YOUR GLOBAL SOURCE FOR TEST AND MEASUREMENT SOLUTIONS

SYSTEM IIA

AUTOMATIC POWER METER CALIBRATION SYSTEM

10 MHz to 18 GHz

(expandable 100 KHz to 40 GHz)

IEEE - 488

For use in Laboratories, Quality Assurance Inspection, Maintenance

Simplicity, Accuracy, and Cost Effectiveness...

Calibration of RF power meter/mount combinations is faster and more accurate than ever before when using the TEGAM System IIA. System IIA is IEEE-488 bus controlled and transforms a slow and costly task into a quick and accurate procedure.

The calibration accuracy of System IIA is typically less than 1% above accuracies provided directly by the National Institute of Standards and Technology (NIST), including mismatch uncertainties. Total accuracy is less than 1.2 to 2.5% (RSS) depending on frequency and VSWR of the device under test.

Calibration speed of the System IIA is typically 5 seconds per measurement frequency, depending on settling time of the power sensor/meter under test. System IIA is used for the transfer of calibration factors to thermistor and thermocouple as well as diode-type RF Power Meter sensors. Accurate measurement of signal source output level can also be performed. Using power ratio methods, variable and step attenuators and attenuation measuring equipment can be calibrated as well as measurement of receiver, amplifier, or attenuator linearity.

The System IIA can perform many other functions such as:

- Measuring Calibration Factors of RF Power Meters (analog or digital) and RF Power Transfer Standards (Terminating and Feedthrough Mounts).
- Measuring linearity of detectors, variable attenuators, receivers, amplifiers and spectrum analyzers.
- Compression ratios at high signal levels.
- Compression due to noise at low signal levels.
- Compare Power Standards.
- Calibrate Piston Attenuators.

Other System IIA features include:

- Accuracies < 1% (RSS) above that provided directly by NIST.
- Total system accuracy for the transfer of calibration factors 1.2% to 2.5% (RSS) in the 0.01 to 18 GHz range
- 5 seconds/measurement includes signal averaging and meter settling time.
- Substituted power levels 0.5 mW and 1.0 to 10 mW in 1 mW steps ± 0.1% + 1 μW.
- Calibration factor transfer repeatability 0.1% .
- Can calibrate power sensors from 100 kHz to 40 GHz.
- Mounts come with NIST traceable calibration data with as many as 132 calibration points.

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PRECISION RF POWER SOURCE

In its most elementary form, System IIA consists of an RF Control Unit (Model 1805B) and a temperature stabilized feedthrough type bolometric power standard (Model F1109). When used with a compatible RF source, you have everything required for the accurate transfer of calibration factors for a wide range of power meters and sensors. When used in conjunction with an IEEE-488 bus controller, you have a fast, automatic, precision power meter calibration system.

The Model F1109 permits the accurate transfer of calibration data traceable to NIST from 0.01 to 18 GHz. Additional points within this range can be accurately determined by interpolation due to the unusually flat frequency response of the thermistor mount/splitter combination.

The 1805B uses highly accurate dc power substitution in a precision RF leveling loop. Power levels are established by precision resistor networks at dc, and are verifiable by an accurate dc voltmeter.

With a stable synthesized signal source, 1 MHz resolution can be programmed from 0.01 to 18 GHz on the IEEE-488 bus.

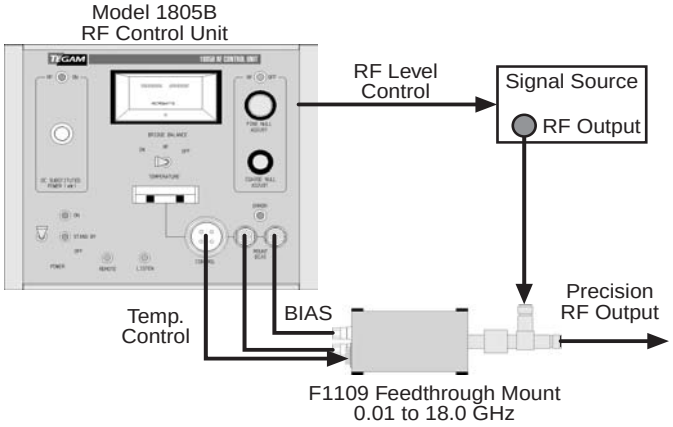


Figure 1. Precision Power Source

Eleven precision power levels of 0.5 and 1 to 10 mW in 1 milliwatt steps permit the verification and/or calibration of the linearity of measurement devices such as power meters (meter scales), power meter/mount combinations, spectrum analyzers and receivers (to achieve a 10 mW power level, a signal source with an output of 100 mW is generally necessary).

PRECISION RF POWER METER

With the addition of a Terminating Bolometric-type Power Standard (Model M1110) and a Model 1806 Dual Type IV Power Meter, System IIA capability is expanded so that recertification of the Model F1109 feed-through type power standard card be accomplished at the user's location. This avoids the requirement for removing the system from service for recalibration. Recertification can be accomplished automatically in less than 2 hours time. The Model M1110 becomes the certifying element and would be periodically (every 1 - 2 years) sent to a calibration facility such as TEGAM, the National Institute of Standards and Technology (NIST), or any equivalent service outside the USA.

The Model 1806 is a Dual Type IV Power Meter and mount temperature controller combination. Metering circuits indicate status of both the power meters and the mount temperature. Mount resistance is front panel switch selectable to accommodate either 100 or 200 ohm thermistor mounts. The 1806 provides +0.03% + 2mW accuracy and measures dc power levels from 10 mW to 30 mW.

Used in conjunction with a calibrated bolometer mount such as the TEGAM F1109 or M1110 and an external digital voltmeter, the Model 1806 serves as a precision power meter for measuring RF power levels and for transferring calibration factors between feed-through mounts or thermistor type sensors. Additionally, the Model 1806 is ideal for performing insertion loss measurements up to 20 dB.

Regardless of the application, all measurements can be directly traced to primary NIST standards. The 1806 is also compatible with HP Models 478A, 8477A, and 486A (with cable 138-652) as well as TEGAM Models M1111, F1116, M1118, M1120 series Coaxial RF Power Transfer Standards and the Model 1107 series Waveguide Standards.

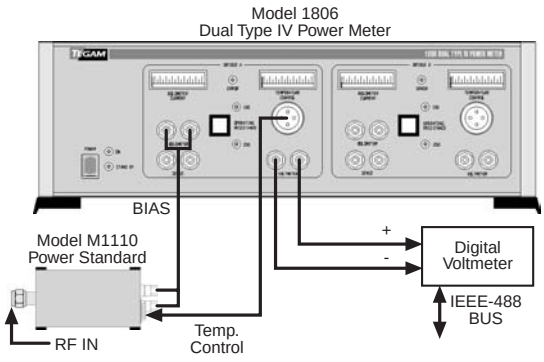


Figure 2. Precision Power Source

Figure 2. Precision Power Source

SYSTEM CALIBRATION/VERIFICATION

As shown in Figure 3, the 1805B RF Control Unit, the F1109 feed-through type power standard, and an RF signal source form a Precision Power Source.

The M1110 terminating type power standard, 1806 NIST Type IV Power meter, and DVM form a Precision Power Meter.

With this arrangement the M1110 power standard is used to calibrate or validate the calibration accuracy of the F1109 feed-through mount. The F1109 is then used as a standard for the transfer of calibration factor to power sensors and power meters. This is accomplished by replacing the 1806 Type IV power meter and the M1110 termination mount with an analog or digital power meter and the power sensor under test.

If an analog power meter is used it must have an external output port similar in function to the RECORDER OUTPUT

port provided on an HP-432 power meter. The external output port is then connected to a digital voltmeter which serves as an IEEE-488 bus communicator.

When used on an IEEE-488 bus, the precision power source automatically sequences through preselected frequencies and power levels, measures the dc substituted power at the output of the mount under test, and calculates the calibration factor.

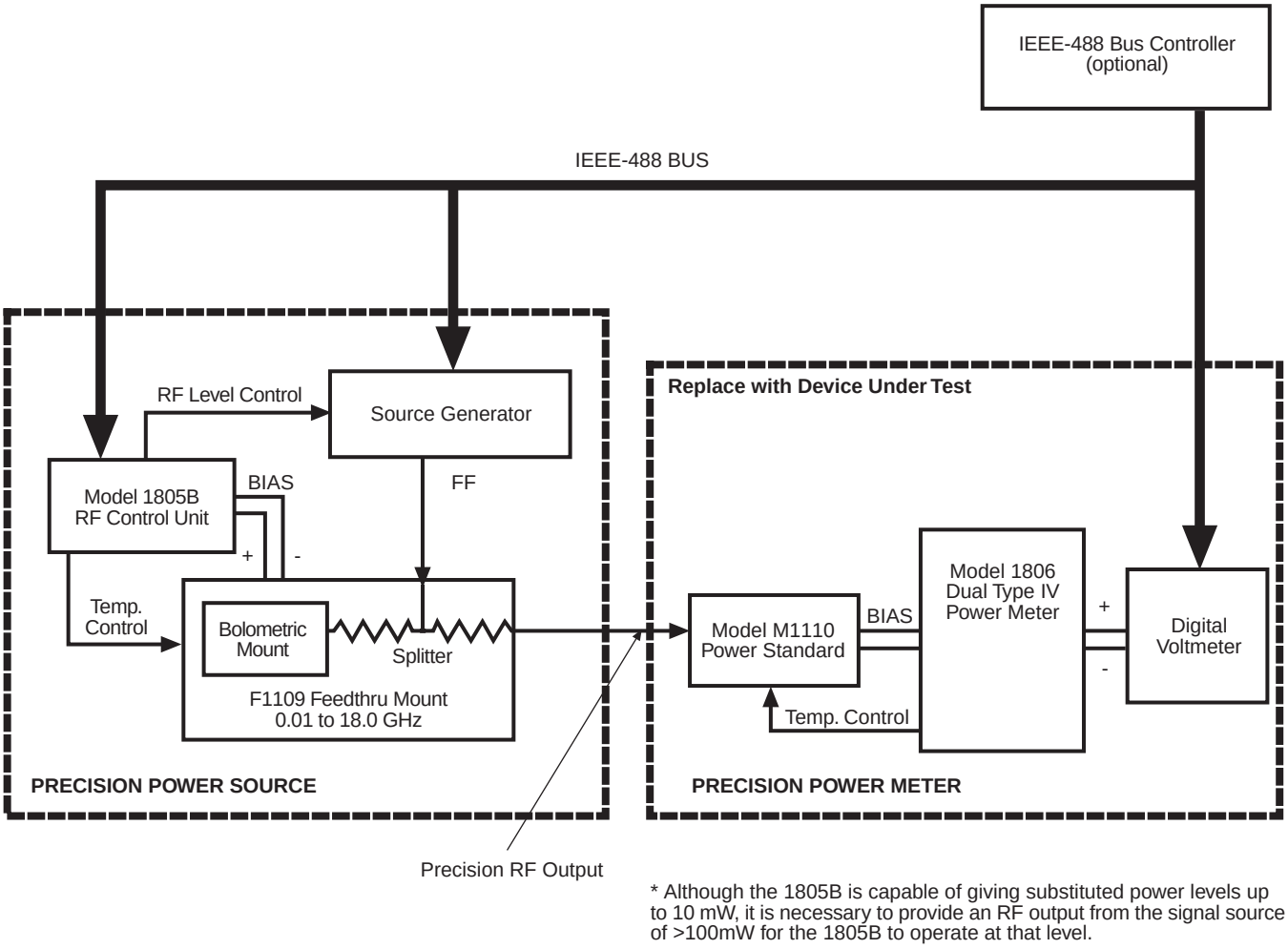


Figure 3. System IIA Measurement Configuration

MEASUREMENT FLEXIBILITY

In addition to the basic task of transferring calibration factors and the measurement of power level and attenuation, System IIA can be easily expanded to offer a wide range of measurement capabilities. TEGAM mounts and mount splitter combinations are available to extend the measurement frequency range down to 100 KHz and up to 26.5 GHz. Mount coupler combinations are also available for measurements in the 18 to 26.5 GHz and 26.5 to 40 GHz ranges.

The terminating bolometer mount (Model M1110) can be used to calibrate the reference output found on many power meters which serve thermocouple and semiconductor (diode) power sensors. The TEGAM Model M1111 provides even better accuracy at 30 and 50 MHz because of its unusually low SWR.

Additionally, System IIA can be used to verify the accuracy and linearity of spectrum analyzers and receivers such as the VM-7.

OPERATIONAL FLEXIBILITY

SELF CALIBRATING - The Model M1110 Bolometric Power Standard enables the user to calibrate or verify calibration of the F1109 power mount. Therefore the system is easily calibrated. Measurement accuracy is constantly maintained and system operation is quickly and easily verified. Unlike other methods, System IIA is not interrupted while the power reference standard is sent to a higher echelon laboratory for recalibration.

ONE MODEL M1110 CAN BE USED TO SUPPORT ANY NUMBER OF SYSTEM IIA'S - One Model M1110 can be used to verify and/or calibrate other Model F1109 power standards used by satellite sites or other areas within the same facility. Thus, one Model M1110 can support any number of other System IIA's. This is ideal when more than one System IIA is required to support Production, Quality Assurance, and R&D activities.

NIST TRACEABLE - The M1110 can be sent directly to NIST for calibration. This provides a two-fold benefit. System accuracy is traced directly to NIST and down time is avoided since the Model M1110 is not used in the day-to-day operation of System IIA.

WIDE FREQUENCY RANGE - When used with other TEGAM precision power standards and adapters, System IIA can be used for the accurate transfer of calibration factors from 100 kHz to 40 GHz.

MANUAL OR REMOTE CONTROL - System IIA operation may be controlled manually via front panel controls or by a system controller when used on an IEEE-488 bus. Software supplied with System IIA accommodates a wide variety of power meters and sensors.

OPERATING CONVENIENCE

The TEGAM Model 1807A RF Transfer Standard combines the temperature stabilized feed-through type bolometer standard/splitter in a convenient companion unit to the 1805B RF Control Unit. The 1807A provides additional mechanical stability for the power standard test port, and facilitates the use of torque wrenches for even greater precision.

A slide-out tray, located in the bottom portion of the 1807A, provides a stable work platform when calibrating the system with a TEGAM M1110 terminating mount. Other sensors can be supported for safety with blocks or a lab jack as well.

The 1807A and 1805B units may be ordered as shown in a bench mount configuration, or with rack mounting kit number 1919 for standard rack mounting.

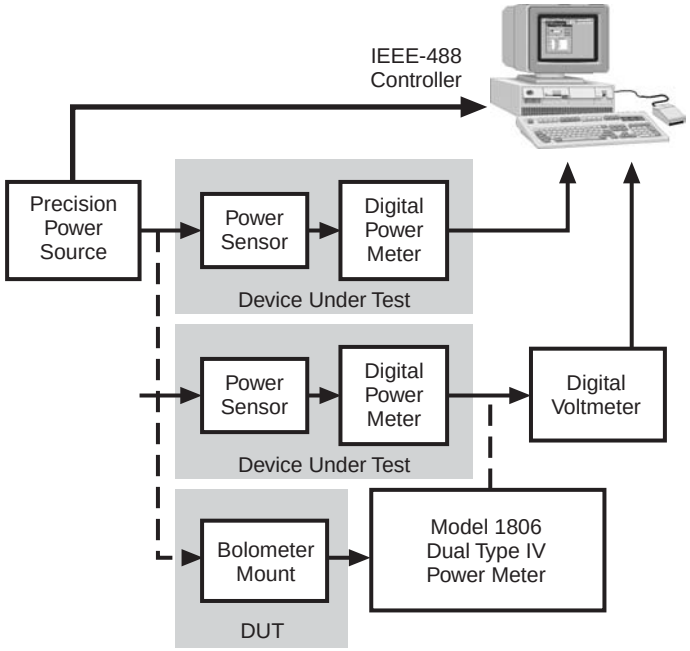
The 1807A covers frequencies from 10MHz to 18 GHz. We offer other Transfer Standards in this form to cover frequencies of 50 MHz to 26.5 GHz (F1117AC) and 100 kHz to 4.2 GHz (F1119C).

APPLICATIONS

In a typical application, calibrating an HP-436A power meter and its associated power sensor, the F1109 (or 1807A) is used as the reference standard to establish the calibration factor of the power meter and sensor under test. To calibrate the 50 MHz reference output port of the 436A power meter, the M1110 can be used. However, even greater accuracy is obtained by using a TEGAM M1111 terminating mount. The TEGAM M1111 has a maximum SWR of 1.2 (1.05 typical) while the M1110 has a maximum SWR of 1.4 (1.1 typical) at 50 MHz. The Model 1806 Dual Type IV Power Meter can also be used to supply bias power and thermostatic heater control for the M1111 power standard.

If an M1111 is used to calibrate the 50 MHz reference output of the HP-436, the M1110 may be sent to TEGAM, NIST, or equivalent calibration standards laboratory for recalibration without disabling the full calibration capability of System IIA.

The System IIA software package incorporates program instructions for using digital voltmeters to interface with the IEEE-488 bus controller when using the 1806 dual Type IV power meter or when calibrating analog-type power meters that have an external output port.



Power meters are automatically calibrated by System IIA. Digital power meters with bus output may be connected directly to the controller. Analog power meters that have an external output port may be calibrated by connecting them to the controller through a digital voltmeter. A digital power meter without IEEE option may be used via DVM.

Figure 4. System IIA Applications

NIST TRACEABILITY

The calibration factor from a NIST calibrated Model M1110 terminating power standard is transferred to the System IIA F1109 feedthrough power standard with a typical loss of only 1/2 of 1% in transfer uncertainty for 132 traceable frequencies.

As shown in Figure 5, traceability of the Model M1110 mount supplied as a part of System IIA is derived from the TEGAM Model F1109. An additional loss of 1/2 of 1% in transfer uncertainty occurs with this method due to the three tiers of calibration. As an alternative, System IIA can be specified with Model M1110 mounts calibrated directly by NIST, also shown in Figure 5. The NIST calibrated Model M1110 can be returned to NIST for recalibration on an annual or biennial basis.

Depending on logistics, a user of multi-System IIA installations may elect to maintain traceability using a single Model M1110 thermistor mount on a rotational basis between sites and the main reference laboratory. To accommodate such requirements, System IIA can be ordered without Model M1110 terminating mounts.

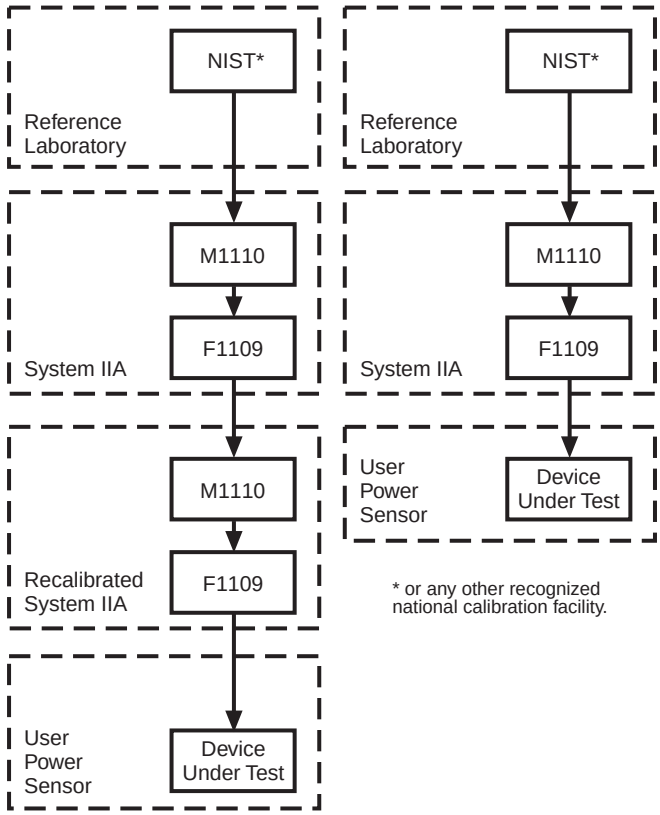


Figure 5. Traceability

SUMMARY OF SYSTEM IIA ERRORS:

Calibrating an F1109 feedthrough mount with a NIST calibrated M1110 terminating mount results in the following errors in worst case and RSS terms.

Instrumentation Errors:

Source of Error	Error	Calibration of F1109 with M1110 @ 10 mW	Calibration of M1110 with F1109 @ 10 mW
Inaccuracy of DC substitution (1805B)	0.1% + 5 mW	0.15%	0.15%
Inaccuracy of DC substitution (1806)	0.03% + 2 mW	0.05%	0.05%
Connector Repeatability	0.1%	0.1%	0.1%
Temperature Drift of Thermistor Mount	0.05%	0.05%	0.05%
Thermistor Unbalance	0.1%	0*	0*
Instability or Calibration Factor with Time	0.1%	0.1%	0**
Total Instrumentation Error Worst Case	0.48% + 7 mW	0.45%	0.35%
Total Instrumentation Error RSS		0.22%	0.19%

* Measurements made at the same power level.
** Calibrations made at nearly the same time.

A comparison of total System IIA errors (worst case and RSS) is as shown below. This table also shows total errors derived using a NIST calibrated M1110. Using the RSS method, System IIA errors can be shown to be approximately 60 percent of those in the worst case analysis.

Total System IIA Errors without GAMMA Correction:

	MODEL F1109 TEGAM CALIBRATED				MODEL M1110 TEGAM CALIBRATED				
FREQUENCY RANGE	Worst Case Spec	Worst Case Typical	RSS** Spec	RSS** Typical	Worst Case Spec	Worst Case Typical	RSS** Spec	NIST* Typical	Calibrated
10-20 MHz	2.33%	1.12%	1.48%	0.57%	4.06%	1.64%	2.03%	0.62%	0.50%
20-50 MHz	1.97%	1.17%	1.16%	0.59%	3.34%	1.74%	1.81%	0.66%	0.50%
50-100 MHz	1.73%	1.16%	.95%	0.59%	2.86%	1.72%	1.68%	0.65%	0.50%
100-1000 MHz	1.49%	1.10%	.77%	0.57%	2.38%	1.60%	1.59%	0.62%	0.50%
1.0-3.5 GHz	1.49%	1.10%	.77%	0.57%	2.38%	1.60%	1.59%	0.62%	0.50%
3.5-4.0 GHz	1.49%	1.10%	.77%	0.57%	2.38%	1.60%	1.59%	0.62%	0.50%
4.0-8.0 GHz	1.73%	1.31%	.95%	0.66%	2.86%	2.02%	1.68%	0.78%	0.50%
8.0-18.0 GHz	2.91%	2.08%	1.88%	1.18%	4.97%	3.31%	2.34%	1.48%	0.75%

* Data based on NIST Report of Calibration number 811963.
** The Root-Sum-Squared (RSS) error is the square root of the sum of the squares of the individual errors which are considered to be random.

A comparison of total System IIA errors (worst case and RSS) with the mismatch error reduced to 0.1% using Gamma corrections is as shown below. This table shows errors derived using a NIST calibrated M1110.

Total System IIA Errors using GAMMA Correction:

	MODEL F1109 TEGAM CALIBRATED		MODEL M1110 TEGAM CALIBRATED		
FREQUENCY RANGE	Worst Case Spec	RSS** Spec	Worst Case Spec	RSS** Spec	NIST* Calibrated
0.01-10 GHz	1.05%	0.56%	1.50%	0.60%	0.50%
10-18.0 GHz	1.30%	0.79%	1.75%	0.82%	0.75%

* Data based on NIST Report of Calibration number 811963 dated July 28, 1992
** The Root-Sum-Squared (RSS) error is the square root of the sum of the squares of the individual errors which are considered to be random.

The following table provides a worst case and RSS analysis of errors when calibrating an HP-8481 power sensor using a F1109 power standard.

Errors in Calibrating 8481 Power Sensor F1109* (without using GAMMA Correction):

FREQUENCY RANGE	SWR	MISMATCH ERROR Specified	MISMATCH ERROR Typical	WORST CASE** Specified	WORST CASE** Typical	RSS** Specified	RSS** Typical
10-30 MHz	1.40	1.00%	0.33%	3.68%	1.80%	1.82%	0.76%
30-50 MHz	1.18	0.50%	0.17%	2.82%	1.69%	1.31%	0.71%
50-2000 MHz	1.10	0.29%	0.14%	2.13%	1.59%	0.89%	0.68%
2-12.4 GHz	1.18	0.80%	0.63%	4.06%	3.06%	2.07%	1.38%
12.4-18 GHz1.28	1.18%	0.94%	4.44%	3.37%	2.25%	1.55%	

* In this example, the F1109 has been calibrated by a TEGAM M1110 which has been NIST calibrated. If the M1110 has been TEGAM calibrated, additional errors result. (Refer to System IIA Errors)

** This does not include instrument errors of the associated power meter which may be ±1.2% worst case or 0.9% RSS.

The following table provides a worst case and RSS analysis of errors using Gamma Correction when calibrating an HP-8481 power sensor using an F1109 power standard. The Gamma Corrections were utilized in the calibration of the standard but not for transfer to the 8481 power sensor.

Errors in Calibrating 8481 Power Sensor F1109* (using GAMMA Correction):

FREQUENCY RANGE	SWR	MISMATCH ERROR Specified	MISMATCH ERROR Typical	WORST CASE** Specified	WORST CASE** Typical	RSS** Specified	RSS** Typical
10-30 MHz	1.40	1.00%	0.33%	2.40%	1.73%	1.20%	0.74%
30-50 MHz	1.18	0.50%	0.17%	1.90%	1.57%	0.83%	0.68%
.50-2 GHz	1.10	0.29%	0.14%	1.69%	1.54%	0.72%	0.67%
2-12.4 GHz	1.18	0.80%	0.63%	2.20%	2.03%	1.04%	0.91%
12.4 -18 GHz	1.28	1.18%	0.94%	2.83%	2.59%	1.46%	1.28*

* In this example, the F1109 has been calibrated by a TEGAM M1110 which has been NIST calibrated. If the M1110 has been TEGAM calibrated, additional errors result. (Refer to System IIA Errors)

** This does not include instrument errors of the associated power meter which may be ±1.2% worst case or 0.9% RSS.

TEGAM bolometer mounts exhibit excellent RF impedance characteristics as shown below. This ensures the accurate transfer of calibration factor. Typical uncertainties on a recent calibration were less than 1% with only a few points reaching 1.9%. System IIA errors are further reduced by accuracy analysis using the Root-Sum-Squared method (RSS).

Mismatch Errors (without GAMMA Correction):

FREQUENCY RANGE	M1111 SWR Specified	M1111 SWR Typical	M1110 SWR Specified	M1110 SWR Typical	F1109 SWR Specified	F1109 SWR Typical	Mismatch Specified	Mismatch Typical
10-20 MHz	1.10	1.05	1.60	1.40	1.06	1.01	1.38%	0.17%
20-50 MHz	1.20	1.06	1.40	1.25	1.06	1.02	1.02%	0.22%
50-100 MHz	1.20	1.10	1.30	1.15	1.06	1.03	0.78%	0.21%
100-1000 MHz			1.20	1.10	1.06	1.03	0.54%	0.15%
1.0-3.5 GHz			1.20	1.10	1.06	1.03	0.54%	0.15%
3.5-4.0 GHz			1.20	1.10	1.06	1.03	0.54%	0.15%
4.0-10.0 GHz			1.30	1.20	1.06	1.04	0.78%	0.36%
10.0-18.0 GHz			1.40	1.25	1.10	1.08	1.71%	0.88%

Mismatch Errors (using GAMMA corrections):

FREQUENCY RANGE	M1111 SWR Specified	M1111 SWR Typical	M1110 SWR Specified	M1110 SWR Typical	F1109 SWR Specified	F1109 SWR Typical
10-20 MHz	1.10	1.05	1.60	1.40	1.06	1.01
20-50 MHz	1.20	1.06	1.40	1.25	1.06	1.02
50-100 MHz	1.20	1.10	1.30	1.15	1.06	1.03
100-1000 MHz			1.20	1.10	1.06	1.03
1.0-3.5 GHz			1.20	1.10	1.06	1.03
3.5-4.0 GHz			1.20	1.10	1.06	1.03
4.0-10.0 GHz			1.30	1.20	1.06	1.04
10.0-18.0 GHz			1.40	1.25	1.10	1.08

* All standards calibrated at TEGAM have the calibration factors adjusted for mismatch error in the transfer by using the Gamma correction function contained in the System IIA software. This effectively reduces the mismatch uncertainty contribution to less than ±0.1% RSS from 0.01-18 GHz.

SPECIFICATIONS

The following is a summary of System IIA specifications. Specifications for each individual system component can be found on its applicable data sheet.

SPECIFICATION	DESCRIPTION
FREQUENCY RANGE	100 KHz - 40 GHz (depends on mount)
IMPEDANCE	50 Ω nominal
CALIBRATION FACTOR STABILITY	< 0.5% per year.
CALIBRATION FACTOR POWER DEPENDENCE	< 0.1% from 1 mW, negligible to maximum useful limit.
POWER MEASUREMENT RANGE:	10 µW to 25 mW
RESISTANCE AT BIAS:	200 Ω
TEMPERATURE COEFFICIENT OF RESISTANCE	Negative
CALIBRATION	Individual calibrations traceable to NIST supplied at following frequencies: 100, 200, 455 kHz 1.00, 1.25, 3.00, 5.00 MHz 10 - 100 MHz in 10 MHz increments 100 MHz - 2.0 GHz in 50 MHz increments 2.1 - 4.0 GHz in 100 MHz increments 4.2 - 12.4 GHz in 200 MHz increments 12.75 - 18.0 GHz in 250 MHz increments 18.0 - 26.0 in 1 GHz increments, plus 26.5 GHz 27.0 - 40.0 in 1 GHz increments, plus 26.5 GHz
POWER SENSITIVITY OF RESISTANCE	-13 Ω/mW

TEGAM

YOUR GLOBAL SOURCE FOR TEST AND MEASUREMENT SOLUTIONS

ORDERING GUIDE

ACCREDITED

Model	Description	SystemIIA-18	SystemIIA-18B*	SystemIIA-26	SystemIIA-26B*	SystemIIA-40	SystemIIA-40B*	SystemIIA-26U	SystemIIA-40U
1805B	RF Level Controller	√	√	√	√	√	√		
F1109	Feedthrough Power Standard (10 MHz to 18 GHz)	√	√	√	√	√	√		
SYSIIA-SureCal	SureCal Power Sensor Calibration Software	√	√	√	√	√	√		
138-645	Accessory Kit	√	√	√	√	√	√		
1583-3	1 Meter GPIB Cable (X3)	√	√	√	√	√	√		
1585-1000	36” RF Cable SMA Male Connectors	√	√	√	√	√	√		
OPT.Z540 (1805)	ANSI/NCSL Z540-1-1994 Compliant Calibration with Data for the 1805B	√	√	√	√	√	√		
M1110	Terminating Power Standard		√		√		√		
1806	Dual Type IV Power Meter		√		√	√	√		√
OPT.Z540 (1806)	ANSI/NCSL Z540-1-1994 Compliant Calibration with Data for the 1806		√		√	√	√		√
F1117	Feedthrough Power Standard (50 MHz to 26.5 GHz)			√	√	√	√	√	
1585-1008	36” RF Cable 3.5mm Male Connectors			√	√	√	√	√	
1820	Mount Heater			√	√			√	
M1118	Terminating Power Standard (50 MHz to 26.5 GHz)				√		√		
1107-8	Waveguide Power Standard (26.5 to 40 GHz)					√	√		√
1585-1009	36” RF Cable 2.92mm Male Connectors					√	√		√
1107-8	Waveguide Power Standard (26.5 to 40 GHz) (used to cal first 1107-8)						√		

Systems marked with * include the additional equipment required to calibrate the Feedthrough Mounts - so they won’t have to be sent to an external lab for calibration.

NOTES

- To order a system with the Feedthrough Mounts in a stackable/rack mountable case, add an “S” to the end of the model number.
- Mounts are available to extend frequency range down to 100kHz and to calibrate power sensors up to 250 mW, please see “Coaxial Power Standards” data sheet for details.
- **TEGAM, Inc. is an A2LA Accredited Calibration Laboratory to ISO 17025, Certificate No. 2018.01.**
- A2LA Accredited Calibrations, Extended Warranties, and Calibration Service Plans are available.
- All systems require a signal generator, 8.5 digital voltmeter, and computer with IEEE-488 interface.

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ACCESSORIES

Model 1820 RF Mount Heater: The Model 1820 provides a stable power source for the internal heaters of one or two TEGAM RF Power Standards. The Model 1820 will keep your TEGAM Thermistor Power Standard at operating temperature and ready for use 24 hours a day 7 days a week.

Model 8000 Power Sensor Transport/Storage Case: The Model 8000 is a sturdy, well padded case designed to protect TEGAM Thermistor Power Standards when being transported or stored. fits Models F1109, F1109H, F1116, F1117A, F1119, F1119H, M1110, M1111, M1118 and M1120

RACK MOUNTING: The Model 1806 can be mounted in any cabinet or rack designed according to EIA RS-310 and MIL-STD-189 using the Rack Adapter Kit (P/N 190-499) or Rack Mount Adapters and Side Panels for Chassis Slides (P/N 138-606). A rack adapter kit P/N 1919 is available for mounting Models 1805B and 1807A in the same rack-mount configuration.

MODEL 1727A RF AMPLIFIER: The TEGAM Model 1727A is a general purpose broadband amplifier that operates over 100 KHz to 26.5 GHz frequency range. This amplifier is capable of providing additional power and gain to compensate for system RF path losses and improve system measurement capabilities for such systems as the System IIA. This amplifier provides the capability for automated switching between two generators providing output coverage from 100 KHz to 26.5 GHz at a single output port. A variable gain amplifier provided in the 100 KHz to 10 MHz frequency range provides level control when used with low frequency generators having poor or no external means of level control. Model 1727A Amplifier functions are controlled over IEEE-488 bus or locally using the instrument front panel controls. Refer to Model 1727A Data Sheet for more information.

SWR Measurement Kit (P/N 187-4003): The TEGAM SWR Measurement Kit includes a return loss bridge with an "open" and "short." Using the System IIA Precision Power Source the DUT's impedance to 50 ohms can be checked by measuring return loss through the return loss bridge. The actual measured return loss can be readily converted into SWR by the system software. Refer to the SWR Measurement Data Sheet for more information.

1804 or 1806 to HP Thermistor Mount Cable: Cable used to connect HP Temperature Compensated Thermistor Mounts to a TEGAM Type IV Power Meter. The second set of spade lugs are for monitoring the temperature compensation thermistor beads with the second bridge on the 1806 or with a second 1804.

SYSTEM CABLES: Extra and/or replacement cables can be ordered for the System IIA instruments and components using the following:

Part Number	Description
138-477	Temperature Control Cable
138-492	AM Modulation BNC Cable
138-526	Mount Bias Cable
1583-6*	IEEE-488 Cable (2 meter)*
1585-1000*	Low Loss RF Cable 3 ft*

* These cables are available in other lengths refer to the Accessory Cables data sheet for more information. This data sheet also contains other cables that can be used with the System IIA.

Other types and custom cabling requirements for your System IIA can be addressed by contacting the sales staff at TEGAM.

CALIBRATED ATTENUATORS, ADAPTERS, & REPLACEMENT SPLITTERS: Extra and/or replacement Attenuators, Adapters and Power Splitters with characterized S-parameter data can be supplied using the following:

Part Number	**Description**
102-373-1	Power Splitter, Model F1116
102-373-5	Power Splitter, Model F1119
102-475-1	Power Splitter, Model F1109
138-645-1	30 dB Attenuator, N
138-645-2	30 dB Attenuator, 3.5mm
138-645-4	Adapter, GPC-7 to N Male
138-645-5	Adapter, SMA Female to N Male
1593	Power Splitter, Model F1117A
7002-14	Adapter, N Male to SMA Female (NOT Calibrated)

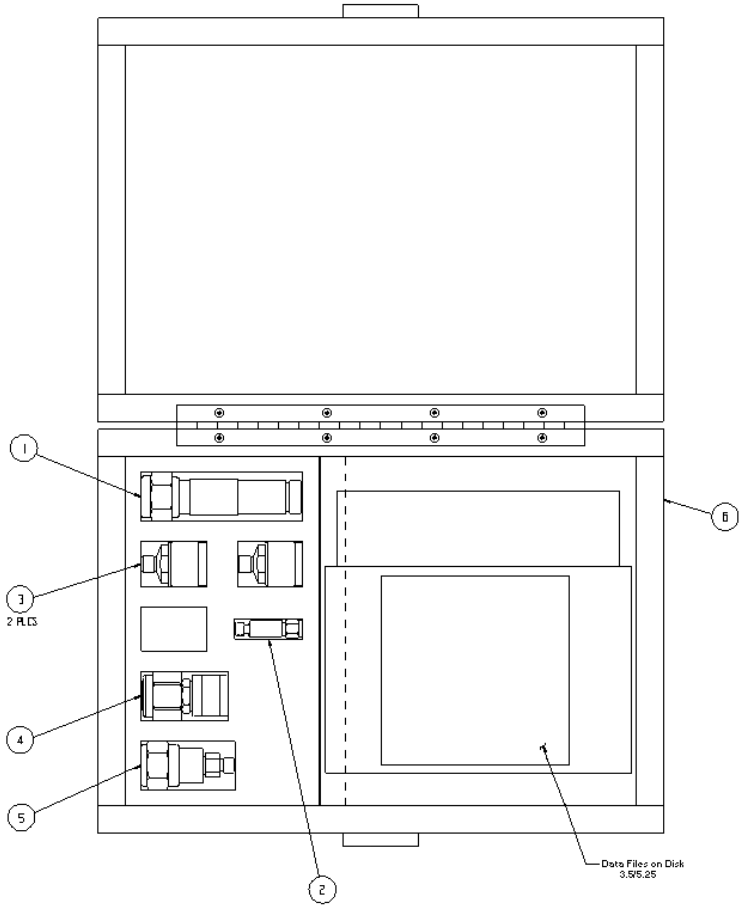
The entire TEGAM Measurement Accessory Kit can be ordered using P/N 138-645. All data is supplied on diskette (IBM format only).

1820 Mount Heater
8000 Power Sensor Transport/Storage Case
138-652 1806 or 1804 to HP Thermistor Mount Cable

System IIA Accessory Kit (P/N 138-645)

0.01-26.5 GHz

This Accessory Kit (P/N 138-645) manufactured by Weinschel Corporation has been primarily designed to aid the System IIA operator in the calibration of most any type of power sensor and/or meter. The Weinschel Accessory Kit includes calibrated 30 dB attenuator to calibrate high sensitivity sensors, calibrated adapters for calibrating sensors with different connector types other than Type N or 3.5 mm, general purpose Type N to SMA adapters for signal source hook up. S parameter data is supplied on diskette for the 30 dB attenuators and the calibrated adapters (Refer to chart below for details).



Find No. No.	Description	Tegam Part No.	QTY
1	Coaxial Fixed Attenuator, Type N, dc-18 GHz, 30 dB, 5 Watts	138-645-1	1
2	Coaxial Fixed Attenuator 3.5 mm dc-26.5 GHz, 30 dB 1 Watts	138-645-2	1
3	Adapter, Type N to SMA Female, dc-18 GHz, SWR: 1.15	7002-14	2
4	Adapter, GPC-7 to N Male, dc-18 GHz, SWR: 1.06 138-645-4	138-645-4	1
5	Adapter, N Male to SMA Female, dc-18 GHz, SWR: 1.06	138-645-5	5
6	Storage Case, Wood Construction with hinged top and latch	080-417	1