

Temperature Monitoring Posts



Temperature Monitoring Posts

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Introduction

Basic Information

The TMP (Temperature Monitoring Posts) have 3 temperature sensors. When properly buried, these sensors should measure:

- 1) Air temperature @ 1 meter above ground.
- 2) Crown temperature (same as Winter Wheat seeding depth).
- 3) Soil temperature @ 10 inches below the surface.

The TMP require a power supply from 10-20 volts. It is important that a solid and stable connection is made to the power source. If power is lost to the device for any period of time data collection of temperatures will stop until restarted using a laptop and the installed software. If you need to change the power source please retrieve data from the post before restarting data collection.

The TMP are sealed with silicone at the caps, at each sensor, and at the power and USB cables. If you suspect that any of these seals have been broken, immediately patch them. There is sensitive electrical equipment inside that will be damaged by moisture

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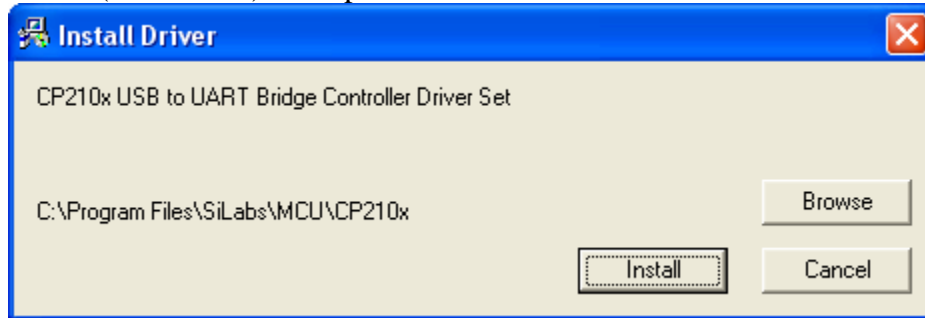
Setting up a laptop for use with Temperature Monitoring Posts

Getting Started

- Run TMP_Setup.exe . If you do not have this file, it can be downloaded from http://cropadaptationgenomics.ca/resources/TMP_Setup.exe .
- The setup will start, continue through it by clicking on the buttons labelled *Next>* or *Install*

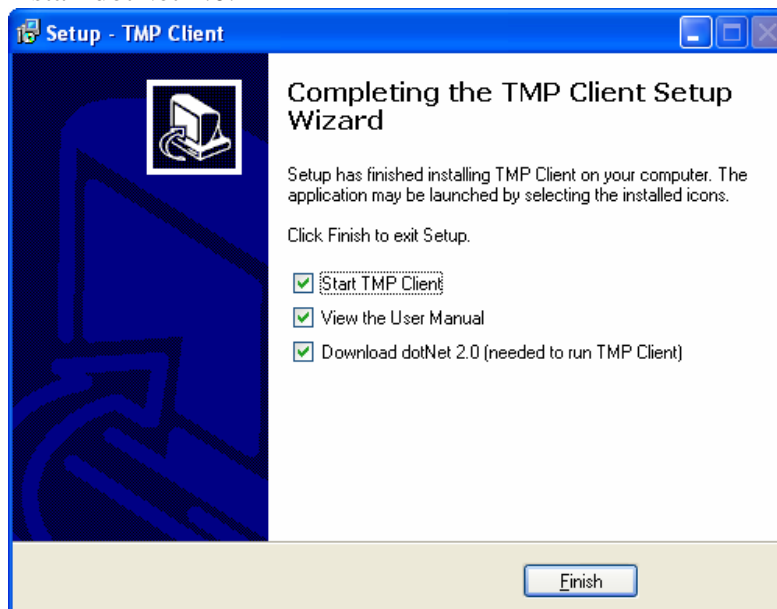
Install Driver

- After installation of the TMP Client is complete, the setup will begin installation of the drivers for the TMP. A window (seen below) will open. Press *Install*.



Finishing Installation

- After the TMP Driver has been installed, you will be given the option to view this user manual. Please read the entire manual before continuing with connecting the TMP to your computer.
- TMP Client requires the dotNet 2.0 framework to run. Your computer may already have this installed, but if it does not, you can check the box beside *Download dotNet 2.0* . Checking this box will take you to the Microsoft website where you can download dotNet 2.0, <http://www.microsoft.com/downloads/details.aspx?FamilyID=0856EACB-4362-4B0D-8EDD-AAB15C5E04F5&displaylang=en> . If you get an error while trying to start TMP Client it is likely that you need to install dotNet 2.0.



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Powering the TMP

It is suggested that you use an automotive battery to power the TMP. The brown and white twisted wires that are just above the crown temperature sensor are to be connected to a 12 volt supply. The white wire is to be connected to positive (+) and the brown wire should be connected to ground (-).

The battery should be kept off of the ground, either raised or simply on a plywood sheet. A cover should be put on top of the battery (perhaps an upside down 5 gallon pail) to keep it dry and keep animals from interfering with the wires.

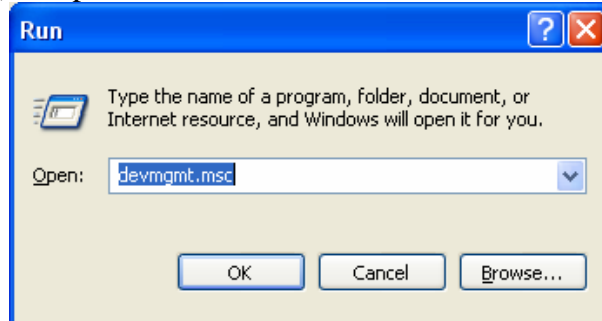
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Setting up connection to the Device

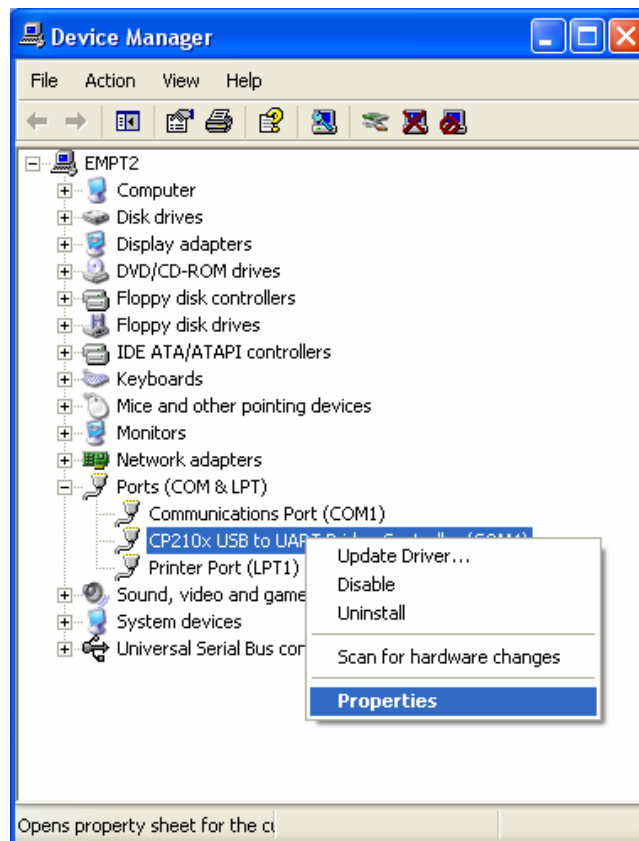
This section only needs to be done the first time you connect your TMP to your laptop.

After the driver has been installed, you can connect the TMP to your laptop. The first time you make the connection it may take a minute to finalize the selection. Usually, a balloon will appear in the bottom right corner of your screen saying “New Hardware is Ready”. At this point you may continue with setting up the TMP. Subsequent connections will not require this wait before continuing.

- Click on the *Start* menu and select *Run*. A new window will open. Type "devmgmt.msc" (without quotes) and press the *OK* button.

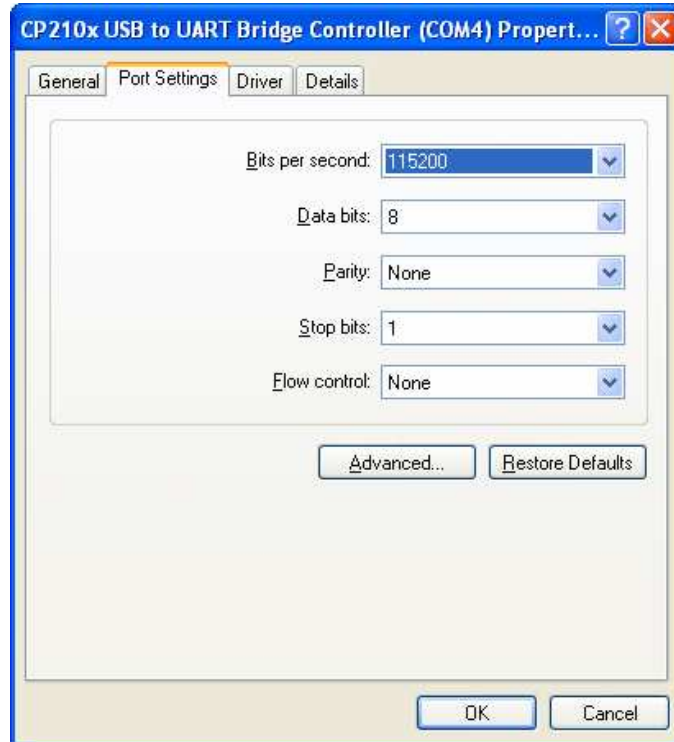


- A new window will open called “Device Manager”. Click on the “+” to the left of “Ports (COM & LPT)” to expand its contents. Right click on the entry called “CP210x USB TO UART Bridge Controller (####)” and choose *Properties*. Please take note of the text that is in the place of “####” on your computer, for example “COM4”. This will need to be known later.



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- A new window will open to change the settings for your connection to the TMP. Click on the *Port Settings* tab at the top of the window and change each of the dropdown boxes to the same as the figure below. It is likely that only the *Bits per second* box will need to be changed. When you have completed the changes press *OK*. Now close the *Device Manager* window.



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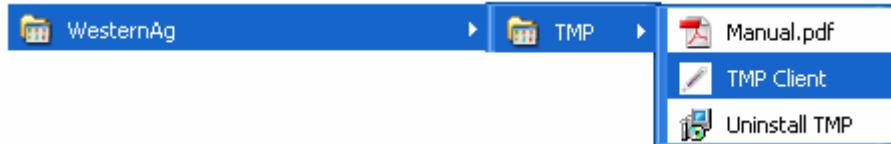
Interacting with the TMP

Starting the TMP Application

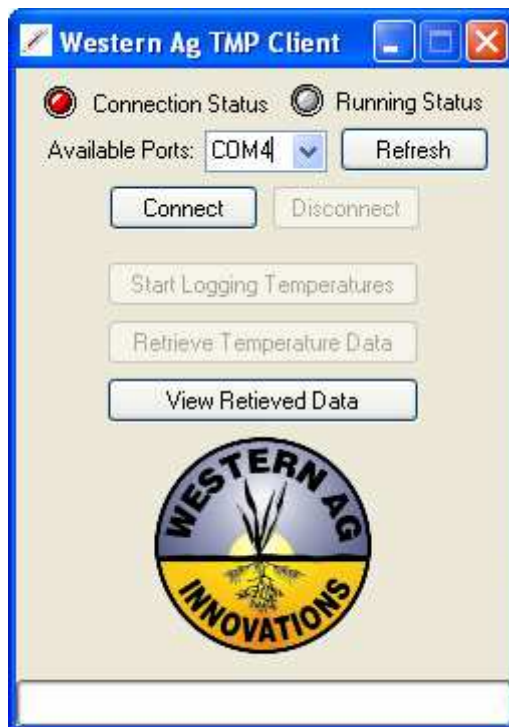
Once you have installed the driver, support files and the application, and have modified the settings for your connection and have provided a stable power source to the TMP you must initialize it before it will begin to log temperature data.

Ensure that the TMP's USB cable is connected to your laptop **BEFORE** you start the application.

To start the TMP Application, go to your Start Menu and choose the *TMP Application* entry in the *Temperature Monitoring Post* menu group.



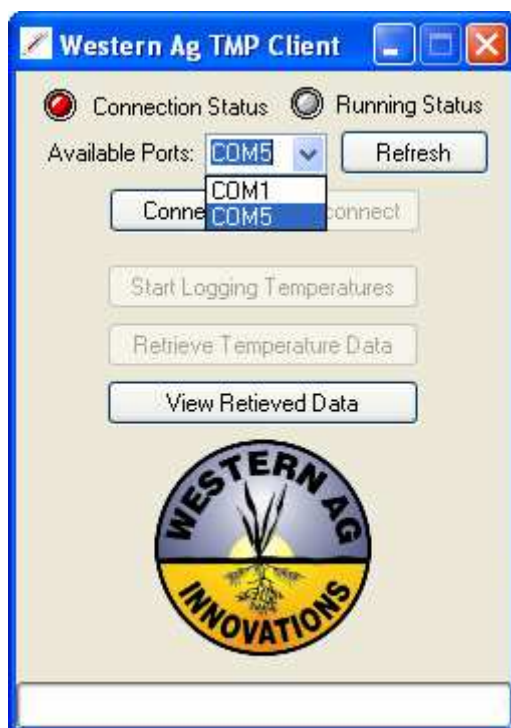
A window shown in the figure below will open.



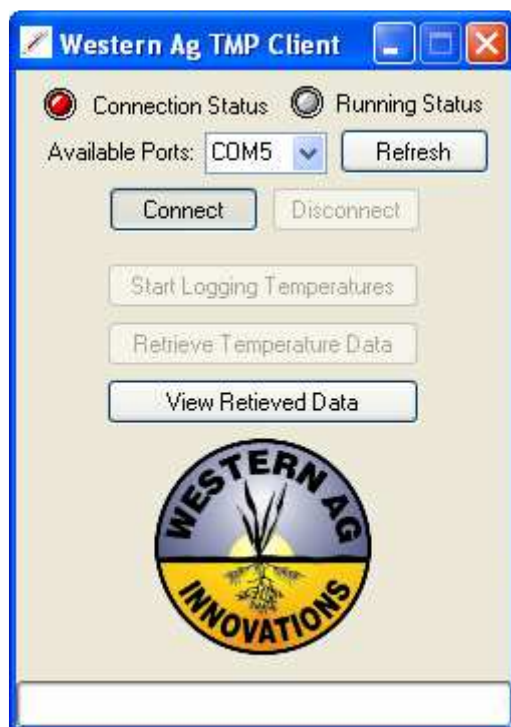
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Connect to the TMP

- Select the port that your TMP is connected to. This will be the value which was noted in the “Connecting to the Device” section above.

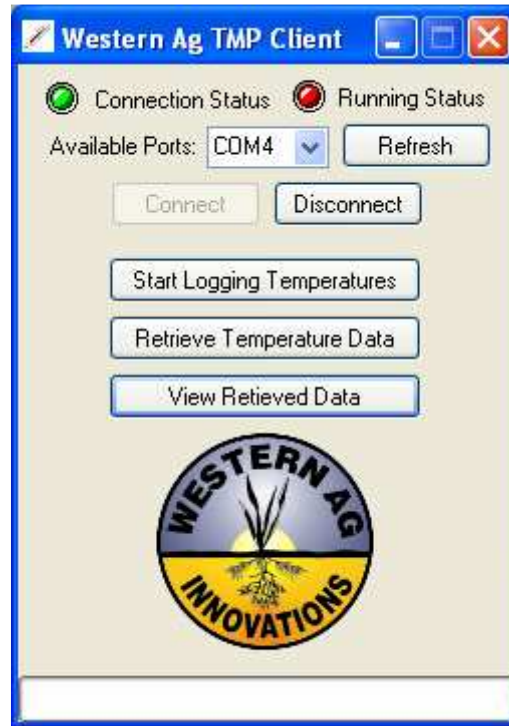


- After choosing a port, press *Connect*.



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- If you are connected properly to the TMP, the status light beside *Connection Status* will turn green. The *Running Status* light will be red if the TMP has not been started, or green if the TMP was started when it was previously connected to.



Initialization

Initialization prepares a “log” in the TMP. Part of this process involves copying the date and time from your computer to the TMP. This helps ensure that accurately timed temperature change records can be kept. **Note:** Please be sure that the time and date on your computer are accurate when you perform initialization.

Initialization must be performed each time there is a power disruption to the TMP. Temperature logging will **ONLY** begin after you have initialized the TMP.

- You may now initialize the TMP and start temperature collection. If the *Running* light is green then the application has already been initialized. If the light is red (figure a), you can initialize it by pressing the *Start Logging Temperatures* button.
- The *Running* light will turn yellow (figure b) for a few seconds while the data log is being prepared on the TMP. When it is complete, the light will turn green (figure c) and you can continue.

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figure a.



figure b.

Temperature Monitoring Posts



figure c.

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Retrieve Temperature Data

- Connect to the TMP using the steps found in “Connect to the TMP”.
- Press the *Retrieve Temperature Data* button to begin transfer of temperature data from the TMP to your laptop.
- The progress bar at the bottom of the window will display the transfer of data from the TMP to your computer.



- After the data is transferred to your computer you will be asked where you would like to save the data. A default file name is suggested which includes the TMP ID and the current date. The data will be save as a Comma Separated Values (*.csv) file that can be opened with MS Excel, Notepad, or most spreadsheet applications.



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Sending the Data

After retrieving the data from the TMP please attach the *.csv data file you just retrieved and send the email to scottg@empowertools.ca .

Viewing the Data

You can review it by pressing the *View Data* button. This will open an Excel template that allows you to import temperature data from the Comma Separated Value files that you retrieve from the TMP. Please see below for further instructions on its use.

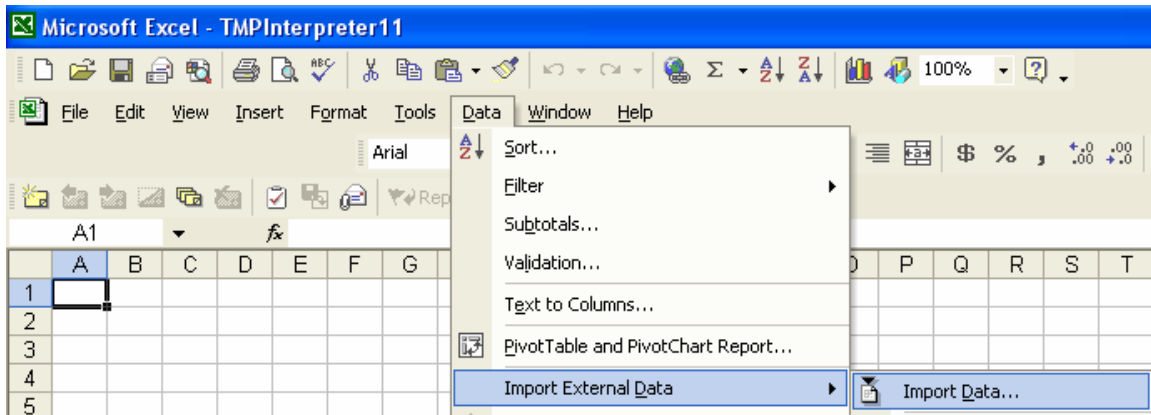
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View Interpreted Log Results

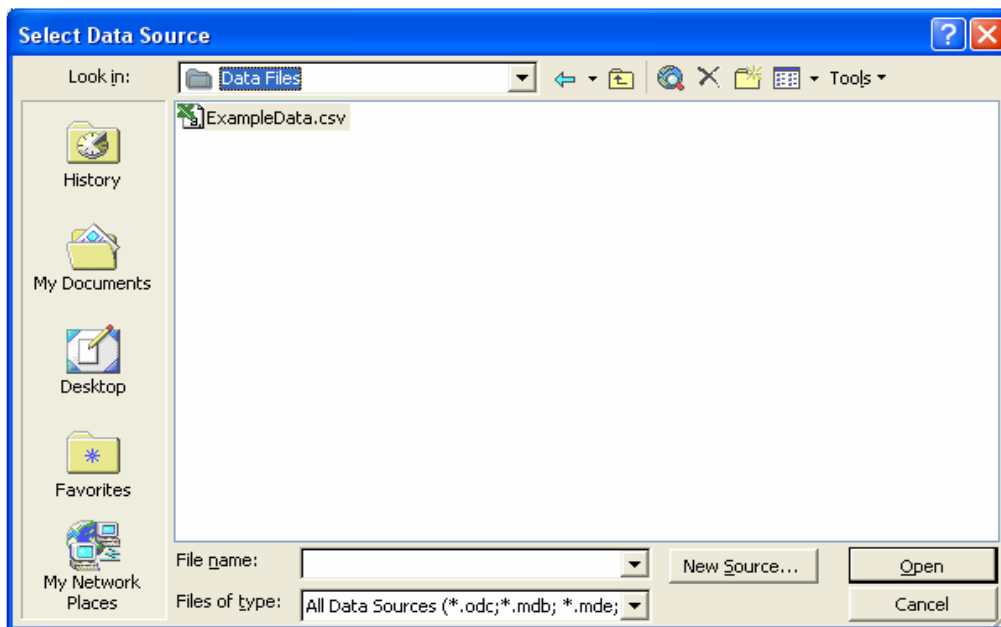
NOTE - Microsoft Excel must be installed on your machine in order to use the Log Interpreter.

Importing the Log into Excel Template

1. Either start the Log Interpreter by using the *View Data* button in the Temperature Monitoring Posts Application or by clicking *Start > All Programs > Temperature Monitoring Post > Log Interpreter*. This opens an Excel worksheet.
2. Next in the menu bar click *Data > Import External Data > Import Data...*. This opens the **Select Data Source** dialog.

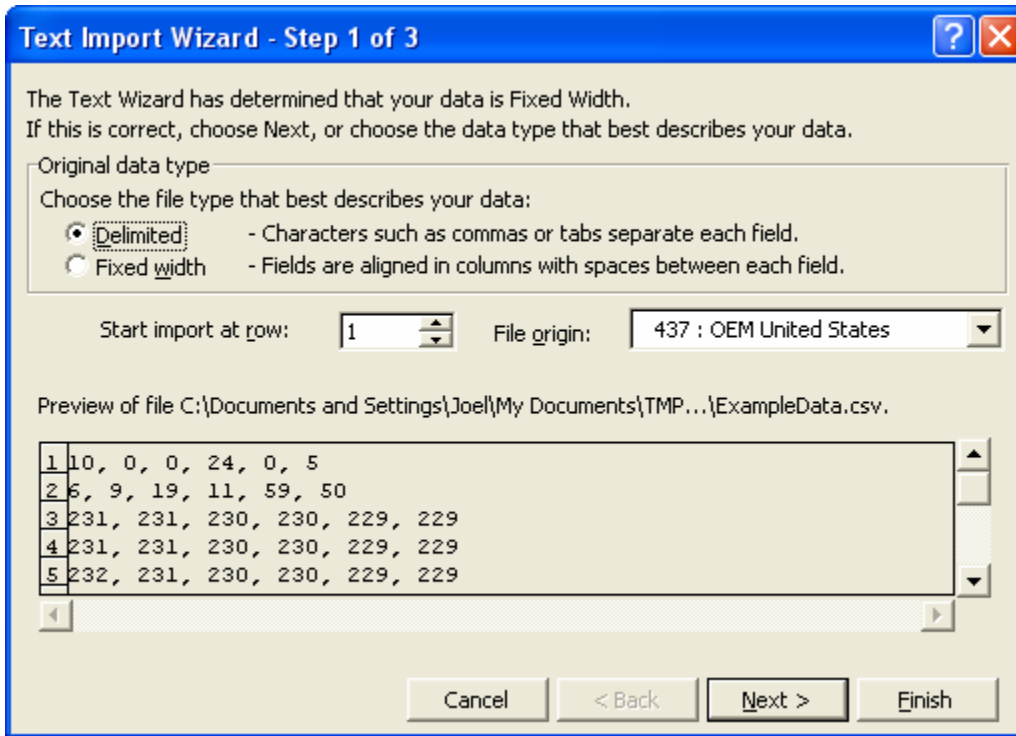


3. Select the Log File that you want to interpret and click *Open* (Default location is: C:\Program Files\Temperature Monitoring Post\Data Files). This will start a **Text Import Wizard**.

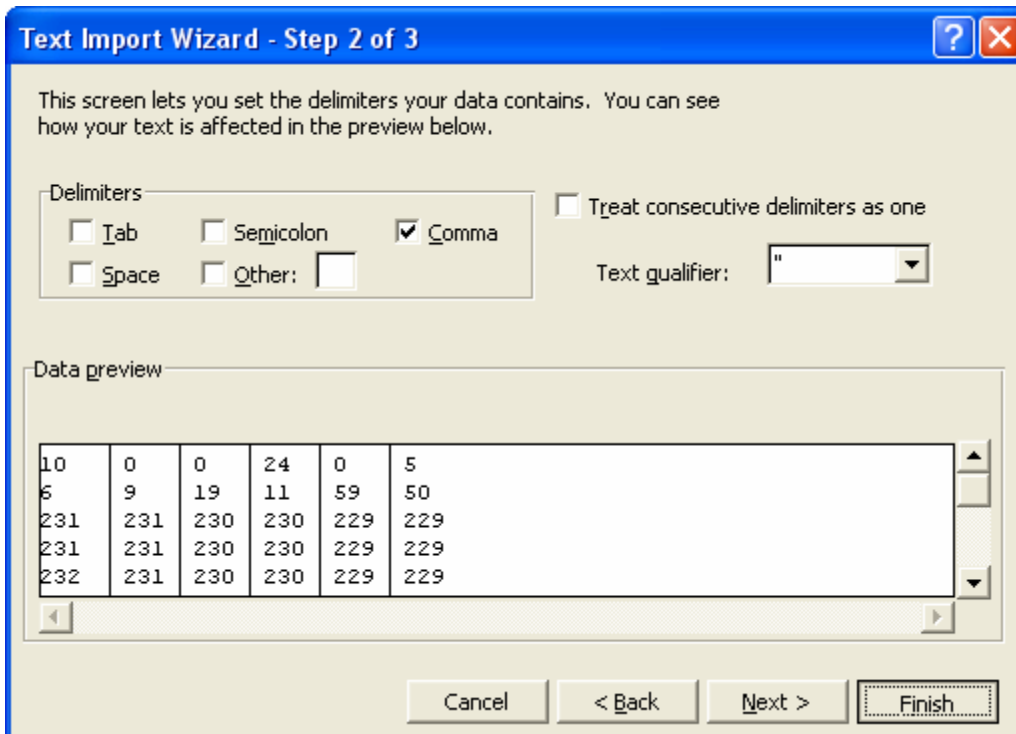


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- Step 1 in the Wizard: select the *Delimited* radio button and click *Next >*

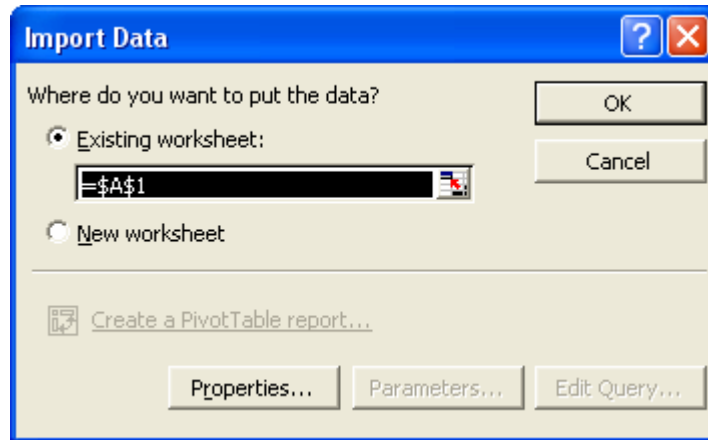


- Step 2 in the Wizard: select *Comma* check box and click *Finish*



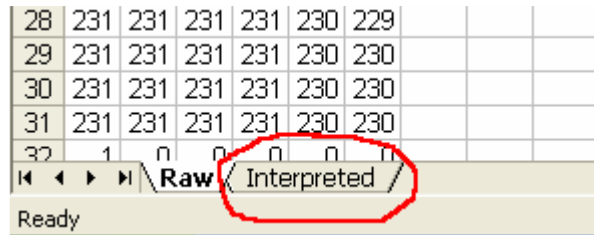
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- Make sure that the *Existing worksheet* radio button is selected, and the edit box has ‘=\$A\$1’ in it. Then click *OK*.



Reading the Temperatures

- Change from the *Raw* Excel worksheet to the *Interpreted* worksheet by clicking the tab at the bottom of the Excel window.



- The *Interpreted* spreadsheet has four main columns: The Ground, Crown, and Air Temperatures as well as the Date.

1	Date	Ground Temp in °C			Crown Temp in °C			Air Temp in °C		
2		max	average	min	max	average	min	max	average	min
3	September 19, 2006	22.1	22.1	22.1	21.2	21.2	21.2	20.2	20.2	20.2
4	September 20, 2006	22.1	22.1	22.1	21.2	21.2	21.2	20.2	20.2	20.2
5	September 21, 2006	23.1	22.6	22.1	21.2	21.2	21.2	20.2	20.2	20.2
6	September 22, 2006	23.1	22.6	22.1	21.2	21.2	21.2	20.2	20.2	20.2

- For each Date, there is a maximum, an average and a minimum temperature for each of the three sensors.
- There will only be valid temperature data for the dates prior to the day that the log was downloaded from the Temperature Monitoring Post.
- The beginning of invalid data should look as follows:

31	October 17, 2006	22.1	22.1	22.1	22.1	22.1	22.1	21.2	21.2	21.2
32	October 18, 2006	-84.6	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
33	October 19, 2006	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!