

# CR1000X Specifications



Datalogger

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.

|                                     |   |
|-------------------------------------|---|
| System specifications               | 1 |
| Physical specifications             | 1 |
| Power requirements                  | 1 |
| Power output specifications         | 2 |
| Analog measurement specifications   | 2 |
| Pulse measurement specifications    | 4 |
| Digital input/output specifications | 4 |
| Communications specifications       | 5 |
| Standards compliance specifications | 5 |
| Warranty                            | 5 |
| Terminal functions                  | 6 |

## 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

- **Accuracy:**  $\pm 3$  min. per year, optional GPS correction to  $\pm 10 \mu\text{s}$

**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



**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)

| Temperature (°C) | Current Limit <sup>1</sup> (A) |
|------------------|--------------------------------|
| -40°             | 4.53                           |
| 20°              | 3.00                           |
| 70°              | 1.83                           |
| 85°              | 1.56                           |

<sup>1</sup> 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.

| SW12 current limits |                                 |
|---------------------|---------------------------------|
| Temperature (°C)    | Current Limit <sup>1</sup> (mA) |
| -40°                | 1310                            |
| 0°                  | 1004                            |
| 20°                 | 900                             |
| 50°                 | 690                             |
| 70°                 | 550                             |
| 80°                 | 470                             |

<sup>1</sup> 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 ( $\pm 5\%$ )
- **Current Limit:** 230 mA

### C as power output

- C Terminals:
  - **Output Resistance ( $R_o$ ):** 150  $\Omega$
  - **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.

|                     | Range       | Resolution | Accuracy                       | Maximum Source/Sink Current <sup>1</sup> |
|---------------------|-------------|------------|--------------------------------|--|
| Voltage Excitation  | $\pm 4$ V   | 0.06 mV    | $\pm(0.1\%$ of setting + 2 mV) | $\pm 40$ mA                              |
| Switched, Regulated | +3.3 or 5 V | 3.3 or 5 V | $\pm 5\%$                      | 50 mA                                    |

<sup>1</sup> 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 G $\Omega$  typical

**Input Voltage Limits:**  $\pm 5$  V

**Sustained Input Voltage without Damage:**  $\pm 20$  VDC

**DC Common Mode Rejection:**

- > 120 dB with input reversal
- $\geq 86$  dB without input reversal

**Normal Mode Rejection:** > 70 dB @ 60 Hz

**Input Current @ 25 °C:**  $\pm 1$  nA typical

**Filter First Notch Frequency ( $f_{N1}$ ) Range:** 0.5 Hz to 31.25 kHz (user specified)

## Analog Range and Resolution:

|                                   |                         | Differential with Input Reversal |                   | Single-Ended and Differential without Input Reversal |                   |
|-----------------------------------|-------------------------|----------------------------------|-------------------|--|-------------------|
| Notch Frequency ( $f_{N1}$ ) (Hz) | Range <sup>1</sup> (mV) | RMS ( $\mu$ V)                   | Bits <sup>2</sup> | RMS ( $\mu$ V)                                       | Bits <sup>2</sup> |
| 15000                             | $\pm 5000$              | 8.2                              | 20                | 11.8   | 19                |
|                                   | $\pm 1000$              | 1.9                              | 20                | 2.6  | 19                |
|                                   | $\pm 200$               | 0.75                             | 19                | 1.0  | 18                |
| 50/60 <sup>3</sup>                | $\pm 5000$              | 0.6                              | 24                | 0.88   | 23                |
|                                   | $\pm 1000$              | 0.14                             | 23                | 0.2  | 23                |
|                                   | $\pm 200$               | 0.05                             | 22                | 0.08   | 22                |
| 5                                 | $\pm 5000$              | 0.18                             | 25                | 0.28   | 25                |
|                                   | $\pm 1000$              | 0.04                             | 25                | 0.07   | 24                |
|                                   | $\pm 200$               | 0.02                             | 24                | 0.03   | 23                |

<sup>1</sup> Range overhead of ~5% on all ranges guarantees that full-scale values will not cause over range

<sup>2</sup> Typical effective resolution (ER) in bits; computed from ratio of full-scale range to RMS resolution.

<sup>3</sup> 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:  $\pm(0.04\%$  of measurement + offset)
- -40 to 70 °C:  $\pm(0.06\%$  of measurement + offset)

**Voltage Measurement Accuracy Offsets:**

| Range (mV) | Typical Offset ( $\mu$ V RMS)    |   |
|------------|----------------------------------|---|
|            | Differential with Input Reversal | Single-Ended or Differential without Input Reversal |
| $\pm 5000$ | $\pm 0.5$                        | $\pm 2$   |
| $\pm 1000$ | $\pm 0.25$                       | $\pm 1$   |
| $\pm 200$  | $\pm 0.15$                       | $\pm 0.5$   |

**Measurement Settling Time:** 20  $\mu$ s to 600 ms; 500  $\mu$ s default

**Multiplexed Measurement Time:**

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

|                                    |                        | Differential with Input Reversal | Single-Ended or Differential without Input Reversal |
|------------------------------------|------------------------|----------------------------------|---|
| Example $f_{N1}$ <sup>1</sup> (Hz) | Time <sup>2</sup> (ms) | Time <sup>2</sup> (ms)           | Time <sup>2</sup> (ms)                              |
| 15000                              | 2.04                   | 1.02                             |   |
| 60                                 | 35.24                  | 17.62                            |   |

|                                    | Differential with Input Reversal | Single-Ended or Differential without Input Reversal |
|------------------------------------|----------------------------------|---|
| Example $f_{N1}$ <sup>1</sup> (Hz) | Time <sup>2</sup> (ms)           | Time <sup>2</sup> (ms)                              |
| 50                                 | 41.9                             | 20.95   |
| 5                                  | 401.9                            | 200.95  |

<sup>1</sup> Notch frequency (1/integration time).

<sup>2</sup> Default settling time of 500  $\mu$ s used.

## 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 **RevDiff** and excitation reversal **RevEx** for excitation voltage <1000 mV. Does not include bridge resistor errors or sensor and measurement noise.

- 0 to 40 °C:  $\pm(0.01\%$  of voltage measurement + offset)
- -40 to 70 °C:  $\pm(0.015\%$  of voltage measurement + offset)
- -55 to 85 °C (XT):  $\pm(0.02\%$  of voltage measurement + offset)

## Period-averaging measurement specifications

**Terminals:** SE1-SE16

**Accuracy:**  $\pm(0.01\%$  of measurement + resolution), where resolution is 0.13  $\mu$ s 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 =  $1/(2 * (\text{minimum pulse width}))$  for 50% duty cycle signals

| Gain Code Option | Voltage Gain | Minimum Peak to Peak Signal (mV) | Maximum Peak to Peak Signal (V) | Minimum Pulse Width ( $\mu$ s) | Maximum Frequency (kHz) |
|------------------|--------------|----------------------------------|---------------------------------|--------------------------------|-------------------------|
| 0                | 1            | 500                              | 10                              | 2.5                            | 200                     |
| 1                | 2.5          | 50                               | 2                               | 10                             | 50                      |
| 2                | 12.5         | 10                               | 2                               | 62                             | 8                       |
| 3                | 64           | 2                                | 2                               | 100                            | 5                       |

## 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<sup>32</sup>

**Maximum Counts Per Scan:** 2<sup>32</sup>

**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:**

| 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 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, UART<sup>1</sup>, RS-232<sup>2</sup>, RS-422<sup>3</sup>, RS-485<sup>4</sup>, SDM<sup>5</sup>, SDI-12<sup>6</sup>, I2C<sup>7</sup>, and SPI<sup>8</sup> 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:**

| Terminal Pair Configuration | 5 V Source | 3.3 V Source |
|-----------------------------|------------|--------------|
| Logic low                   | ≤ 1.5 V    | ≤ 0.8 V      |
| Logic high                  | ≥ 3.5 V    | ≥ 2.5 V      |

## Edge timing

**Terminals:** C1-C8

<sup>1</sup>Universal Asynchronous Receiver/Transmitter for asynchronous serial communications.

<sup>2</sup>Recommended 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.

<sup>3</sup>Communications protocol similar to RS-485. Most RS-422 sensors will work with RS-485 protocol.

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

<sup>5</sup>Synchronous 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.

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

<sup>7</sup>Inter-Integrated Circuit is a multi-controller, multi-peripheral, packet switched, single-ended, serial computer bus.

<sup>8</sup>Serial Peripheral Interface - a clocked synchronous interface, used for short distance communications, generally between embedded devices.

**Maximum Input Frequency:**  $\leq 1$  kHz

**Resolution:** 500 ns

## Edge counting

**Terminals:** C1-C8

**Maximum Input Frequency:**  $\leq 2.3$  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  $\mu$ s or 32 kHz

## Pulse-width modulation

**Maximum Period:** 36.4 seconds

**Resolution:**

- **0 – 5 ms:** 83.33 ns
- **5 – 325 ms:** 5.33  $\mu$ s
- **> 325 ms:** 31.25  $\mu$ s

## 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), SFTP, FTP(S), POP3/TLS, NTP, SMTP/TLS, SNMPv3, CS I/O IP, MQTT<sup>1</sup>

**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  $\mu$ s. 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](http://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;  $\pm 15$  kV air,  $\pm 8$  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, bringing the total to seven years.

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<sup>1</sup>Message Queuing Telemetry Transport - a messaging protocol for the Internet of Things (IoT)

## Terminal functions

| Analog input terminal functions |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   |     |     |
|---------------------------------|---------------------|---|---------------------|---|---------------------|---|---------------------|---|---------------------|---|---------------------|---|---------------------|---|---------------------|---|-----|-----|
| SE<br>DIFF                      | 1 2                 |   | 3 4                 |   | 5 6                 |   | 7 8                 |   | 9 10                |   | 11 12               |   | 13 14               |   | 15 16               |   | RG1 | RG2 |
|                                 | $\uparrow^1$<br>H L |   | $\uparrow^2$<br>H L |   | $\uparrow^3$<br>H L |   | $\uparrow^4$<br>H L |   | $\uparrow^5$<br>H L |   | $\uparrow^6$<br>H L |   | $\uparrow^7$<br>H L |   | $\uparrow^8$<br>H L |   |     |     |
| Single-Ended Voltage            | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ |     |     |
| Differential Voltage            | H                   | L | H                   | L | H                   | L | H                   | L | H                   | L | H                   | L | H                   | L | H                   | L |     |     |
| Ratiometric/Bridge              | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ |     |     |
| Thermocouple                    | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ |     |     |
| Current Loop                    |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   |                     |   | ✓   | ✓   |
| Period Average                  | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ | ✓                   | ✓ |     |     |

| Pulse counting terminal functions |    |    |       |
|-----------------------------------|----|----|-------|
|                                   | P1 | P2 | C1-C8 |
| Switch-Closure                    | ✓  | ✓  | ✓     |
| High Frequency                    | ✓  | ✓  | ✓     |
| Low-level Ac                      | ✓  | ✓  |       |

| Analog output terminal functions |         |
|----------------------------------|---------|
|                                  | VX1-VX4 |
| Switched Voltage Excitation      | ✓       |

| Voltage Output |                    |         |    |     |        |        |
|----------------|--------------------|---------|----|-----|--------|--------|
|                | C1-C8 <sup>1</sup> | VX1-VX4 | 5V | 12V | SW12-1 | SW12-2 |
| 5 VDC          | ✓                  | ✓       | ✓  |     |        |        |
| 3.3 VDC        | ✓                  | ✓       |    |     |        |        |
| 12 VDC         |                    |         |    | ✓   | ✓      | ✓      |

<sup>1</sup> C terminals have limited drive capacity. Voltage levels are configured in pairs.

| Communications terminal functions |     |    |    |    |    |    |    |    |            |
|-----------------------------------|-----|----|----|----|----|----|----|----|------------|
|                                   | C1  | C2 | C3 | C4 | C5 | C6 | C7 | C8 | RS-232/CPI |
| SDI-12                            | ✓   |    | ✓  |    | ✓  |    | ✓  |    |            |
| GPS                               | PPS | Rx | Tx | Rx | Tx | Rx | Tx | Rx |            |
| TTL 0-5 V                         | Tx  | Rx | Tx | Rx | Tx | Rx | Tx | Rx |            |
| LVTTTL 0-3.3 V                    | Tx  | Rx | Tx | Rx | Tx | Rx | Tx | Rx |            |
| RS-232                            |     |    |    |    | Tx | Rx | Tx | Rx | ✓          |
| RS-485 (Half Duplex)              |     |    |    |    | A- | B+ | A- | B+ |            |

| Communications terminal functions   |      |      |       |     |      |      |       |     |            |
|---|------|------|-------|-----|------|------|-------|-----|------------|
|   | C1   | C2   | C3    | C4  | C5   | C6   | C7    | C8  | RS-232/CPI |
| RS-485 (Full Duplex)  |      |      |       |     | Tx-  | Tx+  | Rx-   | Rx+ |            |
| I2C   | SDA  | SCL  | SDA   | SCL | SDA  | SCL  | SDA   | SCL |            |
| SPI   | MOSI | SCLK | MISO  |     | MOSI | SCLK | MISO  |     |            |
| SDM <sup>1</sup>  | Data | Clk  | Enabl |     | Data | Clk  | Enabl |     |            |
| CPI/CDM   |      |      |       |     |      |      |       |     | ✓          |
| <sup>1</sup> SDM can be on either C1-C3 or C5-C7, but not both at the same time.<br>Communications functions also include Ethernet and USB. |      |      |       |     |      |      |       |     |            |

| Digital I/O terminal functions |       |
|--------------------------------|-------|
|                                | C1-C8 |
| General I/O                    | ✓     |
| Pulse-Width Modulation Output  | ✓     |
| Timer Input                    | ✓     |
| Interrupt                      | ✓     |
| Quadrature                     | ✓     |



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