DATA SHEET

MODEL 2100A

Power Calibration System

- **240 Volt - 5 Amp**
- **Watt Hour & Energy Meter Calibration**
- **Uncertainty to <20 PPM**
- **Menu Driven Software**
- **All Power Factors, Leading & Lagging**

MODEL INFORMATION

The Model 2100A is designed to generate voltages up to 240V and currents to 5A at any power factor from zero lag though unity to zero lead. Completely automated, the 2100A is ideal for calibrating wattmeters, energy meters, watt hour meters, watt transducers and VA measurements to <20 PPM.

Traceability is provided through a built in standard resistor (12 k ohms) for in-phase measurements and a standard capacitor (0.22 µf for 60 Hz) for quadrature measurements. The system is also capable of calibrating the Model 2100A's own internal resistance standard directly against an external standard. A controller and software are used to control the units together using an IEEE 488 interface. The system is supplied in a 1.8 meter equipment rack on castors for mobility. The rack is equipped with a pull out tray for placing the unit under test (UUT). All connections to the UUT are made from the front panel of the system. Up to 3 wattmeters can be calibrated at a time.

The system is comprised of a Power Comparator Model 2000B, a 10mA in phase Quadrature Current Source Model 2002, a Transconductance Amplifier Model 2701A, an Auto Ranging Current Transformer Model 2003A, a Detector Amplifier Model 2001B and an AC Voltage Source Model 2201A. A commercially available AC/DC Transfer Standard is required to measure the AC voltage. Several wattmeters, DVM's and AC/DC Transfer Standards have drivers built into the system software. The source code maybe purchased from MI allowing other measurement devices to be added at anytime.

The 2100A Reference Power Calibration System is a fully automated and programmable primary standard for AC power measurements. It can be used for calibrating both active and reactive power and energy meters under sinusoidal conditions. Traceability for the measurements is provided by a standard resistor and standard capacitor internal to the Model 2002 current source and the AC/DC Transfer Standard. The internal resistor and capacitor are supplied with a calibration report when the system is calibrated prior to shipment.

The system, utilizing our Model 2000B AC Comparator and 2001B Detector, is capable of calibrating the standard resistor against external standards to better than 3 PPM uncertainty. The Model 7050, 12K Ohm AC Standard Resistor, may be sent out for calibration periodically.

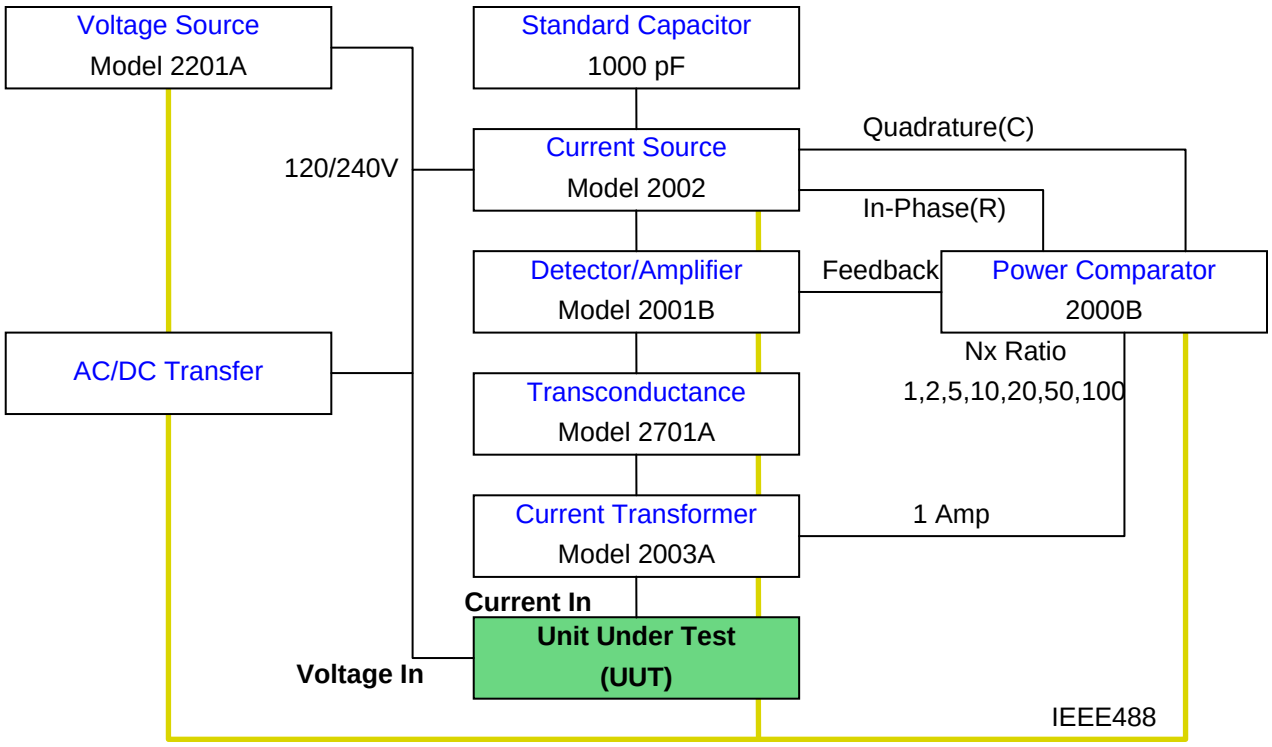
Software menus allow for changing voltages, currents, power factors and number of readings easily. The Mean, Sigma, Standard Deviation and Variance are calculated and displayed on the system calibration report.

Within the 2100A Power Calibration System, the AC/DC Transfer Standard must be capable of measuring both 120V and 240V. Accuracy of the system is based on the uncertainty of the resistor, capacitor and AC/DC Transfer Standard. The resistor and capacitor in the Model 2002 current source are supplied with a National Research Council of Canada (NRCC) calibration report. Calibration of the resistor and capacitor are performed at the test voltages of the system; 120 and 240 volts, 50 or 60 Hz.

Model 2100 Power Reference System Software Main Menu

MEASUREMENTS INTERNATIONAL PRESCOTT, ONTARIO, CANADA		
SELF-BALANCING POWER & ENERGY CALIBRATION SYSTEM		
POWER CALIBRATION	<E> - ENERGY	<P> - POWER
Actual Parameters	<F1=Start Balancing>	Ready For Balancing
AC Voltage - <F2=Change> 100.0000 Vrms +/- 2.00ppm	<F12=No of Measurements> 5	Reference Capacitor 1000.0000pF +/- 2.0 ppm
Current/Power Fact. Pairs Entered: 1 <F3=Change>	<F11=Set Readings To Mean> 5	Reference Resistor 11.999436KΩ +/- 2.1 ppm
Wattmeter: none Voltmeter: not used	<F7=Choose Wattmeter> <F10=Printer On/Off>	<Ctrl+F5=New Value of C> <Ctrl+F6=New Value of R>
<F4=Set Waiting Time> 4 sec	Frequency 50 Hz +/- 2.0 ppm	<F8=Exit To DOS>

Flow Chart of Power Calibration System



Specifications:

Output Voltage	120/240 Volts Maximum
Voltage Accuracy	10 PPM
Output Current	5 Amps Maximum
Current Accuracy	10 PPM
Test Frequency	50 and 60 Hz
Current Ratios	1, 2, 5, 10, 20, 50, 100, 250, 500
Power Factor	-0 to 1 to +0 (All)
Power Accuracy	20 PPM Magnitude 20 PPM Quadrature
Operating Environment	18 to 34°C, 10 to 80% RH

Product Details	
Warranty	2 Year Parts & Labor
Dimensions	1.8 Meter Rack, 484 mm Width
Weight	300 kg
Shipping Weight	350 kg
Operating Power	100, 120, 220, 240Volts - 50/60 Hz

SELF-BALANCING POWER & ENERGY REFERENCE CALIBRATION SYSTEM

TYPICAL CALIBRATION REPORT

Wattmeter Under Test: MIL 2010A Serial Number: 950701
Voltmeter: Not Used
Time: 09:15:22 Date : 06-11-1997

WATTMETER RANGE
Voltage [V]……. 120
Current [mA].... 1000
SI UNITS…….WATTS

TEST CONDITIONS

Voltage [V]……120 +/- 1.00 ppm
Current[mA].....1000 mA
Power Factor... 1

MIL Watts	MIL Uncertainty	Test Watts	Test Uncertainty	Test Error
+120.0000	+4.73	+120.0005	+5.49	+4.35
+120.0000	+4.73	+120.0003	+5.37	+2.29
+120.0000	+4.73	+120.0004	+5.28	+3.43
+120.0000	+4.73	+120.0004	+5.68	+3.23
+120.0000	+4.73	+120.0006	+5.25	+5.24
+120.0000	+4.73	+120.0004	+6.02	+3.67
+120.0000	+4.73	+120.0005	+5.57	+4.20
+120.0000	+4.73	+120.0003	+6.10	+2.86
+120.0000	+4.73	+120.0007	+5.23	+5.44
+120.0000	+4.73	+120.0007	+5.32	+5.93

	Test Meter
	=========
MEAN……	+4.06
SIGMA……..	+0.38
STD.DEVIATION……..	+1.19
VARIANCE……..	+1.41

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