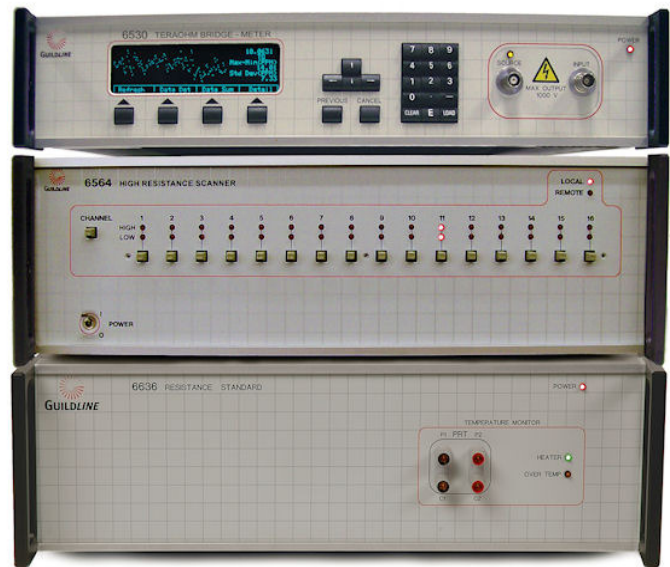


# 6535 AUTOMATED HIGH RESISTANCE MEASUREMENT SYSTEM



**The 6535 is a modular High Resistance Measurement System consisting of Guildline's new 6530 TeraOhm Bridge-Meter, our new 6564 High Resistance Scanner and optionally the Temperature Stabilized 6636 High Resistance Standards. Individual data sheets can be located on the Guildline Website for each of these instruments and standards.**

Guildline's 6535 High Resistance Measurement System provides demanding users around the world the best in DC High Resistance Measurement performance and value for the range of 100 kOhms to 20 POhms. Incorporating some of the most unique standards available for measurement, this system is the only "turn-key" Automated High Resistance Measurement System available today. Guildline unique Standards include the 6530 TeraOhm Bridge-Meter, a 6564 High Resistance Scanner and our 6636 Temperature Stabilized High Value Resistance Standard. The 6535 is used to automate multiple measurements with Direct Measurement and Bridge Ratio Modes up to 20 PΩ's.



6535 Front View

The System is highly configurable to meet wide ranging workload requirements. The 6535 is capable of dual modes of operation with direct resistance measurements from 100 kΩ to 20 PΩ with voltages to 1000 Volts. Similarly, the 6535 System provides a Bridge Ratio mode to allow the absolute best uncertainty found in any commercialized automated system today. The Current Mode Option allows the System to measure direct current from 10<sup>-5</sup> to 10<sup>-13</sup> Amps. With the use of the 6636 resistance standards, the 6535 System can also generate traceable, low uncertainty, currents.

Guildline's unique design and modularity allows customers to purchase what they need today to support their research, or the calibration of their current work-load, and be assured of an upgrade path to support their future requirements. The system is typically delivered ready for use in a single 'fly-away' rack. In fact, a system with a built in 8 Element 6636 Resistance Standard, 16 Scanner Channels, and the 6530 TeraOhm Bridge-Meter **is less than 14" in total height.**

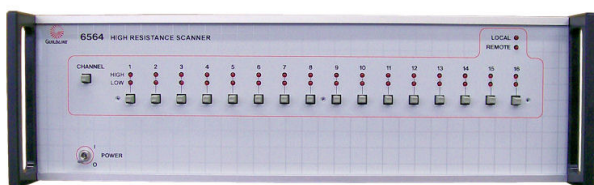
This High Resistance Measurement System, along with optional adaptors and utilities, provides National Metrology Institutes, Calibration Companies, Power Companies, Militaries and other customers with:

- Two Modes of Operation, Direct Measurement and Bridge Mode
- Standard **B**ase Resistance Measurement from 1MΩ to 100 TΩ!
- e**X**panded **R**esistance Measurement Range from 100 kΩ to 20 PΩ!
- e**X**panded **P**erformance of 8 ppm for 1 MΩ to 1 GΩ & < 50 ppm for 10 GΩ to 1 TΩ!
- Multi-Ratios up to 1000:1!
- Test Voltages from 1 to 1000 Volts!
- Optional Current Mode to measure currents from 10<sup>-5</sup> to 10<sup>-13</sup> Amps!
- Scanner Capabilities to 1000V and 64 Channels!
- Transferring the Traceability of Primary Standards from NMI's or other sources!
- Automated procedures for Calibrating High Resistance Decade Boxes!
- Surface and Volume Resistivity with optional test fixtures!
- Simple Artifact Verification Procedure to ensure the 6530 TeraOhm Bridge-Meter remains within operating specifications!

This automation and functionality provided by the 6535 System improves the calibration uncertainties, range of equipment that can be supported, and the efficiency of calibration laboratories and research facilities. The 6535 High Resistance Measurement System can either be operated manually or in a computerized mode via the Standard IEEE-488 communication. The included GUI based software program, TeraCal™, incorporates features and utilities that allow operators to improve measurement effectiveness and provide efficiency for data management. This includes the ability to perform automatic data acquisition, real time graphing of results, real time uncertainty analysis, history logging, charting, and regression analysis. All user definable test variables, such as resistance standard to use, excitation voltage, etc can be programmed on a per test basis. These features give users full control and flexibility in automating routine calibration procedures and maximizing workload capabilities.



6636 Rear View



6564 Scanner Front View

The new Guildline 6564 High Resistance Scanner is included with the system. The number of channels can go from 8 all the way to 64. Customers need to evaluate the number of standard resistors they have or plan on having and the number of free channels they wish to use. For example if a user bought a 6535 with the highly stable 6636 Temperature Stabilized Resistance Standard, up to 8 channels would be required to connect all individual resistance standards for automation. The 6564 Scanner allows for completely automated measurements up to 1000 Volts at 100 TOhms

with no uncertainty added to the measurement process, and up to 20 POhms with an offset that can be calibrated out. Remember, with TeraCal Software, multiple tests can be sequenced and grouped for the Standards to run even when operators are not present! For example a complete set of working standards from 100 kOhms to 100 TOhms can be calibrated in a single day without operator intervention. The 6535 is a complete system capable of fully automated multiple-channel calibrations and measurements.

A customer has the choice of four 6530 TeraOhm Bridge-Meter models. The 6530 XP and XPR models provide the best uncertainties of any commercially available high resistance measurement instrument including better uncertainties than commercially available dual source bridges. The XR and XRP models provide the widest range of resistance measurement of any instrument. Existing Guildline 6520 Teraohmmeters can be upgraded to any of the four 6530 Models which will provide better performance and uncertainties. And at the same time a 6520 customer can upgrade to a complete 6535 System at a substantially reduced price.

Another key feature of Guildline’s 6535 System is its multi-ratio functionality which supports ratios up to 1000:1. This feature allows customers to reduce the number of resistance standards required, and associated annual calibration costs. As well, the multi-ratio functionality will reduce calibration uncertainties by optimizing the use of lower value resistance standards that provide better uncertainties. This multi-ratio functionality allows customers to greatly reduce their uncertainties when laddering up from lower value resistance standards.

Comparison of 6535 Selected Models vs MIL TeraΩBridge Specifications

Measurement Range (Ohms)	Applied Voltage Threshold (Guildline Range)	6535 Bridge Mode (± ppm of Reading) 23°C ± 2°C		MIL TeraΩBridge (± ppm of Reading)	
		With 6530 XR 1:1 & 10:1 Ratio	With 6530 XPR 1:1 & 10:1 Ratio	23°C 1:1 Ratio Only	23°C ± 2°C 1:1 Ratio Only
200k to 2M	1V to 10V	15	8	10	30
2M to 20M	1V to 100V	15	8	10	30
20M to 200M	1V to 1000V	15	8	10	30
200M to 2G	1V to 1000V	15	8	15	35
2G to 20G	1V to 1000V	20	10	30	50
20G to 200G	1V to 1000V	20	15	60	80
200G to 2T	1V to 1000V	70	50	120	130
2T to 20T	10V to 1000V	200	120	150	170
20T to 200T	100V to 1000V	500	200	250	270
200T to 2P	1000V	1500	800	1000	1020
2P to 20P	1000V	3500	2000	NA	NA

A 6535 System has built-in EMI shielding and temperature stability. This greatly reduces the environmental effects as can be seen in the above table which just addresses temperature.

Other high resistance measurement instruments, including dual source bridges, are very sensitive to electrostatic, EMI and temperature affects.

The 6564 High Resistance Scanners come in 8 or 16 channel models and four scanners can be combined to provide a total of 64 channels – more than any other manufacturer.

The latest version of the TeraCal™ software provides full SCPI based GPIB control of the 6535 System. It provides data storage, report/certificate generation, and utilities to allow a variety of other resistance characteristics to be measured. Data can also be easily exported to Microsoft

TΩ	Detail	Summary	10.0524
Minimum	10.0532035	10.0521377	TΩ
Maximum	10.0535645	10.0545616	Count
Average	10.0533511	10.0533511	19
Std Dev	7.51	37.33	(PPM)
Samples	67	3362	

Refresh | Clear Det | Clear Sum | Detail

Excel. TeraCal™ calculates uncertainty by either using expanded uncertainties in accordance with ISO/IEC 17025:2005 requirements or alternatively uncertainties can be arithmetically summed.

Production line testing, calibration of electrometers, semiconductor testing, capacitance leakage measurement, film surface and volume resistivity measurement, and other applications can all be automated by using the 6535 System. In the current mode, the 6530 Series can also be used to measure chemical reaction rates, photo-electric effects and ionization effects.

With a wide selection of options available, the power of the 6535 System is greatly increased. Added features include the ability to automatically record the ambient temperature, humidity and pressure via the 65220 environmental option or via user provided equipment. The information is logged and time stamped so a change in any of these conditions, which may have affected the measurement, is readily available. Other options include Shielded and Environmental enclosures, Surface and Volume Resistivity fixtures, Calibration Kits, and Lead Kits. Refer to the 6520 Option datasheet for description of available options – all of which work with the new 6535 High Resistance Measurement System.

The modularity of the 6535 High Resistance Measurement System is based on over 50 years of innovation, design knowledge, and manufacturing experience that Guildline has in building resistance instruments. With a single system, the requirement for laboratory space is greatly reduced. There is also a corresponding reduction in the power requirements and associated heat generation when compared with numerous instruments required from multiple manufacturers to meet the same requirements. The modularity and expandability provided by a 6535 High Resistance Measurement System means that customers can upgrade the 6535 Measurement System in the following ways:

**Increased Uncertainty / Accuracy:** Customers can upgrade from the Base Model 25 ppm uncertainty for the 1 MΩ to 1 GΩ range to the **Expanded Performance Models** (i.e. XP and XPR) uncertainties of 8 ppm for the 1 MΩ to 1 GΩ range and < 50 ppm for the 10 GΩ to 1 TΩ range. This allows customers to expand their calibration scope as new instruments are released into the market place.

**Expanded Resistance Measurement Range:** Customers can upgrade from the Base Model ranging from 100 MΩ to 100 TΩ to the **eXpanded Range** and **eXpanded Performance & Range** (XP and XPR) Models which measure from 100 kΩ up to 20 PΩ with lower uncertainties.

**Current Option:** This option allows currents to be measured from  $10^{-5}$  to  $10^{-13}$  Amps. A 6535 System with Current Option can be used to calibrate low current meters such as nano-amp meters. If a 6636 Temperature Controlled resistance standard is included with the system, stable and traceable low value currents can also be generated.

**Scanner Channels:** The 6535 System can be purchased with 8 to 64 channels allowing a wide range of standards and instruments to be connected and calibrated automatically without operator intervention.

**Complete Modularity and Expandability:** National Metrology Institutes, Electrical Power Companies, Calibration Companies, Militaries and other customers are continually upgrading their calibration procedures. As their requirements for high resistance and low current measurements expand, they are purchasing the upgrade options provided for the 6535 System. Guildline is the only manufacturer in the world to provide these modular expansion features for a high resistance measurement system. With Guildline's integrated 6535 High Resistance Measurement System, customers only have to deploy and support a single system to meet their high resistance and low current requirements. Whether you are a national, commercial or military laboratory this means a substantial reduction in staff training which is important given staff rotations and the cost of training. The flexibility to purchase expansion options and upgrades to the 6535 System means that new calibration procedures can be implemented inexpensively without the additional training and support that is required when new calibration instruments have to be purchased from multiple vendors.

**Lower Capital and Operating Costs:** A 6535 System can be purchased at lower cost than individual resistance standards and a commercial dual source bridge which requires two very stable voltage sources, a bridge, and a detector. And not only is the initial purchase cost less, but the ongoing annual calibration costs are less with a 6535 System.

In summary, customers who purchase a 6535 High Resistance Measurement System can make automated precision high resistance and low current measurements and calibrate both high resistance and low current standards. Purchase of a 6535 protects their initial investment, provides a growth path as their requirements change, and enables the expansion of their initial high resistance / low current measurement system to support new calibration procedures and new test and measurement equipment. Equally important, customers have dramatically reduced capital, training and ongoing life cycle support costs.

Equip your research facilities and calibration laboratories with the best, proven solution – the 6535 System. No other High Resistance System in the world offers the low uncertainties, wide range of operation, automation functionality, and flexibility to customers.

**For more information about the 6535 High Resistance Measurement System or any of our other primary level instruments contact Guildline Instruments at:**

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