

2302 Battery Simulator

DC VOLTAGE OUTPUT (2 YEARS, 23°C ± 5°C)

OUTPUT VOLTAGE: 0 to +15VDC.
OUTPUT ACCURACY: ±(0.05% + 3mV).
PROGRAMMING RESOLUTION: 1mV.
READBACK ACCURACY¹: ±(0.05% + 3mV).
READBACK RESOLUTION: 1mV.
OUTPUT VOLTAGE SETTLING TIME: 5ms to within stated accuracy.
LOAD REGULATION: 0.01% + 2mV.
LINE REGULATION: 0.5mV.
STABILITY²: 0.01% + 0.5mV.
MEASUREMENT TIME CHOICES: 0.01 to 10 PLC⁷, in 0.01PLC steps.
AVERAGE READINGS: 1 to 10.
READING TIME^{1,8,9}: 31ms, typical.
TRANSIENT RESPONSE: **High Bandwidth** **Low Bandwidth**
 Transient Recovery Time¹³ <40µs³ or <60µs⁴ <80µs³ or <100µs⁴
 Transient Voltage Drop <75mV³ or <100mV⁴ <250mV³ or <400mV⁴

REMOTE SENSE: 1V max. drop in each lead. Add 2mV to the voltage load regulation specification for each 1V change in the negative output lead due to load current change. Remote sense required. Integrity of connection continually monitored. If compromised, output will turn off automatically once settable window (±0 to ±8 volts) around normal voltage exceeded.

VARIABLE OUTPUT IMPEDANCE

RANGE: 0 to 1.00Ω in 0.01Ω steps. Value can be changed with output on.

DC CURRENT (2 Years, 23°C ± 5°C)

OUTPUT CURRENT:
 0–4V: 5A max.
 >4V: $I_{MAX} = 60W / (V_{OUT} + 6)$ (not intended to be operated in parallel).
SOURCE COMPLIANCE ACCURACY: ±(0.16% + 5mA)⁵.
PROGRAMMED SOURCE COMPLIANCE RESOLUTION: 1.25mA.
READBACK ACCURACY¹: **5A Range:** ±(0.2% + 200µA).
 5mA Range: ±(0.2% + 1µA).
READBACK RESOLUTION: **5A Range:** 100µA.
 5mA Range: 0.1µA.
CURRENT SINK CAPACITY:
 0–5V: 3A max.
 5V–15V: Derate 0.2A per volt above 5V. Compliance setting controls sinking.
LOAD REGULATION: 0.01% + 1mA.
LINE REGULATION: 0.5mA.
STABILITY⁴: 0.01% + 50µA.
MEASUREMENT TIME CHOICES: 0.01 to 10 PLC⁷, in 0.01PLC steps.
AVERAGE READINGS: 1 to 10.
READING TIME^{1,8,9}: 31ms, typical.

PULSE CURRENT MEASUREMENT OPERATION

TRIGGER LEVEL: **5A Range:** 5mA to 5A, in 5mA steps.
 1A Range: 1mA to 1A, in 1mA steps.
 100mA Range: 0.1mA to 100mA, in 100µA steps.

TRIGGER DELAY: 0 to 100ms, in 10µs steps.

INTERNAL TRIGGER DELAY: 15µs.

HIGH/LOW/AVERAGE MODE:

 Measurement Aperture Settings: 33.3µs to 833ms, in 33.3µs steps.

 Average Readings: 1 to 100.

PULSE CURRENT MEASUREMENT ACCURACY¹¹ (2 Years, 23°C ± 5°C):

APERTURE	ACCURACY ±(% reading + offset + rms noise ¹⁰)
<100 µs	0.2% + 900 µA + 2 mA
100 µs – 200 µs	0.2% + 900 µA + 1.5mA
200 µs – 500 µs	0.2% + 900 µA + 1 mA
500 µs – <1 PLC	0.2% + 600 µA + 0.8mA
1 PLC ¹²	0.2% + 400 µA + 0 mA
>1 PLC	0.2% + 400 µA + 100 µA

BURST MODE CURRENT MEASUREMENT

MEASUREMENT APERTURE: 33.3µs.

CONVERSION RATE: 3650/second, typical.

INTERNAL TRIGGER DELAY: 15µs.

NUMBER OF SAMPLES: 1 to 5000.

TRANSFER SAMPLES ACROSS IEEE BUS IN BINARY MODE: 4800 bytes/s, typical.

LONG INTEGRATION MODE CURRENT MEASUREMENT

MEASUREMENT TIME⁶: 850ms (840ms) to 60 seconds in 1ms steps.

DIGITAL VOLTMETER INPUT (2 Years, 23°C ± 5°C)

INPUT VOLTAGE RANGE: –5 to +30VDC.

INPUT IMPEDANCE: 2MΩ typical.

MAXIMUM VOLTAGE (either input terminal) WITH RESPECT TO OUTPUT LOW:
–5V, +30V.

READING ACCURACY¹: ±(0.05% + 3mV).

READING RESOLUTION: 1mV.

CONNECTOR: HI and LO input pair part of Output #1's terminal block.

MEASUREMENT TIME CHOICES: 0.01 to 10 PLC⁷, in 0.01PLC steps.

AVERAGE READINGS: 1 to 10.

READING TIME^{1,8,9}: 31ms, typical.

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GENERAL

ISOLATION (low-earth): 22VDC max.

PROGRAMMING: IEEE-488.2 (SCPI).

USER-DEFINABLE POWER-UP STATES: 5.

REAR PANEL CONNECTORS: 8-position quick disconnect terminal block for output (4), sense (2), and DVM (2).

TEMPERATURE COEFFICIENT (outside 23°C ±5°C): Derate accuracy specification by $(0.1 \times \text{specification})/^{\circ}\text{C}$.

OPERATING TEMPERATURE: 0° to 50°C (Derate to 70%). 0° to 35°C (Full power).

STORAGE TEMPERATURE: -20° to 70°C.

HUMIDITY: <80% @ 35°C non-condensing.

DISPLAY TYPE: 2-line × 16 character VFD.

REMOTE DISPLAY/KEYPAD OPTION: Disables standard front panel.

DIMENSIONS: 89mm high × 213mm wide × 411mm deep (3½ in × 8¾ in × 16⅝ in).

NET WEIGHT: 3.2kg (7.1 lbs).

SHIPPING WEIGHT: 5.4kg (12 lbs).

INPUT POWER: 100–120VAC/220–240VAC, 50 or 60Hz (auto detected at power-up).

POWER CONSUMPTION: 150VA max.

WARRANTY: Two years parts and labor on materials and workmanship.

EMC: Conforms with European Union Directive directive 89/336/EEC, EN 55011, EN 50082-1, EN 61000-3-2 and 61000-3-3, FCC part 15 class B.

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

AC LINE LEAKAGE CURRENT: 450µA @ 110VAC, typ.; 600µA @ 220V, typ.

RELAY CONTROL PORT: 4-channel, each capable of 100mA sink, 24V max. Total port sink capacity (all 4 combined) is 250mA max. Accepts DB-9 male plug.

ACCESSORIES SUPPLIED: User and service manual, output connectors mating terminal (part no. CS-846).

ACCESSORIES AVAILABLE:

Model 2304-DISP: Remote LCD Display/Keypad (4.6 in × 2.7 in × 1.5 in). Includes 2.7m (9 ft) cable and rack mount kit.

¹ PLC = 1.00.

² Following 15 minute warm-up, the change in output over 8 hours under ambient temperature, constant load, and line operating conditions.

³ Remote sense, at output terminals, 0.5A to 5A typical.

⁴ Remote sense, with 4.5m (15 ft) of 16 gauge (1.31mm²) wire and 1Ω resistance in each lead to simulate typical test environment, 1.5A load change (0.15A to 1.65A).

⁵ Minimum current in constant current mode is 6mA.

⁶ 60Hz (50Hz).

⁷ PLC = Power Line Cycle. 1PLC = 16.7ms for 60Hz operation, 20ms for 50Hz operation.

⁸ Display off.

⁹ Speed includes measurement and binary data transfer out of GPIB.

¹⁰ Typical values, peak-to-peak noise equals 6 times rms noise.

¹¹ Based on settled signal: 100µs pulse trigger delay.

¹² Also applies to other apertures that are integer multiples of 1PLC.

¹³ Recovery to within 20mV of previous level.

Specifications are subject to change without notice.