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Section 1. General Information

1-1. INTRODUCTION

The Keithley Model 181 is a 5½ and 6½ digit DC voltmeter with resolution to 10nV. The Model 181 is a unique DC voltmeter in the respect that it combines microprocessor technology for full programmability with a new concept in nanovolt front ends. It provides highly accurate, stable and low noise readings from 10nV to 1000VDC on 7 voltage ranges. The 2V through the 1000V ranges utilize the 5-way binding posts. The 2mV through the 200mV ranges utilize the special low thermal input connector.

The service manual contains the necessary information for calibrating and maintaining the Model 181. This information is provided in various sections throughout the manual. These sections are listed as Performance Verification, Theory of Operation and Maintenance/Calibration. Along with this section, General Information, this manual also includes the Accessories, a Parts List, and the Schematic Diagrams.

1-2. Warranty Information

The warranty is given on the inside front cover of this manual. If there is a need to exercise the warranty, contact the Keithley representative in your area to determine the proper action to be taken. Keithley maintains service facilities in the United Kingdom and West Germany, as well as in the United States. Check the inside front cover of this manual for addresses.

1-3. Manual Addenda

Improvements or changes to the instrument which occur after the printing of this manual will be explained on a manual addendum.

1-4. Safety Symbols and Terms

This **WARNING** will be used throughout the manual whenever a danger exists that could result in personal injury or death. There is also an explanation of the potential danger that exists.

This **CAUTION** will be used throughout the manual whenever a hazard exists that could damage the instrument.

The symbol ⚠ on the instrument denotes that the user should refer to the operating instructions.

The symbol ⚡ on the instrument denotes that 1000V or more may be present on the terminal(s).

DC VOLTS RANGE	5½-DIGIT RESOLUTION	ACCURACY ±(%rdg + digits) 24 HR., 22°-24°C	ACCURACY ±(%rdg + digits) 1 YR., 18°-28°C	TEMPERATURE COEFFICIENT ±(%rdg + digits)/°C 0°-18°C & 28°-35°C	INPUT RESISTANCE	MAXIMUM ALLOWABLE INPUT	NMRR (LINE FREQUENCY)
2mV	10 nV	0.006% + 5 d*	0.015% + 5d*	0.002 % + 3 d	> 1GΩ	120V**	> 90dB
20mV	100 nV	0.006% + 2 d*	0.015% + 2d*	0.002 % + 0.5d	> 1GΩ	120V**	> 80dB
200mV	1 μV	0.006% + 2 d	0.015% + 2d	0.002 % + 0.2d	> 1GΩ	120V**	> 80dB
2 V	10 μV	0.004% + 1.5d	0.007% + 2d	0.0007% + 0.2d	> 1GΩ	1000V	> 60dB
20 V	100 μV	0.004% + 1.5d	0.01 % + 2d	0.0008% + 0.2d	10MΩ	1000V	> 60dB
200 V	1mV	0.004% + 1.5d	0.01 % + 2d	0.0008% + 0.2d	10MΩ	1000V	> 60dB
1000 V	10mV	0.005% + 1.5d	0.01 % + 2d	0.0012% + 0.2d	10MΩ	1000V	> 60dB

CMRR: 160dB on mV ranges, 140dB on V ranges; at DC and line frequency (50 or 60Hz). (1kΩ unbalance)

*When properly zeroed.
**10 seconds maximum; 35V rms continuous

IEEE-488 BUS IMPLEMENTATION:

Multiline Commands: DCL, LLO, SDC, GET.
Uniline Commands: IFC, REN, EOI, SRQ, ATN.

PROGRAMMABLE PARAMETERS:
Front Panel Controls: Range, Filter, Zero, Damping, Hi Resolution.
Internal Parameters: SRQ Response, Trigger Modes, Data Terminators.

ADDRESS MODES: Talk-Only and Addressable.

TRIGGER MODES:
One Shot: Updates output buffer once at first valid conversion after trigger on TALK and/or GET.
Continuous: Updates output buffer at all valid conversions after trigger.

GENERAL

NOISE: Less than 30nV p-p on lowest range with Filter on.

INPUT CAPACITANCE: 5000pF on mV ranges.

SETTLING TIME: 0.5s to within 25 digits of final reading with Filter on, Damping off.

FILTER: 3-pole digital; RC = 0.5, 1 or 2 seconds depending on range.

CONVERSION SPEED: 4 readings/second.

DISPLAY: Seven 13mm (0.5 in.) LED digits with appropriate decimal point and polarity.

OVERLOAD INDICATION: Display indicates polarity and OFLO.

ANALOG OUTPUT:
Accuracy: ± (0.15% of displayed reading + 1mV).
Time Constant: 400ms.
Level: ± 2V full scale on all ranges; X1 or X1000 gain.

ISOLATION: Input LO to Output LO or power line ground: 1400V peak, 5 × 10^5V•Hz, greater than 10^9Ω paralleled by 1500pF

WARMUP: 1 hour to rated accuracy when properly zeroed.

ENVIRONMENTAL LIMITS: **Operating**: 0°C to 35°C, 0% to 80% relative humidity. **Storage**: – 25°C to 65°C.

POWER: 105-125V or 210-250V (internal switch selected), 50-60Hz, 30V•A maximum.

INPUT CONNECTORS: Special low thermal for 200mV and lower ranges. Binding posts for 2V to 1000V ranges.

DIMENSIONS, WEIGHT: 127mm high × 216mm wide × 359mm deep (5" × 8½" × 14⅛"). Net weight 3.85kg (8½ lbs.).

ACCESSORY SUPPLIED: Model 1506 Low Thermal Input Cable.

ACCESSORIES AVAILABLE:
Model 1019 Rack Mounting Kit
Model 1483 Low Thermal Connection Kit
Model 1484 Refill Kit for 1483 Kit
Model 1485 Female Low Thermal Input Connector
Model 1486 Male Low Thermal Input Connector
Model 1488 Low Thermal Shorting Plug
Model 1503 Low Thermal Solder and Flux
Model 1506 Low Thermal Input Cable (4 ft., Clips)
Model 1507 Low Thermal Input Cable (4 ft., Lugs)
Model 1815 Maintenance Kit

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