



Pinion Products Corporation Inc.

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**INSTRUCTION MANUAL – RESISTANCE TO GROUND METER,
MODEL RTG-210**



IMPORTANT!! READ THIS MANUAL BEFORE OPERATING THIS UNIT.

THEORY OF OPERATION

The Pinion/Voyager model RTG-210 Resistance to ground meter is a simple to use, highly repeatable measuring device for determining the resistance to ground. The principle of operation is as follows:

A voltage, V(30 Volts), is applied to the grounding cable which is connected to 'ESD' ground. The center probe contact (spring loaded) provides a ground return of the current supplied by the grounding cable. The resistance to ground of the material being measured is expressed as ten to some power, written as Ohms = 10^x ; where "x" is rounded to the nearest integer by the RTG-210 with the following exceptions:

The 10^5 range covers 10^4 to $10^{5.5}$. This allows the first display segment to indicate surface resistivities less than 10^4 Ohms.

SPECIFICATIONS:

<u>Display Segment</u>	<u>Resistance Range (Ohms)</u>
10^4	$<10^4$
10^5	$10^4 - 10^{5.5}$
10^6	$10^{5.5} - 10^{6.5}$
10^7	$10^{6.5} - 10^{7.5}$
10^8	$10^{7.5} - 10^{8.5}$
10^9	$10^{8.5} - 10^{9.5}$
10^{10}	$10^{9.5} - 10^{10.5}$
10^{11}	$10^{10.5} - 10^{11.5}$
10^{12}	$10^{11.5} - 10^{12.5}$
$10^{12.5}$	$>10^{12.5}$

Accuracy: Indicated exponent +/- .3

Power supply: Rechargeable nicad or nickel metal hydride batteries (4 "C" size).

Test Voltage: 30 Volts +/- 2 Volts current limited to 2 mA.

Contact Area: 0.0123 sq in/probe

Contact Pressure: 40-lbs/sq in/probe.

Contact material: Conductive rubber.

Dimensions: 3"H x 4"D x 5" W

Weight: 2 pounds

Calibration Procedure:

The RTG-210 should be calibrated annually. If any step fails as per the following instructions, the unit should be returned to Pinion Products Corporation Inc. for repair and calibration. Pinion Products Corporation Inc. can provide both a standard NIST Calibration with certification traceable to NIST and after calibration data, or a MIL calibration with certification traceable to NIST and both before and after calibration data.

- 1.) The batteries should be charged before beginning the calibration procedure.

- 2.) Remove the 4 screws, two each side, from the unit, and set the cover to the side. Leave the wires attached so that there is access to the printed circuit board. Turn the unit "ON".
- 3.) All voltage measurements are made relative to the unit ground. The test point for ground is adjacent to the -15 and +15 volt test points.
- 4.) Use a 4-½ digit digital voltmeter such as a Keithley Model 175 Multimeter to measure the voltage on the 30VTP. Record this voltage as V30.
- 5.) Measure and record the voltage at the +15V test point as V15.
- 6.) Calculate and record I(ref) using the formula: $I(\text{ref}) = V30 * .04054$
- 7.) Calculate and record R(tp1) using the formula $R(\text{tp1}) = (V15 - .236) / (I(\text{ref}))$.
- 8.) Calculate and record I(O) using the formula $I(O) = I(\text{ref}) * 1.016$, (exponent -3)
- 9.) Calculate and record I(6) using the formula $I(6) = I(\text{ref}) * .992$, (exponent -9)
- 10.) Turn the unit off and remove the shorting jumper connected to TP1 and its adjacent pin. Measure the resistance between the +15V test point and TP1 lead closest to R7. Adjust P1 until the measured resistance is equal to the calculated value RTP1 +/- 1%.
- 11.) Replace the jumper on TP1 and the adjacent pin. Turn the unit on. Connect a current source (e.g. Keithley Model 220) to the side of R6 connected to the large round pad in the center of the board. Apply a current equal to the calculated I(O). Measure the voltage on the test pin marked "OUT" and adjust P2 until the measured voltage is 0.000 VDC +/- .050 VDC.
- 12.) Apply a current equal to calculated value I(6) to the same point as in step 11. Measure the voltage on the test pin marked "OUT", and adjust P3 until the measured voltage is 6.000 VDC +/- .050 VDC.
- 13.) Apply a current equal to $.003^{*-9}$ amperes. Measure the voltage on the test pin marked "OUT", and adjust P6 for a reading of 8.5 VDC +/- .05VDC. The $10^{*12.5}$ led should be illuminated.
- 14.) Apply a current equal to $.03^{*-9}$ amperes. Measure the voltage on the test pin marked "OUT", and verify a reading of approximately 7.5 VDC. The 10^{*12} led should be illuminated.
- 15.) Measure the voltage on the pin marked +8.000 VDC and adjust P4 for a reading of 8.000 VDC +/- .050 VDC.
- 16.) Measure the voltage on the pin marked -2.000 VDC and adjust P5 for a reading of -2.000 VDC +/- .050 VDC.
- 17.) The calibration procedure is now complete. Place the cover back on the base and replace the screws.

Operating Instructions:

- 1) The RTG-210 is extremely simple to operate. Simply turn the unit on, and place it on the surface to be measured. Connect the supplied grounding cable from the banana jack on the rear of the unit to your ESD ground connection, and read the display.
- 2) Measurements in the 10^{*11} to $10^{*12.5}$ may require a few seconds for the illuminated display to stabilize.
- 3) The indicated reading will be resistance to ground readings.

Calibration Check:

- 1.) This is a “Quick” calibration check to verify the RTG-210 is performing within tolerance.
- 2.) Connect a voltmeter to the banana jack relative to ground. The voltage should equal 30V +/- 2 V.
- 3.) Connect a programmable current source to the center probe contact and ground of the RTG-210.
- 4.) Apply the currents in the following table and check that the appropriate display segment is illuminated.

Current (Amperes)	Display Segment	Tolerance
$1.45 * 10^{-3}$	$<10^4$	1%
$4.95 * 10^{-4}$	10^5	1%
$3.77 * 10^{-5}$	10^6	1%
$3.84 * 10^{-6}$	10^7	1%
$3.85 * 10^{-7}$	10^8	1%
$3.85 * 10^{-8}$	10^9	1%
$3.85 * 10^{-9}$	10^{10}	1%
$3.85 * 10^{-10}$	10^{11}	1%
$3.85 * 10^{-11}$	10^{12}	1%
$6.00 * 10^{-12}$	$10^{12.5}$	35%

- 5.) The calibration check is now complete. If any step failed, the RTG-210 requires calibration. Please notify Pinion Products Corporation Inc. that the RTG-210 failed its calibration check, and information will be supplied on the procedure for having the RTG-210 calibrated.

Accessories:

The following options and accessories are available for your SRM/RTG Surface Resistivity Meter:

SFS-100 Replacement Conductive Rubber probes (set of 4)

BFS-100 1” Diameter Conductive Rubber Probes (set of 4)

6550-0011 Replacement Battery Pack (each SRM contains two battery packs)

6120-0035 Replacement Battery Charger for SRM

4000-0001 Carry Case

Please visit our website for details at www.pinionproducts.net