



Model 6000B

Automated 100 Volt High
Resistance Bridge

Cutkosky Divider

Range: 1K to 1T Ohm

4 Channel Matrix Scanner

IEEE488 Interface

Self Balancing - Self Calibration

General Description:

The Model 6000B is a fully automated bridge using the Cutkosky Divider principle. Maximum voltage for the 6000B is 100 Volts. This technology offers new solutions for measuring high value resistors more accurately and at lower currents. The Cutkosky or Binary Voltage Divider Technology, solves all errors normally associated with a direct current comparator while offering significantly improved uncertainties. An internal guard circuit is used to guard the measuring circuit. This guard may also be used to drive the measuring leads, a guarded detector and resistor enclosures to increase the effective insulation resistance and improve overall performance.

Measurements International's (6000SW) operating software is available in both windows 95/98 and NT platforms. The system requires a stable 100V source (Model 1000A) and a DVM Detector (Fluke 8842A, HP3458A). Optimum performance is achieved using the HP 3458A as a guarded detector.

The Model 6000B has a four-channel matrix scanner with inputs labeled R1, R2, R3 and R4. The number of inputs can be expanded to 40 when the 6000B is used in conjunction with Models 4210A and 4220A, ten and twenty channel, Low Thermal Four Terminal Matrix Scanners.

Calibration of the 6000B is performed easily and automatically. Calibration data is stored to file for history analysis. New calibration data is compared to the last calibration data for tracking drift of the BVD.

The principle of the 6000B Automatic Potentiometer is based on the Binary Voltage Divider (BVD). The reference to the BVD is supplied from a stable voltage reference, Model 1000A. The Model 1000A is a low drift, stable, noise free 100-Volt Source. The 100V reference is connected to the rear of the 6000B Source input terminals. The DMM detector with an input impedance of 10 G Ω or higher is used to measure the difference between the output of the BVD and the voltage under test. An isolated guard circuit is provided to guard the BVD and the DMM detector when performing measurements. The guard voltage can also be used to drive the cans and/or shields of resistors under test to reduce leakage problems between the case and the resistor.

System Software and Applications:

The Measurements International's 6000SW controls all of the above automatically. The software features report generation, historical analysis, while tracking and correcting for resistor drift rates. All measurement data is displayed in graph form as the measurement progresses. All uncertainties are calculated at 2 sigma. The software allows selection on standard deviation and uncertainty calculations.

For SR104 measurements, the 6000SW allows users to measure the temperature of the SR104 at time of measurement using an external thermistor. The thermistor is placed in the well of the SR104 and is measured against a 1 M Ω reference resistor. The 1M Ω standard resistor is used to keep the current in the thermistor as low as possible as not to cause self heating in the well of the SR104. The software can then correct the value of the SR104 back to 23 or 25° C.

The 6000B can also be used in conjunction with Measurements International's Model 4220A and 4220-1 interface adapter for calibration of SR1010 series of hamon resistance boxes.

Combined with the Measurements International Model 9300 series of air baths, alpha and beta calculations can be performed automatically on resistors under test. All data can be exported directly to Excel for various test patterns or mainframe applications. External atmospheric pressure, humidity and temperature indicators are optional and the entire system can be enclosed in a 4 or 6 ft. rack. Resistor baths (oil or air), instrument controllers, printers, system software, IEEE interface, installation and training are all available for complete system packages.

System Requirements:

Computer, 486 or higher running at 166 MHz, with 32 MEG of RAM, Windows 95/98 or Windows NT and a National Instruments IEEE488 Interface Card (not included).

Data Subject to Change



Measurements International

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Measurements International

A Metrology Based Company

6000SW – Windows Operating Software:

Setup Menu

Setup Menu

6000 Serial Number: 990312
Company Name: Measurements International

Data Files Directory: c:\6000
History Files Directory: c:\6000

Scanner #1: None
Scanner #2: None
Bath: N/A

Set Directory to Save Files: c:\6000
Source Voltage: 10 V
Uncertainty: 1 ppm

DVM Commands: Microvolt Range Cmd: R 0
Auto Range Cmd: R AUTO
Internal Trigger Cmd: T 1
External Trigger Cmd: T 2
Termination Character Cmd: []
Reading Trigger Cmd: []
Reading Rate Cmd: []
Setup Function Cmd: NPLC 10; LFREQ LINE

Other DVM: New DVM
4:1291.dvm
18842a.dvm
lp3458-1.dvm

Rotronic AM3 [Temp./Hum.]: N/A
Mensor 15000 [Pressure]: N/A
Software Version: Customer

Resistor ID Menu

Resistor Menu

ID File Name: test.res
Designator: R1
Resistor Channel: SC_1,CH_2
Resistor Type: Resistor
Pie-Cal Date (m/d/y): []

Mfg./Model Number: ML 9331
Value (ohms): 10000
Calibrated Value (ohms): []
Coeff. Temperature: []

Serial Number: RL_SN
Uncertainty (ppm): 0.5
Calibration Date (m/y): []
Alpha (ppm): []

ID Number: []
Auto Update Data: No
Drift / Month (ppm): []
Beta (ppm): []

Buttons: Copy to List, Save to File, Clear Entries, Clear Prog., Clear ALL, Notepad, Write, Exit

Ref.	Value (ohms)	Mfg./Model#	Serial #	ID #	Type	Uncertainty	Auto Update	Resistor Channel
R1	10000	ML 9331	RL_SN		Resistor	0.5	No	SC_1,CH_2
R2	100000	ML 9331	R2_SN		Resistor	0.5	Yes	SC_1,CH_4

Program ID Menu

Program Menu

Ref.	Value (ohms)	Serial #	Type	Resistor Channel
R1	10000	RL_SN	Resistor	SC_1,CH_2
R2	100000	R2_SN	Resistor	SC_1,CH_4

Buttons: Select active program, Create/Edit measurement program, Create a combined program from individual mmt programs

Program Sources: HI, LO, 1M (for Thermistors), Program Destination (P1)

Program Settings: Reversal, Number of Meas., Number for Stats., Settle Time (sec.), DVM Rds. to Avg.

Ref.	Program	Reference	Therm. (HL/LO/1M)	Reversal	No. of Mmts.	No. for Stats.	Settle Time (s)	DVM Rds.
P1	R2,R1	R1		Yes	3	5	15	25

Click on a top grid row for HI resistor selection, else click 'Edit a program' to edit.

Measurement Menu

6000 Main Menu Screen

Buttons: Meas. GO, Meas. STOP, Setup, Calibrate, Resistors, Programs, Files, History, Meas. Opt., Output Data, IEEE488, EXIT

1 division = 0.63 ppm
Resistance values (1 to 5) plotted reference to mean for R2, R1

Min (2) 100002.651179708 Mean 100002.660081348 Max (1) 100002.685052999

#	Ratio	Measurement Index	Graph	Graph	Graph	Graph	Graph	Graph
1	10.000273941	100002.73949477	None	None	None	None	None	None
2	10.000265198	100002.651979708	None	None	None	None	None	None
3	10.000265095	100002.65094044	None	None	None	None	None	None
4	10.000265269	100002.652692852	None	None	None	None	None	None
5	10.000265334	100002.653340735	None	None	None	None	None	None

Buttons: Print, Clip, Label

Buttons: Meas. Inactive, HI, LO, Meas. Settings, Program Info

Buttons: Elem., of, Plus, Min, Top, Bottom

Meas. Inactive: Mean 10.00026601, Std Dev. 0.1795 ppm, Uncert. 0.5298 ppm, Voltage 9.9997 V, Program ID UAF2, Temp. [] °C

History Menu

History

'SAMPLE HIS' file plotted relative to mean for 10 iterations.

Min (9) 9999.989128 Mean 9999.989540 Max (1) 9999.989949

#	Date	Resistance (ohms)	Std. Dev. (ppm)
1	1/2/98	9999.989949	0.0173
2	2/2/98	9999.989541	0.0179
3	3/2/98	9999.989564	0.0205
4	4/2/98	9999.989405	0.0193
5	5/2/98	9999.989094	0.0212
6	6/2/98	9999.989467	0.0148
7	7/2/98	9999.989631	0.0183
8	8/2/98	9999.989567	0.0183
9	9/2/98	9999.989128	0.0189
10	10/2/98	9999.989203	0.0222

Buttons: MS Excel, Notepad, Write, Print, Exit

None, Std Dev, Best Fit, Std Dev, Best Fit

Y Mean: 9999.989540
Sum Y: 99993.89540
Sum Y^2: 9.99979E+8
Sum Y least squares: 4.98970E+7
Y Std. Dev.: 1.74968E-4
X Mean: 5.5
Sum X^2: 305
Sum X least squares: 82.6
Sum XY: 549993.4205
X Regression Entry: 9999.989944

Resistor Serial Number: SN1214567890
Y Intercept: 9999.989949
Slope: -5.06E-5
Correlation: -8.50703E-1
Predicted Y: 9999.989944

Calibration Report

Calibration Menu

Buttons: Calibrate, Abort Cal, Display Last Cal, Save Cal, Print Cal, Exit

6000 Serial Number: 971005
Source Voltage: 50.0020 Volts
Last Calibration Date: 1/25/98
Temperature: 23 °C
Last Calibration Time: 5:22:10 PM
Pressure: [] KPa
Calibration Personnel: Tony
Humidity: 48 %RH

Stage	Correction Factor (x10E-6)	Standard Deviation (95%) (x10E-6)	Change from Last Calibration (x10E-6)
1	-0.010	0.002	-0.003
2	-0.009	0.001	0.001
3	-0.002	0.001	0.001
4	-0.018	0.001	0.000
5	-0.038	0.001	-0.004
6	-0.086	0.001	0.001
7	0.245	0.001	-0.003
8	0.171	0.001	0.000
9	0.036	0.002	0.004
10	-1.736	0.001	-0.007
11	-0.416	0.001	0.001
12	-1.493	0.001	-0.015
13	2.777	0.001	0.020

Measurements International's 6000SW was developed by metrologists for metrologists. The software features real time uncertainty analysis, graphing, history logging and graphing, data storage with export to excel and regression analysis. The 6000SW provides ultimate programmability and control for all your resistors and temperature calibrations, now and in the future.

Model: 6000B

Specifications:

Resistor Range	Accuracy (95%) 2s Ratio 0.1 Through 10	Applied Voltage
1K to 10 K Ohm	<0.1 ppm	1, 2, 5, 10, 20,
10K to 100K Ohm	<0.1 ppm	10, 20, 50, 100
100K to 1M Ohm	<0.1 ppm	10, 20, 50, 100
1M to 10M Ohm	<0.1 ppm	10, 20, 50, 100
10M to 100M Ohm	<0.5 ppm	10, 20, 50, 100
100M to 1G Ohm	<5 ppm	10, 20, 50, 100
<i>Measurements Above 1G Ohm Require Special Resistor Configurations</i>		
10G Ohm	<20 ppm	10, 20, 50, 100
100G Ohm	<200 ppm	10, 20, 50, 100
1T Ohm	<500 ppm	10, 20, 50, 100
Ratio 100:1	<2 ppm	10, 20, 50, 100
Ratio 1000:1	<20 ppm	10, 20, 50, 100
Linearity	0.01 ppm	
Short Term Drift (2 hours)	< .2 ppm for 8 hours	
Operating Environment	18 to 34°C, 10 to 80%	
Warranty	1 Year Parts & Labor	

Dimensions:

270 x 450 x 380 mm

Weight:

15 kg

Shipping Weight:

20 kg

Accessories:

4210A Matrix Scanner

4220A

1000A

9300

TR104 Thermistor

Operating Power:

100, 120, 220, 240V - 50/60Hz

Distributed By:

How to Order:

Model: 6000B - High Resistance Bridge

Model 1000A - 100 Volt Source

Rev. 02/99/08

Data Subject to Change



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