MINIATURE CONCENTRIC RING FIXTURE

PRF-912B

User Manual

PROSTAT®

Table of Contents

PROSTAT® PRF-912B 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 con¬nectors adapter. The optional PRV-913B Dual Verification Fixture is designed to confirm the proper operation of the PRF-912B and PRF-922B Miniature Concentric Resistance Fixtures.

Figure 1: PRF-912B Miniature Concentric Resistance Probe.

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-912B 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 1/10th 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 ($1.0x10^{12}$) 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.

    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.

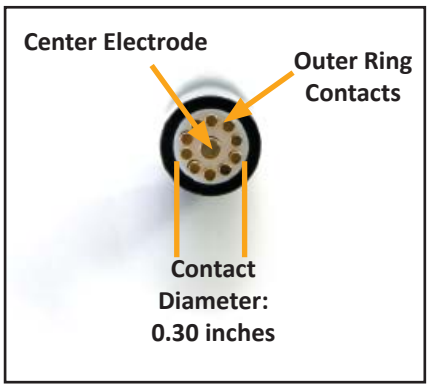

Figure 2: Concentric Ring Configu-ration

3. The PRF-912B resistance fixture approxi¬mates the same measurements obtained when using a standard ESD Associa tion 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 adapter and instructions

6. Optional accessories include the PRV-913B Dual Fixture Verifi cation Reference, de-scribed below.

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

B. PRV-913B Dual Verification Fixture Description

1. Approximately 2 inches (50.8mm) square by 1.12 inches (28.5mm) thick, the PRV-913B 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 (±1%) resistors in parallel, connecting the center pad to each of the ten peripheral trace pads. It provides a specific reference resistance of $1.0x10^6$ ohms (<±2%) for the Concentric Ring side of the fixture.

   The 2-Point Probe side of the fixture incorporates a $1.0x10^6$ ohms (<±1%) resistor connected across two test pads.

2. Properly used, the PRV-913B insures that all PRF-912B & PRF-922B spring loaded test probes make defined contact with the reference surface. It has the capability of providing a 1-megohm ($1.0x10^6$ ohm) reference measurement with a theoretical maximum total variance of $9.5x10^5$ to $1.05x10^6$ ohms. Typical reference measurements range from $1.01x10^6$ to $1.03x10^6$ 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.

Figure 4: PRV-913B Dual Verification Fixture

a. To accommodate the PRF-912B or PRF-922B center electrode a single gold contact point is positioned at the center of the PRV-913B Verification Test Surface.

b. The center position is connected to the ten individual outer ring race 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.

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-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.**

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 ≤ 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

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

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).

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

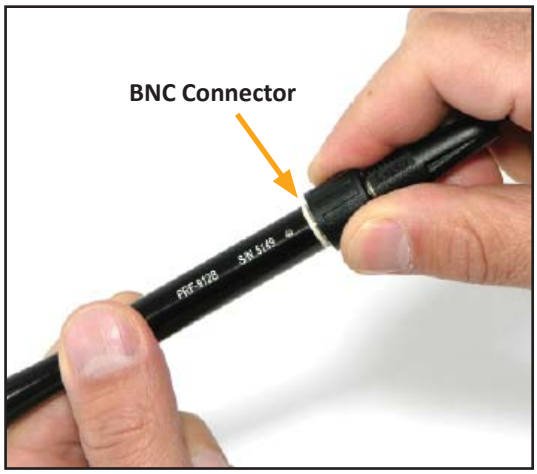

Figure 5: Connect shielded cable to PRF-912B's BNC fixture

Figure 6: PRF-912B with Cable & Banana Coverter

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 ¾ 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 ESD Check ESI-870 Resistance Indicator, or $<10^4$ ohms when using the PRS-801 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-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 $1.0x10^{12}$ 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 ESD Check ESI-870 Resistance Indicator

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

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

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

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 7: Remove Probe Cover

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 $1.0x10^6$ ohms ±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.

Figure 8: Insert PRF-912B Fixture into PRV-913B 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 S11.11 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-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.

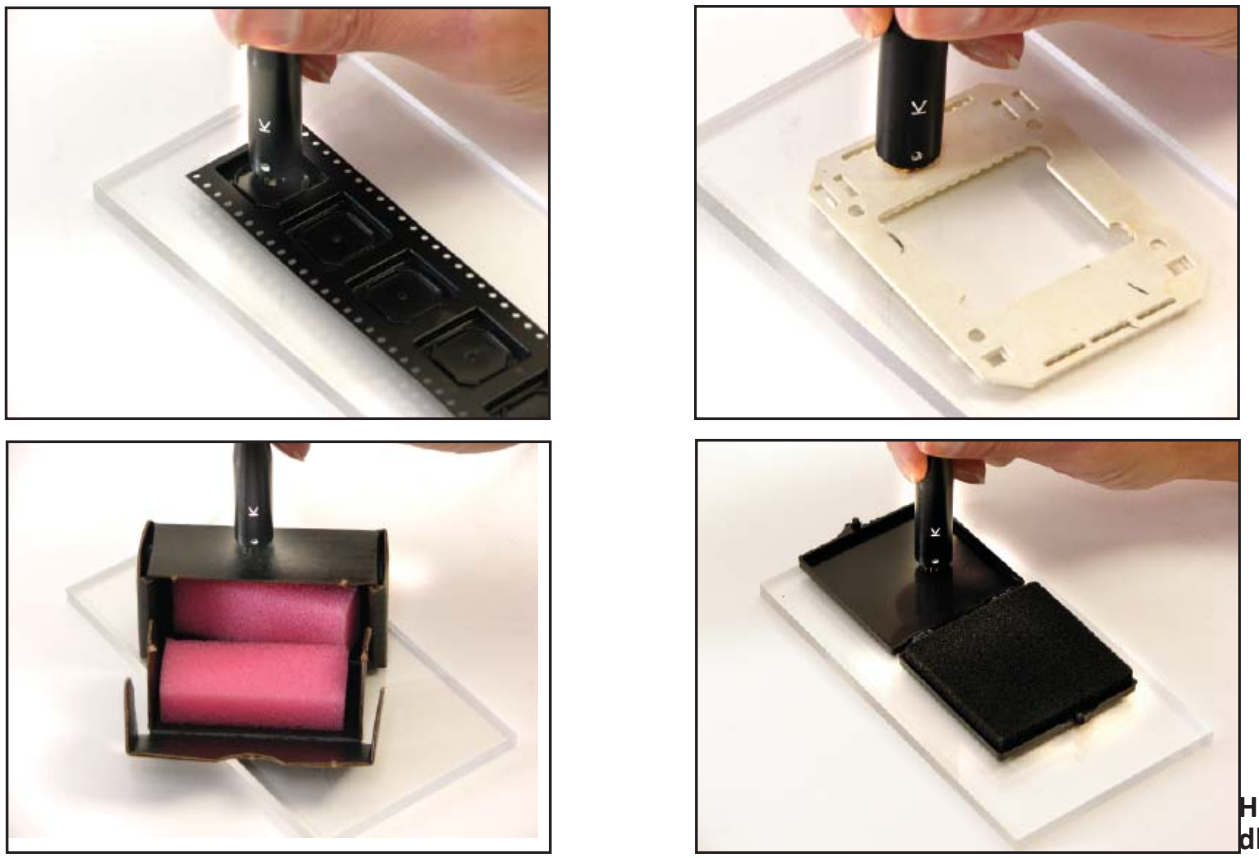

Figure 9: Measurement Illustrations Using the Prostat PRF-912B Fixture

Han-dling & 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 be fore re-assembling.

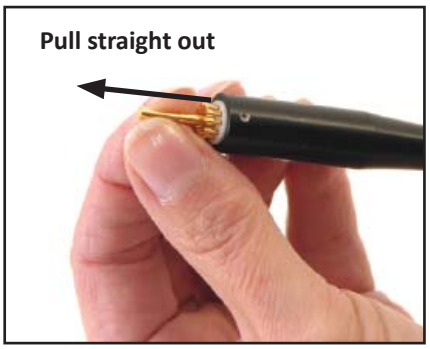

Figure 10: Remove Spring-Loaded probe electrode by grasping firmly and pulling straight out of its socket.

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

Figure 13: Insert Test Probe into its Socket and Press Firmly to fully seat

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

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.

V. Warranty Information

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.

F. 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 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-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.
Minimum 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

Dimensions:	2.0 in x 2.0 in x 1.12 in (50.8mm x 50.8mm x 28.5mm)
Weight:	5.29 ounces (150 grams)
Finish:	Black anodized
Contact Pads:	Copper substrate with nickel and hard gold plating
Resistors:	±2% precision, 10-megohm resistors, total of 10 (Concentric Ring Side) ±2% precision, 1 each 10-megohm resistor (2-Point Side)
Power:	Not applicable. Powered by PRF-912B during test

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Specifications are subject to change without notice.

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