CHAPTER 1
GENERAL INFORMATION

1.1 INTRODUCTION

The SD Model 7004 Digital Multimeter is a full four-digit precision instrument. It offers the five selectable functions of dc voltage, dc current, ac voltage, ac current and resistance. The instrument utilizes an advanced Dual-Slope Integration design with an extremely low-noise input amplifier and a fully guarded, isolated input circuit. These features combine to provide high accuracy and stability, plus exceptional immunity to the effects of both common mode and normal mode noise.

All function and range selection is made from front-panel push-button controls. The readout features a nonblinking display of four full digits plus overrange, auto-positioned decimal point, and an indicator for off-scale readings. Polarity indication for dc voltage and current is automatic with a minus indicator display.

Model 7004 is light-weight and completely portable. It consumes less than 8 watts while operating at line frequencies from 48 to 440 Hz and at voltages of 115/230 V or 100/200 V. The Multimeter may be fitted with an optional built-in battery pack with no increase in size. Optional DTL/TTL compatible digital outputs can also be included for remote printout, digital limit comparison, or other automatic data system requirements.

1.2 SPECIFICATIONS

DC VOLTS

Range:	±.10000 V, ±1.0000 V, ±10.000 V, ±100.00 V, ±1000.0 V.
Resolution:	±10 μV to ±0.1 V in decade steps depending on range.
Overrange:	30% on all ranges except on 1000 V range. Maximum readings are ±.13000 V, ±1.3000 V, ±13.000 V, ±130.00 V and ±1000.0 V at full accuracy.
Polarity Selection:	Automatic with minus indicator.
Input Impedance:	>1000 MΩ on 0.1 V, 1 V, and 10 V ranges. 10 MΩ on 100 V and 1000 V ranges.

DC VOLTS (Cont'd)

Accuracy:	All ranges except 0.1 V range (25±5°C); ±0.01% rdg. ±0.01% f.s. for 1 month. ±0.02% rdg. ±0.01% f.s. for 3 months. 0.1 V range (25±1°C); ±0.02% rdg. ±0.02% f.s. for 1 month.
Temperature Stability (0°C to 50°C):	All ranges except 0.1 V range; ±0.001% rdg. ±0.001% f.s./°C. 0.1 V range; ±0.005% rdg. ±0.01% f.s./°C.
Full-Scale Step Response:	1 second to rated accuracy.
Normal Mode Noise Rejection:	>60 dB at 60 Hz.
Common Mode Noise Rejection:	>120 dB at dc; 100 dB from 49 Hz to 1 kHz with 1 kΩ source unbalance.
Maximum Input:	±1000 volts on any range without damage.

DC CURRENT

Ranges:	±.10000 mA, ±1.0000 mA, ±10.000 mA, ±100.00 mA, ±1000.0 mA.
Resolution:	±10 nA to ±0.1 mA in decade steps depending on range.
Overrange:	30% on all ranges. Maximum readings are ±.13000 mA, ±1.3000 mA, ±13.000 mA, ±130.00 mA and ±1300.0 mA at full accuracy.
Polarity Selection:	Automatic with minus indicator.
Configuration:	Shunts, internal to instrument.
Accuracy:	All ranges except 0.1 mA range (25±5°C): ±0.1% rdg. ±0.01% f.s. for 3 months. 0.1 mA range (25±1°C): ±0.1% rdg. ±0.04% f.s. for 3 months.
Temperature Stability (0°C to 50°C):	±0.005% rdg. ±0.002% f.s./°C.
Full Scale Step Response:	1 second to rated accuracy.
Normal Mode Noise Rejection:	>60 dB at 60 Hz.

DC CURRENT (Cont'd)

Common Mode Noise Rejection:	>120 dB at dc; 100 dB from 49 Hz to 1 kHz with 1 kΩ source unbalance.
Maximum Input:	100% above range selected without damage.

AC VOLTS

Ranges (rms value):	.10000 V, 1.0000 V, 10.000 V, 100.00 V, 1000.0 V.
Resolution:	10 μV to 0.1 V in decade steps depending on range.
Overrange:	30% on all ranges except 1000 V range. Maximum readings are .13000 V, 1.3000 V, 13.000 V, 130.00 V, and 500.00 V.
Input Impedence:	1 MΩ shunted by 100 pF.
Accuracy (50 Hz to 20 kHz, except 1000 V range is 50 Hz to 10 kHz.)	All ranges except 0.1 V range (25±5°C); ±0.2% rdg. ±0.02% f.s. for 3 months. 0.1 V range (25±1°C); ±0.5% rdg. ±0.2% f.s. for 3 months.
Full-Scale Step Response:	3 seconds to rated accuracy.
Maximum Input:	500 volts rms on 10 V, 100 V, and 1000 V ranges. 150 volts rms on 0.1 V and 1 V ranges without damage.

AC CURRENT

Ranges:	.10000 mA, 1.0000 mA, 10.000 mA, 100.00 mA, 1000.0 mA.
Resolution:	10 nA to 0.1 mA in decade steps depending on range.
Overrange:	30% on all ranges. Maximum readings are .13000 mA, 1.3000 mA, 13.000 mA 130.00 mA, and 1300.0 mA.
Configuration:	Shunts internal to instrument.
Accuracy (50 Hz to 20 kHz):	All ranges except 0.1 mA range (25±5°C); ±0.3% rdg. ±0.02% f.s. for 3 months. 0.1 mA range (25±1°C); ±0.5% rdg. ±0.2% f.s. for 3 months.

AC CURRENT (Cont'd)

Full-Scale Step Response:	3 seconds to rated accuracy.
Maximum Input:	100% above range selected without damage.

RESISTANCE

RANGE	CURRENT THRU RX		RESOLUTION
1.0000 kΩ	5 mA	1 kΩ	0.1 ohm
10.000 kΩ	500 µA	10 kΩ	1 ohm
100.00 kΩ	50 µA	100 kΩ	10 ohms
1000.0 kΩ	5 µA	1000 kΩ	100 ohms
10.000 MΩ	0.5 µA	10 MΩ	1000 ohms

Overrange:	30% on all ranges. Maximum readings are 1.3000 kΩ, 13.000 kΩ, 130.00 kΩ, 1300.0 kΩ, and 13.000 MΩ at full accuracy.
Configuration:	Two-wire measurement system.
Accuracy:	All ranges (25±5°C); ±0.1% rdg. ±0.01% f.s.
Full-Scale Step Response:	Typical 1 second on all kΩ ranges; 3 seconds on 10 MΩ range.
Voltage Protection:	130 V rms without damage on any range.

GENERAL

Input Configuration:	Fully floating and guarded in all functions.
Maximum Common Mode Voltage:	±500 V dc or peak V ac.
Range Selection:	Manual by front-panel control.
Sample Rate:	Continuously adjustable by front-panel control from 5 readings/second to 1 reading/10 seconds. Hold position enables external measurement command.

GENERAL (Cont'd)

Display:	Full four-digits plus overrange digit (gas discharge tubes); automatic decimal point positioning for all functions and ranges; negative polarity indicator; display storage for non-blinking readout; offscale indication.
Operating Temperature:	0°C to +50°C.
Humidity Range:	0 to 80% Relative Humidity (0°C to +35°C). 0 to 70% Relative Humidity (+35°C to +50°C).
Dimensions:	3-1/2" H x 8-1/2" W x 13" D half-rack size portable package, including two side-carry handles.
Weight:	8 lb (3.6 kg) net; 13 lb (6 kg) shipping. Optional battery pack adds 4 pounds.
Power:	115/230 (±10%) V ac, or 100/200 (±10%) V ac, 48-440 Hz, 8 watts maximum.

1.3 OPTIONAL FEATURES

DIGITAL OUTPUTS (OPTION 05)	Nonisolated 8-4-2-1 BCD outputs and recorder control signals with DTL/TTL compatible logic levels. DATA RECORDER COMMON MUST BE ISOLATED FROM MEASUREMENT SOURCE COMMON. *Note: Output signals are not short-circuit-proof.*
Outputs:	4 digits of BCD, and "1" (true) bit for overrange, minus polarity, and print command. Binary "0" (false) = +2.4 to +5 V, 0.1 mA source. Binary "1" (true)= 0 to +0.5 V, 1.8 mA sink.

DIGITAL OUTPUTS (Cont'd)

Inputs:	Single line contact closure to P.S. Common for external READ-ON-DEMAND (single measurement per command), and RECORDER BUSY (inhibit).
INTERNAL BATTERY PACK (OPTION 09)	Provides 6 hours of continuous operation between charges; 14-hour recharge cycle through built-in charger. Charges from external power line with instrument in operation. Internal batteries do not increase size of instrument. Three-way battery power switch on rear panel: 1) BATTERY OFF - Operates from power and recharges batteries. 2) BATTERY ON - Operates from internal batteries or external floating +12 volt dc source which may be connected internally through rear-panel port. Instrument draws 0.7 ampere. 3) BATTERY TEST - Checks internal battery condition from front-panel display; also, verifies instrument performance.