

CR1000 Specifications

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; non-condensing environment required.

PROGRAM EXECUTION RATE

10 ms to 30 min. @ 10 ms increments

ANALOG INPUTS

8 differential (DF) or 16 single-ended (SE) individually configured. Channel expansion provided by AM16/32 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 measurements with input reversal is half the Basic Res.** Noise values are for DF measurements with input reversal; noise is greater with SE measurements.

Input Range (mV)	Basic Res (µV)	250 µs Int. (µV RMS)	50/60 Hz Int. (µV RMS)
±5000	1330	385	192
±2500	667	192	95.9
±250	66.7	19.2	19.2
±25	6.7	2.3	1.9
±7.5	2	0.62	0.58
±2.5	0.67	0.34	0.19

Offset for DF w/input reversal = (Basic Res+1.0 µV)/2

Offset for DF w/o input reversal = Basic Res + 1.0 µV

Offset for SE = Basic Res + 2 µV

ACCURACY¹:

- ±(0.1% of reading + offset), 0° to 40°C
- ±(0.2% of reading + offset), -25° to 50°C
- ±(0.4% of reading + offset), -55° to 85°C (-XT only)

MINIMUM TIME BETWEEN VOLTAGE

MEASUREMENTS: Includes the measurement time and conversion to engineering units. For voltage measurements, the CR1000 integrates the input signal for 0.25 ms or a full 16.66 ms or 20 ms line cycle for 50/60 Hz noise rejection. DF measurements with input reversal incorporate two integrations with reversed input polarities to reduce thermal offset and common mode errors and therefore take twice as long.

250 µs Analog Integration:	~1 ms SE
1/60 Hz Analog Integration:	~20 ms SE
1/50 Hz Analog Integration:	~25 ms SE

COMMON MODE RANGE: ±5 V

DC COMMON MODE REJECTION: >100 dB

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

SUSTAINED INPUT VOLTAGE W/O DAMAGE: ±16 Vdc max.

INPUT CURRENT: ±1 nA typical, ±6 nA max. @ 50°C; ±90 nA @ 85°C

INPUT RESISTANCE: 20 Gohms typical

ACCURACY OF BUILT-IN REFERENCE JUNCTION

THERMISTOR (for thermocouple measurements):

- ±0.3°C, -25° to 50°C
- ±0.8°C, -55° to 85°C (-XT only)

ANALOG OUTPUTS

3 switched voltage, active only during measurement, one at a time.

RANGE AND RESOLUTION: Voltage outputs programmable between ±2.5 V with 0.67 mV resolution.

ACCURACY: ±(0.08% of setting + 8.0 mV), 0° to 40°C

- ±(0.15% of setting + 8.0 mV), -25° to 50°C
- ±(0.25% of setting + 8.0 mV), -55° to 85°C (-XT only)

CURRENT SOURCING/SINKING: ±25 mA

RESISTANCE MEASUREMENTS

MEASUREMENT TYPES: The CR1000 provides ratiometric measurements of 4- and 6-wire full bridges, and 2-, 3-, and 4-wire half bridges. Precise, dual polarity excitation using any of the 3 switched voltage excitations eliminates dc errors.

RATIO ACCURACY¹: Assuming excitation voltage of at least 1000 mV, not including bridge resistor error. ±(0.04% of reading + Offset/V_{ex})

Offset values are reduced by a factor of 2 when excitation reversal is used.

Offset for DF w/input reversal = (Basic Res+1.0 µV)/2

Offset for DF w/o input reversal = Basic Res + 1.0 µV

Offset for SE = Basic Res + 2 µV

PERIOD AVERAGING MEASUREMENTS

The average period for a single cycle is determined by measuring the average duration of a specified number of cycles. The period resolution is 192 ns divided by the specified number of cycles to be measured; the period accuracy is ±(0.01% of reading + resolution)¹. Any of the 16 SE analog inputs can be used for period averaging. Signal limiting are typically required for the SE analog channel.

INPUT FREQUENCY RANGE:

Input Range	Signal (peak to peak) ² Min	Max	Min. Pulse W.	Max ³ Freq.
±2500 mV	500 mV	10 V	2.5 µs	200 kHz
±250 mV	10 mV	2 V	10 µs	50 kHz
±25 mV	5 mV	2 V	62 µs	8 kHz
±2.5 mV	2 mV	2 V	100 µs	5 kHz

2-Signal centered at datalogger ground.

3-Maximum frequency equals 1/(Twice Minimum Pulse Width) for 50% duty cycle signals.

PULSE COUNTERS

Two 24-bit inputs selectable for switch closure, high frequency pulse, or low-level ac.

MAXIMUM COUNTS PER SCAN: 16.7x10⁶

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: 250 kHz
- Maximum Input Voltage: ±20 V
- Voltage Thresholds: Count upon transition from below 0.9 V to above 2.2 V after input filter with 1.2 µs time constant.

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

- Input Hysteresis: 16 mV @ 1 Hz
- Maximum ac Input Voltage: ±20 V
- Minimum ac Input Voltage:

(Sine wave mV RMS)	Range (Hz)
20	1.0 to 20
200	0.5 to 200
2000	0.3 to 10,000
5000	0.3 to 20,000

DIGITAL I/O PORTS

8 ports software selectable, as binary inputs or control outputs. C1-C8 also provide edge timing, subroutine interrupts/wake up, switch closure pulse counting, high frequency pulse counting, asynchronous communications (UART), SDI-12 communications, and SDM communications.

HIGH FREQUENCY MAX: 400 kHz

SWITCH CLOSURE FREQUENCY MAX: 150 Hz

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

OUTPUT RESISTANCE: 330 ohms

INPUT STATE: high 3.8 to 5.3 V; low -0.3 to 1.2 V

INPUT HYSTERESIS: 1.4 V

INPUT RESISTANCE: 100 kohms

SDI-12 INTERFACE SUPPORT

Control ports 1, 3, 5, and 7 may be configured for SDI-12 asynchronous communications. Up to ten SDI-12 sensors are supported per port. It meets SDI-12 Standard version 1.3 for datalogger mode.

CE COMPLIANCE

STANDARD(S) TO WHICH CONFORMITY IS DECLARED: BS EN61326:2002

CPU AND INTERFACE

PROCESSOR: Hitachi H8S 2322 (16-bit CPU with 32-bit internal core)

MEMORY: Battery-backed SRAM; 2 Mbytes, 16 kbytes for program storage; 4 Mbytes optional

SERIAL INTERFACES: COM1 (CS I/O, used to interface with Campbell Scientific peripherals), COM2 (Standard RS-232 communication port)

PARALLEL INTERFACE: 40-pin interface for attaching data storage or communication peripherals such as the CFM100 module

BAUD RATES: Selectable from 300 to 115.2 kbps. ASCII protocol is one start bit, one stop bit, eight data bits, and no parity.

CLOCK ACCURACY: ±3 min. per year (-30° to 85°C); ±15 min. per year (-55° to 85°C, -XT only)

SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 Vdc

TYPICAL CURRENT DRAIN:

- Sleep Mode: ~0.5 mA
- 1 Hz Sample Rate (one fast SE meas.): ~0.6 mA
- 100 Hz Sample Rate (one fast SE meas.): ~7.0 mA
- 100 Hz Sample Rate (one fast SE meas. w/RS-232 communications): ~7.0 mA

EXTERNAL BATTERIES: 12 Vdc nominal; reverse polarity protected.

PHYSICAL SPECIFICATIONS

SIZE: 8.5" x 3.9" x 0.85" (21.6 x 9.9 x 2.2 cm) - Measurement & Control Module; 9.4" x 4" x 2.4" (23.9 x 10.2 x 6.1 cm) - CR1000WP Wiring Panel. Additional clearance required for serial cable and sensor leads.

WEIGHT: 2.1 lbs (1 kg)

WARRANTY

Three years against defects in materials and workmanship.

¹Sensor and measurement noise not included



CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540
Offices also located in: Australia • Brazil • Canada • England • France • South Africa • Spain

Copyright © 2004
Campbell Scientific, Inc.
Printed November 2004