



# **SURFACE AND VOLUME RESISTANCE PROBE**

## **M 803B Operating Manual**

## Table of Contents


I. Important Safety Information .....	2
Informations Importantes d'inocuite .....	4
II. Description of Contents .....	6
III. Optional Accessories .....	7
IV. Set-Up Guide .....	8
V. Functionality .....	10
V. Specifications .....	11
VII. Repair and Maintenance .....	12
VIII. Troubleshooting Guide .....	13
X. Warranty .....	14

Products described in this manual are designed and assembled in the U.S.A. by

Electro-Tech Systems, Inc.

700 West Park Avenue

Perkasie, PA 18944

 [www.electrotechsystems.com](http://www.electrotechsystems.com) (215) 887-2196

D01893 Revision B – Page 1 of 14

# I. Important Safety Information



## WARNING

This symbol accompanied by the word "WARNING" calls attention to an act or a condition which can lead to serious personal injury or death of operators and bystanders.



## CAUTION

This symbol accompanied by the word "CAUTION" indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

The symbol without any warning text indicates potential damage to device when misused.



This symbol indicates the presence of hazardous AC or DC voltages constituting the risk of electric shock.



This symbol indicates a risk of fire due to improper handling or failure of device. For continued protection against risk of fire, when replacing fuses use only fuses of the specified type and current ratings.



This symbol indicates the danger of an electro-static discharge to which equipment may be sensitive. Observe all precautions for handling electrostatic sensitive devices.



These symbols indicate extreme temperature which can cause burns or frostbite. Avoid contact with surface. Failure to follow precautions may result in moderate to severe injury.

## SAFETY INSTRUCTIONS

	<p><b>WARNING</b></p> <p><b>Read and fully understand operator's manual before using this machine.</b></p> <p><b>Failure to follow operating instructions could result in death or serious injury.</b></p>	
--	--	--

The equipment described in this manual is designed and manufactured to operate within defined design limits. Any misuse may result in electric shock or fire. To prevent the equipment from being damaged, the following rules should be observed for installation, use and maintenance. **Read the following safety instructions before operating the instrument.**

## POWER



**POWER CORD:** Use only the power cord specified for this equipment and certified for the country of use. If the power (mains) plug is replaced, follow the wiring connections specified for the country of use. When installing or removing the power plug, **hold the plug, not the cord.** The AC supply must be single phase, with RMS Voltage in range 90 – 264 VAC, alternating at a frequency in range 47 – 63 Hz.

## OPERATION

### CAUTION



**DO NOT OPERATE WITH COVERS OR PANELS REMOVED.** Voltages inside the equipment consist of line operating up to 240 VAC.



**DO NOT OPERATE WITH SUSPECTED EQUIPMENT FAILURES.** If any odor or smoke becomes apparent turn off the equipment and unplug it immediately. Failure to do so may result in electrical shock, fire, or permanent damage to the equipment. Contact the factory for further instructions.



**DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.** Operating the equipment in the presence of flammable gases or fumes **constitutes a definite safety hazard.** For equipment designed to operate in such environments the proper safety devices must be used such as dry air or inert gas purge, intrinsic safe barriers and/or explosion-proof enclosures.



**DO NOT IMPEDE THE CHAMBER FROM VENTING EXCESS PRESSURE.** Dehumidification system is an open loop system that pumps external air into the chamber. If the chamber is not allowed to vent, pressure can build up and cause serious damage to the chamber. A pressure monitoring system is highly recommended.



**INLET AIR PRESSURE MUST BE LESS THAN 100 PSI (6.89 Bar) & INLET AIR TEMPERATURE MUST BE WITH RANGE OF 33° - 120° F (0.5° - 49° C)** Serious injury could result.



**APPROPRIATE FILTRATION OF COMPRESSED AIR IS RECOMMENDED.** Build-up of contaminants can damage the desiccant towers & reduce their effectiveness in drying inlet air. **AIR PRESSURE MUST BE GREATER THAN 50 PSI (3.45 Bar)** For optimal system performance.



**DO NOT USE IN ANY MANNER NOT SPECIFIED OR APPROVED BY THE MANUFACTURER.** Unapproved use may result in damage to the equipment or present an electrical shock or fire hazard.

# Informations Importantes d'inocuite



Ce symbole accompagné du mot (WARNING) attire l'attention sur un acte ou une condition qui peut entraîner des blessures graves ou la mort des opérateurs et des passants.



Ce symbole accompagné du mot (CAUTION) indique une situation potentiellement dangereuse qui, si elle n'est pas évitée, pourra entraîner des blessures mineures ou modérées. Le symbole sans texte d'avertissement indique des dommages potentiels à l'appareil en cas d'utilisation abusive.



Ce symbole indique la présence d'une climatisation dangereuse ou d'un courant continu constituant le risque de choc électrique.



Ce symbole indique un risque d'incendie dû à une mauvaise manipulation ou à une défaillance de l'appareil. Pour une protection continue contre les risques d'incendie, lors du remplacement des fusibles, utilisez uniquement des fusibles du type et des valeurs nominales spécifiés.



Ce symbole indique le danger d'une décharge électrostatique à laquelle l'équipement peut être sensible. Observez toutes les précautions à prendre pour manipuler les appareils sensibles à l'électricité statique.



Ces symboles indiquent une température extrême qui peut causer des brûlures ou des engelures. Éviter le contact avec la surface. Le non-respect des précautions peut entraîner des blessures modérées à graves.

## CONSIGNES DE SÉCURITÉ



**Lisez et comprenez bien le manuel de l'utilisateur avant d'utiliser cette machine. Le non-respect des instructions d'utilisation peut entraîner la mort ou des blessures graves**



L'équipement décrit dans ce manuel est conçu et fabriqué pour fonctionner dans les limites de conception définies. Toute mauvaise utilisation peut entraîner un choc électrique ou un incendie. Pour éviter que l'équipement ne soit endommagé, les règles suivantes doivent être respectées pour l'installation, l'utilisation et l'entretien. **Lisez les consignes de sécurité suivantes avant d'utiliser l'instrument.**

## ALIMENTATION



**CORDON D'ALIMENTATION:** Utilisez uniquement le cordon d'alimentation spécifié pour cet équipement et certifié pour le pays d'utilisation. Si la fiche d'alimentation (secteur) est remplacée, suivez les connexions de câblage spécifiées pour le pays d'utilisation. Lors de l'installation ou du retrait de la fiche d'alimentation, **tenez la fiche, pas le fil.**



**MISE À LA TERRE:** Le cordon d'alimentation fourni est équipé d'une **fiche à 3 broches avec mise à la terre (une fiche avec une troisième broche de mise à la terre)**. Il s'agit à la fois d'une fonction de sécurité pour éviter les chocs électriques et d'une exigence pour le bon fonctionnement de l'équipement. Si la prise à utiliser n'est pas compatible avec la fiche à 3 broches, changez la prise ou utilisez un adaptateur de mise à la terre.



**FUSIBLES:** Remplacez les fusibles uniquement par des fusibles ayant le courant nominal, la tension et le type spécifié tels que fusion normale, temporisation, etc. **N'UTILISEZ PAS** de fusibles de fortune ou ne court-circuitiez pas le porte-fusible. Cela pourrait entraîner un risque d'électrocution ou d'incendie ou endommager gravement l'instrument.

## OPÉRATION

### PRUDENCE



**NE PAS UTILISER AVEC LES COUVERCLES OU LES PANNEAUX RETIRÉS.** Les tensions à l'intérieur de l'équipement consistent en une ligne (secteur) pouvant aller de 100 à 240 VAC.



**NE PAS UTILISER AVEC DES PANNES D'ÉQUIPEMENT SUSPECTES.** Si une odeur ou de la fumée se dégage, éteignez l'équipement et débranchez-le immédiatement. Le non-respect de cette consigne peut entraîner un choc électrique, un incendie ou des dommages permanents à l'équipement. Contactez l'usine pour plus d'instructions.



**NE PAS UTILISER DANS UNE ATMOSPHÈRE EXPLOSIVE.** L'utilisation de l'équipement en présence de gaz ou de fumées inflammables constitue un **danger certain pour la sécurité**. Pour les équipements conçus pour fonctionner dans de tels environnements, des dispositifs de sécurité appropriés doivent être utilisés, tels que la purge d'air sec ou de gaz inerte, les barrières de sécurité intrinsèque et/ou les enceintes antidéflagrantes..



**NE PAS EMPÊCHER LA CHAMBRE D'ÉVACUER L'EXCÈS DE PRESSION.** Les systèmes de déshumidification disponibles comprennent des systèmes en boucle ouverte qui pompent l'air extérieur dans la chambre. Si la chambre n'est pas autorisée à s'aérer, la pression peut s'accumuler et causer de graves dommages à la chambre.



**UTILISEZ UNE SOURCE D'EAU DISTILLÉE OU DÉSIONISÉE POUR L'HUMIDIFICATION.** L'accumulation de contaminants sur le transducteur causera des contraintes au transducteur et à l'électronique et entraînera une défaillance prématurée et invalidera la garantie.



**NE PAS UTILISER D'UNE MANIÈRE NON SPÉCIFIÉE OU APPROUVÉE PAR LE FABRICANT.** Une utilisation non approuvée peut endommager l'équipement ou présenter un risque d'électrocution ou d'incendie.

## II. Description of Contents



Item No.	Item	Qty.	Description
1	ETS 803B	1	The Model 803B Resistance/Resistivity Probe design has been adopted as the industry standard for measuring the resistance characteristics of planar material.
2	3-wire cable assembly	1	Cable assembly that is used for the connection between the 803 B and a measuring device.
3	4" Acrylic Disc	1	Acrylic disc that is used to measure the surface resistivity.
4	4" Aluminum Disc	1	Aluminum disc that is used to measure the volume resistivity.

### III. Optional Accessories

These optional accessories may have been part of your purchase and included with your M 803B. If not, the description may assist you in determining if these items may be applicable in the future.

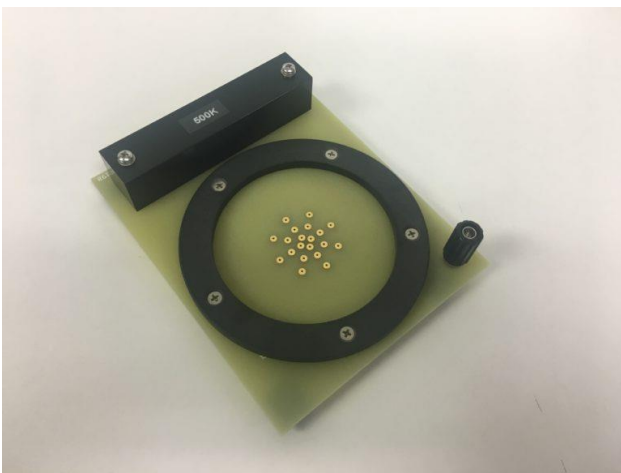
#### **M 809B Resistance Verification Fixture (per ANSI/ESD STM 11.11)**

Utilize the M 809B to confirm the M 803B Probe is measuring correctly by verifying the alignment of the concentric rings and the low measurement range using an array of 20 resistors (10 M $\Omega$ /1%). The reverse side has a resistor of 1 T $\Omega$ /5% that checks both the high range measurement accuracy and determines the electrification time.



#### **M 819 Volume Resistance Verification Fixture**

The Model 819 verifies the surface contact of the Model 803B center electrode using a similar parallel array of 20 resistors (10 M $\Omega$ /1%) spaced around the surface area of the center electrode.

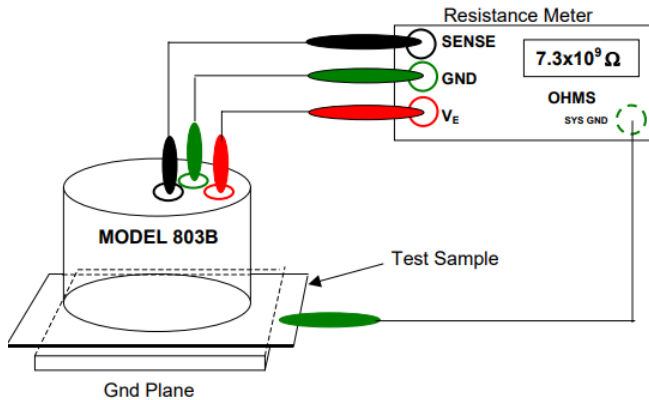




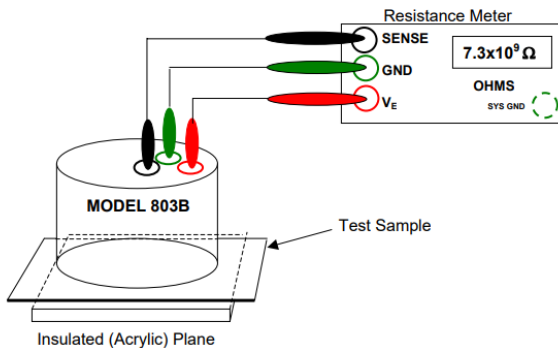
# IV. Set-Up Guide

## Set-Up Guide

### 803B probe/Resistance Meter Hookup for Surface Resistivity Measurement (ASTM D257-14)

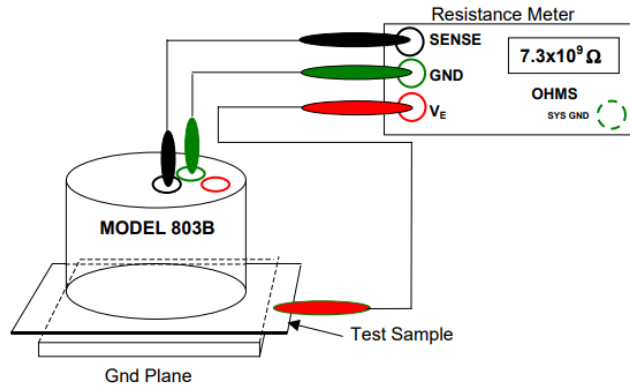


### 803B probe/Resistance Meter Hookup for Surface Resistivity Measurement (ESDA STM11.11)

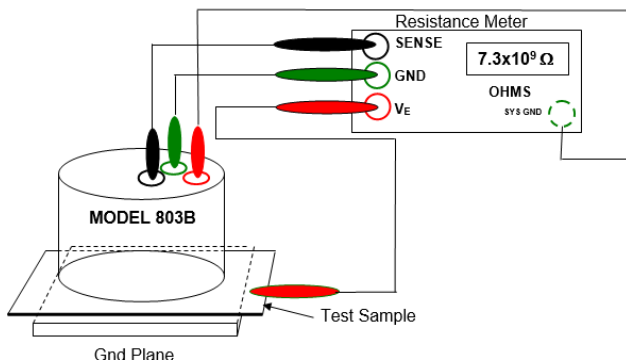


**Surface Resistance and Resistivity**  
Model 803B Probe hookup to a resistance meter for measuring surface resistance/resistivity. The Teflon sense cable is connected to the Inner electrode (Black banana Jack) and the voltage cable is connected to the Outer Electrode (Red banana Jack). The ground plane is connected to the ground on the meter. Also, the outer shell of the Model 803B Probe is connected to ground (This ground connection is not necessary for resistances less than  $10^9$  ohms). If a meter with only two output connections is used, connect the HI side (usually red) to the Outer electrode and the LO side (usually black), to the Inner electrode.

### 803B probe/Resistance Meter Hookup for Volume Resistivity Measurement (ASTM D257-14)



### 803B probe/Resistance Meter Hookup for Volume Resistivity Measurement (ANSI/ESD STM11.11)



### Volume Resistivity

Model 803B Probe hookup to a resistance meter for measuring volume resistance/resistivity. The Teflon sense cable is connected to the inner electrode (Black Banana Jack) and the voltage cable is connected to the plate (the same plate as is used for the ground plane for surface resistivity). The outer electrode (Black Banana Jack) is connected to ground (ASTM D257-14) along with the outer shell of the Probe for measuring the volume resistivity of insulating material.

## V. Functionality

The Model 803B Probe will accurately measure the surface resistance/resistivity of any smooth surface that is greater than 2.5" in diameter. The standard 2.2 kg (5-pound) probe weight is sufficient for the electrodes to make total contact with the material surface of most film and foam materials.

The Model 803B Resistance/Resistivity Probe design has been adopted as the industry standard for measuring the resistance characteristics of planar material. This concentric ring probe incorporates a geometrical configuration that provides an x10 multiplication factor to convert the surface resistance measurement to surface resistivity. The Probe is also capable of measuring volume resistance and volume resistivity of material having smooth flat surfaces of at least 2.5" diameter. The ability of the Model 803B Probe to measure materials of this size makes it compatible with the standard specimen size used in most electrostatic parameter testing.

The design of the Model 803B Probe electrode configuration is derived from the applicable formulas set forth in ASTM D257-14. For the concentric ring design the surface resistivity, is a function of the ratio between the inner and outer ring diameters as shown in the following formula:

$$\rho_s = \frac{(D_1 + D_2)}{(D_2 - D_1)} \pi R_m \text{ Ohms/sq}$$

$D_1$  = Outside Diameter of inner ring

$D_2$  = Inner Diameter of outer ring

$R_m$  = Measured resistance in ohms

# V. Specifications

## **ELECTRICAL**

**Measurement Range:**  $10^2 \Omega$  to  $10^{14} \Omega$

**Contact electrodes:** Nickel coated graphite silicone

**Volume resistance:** As low as  $10^2 \Omega$

**Insulation:** Teflon®

## **MECHANICAL**

### **Electrode Dimensions:**

**Outer ring:** 8 mm dia. x 3 mm width x 3 mm thick (2.5" dia. x 0.125" width x 0.125" thick)

**Inner disk:** 30.5 mm dia. x 3 mm thick (1.2" dia. x 0.125" thick)

**Shore-A Hardness:**  $65 \pm 10$  Durometer

**Probe dimensions:** 83 mm dia. x 102mm height (3.25" dia. x 4.0" height)

**Weight:**  $2.2 \pm 0.05$  kg (5.0 lb.  $\pm$  2oz)

**Cables (Banana-Banana):** 920mm (3-foot); STD. Banana Jack 4mm (0.162"): Red (Source), Black (Sense), Green (Shield)

## VII. Repair and Maintenance

- The Model 803B Resistance/Resistivity Probe is a precision instrument and should be handled as such. The alignment of the Inner and Outer electrodes is critical to ensure total surface contact. The silicon rubber contact material is impregnated with carbon nickel to obtain low contact resistance. The user must ensure that the contact area is clean and free of contaminants prior to making a measurement. Also, the Probe should not be exposed to atmospheres or surfaces that may corrode the carbon nickel particles. If exposure is necessary, the contacts should be cleaned with Isopropyl alcohol immediately after use.
- When not in use the Probe should be kept on a flat smooth surface such as the test bed. The Probe should never be kept on a sharp or protruding object since this may damage or put a set in the silicon rubber electrodes.
- If the contact electrodes are damaged or the Probe knocked out of alignment, the unit must be returned to ETS for repair. The Probe does not contain any user replaceable parts.
- The optional ETS Models 809B and 819 Calibration Check Fixtures enable the user to verify the integrity and correct alignment of the electrodes prior to use.
- For measurements below  $10^9$  Ohms, standard banana plug-to-banana plug cables may be used. However, for measurements above  $10^9$  Ohms a high resistance, such as Teflon, cable must be used for the sense lead. Replacement cables are available from ETS.

See Troubleshooting Guide.

To return equipment to ETS for repair or service it is first necessary to obtain an RMA number. Please call [215-887-2196](tel:215-887-2196) or email [service@ets2.com](mailto:service@ets2.com). You can also utilize the contact form found on our website at [www.electrotechsystems.com](http://www.electrotechsystems.com).

## VIII. Troubleshooting Guide

Problem	Possible Causes	Corrective Actions
Reading too high or over-scale	Improper connections of test cable	See Setup Guide
	Broken wire(s) on test cable	Get replacement test cable from ETS
	Excessive contaminants on conductive electrodes	Clean conductive electrode(s) with Isopropyl alcohol
	Conductive electrode(s) separated from probe	Return to ETS for repairs
Reading too low or under-scale	Improper connections of test cable	See Setup Guide
	Excessive contaminants underneath probe body	Clean all Teflon washers underneath electrodes with Isopropyl alcohol
		Check for any conductive test samples may be latched underneath electrodes
Measurements unstable	Samples are in insulative range	Set electrification time to at least 15 seconds before taking reading
Volume Resistivity measurements unstable	Insulation plane was used	Use ground plane to provide electrification voltage

## X. Warranty

**Limited Warranties.** Seller warrants that all goods manufactured and delivered hereunder shall (a) conform to any samples, drawings, specifications, or other written documents provided to Seller by Buyer or approved by Buyer to Seller and (b) be free from all defects in workmanship and material. Buyer's sole remedy against Seller for breach of either of the specifically mentioned warranty shall be the repair or replacement, at Seller's sole option, of the defective workmanship or material. The seller expressly disclaims all other warranties, express and/or implied, including but not limited to those of merchantability and fitness for a particular purpose. In no event shall Seller be liable, under either warranty or otherwise, to Buyer in excess of the purchase price of the products paid to Seller by Buyer. In no event shall Seller be liable for any loss or damage arising directly or indirectly from the use of the product or for consequential or incidental damages. Seller's specified warranties will expire and lapse (i) for renewable items (such as gloves, iris ports and desiccants), sixty (60) days from date of shipment and (ii) for all standard equipment and otherwise nonrenewable items, one year from date of shipment.