



USER MANUAL

MINIATURE RESISTANCE PROBES

PRF-912B PRF-922B PRV-913B

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
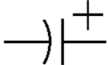
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Warning! Important Safety Information

Please read the Safety Instructions before using your Probe.

Refer to the table below for an explanation of symbols which may be on your Prostat product.

In this manual, a Warning identifies conditions and actions that pose hazards to the user. A Caution identifies conditions and actions that may damage the Probe or the equipment under test.

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). THERE ARE NO USER SERVICEABLE PARTS INSIDE. REFER ALL SERVICING TO QUALIFIED PERSONNEL.			AC voltage: Rated voltage marked with this symbol is AC voltage.
	This symbol indicates that high voltage is present inside. It is dangerous to make any kind of contact with any internal part of this product.		DC voltage: Rated voltage marked with this symbol is DC voltage.
	This symbol indicates that this product has included important literature concerning operation and maintenance.		Caution. Consult instructions for use: This symbol instructs the user to consult the user manual for further safety related information.
	This symbol indicates earth ground.		This symbol represents capacitance.

- Never insert anything metallic into the open parts of this probe. This may cause a danger of electric shock.
- To avoid electric shock, never touch the inside of this apparatus. Only a qualified technician should open this apparatus.
- Do not drop or strike the product. If the product is damaged, contact a Prostat Authorized Service Center.
- This equipment is intended for use in electrostatic processes that are free from water, oil, solvent and other conductive contaminants. Exposure to such contaminants will cause failure of the electrical insulation system in the product
- This equipment may require proper grounding for accurate measurement in certain ranges.
- This equipment may get damaged if dropped. In such an event, it should be carefully examined and any necessary repairs be made by an authorized technician.
- In rare cases cleaning the probe with a slightly dampened cloth may be required. Should this be required, use a very weak solution of liquid soap and water. The cloth should be barely damp. DO NOT allow the probe to become wet with the cleaning solution.
- DO NOT allow cleaning solution to enter the probe through. Should the probe become damaged with cleaning solutions, the warranty is voided.
- Do not expose this probe to dripping or splashing.

The Probes complies with:

Document	PRF-912B	PRF-922B
ESD TR53 Compliance Verification		•
ANSI/ESD S20.20		•
ANSI/ESD STM11.13 Two-Point Resistance		•
IEC 61340-4-10 Two-Point Resistance		•

01 INTRODUCTION

The PRF-912B is designed in miniature to approximate surface resistance measurements typically obtained with the ANSI/ESD STM11.11 Surface Resistance Standard fixture. The PRF-912B, however, is approximately 1/10th the size of the ANSI/ESD STM11.11 fixture. Based on its size the PRF-912B is often referred to as a Miniature Concentric Ring.

To obtain an estimate of ASTM D-257 Surface Resistivity in ohms/square, simply multiply the PRF-912B fixture measurement by 10 (i.e., add one order of magnitude).

The PRF-922B Miniature Two Point probe accurately measures point-to-point resistance of small areas up to 1.0×10^{12} ohms. Use the PRF-922B to measure small material samples, hard to access molded areas, edges of parts, tray or tape cells and other very small objects and surfaces.

The spacing of the 2 electrodes allows for a measurement area of 0.325 inches (8.26mm) on planar material. When measuring molded parts, the PRF-922B allows you to measure a diameter of 0.491" (12.46mm). When used with the supplied conductive rubber boots, it provides point-to-point resistance measurements in accordance with ANSI/ESD STM11.13 and IEC 61340-4-10.

The PRV-913B is designed to verify that a Prostat mini probe resistance fixtures, either the PRF-912B, the PRF-922B or the PRF-922A-B, physically functions as intended. That is, the spring-loaded contacts compress and extend freely and are electrically connected to the probe's circuitry.

Miniature Probe Contents

Table 1 is a list of the items included with your Probe.

Part No.	Description	PRF-912B	PRF-922B
	Miniature Resistance Probe	•	•
PRF-900L	Connection Cable	•	•
PRF-900C	Probe Protective Cap	•	•
MR-001	Rubber Adapter Boots	• (1)	• (2)
MR-002	Rubber Adapter Ring	• (1)	
PRF-900LP	Long Pin	• (1)	• (2)
PRF-900S	Short Pin	• (1)	
PRV-913B	Dual Verification Fixture		

Table 1. Packing List



CAUTION!

To avoid electrical shock, Do Not Touch the probe test electrodes, test bed, or exposed metal BNC connections when power is being applied to the probe.



WARNING!

Never exceed the maximum applied operating test voltage of 100 volts.



CAUTION!

Storage or use of these probes, fixtures and accessories in damp or wet conditions may cause damage to electrical circuits, and contact surfaces, which may affect performance or increase the possibility of personnel shock or arc discharge.



WARNING!

Improper handling and use of energized circuits may cause arc discharge, which in turn may cause the ignition of combustible materials or fumes. Do not use exposed energized circuits in flammable areas.

02 GENERAL DESCRIPTION

The miniature resistance probes are designed to work in conjunction with a precision wide range resistance instrument, such as the PRS-801B, PRS-812B or PAS-853B Resistance Meters, and an insulated test bed (e.g., PTB-920 or equivalent).

The instrument and probe combination provides direct surface resistance measurements in ohms, generally in accordance with the ESD Association's ANSI/ESD STM11.11 test standard.

The resistance measurement range of the probes are 0.9 ohms at <10 volts to 1.0E+12 (1.0x10¹²) ohms at 100 volts.

The PRV-913B consists of high quality black anodized housing and high resistance circuit board. One side of the PRV-913B circuit assembly incorporates an array of ten (10) each 10 megohm precision ($\pm 1\%$) resistors in parallel, connecting the center pad to each of the ten peripheral trace pads. It provides a specific reference resistance of 1.0x10⁶ ohms ($< \pm 2\%$) for the Concentric Ring side of the fixture. The two-point side of the fixture incorporates a 1.0x10⁶ ohms ($< \pm 1\%$) resistor connected across two test pads.

PRF-912B Miniature Concentric Ring

The PRF-912B Miniature Concentric Ring consists of a spring loaded 0.10-inch (2.54 mm) diameter center electrode surrounded by 10 each 0.06-inch (1.59 mm) diameter contact electrodes that electrically form a continuous outer ring. Contacts are pogo-pin type ATE quality probes made of beryllium Copper coated with 60 microinches of hard Gold.

1. The PRF-912B's center electrode is electrically separated from the outer ring contacts by a high resistance dielectric (Teflon). The center electrode acts as a current sensor during resistance measurements. It is connected to the negative (-) terminal of a wide range measurement instrument via the PRF-900L Connection Cable.

2. The outer ring contacts are electrically connected at a common point. They apply the test voltage to the material under test during a resistance measurement.
3. They are connected to the positive (+) terminal of the wide range measurement instrument with the PRF-900L Connection Cable.
4. The fixture's total surface contact diameter is approximately 0.30 inches and is ideal for measuring surface resistance of small areas, 0.32 inches or larger.
5. The PRF-912B concentric ring approximates the same measurements obtained when using a standard ANSI/ESD S11.11 concentric ring fixture.
6. Overall size of the PRF-912B is 0.50 inches in diameter by 5.9 inches (150 mm) long (**Figure 1**). This optimal size and shape make the fixture very comfortable and easy to handle. Its outer housing is made of black anodized aluminum.



Figure 1. PRF-912B Profile with protective covers removed

PRF-922B Miniature Two-Point Probe

The PRF-922B Miniature Two-Point Probe consists of 2 gold plated, spring-loaded contact electrodes spaced 0.239 inches (6.08mm) apart, center-to-center. The electronic quality gold plated contact probes are 0.1-inch (2.54mm) in diameter, and are supplied with conductive synthetic rubber contact boots, which are 0.123 inch (3.12mm) diameter. The conductive boots are used to reduce contact resistance between the gold contact probes and materials under test in certain applications.

1. Contacts are pogo-pin type ATE quality probes made of beryllium Copper, coated with 60 micro inch of hard Gold. Spacing allows for measurement of items with surfaces approximately 0.125 inches wide having a length of 0.325" inches or larger for planar material.
2. The contact assembly's outer housing incorporates "stops" that insure consistent contact pressure during measurement.

3. Overall size of the PRF-922B is 0.50 inches in diameter by 6.75 inches (171 mm) long (Figure 2). This optimal size and shape make the fixture very comfortable and easy to handle. Its outer housing is made of black anodized aluminum.



Figure 2. PRF-922B Profile with protective covers removed

Use of Measurement Power Supply

1. The probe is a high-performance micro probed designed for use with a maximum input voltage of 100 volts. As such, it is capable of delivering an annoying shock to any person touching the spring-loaded contacts when they are energized.
2. If used with the PRS-801B Resistance System, the current capability of the micro probe instrument combination is limited to a very low, typically harmless level. However, a distinct hazard exists in the operator's reaction to a possible shock.
3. To avoid shock, operating personnel should not touch the electrodes, or any exposed metallic parts of the probe or cable assembly when power is applied to the probe.
4. The designed operating voltage limit for normal auditing and laboratory measurements is 100 volts. Exceeding 100 volts greatly increases the risk of personnel shock hazards.
5. Only qualified instrument repair and test personnel should exceed the 100-volt operation limit and then do so only under controlled conditions using maximum precautions against personnel shock.
6. Never, under any conditions, exceed 500 volts during fixture test or repair.

Other Operational Precautions

1. Do Not Use the probe if it fails to function during its continuity inspection test.
2. Do Not Use the probe if it becomes damaged in any way.
3. Only Prostat authorized, qualified repair personnel may open probe, terminal assemblies, or perform product repair. Unauthorized opening of fixture or instrument housings, device tampering, or attempted repair will void product warranty and completely absolve Prostat Corporation, its employees, suppliers and representatives of any responsibility, liability, or other, whatsoever.
4. **Do Not Touch Electrode Surfaces.** Electrodes will become contaminated with skin oils and salts and may become damaged or rendered inaccurate.
5. **Do Not Use or Store the probe or PRV-913B In Damp Environments.** Always store devices with protective caps in place in a dry environment, preferably at $\leq 20\%$ Relative Humidity.
6. Do not use these probes and devices in combustible or explosive environments.
7. Do not attempt to measure energized materials, items or circuits with the probe.
8. The probe is a precision fixture to be operated by experienced personnel familiar in the use and handling of devices employing energized power supplies.
9. Do Not Drop or cause mechanical damage to these devices.

03 CONNECTION AND OPERATION

Both the PRF-912B and PRF-922B use the same connection cable to connect the probe to a resistance meter. Below describes how to connect your probe to a PRS-801B Resistance Meter using the PRF-900L, included with your probe.

Probe Setup

1. Connect the BNC connector of the PRF-900L Adapter Lead to miniature probe.
 - a. Remove black rubber protective cover from the probe's BNC connection.
 - b. Attach cable to the probe's BNC connection (**Figures 3 & 4**).

2. Once the cable is installed, the probe is ready for continuity test, verification and use.



Figure 3. Attach lead's BNC to the probe's BNC's



Figure 4. Probe with PRF-900L attached.

3. To use, insert the black and red inputs of the PRF-900L Lead to the PRS-801B, PRS-812B or PAS-853B resistance meter.

Confirming Proper BNC Connections, Continuity & High Resistance Tests

The following confirms proper connections by checking continuity of the probe against a metal plate, then confirms its ability to measure high resistance.

1. To confirm general setup and function of the probe, place the electrodes against a clean metal surface. For example, the plated metal side of the PTB-920 Dual Surface Test Bed.
 - a. Hold the probe vertically, and apply pressure to slightly compress the electrodes, making positive contact with the metal surface.
 - b. Activate the resistance instrument to obtain a measurement.
 - i. In the case where the PRS-801B is the measurement instrument, it should measure approximately 1.00 ohm, or less.
 - ii. With other instruments, they should provide a LOW resistance indication. For example, $<10^4$ ohms when using a resistance meter not capable of measuring less than 10000 ohms.

2. Repeat the above procedure using the clean insulated surface (black, labeled side) of the PTB-920, or an insulated acrylic plate.
 - a. Hold the probe vertically, and apply pressure to compress the electrodes, making positive contact with the insulated surface.
 - b. Activate the resistance instrument to obtain a measurement.
 - c. In the case where the PRS-801B is the measurement instrument, it should measure 1.00×10^{12} ohms, or greater.
 - d. With other instruments, they should provide a HIGH resistance indication. For example, 10^{12} or $>10^{12}$ ohms.

Probe Verification using the PRV-913B Verification Fixture

The PRV-913B Dual Verification Fixture consists of a high quality black anodized housing and high resistance circuit board. One side of the PRV-913B circuit assembly incorporates an array of ten (10) each 10 megohm precision ($\pm 1\%$) resistors in parallel, connecting the center pad to each of the ten peripheral trace pads. It provides a specific reference resistance of 1.0×10^6 ohms ($< \pm 2\%$) for the Concentric Ring side of the fixture.

The Two-Point Probe side of the fixture incorporates a 1.0×10^6 ohms ($< \pm 1\%$) resistor connected across two test pads.

1. Connect the PRF-900L adapter lead to the resistance measurement instrument. The red jack of the lead should be connected to the Positive (+) power terminal. This applies test voltage to the 10 outer ring electrodes.
2. Remove the cover from the probe (**Figure 5**).
3. If using the PRF-912B, position the probe vertically into the Concentric Ring Probe side of the PRV-913B with its spring-loaded pin electrodes making direct contact with the fixture's gold-plated test segments (**Figure 6**).
4. If using the PRF-922B, position the probe vertically into the Two-Point Probe side of the PRV-913B with its spring-loaded pin electrodes making direct contact with the fixture's gold-plated test segments (**Figure 6**).
5. Depending on your resistance instrument select either 10V or 100V test voltage.

- When measuring the **PRF-912B** with the PRV-913B, resistance should be 1.00×10^6 ohms $\pm 2\%$. The **PRF-922B** probe should measure 1.00×10^6 ohms $\pm 1\%$.



Figure 5. Remove Probe Cover.



Figure 6. Insert the Probe into the PRV-913B Fixture.

Basic Measurements

- Place the material to be measured on an insulated test bed, the clean insulated surface (black, labeled side) of the PTB-920, or an insulated acrylic plate.
- Position the probe vertically directly over the test area and lower it until the spring-loaded center electrode makes direct contact with the material under test.
- Apply sufficient pressure on the probe until the center and outer spring-loaded electrode are partially compressed while in contact with the test material.



IMPORTANT NOTE!

Adjust probe pressure to ensure that the electrode springs are controlling the probe's connection with the material's surface and that the springs are not fully compressed against their stops. This will ensure reproducible measurements.

- Select appropriate instrument test voltage and initiate resistance measurement.

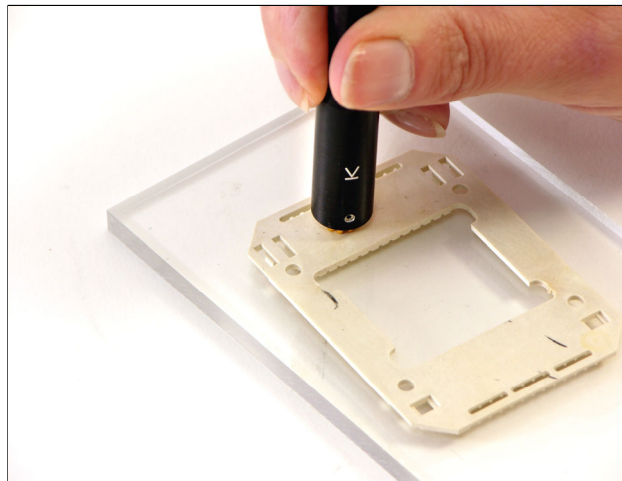
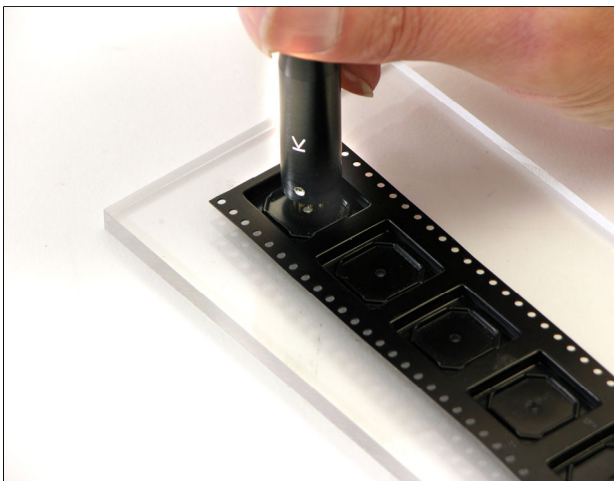
5. If using the **PRF-912B**, ANSI/ESD STM11.11 test voltage guidelines for measuring packaging materials are as follows:
 - a. For material resistance measurements of less than 1.0×10^4 ohms, use <10 volts.
 - b. For measurements of 1.0×10^4 to $<1.0 \times 10^6$ ohms, use 10 volts.
 - c. For measurements greater than 1.0×10^6 ohms, use 100 volts

6. If using the **PRF-922B**, ANSI/ESD STM11.13 test voltage guidelines for measuring packaging materials are as follows:
 - a. For material resistance measurements of less than 1.0×10^4 ohms, use <10 volts.
 - b. For measurements of 1.0×10^4 to $<1.0 \times 10^6$ ohms, use 10 volts.
 - c. For measurements greater than 1.0×10^6 ohms, use 100 volts



NOTE!

For optimal performance and accuracy, use the Prostat PRS-801B Resistance System in its AUTOMATIC Mode (either Default Mode 1 [Ohms], or Mode 2 [Exponential 1.0EXX/Ohms] display). AUTOMATIC Mode will control test voltage, resistance range adjustment and electrification period automatically.



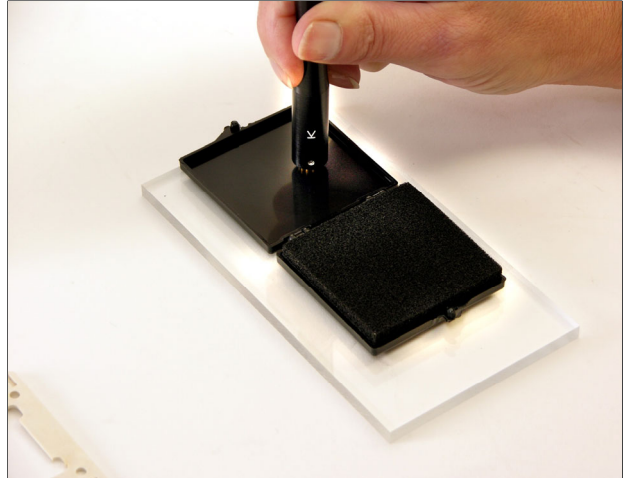
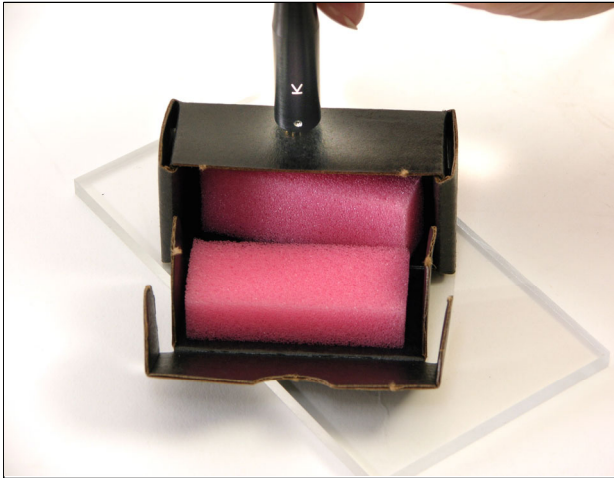


Figure 7. Measurement Illustrations Using the Probes.

Using the Probe Stopper with the PRF-912B

The PRF-922B has side stoppers built into the probe to limit the applied electrode pressure. Though the PRF-912B doesn't have those side stoppers built into the probe, the PRF-900 STOP fixture can be attached to the probe to limit the pressure as well.

The PRF-900 STOP fits snugly on the fixture's housing, surrounding the concentric ring pin assembly (Figure 8). This assists the user in obtaining repeatable measurements using consistent electrode pressure (Figure 9).



Figure 8. PRF-900 STOP on the PRF-912B.

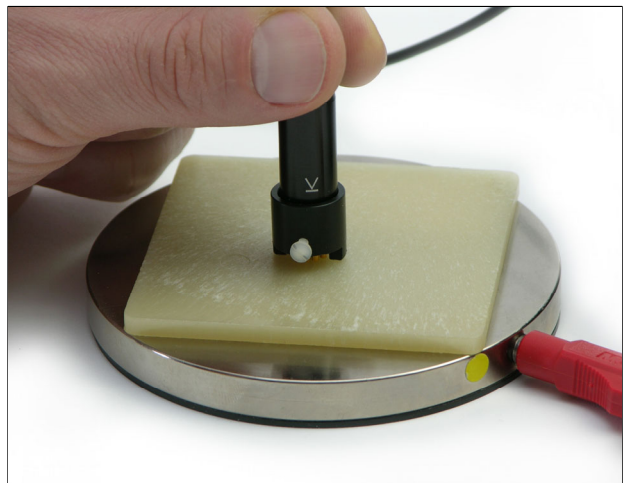


Figure 9. Prevents excess pressure to the electrodes.

04 ONE-POINT MEASUREMENT

The **PRF-922B** can be converted into a One-Point Probe. The single pin probe configuration measures effective resistance across and or through a material or assembly.

A proper measurement would include placing the material, or device under test (DUT), onto a clean metal test bed that is isolated from ground, such as the PTB-920 Test Bed. This ensures that only the material is being measured, and the measurement is not affected by voltage variables on ground.

Using the PRF-922B as a One-Point Probe

Follow the instructions below to temporarily convert the PRF-922B into a one-point probe:

1. Define pin continuity as shown in **Figure 10**. Using a continuity instrument such as a multimeter, measure from each probe pin to the BNC/Banana Adapter installed at the end of the shielded cable. This determines the probe pin that is connected to the shielded cable and BNC/Banana Adapter. It also confirms measurement continuity through the fixture.

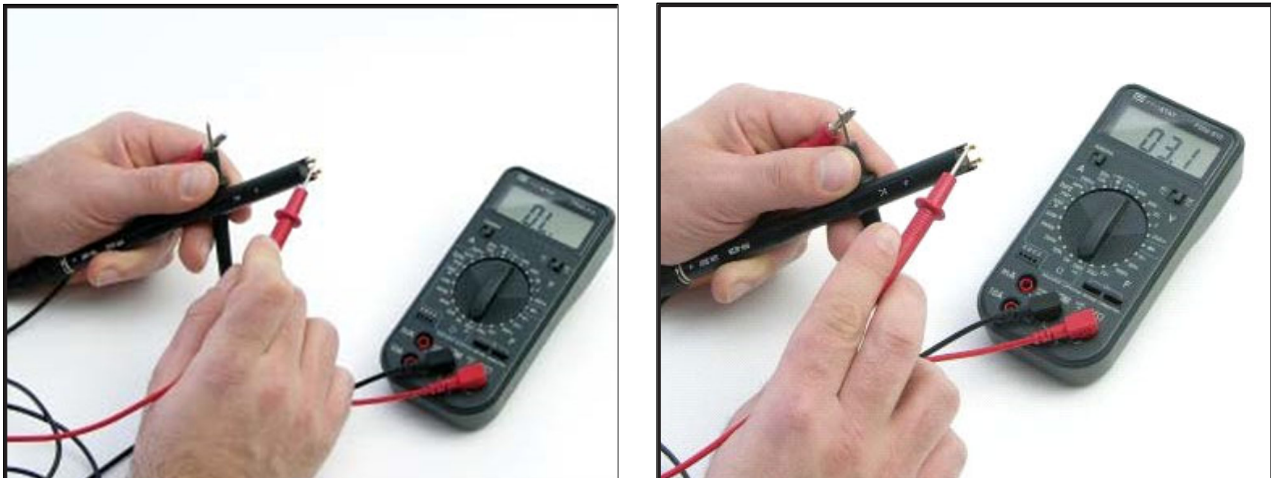


Figure 10. Measurement Illustrations Using the Probes.

2. If desired, remove the non-conducting pin from the PRF-922B fixture as shown in Figure 9. This allows precise positioning of the single active conducting pin.

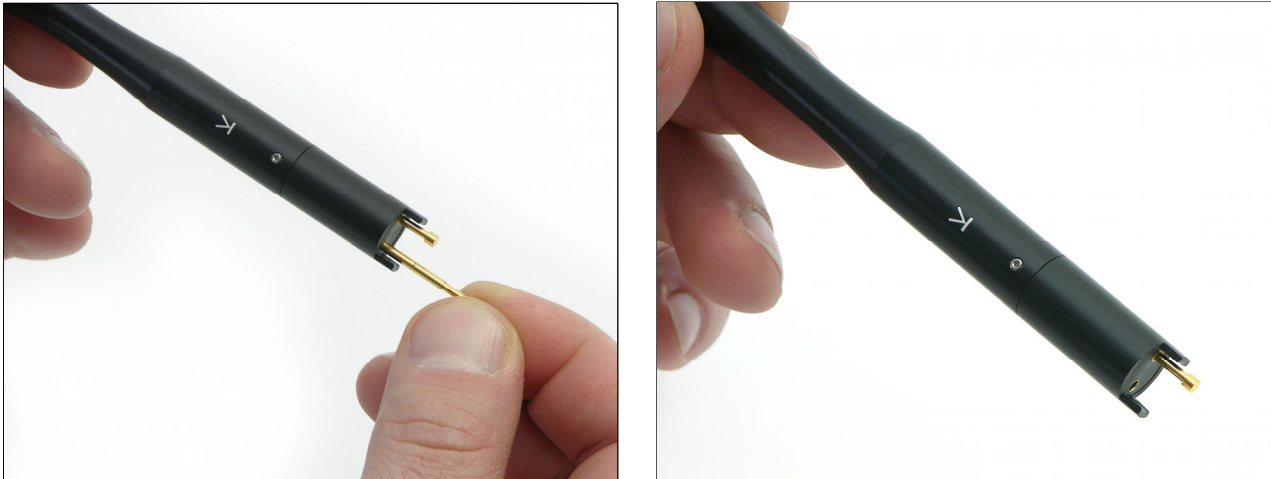


Figure 11. Removing the inactive pin helps identify point of actual measurement by the active pin.

3. Once pin continuity is determined and connection confirmed, install a conductive rubber boot on the active measurement pin. The boot reduces contact resistance and enhances measurement repeatability as required by ANSI/ESD STM11.13.

Material & Device Measurements with One-Point Probe

The metal test bed is connected to the resistance instruments positive (+) terminal, which provides voltage to the test bed during the measurement. The micro probe shielded cable with installed adapter lead is connected to the resistance instruments negative (-) terminal.

The negative terminal provides the current from the DUT to the instrument circuit, which calculates and displays the resistance of the material or DUT (Figure 12).

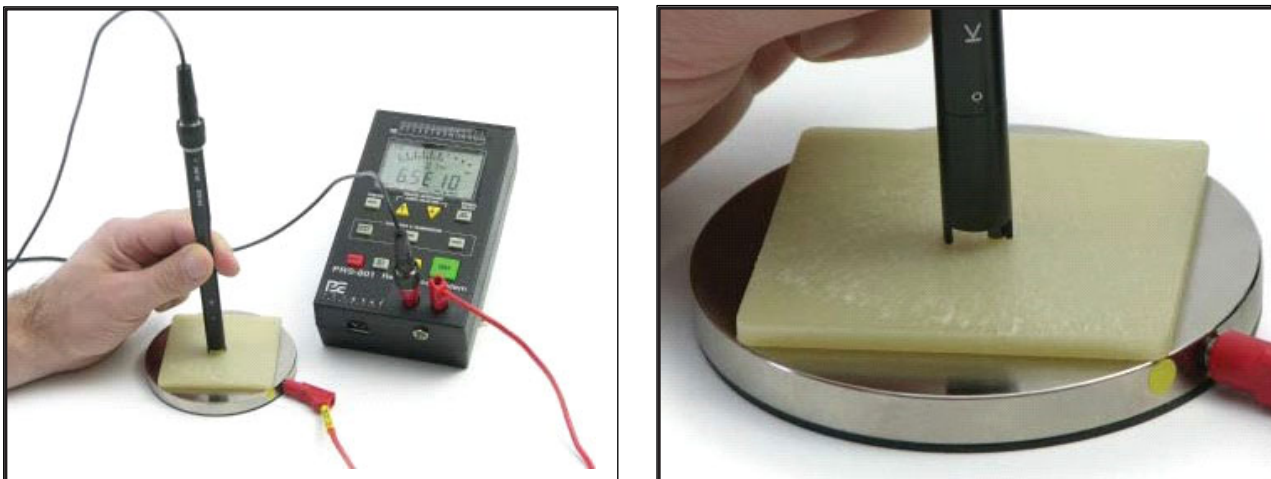


Figure 12. Setup for probe measurement of a material or device as described in ANSI/ESD STM11.13.



NOTE!

Note that before the measurement, the metal test bed is temporarily grounded to dissipate existing charges on its surface. The Operator should also be properly grounded to avoid body charges influencing the measurement.

05 HANDLING AND MAINTENANCE

Maintenance of the Miniature Probes

1. Store the miniature probe in a clean, dry environment with both BNC and Probe covers installed for environmental and mechanical protection.
2. Periodically, remove all spring-loaded test pins. Clean the spring-loaded test probes and Teflon mounting disk with a solution of laboratory grade isopropyl alcohol and a lint-less cloth, or laboratory quality swab. Allow components to dry thoroughly before re-assembling.



Figure 13. Removing the pins on the PRF-912B



Figure 14. Removing the pins on the PRF-922B

- a. Remove each test probe individually by grasping it firmly then pulling it straight out of its socket.
- b. Inspect each probe for damage, then clean with the alcohol solution. If a probe is damaged, i.e., bent, does not compress smoothly, or has deep surface scratches, replace it with a new probe of the same size and characteristics. (Contact Prostat

Corporation, Customer Service for spare replacement probes.)

- c. Clean and dry the Teflon mounting disk twice to insure cleanliness
 - d. Carefully re-install the spring-loaded test probes, and fully re-seat them in their sockets
3. After cleaning, perform continuity, high resistance and verifier checks.

Using the Conductive Rubber Boots and Rings

Measurements obtained without the use of conductive rubber boots will simulate material contact by metal objects. In this situation, contact resistance is high and the resulting measurements will be higher than those obtained using conductive rubber boots. (Figures 15 & 16).

Conductive rubber boots are used to reduce contact resistance between the electrodes and material under test. Measurements made with boots installed are typically lower than those obtained without boots.



Figure 15. Rubber Boot and Ring on the PRF-912B



Figure 16. Rubber Boots on the PRF-922B

Maintenance of the PRV-913B Two-Point Dual Verification Fixture

1. Store the PRV-913B in a clean, dry environment.
2. Periodically, clean and dry the gold fixture contact segments twice with a solution of laboratory grade isopropyl alcohol and laboratory quality swab

Calibration Information

The miniature probes and verification fixture's specifications are based on a 1 year calibration cycle. Recalibration must be done by qualified personnel. Contact your local Prostat Authorized Calibration Lab for more information about recalibration.

Replacement Parts and Accessories

Table 2 is a list of user-replaceable parts for the resistance meter models. To order replacement parts, contact your Authorized Reseller. **Table 3** is a list of compatible resistance meters.

Part No.	Description
PRF-912B	Miniature Concentric Ring
PRF-922B	Miniature Two-Point Probe
PRV-913B	Dual Verification Fixture
PRF-900L	Adapter Lead
PRF-900C	Pin Protective Cap
900-002	Rubber BNC Protective Cap
PRF-900LP	Long Pin for PRF-912B, PRF-922B
PRF-900SP	Short Pin for PRF-912B
PRF-900STOP	Stopper for PRF-912B
PRF-MR55	Set of 5 Rings and 5 Boots (for the PRF-912B)
PRF-MR10	Set of 10 Boots (for the PRF-922B)

Table 2. Replacement Parts and Accessories

The Prostat meters listed below are compatible with the probes. For more information about these accessories and their prices, contact a Prostat Authorized Reseller.

Part No.	Description
PRS-801B	Resistance System
PRS-812B	Resistance Meter
PAS-853B	Wide Range Ohmmeter

Table 3. Compatible Resistance Meters



QUESTIONS OR COMMENTS?

CALL	OR VISIT US ONLINE AT	WRITE
1-855-STATIC1 (782-8421)	www.prostatcorp.com/contact-us	Prostat Corporation 399 Wall Street, Suite G Glendale Heights, IL 60139

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