

specifications, model 153

AS A VOLTMETER OR NULL DETECTOR:

RANGE: Zero-left: 10 microvolts full scale to 1000 volts in 17 overlapping 1x and 3x ranges.

Zero-center: 5 microvolts full scale to 500 volts in 17 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

±1% of full scale on 3-millivolt to 1000-volt ranges.

±2% of full scale on 100-microvolt to 1-millivolt ranges.

±3% of full scale on 10-microvolt and 30-microvolt ranges.

ZERO DRIFT: Less than ±2 microvolts per 24 hours after warm-up with reasonably constant ambient temperature. Less than 8 microvolts during 2-hour warm-up. Long term drift is non-cumulative.

INPUT NOISE: Less than 0.06 microvolt rms (0.3 microvolt peak-to-peak) on most sensitive range with input shorted. Less than 0.1 microvolt rms (0.5 microvolt peak-to-peak) on most sensitive range with 1 megohm source.

INPUT RESISTANCE:

Greater than 200 megohms on 100 microvolt to 1000 volt ranges.

Greater than 50 megohms on 30 microvolt range.

Greater than 20 megohms on 10 microvolt range.

NOTE: Input resistance of any range may be shunted by a 2 megohm resistor using the Function switch.

LINE FREQUENCY REJECTION: A power line or twice power

line frequency which is 40 db $\left(\frac{p-p}{dc}\right)$ greater than full scale affects reading less than 0.5%.

RISE TIME (10% to 90%): Less than 1 second on 100-microvolt to 1000-volt ranges.

Less than 5 seconds on 10-microvolt and 30-microvolt ranges.

AS AN AMMETER:

RANGE: Zero-left: 10^{-11} ampere full scale to 10^{-1} ampere in 21 overlapping 1x and 3x ranges.

Zero-center: 5×10^{-12} ampere full scale to 5×10^{-2} ampere in 21 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

±2% of full scale on 3×10^{-9} ampere to 1×10^{-1} ampere ranges.

±3% of full scale on 1×10^{-10} ampere to 1×10^{-9} ampere ranges.

±4% of full scale on 1×10^{-11} ampere and 3×10^{-11} ampere ranges.

ZERO DRIFT: Less than $\pm 2 \times 10^{-12}$ ampere per 24 hours after warm-up with reasonably constant ambient temperature. Less than 8×10^{-12} ampere during 2-hour warm-up.

INPUT NOISE (with input open): Less than 0.1×10^{-12} ampere rms (0.5×10^{-12} ampere peak-to-peak) on most sensitive range.

INPUT RESISTANCE: Varies from one ohm on 10^{-1} ampere range to one megohm on 10^{-11} ampere range.

RISE TIME (10% to 90%): Less than 2 seconds on 10^{-10} ampere to 10^{-1} ampere ranges.

Less than 5 seconds on 10^{-11} ampere and 3×10^{-11} ampere ranges.

GENERAL:

POLARITY: Meterswitch selects left-zero (positive or negative) or center-zero scales. Recorder output polarity is not reversed.

ISOLATION: Circuit ground to chassis ground: Greater than 10^9 ohms shunted by 0.05 microfarad. Circuit ground may be floated up to ±500 volts dc or peak with respect to chassis ground.

RECORDER OUTPUT:

Output: 0 to ±1 volt dc (adjustable) at up to one milli-ampere for full-scale meter deflection on any range.

Resistance: Less than 10 ohms with output potentiometer set for maximum output.

Voltage Gain: $\frac{\text{one volt}}{\text{Voltage setting in volts}}$

Noise: Input noise times voltage gain plus modulation products.

Modulation Products: Less than 5% peak-to-peak of full scale with input shorted.

CONNECTORS: Input: Special TRIAX. Output: Binding posts.

POWER: 105-125 or 210-215 volts (switch selected), 50 or 60 cps, 35 watts.

DIMENSIONS, WEIGHT: $10\frac{1}{2}$ " high x $6\frac{5}{8}$ " wide x 10" deep. Net weight, 13 pounds.

ACCESSORIES SUPPLIED: Model 1532 Low Thermal Test Leads: connector and 3-foot cable with alligator clips.

ACCESSORIES AVAILABLE:

Model 1531 Gripping Probe with 3 foot cable \$ 35

Model 1532 Test Leads (extra set) \$ 25

Model 1533 Mating Connector for special triax input \$ 10

Model 1534 Special Low Thermal Triax Cable,

10-ft. length \$ 15

PRICE:

Model 153 Microvolt-Ammeter \$550

**KEITHLEY
INSTRUMENTS**
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TENTATIVE SPECIFICATIONS, MODEL 153

AS A VOLTMETER OR NULL DETECTOR:

RANGE: Zero-left: 10 microvolts full scale to 1000 volts in 17 overlapping 1x and 3x ranges.

Zero-center: 5 microvolts full scale to 500 volts in 17 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

±1% of full scale on 3-millivolt to 1000-volt ranges.

±2% of full scale on 100-microvolt to 1-millivolt ranges.

±3% of full scale on 10-microvolt and 30-microvolt ranges.

ZERO DRIFT: Less than ±2 microvolts per 24 hours after warm-up with reasonably constant ambient temperature. Long term drift is non-cumulative.

Less than 8 microvolts during 2-hour warm-up.

INPUT NOISE: Less than 0.06 microvolt rms (0.3 microvolt peak-to-peak) on most sensitive range with input shorted. Less than 0.1 microvolt rms (0.5 microvolt peak-to-peak) on most sensitive range with 1 megohm source.

INPUT RESISTANCE:

Greater than 200 megohms on 100 microvolt to 1000 volt ranges.

Greater than 50 megohms on 30 microvolt range.

Greater than 20 megohms on 10 microvolt range.

NOTE: Input resistance of any range may be shunted by a 2 megohm resistor using the Function switch.

LINE FREQUENCY REJECTION: A power line or twice power line frequency which is 40 db $\left(\frac{P-P}{dc}\right)$ greater than full scale affects reading less than 0.5%.

RISE TIME (10% to 90%): Less than 1 second on 100-microvolt to 1000-volt ranges.

Less than 5 seconds on 10-microvolt and 30-microvolt ranges.

AS AN AMMETER:

RANGE: Left zero: 10^{-11} ampere full scale to 10^{-1} ampere in 21 overlapping 1x and 3x ranges.

Center zero: 5×10^{-12} ampere full scale to 5×10^{-2} ampere in 21 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

±2% of full scale on 3×10^{-9} ampere to 1×10^{-1} ampere ranges.

±3% of full scale on 1×10^{-10} ampere to 1×10^{-9} ampere ranges.

±4% of full scale on 1×10^{-11} ampere and 3×10^{-11} ampere ranges.

ZERO DRIFT: Less than $\pm 2 \times 10^{-12}$ ampere per 24 hours after warm-up with reasonably constant ambient temperature.
Less than 8×10^{-12} ampere during 2-hour warm-up.

INPUT NOISE (with input open): Less than 0.1×10^{-12} ampere rms (0.5×10^{-12} ampere peak-to-peak) on most sensitive range.

INPUT RESISTANCE: Varies from one ohm on 10^{-1} ampere range to one megohm on 10^{-11} ampere range.

RISE TIME (10% to 90%): Less than 2 seconds on 10^{-10} ampere to 10^{-1} ampere ranges.
Less than 5 seconds on 10^{-11} ampere and 3×10^{-11} ampere ranges.

GENERAL:

POLARITY: Meter switch selects left-zero (positive or negative) or center-zero scales. Recorder output polarity is not reversed.

ISOLATION: Circuit ground to chassis ground: Greater than 10^9 ohms shunted by 0.05 microfarad. Circuit ground may be floated up to ± 500 volts dc or peak with respect to chassis ground.

RECORDER OUTPUT:

Output: 0 to ± 1 volt dc (adjustable) at up to one milliampere for full-scale meter deflection on any range.

Resistance: Less than 10 ohms with output potentiometer set for maximum output.

Voltage Gain: $\frac{\text{one volt}}{\text{Voltage setting in volts}}$

Noise: Input noise times voltage gain plus modulation products.

Modulation Products: Less than 5% peak-to-peak of full scale with input shorted.

CONNECTORS: Input: Special TRIAX. Output: Binding posts.

POWER: 105-125 or 210-250 volts (switch selected), 50 or 60 cps, 35 watts.

DIMENSIONS, WEIGHT: 10-1/2" high x 6-5/8" wide x 10" deep.
Net weight, 13 pounds.

ACCESSORIES SUPPLIED: Model 1532 Low Thermal Test Leads: connector and 3-foot cable with alligator clips.

ACCESSORIES AVAILABLE:

Model 1531 Probe gripping probe with 3 foot cable . . . \$35

Model 1532 Test Leads (extra set) \$25

Model 1533 Mating Connector for special triax input . . \$10

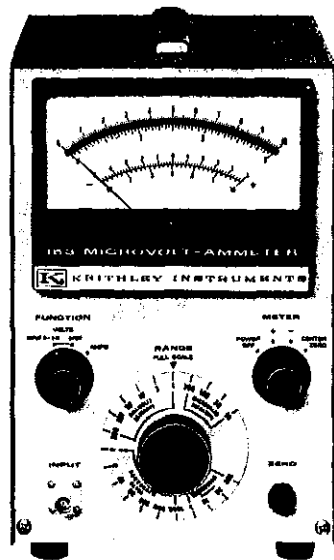
Model 1534 Special Low Thermal Triax Cable, 10-ft. length \$15

PRICE:

Model 153 Microvolt-Ammeter \$550

MODEL 153

MICROVOLT - AMMETER



specifications, model 153

AS A VOLTMETER AND NULL DETECTOR

RANGE: 10 microvolts full scale to 1000 volts in 17 overlapping 1 x and 3x ranges.

ACCURACY (exclusive of noise and drift):

- ± 1% of full scale on 3-millivolt to 1000-volt ranges.
- ± 2% of full scale on 100-microvolt to 1-millivolt ranges.
- ± 3% of full scale on 10 and 30-microvolt ranges.

ZERO DRIFT: Less than ± 2 microvolts per 24 hours after warm-up with reasonably constant ambient temperature. Less than 8 microvolts during 2-hour warm-up. Long term drift is noncumulative.

INPUT NOISE: With input shorted, less than 0.06 microvolt rms (0.3 microvolt peak-to-peak) on most sensitive range.

With 1-megohm source, less than 0.1 microvolt rms (0.5 microvolt peak-to-peak) on most sensitive range.

INPUT RESISTANCE:

- Greater than 200 megohms on 100-microvolt to 1000-volt ranges.
- Greater than 50 megohms on 30-microvolt range.
- Greater than 20 megohms on 10-microvolt range.

Note: Input resistance of any range may be shunted by a 2-megohm resistor by using the Function switch.

LINE FREQUENCY REJECTION: A voltage of power line or twice power line frequency which is 40 dB ($\frac{p-p}{dc}$) greater than full scale affects reading less than 0.5%.

RISE TIME (10% to 90%): Less than 1 second on 100-microvolt to 1000-volt ranges.
Less than 5 seconds on 10 and 30-microvolt ranges.

AS AN AMMETER

ACCURACY (exclusive of noise and drift):

- ± 2% of full scale on 3×10^{-9} to 10^{-1} ampere ranges.
- ± 3% of full scale on 10^{-10} to 10^{-9} ampere ranges.
- ± 4% of full scale on 10^{-11} and 3×10^{-11} ampere ranges.

ZERO DRIFT: Less than ± 2×10^{-12} ampere per 24 hours after warm-up with reasonably constant ambient temperature.

Less than 8×10^{-12} ampere during 2-hour warm-up.

INPUT NOISE (with input open): Less than 0.1×10^{-12} ampere rms (0.5×10^{-12} ampere p-p) on most sensitive range.

INPUT RESISTANCE: One ohm on 10^{-1} ampere range, increasing to one megohm on 10^{-11} ampere range.

RISE TIME (10% to 90%): Less than 2 seconds on 10^{-10} to 10^{-1} ampere ranges.

Less than 5 seconds on 10^{-11} and 3×10^{-11} ampere ranges.

GENERAL

POLARITY: Meter switch selects left-zero (positive or negative) or center-zero scales. Recorder output polarity is not reversed.

ISOLATION: Circuit ground to chassis ground: Greater than 10^8 ohms shunted by $0.05 \mu F$. Circuit ground may be floated up to ± 500 volts dc or peak with respect to chassis ground.

RECORDER OUTPUT

Output: 0 to ± 1 volt (adjustable) at up to 1 milliampere for full-scale meter deflection on any range.

Resistance: Less than 10 ohms with output potentiometer set for maximum output.

Voltage Gain: 1 volt/Voltage setting in volts

Noise: Input noise times voltage gain plus modulation products.

Modulation Products: Less than 5% peak-to-peak of full scale with input shorted.

CONNECTORS: Input: Special Triaxial. Output: Binding posts.

POWER: 105-125 or 210-250 volts (switch selected), 50 or 60 Hz, 35 watts.

ACCESSORIES AVAILABLE

- Model 1531 Gripping Probe (see page 45) \$ 50
- Model 1532 Low-Thermal Test Leads (extra) \$ 27
- Model 1533 Mating Connector: for special triaxial input \$ 10
- Model 1534 Special Low-Thermal Triax Cable: 10 ft. (3m) length of cable only.

Model 4005 Single/Dual Rack Mounting Kit: Adapts one or two Models 153 for standard 10 1/2 in. x 19 in. rack mounting, 11 in. (280mm) depth behind front panel.

SPEC-153 PL3

The Model 153

RANGE: 10^{-11} ampere full scale to 10^{-1} ampere in 21 overlapping 1x and 3x ranges.

MODEL 148

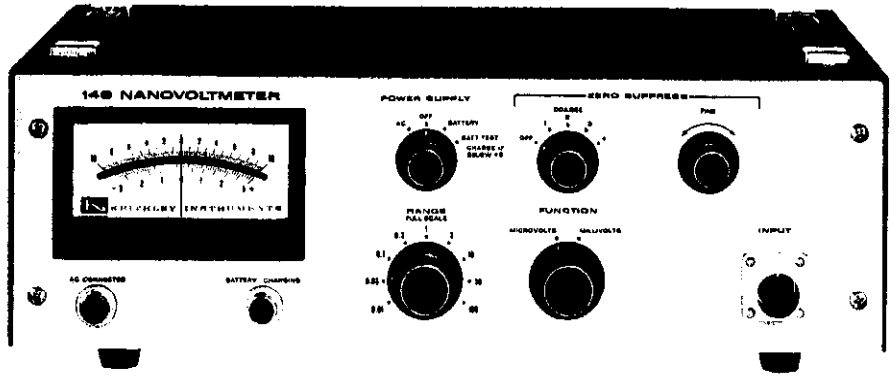
- Sensitivity: 10 nanovolts full scale
- Noise: Less than 0.2 nanovolt rms
- Drift: Less than 10 nanovolts per 24 hours
- 60 Hz rejection over 4000:1

The Model 148 Nanovoltmeter has more voltage sensitivity and greater stability than any other commercially available room-temperature voltmeter (see page 42). In addition, it is as easy and convenient to use as an ordinary VVM. Features include battery or line operation, front panel zero suppression, excellent line frequency rejection and a 1 volt, 1 milliamperer output to drive other instruments.

Full scale ranges from 10 nanovolts to 100 millivolts and are selectable on a 20 dB full scale meter. Possible alternate dc measurements include 1000 volt range which allows up to 2000 v peak-to-peak voltage measurement. The meter has a 1000 ohm input impedance and a 1000 ohm output impedance. It has a 1000 ohm input impedance and a 1000 ohm output impedance. It has a 1000 ohm input impedance and a 1000 ohm output impedance. It has a 1000 ohm input impedance and a 1000 ohm output impedance. It has a 1000 ohm input impedance and a 1000 ohm output impedance.

Zero suppression allows the Model 148 to read down to 100 microvolts. The meter is available with a 60 Hz or 50 Hz line frequency rejection. The meter is available with a 60 Hz or 50 Hz line frequency rejection. The meter is available with a 60 Hz or 50 Hz line frequency rejection. The meter is available with a 60 Hz or 50 Hz line frequency rejection. The meter is available with a 60 Hz or 50 Hz line frequency rejection.

NANOVOLTMETER



specifications, model 148

RANGE: 10 nanovolts (10 x 10⁻⁹ volt) full scale to 100 millivolts on a zero-center meter. 18 overlapping ranges in 1x and 3x steps.

ACCURACY

Meter: ± 2% of full scale on all ranges.

Output Terminals: ± 1% of full scale on all ranges.

Note: Accuracy specifications exclude noise and drift.

ZERO DRIFT: Less than 10 nanovolts per 24 hours after 1-hour warm-up with reasonably constant ambient temperature. Long-term drift is non-cumulative.

INPUT NOISE: with input shorted. Less than 0.2 nanovolt rms (1 nanovolt peak-to-peak) on most sensitive range.

RESOLUTION: Better than 1 nanovolt on the most sensitive range.

INPUT CHARACTERISTICS

Range	Input Resistance Greater than	Maximum Source ¹ Resistance	Line ² Frequency Rejection
10.0 nV	1 kΩ	10Ω	3000:1
30.0 nV	3 kΩ	30Ω	1000:1
0.1 μV	10 kΩ	100Ω	1000:1
0.3 μV	30 kΩ	300Ω	500:1
1.0 μV	100 kΩ	1 kΩ	300:1
			100:1
3.0 μV to 100.0 μV	300 kΩ	3 kΩ	decreasing to 50:1
			100:1
0.01 mV to 100.0 mV	1 MΩ	10 kΩ	decreasing to 5:1

Notes: 1 Source resistances higher than the recommended maximum will increase noise and rise time.

2 Ratio of impressed peak-to-peak line frequency voltage at input to indicated dc voltage.

COMMON MODE REJECTION: 50 or 60 Hz: greater than 160 dB. 100 or 120 Hz: greater than 140 dB. (See note 2 above.)

ISOLATION: Circuit ground to chassis ground: Greater than 10⁹ ohms shunted by 0.05 microfarad. Circuit ground may be floated up to ±400 volts with respect to chassis ground. On battery operation, may be completely isolated from power line and ground.

RISE TIME 10% to 90%

30-nanovolt Range: Less than 2 seconds when source resistance is less than 10% of maximum; 4 seconds using maximum source resistance. Rise time is about 3 times longer on 10-nanovolt range.

0.1-microvolt to 100-millivolt Ranges: Less than 0.5 second when source resistance is less than 10% of maximum; 3 seconds using maximum source resistance.

ZERO SUPPRESSION: Up to at least 100 microvolts on the microvolt ranges and up to at least 100 millivolts on the millivolt ranges. Stability is such that 100 times full scale may be suppressed.

RECORDER OUTPUT

Output: ± 1 volt dc at up to 1 milliamperer for full-scale meter deflection.

Resistance: Less than 5 ohms within the amplifier pass band.

Gain: 1 volt/Range setting in volts

Noise: Input noise times gain plus modulation products.

Modulation Products: Less than 2% peak-to-peak of full scale with input shorted.

CONNECTORS: Input: Special Keithley Model 1485. Output: Amphenol 80-PC2F.

POWER:

Line Operation: 105-125 or 210-250 volts (switch selected), 60 Hz, 16 watts. 50-Hz models available.

Battery Operation: Rechargeable nickel-cadmium 6-volt battery pack. 14 hours full charge to complete discharge. For maximum battery life, battery operation recommended for no more than 8 consecutive hours before recharge.

DIMENSIONS: WEIGHT 5½" high x 17½" wide x 10" deep; net weight, 20 pounds.

ACCESSORIES SUPPLIED: Model 1481 Low-Thermal Input Cable with alligator clips; mating output and demodulator test plugs; internally mounted nickel-cadmium battery pack and charging circuit.

ACCESSORIES AVAILABLE: (Many of the following accessories are described on page 45.)

- Model 1481 Low-Thermal Input Cable (extra) \$ 30
- Model 1482 Low-Thermal Input Cable \$ 30
- Model 1483 Low-Thermal Connection Kit \$ 90
- Model 1484 Refill Kit \$ 35
- Model 1485 Female Low-Thermal Input Connector \$ 10
- Model 1486 Male Low-Thermal Input Connector \$ 10
- Model 1488 Low-Thermal Shorting Plug \$ 30
- Model 1489 Replacement Battery Pack \$ 50
- Model 4002 Rack Mounting Kit \$ 17

PRICES (For export pricing see inside front cover.)

Model 148 Nanovoltmeter (60 Hz, Bench) \$1485

Model 148 Nanovoltmeter (50 Hz) \$1495

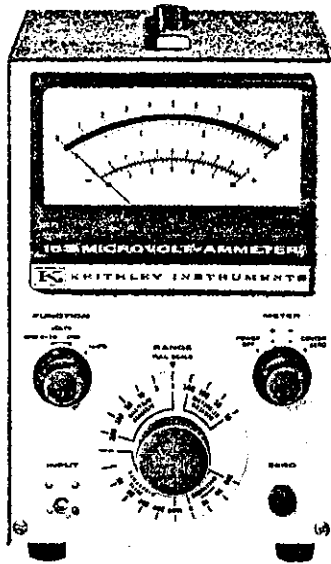
MODEL 153

- sensitivity 5 microvolts full scale
- noise less than 0.06 microvolt rms
- drift less than 2 microvolts per 24 hours
- optimized for measurements with source resistances of 500 k Ω to 5 M Ω

The Model 153 is an ideal microvolt-ammeter for general laboratory use. It has high input resistance — 200 megohms on the 100-microvolt and higher ranges. Selectable left or center zero gives maximum performance for both voltmeter and null detector applications. High ac rejection and excellent floating operation make the Model 153 a suitable null detector for impedance bridges and potentiometers. The Model 153 Microvolt-Ammeter recovers quickly from 1-volt overloads without observable offset, even on its most sensitive range. Excellent isolation from ground permits use in floating circuits. Low drift and a recorder output make it a highly stable amplifier for long-term measurements.

Applications include the measuring of a wide variety of voltages such as contact potentials, vacuum tube electrode potentials, biologically generated emfs and electrochemical potentials. Other applications include use with various voltage generating transducers such as piezoelectric generators, Hall effect generators and strain gauges.

MICROVOLT - AMMETER



specifications, model 153

AS A VOLTMETER AND NULL DETECTOR

RANGE Zero-left: 10 microvolts full scale to 1000 volts in 17 overlapping 1x and 3x ranges.
Zero-center: 5 microvolts full scale to 500 volts in 17 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

- ± 1% of full scale on 3-millivolt to 1000-volt ranges.
- ± 2% of full scale on 100-microvolt to 1-millivolt ranges.
- ± 3% of full scale on 10 and 30-microvolt ranges.

ZERO DRIFT: Less than ± 2 microvolts per 24 hours after warm-up with reasonably constant ambient temperature. Less than 8 microvolts during 2-hour warm-up. Long term drift is noncumulative.

INPUT NOISE With input shorted, less than 0.06 microvolt rms (0.3 microvolt peak-to-peak) on most sensitive range.

With 1-megohm source, less than 0.1 microvolt rms (0.5 microvolt peak-to-peak) on most sensitive range.

INPUT RESISTANCE:

- Greater than 200 megohms on 100-microvolt to 1000-volt ranges.
- Greater than 50 megohms on 30-microvolt range.
- Greater than 20 megohms on 10-microvolt range.

Note: Input resistance of any range may be shunted by a 2-megohm resistor by using the Function switch.

LINE FREQUENCY REJECTION: A voltage of power line or twice power line frequency which is 40 dB ($\frac{p-p}{dc}$) greater than full scale affects reading less than 0.5%.

RISE TIME (10% to 90%): Less than 1 second on 100-microvolt to 1000-volt ranges.
Less than 5 seconds on 10 and 30-microvolt ranges.

AS AN AMMETER:

RANGE: Zero-left: 10⁻¹¹ ampere full scale to 10⁻¹ ampere in 21 overlapping 1x and 3x ranges.
Zero-center: 5 x 10⁻¹² ampere full scale to 5 x 10⁻³ ampere in 21 overlapping 5x and 15x ranges.

ACCURACY (exclusive of noise and drift):

- ± 2% of full scale on 3 x 10⁻⁹ to 10⁻¹ ampere ranges.
- ± 3% of full scale on 10⁻¹⁰ to 10⁻⁸ ampere ranges.
- ± 4% of full scale on 10⁻¹¹ and 3 x 10⁻¹¹ ampere ranges.

ZERO DRIFT: Less than ± 2 x 10⁻¹² ampere per 24 hours after warm-up with reasonably constant ambient temperature.

Less than 8 x 10⁻¹² ampere during 2-hour warm-up.

INPUT NOISE (with input open): Less than 0.1 x 10⁻¹² ampere rms (0.5 x 10⁻¹² ampere p-p) on most sensitive range.

INPUT RESISTANCE: One ohm on 10⁻¹¹ ampere range, increasing to one megohm on 10⁻¹ ampere range.

RISE TIME (10% to 90%): Less than 2 seconds on 10⁻¹⁰ to 10⁻¹ ampere ranges.

Less than 5 seconds on 10⁻¹¹ and 3 x 10⁻¹¹ ampere ranges.

GENERAL:

POLARITY: Meter switch selects left-zero (positive or negative) or center-zero scales. Recorder output polarity is not reversed.

ISOLATION: Circuit ground to chassis ground: Greater than 10⁸ ohms shunted by 0.05 μ F. Circuit ground may be floated up to ± 500 volts dc or peak with respect to chassis ground.

RECORDER OUTPUT:

Output: 0 to ± 1 volt (adjustable) at up to 1 milliampere for full-scale meter deflection on any range.

Resistance: Less than 10 ohms with output potentiometer set for maximum output.

Voltage Gain: 1 volt/Voltage setting in volts

Noise: Input noise times voltage gain plus modulation products.

Modulation Products: Less than 5% peak-to-peak of full scale with input shorted.

CONNECTORS: Input: Special Triaxial. Output: Binding posts.

POWER: 105-125 or 210-250 volts (switch selected), 50 or 60 Hz, 35 watts.

DIMENSIONS, WEIGHT: 10½" high x 6½" wide x 10" deep; net weight, 13 pounds.

ACCESSORIES SUPPLIED: Model 1532 Low-Thermal Test Leads: connector and 3' cable with alligator clips.

ACCESSORIES AVAILABLE

- Model 1531 Gripping Probe (see page 45) \$ 50
- Model 1532 Low-Thermal Test Leads (extra) \$ 27
- Model 1533 Mating Connector: for special triaxial input \$ 10
- Model 1534 Special Low-Thermal Triax Cable: 10' length of cable only \$ 15
- Model 4005 Rack Mounting Kit (see page 45) \$ 30

PRICE Model 153 Microvolt-Ammeter (Bench) \$625
(For export pricing see inside front cover.)