

CR9000X & CR9000XC Specifications

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; extended testing over -40° to +70°C range available as an option, excluding batteries. Non-condensing environment is required. To maintain specifications, Campbell Scientific recommends recalibrating data-loggers every two years. We recommend that you confirm system configuration and critical specifications with Campbell Scientific before purchase.

CR9032 CPU MODULE

PROCESSORS: 180 MHz Hitachi SH-4

MEMORY: 128 Mbytes of internal SDRAM for program and data storage. Expanded data storage with PCMCIA type I, type II or type III cards or CompactFlash® cards with an adapter

SERIAL INTERFACES: RS-232 9-pin RS-232 DCE port for computer or modem. CS I/O 9-pin port for CSI peripherals and SDM devices.

ETHERNET INTERFACE: 10baseT/100baseT port for communications over a local network or the Internet.

CR9011 POWER SUPPLY MODULE

VOLTAGE: 9.6 to 18 Vdc

TYPICAL CURRENT DRAIN: Base system with no modules is 500 mA active; 300 mA standby. Current drain of individual I/O modules varies. Refer to specifications for each I/O module for specific values. Power supply module can place the system in standby mode by shutting off power to the rest of the modules.

DC CHARGING: 9.6 to 18 Vdc input charges internal batteries at up to 2 A rate. Charging circuit includes temperature compensation.

INTERNAL BATTERIES: Sealed rechargeable with 14 Ahr (7 Ahr for the CR9000XC) capacity per charge.

EXTERNAL BATTERIES: External 12 V batteries can be connected.

CR9041 A/D and AMPLIFIER MODULE

A/D Conversions: 16-bit, 100 kHz

CR9050 & CR9051E ANALOG INPUT MODULES

INPUT CHANNELS PER MODULE: 14 Differential (diff) or 28 single-ended (SE)

RANGE, RESOLUTION, AND INPUT NOISE:

Input Range (mV)	Resolution (1 A/D count) (µV)	Input Noise CR9050 (µV RMS)	Input Noise CR9051E (µV RMS)	Max Sample Rates (kHz)
±5000	158.0	105	130	100
±1000	32.0	35	35	100
±200	6.3	7	7	50
±50	1.6	4	4	50

Note: Measurement averaging provides lower noise and better resolution.

ACCURACY OF VOLTAGE MEASUREMENTS:

Single-ended & Differential:

±(0.07% of reading + 4 A/D counts) -25° to +50°C
±(0.14% of reading + 4 A/D counts) -40° to +70°C

Dual Differential (two measurements with input polarity reversed):

±(0.07% of reading + 1 A/D count) -25° to +50°C
±(0.14% of reading + 1 A/D count) -40° to +70°C

COMMON MODE RANGE: ±5 V

DC COMMON MODE REJECTION: >120 dB

INPUT RESISTANCE: 2.5 gigaohms typical

MAXIMUM INPUT VOLTAGE WITHOUT DAMAGE:
±20 V CR9050, -40 to +50 V CR9051E

TYPICAL CURRENT DRAIN: 25 mA active

Resistance & Conductivity Measurements (also requires CR9060 Excitation Module)

ACCURACY: ±(0.04% of reading + 2 A/D counts) limited by accuracy of external bridge resistors.

MEASUREMENT TYPES: 6-wire and 4-wire full bridge, 4-wire, 3-wire, and 2-wire half bridge. Uses excitation reversal to remove thermal EMF errors.

CR9055(E) 50 V-ANALOG INPUT MODULE

INPUT CHANNELS PER MODULE: 14 diff or 28 SE.

RANGE AND RESOLUTION:

Input Range (V)	Resolution (1 A/D count) (µV)	Input Noise (µV RMS)	Max Sample Rates (kHz)
±50	1580	1050	100
±10	320	350	100
±2	63	85	50
±0.5	16	60	50

Note: Measurement averaging provides lower noise and better resolution.

ACCURACY OF VOLTAGE MEASUREMENTS:

Single-Ended & Differential:

±(0.1% of reading + 4 A/D counts) -25° to +50°C
±(0.2% of reading + 4 A/D counts) -40° to +70°C

Dual Differential:

(two measurements with input polarity reversed)
±(0.1% of reading + 1 A/D count) -25° to +50°C
±(0.2% of reading + 1 A/D counts) -40° to +70°C

COMMON MODE RANGE: ±50 V

DC COMMON MODE REJECTION: >62 dB

INPUT RESISTANCE: 100 kohms typical

MAXIMUM INPUT VOLTAGE WITHOUT DAMAGE: ±150 V

TYPICAL CURRENT DRAIN: 15 mA active

CR9058E ISOLATION MODULE

INPUT CHANNELS PER MODULE: 10 isolated, differential; each channel has its own isolation ground for shielded cable connection.

RANGE, RESOLUTION, AND INPUT RESISTANCE:

Input Range (Vdc)	Resolution w/o Averaging (µV)	Resolution w/ Averaging (µV)	Input Resistance (kohms)
±2	±10	±2	10,000
±20	±100	±20	88.9
±60	±300	±60	269

ACCURACY:

Gain Error: ±0.02% of reading (-40° to +50°C), ±0.07% of reading (-40° to +70°C)

Offset Error: ±0.01% of FSR (-40° to +50°C), ±0.01% of FSR (-40° to +70°C)

INPUT TO SYSTEM GROUND CMRR db:

Input Range (Vdc)	DC	60 Hz	300 Hz	2 kHz
±2	>160	93.3	81.0	70.7
±20	>160	99.1	88.8	71.6
±60	>160	94.6	85.3	66.7

INPUT TO INPUT CROSSTALK db:

Input Range (Vdc)	DC	60 Hz	300 Hz	2 kHz
±2	< -160	-121.3	-108.8	-94.3
±20	< -160	-120.8	-98.6	-96.1
±60	< -160	-108.7	-87.9	-82.5

MINIMUM SCAN TIME PER MODULE (for VoltDiff or TCDiff):
1460 µs with no input reversal and no open circuit detection; selecting input reversal (Rev parameter = 1) adds 2300 µs to the minimum scan time and selecting open circuit detection (voltage range = V2C) adds 1460 µs to the minimum scan time. If the scan time is insufficient, the CR9000X will report an error at compile time.

MAXIMUM CONTINUOUS VOLTAGE W/O DAMAGE:

Input Range (Vdc)	H to L (Vdc)	H or L to ISO Ground (Vdc)	ISO Ground to System Ground (Vdc)	H or L to System Ground (Vdc)
±2	±208	±109	±360	±469
±20	±223	±121	±360	±481
±60	±448	±233	±360	±593

MAXIMUM ESD VOLTAGE ON INPUTS: ±5000V

TYPICAL CURRENT DRAIN: 360 mA operating, 5 mA standby

CR9052DC/CR9052IEPE ANTI-ALIAS MODULES

Refer to the CR9052DC and CR9052IEPE Brochure.

CR9060 EXCITATION MODULE

TYPICAL CURRENT DRAIN: 108 mA quiescent, 125 mA active

Analog Outputs

ANALOG OUTPUTS PER MODULE: 10 switched, 6 continuous

SWITCHED: Provides excitation for resistance measurements.

Only one output can be active at a time.

CONTINUOUS: All outputs can be active simultaneously.

RANGE: ±5 V

ACCURACY: ±(0.2% of output ±4 mV)

RESOLUTION: 12-bit A/D (2.4 mV)

OUTPUT CURRENT: ±50 mA

Digital Control Outputs

CONTROL CHANNELS PER MODULE: 8

OUTPUT VOLTAGES (no load):

High: 5.0 V ±0.2 V
Low: < 0.2 V

OUTPUT RESISTANCE: 100 ohms

CR9071E COUNTER & DIGITAL I/O MODULE

Counter Channels

COUNTER CHANNELS PER MODULE: 12

MAXIMUM COUNTS PER INTERVAL: 2³² Max. counts per interval will never be reached because with a maximum input frequency of 1 MHz, the 32-bit counter will go 71.58 minutes before it rolls over. The maximum CR9000X scan rate is 1 minute.

SWITCH CLOSURE MODE (4 channels)

Minimum switch closed time: 5 ms
Minimum switch open time: 6 ms
Maximum bounce time: 1 ms open without being counted

HIGH FREQUENCY MODE (all channels)

Minimum pulse width: 500 ns
Maximum input frequency: 1 MHz
Thresholds: Pulse counted on transition from below 1.5 V to above 3.5 V
Maximum input voltage: ±20 V

Note: Because of the pulse channels' input filter with a 200 ns time constant, higher frequencies will require larger input transitions.

LOW LEVEL AC MODE (8 channels)

Input hysteresis: 10 mV
Minimum ac voltage: 25 mV RMS
Maximum input voltage: ±20 V
Frequency range:

(mV RMS)	RANGE (Hz)
25	1 to 10,000
≥50	0.5 to 20,000

TYPICAL CURRENT DRAIN: 35 mA

Digital Inputs/Outputs

I/O CHANNELS PER MODULE: 16

OUTPUT VOLTAGES (no load)

High: 5.0 V ±0.2 V
Low: < 0.2 V

OUTPUT RESISTANCE: 320 ohms

INPUT STATE:

High: 3.5 to 5 V
Low: -0.5 to 1.2 V

INPUT RESISTANCE: 100 kOhms

Interval Measurement

I/O CHANNELS: Resolution is the scan rate

PULSE CHANNELS

Maximum interval: 1 minute
Resolution: 40 ns

TRANSIENT PROTECTION

All analog and digital inputs and outputs use gas discharge tubes and transient filters to protect against high-voltage transients. Digital I/Os also have over-voltage protection clamping.

PHYSICAL

Size

LAB ENCLOSURE: 15.75"L x 9.75"W x 8"D (40 x 24.8 x 20.3 cm)

FIBERGLASS ENVIRONMENTAL ENCLOSURE:
18"L x 13.5"W x 9"D (45.7 x 34.3 x 22.9 cm)

CR9000XC: 10"L x 11"W x 9"D (25.4 x 27.9 x 22.9 cm)

Weight

LAB ENCLOSURE: 30 lbs including modules (13.6 kg)

FIBERGLASS ENVIRONMENTAL ENCLOSURE:
42 lbs including modules (19.1 kg)

CR9000XC: 27 lbs including modules (12.3 kg)

REPLACEMENT BATTERIES: 6.4 lbs (2.9 kg)

ADDITIONAL MODULES: 1 lb each (0.5 kg)

WARRANTY

Three years against defects in materials and workmanship.

