2306 Dual Channel Battery/Charger Simulator

OUTPUT #1 (BATTERY)

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

OUTPUT VOLTAGE: 0 to +15VDC.

OUTPUT ACCURACY: ±(0.05% + 3mV).

PROGRAMMING RESOLUTION: 1mV.

READBACK ACCURACY[1]: ±(0.05% + 3mV).

READBACK RESOLUTION: 1mV.

OUTPUT VOLTAGE SETTLING TIME: 5ms to within stated accuracy.

LOAD REGULATION: 0.01% + 2mV.

LINE REGULATION: 0.5mV.

STABILITY[2]: 0.01% + 0.5mV.

MEASUREMENT TIME CHOICES: 0.01 to 10 PLC[7], in 0.01PLC steps.

AVERAGE READINGS: 1 to 10.

READING TIME [1,8,9]: 31ms, typical.

TRANSIENT RESPONSE:	High Bandwidth	Low Bandwidth
Transient Recovery Time[13]	<40µs[3] or <60µs[4]	<80µs[3] or <100µs[4]
Transient Voltage Drop	<75mV[3] or <100mV[4]	<250mV[3] or <400mV[4]

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)

CONTINUOUS AVERAGE OUTPUT CURRENT:

Channel #2 (Charger) OFF:
I = 50W/(Vset channel 1 + 6V); 5A max.

Channel #2 (Charger) ON:
I = (50W – Power consumed by channel #2)/(Vset channel 1 + 6V); 5A max.

The power consumed by channel #2 is calculated as:

Channel #2 sourcing current:
Power consumed = (Vset channel 2 + 6V) × (current supplied)

Channel #2 sinking current:
Power consumed = 5 × (sink current)

Peak currents can be a maximum of 5A provided the average current is within the above limits.

CONTINUOUS AVERAGE SINK CURRENT:

Channel #2 (Charger) OFF:
0–5V: 3A max.
5–15V: Derate 0.2A per volt above 5V. Compliance setting controls sinking.

Channel #2 (Charger) ON:
Available current = (50W – Power consumed by channel #2)/5; 3A max. (0–5V).
Derate 0.2A per volt above 5V.

SOURCE COMPLIANCE ACCURACY: ±(0.16% + 5mA)[5].

PROGRAMMED SOURCE COMPLIANCE RESOLUTION: 1.25mA.

READBACK ACCURACY[1]: **5A Range:** ±(0.2% + 200µA).
5mA Range: ±(0.2% + 1µA).

READBACK RESOLUTION: **5A Range:** 100µA.
5mA Range: 0.1µA.

LOAD REGULATION: 0.01% + 1mA.

LINE REGULATION: 0.5mA.

STABILITY[4]: 0.01% + 50µA.

MEASUREMENT TIME CHOICES: 0.01 to 10 PLC[7], 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 ACCURACY[11] (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 TIME[6]: 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 ACCURACY[1]: ±(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 PLC[7], in 0.01PLC steps.

AVERAGE READINGS: 1 to 10.

READING TIME [1,8,9]: 31ms, typical.

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OUTPUT #2 (CHARGER)

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

OUTPUT VOLTAGE: 0 to +15VDC.
OUTPUT ACCURACY: ±(0.05% + 10mV).
PROGRAMMING RESOLUTION: 10mV.
READBACK ACCURACY[1]: ±(0.05% + 3mV).
READBACK RESOLUTION: 1mV.
OUTPUT VOLTAGE SETTLING TIME: 5ms to within stated accuracy.
LOAD REGULATION: 0.01% + 2mV.
LINE REGULATION: 0.5mV.
STABILITY[2]: 0.01% + 0.5mV.
MEASUREMENT TIME CHOICES: 0.01 to 10 PLC[7], in 0.01PLC steps.
AVERAGE READINGS: 1 to 10.
READING TIME [1,8,9]: 31ms, typical.

TRANSIENT RESPONSE:	**High Bandwidth**	**Low Bandwidth**
Transient Recovery Time[13]	<50µs[3] or <80µs[4]	<60µs[3] or <100µs[4]
Transient Voltage Drop	<120mV[3] or <150mV[4]	<160mV[3] or <200mV[4]

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.

DC CURRENT (2 Years, 23°C ± 5°C)

CONTINUOUS AVERAGE OUTPUT CURRENT:
Channel #1 (Battery) OFF:
I = 50W/(Vset channel 2 + 6V); 5A max.
Channel #1 (Battery) ON:
I = (50W – Power consumed by channel #1)/(Vset channel 2 + 6V); 5A max.
The power consumed by channel #1 is calculated as:
Channel #1 sourcing current:
Power consumed = (Vset channel 1 + 6V) × (current supplied)
Channel #1 sinking current:
Power consumed = 5 × (sink current)
Peak currents can be a maximum of 5A provided the average current is within the above limits.

CONTINUOUS AVERAGE SINK CURRENT:
Channel #1 (Battery) OFF:
0–5V: 3A max.
5–15V: Derate 0.2A per volt above 5V. Compliance setting controls sinking.
Channel #1 (Battery) ON:
Available current = (50W – Power consumed by channel #1)/5; 3A max. (0–5V).
Derate 0.2A per volt above 5V.

SOURCE COMPLIANCE ACCURACY: ±(0.16% + 5mA)[5].
PROGRAMMED SOURCE COMPLIANCE RESOLUTION: 1.25mA.
READBACK ACCURACY[1]: **5A Range:** ±(0.2% + 200µA).
5mA Range: ±(0.2% + 1µA).
READBACK RESOLUTION: **5A Range:** 100µA.
5mA Range: 0.1µA.
LOAD REGULATION: 0.01% + 1mA.
LINE REGULATION: 0.5mA.
STABILITY[4]: 0.01% + 50µA.
MEASUREMENT TIME CHOICES: 0.01 to 10 PLC[7], in 0.01PLC steps.
AVERAGE READINGS: 1 to 10.
READING TIME [1,8,9]: 31ms, typical.

PULSE CURRENT MEASUREMENT OPERATION

TRIGGER LEVEL: 5mA to 5A, in 5mA 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 ACCURACY[11] (2 Years, 23°C ±5°C):

APERTURE	ACCURACY ±(% reading + offset + rms noise[10])
<100 µs	0.2% + 900 µA + 2 mA
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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: 2040/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 TIME[6]: 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 ACCURACY[1]: ±(0.05% + 3mV).
READING RESOLUTION: 1mV.
CONNECTOR: HI and LO input pair part of Output #2's terminal block.
MEASUREMENT TIME CHOICES: 0.01 to 10 PLC[7], 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. Do not exceed 60VDC between any two terminals of either connector.

PROGRAMMING: IEEE-488.2 (SCPI).

USER-DEFINABLE POWER-UP STATES: 5.

REAR PANEL CONNECTORS: Two 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 × specification)/°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 × 8⅜ in × 16¾₁₆ 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.

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