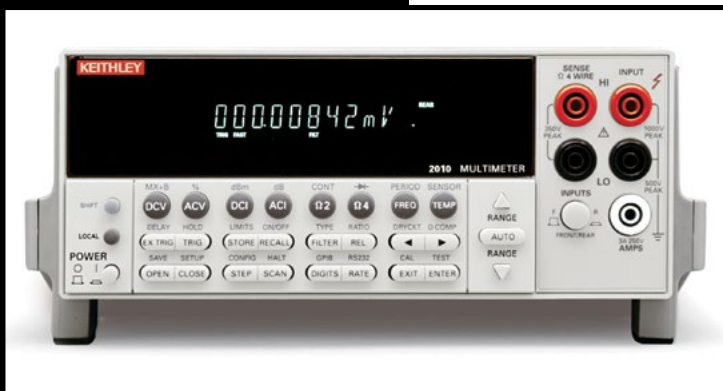


2010

Low Noise 7½-Digit Autoranging Multimeter



- 7½-digit resolution
- 100nV rms noise floor
- 7ppm DCV repeatability
- Built-in 10-channel scanner mainframe
- Dry circuit and low power measurement mode
- 15 measurement functions including support for RTD and thermocouple temperature measurements
- Built-in ratio measurement function
- GPIB and RS-232 interfaces

Ordering Information

2010 Autoranging DMM

Accessories Supplied

Model 1751 Safety Test Leads, User Manual, Service Manual

SERVICES AVAILABLE

| | |
|-------------------|---|
| 2000-SCAN-3Y-EW | 1-year factory warranty extended to 3 years from date of shipment |
| 2001-TCSCAN-3Y-EW | 1-year factory warranty extended to 3 years from date of shipment |
| 2010-3Y-EW | 1-year factory warranty extended to 3 years from date of shipment |
| C/2000-3Y-ISO | 3 (ISO-17025 accredited) calibrations within 3 years of purchase for Model 2000-SCAN* |
| C/2001-3Y-ISO | 3 (ISO-17025 accredited) calibrations within 3 years of purchase for Model 2001-TCSCAN* |
| C/2010-3Y-ISO | 3 (ISO-17025 accredited) calibrations within 3 years of purchase for Model 2010* |

*Not available in all countries

The 7½-digit Model 2010 Low Noise Multimeter combines high resolution with the high speed and accuracy needed for production applications such as testing precision sensors, transducers, A/D and D/A converters, regulators, references, connectors, switches, and relays. It is based on the same high speed, low noise A/D converter technology as the Models 2000, 2001, and 2002.

High Measurement Flexibility

The 2010 has 15 built-in measurement functions, including DCV, ACV, DCI, ACI, 2WΩ, 4WΩ, dry circuit resistance, temperature (with either thermocouples or RTDs), frequency, period, ratio, continuity measurement, and diode testing. This multi-functional design minimizes added equipment costs.

Creating a self-contained multipoint measurement solution is as simple as plugging a 2000-SCAN or 2001-TCSCAN scanner card into the option slot in the 2010's back panel. This "plug-in" approach eliminates the need for a separate scanner and significantly reduces programming and setup time in applications involving a limited number of test points. For larger applications, the 2010 is compatible with Keithley's Series 7000 switch matrices and cards.

Unique Resistance Measurement Functions

Characterizing the resistance, linearity, or isolation of contacts, connectors, switches, or relays completely and efficiently demands an uncommon combination of ohms measurement capabilities. The 2010 offers:

- **Low-power ohms measurement mode.** Low-level resistance measurements can be made with source current as low as 100μA, an order of magnitude lower than is possible with other DMMs, so device self-heating is minimized. Among other benefits, this low-power measurement capability makes the 2010 suitable for end-of-life contact testing per ASTM B539-90.
- **Dry circuit test function.** When measuring contact and connector resistances, it is important to control the test voltage carefully in order to avoid puncturing any oxides or films that may have formed. A built-in clamp limits the open circuit test voltage to 20mV to ensure dry circuit conditions.
- **Offset compensated ohms function.** This function eliminates thermal effects that can create errors in low-level resistance measurements in system environments.
- **Extended ohms measurement capability.** The 2010 provides a 10Ω range for more precise measurements of low resistances.

Optional Multiplexer Cards

Creating a self-contained multipoint measurement solution is as simple as plugging a scanner card into the option slot on the 2010's back panel. This approach eliminates the complexities of triggering, timing, and processing issues and helps reduce test time significantly. For applications involving more than 10 measurement points, the 2010 is compatible with Keithley's Series 7000 switch matrices and cards.

Model 2000-SCAN Scanner Card

- Ten analog input channels (2-pole)
- Configurable as 4-pole, 5-channel

ACCESSORIES AVAILABLE

| TEST LEADS | |
|----------------------|---|
| 5804/5 | 4-Wire/Kelvin Test Lead Sets |
| SWITCH/SCANNER CARDS | |
| 2000-SCAN | 10-channel Scanner |
| 2001-TCSCAN | 9-channel Thermocouple Scanner |
| CABLES/ADAPTERS | |
| 7007-1 | Shielded IEEE-488 Cable, 1m (3.3 ft) |
| 7007-2 | Shielded IEEE-488 Cable, 2m (6.6 ft) |
| 7009-5 | RS-232 Cable |
| RACK MOUNT KITS | |
| 4288-1 | Single Fixed Rack Mount Kit |
| 4288-2 | Dual Fixed Rack Mount Kit |
| GPIB INTERFACES | |
| KPCI-488LPA | IEEE-488 Interface/Controller for the PCI Bus |
| KUSB-488B | IEEE-488 USB-to-GPIB Interface Adapter |

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A Tektronix Company

DMM optimized for resistance measurement applications

DIGITAL MULTIMETERS & SYSTEMS

2010

Low Noise 7½-Digit Autoranging Multimeter

DC VOLTAGE

| Range | Resolution | Accuracy 23°C ± 5°C ±(ppm of rdg. + ppm of range) | | Input Resistance |
|--------------|------------|--|--------|------------------|
| | | 90 Day | 1 Year | |
| 100.00000 mV | 10 nV | 25 + 9 | 37 + 9 | > 10 GΩ |
| 1.0000000 V | 100 nV | 18 + 2 | 25 + 2 | > 10 GΩ |
| 10.000000 V | 1 μV | 18 + 4 | 24 + 4 | > 10 GΩ |
| 100.00000 V | 10 μV | 25 + 5 | 35 + 5 | 10 MΩ ±1% |
| 1000.0000 V | 100 μV | 31 + 6 | 41 + 6 | 10 MΩ ±1% |

RESISTANCE

| Range | Resolution | Accuracy 23°C ± 5°C ±(ppm of rdg. + ppm of range) | | Test Current |
|--------------|------------|--|----------|--------------|
| | | 90 Day | 1 Year | |
| 10.000000 Ω | 1 μΩ | 40 + 9 | 60 + 9 | 10 mA |
| 100.00000 Ω | 10 μΩ | 36 + 9 | 52 + 9 | 1 mA |
| 1.0000000 kΩ | 100 μΩ | 33 + 2 | 50 + 2 | 1 mA |
| 10.000000 kΩ | 1 mΩ | 32 + 2 | 50 + 2 | 100 μA |
| 100.00000 kΩ | 10 mΩ | 40 + 4 | 70 + 4 | 10 μA |
| 1.0000000 MΩ | 100 mΩ | 50 + 4 | 70 + 4 | 10 μA |
| 10.000000 MΩ | 1 Ω | 200 + 4 | 400 + 4 | 640 nA/10 MΩ |
| 100.00000 MΩ | 10 Ω | 1500 + 4 | 1500 + 4 | 640 nA/10 MΩ |

DC CURRENT

| Range | Resolution | Accuracy 23°C ± 5°C ±(ppm of rdg. + ppm of range) | | Burden Voltage |
|--------------|------------|--|-----------|----------------|
| | | 90 Day | 1 Year | |
| 10.000000 mA | 1 nA | 300 + 80 | 500 + 80 | < 0.15 V |
| 100.00000 mA | 10 nA | 300 + 800 | 500 + 800 | < 0.18 V |
| 1.0000000 A | 100 nA | 500 + 80 | 800 + 80 | < 0.35 V |
| 3.000000 A | 1 μA | 1200 + 40 | 1200 + 40 | < 1 V |

CONTINUITY 2W

| Range | Resolution | Accuracy 23°C ± 5°C ±(ppm of rdg. + ppm of range) | | Test Current |
|-------|------------|--|-----------|--------------|
| | | 90 Day | 1 Year | |
| 1 kΩ | 100 mΩ | 100 + 100 | 120 + 100 | 1 mA |

DIODE TEST

| Range | Resolution | Accuracy 23°C ± 5°C ±(ppm of rdg. + ppm of range) | | Test Current |
|-------------|------------|--|--------|--------------|
| | | 90 Day | 1 Year | |
| 10.000000 V | 1 μV | 30 + 7 | 40 + 7 | 1 mA |
| 4.400000 V | 1 μV | 30 + 7 | 40 + 7 | 100 μA |
| 10.000000 V | 1 μV | 30 + 7 | 40 + 7 | 10 μA |

DC OPERATING CHARACTERISTICS

| Function | Digits | Readings/s | PLCs |
|---|--------|-------------|------|
| | 7½ | 4 (3) | 5 |
| | 6½ | 30 (27) | 1 |
| DCV (all ranges), DCI (all ranges), and Ohms (<10M range) | 6½ | 50 (44) | 1 |
| | 5½ | 260 (220) | 0.1 |
| | 5½ | 490 (440) | 0.1 |
| | 5½ | 1000 (1000) | 0.04 |
| | 4½ | 2000 (1800) | 0.01 |

DC NOISE PERFORMANCE

| Rate | Digits | RMS Noise 100mV Range (2 min.) | RMS Noise 10V Range (2 min.) | NMRR | CMRR |
|----------|--------|--------------------------------------|------------------------------------|-------|--------|
| 5 PLC | 7½ | 110 nV | 1.2 μV | 60 dB | 140 dB |
| 1 PLC | 6½ | 125 nV | 1.4 μV | 60 dB | 140 dB |
| 0.1 PLC | 5½ | 1.9 μV | 11.5 μV | — | 80 dB |
| 0.01 PLC | 4½ | 2.9 μV | 139 μV | — | 80 dB |

TRUE RMS AC VOLTAGE AND CURRENT CHARACTERISTICS

| Voltage Range | Resolution | Frequency Range | Accuracy (1 Year) 23°C ± 5°C ±(% of reading + % of range) | |
|-----------------|----------------|-----------------|---|--|
| | | | ±(% of reading + % of range) | |
| 100 mV to 750 V | 0.1 μV to 1 mV | 3 Hz–10 Hz | 0.35 + 0.03 | |
| | | 10 Hz–20 kHz | 0.06 + 0.03 | |
| | | 20 kHz–50 kHz | 0.12 + 0.05 | |
| | | 50 kHz–100 kHz | 0.60 + 0.08 | |
| | | 100 kHz–300 kHz | 4 + 0.5 | |

AC OPERATING CHARACTERISTICS

| Function | Digits | Readings/s | Rate | Bandwidth |
|---|--------|------------|------|----------------|
| ACV (all ranges), and ACI (all ranges) | 6½ | 0.5 (0.4) | SLOW | 3 Hz–300 kHz |
| | 6½ | 1.4 (1.5) | MED | 30 Hz–300 kHz |
| | 6½ | 4.0 (4.3) | MED | 30 Hz–300 kHz |
| | 6½ | 2.2 (2.3) | FAST | 300 Hz–300 kHz |
| | 6½ | 35 (30) | FAST | 300 Hz–300 kHz |

FREQUENCY AND PERIOD CHARACTERISTICS

| ACV Range | Frequency Range | Period Range | Gate Time | Resolution ±(ppm of reading) | Accuracy 90 Day/1 Year ±(% of reading) |
|-----------------|-----------------|----------------|-----------|---------------------------------|--|
| 100 mV to 750 V | 3 Hz to 500 kHz | 333 ms to 2 μs | 1 s | 0.3 | 0.01 |

TEMPERATURE CHARACTERISTICS

Thermocouple

| Type | Range | Resolution | Accuracy ¹ 90 Day/1 Year (23°C ± 5°C) Relative to Reference Junction | | USING 2001-TCSCAN ² |
|------|------------------|------------|--|--|-----------------------------------|
| | | | ±0.5°C | | |
| J | –200 to + 760°C | 0.001°C | ±0.5°C | | ±0.65°C |
| K | –200 to + 1372°C | 0.001°C | ±0.5°C | | ±0.70°C |
| N | –200 to + 1300°C | 0.001°C | ±0.5°C | | ±0.70°C |
| T | –200 to + 400°C | 0.001°C | ±0.5°C | | ±0.68°C |

4-WIRE RTD

| Range | Resolution | Accuracy ³ 90 Day/1 Year (23°C ± 5°C) | Accuracy ³ 2 Years (23°C ± 5°C) |
|-----------------|------------|--|--|
| –100° to +100°C | 0.001°C | ±0.08°C | ±0.12°C |
| –200° to +630°C | 0.001°C | ±0.14°C | ±0.18°C |

TEMPERATURE NOTES

- For temperatures <–100°C, add ±0.1°C and >900°C add ±0.3°C.
- Specifications apply to channels 2–6. Add 0.06°C/channel from channel 6.
- Excluding probe errors.

GENERAL

POWER SUPPLY: 100V / 120V / 220V / 240V.

LINE FREQUENCY: 50Hz to 60Hz and 440Hz, automatically sensed at power-up.

POWER CONSUMPTION: 22VA.

VOLT HERTZ PRODUCT: ≤8 × 10⁵ V·Hz.

OPERATING ENVIRONMENT: Specified for 0° to 50°C. Specified to 80% R.H. at 35°C.

STORAGE ENVIRONMENT: –40° to 70°C.

ALTITUDE: Up to 2000 meters.

SAFETY: Conforms to European Union Directive 73/23/EEC EN 61010-1, Cat II.

EMC: Complies with European Union Directive 89/336/EEC, EN 61326-1.

VIBRATION: MIL-PRF-28800F Class 3 Random.

WARMUP: 2 hours to rated accuracy.

DIMENSIONS:

Rack Mounting: 89mm high × 213mm wide × 370mm deep (3½ in × 8½ in × 14½ in).

Bench Configuration (with handle and feet): 104mm high × 238mm wide × 370mm deep (4½ in × 9½ in × 14½ in).

SHIPPING WEIGHT: 5kg (11 lbs).

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