CR5000 Specifications

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; non-condensing environment required. To maintain electrical specifications, Campbell Scientific recommends recalibrating dataloggers every two years. We recommend that you confirm system configuration and critical specifications with Campbell Scientific before purchase.

PROGRAM EXECUTION RATE

The CR5000 can measure one channel and store the result in 500 µs; all 40 single-ended (SE) channels can be measured in 8 ms (5 kHz aggregate rate).

ANALOG INPUTS

20 differential (DF) or 40 single-ended (SE) individually configured. Channel expansion provided by AM16/32B and AM25T multiplexers.

RANGES, RESOLUTION, AND TYPICAL INPUT NOISE: Basic Resolution (Basic Res) is the A/D resolution of a single conversion. Resolution of DF with input reversal is half the Basic Res. Noise values are for DF with input reversal; noise is greater with SE.

Input Rng (mV)	Basic Res (µV)	0 Int. (µV RMS)	250 µs Int. (µV RMS)	20/16.7 ms Int. (µV RMS)
±5000	167	70	60	30
±1000	33.3	30	12	6
±200	6.67	8	2.4	1.2
±50	1.67	3.0	0.8	0.3
±20	0.67	1.8	0.5	0.2

ACCURACY[1]:
$\pm$(0.05% of reading + offset), 0° to 40°C
$\pm$(0.075% of reading + offset), -25° to 50°C
$\pm$(0.10% of reading + offset), -40° to 85°C (-XT only)

[1]The sensor and measurement noise is not included and the offsets are the following:

Offset for DF w/input reversal = Basic Res + 1.0 µV
Offset for DF w/o input reversal = 2Basic Res + 2.0 µV
Offset for SE = 2Basic Res + 10 µV

MINIMUM TIME BETWEEN VOLTAGE MEASUREMENTS:

Zero Integration:	125 µs
250 µs Integration:	475 µs
16.7 ms Integration:	19.9 ms
20 ms Integration:	23.2 ms

INPUT LIMITS: ±5 V

DC COMMON MODE REJECTION: >100 dB with input reversal (>80 dB without input reversal)

NORMAL MODE REJECTION: 70 dB @ 60 Hz when using 60 Hz rejection

SUSTAINED INPUT VOLTAGE W/O DAMAGE: ±16 Vdc

INPUT CURRENT: ±2 nA typ., ±10 nA max. @ 50°C

INPUT RESISTANCE: 20 Gohms typical

ACCURACY OF BUILT-IN REFERENCE JUNCTION THERMISTOR (for thermocouple measurements):
±0.25°C, 0° to 40°C
±0.5°C, -25° to 50°C
±0.7°C, -40° to 85°C (-XT only)

ANALOG OUTPUTS

4 switched voltage; 4 switched current; 2 continuous voltage; switched outputs active only during measurements, one at a time.

RANGE: Voltage outputs programmable between ±5 V; current outputs programmable between ±2.5 mA

RESOLUTION: 1.2 mV for voltage outputs; 0.6 µA for current outputs

ACCURACY: ±10 mV for voltage outputs; ±10 µA for current outputs

CURRENT SOURCING: 50 mA for switched voltage; 15 mA for continuous

CURRENT SINKING: 50 mA for switched voltage; 5 mA for continuous (15 mA w/selectable option)

COMPLIANCE VOLTAGE: ±5 V for switched current excitation

RESISTANCE MEASUREMENTS

Provides voltage ratio measurements of 4- and 6-wire full bridges, and 2-, 3-, 4-wire half bridges. Direct resistance measurements available with current excitation. Dual-polarity excitation is recommended.

VOLTAGE RATIO ACCURACY[2]: Assumes input and excitation reversal and an excitation voltage of at least 2000 mV.

$\pm$(0.04% Reading + Basic Res/4) 0° to 40°C
$\pm$(0.05% Reading + Basic Res/4) -25° to 50°C
$\pm$(0.06% Reading + Basic Res/4) -40° to 85°C (-XT)

ACCURACY[2] WITH CURRENT EXCITATION: Assumes input and excitation reversal, and an excitation current, I_x, of at least 1 mA.

$\pm$(0.075% Reading + Basic Res/2I_x) 0° to 40°C
$\pm$(0.10% Reading + Basic Res/2I_x) -25° to 50°C
$\pm$(0.12% Reading + Basic Res/2I_x) -40° to 85°C (-XT)

[2]The sensor and measurement noise is not included.

PERIOD AVERAGING MEASUREMENTS

The average period for a single cycle is determined by measuring the duration of a specified number of cycles. Any of the 40 SE analog inputs can be used; signal attenuation and ac coupling may be required.

INPUT FREQUENCY RANGE:

Input Range	Signal (peak to peak) Min.	Max [3]	Min. Pulse W.	Max Freq.
±5000	600 mV	10 V	2.5 µs	200 kHz
±1000	100 mV	2.0 V	5.0 µs	100 kHz
±200	4 mV	2.0 V	25 µs	20 kHz

[3]Maximum signals must be centered around datalogger ground.

RESOLUTION: 70 ns/number of cycles measured

ACCURACY: ±(0.03% of Reading + Resolution)

PULSE COUNTERS

Two 16-bit inputs selectable for switch closure, high frequency pulse, or low-level ac.

MAXIMUM COUNT: 4×10^9

SWITCH CLOSURE MODE:
Minimum Switch Closed Time: 5 ms
Minimum Switch Open Time: 6 ms
Max. Bounce Time: 1 ms open w/o being counted

HIGH-FREQUENCY PULSE MODE:
Maximum Input Frequency: 400 kHz
Maximum Input Voltage: ±20 V
Voltage Thresholds: Count upon transition from below 1.5 V to above 3.5 V at low frequencies. Larger input transitions are required at high frequencies because of 1.2 µs time constant filter.

LOW-LEVEL AC MODE: Internal ac coupling removes dc offsets up to ±0.5 V.

Input Hysteresis: 15 mV
Maximum ac Input Voltage: ±20 V
Minimum ac Input Voltage:

Sine wave (mV RMS)	Range (Hz)
20	1.0 to 1000
200	0.5 to 10,000
1000	0.3 to 16,000

DIGITAL I/O PORTS

8 ports selectable as binary inputs or control outputs.

OUTPUT VOLTAGES (no load): high 5.0 V ±0.1 V; low < 0.1 V

OUTPUT RESISTANCE: 330 ohms

INPUT STATE: high 3.0 to 5.3 V; low -0.3 to 0.8 V

INPUT RESISTANCE: 100 kohms

SWITCHED 12 V

Two independent 12 V unregulated sources switched on and off under program control. Thermal fuse hold current = 900 mA @ 20°C, 650 mA @ 50°C, 360 mA @ 85°C.

EMI and ESD PROTECTION

The CR5000 is encased in metal and incorporates EMI filtering on all inputs and outputs. Gas discharge tubes provide robust ESD protection on all terminalblock inputs and outputs. The following European CE standards apply.

EMC tested and conforms to BS EN61326:1998.

Details of performance criteria applied are available upon request.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to correct the interference at the user's own expense.

CPU AND INTERFACE

PROCESSOR: Hitachi SH7034

MEMORY: Battery-backed SRAM provides 2 Mbytes for data and operating system use with 128 kbytes reserved for program storage. Expanded data storage with PCMCIA type I, type II, or type III card, or CF card (requires an adapter).

DISPLAY: 8-line-by-21 character alphanumeric or 128 x 64 pixel graphic LCD display w/backlight.

SERIAL INTERFACES: Optically isolated RS-232 9-pin DCE port for computer or non-CSI modem connection. CS I/O 9-pin port for Campbell Scientific peripherals.

BAUD RATES: Selectable from 1,200 to 115,200 bps. ASCII protocol is eight data bits, one start bit, one stop bit, no parity.

CLOCK ACCURACY: ±1 minute per month, -25° to +50°C; ±2 minute per month, -40° to +85°C

SYSTEM POWER REQUIREMENTS

VOLTAGE: 11 to 16 Vdc

TYPICAL CURRENT DRAIN: 400 µA software power off; 1.5 mA sleep mode; 4.5 mA at 1 Hz (200 mA at 5 kHz) sample rate.

INTERNAL BATTERIES: 7 Ahr rechargeable base (optional); 1650 mAhr lithium battery for clock and SRAM backup, 10 years of service typical, less at high temperatures.

EXTERNAL BATTERIES: 11 to 16 Vdc; reverse polarity protected.

PHYSICAL SPECIFICATIONS

SIZE: 9.8" x 8.3" x 4.5" (24.7 cm x 21.0 cm x 11.4 cm) Terminal strips extend 0.4" (1.0 cm).

WEIGHT: 4.5 lbs (2.0 kg) with low-profile base; 12.2 lbs (5.5 kg) with rechargeable base

WARRANTY

3 years against defects in materials and workmanship.