QUICK DEPLOY GUIDE

Campbell SCIENTIFIC

CRVW3 Data Logger

pn #31174
3/2023

Info Link

VSPECT POWERED

Introduction

The quick deploy guide is a reference tool outlining the setup process. Keep this document with the CRVW3 for future reference. The CRVW3 Owner's Manual is the definitive source for detailed setup, configuration, and installation instructions.

www.campbellsci.eu/crvw3 - CSL I.D - 1056

Quick Deploy Contents

Precautions

The CRVW3 is a rugged instrument and can provide years of service with proper care and maintenance.

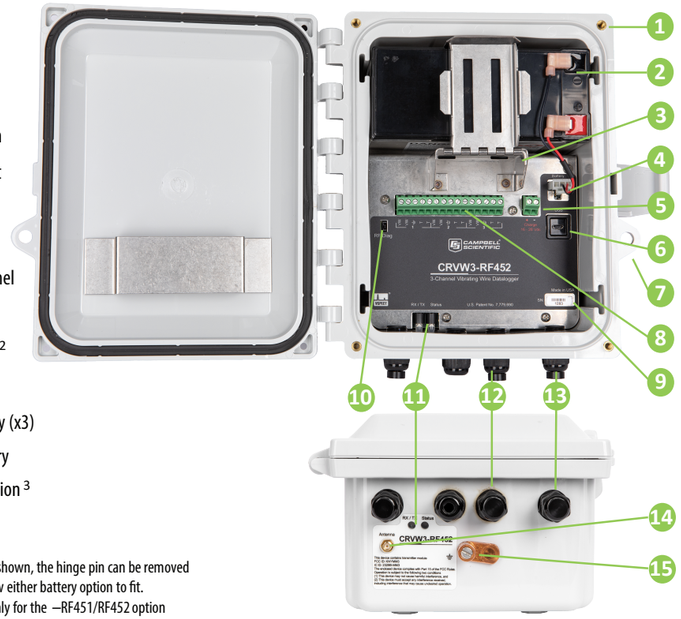
- Protect the CRVW3 from over-voltage (16–28 VDC charge input)
- Protect the CRVW3 from internal moisture (maintain desiccant)
- Protect the CRVW3 from electrostatic discharge (ground properly)

Hardware Overview

CRVW3

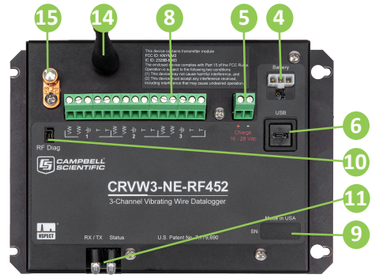
1. Lid screws
2. Battery[1]
3. Battery hinge pin[1]
4. Battery connection
5. Charge/solar input
6. USB connection
7. Enclosure lock
8. CRVW3 wiring panel
9. Serial number
10. Radio diagnostics[2]
11. LED indicators
12. Sensor cable entry (x3)
13. Charge cable entry
14. Antenna connection[3]
15. Ground lug

[1] Rechargeable battery option shown, the hinge pin can be removed and the hinge rotated to allow either battery option to fit.
[2] The radio diagnostic port is only for the –RF451/RF452 option
[3] RPSMA antenna connection



CRVW3 with enclosure

The CRVW3 is available field ready with an enclosure and battery or as an individual component. The configuration and operation of the CRVW3 is the same for either option. The enclosure model is field ready while the non enclosure model allows the user to select an enclosure/battery for specific site requirements.



CRVW3 without enclosure (NE option)

VSPECT Overview

VSPECT provides the best vibrating wire measurement available[4]. Sensor frequency is easily identified while filtering out environmental and electrical noise that affects the quality of other vibrating wire readers. VSPECT provides measurement diagnostics to understand sensor response, installation quality, and identify incorrect wiring or damaged sensors.

Output and Diagnostics

Sensor Frequency[5] (Hz)
Frequency is the basic measurement from a vibrating wire sensor. The frequency can be converted into engineering units (pressure, displacement, etc.) and is identified as the largest measured amplitude signal within the frequency sweep.

Sensor Amplitude[6] (mV RMS)
Signal strength from the vibrating wire sensor. Amplitude varies and is affected by the sensor type, excitation strength (adjustable), and sensor cable length.

Signal-to-Noise Ratio[6] (unitless)
The signal-to-noise ratio is calculated as sensor signal amplitude divided by the largest noise amplitude within the sweep frequency. A low signal-to-noise ratio indicates a weak sensor signal or a noisy environment.

Noise Frequency[6] (Hz)
The largest amplitude noise signal within the frequency sweep.

Decay Ratio[6] (Hz)
Signal attenuation; how quickly the signal strength decreases.

Thermistor/RTD Resistance[5] (ohms)
Used to calculate sensor temperature and correct for thermal effects[7].

[4] Protected under U.S. Patent No. 7,779,690
[5] Frequency and resistance are measured values
[6] Diagnostic values used to describe the quality of the frequency measurement
[7] The temperature measurement (when present) can be used in the CRVW3, another data logger or post processed to apply a thermal correction.

Measurement Graphs

The following two sets of graphs illustrate the use of VSPECT to identify a sensor signal in a quiet and noisy environment. Both graphs were created from the same sensor using the Vibrating Wire Report created using a VWAnalyzer. Fig. 1 was measured in an electrically quiet environment, while Fig. 2 was measured in an electrically noisy environment (AC power) similar to what can be seen in a field environment (power lines, motors, radio signals, etc.). The time series on Fig. 1 shows a relatively clean signal 19 that is more clearly identified 17 on the frequency spectrum 16. The time series 23 on Fig. 2 shows the influence of the noise 24. Vibrating wire readers that only use the time series 23 to determine the frequency may report an incorrect frequency as a result of noise. The frequency spectrum (VSPECT) filters the noise 21 and easily identifies the sensor signal 22. VSPECT provides noise immunity by correctly identifying the sensor signal and ignoring the influence of electrical noise that plagues time-domain-based vibrating wire readers.

16. The Frequency Spectrum graph shows signals with respect to frequency (VSPECT)
17. The sensor signal is determined as the largest signal within the frequency sweep
18. The Time Series graph shows raw signals observed with respect to time
19. A time series with minimal noise influence
20. The frequency sweep is shown as the white area on the graph, only signals within the frequency sweep will be considered as a possible sensor signal

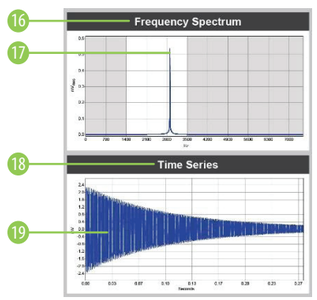


Figure 1: *VW Signal*

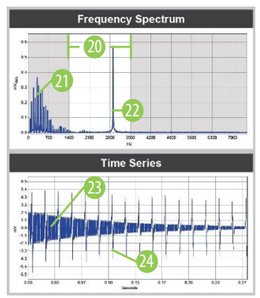
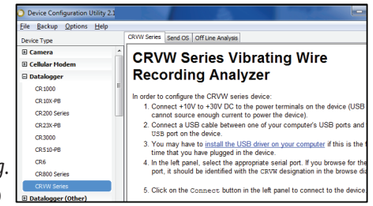


Figure 2: *VW Signal With Noise*

21. Noise is identified and ignored
22. A sensor signal is easily identified even when noise is present in the measurement
23. A time series with observable noise
24. Noise in the time series (this is what confuses non-VSPECT devices)

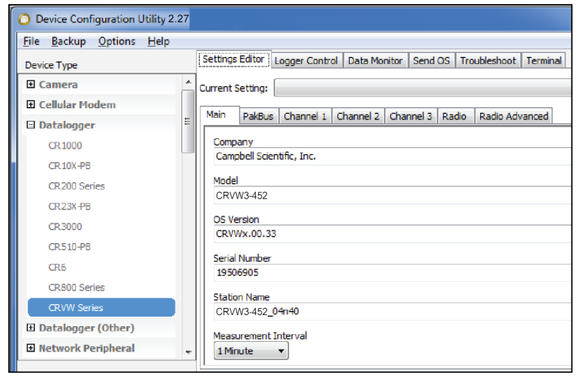
1 Software

- *Device Configuration Utility* (*DevConfig*) is used to setup and configure the CRVW3.
- *LoggerNet* and *PC400* are used to collect data (see step 6), all include *DevConfig*.
- USB drivers, and the steps to connect the CRVW3, are shown on the CRVW Series page of *DevConfig*, version 2.10 or higher is required.
- *DevConfig* and *PC400* may be downloaded (no cost) at: www.campbellsci.com/downloads



2 Setup & Configuration

Settings in *DevConfig* for the CRVW3 data logger, radio, and the channels are shown below. Additional explanations are included in *DevConfig*. The USB connection can power the CRVW3 during setup.

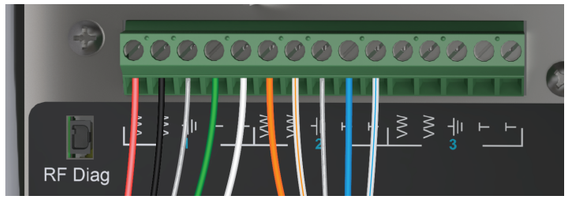


Settings Editor	
Main	Measurement interval and current station OS version
PakBus	PakBus address, security settings, and PakBus communications settings
Channel	Channel configuration: frequency sweep, thermistor & calcs
Radio/Advanced	Radio operation mode, ID, power mode, transmit strength, and RF packet settings
Logger Control	Set data logger clock
Data Monitor	Look at most recent data
Send OS	Send/update the CRVW3 OS
Troubleshoot	Test sensor response/channel. Used to verify sensor operation, wiring, or to troubleshoot (requires 12VDC power connection).
Terminal	Not typically used. A low level communication tool.

3 Sensor Connection

- Loosen and remove the plug from cable entry location (bottom of enclosure)
- Insert the cable from the outside
- Connect the sensor to the CRVW3 wiring panel as described in the table and illustration below
- Hand-tighten the cable entries (Do Not Overtighten)

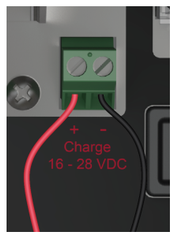
Label	Description	Common Colour Schemes	
VW	First Vibrating Sensor Wire	Red	Orange
VW	Second Vibrating Sensor Wire	Black	Orange/White
⏚	Ground Wire	Shield	Shield
T	First Thermistor Wire	Green	Blue
T	Second Thermistor Wire	White	Blue/White



Wiring Note:
Vibrating sensor wires may be wired in reverse order (black and red instead of red and black). Thermistor wires are similarly interchangeable.

4 Power Options

- Connect the battery wires (rechargeable or alkaline D-cells) to the CRVW3 wiring panel
- Connect solar panel (optional) to charge "+" & "-" (**Solar Panel Polarity Matters**)
- A 10 Watt solar panel is commonly used, however a 5 or 20 Watt may also be used depending on site-specific communications and location

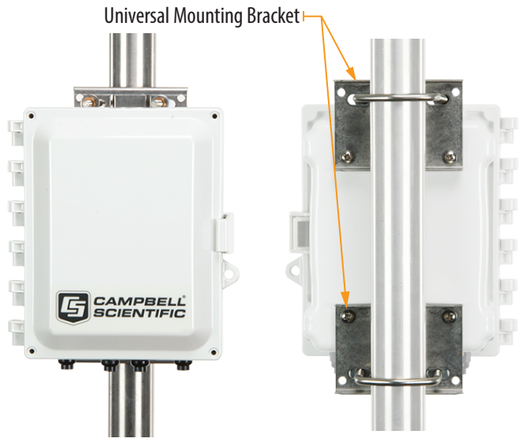


LED Indicators		
Wireless RX/TX	Flash red	Radio transmit
	Flash green	Radio receive
	Solid red	Radio error
	Solid orange	Busy (configuring)
	Off	No communications
Status	Solid green	Measurement
	Flash green	"Awake" mode, USB, recently configured
	Solid orange	Busy (configuring, or can't communicate)
	Solid red	Measurement/program error
	Flash red	USB power insufficient for measurements
	Off	Device is asleep, waiting for next measurement

Regulator/Solar Panel Note:
- The rechargeable battery will be charged by the CRVW3 when used with a solar panel (proper installation, solar conditions).

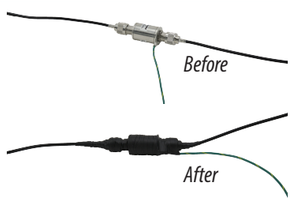
5 Field Installation

Enclosure Mounting	Use the supplied standard mounting kit or the Universal Mounting Bracket (shown below) to secure the CRVW3 enclosure.
Grounding	Connect the ground lug to earth ground. A small enclosure grounding kit is available for grounding into soil.
Moisture Protection	Ensure the lid is securely closed, cable entry points are tightened, and desiccant packs are installed. Orient the enclosure to minimize water entry (typically with cable entries facing downward).



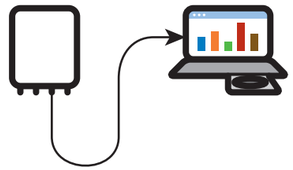
Antenna Options	A small antenna may be connected directly to the enclosure. For longer distance communications, a higher gain or directional antenna with an exterior cable may be necessary. A surge suppressor kit is recommended when using cabled antennas.
Radios	Radios can only communicate with similar radios. For example, a CRVW3-RF407 can only communicate with other devices that have a built-in -RF407 radio option, or are connected to a stand-alone RF407 radio. Similarly, the CRVW3-RF451/RF452 can only communicate with other devices that have a built-in -RF451/RF452 radio option, or are connected to a stand-alone RF452, RF451, or RF450.
Verify Sensor Operation	Sensor operation should be validated prior to leaving the site by using the Data Monitor or Troubleshoot tab in *DevConfig*.

Installation Note:
Protect environmentally exposed antenna connections with self-vulcanizing tape as shown here.

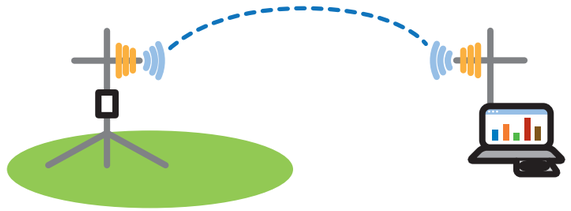


6 Data Collection & Communications

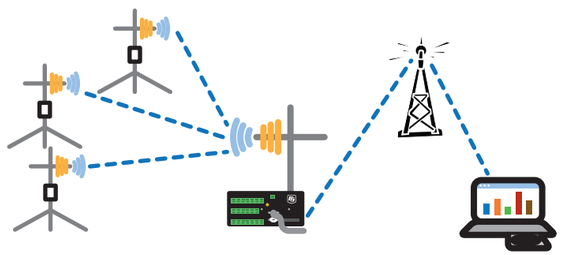
***LoggerNet* or *PC400* Software:**
- Create a station in the software for the CRVW3 based on specific communication requirements (direct connect, radio, multiple stations, etc.)
- Collect data from the station
- Radio & Automated collections require *LoggerNet*



USB Direct Connection	• Requires USB cable (included) • Data can be collected with the CRVW3 powered by USB/PC power



Simple Radio Connection	• Good for stations within radio frequency (RF) range of the base station/radio • Field testing with a laptop and radio



Advanced Communications	• Can utilize one network offsite connection; cell phone, satellite, or other IP connection. • A centralized data logger collects site data into a single device • Multiple CRVW3 data loggers connect to a centralized data logger

Communications Note:
A more thorough discussion on connection methods and advanced communications is found in the CRVW3 Manual.

7 Radio Network Basics

- *DevConfig* is used to setup/configure individual settings. *Network Planner* (*LoggerNet*) may be used to setup complete networks, or to see the settings that *LoggerNet* would assign (PakBus addresses, router settings, etc.).
- Select appropriate antennas based on site conditions.
- Successfull communications will be aided by:
  - line-of-site between stations
  - raised antenna locations
- Make sure radio settings match (see table below)

RF451/RF452 Settings	RF407, RF412, RF422, and RF427 Settings
• Only one master radio • Subnet and Network IDs	• Protocol, power mode, and retry levels • RF Network and Hop Sequence

8 Maintenance

Routine maintenance is the best standard of practice to promote a functioning system. Here are some maintenance recommendations; some sites may have more specific maintenance requirements.

Moisture Protection	• Minimize moisture intrusion inside the enclosure • Replace desiccant and humidity indicator card as needed • Check cable entry points for a good seal • Wipe moisture off lid gasket prior to opening (reduce water ingress)
Grounding	• Check grounding rod, grounding cable, and connections • Inspect for loose connections
Solar Panel	• Clean solar panel with mild detergent and a clean cloth • Remove any solar barriers (fallen debris, overhead branches, leaves, etc.)
Data Collection	• Data should be collected at regular intervals