

Model 292A

Surface Resistance Test Kit

Instruction Manual



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Specifications subject to change without notice.
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Specifications

Range:	1.0 x 10 ³ to 1 x 10 ¹² Ω @ 10V 1.0 x 10 ⁶ to 1 x 10 ¹² Ω @ 100V
Accuracy:	Resistance measurements within +/-10% (20% for resistance values 1x10 ¹¹ and greater.)
Open Circuit Voltages:	10 and 100 volts ±5%
Electrification Period:	15 seconds
Temperature Accuracy:	±5 degrees F and ±3 degrees C Typ. +/- 10%
Relative Humidity:	Range from 5% - 95%; ±10 digits Typ.
Power:	Two - Alkaline AA batteries Battery Life: approximately 1500 measurements.
Meter Jacks:	Left jack on meter accepts a 3.5 mm plug Right jack on meter accepts a standard banana plug
Test Leads:	Black lead terminated with a 3.5 mm plug one end and a standard banana plug on the other White lead terminated with a standard banana plug both ends
External Electrodes:	Two NFPA-99 5 pound electrodes (80 oz.) ±2oz with Shore A (IRHD) 50 - 70 durometer conductive pads that comply with EOS/ESD S4.1
Resistivity Electrodes:	Model 292A/41 (<i>optional</i>) Parallel conductive silicone rubber electrodes 1.875 inches long and spaced 1.875 inches apart mounted onto a separate adapter.
Meter Weight:	.7 lbs / .03 kg
Dimensions:	8.1" L x 4.1" W x 1.5" H (20.6cm x 10.4cm x 3.8cm)
Kit includes:	Meter Protective carrying case Test leads Two NFPA-99 5-pound electrode weights Two AA Alkaline batteries Operator's Manual

Resistivity adapter is optional and must be ordered separately.

Specifications are subject to change without notice.

Description

Monroe Model 292A Digital Surface Resistance Test Kit is a portable, versatile, instrument designed to accurately measure resistance between two points (RTT), surface to ground (RTG), and surface resistivity in accordance with EOS/ESD Association standard S-4.1. In addition, the meter measures ambient temperature and relative humidity.

The Surface Resistance Meter is designed to make measurements in accordance with specified test methods on:

- Work surfaces – ANSI/ESD S4.1 Work surfaces – Resistance Measurements
- Floors – ANSI/ESD S7.1 – Resistive Characterization of Materials Floor Materials
- Footwear – ANSI/ESD S9.1 and S9.2 – Footwear- Resistive Characterization
- Garments – ANSI/ESD STM 2.1 Garments
- Seating –ANSI/ ESD STM 12.1 Seating – Resistive Measurement
- Floor/Footwear – ANSI/ESD STM 97.1 Floor Materials and Footwear Resistance Measurement in Combination with a Person
- Workstations – ESD-AVD 53.1 ESD Protective Workstations

Electrification Period:

The 292A Surface Resistance Test Kit provides the proper electrification period of 15 seconds per ANSI/ESD S4.1.

Liquid Crystal Display (LCD):

A 3.5 digit 9/16” high, liquid crystal display provides easy to read measurements directly from the meter. No interpretations or calculations are required.

LED Displays:

Surface resistance exponents are displayed via 12 light emitting diodes ($< 10^3 - >10^{12}$). LEDs are color coded for quick check recognition: Five additional Function LEDs identify the measurement taken when lit.

Exponent	Color
< 3, 3	Red
4, 5	Green
6, 7, 8	Blue
9, 10	Green
11, 12, >12	Yellow

Auto/10 Volt Hold Test Range Voltage Button:

When in the “up” or Auto position, during resistance testing, the meter automatically switches to the correct voltage for the resistance range. When in the “down”, or 10 Volt Hold position, automatic voltage selection is overridden and the test is performed at 10 Volts regardless of resistance level. An LED illuminates to note selected voltage.

Test Button

The red test button activates electrical power to the meter. When the test button is depressed and held the exponent LED is lit immediately. During the meter’s electrification period the LCD will display the temperature in Fahrenheit for 5 seconds, the temperature in Celsius for 5 seconds, then the Relative Humidity as a percent for 5 seconds, and then the surface resistance measurement in decimal notation.

Quick Check Button:

When set to FULL, the meter will cycle through the 15 second electrification period that displays the temperature and relative humidity before the surface resistance mantissa is displayed.

*When set to QUICK, the meter will skip the 15 seconds and immediately display the surface resistance mantissa.

- Temperature in degrees F (+/- 5⁰)
- Temperature in degrees C (+/- 3⁰)
- Relative Humidity as a percentage (+/- 10 integers)
- Surface Resistance Mantissa (with exponent displayed via LED, measurement expressed in ohms.)

Jacks

The left hand jack on the meter accepts a shielded 3.5mm plug. The right hand jack accepts a standard banana plug.

Test Leads

One end of the black test lead provided is terminated with a 3.5mm plug and fits the left meter jack. The 3.5mm plug is shielded per ESD S4.1 (Refer to RTG test procedure later in this manual.) The other end of the black test lead and both ends of the white test leads are terminated with a standard banana plug.

Battery Replacement

The battery compartment is located in the back of the unit. Observe polarity and carefully replace the batteries with alkaline Type AA. Polarity must be correct or damage may occur. Close battery door and reinstall bottom end cap onto meter case.

Cleaning and Maintenance

Work surfaces or material to be tested should be cleaned prior to testing to ensure that surface dirt and contamination do not affect the test results. Periodically clean the two 5-pound conductive rubber probe electrode surfaces. Use solvent free rubber cleaners. We recommend using an anti-static cleaner or Stat Wipes, pre-saturated cleaning wipes. Make sure the surface is dry before testing.

The 292A Surface Resistance Test Kit requires little maintenance with no user serviceable parts. If your meter requires service beyond cleaning the electrodes or changing the batteries, please contact the factory.

Calibration

Monroe Electronics instruments are factory-calibrated prior to shipment. Recalibration should be performed annually, or more frequently if specified by contract or company policy. Your instrument should also be recalibrated any time it has been repaired or tampered with. We are happy to recalibrate your instrument for you at a reasonable cost, or provide information and procedures on calibration upon request.

General Guidelines for Testing

- Use both 5-pound electrodes for RTT (Resistance between two points) testing.
- Use one 5-pound electrode and one lead to a groundable point for RTG (Resistance to Ground) testing.
- Use the optional resistivity adapter Model 292A/41 with leads for Resistivity measurements.
- Make sure that the item being measured is electrically isolated (i.e. placed on an insulative surface) as the meter will measure the lower resistance path.
- Make sure that the test leads are separated or the meter may measure the lower resistance path
- When using the 5-pound electrodes:
 - o Place the electrodes no closer than 2 inches from edge of surface being measured.
 - o Place the electrodes no closer than 3 inches to any groundable point
 - o Preferred placements include: most commonly used surface portion, most worn, center, and furthest from a groundable point.
 - o For RTG, connect the sensing lead with shielded plug to the groundable point.

Literature References

Monroe Electronics recommends that anyone using Model 292A read the following standards from the ESD Association:

EOS/ESD-ADV1.0 – Glossary of Terms
EOS/ESD-S4.1 – Work surfaces
EOS/ESD-S6.1 – Grounding
ESD-S7.1 – Floor Materials
EOS/ESD-S11.11 – Surface Resistivity

These documents are available directly from the ESD Association
7900 Turin Road
Suite 4
Rome NY 13440-2069
(315) 339-6937

RTT - Measuring Resistance Between Two Points

Point to point surface resistance measurements are made using the meter with both of the 5-pound weight electrodes. This test determines the resistance between two points independent of a ground point.

To perform surface resistance tests you must first determine what test procedure to use. The test procedure helps you determine the proper preparation of the material to be tested and the spacing of the weights. Once the testing parameters are determined proceed with set up for point-to-point testing.



- Connect the test leads to the meter and the 5-pound electrodes in a set up similar to the one shown above.
- Place both electrodes on the material at positions determined by the procedure selected. Set the meter to the required test voltage as specified in the test procedure and the resistance of the material.
- Press and hold the red test button for at least 15 - 20 seconds. The LCD expresses surface resistance ohm values and an illuminated LED indicates the reading's exponential value.

RTG – Resistance to Ground Measurements

Resistance to ground measurements indicate the surface resistance between selected locations on a work surface and a groundable point or points. Ground points are usually in the form of snaps installed on the material so that the material can be grounded via ground cords.

The charge dissipative rate of all ESD protective materials is related directly to electrical resistance to ground. When making Resistance-to-Ground measurements follow this procedure:



- Connect the black test lead to the left hand jack on the meter and to ground.
- Connect the white test lead to the right hand jack on the meter and to the 5-pound electrode.
- Place the electrode on the material at the position specified by the procedure selected.
Set the meter to the desired voltage range. Be sure to keep the cords separated in order to prevent false readings, especially when testing high resistance materials.
- Press and hold the red test button for at least 15 - 20 seconds. The LCD expresses surface resistance ohm values and an illuminated LED indicates the reading's exponential value.
- Repeat the procedure to measure other points on the material under test.

Surface Resistivity Measurements

To make surface resistivity measurements the user must also have the optional resistivity adapter sled, Model 292A/41.

Parallel silicone rubber electrodes provide for direct measurement of surface resistivity. No conversion is required with the Surface Resistivity Test Kit. The electrode geometry is 1 square resulting in a reading expressed in ohms/square.

Connect the test leads from the meter to the Resistivity Adapter

Place the adapter's parallel electrodes to the surface of the material to be tested at the position specified in the selected procedure. For consistency place the 5lb electrode on the adapter as shown to hold firmly in place.

Press and hold the red test button for at least 15 - 20 seconds. The LCD expresses surface resistivity in ohms/square and an illuminated LED indicates the reading's exponential value.



WARRANTY

Monroe Electronics, Inc., warrants to the Owners, this instrument to be free from defects in material and workmanship for a period of two years after shipment from the factory. This warranty is applicable to the original purchaser only.

Liability under this warranty is limited to service, adjustment or replacement of defective parts (other than tubes, fuses or batteries) on any instrument or sub-assembly returned to the factory for this purpose, transportation prepaid.

This warranty does not apply to instruments or sub-assemblies subjected to abuse, abnormal operating conditions, or unauthorized repair or modification.

Since Monroe Electronics, Inc. has no control over conditions of use, no warranty is made or implied as to the suitability of our product for the customer's intended use.

THIS WARRANTY SET FORTH IN THIS ARTICLE IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESS, IMPLIED OR STATUTORY INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. Except for obligations expressly undertaken by Monroe Electronics, in this Warranty, Owner hereby waives and releases all rights, claims and remedies with respect to any and all guarantees, express, implied, or statutory (including without limitation, the implied warranties of merchantability and fitness), and including but without being limited to any obligation of Monroe Electronics with respect to incidental or consequential damages, or damages for loss of use. No agreement or understanding varying or extending the warranty will be binding upon Monroe Electronics unless in writing signed by a duly authorized representative of Monroe Electronics.

In the event of a breach of the foregoing warranty, the liability of Monroe Electronics shall be limited to repairing or replacing the non-conforming goods and/or defective work, and in accordance with the foregoing, Monroe Electronics shall not be liable for any other damages, either direct or consequential.

RETURN POLICIES AND PROCEDURES FACTORY REPAIR

Return authorization is required for factory repair work. Material being returned to the factory for repair must have a Return Material Authorization number. To obtain an RMA number, call 585-765-2254 and ask for Customer Service.

Material returned to the factory for warranty repair should be accompanied by a copy of a dated invoice or bill of sale, which serves as a proof of purchase for the material. Serial numbers, date codes and tamper proof stickers on our products also serve to determine warranty status. Removal of these labels or tags may result in voiding a product's warranty.

Repairs will be returned promptly. Repairs are normally returned to the customer by UPS within 10 to 15 working days after receipt by Monroe Electronics, Inc. Return (to the customer) UPS charges will be paid by Monroe Electronics on warranty work. Return (to the customer) UPS charges will be prepaid and added to invoice for out-of-warranty repair work.

RETURN OF REPAIRED ITEMS:

Factory repairs will be returned to the customer by the customer's choice of FedEx, DHL or UPS. Warranty repairs will be returned via UPS ground. The customer may request accelerated shipping via the previous mentioned carriers for both warranty and non-warranty repairs. NOTE: Accelerated transportation expenses for all factory repairs will always be at the expense of the customer despite the warranty status of the equipment.

FACTORY REPAIRS TO MODIFIED EQUIPMENT:

Material returned to the factory for repair that has been modified will not be tested unless the nature and purpose of the modification is understood by us and does not render the equipment untestable at our repair facility. We will reserve the right to deny service to any modified equipment returned to the factory for repair regardless of the warranty status of the equipment.