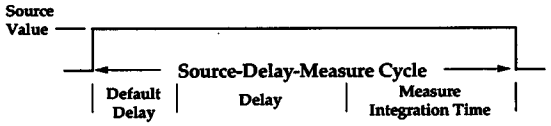
Models 236 and 237 Source Measure Units Specifications

SOURCE-MEASURE UNIT: Sources voltage while measuring current, or sources current while measuring voltage.

FUNCTION: Can be used as DC source or meter, sweep source, or full source-measure unit.

SOURCE-DELAY-MEASURE CYCLE:



Default Delay: Fixed delay for instrument settling.

User Delay: Additional delay for device under test or system capacitance.

MEASURE:

Integration Time:

Fast	416	µsec.	4 digit resolution
Medium	4	msec.	5 digit resolution
Line Cycle	16.67	msec. (60 Hz)	5 digit resolution
	20.00	msec. (50 Hz)	

Elapsed Time: Measures and stores time from sweep trigger to measurement complete for each step of sweep.

RANGING:

Source: Auto-ranging through keypad entry; fixed range selection using rotary dial and SELECT keys (DC function). Fully programmable in SWEEP function.

Measure: Auto or fixed range. Fixed range selection made by choice of COMPLIANCE value.

FILTER: Takes n measurements, calculates and outputs average (n = 2, 4, 8, 16, or 32, selectable).

SUPPRESS: Subtracts displayed measurement from subsequent readings.

MENU: DC Measurement Delay, Default Delay On/Off, Local/Remote Sense, 50/60Hz, IEEE Address, Self Tests.

DATA ENTRY: Numeric keypad or detented rotary dial.

TRIGGER:

Input and Output: Set for any phase of SOURCE-DELAY-MEASURE sequence or trigger output at end of sweep.

Origin: Internal, External (including front panel MANUAL TRIGGER button), IEEE-488 bus (TALK, GET, "X").

MEMORY: Stores one full sweep (up to 1000 points) of source, delay, and measure values, elapsed times, and sweep parameters. Lithium battery backup.

INTERLOCK: Use with test fixture or external switch. Normally closed; open puts instrument in standby.

Specifications subject to change without notice.

VOLTAGE

SOURCE V			MEASURE V		
RANGE (Max. Value)	STEP SIZE	ACCURACY (1 Year, 18°–28°C)	RESOLUTION 4-Digit	5-Digit	ACCURACY[1] (1 Year, 18°–28°C)
±1.1000V[2]	100 µV	±(0.033%+650 µV + [I_O/I_{FS}] × 450µV)	100 µV	10 µV	±(0.028% + 300µV + [I_O/I_{FS}] × 450µV)
±11.000V	1 mV	±(0.033%+ 2.4mV)	1 mV	100 µV	±(0.025%+ 1mV)
±110.00V	10 mV	±(0.033%+ 24mV)	10 mV	1 mV	±(0.025%+ 10mV)
±1100.0V[3]	100 mV	±(0.04 %+240mV)	100 mV	10 mV	±(0.035%+100mV)

I_O = Output current

I_{FS} = Full scale on selected current range

[1] Specifications apply for 5-digit resolution. For 4-digit resolution add 100ppm of range.

[2] Assumes remote sense for I > 100µA.

[3] 1100V range available on Model 237 only.

COMPLIANCE: Bipolar current limit set with single value.

Maximum: ±100mA (except ±10mA on 1100V range in Model 237).

Minimum: ±0.1% of range, except 0.5% of 1.1V range.

Accuracy, Step Size: Same as current source.

NOISE (p-p):

Range	0.1–10Hz
110V–1100V	< 3ppm of range
11 V	< 3ppm of range
1.1 V	<10ppm of range

WIDEBAND NOISE: 0.1 to 20MHz, 8mV p-p typical.

OVERSHOOT: <0.01% (110V step, 10mA range).

SETTLING TIME: <500µsec. to 0.01% (110V step, 10mA range).

NMRR: >60dB at 50 or 60Hz (LINE CYCLE integration time selected).

CMRR: >120dB at DC, 50 or 60Hz (LINE CYCLE integration time selected).

INPUT IMPEDANCE (as a voltmeter): >$10^{14}\Omega$ paralleled by <20pF.

CURRENT

SOURCE I			MEASURE I		
RANGE (Max. Value)	STEP SIZE	ACCURACY (1 Year, 18°–28°C)	RESOLUTION 4-Digit	5-Digit	ACCURACY[1] (1 Year, 18°–28°C)
±1.0000 nA	100 fA	±(0.3 %+450 fA)	100 fA	10 fA	±(0.3 %+100 fA)[2]
±10.000 nA	1 pA	±(0.3 %+ 2 pA)	1 pA	100 fA	±(0.3 %+ 1 pA)
±100.00 nA	10 pA	±(0.21%+ 20 pA)	10 pA	1 pA	±(0.21 %+ 6 pA)
±1.0000 µA	100 pA	±(0.05%+200 pA)	100 pA	10 pA	±(0.04 %+ 60 pA)
±10.000 µA	1 nA	±(0.05%+ 2 nA)	1 nA	100 pA	±(0.035%+700 pA)
±100.00 µA	10 nA	±(0.05%+ 20 nA)	10 nA	1 nA	±(0.035%+ 6 nA)
±1.0000 mA	100 nA	±(0.05%+200 nA)	100 nA	10 nA	±(0.035%+ 60 nA)
±10.000 mA	1 µA	±(0.05%+ 2 µA)	1 µA	100 nA	±(0.038%+600 nA)
±100.00 mA	10 µA	±(0.1 %+ 20 µA)	10 µA	1 µA	±(0.1 %+ 6 µA)

[1] Specifications apply for 5-digit resolution. For 4-digit resolution, all offset terms are 200ppm of range.

[2] Offset specification applies for 23°C ± 1°C with suppression. Temperature coefficient 50fA/°C.

COMPLIANCE: Bipolar voltage limit set with single value.

Maximum: ±1100V (except ±110V on 100mA range in Model 237).

Minimum: ±0.1% of selected current range.

Accuracy, Step Size: Same as voltage source.

NOISE (p-p of range): 0.1–10Hz: <3ppm (<20ppm on 1nA and 10nA ranges).

OVERSHOOT: <0.01% typical (10mA step, R_L = 10kΩ).

SETTLING TIME: <500µsec. to 0.01% (10mA step, R_L = 10kΩ).

OUTPUT R, C: >$10^{14}\Omega$ paralleled by <20pF (on 1nA range).

VOLTAGE BURDEN (as an ammeter): <1mV.

IEEE-488 BUS IMPLEMENTATION

MULTILINE COMMANDS: DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD.

UNILINE COMMANDS: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

All front panel functions and setups are available over the IEEE-488 bus, in addition to Status, Service Request, Output Format, EOI, Trigger, and Terminator.

IEEE-488 address is set from front panel menu.

EXECUTION SPEED

MINIMUM SOURCE-DELAY-MEASURE CYCLE TIME: 1msec.

RESPONSE TO IEEE-488 COMMAND (as a source): 25msec.

MEASUREMENT RATE: 1msec. per point into internal buffer.

CONTINUOUS MEASUREMENT SPEED (source DC value over IEEE-488 bus): 110 readings per second.

TRIGGER LATENCY TIME: <2msec.

GENERAL

LOAD CAPACITANCE: Stable into 20,000pF typical.

REMOTE SENSE: Corrects for up to 2V drop in each output lead. Maximum 1kΩ per sense lead for rated accuracy. Residual output resistance (as a voltage source) is 0.5Ω.

GUARD: **Output Resistance:** ≤12kΩ.
Maximum Output Current: ±2mA.
Offset Relative to Output HI: ±2mV max.

ISOLATION (Output LO to chassis): Typically $>10^{10}\Omega$ in parallel with 500pF.

MAXIMUM COMMON MODE VOLTAGE: 200V.

CONNECTORS: **Outputs:** 3-lug triax.
Trigger Input/Output: BNC.
Interlock: 3-pin miniature DIN.

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C):
±(0.1 × applicable accuracy specification)/°C.

ENVIRONMENT:

Operating: 0°–50°C, 70% relative humidity up to 35°C. Linearly derate 3% RH/°C, 35°–50°C.

Storage: –25° to 65°C.

WARM-UP: One hour to rated accuracy.

COOLING: Internal fan forced air cooling.

POWER: 105–125 or 210–250V AC (external switch selectable), 90–110V and 180–220V version available. 100VA max.

DIMENSIONS, WEIGHT: 89mm high × 435mm wide × 448mm deep (3.5 in. × 17.125 in. × 17.625 in.). Net weight 9kg (19.75 lbs.).

ACCESSORIES SUPPLIED:

Model 7078-TRX-10: Triax to Triax Cable, 3m (10 ft.) (2 supplied)
Model 236-ILC-3: Interlock Cable

ACCESSORIES AVAILABLE:

Model 8000-10: Equipment Rack for 3 SMUs (10 in.)
Model 8000-14: Equipment Rack for 4 SMUs (14 in.)