



Measurements International

Metrology is Our Science, Accuracy is Our Business™

ACCUBRIDGE® 6242D/6242DXS AUTOMATED RESISTANCE BRIDGE

with Maximum Ratio up to 100:1



Featuring

- ▶ Resistance and Temperature Applications
- ▶ Range 0.001 Ω to 1 G Ω
- ▶ Best Accuracy < 0.1 ppm with Optional 0.02 ppm
- ▶ Ratio Self-Calibration
- ▶ System Integration with Measurements International (MI) Matrix Scanners and High-Current Range Extenders

Overview

The 6242D and 6242DXS are wide-range DCC Resistance Bridges based on best-selling Measurements International technology and design. The 6242D comes in a standard Model 6242D or there is an improved specification Model 6242DXS available.

Feature	Benefit
An exceptional range offering full measurement solution	Can measure from 0.1 Ω to 1 G Ω
Industry-unmatched measurement time	Full spec measurements completed in as little as 5 minutes
Direct Current Comparator technology-based	Provides excellent stability and range linearity
Fast reversal rates	Reversal rates as fast as 4 seconds without affecting bridge accuracy
Extremely low uncertainty	Allows sub-ppm high-current measurements
Automation software included	Allows complete control of all resistance measurements and parameters
National and Primary Lab continuity	Used by Defence, Energy, NMI's and Space Organizations
Up to 10,000 Amps	Can be expanded for Shunt Calibrations and DCCT's
Dual use operation	Use for Resistor maintenance or measuring SPRT's



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The AccuBridge® Family of Bridges

Since its inception in 1987, MI provided customers with the best resistance-measuring equipment. As the original manufacturer of the Automated Direct Current Comparator (DCC) Resistance Bridge, MI has been the industry leader in providing the highest level of automated resistance bridges and turn-key systems to metrology laboratories worldwide.

The 6242D is a high-performance Model MI Bridge. It is one of a family of bridges where there are various bridges optimized for different needs or subranges. These models range from measuring Quantum Hall Resistance Standards (QHR) over a smaller range of resistance but with excellent uncertainties to others which are a better fit for other labs with a broader range of measurements but with larger uncertainties. Three different bridge designs use different measurement methods to measure over 21 orders of magnitude of resistance, from 1 $\mu\Omega$ to 10 P Ω . The AccuBridge® family offers the best line of bridges available to measure the widest resistance range.

Ratio Range and Accuracy

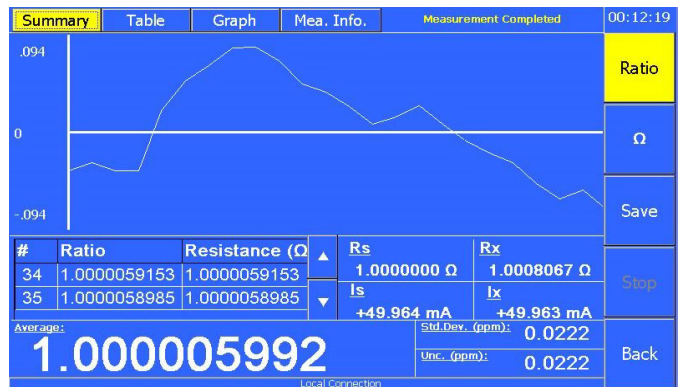
The 6242D DCC, with its binary wound current comparator technology, balances the current ratio with an effective resolution of 25-bit. This provides ratio measurements with an accuracy of better than 100 ppb with a linearity of better than 5 ppb. The 6242D can perform ratio measurements (R_x/R_s) with resistances valued from 0.001 Ω to 1 G Ω range. A line of optional high-current range extenders permits measurements down to 1 $\mu\Omega$ for shunt resistance or direct-current current transformer (DCCT) measurement applications.

Operation

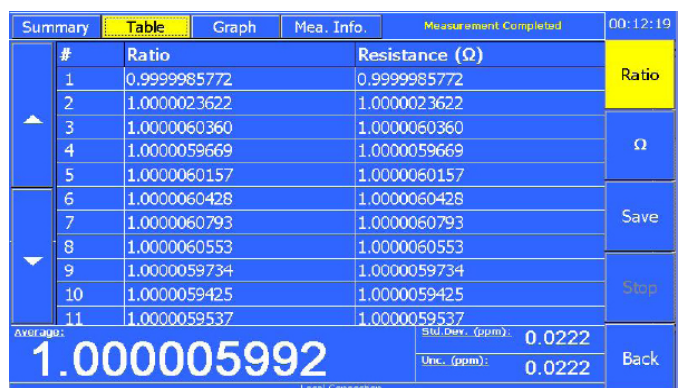
The 6242D has a standard (R_s) input and an unknown (R_x) input for measuring the ratio of the two resistors. All resistor connections are made using 4-terminal connections. Automatic current reversal ensures that DC offsets and thermals are canceled out during the measurement. Measurement parameters such as current through the unknown resistor, settle time, a number of measurements, and a number of statistics on the large touchscreen display menu. The display is interactive

with the measurements, as shown in the screen images below. The average value and uncertainty (based on the statistics) are displayed when the reading is complete.

All uncertainty calculations are 2 σ level. For absolute measurements, you enter the value and related uncertainty of the standard resistor using the display keypad. Calibration verification can be made by performing an interchange measurement at any ratio. Additionally, the interchange technique works at all ratios. While the 6242D is ideally suited for front panel operation, you can team it with MI's 6242D-SW operating software for fully automated measurements, history logging, graphing, and regression analysis. The optional 10-, 16- or 20-channel scanners can significantly improve this operation to automate different resistor intercomparisons.



The Summary tab displays Current Measurement Data



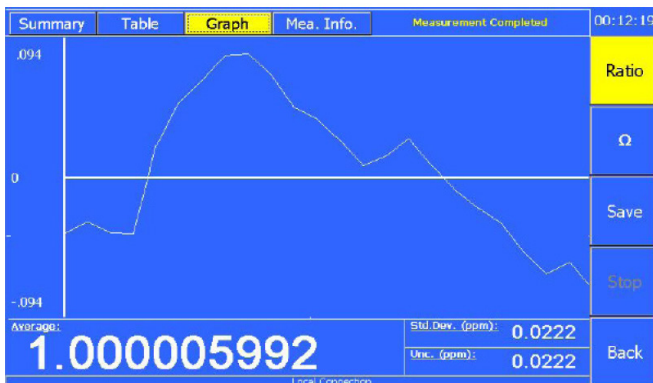
The Table tab displays a chronological list of measurement data



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The Graph tab displays a graphical representation of the data.

Rs		Rx		Ratio
Type	Resistor	Type	Resistor	
Absolute Value	1	Absolute Value	1	Ω
Unc. (PPM)	0	Ix (mA)	50	
Reversal Time (s)	8	# Meas.	35	Save
Sample Time (s)	5	# Stats.	25	Stop
Type of Meas.	4	Filter	3	Back
Average: 1.000005992		Std. Dev. (ppm): 0.0222		
		Unc. (ppm): 0.0222		

The Measurement Information tab displays measurement parameters

Measurements International provides world-class expertise in DC resistance metrology to National Measurements Institutes (NMIs) primary and Calibration Laboratories that need to achieve the lowest possible traceable uncertainty in their measurements and calibration equipment. As your accreditation and global support partner, MI helps ensure your competitive advantage by offering leading product knowledge and application expertise through coaching, system design, implementation, calibration services, and outgoing expert support.

At MI, it's not only about the equipment and science; it's about what you can do and the ease with which you can do it.

Automated current reversal ensures that DC offsets and thermals are canceled out during the measurement. The 6242D has a standard (R_s) input and an unknown (R_x) input for measuring the ratio of the two resistors. All resistor connections are made using 4-terminal connections. Calibration verification can be made by performing an interchange measurement at any ratio. The interchange technique works at all ratios.

6242D Windows® Based Operating Software

Measurements International's 6242D-SW Windows®-based operating software features measurement automation, report generation, historical analysis, and tracking and correcting for resistor drift rates.

When you combine the 6242D with an MI IEEE-488 controlled 9400 Standard Resistor Oil Bath or 9300A Air Bath, you can automatically perform alpha and beta calculations on resistors under test.

You can export all data directly to Excel for various test patterns or mainframe applications. Resistor baths (oil or air), instrument controllers, printers, system software, IEEE-488 interface, installation, and training are available for complete system packages.

When you use the 6242D in conjunction with our 6011 series of Range Extenders and 6150A Power Supplies, you can extend its range. Our Range Extenders include the 6011D/150 A and 6011D/300 A modules. The range can be extended further to 1 $\mu\Omega$ with our model 6013M/400 A Range Extender, or model 6014M/3000 A Range Extender.





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AccuBridge® 6242D Accessories Channel Extension

By using combinations of up to four matrix scanners, you can increase the number of input channels to almost any number from 10 to 40. Our Automated Low-thermal Matrix Scanners include the 4210A and 4210B with 10 input and 2 output channels; 4216A, 4216B with 16 input and 2 output channels; and 4220A and 4220B with 20 input and 2 output channels. Our A-series of matrix scanners have tellurium copper terminals on their inputs and outputs while our B-series units have four-wire Teflon cable on their inputs and outputs.



For more information, see our Model 4210, 4216, and 4220 Automated Low-thermal Matrix Scanners data sheet.

Model 9300A Temperature Controlled Chamber with IEEE-488

The 6242D is also ideal for verifying the temperature and power coefficient of resistors or shunts using the MI 9300A Air Bath. Up to four SR104s or a combination thereof can be installed in the bath, two shelves are provided. The IEEE-488 drivers for this bath are built into the software for automated measurements and calculations of alpha, beta coefficients, and resistor values. A Hi/Lo temperature protection circuit is built into the bath to protect your resistors.



For more information, see our Model 9300A Air Bath data sheet.

Model 9400 Oil Bath with IEEE-488

We designed our model 9400 Standard Resistor Oil Bath based on years of customer feedback on existing resistor oil baths. You control this bath through a touchscreen interface. Due to its low electrical noise, the quiet 9400 can be used with the Cryogenic Current Comparator (CCC) and Quantum Hall Resistance Standard (QHR). Depending on the quantity of resistors in the bath, the stirrer motor speed can be changed. The IEEE-488 drivers for this bath are



built into the software for automated measurements and calculations of alpha and beta coefficients and resistor values.

For more information, see our Model 9400 Standard Resistor Oil Bath data sheet.

Model 9331 & 9331R Series Air Resistors

MIL's high-accuracy working standard air resistors are used for precision on-site resistance calibrations for values from 100 $\mu\Omega$ to 100 M Ω . Our 9331's are small, light, and rugged resistance standards that do not require a temperature-controlled oil or air bath for their specification range. The stability and temperature coefficients of the 9331s make them ideal for easy transport and operation in any working environment within the range of 18 °C to 28 °C.



Connections to the model 9331R are made with tellurium copper 5-way binding posts for values to 100M. A separate ground terminal is included for guarding, and the case is hermetically sealed to keep moisture out. The model 9331 ranges from 0.0001 Ω to 100 M. For more information, see our Model 9331, 9331R, 9331G Standard Air Resistor data sheets.

Model 9210 Series Standard Oil Resistors

Standard Oil Resistors provide better stability and temperature coefficients over air resistors and provide the highest precision and stability in resistance measurements. Our standard oil resistors include the 9210A Primary 1 Ω , 9210A Primary 0.1 Ω , and 9210B series from 0.1 Ω to 100 k Ω . The 9210A 1 Ω and 9210A 0.1 Ω resistors have a negligible pressure coefficient.



For more information, see our Model 9210A MI-Type Standard and Model 9210B Reference Series Standard Oil Resistors Data Sheets.



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6011D Series Range Extenders

Our 6011D series of Low Resistance Shunt Measurement Systems offer the best accuracy, lowest uncertainty, and are the easiest to use commercial systems available. Our range extenders are fully automated, expanding the measuring capabilities of the 6010D or 6242D to measure lower resistance values at higher currents. A typical MI Measurement System consists of the AccuBridge® 6010 or 6242 Automated Resistance Bridge, a 6011 Range Extender, and the 6150A Power Supply. All required cables are supplied with the system.



For more information, see our Model 6011D Automated Range Extender and Power Supplies Data Sheet and the 6010/6242 Precision Shunt Measurement System Data Sheet.

ORDERING INFORMATION	
4210A	Low-thermal Matrix Scanner (10-Channels)
4216A	Low-thermal Matrix Scanner (16-Channels)
4220A	Low-thermal Matrix Scanner (20-Channels)
4210B	Low-thermal Matrix Scanner (10-Channels)
4216B	Low-thermal Matrix Scanner (16-Channels)
4220B	Low-thermal Matrix Scanner (20-Channels)
4220-1R	Hamon Adapter (4220A)
6511D	10 A Range Extender with DC Supply
6011D	150 A Range Extender
6011/300	300 A Range Extender
6150A	150 A DC Supply
9332	Series of Shunts (10 A to 3000 A, 100 mΩ to 10 μΩ)
9300A	Air Bath
9400	Oil Bath
J005-SPEC 30/100	4-Conductor Teflon Cable, 30 m or 100 m



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Specifications: Rev 6

Resistance Specification 6242D/6242DXS			
RS Nominal Value	R _s /R _x Ratio		
	1:1	1:10	1:100
1 Ω	0.1 / 0.02 ppm	0.1 / 0.03 ppm	0.1 ppm
10 Ω	0.1 / 0.02 ppm	0.1 / 0.03 ppm	0.1 ppm
100 Ω	0.1 / 0.02 ppm	0.1 / 0.03 ppm	0.3 ppm
1 kΩ	0.1 / 0.02 ppm	0.1 / 0.03 ppm	0.8 ppm
10 kΩ	0.1 ppm	0.1 ppm	2.5 ppm
100 kΩ	0.5 ppm	0.3 ppm	5 ppm
1 MΩ	1 ppm	2 ppm	10 ppm
10 MΩ	2 ppm	7 ppm	
100 MΩ	8 ppm	8 ppm	

* RS 0.1 Ω: RX 1.0 Ω < 0.2 ppm

* < 0.1 see MI Series of Range Extenders

* 0.001:1, 0.01:1 with Range Extender

Resistance Ratio Range	0.001:1, 0:01:1, 0.1:1 1:1, 10:1, 100:1	Test Voltage Range	1 V to 1 kV
Linearity	± 0.01 ppm	Current Reversal	4 to 1000 seconds
Resolution	± 0.001 ppm of full-scale	Time to Stated Accuracy (warm-up)	< 1 minute
Input Channels	2 (expandable to 40 with 4220A Matrix Scanner)	Temperature Coefficient	± 0.01 ppm/°C
Configuration	4-Terminal	Mode of Operation	Front Panel control or automated (IEEE-488)
Test Current Range	1 µA to 150 mA	Operating Environment	15 °C to 34 °C, 10 % to 90 % RH non-condensing
Extended Test Current Option	150 mA to 3000 A	Warranty	2 year Parts and Labour

Dimensions (L × W × H):
483 x 565 x 178 (mm)

Weight:
19 kg

Shipping Weight:
23 kg

Mains Power:
100, 120, 220, 240 V_{ac} — 50/60 Hz

Corporate Headquarters

Measurements International
PO Box 2359, 118 Commerce Drive
Prescott, Ontario, Canada K0E 1T0

Phone: 613-925-5934

Fax: 613-925-1195

Email: sales@mintl.com

Toll Free: 1-800-324-4988

