

Resistance Meter PRS-812



Operations Manual

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PROSTAT® PRS-812 RESISTANCE METER

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I. Introduction & Description

The PRS-812 Resistance Meter makes precision resistance measurements from 0.1 up to 1.0×10^{12} ohms with an overall measurement tolerance of $\pm 5\%$. It is capable of measuring up to 2.0×10^{14} ohms with tolerance depending on procedures and conditions. The PRS-812's wide range and close tolerance make it the ideal ESD Auditing instrument for measuring resistance to a variety of ESD and general industry specifications. It is operated by programmed microprocessors that control the instrument's measurement process, resistance auto ranging, test voltage selection, electrification periods, and display functions. It can be operated in either fully automatic or manual modes, or a combination of automatic and manual modes.

The PRS-812 is unique in that it records and stores up to 80 resistance measurements in its own non-volatile memory register. Stored data is summarized with a push of a button.

Its accuracy is based on its ability to rapidly make several measurements each second, and average them until a stable set of eight measurements, all within 5% tolerance, are obtained. The final averaged data is displayed as the resistance measurement. Typically, measurements at less than 1 ohm are within 5% of tolerance, and those between 1.0 and 1.0×10^{12} ohms are within 0.5% of laboratory references.

While quite sophisticated in design, the PRS-812 Resistance Meter is easy to use and extremely helpful in making accurate ESD auditing measurements, or general resistance and continuity checks.



Figure 1: PRS-812 during Power Up

CAUTION

To avoid electrical shock or damage to the PRS-812 Resistance Meter, read this manual completely before installing batteries or using the instrument

A. Measurement Applications

The PRS-812 Resistance Meter is designed to measure resistance characteristics of electrostatic discharge (ESD) control materials and products to current ESD industry standards, including:

Wrist Straps (ESD S1.1)	Garments (ESD S2.1)	Flooring (ESD S7.1)
Worksurfaces (ESD S4.1)	Common Point ESD Grounds (ESD S6.1)	
Footwear	Seating	Workstations
Equipment	Carts	Production Aids
Packaging (ESD S11.11, ESD S11.12 & ASTM 257)	Material-Handling Containers	
ESD Program Standard ANSI/ESD 20.20 & European Norm EN 00015		

B. PROSTAT PRS-801 Resistance System Components:

The PROSTAT PRS-812 Resistance Meter includes the following items

1. PRS-812 Resistance Meter Instrument with 2 each 9V alkaline batteries
2. Two 10-foot leads (PRS-800 L) for general audit measurements up to 1.0×10^{12} ohms.
3. One heavy duty, black "Bulldog" clip (PRS-801 BC)

PRS-812 Resistance Meter

4. Two Metal Alligator Clips (PSI-870-MAC)
5. One Insulated Test Plate (PRS-800-INS)
6. One Metal Test Plate (PRS-800-MTL)
7. One calibration shunt for low range adjustment (PRS-801 CC)

Optional accessories are available for the PROSTAT PRS-812 Resistance Meter. Refer to PROSTAT's current brochure or web site (www.prostatcorp.com) for additional information.

C. PRS-812 Basic Description & Functions

The PRS-812 Resistance Meter has several test, display and data logging functions:

The PRS-812 six basic measurement modes are described in the following table

MODE	DISPLAYED UNITS	INDICATION	RESIST. RANGE	TEST VOLTS	TEST FUNCTIONS
AUTOMATIC 1	1.0EXX IND Ω - T Ω	AUTO	AUTO.	AUTO.	AUTOMATIC RESISTANCE RANGE, TEST VOLTS, ELECTRIFICATION, DISPLAY HOLD
AUTOMATIC 2	OHMS Ω - T Ω	AUTO	AUTO.	AUTO.	SEE TABLE NOTE #1
MANUAL 1	1.0EXX IND Ω - T Ω	MANUAL	MAN.	MAN. or AUTO	TEST ONLY; NO DISPLAY HOLD UL = UNDER DECADE LEVEL
MANUAL 2	OHMS Ω - T Ω	MANUAL	MAN.	MAN. or AUTO	SEE TABLE NOTE #2
MANUAL/ AUTOMATIC 1	1.0EXX IND Ω - T Ω	AUTO & MANUAL	MAN. Start AUTO Run	AUTO.	MANUAL SETUP STARTING DECADE, AUTO ADJUST RANGE, TEST VOLTS, ELECTRIFICATION DISPLAY HOLD
MANUAL/ AUTOMATIC 2	OHMS Ω - T Ω	AUTO & MANUAL	MAN. Start AUTO Run	AUTO.	

TABLE NOTES:

#1 AUTOMATIC: RESISTANCE RANGES IN AUTO 0.1 Ω TO < 2.0E+12 Ω as follows

@<10V: 0.1 TO < 1.0E+04 Ω (0.1 Ω - < 10K Ω)

@ 10V: 1.0E+04 TO < 1.0E+06 Ω (10K Ω - < 1M Ω)

@100V: 1.0E+06 TO < 2.0E+12 Ω (1M Ω - < 2T Ω) **See Note Below**

#2 MANUAL: RESISTANCE RANGES IN MAN 0.1 Ω TO < 2.0E+12 Ω as follows

@<10V: 0.1 TO < 1.0E+05 Ω (0.1 Ω - < 100K Ω)

@ 10V: 1.0E+03 TO < 1.0E+09 Ω (1K Ω - < 1G Ω)

@100V: 2.0E+05 TO < 2.0E+12 Ω (200K Ω -< 2T Ω) **See Note Below**

#3 AUTO-MANUAL: (Same as AUTOMATIC)

RESISTANCE RANGES IN AUTO-MANUAL 0.1Ω TO < 2.0E+12Ω as follows

@<10V: 0.1 TO < 1.0E+04Ω (0.1Ω - < 10KΩ)

@ 10V: 1.0E+04 TO < 1.0E+06Ω (10KΩ - < 1MΩ)

@100V: 1.0E+06 TO < 2.0E+12Ω (1MΩ - < 2TΩ) **See Note Below**

NOTE: It is capable of measuring up to 2.0×10^{14} ohms with tolerance depending on procedures and conditions.

2. The PRS-812 provides three separate test voltages for resistance measurements as indicated in the table, above:

<10 Volts	
10 Volts	(Constant Test Voltage)
100 Volts	(Constant Test Voltage)

In AUTOMATIC and AUTOMATIC/MANUAL modes, test voltages are selected by the instrument based on resistance characteristics of materials being measured. In the MANUAL mode the operator may select test voltage.

3. The PRS-812 displays resistance Measurements in several ways:

- a. 14 individual operator programmable LED's each representing one order of magnitude from $<10^3$ to $>10^{12}$ ohms. The LED's are preprogrammed for their respective colors during final assembly of the instrument. Should a different color combination be desired by the user, the program may be modified by PROSTAT during routine annual calibration, or upon request. A modest service charge is required for this service. LED colors include, GREEN, RED, YELLOW, and OFF (Blank)

NOTE: The PRS-812 provides very accurate measurements up to 1.0×10^{12} ohms, and has the capability to display values up to 2.0×10^{14} ohms. However, the user should be aware that accuracy degrades rapidly above 1.0×10^{12} ohms.

- b. The large Liquid Crystal Display (LCD) includes an analog (1 - 10) scale and X1, X10 and X100 multiplier indication for measurement in Ω, KΩ, MΩ, GΩ and TΩ.
- c. Digital measurements are provided using integers and Ω, KΩ, MΩ, GΩ, TΩ indicators, or in exponential format (1.0EXX) with Ω -TΩ indicators.
4. The PRS-812 includes data logging (storage) capabilities for up to 80 data points when RECORD is selected. The instrument will provide calculation and display of Minimum, Maximum and Average of all measurements in the instrument's memory at any time RECALL is selected.

II. Cautions & Warnings

- A. As with any electrical device, use proper safety precautions and safe measurement procedures to avoid personnel shock and arc discharge.
- B. The PRS-812 Resistance Meter is battery operated and delivers test voltages up to 100 volts.

CAUTION

To avoid electrical shock, do not touch lead conductors, fixtures or accessories except as specifically instructed in this and PROSTAT accessory operations manuals.

- C. The instrument is current limited for safety, However, if improperly used it may be capable of delivering an annoying shock to a person touching conductors energized by the PRS-812, particularly at 100 volts.
- D. Although the PRS-812 is current limited, a distinct hazard exists in the person's **reaction** to a potential shock.
- E. To avoid personnel shock, follow the General Operations instructions at all times. **Do not touch energized** electrodes or fixtures when power is applied except as specifically described in this and accessory instructions.
- F. **Do not** operate or store the instrument in damp environments or wet conditions.

CAUTION

Storage or use of this instrument in high humidity, damp or wet conditions may cause damage to the instrument's electronic circuits, effect performance and can increase the possibility of personnel shock or arc discharge.

- G. **Do not use** the PRS-812 in combustible or explosive environments

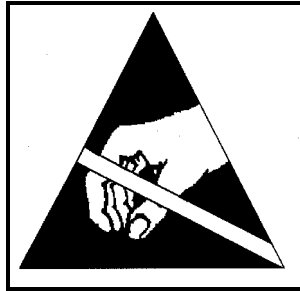
WARNING

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.

- H. **Do not** attempt to measure energized circuits with the PRS-812
- I. **Do not use** the PRS-812 if it becomes damaged in any way
- J. Only **qualified instrument personnel** should attempt to service or repair the PRS-812
- K. Other Safety & Operating Considerations
 - 1. 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.
 - 2. The PRS-812 is a precision instrument and should be operated by experienced personnel familiar with using and handling of devices containing power supplies.

CAUTION

The PRS-812 Contains Electrostatic Discharge Sensitive (ESDS) components and includes precision alignment of circuit elements. Only ESD Qualified instrument repair personnel should perform service.



3. The PRS-812 contains Electrostatic Discharge Sensitive (ESDS) components. Qualified personnel should service it only at ESD Controlled workstations. Do not attempt to dismantle the PRS-812 without PROSTAT's authorization and expert supervision. The instrument contains exceptionally clean circuits that are aligned and adjusted in a precise manner for optimal operation and accurate performance. Unauthorized opening of the PRS-812 housing **will void** the instrument's warranty.

WARNING

Unauthorized opening of the PRS-812 case or dismantling in any manner **WILL VOID THE INSTRUMENT'S WARRANTY.**

4. Read this manual in its entirety before installing batteries or using the PRS-812.
5. Do not drop or cause unnecessary mechanical shock to your PRS-812 instrument
6. Store the instrument in a clean, dry environment. Do not expose the instrument to wet, extremely hot or cold conditions.
7. If the unit is stored in a cold environment, allow it to stabilize at room temperature before powering up the unit. This will prevent damage due to condensation that may accumulate on the instrument's circuit boards.

III. Controls, Connections & Indicators

Before operating the PRS-812 instrument become familiar with each control and display function. A thorough understanding of the instrument's operation will make its use a pleasant experience, enhance measurement accuracy, avoid mistakes and prolong the life of the instrument.

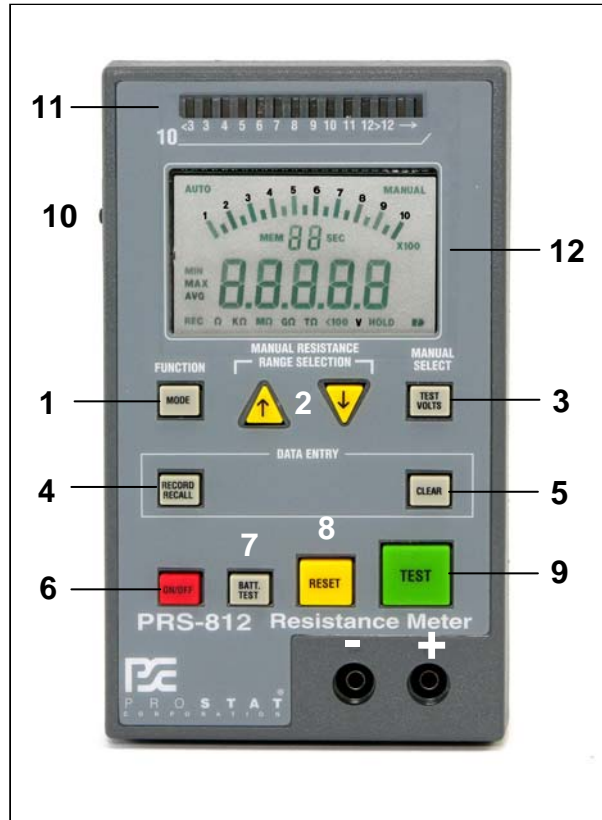


Figure 2: PRS-812 Controls & Display Indicators

PRS-812 Controls

[1] **FUNCTION/ MODE** Toggles through Six Operation Modes

(1) **AUTO:** (AUTOMATIC) displays data in exponential format 1.0EXX

NOTE: **AUTO** in exponential format, e.g., 1.3E05, is the *Default* start up mode when the instrument is turned ON.

(2) **AUTO:** (AUTOMATIC) displays data in Ω , K Ω , M Ω , G Ω and T Ω

In **AUTOMATIC** the instrument controls resistance ranges, test voltage and electrification periods.

(3) **MANUAL:** displays data in exponential format 1.0EXX

(4) **MANUAL:** displays data in Ω , K Ω , M Ω , G Ω and T Ω

In **MANUAL**, the operator selects resistance range in single decade increments. Test voltage may be selected by the operator, or allowed to function automatically based on resistance range selected. The operator determines electrification period in seconds (SEC) using the displayed timer in the center of the LCD.

(5) **AUTO-MANUAL:** displays data in exponential format 1.0EXX

(6) **AUTO-MANUAL:** displays data in Ω , K Ω , M Ω , G Ω and T Ω

In **AUTO-MANUAL**, the operator manually selects the initial resistance range in decade increments. Once set, the PRS-801 **starts** the measurement process from the preset resistance decade, rather than re-zeroing itself for each measurement. This feature saves measurement cycle time and extends battery life. In this mode the instrument automatically controls test voltage, range and measurement electrification period.

[2] RESISTANCE RANGE SELECT.

Two Triangular Arrow Buttons UP (↑) and DOWN (↓) select Resistance Measurement Range in single orders of magnitude while in MANUAL or AUTOMATIC/MANUAL modes

[3] TEST VOLTS

Manual Selection of <10, 10 or 100 volts in **MANUAL**, selects **initial** test voltage. **MANUAL** Test Voltage & Resistance Limits are as follows:

@<10V: 0.1 TO <1.0E+04Ω (0.1Ω-< 10KΩ)

@ 10V: 1.0E+02 TO <1.0E+09Ω (100Ω-< 1GΩ)

@100V: 1.0E+05 TO <2.0E+14Ω (100KΩ-< 2TΩ) **NOTE:** Optimal minimum measurement in **MANUAL** using 100 volts is 2.0E+05.

[4] RECORD/RECALL

If **REC** is not displayed in the lower left corner of the LCD, pressing **RECORD/RECALL** once turns Memory Register ON [**REC** will then be displayed in LCD]. If **REC** is ON and measurement data is stored in memory, pressing **RECORD/RECALL** once will provide access to the memory register. Pressing **RECORD/RECALL** successively will calculate and sequentially display Minimum [MIN], Maximum [MAX] and Average [AVG] of data stored in the Memory Register. If memory is ON and register contains stored data pressing **RECALL** will provide the following information:

First Press RECALL: Provides access to data in Memory

NOTE: **MEM** XX Flashes in LCD indicating number of data points in the register and the last measurement is displayed. Pressing DOWN (↓) and UP (↑) displays other data points and their respective position in the register is shown in the **MEM** XX section of the LCD.

Second Press RECALL: Displays **MIN** Data Point in Memory

Third Press RECALL: Displays **MAX** Data Point in Memory

Note: When displayed, **OL** [Over Level] indicates a measurement *greater than* (>) 2.0×10^{14} ohms, which is beyond the measurement capability of the PRS-812.

Fourth Press RECALL: Displays **AVG** of all Memory Data Points

Note: **OL** [Over Level] measurements [$>2.0 \times 10^{14}$ ohms] are *not* included in displayed average (AVG) calculation.

Fifth Press RECALL: Returns System to normal operations

Note: If in RECALL mode, pressing **RESET** will return the instrument to normal measurement operations.

Note: If RECALL is not pressed, a fifth time **OOPS** will be displayed in the LCD when TEST is next pressed. To Clear OOPS, press RESET. The instrument will return to normal

[5] CLEAR

In normal operations **CLEAR** erases data in Memory Register, discards most recent measurement, or turns the **REC** function OFF as follows:

- a. When in any operation mode, and **HOLD** is *not* displayed, pressing **CLEAR** will erase *all data* stored in Memory.

NOTE: The process of turning the **REC** function OFF will clear the Memory Register of all stored data. Be sure that this is indeed desirable before pressing the CLEAR button.

- b. If a measurement is displayed in HOLD, *prior to* pressing RESET button pushing CLEAR will discard that held value and will *not* enter it into Memory. Other data in Memory Register remains intact.
- c. If reviewing data in the Memory Register while in the **RECALL** mode, pressing **CLEAR** will discard the displayed data point. Other data in Memory Register remains intact and indexes down one space to replace the discarded data point.
- d. When in any operation mode, and **HOLD** is *not* displayed, pressing **CLEAR** will erase *all data* stored in the Memory Register. Pressing **OFF** will disable the **REC** mode and the instrument will be de-energized. When powered up again the **REC** mode will remain disabled until **RECORD/RECALL** is pressed once.

[7] ON/OFF

Turns instrument ON for normal operations, performs functional & Battery tests, turns instrument OFF.

[8] BATT. TEST

Displays **GOOD** on LCD if battery provides acceptable voltage for accurate measurements, or displays **Lo** if unacceptable and batteries require replacement.

[9] RESET

Saves measurement and prepares instrument for next test cycle, i.e., enters measurement into Memory Register if **REC** is ON, and clears **HOLD** and the LCD display between measurements.

[10] TEST

Begins measurement sequence in accordance with selected mode

[11] BATTERY BUSS CUT OFF

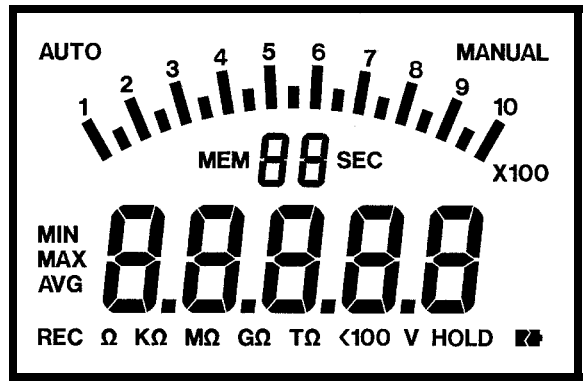
Battery buss cut-off switch is used to isolate the main batteries from the instrument's circuit during battery change, instrument storage and transport.

Display Elements

[11] Colored LED's 14 LED's across the top of the PRS-812 indicate measurement order of magnitude in decades from $<10^3$ to $>10^{12}$ + ohms.

NOTE: The PRS-812 provides very accurate measurements up to 1.0×10^{12} ohms, and has the capability to "indicate" values up to 2.0×10^{14} ohms. However, the user should be aware that accuracy degrades rapidly above 1.0×10^{12} ohms.

[12] PRS-812 Liquid Crystal Display Elements:



AUTO When ON Indicates instrument in AUTOMATIC mode

MANUAL When ON indicates instrument in MANUAL mode


When **AUTO** and **MANUAL** are ON, indicates instrument is in AUTOMATIC/MANUAL mode.

Analog Scale & X100 Indicator

The one decade analog scale elements darken to indicate measurement integer. **X1**, **X10** or **X100** darken to indicate the scale multiplier. Combine the Analog indicators with **Ω**, **KΩ**, **MΩ**, **GΩ** and **TΩ** symbols to obtain an analog measurement.

MEM 00 Provides the number of data points stored in the Memory Register when **REC** is ON and instrument is **RESET** in preparation for a new measurement. The Memory Register can store up to 80 data points.

00 SEC Display's electrification period required for the measurement when in **TEST** during **AUTOMATIC** and **AUTOMATIC/MANUAL** measurement modes. In **MANUAL**, provides continuous measurement timing up to 99 seconds, then restarts at 0 seconds.

MIN	Displayed when RECALL button is pushed first time while in REC mode. Number displayed when MIN is indicated is the Minimum data value in Memory Register.
MAX	Displayed when RECALL button is pushed a second time (sequentially) in REC mode. Number displayed when MAX is indicated is the Maximum data value in Memory Register.
AVG	Displayed when RECALL button is pushed the third time (sequentially) in REC mode. Number displayed when AVG is indicated is the Average of all data values in Memory Register that are less than 1.0×10^{14} ohms. (OL 's are not included in averaging calculation.)
	Note: <i>Either the RECALL button must be depressed a fifth time or RESET pressed to return the system to its operational, measurement mode.</i>
REC	Indicates that the Memory Register is ON and is Recording data each time the RESET button is depressed after a TEST measurement.
Ω	Ohms: Indicates measurement between 0.1 and 999 ohms
KΩ	Indicates measurements from 1,000 (1.0×10^3) to 990,000 (9.9×10^5) ohms
MΩ	Indicates measurements from 1,000,000 (1.0×10^6) to 999,000,000 (9.9×10^8) ohms
GΩ	Indicates measurements from 1,000,000,000 (1.0×10^9) to 999,000,000,000 (9.9×10^{11}) ohms
TΩ	Indicates measurements from 1,000,000,000,000 (1.0×10^{12}) to 999,000,000,000,000 (9.9×10^{14}) ohms
<100 V	Indicates <10 , 10 or 100 volts being applied as the test voltage.
HOLD	Indicates measurement is complete at the end of a TEST cycle. Holds data point in display until instrument is RESET or CLEAR is depressed.
	Battery indication for low voltage
PRS-812 Connections	
[+] Positive Terminal	Power terminal for supplying Test Voltage to fixture or material under test.
[-] Negative Terminal	Sensing Terminal for measurement of current (I) through fixture or material under test.

Battery Compartment

Located in lower section of case, opposite LCD display. The compartment holds two 9V-transistor batteries. Two screws secure the battery cover. **Note: Use only Long Life Alkaline Batteries. Remove batteries when instrument is not in use for long periods of time.**



Figure 3: Opening Battery Compartment.



Figure 4: Install 2 each 9V Batteries

IV. Setup & Calibration

A. Battery Installation (See Figures 3 & 4)

1. Position Battery Buss Cut Off switch to OFF position
2. To install batteries, remove two Phillips locking screws and cover. Attach two **Long Life Alkaline** 9V batteries to the two battery buss connections provided.
3. Position batteries in compartment with power leads neatly positioned above battery connections. Carefully re-install battery cover and locking screws.

NOTE: Do Not depress Red ON/OFF button during battery installation while Battery Buss Cut Off is ON. Always switch Battery Buss Cut Off to **OFF** when changing batteries. Should the ON/OFF button be depressed during battery change and Battery Bus is ON the instrument may lock up and not function properly. In this case, simply disconnect the batteries, then re-install with Battery Buss switch in the OFF position.

B. Low Resistance Range (<10 Ohms) Calibration

1. Install the calibration shunt across the Negative (-) and Positive (+) Lead Terminals (Figure 5, below).

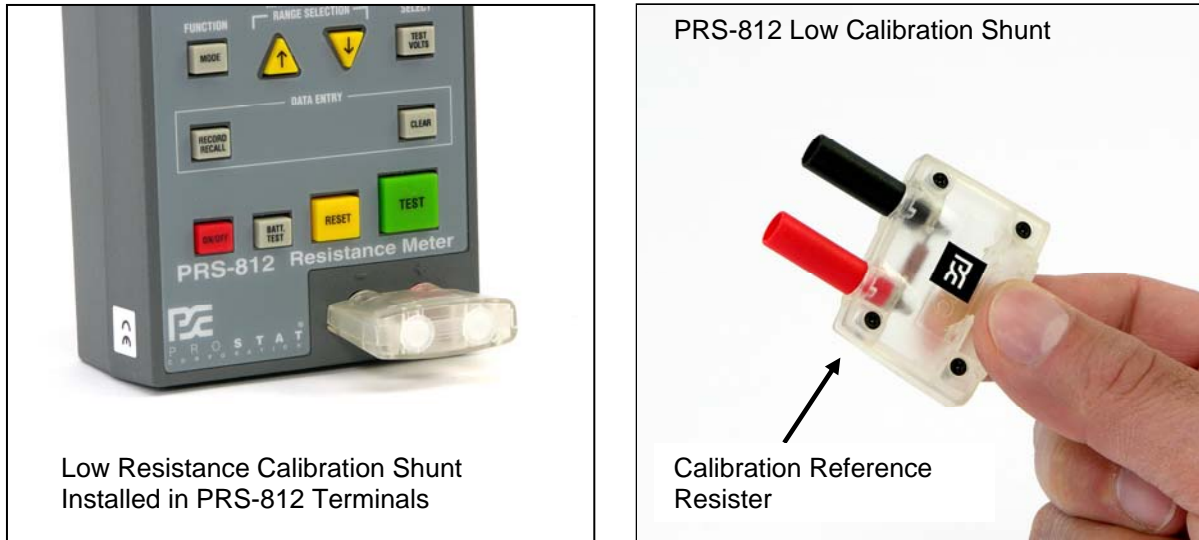


Figure 5: Low Resistance Range Calibration Shunt Installation.

2. Press the Red ON/OFF power button. The instrument display should become energized, each LED will be tested in sequence, and **Good** will be displayed in the LCD if the batteries have sufficient test capacity.
3. Allow the instrument circuits to warm-up for a few minutes; approximately 2 - 3 minutes are sufficient, prior to completing the calibration sequence.
4. Press the Yellow RESET, then the Gray CLEAR button within ½ second. The message **CAL** will be displayed in the LCD. (See Figure 6)
5. Press the Yellow RESET button to complete low range (0.1 to 10 ohm) calibration. The **CAL** message will automatically be cleared when RESET is pressed. (See Figure 7)
6. Press the Green TEST button. Indicated resistance should be 1.02 (± 0.02) ohms as shown in Figure 7. Press RESET to clear the display. NOTE: If 1.02 (± 0.02) ohms is not displayed, repeat the calibration process.
7. Remove the calibration shunt from the lead terminals
8. The PRS-812 is now ready for wide range measurements from 0.1 to 1.0E+12 Ohms



Figure 6: Start the Calibration Sequence by Pressing RESET then CLEAR within ½ Second



Figure 7: Complete Calibration Sequence by Pressing RESET. To confirm Calibration, Press TEST to measure the Calibration Shunt resistance. Shunt resistance should *display* 1.02 Ohms ± 0.02 Ohms

V. Instrument Operation

A. Overview of PRS-812 Operation & Measurement Test Cycle Sequence

The following 10 points provide an overview for calibrating and using the PRS-812 for resistance measurements.

1. Slide Battery Buss Cut Off switch to ON
2. Press Red ON/Off button once to power up PRS-812
 - a. Instrument performs circuit check, and tests LED's, LCD display, and battery voltage.
 - b. LCD displays **Good** if battery voltage suitable for instrument operation; displays **Lo** if batteries require replacement
 - c. Instrument ends startup sequence in default **AUTO**, Exponential Display Mode 1.0EXX.
3. Select Function Mode if other than **AUTO**, Exponential Display Mode 1.0EXX is desired by pressing MODE button.
4. Perform low resistance range calibration after 3 minute instrument warm-up, if desired
 - a. Install Calibration Shunt between positive (+) and negative (-) terminals
 - b. Press RESET then CLEAR within $\frac{1}{2}$ second
 - c. **CAL** is displayed in LCD

- d. Press RESET to calibrate instrument to shunt reference
 - e. Press TEST to measure shunt resistance of 1.02 ± 0.02 ohms (Ω)
 - f. Press RESET button to prepare instrument for the next measurement
 - g. Repeat calibration procedure if necessary
 - h. Remove Calibration Shunt
5. Connect test leads to positive (+) [Power] and negative (-) [Sensing] terminals
- Standard 10-foot test leads are used for general audit measurements.
6. Connect test leads to electrodes, fixture or circuit to be measured
7. Press Green TEST button to initiate Automatic measurement Test Cycle
- a. The resistance range is reset to minimum. It is automatically adjusted in conjunction with the resistance characteristics of the materials under test, based on:
 - (1) Test voltage; and,
 - (2) Current flow.
 - b. Test Voltage is reset to <10V and automatically increased in accordance with the following material resistance characteristics:
 - (1) **<10 Volts:** 0.1 to less than 1.0×10^4 ohms ($0.1\Omega - <10K\Omega$)
 - (2) **10 Volts:** 1.0×10^4 to less than 1.0×10^6 ohms ($10K\Omega - < 1M\Omega$)
 - (3) **100Volts:** 1.0×10^6 to 2.0×10^{14} ohms ($1M\Omega - 200T\Omega$)
 - c. Electrification period, i.e., the time period during which test voltage is applied to the material under test, is automatically adjusted to the PRS-812's measurement characteristics and industry standards (ESD S11.11) as follows:
 - (1) **2 to 3 Seconds:** 0.1 to less than 1.0×10^4 ohms ($0.1\Omega - <10K\Omega$)
 - (2) **2 to 4 Seconds:** 1.0×10^4 to less than 1.0×10^6 ohms ($10K\Omega - < 1M\Omega$)
 - (3) **7 to 8 Seconds:** 1.0×10^6 to $>1.0 \times 10^{12}$ ohms ($1M\Omega - >1T\Omega$)
 - (4) **15+ Seconds:** 1.0×10^{12} to 2.0×10^{14} ohms ($1T\Omega - 200T\Omega$)

NOTE: The PRS-812 provides very accurate measurements up to 1.0×10^{12} ohms, and has the capability to display values up to 2.0×10^{14} ohms. However, the user should be aware that accuracy degrades rapidly above 1.0×10^{12} ohms.

8. When the PRS-812 displays and holds the final resistance measurement, **HOLD** is indicated in the lower, right corner of the LCD.

The PRS-812 is processor controlled to obtain hundreds of measurements per second, and to make rapid adjustments in resistance range and test voltage as necessary. It will display the resistance measurement of the material under test based on the following criteria:

- a. A digital numeric display is the averaged result of eight (8) individual, consecutive measurements, each within $\pm 5\%$ of each other
- b. The display is continuously updated during the measurement's electrification period
- c. The final displayed measurement is the averaged result of the last eight (8) individual, consecutive measurements, each within $\pm 5\%$, at the end of the electrification period.
- d. If the material or test conditions vary such that eight consecutive measurements, each within $\pm 5\%$ of each other cannot be obtained, the PRS-812 will extend the electrification period until the measurement criteria are met; or,
- e. The electrification period will automatically be terminated and the **most recent** averaged result of eight (8) individual, consecutive measurements will be displayed and held.
- f. In rare cases, when a stable measurement cannot be obtained the display will reset. NOTE: When several "held" measurements vary greater than 15 to 20 percent of each other this typically indicates inconsistencies in the material or test conditions.

9. To save the displayed measurement in the Memory Register and prepare the PRS-812 for the next measurement, press the Yellow RESET button. Pressing RESET causes three functions:

- a. Enters (saves) last measurement into Memory Register

NOTE: REC must be displayed in the lower, left corner of the LCD in order to enter the measurement in the Memory Register. If REC is not displayed, press RECORD/RECALL once, **then press** RESET to save the data.

- b. Increases LCD displayed number of data points in the Memory Register (MEM) by one, e.g., **MEM 02**
- c. Returns the PRS-812 to its last function mode in preparation for the next measurement

10. To make several measurements, simply press TEST to obtain the next measurement, then RESET to save it. Repeat the TEST and RESET process for each measurement desired.

NOTE: Be sure to press RESET after your last measurement to save it in your Memory Register before turning the PRS-812 **OFF**. If the instrument is turned **OFF** before pressing RESET **the last measurement will be lost**.

Good Measurement Practices, specific Operational Procedures and descriptions of functional modes are covered in detail, below.

B. Good Measurement Practices

Several factors will effect precision resistance measurements. Most practitioners are aware of the importance of using care when handling instruments, proper use of connections, lead resistance, grounding, and the impact of electrical or electrostatic fields on their equipment.

As with most very precise instruments, the PRS-812 circuits and its cables are sensitive to the effects of electromagnetic and electrostatic fields. These effects, are minimized by instrument and test lead design and material selection. However, good measurement practices should be exercised at all times to ensure accuracy and repeatability. Follow the recommendations below to obtain optimal performance from the PRS-812.

1. Instrument handling and preparation

- a. Do not drop or cause mechanical shock to your instrument
- b. Store the instrument in a clean, dry environment. Do not expose the instrument to wet, extremely hot or cold conditions.
- c. If the unit is stored in a cold environment, allow it to stabilize at room temperature before powering up the unit.
- d. Be sure fresh batteries are installed when beginning an extensive measurement sequence. Periodically check the condition of your batteries by pressing BATT. TEST. If **Lo** is indicated, replace your batteries.

Operational Note: Low voltage batteries will affect measurement accuracy!

- e. When making resistance measurements at or below 10 ohms, *always* perform The Low Range Calibration Procedure. Repeat the procedure to confirm the instrument's response.
- f. During resistance measurements, stand back, away from the instrument to avoid body capacitance or fields from effecting instrument accuracy.
- g. To avoid body fields from interfering with instrument accuracy, wear a wrist strap attached to a tested ESD ground to dissipate body charges.

WARNING

To prevent possible electrical shock, **Do Not Touch** energized circuits, leads or fixtures while grounded.

Use only pre-tested ground connections that meet local safety standards and codes for earth grounding. Refer to National Electrical Codes and ESD Association Standard S6.1 *Grounding* for information and test procedures. Ground testing should be conducted only by qualified personnel.

2. Use only PROSTAT test leads, cables and accessories supplied with the PRS-812. Be sure that leads are properly connected to their respective terminals as described below.

a. The 10-foot general measurement leads are custom made of high quality, silicon rubber for maximum insulation properties and measurement accuracy. These leads are intended for general measurements up to 10^{12} -ohm range. Shielding is not incorporated in the 10-foot lead construction.

(1) When installed in the PRS-812 terminals, be sure the right angle sheathed banana connections are fully inserted and positively seated for full terminal contact.

NOTE: Do not apply excessive force when mounting leads on the terminals to prevent deformation or damage to the terminal circuit board.

(2) The straight, retractable-sheathed banana plugs are intended for connection to measurement electrodes, fixtures or clip accessories.

(4) The leads may be installed in either positive (+) or negative (-) terminals

3. When making measurements in the manufacturing environment, move the instrument and test leads away from power cables and heavy electrical equipment to prevent electromagnetic interference.

4. If groundable fixtures are employed for material measurements, and when using 10-foot leads, attach an auxiliary lead from the fixture to an ESD safe earth ground.

5. Prior to making precision measurements, allow the PRS-812 to warm-up for 3 minutes and perform the Low Resistance Calibration procedure. If extensive measurements are being made, periodically check the instrument's calibration by measuring the supplied calibration shunt.

C. Operation in AUTOMATIC Modes

The PRS-812 was designed to simplify measurement standards and general rules for making wide range resistance measurements. The PRS-812's AUTOMATIC mode controls the critical aspects of Test Voltage, Resistance Range, and Electrification Period to meet ESD Standard S11.11 Surface Resistance, other ESD standards and general measurement requirements. Most measurements can be performed in AUTOMATIC, which has two function modes:

AUTO Mode 1: Auto Exponential Display 1.0EXX plus above Ω indicators

AUTO Mode 2: Auto Display in Ω , K Ω , M Ω , G Ω and T Ω indicators

AUTO Mode 1 is the default functional mode when the PRS-812 is powered up. To change to AUTO Mode 2, simply press the MODE button once. The AUTOMATIC modes are used in measurements where the following attributes are desired:

- ⇒ Automatic Test Voltage selection and control from 0.01 to 100 volts
- ⇒ Automatic resistance scale control from 0.1 ohm to 1.0×10^{12} ohms (1 T Ω)

- ⇒ Automatic Electrification Period timing based on the instrument's measurement capabilities and industry standards for measurement of ESD controlled materials.

In AUTOMATIC Modes, the PRS-812 performs the following functions during the Measurement Test Cycle once the TEST button is pressed:

1. Resets the RESISTANCE RANGE to minimum, i.e., 0.1 Ω
2. Sets TEST VOLTAGE to <10 volts (millivolts), applies initial voltage to material under test
3. Resets the ELECTRIFICATION PERIOD timer to 0 seconds, then starts timer
4. During Measurement Test Cycle:
 - a. Adjusts RESISTANCE RANGE in accordance with material resistive characteristics
 - b. Automatically adjusts TEST VOLTAGE in accordance with material resistive characteristics and industry standards
 - c. Automatically adjusts ELECTRIFICATION PERIOD in accordance with material resistive characteristics and industry standards
5. At completion of Test Cycle, displays and **HOLDS** measurement, test voltage, order of magnitude (LED), analog scale & multiplier, and electrification time at end of period.

D. Automatic Mode Procedures

1. Attach the desired test leads to the fixture, electrodes or points to be measured

Note: The standard PROSTAT 10 ft. test leads are intended for measurements up to the 10^{12} ohm range. This is the maximum range of the PRS-812 for precision resistance measurements.

2. **Slide the Battery Buss Cut Off to the ON position.** This connects the 9V batteries to the instrument's circuitry.

Note: Slide the Battery Buss Cut Off to the OFF position when the instrument is not in use, particularly during storage and transport to prevent unintentional instrument power up.

3. Press the Red ON/OFF button to power up the instrument. (See Figure 1)
4. **AUTO** is displayed in the LCD. (See Figure 2)
 - a. The default Mode for the PRS-812 is Automatic Resistance Measurement in Exponential Format. (1.0EXX). See Figure 2.
 - b. If measurements are to be displayed in Ohms, press the Gray MODE button **once**.



Figure 8: PRS-812 Power Up tests display circuits, LED indicators and batteries

5. If **REC** is not displayed in the lower left corner of the Liquid Crystal Display (LCD), press Gray RECORD/RECALL button once to display **REC** in LCD. This activates the Memory Register, enabling data storage.
6. Press the Green TEST button to begin the AUTOMATIC measurement sequence. The instrument will automatically reset the resistance range to 0.1 Ohms (1.0E-01), and select **<10** volts to be applied to the Positive (+) Lead Terminal. The electrification timer will start counting seconds.



Figure 9: PRS-812 Powered Up in AUTO Exponential Mode (Right). To change to Ohms Data Display Press Function Mode button once. (Left)

7. Measurements Less than 10,000 ohms (<1.0x10⁴ ohms):

- a. When the resistance measurement is less than 1.0x10⁴ ohms, test voltage will remain at <10V, the resistance range will be adjusted automatically and a stable resistance measurement will be obtained within 2.0 to 3.0 seconds.
- b. Once a stable measurement is confirmed and displayed by the instrument, **HOLD** will be energized in the LCD and the electrification timer will stop.
- c. An LED corresponding to the measurement's order of magnitude will be energized

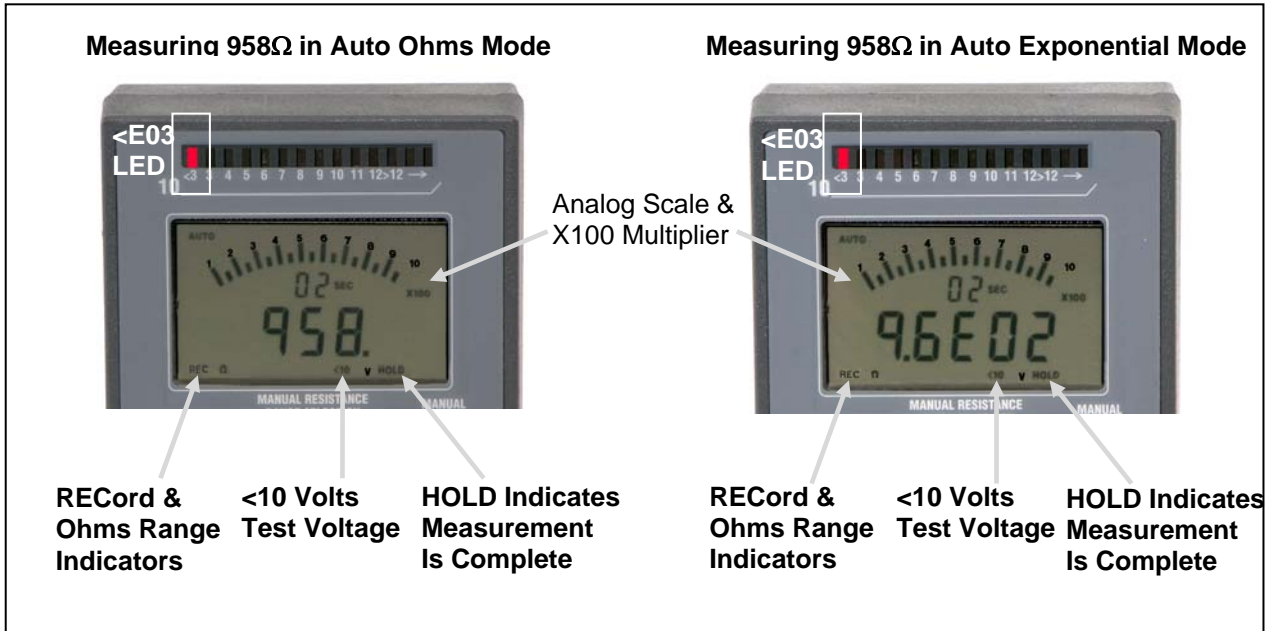


Figure 10: Comparing PRS-812 Display in Automatic Ohms Mode and Automatic Exponential Mode after the same low resistance measurement.

8. Measurements from 1.0x10⁴ to less than 1.0x10⁶ ohms:

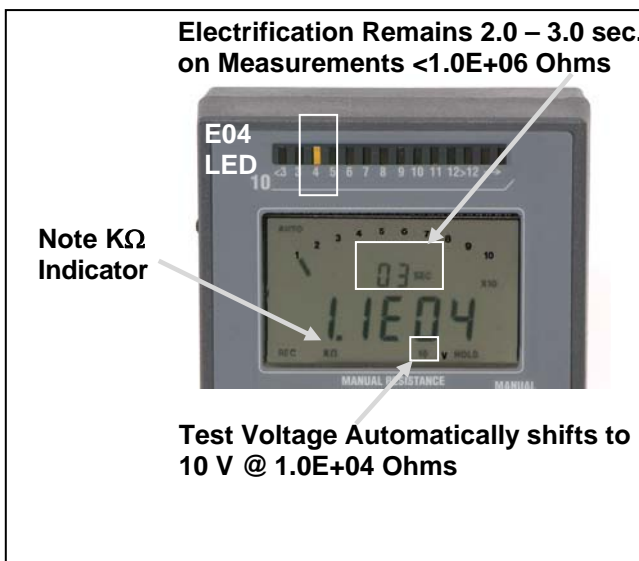


Figure 11: Test Voltage at 10 Volts from 1.0E+04 to <1.0E+06 Ohms in Auto

- a. When the resistance measurement is greater than 1.0x10⁴ ohms test voltage will automatically be increased to 10 volts, and the resistance range will be adjusted as necessary.
- b. A stable resistance measurement will be obtained within 2.0 to 4.0 seconds.
- c. Once a stable measurement is confirmed and displayed, **HOLD** will be energized in the LCD and the electrification timer will stop.
- d. An LED corresponding to the measurement's order of magnitude will be energized

9. Measurements from 1.0×10^6 to less than 1.0×10^{12} ohms:

- When the resistance measurement is greater than 1.0×10^6 ohms the test voltage will automatically be increased to **100** volts and the resistance range will be accordingly. Electrification (Test Period) is automatically adjusted to 7.5 seconds.
- Unless there are variations in the material or object being measured, a stable resistance measurement will be obtained within 8.0 seconds.

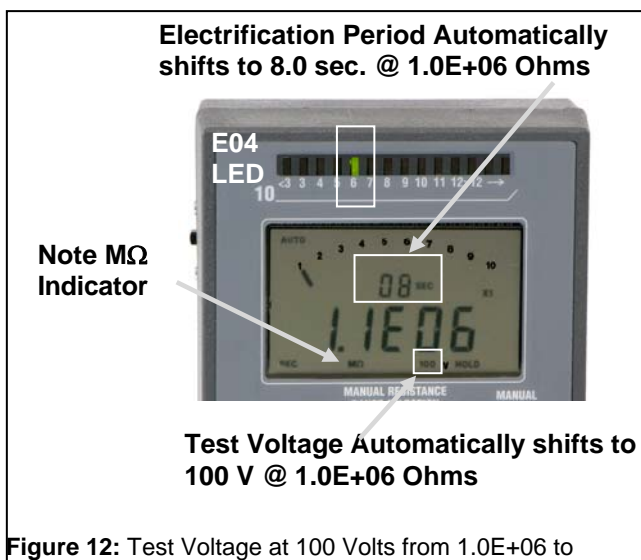


Figure 12: Test Voltage at 100 Volts from 1.0×10^6 to 1.0×10^{14} Ohms in Auto

Note: The PRS-812 can obtain an accurate resistance measurement within 2.5 seconds up to 1.0×10^{12} ohms, depending on material characteristics. An additional 5.0 seconds of electrification is applied in accordance with ESD Association S11.11 Surface Resistance Standard.

- Once a stable measurement is confirmed and displayed by the instrument, **HOLD** will be energized in the LCD and the electrification timer will stop.
- An LED will be energized corresponding to the measurement's order of magnitude

10. Measurements from 1.0×10^{12} to 2.0×10^{14} ohms:

- When the resistance measurement is greater than 1.0×10^{12} ohms, the test voltage will remain at **100** volts and the instrument will adjust the resistance range.
- The instrument's ELECTRIFICATION PERIOD is extended to a **15+ seconds**. A stable resistance measurement will be obtained in approximately 15.0 to 20.0 seconds.
- Once a stable measurement is confirmed and displayed by the instrument, **HOLD** will be displayed in the LCD and the electrification timer will stop.

NOTE: The PRS-812 provides very accurate measurements up to 1.0×10^{12} ohms, and has the capability to display values up to 2.0×10^{14} ohms. However, the user should be aware that accuracy degrades rapidly above 1.0×10^{12} ohms.

- An LED corresponding to the measurement's order of magnitude will be energized

11. Measurements or Indications Greater Than 2.0×10^{14} ohms:

- If the measurement is greater than 2.0×10^{14} ohms, the test voltage will remain at **100** volts and the resistance range will be adjusted until the instrument's range is exceeded.
- OL** (Over Level) will be displayed in the LCD, and the >14 LED will be energized.

- c. Once the instrument confirms a stable measurement, if any, **HOLD** will be displayed in the LCD and the electrification timer will stop. If a stable measurement cannot be obtained at this range **OL** will be displayed.

E. Resistance Measurements in MANUAL Modes of Operation

To select MANUAL in either, Exponential (Mode 3) or Ohms (Mode 4) Display, use the FUNCTION MODE button to toggle through choices. Manual is used for a variety of applications where one desires to override Automatic functions:

- ⇒ Measurements where magnitude is in a defined decade and test voltage is fixed.
- ⇒ When an extended electrification period may be desired
- ⇒ Manual selection of test voltage for standards not consistent with Automatic settings

The following summarizes MANUAL Mode Operations and assumes test leads are installed

1. Slide Battery Buss Cut Off switch to ON position
2. Press Red ON/OFF button once to power up the instrument.
3. To select MANUAL MODE press the MODE button until MANUAL appears in the LCD.
 - a. Press the MODE button 2 times selects MANUAL Exponential display (1.0EXX).
 - b. Pressing the MODE button three (3) times, selects MANUAL display in Ohms.
4. Set **RESISTANCE RANGE SELECTION** using the UP↑ and DOWN ↓ arrow keys.
 - a. Selects Range in one-decade increments as indicated with colored LED's.
 - b. For resistance ranges below <E03, use the LCD displayed decimal point (.) for setting the desired decade. The <3 LED will be illuminated.
5. Set test voltage by pressing **MANUAL SELECT TEST VOLTS** button until the desired voltage is displayed in lower portion of LCD, i.e., <10, 10 or 100 Volts. **MANUAL** Test Voltage & Resistance Limits are defined below.

IMPORTANT: *Violating these limits may effect measurement accuracy.*

<10V:	0.1 to <1.0x10 ⁴ ohms	(0.1Ω - < 10KΩ)
10V:	1.0x10 ² to <1.0x10 ⁹ ohms	(100Ω - < 1GΩ)
100V:	1.0x10 ⁵ to 2.0x10 ¹⁴ ohms	(100KΩ - 200TΩ)

NOTE: If a test voltage is **not manually selected**, test voltage control will default to Automatic Mode limits, switching higher or lower in accordance with resistance range selection, when the TEST button is pressed.

6. Press TEST to begin the Measurement Test Cycle.

- a. The instrument will:
 - (1) Apply and display the selected Test Voltage, or automatically default to and display the appropriate voltage for the selected resistance decade
 - (2) Self adjust the measurement resistance range to the **selected decade**
 - (3) Start the electrification period timer
 - b. If the measurement is within the **selected decade**, it and the electrification time will be displayed continuously in the LCD.
 - c. Pressing RESET will stop the Measurement Test Cycle, and simultaneously:
 - (1) Turn Test Voltage power supply OFF
 - (2) Save the displayed measurement in the Memory Register
 - (3) Add one data point to the MEM XX counter and display total number of data points in the Memory Register, e.g., **MEM 05**
 - (4) Prepare the instrument for the next measurement using the same settings.
 - (5) Pressing TEST will start a new Measurement Test Cycle
7. If the resistance you are measuring is **higher** than the decade that the PRS-812 is set for **OL (Over Level)** will be displayed. To move the selected resistance range up to a higher decade:
- a. Press RESET once, this stops the Test Cycle but *does not add OL* to the Memory
 - b. Press MANUAL RESISTANCE RANGE SELECTION up arrow (↑) to select the desired decade; the appropriate LED will illuminate indicating the current selection
 - c. Press TEST to restart the Test Cycle
 - d. Repeat the RESET, Resistance Range adjustment and TEST sequence until a stable measurement is displayed
8. If the resistance is **lower** than the selected decade, the PRS-812 will display **UL (Under Level)**. To move the selected resistance range up to a lower decade:
- a. Press RESET once, this stops the Test Cycle but *does not add UL* to the Memory
 - b. Press MANUAL RESISTANCE RANGE SELECTION down arrow (↓) to select the desired decade; the appropriate LED will illuminate indicating the current selection
 - c. Press TEST to restart the Test Cycle
 - d. Repeat the RESET, Resistance Range adjustment and TEST sequence until a stable measurement is displayed

F. Resistance Measurements in the AUTOMATIC/MANUAL MODE of OPERATION

To select AUTOMATIC/MANUAL in either, Exponential (Mode 5) or Ohms (Mode 6) Display, use the FUNCTION MODE button to toggle through choices. AUTOMATIC/MANUAL is used for a variety of applications where one desires to reduce Measurement Test Cycle time by overriding Automatic *reset-to-minimum* functions. It is intended for applications where:

- ⇒ Multiple Measurement series where magnitude is in a defined set of *two or three* decades, and test voltage must vary with actual resistance measurements.
- ⇒ When AUTOMATIC electrification period and Test Voltage control must be maintained to current industry (and Automatic Mode) settings

This mode prevents the PRS-812 from resetting the Test Voltage and Resistance Range to Minimum for each Measurement Test Cycle. In this mode, measurements start at the resistance range selected by the operator, and its commensurate Test Voltage. Otherwise, it is used similar to the AUTOMATIC Mode

The following summarizes AUTOMATIC/MANUAL Mode Operations and assumes test leads are properly connected.

1. Slide Battery Buss Cut Off switch to ON position
2. Press Red ON/OFF button once to power up the instrument.
3. Select AUTOMATIC/MANUAL MODE by pressing the MODE select button until **AUTO** and **MANUAL** appear in the LCD display.
 - a. Pressing the MODE button four (4) times selects AUTOMATIC/MANUAL display in Exponential (1.0EXX).
 - b. Pressing the MODE button 5 times selects AUTOMATIC/MANUAL Ohms display.
4. Set **RESISTANCE RANGE SELECTION** using the UP↑ and DOWN↓ arrow keys.
 - a. Range selection is made in one-decade increments and indicated with illuminated LED's.
 - c. For resistance ranges below <E03, use the LCD displayed decimal point (.) for setting the desired decade. The <3 LED will be illuminated.
5. Press the Green TEST button to begin the AUTOMATIC/MANUAL Measurement Test Cycle.
 - a. The instrument will automatically start the Test Cycle from **the selected** resistance range decade
 - b. Initial Test Voltage for the selected resistance decade will be applied. For example if the 10⁶ ohms decade was selected, initial Test Voltage will be **100 Volts**.
 - c. At this point the PRS-812's AUTOMATIC Mode takes control of the Measurement Test Cycle:

- (1) Automatically re-adjusts RESISTANCE RANGE in accordance with material resistive characteristics
- (2) Automatically re-adjusts TEST VOLTAGE in accordance with material resistive characteristics and industry standards
- (3) Automatically re-adjusts ELECTRIFICATION PERIOD in accordance with material resistive characteristics and industry standards
- (4) At completion of Test Cycle, displays and **HOLDS** final resistance measurement, test voltage, order of magnitude (LED), analog scale & multiplier, and electrification time at end of electrification period.

G. The Memory Register: Data Logging & Calculation

As previously described, the PRS-812 Resistance System will acquire and store up to 80 measurements, or data points, in its Memory Register when Record (**REC**) is activated. Data is entered in memory each time the RESET button is pressed following a measurement. The data in memory can be reviewed for its minimum, maximum and average values by pressing the RECALL button.

1. To Activate the Record Mode press the gray RECORD/RECALL button once. **REC** will be displayed in the lower left corner of the instrument's LCD display.
2. To Turn the Recording Mode (**REC**) OFF, perform the following sequence:

NOTE: The process of turning the **REC** function OFF will clear the Memory Register of all stored data. Be sure that this is indeed desirable before pressing the CLEAR button.

- a. With the unit ON, press CLEAR
 - b. Then press the Red ON/OFF button to turn the instrument OFF
 - c. Press the Red ON/OFF button to power up the instrument
 - d. Note that **REC** is no longer displayed in the lower, left corner of the LCD
3. To Review Data in the Memory Register press the RECORD/RECALL button four times, as follows:
 - a. 1st Press RECORD/RECALL: Provides access to data points in the Memory Register
 - (1) Use UP ↑ arrow and DOWN ↓ arrow keys to scroll through data.
 - (2) You may select a data point and eliminate it by pressing CLEAR. All other stored data will shift one slot in the register to replace deleted data.
 - (3) **Min, Max** and **Average** of remaining data in Memory will be recalculated.

- (4) Press RECORD/RECALL to proceed, or RESET to exit Memory Register and return to normal operations.

OPERATIONAL NOTE: You may return the instrument to normal operations from the RECORD/RECALL mode at any time by pressing RESET.

- b. 2nd Press RECORD/RECALL: LCD Displays **MIN** and the lowest recorded resistance value saved in the Memory Register
- c. 3rd Press RECORD/RECALL: Displays **MAX** and the highest recorded resistance value saved in the Memory Register

Note: When displayed, **OL** (*Over Level*) indicates a measurement *greater than* (>) 2.0×10^{14} ohms, beyond the measurement capability of the PRS-812

- d. 4th Press RECORD/RECALL: Displays **AVG** and the average of all recorded resistance values saved in the Memory Register

Note: **OL** (*Over Level*) measurements greater than (>) 2.0×10^{14} ohms are *not* included in displayed average (**AVG**) calculation. **AVG** is the calculated average of all resistance values less than (<) 2.0×10^{14} ohms, *rounded to the first decimal point*.

- e. 5th Press RECORD/RECALL: Returns PRS-812 Meter to normal operations

Note: If RECALL is not pressed, a fifth time **OOPS** will be displayed in the LCD when TEST is next pressed. To Clear OOPS, press RESET. The instrument will return to normal operations.

VI. Instrument Maintenance

A. Calibration & Repair

1. Instrument Calibration should be performed annually
2. Only Prostat Corporation or their authorized instrument laboratory should perform PRS-812 calibration or repair.
3. Before shipping instrument to Prostat Corporation (USA) for service, contact Prostat calibration & customer service for a Return Material Authorization (RMA) tracking number by the following means: See WARRANTY INFORMATION, below, for further instructions.

B. General Handling & Maintenance

1. Cleaning
 - a. Wipe case and LCD with clean, low linting damp cloth
 - b. Do not use solvents for cleaning case or LCD,

2. Handling

- a. Store the instrument in a clean, dry environment. Do not expose the instrument to wet, extremely hot or cold conditions.
- b. Do not drop or cause mechanical shock to your instrument
- c. If the unit is stored in a cold environment, allow it to stabilize at room temperature before powering up the unit.
- d. Remove batteries before storing the instrument for long periods.

Be sure fresh batteries are installed when beginning an extensive measurement sequence. Periodically check the condition of your batteries by pressing BATT. TEST. If **Lo** is indicated, replace your batteries.

VII. 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.

**DO NOT RETURN ANY ITEM WITHOUT HAVING FIRST
RECEIVED A RETURN MATERIALS AUTHORIZATION
(RMA) NUMBER FROM PROSTAT**

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

Prostat Corporation

PRS-812 Resistance Meter

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.

PRS-812 Resistance Meter Specifications

Range:	Resistance from <0.1 (1.0E-1) Ohms to 200 Tera ohms (1.0E+12 ohms). Maximum resistance indication: 200 Tera ohms (2.0E+14 ohms).
Test Voltages:	<p><u>Automatic mode Default:</u> <0.01 to 10 volts Variable 1.0E-1 to 1.0E+4 Ohms Constant Voltage 10 volts \pm <0.2 volts 1.0E+4 to 1.0E+6 Ohms At 10 & 100 Volts 100 volts \pm <2.0 volts 1.0E+6 to 2.0E+14 Ohms</p> <p><u>Manual Mode:</u> <0.01 to 10 volts Variable 1.0E-1 to 1.0E+4 Ohms 10 volts \pm <0.2 volts 1.0E+3 to 1.0E+9 Ohms 100 volts \pm <2.0 volts 2.0E+5 to 2.0E+14 Ohms</p>
Accuracy:	Overall: \pm <5% at ambient conditions (at 23°F and 30% Rh). Specific Range Tolerances: 1.0E-1 to 1.0E+1 ohms: \pm 5% Corrected for Test Lead Resistance 1.0E+1 to 1.0E+12 ohms: \pm 2.0% with 10-foot Test Leads 1.0E+12 to 2.0E+14 ohms: \pm 50%
Display:	Multi-function 2-5/8" x 1-5/8" Liquid Crystal Display with 0.5" digit height. Displays 3-1/2 digits in Ohms, or 1.0EXX in exponential format. Ohms Display indicators: Ω , K Ω , M Ω , G Ω and T Ω . Includes 19-segment analog scale (1-10 with 0.5 indication) with x1, x10, & x100 multipliers. Number of Data Points in Memory (0 – 80). Automatic Electrification Time (seconds), or Time required to Manually obtain steady state measurement. Displays data HOLD, BATTERY status, MIN, MAX, AVG, REC and Test Voltage (<10, 10, or 100 V)
LED Indicators	14 Color LED's from <10 ³ to >10 ¹⁴ ohms. Colors (RED, GREEN, YELLOW, or Blank/OFF).
Timer Memory:	Times measurements In Seconds up to 99 seconds (Displayed on LCD)

Register stores up to 80 data points (MEM # Displayed after RESET)

Response & Electrification: Response from >0.1 to <1.0E06 Ohms: <2.0 seconds
Average Measurement Period from 0.1 ohms to 1.0E12 Ohms **2.5** Seconds.
Calculated Electrification Period per ESD S11.11, **7.5** second 0.1 ohms to 10E+12 Ohms. Programmed Electrification >1.0E+12 Ohms: **15.0+** seconds

Power : Two 9-VDC alkaline batteries. Nominal battery life 25 hours.

Dimensions: 4.0" wide x 6.0" long x 2.0" deep.

Weight: 22 ounces, with batteries

Open Circuit Current (I): <4ma @ 100 Volts

PRS-812 Instrument Controls

FUNCTION/ MODE Toggles Through Six (6) Operation Modes:

<u>MODE</u>	<u>DISPLAYED UNITS</u>	<u>INDICATION</u>	<u>RESIST. RANGE</u>	<u>TEST VOLTS</u>	<u>TEST FUNCTIONS</u>
AUTOMATIC 1	1.0EXX IND Ω - TΩ	<u>AUTO</u>	AUTO.	AUTO.	AUTOMATIC RESISTANCE RANGE, TEST VOLTS, ELECTRIFICATION, DISPLAY HOLD
AUTOMATIC 2	OHMS Ω - TΩ	<u>AUTO</u>	AUTO.	AUTO.	SEE TABLE NOTE #1
MANUAL 1	1.0EXX IND Ω - TΩ	<u>MANUAL</u>	MAN.	MAN. or AUTO	TEST ONLY; NO DISPLAY HOLD UL = UNDER DECADE LEVEL
MANUAL 2	OHMS Ω - TΩ	<u>MANUAL</u>	MAN.	MAN. or AUTO	OL = OVER DECADE LEVEL SEE TABLE NOTE #2
MANUAL/ AUTOMATIC 1	1.0EXX IND Ω - TΩ	<u>AUTO & MANUAL</u>	MAN. Start AUTO Run	AUTO.	MANUAL SETUP STARTING DECADE, AUTO ADJUST RANGE, TEST VOLTS, ELECTRIFICATION DISPLAY HOLD
MANUAL/ AUTOMATIC 2	OHMS Ω - TΩ	<u>AUTO & MANUAL</u>	MAN. Start AUTO Run	AUTO.	

TABLE NOTES:

#1 AUTOMATIC: RESISTANCE RANGES IN AUTO 0.1Ω TO <2.0E+12Ω as follows

@<10V: 0.1 TO <1.0E+04Ω (0.1Ω - < 10KΩ)

@ 10V: 1.0E+04 TO <1.0E+06Ω (10KΩ - < 1MΩ)

@100V: 1.0E+06 TO <2.0E+12Ω (1MΩ - <200TΩ)

#2 MANUAL: RESISTANCE RANGES IN MAN 0.1Ω TO <2.0E+12Ω as follows

@<10V: 0.1 TO <1.0E+05Ω (0.1Ω - <100KΩ)

@ 10V: 1.0E+03 TO <1.0E+09Ω (1KΩ - <1GΩ)

@100V: 2.0E+05 TO <2.0E+12Ω (200KΩ-< 200TΩ)

#3 AUTO-MANUAL: (Same as AUTOMATIC)

RESISTANCE RANGES IN AUTO-MANUAL 0.1Ω TO <2.0E+12Ω as follows

@<10V: 0.1 TO <1.0E+04Ω (0.1Ω - < 10KΩ)

@ 10V: 1.0E+04 TO <1.0E+06Ω (10KΩ - < 1MΩ)

@100V: 1.0E+06 TO <2.0E+12Ω (1MΩ - <200TΩ)

NOTE: It is capable of measuring up to 2.0×10^{14} ohms with tolerance depending on procedures and conditions.

Resistance Range Select.	2 Triangular button Arrows: UP ↑ and DOWN ↓. Select Resistance Range in single decades in Manual and Automatic/Manual modes
Test Volts	Manual Selection of <10, 10 or 100 volts in Manual Mode
Record/Recall	Turns Memory Register ON if OFF. Provides access to all data in Memory Register. Calculates and Displays Minimum, Maximum and Average of data stored in Memory Register.
Clear	Erases data in Memory Register; if in HOLD mode, discards most recent Held Value
ON/OFF	Power-up, perform functional & Battery tests, Power-down if ON.
Batt. Test	Displays GOOD on LCD if acceptable voltage or Lo if unacceptable
Reset	Enters (saves) data into Memory Register, Clears HOLD and Display.
Test	Begins measurement sequence.
Battery Buss Cut Off	ON/OFF Switch isolates batteries from instrument circuits for storage & transport



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