

**Watt Meter Model 2010A**

The 2010A was designed as a self-contained portable standard. Based on the TDM principle it provides accurate reliable measurements (< 50 PPM) for all power factors. It has 10 current ranges from 5mA to 5A and two voltage ranges of 120 and 240V with automatic and manual ranging. Outputs include a 2 V output for V & I, which can be inputted into a waveform analyzer, a precision 10VDC output and an optional frequency output. The RMS Power, Volts and Current are displayed. Higher voltage and currents can be measured adding Models 2500A and 7020H.

Watt Transducer Model 2010M

The 2010M accurately converts AC power to DC Voltage which can be read by any 8^{1/2} digit DMM. It is designed as a portable transfer standard for calibration of watt and watt-hour meters. The 2010M has two voltage ranges (120 & 240) and two current ranges of 1 and 5 amps respectively. Accuracy for the full power factor range is better than 50ppm.

Primary Power Calibration Systems Model 2100A & Model 2100B

The 2100 system was developed to calibrate watt meters, energy meters, watt hour meters, watt transducers and VAR meters. Based on the two stage compensated current transformer technology measurements can be made at any power factor from zero lag through unity to zero lead, positive or negative power. Traceability of the system is provided through a standard resistor, standard capacitor and AC/DC voltage measurement. Both systems are fully automated over the IEEE 488 interface bus complete with software and full report generation. The uncertainty of the calibration system is better than 20 ppm. The 2100 Power Calibration System has become the choice of National Laboratories around the world.

High Voltage AC Divider Model 2500A/2501A

The 2500A/2501A is the low voltage arm of a high voltage capacitive divider consisting of a HV capacitor and LV standard capacitor. Based on the compensated-current-comparator capacitive-divider principle it provides a precise ratio of high AC voltages (up to 1M Volts) down to workable levels. The current comparator automatically corrects for any phase and magnitude errors, (< 20 PPM in phase and magnitude.) The 2500A has 7 voltage ranges. Typical application is in Loss Measurement Systems and HV research.

Transconductance Amplifier Model 2701A

The 2701A, based on linear technology, has three current ranges of 5, 20 & 100A AC & DC with stability < 100 PPM. In the AC mode the output is directly proportional to the input signal (5 V max. on each range). The 2701A offers several advantages over switched mode power supplies in both speed and accuracy when supplying current to resistive, capacitive and inductive loads. The 5-amp range insures better accuracy at lower currents.

Automated High Voltage Capacitance/Inductance/Tan Delta Bridge Model 7010A/7010B

The 7010, based on the two-stage compensated CT, was designed for the precision measurement of HV Capacitors and for accurate load loss measurements of HV inductive loads. The display is updated every one second. The 7010 is self balancing with an accuracy of < 20 PPM in phase and magnitude. The 7010B maximum ratio is 1000:1. The ranges can be extended up to 1,000,000:1 using the 7020H current transformer. It can be used in stand-alone mode or over the IEEE488 interface bus. An optional software package is available.

Current Transformer Model 7020H

The 7020H uses passive two stage compensated current comparator technology. Current transformers up to 10,000 Amps with ratio accuracies of better than 20 ppm in both phase and magnitude are available. The 7020H is an ideal current transformer when the compensation winding is connected to another compensated current transformer. Otherwise the 7020H will support burdens up to 100 mΩ without affecting its accuracy.



A Metrology Company

**AWRMS**

Automated System features capabilities for testing in one set up on all types of transformers meeting IEEE and International Standards. The AWRMS is available in two models with resistance and temperature measurements only and fully loaded with resistance, ratio and temperature measurements. The system is fully automated with 20 thermocouple inputs connected to the measuring section through a scanner. Operator interface to the system is through LABVIEW software with the test results being output to an ASCII file for easy import to spreadsheets. System accuracies are < 0.1%.

LMS 2000/100

The LMS 2000/100 is a complete transformer Loss Measurement System designed for power frequency testing and calibration of large and medium power transformers, large motors and turbines. Single and three phase measurements can be performed up to 4000A, 100 kV at 50 or 60 Hz. The LMS is fully automated and requires no manual intervention during operation. The voltage input is through a HV capacitor and Model 2500A, the current input is through a HV Current transformer (7021U). The power is measured using the MI 2010A wattmeter. The system updates every one-second and can follow the generator output as the voltage and current are applied to the transformer under test. The 2010A has two outputs of 2V each which are fed into a built in waveform analyzer for displaying the waveforms during measurements. The waveform can be printed at the time of test for inclusion in the calibration report. Operator interface is through labview software with the test results output to an ASCII file for easy import to spreadsheets. System accuracies are < 50 PPM of full scale for all power factors.

**CALIBRATION SERVICES****Primary Standards Laboratory**

Measurements International has established a state of the art calibration laboratory. With highly qualified personnel, MI provides complete primary calibrations of resistance and voltage traceable to NRC and NIST. The SCC accredits the capability of Measurements International for being able to perform listed calibrations (visit www.mintl.com for details) at the given Best Measurement Capability with traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. Measurements International uses four different calibration methods depending on the standard. We provide efficient calibration schedules to meet your needs.

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Quantized Hall Effect Resistance System (QUANT) Model 6800

The QUANTΩ is an automated, portable, Primary Resistance System which provides an economical means to accurately transfer the resistance of the QHR device (I=2) to secondary resistance standards. The system is comprised of the QHR device, the Cryogenic Components and a DCC Resistance Bridge (6010Q) which transfers the resistance of the QHR device to a 1000Ω standard resistor with an accuracy of < 0.02 PPM and repeatability of < 0.01 PPM. Magnetic field sweep measurements of V_{xx} and V_{xy}, precision V_{xx} measurements and contact resistance measurements can all be made using this same bridge. The bridge and low-thermal scanner can also be used to transfer the QHR resistance from the 1000Ω resistor up to the 10k and down to the 100, 10 and 1Ω standard resistors to an accuracy of < 0.02 PPM. The QUANTΩ can be used as stand alone or with MI's QUANTΩ software for automated measurements.



Resistance Measurement Systems Model 6010-100A, 400A & 2000A

MI has designed and developed several resistance and shunt measurement systems requiring minimal intervention. Ratio's from 1,000,000:1 (1μΩ to 1Ω) can be achieved at full currents up to 2000 Amps. These systems are totally automated turnkey metrology solutions to calibrate resistors and current shunts under full power conditions to an accuracy of <0.2 PPM for the 6010-100 & <1 PPM for the 6010-400A and 6010-2000A systems.



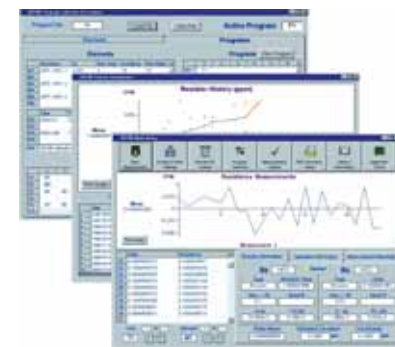
High Resistance Measurement System Model 6000B-100V

MI has designed and developed an automated high resistance measurement system in a turnkey metrology solution from 1000Ω to 1TΩ to an accuracy of < 0.1 PPM. The system comes complete with a model 4210A ten-channel matrix scanner, a model 1000A 100V DC Source and a long scale DMM as a detector. The system is expandable to 40 inputs using MI's model 4220A twenty channel matrix scanners.



Software for Model 6000B, 6010C, 6242A, 6010T, 6015T & 8000A

MI has developed its own software to use with the above turnkey systems. The software features real time uncertainty analysis, graphing, history logging, and data storage with file transfer to spreadsheets. The software features a user interface, which allows the users to incorporate other products into the system such as calibrators and DMM's for calibration by the MI systems. The software allows the user to input temperature, humidity and pressure of the laboratory, either manually or automatically. Programs can be created to start your measurements at any time of the day or night. Temperature coefficient of resistors can be measured and calculated automatically by connecting the MI 9301JW oil bath.



DC RESISTANCE

100 Volt DC Reference Model 1000A

Model 1000A was designed for use with the MI 6000B. It can be used in any application requiring a stable DC voltage. It has seven selectable outputs of 1,2,5,10,20,50 and 100 V. It has excellent short-term stability (<1 PPM over 8 hours), low drift and low noise.



Matrix Scanners Model 4210A, 4220A & 4220A/30

MI has designed and developed the greatest selection of 4 terminal matrix scanners. When used with the MI series of 6010 or 6000 bridges, it provides a convenient way to reduce the cost of calibration. With the 4220 up to 20 resistors can be connected simultaneously allowing a convenient means of inter-comparing resistors. The 4220A/30 allows a convenient way to automate resistor measurements up to 30 Amps.



High Resistance Bridge Model 6000B

The 6000B is fully automated based on the Binary Voltage Divider (BVD) principle. This technology offers new solutions for measuring high value resistors (1000Ω to 1TΩ) featuring self-calibration in terms of measurement accuracy (< 0.1 ppm) and linearity (0.01 ppm). MI 6000 Software provides ultimate programmability and control for data handling for all your resistor calibrations.



Automated Resistance Bridge Model 6010C

The 6010C is a fully automated resistance bridge based on the Direct Current Comparator principal. It features speed and measurement accuracy (< 0.05 ppm) and has a resistance range from 0.001Ω to 13kΩ. It has been designed for flexibility and ease of use with selectable test currents from 10μA to 150mA. Automatic current reversals eliminate thermal emf's while self-calibration of the DCC can be carried out at any time. The Model 6010 is the choice of National Laboratories around the world.



Automated Range Extenders Model 6011C, 6012M, 6013M, 6023 & 6025

MI has designed and developed a full range of high current range extenders for measurements up to 100A (6011B), 400A (6013M, 6023) & 2000A (6012M, 6025). These can be used stand alone or with MI's 6010C resistance bridge. Based on the DCC principle, current division ratio's of 1,000,000:1 can be made to an accuracy of < 1 PPM. All the range extenders can be calibrated using the 6010C bridge.



Automated 100A DC Current Source Model 6100A

The 6100A was designed and developed for use in MI's 6010-100A Resistance Measurement System. It uses linear technology and has two ranges of 5 & 100A and offers several advantages over switched mode power supplies for supplying current to resistive, capacitive & inductive loads. Drift is < 100 PPM over 8 hours.



TEMPERATURE

Temperature Stabilized Resistance Standards Model 4304, 4310, 4310HR

MI offers a complete line of Temperature Stabilized Resistance Standards. The 4304 is a transportable 4 element working resistance standard with values of 1Ω, 10kΩ, 1MΩ and 100MΩ with battery pack. The 4310 is a rack mount, 9 element resistance standard (0.1Ω to 10MΩ) ideally suited for automated resistance measuring systems. The 4310HR is a 6 element high resistance standard (1GΩ to 100TΩ). Custom resistance elements are available upon request.



Automated Thermometry Bridge Model 6010T & 6015T

The 6010T & 6015T were specifically designed for automated thermometry applications for calibration of PRT's, SPRT's and thermistors. Both are fully automated based on the DCC principle with current reversing to eliminate thermals. The 6010T has an accuracy of < 0.05 PPM with a maximum ratio of 14:1, the 6015T has an accuracy of < 0.02 PPM with a maximum ratio of 1.5:1.



Automated Resistance Bridge Model 6242A

The 6242A was designed for a measurement range from 0.01Ω to 1GΩ. Based on DCC technology, it is ideal for laboratories where the accuracy of the 6010 is not required. The accuracy is < 0.2 PPM up to 10K and < 10 PPM at 1GΩ.



Automated Secondary Temperature Bridge Model 6242T

The Model 6242T is a high accuracy resistance bridge designed specifically for resistance thermometry. Based on the Direct Current Comparator, its unique DC Reversal eliminates thermal EMF effects to provide fast, reliable measurements under a wide range of real operating conditions. Designed with a resistance range of 0.1 to 10,000Ω with an accuracy of < 0.2 (0.05m°C). The 6242T is ideal for laboratories that do not require the accuracy level of an NMI.



DC VOLTAGE

Primary Resistance Standards Model 9210A

MI is developing a full line of primary resistance standards (0.1Ω to 10kΩ) to replace the L&N Thomas-Type Resistance standards. The 9210A is the most stable resistor available and is based on a specially treated alloy using a proprietary process to improve its stability and temperature coefficient. (Long term drift rate better than 0.2 ppm per year and TC of less than 0.05 ppm/°C.)



Standard Air Resistors Model 9331, 9331S

MI manufactures a full line of resistance standards from 1ohm to 10M (Model 9331) and a new series from 100M to 100T ohm, (Model 9331G) with excellent stability. Their small rugged and light weight makes them ideal for customer site calibrations. All resistors come with a calibration report traceable to national standards. Resistors are stocked in standard decade values with custom values available. A full line of interconnecting cables are available for each model.



DC Current Shunts Model 9332

MI has designed and developed a series of high current shunts. Accuracy is < 0.01% and long term stability is < 10 PPM/year. When placed in oil, the current shunts can be used as standard resistors. Shunts up to 1500A are available with custom values available with calibration reports.



Multiple Value DC Current Shunt Model 9311A

The 9311A was designed with 9 current shunts from 0.1mA to 300A. Accuracies are < 0.04%. The 9311A can be used as a current shunt or as a set of secondary air resistors. A calibration report is supplied.



Temperature Controlled Air Bath Model 9300

The 9300 was designed as a convenient way to maintain the temperature of air resistors. Using thermoelectric peltier element, it has a temperature range of 15 to 40°C and can also be used to perform temperature coefficient work on air resistors. The stability is < 50mK.



Temperature Controlled Air Bath Model 9300A

The 9300A is designed to house 4 standard air resistors and is bus controllable. Using thermoelectric peltier element, it has a temperature range of 15 to 40°C and can also be used to perform temperature coefficient work on air resistors. The stability is < 50mK.



Resistor Oil Baths Model 9301JW, 9302JW & 9303JW

MI offers a complete line of resistor oil baths used for the maintenance of primary resistors. The 9301JW and 9302JW are floor models with a capacity of 95 and 157 liters. The 9303JW is a 51 liter bench top bath. The 9301-1 interconnection shelf provides time savings and a convenient means to connect resistors above the oil, eliminating oil spills and physical contact with the oil.



Automated Potentiometer Model 8000A

The 8000A was designed to be the workhorse for DC Voltage measurements providing scaling between the Standard Cells and 10 Volt References. Based on the BVD principal the 8000A is self-balancing, self-calibrating and provides a convenient way to verify the linearity of DMM's, calibrators and to calibrate Kelvin Varley Dividers. The accuracy of the 8000A is better than 0.05 PPM, and linearity of better than 0.01 PPM. The system requires a stable 10V source and DVM detector.



Range Extender Model 8001A

The 8001A was designed to increase the range of the 8000A to 1200 Volts, with 5 voltage ranges (10, 30, 120, 300 & 1200). It was developed to automatically calibrate the full voltage range of DC calibrators and DMM's with an accuracy < 2 PPM at 1200V. It is fully automatic and can be calibrated without manual intervention using the 8000A and MI software.

