

## Miniature Concentric Ring Fixture Set PRF-912B & PRV-913B



Operations Manual

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**PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set**

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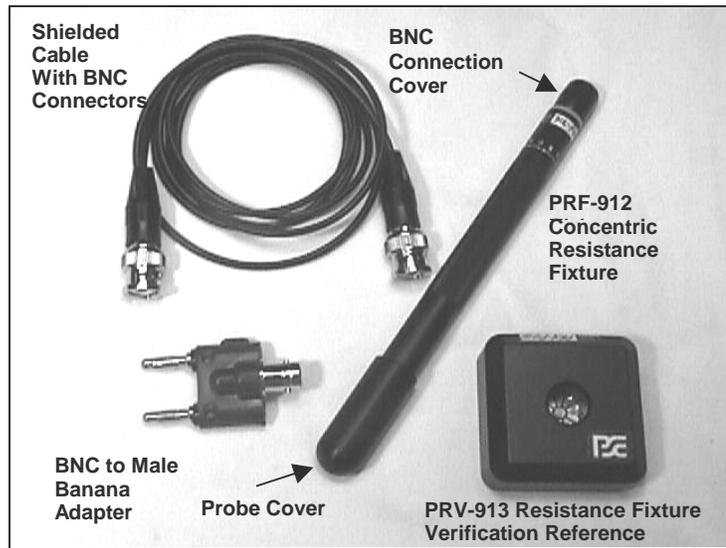
**TABLE OF CONTENTS****PROSTAT® PRF-912B & PRV-913B MINIATURE CONCENTRIC RING FIXTURE SET**

<u>Title</u>	<u>Page #</u>
I. Introduction & Description .....	3
II. Cautions & Warnings .....	6
III. PRF-912B Micro Probe & PRV-913B Verifier Operations.....	8
IV. Handling & Maintenance .....	12
V. Warranty Information.....	13
General Specifications .....	15

## PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set

### I. Introduction & Description

The PRF-912B Miniature Concentric Resistance Fixture accurately measures surface resistance of small areas. It consists of a PRF-912B Concentric Resistance Fixture, shielded cable equipped with BNC connectors, and a BNC to male banana connectors adapter. The **optional** PRV-913B Dual Verification Fixture is designed to confirm the proper operation of the PRF-912B and high resistance PRF-914B Miniature Concentric Resistance Fixtures.



**Figure 1: PRF-912B Miniature Concentric Resistance Fixture Measurement Set with Optional PRV-913B Dual Verification Fixture.**

The PRF-912B is designed to work in conjunction with a precision wide range resistance instrument, such as the PROSTAT PRS-801 Resistance System, and an insulated test bed (e.g., PTB-920 or equivalent). This instrument and fixture combination provides direct surface resistance measurements in ohms, generally in accordance with the ESD Association's S11.11 Surface Resistance test standard. To obtain an estimate of ASTM D-257 Surface Resistivity in ohms/square, simply multiply the PRF-912 fixture measurement by 10, i.e., add one order of magnitude.

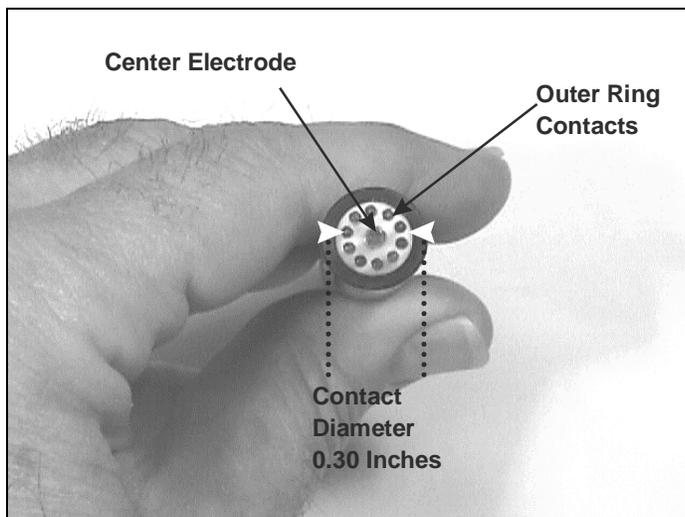
#### A. PRF-912B Concentric Resistance Fixture Description

This precision fixture is designed in miniature to approximate surface resistance measurements typically obtained with the ESD Association's ESD S11.11 Surface Resistance Standard fixture. The PRF-912B, however, is approximately 1/10<sup>th</sup> the size of the S11.11 fixture. Based on its size the PRF-912B is often referred to as a "micro probe".

1. The resistance measurement range of the PRF-912B fixture is 0.9 ohms at <10 volts to 1.0E+12 (1.0x10<sup>12</sup>) ohms at 100 volts.
2. The miniature concentric fixture consists of a spring loaded 0.10 inch (2.54 mm) diameter center electrode surrounded by 10 each 0.06 inch (1.5 mm) diameter contact electrodes that electrically form a continuous outer ring. (Figure 2) Contacts are pogo-pin type ATE quality probes made of beryllium Copper coated with 60 microinch of hard Gold.

## PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set

- a. 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 RG-174 coaxial cable's inner conductor, BNC coupler and dual BNC/Banana adapter.
- b. 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. They are connected to the positive (+) terminal of the wide range measurement instrument via the RG-174 coaxial cable's outer conductor, BNC coupler and dual BNC/Banana adapter.
- c. 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.



**Figure 2: Concentric Ring Configuration**

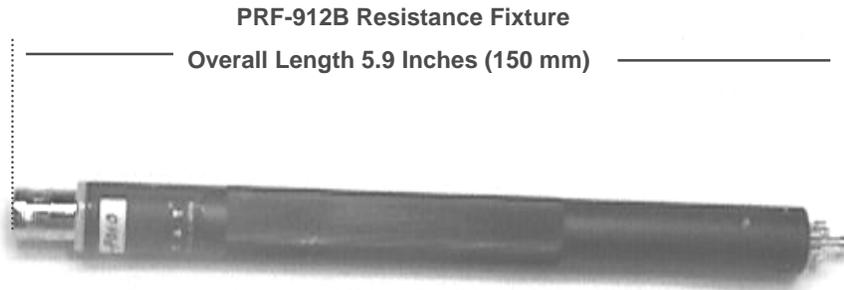
adapter and instructions

6. Optional accessories include the PRV-913B Dual Fixture Verification Reference, described below.

3. The PRF-912B resistance fixture approximates the same measurements obtained when using a standard ESD Association Standard ANSI/ESD S11.11 concentric ring fixture.
4. Overall size of the PRF-912B is 0.50 inches in diameter by 5.9 inches (150 mm) long. (Figure 3) This optimal size and shape make the fixture very comfortable and easy to handle. Its outer housing is made of black anodized aluminum.
5. PRF-912B Standard accessories include protective cover, one RG-174 cable, a BNC/banana

## PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set

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**Figure 3: PRF-912B Profile with protective covers removed**

### B. PRV-913B Dual Verification Fixture Description

1. Approximately 2 inches (50.1mm) square by 0.82 inches (21mm) thick, the PRV-913B is designed to confirm the proper function of the PRF-912B, PRF-914B and PRF-922B Microprobe Resistance Fixtures. It consists of a high quality black anodized housing and circuit board incorporating an array of ten (10) each 10 megohm precision ( $\pm 2\%$ ) resistors in parallel, connecting the center pad to each of the ten peripheral trace pads, it provides a specific reference resistance of  $1.0 \times 10^6$  ohms ( $\pm 5\%$ ) on the concentric ring side.

On the other side, it consists of a circuit board containing 1 each, 1 megohm (1%) resistor connecting two peripheral trace pads. It provides a specific reference resistance of  $1.0 \times 10^6$  ohms ( $\pm 1\%$ ) on the two-point side.



**Figure 4: PRV-913B Resistance Verification Reference**

outer ring

2. Properly used, the PRV-913B insures that all PRF-912B & PRF-914B spring loaded test probes make defined contact with the reference surface. It has the capability of providing a 1-megohm ( $1.0 \times 10^6$  ohm) reference measurement with a theoretical maximum total variance of  $9.5 \times 10^5$  to  $1.05 \times 10^6$  ohms. Typical reference measurements range from  $1.01 \times 10^6$  to  $1.03 \times 10^6$  ohms, i.e., equal to or less than +3% error.
3. PRV-913B fixture contact surfaces consist of copper substrates, finished with nickel and hard Gold plating.
  - a. To accommodate the PRF-912B or 914B center electrode a single gold contact point is positioned at the center of the PRV-913B Verification Test Surface.

The center position is connected to the ten individual trace pads by the ten, 10 megohm resistors.

## 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.

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-912B 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-801 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-912B 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**.

**PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set**

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

**B. Other Operational Precautions**

1. **Do Not Use the PRF-912B Micro Probe** if it fails to function during its continuity inspection test.
2. **Do Not Use the PRF-912B Micro Probe** if it becomes damaged in any way
3. **Only Prostat Corporation authorized**, qualified repair personnel may open PRF-912B 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-912B Or PRV-913B In Damp Environments** Always store devices with protective caps in place in a dry environment, preferably at  $\leq 20\%$  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.

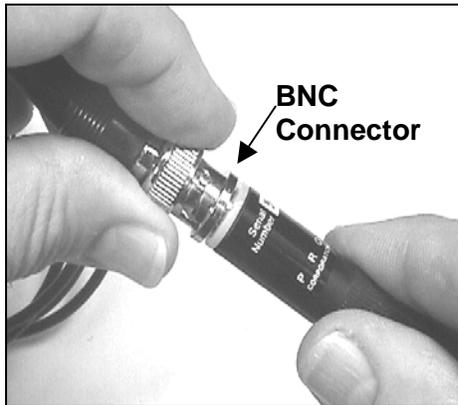
7. **Do not** attempt to measure energized materials, items or circuits with the PRF-912B

## PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set

8. The PRF-912B 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-912B Micro Probe & PRV-913B Verifier Operations

#### A. PRF-912B Setup

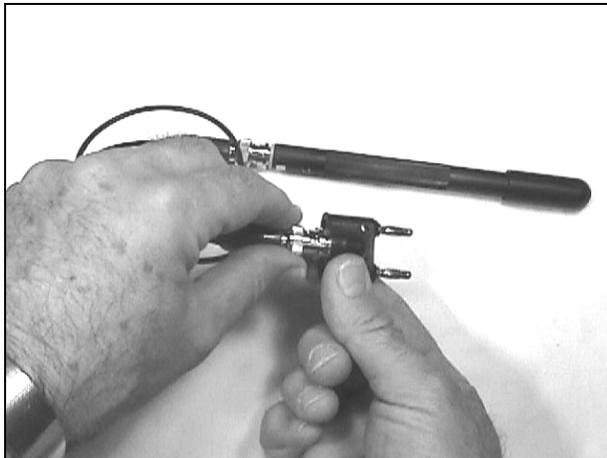


**Figure 5: Connect shielded cable to PRF-912B's BNC fixture**

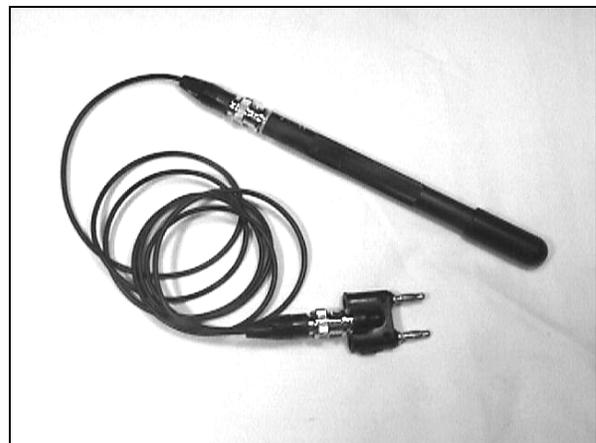
1. Connect measurement cable to PRF-912B
  - a. Remove black rubber protective cover from PRF-912B's BNC connection
  - b. Attach shielded cable to the probe's BNC connection (Figure 5).

Note that the BNC connection system is based on a "bayonet" design. Locate the 2 locking studs on the fixture's male connector. Match them to grooves of the female connector. Then simply push and twist the female clockwise until it locks on to the fixture.

2. Connect measurement cable to Dual Banana BNC Converter (Figure 6).



**Figure 6: Connect Cable to Banana Converter**



**Figure 7: PRF-912B with Cable & Banana Converter**

## PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set

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3. Once the cable and BNC adapter are installed the PRF-912B is ready for continuity test, verification and use
4. To use, connect dual banana converter to wide range, resistance instrument with  $\frac{3}{4}$  inch terminal spacing. Flange side of dual banana should be connected to the Positive (+) power terminal.

NOTE: To remove BNC connections, apply slight pressure and twist connector counter clockwise.

### 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.

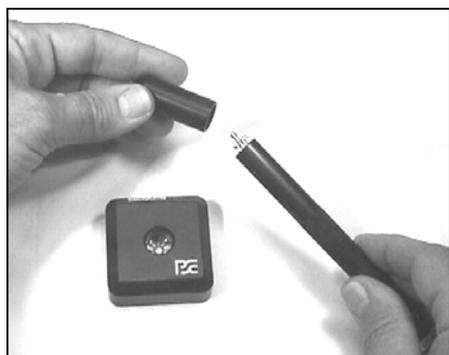
1. To confirm general setup and function of the PRF-912B, place the electrodes against a clean metal surface. For example, the plated metal side of the Prostat PTB-920, Dual Surface Test Bed.
  - a. Hold the PRF-912B vertically, and apply pressure to slightly compress the electrodes, making positive contact with the metal surface.
  - b. Activate the wide range, resistance instrument to obtain a measurement.
    - (1) In the case where the Prostat PRS-801 is the measurement instrument, it should measure approximately 1.0 ohm, or less.
    - (2) With other instruments, they should provide a LOW resistance indication. For example,  $<10^3$  ohms when using the Prostat PSI-870 Resistance Indicator, or  $<10^4$  ohms when using the Prostat PRS-800 analog Megohmmeter.
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-912B 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 Prostat PRS-801 is the measurement instrument, it should measure  $1.0 \times 10^{12}$  ohms, or greater.
    - (2) With other instruments, they should provide a HIGH resistance indication. For example,  $10^{12}$  or  $>10^{12}$  ohms when using the Prostat PSI-870 Resistance

## PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set

- (3) Indicator, or approximately  $10^{11}$  ohms when using the Prostat PRS-800 analog Megohmmeter.

### C. PRF-912B Verification Using the PRV-913B

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.



**Figure 8: Remove Probe Cover**

2. Remove PRF-912B Probe Cover (Figure 8).
3. Position PRF-912B vertically into the PRV-913B Verifier with its spring loaded pin electrodes making direct contact with the Verifier's gold plated test segments.



**Figure 9: Insert PRF-912B Fixture into PRV-913B Verifier and Measure Verifier Resistance**

4. Depending on your resistance instrument select either 10V or 100V test voltage.
5. Measure PRF-912B probe resistance while positioned in the PRV-913B Verifier. Resistance should be  $1.0 \times 10^6$  ohms  $\pm 1\%$ .

### D. Basic Measurements Using the PRF-912B 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-912B 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.

**PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set**

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**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 S11.11 test voltage guidelines for measuring packaging materials are as follows:
  - a. For material resistance measurements of less than  $1.0 \times 10^4$  ohms, use  $<10$  volts.
  - b. For measurements of  $1.0 \times 10^4$  to  $<1.0 \times 10^6$  ohms, use 10 volts.
  - c. For measurements greater than  $1.0 \times 10^6$  ohms, use 100 volts

NOTE: For optimal performance and accuracy, use the Prostat PRS-801 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.

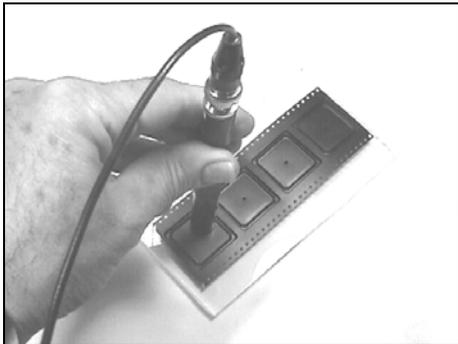


Figure 10: Measuring Carrier Tape

Measurement Illustrations  
Using the PROSTAT PRF-  
912B Fixture

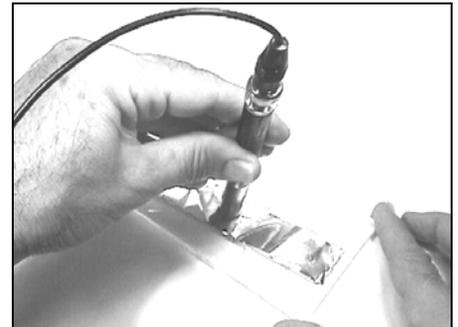


Figure 11: Measuring Tape & Foil

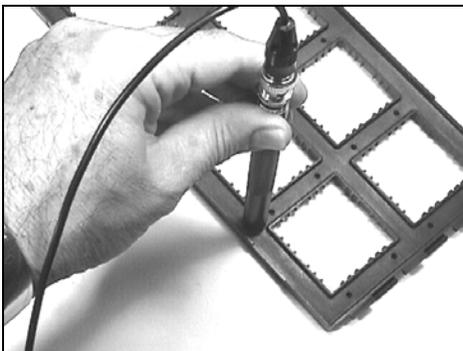


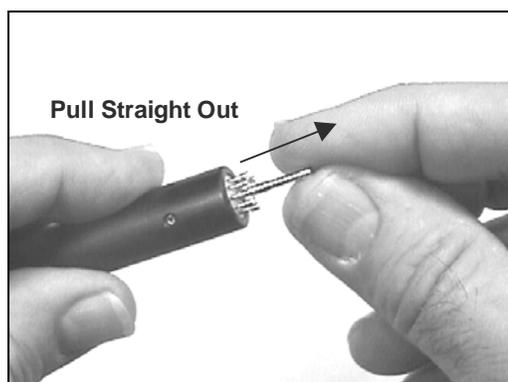
Figure 12: Measuring Device Tray



Figure 13: Measuring Formed Tray

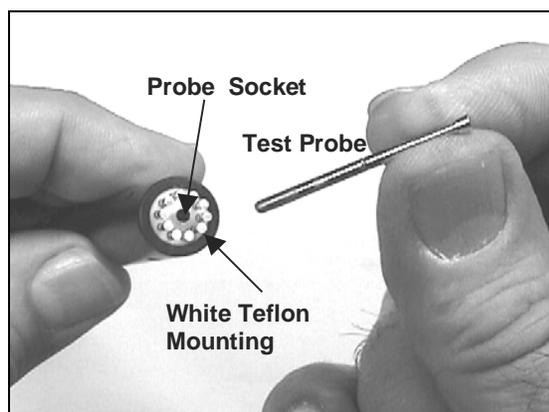
#### IV. Handling & Maintenance

1. Store the PRF-912B 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.

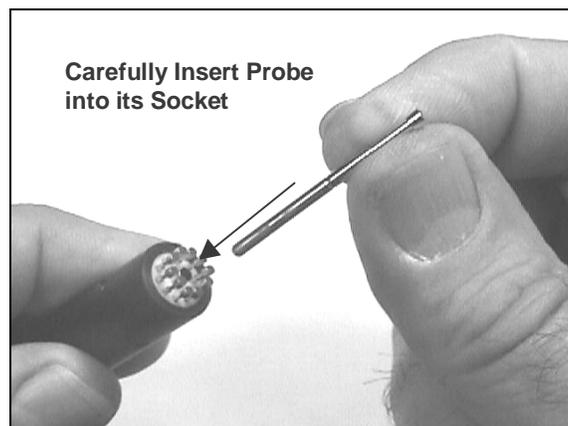


**Figure 14: Remove Spring-Loaded probe electrode by grasping firmly and pulling straight out of its socket.**

- 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



**Figure 15: View of PRF-912B Spring-Loaded Test Pins, Socket & Teflon Mounting Disk**



**Figure 16: Insert Test Probe into its Socket and Press Firmly to fully seat**

3. After cleaning, perform Continuity, High Resistance and Verifier checks.

**PRF-912B & PRV-913V Miniature Concentric Ring Fixture Set**

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## A. PRV-913B 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. Instrument Maintenance

**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.

<p>DO NOT RETURN ANY ITEM WITHOUT HAVING FIRST RECEIVED A RETURN MATERIALS AUTHORIZATION (RMA) NUMBER FROM PROSTAT</p>
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2. For detailed shipping instructions and Return Materials Authorization (RMA), contact:

**PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set**

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Prostat Corporation  
1072 Tower Lane  
Bensenville, IL 60106  
Telephone: (630) 238-8883  
Fax: (630) 238-9717

**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-912B & PRV-913V Miniature Concentric Ring Fixture Set**

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**PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set Specifications**PRF-912B Miniature Concentric Ring

Physical Dimensions: Length: 5.9 inches (150mm) without probe cover. 6.5 inches (165mm) with probe cover. Probe diameter 0.5 inches (12.7mm). Probe cover outer diameter 0.63 inches (16mm).

Probe Weight: 1.5 ounces (43 grams)

Finish: Black anodized

Dielectric Material: Teflon

Contact Dimensions: Inner (Center) Contact Probe: 0.1 inches (2.54mm)  
Outer Contact Probes: Ten each 0.06 inches (1.59mm) diameter at 0.258 inches (6.56mm) bolt circle.

Min. Sample Size: 0.32 inches (8.2mm) diameter

Probe Spring Force/Test: 3.5 pounds (1.6 kg)

Probe Total Travel: 0.3 inches (7.8mm)

Connection: BNC with outer source and inner sense connections

Cable: RG-174 coaxial cable equipped with insulated BNC couplers, and BNC/Banana adapter for connection to Prostat PRS-801 Resistance System.

Power: Not applicable. Fixture powered by resistance instrument.

Warranty: Prostat Corporation, Limited one year

PRV-913B Dual Verification Fixture

Physical Dimensions: 2.0 in x 2.0 in x 0.83 in (50.1mm x 50.1mm x 21mm)

Fixture Weight: 5.29 ounces (150 grams)

Finish: Black anodized

Contact Pads: Copper substrate with nickel and hard gold plating

Resistors:  $\pm 2\%$  precision, 10-megohm resistors, total of 10 (Concentric Ring Side)  
 $\pm 2\%$  precision, 1 each 10-megohm resistor (2-Point Side)

Power: Not applicable. Powered by PRF-912B during test

Warranty: Prostat Corporation, Limited one year

**PRF-912B & PRV-913B Miniature Concentric Ring Fixture Set**

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