Model 6520

Programmable Digital Teraohmmeter

Ultra Accurate, Ultra High Resistance Measurement

Guildline Instruments Limited 6520 Programmable Teraohmmeter is the latest innovation in Teraohmmeters. This ultra-high resistance Teraohmmeter incorporates the latest technology that allows Metrologist's easy direct reading, high resistance measurement capabilities, while providing internal measurement techniques superior to that of most DCC bridges available today. The 6520 allows users to make resistance measurements up to 10^{16}. A new measurement and calibration software package TeraCal™, is supplied with every system. Whether used in automated solutions or stand-along applications, the 6520 now provides a fully automated method for calibrating both high and ultra-high resistance values and allows for direct Surface and Volume measurements.

The 6520's unique design greatly improves accuracy, stability, and functionality for making high resistance measurements. Convenient Resistance and Current ranges from 10^{5} to 10^{16} ohms and 10^{-1} to 10^{-14} amps are provided. When used as a Transfer Standard, uncertainties better than ±0.0025% can be achieved.

6520 Features

- Resistance Mode: Range 100 kΩ to Over 10,000 TΩ (Teraohms)
- Current Mode: Range 10^{-2} amps to 10^{-13} amps
- Automatic Sensing of Resistance Range, Integration Time and Threshold Voltage
- Surface and Volume Resistivity Measurements with 65221 Test Fixture
- Test Voltages 1 to 1000 volts
- Environmental Monitoring with 65220 Sensors
- Logging, Graphical Display and Analysis of Measurements
- Sofcal™ for On-Board Intelligence and Front Panel Calibration
- TeraCal™ Data Acquisition Software Automates Operation
- SCPI compliant IEEE-488.2 and RS232C Built-In as Standard
- Rear Input Option

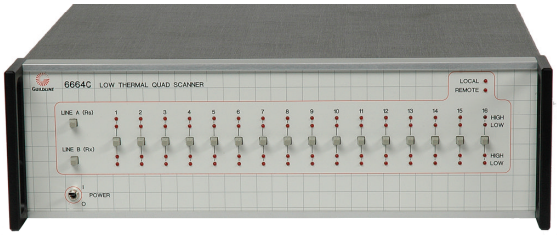
The 6520 Achieves the Highest Accuracy and Widest Resistance Measurement Ranges Commercially Available Today!

In manual operation users have control over important test parameters such as Integration Times, Threshold and Test Voltages, and Voltage Reversal Rates. However, an automatic mode allows the 6520 to determine appropriate resistance range, integration time and applied voltage for the entire measurement range. A combination of selected integration times (5mS to 1000S) and selected test voltages (1V to 1000V) also allow the user to measure voltage coefficients for resistivity and resistance measurements.

The front panel provides direct measured values and can graphically display on-going measurements as well as environmental conditions. This provides an easy method of determining the settling time of a measurement and the stability of a resistor. The system can also internally calculate and display Min, Max, Average, and Standard Deviation values that allow analysis of measurements, all without the need for a computer.

With the built-in profiles menu, users have the ability to save threshold, voltage, soak, delay times and other measurement parameters. This allows for expedient setup recall for repetitive measurements.

NEW 1000 Volt, High Resistance Scanner!



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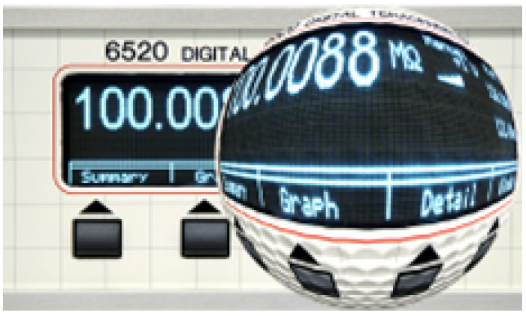
The 6520 utilizes internal firmware menus (Sofcal™) to configure the IEEE-488.2 and the RS232C interfaces. In addition, Sofcal™ provides supply and reference voltage diagnostics, protection resistor compensation, integrator linearity check and standard calibration from the front panel. The calibration is simply achieved by connecting a known reference resistor to the input connectors (accessory 9336-100M) and starting the Artifact calibration procedure. The on-board firmware also provides self test and diagnostic help features.

Production line testing, calibration of electrometers, semiconductor testing, capacitance leakage measurement, film surface and volume resistivity measurement, and other applications (performed in the past by previous Teraohmmeters) can all be automated by using the 6520. In the current mode, the instrument can also be used to measure chemical reaction rates, photo-electric effects and ionization effects.

The IEEE-488.2 and RS 232C interfaces come as standard. An external trigger input is also provided to command a measurement from an external device, process or timing mechanism.

More than a Measurement Device – A True Metrologists Tool!

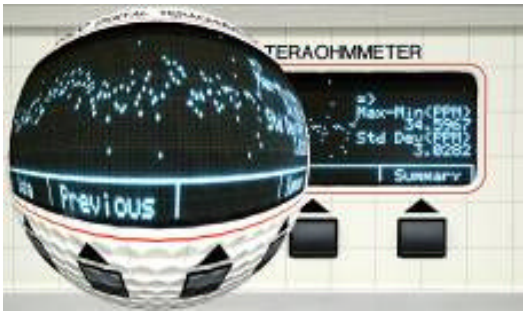
Take a look at the new Guildline 6520 Teraohmmeter and you will find it has been completely re-engineered and provides much better performance than older models. The unique temperature controlled measurement chamber keeps all internal measurements at the same temperature and controlled air flow dissipates heat. The latest in IEEE and RS232 communications, powerful new firmware for complete and easy measurement calculations and test setups, and improved performance will help any Metrologist's in achieving difficult measurement and accreditation requirements. Just take a look at some of the features found on the 6520…



Measurement Collection – It's not enough anymore to just collect the measurements.. Variables that affect the measurement must be identified and analyzed. The 6520 provides the ability to collect, store and time stamp temperature, relative humidity and barometric pressure. All variables that adversely impact high resistance measurements! Another unique feature found on the 6520 is the ability to know exactly when you are in an uncalibrated range. A message appears right on the display anytime you are trying to use parameters that would invalidate the measurement collection!

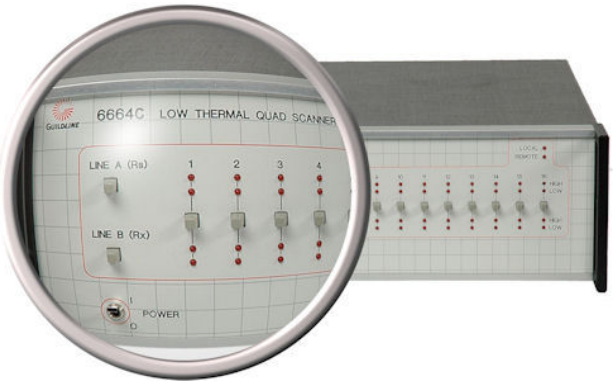
Measurements Setups – The 6520 allows the user, not the manufacture, to define the measurement sample and test parameters. While Guildline provides some recommended setups, all test configurations can be easily changed and even saved into one of 36 user profiles for fast and controlled measurement setups.

Measurement Analysis – The 6520 provides the capability to fully analyze all measurements without having to use a computer. Important information such as measurement sample size, minimum and maximum readings achieved, calculated average reading and standard deviations of the measurements samples – all there at the push of a button and more….



Trending Measurements – The ability to see measurement trends allows users an unparalleled look at the measurement cycle. Visually see the measurement affects when changing setup variables such as voltage polarities, integration times or capacitance values. Also see the measurement affects due to temperature, pressure or humidity changes. The 6520 allows you to see the complete or immediate measurement processes at your leisure, not ours. See what you have been missing!

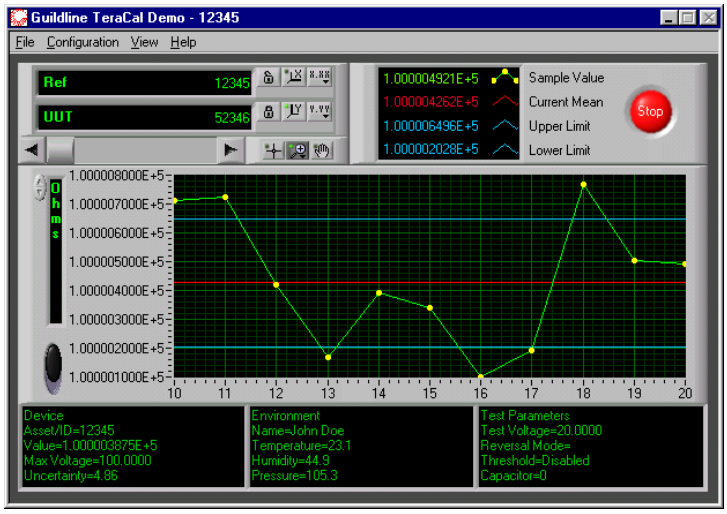
Now a Complete High Resistance Automated Solution



Looking for complete automation of High Resistance Standards? Then look at our NEW 6664C High Voltage Scanner. Simply connect the 6520 inputs to one side of the scanner, and connect up to 15 more resistors to the remaining Scanner Channels. Then simply run a batch measurement from TeraCal Software and you can easily address these difficult high resistance measurements with a cost effective and time saving solution. The 6664C Scanner can handle the complete output voltage of the 6520 (1000 Volts) and adds virtual no uncertainty to the measurement for resistance measurements less than 100 GOhms. 8 Channel and 16 Channel Models are available in the 6664C Series.

TeraCal Software

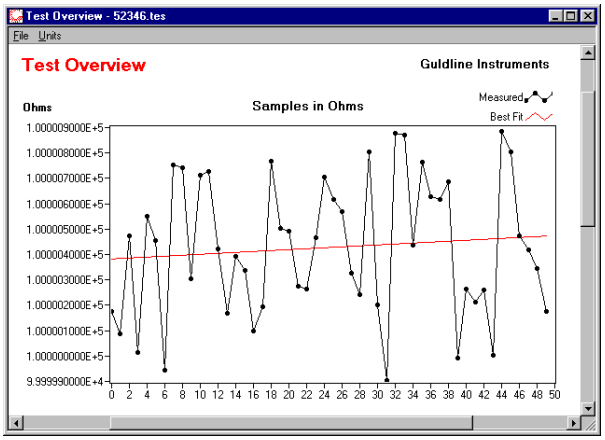
The newly developed software, TeraCal™ provides full SCPI based GPIB control of the Model 6520. It provides data storage, report/certificate generation, and other utilities to allow a variety of other resistance characteristics to be measured. Data can also be easily exported to Microsoft Excel. TeraCal™ calculates uncertainty by either using expanded uncertainties in accordance with ISO/IEC 17025:2005 requirements or alternatively uncertainties can be arithmetically summed.



Features of TeraCal include

- ***Measurement Automation.***
- ***6520 Transfer Cal Utility.***
- ***Surface/Volume Resistivity.***
- ***Voltage Coefficient Utility.***
- ***Export to Excel, Crystal, and HTML.***
- ***Data and Trend Analysis.***
- ***Uncertainty Calculation.***
- ***Data Logger Acquisition.***
- ***Device Profiling***
- ***New 3D Graphical Look***

The 6520 can be remotely controlled and automated via Guildline's TeraCal™ software by using the IEEE-488.2 interface. TeraCal™ is a convenient Windows®-based software program, developed using the National Instruments LabVIEW™ platform and designed specifically for Metrologists.



TeraCal™ provides easy to use controls, data storage, report generation and utilities for the performance of a variety of resistance measurements. When used with the 65221 test fixture, this includes surface and volume resistivity. When the optional 65220 environmental sensors are installed, the ambient temperature, humidity and pressure can be recorded. To run TeraCal™, a Windows 9X/NT computer with an optional National Instruments IEEE-488.2 interface card is required

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6520 Options

65220 Environmental Monitors

With a wide selection of options available, the power of the 6520 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 allow Metrologists to support their own 6520. Refer to the 6520 option datasheet for description of available options.

Life Cycle Support

User support of the 6520 has never been easier. Users have choice between two levels of Calibration Philosophies.

Artifact Calibration is achieved by the use of a single 100 Mohm standard resistor connected to the front or optional rear terminals. An internal program ("SofCal™) then uses this resistor to perform an automated procedure similar to techniques used in other MFR's artifact calibration routines. A full calibration is achieved by first performing an Artifact calibration, then using a series of precision high resistance standards to verify the remaining ranges required by the laboratory.

Additionally the 6520 allows Calibration Laboratories to use their own set of standard resistors for verifying linearity and producing drift history. Guildline also produces standard "AIR" resistors, models 9336 and 9337, with values up to 10 Peta Ohm capable of performing this verification. These resistors can also be used for "Transfer" type measurements.

Need The Ultimate In A Primary Resistance Standard?

6636 Temperature Stabilized Resistance Standards

Whether you have had your fill of oil baths or you can't afford to spend the large amount of capital required for a tightly controlled laboratory, but still want the best performing Resistance Standards, take a look at our 6634A and 6636 Temperature Stabilized Resistance Standards. With unsurpassed stabilities, its own built-in temperature environment, and temperature coefficients down in the parts per billion (ppb) these standards are an excellent addition to any Metrology Laboratory.

Unparalleled Support

And our support just got even better. Guildline Instruments now provides an industry leading two year warranty on every 6520 and all associated resistance standards. We know that the 6520 will work for you out of the box and in the future… and we back it up.

Certified by the National Research Counsel of Canada (NRCC) Calibration Laboratory Accreditation Program (CLAS), Guildline can provide some of the best uncertainties you will find from any manufacturer. With an Accredited Range from 1 uΩ (micro ohm) to 10 PΩ (Peta Ohm's), Guildline can calibrate not only our own standards, but other manufacturer's as well. Call us today for pricing and turn-around times.

For Nuclear Customers, Guildline has passed a NUPIC audit.

6520 Resistance Measurement Specifications

Measurement Range[1] (Ohms)	Applied Voltage[2] Threshold	Uncertainty (% of Reading) @ 23°C ± 2°C		Temperature[5] Coefficient (±% of reading/°C
		12 Month[3]	Transfer[4] (4 Hours)	
90k to 200k	1V	0.025	0.006	0.01
200k to 2M	1V	0.025	0.0025	0.0035
2M to 20M	1V	0.025	0.0025	0.0035
20M to 200M	1V to 10V	0.015	0.0025	0.0035
200M to 2G	1V to 100V	0.02	0.0025	0.005
2G to 20G	1V to 1000V	0.06	0.0025	0.007
20G to 200G	10V to 1000V	0.08	0.0025	0.01
200G to 2T	100V to 1000V	0.12	0.008	0.02
2T to 20T	1000V	0.35	0.05	0.03
20T to 200T	1000V	0.6	0.07	0.05
200T to 2P	1000V	2.5	0.2	0.1
2P to 20P	1000V	30	0.5	1

1. Ranges are automatically selected or may be chosen manually. The maximum test voltage is selectable.
2. This column is presented only in this data sheet for purposes of identifying uncertainties with a measurement range via common Engineering units.
3. 12 Month Specification applies after 6520 hour warm up, with operating in Auto mode to 1T ohms and with a soak time of 5 seconds or more above 1T Ohm and when the current is no less than one picoampere through the unknown resistor.
4. Transfer Uncertainty does not include instabilities of the Transfer Resistance Standard or the test resistance (e.g. dielectric effects, Voltage coefficients). This is the 6520 stability of the measurements over the characterized 4 hour time period.
5. The temperature coefficient only needs to be accounted when the laboratory operating environment is outside the 23°C + /2°C.

6520 Current Measurement Specifications

Range (A)	1 Year Uncertainty ±% of reading @ 23°C ± 2°C	Temperature[1] Coefficient ±% of reading/°C
$10^{-3} \le I \le 10^{-2}$	Not Specified	Not Specified
$10^{-4} \le I < 10^{-3}$		
$10^{-5} \le I < 10^{-4}$		
$10^{-6} \le I < 10^{-5}$	0.1	0.005
$10^{-7} \le I < 10^{-6}$	0.1	0.005
$10^{-8} \le I < 10^{-7}$	0.2	0.03

Range (A)	1 Year Uncertainty ±% of reading @ 23°C ± 2°C	Temperature[1] Coefficient ±% of reading/°C
$10^{-9} \le I < 10^{-8}$	0.2	0.03
$10^{-10} \le I < 10^{-9}$	0.2	0.1
$10^{-11} \le I < 10^{-10}$	1.0	0.1
$10^{-12} \le I < 10^{-11}$	2.0	0.2
$10^{-13} \le I < 10^{-12}$	10.0	1

1. The temperature coefficient only needs to be accounted when the laboratory operating environment is outside the 23°C + /2°C.

9334A's, 9336's and 9337's Resistance Standards are calibrated at one recommended and specified current or voltage. Guildline can calibrate at additional voltages or currents for a nominal fee. To calculate error due to voltage coefficients, simply look at the voltage the unit was calibrated and voltage the resistor is being used at. For example, if a 100MOhm resistor was calibrated at 100 Volts, but being used at a 50 Volt level, than the voltage coefficient uncertainty can be calculated by (100V - 50V = 50V). 50V x 0.2 ppm/V = 10 ppm uncertainty error contributed to voltage differences. Voltage Coefficients are provided for all Guildline Standard Resistors above 1 MOhm

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General Specifications

Measurement Ranges	
Resistance Mode	10^{5} to 10^{16} ohms
Current Mode	10^{-2} to 10^{-13} amps

Input Impedance	
Resistance Mode	100 k ohms
Current Mode	100 kohms, 100 Ohms above 10 uA

Display Resolution:	4 to 8 Digits (Selectable)
Measurement time:	5ms to > 1000 seconds

Interfaces	
	IEEE 488.2
	RS232

Power	
	100, 120, 220 and 240 VAC (± 10%)
	50 or 60 Hz (± 5%)
	50 VA

Front Panel Connections	
Input Connector:	3 lug Triax
Source connector:	High Voltage BNC

Test Voltage (Programmable Steps):	1, 2, 5, 10, 20, 50, 100, 200, 500 & 1000 Volts (DC)

Environmental	Operating	Storage
Temperature	15°C to 30°C	-30°C to 70°C
Humidity (non-condensing)	20% to 50% RH	15% to 80% RH

Dimensions	Height	Length	Width
Metric	89 mm	500 mm	444 mm
US	3.5"	19.7"	17.5"

Weight	11.4 kg	25 lbs

Shipping	18.2 kg	40 lbs

Environmental Monitor (65220 Option)	Range	12 Month Uncertainty
Temperature	-50°C to 100°C	±0.3% (+ sensor error)
Humidity:	0% to 100% RH	±0.3% (+ sensor error)
Atmospheric Pressure:	15 to 115 kPa	±0.3% (+ sensor error)

Ordering Information

6520	Programmable Digital Teraohmmeter
TeraCal™	Data Acquisition software (included) Requires optional Windows 9X/NT computer and National Instruments IEEE-488.2 Card
/CC	Calibration Certificate included.
/RC	Report of Calibration Available at Additional Charge
/TM6520	Technical Manual included.
6664C/16	16 Channel, 1000 Voltage Resistance Scanner
	6520 Options (See 6520 Options datasheet for more information)
65201	Penn Airborne Adapter
65220	Environmental Monitor
65221	Surface/Volume Resistivity Test Fixture
65222	Large Shielded Sample Enclosure
65223	Small Shielded Sample Enclosure
65224	Zero Link
65225	Lead Set
65226	Calibration Kit (Includes 65224 & 9336-100M)
9336-100M	100 MOhm Artifact Calibration Resistor
9336/9337	See Data Sheets For More Information on these Standards
6636	See 6636 Data Sheet For More Information on Temperature Stabilized High Resistance Standards
5030 Series	Programmable Precision Air Baths (Also provide EMI Shielding)

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