Getting Started Guide

Datalogger

CR6

Measurement and Control Datalogger

Revision: 10/18/17

RELIABLE SINCE 1974 MONITORING

CAMPBELL SCIENTIFIC

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Getting Started

Getting Started provides a cursory view of data acquisition and walks you through a procedure to set up a simple system. You may not find it necessary to progress beyond **Getting Started**. However, should you want to dig deeper into the complexity of the datalogger's functions or quickly look for information, extensive information is available in the online help or product manual.

Overview

This exercise will guide you through the following steps:

- Connecting the datalogger to the computer.
- Attaching a sensor to the datalogger.
- Creating a program for the datalogger to measure the sensor.
- Making a simple measurement.
- Storing measurement data on the datalogger.
- Collecting data from the datalogger with a computer.
- Viewing real-time and historical data with the computer.

In addition to your datalogger, the following items are used in this exercise (many are shipped with your datalogger and all are available on www.campbellsci.ca). If you do not have all of these items, you can provide suitable substitutes.

- Power supply (if not connecting via USB).
- Type-T Thermocouple, 4 to 5 inches long; one is shipped with the datalogger.
- For a USB connection:
    - Computer with a USB port.
    - USB cable.
- For an RS-232 connection:
    - Computer with a nine-pin RS-232 port.
    - Serial cable.
- Datalogger support software.

More in-depth study may require other Campbell Scientific publications, most of which are available online at www.campbellsci.ca. Generally, if a particular feature of the datalogger requires a peripheral hardware device, more information is available in the help or manual written for that device.

USB or RS-232 Communications

Setting up a USB or RS-232 connection is a good way to begin communicating with your datalogger. Because these connections do not require configuration (like an IP address), you need only set up the communication between your computer and the datalogger. Watch a video or use the following instructions.

Initial setup instruction follows. These settings can be revisited using the datalogger support software **Edit Datalogger Setup** option ( ).

1. Using datalogger support software, launch the EZSetup Wizard.
   - PC200W and PC400 users, click the **Add Datalogger** button ( ).
   - LoggerNet users, click the **Setup** ( ) option, click the **View** menu to ensure you are in the **EZ (Simplified)** view, then click the **Add Datalogger** button.
2. Click **Next**.
3. Select your datalogger from the list, type a name for your datalogger (for example, a site or project name), and click **Next**.
4. If prompted, select the **Direct Connect** connection type and click **Next**.
5. If this is the first time connecting this computer to a CR6 via USB, click the **Install USB Driver** button, select your datalogger, click **Install**, and follow the prompts to install the USB drivers.
6. Plug the datalogger into your computer using a USB or RS-232 cable. The USB connection supplies 5 V power as well as a communication link, which is adequate for setup, but a 12 V battery will be needed for field deployment. If using RS-232, external power must be provided to the datalogger and a CPI/RS-232 RJ45 to DB9 cable is required to connect to the computer.

   Note: The **Power** LED on the datalogger indicates the program and power state. Because the datalogger ships with a program set to run on power-up, the **Power** LED flashes 3 times every 10 seconds when powered over USB. When powered with a 12 V battery, it flashes 1 time every 10 seconds.

7. From the **COM Port** list, select the COM port used for your datalogger.
8. USB and RS-232 connections do not typically require a **COM Port Communication Delay** - this allows time for the hardware devices to "wake up" and negotiate a communication link. Accept the default value of **00 seconds** and click **Next**.
9. The baud rate and PakBus address must match the hardware settings for your datalogger. A USB connection does not require a baud rate selection, RS-232 connections default to 115200 baud, and the default PakBus address is **1**.
   - Set an **Extra Response Time** if you have a difficult or marginal connection and you want the datalogger support software to wait a certain amount of time before returning a communication failure error.
   - LoggerNet and PC400 users can set a **Max Time On-Line** to limit the amount of time the datalogger remains connected. When the datalogger is contacted, communication with it is terminated when this time limit is exceeded. A value of **0** in this field indicates that there is no time limit for maintaining a connection to the datalogger.

10. Click **Next**.
11. By default, the datalogger does not use a security code or a PakBus encryption key. Therefore, the **Security Code** can be set to **0** and the **PakBus Encryption Key** can be left blank. If either setting has been changed, enter the new code or key.
12. Click **Next**.
13. Review the **Communication Setup Summary**. If you need to make changes, click the **Previous** button to return to a previous window and change the settings.

Setup is now complete, and the EZSetup Wizard allows to you click **Finish** or click **Next** to test your communication, set the datalogger clock, and send a program to the datalogger.

Testing Communication and Completing EZ Setup

1. Using datalogger support software EZ Setup, access the **Communication Test** window. This window is accessed during EZ Setup (see "USB or RS-232 Communications" on page 2 for more information). Alternatively, you can double-click a datalogger from the station list to open the EZ Setup Wizard and access the **Communication Test** step from the left side of the window.
2. Ensure the datalogger is connected to the computer, select **Yes** to test the communication, then click **Next** to initiate the test.
3. With a successful connection, the **Datalogger Clock** window displays the time for both the datalogger and the computer.
   - The **Adjusted Server Date/Time** displays the current reading of the clock for the computer or server running your datalogger support software. If the **Datalogger Date/Time** and **Adjusted Server Date/Time** don't match, you can set the datalogger clock to the **Adjusted Server Date/Time** by clicking **Set Datalogger Clock**.
   - Use the **Time Zone Offset** to specify a positive or negative offset to apply to the computer time when setting the datalogger clock. This offset will allow you to set the clock for a datalogger that needs to be set to a different time zone than the time zone of the computer (or to accommodate for changes in daylight saving time).
4. Click **Next**.
5. The datalogger ships with a default **GettingStarted** program. If the datalogger does not have a program, you can choose to send one by clicking the **Select and Send Program** button. Click **Next**.
6. LoggerNet only - Watch a video or use the following instructions:
   - The **Datalogger Table Output Files** window displays the data tables available to be collected from the datalogger and the output file name. To include a data table in scheduled collection, select the data table from the **Tables** list and check the **Table Collected During Data Collection** box. Select a **Data File Option**: **Append to End of File** adds new data to the end of the existing data file, **Overwrite Existing File** replaces the existing file with a newly created file, and **No Output File** results in no data file being written to disk. Make note of the **Output File Name** and location. Click **Next**.
   - Check **Scheduled Collection Enabled** to have LoggerNet collect data from the datalogger according to a schedule. Set the **Base Date** and **Time** to begin scheduled collections. Set a **Collection Interval**, then click **Next**.
7. Click **Finish**.

Connecting the Datalogger to a Computer

Once you have configured your connection (see "USB or RS-232 Communications" on page 2), you can connect the datalogger to your computer.

- PC200W and PC400 users, select the datalogger from the list and click the **Connect** button ().
- LoggerNet users, select **Main** and click the **Connect** button () on the LoggerNet toolbar, select the datalogger from the **Stations** list, then click the **Connect** button ().

To disconnect, click the **Disconnect** button ().

Creating a Program in Short Cut

Use the Short Cut software to generate a program for your datalogger. Short Cut is included with your datalogger support software.

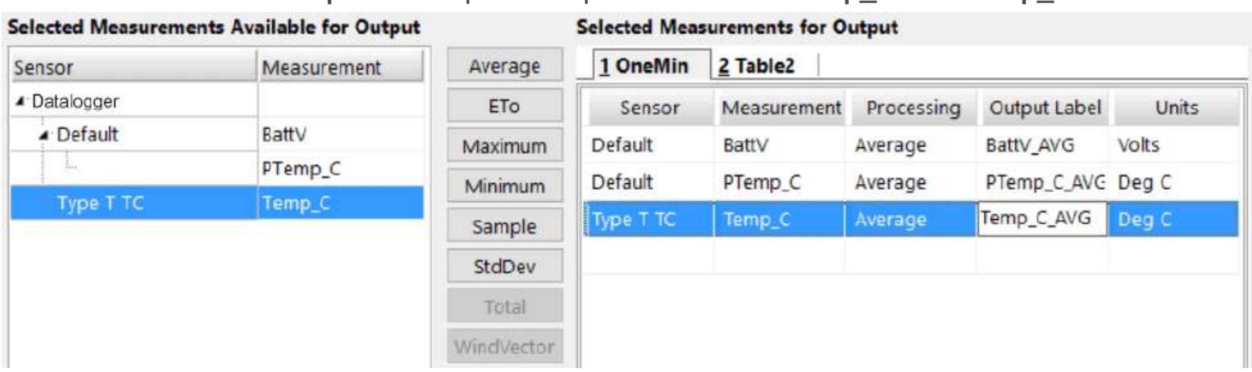
This section will guide you through programming a CR6 datalogger to measure the voltage of the datalogger power supply, the internal temperature of the datalogger, and a thermocouple. With minor changes, these steps can apply to other measurements. Watch a video or use the following instructions.

1. Using datalogger support software, launch Short Cut.
   - PC200W and PC400 users, click the **Short Cut** button ( ).
   - LoggerNet users, click **Program** then click the **Short Cut** button ( ).
2. Click **Create New Program**.
3. Select the **CR6 Series** datalogger and click **Next**.

> **Note**: The first time Short Cut is run, a prompt will appear asking for a choice of noise rejection. Select **60 Hz Noise Rejection** for North America and areas using 60 Hz ac voltage. **Select 50 Hz Noise Rejection** for most of the Eastern Hemisphere and areas that operate at 50 Hz.
>
> A second prompt lists sensor support options. **Campbell Scientific, Inc. (US)** is probably the best fit if you are outside Europe.
>
> To change the noise rejection or sensor support option for future programs, use the **Program** menu.

4. A list of **Available Sensors and Devices** and **Selected Measurements Available for Output** display. Battery voltage `BattV` and internal temperature `PTemp_C` are selected by default. During operation, battery and temperature should be recorded at least daily to assist in monitoring system status.
5. Use the Search feature or expand folders to locate your sensor or device. Double-click on a sensor or measurement in the **Available Sensors and Devices** list to configure the device (if needed) and add it to the **Selected** list. For the example program, expand the **Sensors/Temperature** folder and double-click **Type T Thermocouple**.
6. If the sensor or device requires configuration, a window displays with configuration options. Click **Help** at the bottom of the window to learn more about any field or option. For the example program, accept the default options:
   - **1 Type T TC** sensor
   - **Temp_C** in **Deg C** as the **Temperature**
   - **PTemp_C** as the **Reference Temperature Measurement**.
7. Click **OK**.
8. Click **Wiring Diagram** on the left side of the window to see how to wire the sensor to the datalogger. With the power disconnected from the datalogger, insert the wires as directed in the diagram. Ensure you clamp the terminal on the conductor, not the wire insulation. Use the included flat-blade screwdriver to open/close the terminals.
9. Click **Sensors** on the left side of the window to return to the sensor selection window, then click **Next** at the bottom of the window.

10. Type **1** in the **How often should the datalogger measure its sensor(s)** box.
11. Use the **Output Setup** options to specify how often measurements are to be made and how often outputs are to be stored. Note that multiple output intervals can be specified, one for each output table (**Table1** and **Table2** tabs). For the example program, only one table is needed. Click the **Table2** tab and click **Delete Table**.
12. In the **Table Name** box, type **OneMin** to change the name of the table.
13. Change the **Data Output Storage Interval** to **1** minute.
14. Optionally, select to copy the table to an external storage device.
15. Check the **Advanced Outputs** option if you want to specify the number of records and data events to store, set output intervals, specify measurements to evaluate, or set flags based on the value of a variable.
16. Click **Next**.
17. Select the measurement from the **Selected Measurements Available for Output** list, then click an output processing option to add the measurement to the **Selected Measurements for Output** list. For the example program, select **BattV** and click the **Average** button to add it to the **Selected Measurements for Output** list. Repeat this procedure for **PTemp_C** and **Temp_C**.



18. Click **Finish** to compile the program. Replace the **untitled.cr6** default name with **MyTemperature.cr6** and click **Save**.
19. If LoggerNet or other datalogger support software is running on your computer, and the datalogger is connected to the computer (see "Connecting the Datalogger to a Computer" on page 5 for more information), you can choose to send the program. For the example program, click **No**.

> **Note**: A good practice is to always retrieve data from the datalogger before sending a program; otherwise, data may be lost. See "Collecting Data" on page 10 for detailed instruction.

If your data acquisition requirements are simple, you can probably create and maintain a datalogger program exclusively with Short Cut. If your data acquisition needs are more complex, the files that Short Cut creates are a great source for programming code to start a new program or add to an existing custom program using CRBasic. See the CRBasic Editor help for detailed information on program structure, syntax, and each instruction available to the datalogger.

> **Note**: Once a Short Cut generated program has been edited with CRBasic Editor, it can no longer be modified with Short Cut.

Sending a Program to the Datalogger

The datalogger requires a CRBasic program to direct measurement, processing, control, and data storage operations. The program file may use the extension `.cr6` or `.dld`.

A good practice is to always retrieve data from the datalogger before sending a program; otherwise, data may be lost. To collect data using LoggerNet, connect to your datalogger and click the **Collect Now** button (). Some methods of sending a program give the option to retain data when possible. Regardless of the program upload tool used, data will be erased when a new program is sent if any change occurs to one or more data table structure in the following list:

- Data table name(s)
- Data output interval or offset
- Number of fields per record
- Number of bytes per field
- Field type, size, name, or position
- Number of records in table

Sending a Program Using Datalogger Support Software

Watch a video or use the following instructions.

1. Connect the datalogger to your computer (see "Connecting the Datalogger to a Computer" on page 5 for more information).
2. Using your datalogger support software, click **Send New** or **Send Program** (located in the Current Program section on the right side of the window).
3. Navigate to the location of the program, select it, and click **Open**. For the example program created in "Creating a Program in Short Cut" on page 6, navigate to **C:\Campbellsci\SCWin** and select **MyTemperature.cr6**.
4. Confirm that you would like to proceed and erase all data tables saved on the datalogger. The program will send, compile, then display results.

After sending a program, it is a good idea to monitor the data to make sure it is measuring as you expect.

Working with Data

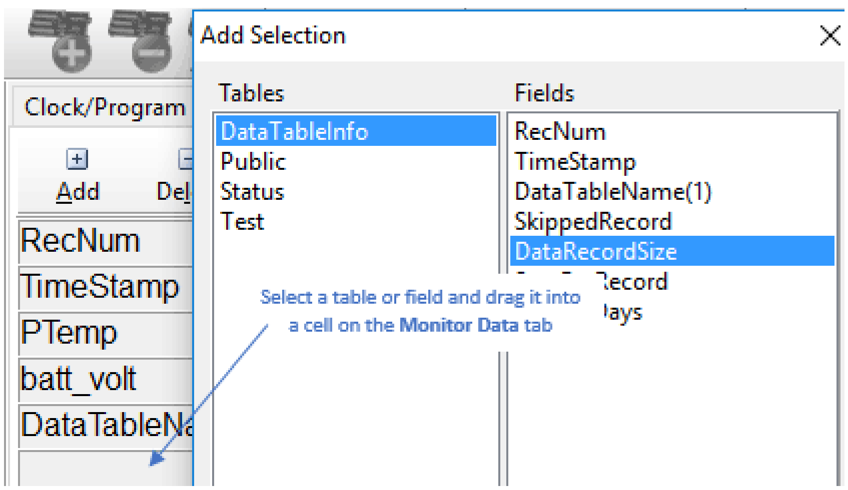
By default, the datalogger includes three tables: **Public**, **Status**, and **DataTableInfo**. Each of these tables only contains the most recent measurements and information.

- The **Public** table contains the measurements as they are made. It is updated at the scan interval set within the datalogger program.
- The **Status** table includes information on the health of the datalogger and is updated only when viewed.
- The **DataTableInfo** table reports statistics related to data tables. It also only updates when viewed.
- User-defined data tables update at the schedule set within the program.

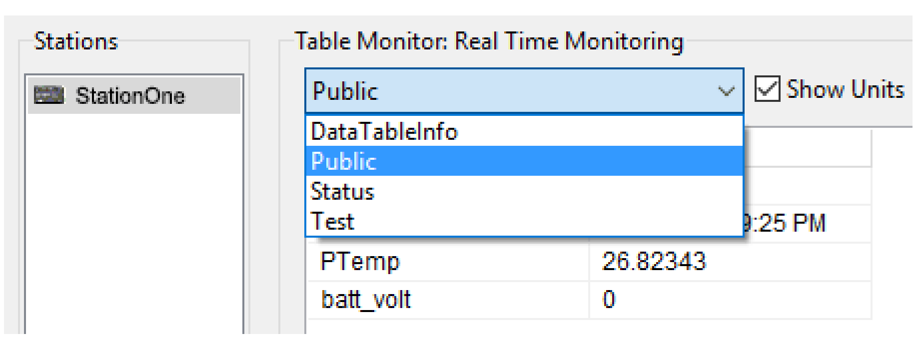
Monitoring Data

Follow a tutorial or use the following instructions:

PC200W and PC400 users, click the **Connect** button ( ), then click the **Monitor Data** tab. When this tab is first opened for a datalogger, values from the **Public** table are displayed. To view data from other tables, click the **Add** button ( ), select a table or field from the list, then drag it into a cell on the **Monitor Data** tab.



LoggerNet users, select **Main** and click the **Connect** button ( ) on the LoggerNet toolbar, select the datalogger from the **Stations** list, then click the **Connect** button ( ). Once connected, you can select a table to view using the **Table Monitor** list.



Collecting Data

The datalogger writes to data tables according to the schedule set within the CRBasic program. After the program has been running for enough time to generate data records, data may be collected and reviewed via your datalogger support software. Collections may be done manually, or automatically through scheduled collections set in LoggerNet **Setup**. Follow a tutorial or use the following instructions.

Collecting Data Using LoggerNet

1. LoggerNet users, select **Main** and click the **Connect** button ( ) on the LoggerNet toolbar, select the datalogger from the **Stations** list, then click the **Connect** button ( ).
2. Click the **Collect Now** button ( ).
3. After the data is collected, the **Data Collection Results** window displays the tables collected and where they are stored on the computer.
4. Click **View File** to view the data.

Collecting Data Using PC200W or PC400W

1. PC200W and PC400 users, click the **Connect** button ( ).
2. Click the **Collect Data** tab.
3. Select an option for **What to Collect**. Either option creates a new file if one does not already exist.
   - **New data from datalogger (Append to data files)**: Collects only the data in the selected tables stored since the last data collection and appends this data to the end of the existing table files on the computer.
   - **All data from datalogger (Overwrite data files)**: Collects all of the data in the selected tables and replaces the existing table files on the computer.
4. Select the tables to collect from the list at the bottom of the window.
5. Click **Start Data Collection**.
6. The **Data Collection Results** window displays the tables collected and where they are stored on the computer.
7. Click **View File** to view the data.

Viewing Historic Data

View historic data in a spreadsheet format using View Pro. View Pro also contains tools for visualizing data in several graphical layouts. Follow a tutorial or use the following instructions:

Once the datalogger has had ample time to take multiple measurements, you can collect and review the data.

1. To view the most recent data, connect the datalogger to your computer and collect your data (see "Collecting Data" on page 10 for more information).
2. Open View Pro:
   - LoggerNet users select **Data** and click **View Pro** ( ) on the LoggerNet toolbar.
   - PC200W and PC400 users click the **View Data Files via View Pro** toolbar button ( ).
3. Click the **Open** toolbar button ( ), navigate to the directory where you saved your tables (the default directory is **C:\Campbellsci**`[your datalogger software application]`). For the example program, navigate to the **C:\Campbellsci\LoggerNet** folder and select **OneMin.dat**.