

# CR800-Series Specifications

Electrical specifications are valid over a -25° to +50°C, non-condensing environment, unless otherwise specified. Recalibration recommended every two years. Critical specifications and system configuration should be confirmed with Campbell Scientific before purchase.

## PROGRAM EXECUTION RATE

10 ms to one day @ 10 ms increments

## ANALOG INPUTS (SE1-SE6 or DIFF1-DIFF3)

3 differential (DF) or 6 single-ended (SE) individually configured input channels. Channel expansion provided by optional multiplexers.

RANGES and RESOLUTION: 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.

Range (mV) <sup>1</sup>	DF Res (µV) <sup>2</sup>	Basic Res (µV)
±5000	667	1333
±2500	333	667
±250	33.3	66.7
±25	3.33	6.7
±7.5	1.0	2.0
±2.5	0.33	0.67

<sup>1</sup>Range overhead of ~9% on all ranges guarantees that full-scale values will not cause over range.

<sup>2</sup>Resolution of DF measurements with input reversal.

## ACCURACY<sup>3</sup>:

±(0.06% of reading + offset), 0° to 40°C

±(0.12% of reading + offset), -25° to 50°C

±(0.18% of reading + offset), -55° to 85°C (-XT only)

<sup>3</sup>Accuracy does not include sensor and measurement noise. Offsets are defined as:

Offset for DF w/input reversal = 1.5-Basic Res + 1.0 µV

Offset for DF w/o input reversal = 3-Basic Res + 2.0 µV

Offset for SE = 3-Basic Res + 3.0 µV

## ANALOG MEASUREMENT SPEED:

Integra- tion Type/ Code	Integra- tion Time	Settling Time	Total Time <sup>5</sup>	
			SE w/ No Rev	DF w/ Input Rev
250	250 µs	450 µs	~1 ms	~12 ms
60 Hz <sup>4</sup>	16.67 ms	3 ms	~20 ms	~40 ms
50 Hz <sup>4</sup>	20.00 ms	3 ms	~25 ms	~50 ms

<sup>4</sup>AC line noise filter.

<sup>5</sup>Includes 250 µs for conversion to engineering units.

INPUT NOISE VOLTAGE: For DF measurements with input reversal on ±2.5 mV input range; digital resolution dominates for higher ranges.

250 µs Integration: 0.34 µV RMS  
50/60 Hz Integration: 0.19 µV RMS

INPUT LIMITS: ±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 (Vx1-Vx2)

2 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.

V<sub>x</sub> ACCURACY: ±(0.06% of setting + 0.8 mV), 0° to 40°C  
±(0.12% of setting + 0.8 mV), -25° to 50°C  
±(0.18% of setting + 0.8 mV), -55° to 85°C (-XT only)

V<sub>x</sub> FREQUENCY SWEEP FUNCTION: Switched outputs provide a programmable swept frequency, 0 to 2500 m square waves for exciting vibrating wire transducers.

CURRENT SOURCING/SINKING: ±25 mA

## RESISTANCE MEASUREMENTS

MEASUREMENT TYPES: Ratiometric measurements of 4- and 6-wire full bridges, and 2-, 3-, and 4-wire half bridges. Precise, dual polarity excitation for voltage excitation eliminates dc errors. Offset values are reduced by a factor of 2 when excitation reversal is used.

VOLTAGE RATIO ACCURACY<sup>6</sup>: Assuming excitation voltage of at least 1000 mV, not including bridge resistor error.

±(0.04% of voltage reading + offset)/V<sub>x</sub>

<sup>6</sup>Accuracy does not include sensor and measurement noise. Offsets are defined as:

Offset for DF w/input reversal = 1.5-Basic Res + 1.0 µV

Offset for DF w/o input reversal = 3-Basic Res + 2.0 µV

Offset for SE = 3-Basic Res + 3.0 µV

## PERIOD AVERAGING MEASUREMENTS

Any of the 6 SE analog inputs can be used for period averaging. Accuracy is ±(0.01% of reading + resolution), where resolution is 136 ns divided by the specified number of cycles to be measured.

## INPUT AMPLITUDE AND FREQUENCY:

Voltage Gain	Input Range (±mV)	Signal (peak to peak) <sup>7</sup>		Min Pulse Width (µV)	Max <sup>8</sup> Freq (kHz)
		Min. (mV)	Max (V)		
1	250	500	10	2.5	200
10	25	10	2	10	50
33	7.5	5	2	62	8
100	2.5	2	2	100	5

<sup>7</sup>With signal centered at the datalogger ground.

<sup>8</sup>The maximum frequency = 1/(Twice Minimum Pulse Width) for 50% of duty cycle signals.

## PULSE COUNTERS (P1-P2)

2 inputs individually selectable for switch closure, high frequency pulse, or low-level ac. Independent 24-bit counters for each input.

MAXIMUM COUNTS PER SCAN: 16.7 x 10<sup>6</sup>

## 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: 12 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 (C1-C4)

4 ports software selectable, as binary inputs or control outputs. Provide edge timing, subroutine interrupts/wake up, switch closure pulse counting, high frequency pulse counting, asynchronous communications (UARTs), SDI-12 communications, and SDM communications.

HIGH FREQUENCY MAX: 400 kHz

SWITCH CLOSURE FREQUENCY MAX: 150 Hz

EDGE TIMING RESOLUTION: 540 ns

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

OUTPUT RESISTANCE: 330 ohms

INPUT STATE: high 3.8 to 16 V; low -8.0 to 1.2 V

INPUT HYSTERESIS: 1.4 V

INPUT RESISTANCE: 100 kohm with inputs <6.2 Vdc  
220 ohms with inputs ≥6.2 Vdc

## SWITCHED 12 V (SW12)

One independent 12 Vdc unregulated source is switched on and off under program control. Thermal fuse hold current = 900 mA @ 20°C, 650 mA @ 50°C, 360 mA @ 85°C.

## CE COMPLIANCE

STANDARD(S) TO WHICH CONFORMITY IS DECLARED: IEC61326:2002

## COMMUNICATIONS

RS-232 PORTS:

9-pin: DCE (not electrically isolated) for computer or non-CSI modem connection.

COM1 to COM2: Two independent Tx/Rx pairs on control ports (non-isolated); 0 to 5 Vdc UART

Baud Rate: selectable from 300 bps to 115.2 kbps.

Default Format: 8 data bits; 1 stop bits; no parity

Optional Formats: 7 data bits; 2 stop bits; odd, even parity

CS I/O PORT: Interface with CSI telecommunication peripherals

SDI-12: Digital control ports 1 or 3 are individually configured and meet SDI-12 Standard version 1.3 for datalogger mode. Up to ten SDI-12 sensors are supported per port.

PROTOCOLS SUPPORTED: PakBus, Modbus, DNP3, FTP, HTTP, XML, POP3, SMTP, Telnet, NTCIP, NTP, SDI-12, SDM

## SYSTEM

PROCESSOR: Renesas H8S 2322 (16-bit CPU with 32-bit internal core running at 7.4 MHz)

MEMORY: 2 MB of Flash for operating system; 4 MB of battery-backed SRAM for CPU usage, program storage and final data storage

RTC CLOCK ACCURACY: ±3 min. per year. Correction via GPS optional.

RTC CLOCK RESOLUTION: 10 ms

## SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 Vdc

EXTERNAL BATTERIES: 12 Vdc nominal (power and connection is reverse polarity protected)

INTERNAL BATTERIES: 1200 mAh lithium battery for clock and SRAM backup, typically provides 3 years of backup

TYPICAL CURRENT DRAIN:

Sleep Mode: 0.7 mA typical; 0.9 mA max.  
1 Hz Sample Rate (1 fast SE meas.): 1 mA  
100 Hz Sample Rate (1 fast SE meas.): 16.2 mA  
100 Hz Sample Rate (1 fast SE meas. w/RS-232 communication): 27.6 mA  
CR1000KD or CR850 Keyboard Display On (no backlight): add 7 mA to current drain  
CR1000KD or CR850 Keyboard Display On (backlight on): add 100 mA to current drain

## PHYSICAL

DIMENSIONS: 24.1 x 10.4 x 5.1 cm (9.5 x 4.1 x 2 in.); additional clearance required for cables and leads.

WEIGHT (datalogger + base): 0.7 kg (1.5 lb)

## WARRANTY

3 years against defects in materials and workmanship.

