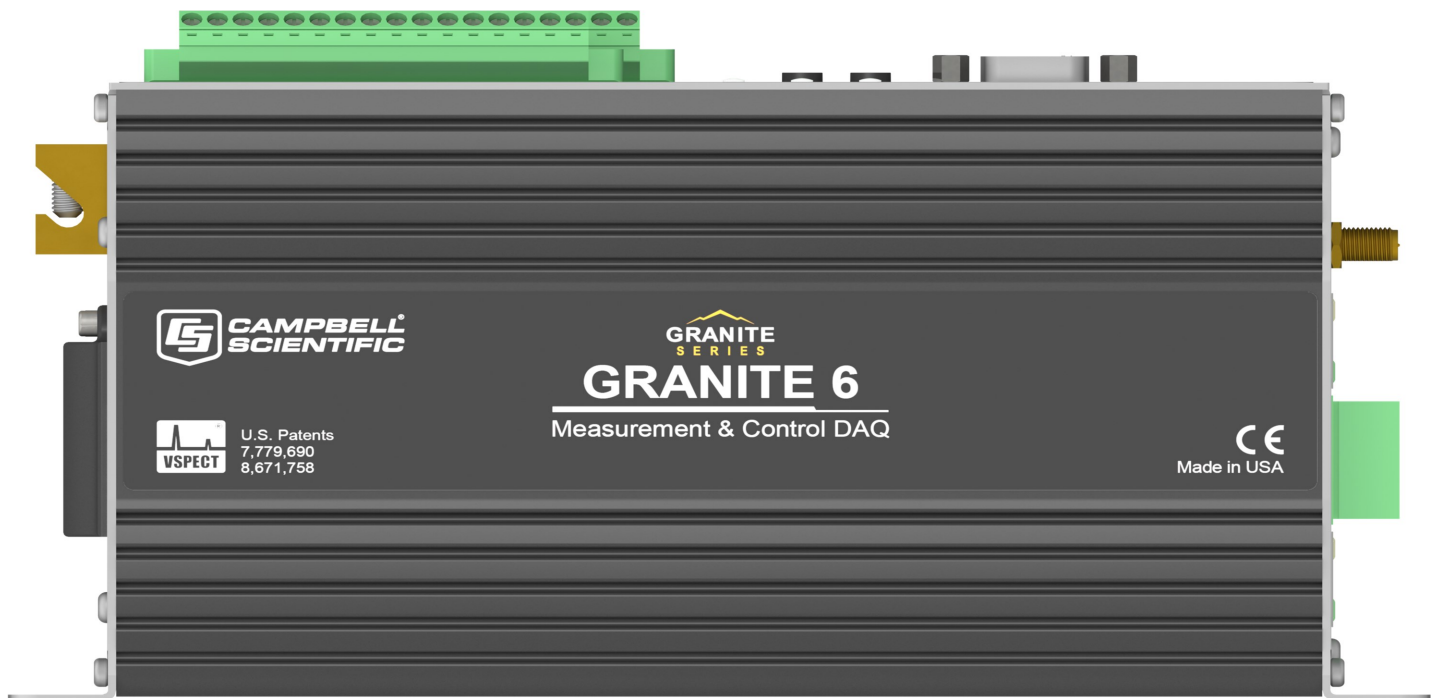




# GRANITE 6

## Measurement and Control DAQ



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# 1. Getting started

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**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 this. However, should you want to dig deeper into the complexity of the data logger functions or quickly look for details, extensive information is available in the full GRANITE 6 manual.

This exercise guides you through the following steps:

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

In addition to your data logger, the following items are used in this exercise (many are shipped with your data logger and all are available on [www.campbellsci.com](http://www.campbellsci.com) 


- Type T thermocouple, 4 to 5 inches long; one is shipped with the data logger
- Computer with a USB port
- USB cable
- Data logger support software such as *LoggerNet*, *RTDAQ*, or *PC400* installed on your computer

Additional Campbell Scientific publications are available online at [www.campbellsci.com](http://www.campbellsci.com) .

Video tutorials are available at [www.campbellsci.com/videos](http://www.campbellsci.com/videos) . Generally, if a particular feature of the data logger requires a peripheral hardware device, more information is available in the help or manual written for that device.


## 2. USB communications

---

Setting up a USB connection is a good way to begin communicating with your data logger. Because this connection does not require configuration (like an IP address), you need only set up the communications between your computer and the data logger. Use the following instructions or watch the Quickstart videos at <https://www.campbellsci.com/videos> .

### TIP:





You will physically connect your data logger to your computer in step 6.

Follow these steps to get started. These settings can be revisited using the data logger support software **Edit Datalogger Setup** option .

1. Using data logger support software, launch the EZSetup Wizard.

### NOTE:

New software installations automatically open the EZSetup Wizard the first time they run.

- *LoggerNet* users, click **Setup** , select the **View** menu and ensure you are in the **EZ (Simplified)** view, then click **Add Datalogger** .
  - *RTDAQ* users, click **Add Datalogger** .
  - *PC400* users, click **Add Datalogger** .
2. Click **Next**.
  3. Select your data logger from the list. In the **Datalogger Name** field, type a meaningful name for your data logger (for example, a site identifier or project name), and click **Next**.
  4. Select the **Direct Connect** connection type and click **Next**.
  5. If this is the first time connecting this computer to a GRANITE 6 via USB, click **Install USB Driver**, select your data logger, click **Install**, and follow the prompts to install the USB driver.
  6. Plug the data logger into your computer using a USB cable. The USB connection supplies 5 V power as well as a communications link, which is adequate for setup. A 12 V battery will be needed for field deployment. If using RS-232, external power must be provided to the data logger, and a CPI/RS-232 RJ45 to DB9 cable is required to connect to the computer.

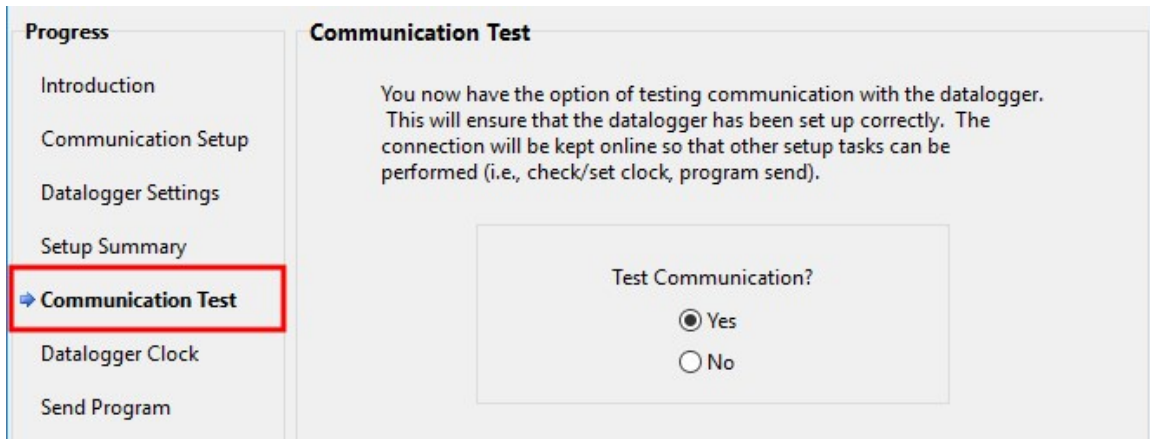
**NOTE:**

The Power LED on the data logger indicates the program and power states. Because the data logger ships with a program set to run on power-up, the Power LED flashes three times every 10 seconds when powered over USB. When powered with a 12 V battery, it flashes once every 10 seconds. When no program is running, the LED is always on.


7. From the **COM Port** list, select the COM port used for your data logger. It will appear as GRANITE 6 (COM number).
8. USB connections do not typically require a **COM Port Communication Delay**; this type of delay allows time for hardware devices to "wake up" and negotiate a communications link. Accept the default value of **00 seconds** and click **Next**.
9. You **must match** the PakBus address hardware settings of your data logger. A USB connection does not require a baud rate selection, keep the default. The default PakBus address is **1**.
10. Set an **Extra Response Time** if you have a difficult or marginal connection and you want the data logger support software to wait a certain amount of time before returning a communications failure error. Accept the default value of **00 seconds**.
11. Set a **Max Time On-Line** to limit the amount of time the data logger remains connected. When the data logger is connected, communications with it are 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 data logger.
12. Leave the **Neighbor PakBus Address** as the default of **0**.
13. Click **Next**.
14. By default, the data logger 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.
15. Click **Next**.
16. Review the **Setup Summary**. If you need to make changes, click **Previous** to return to a previous window and change the settings.
17. Setup is now complete. The EZSetup Wizard allows you to **Finish**, or you may click **Next** to test communications, set the data logger clock, and send a program to the data logger. See [Testing communications with EZSetup](#) (p. 4) for more information.

# 3. Testing communications with EZSetup

1. Advance to, or select, the **Communication Test** step in EZ Setup. See [USB communications](#) (p. 2) for more information.





2. Ensure the data logger is physically connected to the computer, select **Yes** to test communications, then click **Next** to initiate the test.
3. With a successful connection, the **Connection Time** with the data logger is displayed in the lower-left corner of the wizard. Click **Next**.
4. The **Datalogger Clock** window displays the time for both the data logger and the computer (server).
  - The **Adjusted Server Date/Time** displays the current reading of the clock for the computer running your data logger support software. If the **Datalogger Date/Time** and **Adjusted Server Date/Time** do not match, click **Set Datalogger Clock** to set the data logger clock to the computer clock.
  - Optionally, specify a positive or negative **Time Zone Offset** to apply when setting the data logger clock. This offset allows you to set the clock for a data logger that is in a different time zone than the computer (or to accommodate for changes in daylight saving time).
5. Click **Next**.

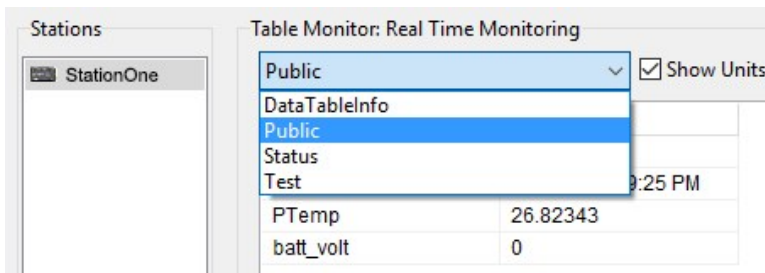
6. The data logger ships with a default **GettingStarted** program. If the data logger does not have a program, you can choose to send one by clicking **Select and Send Program**. Click **Next**.
7. **LoggerNet** only - Use the following instructions or watch the [Scheduled/Automatic Data Collection video](#)   
  - The **Datalogger Table Output Files** window displays the data tables available to be collected from the data logger and the output file name. By default, all data tables set up in the data logger program will be included for collection. Make note of the **Output File Name** and location. Click **Next**.
  - Check **Scheduled Collection Enabled** to have **LoggerNet** automatically collect data from the data logger on the **Collection Interval** entered. When the **Base Date** and **Time** are in the past, scheduled collection will begin immediately after finishing the EZSetup wizard. Do not set up a scheduled collection during this tutorial. Click **Next**.
8. Click **Finish**, or you may click **Next** to test communications, set the data logger clock, and send a program to the data logger.



# 4. Making the software connection

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Once you have configured your hardware connection (see [USB communications](#) (p. 2)), your data logger and computer can communicate. Use the **Connect** screen to send a program, set the clock, view real-time data, and manually collect data.

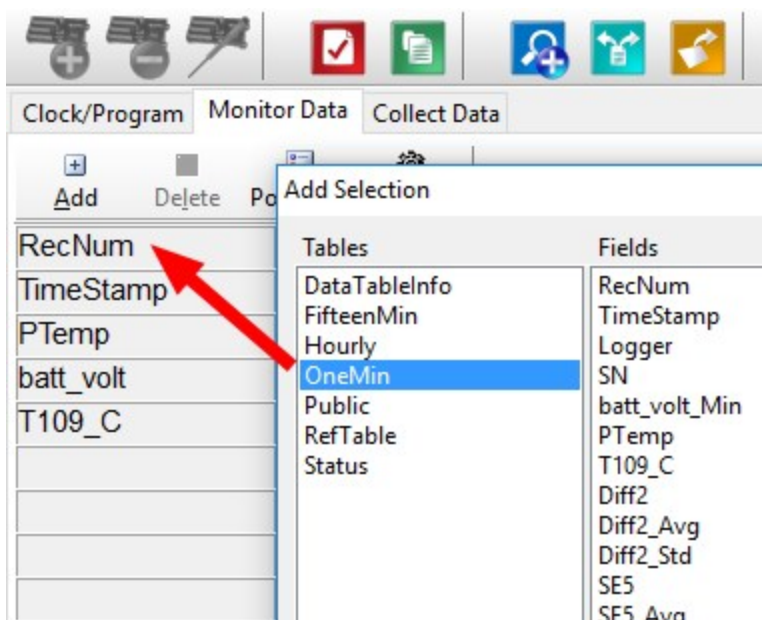
*LoggerNet* users, select the **Main** category and **Connect**  on the *LoggerNet* toolbar, then select the data logger from the **Stations** list, then click **Connect** . Once connected, select a table to view in the **Table Monitor**.



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

Additionally, *RTDAQ* has a **Start/Stop** button to start and stop monitoring data values. The name of this button changes based on its state.





For more information, see [Working with data](#) (p. 17).

#### NOTE:



When powered only by USB, the battery voltage is reported as 0.00. This is to remind you that a 12 V battery is needed for field deployment.

See [Collecting data](#) (p. 18) for more information on copying stored data from the data logger to the computer.

To disconnect, click **Disconnect** .




For more information, see the [Connect Window Tutorial](#) .

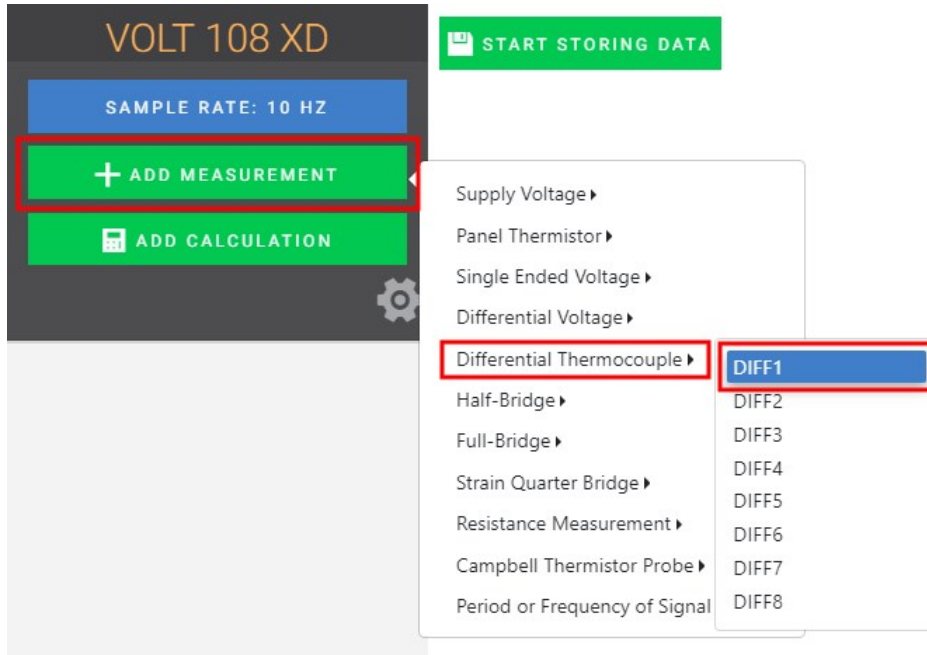
## 5. Measurement quickstart using *SURVEYOR*

Campbell Scientific *SURVEYOR* software is an easy way to quickly see measurement results and store data from a GRANITE Measurement Module. The module configuration can be saved on the computer or exported as a CRBasic data logger program. *SURVEYOR* is available as a download from [www.campbellsci.com/cs-surveyor](http://www.campbellsci.com/cs-surveyor) . A video tutorial is available at [www.campbellsci.com/videos/surveyor](http://www.campbellsci.com/videos/surveyor) .

If your data acquisition system does not include a GRANITE Measurement Module such as the VOLT 100 series proceed to [Programming quickstart using Short Cut](#) (p. 11).

This section will guide you through reading a differential Type-T thermocouple on a VOLT 100 series Measurement Module. With minor changes, these steps can apply to other compatible measurements and Measurement Modules.

1. Open **SURVEYOR** .
2. Connect a USB cable between your computer and the VOLT 100 series **USB** port.
3. Apply 9.6 to 32 VDC external power using the green **Power** connector on the side of the VOLT 100 series.
4. Select **Connect Now** .
5. Select the communications port, it will be labeled similar to **VOLT 100 series (COM3)**.
6. Make selections for **Speed or Noise Rejection** and **CAN enabled**. See the **SURVEYOR** help  for more information on all settings.
7. Click **Apply**.
8. Select a **Sample Rate**. For this exercise, select **10 Hz**. (1/2 Hz is typical for thermocouple measurements.)
9. **Add Measurement(s)**. For this exercise, add a Type-T differential thermocouple on **DIFF1**.



10. Wire the sensor according to the given wiring diagram.

TCDiff 1 Properties

SHOW WIRING

Wire	Color	Terminal
Sig+	Blue	Diff1H
Sig-	Red	Diff1L

Variable Name *i*

tcdiff1

Thermocouple Type *i*

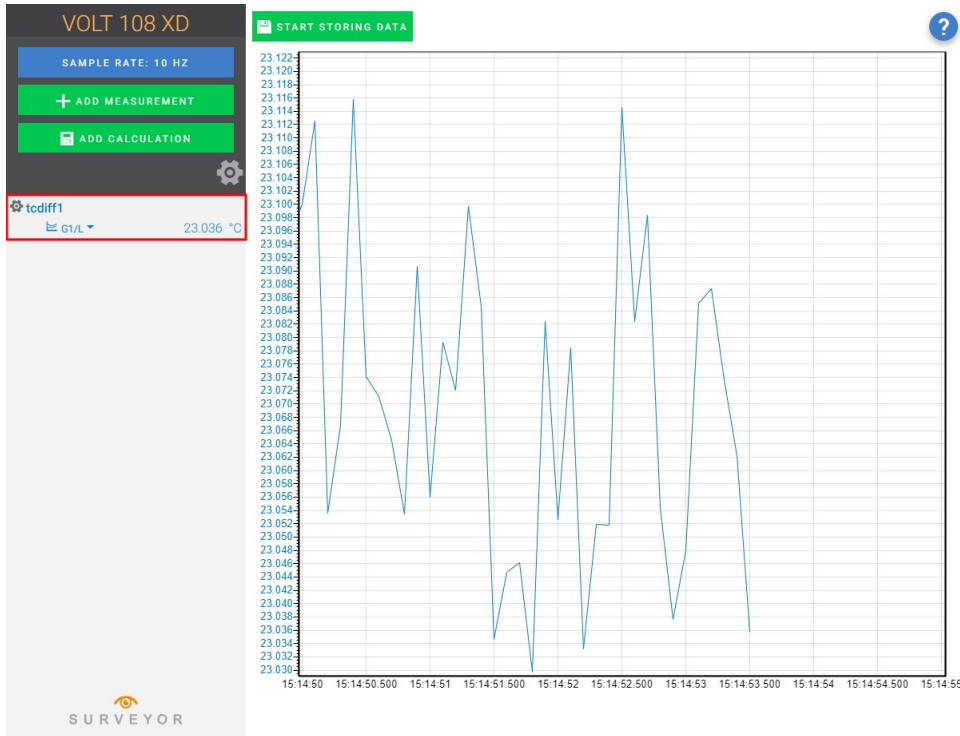
TypeT Copper Constantan ▾


Units *i*

°C ▾

11. Complete the rest of the form and **Apply** to save the configuration.

12. Check the resulting measurements in the numeric and graphic displays.



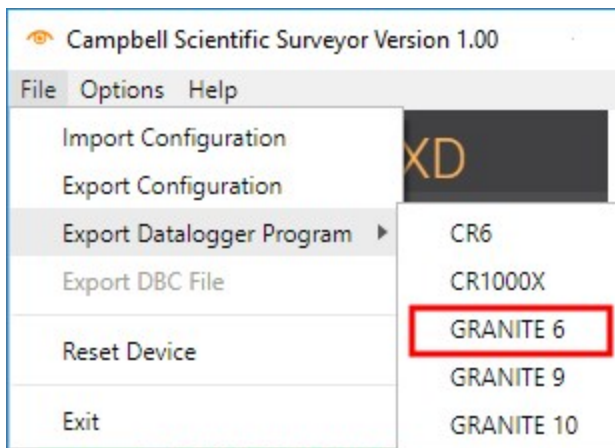
13. Click **Start Storing Data** . While data is being stored the options to stop and pause data storage become available.

## 6. Programming quickstart using *SURVEYOR*

Campbell Scientific *SURVEYOR* is an easy way to generate a simple CRBasic program for your VOLT 100 series Campbell Scientific data acquisition system.

1. Configure the VOLT 100 series for measurements, see [Measurement quickstart using SURVEYOR](#) (p. 7).

2. Select **File > Export Datalogger Program** then select the data logger you will be connecting the VOLT 100 series to. For this example, we'll select GRANITE 6.



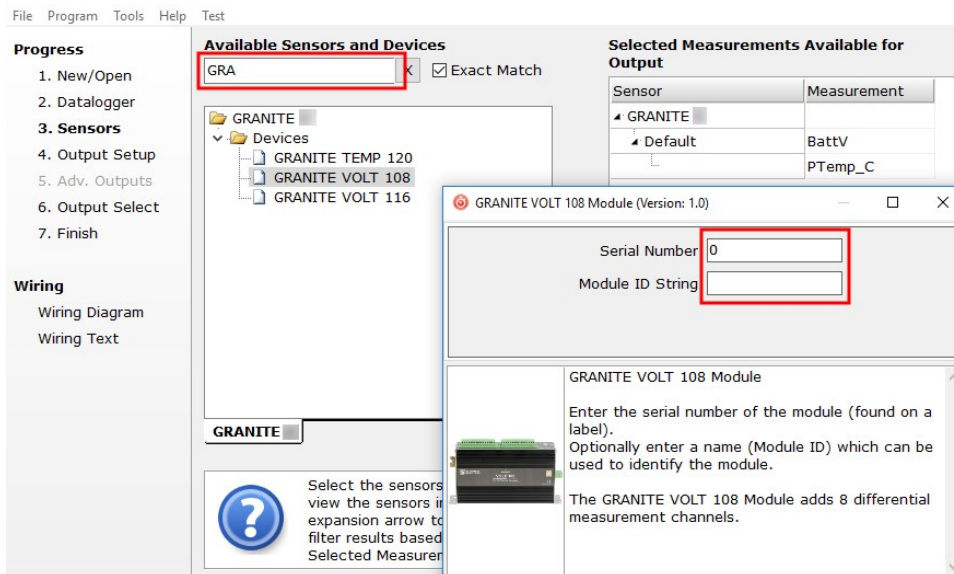
3. By default, the CRBasic program will be saved in C:\Users\username\Documents\SURVEYOR.

## 7. Programming quickstart using *Short Cut*

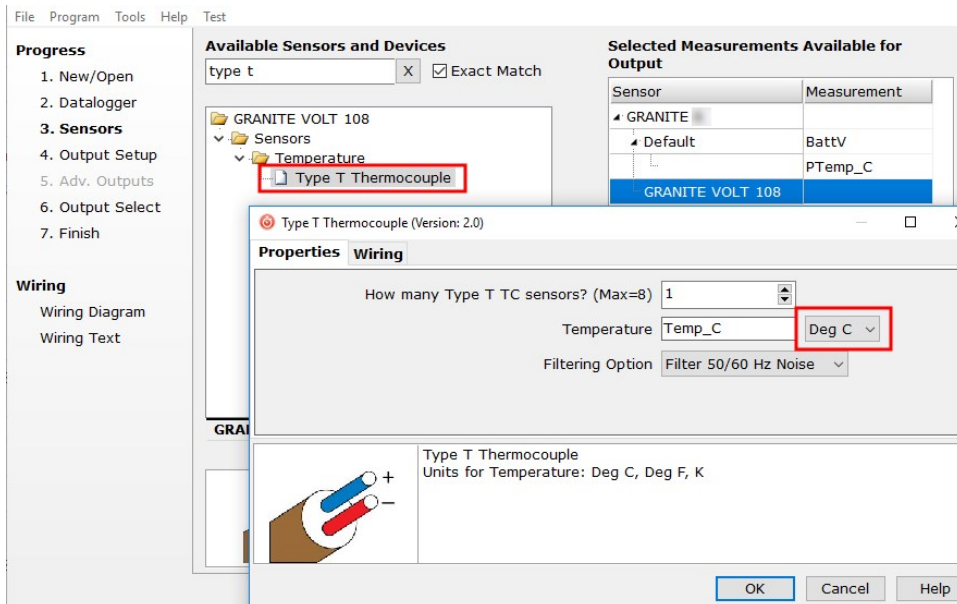
*Short Cut* is another easy way to program a Campbell Scientific data acquisition system to measure a sensor and assign wiring terminals. *Short Cut* is available as a download from [www.campbellsci.com/shortcut](http://www.campbellsci.com/shortcut). It is also included in installations of *LoggerNet*, *RTDAQ*, and *PC400*.

The following procedure shows using *Short Cut* to program the data logger to measure a type-T thermocouple on a VOLT 100 series.

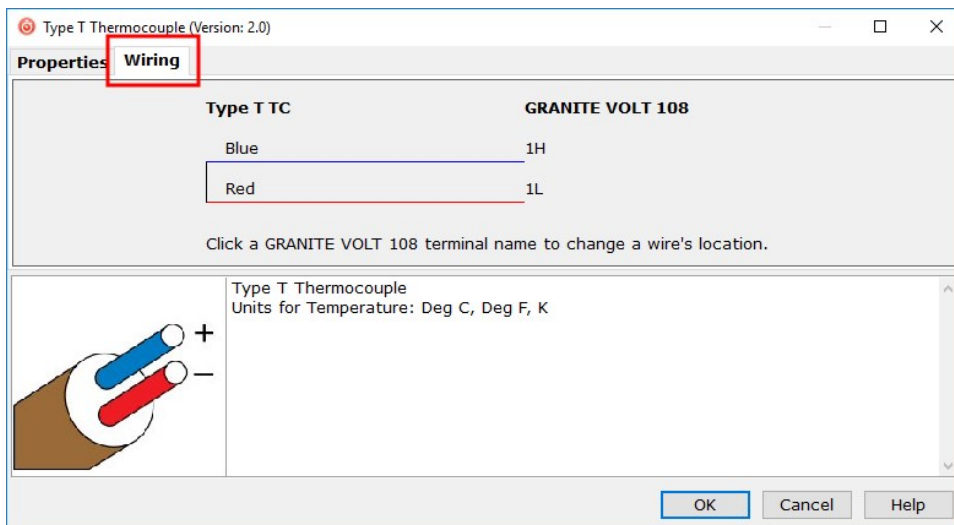
1. Open *Short Cut* and click **Create New Program**.
2. Double-click your data logger.
3. In the **Available Sensors and Devices** box, start typing GRANITE. You can also locate it in the **Devices** folder. Double click the GRANITE Measurement Module you are working with. Type the serial number located on the VOLT 100 series label. Optionally, type a name in the **Module ID String** if you want the module to have an ID. This is useful when multiple VOLT 100 series modules are connected to the data logger.



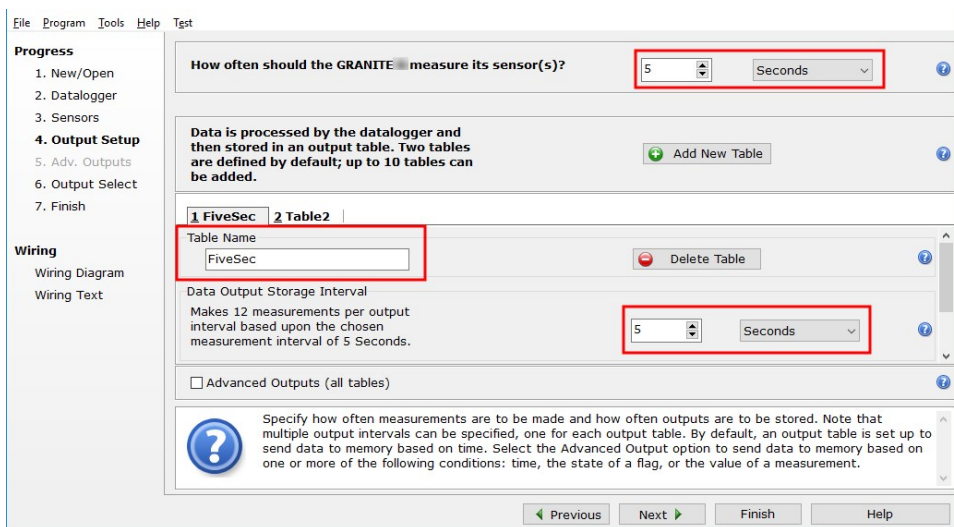
4. In the **Available Sensors and Devices** box, type Type T. You can also locate the thermocouple in the **Sensors > Temperature** folder. Double click **Type T Thermocouple**. Type the number of type T thermocouples connected to the VOLT 100 series. The temperature defaults to degree C. This can be changed by clicking the **Temperature** units box and selecting one of the other options.



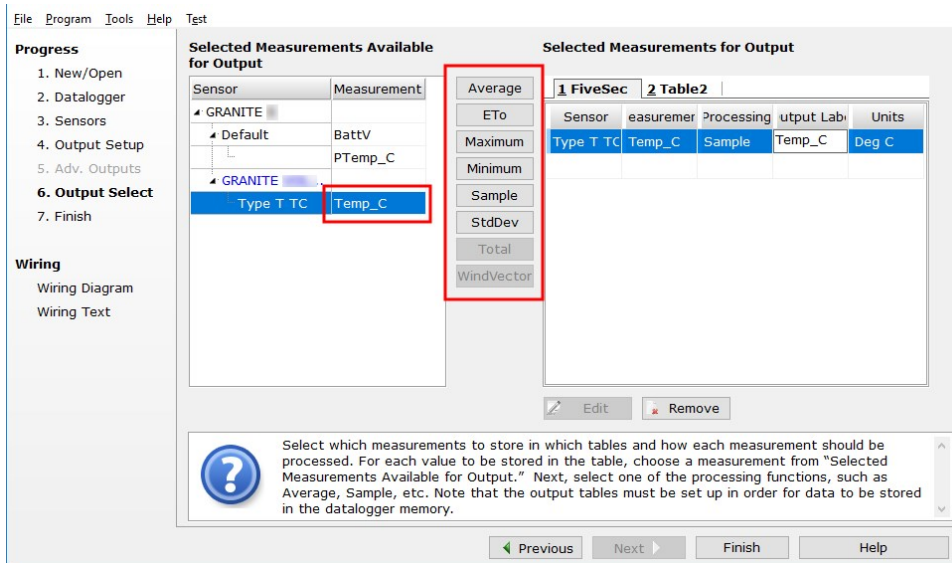
- Click on the **Wiring** tab to see how the sensor is to be wired to the VOLT 100 series. Click **OK** after wiring the thermocouple.



- Repeat steps four and five for other sensors you want to measure. Click **Next**.
- In **Output Setup**, type the scan rate, a meaningful table name, and the **Data Output Storage Interval**.



8. Select the measurement and its associated output option.



9. Click **Finish** and save the program. Send the program just created to the data logger if it is connected to the computer.
10. If the thermocouple is connected to the VOLT 100 series, check the output of the thermocouple in the data display of *LoggerNet*, *RTDAQ*, or *PC400* to make sure it is making reasonable measurements.



# 8. Sending a program to the data logger




## TIP:

It is good practice to always retrieve data from the data logger before sending a program; otherwise, data may be lost. See [Collecting data](#) (p. 18) for detailed instruction.

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 structures 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

Use the following instructions or watch the [Quickstart part 3 video](#) .

1. Connect the data logger to your computer.
  - **LoggerNet** users, select **Main** and **Connect**  on the **LoggerNet** toolbar, select the data logger from the **Stations** list, then **Connect** .
  - **RTDAQ** and **PC400** users, select the data logger from the list and click **Connect** .
2. **LoggerNet** users, click **Send New...** (located in the **Current Program** section on the right side of the window).  
**RTDAQ** and **PC400** users, click **Send Program...** (located in the **Datalogger Program** section on the right side of the window).
3. **RTDAQ** and **PC400** users, confirm that you would like to proceed and erase all data tables saved on the data logger. Click **Yes**.
4. Navigate to the program, select it, and click **Open**. For example: navigate to **C:\Campbellsci\SCWin** and select **MyTemperature.CRB**. Click **Open**.
5. **LoggerNet** users, confirm that you would like to proceed and erase all data tables saved on the data logger. Click **Yes**.
6. The program is sent and compiled.

7. Review the **Compile Results** window for errors, messages and warnings.

8. **LoggerNet** users, click **Details**, select the **Table Fill Times** tab.

**RTDAQ** and **PC400** user click **OK** then click **Station Status** ☒, select the **Table Fill Times** tab.

Ensure that the times shown are expected for your application. Click **OK**.

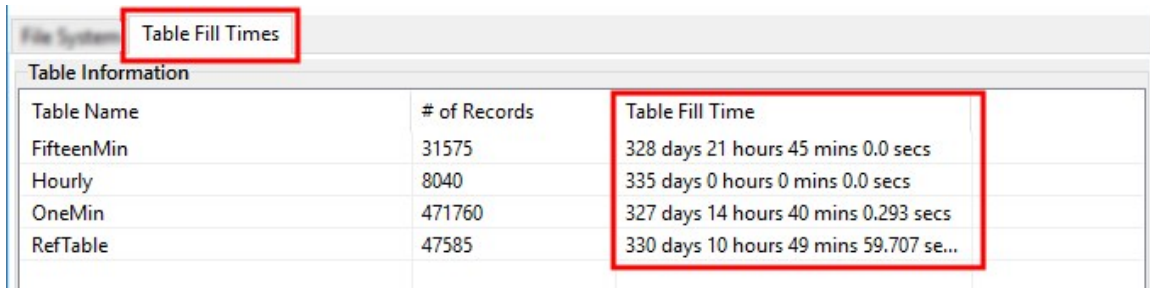


Table Fill Times		
Table Information		
Table Name	# of Records	Table Fill Time
FifteenMin	31575	328 days 21 hours 45 mins 0.0 secs
Hourly	8040	335 days 0 hours 0 mins 0.0 secs
OneMin	471760	327 days 14 hours 40 mins 0.293 secs
RefTable	47585	330 days 10 hours 49 mins 59.707 se...

After sending a program, it is a good idea to monitor the Public table to make sure sensors are taking good measurements. See [Working with data](#) (p. 17) for more information.

# 9. Working with data



## 9.1 Default data tables

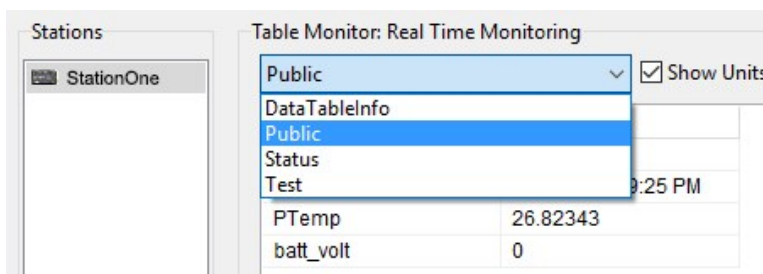
By default, the data logger includes three tables: **Public**, **Status**, and **DataTableInfo**. Each of these tables only contains the most recent measurements and information.



- The **Public** table is configured by the data logger program, and updated at the scan interval set within the data logger program. It shows measurement and calculation results as they are made.
- The **Status** table includes information about the health of the data logger 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.

For information on collecting your data, see [Collecting data](#) (p. 18).

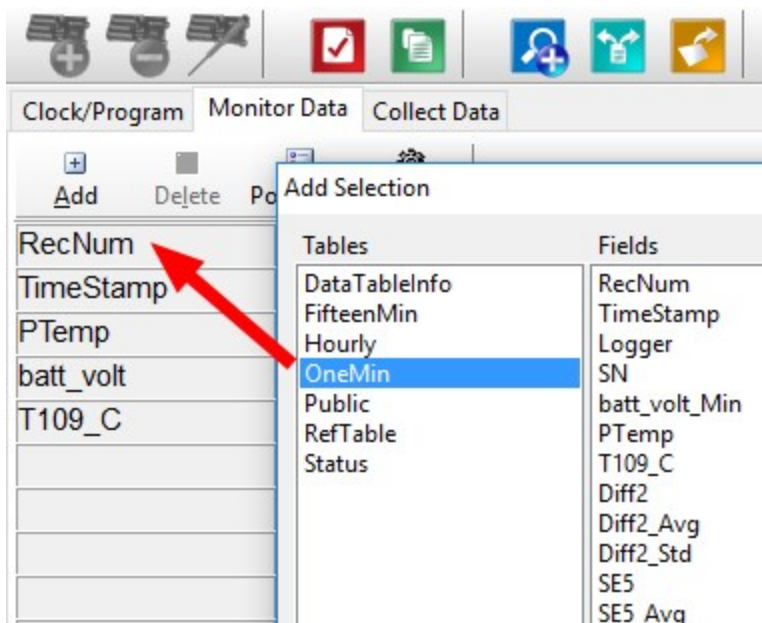
Use these instructions or follow the [Connect Window tutorial](#)  to monitor real-time data.

**LoggerNet** users, select the **Main** category and **Connect**  on the **LoggerNet** toolbar, then select the data logger from the **Stations** list, then click **Connect** . Once connected, select a table to view in the **Table Monitor**.




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




Additionally, **RTDAQ** has a **Start/Stop** button to start and stop monitoring data values. The name of this button changes based on its state.




## 9.2 Collecting data

The data logger writes to data tables based on intervals and conditions set in the CRBasic program. After the program has been running for enough time to generate data records, data may be collected by using data logger support software. During data collection, data is copied to the computer and still remains on the data logger. Collections may be done manually, or automatically through scheduled collections set in **LoggerNet Setup**. Use these instructions or follow the [Collect Data Tutorial](#) .


### 9.2.1 Collecting data using *LoggerNet*

1. From the **LoggerNet** toolbar, click **Main** and **Connect** , select the data logger from the **Stations** list, then **Connect** .
2. Click **Collect Now** .
3. After the data is collected, the **Data Collection Results** window displays the tables collected and where they are stored on the computer.
4. Select a data file, then **View File** to view the data. See [Viewing historic data](#) (p. 20)

## 9.2.2 Collecting data using *RTDAQ*



1. Click **Connect**  on the main *RTDAQ* window.
2. Go to the **Collect Data** tab.
3. Leave the default **Collection Options**:
  - **Collect Mode** should be **Data Since Last Collection**
  - **File Mode** should be **Append to End of File**.
  - **File Format** should be **ASCII Table Data (TOA5)**
4. Select the check boxes for tables in the **Table Collection** list to indicate which tables will be collected.
5. Click **Start Collection**.
6. After the data is collected, the **Data Collection Results** window displays the tables collected and where they are stored on the computer.
7. Select a data file, then **View File** to view the data. See [Viewing historic data](#) (p. 20)

## 9.2.3 Collecting data using *PC400*




1. Click **Connect**  on the main *PC400* window.
2. Go to the **Collect Data** tab.
3. By default, all output tables set up in the data logger program are selected for collection. Typically, the default tables (DataTableInfo, Public, and Status) are not collected.
4. Select an option for **What to Collect**. Either option creates a new file if one does not already exist.
  - **New data from data logger (Append to data files)**: This is the default, and most often used option. Collect only the data, in the selected tables, stored since the last data collection from this instance of *PC400* and append this data to the end of the existing files on the computer.
  - **All data from data logger (Overwrite data files)**: Collects all of the data in the selected tables and overwrites (or replaces) the existing data files on the computer.
5. Click **Start Data Collection**.

6. After the data is collected, the **Data Collection Results** window displays the tables collected and where they are stored on the computer.
7. Select a data file, then **View File** to view the data. See [Viewing historic data](#) (p. 20)

## 9.3 Viewing historic data

View Pro  contains tools for reviewing data in tabular form as well as several graphical layouts for visualization. Use these instructions or follow the [View Data Tutorial](#) .

Once the data logger has had enough time to store multiple records collect and review the data.

1. To view the most recent data, connect the data logger to your computer and collect your data (see [Collecting data](#) (p. 18) for more information).
2. Open View Pro:
  - **LoggerNet** users click **Data** then **View Pro**  on the **LoggerNet** toolbar.
  - **RTDAQ** and **PC400** users click **View Data Files via View Pro** .
3. Click **Open** , navigate to the directory where you saved your tables (the default directory is C:\Campbellsci\[your data logger software application]). For example: navigate to the C:\Campbellsci\LoggerNet folder and select **OneMin.dat**.
4. Click **Open**.

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