

RESISTANCE/RESISTIVITY PROBES AND KITS

Series 840



Operating Instructions

5/09



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1.0 GENERAL

The 840 Series of Resistance/Resistivity Probes offers the user a convenient measuring system to meet virtually all resistance/resistivity measurement requirements. Spring-loaded pins allows the user to measure the surface and volume resistance, and therefore calculate the resistivity, of flat, uneven and curved surfaces. All components contained in the Kit are available separately.

The Model 840 Kit features:

- Probes to meet ESD Assoc., NFPA & ASTM requirements
- Direct x10 surface resistivity conversion
- Spring-loaded contact configurations
- Conductive rubber electrode configurations
- Resistance Indicator, Temperature/Humidity/Dew Pt Indicator and all necessary test beds, cables and adapters
- Quick-Disconnect Probes

NOTE: For probes purchased separately please refer to the applicable sections of this manual.



Figure 1.0-1: Model 840-3 Resistance/Resistivity Probe Kit

2.0 Applications

The Model 840-3 Resistance/Resistivity Probe Kit includes the Models 841, 842 and 843 spring-loaded Probes and the Model 845 Surface Resistance Probe(s). The Models 841, 842 and 843 enable the user to measure the surface resistance of small, flat, uneven or curved objects as small as .75" dia. x.188" and .438" deep (1.9 x .5 and 1.1 cm).

The Model 845 is a lightweight version of the ESD Assoc. S4.1 and NFPA 5-lb Probe (ETS Model 850). It weighs approximately 1 pound (2.2 kg) making it user friendly in

both field and high volume measurement applications. In virtually all applications, specified limits met with this Probe will also meet the specified limits using a standard 5 lb probe. A 2.5" diameter dual concentric ring electrode configuration is available as an option.

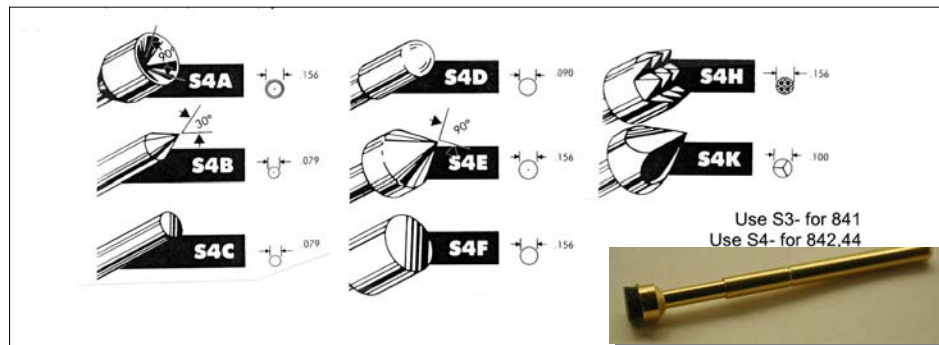
All concentric ring probes have a geometric configuration that automatically converts the measured resistance to surface resistivity, when applicable, by multiplying the resistance reading by 10.

The Probes can be used alone with a standard shielded BNC cable or with the Model 848 Universal Handle with 3-ft (1m), 2-conductor shielded Teflon cable terminated with standard banana plugs for use with most resistance meters. This design concept allows easy probe customization to meet virtually any user requirement.

The Kit includes a carrying case that can be configured with any combination of Probes, cables and adapters, insulated and conductive test beds, resistance meter, Temperature/Humidity/Dew Point Indicator and Ground Point Verifier.

3.0 Description

The Series 840 Resistance/Resistivity Probes, except the Model 845, utilize gold-plated, spring-loaded, flat tip pins as the contact electrode. Each pin requires 5 oz (688 gr) of force for total compression. The electrodes are installed in separate sockets allowing for easy replacement by the user. The SOURCE and SENSE electrodes are separated by a Teflon core for high insulation resistance. When compressed, they extend 0.5" (1.3 cm) beyond the core. Other electrode configurations, shown in Figure 3.0-1, such as smaller diameter, conical, waffle, pointed and conductive rubber contact surfaces are available as options.



Use S3- for 841 Use S4-For 842, 844

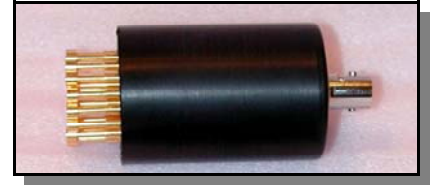
Figure 3.0-1: Available spring-loaded electrodes

All Series 840 Probes have standard BNC output jacks. They can be connected directly to any 2-wire resistance meter using the appropriate cable (3 foot BNC to separate banana plug cable standard for stand-alone Probe test heads). The Model 848 Handle Assembly is .875" (2.2 cm) diameter by 4" (10 cm) long and has a fixed, 3' (92 cm) 3-wire, Teflon shielded cable with standard banana plug terminations for Source, Sense and Ground. The handle fits all Series 840 Probes, and provides both user convenience and reduced cost associated with having a single cable assembly.

Model 841 is a .875" (2.2 cm) diameter concentric ring Probe with a single .156" (.4 cm) diameter center electrode and 7, .100" (.25) diameter outer electrodes on .438" (1.1 cm) centers. Minimum measurement size is a .5" (1.3 cm) diameter surface with a .438" (1.1 cm) deep cavity.



Model 842 is a 1.5" (3.8 cm) diameter concentric ring Probe with an inner ring of 5, .156" (.4 cm) electrodes and an outer ring of 17, .156" diameter outer electrodes on .875" (2.2 cm) centers. Minimum measurement size is 1.25" (3.2 cm) with a .25" (.64 cm) deep cavity.



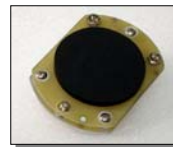
Model 844 is a .875" (2.2cm) diameter 2-point Probe with 2, .156 (.4 cm) diameter electrodes spaced .25" (.64 cm) between centers. Minimum measurement size is .75" x .188" (1.9 x .48 cm) with a .438 (1.1 cm) cavity." Also available with .125: dia. conductive rubber electrode tips.



Model 845 is a 2.5" (6.4 cm) diameter single point Probe with the standard conductive rubber electrode. Electrode resistance is less than 100 Ohms. It is a 1 lb (2.2 kg) version of the ESD Assoc. S4.1 and NFPA specified 5 lb Probe.



Model 870EA is a standard 2.5" diameter dual concentric ring electrode assembly on one side and a 2.5" diameter conductive rubber electrode on the opposite side. It is the standard Electrode Assembly used with the ETS Model 870 Wide Range Resistance Indicator. It has standard banana jack terminations and requires additional weight when making a measurement.



Model 880 Autoranging Resistance Indicator is an accurate, battery-powered instrument that utilizes an LED bargraph to indicate the decade of the measured resistance. Mid-decade is indicated by adjacent LEDs lighting. It has both built-in parallel bar electrodes and auxiliary inputs that accept standard banana plugs. Plugging in a banana plug automatically disconnects the respective bar electrode from the measuring circuit. The Model 880 is capable of measuring resistance over the range from $<10^3$ to $>10^{12}$ Ohms using a test voltage that automatically switches to 10 Volts for measurements $<10^5$ Ohms and to 100 Volts for all other measurements.



Model 256 Utility Wiring Verifier provides both a quick, accurate check of the AC outlet (North American Std only) wiring and a standard banana jack to access electrical ground.



Model 5646 Temperature/ Humidity/ Dew Point Indicator is a small, accurate instrument that measures temperature in either °F or °C from 32 to 122°F (-20 to 70°C), relative humidity from 5-95% RH plus calculates dew point. Measurement accuracy is ±0.9°F (0.5°C) and ±3% RH with a resolution 0.1°F/C and 0.1% RH. After 10 minutes the power automatically switches itself off.



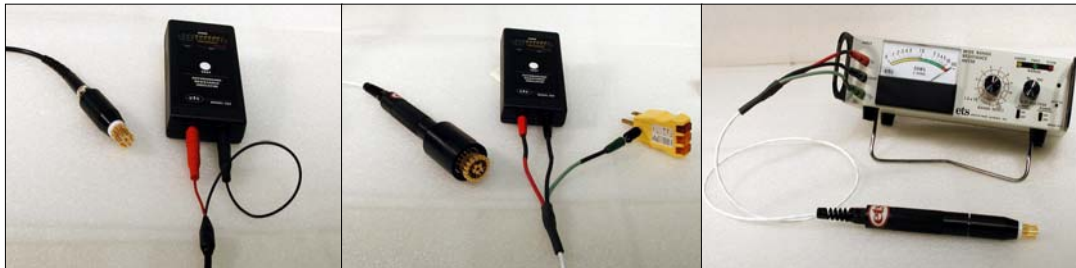
Accessories The Model 840 kit comes complete with both a 4.0” (30.2 cm) aluminum test bed with a 0.80” hole in the side and an insulated (acrylic) test bed. Based on the particular kit configuration, BNC-BNC, BNC-Banana Jack cables and BNC-Banana Jack or Plug adapters are provided. The diagrams indicate the various combinations available.



4.0 OPERATION

4.1 Spring-loaded Electrodes

All Series 840 Probes use BNC connectors at the probe end. This enables the Probes to be used individually or be connected to the Model 848 Handle. The Handle incorporates a 3’ (1m), 2-conductor Teflon shielded cable terminated with standard banana jacks. The BLACK jack is the SENSE lead and is connected to the center pin of the BNC (inner ring of electrodes). The RED jack is the VOLTAGE lead and is connected to the shell of the BNC (outer ring of electrodes). The GREEN jack is GROUND and is connected to the cable shield that terminates inside the handle. If a grounded meter is not used this plug is either not connected or it can be connected to a separate ground. Typical hook-ups are shown in Figure 4.1-1.



841/880 with BNC Cable

842/880 with Handle & Ground

841/872 with Handle Assembly

Figure 4.1-1: Typical Probe Connections

4.2 2.5” Surface Resistance Probe

The BNC connector on the Model 845 Probe has both the center pin and the outer shell internally connected together. When using the Handle either the BLACK or RED plug may be used. When using a BNC-BNC cable in conjunction with the BNC-Banana Plug adapter the center pin only is connected. When the Kit is supplied with a single Model 845 Probe, Point-Point resistance measurements are made by using one of the parallel bar electrodes of the Model 880 Resistance Indicator as the second electrode. Figure 4.2-1 shows typical Probe connections.

To make a measurement, simply place the appropriate probe on the test surface and apply sufficient pressure to compress the spring-loaded electrodes fully and then release pressure until approximately 75% compression is maintained. The spring loading will compensate for both non-perpendicular placement of the probe on the test surface and uneven test surfaces. Hold the probe steady on the test surface until a stable reading is obtained. For practical considerations, the probe should only be used to make measurements up to the 10^{12} Ohm range.

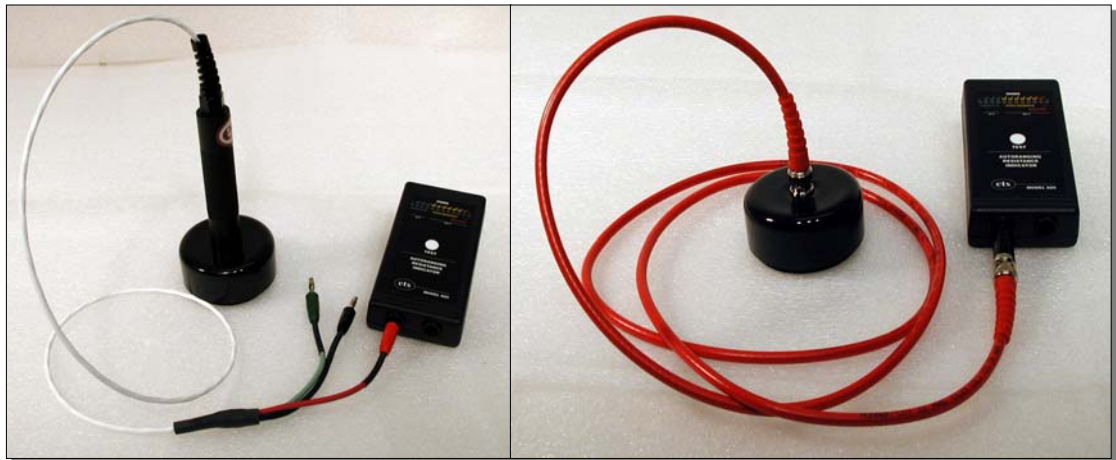


Figure 4.2-1: Typical Model 845 Probe connections

If the Probes are used without the Handle then either a BNC-banana plug cable (Pomona #5343-C-36) or a BNC-BNC cable with BNC-Double Banana plug adapter (Pomona #1269) is required. Other resistance meters that already have banana plug cables can be used with a Banana Jack-BNC adapter (Pomona #1469).

4.3 Standard Dual Concentric Ring/2.5” Electrodes (Optional)

The Model 870EA 2.5” Dual Concentric Ring/2.5” Electrode Assembly uses standard banana jacks. Figure 4.3-1 shows the connections for the dual concentric rings and for the single 2.5” diameter electrode. When using this electrode additional weight must be applied to achieve valid readings.

4.4 Probe Maintenance

The Series 840 Probes should not require any service if care is exercised in their use. However, if one or more spring-loaded contacts become damaged, they can easily be replaced by pulling them out of the socket. A small needle nose pliers may be required if the head is broken off. If the socket is damaged then the Probe must be returned to the factory for repair. Replacement contacts are available from ETS and are installed by simply inserting them into the socket and then gently pushing them all the way in.



Figure 4.3-1: Model 870EA Connections

4.5 Test Beds

The 3.0" diameter insulated and conductive test beds are used to perform surface resistance measurements in accordance with EOS/ESD-S11.11 and S11.13 and surface and volume resistivity in accordance with ASTM-D 257 and volume resistance in accordance with ESD-S11.12, respectively. The conductive test bed has a 0.80" hole in the side for connection to ground for surface resistivity measurements in accordance with ASTM-D 257 and to the voltage source for volume resistance/resistivity measurements.

4.6 Model 880 Wide Range Resistance Indicator

The Model 880 may be used with the built-in parallel bar electrodes or as an independent indicator using external probes. When the external probe banana plugs are inserted, the internal electrodes are disconnected. When using the Model 848 Handle only the RED and BLACK wires are connected to the Model 880. If shielding is required then connect the GREEN plug to ground using either the Model 256 Verifier or the Clip adapter.

NOTE: The banana plugs must be at least 0.5" (12.7 mm) long and be fully inserted to disconnect the internal electrodes. If only short banana plugs are available then place the Indicator on the insulated test bed to perform the measurement.

To measure Resistance-to-Ground (RTG) plug the supplied banana–banana cable (with or without clip adapter attached) to one of the banana jacks and the other end to ground using either the Model 256 Verifier or the clip.

To perform a measurement using external probes, depress and hold the TEST button on the Model 880 Indicator for approximately 3-5 seconds for resistance measurements below 10^8 Ohms and 10-15 seconds for measurements above. The illuminated LED(s) indicate the measured resistance to the nearest ½-decade.

4.7 Model 5646 Temperature/Humidity/Dew Point Indicator


The Model 5646 shown in Figure 4.7-1 is controlled by a single pushbutton. To turn on the Indicator depress the ON button once. The display self-check sequence starts and then automatically switches to the relative humidity display in %RH. Depressing the ON button again switches the display to temperature in either °F or °C. Depressing the ON button again displays dew point in either °F or °C. Depressing the ON button and holding it down for 3 seconds turns the Indicator off. After 10 minutes the Indicator automatically turns off.

To select °F or °C depress the ON button to power up the Indicator. Continue holding the button down until the self-check test is finished. The display will then switch from °C to °F. Pressing the button down again returns the reading to °C. Wait 3 seconds before pressing the button again. The selected unit will then be defaulted each time the Indicator is turned on.

The Model 5646 sensor is protected by a quick twist cap at the bottom of the probe stem. The cap should always be in the closed position when the Indicator is not in use.



Figure 4.7-1: Model 5646 Temp/Humidity/Dew Point Indicator

The Model 5646 uses a 3-AAA, 1.5V batteries with an operating life of approximately 200 hours. The display contains a BATTERY LO indicator. When the battery has to be replaced, the battery symbol  appears in the display during measurement. Open the housing using a small screwdriver. Remove the used cell and replace with the correct one. **CAUTION:** Observe battery polarity.

5.0 WARRANTY

Electro-Tech Systems, Inc. warrants its equipment, its accessories and parts of its manufacture to be and remain free from defects in material and workmanship for a period of one (1) year from the date of invoice., ETS will, at it's discretion, either replace or repair without charge, F.O.B. Glenside, similar equipment or a similar part to replace any equipment or part of its manufacture which, within the above stated time, is proved to have been defective at the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment that are purchased from other manufacturers shall be subject only to the manufacturer's warranty. The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever.

This warranty becomes null and void should the Resistance/Resistivity Kit, or any part thereof, be abused or modified by the customer or if used in any application other than that for which it was intended. This warranty to replace or repair is the only warranty, either expressed or implied or provided by law. It is in lieu of all other warranties and the Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories and, in particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce. The buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified before any equipment is returned for repair. ETS will issue an RMA (Return Material Authorization) number for return of said equipment. Equipment should be shipped in the original packaging. If this is not possible, the equipment should be packed in a sufficiently large box of double wall construction with substantial packing around all sides. A description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument. Electro-Tech Systems, Inc. will not assume responsibility for additional cost of repair due to damage Incurred during shipment as a result of poor packaging.