MINIATURE TWO-POINT PROBE SET

PRF-922B

User Manual

PROSTAT®

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PROSTAT® PRF-922B MINIATURE TWO-POINT PROBE SET

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I. Introduction & Description

The PRF-922B Miniature Two-Point Resistance Fixture Set accurately measures surface resistance of small areas. It consists of a PRF-922B Two-Point Resistance Fixture assembly, shielded cable equipped with BNC connectors; probe cover, and a BNC to male banana adapter.

The PRF-922B works in conjunction with a wide range resistance instrument, such as the Prostat PRS-801B Resistance System, the PRS-812B Resistance Meter or the PAS-853B Wide Range Ohmmeter, and an insulated test bed. This instrument and fixture combination provides direct point-to-point resistance measurements in ohms across the sur- face of small parts and assemblies.

Figure 1: PRF-922B Miniature Two-Point Resistance Fixture Measurement Set.

A. PRF-922B Two-Point Resistance Fixture Description

This precision fixture 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. The resistance measurement range of the PRF-922B fixture is 0.90 ohms at <10 volts to 1.0E+12 ($1.0x10^{12}$) ohms at 100 volts.

2. 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.

3. The contact assembly’s outer housing incorporates “stops” that insure consistent contact pressure during measurement.

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

II. Cautions & Warnings

As with any electrical device, use proper electrical precautions and measurement practices to avoid personnel shock. Read this manual in its entirety before attempting to use these products.

NOTE

This manual displays Cautions and Warnings alerting the user to hazardous operation and servicing conditions. **CAUTION** or **WARNING** headings throughout this publication flag this information, where appropriate. Follow all Caution and Warning instructions at all times.

A. Use of Measurement Power Supply

1. The PRF-922B 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.

   a. If used with the Prostat 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.

   b. To avoid shock, operating personnel should not touch the electrodes, or any exposed metallic parts of the PRF-922B fixture or cable assembly when power is applied to the probe.

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

   c. 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.

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

   d. 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.**

   e. Never, under any conditions, exceed 500 volts during fixture test or repair.

B. Other Operational Precautions

1. Do Not Use the PRF-922B Micro Probe if it fails to function during its continuity inspection test.

2. Do Not Use the PRF-922B Micro Probe if it becomes damaged in any way

3. Only Prostat Corporation authorized, qualified repair personnel may open PRF-922B or PRV-913B housing, terminal assemblies, or perform product repair. Unauthorized opening of fixture or instrument housings, device tampering, or attempted repair will absolutely void product warranty and completely absolve Prostat Corporation, its employees, suppliers and representatives of any responsibility, liability, or other, whatsoever.

WARNING
Unauthorized opening of fixture or instrument housings, device tampering, or attempted repair will absolutely void product warranty and completely absolve Prostat Corporation 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 PRF-922B Or PRV-913B In Damp Environments.** Always store devices with protective caps in place in a dry environment, preferably at ≤ 20% Relative Humidity.

CAUTION

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

6. Do not use these fixtures and devices in combustible or explosive environments.

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.

7. Do not attempt to measure energized materials, items or circuits with the PRF-922B
8. The PRF-922B 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.

III. PRF-922B Micro Probe & PRV-913B Verifier Operations

A. PRF-922B Setup

1. Connect measurement cable to PRF-922B
    a. Remove black rubber protective cover from PRF-922B's BNC connection.
    b. Attach shielded cable to the probe's BNC connection (Figure 2).
2. Connect measurement cable to Dual Banana BNC Converter (Figure 3).

Figure 2: Connect shielded cable to PRF-922B's BNC fixture

Figure 3: PRF-922B with Cable attached

3. Once the cable is installed the PRF-922B is ready for continuity test, verification and.

4. To use, connect BNC end of the cable to a wide range, resistance instrument with ¾ inch terminal spacing. Flange side of dual banana should be connected to the Positive (+) power terminal.

B. Confirming Proper BNC Connections, Continuity & High Resistance Tests

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

1. To confirm general setup and function of the PRF-922B, place the electrodes against a clean metal surface. For example, the plated metal side of the Prostat PTB-920, Dual Surface Test Bed.

   a. Hold the PRF-922B vertically, and apply pressure to slightly compress the electrodes, making positive contact with the metal surface.

   b. Activate the wide range, resistance instrument to obtain a measurement.

      (1) In the case where the Prostat PRS-801B is the measurement instrument, it should measure approximately 1.00 ohm, or less.

      (2) With other instruments, they should provide a LOW resistance indication. For example, $<10^4$ ohms when using the PRS-801B Resistance Meter.

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 PRF-922B vertically, and apply pressure to compress the electrodes, making positive contact with the insulated surface.

b. Activate the wide range, resistance instrument to obtain a measurement.

(1) In the case where the PRS-801B is the measurement instrument, it should measure $1.00x10^{12}$ ohms, or greater.

(2) With other instruments, they should provide a HIGH resistance indication. For example, 10^{12} or $>10^{12}$ ohms.

(3) or approximately 10^{11} ohms when using the PRS-801B Resistance Meter

C. PRF-922B Verification Using the PRV-913B Two-Point verification fixture

1. Connect the BNC/banana adapter to the wide range, resistance measurement instrument. Flange side of dual banana should be connected to the Positive (+) power terminal. This applies test voltage to the 10 outer ring electrodes.

2. Remove PRF-922B Probe Cover (Figure 5).

3. Position PRF-922B vertically into the PRV-913B Two-Point Verifier with its spring loaded pin electrodes making direct contact with the Verifier's gold plated test segments.

4. Depending on your resistance instrument select either 10V or 100V test voltage.

5. Measure PRF-922B probe resistance while positioned in the PRV-913B Two-Point Verifier. Resistance should be $1.00x10^{6}$ ohms ±5%.

Figure 5: Remove Probe Cover

D. Basic Measurements Using the PRF-922B Micro Probe

1. Place 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.

2. Position the PRF-922B vertically directly over test area and lower it until the spring loaded center electrode makes direct contact with the material under test.

3. Apply sufficient pressure on the probe until the center and outer spring loaded electrode are partially compressed while in contact with the test material.

Figure 6: Insert PRF-922B Fixture into PRV-913B Two-Point Verifier and Measure Verifier Resistance

IMPORTANT NOTE
Adjust probe pressure to insure 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 insure reproducible measurements.

4. Select appropriate instrument test voltage and initiate resistance measurement. ESD Association ANSI/ESD STM11.13 test voltage guidelines for measuring packaging materials are as follows:

   a. For material resistance measurements of less than $1.0x10^4$ ohms, use <10 volts.

   b. For measurements of $1.0x10^4$ to $<1.0x10^6$ ohms, use 10 volts.

   c. For measurements greater than $1.0x10^6$ 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.

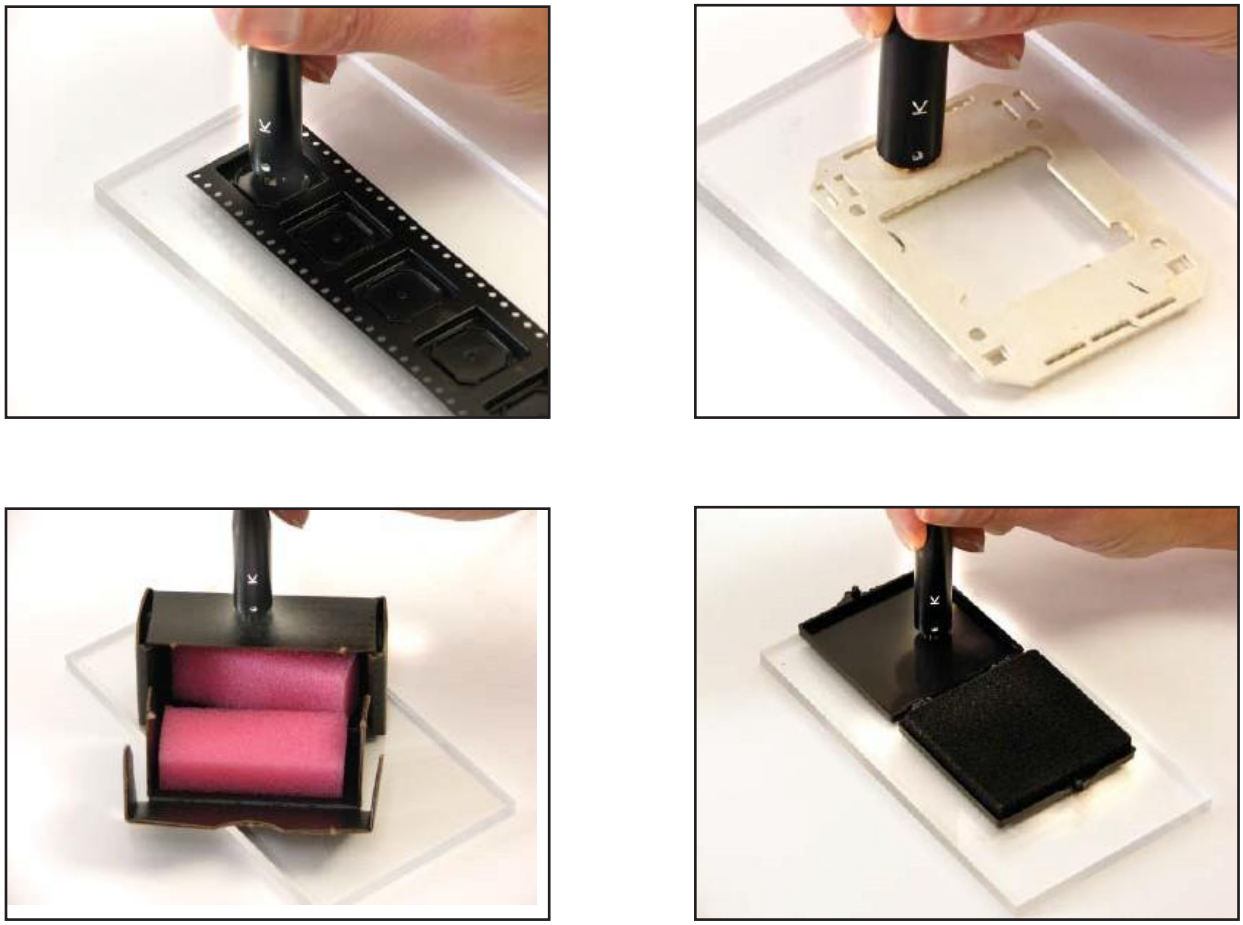

Figure 7: Measurement Illustrations Using the Prostat PRF-922B Fixture

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

A. Define pin continuity as shown in Figure 8. Using a continuity instrument such as a multimeter, measure from each fixture pin to the BNC/Banana Adapter installed at the end of the shielded cable. On the PRF-922B 2-Point fixture this determines the probe pin that is connected to the shielded cable and BNC/Banana Adapter. It also confirms measurement continuity through the fixture.

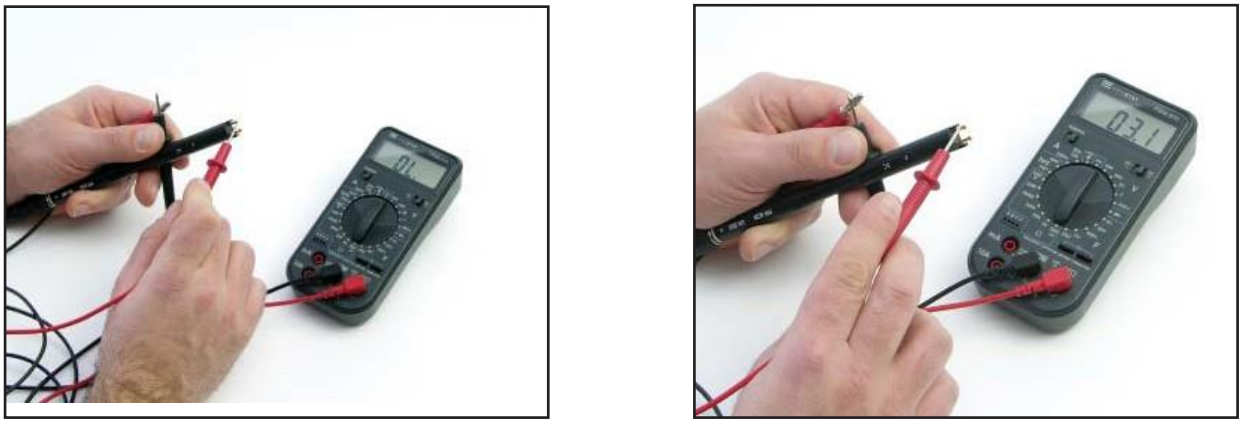

Figure 8: Measure pin continuity to the adapter banana to identify active measuring pin.

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

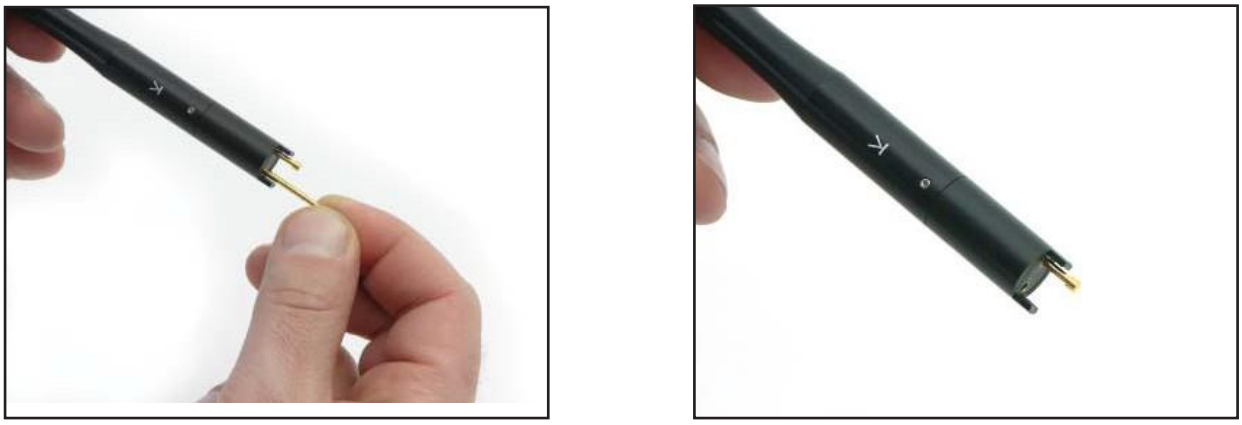

Figure 9: Removing the inactive pin helps identify point of actual measurement by the active pin.

C. Once pin continuity is determined and connection confirmed, install a conductive rubber boot on the active measurement pin as shown below as shown in Figure 5. The boot reduces contact resistance and enhances measurement repeatability. It is required by ANSI/ESD STM11.13.

V. Material & Device Measurements with Single Pin 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 Prostat PTB-920 Test Bed. This insures that only the material is being measured and the measurement is not affected by voltage variables on ground. 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.

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 BNC/Banana Adapter 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. Proper measurement setup is shown below in Figure 10.

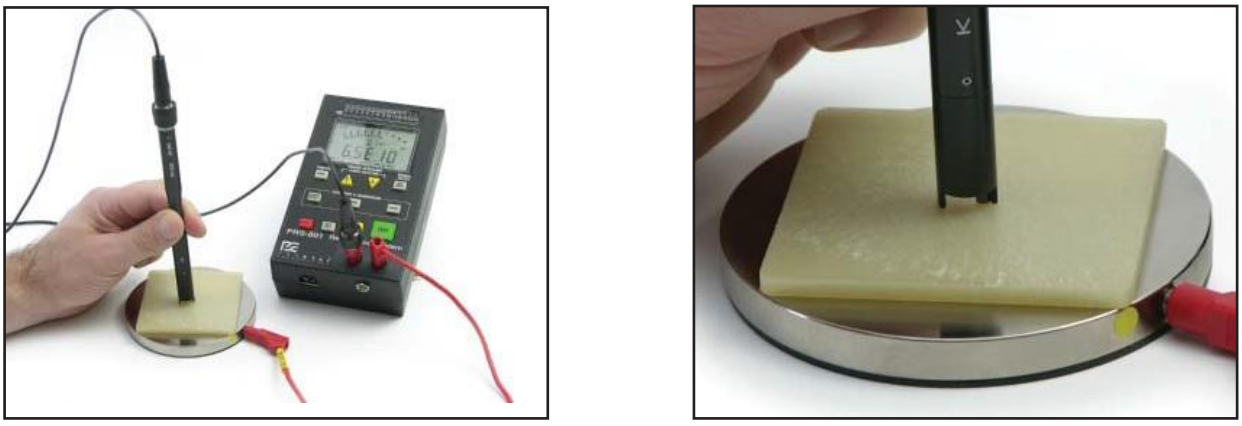

Figure 10: Measurement setup for probe measurement of a material or device as described in ANSI/ESD STM11.13

Figure 7 shows the classic setup for measurement of a material's resistance in accordance with ANSI/ESD STM11.12 Volume Resistance. It also provides an indication of the material's probable resistance to ground (Rtg) when in use and while in contact with a grounded conductive surface. Note that this measurement is not an actual Rtg measurement. It is simply an indication that the material or DUT may be Groundable, depending on its measured resistance characteristics.

VI. Resistance to Ground (Rtg) Measurements

Rtg measurements are made on installed materials, or assemblies while used in the manufacturing process. ESD control materials and tools are intended to function while properly grounded. Rtg measurement confirms the material is (a) actually grounded, and (b) the total resistance of the material when grounded is within the ESD program requirements. There are many process elements that must be confirmed as grounded and within program requirements using Rtg. Examples of are:

- Floors, worksurfaces, chairs, carts
- Device trays when loaded into equipment
- Critical equipment parts, tools, assembly fixtures
- …and many others

Rtg measurements are made with the positive (+) instrument lead connected directly to the facility's equipment ground system (or auxiliary ground, if used), and the test probe connected to the instruments negative (-) terminal as previously described above. During the measurement, test voltage is applied to the ground system and current is measured on the installed material or device under test by the single point probe.

Often, Rtg measurement is described as a "system measurement" that includes additional materials, objects, devices and connections in series with the device under test and ground. Examples of Rtg system measurements are described below.

Device Tray in Feeder Equipment: This measurement confirms continuity from the tray to ground through several elements
- Paint on tray contact surface
- Support shelf
- Shelf support and control linkage
- Shelf linkage to machine frame support
- Machine frame to ground

Device Transport Cart: This Rtg measurement combines equipment components with the environments floor surface, including:
- Cart shelf surface
- Cart frame
- Cart wheels
- Floor surface to ground

Assembly Fixture at Workstation: Rtg measurement from the fixture may include several elements, depending on how it is installed, such as:
- The fixture's device holding assembly
- Fixture frame
- Workstation surface supporting the fixture
- Workstation surface to the workstation's frame
- Workstation frame to ground

The photo in Figure 8 is an Rtg measurement of a tray on a worksurface mat. In this configuration the resistance measurement includes the tray, the mat, the mat connections and wiring to ground. Notice that the positive test lead is separately connected to ground.

VII. Handling & Maintenance

A. PRF-922B Miniature Two-Point Probe Fixture

1. Store the PRF-922B 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.

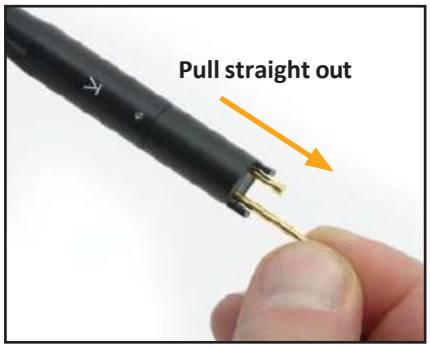

Figure 11: Remove Spring-Loaded probe electrode by grasping firmly and pulling straight out of its socket.

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 Veri fier checks.

B. Use of Conductive Rubber Electrode “Boots” to Reduce Contact Resistance

1. Measurements obtained without 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. (Figure 9)

2. 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 9: Installing Conductive Rubber Electrode “Boots”

C. 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.

V. Warranty Information

A. Prostat Warranty

Prostat Corporation expressly warrants that for a period of one (1) year from the date of purchase, that Prostat instruments will be free from defects in material (parts) and workmanship (labor). If Prostat receives notice of such defect during the warranty period, Prostat will replace at its expense such parts that it determines to be defective. Any defective part must be returned to PROSTAT postage prepaid with proof of purchase date.

Warranty Exclusions – THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESS 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 PROSTAT or any seller be responsible or liable for special, incidental, or consequential losses or damages, under any legal theory including but not limited to contract, negligence, or strict liability.

Fulfillment by Prostat of its express warranty obligations described above will be purchaser’s exclusive remedy and will be Prostat’s and seller’s limit of liability for any breach of warranty or otherwise.

B. Shipping of Warranty Returns

1. Obtain a Return Materials Authorization (RMA) number and shipping address from Prostat customer service. Pack the instrument carefully and ship it prepaid and insured to the proper destination provided by Prostat’s customer service department.

2. For detailed shipping instructions and Return Materials Authorization (RMA), contact Prostat.

C. Shipping Non-Warranty Items

1. Any Prostat product returned for non-warranty repair or calibration requires a Return Materials Authorization (RMA) number and should be packaged and shipped as described above, and as directed by Prostat's customer service department.

2. The following information must be included with the returned product:

   a. Description of the problem

   b. Customer's Purchase Order Number & Prostat's Materials Authorization (RMA) number

   c. Name, telephone number and fax number of individual contact who can provide more information regarding the problem and related application(s).

   d. Complete return address.

PRF-922B Two-Point Probe Specifications

PRF-922B Miniature Two-Point

Physical Dimensions:	Length: 6.75 inches (171mm) without probe covers. 8.25 inches (210mm) with probe covers. Probe diameter 0.49 inches (12.45mm). Probe cover outer diameter 0.60 inches (15.25mm).
Probe Weight:	2.0 ounces (58 grams)
Finish:	Black anodized
Dielectric Material:	Teflon
Contact Dimensions:	Inner (Center) Contact Probe: 0.1 inches (2.54mm)
Min Sample Size:	**Planar material:** 0.125” (3.175mm) wide having a length of 0.325” (8.26mm) **Molded parts (3 dimensional):** 0.491” (12.46mm) diameter
Probe Spring Force/Test:	1.5 pounds (0.68 kg)
Probe Total Travel:	0.25 inches (6.4mm) Self-limited
Connection:	BNC with outer source and inner sense connections
Power:	Not applicable. Fixture powered by resistance instrument.
Warranty:	Prostat Corporation, Limited one year

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Specifications are subject to change without notice.

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