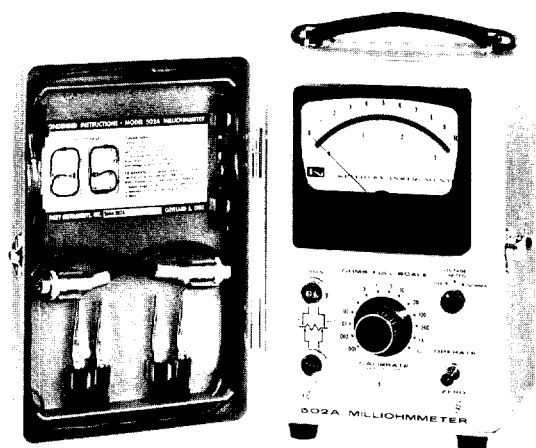


MODELS 502A, 503

MILLIOHMMETERS



- sensitivity to 30 micro-ohms
- accuracy 3% of full scale
- dissipation less than 2 microwatts
- voltage across sample less than 25 mV pk-pk
- battery operation, better than 360 hours

MODEL 502A

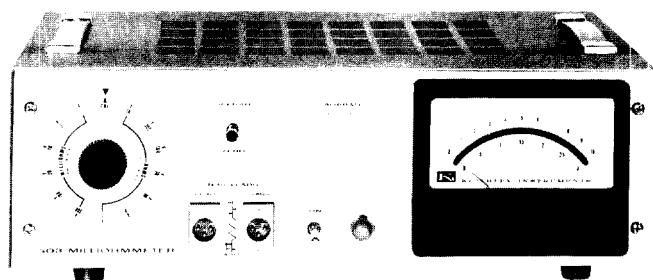
The Model 502A Milliohmmeter is designed for fast, accurate low resistance measurements in the laboratory and the field. It gives rapid indications without zero drift, or errors due to thermal emf's. Readings are presented on a linear scale in 13 overlapping ranges. Minimum detectable resistance is about 0.00003 ohm.

Typical applications include resistivity measurements, corrosion tests, and testing of switch and relay contacts, printed circuits, grounding systems and wave-guide joint resistance. The very low power dissipation in a sample makes the Model 502A especially suitable for safe checking of fuses, squibs and similar explosive devices. Other applications are measuring resistivity profiles in thermoelectric materials, making temperature measurements with thermistors and measuring electrolytic conductivity.

The 502A has a voltage-limited operating model which limits the voltage applied across a sample to 25 millivolts peak-to-peak. Limiting the maximum voltage applied to the sample permits dry circuit testing without breaking down thin insulating films. Maximum power dissipation due to improper range setting in this mode is 65 microwatts.

Once a range has been determined in the voltage limited mode, switching to the normal mode permits more accurate measurements without changing the applied voltage or power dissipation.

A four-terminal measuring system is used to eliminate errors due to lead and contact resistance. A 94 Hz square wave current is applied through one pair of terminals and the voltage drop is measured through the other pair.



- sensitivity to 10 micro-ohms
- accuracy 1% of full scale
- dissipation in sample less than 10 microwatts
- convenient analog output
- easy-to-read linear scale

MODEL 503

The Model 503 Milliohmmeter permits rapid, accurate low resistance tests. Measurements are read directly on a mirror scale meter. Balancing is unnecessary, calibration stability is excellent and the instrument is not damaged by overload.

Features include: 13 full-scale ranges from 0.001 to 1000 ohms; accuracy of $\pm 1\%$ of full-scale meter indication and $\pm 0.5\%$ of full-scale output voltage; no zero drift; rise time of 0.25 seconds to 90% of final value; sample dissipation of less than 10 microwatts; 100-millivolt dc output for chart recordings or control functions; and front panel calibration.

A four-terminal measuring system is used to eliminate errors due to lead and contact resistance. Since an ac measuring current is used, biasing dc currents may be superimposed on the sample during measurement without affecting the accuracy of the readings. This permits investigating variations of resistance with current.

Typical uses include measurements of internal resistance of dry cells, resistivity profiles of thermo-electric materials, measurements of temperatures with thermistors, and safe measurement of fuses.

RANGE ohms	Applied Current, milliamperes rms	Voltage Drop, microvolts rms	Maximum Dissipation in Sample, microwatts
0.001	14	14	0.2
0.003	14	42	0.6
0.01	14	144	2.00
0.03	4.7	144	0.66
0.1	1.4	144	0.2
0.3	.47	144	0.0066
1.0	0.14	144	0.02
3.0	0.28	850	0.24
10	0.085	850	0.072
30	0.0028	850	0.024
100	0.0085	850	0.0072
300	0.0028	850	0.0024
1000	0.00085	850	0.00072

RISE TIME (10% to 90%): 1 second on all ranges.

ACCURACY:

Normal Mode: $\pm 3\%$ of full scale on 1000-ohm to 0.003-ohm ranges; $\pm 5\%$ of full scale on 0.001-ohm range.

Note: Less than 2% error is added in measuring samples with a series reactance of 4% of sample resistance.

Voltage Limited Mode: Degraded from Normal mode by 2-10%; after an on-scale reading is obtained, the unit may be safely switched to the Normal mode for a more accurate reading.

SAFETY:

Normal Mode: Maximum voltage across sample, 1.4 volts. Maximum power dissipation due to improper range setting, 3 milliwatts. Maximum power dissipation due to component failure and improper range setting, 6 milliwatts.

Voltage Limited Mode: Maximum voltage applied across sample, 25 millivolts peak-to-peak. Maximum power dissipation due to improper range setting, 65 microwatts.

ZERO DRIFT: None.

WARM-UP TIME: 30 seconds.

INPUT ZERO: Lever switch prevents off-scale meter indications while changing samples.

REPEATABILITY: Within 2%.

CONNECTORS: Test Leads; Amphenol 80-PC2F.

POWER: Battery Complement: Four E146 (8.4V); two RM401R (1.34V), two RM42R (1.34V); 360 hours minimum life.

DIMENSIONS, WEIGHT: 255 mm high x 170 mm wide x 170 mm deep (10 in. x 6 7/8 in. x 6 7/8 in.). Net weight, 3.9 kg (9 lbs.).

ACCESSORIES SUPPLIED: Model 5022 Current and Voltage Leads; one set alligator clips; one set Miniproduct adapters; mating connectors.

ACCESSORIES AVAILABLE:

Model 5022 Current and Voltage Leads (extra set) \$ 75

PRICE: (For export pricing see inside front cover.)

Model 502A Milliohmmeter (portable) \$825

RANGE ohms	Applied Current, milliamperes rms	Voltage Drop, microvolts rms	Maximum Dissipation in Sample, microwatts
0.001	100	100	10.0
0.003	33.0	100	3.3
0.01	10.0	100	1.0
0.03	3.30	100	0.33
0.1	1.0	100	0.10
0.3	0.33	100	0.033
1.0	0.10	3000	0.03
3.0	0.03	3000	0.009
10	0.01	3000	0.003
30	0.003	3000	0.0009
100	0.001	3000	0.0003
300	0.0003	3000	0.00009
1000	0.0001	3000	0.00003

ACCURACY:

Meter: $\pm 1\%$ of full scale on all ranges.

Output Terminals: $\pm 0.5\%$ of full scale on all ranges.

Note: Less than 1% error is added in measuring samples with a series reactance of 2% of sample resistance.

SAFETY: Maximum power dissipation in sample with improper range, setting is 80 milliwatts. Maximum dissipation caused by instrument component failure and improper range setting is 160 milliwatts.

ZERO DRIFT: None.

WARM-UP TIME: 15 minutes.

INPUT ZERO: Lever switch prevents off-scale meter indications while changing samples.

RISE TIME (10% to 90%): 0.25 second on all ranges.

REPEATABILITY: Within 0.25% of full-scale range setting.

CALIBRATION: Internal resistance standard to calibration with front panel controls.

RECORDER OUTPUT:

Output: + 100 millivolts dc at full scale.

Output Resistance: 800 ohms.

Noise (above 10 Hz): Less than 1 millivolt rms.

CONNECTORS: Test Leads: Cannon XLR-3-32. Output: Amphenol 80-PC2F.

POWER: 105-125 or 210-250 volts, 50-1000 Hz, 30 watts.

DIMENSIONS, WEIGHT: 133 mm (5 1/4 in.) full-rack, overall bench size, 155 mm high x 440 mm wide x 380 mm deep (6 1/8 in. x 17 1/2 in. x 15 in.). Net weight, 8.2 kg (18 lbs.).

ACCESSORIES SUPPLIED: Model 5031 Current and Voltage Leads; mating output connectors.

ACCESSORIES AVAILABLE:

Model 4000 Rack Mounting Kit (See page 63.) \$ 23

Model Model 5031 Current and Voltage Leads (extra set) \$ 75

PRICE: (For export pricing see inside front cover.)

Model 503 Milliohmmeter (bench) \$1075