CR1000X Specifications

Electrical specifications are valid over a -40 to +70 °C, non-condensing environment, unless otherwise specified. Extended electrical specifications (noted as XT in specifications) are valid over a -55 to +85 °C non-condensing environment. Recalibration is recommended every three years. Critical specifications and system configuration should be confirmed with Campbell Scientific before purchase.

- **Accuracy**: ±3 min. per year, optional GPS correction to ±10 μs

Wiring Panel Temperature: Measured using a 10K3A1A BetaTHERM thermistor, located between the two rows of analog input terminals.

### Physical specifications

- **Dimensions**: 23.8 x 10.1 x 6.2 cm (9.4 x 4.0 x 2.4 in); additional clearance required for cables and wires.
- **Weight/Mass**: 0.86 kg (1.9 lb)
- **Case Material**: Powder-coated aluminum

### Power requirements

- **Protection**: Power inputs are protected against surge, over-voltage, over-current, and reverse power. IEC 61000-4 Class 4 level.

### Power In Terminal:

- **Voltage Input**: 10 to 18 VDC
- **Input Current Limit at 12 VDC**:
  - 4.35 A at -40 °C
  - 3 A at 20 °C
  - 1.56 A at 85 °C
- **30 VDC sustained voltage limit without damage.**

### USB Power:

- Functions that will be active with USB 5 VDC include sending programs, adjusting data logger settings, and making some measurements. If USB is the only power source, then the CS I/O port and the 5V, 12V, and SW12 terminals will not be operational.

### Internal Lithium Battery:

- AA, 2.4 Ah, 3.6 VDC (Tadiran TL 5903/S) for battery-backed SRAM and clock. 3-year life with no external power source.

### Average Current Drain:

- Assumes 12 VDC on POWER IN terminals.
  - **Idle**: <1 mA
  - **Active 1 Hz Scan**: 1 mA
  - **Active 20 Hz Scan**: 55 mA
  - **Serial (RS-232/RS-485)**: Active + 25 mA
  - **Ethernet Power Requirements**:
    - Ethernet 1 Minute: Active + 1 mA
    - Ethernet Idle: Active + 4 mA
    - Ethernet Link: Active + 47 mA

### System specifications

- **Processor**: Renesas RX63N (32-bit with hardware FPU, running at 100 MHz)

### Memory:

- Total onboard: 128 MB of flash + 4 MB battery-backed SRAM
  - Data storage: 4 MB SRAM + 72 MB flash (extended data storage automatically used for auto-allocated Data Tables not being written to a card)
  - CPU drive: 30 MB flash
  - OS load: 8 MB flash
  - Settings: 1 MB flash
  - Reserved (not accessible): 10 MB flash
- Data storage expansion: Removable microSD flash memory, up to 16 GB

### Program Execution Period:

- 1 ms to 1 day

### Real-Time Clock:

- Battery backed while external power is disconnected
- **Resolution**: 1 ms

---

Campbell Scientific, Inc.  
June 16, 2020

Vehicle Power Connection: When primary power is pulled from the vehicle power system, a second power supply OR charge regulator may be required to overcome the voltage drop at vehicle start-up.

Power output specifications

System power out limits (when powered with 12 VDC)

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Current Limit1 (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>−40°</td>
<td>4.53</td>
</tr>
<tr>
<td>20°</td>
<td>3.00</td>
</tr>
<tr>
<td>70°</td>
<td>1.83</td>
</tr>
<tr>
<td>85°</td>
<td>1.56</td>
</tr>
</tbody>
</table>

1 Limited by self-resetting thermal fuse

12 V and SW12 V power output terminals

12V, SW12-1, and SW12-2: Provide unregulated 12 VDC power with voltage equal to the Power Input supply voltage. These are disabled when operating on USB power only.

<table>
<thead>
<tr>
<th>SW12 current limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>−40°</td>
</tr>
<tr>
<td>0°</td>
</tr>
<tr>
<td>20°</td>
</tr>
<tr>
<td>50°</td>
</tr>
<tr>
<td>70°</td>
</tr>
<tr>
<td>80°</td>
</tr>
</tbody>
</table>

1 Thermal fuse hold current.

5 V and 3.3 V

5V: One regulated 5 V output. Supply is shared between the 5V terminal and CS I/O DB9 5 V output.

- Voltage Output: Regulated 5 V output (±5%)
- Current Limit: 230 mA

C as power output

- C Terminals:
  - Output Resistance ($R_o$): 150 Ω
  - 5 V Logic Level Drive Capacity: 10 mA @ 3.5 VDC
  - 3.3 V Logic Level Drive Capacity: 10 mA @ 1.8 VDC

CS I/O pin 1

- 5 V Logic Level Max Current: 200 mA

Voltage excitation

VX: Four independently configurable voltage terminals (VX1-VX4). When providing voltage excitation, a single 16-bit DAC shared by all VX outputs produces a user-specified voltage during measurement only. VX terminals can also be used to supply a selectable, switched, regulated 3.3 or 5 VDC power source to power digital sensors and toggle control lines.

<table>
<thead>
<tr>
<th>Maximum Source/Sink Current1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Excitation: ±4 V</td>
</tr>
<tr>
<td>Resolution: 0.06 mV</td>
</tr>
<tr>
<td>Accuracy: ±0.1% of setting + 2 mV</td>
</tr>
<tr>
<td>±40 mA</td>
</tr>
</tbody>
</table>

Switched, Regulated: +3.3 or 5 V

<table>
<thead>
<tr>
<th>Maximum Source/Sink Current1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Excitation: +3.3 or 5 V</td>
</tr>
<tr>
<td>Resolution: 3.3 or 5 V</td>
</tr>
<tr>
<td>±5%</td>
</tr>
<tr>
<td>±50 mA</td>
</tr>
</tbody>
</table>

1 Exceeding current limits causes voltage output to become unstable. Voltage should stabilize when current is reduced to within stated limits.

Analog measurement specifications

16 single-ended (SE) or 8 differential (DIFF) terminals individually configurable for voltage, thermocouple, current loop, ratiometric, and period average measurements, using a 24-bit ADC. One channel at a time is measured.

Voltage measurements

Terminals:

- Differential Configuration: DIFF 1H/1L – 8H/8L
- Single-Ended Configuration: SE1 – SE16

Input Resistance: 20 GΩ typical

Input Voltage Limits: ±5 V

Sustained Input Voltage without Damage: ±20 VDC

DC Common Mode Rejection:

- > 120 dB with input reversal
- ≥ 86 dB without input reversal

Normal Mode Rejection: > 70 dB @ 60 Hz

Input Current @ 25 °C: ±1 nA typical

Filter First Notch Frequency ($f_N$) Range: 0.5 Hz to 31.25 kHz (user specified)
## Analog Range and Resolution:

<table>
<thead>
<tr>
<th>Notch Frequency ((f_{N1})) (Hz)</th>
<th>Range (^1) ((mV))</th>
<th>RMS ((\mu V))</th>
<th>Bits(^2)</th>
<th>RMS ((\mu V))</th>
<th>Bits(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15000</td>
<td>±5000</td>
<td>8.2</td>
<td>20</td>
<td>11.8</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>±1000</td>
<td>1.9</td>
<td>20</td>
<td>2.6</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>±200</td>
<td>0.75</td>
<td>19</td>
<td>1.0</td>
<td>18</td>
</tr>
<tr>
<td>50/60(^3)</td>
<td>±5000</td>
<td>0.6</td>
<td>24</td>
<td>0.88</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>±1000</td>
<td>0.14</td>
<td>23</td>
<td>0.2</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>±200</td>
<td>0.05</td>
<td>22</td>
<td>0.08</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>±5000</td>
<td>0.18</td>
<td>25</td>
<td>0.28</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>±1000</td>
<td>0.04</td>
<td>25</td>
<td>0.07</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>±200</td>
<td>0.02</td>
<td>24</td>
<td>0.03</td>
<td>23</td>
</tr>
</tbody>
</table>

\(^1\) Range overhead of −5% on all ranges guarantees that full-scale values will not cause over range

\(^2\) Typical effective resolution (ER) in bits; computed from ratio of full-scale range to RMS resolution.

\(^3\) 50/60 corresponds to rejection of 50 and 60 Hz ac power mains noise.

### Accuracy (does not include sensor or measurement noise):

- 0 to 40 °C: ±(0.04% of measurement + offset)
- −40 to 70 °C: ±(0.06% of measurement + offset)

### Voltage Measurement Accuracy Offsets:

<table>
<thead>
<tr>
<th>Range ((mV))</th>
<th>Differential with Input Reversal</th>
<th>Single-Ended or Differential without Input Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>±5000</td>
<td>±0.5</td>
<td>±2</td>
</tr>
<tr>
<td>±1000</td>
<td>±0.25</td>
<td>±1</td>
</tr>
<tr>
<td>±200</td>
<td>±0.15</td>
<td>±0.5</td>
</tr>
</tbody>
</table>

### Measurement Setting Time:

20 µs to 600 ms; 500 µs default

### Multiplexed Measurement Time:

Measurement time = INT(multiplexed measurement time • (reps+1)) + 2ms

## Resistance measurement specifications

The data logger makes ratiometric-resistance measurements for four- and six-wire full-bridge circuits and two-, three-, and four-wire half-bridge circuits using voltage excitation. Excitation polarity reversal is available to minimize dc error.

### Accuracy:

Assumes input reversal for differential measurements

- RevDi ff and excitation reversal RevEx for excitation voltage <1000 mV. Does not include bridge resistor errors or sensor and measurement noise.
- 0 to 40 °C: ±(0.01% of voltage measurement + offset)
- −40 to 70 °C: ±(0.015% of voltage measurement + offset)
- −55 to 85 °C (XT): ±(0.02% of voltage measurement + offset)

### Period-averaging measurement specifications

#### Terminals:

SE1-SE16

### Accuracy:

±(0.01% of measurement + resolution), where resolution is 0.13 µs divided by the number of cycles to be measured

### Ranges:

- Minimum signal centered around specified period average threshold.
- Maximum signal centered around data logger ground.
- Maximum frequency = 1/(2 * (minimum pulse width)) for 50% duty cycle signals

## Experimental Observations

<table>
<thead>
<tr>
<th>Example fN1 (^1) (Hz)</th>
<th>Time (^2) (ms)</th>
<th>Time (^2) (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15000</td>
<td>2.04</td>
<td>1.02</td>
</tr>
<tr>
<td>50</td>
<td>41.9</td>
<td>20.95</td>
</tr>
<tr>
<td>5</td>
<td>401.9</td>
<td>200.95</td>
</tr>
</tbody>
</table>

\(^1\) Notch frequency (1/integration time).

\(^2\) Default settling time of 500 µs used.
Current-loop measurement specifications

The data logger makes current-loop measurements by measuring across a current-sense resistor associated with the RS-485 resistive ground terminal.

**Terminals**: RG1 and RG2

**Maximum Input Voltage**: ±16 V

**Resistance to Ground**: 101 Ω

**Current Measurement Shunt Resistance**: 10 Ω

**Maximum Current Measurement Range**: ±80 mA

**Absolute Maximum Current**: ±160 mA

**Resolution**: ± 20 nA

**Accuracy**: ±(0.1% of reading + 100 nA) @ -40 to 70 °C

Pulse measurement specifications

Two inputs (P1-P2) individually configurable for switch closure, high-frequency pulse, or low-level AC measurements. See also Digital input/output specifications (p. 4). Each terminal has its own independent 32-bit counter.

**NOTE:**
Conflicts can occur when a control port pair is used for different instructions (TimerInput(), PulseCount(), SDI12Recorder(), WaitDigTrig()). For example, if C1 is used for SDI12Recorder(), C2 cannot be used for TimerInput(), PulseCount(), or WaitDigTrig().

**Maximum Input Voltage**: ±20 VDC

**Maximum Counts Per Channel**: 2^32

**Maximum Counts Per Scan**: 2^32

**Input Resistance**: 5 kΩ

**Accuracy**: ±(0.02% of reading + 1/scan)

Switch closure input

**Terminals**: C1-C8

**Pull-Up Resistance**: 100 kΩ to 5 V

**Event**: Low (<0.8 V) to High (>2.5 V)

**Maximum Input Frequency**: 150 Hz

**Minimum Switch Closed Time**: 5 ms

**Minimum Switch Open Time**: 6 ms

**Maximum Bounce Time**: 1 ms open without being counted

High-frequency input

**Terminals**: C1-C8

**Pull-Up Resistance**: 100 kΩ to 5 V

**Event**: Low (<0.8 V) to High (>2.5 V)

**Maximum Input Frequency**: 250 kHz

**Low-level AC input**

**Minimum Pull-Down Resistance**: 10 kΩ to ground

DC-offset rejection: Internal AC coupling eliminates DC-offset voltages up to ±0.05 VDC

**Input Hysteresis**: 12 mV at 1 Hz

**Low-Level AC Pulse Input Ranges**:

<table>
<thead>
<tr>
<th>Sine wave (mV RMS)</th>
<th>Range (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1.0 to 20</td>
</tr>
<tr>
<td>200</td>
<td>0.5 to 200</td>
</tr>
<tr>
<td>2000</td>
<td>0.3 to 10,000</td>
</tr>
<tr>
<td>5000</td>
<td>0.3 to 20,000</td>
</tr>
</tbody>
</table>

Digital input/output specifications

Terminals configurable for digital input and output (I/O) including status high/low, pulse width modulation, external interrupt, edge timing, switch closure pulse counting, high-frequency pulse counting, UART1, RS-232, RS-422, RS-485, SDM5, SDI-126, I2C7, and SPI8 function. Terminals are configurable in pairs for 5 V or 3.3 V logic for some functions.

**NOTE:**
Conflicts can occur when a control port pair is used for different instructions (TimerInput(), PulseCount(), SDI12Recorder(), WaitDigTrig()). For example, if C1 is used for SDI12Recorder(), C2 cannot be used for TimerInput(), PulseCount(), or WaitDigTrig().

**Terminals**: C1-C8

**Maximum Input Voltage**: ±20 V

**Logic Levels and Drive Current**:

<table>
<thead>
<tr>
<th>Terminal Pair Configuration</th>
<th>5 V Source</th>
<th>3.3 V Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic low</td>
<td>≤ 1.5 V</td>
<td>≤ 0.8 V</td>
</tr>
<tr>
<td>Logic high</td>
<td>≥ 3.5 V</td>
<td>≥ 2.5 V</td>
</tr>
</tbody>
</table>

**Edge timing**

**Terminals**: C1-C8

---

1Universal Asynchronous Receiver/Transmitter for asynchronous serial communications.

2Recommended Standard 232. A loose standard defining how two computing devices can communicate with each other. The implementation of RS-232 in Campbell Scientific data loggers to computer communications is quite rigid, but transparent to most users. Features in the data logger that implement RS-232 communication with smart sensors are flexible.

3Communications protocol similar to RS-485. Most RS-422 sensors will work with RS-485 protocol.

4Recommended Standard 485. A standard defining how two computing devices can communicate with each other.

5Synchronous Device for Measurement. A processor-based peripheral device or sensor that communicates with the data logger via hardware over a short distance using a protocol proprietary to Campbell Scientific.

6Serial Data Interface at 1200 baud. Communication protocol for transferring data between the data logger and SDI-12 compatible smart sensors.

7Inter-Integrated Circuit is a multi-master, multi-slave, packet switched, single-ended, serial computer bus.

8Serial Peripheral Interface - a clocked synchronous interface, used for short distance communications, generally between embedded devices.
Maximum Input Frequency: ≤ 1 kHz
Resolution: 500 ns

Edge counting
Terminals: C1-C8
Maximum Input Frequency: ≤ 2.3 kHz

Quadrature input
Terminals: C1-C8 can be configured as digital pairs to monitor the two sensing channels of an encoder.

Maximum Frequency: 2.5 kHz
Resolution: 31.25 µs or 32 kHz

Pulse-width modulation
Maximum Period: 36.4 seconds
Resolution:
- 0 – 5 ms: 83.33 ns
- 5 – 325 ms: 5.33 µs
- > 325 ms: 31.25 µs

Communications specifications
Ethernet Port: RJ45 jack, 10/100Base Mbps, full and half duplex, Auto-MDIX, magnetic isolation, and TVS surge protection.

Internet Protocols: Ethernet, PPP, RNDIS, ICMP/Ping, Auto-IP (APIPA), IPv4, IPv6, UDP, TCP, TLS (v1.2), DNS, DHCP, SLAAC, Telnet, HTTP(S), FTP(S), POP3/TLS, NTP, SMTP/TLS, SNMPv3, CS I/O IP

Additional Protocols: CPI, PakBus, PakBus Encryption, SDM, SDI-12, Modbus RTU / ASCII / TCP, DNP3, custom user definable over serial, UDP, NTCIP, NMEA 0183, I2C, SPI

USB Device: Micro-B device for computer connectivity

CS I/O: 9-pin D-sub connector to interface with Campbell Scientific CS I/O peripherals.

SDI-12 (C1, C3, C5, C7): Four independent SDI-12 compliant terminals are individually configured and meet SDI-12 Standard v 1.4.

RS-485 (C5 to C8): One full duplex or two half duplex
RS-422 (C5 to C8): One full duplex or two half duplex

RS-232/CPI: Single RJ45 module port that can operate in one of two modes: CPI or RS-232. CPI interfaces with Campbell Scientific CDM measurement peripherals and sensors. RS-232 connects, with an adapter cable, to computer, sensor, or communications devices serially.

CPI: One CPI bus. Up to 1 Mbps data rate. Synchronization of devices to 5 µS. Total cable length up to 610 m (2000 ft). Up to 20 devices. CPI is a proprietary interface for communications between Campbell Scientific data loggers and Campbell Scientific CDM peripheral devices. It consists of a physical layer definition and a data protocol.

Hardwired: Multi-drop, short haul, RS-232, fiber optic
Satellite: GOES, Argos, Inmarsat Hughes, Iridium

Standards compliance specifications
View EU Declarations of Conformity at www.campbellsci.com/cr1000x.

Shock and Vibration: MIL-STD 810G methods 516.6 and 514.6
Protection:
- Wiring panel: IP40
- Measurement module when connected to the wiring panel: IP65

EMI and ESD protection:
- Immunity: Meets or exceeds following standards:
  - **ESD**: per IEC 61000-4-2; ±15 kV air, ±8 kV contact discharge
  - **Radiated RF**: per IEC 61000-4-3; 10 V/m, 80-1000 MHz
  - **EFT**: per IEC 61000-4-4; 4 kV power, 4 kV I/O
  - **Surge**: per IEC 61000-4-5; 4 kV power, 4kV I/O
  - **Conducted RF**: per IEC 61000-4-6; 10 V power, 10 V I/O
- Emissions and immunity performance criteria available on request.

Warranty
Standard: Three years against defects in materials and workmanship.

Extended (optional): An additional four years. against defects in materials and workmanship, bringing the total to 7 years.
## Terminal functions

### Analog input terminal functions

<table>
<thead>
<tr>
<th>SE DIFF</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7-8</th>
<th>9-10</th>
<th>11-12</th>
<th>13-14</th>
<th>15-16</th>
<th>RG1</th>
<th>RG2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Single-Ended Voltage</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Differential Voltage</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Ratiometric/Bridge</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Current Loop</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Period Average</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Pulse counting terminal functions

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>C1-C8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch-Closure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>High Frequency</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Low-level Ac</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

### Analog output terminal functions

<table>
<thead>
<tr>
<th>VX1-VX4</th>
<th>C1-C8¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Switched Voltage Excitation</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Voltage Output

<table>
<thead>
<tr>
<th>C1-C8¹</th>
<th>VX1-VX4</th>
<th>5V</th>
<th>12V</th>
<th>SW12-1</th>
<th>SW12-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 VDC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.3 VDC</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>12 VDC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

¹ C terminals have limited drive capacity. Voltage levels are configured in pairs.

### Communications terminal functions

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>RS-232/CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDI-12</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS</td>
<td></td>
<td>PPS</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Rx</td>
<td></td>
</tr>
<tr>
<td>TTL 0-5 V</td>
<td>Tx</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Rx</td>
<td>Rx</td>
<td></td>
</tr>
<tr>
<td>LVTTL 0-3.3 V</td>
<td>Tx</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Tx</td>
<td>Rx</td>
<td>Rx</td>
<td>Rx</td>
<td></td>
</tr>
<tr>
<td>RS-232</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>RS-485 (Half Duplex)</td>
<td>A-</td>
<td>B+</td>
<td>A-</td>
<td>B+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Communications terminal functions

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>RS-232/CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-485 (Full Duplex)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2C</td>
<td></td>
<td></td>
<td>SDA</td>
<td></td>
<td>SDA</td>
<td>SDA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MOSI</td>
<td>MISO</td>
<td>SCLK</td>
</tr>
<tr>
<td>SDM(^1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

\(^1\) SDM can be on either C1-C3 or C5-C7, but not both at the same time.

Communications functions also include Ethernet and USB.

Digital I/O terminal functions

<table>
<thead>
<tr>
<th></th>
<th>C1-C8</th>
</tr>
</thead>
<tbody>
<tr>
<td>General I/O</td>
<td>✓</td>
</tr>
<tr>
<td>Pulse-Width Modulation Output</td>
<td>✓</td>
</tr>
<tr>
<td>Timer Input</td>
<td>✓</td>
</tr>
<tr>
<td>Interrupt</td>
<td>✓</td>
</tr>
<tr>
<td>Quadrature</td>
<td>✓</td>
</tr>
</tbody>
</table>
Campbell Scientific regional offices

**Australia**
- **Location:** Garbutt, QLD Australia
- **Phone:** 61.7.4401.7700
- **Email:** info@campbellsci.com.au
- **Website:** www.campbellsci.com.au

**Brazil**
- **Location:** São Paulo, SP Brazil
- **Phone:** 11.3732.3399
- **Email:** vendas@campbellsci.com.br
- **Website:** www.campbellsci.com.br

**Canada**
- **Location:** Edmonton, AB Canada
- **Phone:** 780.454.2505
- **Email:** dataloggers@campbellsci.ca
- **Website:** www.campbellsci.ca

**China**
- **Location:** Beijing, P. R. China
- **Phone:** 86.10.6561.0080
- **Email:** info@campbellsci.com.cn
- **Website:** www.campbellsci.com.cn

**Costa Rica**
- **Location:** San Pedro, Costa Rica
- **Phone:** 506.2280.1564
- **Email:** info@campbellsci.cc
- **Website:** www.campbellsci.cc

**France**
- **Location:** Vincennes, France
- **Phone:** 0033.0.1.56.45.15.20
- **Email:** info@campbellsci.fr
- **Website:** www.campbellsci.fr

**Germany**
- **Location:** Bremen, Germany
- **Phone:** 49.0.421.460974.0
- **Email:** info@campbellsci.de
- **Website:** www.campbellsci.de

**India**
- **Location:** New Delhi, DL India
- **Phone:** 91.11.46500481.482
- **Email:** info@campbellsci.in
- **Website:** www.campbellsci.in

**South Africa**
- **Location:** Stellenbosch, South Africa
- **Phone:** 27.21.8809960
- **Email:** sales@campbellsci.co.za
- **Website:** www.campbellsci.co.za

**Spain**
- **Location:** Barcelona, Spain
- **Phone:** 34.93.2323938
- **Email:** info@campbellsci.es
- **Website:** www.campbellsci.es

**Thailand**
- **Location:** Bangkok, Thailand
- **Phone:** 66.2.719.3399
- **Email:** info@campbellsci.asia
- **Website:** www.campbellsci.asia

**UK**
- **Location:** Shepshed, Loughborough, UK
- **Phone:** 44.0.1509.601141
- **Email:** sales@campbellsci.co.uk
- **Website:** www.campbellsci.co.uk

**USA**
- **Location:** Logan, UT USA
- **Phone:** 435.227.9120
- **Email:** info@campbellsci.com
- **Website:** www.campbellsci.com