## DESCO TECHNICAL BULLETIN TB-2024

# Digital Surface Resistance/Resistivity Test Kit Operation and Maintenance





Figure 1. Desco Item 19770

### Description

The LCD Surface Resistance/Resistivity Test Kit is a portable instrument designed to measure resistance between two points (RTT), surface to ground (RTG), and surface resistivity in accordance with ANSI EOS/ESD Association Standard S4.1. The unit's unique Liquid Crystal Display (LCD) allows the user to easily read measurements directly from the meter. No interpretation or calculations are necessary. Per ANSI/ESD S20.20, test equipment is required to enact Compliance Verification

Plan Requirement - Test equipment shall be selected to make measurements of appropriate properties of the technical requirements that are incorporated into the ESD program plan. This unit is ideally suited for evaluating the electrical properties of ESD protective work surfaces and flooring products.

The LCD Surface Resistance/Resistivity Test Kit is NIST calibrated and is available in three models:

Model	Description	Voltage/Hz
19770	Test Kit	120/50-60
19775	Test Kit	220/50-60
19771	Tester Only	120/50-60



Figure 2. Parallel Resistivity Electrodes on bottom of meter.

The meter also incorporates two parallel probes on the bottom of the unit which allows surface resistivity measurements. These parallel electrodes allow for quick and easy testing of a variety of surfaces and materials, without the use of 5 pound electrodes. The 5-pound electrodes (item 50003), and test leads (item 50075) can be bought separately.

The Test Kit displays a measurement per ESD S4.1-1997 proving the proper electrification period of 15 seconds during which numerous readings and calculations are executed. **NOTE:** Testing in accordance with ESD S4.1-1997 requires 15 seconds of electrification; in contrast, most analog type meters display measurements instantaneously.

#### **Recommended Literature**

Desco recommends that you read the following standards from the ESD Association:

ANSI/ESD S20.20 — Development of ESD Control Program ESD ADV1.0 — Glossary of Terms ESD S4.1 — Worksurfaces ANSI EOS/ESD S6.1 — Grounding ANSI ESD S7.1 — Floor Materials ANSI EOS/ESD S11.11 — Surface Resistivity

These documents can be obtained directly from the ESD Association, 7902 Turin Rd., Suite 4, Rome, NY 13440-2069, (315) 339-6937.

In addition to the Association Standards listed previously, anyone testing the electrical properties of ESD protective surfaces should also obtain copies of:

MIL-HDBK 263A	EIA-IS-5-A	ASTM-F-150
EN 100015	EIA-625	

These standards are available from the agencies who produce them. If you need help in obtaining these documents, please contact our customer service department.

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#### Inspection

Remove the meter from the carton and inspect for damage. Each test kit should include the following:

- 1 Protective carrying case
- 1 LCD megohmeter
- 2 Test leads
- 2 5-pound electrodes
- 1 Grounding clip
- 1 AC adapter/charger
- 1 Rechargeable battery

Properly store the meter and component assemblies when not in use. Do not charge battery unless it is fully discharged. Doing so will reduce the life of the battery.

#### Features

**A. Scale:** 1/2 inch high digital LCD display provides easy to read resistivity/resistance measurements. Values are expressed with a mantissa and exponent power. For example, if the display reads "2.9 E 9", 2.9 is the mantissa, 9 is the exponent power; the reading is 2.9 x 10<sup>9</sup> ohms.

**B. Test Button:** This button turns on the power to the meter. The operator needs to hold the button down for 10-20 seconds for the unit to make numerous readings and calculations. (Testing in accordance with ESD S4.1-1997 requires 15 seconds of electrification; in contrast, most analog type meters display measurements instantaneously.) When released, the measured reading will remain illuminated for at least 10 seconds.

#### C. Test Range Voltage Switch:

10 Volts for 1x10<sup>3</sup> - 1x10<sup>11</sup> ohms

100 Volts for 1x10<sup>6</sup> - 1x10<sup>12</sup> ohms

**D. Jacks:** 2.5mm plugs will fit the megohmmeter jacks. Banana plugs will fit the 5 lb. electrodes.

## **E. AC-Battery Charger Jack:** 12 volts DC - 100mA.

- F. 9 Volt Battery Compartment.
- G. Parallel Electrodes.







Figure 4. If the value of the measurement is below 1000 ohms on the 10 volt scale or  $1 \times 10^6$  on the 100 volt scale an "L" will appear on the LCD display.



Figure 6. A "P" will appear on the LCD display if there is too much electrical 60Hz noise in the area or if a test is performed on a high open resistance.



Figure 5. If the value of the measurement is over 5x10<sup>12</sup> ohms an "H" will appear on the LCD display.



Figure 7. When the unit's batteries need recharging a "BAL" will appear on the LCD display as the meter is being operated. To maximize the life of the battery do not recharge until a low battery "BAL" is displayed.

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Figure 8. Clean before testing.

## Cleaning

Work surfaces or materials 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 built-in parallel electrodes and the two 5 lb. electrode conductive rubber probe surfaces. Use solvent-free and silicone-free cleaners. We recommend using Desco Reztore<sup>™</sup> anti-static surface and mat cleaner (item 10435). Be sure the surface is dry before testing.

### **Power Requirements**

The meter is powered by a rechargable 9 volt Nickel/Cadium battery or a special AC to DC adapter. The adapter is also used to recharge the 9 volt battery.

#### Surface Resistance Measurements (RTT) Complies with ESD S4.1

Point to point surface resistance measurements are made using the meter along with both of the 5 pound electrodes. This test will determine the resistance between two points, independent of a groundable point. To perform surface resistance tests you must first determine what test procedure you will be using. The test procedure will help you to determine proper preparation of the material to be tested and the spacing of the weights. Once testing parameters are determined you can proceed with the following instructions:

A. Connect the test leads to the meter by inserting the banana termination end of a test lead into the 5 lb. electrode and the 2.5 mm mini phone plug end into the megohmmeter.

B. Place both electrodes on the material at positions determined by the procedure selected. Set the meter to the required test voltage determined by the test procedure and the resistance of the material. Conductive material 10<sup>4</sup> ohms or less is usually tested at 10 volts. Dissipative material is usually tested at 100 volts. If material to be tested is unknown, it is recommended to first test at 10 volts.

C. Press and hold the red test button for 10-20 seconds (the unit will be making numerous measurements and

calculations.) The measured resistance value will appear on the display. This reading is expressed in ohms. You may want to record the temperature, humidity and test voltage.



Figure 9. Setting up for RTT testing.

#### Surface-to-Ground Measurements (RTG) Complies with ESD S4.1

The Surface-to-Ground readings will measure 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 dissipation rate of all ESD protective materials is related directly to electrical resistance to ground. When making Surface-to-Ground measurements, follow this prodedure:

A. Connect one of the 5 pound electrodes to the megohmmeter using one of the test leads.



Figure 10. Setting up for RTG testing.

B. Using the other lead, connect one end to the megohmmeter. Insert the grounding clip included with the test clip onto the banana plug on the other end of the lead. Now, connect the grounding clip to the groundable point on the surface to be tested.

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D. Press the red test button for 10-20 seconds. The measured resistance value will appear on the display. This reading is expressed in ohms. You may want to record the reading, humidity, temperature and test voltage.

E. Repeat procedure on the other points on the material under test.

#### Surface Resistivity Measurements -Quick Reference Complies with ANSI EOS/ESD S11.11

A. Firmly place the megohmmeter's parallel probes on the surface of the material to be tested, at the position specified by the procedure selected.

B. Press and hold the red test button for 10-20 seconds. The measured resistivity value will appear on the display. This reading is expressed in ohms. You may want to record ambient temperature and humidity.

#### Maintenance

Your Surface Resistance Test Kit will require little maintenance, and there are no user serviceable parts. If your megohmmeter requires service beyond cleaning the probes or replacing or recharging the battery, please contact the factory.

### Calibration

The 19770 is calibrated to NIST traceable standards. Please call our Customer Service Department at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for details.

In-house calibration can be performed by using 1% resistors in each of the meter ranges. Simply attach the resistors to the enclosed cords using grounding clips and recording the meter display. Keep the cords separated. Adjustments to the internal resistance pots can be done quite easily. Request this procedure from the Desco Customer Service Department.

### Specifications

Ranges:	10 <sup>3</sup> - 10 <sup>11</sup> ohms @ 10 Volts 10 <sup>6</sup> - 10 <sup>12</sup> ohms @ 100 Volts
Power Supply:	9 volt rechargeable Nickel/Cadmium battery and AC adapter/charger included. Alkaline battery optional.

Battery Life:	Nikel/Cadmium - approximately 1 hour
Charge Time:	12 hours
Adapter Output:	12 volt DC - 100mA
Internal Electrodes:	Two parallel conductive silicone rubber replaceable electrodes
External Electrodes:	Two 5-pound weighted electrodes, 2.5" in diameter, complies with EOS/ESD-S4.1
Display:	One six character .500" LCD display
Accuracy:	$10^3 - 10^9 = \pm 15\%$ at 10-90% RH $10^9 - 10^{11} = \pm 20\%$ at 10-60% RH $10^{11} - 10^{12} = \pm 30\%$ at 10-50% RH
Meter Weight:	13 oz.
Charger Weight:	11 oz.
Dimensions:	7.5"L x 4"W x 1.75"H
Power Switch:	Momentary on. Releasing the switch will hold and display for >10 seconds.

#### **Limited Warranty**

Desco expressly warrants that for a period of one (1) year from the date of purchase, Desco Test Kits will be free of defects in material (parts) and workmanship (labor). Within the warranty period, the product will be tested, repaired, or replaced at Desco's option, free of charge. Call our Customer Service Department at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Include a copy of your original packing slip, invoice, or other proof of purchase date. Any unit under warranty should be shipped prepaid to the Desco factory.Warranty repairs will take approximately two weeks.

If your unit is out of warranty call Customer Service at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Desco will quote repair charges necessary to bring your unit up to factory standards.

#### 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 Desco 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.

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