

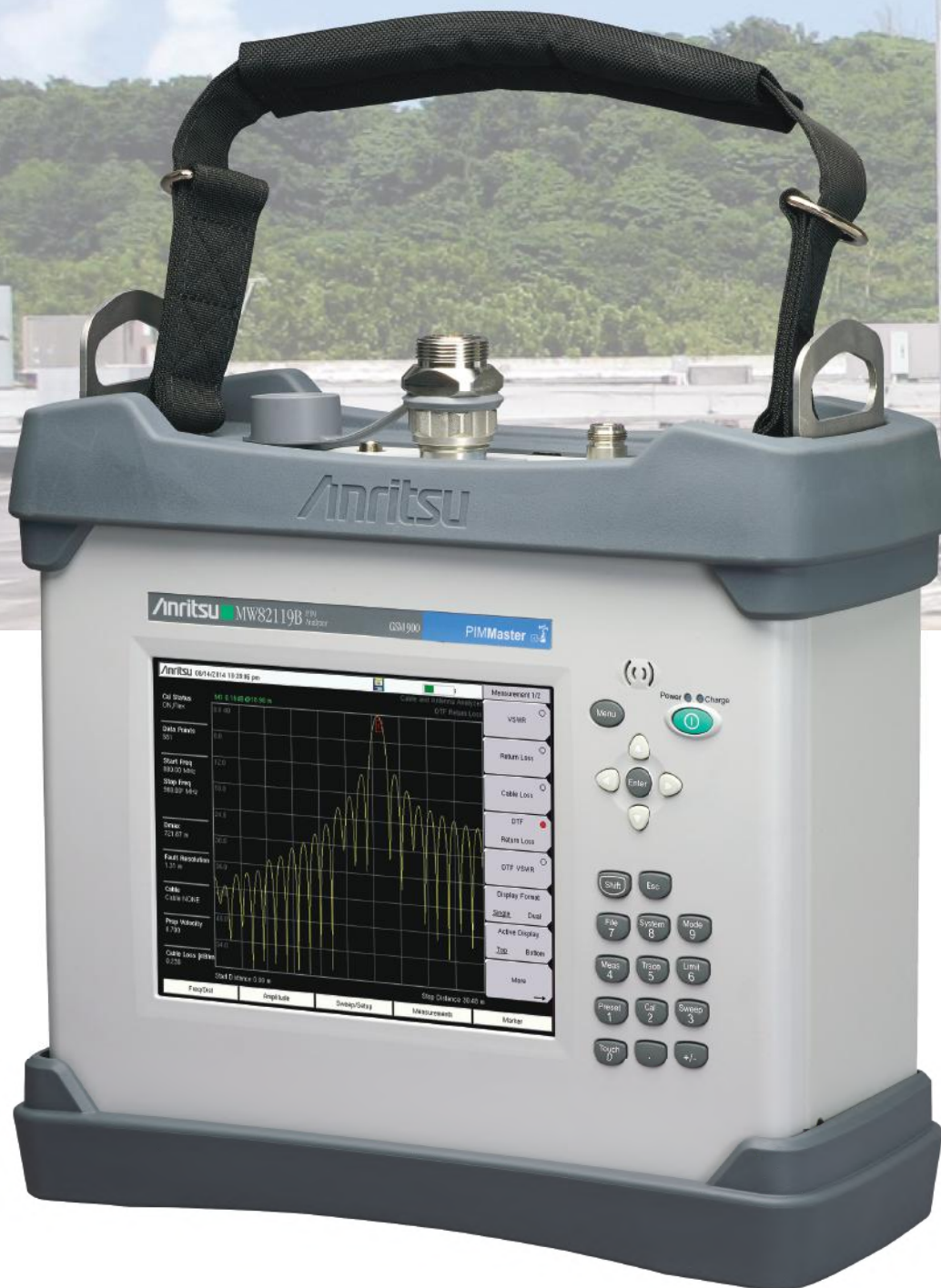
**Anritsu** Advancing beyond


# PIM Master™ MW82119B

Passive Intermodulation (PIM) Analyzer with Site Master™ Cable & Antenna Analyzer Option

LTE 600 w/1900, LTE 700, 2-Port LTE 700, APT 700, LTE 800, Cellular 850, E-GSM 900, DCS 1800, PCS/AWS, UMTS 2100, LTE 2600







# PIM Master MW82119B

## **PIM Issues**

PIM is a growing issue for cellular network operators. PIM issues may occur as existing equipment ages, when co-locating new carriers, or when installing new equipment. PIM is a particular issue when overlaying (diplexing) new carriers into old antenna runs. PIM can create interference that will reduce a cell's receive sensitivity or even block calls. This interference can affect both the cell that creates it as well as other nearby receivers. PIM is created by high transmitter power, so on-site PIM testing needs to be done at or above the original transmitter power levels to make sure that the test reveals any PIM issues.

## **PIM Solution**

The PIM Master MW82119B with Site Master option provides an integrated test solution capable of certifying both PIM and line sweep performance with a single test instrument. The PIM Master MW82119B solution offers the same ease-of-use, ruggedness, and familiar menus as its predecessor, along with new features to enhance productivity and speed site testing. Contractors and maintenance technicians now only need to carry one tool to fully certify cable and antenna system performance.

## **Features**

- PIM vs Time
- Swept PIM
- Distance-to-PIM
- Return Loss (Option 331)
- VSWR (Option 331)
- Cable Loss (Option 331)
- Distance-to-Fault
- 2-Port PIM (Option 703 only)
- Line Sweep Tools PC application for result archiving and creation of close out reports.
- Compatible with Smart Aligner Android application for combined PIM, antenna and line sweep closeout reports



## Integrated Test Solution



### Passive Intermodulation Analyzer Features

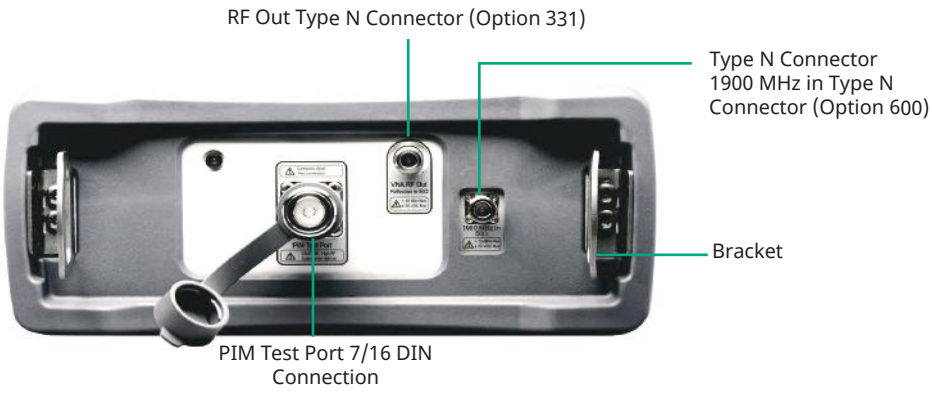
Feature	Description
Measurement Frequencies	600 MHz, 700 MHz, 800 MHz, 850 MHz, 900 MHz, 1800 MHz, 1900 MHz, 2100 MHz, 2600 MHz
Measurements	PIM vs. Time, Swept PIM, Noise Floor, Distance-to-PIM (DTP)
Intermodulation Order	3 <sup>rd</sup> , 5 <sup>th</sup> , and 7 <sup>th</sup> order, when in receive band (user selectable)
RF Test Power	Two CW tones 20 dBm to 46 dBm, 0.1 dBm steps
RF Test Power	Option 703 only: 1-Port: Two CW Tones 20 dBm to 43 dBm, 0.1 dBm steps 2-Port: Two CW Tones 20 dBm to 46 dBm, 0.1 dBm steps
Residual PIM Performance	< -117 dBm max, < -125 dBm typical (2 x 43 dBm test tones) < -134 dBm, < -140 dBm typical (2 x 20 dBm test tones)
Residual PIM Performance	Option 703 only: 1-Port: < -117 dBm, < -125 dBm typical (2x 43 dBm test tones) < -134 dBm, < -140 dBm typical (2x 20 dBm test tones) 2-Port: < -123 dBm (2 x 43 dBm test tones) < -115 dBm (2 x 46 dBm test tones)
Internal DTP	Fully integrated, no external modules required

### Cable and Antenna Features (Option 331)

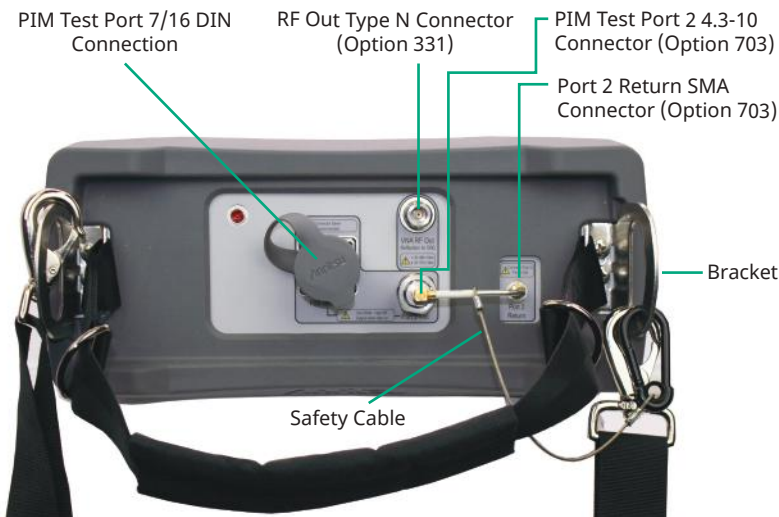
Feature	Description
Measurement Frequency	2 MHz to 3 GHz
Measurements	Return Loss, VSWR, Cable Loss, Distance-to-Fault (DTF), Return Loss, VSWR, 1-Port Phase, Smith Chart (50/75 $\Omega$ selectable)
High Measurement Accuracy	> 42 dB directivity, OSL calibration
High Interference Immunity	0 dBm within $\pm$ 10 kHz of carrier frequency (On-Frequency)

### Features

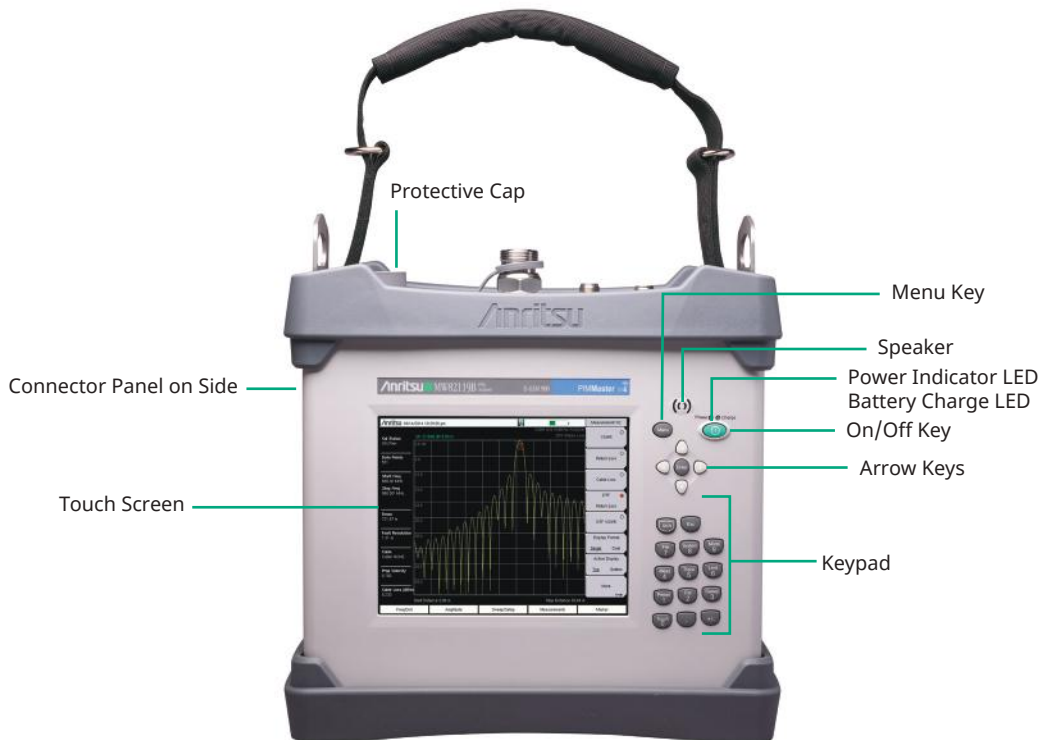
Feature	Description
Battery Operated	Li-Ion battery, 3.0 hours, typical
Small Size	350 mm x 314 mm x 152 mm (13.8 in x 12.4 in x 6.0 in)
Lightweight	9.2 kg to 12.4 kg (20 lb to 27 lb), varies by frequency option
Touch Screen Display	213 mm (8.4 in) daylight viewable
Operating Temperature Range	-10 °C to +55 °C
Ingress Protection	IP54 rated for dust and water spray, IP67 inside transit case
Shock Resistant	MIL-STD-810G drop tests inside soft carry case, 26 drops, 122 cm (48 in) drop height
Remote Control	> 100 m (>300 ft) with external Wi-Fi router
GPS Data Tagging	Option 31, requires GPS antenna
High Accuracy Power Meter	Option 19, requires USB power sensor



Single Port Instruments RF Connector Configuration



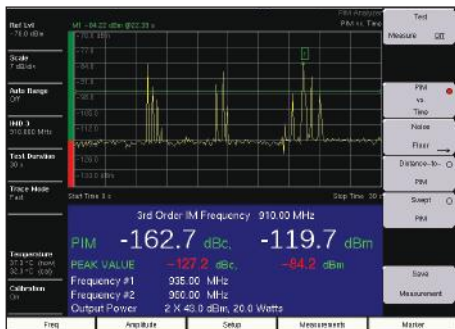
2-Port PIM RF Connector Configuration



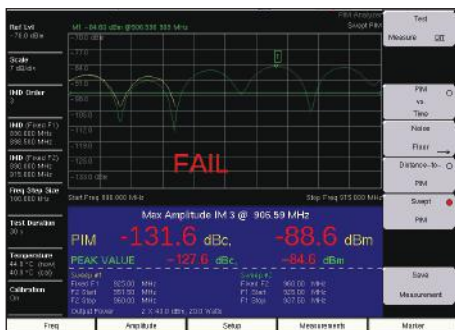
Size: 350 mm x 314 mm x 152 mm (13.8 in x 12.4 in x 6.0 in)  
 Lightweight: 9.2 kg (20 lb to 27 lb), varies by frequency option

# PIM Master MW82119B Features

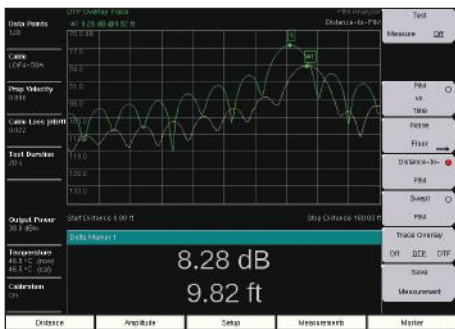
PIM is a form of interference generated by components such as connectors, cable assemblies, filters, and antennas. When subjected to the downlink signals at a cell site, these normally linear components can generate spurious signals. The PIM Master MW82119B is a specialized test instrument able to measure system linearity and identify fault locations both inside the cable system and beyond the antenna. It also supports major wireless standards in use around the world.



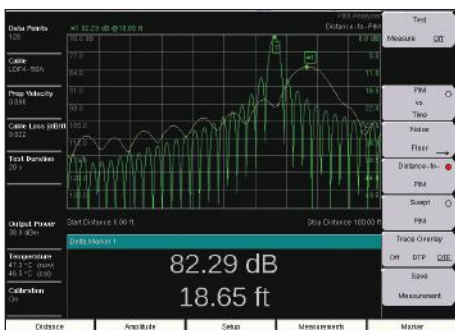
PIM vs. Time



Swept PIM



Trace Overlay - DTP/DTP



Trace Overlay - DTP/DTF

## PIM vs. Time

PIM vs. time is a fixed-frequency test that displays PIM magnitude over time. This measurement is particularly useful for dynamic PIM tests since it captures the peak PIM value for pass / fail analysis and provides a visual indication of the stability of the system under test.

## Swept PIM

Swept PIM tests measure Intermodulation product magnitude versus frequency. The test is conducted by holding one test frequency fixed while varying the second test frequency, causing the IM product to “sweep” across the receive band of the system.

When multiple PIM sources are present on a line, it is possible for the signals to combine out of phase, thus creating low PIM readings at some frequencies and high PIM readings at others. A swept PIM test evaluates a range of IM product frequencies, giving users a clearer picture of the true PIM performance of a system.

## Distance-to-PIM (DTP)

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

## Trace Overlay

Trace overlay is a feature that allows real-time comparison between the active DTP measurement and a previously recorded DTP or DTF trace. Knowing where a PIM source is located relative to a known “PIM marker” or known RF connection simplifies troubleshooting for faster fault identification.

DTP/DTF overlays can show whether a PIM fault is inside the feed system or beyond the antenna. Placing a known PIM source, such as steel wool, on an antenna’s radome and running DTP creates a marker at its radiating surface that can be stored and compared to the system DTP trace. If the system DTP peak is farther away, the PIM is beyond the antenna.

Two DTF measurements are typically required for site certification. One with a short circuit at the end of the cable used to measure the cable length, and a second with a precision load at the end of the cable used to evaluate connection quality. DTP/DTF overlays provide a “map” on the instrument screen to accurately show connector locations when evaluating PIM issues.

## Noise Floor

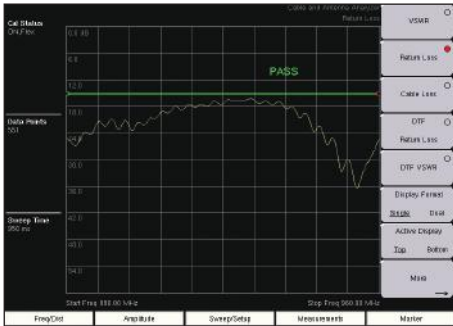
Noise floor measurements are available that monitor the full Rx band or current IM product frequency with the PIM Master MW82119B transmitters turned off. This allows the user to quickly check to make sure the spectrum is clear of interference before performing a PIM test.

## 2 x 40 W Test Capability

The PIM Master MW82119B allows operators to adjust the test power from 20 dBm (0.1 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 in use. 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 antenna environment.

# PIM Master Cable and Antenna Analyzer Features (Option 331)

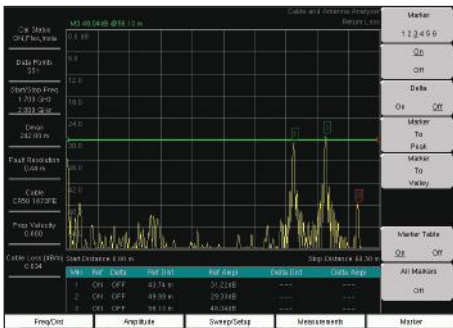
The Anritsu Site Master is a trusted site commissioning tool that has set the standard for cable and antenna analysis for nearly two decades. With the Site Master option installed, the PIM Master MW82119B gains the single port measurement capabilities of an Anritsu Site Master S331E. This powerful combination provides the ability to measure return loss, VSWR, cable loss, Distance-to-Fault, PIM, and Distance-to-PIM with a single test instrument. Using Return Loss (VSWR) as a quality metric, the Site Master is able to accurately detect sources of high reflections, caused by pinched cables, loose or corroded connectors, lightning strikes, and bullet holes. Left un repaired, these defects can damage transmitters, reduce cell coverage, and lower data transmission rates.



Return Loss / VSWR

## Return Loss / VSWR

This option makes accurate return loss and VSWR measurements needed to certify that the cable and antenna system conforms to performance specifications.



Distance-to-Fault

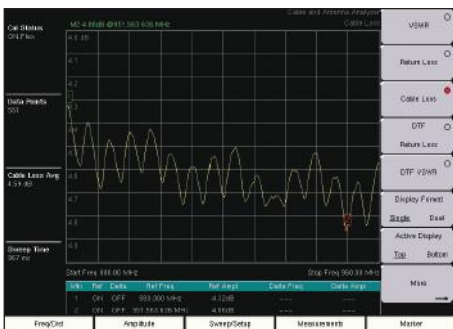
## Cable Loss

With a short installed at the end of the cable, this option measures and displays the average cable loss of the system. Excessive cable loss not only reduces radiated power, but also masks return loss issues in the system.

## Distance-to-Fault (DTF)

While measuring return loss is an accurate way to verify system health, DTF is a useful troubleshooting tool for locating system problems. The DTF measurement option uses the fast Fourier transform to convert frequency data to the time domain and displays signal anomalies with respect to distance.

DTF is also useful for measuring the cable length. By placing a short circuit at the end of the cable and knowing the cable properties, the length of the cable can be accurately measured. This option includes an extensive cable library, and allows users to quickly find and apply the correct cable parameters for distance measurements.



Cable Loss

## Standard Open-Short-Load (OSL) Calibration

OSL calibration comes standard with the Site Master option. Calibration allows for accurate vector-corrected measurements by mathematically removing source match, directivity, and frequency response errors. Directivity is the main contributor to measurement uncertainty, and corrected directivity of 42 dB or better is common using Anritsu precision components.



Dual Display

## FlexCal™

The Site Master FlexCal broadband calibration feature allows users to change the start and stop frequencies after calibration without having to recalibrate the instrument.

## RF Immunity

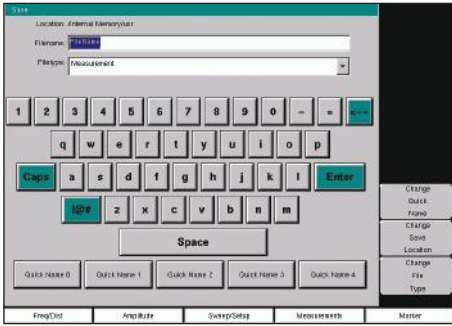
The Site Master option includes Anritsu's unique RF immunity algorithms that enable users to make accurate cable and antenna measurements even in the presence of strong RF activity from co-located cell sites.

## Dual Display

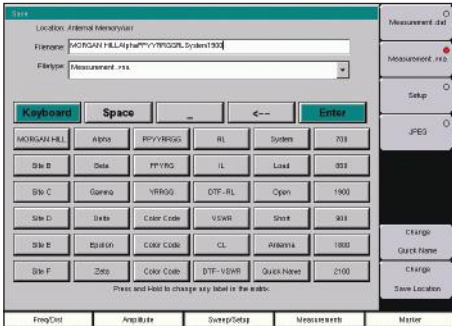
The dual display enables users to view two cable and antenna measurements on the same display. Since the top and bottom displays can be controlled independently, users can set different markers and limit lines on each display. This results in significant time savings for measurements such as cable loss and cable length that both require the same physical set-up.



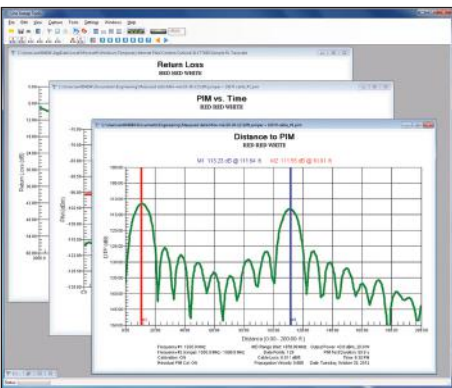
# Valuable Options and Features



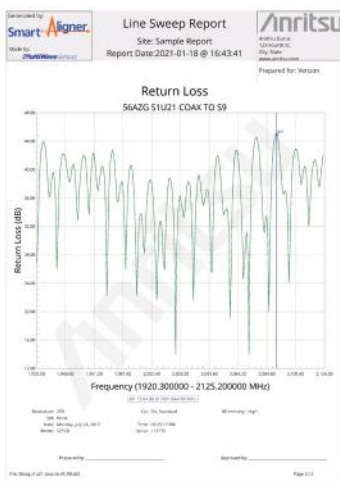
**Built-in Keyboard**



**Quick Name Matrix**



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



## Built-in Keyboard

The built-in, fully functional touch screen keyboard enable users to enter detailed test descriptions.

## Quick Name Matrix

The quick name matrix enables users to store commonly used words or phrases for fast file naming. Long file names containing cell site ID, sector information, color coding, measurement type, frequency, and termination can be generated in seconds with only a few button pushes.

## Local Language Support

Nine languages come standard on the PIM Master MW28119B: English, Japanese, Chinese, Italian, French, German, Spanish, Russian, and Korean. One custom, user-defined language can be uploaded into the instrument using Anritsu Master Software Tools.

## Display Appearance Options

Five different screen settings are available to enhance visibility in different operating environments. 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.

## File Transfer

Measurement files can be easily transferred between the PIM Master MW28119B and a PC for trace validation, report generation, and archiving. Transfer can happen by copying or saving the trace directly to a USB memory stick. Data can also be transferred over a USB or Ethernet cable.

## Line Sweep Tools (LST)

LST increases productivity for people who deal with dozens of cable and antenna traces and PIM traces every day.

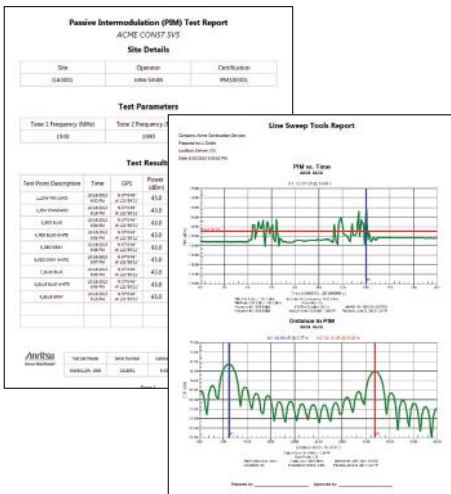
- Familiar user interface and short learning curve for users of Anritsu's Handheld Software Tools.
- Marker and limit line presets make a quick task of applying markers and a limit line to similar traces, as well as validating traces.
- Renaming grid makes changing file names, trace titles, and trace subtitles from field values to those required for a report much quicker than manual typing and is less prone to error.
- Report generator will generate a professional looking PDF of all open traces with additional information such as contractor logos and contact information.
- PIM Report Generator will generate a tabular summary report of all open PIM vs. time, noise floor, and/or swept PIM measurements, complete with pass/fail analysis and summary of instrument settings.

## Smart Aligner Application

The Smart Aligner application, developed in partnership with Multiwave Sensors, is freely downloadable from the Google Play app store. This Android application imports results data from Multiwave Sensors antenna alignment tools and Anritsu's PIM Master including optional Site Master cable and antenna analyzers to facilitate a quick creation of measurement results closeout reports in .pdf format. Closeout reports are required from contractors to network operators before payment is authorized. With the Smart Aligner app, these reports can be created on site and emailed directly from a smartphone speeding up the process.



# Valuable Options and Features



Test Reports generated using Line Sweep Tools (LST)

## easyTest™ Tools

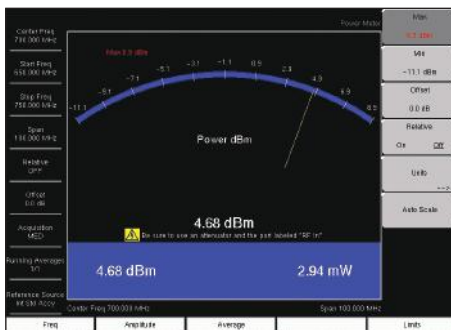
Anritsu's easyTest Tools allows experienced users to create, deliver, and display work instructions that appear on the instrument screen. These work instructions make life easier for less experienced PIM and line sweep operators. Direct benefits include: accurate testing, repeatable results, and less rework. measurements at the right location.



GPS Dialog

## GPS Option (Option 31)

The GPS option can be used to confirm the exact measurement location (longitude, latitude, and altitude) and Universal Time (UT) information. Each trace can be stamped with location information to ensure you are taking measurements at the right location.



High-Accuracy Power Meter

## High-Accuracy Power Meter (Option 19)

This option enables you to make high-accuracy RMS measurements. This capability is perfect for measuring both CW and digitally modulated signals such as CDMA/EV-DO, GSM/EDGE, WCDMA/HSPA+, and P25. You can select from a wide range of USB sensors delivering better than  $\pm 0.16$  dB accuracy. An additional benefit of using the USB connection is that a separate DC supply (or battery) is not needed since the necessary power is supplied by the USB port.

USB Power Sensors (require instrument with Option 19 or may be used separately with a PC)

MA24105A Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm

MA24108A Microwave USB Power Sensor, 10 MHz to 8 GHz, -40 dBm to +20 dBm

MA24118A Microwave USB Power Sensor, 10 MHz to 18 GHz, -40 dBm to +20 dBm

MA24126A Microwave USB Power Sensor, 10 MHz to 26 GHz, -40 dBm to +20 dBm

MA24208A Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm to -60 dBm

MA24218A Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm to -60 dBm



## Valuable Options and Features



Remote Access Tool for Tower Top Testing

### Certified Training

Instructor-led training courses are available for both PIM and Line Sweep measurements. Classes cover: measurement theory, safety, best practices, assessing results, and hands-on, practical measurement exercises. Students passing the written and practical exams receive a Certificate of Completion and wallet-sized certification card.

### Remote Control

The PIM Master MW82119B 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. For PIM tests, this capability is also useful for rooftop testing, allowing one person to control the test remotely while following the cable run and performing dynamic PIM tests.

## Ordering Information



Model Number	Description
MW82119B	PIM Master Passive Intermodulation Analyzer (must be ordered with ONE frequency option)
<b>Frequency Options</b>	
MW82119B-0600	LTE 600 w/1900
MW82119B-0700	LTE 700
MW82119B-0701	APT 700
MW82119B-0703	2-Port LTE 700
MW82119B-0800	LTE 800
MW82119B-0850	Cellular 850
MW82119B-0900	E-GSM 900
MW82119B-0180	DCS 1800
MW82119B-0194	PCS/AWS 1900/2100
MW82119B-0210	UMTS 2100
MW82119B-0260	LTE 2600
<b>Other Options</b>	
MW82119B-0019	High-Accuracy Power Meter (requires USB power sensor)
MW82119B-0031	GPS Receiver (requires GPS antenna)
MW82119B-0331	Site Master Cable and Antenna Analyzer
MW82119B-0098	Standard Calibration to ISO 17025 and/or Z540.1
MW82119B-0099	Premium Calibration to ISO 17025 and/or Z540.1 plus test data
MW82119B-0099	Premium Calibration to ISO 17025 and/or Z540.1 plus test data



+1 (888) 880-6804  
sales@testforce.com

# Anritsu Advancing beyond

Specifications are subject to change without notice.

## • United States

**Anritsu Americas Sales Company**  
450 Century Parkway, Suite 190, Allen, TX 75013 U.S.A.  
Phone: +1-800-Anritsu (1-800-267-4878)

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

## • Mexico

**Anritsu Company, S.A. de C.V.**  
Blvd Miguel de Cervantes Saavedra #169 Piso 1, Col. Granada  
Mexico, Ciudad de Mexico, 11520, MEXICO  
Phone: +52-55-4169-7104

## • United Kingdom

**Anritsu EMEA Ltd.**  
200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.  
Phone: +44-1582-433200  
Fax: +44-1582-731303

## • France

**Anritsu S.A.**  
12 avenue du Québec, Immeuble Goyave,  
91140 VILLEBON SUR YVETTE, France  
Phone: +33-1-60-92-15-50

## • 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.**  
Spaces Eur Arte, Viale dell'Arte 25, 00144 Roma, Italy  
Phone: +39-6-509-9711

## • Sweden

**Anritsu AB**  
Kistagången 20 B, 2 tr, 164 40 Kista, Sweden  
Phone: +46-8-534-707-00

## • Finland

**Anritsu AB**  
Technopolis Aviapolis, Teknobulevardi 3-5 (D208.5),  
FI-01530 Vantaa, Finland  
Phone: +358-20-741-8100

## • Denmark

**Anritsu A/S**  
c/o Regus Winghouse, Ørestads Boulevard 73, 4th floor,  
2300 Copenhagen S, Denmark  
Phone: +45-7211-2200

## • Russia

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

## • Spain

**Anritsu EMEA Ltd.**  
**Representation Office in Spain**  
Paseo de la Castellana, 141. Planta 5, Edificio Cuzco IV  
28046, Madrid, Spain  
Phone: +34-91-572-6761

## • Austria

**Anritsu EMEA GmbH**  
Am Belvedere 10, A-1100 Vienna, Austria  
Phone: +43-(0)1-717-28-710

## • United Arab Emirates

**Anritsu EMEA Ltd.**  
**Anritsu A/S**  
Office No. 164, Building 17, Dubai Internet City  
P. O. Box - 501901, Dubai, United Arab Emirates  
Phone: +971-4-3758479

## • India

**Anritsu India Private Limited**  
6th Floor, Indiqube ETA, No.38/4, Adjacent to EMC2,  
Doddanekundi, Outer Ring Road, Bengaluru - 560048, India  
Phone: +91-80-6728-1300  
Fax: +91-80-6728-1301

## • Singapore

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

## • Vietnam

**Anritsu Company Limited**  
16th Floor, Peakview Tower, 36 Hoang Cau Street, O Cho Dua Ward,  
Dong Da District, Hanoi, Vietnam  
Phone: +84-24-3201-2730

## • P.R. China (Shanghai)

**Anritsu (China) Co., Ltd.**  
Room 2701-2705, Tower A, New Caohejing International  
Business Center No. 391 Gui Ping Road 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: +81-46-296-6509  
Fax: +81-46-225-8352

## • Korea

**Anritsu Corporation, Ltd.**  
5FL, 235 Pangyoyeok-ro, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 13494 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

## • Australia

**Anritsu Pty. Ltd.**  
Unit 20, 21-35 Ricketts Road, Mount Waverley, Victoria 3149, 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

List Revision Date: 20210610



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