Portable Surface Resistivity Tester
Operation and Maintenance

Introduction
ESD Systems’ Surface Resistivity Tester is a portable test instrument which provides RTT, RTG, and surface resistivity measurements. The 41261’s expanded measurement range allows for testing of a wider variety of static dissipative and conductive materials. Eleven color-coded LEDs easily identify static dissipative, conductive, and insulative ranges. The Resistivity Tester will test materials with a surface resistivity of $1 \times 10^3 - 1 \times 10^{12}$ Ohms/sq., and is accurate to +/- 10%. This test instrument is ideally suited for Quality Control and Field Service personnel as well as for use in routine auditing of your ESD protective materials. The 41261 features simple one-button operation and is powered by a 9 volt alkaline battery. This state-of-the-art, auto-ranging instrument combines top performance along with lightweight portability.

The Surface Resistivity Tester has not been designed to meet ANSI EOS/ESD-S4.1 test equipment requirements. This test instrument is intended for use only as an auxiliary tool for monitoring surface resistivity performance. If you are interested in obtaining a meter which does meet the test equipment requirements of ANSI EOS/ESD-S4.1, we recommend model 41273 Surface Resistance Test Kit.

For more information on this product, ask for Tech Brief PS-2060.

Installation
Remove the meter from the carton and inspect for damage. Each unit includes:

1. Resistivity meter
2. Grounding lead assembly
3. PS-2059 Tech Brief
4. 9 volt battery

Properly store the meter and its component assemblies when not in use.

Operation
The Resistivity Tester will perform Surface and Surface-to-Ground resistivity measurements. Work surfaces or materials to be tested should be cleaned prior to testing to ensure that surface dirt and contamination do not affect results. It is recommended that non silicone based cleaners such as ESD Systems #16030 Reztore Surface and Mat Cleaner be used for regular cleaning of ESD protective work surfaces.

Surface and Surface-to-Ground resistance readings are indicated by the series of LEDs on the face of the meter. Each LED designates the indicated surface resistivity range. Every LED indicates a corresponding order of magnitude of resistivity. If it is neither conductive nor static dissipative, only the red “INSULATIVE” LED will light.
Battery Operation

Battery function is automatically checked by the unit when the meter is turned on. If the battery voltage drops below the required voltage, the red LED on center of the meter will not light, indicating a “low battery” condition. Replace the battery by removing the bottom end panel on the meter.

Maintenance

Your Surface Resistivity Tester will require very little maintenance, and there are no user-serviceable parts. If your meter requires service beyond simply replacing the battery, please contact the ESD Systems factory.

Theory of Operation

The Surface Resistivity Tester measures resistance by setting up a bridge between two precision 1% resistors of known value and the surface being tested, of unknown value. When the green button is depressed a test voltage of 9 VDC is applied across the meter’s electrodes, depending on the test being performed. A test voltage resulting from a resistivity bridge is compared to reference voltages established by internal circuitry. Based on the voltage measured the appropriate LED is lit.

Surface Resistivity Measurements

Surface resistivity measurements are made using only the meter. When the “GREEN” button is depressed a test voltage of 9 VDC is applied across the meter’s electrodes. To perform surface resistivity tests, follow these simple instructions:

A. Check battery operation by depressing the “GREEN” button on the center of the meter. The red “INSULATIVE” LED will light to indicate that the unit is functioning properly.

B. Place the meter on the surface being tested. Both electrodes should make contact with the surface.

C. Press the “GREEN” button. The surface resistivity will be indicated by the LED which lights up. Green LED’s indicate conductive materials. Yellow LED’s indicate dissipative materials.

Surface-to-Ground Measurements

The Surface-to-Ground measurements are made with a grounding lead assembly. When the grounding lead is plugged into the meter, voltage is diverted from the electrode to the cord in order to measure resistance. When making Surface-to-Ground measurements, follow these procedures:

A. Check battery operation by depressing the “GREEN” button. The red “INSULATIVE” LED will light to indicate that the unit is functioning properly.

B. Plug the ground lead assembly into the ground jack on the face of the meter. (See Figure 4.)

C. Place the Resistivity Tester on the material being tested.

D. Connect the opposite end of the grounding lead to the ground point for the surface being tested.

E. Press the green button. The LEDs will indicate the results. (See Figure 5.)

F. Unplug the cord when testing is finished.

Figure 3. Measuring surface resistivity.

Figure 4. Installation grounding lead assembly.

Figure 5. Measuring Surface-to-Ground resistance.
Specifications

- **Sensitivity Range**
  - Surface Resistivity: $1 \times 10^{-3} - 1 \times 10^{12}$ Ohms/sq
  - Surface to Ground Resistivity: $1 \times 10^{-3} - 1 \times 10^{12}$ Ohms/sq

- **LED Key (from left to right)**
  1. Green $10^3$ Conductive
  2. Green $10^4$ Conductive
  3. Green $10^5$ Conductive
  4. Yellow $10^6$ Static Dissipative
  5. Yellow $10^7$ Static Dissipative
  6. Yellow $10^8$ Static Dissipative
  7. Yellow $10^9$ Static Dissipative
  8. Yellow $10^{10}$ Static Dissipative
  9. Yellow $10^{11}$ Static Dissipative
  10. Red $10^{12}$ Insulative
  11. Red (Center) $>10^{12}$ Insulative

- **Test Sample Size**
  2” x 2” or larger

General Characteristics

- **Power Supply**
  9 volt alkaline battery

- **Test Voltage**
  Nominal 9 volts

- **Temperature Range**
  - Operating: $-40°F$ to $120°F$
  - (10°C to 40°C)
  - Storage: $(-15°C$ to $+60°C$)

- **Relative Humidity**
  0% to 90% (non-condensing) RH

- **Operation**
  Resistivity bridge

- **Readout**
  Eleven LEDs

- **Resolution**
  One order of magnitude

- **Accuracy**
  ±10%

- **Repeatability**
  ±5%

- **Weight**
  6 ounces

- **Dimensions**
  5.00” x 2.75” x 1.25”

Calibration

The model 41261 is calibrated to factory standards. For information on calibration to NIST traceable standards contact our customer service department.

Calibration may be performed to ensure that the tester is operating within limits. Calibration of the Surface Resistivity Tester can be performed using the following procedure. You will need 1% resistors of the following values: 1K, 10K, 100K, 1M, 10M, 100M, 1G, 10G, 100G, and 1,000G Ohms. These precision resistors will be placed across the two electrodes on the bottom of the meter. **Do not hold resistors with fingers.** See Figure 6 below.

A. Place the 41261 on an insulator (e.g., Teflon or glass) and press the green test button. Only the center Red LED, marked “Insulative”, should be illuminated. If this LED fails to light, the meter’s battery should be replaced before proceeding.

B. Place the 1K Ohm resistor across the electrodes as illustrated below in Figure 6. Press the test button. The $10^3$ LED should light.

C. Continue this process with each consecutive resistor, checking to make sure the appropriate LEDs are illuminated. If all resistors check properly, the unit’s calibration is verified.

Adjustment

Unauthorized servicing or modifications to the 41261 will void the product warranty. Servicing should only be performed by the factory. See warranty section for repair charges.

Limited Warranty

ESD Systems expressly warrants that for a period of one (1) year from the date of purchase, ESD Systems Surface Resistivity Testers will be free of defects in material (parts) and workmanship (labor). Within the warranty period, a unit will be tested, repaired or replaced at ESD Systems option, free of charge. Any unit under warranty should be shipped prepaid to the ESD Systems factory, call Customer Service at 508-485-7390 for proper shipping instructions and address. Include a copy of your original packing slip, invoice, or other proof of purchase date. Warranty repairs will take approximately two weeks.

If your unit is out of warranty, ESD systems will quote repair charges necessary to bring your unit up to factory standards. Ship your unit freight prepaid and call Customer Service at 508-485-7390 for proper shipping instructions and address.

Warranty Exclusions

THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH ARE SPECIFICALLY DISCLAIMED. The express warranty will not apply to defects or damage due to accidents, neglect, misuse, alterations, operator error, or failure to properly maintain, clean or repair products.

Limit of Liability

In no event will ESD Systems or any seller be responsible or liable for any injury, loss or damage, direct or consequential, arising out of the use of or the inability to use the product. Before using, users shall determine the suitability of the product for their intended use, and users assume all risk and liability whatsoever in connection therewith.
Other Test Products Available From Plastic Systems

**Digital Surface Resistance/ Resistivity Test Kit Model 41273**

ESD Systems’ Surface Resistance Test Kit Models 41273 (110V) and 41274 (220V) include a surface resistance meter, two electrodes, charger and carrying case. This meter operates at both 10 and 100 volts for testing in the $10^2$ to $10^{12}$ Ohms range. The meter also has built-in electrodes attached to the bottom of the meter. The surface resistance test kit includes two 5 pound 2.5 inch diameter electrodes suitable for conducting RTT or RTG measurements. For more information ask for Tech Brief PS-2060.

**Combo Tester Model 41201**

ESD Systems’ 41201 Combo Tester is a 3-state touch tester designed for easy, frequent testing of ESD personnel grounding devices. The Combo Tester incorporates a unique dual test circuit design which improves accuracy of testing and eliminates the need for separate wrist strap and foot ground test units. The 41201 is equipped with a 750K - 10M Ohm circuit, ideal for testing of wrist straps and a 750K - 100M Ohm circuit designed for accurate testing of footwear. For more information ask for Tech Brief PS-2057.

**“Touch Type” Tester Model 41193**

This economical “touch type” tester has a pass range of 750K - 10M Ohm. The unit’s compact design makes it perfect for the workbench. The tester contains a switch selectable audible alarm that makes this unit very user friendly. Two operators and a work surface can be conveniently grounded by this unit. This unit is available in two operating voltages, 120 VAC and 220 VAC. For more information on this tester ask for Tech Brief PS-2055.

**Combo Test Stand Model 41203**

ESD Systems’ Combo wrist strap and footwear tester is a simple-to-operate single station test fixture. The 41203 rugged steel frame is powder coated in a non-conductive white finish that helps to prevent false readings if contacted by skin or loose smocks. This tester automatically switches internal circuitry to test at the appropriate ranges for foot wear or wrist straps. LEDs and an audible signal indicate test results. The tester is battery operated and incorporates a unique dual circuit design with a pass range of 750K - 10M Ohm for wrist straps and 750K - 100M Ohm for footwear. For more information ask for Tech Brief PS-2058.

**Calibration Unit NIST Traceable Model 41230**

ESD Systems’ model 41230 calibration unit is designed to simplify the process of calibrating wrist strap and foot ground test equipment. The calibration unit allows the user to quickly and easily verify whether a tester is operating within specifications. The 41230 is a passive device, and requires no power source. The calibration unit is manufactured within industry accepted test range for both wrist straps and foot grounders. The wrist strap pass range is set at 750K - 10M Ohm while the foot ground test range is set at 750K - 100M Ohm. Ask for Tech Brief PS-2006 for additional information.