

PIM Master™ Passive Intermodulation Analyzer



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
- 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.

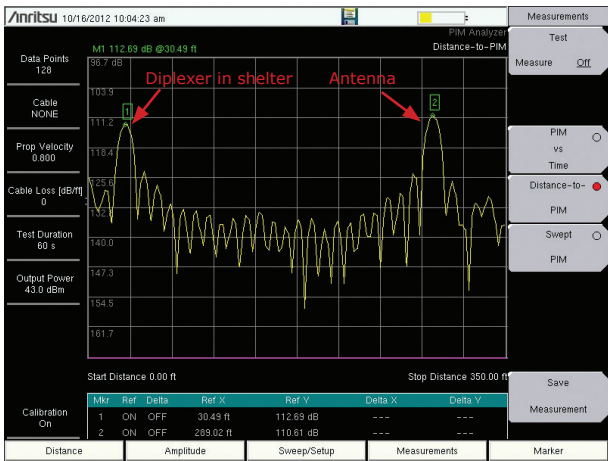
2 x 40 W Test Capability

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.

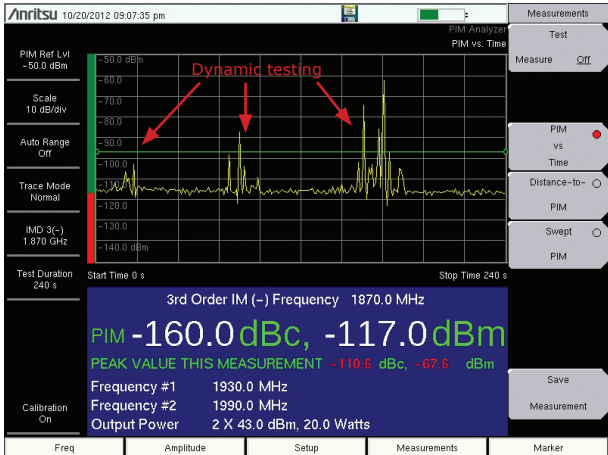
PIM Master™ Passive Intermodulation Analyzer



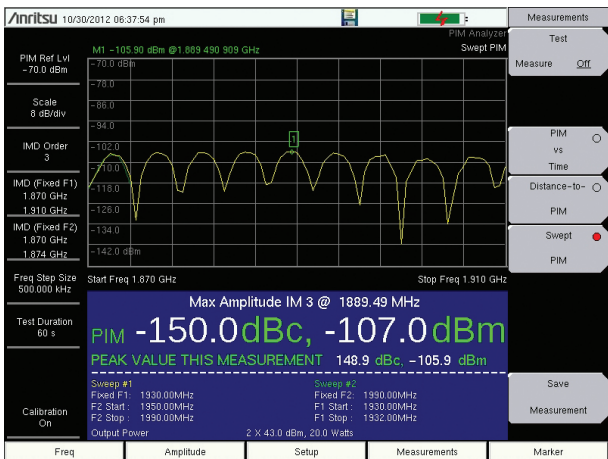
PIM Master™ Overview



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. Using Anritsu's familiar Line Sweep Tools (LST) application, operators can overlay multiple DTP measurements to identify what has changed since the last visit. This enables the ability to see growing PIM problems and take corrective action before they impact network performance.

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.

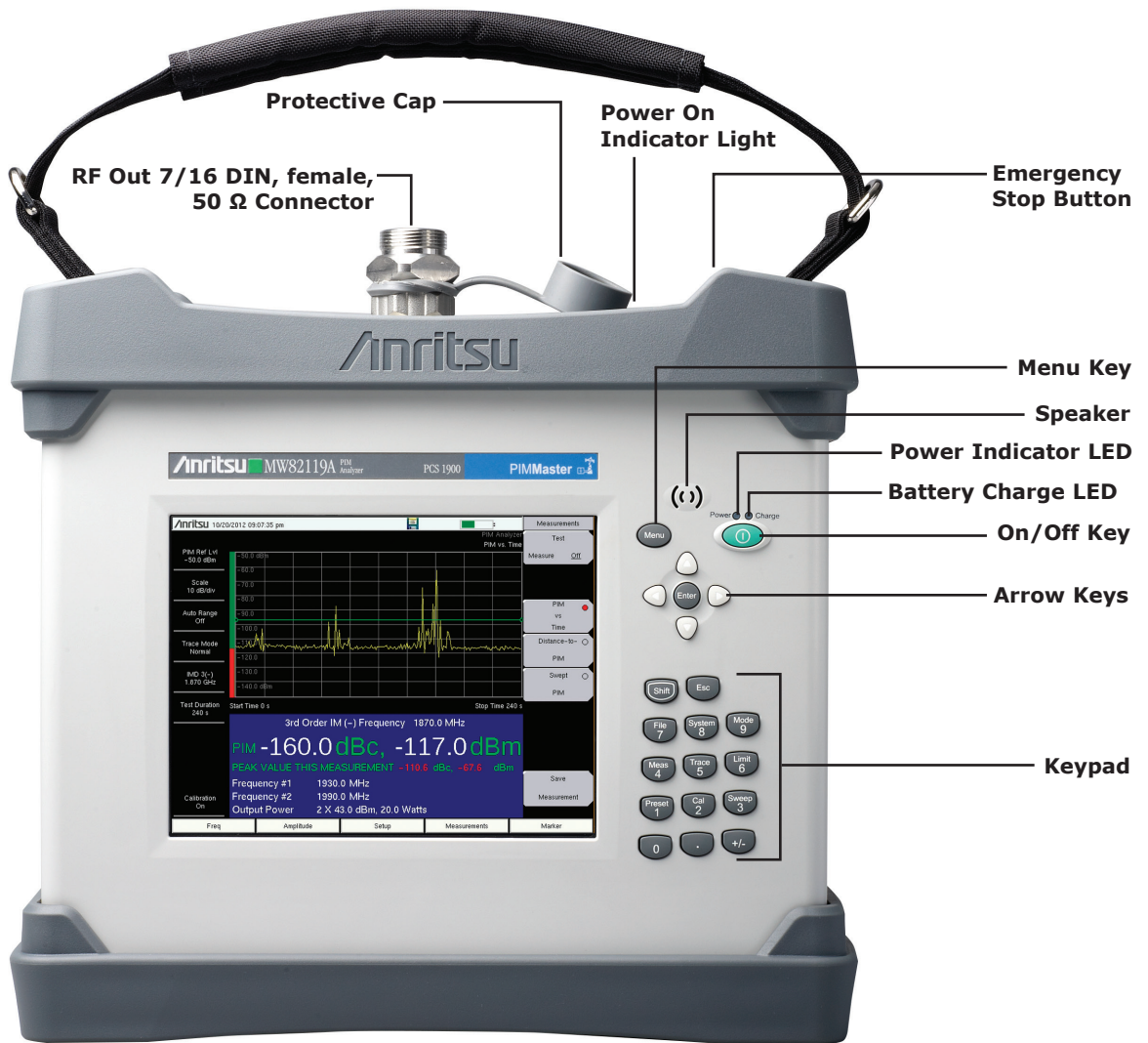
Easy to view display

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



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)

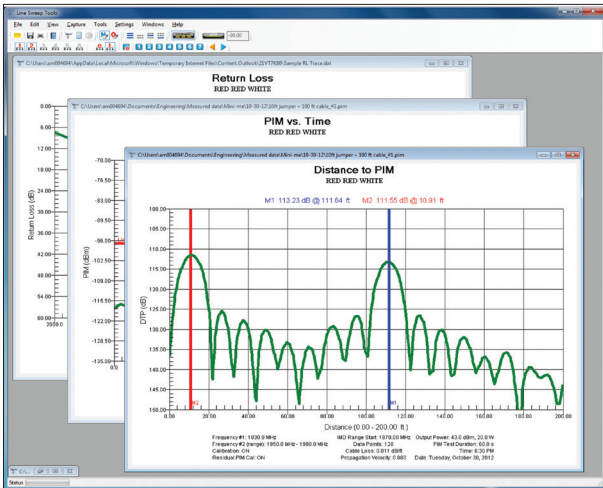
Lightweight: 9.0 kg to 12.2 kg (20 lb to 27 lb) depending on frequency option



PIM Master™ Passive Intermodulation Analyzer



PIM Report Generation and Certified Training



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

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.

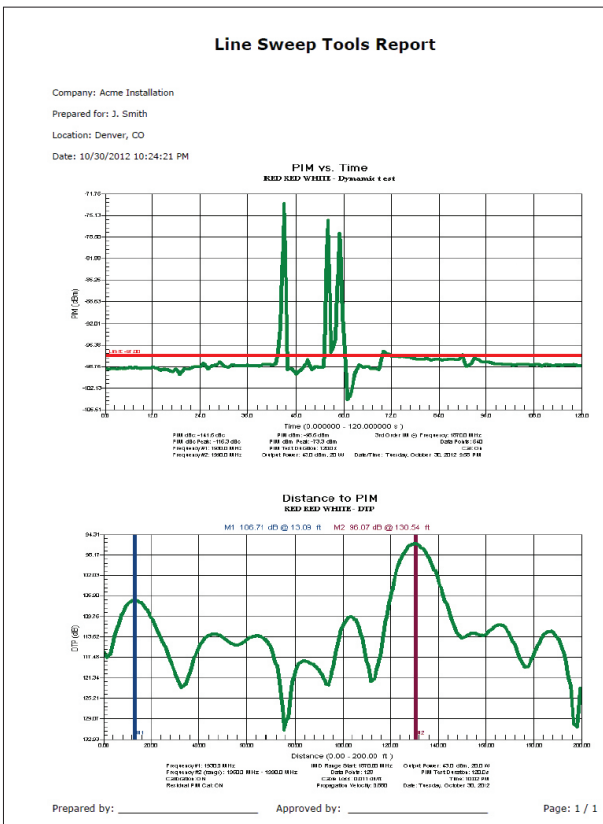
- Brief Course Outline
 - Definition and Description
 - How PIM differs from Return Loss
 - Why is PIM a problem
 - How to test for PIM
 - PIM testing process
 - Hints for successful testing
 - Assessing results
- Labs
 - Hooking up the equipment and confirming proper operation
 - Measuring known good 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.



Test Report generated using Line Sweep Tools (LST)

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 and PIM vs. Time	3 rd , 5 th , and 7 th order intermodulation product when in receive band (user selectable)
Distance-to-PIM	Distance and relative magnitude of multiple PIM sources
Swept PIM	3 rd , 5 th , and 7 th order intermodulation product when in receive band (user selectable)

Instrument Setup Parameters

Frequency	Carrier F1, Carrier F2, Intermodulation Order (3 rd , 5 th , 7 th)
Amplitude	Ref Value, Scale, Auto Range (On/Off), Amplitude Tone (On/Off)
Setup	Output Power, Test Duration (1 s to 3,600 s)
Limit Lines	Limit (Upper/Lower), On/Off, Limit Move, Limit Alarm (On/Off)
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
Transmit Frequency Range	
Option 700	Tx: 734 MHz to 734.5 MHz, 745 MHz to 766 MHz Rx(L): 698 MHz to 722 MHz, Rx(U): 779.5 MHz to 804.5 MHz
Option 850	Tx: 869 MHz to 871.5 MHz, 881.5 MHz to 894 MHz Rx: 824 MHz to 849 MHz
Option 900	Tx: 927 MHz to 937.5 MHz, 951.5 MHz to 960 MHz Rx: 880 MHz to 915 MHz
Option 180	Tx: 1805 MHz to 1837.5 MHz, 1857.5 MHz to 1880 MHz Rx: 1710 MHz to 1785 MHz
Option 190	Tx: 1930 MHz to 1932.5 MHz, 1950 MHz to 1990 MHz Rx: 1870 MHz to 1910 MHz
Option 192	Tx: 1930 MHz to 1935 MHz, F2: 2110 MHz to 2155 MHz Rx: 1710 MHz to 1750 MHz
Residual PIM Performance	<-117 dBm, <-125 dBm typical (2x 43 dBm test tones)
PIM Measurement Range	-70 dBm to -130 dBm

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	2.5 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/-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
Frequency Options	
MW82119A-0700	(Must order one) LTE 700 MHz
MW82119A-0850	Cellular 850 MHz
MW82119A-0900	E-GSM 900 MHz
MW82119A-0180	DCS 1800 MHz
MW82119A-0190	PCS 1900 MHz
MW82119A-0192	PCS/AWS 1900/2100 MHz
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
2000-1712-R	Soft Carrying Case
2000-1714-R	Shoulder Strap
1091-387-R	Adapter, 7/16 DIN(f) to 7/16 DIN(m), 50 Ω (Connector Saver)
10920-00060	Handheld Instruments Documentation Disc
2300-530	Anritsu Tool Box with Line Sweep Tools (LST) DVD Disc
10580-00285	User Guide
633-75	High-capacity Li-Ion Battery Pack
40-187-R	AC/DC Power Supply
(Country dependent)	AC Power Cable
806-141-R	Automotive Cigarette Lighter 12 VDC Adapter
2000-1371-R	Ethernet Cable, 7 ft/213 cm
3-2000-1498	USB A-mini B Cable, 10 ft/305 cm
11410-00679	PIM Master Product Brochure
	One Year Warranty (Including battery, firmware, and software)
	Certificate of Calibration

Accessory Kits



Part Number	Description
2000-1716-R	PIM Master Accessory Kit with 2.75 m Armored PIM Test Cable and Hard Case
<i>PIM accessory kit includes</i>	
16DD50-2.75-R	Armored PIM Test Cable, 2.75 m, 45 MHz to 3000 MHz, 7/16 DIN(m), 50 Ω
2000-1724-R	Low PIM Termination, 700 MHz to 2600 MHz, 40 W CW, 7/16 DIN(m), 7/16 DIN(f), 50 Ω
1091-390-R	PIM Standard, -80 dBm ±3 dB @ 1775 MHz, 20 W, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-403-R	PIM Standard, -80 dBm ±3 dB @ 910 MHz, 20 W, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω
1091-386-R	Adapter, 7/16 DIN(f) to N(f), 50 Ω
1091-389-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
1091-385-R	Adapter, 7/16 DIN(m) to 7/16 DIN(m), 50 Ω
760-260-R	Hard Case
01-510	Crescent Wrench
01-512-R	1" Torque Wrench
01-513-R	1¼" Torque Wrench
971-9-R	Isopropyl Alcohol Wipes (50 pieces)
971-10-R	Tapered Cotton Swab (100 pieces)
971-11-R	Duster (10 oz. spray can) (blow away microscopic contaminants)

Optional Accessories



Part Number	Description
760-259-R	MW82119A Transit Case
67135	Backpack for Accessories
2000-1374	Dual Battery Charger
16DD50-4.0-R	Armored PIM Test Cable, 4 m, 45 MHz to 3000 MHz, 7/16 DIN(m), 50 Ω
2000-1528-R	GPS Antenna, SMA(m) with 15 ft cable
2000-1652-R	GPS Antenna, SMA(m) with 1 ft cable
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
10580-00315	Certified PIM Master™ PIM Measurement Training Course

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To receive a quote to purchase a product or order accessories visit our online ordering site: www.ShopAnritsu.com

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For available training courses visit: www.anritsu.com/training



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