



## CR6 Series

Measurement and Control Datalogger



# One Datalogger, Countless Applications

Featuring advanced  
vibrating-wire technology

## Overview

The CR6-series measurement and control datalogger is a powerful core component for your data-acquisition system. We combined the best features of all our dataloggers and added faster communications, low power requirements, built in USB, compact size, and improved analog input accuracy and resolution. The CR6 series also

introduces our new universal (U) terminal—an ingenious way for allowing virtually any sensor (analog, digital, or smart) to be connected to any U terminal. This is also our first multipurpose datalogger capable of doing static vibrating-wire measurements.

## Benefits and Features

- › Powerfully versatile, multi-tool of data acquisition
- › U terminals configurable to what you want them to be: analog or digital, input, or output
- › Static vibrating wire measurements using our patented spectral analysis
- › Surge ESD and over-voltage protection on all terminals
- › Flexible power input from solar panel, dc power supply, 12 V battery, USB
- › Onboard communication options include Ethernet, Wi-Fi, and spread spectrum radios
- › CR6-WIFI ideal for short-range, wireless IP communication
- › CR6-RF407/412/422 ideal for low power medium range license-free radio communication
- › CR6-RF451 ideal for long-range, license-free radio communication
- › Wiring made easy through removable terminal block
- › MicroSD card drive for extended memory requirements
- › Serial sensors support with RS-232 and RS-485 native
- › CPI for hosting Campbell high speed sensors and distributed modules (CDM)
- › Programmable with CRBasic or SCWin program generator, completely PakBus compatible
- › Shared operating system (OS) with the popular CRBasic CR1000, CR800, and CR3000 dataloggers

## General Specifications

- › **CPU:** 32 bit with hardware FPU, running at 100 MHz
- › **Internal Memory:** 4 MB SRAM for data storage, 6 MB flash for OS, 1 MB serial flash (CPU) for program files
- › **MicroSD Drive** for extended data storage up to 16 GB
- › **Clock Accuracy:**  $\pm 3$  min per year, optional GPS correction to 10  $\mu$ s
- › **USB micro B** for direct connection to PC (limited power source during configuration), 2.0 full speed, 12 Mbps
- › **10/100 Ethernet RJ45** for LAN connection
- › **CS I/O Port** for connection to Campbell Scientific modems and displays
- › **CPI Port** for terminal expansion using Campbell Distributed modules (CDM)
- › **Battery Terminal Pair** for regulated 12 V power input or rechargeable 12 V VRLA for UPS mode
- › **Charge Terminal Pair** for 16 to 32 V from dc power converter or 12 or 24 V solar panel
- › **Two Switched 12 V Terminals** for powering sensors or communication devices, 1100 mA @ 20°C
- › **Continuous 12 V Terminal**

More info: 435.227.9120

[www.campbellsci.com/cr6](http://www.campbellsci.com/cr6)



## General Specifications Continued

► **Compliance Information:** View the CR6-WIFI EU Declaration of Conformity at: [www.campbellsci.com/cr6](http://www.campbellsci.com/cr6)

► **Twelve Universal (U) Terminals:** U terminals are software configurable for analog or digital functions

◦ Analog functions consist of:

- ◆ Analog inputs: 12 single-ended or 6 differential with  $\pm 5000$  mV,  $\pm 1000$  mV,  $\pm 200$  mV ranges 24 bit ADC
  - ◆ Analog outputs:  $\pm 2.5$  V or  $\pm 2.5$  mA ranges for bridge measurements 12 bit DAC
  - ◆ Static frequency-analyzed vibrating wire: terminal pair both excites to 12 V p-p and 100 Hz to 6.5 kHz and reads vibrating-wire transducers using our patented spectral-analysis technology (VSPECT™)
  - ◆ Thermistor: completion resistor internal 5 k $\Omega$
  - ◆ Period average: up to 200 kHz, amplitude dependent
- Digital I/O functions consist of 5 V or 3.3 V logic levels for:
- ◆ General status/control
  - ◆ Voltage source: 5 V, 3.3 V, 20 mA @ 3.5 V
  - ◆ Low level ac: up to 20 kHz, amplitude dependent
  - ◆ Switch closure (150 Hz) or high frequency counter (1 MHz)
  - ◆ Pulse width modulation
  - ◆ Interrupts and timer input
  - ◆ SDI-12 and SDM
  - ◆ Serial asynchronous communication Tx/Rx pairs

► **Four Control (C) Terminals:** C terminals are software configurable for digital functions

◦ Digital I/O functions consist of 5 or 3.3 V logic levels for:

- ◆ RS-232/RS-485: half or full duplex
- ◆ General status/control
- ◆ Voltage source 5 V, 3.3 V: 10 mA @ 3.5 V
- ◆ Switch closure (150 Hz) or high frequency counter (1 MHz)
- ◆ Pulse width modulation
- ◆ Interrupts and timer input
- ◆ SDI-12 and SDM
- ◆ Serial asynchronous communication Tx/Rx pairs

► **Best Analog Accuracy:**  $\pm(0.04\%$  of reading + 2  $\mu$ V), 0° to 40°C

► **Best Effective Resolution:** 50 nV ( $\pm 200$  mV range, differential measurement, input reversal, 5 Hz  $f_{NI}$ )

► **Operating Temperature Range**

- Standard: -40° to +70°C
- Extended: -55° to +85°C (not available for communication options)

► **Weight**

- CR6: 0.42 kg (0.92 lb)
- CR6-WIFI: 0.50 kg (1.10 lb)
- CR6-RF451: 0.52 kg (1.15 lb)
- CR6-RF407/412/422: 0.51 kg (1.13 lb)

► **Dimensions:** 20.3 x 10.2 x 6.1 cm (8.0 x 4.0 x 2.4 in)

## Programmable Terminals

Twelve U terminals and four C terminals are programmable for the following functions.

| Analog Input Function       | C1   | C2   | C3     | C4   | U1   | U2   | U3     | U4  | U5   | U6   | U7     | U8  | U9   | U10  | U11    | U12 | Max |
|-----------------------------|------|------|--------|------|------|------|--------|-----|------|------|--------|-----|------|------|--------|-----|-----|
| Single Ended                |      |      |        |      | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 12  |
| Differential                |      |      |        |      | H    | L    | H      | L   | H    | L    | H      | L   | H    | L    | H      | L   | 6   |
| Period Average              |      |      |        |      | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 12  |
| Vibrating Wire              |      |      |        |      | ✓    |      | ✓      |     | ✓    |      | ✓      |     | ✓    |      | ✓      |     | 6   |
| Thermistor                  |      |      |        |      | ✓    |      | ✓      |     | ✓    |      | ✓      |     | ✓    |      | ✓      |     | 6   |
| Analog Output Function      | C1   | C2   | C3     | C4   | U1   | U2   | U3     | U4  | U5   | U6   | U7     | U8  | U9   | U10  | U11    | U12 | Max |
| Switched-Voltage Excitation |      |      |        |      | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 12  |
| Switched-Current Excitation |      |      |        |      | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 12  |
| Digital I/O Function        | C1   | C2   | C3     | C4   | U1   | U2   | U3     | U4  | U5   | U6   | U7     | U8  | U9   | U10  | U11    | U12 | Max |
| RS-232                      | Tx   | Rx   | Tx     | Rx   |      |      |        |     |      |      |        |     |      |      |        |     | 2   |
| RS-485 (Half Duplex)        | A(-) | B(+) | A(-)   | B(+) |      |      |        |     |      |      |        |     |      |      |        |     | 2   |
| RS-485 (Full Duplex)        | Tx-  | Tx+  | Rx-    | Rx+  |      |      |        |     |      |      |        |     |      |      |        |     | 1   |
| RS-232 TTL                  | Tx   | Rx   | Tx     | Rx   | Tx   | Rx   | Tx     | Rx  | Tx   | Rx   | Tx     | Rx  | Tx   | Rx   | Tx     | Rx  | 8   |
| SDI-12*                     | ✓    |      | ✓      |      | ✓    |      | ✓      |     | ✓    |      | ✓      |     | ✓    |      | ✓      |     | 8   |
| SDM                         | DATA | CLK  | ENABLE |      | DATA | CLK  | ENABLE |     | DATA | CLK  | ENABLE |     | DATA | CLK  | ENABLE |     | 4   |
| SPI                         | MOSI | SCLK | MISO   |      | MOSI | SCLK | MISO   |     | MOSI | SCLK | MISO   |     | MOSI | SCLK | MISO   |     | 4   |
| I2C                         | SDA  | SCL  | SDA    | SCL  | SDA  | SCL  | SDA    | SCL | SDA  | SCL  | SDA    | SCL | SDA  | SCL  | SDA    | SCL | 8   |
| General I/O Pair            | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| 5 V or 3.3 V Source         | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| Pulse-Width Modulation      | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| Timer Input                 | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| Interrupt                   | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| Pulse Counting Function     | C1   | C2   | C3     | C4   | U1   | U2   | U3     | U4  | U5   | U6   | U7     | U8  | U9   | U10  | U11    | U12 | Max |
| Switch Closure              | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| High Frequency              | ✓    | ✓    | ✓      | ✓    | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | ✓    | ✓    | ✓      | ✓   | 16  |
| Low Level AC                |      |      |        |      |      | ✓    |        | ✓   |      | ✓    |        | ✓   |      | ✓    |        | ✓   | 6   |

## Terminal Pair Use Examples

1. If U1 is programmed for analog input or output, its associated pair, U2, may only be used as an analog input or output.
2. If U6 is programmed as a low level ac pulse connection, its associated pair, U5, may only be used for digital I/O or pulse counting.

\*If C or U terminal is programmed as an SDI-12 connection, its associated pair may only be used for digital I/O functions.

## CR6-WIFI Specifications

### *Wireless Local Area Network (WLAN)*

- › **Supported Technologies:** 802.11 b/g/n, WPA/WPA2-Personal, WPA/WPA2-Enterprise Security, WEP
- › **Client Mode:** WPA/WPA2-Personal and Enterprise, WEP
- › **Access Point Mode:** WPA2-Personal
- › **Communication Rate**
  - 802.11b: up to 11 Mbps
  - 802.11g: up to 54 Mbps
  - 802.11n: up to 72 Mbps
- › **Frequency:** 2.4 GHz
- › **Antenna Connector:** RPSMA
- › **Antenna:** pn 16005 unity gain (0 dBd), 1/2 wave whip, omnidirectional with articulating knuckle joint for vertical or horizontal orientation.
- › **Transmit Power:** 7 to 18 dBm

- › **Rx Sensitivity:** -97 dBm

### *WLAN Power Requirements (@ 12 Vdc)*

- › **Client Mode:** 7 mA idle, 70 mA communicating
- › **Access Point Mode:** 62 mA idle, 65 mA communicating
- › **Sleep (disabled using IPNetPower() or DevConfig setting):** <0.1 mA

### *Compliance Information*

- › **FCC ID:** XF6-RS9113SB
- › **IC ID:** 8407A-RS9113SB
- › **ETSI**
- › View the CR6-WIFI EU Declaration of Conformity at: [www.campbellsci.com/cr6](http://www.campbellsci.com/cr6)

## CR6-RF407, CR6-RF412 Specifications

### *Frequency Hopping Spread Spectrum Radios (FHSS)*

- › **Transmit**
  - Output Power: 5 to 250 mW, user selectable
  - Frequency
    - ♦ RF407: 902 to 928 MHz (US, Canada)
    - ♦ RF412: 915 to 928 MHz (Australia, New Zealand)
  - Channel Capacity
    - ♦ RF407: Eight 25-channel hop sequences sharing 64 available channels
    - ♦ RF412: Eight 25-channel hop sequences sharing 31 available channels
  - RF Data Rates: 200 kbps
- › **Receive Sensitivity:** -101 dBm
- › **Antenna Connector:** RPSMA (external antenna required; see [www.campbellsci.com/order/cr6](http://www.campbellsci.com/order/cr6) for Campbell Scientific antennas)

### *Average Additional Current Contribution @ 12 Vdc*

- › **Transmit:** 45 mA
- › **Idle On:** 12 mA
- › **Idle 0.5 s Power Mode:** 4 mA
- › **Idle 1 s Power Mode:** 3 mA
- › **Idle 4 s Power Mode:** 1.5 mA

### *Compliance Information*

- › **CR6-RF407**
  - United States: FCC Part 15.247: MCQ-XB900HP
  - Industry Canada: IC: 1846A-XB900HP
- › **CR6-RF412**
  - ACMA RCM
  - United States: FCC Part 15.247: MCQ-XB900HP
  - Industry Canada: IC: 1846A-XB900HP

## CR6-RF422 Specifications

### *F868 MHz SRD 860 Radio with Listen Before Talk (LBT) and Automatic Frequency Agility (AFA)*

#### **Transmit**

- Output Power: 2 to 25 mW, user selectable
- Frequency: 863 to 870 MHz (European Union)
- Channel Capacity: 30 channels (default), software configurable for meeting local regulations; 10 sequences for reducing interference through channel hop
- RF Data Rates: 10 kbps

**Receive Sensitivity:** -106 dBm

**Antenna Connector:** RPSMA (external antenna required)

### *Average Additional Current Contribution @ 12 Vdc*

- › **Transmit:** 20 mA
- › **Idle On:** 9.5 mA
- › **Idle 0.5 s Power Mode:** 3.5 mA
- › **Idle 1 s Power Mode:** 2.5 mA
- › **Idle 4 s Power Mode:** 1.5 mA

### *Compliance Information*

- › View the CR6-RF422 EU Declaration of Conformity at: [www.campbellsci.com/cr6](http://www.campbellsci.com/cr6)

## CR6-RF451 Specifications

### *Frequency Hopping Spread Spectrum Radio (FHSS)*

#### › **Transmit**

- Output Power: 10 mW to 1 W, user selectable
- Frequency: 902 to 928 MHz
- Modulation: 2 level GFSK
- RF Data Rates: 115.2 or 153.6 kbps, selectable speeds

#### › **Receive Sensitivity**

- -108 dBm at 115.2 kbps for  $10^{-4}$  BER
- -103 dBm at 153.6 kbps for  $10^{-4}$  BER

#### › **Antenna Connector:** RPSMA female (external antenna required; see [www.campbellsci.com/order/cr6](http://www.campbellsci.com/order/cr6) for Campbell Scientific antennas)

### *Average Additional Current Contribution @ 12 Vdc*

#### › **Transmit:** 650 mA, maximum

#### › **Receive:** 40 mA

#### › **Idle:** 15 mA

#### › **Sleep:** 6 mA

### *Compliance Information*

#### › **FCC ID:** KNYAMM0921TT

#### › **IC ID:** 2329B-AMM092ITT

