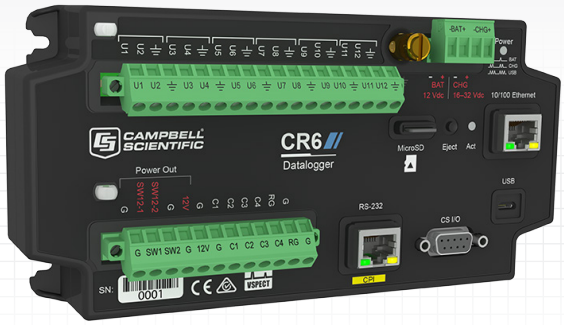
CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

CR6 Series

Measurement and Control Datalogger



One Data Logger, Countless Applications

Featuring advanced vibrating-wire technology

Overview

The CR6-series measurement and control data logger is a powerful core component for your data-acquisition system. We combined the best features of all our data loggers 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 data logger 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-RF407/412/422/427 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
- One non-isolated current input channels included for directly connecting sensors with 0-to-20 mA or 4-to-20 mA current outputs[a]
- 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

General Specifications

- **CPU:** 32 bit with hardware FPU, unning at 100 MHz
- **Internal Memory[b]:** 128 MB flash and 4 MB battery-backed SRAM
- **MicroSD Drive** for extended data storage (Campbell Scientific offers 2 GB and 8 GB microSD cards)
- **Clock Accuracy:** ±3 min per year, optional GPS correction to 10 µs
- **USB micro B** for direct connection to computer (limited power source during configuration), 2.0 full speed, 12 Mbps
- **CS I/O Port** for connection to Campbell Scientific modems and displays
- 1**0/100 Ethernet RJ45** for LAN connection
- **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

[a]Capability only applies to CR6s with serial numbers 7502 or newer. These data loggers have two blue stripes on their label

[b]Internal memory is for CR6s with serial numbers 7502 or newer.

General Specifications Continued

- **Continuous 12 V Terminal**
- **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 ±5000 mV, ±1000 mV, ±200 mV ranges 24 bit ADC
    - Analog outputs: ±2.5 V or ±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 kΩ
    - 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
- **Best Analog Accuracy:** ±(0.04% of reading + 2 µV), 0° to 40°C
- **Best Effective Resolution:** 50 nV (±200 mV range, differential measurement, input reversal, 5 Hz f_{N1})
- **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
- **Operating Temperature Range**
  - Standard: -40° to +70°C
  - Extended: -55° to +85°C (not available for communication options)
- **Compliance Information:**
  - View the EU Declaration of Conformity for the CR6, CR6-WIFI, and CR6-RF422 at: www.campbellsci.com/cr6
  - Shock: MIL-STD 810G method 516.6
  - Vibration: MIL-STD 810G method 514.6
  - Protection: IP50
- **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/RF412/RF422/RF427: 0.51 kg (1.13 lb)
- **Dimensions:** 21 cm x 10.2 x 5.7 cm (8.3 in x 4.0 x 2.2 in)

Terminal Functions

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

Analog Input	C1	C2	C3	C4	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	RG	RS-232/CPI	Max
Single Ended					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			12
Differential					H	L	H	L	H	L	H	L	H	L	H	L			6
Period Average					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			12
Vibrating Wire					✓		✓		✓		✓		✓		✓				6
Current Loop																	✓		1
Thermistor					✓		✓		✓		✓		✓		✓				6
Analog Output	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**RG**	**RS-232/CPI**	**Max**
Switched-Voltage Excitation					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			12
Switched-Current Excitation					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			12
Communications	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**RG**	**RS-232/CPI**	**Max**
SDI-12	✓		✓		✓		✓		✓		✓		✓		✓				8
GPS Time Sync	Tx	Rx	Tx	Rx	PPS	Rx													1
TTL 0 to 5 V	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx			8
LVTTL 0 to 3.3 V	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx			8
RS-232	Tx	Rx	Tx	Rx														✓	3
RS-485 (Half Duplex)	A(-)	B(+)	A(-)	B(+)															2
RS-485 (Full Duplex)	Tx-	Tx+	Rx-	Rx+															1
I2C	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL			8
SPI	MOSI	SCLK	MISO		MOSI	SCLK	MISO		MOSI	SCLK	MISO		MOSI	SCLK	MISO				4
SDM	DATA	CLK	ENABLE		DATA	CLK	ENABLE		DATA	CLK	ENABLE		DATA	CLK	ENABLE				1
CPI/CDM																		✓	1
Digital I/O	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**RG**	**RS-232/CPI**	**Max**
General I/O Pair	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
5 V or 3.3 V Source	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Pulse-Width Modulation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Timer I/O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Interrupt	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Pulse Counting	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**RG**	**RS-232/CPI**	**Max**
Switch Closure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
High Frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Low Level AC						✓		✓		✓		✓		✓		✓			6

Terminal Use Examples and Notes

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. *Triggering conflicts can occur when companion ports are used for different triggering instructions (TimerInput, PulseCount, SDI12Recorder, WaitDigTrig). For example, if U3 is used for the SDI12Recorder instruction, U4 cannot be used in the TimerInput, PulseCount, or WaitDigTrig instructions.*
3. *Only one trio of channels can be programmed as an SDM connection. For example, if channels C1–C3 are used for an SDM connection, you cannot connect another SDM on any of the other channels.*

CR6-RF407, CR6-RF412, and CR6-RF27 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)
    - RF427: 902 to 907.5 MHz, 915 to 928 MHz (Brazil)
  - Channel Capacity
    - RF407: Eight 25-channel hop sequences sharing 64 available channels
    - RF412: Eight 25-channel hop sequences sharing 31 available channels
    - RF427: Eight 25-channel hop sequences sharing 43 available channels
  - RF Data Rates: 200 kbps
- **Receive Sensitivity:** -101 dBm
- **Antenna Connector:** RPSMA (external antenna required; see www.campbellsci.com/order/cr6 for Campbell Scientific antennas)

Average Additional Current Contribution @ 12 Vdc

- **Transmit:** < 80 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
  - Mexico IF: RCPDIXB15-0672-A1
- **CR6-RF412**
  - ACMA RCM
  - United FCC Part 15.247: MCQ-XB900HP
  - Industry Canada (IC): 1846A-XB900HP
- **CR6-RF427:** Brazil ANATEL standards in Resolution No. 506: 08335-17-10644

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

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 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

- **United States FCC ID:** KNYAMM0921TT
- **Industry Canada (IC):** 2329B-AMM0921TT

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, 70 mA communicating
- **Sleep (disabled using IPNetPower() or DevConfig setting):** <0.1 mA

Compliance Information

- **United States FCC ID:** XF6-RS9113SB
- **Industry Canada (IC):** 8407A-RS9113SB

Note: The user is responsible for emissions if changing the antenna type or increasing the gain.

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