

PM Series Microwave Power Calibration System



- Supports Sensors from most major manufacturers from 6 kHz to 50 GHz
- Faster than direct compare method
- Lowest total uncertainty
- National Metrology Institute class thermistor reference standard
- Complete Automation with PS-Cal® by TEGAM

The PM Series calibrator simplifies the tedious and complex process of RF power sensor calibration. The goal is to realize consistent, cost effective and traceable calibrations. However, the manual approach is very demanding of even the most experienced technician.

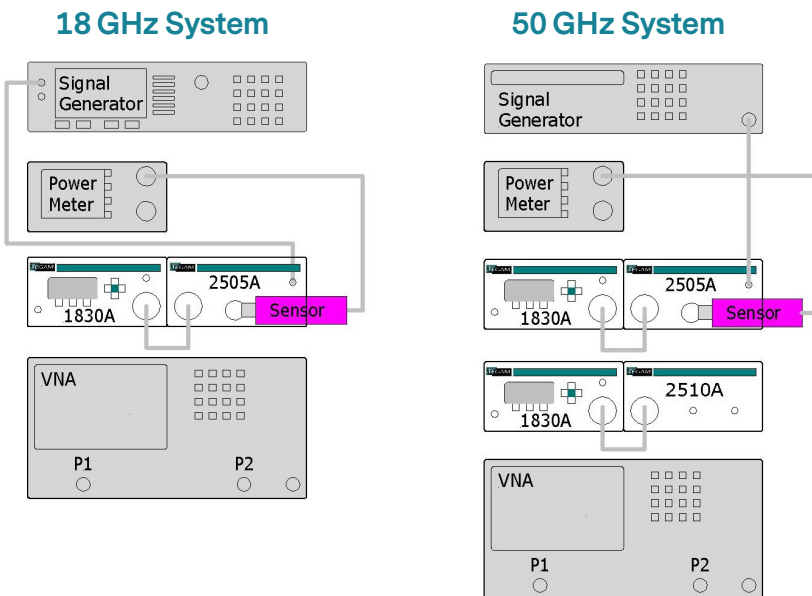
A successful calibration involves:

- Setting instruments
- Keeping track of standards
- Computing mismatch (Γ)
- Computing calibration factors (k)
- Computing total uncertainties
- Programming EPROM sensors
- Generating reports and labels

The PM Series automates and standardizes this process while providing compatibility with a wide variety of instruments and power sensors.

The PM Series is built upon the 1830A metrology grade RF Power Meter. This is the only RF Power Meter on the market that is compatible with all known types of thermistor sensors including TEGAM, Keysight, Weinschel, Hughes and Millitech.

A line of compatible RF power thermistor transfer and reference standards have been developed that provide flexibility and expandability as your RF calibration needs grow. These standards are based on the same time proven method used by NIST, PTB, NIM and other national metrology organizations around the world.



Complete System Integration | PMX Series

TEGAM has condensed their experience with microwave calibration into one convenient and accurate automated system that operates from 6 kHz to 18 or 50 GHz. Turnkey packages are available that include the VNA, signal generator, microwave power standards, workstation, software and accessories required for immediate productivity. The system is configured with instruments from different manufacturers that have been tested and verified by TEGAM to produce an accurate and repeatable calibration. Onsite installation and training are available with each complete system for a fast and trouble free start up. Due to the wide range of options, the PMX system is quoted on an as requested basis.

Major System Components

PS-Cal® allows for unmatched flexibility when it comes to hardware driver availability. Popular VNA's like the Agilent/Keysight 8510C and PNA, Anritsu VectorStar and Shockwave, as well as the Rohde & Schwarz ZVA can all be utilized with PS-Cal. The procedures allow for use up to two signal sources per procedure, including function generators. The following chart consists of equipment that is compatible with PS-CAL for power sensor calibration.

PS-Cal Compatible Equipment List*

Network Analyzers	Power Meters	Signal Generators	Voltmeters
Agilent_4294A	Anritsu_ML2437A	HP 83600 Series	Fluke_8508A
Agilent_8722D	TEGAM_1830A_PowerMeter	Agilent 33220A	Fluke_884xA
Agilent_E5071C	Agilent_N1911A	Agilent 33250A	HP/Agilent_34401A
Agilent_PNA_E836xA	Agilent_N1912A_Ch1	Agilent ESG Series	HP/Agilent_34420A
Agilent_PNA_N522xB_LFE	Agilent_N1913A	Agilent EXG Series	HP/Agilent_3458A
Agilent_PNA_N5230C	Agilent_N1914A_Ch1	Agilent MXG Series	HP_34410A
Agilent_PNA_N524xA	HP_436A	Agilent PSG Series	HP_3478A
Anritsu_372xx	Agilent_USB_200xA	Anritsu 68xx	Keithley_2001
Anritsu_VectorStar	Agilent_USB_U848xA	Anritsu 693xxB	
HP_3577B	Anritsu_ML2437A	Anritsu MG369xx	
HP_8510C	Boonton 4232A CH1	Anritsu_MG369xx_SCPI	
HP_8753D	Boonton 4500A CH1	Fluke 96000A	
HP_8753E	Boonton 4500B CH1	Fluke_96000A_HF	
Keysight_E5080A	Boonton 4531A CH1	Fluke 9640A	
R&S_ZVA	Boonton 4532A CH1	Holzworth 9000B	
R&S_ZVL	Boonton 4541A CH1	HP 3325A\B	
Keysight_P9374B	Boonton 4542A CH1	HP 8340B	
	Gigatronics 8541C	HP 8350B	
	Gigatronics 8651A	HP 8648ABCD	
	Gigatronics_8501A_CH1	HP 8662A	
	Gigatronics_8502A_CH1	HP 8673D	
	HP/Agilent_E4416A	R&S SMA100A	
	HP/Agilent_E4417A_Ch1	R&S SMB100A	
	HP/Agilent_E4418A	R&S SMF100A	
	HP/Agilent_E4419A_Ch1	R&S SML0x	
	HP_436A	R&S SMRxx	
	HP_437B	R&S SMY0x	
	Ladybug_LB59xx		
	Marconi_6960		
	R&S_NRP2_Ch1		
	R&S_NRVS		
	Ladybug_LBxxx_Sensor		

*Limitations apply to supported ranges, features, and versions of listed equipment.

PM Series Package Summary*						
Part Number	Description	PMX18-012	PMX50-002	PMX50-014	PMC18-011	PMC50-001
1830A	RF Power Meter	▪	▪	▪▪	▪	▪
2505A	18 GHz Transfer	▪		▪		
2510A	50 GHz Transfer		▪	▪		
1505A	18 GHz Standard				▪	
1510A	50 GHz Standard					▪
CA-7-48	Cable, F/M bias					
CA-7-15	Cable, F/M bias					
CA-10-48	Cable, large heater					
CA-11-48	Cable, small heater					
CA-11-15	Cable, small heater					
CA-21-48	Cable, 15XX/25XX				▪	▪
CA-21-15	Cable, 15XX/25XX	▪	▪	▪▪		
CA-14-2M	Cable, USB A/A 2M	▪	▪	▪▪	▪	▪

*Software purchased separately

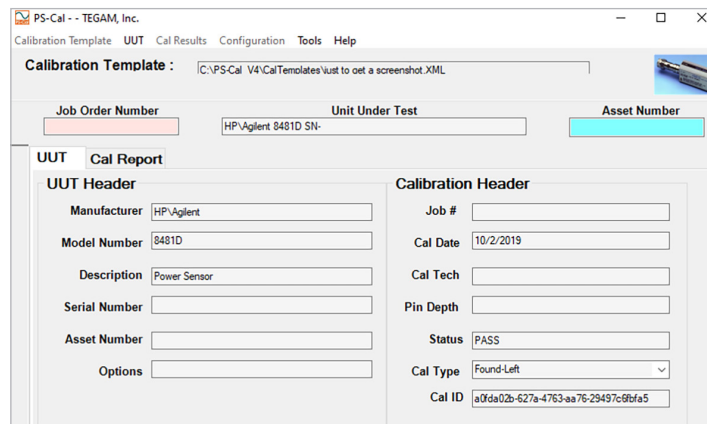
PS-Cal calibration software delivers both automation and confidence to RF power sensor calibration.

Correctly calibrating an RF power sensor is an involved process that requires numerous complex calculations of calibration factor, mismatch correction and uncertainty. PS-Cal is successfully deployed by many organizations who are ISO 17025 accredited. Combined with the fastest calibration available across the greatest number of different sensors, it is the only real option for those who need automation with sensors from multiple manufacturers.

Calibration Software

PS-Cal by TEGAM

- Fully automated RF power sensor calibration
- VNA support for automated SII parameter measurements
- User customizable calibration procedures
- Upload and download EPROM data of most Anritsu, Keysight (both E4400 and E9300 series), Boonton, and Giga-tronics power sensors
- Flexible standards allow the operator to use the instruments in their lab
- Data stored for easy manipulation
- Selecting calibration procedures fast and easy
- Dynamic Uncertainty Calculations



PS-Cal - TEGAM, Inc.

Calibration Template UUT Cal Results Configuration Tools Help

Calibration Template : C:\PS-Cal V4\CalTemplates\ust to oet a screenshot.XML

Job Order Number Unit Under Test Asset Number

HPVAgilent 8481D SN-

UUT Cal Report

UUT Header

Manufacturer HPVAgilent

Model Number 8481D

Description Power Sensor

Serial Number

Asset Number

Options

Calibration Header

Job #

Cal Date 10/2/2019

Cal Tech

Pin Depth

Status PASS

Cal Type Found-Left

Cal ID a0fda02b-627a-4763-aa76-29497c9bfa5

RF Power Meter for Metrology

MODEL 1830A

- Frequency Range: 110 GHz (sensor dependent)
- Meter Uncertainty: $\pm 0.05\%$ of reading, $\pm 0.5 \mu\text{W}$ (0.1% at 1 mW)
- Calibrate 50 MHz reference outputs (with appropriate sensor)
- Compatible with most DC substitution thermistor sensors
- Directly reads calibrated RF power
- Replaces HP432



Microwave Calibration Standard

MODEL 2505A

- Feedthrough design for calibrating microwave power sensors
- Provide lowest-uncertainty monitoring of RF power supplied to a Device Under Test
- Calibrate RF power sensors from 6 kHz to 18 GHz
- Temperature controlled for minimal response to ambient environment
- Thermistor bolometer for lowest drift of absolute power reading
- 0.01 to 25 mW power range
- Rack mount option available



Microwave Calibration Standard

MODEL 1505A

- Terminating Design
- Transfer calibration from NIST (or other NMI) to feedthrough standards with the lowest possible uncertainty from 6 kHz to 18 GHz
- Lowest uncertainty of any available CW absolute power sensor
- Temperature controlled for minimal response to ambient environment
- Thermistor bolometer design
- 0.01 to 25 mW power range



Microwave Calibration Standard

MODEL 2510A

- Feedthrough design for calibrating microwave power sensors
- Provide lowest-uncertainty monitoring of RF power supplied to a Device Under Test
- Calibrate RF power sensors from 10 MHz to 50 GHz
- Temperature controlled for minimal response to ambient environment
- Thermistor bolometer design
- 0.01 to 25 mW power range
- Rack mount option available



Microwave Calibration Standard

MODEL 1510A

- Terminating Design
- Transfer calibration from NIST (or other NMI) to feedthrough standards with the lowest possible uncertainty from 10 MHz to 50 GHz
- Lowest uncertainty of any available CW absolute power sensor
- Temperature controlled for minimal response to ambient environment
- Thermistor bolometer design
- 0.01 to 25 mW power range



Uncertainty Calculation for a Power Sensor Calibration

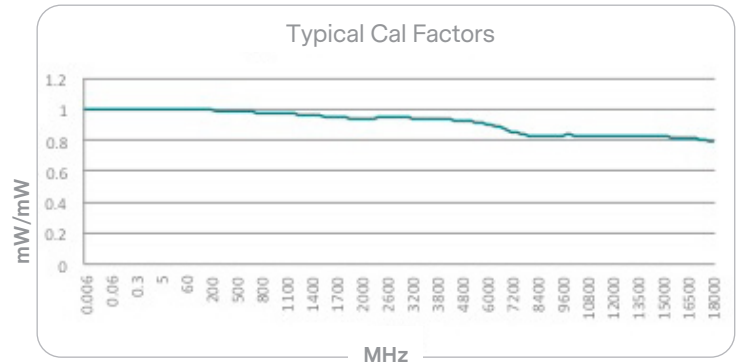
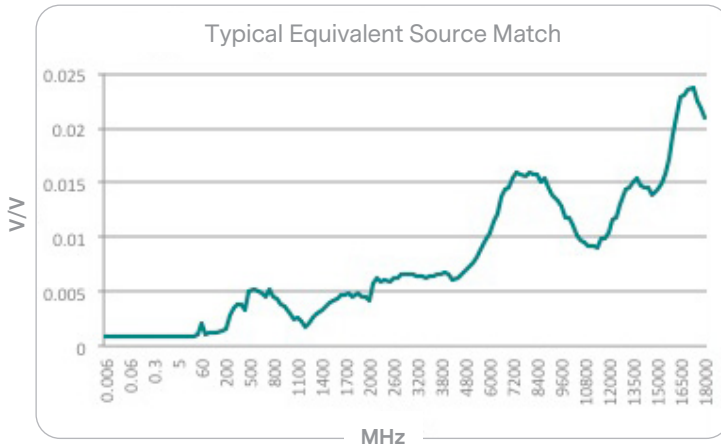
Example calibration: Frequency: 18 GHz
Power: 1 mW

$$k_{DUT} = \frac{P_{DUT}}{P_{FT_{z0}}} (|1 - \Gamma_{FT} \Gamma_{DUT}|^2)$$

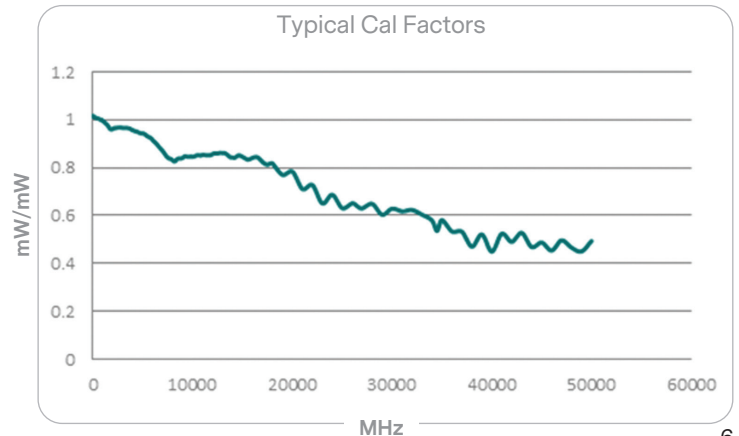
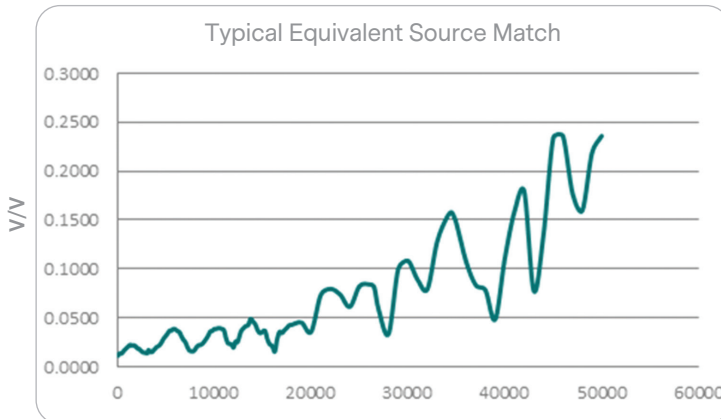
Input Component	Value of Input	Uncertainty of Input Value	Uncertainty Contribution to k of Input
2505A calibration factor	.8851 mW/mW	.01 mW/mW	.01 mW/mW
2505A Rho	.042 V/V	.03 V/V	.00114 mW/mW
2505A Phi	-41.8 degrees	8 degrees	.00111 mW/mW
1830A Power Reading	1.0000 mW	.07% of rdg	.00059 mW/mW
DUT Rho	.111 V/V	.03 V/V	.00014 mW/mW
DUT Phi	120 degrees	4 degrees	.00055 mW/mW
DUT Power Reading	1.0050 mW	.5% of rdg	.00431 mW/mW
Repeatability	.002 mW/mW		.002 mW/mW
RSS Uncertainty			.0113 mW/mW

Performance Graphs

2505A



2510A



PM Series Supported Sensors

HP / AGILENT / KEYSIGHT			
SENSOR	FREQUENCY RANGE	EEPROM Read/Write	Required PM Series
478A	10 MHz to 10 GHz		PMX18
8478B	10 MHz to 18 GHz		PMX18
8481A	10 MHz to 18 GHz		PMX18
8481B	10 MHz to 18 GHz		PMX18
8481D	10 MHz to 18 GHz		PMX18
8481D-039	10 MHz to 22 GHz		PMX50
8481H	10 MHz to 18 GHz		PMX18
8482A	100 kHz to 4.2 GHz		PMX18
8482B	100 kHz to 4.2 GHz		PMX18
8482H	100 kHz to 4.2 GHz		PMX18
8484A	10 MHz to 18 GHz		PMX18
8485A	50 MHz to 26.5 GHz		PMX50
8485A-033	50 MHz to 33 GHz		PMX50
8485D	50 MHz to 26.5 GHz		PMX50
8487A	50 MHz to 50 GHz		PMX50
8487D	50 MHz to 50 GHz		PMX50
11722A	100 kHz to 4.2 GHz		PMX18
11792A	50 MHz to 26.5 GHz		PMX50
EPC-E18	10 MHz to 18 GHz	✓	PMX18
EPC-E26	50 MHz to 26.5 GHz	✓	PMX50
E4412A	10 MHz to 18 GHz	✓	PMX18
E4413A	50 MHz to 26.5 GHz	✓	PMX50
E9300A	10 MHz to 18 GHz	✓	PMX18
E9300B	10 MHz to 18 GHz	✓	PMX18
E9300H	10 MHz to 18 GHz	✓	PMX18
E9301A	10 MHz to 6 GHz	✓	PMX18
E9301B	10 MHz to 6 GHz	✓	PMX18
E9301H	10 MHz to 6 GHz	✓	PMX18
E9304A	9 kHz to 6 GHz	✓	PMX18
E9321A	50 MHz to 6 GHz	✓	PMX18
E9322A	50 MHz to 6 GHz	✓	PMX18
E9323A	50 MHz to 6 GHz	✓	PMX18
E9325A	50 MHz to 18 GHz	✓	PMX18
E9326A	50 MHz to 18 GHz	✓	PMX18
E9327A	50 MHz to 18 GHz	✓	PMX18
N1921A	50 MHz to 18 GHz		PMX18
N1922A	50 MHz to 40 GHz		PMX50
N5532A-504	100 kHz to 4.2 GHz	✓	PMX18
N5532A-518	10 MHz to 18 GHz	✓	PMX18
N5532A-526	30 MHz to 26.5 GHz	✓	PMX50
N5532A-550	30 MHz to 50 GHz	✓	PMX50
N8481A	10 MHz to 18 GHz	✓	PMX18
N8482A	100 kHz to 6 GHz	✓	PMX18
N8485A	10 MHz to 26.5 GHz	✓	PMX50
N8487A	50 MHz to 50 GHz	✓	PMX50
U2000A	10 MHz to 18 GHz	✓	PMX18
U2000B	10 MHz to 18 GHz	✓	PMX18
U2000H	10 MHz to 18 GHz	✓	PMX18
U2001A	10 MHz to 6 GHz	✓	PMX18
U2001B	10 MHz to 6 GHz	✓	PMX18
U2001H	10 MHz to 6 GHz	✓	PMX18
U2002A	50 MHz to 24 GHz	✓	PMX50
U2002H	50 MHz to 24 GHz	✓	PMX50
U2004A	9 kHz to 6 GHz	✓	PMX18
U8481A	10 MHz to 18 GHz	✓	PMX18
U8485A	10 MHz to 33 GHz	✓	PMX50
U8487A	10 MHz to 50 GHz	✓	PMX50
U2021XA	50 MHz to 18 GHz		PMX18
U2022XA	50 MHz to 40 GHz		PMX50
U2022XA_H50	50 MHz to 50 GHz		PMX50

ROHDE & SCHWARZ			
SENSOR	FREQUENCY RANGE	EEPROM Read/Write	Required PM Series
NRP6A	8 kHz to 6 GHz	✓	PMX18
NRP18A	8 kHz to 18 GHz	✓	PMX18
NRP8S	10 Mhz to 8 GHZ	✓	PMX18
NRP18S	10 MHz to 18 GHz	✓	PMX18
NRP33S	10 MHz to 33 GHz	✓	PMX50
NRP40S	10 MHz to 40 GHz	✓	PMX50
NRP50S	10 MHz to 50 GHz	✓	PMX50
NRP18T	DC to 18 GHz	✓	PMX18
NRP33T	DC to 33 GHz	✓	PMX50
NRP40T	DC to 40 GHz	✓	PMX50
NRP50T	DC to 50 GHz	✓	PMX50
NRP-Z11	10 MHz to 8 GHz	✓	PMX18
NRP-Z21	10 MHz to 18 GHz	✓	PMX18
NRP-Z22	10 MHz to 18 GHz	✓	PMX18
NRP-Z31	10 MHz to 33 GHz	✓	PMX50
NRP-Z41	10 MHz to 40 GHz	✓	PMX50
NRP-Z51	DC to 18 GHz	✓	PMX18
NRP-Z52	DC to 33 GHz	✓	PMX50
NRP-Z55.03	DC to 40 GHz	✓	PMX50
NRP-Z55.04	DC to 44 GHz	✓	PMX50
NRP-Z56	DC to 50 GHz	✓	PMX50
NRP-Z61	10 MHz to 40 GHz	✓	PMX50
NRP-Z81	50 MHz to 18 GHz	✓	PMX18
NRP-Z85	50 MHz to 40 GHz	✓	PMX50
NRP-Z86	50 MHz to 44 GHz	✓	PMX50
NRP-Z91	9 kHz to 6 GHz	✓	PMX18
NRP-Z92	9 kHz to 6 GHz	✓	PMX18
NRP-Z211	10 MHz to 8 GHz	✓	PMX18
NRP-Z221	10 MHz to 18 GHz	✓	PMX18
NRV-Z1	10MHz to 18GHz		PMX18
NRV-Z2	10MHz to 18GHz		PMX18
NRV-Z3	1MHz to 2.5GHz		PMX18
NRV-Z4	100kHz to 6GHz		PMX18
NRV-Z5	100kHz to 6GHz		PMX18
NRV-Z6	50MHz to 26.5GHz		PMX50
NRV-Z15	50MHz to 40GHz		PMX50
NRV-Z31	30MHz to 6GHz		PMX18
NRV-Z32	30MHz to 6GHz		PMX18
NRV-Z33	30MHz to 6GHz		PMX18
NRV-Z51	DC to 18GHz		PMX18
NRV-Z52	DC to 26.5GHz		PMX50
NRV-Z53	DC to 18GHz		PMX18
NRV-Z54	DC to 18GHz		PMX18
NRV-Z55	DC to 40GHz		PMX50

LADYBUG			
SENSOR	FREQUENCY RANGE	EEPROM Read/Write	Required PM Series
LB5908A	1MHz to 8GHz	✓	PMX18
LB5908L	9kHz to 8GHz	✓	PMX18
LB5912A	1MHz to 12.5GHz	✓	PMX18
LB5918A	1MHz to 18GHz	✓	PMX18
LB5918L	9kHz to 18GHz	✓	PMX18
LB5926A	1MHz to 26.5GHz	✓	PMX50
LB5926L	9kHz to 26.5GHz	✓	PMX50
LB5940A	1MHz to 40GHz	✓	PMX50
LB5940L	9kHz to 40GHz	✓	PMX50
LB559A	10MHz to 12.5GHz	✓	PMX18
LB579A	10MHz to 18GHz	✓	PMX18
LB589A	10MHz to 26.5GHz	✓	PMX50
LB478A	10MHz to 8GHz	✓	PMX18
LB479A	10MHz to 8GHz	✓	PMX18
LB480A	50MHz to 8GHz	✓	PMX18
LB680A	50MHz to 20GHz	✓	PMX50

PM Series Supported Sensors (continued)

ANRITSU			
SENSOR	FREQUENCY RANGE	EEPROM Read/Write	Required PM Series
MA24002A	10 MHz to 18 GHz	✓	PMX18
MA24004A	10 MHz to 40 GHz	✓	PMX50
MA24005A	10 MHz to 50 GHz	✓	PMX50
MA2411A	300 kHz to 40 GHz	✓	PMX50
MA2411B	300 kHz to 40 GHz	✓	PMX50
MA2442A	10 MHz to 18 GHz	✓	PMX18
MA2442B	10 MHz to 18 GHz	✓	PMX18
MA2442D	10 MHz to 18 GHz	✓	PMX18
MA2444A	10 MHz to 40 GHz	✓	PMX50
MA2444D	10 MHz to 40 GHz	✓	PMX50
MA2445A	10 MHz to 50GHz	✓	PMX50
MA2445D	10 MHz to 50GHz	✓	PMX50
MA2472A	10 MHz to 18 GHz	✓	PMX18
MA2472B	10 MHz to 18 GHz	✓	PMX18
MA2472D	10 MHz to 18 GHz	✓	PMX18
MA2473A	10 MHz to 32 GHz	✓	PMX50
MA2473D	10 MHz to 32 GHz	✓	PMX50
MA2474A	10 MHz to 40 GHz	✓	PMX50
MA2474D	10 MHz to 40 GHz	✓	PMX50
MA2475A	10 MHz to 50 GHz	✓	PMX50
MA2475D	10 MHz to 50 GHz	✓	PMX50
MA2481B	10 MHz to 6 GHz	✓	PMX18
MA2481D	10 MHz to 6 GHz	✓	PMX18
MA2482A	10 MHz to 18 GHz	✓	PMX18
MA2482B	10 MHz to 18 GHz	✓	PMX18
MA2490A	10 MHz to 8 GHz	✓	PMX18
MA2491A	10 MHz to 6 GHz	✓	PMX18

BOONTON			
51071	10 MHz to 26.5 GHz	✓	PMX50
51072	30 MHz to 40 GHz	✓	PMX50
51075	30 MHz to 18 GHz	✓	PMX18
51077	500 kHz to 18 GHz	✓	PMX18
51078	100 kHz to 18 GHz	✓	PMX18
51079	500 kHz to 18 GHz	✓	PMX18
51100_9E	10 MHz to 18 GHz	✓	PMX18
51200	10 MHz to 18 GHz	✓	PMX18
51011_EMC	10 MHz to 8 GHz	✓	PMX18
51011_4B	100 kHz to 12.4 GHz	✓	PMX18
51013_4E	100 kHz to 18 GHz	✓	PMX18
51015_5E	100 kHz to 18 GHz	✓	PMX18
51033_6E	100 kHz to 18 GHz	✓	PMX18
56006	500 kHz to 6 GHz	✓	PMX18
56018	30 MHz to 18 GHz	✓	PMX18
56218	30 kHz to 18 GHz	✓	PMX18
56218_S2	30 MHz to 26.5 GHz	✓	PMX50
56318	500 kHz to 18 GHz	✓	PMX18
56326	500 kHz to 26.5 GHz	✓	PMX50
56340	500 kHz to 40 GHz	✓	PMX50
56518	500 kHz to 18 GHz	✓	PMX18
56526	500 kHz to 26.5 GHz	✓	PMX50
56540	500 kHz to 40 GHz	✓	PMX50
57318	50 MHz to 18 GHz	✓	PMX18
57518	50 MHz to 18 GHz	✓	PMX18
57540	50 MHz to 40 GHz	✓	PMX50
58318	50 MHz to 18 GHz	✓	PMX18
59318	500 MHz to 18 GHz	✓	PMX18
59340	500 MHz to 40 GHz	✓	PMX50

GIGA-TRONICS			
SENSOR	FREQUENCY RANGE	EEPROM Read/Write	Required PM Series
80301A	10 MHz to 18 GHz	✓	PMX18
80302A	10 MHz to 18 GHz	✓	PMX18
80303A	50 MHz to 26.5 GHz	✓	PMX50
80304A	50 MHz to 40 GHz	✓	PMX50
80310A	10 MHz to 18 GHz	✓	PMX18
80313A	50 MHz to 26.5 GHz	✓	PMX50
80314A	50 MHz to 40 GHz	✓	PMX18
80320A	50 MHz to 18 GHz	✓	PMX18
80321A	50 MHz to 18 GHz	✓	PMX18
80322A	50 MHz to 18 GHz	✓	PMX18
80323A	50 MHz to 26.5 GHz	✓	PMX50
80324A	50 MHz to 40 GHz	✓	PMX50
80325A	50 MHz to 18 GHz	✓	PMX18
80330A	10 MHz to 18 GHz	✓	PMX18
80333A	10 MHz to 26.5 GHz	✓	PMX50
80334A	10 MHz to 40 GHz	✓	PMX50
80350A	45MHz to 18GHz	✓	PMX18
80351A	50 MHz to 18 GHz	✓	PMX18
80352A	50 MHz to 18 GHz	✓	PMX18
80353A	50 MHz to 26.5 GHz	✓	PMX50
80354A	50 MHz to 40 GHz	✓	PMX50
80355A	50 MHz to 18 GHz	✓	PMX18
80401A	50 MHz to 18 GHz	✓	PMX18
80402A	50 MHz to 18 GHz	✓	PMX18
80410A	50 MHz to 18 GHz	✓	PMX18
80420A	50 MHz to 18 GHz	✓	PMX18
80421A	50 MHz to 18 GHz	✓	PMX18
80422A	50 MHz to 18 GHz	✓	PMX18
80425A	50 MHz to 18 GHz	✓	PMX18
80501A	10 MHz to 18 GHz	✓	PMX18
80502A	10 MHz to 18 GHz	✓	PMX18
80503A	10 MHz to 26.5 GHz	✓	PMX50
80504A	10 MHz to 40 GHz	✓	PMX50
80601A	50 MHz to 18 GHz	✓	PMX18
80621A	50 MHz to 18 GHz	✓	PMX18
80701A	10 MHz to 18 GHz	✓	PMX18

AEROFLEX / MARCONI			
6910	10MHz to 20GHz		PMX50
6911	10MHz to 20GHz		PMX50
6912	30kHz to 4.2GHz		PMX18
6913	10MHz to 26.5GHz		PMX50
6914	10MHz to 40GHz		PMX50
6914S	10MHz to 46GHz		PMX50
6919	30kHz to 3GHz		PMX18
6920	10MHz to 20GHz		PMX50
6923	10MHz to 26.5GHz		PMX50
6924	30kHz to 40GHz		PMX50
6924S	10MHz to 46GHz		PMX50
6930	10MHz to 18GHz		PMX18
6932	30kHz to 4.2GHz		PMX18
6934	10MHz to 40GHz		PMX50

TEGAM			
1807A	10 MHz to 18 GHz		PMX18
F1109/M1110	10 MHz to 18 GHz		PMX18
F1116	100 kHz to 100 MHz		PMX18
F1117A	50 MHz to 26.5 GHz		PMX50
F1119	100 kHz to 4.2 GHz		PMX18
F1125	100 kHz to 4.2 GHz		PMX18
F1130/M1130	100 kHz to 18 GHz		PMX18
F1135/M1135	10 MHz to 26.5 GHz		PMX50
2505A/1505A	6 kHz to 18 GHz		PMX18
2510A/1510A	10 MHz to 50 GHz		PMX18

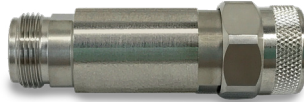
PM Series Accessories

Attenuators

138-645-1

Coaxial fixed attenuator; 30 dB

- Frequency DC to 18 GHz
- Maximum Input Power:
2 W (average), 100 W (peak)
- Maximum SWR: 1.2 to 8 GHz,
1.3 to 12.4 GHz, 1.5 to 18 GHz
- Connector: Type-N male to female
- Includes S-parameter test data



1130-913-02

Coaxial fixed attenuator; 20 dB

- Frequency DC to 18 GHz
- Maximum Input Power:
2 W (average), 100 W (peak)
- Maximum SWR: 1.2 to 8 GHz, 1.3 to 12.4 GHz, 1.5 to 18 GHz
- Connector: Type-N male to female
- Includes S-parameter test data

138-645-2

Coaxial fixed attenuator; 30 dB

- Frequency DC to 26.5 GHz
- Maximum Input Power: 2 W (average),
5 μ sec pulse width; 0.05% duty cycle (peak)
- Maximum SWR: 1.1 to 8 GHz,
1.15 to 12.4 GHz, 1.25 to 26.5 GHz
- Connector: 3.5 mm male to female
- Includes S-parameter test data



2510-913-01

Coaxial fixed attenuator; 30 dB

- Frequency DC to 50 GHz
- Maximum Input Power: 2 W (average)
- Maximum SWR: 1.3 to 26.5 GHz,
1.5 from 26.5 GHz to 50 GHz
- Connector: 2.4 mm male to female
- Includes S-parameter test data

2510-913-20

Coaxial fixed attenuator; 20 dB

- Frequency DC to 50 GHz
- Maximum Input Power: 2 W (average)
- Maximum SWR: 1.3 to 26.5 GHz,
1.5 from 26.5 GHz to 50 GHz
- Connector: 2.4 mm male to female
- Includes S-parameter test data

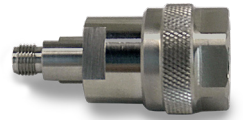


Adapters

138-645-5

Connector/Adapter

- Frequency DC to 18 GHz
- Maximum SWR: 1.065 to 4 GHz, 1.13 to 18 GHz
- Connector: Type-N male to 3.5 mm female
- Includes S-parameter test data



138-645-6

Connector/Adapter

- Frequency DC to 18 GHz
- Maximum SWR: 1.065 to 4 GHz, 1.13 to 18 GHz
- Connector: Type-N female to 3.5 mm male
- Includes S-parameter test data



2510-914-01

Connector/Adapter

- Frequency DC to 18 GHz
- Maximum SWR: 1.07 to 4 GHz, 1.12 GHz to 18 GHz
- Connector: 2.4 mm male to Type-N female
- Includes S-parameter test data

2510-912-01

Connector/Adapter

- Frequency DC to 26.5 GHz
- Maximum SWR: 1.05 DC to 18 GHz, 1.08 18 GHz to 26.5 GHz
- Connector: 2.4 mm male to 3.5 mm female
- Includes S-parameter test data

2510-911-01

Connector/Adapter

- Frequency DC to 40 GHz
- Maximum SWR: 1.05 DC to 4 GHz, 1.08 4 GHz to 20 GHz,
1.12 20 GHz to 40 GHz
- Connector: 2.4 mm male to 2.92 mm female
- Includes S-parameter test data

1510-912-01

Connector/Adapter

- Frequency DC to 26.5 GHz
- Maximum SWR: 1.05 DC to 18 GHz, 1.08 18 GHz to 26.5 GHz
- Connector: 2.4 mm female to 3.5 mm male
- Includes S-parameter test data

1510-911-01

Connector/Adapter

- Frequency DC to 40 GHz
- Maximum SWR: 1.05 DC to 4 GHz, 1.08 4 GHz to 20 GHz,
1.12 20 GHz to 40 GHz
- Connector: 2.4 mm female to 2.92 mm male
- Includes S-parameter test data

Cables

CA-11-15 and CA-11-48 (15" or 48" length)

Heater cable (4-pin mini to 4-pin mini)

For use with the following combinations:

- 1806A connected to F1130A/B and F1135A/B
- 1830A connected to F1130A/B and F1135A/B

CA-10-48 (48" length)

Heater cable (4-pin mini to 4-pin large)

For use with the following combinations:

- 1806A connected to M1130A and M1135A
- 1830A connected to M1130A and M1135A

CA-7-15 and CA-7-48 (15" or 48" length)

Sensor cable for use with the following combinations:

- 1830A connected to F1130A/B, F1135A/B, M1130A or M1135A

CA-27-48

Heater cable for 1805, 1806 to F1109, F1117, M1110, M1118, M1130 and M1135

CA-21-15 and CA-21-48 (15" or 48" length)

Heater and sensor cable for use with the following combinations:

- 1830A connected to 1505A and 2505A
- 1830A connected to 1510A and 2510A

CA-6-48 (48" length)

Sensor cable for use with the following combinations:

- 1830A connected to 478A and 8478B

CA-9-48 (48" length)

Sensor cable; un-terminated cable for customers that wish to make their own cables to interface with the 1830A

CA-20-48 (48" length)

Sensor cable; lug-terminated cable for calibration of the 1830A

CA-28-48 (48" length)

Sensor cable for use with the following combinations:

- 1806A connected to 1505A and 2505A
- 1806A connected to 1510A and 2510A

CA-29-48 (48" length)

Sensor cable for use with the following combinations:

- 1806 connected to 1505A and 2505A
- 1806 connected to 1510A and 2510A

CA-23-12 (12" length)

Low loss RF cable, 50 GHz, 2.4 mm male connectors

- Insertion loss max 1.8 dB

CA-23-36 (36" length)

Low loss RF cable, 50 GHz, 2.4 mm male connectors

- Insertion loss max 4.0 dB

CA-14-2M (2-meter length)

USB cable, USB A to USB A; communication cable for the 1830A

1585-1000 (36" length)

Test cable with SMA straight plug connectors, DC to 18 GHz

- Insertion loss max 1.9 dB

1585-1008 (36" length)

Low loss RF cable, 26.5 GHz, 3.5 mm male connectors

- Insertion loss max 3.0 dB

1585-1009 (36" length)

Low loss RF cable, 40.0 GHz, 2.92mm male connectors

- Insertion loss max 3.6 dB

Torque Wrenches

1130-910-01

Torque wrench, 8mm, 5 in-lbs

1130-911-01

Torque wrench, 3/4", 12 in-lbs

1130-912-01

Torque wrench, 13/16", 14 in-lbs

2510-910-01

Torque wrench, 8mm, 8 in-lbs

Rack Mount Kits

1830-910

Single unit rack mount, 1830A, F113XB, 2505A and 2510A

1830-911

Dual rack mount kit, 1830A, F113XB, 2505A and 2510A

F1120-RMK

Rack mount kit, F11XX Series (before "B" suffix only)

Transport Cases

1500-910

Transport case for 1505A and 1510A power standard

Note: 1510-910 is a standard item with a new purchase of the 1505A or 1510A

2500-910

Transport case for 1830A, F113X, 2505A, 2510A, M1130 and M1135

8000

RF mount transport case for F1109, F1117, M1110, M1118, M1130 and M1135

1800

Transport case, 1806A



For international contact information,
visit advancedenergy.com.

powersales@aei.com (Sales Support)
productsupport.ep@aei.com (Technical Support)
+1 888 412 7832

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

PRECISION | POWER | PERFORMANCE | TRUST

Specifications are subject to change without notice. Not responsible for errors or omissions. ©2025 Advanced Energy Industries, Inc. All rights reserved. Advanced Energy®, and AE® are U.S. trademarks of Advanced Energy Industries, Inc.