WIDE RANGE OHMMETER

PAS-853B

User Manual

PROSTAT®

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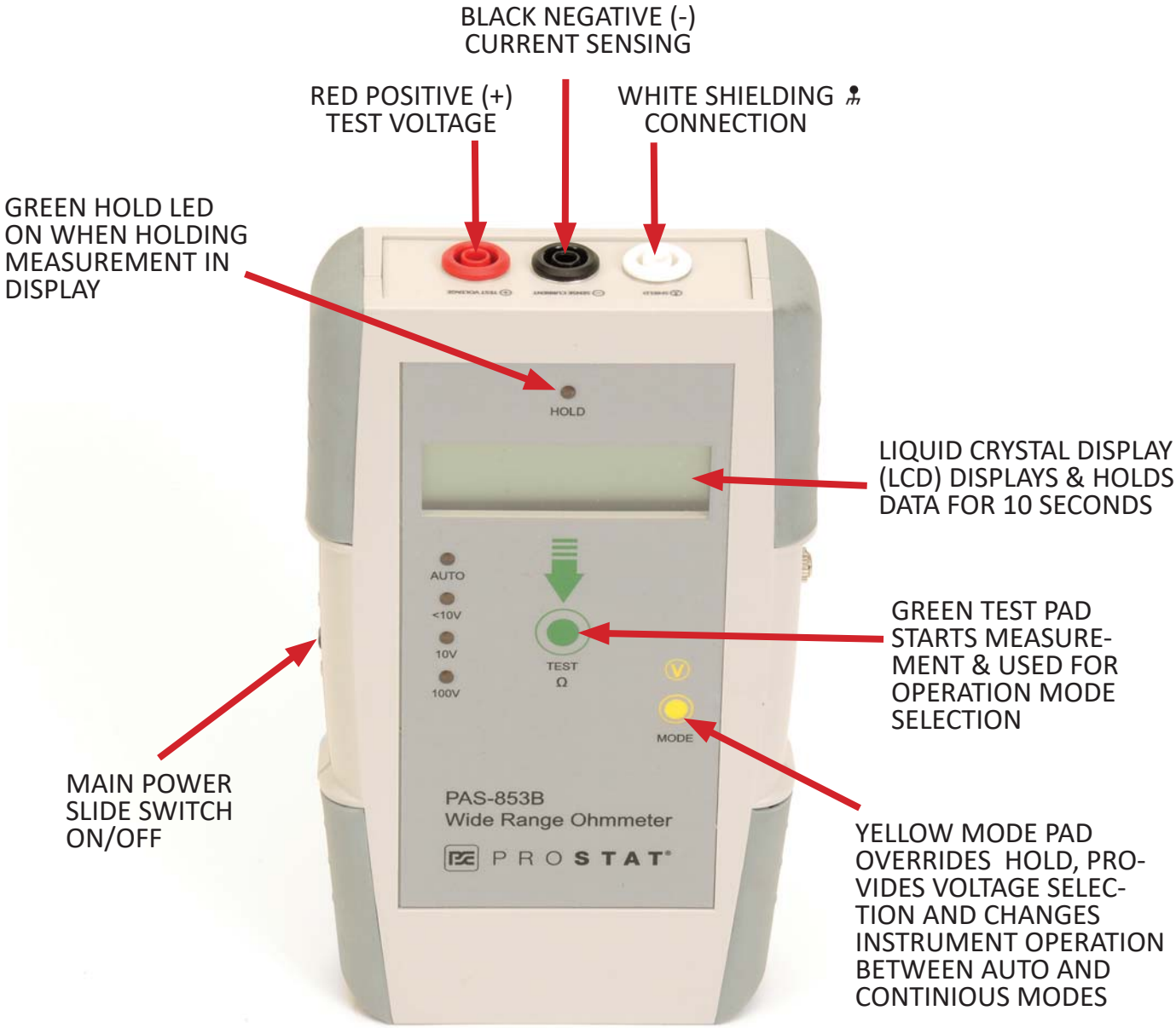
PROSTAT® PAS-853B WIDE RANGE OHMMETER

I. Introduction & Description

The PAS-853B instrument is a wide range ohmmeter that measures accurately from 0.01 to <$1.0x10^{13}$ ohms, i.e., $9.99x10^{12}$ ohms. In its **AUTO** mode the instrument automatically adjusts resistance range and selects test voltage in accordance with standard practices outlined in ANSI/ESD STM11.11, and meets audit requirements of ESD TR53:

- <10 Volts Variable are applied from 0.01 to $9.9x10^{3}$ ohms and provides audible continuity indication below 1.6 ohms
- 10 Volts ± <0.5V (±<5% Constant Voltage, i.e., Under Load) applied from $1.0x10^{4}$ to $9.99x10^{5}$ ohms
- 100 Volts ± <5V (±<5% Constant Voltage, i.e., Under Load) applied from $1.0x10^{6}$ to <$1.0x10^{13}$ i.e., $9.99x10^{12}$ ohms



A. Modes of Operation

There are two main Modes of PAS-853B Operation

1. **AUTO** mode (Displayed as *GO A*): Automatically adjusts resistance range, test voltage and Electrification Period (EP). Measurements stops at the end of EP, Green LED is **ON**, measurement is displayed for 10 seconds then instrument resets for the next measurement.

Figure 2: PAS-853B in AUTO - Default Operation Mode

Figure 3: PAS-853B in Continuous Operation Mode

2. **CONTINUOUS** mode (Displayed as *GO C*): Functions as in **AUTO** mode by automatically adjusting resistance range and test voltage, but continues to measure until the operator presses MODE, or restarts the measurement by pressing TEST. *GO C* disables electrification period control.

3. Manual Voltage Selection can be made in either **AUTO** or **CONTINUOUS** modes by pressing the **MODE** pad before starting the measurement.

   a. To change the mode of operation simultaneously press and release the **TEST** and **MODE** pads.

Figure 4: Press MODE to manually Change Test Voltage

II. Battery Installation

- Battery Main Power **OFF**
- Open Battery Cover
- Replace Battery (9V Alkaline)
- Close Cover

Figure 5: Main Power Battery Cut-Off Switch on side of Instrument

Figure 6: PAS-853B Battery Compartment on bottom of Instrument

A. Install test leads or special fixtures as shown:

1. Slide **MAIN POWER** Switch to **ON**
2. "Go A" is the Default Operation Mode and is displayed when **MAIN POWER** is **ON**
3. To Start Measurement use the Green **TEST** Pad
   a. Press & release **TEST** Pad
   b. Measurement sequence is conducted automatically; ends when Green **HOLD** LED is **ON**
   c. Press **MODE** to interrupt or clear measurement
4. Data is displayed in the LCD & Hold Indicator LED [Top Panel] glows green. Press the Yellow **MODE** button once to erase the data.

   NOTE: Press **TEST** to restart the measurement at any time

Figure 7: Test Lead Connections:
White = Shield
Black = Current Sensing
Red = Test Voltage

B. The **MODE** button performs four useful functions:

1. Override Displayed Data Hold: Resets the instrument for the next measurement and bypasses the automatic **HOLD** function. Note that the existing measurement in the display is discarded.

2. Used with **TEST** pad to change modes of operation between **AUTO / GO A & CONTINUOUS / GO C** operation

3. Selects function and starting test voltage for **AUTO**, or **CONTINUOUS** mode

4. Initiates *CAL?* and *Null* functions:

   a. ***NULL*** Function: Is used to measure lead resistance and adjust the measurement circuit to compensate for lead resistance. Properly used, when shorted together with supplied shunt lead resistance should measure close to zero (0) i.e. 0 to 0.2E-1 ohms, after the measurement circuit is adjusted to compensate for lead resistance. (See Null Adjustment for Lead Resistance)

   b. ***CAL?*** Function: Is used by qualified Prostat® trained technicians to adjust instrument test voltages using a special technique to maintain specification performance. Do not try to adjust test voltages. Exit out of *CAL?*

5. Mode Sequence For manual selection of test voltage:

   a. First Press: Manual <10 Volt Test Voltage

   b. Second Press: Manual 10 Volt Constant Test Voltage

   c. Third Press: Manual 100 Volt Constant Test Voltage

   d. Fourth Press: Return to **AUTO** mode operation

Figure 8: Mode Sequnce

C. Connections

Leads are connected to the Positive (+) and Negative (-) receptacles for resistance instrument measurements. The Black Prostat PAS-853BLB sensing lead incorporates shielding; the shield is connected to the instrument via the White banana plug and receptacle, as shown in Figure 7.

Receptacles are separated by ¾ inch spacing (see Figure 10) to accommodate dual banana plug connectors. These connectors are used for the Prostat® type PRF-912B and PRF-922B microprobe resistance measurement fixtures.

Leads supplied with the PAS-853B are specially designed for this instrument. They have superior outer insulation and a high number of stranded conductors to minimize measurement errors.

1. Be aware that non-Prostat leads may not provide similar performance and will require recalibration of the Null point to improve measurement accuracy.

2. Always use Prostat supplied leads with Prostat equipment for best performance.

   a. Lead quality and length affect instrument accuracy. This is due to several factors such as insulation resistance, lead inductance and capacitance, as well as transmitted “noise” in the

environment. To minimize the effect of noise and transmitted energy on measurement accuracy, the black sensing lead is shielded.

b. Long 200 cm leads are supplied for auditing purposes where lead length is physically necessary. Long Prostat leads will allow the instrument to perform within its targeted performance.

Figure 9: The shield is connected to the meter via the White banana plug and receptacle

Figure 10: Receptacle spacing accommodates dual banana plug connectors.

NOTE
An auxiliary Remote Control connection is installed for calibration and future application purposes.

III. Resistance Measurements in Automatic Mode

In the default **AUTO** mode the instrument makes range and test voltage adjustments automatically, depending on the resistance of the material or object being measured, and in accordance with standard measurement protocol.

A. Once leads are installed, slide the Main Power switch to **ON**.

B. Note that a yellow LED above **AUTO** lights to indicate the instrument is in automatic mode.

C. With leads installed press and release the **TEST** pad. The measurement sequence will be conducted automatically until either the Green LED illuminates, or

   a. The test is interrupted by pressing the **MODE** button once, or

   b. The **TEST** button is pressed to restart the measurement sequence.

Figure 11: Automatic Mode

CAUTION
Test Voltage is supplied through the Red Positive (+) terminal. To measure in accordance with industry standard protocol Test Voltage is applied during the measurement starting at <10 volts (variable), and then automatically increased to constant 10 volts, or constant 100 volts as necessary. When applied, Test voltage magnitude is indicated on the front panel by the illuminated yellow LED above the applicable voltage.

D. Record your measurement as may be required.

NOTE: Measurements will be erased and the instrument reset to zero for the next measurement after *10 seconds.*

IV. Electrification Period in AUTO/GO A Mode

Electrification Period (EP) is the time required for an instrument to make a measurement from zero (0) to within 5% of $1.0x10^{12}$ ohms at 100 volts, plus 5 seconds. The EP is used for resistance measurements equal to, or greater than $1.0x10^{6}$ ohms. The PAS-853B was designed to incorporate variable EP to allow fastest possible, accurate measurements. Typical EP up to less than $1.0x10^{9}$ ohms is typically less than 8.0 seconds. However, measurement conditions in the factory environment vary considerably. To compensate for variables in materials and conditions, the PAS-853B makes many measurements each second and evaluates their consistency and stability. If necessary the PAS-853B will automatically extend the measurement time (EP) to insure an accurate representation of the material under test.

The PAS-853B measurement process is quite fast and once a measurement is stable in the LCD, the operator may elect to use the stable displayed measurement. In this case the EP is manually determined by the operator. This is an efficient operating procedure for determining if the measurement is generally within the required range for the object being audited. In this case, the operator usually observes and confirms measurement stability, which results in faster audit measurements. However, if the measurement is of a critical nature, or being used for material qualification purposes, the full EP for that measurement should be employed, i.e., when the measurement is completed and displayed, and the Green LED comes **ON** as described below.

If the operator desires the EP to be determined by the instrument in **AUTO/GO A** mode, the Green Hold LED illuminates when the appropriate measurement period for each measurement is reached. It takes into account the material variables seen during the measurement and adjusts the EP for optimal measurement accuracy. Typical EP's for the PAS-853B instrument are:

0.01 to 1.0E9 ohms:	Typically 2 to 8 seconds (Range Average ~6.0 seconds)
1.0E09 to 1.0E11 ohms:	7 to 10 seconds
>1.0E11 to <1.0E13 ohms:	10 to 25 seconds

These values are variable and based on the stability of the materials being measured, as well as the environmental conditions. For example, while the default EP for the PAS-853B instrument is 7.5 seconds, EP automatically adjusts to enhance measurement accuracy.

V. Measurements in Manual Mode

To manually select a specific test voltage, once leads or fixtures are installed, slide the Main Power switch to **ON**.

A. Press the **MODE** button one time and note the illuminated LED above **AUTO** is OFF, and the LED above **<10V**, is ON. This means the test voltage is manually set to vary from approximately 1 mv to less than 10 volts, depending on the resistance being measured.

B. Pressing the **MODE** button a second time turns the LED adjacent to <10V OFF, and the LED next to 10V ON. This indicates all measurements will be made at a constant test voltage of 10 volts, which may vary up to <0.5V depending on material resistance.

C. Pressing the **MODE** button a third time moves illuminates the LED above 100V, which provides a constant test voltage of 100V ± <2.0 Volts.

D. Press and release the **TEST** pad to make the measurement.

E. Record the measurement within 10 seconds following the illumination of the Green **HOLD** LED.

F. Resistance measurement ranges in Manual mode are as follows.

@<10 Volts (Variable):	0.1E-1 to 1.0E9 Ohms
@10 Volts (Constant):	1.0E4 to 1.0E10 Ohms
@100 Volts (Constant):	1.0E6 to 9.99E12 Ohms

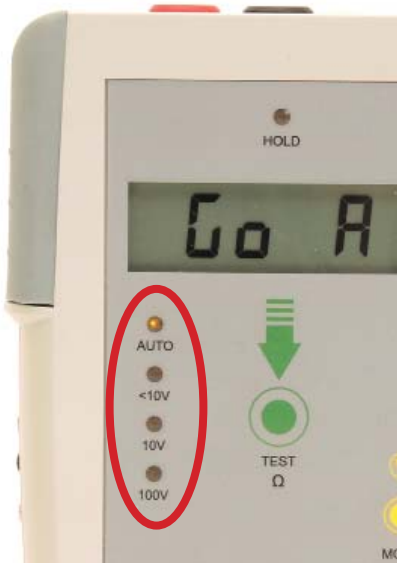


Figure 12: Manual Mode

VI. Null Adjustment for Lead Resistance

To **NULL** lead resistance means to compensate for, or to subtract lead resistance from the measurement so that only the item or circuit resistance being measured is displayed in the LCD. This is especially important when making low resistance measurements less than 1.0 or 2.0 ohms. Two 200 cm Prostat leads have a combined resistance of approximately <0.35 ohms.

A. One method for making low resistance measurements is to determine lead resistance by shorting the leads together with the supplied shorting shunt and press TEST to measure their resistance.

B. If less than 0.02E-1 ohms is displayed, virtually all lead resistance has been removed from the measurement

C. If a value 0.2E0 or greater is displayed, either:

1. Perform the **NULL** procedure described below, or
2. Subtract that value from the final measurement
3. Either 1 or 2, above, are acceptable for low resistance measurements depending on application requirements

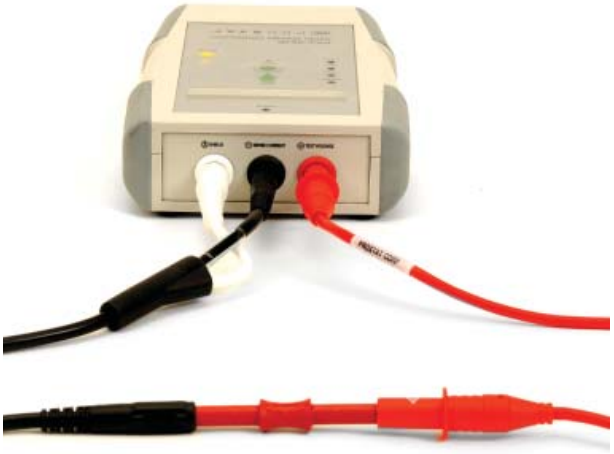


Figure 13: Short the test leads together with the supplied shunt.

Figure 14: 1 each PAS-853S Test Lead Shunt provided with the instrument.

D. To adjust the PAS-853B to compensate for lead resistance connect the leads to the instrument and then short the leads together using the supplied shorting connector (shunt). The instrument should be **OFF** before starting this sequence.

   1. Press and hold the **MODE** button while simultaneously sliding the Main Power switch to **ON**. Continue to hold the **MODE** button down until the unit goes through its startup routine, then *CAL?* is displayed in the LCD. Release the **MODE** button.

Figure 15: Press and Hold the MODE button while sliding the Main Power to ON.

Figure 16: CAL? will be displayed.

2. While *CAL?* is displayed press **MODE** one time and *nULLr?* will be displayed.

Figure 17: Press MODE to select *NULL* process

Figure 18: Press TEST and *r nULL* displays and starts

3. Press **TEST** briefly so that "*r nULL*" is displayed in the LCD, which begins the automatic Null adjustment process. This automatic process requires 10 to 12 seconds to complete. Do not touch the instrument controls during this period – simply allow it to go through its lead measurement sequence.

4. After 10+ seconds the lead resistance will be displayed in the LCD.

   a. Press **MODE** to start memory sequence

   b. *E12 C?* will be displayed; Press **MODE**.

   c. Then "*StorE?*" will be displayed. Press **MODE** to complete sequence.

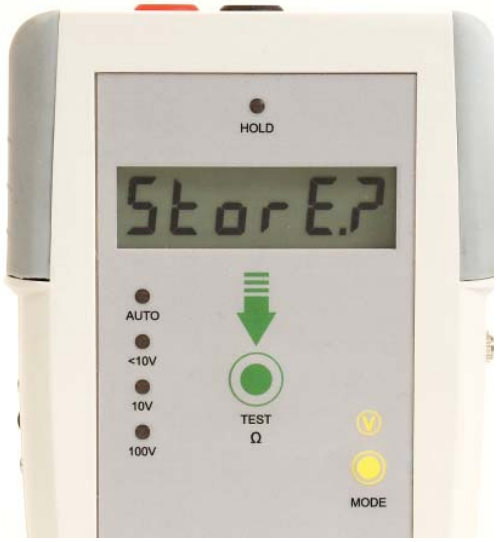


Figure 19: E12 C? and StorE? will display

5. Once the lead resistance is stored in memory, the unit restarts. During startup the instrument firmware ID version is displayed when the instrument is ready to take measurements *Go A* is displayed.

Figure 20: Firmware version

> **NOTE**
> To confirm the adjustment was made, press the **TEST** pad to measure the leads while still shorted together. Lead resistance should be very low i.e., 0.0E-1 to 0.2E-1 ohms. If not, repeat the Null adjustment process again.

VII. Battery Replacment

Before replacing the single 9V alkaline battery, slide the Main Power switch to **OFF**. Open the battery compartment by removing the small #1 Philips head screw. The battery is located in a small sealed compartment. Carefully remove the battery and disconnect the terminal cap from the battery.

DO NOT PULL THE WIRES TO RELEASE THE TERMINAL CONNECTOR!

CAREFULLY PRY THE TERMINAL CAP FROM THE BATTERY TO PREVENT DAMAGE

Connect the new alkaline battery to the terminal and replace it in the spring clamp; replace the battery cover. Use only alkaline batteries for long life and to AVOID DAMAGE to the unit. Do not use standard carbon batteries as they:

- Will not last nearly as long as alkaline batteries
- May overheat causing instrument damage
- Will VOID the instrument's warranty

Figure 21: Battery Replacement

VIII. User Adjustments & Maintenance

The primary user adjustments are limited and have been previously described in this manual, i.e., the Null adjustment to compensate for test lead resistance. There is no reason for the operator or unauthorized personnel to break the warranty seal and open the unit. The instrument's circuits and mechanical connections have been precisely installed and the instrument tested.

Annual calibration includes measurement of test voltage under load and a series of functional resistance test measurements. A Prostat Authorized Calibration Laboratory should make these measurements and adjustments if necessary. NOTE: THE INSTRUMENT IS NOT OPENED FOR, OR DURING CALIBRATION, WHICH IS PERFORMED ELECTRONICALLY.

IX. Warranty Information

A. Limited Warranty & Limitation of Liability

Each Prostat® product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one (1) year and begins on the date of shipment. This warranty extends only to the original buyer or end-user customer of a Prostat Authorized Reseller, and does not apply to fuses, disposable batteries or to any product which, in Prostat's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling. Prostat warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Prostat does not warrant that software will be error free or operate without interruption.

Prostat Authorized Resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Prostat. Warranty support is available if product is purchased through a Prostat authorized sales outlet or Buyer has paid the applicable international price. Prostat reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Prostat's warranty obligation is limited, at Prostat's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Prostat authorized service center within the warranty period. This warranty does not apply to routine calibration of the instrument.

To obtain warranty service, contact your nearest Prostat authorized service center or send the product, with a description of the difficulty, postage and insurance prepaid (FOB Destination), to the nearest Prostat authorized service center. Prostat assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Prostat determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, Prostat will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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Out of Warranty Repairs

Prostat expressly warrants that for a period of 90 Days from the date of repair, by Prostat, instruments and products will be free of defects in material (parts) and workmanship (labor). If Prostat receives notice of such defect during the warranty period, Prostat will replace or repair at its expense such parts which it determines to be defective. Any defective part must be returned to Prostat® postage prepaid with proof of purchase date. This warranty does not apply to routine calibration of the instrument.

Warranty Exclusions - THE FOREGOING EXPRESS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. PROSTAT SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, RELIANCE OR ANY OTHER THEORY.
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In no event will Prostat or any authorized reseller 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 Buyer's exclusive remedy and will be
Prostat's and authorized reseller's limit of liability for any breach of warranty or otherwise.

Recommended Usage

Prostat's instruments and fixtures shall be operated at 65 – 90° Fahrenheit (18 – 32° Celsius), 10 – 60 % Relative Humidity. Prostat recommends making measurements using its instruments and fixtures in an environment of 72 – 76° Fahrenheit (22 – 24° Celsius), 25 – 35% Relative Humidity.

PAS-853B Wide Range Ohmmeter Specifications

CONTROLS

ON/OFF Battery Bus Cut-off

Slide Switch ON SIDE OF CASE
ON: Energizes instrument and LCD displays Software Version then *GO A* with **AUTO** indication (Default)
OFF: Isolates battery and DC voltage from instrument controls and circuit. Use for transport and storage

TEST Pad

With Test Leads installed: Press once & Release. Measurements performed automatically.
In conjunction with MODE changes from Auto operation to Continuous.

MODE Pad

Steps through Auto/Voltage ranges with each press of MODE Pad:

- AUTO: Default automatic resistance range & Voltage control
- <10V: Manual Operation 0.01 to ≤10V Test Voltage;
  - Resistance Range: 0.01E-1 to 9.99E9 Ω
- 10V: Manual Operation at 10V (Nominal, Semi-Constant)
  - Resistance Range: 0.98E4 to 9.99E10 Ω
- 100V: Manual Operation at 100V (±<5V) Constant Voltage
  - Resistance Range: 0.98E6 to 9.99E12 Ω
  - When data in **HOLD**, press **MODE** to terminate **HOLD** without changing operational mode
  - Press **MODE** with **TEST** to change from Auto to Continuous
  - Used to measure lead resistance (*NULL*)
  - Used by Prostat Authorized Technicians for Voltage Calibration

CONNECTIONS

Positive (+) Test Voltage (RED) – Supplies test voltage to electrodes/fixtures

Negative (-) Current sensing (BLACK) – Conducts current from electrode, fixtures or Ground to instrument

Chassis (⏚) Shielding connection to chassis (WHITE) – Reduces transmitted energy and effect on current measurement.

Note: ¾ inch spacing between RED and BLACK accommodates dual banana BNC adapters

INDICATION Colored LED's indicate instrument operational **MODE** and Test Voltage (YELLOW) used for the current measurement, as well as measurement completion (GREEN LED).

- AUTO: **ON** during automatic operations; **OFF** in Manual mode
- <10V:
- 10V
- 100V
- GREEN LED: Measurement hold

ACCURACY

Overall:
± <5% at ambient conditions (at 23°C and 30% Rh)

Nominal Range Tolerances:
± <5% at ambient conditions (at 23°C and 30% Rh)

[1]**Nominal performance by range:**
0.01E-1 to 1.99E+0Ω: ±10%, ±2 Counts
2.00E+0 to 9.99E+9Ω: ±2%, ±2 Counts
1.00E+10 to 9.99E+10: ±5%, ±2 Counts
1.00E+11 to 9.99E+11: ±10%, ±2 Counts
1.00E+12 to 9.99E+12: ±20%, ±4 Counts

TEST VOLTAGES

Automatically selected and controlled in **AUTO** mode. May be manually selected by pressing **MODE** pad in the following order:

- <10V Variable based on resistance load
  - Provides 0.001 to ≤10V
  - Functional in **AUTO** within range 0.01 Ω - <1.0E+4 Ω
  - Manual Operation Resistance Range: 0.01E-1 to 9.99E+9 Ω
- 10V Constant Voltage (Under Load)
  - Test Voltage Varies ± <5% in AUTO or Manual Operations
  - Functional in AUTO within range 1.0E+4 Ω - <1.0E+6 Ω
  -Manual Operation Resistance Range: 0.9E+4 to 9.99E+10 Ω
- 100V Constant Voltage (Under Load)
  - Test Voltage Varies ± <2% in AUTO or Manual Operations
  - Functional in AUTO within range 1.0E+6 Ω - <1.0E+13 Ω
  - Manual Operation Resistance Range: 0.90E6 to 9.99E12 Ω
- Returns to Auto Mode

OPEN CIRCUIT CURRENT

<3mA @ 100V

MODES OF OPERATION

GO A: Performs all automatic and manual voltage select functions, stops and dis plays measurements after Electrification Period (EP) is complete, then displays data with Green LED ON for 10 seconds.

GO C: Performs all automatic and manual voltage select functions, continuously displays measurements until the operator presses **MODE** or **TEST** pads. GO C disables electrification period controls.

POWER

One 9V alkaline transistor battery; battery life > 50 hours

DIMENSIONS

7.25 in. (184 mm) x 4.3 in, (109 mm) x 1.4 in. (36 mm)

WEIGHT

13.2 oz. (375 gram) with battery installed

NOTES

[1]Tolerance and accuracy measurements were conducted under controlled conditions with close tolerance reference resistors.

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