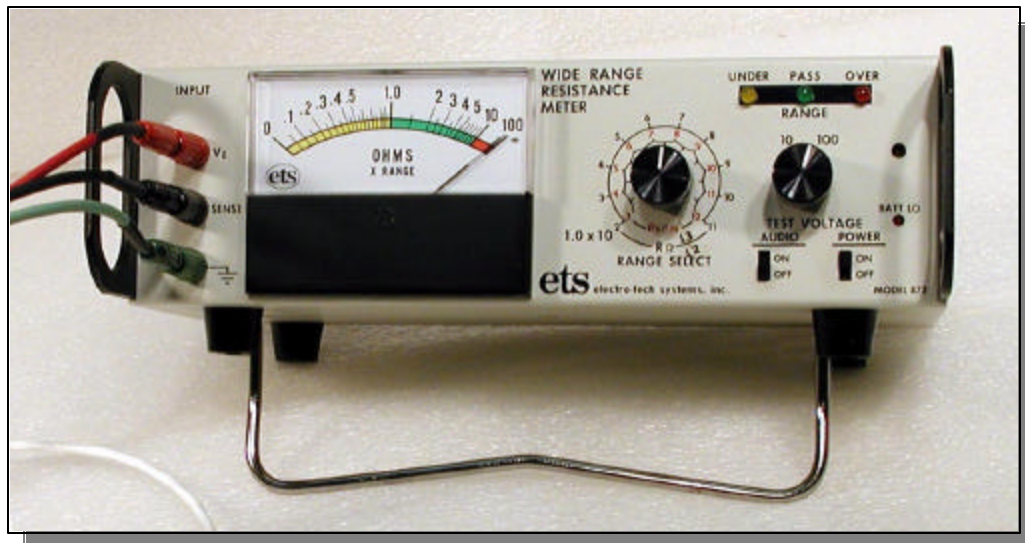


Wide Range Resistance Meter

Model 872

Operating Manual



1.0

Introduction

Many applications require the measurement of resistance or resistivity over a wide range. The Model 872 Wide Range Resistance Meter is a battery or AC powered laboratory instrument that is capable of measuring resistance or resistivity over the range of 10^1 to 10^{13} ohms utilizing a user selected test voltage of either 10 or 100 volts. Measurement accuracy is $\pm 2\%$ over the 10^1 to 10^7 ohms range and better than $\pm 5\%$ over the 10^8 to 10^{12} range.

The Model 872 can be used with any type of resistance or resistivity test probe or test cell. It is an ideal instrument when used with the ETS Model 803 Series Resistance/Resistivity Probes, Model 850 Surface Resistance Probe and Model 805 IC Tube Resistivity Test Fixture for measuring the resistance/resistivity requirements specified in ASTM D-257, EIS-541, NFPA 99, EOS/ESD STD-4 S4.1, STD-7 S7.1 and STD 11.1 S11.1, DS11.2 ASTM F 150 and applicable DOD Standards.

Certain specifications such as ASTM F-150, NFPA 99 and certain DOD Standards also require test voltages of 500 volts. Normally, higher test voltages will result in lower resistance readings. Hence, a "PASS" indication utilizing 10 or 100 volts will generally meet any resistance requirements specified at the higher voltages.

2.0 Equipment Description

The Model 872 Wide Range Resistance Meter is a precision instrument designed for bench top applications. It can be operated from either two (2) 9 volt batteries or the supplied 94-260 VAC, 50/60 Hz power adapter.

The instrument accurately measures resistance over a full 11 decade range from 10^1 to 10^{12} ohms with a total measurement accuracy better than $\pm 5\%$. Three LED point source readouts indicate whether the measured resistance is within the selected range (continuous green light), under the selected range (flashing yellow light) or over the selected range (flashing red light). A pulsating audio tone is also provided to indicate out of range measurements. This tone can be switched on or off by the user.

The RANGE SELECT switch has two scales. The black scale indicates the actual measured resistance. The red scale indicates the calculated surface resistivity when using probes or test fixtures with a built-in X10 multiplication factor. The ETS Model 803 Series and 805 Resistivity Probes/Test Fixtures incorporate the x10 multiplication factor. The switch covers 10 decades from 10^2 to 10^{12} ohms, which corresponds to the green PASS indicator. The additional two decades are obtained by the meter which can measure one decade below and one decade above the green PASS range.

The measuring probes are connected to standard banana jacks located on the front panel of the instrument. A ground jack is also provided for those measurements requiring a grounded surface such as the measurement of surface resistivity of insulating materials as specified in ASTM D 257.

A 36" Teflon insulated shielded cable terminated with standard banana plugs is provided.

3.0 Operation

The Model 872 Wide Range Resistance Meter is an easy to use instrument for accurately measuring resistance/resistivity or indicating the acceptance or rejection of a measurement on a pass/fail basis. The instrument consists of four (4) controls. POWER, AUDIO, RANGE SELECT and VOLTAGE SELECT. The POWER switch turns the unit on, which is indicated by one of the RANGE LEDs illuminating. The AUDIO switch enables the user to disable the pulsating out-of-range audio indicator. The RANGE SELECT switch determines which resistance/resistivity decade will be indicated by the green PASS indicator. The VOLTAGE SELECT switch enables the user to select either a 10 or 100 volt test voltage.

Plug the universal AC Power Module into a standard (94 – 240 volt) outlet if AC power is desired. The 16 volt DC power module is powered when it is plugged in. The POWER switch on the front panel turns the measuring electronics on and off. When the AC power module is used the batteries are disconnected. Standard 9-volt alkaline batteries are used.

Connect the desired measuring probe or test fixture to the red, black or green input connectors located on the front panel. The test voltage is applied to the red connector. If a ground connection is required, connect the GROUND jack on the rear panel to house ground.

Turn the unit on and select the desired test voltage and the desired resistance range by rotating the RANGE SELECT switch to the appropriate PASS range. If a specific resistance/resistivity measurement is desired the select switch should be set to a position that gives a reading in the green range on the meter. Measurements made in either the green or yellow ranges will meet the specified instrument accuracy. However, measurements made in the red range will not meet the accuracy requirements and should not be used.

When testing an unknown material always start with a TEST VOLTAGE of 10 volts. If the measured resistance is greater than 1×10^6 ohms, switch to 100 volts.

If the PASS/FAIL feature of the instrument is used, rotate the RANGE SELECT switch until the green PASS indicator lights. If a specific resistance/resistivity is not specified or required the switch should be set to the range corresponding to the upper limit specified for the material. Depending upon the type of measurement being made (point-to-point resistance, resistance to ground, surface resistivity, volume resistivity, etc.) place the test probe on the unknown material or install the unknown material into the test fixture or test cell and wait at least 10 seconds before taking a reading. A PASS indication will indicate that the material meets the specified resistance/resistivity requirements. If an upper limit PASS range is used, an UNDER range indication will also indicate acceptable material. If a more specific indication is required, rotate the selector switch until the green PASS LED lights. The user is cautioned, however, that for many conductive materials a lower resistance/resistivity limit is also specified.

The pulsating audible tone will sound whenever the indicated resistance/resistivity is either over or under the selected decade range. The tone can be disabled by the user if desired by placing the AUDIO switch in the OFF position.

The user is cautioned that when measuring high resistances (10^8 or greater) the measuring probe and associated interconnect cables become susceptible to external electrostatic fields. When making measurements in this range it is recommended that the operator step away during the 10-second measurement time.

4.0 Maintenance and Calibration

The Model 872 Wide Range Resistance Meter is a ruggedly constructed and reliable instrument and should be handled as any precision laboratory instrument is handled. The instrument contains no user serviceable parts and should be returned to the factory for repair.

To verify the performance of the Model 872 and to check the calibration of each range, a test set-up utilizing a total of twenty (20) precision 1% resistors of different values is required. Table 1 lists the resistor values required to check the calibration of each range. An incorrect indication of a particular resistor value tested in the appropriated range indicates that the range is out of tolerance.

Connect each resistor to the input banana jacks and measure the value using the meter. Note the PASS/FAIL LED indication. When measuring the higher ranges (above 10^7 ohms) lead dress and operator movement can affect the measurement. Utmost care should be exercised to minimize any erroneous indications.

An alternative calibration check can be performed by using several precision resistors of known value and comparing this value with the measurement obtained on the Model 872 Meter. However, this test will not check the PASS/FAIL thresholds.

| Range | CAL Resistor Value | Indication | | | Notes |
|---|--|------------|--------|------|---|
| | | Under | Pass | Over | |
| 1.0 x 10 ² 1.0 x 10 ³ ohms | 98 ohms 102 ohms 980 ohms 1.02K | X | X X | X | Use ¼ watt or larger resistors for these tests. |
| 1.0 x 10 ³ 1.0 x 10 ⁴ ohms | 980 ohms 1.02 ohms 9.8K 10.2K | X | X X | X | Allow at least 5 seconds for indicators to stabilize. |
| 1.0 x 10 ⁴ 1.0 x 10 ⁵ ohms | 9.8K 10.2K 98K 102K | X | X X | X | Allow at least 5 seconds for indicators to stabilize. |
| 1.0 x 10 ⁵ 1.0 x 10 ⁶ ohms | 98K 102K 980K 1.02Meg | X | X X | X | Allow at least 5 seconds for indicators to stabilize. |
| 1.0 x 10 ⁶ 1.0 x 10 ⁷ ohms | 980K 1.02Meg 9.8Meg 10.2Meg | X | X X | X | Allow at least 5 seconds for indicators to stabilize. |
| 1.0 x 10 ⁷ 1.0 x 10 ⁸ ohms | 9.8Meg 10.2Meg 98Meg 102Meg | X | X X | X | Allow at least 10 seconds for indicators to stabilize. |
| 1.0 x 10 ⁸ 1.0 x 10 ⁹ ohms | 95Meg 105Meg 950Meg 1.05Gigohm | X | X X | X | Allow at least 10 seconds for indications to stabilize. |
| 1.0 x 10 ⁹ 1.0 x 10 ¹⁰ ohms | 950Meg 1.05Gigohm 9.5Gigohm 10.5Gigohm | X | X X | X | Allow at least 10 seconds for indications to stabilize. |
| 1.0 x 10 ¹⁰ 1.0 x 10 ¹¹ ohms | 9.5Gigohm 10.5Gigohm 95Gigohm 105Gigohm | X | X X | X | Allow at least 10 seconds for readings to stabilize. |

5.0

Warranty

Electro-Tech Systems, Inc. warrants the Model 872 Wide Range Resistance Meter for a period of one (1) year from date of invoice and will, at the discretion of Seller, either replace or repair without charge, F.O.B. Glenside, similar equipment or a similar part to replace any equipment or part of its manufacture which, within the above stated time, is proved to have been defective at the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment which are purchased from other manufacturers shall be subject only to the manufacturer's warranty.

The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever. This warranty becomes null and void should the Model 872 Wide Range Resistance Meter, or any part thereof, be abused or modified by the customer or if used in any application other than that for which it was intended.

This warranty to replace or repair is the only warranty, either expressed or implied or provided by law, and is in lieu of all other warranties and the Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories and, in particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce and the buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified of the need for equipment repair. ETS will issue an RMA (Return Material Authorization) number for return of equipment.

Equipment should be shipped in the original packaging. If this is not possible, the equipment should be packed in a sufficiently large box of double wall construction with substantial packing around all sides. A description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument.

Electro-Tech Systems, Inc. will not assume responsibility for additional cost of repair due to damage incurred during shipment as a result of poor packaging.