Product Brochure/Technical Data Sheet

Anritsu
envision:ensure

# 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<br>700 MHz | LTE 800<br>800 MHz | Cellular Band<br>850 MHz | E-GSM Band<br>900 MHz | DCS Band<br>1800 MHz |
| PCS/AWS Bands<br>1900/2100 MHz | UMTS Band<br>2100 MHz | LTE 2600<br>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.

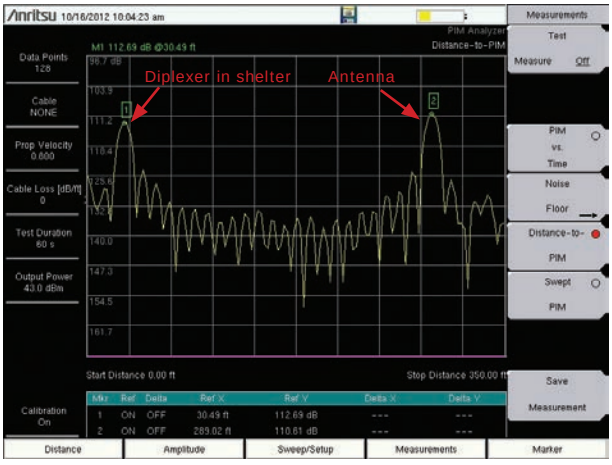
The PIM Master includes Anritsu's patented Distance-to-PIM™ (DTP) technology for accurately determining the location of PIM faults both inside the feed system as well as beyond the antenna. This technology becomes critically important for fault finding DAS installations due to the complexity of the feed 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.

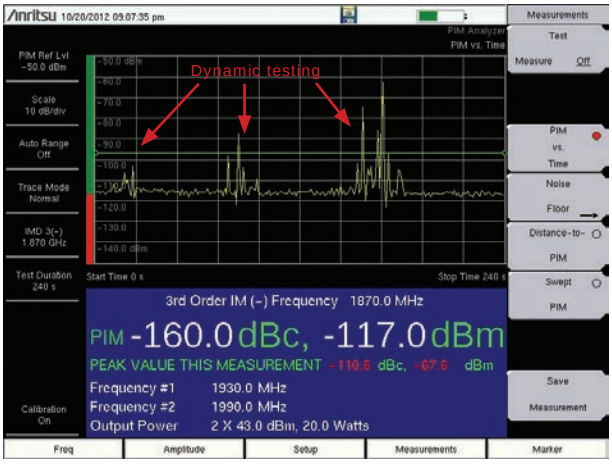
### 2 x 40 W Test Capability

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.

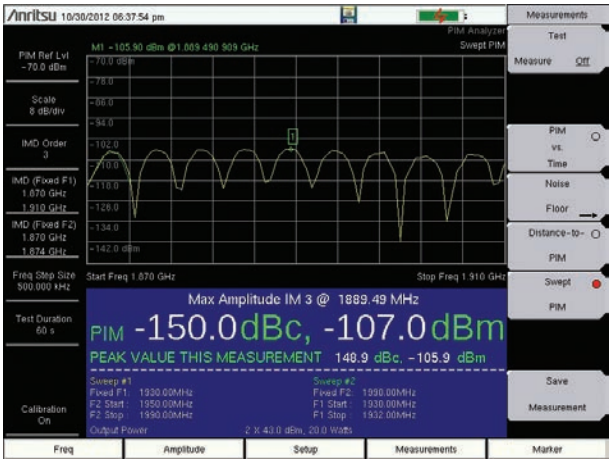
## PIM Master™ Overview




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.

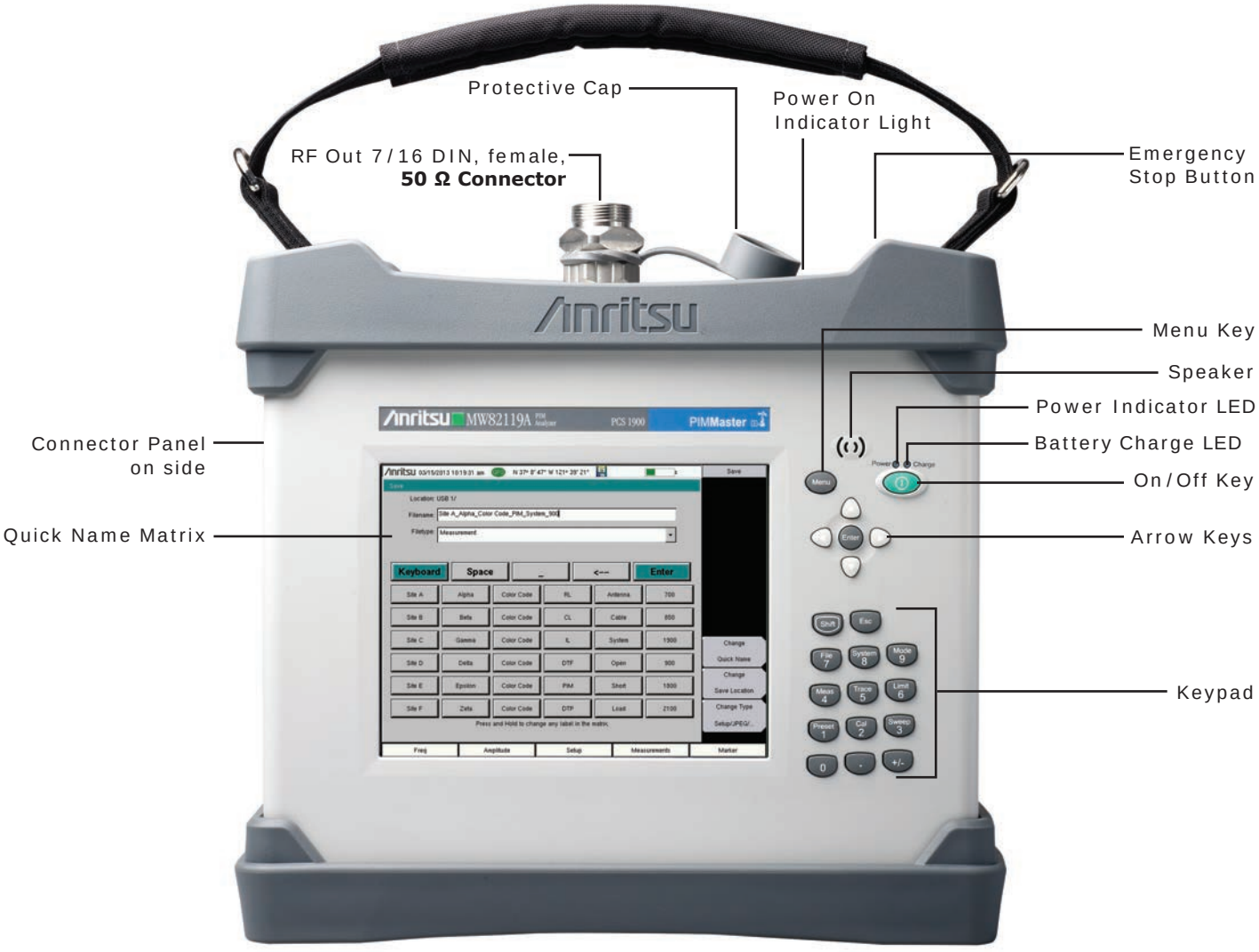
### Noise Floor Measurement

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.

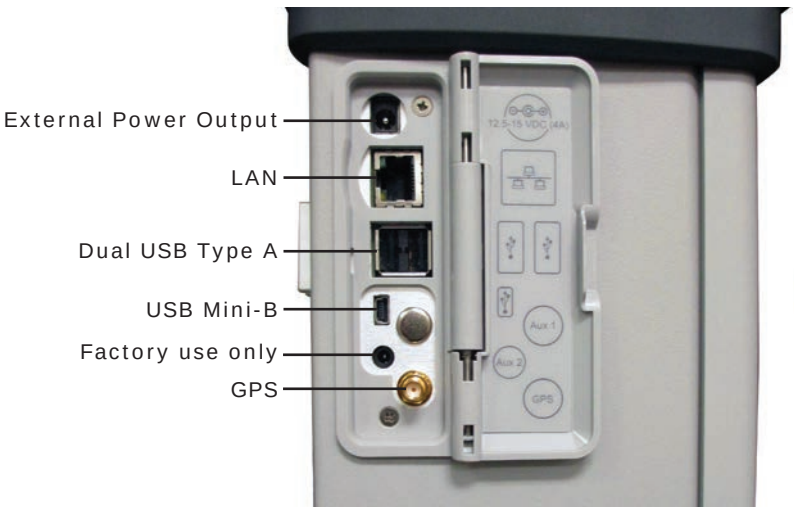
### Easy to view display

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



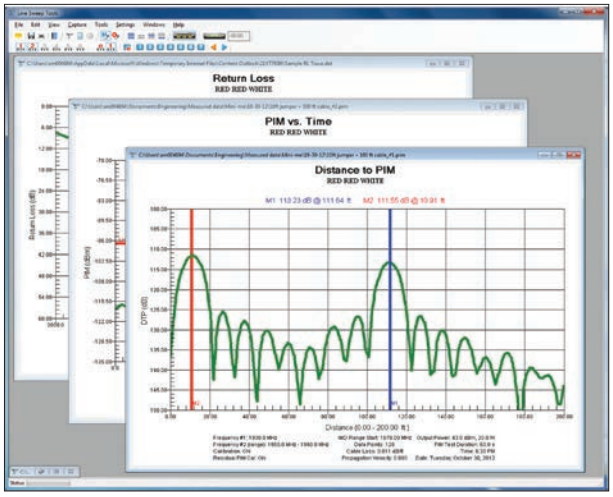

Size: 350 mm x 314 mm x 152 mm (13.8 in x 12.4 in x 6.0 in)
Lightweight: 9.0 kg to 12.2 kg (20 lb to 27 lb) depending on frequency option



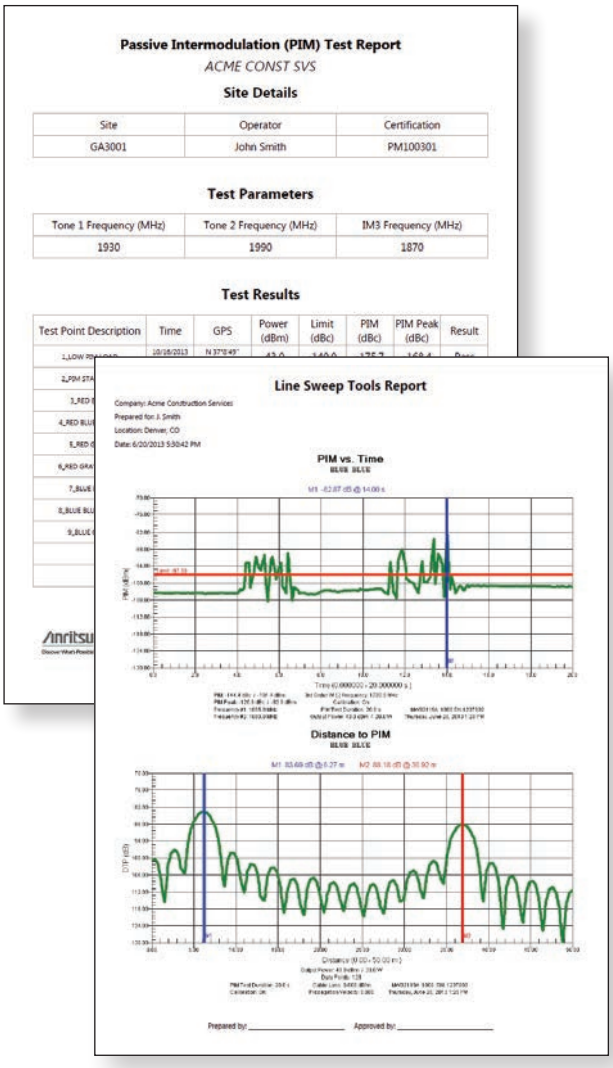

Connector Panel on the left side of MW82119A

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<br>$Rx_{Lower}$: 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<br>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<br>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<br>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<br>Rx: 1710 MHz to 1785 MHz |
| Option 0193 | PCS/AWS | $Tx_1$: 1930 MHz to 1940 MHz, $Tx_2$: 1955 MHz to 1995 MHz,<br>$Tx_3$: 2110 MHz to 2155 MHz,<br>$Rx_1$: 1850 MHz to 1910 MHz (using $Tx_1$ and $Tx_2$),<br>$Rx_2$: 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<br>$Rx_{Lower}$: 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<br>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 (must be ordered one with ONE frequency option) |
| 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-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 |
| 2000-1797-R | Screen Protector Film, 8.4 in. |
| 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 |
| 2000-1783-R | PIM Test Cable, 3.0 m, 7/16 DIN(m) to 7/16 DIN(f), 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 |
| 1091-431-R | Low PIM Adapter, 45°, 7/16 DIN(m) to 7/16 DIN(f), 50 Ω |
| 1091-433-R | Low PIM Adapter, 4.1/9.5(f) to 7/16 DIN(f), 50 Ω |
| 1091-434-R | Low PIM Adapter, 4.1/9.5(m) 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 |
| 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 |

Anritsu envision : ensure


**• United States**
**Anritsu Company**
1155 East Collins Boulevard, Suite 100,
Richardson, TX, 75081 U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

**• Canada**
**Anritsu Electronics Ltd.**
700 Silver Seven Road, Suite 120,
Kanata, Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

**• Brazil**
**Anritsu Electrônica Ltda.**
Praça Amadeu Amaral, 27 - 1 Andar
01327-010 - Bela Vista - São Paulo - SP - Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

**• Mexico**
**Anritsu Company, S.A. de C.V.**
Av. Ejército Nacional No. 579 Piso 9, Col. Granada
11520 México, D.F., México
Phone: +52-55-1101-2370
Fax: +52-55-5254-3147

**• United Kingdom**
**Anritsu EMEA Ltd.**
200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433280
Fax: +44-1582-731303

**• France**
**Anritsu S.A.**
12 avenue du Québec, Batiment Iris 1-Silic 612,
91140 Villebon-sur-Yvette, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

**• Germany**
**Anritsu GmbH**
Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

**• Italy**
**Anritsu S.r.l.**
Via Elio Vittorini 129, 00144 Roma Italy
Phone: +39-06-509-9711
Fax: +39-06-502-2425

**• Sweden**
**Anritsu AB**
Kistagången 20B, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

**• Finland**
**Anritsu AB**
Teknobulevardi 3-5, FI-01530 Vantaa, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

**• Denmark**
**Anritsu A/S**
Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark
Phone: +45-7211-2200
Fax: +45-7211-2210

**• Russia**
**Anritsu EMEA Ltd.**
**Representation Office in Russia**
Tverskaya str. 16/2, bld. 1, 7th floor.
Russia, 125009, Moscow
Phone: +7-495-363-1694
Fax: +7-495-935-8962

**• United Arab Emirates**
**Anritsu EMEA Ltd.**
**Dubai Liaison Office**
P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suite 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

**• Singapore**
**Anritsu Pte. Ltd.**
11 Chang Charn Road, #04-01, Shriro House
Singapore 159640
Phone: +65-6282-2400
Fax: +65-6282-2533

**• India**
**Anritsu India Pvt Ltd.**
2nd & 3rd Floor, #837/1, Binnamangla 1st Stage,
Indiranagar, 100ft Road, Bangalore - 560038, India
Phone: +91-80-4058-1300
Fax: +91-80-4058-1301

**• P. R. China (Shanghai)**
**Anritsu (China) Co., Ltd.**
27th Floor, Tower A,
New Caohejing International Business Center
No. 391 Gui Ping Road Shanghai, Xu Hui Di District,
Shanghai 200233, P.R. China
Phone: +86-21-6237-0898
Fax: +86-21-6237-0899

**• P. R. China (Hong Kong)**
**Anritsu Company Ltd.**
Unit 1006-7, 10/F., Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong, P. R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

**• Japan**
**Anritsu Corporation**
8-5, Tamura-cho, Atsugi-shi,
Kanagawa, 243-0016 Japan
Phone: +81-46-296-1221
Fax: +81-46-296-1238

**• Korea**
**Anritsu Corporation, Ltd.**
5FL, 235 Pangyoyeok-ro, Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-400 Korea
Phone: +82-31-696-7750
Fax: +82-31-696-7751

**• Australia**
**Anritsu Pty Ltd.**
Unit 21/270 Ferntree Gully Road,
Notting Hill, Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

**• Taiwan**
**Anritsu Company Inc.**
7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817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