTP)

The PIM Master's small size and light weight combined with battery operation make it the ideal solution for verifying performance at difficult to access sites such as Remote Radio Head (RRH) installations or indoor Distributed Antenna Systems (DAS). Performing a PIM test at these sites often involves a tower climb or carrying the equipment up a ladder or through small access ports to reach the required point of test. The enhanced portability of the MW82119A enables high power PIM testing where required without heavy lifting and without long extension cords.

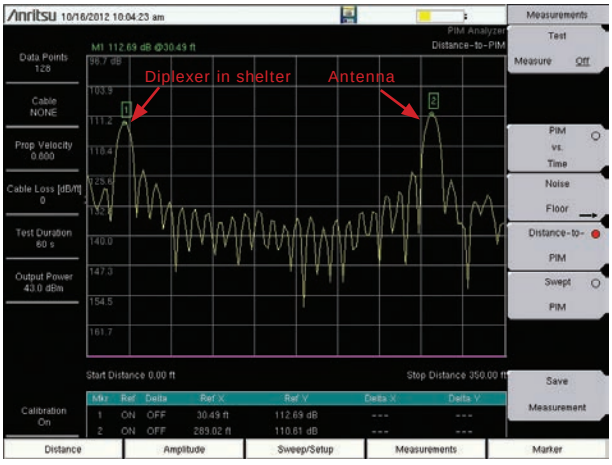
The PIM Master includes Anritsu's patented Distance-to-PIM™ (DTP) technology for accurately determining the location of PIM faults both inside the feed system as well as beyond the antenna. This technology becomes critically important for fault finding DAS installations due to the complexity of the feed system and large number of RF interconnects. Without DTP, finding and eliminating PIM requires a process of elimination involving the movement of low PIM loads in the network until the PIM problem disappears. This process is not only time consuming, but it also means that good connections may be opened (and potentially damaged) in the process of locating PIM problems. Distance-to-PIM allows technicians to quickly and efficiently locate PIM sources at a site resulting in quicker site repairs and lower cost.

As with all Anritsu Handheld products, the MW82119A has been designed and tested to rigorous standards for shock, vibration and temperature extremes to ensure reliable service in an outdoor environment.

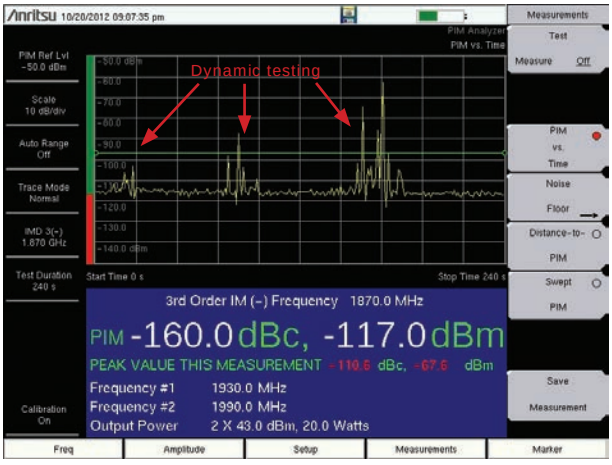
2 x 40 W Test Capability

Even though the package is small and it is battery operated, the MW82119A is a high performance PIM test solution allowing operators to adjust output power from 25 dBm (0.3 Watts) for indoor DAS testing to 46 dBm (40 Watts) for macro site testing. In both indoor and outdoor systems, PIM interference is highly dependent on the power level being transmitted by that system. By matching the PIM test power level more closely to the actual power level used at the site, operators will gain a clearer understanding of the true interference generated by both the RF infrastructure and the environment where the antenna is placed.

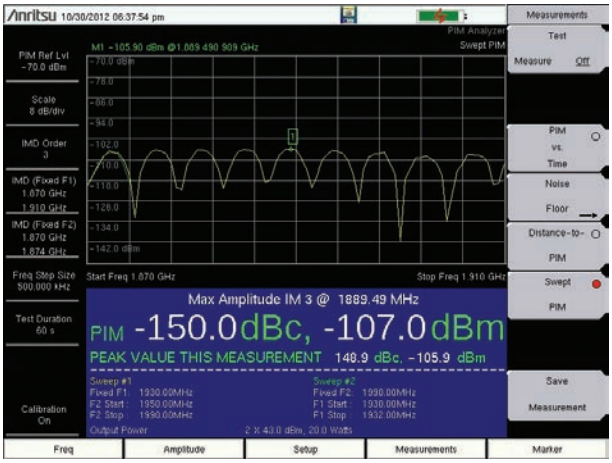
PIM Master™ Overview



Distance-to-PIM (DTP)
PIM Level (dBm) vs. Distance (meter)



PIM vs. Time
PIM Level (dBm) vs. Time (second)



Swept PIM
PIM Level (dBm) vs. Frequency (MHz)

Distance-to-PIM™ (DTP)

Distance-to-PIM (DTP) is similar to Distance-to-Fault (DTF), which Anritsu introduced in the Site Master™ in 1997 for identifying the location of impedance mismatches in a feed line. DTP quickly and accurately identifies the location of PIM faults inside the feed system as well as beyond the antenna. This capability eliminates the guesswork involved in isolating PIM sources and speeds site repairs.

Up to 6 markers can be activated in Distance-to-PIM to identify the magnitude and distance to PIM faults found in the system. A trace overlay feature allows real time comparison between the active DTP measurement and a previously saved DTP trace. This capability can be used to compare “before and after” results on a site or to clearly show the distance between an unknown PIM source and a “PIM marker” placed on the antenna radome.

PIM vs. Time

The PIM Master includes a PIM versus Time measurement that tracks not only the instantaneous PIM level but also records the maximum PIM level experienced throughout a fixed frequency PIM test. The two test frequencies, transmit power level, intermodulation order (3rd, 5th or 7th) and test duration can be easily adjusted by the user to meet the test requirements.

This mode is useful for dynamic PIM tests as it not only captures the peak PIM value for pass / fail determination but also provides a visual indication of the stability of the system under test. When a limit line is entered in this mode, the color of the PIM magnitude changes to red when the value has exceeded the limit value. The peak value will remain red indicating a failure even if the PIM level returns to a passing level after the dynamic stress has been removed.

Swept PIM

When making a Swept PIM measurement, the PIM Master is able to evaluate changes in PIM magnitude versus Intermodulation (IM) frequency. This test is conducted by holding one transmit tone fixed while varying the frequency of the second transmit tone, causing the IM product to “sweep” across a range of frequencies in the receive band of the system. The magnitude of the PIM generated versus frequency is displayed and can be compared to a user-selected pass / fail limit.

PIM measurements are the vector sum of all PIM signals generated on a line at the IM frequency being tested. When multiple PIM sources exist, it is possible for the signals to combine out of phase at a particular test frequency indicating a passing result when the individual PIM levels are actually failures. A swept PIM test varies the IM frequency over a range of frequencies providing the user a clearer picture of the true PIM performance of the system. It is worth mentioning that Distance-to-PIM measurements provide the same function as they also evaluate a range of frequencies rather than a single IM frequency.

Remote Control

The PIM Master can be configured for remote control via WiFi to support a variety of testing scenarios. Line of site distances of >100 m (>328 ft) have been achieved allowing a person on the ground to control the test equipment while a person at the top of the mast makes connections and performs dynamic testing. This capability is also useful for rooftop testing, allowing one person to control the test remotely while following the cable run and performing dynamic tests.

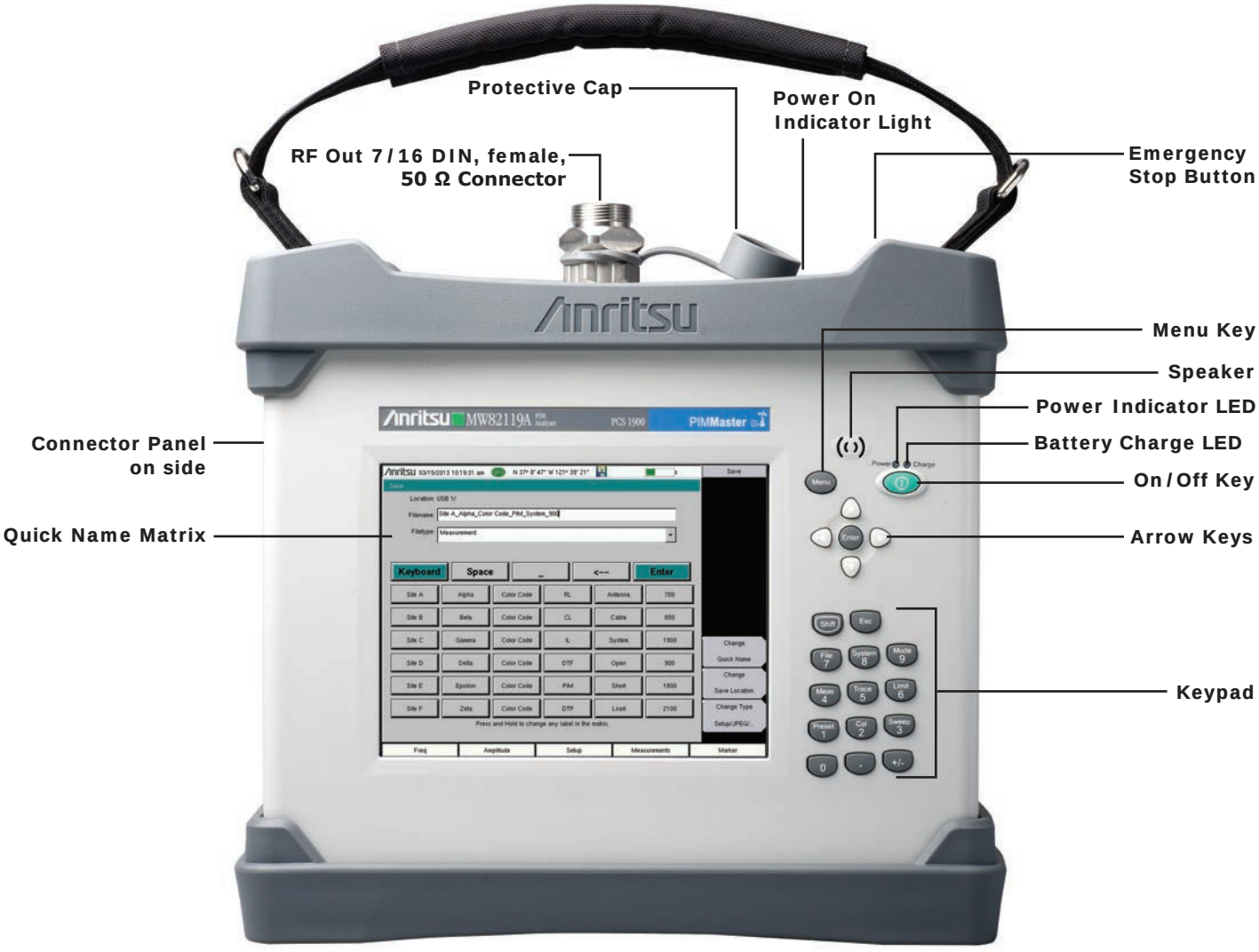
Noise Floor Measurement

A special test mode is available that activates the PIM Master receiver to monitor the IM product frequency vs. time. During this measurement, the PIM Master transmitters are disabled. This feature allows the user to quickly check to make sure the spectrum is clear before performing a PIM test.

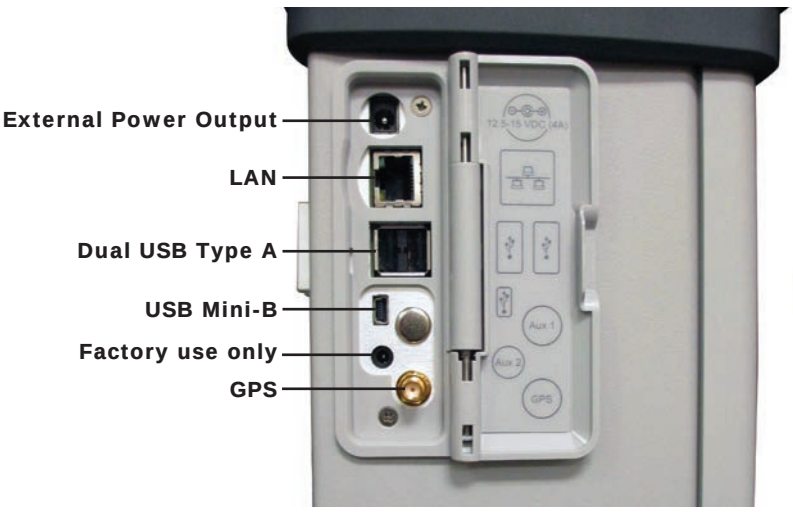
Easy to view display

The PIM Master uses the same large, field proven, color touch screen displays found in other Anritsu Handheld products. Five different screen settings are available to enhance visibility in the environment where the test will be performed. This includes a Black & White setting to improve readability in direct sunlight as well as a Night Vision setting to reduce screen brightness for nighttime operation.

PIM Master Passive Intermodulation Analyzer Features



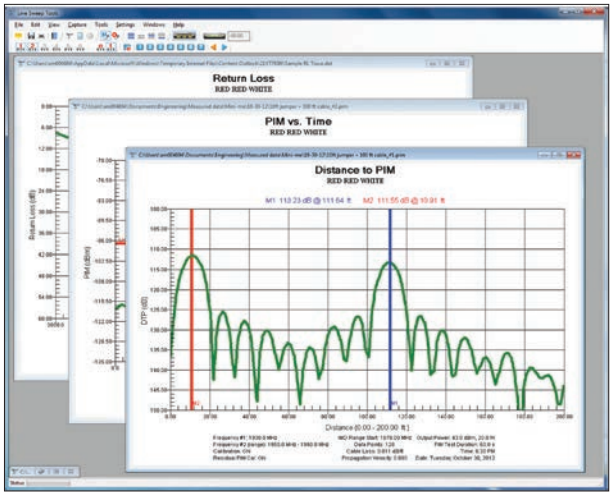
Size: 350 mm x 314 mm x 152 mm (13.8 in x 12.4 in x 6.0 in)
Lightweight: 9.0 kg to 12.2 kg (20 lb to 27 lb) depending on frequency option



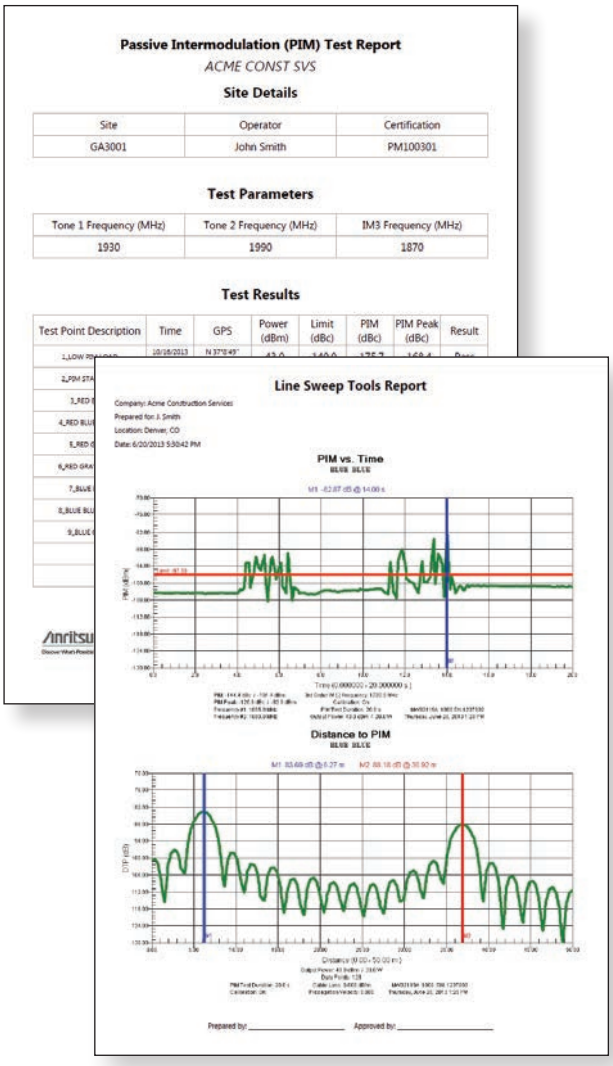
Connector Panel on the left side of MW82119A

Remote Access Tool for Tower Top Testing

PIM Report Generation and Certified Training



Line Sweep Tools (LST) utilized for report generation on a PIM trace



Test Reports generated using Line Sweep Tools (LST)

Line Sweep Tools for Cable, Antenna, and PIM Analyses

Line Sweep Tools (LST) is a post processing tool to manage and archive measured data from Anritsu's cable & antenna analyzers as well as PIM analyzers. Measured PIM results from different frequency band PIM Analyzers as well as measured data from your SiteMaster™ can be combined together into a single, unified site report.

In one report an operator can have all of the information needed to verify the integrity of an antenna system with the measurements of:

- PIM
- Distance-to-PIM (DTP)
- Return Loss
- Insertion Loss
- Distance-to-Fault (DTF)

Contractors, technicians, and engineers can be more productive with one cohesive tool to learn and use in managing antenna line quality measurements.

PIM Master™ Certified PIM Measurement Training Course

Specialized PIM Master™ passive intermodulation measurement training is an intense one-day instructor led training course that focuses on making PIM measurements (theory and lab). This is modeled on our successful Site Master™ Certified Line Sweep course.

- Brief Course Outline
  - Definition and Description
  - How PIM differs from Return Loss
  - Why is PIM a problem
  - How to test for PIM
  - PIM testing process
  - Hints for successful testing
  - Assessing results
- Labs
  - Hooking up the equipment and confirming proper operation
  - Measuring known good and bad devices
  - Device measurement practice
- Exams
  - Theory and safety
  - Hands-on practical
- Certification (after passing exams)
  - Certificate of Completion
  - Wallet-sized photo ID

Students will learn technical aspects of PIM measurements, how to set up a PIM measurement, useful examples of what works and what doesn't, interpreting results, and locating the PIM.

Customer Support

Like all Anritsu products, the PIM Master has a range of support products, services and training allowing you to maximize your return-on-investment.

With Anritsu's design know-how and demanding production testing and performance verification you can count on the PIM Master to give you years of reliable, dependable service.

PIM Master™ Specifications

General Specifications

All specifications and characteristics apply under the following conditions, unless otherwise stated: 1) After 5 minutes of warm-up time, where the instrument is left in the ON state; 2) All specifications subject to change without notice; 3) Typical performance is the measured performance of an average unit; 4) Recommended calibration cycle is 12 months.

Measurements

PIM vs. Time	3rd, 5th, and 7th order intermodulation product when in receive band (user selectable)
Noise Floor	Noise Floor vs. Time at selected IM product frequency
Distance-to-PIM	Distance and relative magnitude of mutiple PIM sources
Swept PIM	3rd, 5th, and 7th order intermodulation product when in receive band (user selectable)

Instrument Setup Parameters

Frequency	Carrier F1, Carrier F2, Intermodulation Order (3rd, 5th, 7th)
Amplitude	Ref Value, Scale, Auto Range (On/Off), Amplitude Tone (On/Off)
Setup	Output Power, Test Duration (1 s to 1,200 s)
Limit Lines	Limit (Upper/Lower), On/Off, Limit Move, Limit Alarm (On/Off, PASS/FAIL indicator)
GPS	On/Off, 3.3/5.0 V
DTP	Cable Velocity, Distance

PIM Measurement Ranges

RF Test Power	Two CW tones 25 dBm to 46 dBm, 0.1 dBm steps
Residual PIM Performance	<-117 dBm, <-125 dBm typical (2x 43 dBm test tones)
PIM Measurement Range	-70 dBm to -130 dBm

Option	Band	Frequency Range
Option 0700	LTE 700	Tx_1: 734 MHz to 734.5 MHz, Tx_2: 746 MHz to 768 MHz Rx_{Lower}: 698 MHz to 717 MHz, Rx_{Upper}: 777 MHz to 806 MHz
Option 0800	LTE 800	Tx_1: 791 MHz to 795 MHz, Tx_2: 811.5 MHz to 821 MHz Rx: 832 MHz to 862 MHz
Option 0850	Cellular 850	Tx_1: 869 MHz to 871 MHz, Tx_2: 881.5 MHz to 894 MHz Rx: 824 MHz to 849 MHz
Option 0900	E-GSM 900	Tx_1: 925 MHz to 937.5 MHz, Tx_2: 951.5 MHz to 960 MHz Rx: 880 MHz to 915 MHz
Option 0180	DCS 1800	Tx_1: 1805 MHz to 1837 MHz, Tx_2: 1857.5 MHz to 1880 MHz Rx: 1710 MHz to 1785 MHz
Option 0190	PCS 1900	Tx_1: 1930 MHz to 1932 MHz, Tx_2: 1950 MHz to 1990 MHz Rx: 1870 MHz to 1910 MHz
Option 0193	PCS/AWS	Tx_1: 1930 MHz to 1940 MHz, Tx_2: 1955 MHz to 1995 MHz, Tx_3: 2110 MHz to 2155 MHz, Rx_1: 1850 MHz to 1910 MHz (using Tx_1 and Tx_2), Rx_2: 1710 MHz to 1755 MHz (using Tx_1 and Tx_3)
Option 0210	UMTS 2100	Tx_1: 2110 MHz to 2112.5 MHz, Tx_2: 2130 MHz to 2170 MHz Rx_{Lower}: 1920 MHz to 1980 MHz, Rx_{Upper}: 2050 MHz to 2090 MHz
Option 0260	LTE 2600	Tx_1: 2620 MHz to 2630 MHz, Tx_2: 2650 MHz to 2690 MHz Rx: 2500 MHz to 2570 MHz

PIM Master Connectors

Test Port	7/16 DIN, female, 50 Ω
Dual USB Type A	2x Type A (connect USB Flash Drive and USB Power Sensor)
USB Mini-B	1x Mini-B (connect to PC for data transfer)
GPS	SMA, female (with GPS option only)
External Power	2.1 mm x 5.5 mm barrel connector, 12 to 15 VDC, < 5.0 A

Display

Size	213 mm (8.4 in) touch screen
Resolution	800 x 600

Battery

Type	Li-Ion
Battery Operation	3.0 hours, typical

Power

Emergency Stop	Red push button
AC/DC Adapter	Input: 100-240 VAC, 50/60 Hz, Output: 12 VDC

Electromagnetic Compatibility

Australia and New Zealand	C-tick N274
Interference	EN 61326-1:2006
Emissions	EN 55011:2007
Immunity	EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-11
European Union	CE Mark, EMC Directive 2004/108/EC

Safety

Safety Class	2006/95/EC, EN 61010-1 Class 1
Product Safety	IEC 60950-1 when used with Anritsu Company supplied Power cable

Environmental

Operating Temperature	-10 °C to 55 °C
Relative Humidity	5 % to 95 % at +40 °C, Non-condensing
Shock	MIL-PRF-28800F Class 2
Storage	-51 °C to 71 °C
Altitude	4600 meters, operating and non-operating

Size and Weight

Size	350 mm x 314 mm x 152 mm (13.8 in x 12.4 in x 6.0 in)
Weight	9.0 kg to 12.2 kg (20 lb to 27 lb)

PIM Master™ Ordering Information

Ordering Information

Model Number	Description
MW82119A	PIM Master™ Passive Intermodulation Analyzer (requires option 700, 800, 850, 900, 180, 190, 193, 210 or 260)
Frequency Options	(must order one, and one only)
MW82119A-0700	LTE 700
MW82119A-0800	LTE 800
MW82119A-0850	Cellular 850
MW82119A-0900	E-GSM 900
MW82119A-0180	DCS 1800
MW82119A-0190	PCS 1900
MW82119A-0193	PCS/AWS 1900/2100
MW82119A-0210	UMTS 2100
MW82119A-0260	LTE 2600
Other Options	
MW82119A-0019	High Accuracy Power Meter (requires USB power sensor)
MW82119A-0031	GPS Receiver (requires GPS antenna)
MW82119A-0098	Standard Calibration to ISO 17025 and/or Z540.1
MW82119A-0099	Premium Calibration to ISO 17025 and/or Z540.1 plus test data

Standard Accessories (included with PIM Master)

Part Number	Description
2000-1786-R	Soft Carrying Case, Screen Access
2000-1714-R	Shoulder Strap
2000-1691-R	Stylus with Coiled Tether
1091-387-R	Adapter, 7/16 DIN(f) to 7/16 DIN(m), 50 Ω (Connector Saver)
2300-577	Anritsu Software Tool Box for Handheld RF Instruments Disc
633-75	High-capacity Li-Ion Battery Pack
40-187-R	AC/DC Power Supply
(Country dependent)	AC Power Cable
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
2000-1371-R	Ethernet Cable, 7 ft/213 cm
3-2000-1498	USB A-mini B Cable, 10 ft/305 cm
10920-00060	Handheld Instruments Documentation Disc
	Three-year warranty (battery one-year warranty)
	Certificate of Calibration

Optional Accessories

Part Number	Description
2000-1745-R	PIM Master Backpack Accessory Kit
2000-1746-R	PIM Master Hard Case Accessory Kit
16DD50-2.75-R	Armored PIM Test Cable, 2.75 m, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
16DD50-4.0-R	Armored PIM Test Cable, 4.0 m, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
2000-1626-R	PIM Test Cable, 3.0 m, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
2000-1724-R	Low PIM Termination, 700 MHz to 2600 MHz, 40 W, 7/16 DIN(m), 7/16 DIN(f), 50 Ω
2000-1749-R	Low PIM Termination, 700 MHz to 2600 MHz, 7/16 DIN(m), 7/16 DIN(f), 50 Ω (for MW82119A only)
1091-390-R	PIM Standard, -80 dBm ±3 dB @ 1775 MHz, with 2x 20 W, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-421-R	Low PIM Adapter, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
1091-422-R	Low PIM Adapter, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-423-R	Low PIM Adapter, 7/16 DIN(m) to N(m), 50 Ω
1091-424-R	Low PIM Adapter, 7/16 DIN(m) to N(f), 50 Ω
1091-425-R	Low PIM Adapter, 7/16 DIN(f) to N(f), 50 Ω
1091-426-R	Low PIM Adapter, 7/16 DIN(f) to N(m), 50 Ω
1091-427-R	Low PIM Adapter, 7/16 DIN(f) to 7/16 DIN(f), 50 Ω
01-510	Adjustable Wrench
01-513-R	1¼" Torque Wrench
67135	Backpack for Accessories
760-259-R	Transit Case (holds MW82119A PIM Analyzer only)
760-265-R	Transit Case (holds MW82119A PIM Analyzer plus accessories)
2000-1374	Dual Battery Charger
2000-1528-R	GPS Antenna, SMA(m) with 15 ft cable
2000-1652-R	GPS Antenna, SMA(m) with 1 ft cable
2000-1760-R	GPS Antenna, SMA(m), 25 dB gain
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24105A	Inline High Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm
10580-00370	Certified PIM Master™ PIM Measurement Training Course

Manuals

Part Number	Description
10580-00285	User Guide (soft copy on Handheld Instruments Documentation Disc and @ www.anritsu.com)
10920-00060	Handheld Instruments Documentation Disc