Resistance Pro Meter Kit
Installation, Operation and Maintenance

Made in the
United States of America

SCS-73627 Meter and Accessories

The Surface Resistance Meter is referenced and designed to be used to make measurements in accordance with the test procedures in:

- Compliance Verification-ESD TR53-Resistance Measurements
- Worksurfaces-ANSI/ESD S4.1 Worksurfaces
- Floors-ANSI/ESD S7.1-Resistive-Characterization of Materials Floor Materials
- Foot Grounders-ESD SP9.2-Foot Grounders Resistive Characterization
- Garments-ANSI/ESD STM2.1 Garments Seating-ANSI/ESD STM12.1-Seating-Resistive Measurement
- Floor/Footwear-ANSI/ESD STM97.1-Floor Materials and Footwear- Resistance Measurement in Combination with a Person

Description

The Resistance Pro Meter is an instrument designed to measure resistance of ESD materials. There are following three of sales part number

- SCS-73627: Meter only
- SCS-73627-ABC: 2 of Single-Surface Electrode
- SCS-73627-PRO: 1 of Single-Surface Electrode and 1 of Dual-Surface Electrode

Its test functions include:

- Resistance measurement accuracy of ±10% (±20% accuracy for 5 x 10^3 ohms and lower, ±20% for 5 x 10^{11} ohms and greater)
- Resistance range of <1 x 10^3ohms to >1 x 10^{12} ohms
- Under load voltages of 10 and 100 volts ±5%
- Electrification period of approximately 15 seconds

The Resistance Pro Meter also measures ambient temperature and relative humidity. Up to 100 measurements may be stored and recalled from the meter's internal memory. This includes the resistance value, temperature, relative humidity and test voltage at the time of the measurement.

“A Compliance Verification Plan shall be established to ensure the Organization’s fulfillment of the technical requirements of the ESD Control Program Plan. Process monitoring (measurements) shall be conducted in accordance with a Compliance Verification Plan that identifies the technical requirements to be verified, the measurement limits and the frequency at which those verifications shall occur. The Compliance Verification Plan shall document the test methods and equipment used for process monitoring and measurements. If the test methods used by the Organization differ from any of the standards referenced in this document, then there must be a tailoring statement that is documented as part of the ESD Control Program Plan. Compliance verification records shall be established and maintained to provide evidence of conformity to the technical requirements. The test equipment selected shall be capable of making the measurements defined in the Compliance Verification Plan.” (ANSI/ESD S20.20 section 7.3)

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The Resistance Pro Meter and its accessories are available in the following item numbers:

SCS-73627

1 73627 Resistance Pro Meter
2 19300 Test Leads, 5' Length
4 1.5V Alkaline Batteries
1 09838 Ground Plug Adapter
1 09750 Gator Clip
1 09880 Aluminum Carrying Case

SCS-73627-PRO

1 73627 Resistance Pro Meter
2 19300 Test Leads, 5' Length
1 REM002 Single-Surface Electrode
1 REM003 Dual-Surface Electrode
4 1.5V Alkaline Batteries
1 09838 Ground Plug Adapter
1 09750 Gator Clip
1 09880 Carrying Case

SCS-73627-ABC

1 73627 Resistance Pro Meter
2 19300 Test Leads, 5' Length
2 REM002 Single-Surface Electrode
4 1.5V Alkaline Batteries
1 09838 Ground Plug Adapter
1 09750 Gator Clip
1 09880 Aluminum Carrying Case

OPTIONS

19295 Handheld Probe
SPP2 Two-Point Probe

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Features and Components

Resistance Pro Meter

Resistance Pro Meter Features and Components

A. Test Jacks: The shielded black test lead's male SMA connector connects into the meter's female SMA connector, and the red test lead's banana plug connects into the meter's banana jack.

B. Exponent LEDs: These LEDs indicate the Surface resistance exponent value. They are color coded for resistance decade quick checks.

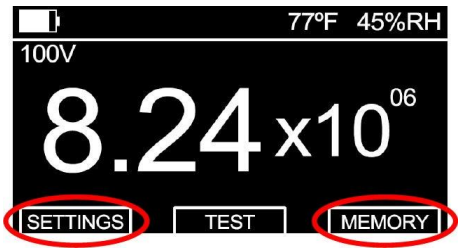
Exponent	Color
<3, 3	Yellow
4, 5, 6, 7, 8, 9, 10	Green
11, 12, >12	Red

(i.e. 8 = 10^8 ohms or 100,000,000 ohms).

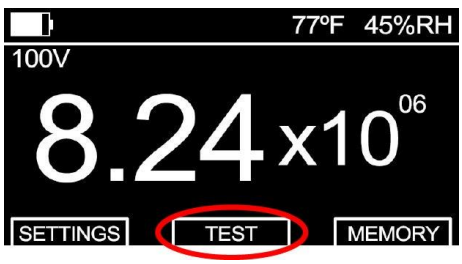
C. OLED Display: Displays the temperature, relative humidity, battery life, test voltage and resistance measurement.

D. Power Switch: Slide the switch to the left to power the meter OFF. Slide the switch to the right to power the meter ON.

E. Black Pushbuttons: Each black pushbutton corresponds to the prompts on the bottom-left and bottom-right of the display. These buttons are used to access the Settings and Memory Recall menus and scroll up and down between menu options.



F. Red Pushbutton: Corresponds to the prompts located in the bottom-center of the display. This button is used to perform tests and select menu options. Press and hold this button when in the Settings and Memory Recall menus to exit and return to the home screen.



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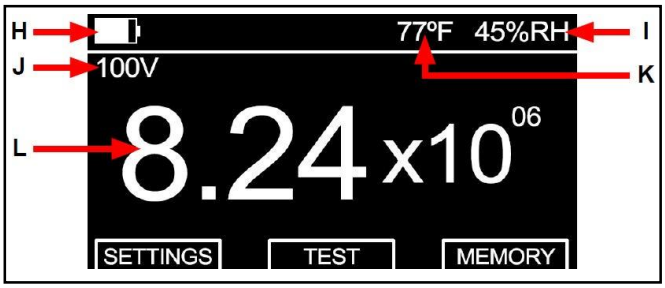
G. Battery Compartment: Open this compartment to install the four AA alkaline batteries needed to power the meter. Replace the batteries once the battery icon on the display is empty.

Home / Test Results Screen



Home/Test Results screen

H. Battery Life Indicator: Displays the approximate life of the meter's 4 AA alkaline batteries.

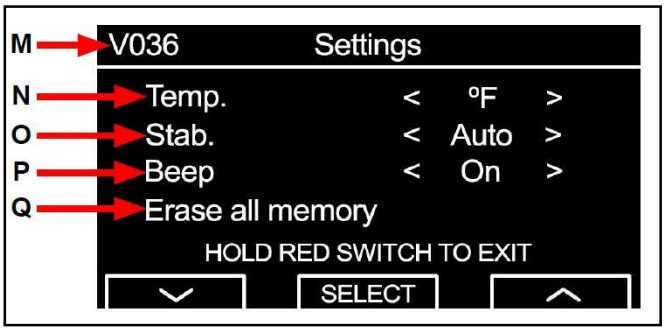
I. Relative Humidity: Displays the relative humidity.

J. Test Voltage: Displays the test voltage used to complete the measurement.

K. Temperature: Displays the ambient temperature.

L. Resistance Measurement: Displays the resistance measurement in ohms (Ω).

Settings Manu



Settings menu

M. Firmware Revision: Displays the meter's firmware revision.

N. Temperature: Sets the unit of measurement for temperature to either Fahrenheit (ºF) or Celsius (ºC).

O. Stabilization Mode: Sets the meter's Electrification period setting to either Auto and Fixed Stabilization.

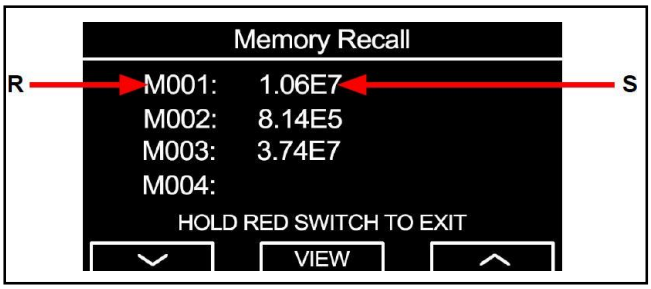
Auto - Enables a 15-second electrification period when the measured resistance is 1 x 10^{10} ohms or greater to maintain test accuracy.

Fixed - Complies with ANSI/ESD S4.1 and enables A 15-second electrification period when the measured resistance is 1 x 10^{6} ohms or greater.

P. Beep: Enables and disables the audible beep when the meter's pushbuttons are pressed.

Q. Erase all memory: Erases all stored measurement transactions saved in the meter's memory.

Memory Recall Menu



Settings menu

R. Memory Slot Number: Indicates the memory slot number.

S. Resistance Measurement: Indicates the resistance measurement value for the respective memory slot.

Operation

General Guidelines

Use both of Single and Dual Surface Electrodes for Resistance Point-to-Point (Rtt) measurements.

Use the Single-Surface-Electrode, and connect the black test lead to ground for Resistance-to-Ground (Rtg) measurements.

Ensure that the item being measured is electrically isolated (placed on an insulative surface). The meter will measure the lowest resistance path.

Minimize crossing the test leads when possible.

When measureing point to point resistance (Rtt):

- Place two electrodes no closer than 2" from the edge of the surface being measured.
- Place two electrodes no closer than 3" to any groundable point.
- Place two electrodes about 10" apart from each other for Rtt measurements of a worksurface.
- Place two electrodes about 3' apart from each other for Rtt measurement of a floor.

Preferable electrode placements include:

- Most commonly used area of a surface
- Most worn area
- Center of surface
- Furthest area from a grounded point

If the surface to be measured has sections (i.e. floor tiles, garment panels), place two electrodes on different sections for Rtt measurements.

Clean the material's surface for test lab measurements, but do not clean the surface for materials that are already installed. Only clean and re-test the installed material if failure occurs.

Measure Resistance-to-Ground (Rtg) Figure 1

1. Do not clean the surface.
2. Remove from the surface only those items that might interfere with the test. ESD sensitive devices shall also be removed.
3. Connect one test lead to a grounded point.
4. Connect another test lead to the Single-Surface Electrode, then place the electrode on the furthest convenient point on the surface.
5. Push the red pushbutton to perform a test. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
6. Push the right black pushbutton to save the measurement if desired.
7. Perform additional measurements by placing the electrode on the most commonly used or worn area.

Measure Resistance Point-to-Point (Rtt) on the Surface Figure 2

1. Do not clean the surface.
2. Remove from the surface only those items that might interfere with the test. ESD sensitive devices shall also be removed.
3. Connect one test lead to the Single-Surface Electrode, another test lead to another Single-Surface Electrode or to the Dual-Surface Electrode's black jack, then place two electrodes on the most commonly used area of the surface.
4. The disk surface of the Dual-Surface Electrode should be used in this kind of test.
5. The electrodes should also be 2" away from any edge and 3" away from any grounded point. If the most used area is not obvious, use two points near the center of the surface.
6. Push the red pushbutton to perform a test. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
7. Push the right black pushbutton to save the measurement if desired.
8. Perform additional measurements by placing the electrodes on the most commonly used or worn area.

Measure Surface Resistance and Resistivity Figure 3

1. Place the Dual-Surface Electrode on top of the material to be tested. The concentric ring surface should be used in this kind of test.
2. Connect both test leads to the Dual-Surface Electrode's black and red jacks.
3. Push the red pushbutton to perform a test. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
4. Push the right black pushbutton to save the measurement if desired.

Resistivity and Resistance Per ANSI/ESD STM11.11 section 12.0 “CONVERSION TO RESISTIVITY, When it is appropriate to convert a resistance obtained by this test method to an equivalent resistivity in ohms per square, multiply the resistance measurements obtained by this method by ten. The conversion factor of ten is derived from the geometry of the electrode assembly. NOTE: Conversions to resistivity may not be valid for materials that are laminated, plated or metallized with conductive materials. This fact should be understood when users of this test procedure are required to satisfy specifications given in “ohms/square.”

Measure Samll Materials Figure 4

1. Connect both test leads to the Two-Point Probe
2. Compress the spring-loaded pins downward onto the material until the probe runs against the dead stop. Ensure that your skin does not make contact with any of the metal on the probe
3. Push the red pushbutton to perform a test. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
4. Push the right black pushbutton to save the measurement if desired.

Measure Floor Materials and Footwear-Resistance Measurement in Combination with a Person (ANSI/ESD STM97.1) Figure 5

1. Connect the red test lead to the Handheld Probe, connect the black lead to the Single-Surface Electrode.
2. Put the Single-Surface Electrode on the floor, a person stands on the floor and hold the Handheld Probe.
3. Push the red pushbutton to perform a test. Should the 15-second electrification period appear, it may be bypassed by pushing the red pushbutton a second time.
4. Push the right black pushbutton to save the measurement if desired.

Maintenance

The Resistance Pro Meter requires little maintenance. There are no user serviceable parts. If the meter requires service beyond cleaning the electrodes or replacing the batteries.

Battery Replacement

Replace the batteries once the battery life indictator is empty. Open the compartment located on the back of the meter to replace the batteries. The meter uses four AA alkaline batteries. Ensure that the batteries’ polarities are oriented in the correct fashion to avoid any possible circuit damage.

Cleaning the Resistance Pro Meter

The area surrounding the test jacks at the top end of the meter should be wiped with a clean, isopropanol-alcohol moistened cloth to remove skin oils that will accumulate and affect the meter’s accuracy at high resistances. The frequency of cleaning will depend on usage. SCS recommends cleaning this area once a month. Cable jackets should also be cleaned in this fashion.

Cleaning the Electrodes

Per ANSI/ESD S4.1 “Clean the electrodes with a minimum 70% isopropanol-water solution. Make sure the electrodes’ conductive pads are dry prior to use.”

See specific product test standards for test lab specimen cleaning instructions. Per ANSI/ESD S4.1 Worksurfaces “The test specimens and electrodes shall be cleaned twice with a minimum 70% isopropanol-water solution using a clean, low-linting cloth each time.” (Note: The item should then be conditioned for 72 hours minimum)

Calibration

Frequency of recalibration should be based on the critical nature of those ESD sensitive items handled and the risk of failure for the ESD protective equipment and materials. In general, SCS recommends that calibration be performed annually.

In-house calibration can be performed by using ±1% tolerance resistors in each of the meter's decade ranges. Connect the resistors to the test leads using clips and record the meter's display. Minimize crossing the test leads when possible. Contact SCS Customer Service should adjustments be necessary. Special equipment is required to adjust the meter.

Required Equipment

- Digital Multimeter (±1.25% accuracy @10VDC and 100VDC)
- Resistance Decade Box with a range of 10^3 to 10^{12} ohms (±2% accuracy @ 10^3 to 10^{10} ohms; ±5% accuracy @ 10^{11} to 10^{12} ohms)
- Thermometer (±1°F accuracy)
- Relative Humidity Meter (±2% accuracy)
- 99% Isopropyl Alcohol and Cleaning Wipes

Setup

- **Test Area**-needs to be free of any high voltage transformers or power supplies and away from any type of fluorescent lighting or high power lighting.
- **Worksurface**-needs to be covered with a grounded conductive mat at 1.0 x 10^3 or less.
- **Technician**-needs to be connected to equipment ground with a 0 ohm resistor in the ground cord.
- **Decade Box**-needs to be connected to equipment ground.

Normalization of the Meter

The temperature inside the testing area needs to be 75°F ±3°F (23.9°C ±1.7°C) at 40% to 60% relative humidity. The meter needs to stay at a temperature of 75°F ±3°F (23.9°C ±1.7°C) for approximately 1 hour for proper readings. The meter cannot be normalized inside objects, enclosed boxes, containers or cases. The temperature inside an enclosed case will differ from the outside temperature. These cases will act as insulators. The meter must remain stationary in the testing area for about 1 hour without any significant changes to the temperature.

NOTE: Accuracy is measured after normalizing the meter for a minimum of 1 hour.

Calibration Verification Procedure

1. Use only the test leads that were supplied with the meter.
2. Use 99% isopropyl alcohol to clean the two test jacks located at the top of the meter. Oil from human fingers can affect the accuracy of the meter.
3. Connect the test leads to the test jacks located at the top of the meter. Connect the opposite end of the test leads to a DC voltmeter.
4. The measured voltage should start at 10V ±5%, then press the red pushbutton increase to 100V ±5% at the end of the test cycle.
5. Connect the test leads to the Resistance Decade Box. Apply the load resistance values indicated in the table below. The meter should display accuracy within ±10% to ±20% of the loaded resistance value.

Load Resistance	Accuracy	Display Value	Exponent LED
1 x 10^{12}	+20%	1.20x10^{12}	12
	-20%	8.00x10^{11}	11
1 x 10^{11}	+10%	1.10x10^{11}	11
	-10%	9.00x10^{10}	10
1 x 10^{10}	+10%	1.10x10^{10}	10
	-10%	9.00x10^{09}	9
1 x 10^{09}	+10%	1.10x10^{09}	9
	-10%	9.00x10^{08}	8
1 x 10^{08}	+10%	1.10x10^{08}	8
	-10%	9.00x10^{07}	7
1 x 10^{07}	+10%	1.10x10^{07}	7
	-10%	9.00x10^{06}	6
1 x 10^{06}	+10%	1.10x10^{06}	6
	-10%	9.00x10^{05}	5
1 x 10^{05}	+10%	1.10x10^{05}	5
	-10%	9.00x10^{04}	4
1 x 10^{04}	+10%	1.10x10^{04}	4
	-10%	9.00x10^{03}	3
1 x 10^{03}	+20%	1.20x10^{03}	3
	-20%	<1.0x10^{03}	<3

Specifications

Resistance Ranges	1 x 10^3 to 1 x 10^6 ohms@10 Volts, complies with ANSI/ESD S4.1 1 x 10^6 to 1 x 10^{12} ohms@ 100 Volts, complies with ANSI/ESD S4.1
Resistance Accuracy at 23ºC, 40% R.H.	Resistance easurements within ±10% (±20% accuracy for 5 x 10^3 ohms and lower, ±20% accuracy for 5 x 10^{11} ohms and greater), complies with ANSI/ESD S4.1. Under load voltages of 10 Volts ±5% and 100 Volts ±5% exceeds requirements of ANSI/ESD S4.1.
Temperature Accuracy	+/-10%
Relative Humidity Accuracy	±10 integers
Power Supply	4 AA alkaline batteries
Display	OLED, 2.7" diagonal, 128 x 64 pixel resolution
Memory Capacity	100 measurements
Operating Temperature	41ºF to 85ºF (5ºC to 30ºC)
Environmental Requirements	Indoor use only at altitudes less than 6500 ft. (2 km) Maximum relative humidity of 80% up to 85°F (30°C)
Dimensions (meter)	3.94" x 8.27" x 1.26" 100mm x 210mm x 32 mm
Dimensions (carrying case)	15.0" x 14.5" x 3.5" / 381mm x 368mm x 89mm
Weight (meter with batteries)	0.9 lbs / 0.4 kg
Weight (populated carrying case)	13.0 lbs / 5.9 kg
Country of Origin	United States of America

Limited Warranty, Warranty Exclusions, Limit of Liability and RMA Request Instructions

See the SCS Warranty - StaticControl.com/Limited-Warranty.aspx

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Measuring Electrodes and Diagrammatic Drawing

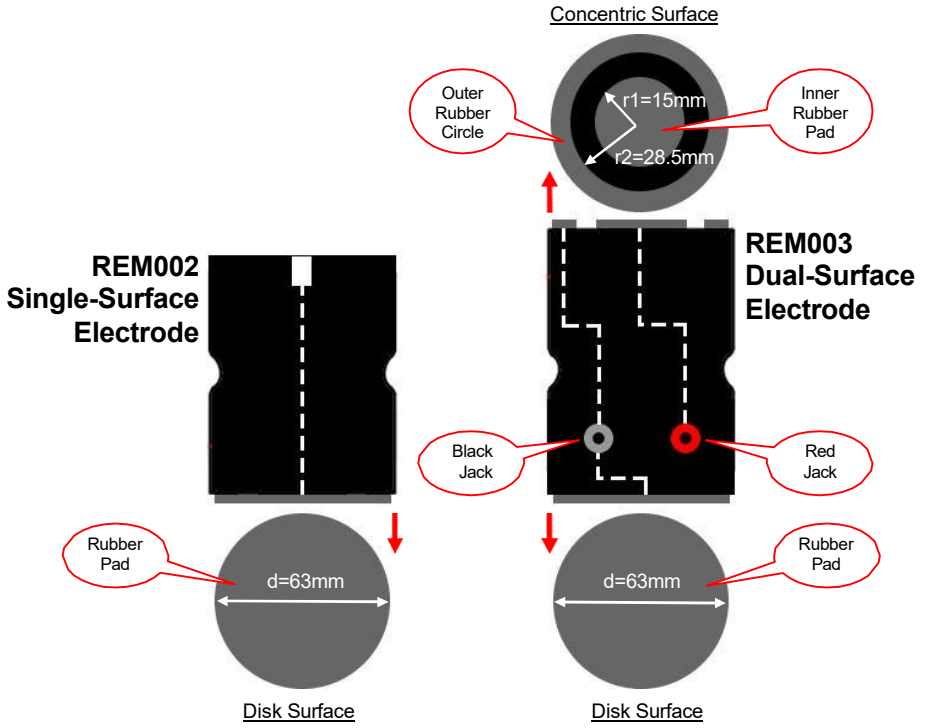


Figure 1 - Measure Resistance-to-Ground According to ANSI/ESD TR53

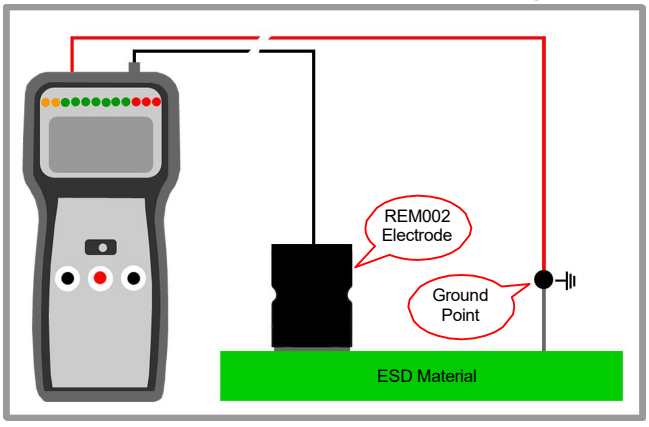
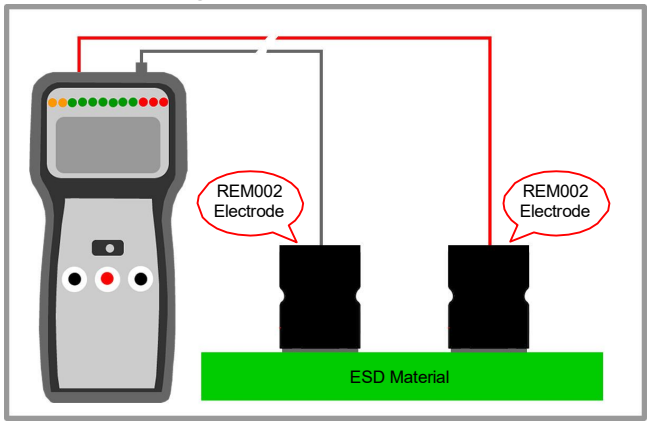


Figure 2 - Measure Resistance Point-to-Point According to ANSI/ESD TR53



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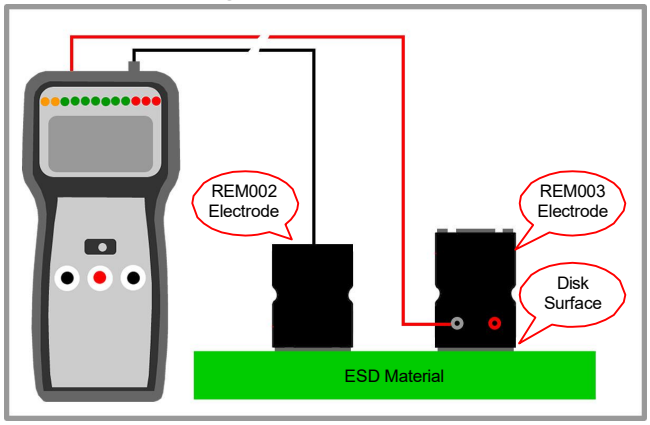

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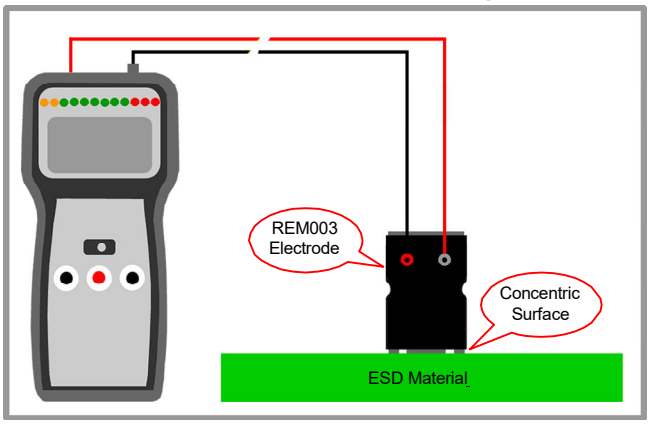
Figure 3 - Measure Surface Resistance According to ANSI/ESD STM11.11



Convert Surface Resistance to Surface Resistivity

Surface Resistivity = Reading of Meter x 10

Figure 4 - Measure Resistance of Small Materials According to ANSI/ESD STM11.13

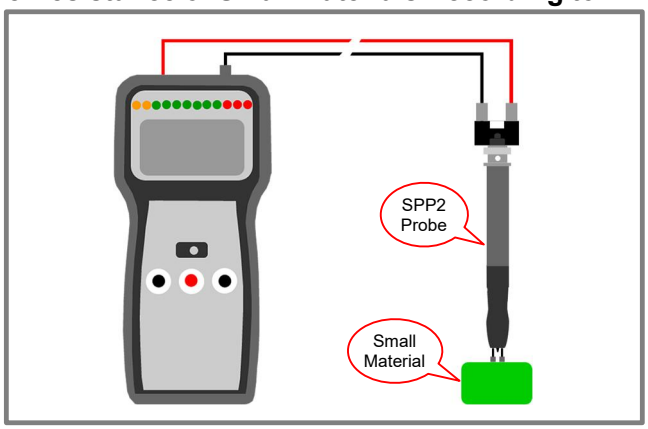


Figure 5 - Measure Floor Materials and Footwear Resistance According to ANSI/ESD STM97.1