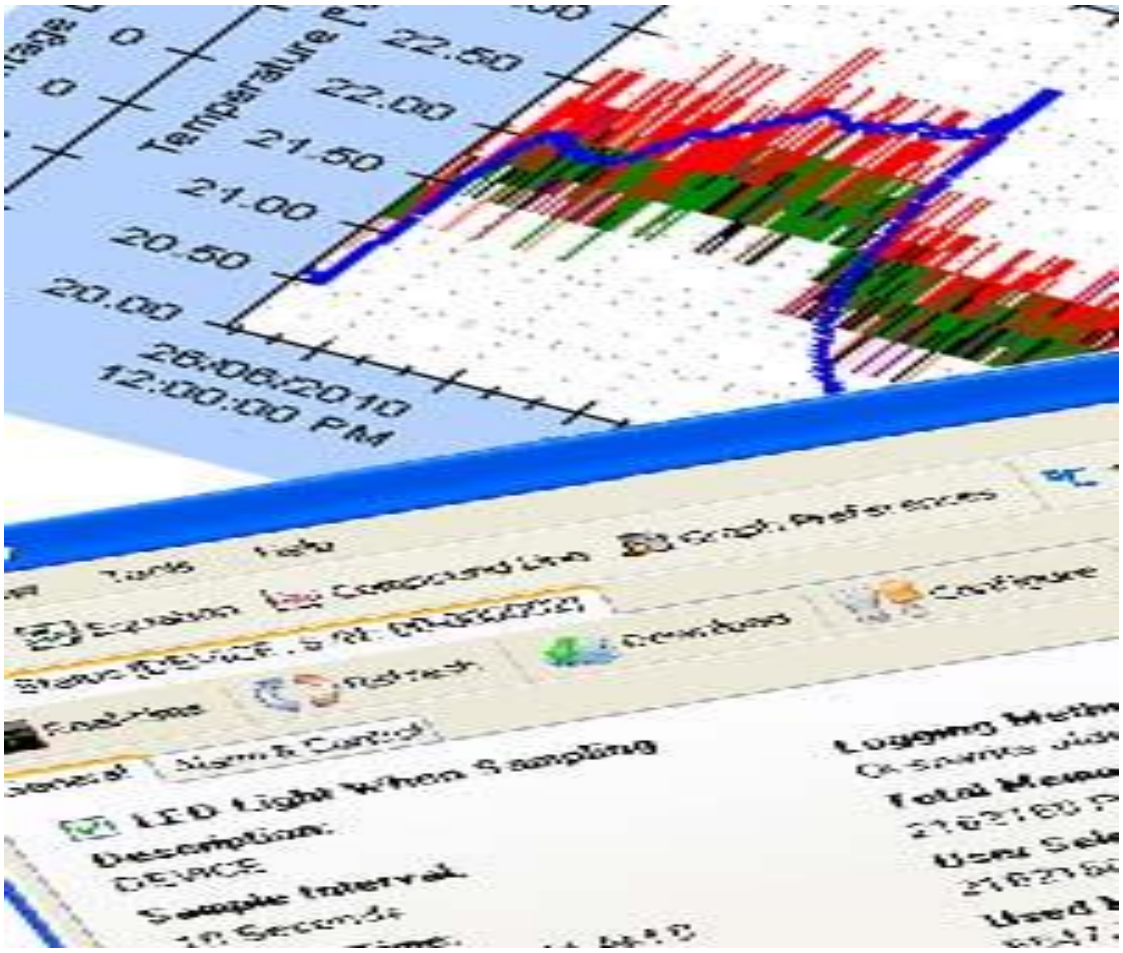
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SiteView

Site-Log Data Logger Software



User's Manual

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ABOUT THIS MANUAL

This manual contains operational information for SiteView software.

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Revision 3.0 For SiteView 4, May, 2018

Table of Contents

ABOUT THIS MANUAL 1

LIMITS OF LIABILITY AND DISCLAIMER OF WARRANTY: 1
COPYRIGHT AND TRADEMARKS 1
END USER LICENSE AGREEMENT 1
FEATURES 6
SYSTEM REQUIREMENTS 6

CHAPTER 1 - INSTALL SITEVIEW 7

INSTALL SITEVIEW 7
CONNECT DATA LOGGER 12
ACTIVATE SITEVIEW 15

CHAPTER 2 – PROTECT YOUR LOGGER 17

TYPES OF USER ACCOUNT AND PRIVILEGE 17
CREATE ACCOUNTS 17

CHAPTER 3 - COMMUNICATE WITH LOGGER 21

USB PORT CONNECTION 21
Start Communication 21
USB DEVICE SERVER CONNECTION 22
Communicate With Site USB Device Server or PRECISE-LOG Logger: 23
Start Communication 24
Adjust Ethernet Settings 27
SERIAL PORT CONNECTION 27
Start Communication 27

CHAPTER 4 - VIEW STATUS OF LOGGER 29

WHAT IS THE STATUS OF LOGGER 29
GENERAL STATUS 30
ALARM AND EXCITATION STATUS 30
KNOW IF LOGGER OPERATE PROPERLY? 31

CHAPTER 5 - DOWNLOAD LOGGER DATA 32

CHOOSE FILENAME AND TIME SPAN 32

CHAPTER 6 - CONFIGURE LOGGER 34

CLOCK OF DATA LOGGER 35
DECIDE WHEN TO START AND WHEN TO STOP LOGGING 35
DECIDE HOW OFTEN THE LOGGER SAMPLES SOURCES 36
DECIDE WHICH CHANNELS TO LOG ON 36
DECIDE HOW TO CONVERT TO PHYSICAL MEASUREMENT 37
Role of Equation 37
Decide What Equation to Use 37
MANAGE ALARM AND EXCITATION CONTROL 38
Configure Channel Alarms 38

Decide what to do when in Alarm State *38*
Configure Excitation Control *38*
QUICK WAY TO CALIBRATE LOGGER 39
Understand Cali. Low & Cali. High *39*
Calibrate Channel *40*
SAVE SETTINGS AND START NEW SESSION 40

CHAPTER 7 - REAL-TIME CHART VIEWING/RECORDING 41

DISPLAY REAL-TIME DIALOG 41
SAVE REAL-TIME DATA 42
CHANGE VIEWS PROPERTIES 42

CHAPTER 8 - CALIBRATE LOGGER 44

On-Line Calibrate *44*
Off-Line Calibrate *49*

CHAPTER 9 - WORK WITH EQUATIONS 51

WHAT IS EQUATION 51
BUILT-IN EQUATIONS 51
Equations for Temperature Channels *51*
Equations for Relative Humidity Channel *52*
Equaitons for Voltage Channels *52*
Equations for Current Channels *52*
Equations for Pulse/State/Event Channels *52*
TEMPERATURE EQUATION FOR THERMISTOR 52
CUSTOM EQUATION 54
CREATE EQUATION 55
IMPORT/EXPORT EQUATIONS 57
APPLY EQUATION TO LOGGER 60
CREATE CUSTOM-LINE EQUATION 60
ADD CUSTOM-LINE EQUATION TO PLOT 61
CALL/INVOKE OTHER CUSTOM EQUATIONS 62

CHAPTER 10 - WORK WITH UNITS 64

WHAT IS UNIT 64
OPEN UNIT CATEGORY DIALOG 65
CREATE UNIT 66
IMPORT/EXPORT UNITS 67
USE UNIT 70
Apply Unit Category in Equation *70*
Change Unit *70*
Change Unit in Plot *71*

CHAPTER 11 - WORK WITH SETTINGS & PREFERENCES 72

GRAPH PREFERENCES 72
SAVING SITEVIEW FILE (SVF) 73
SVF FILENAME STRUCTURE 73

LOOK AND FEEL (SKIN) 74
REAL-TIME SETTINGS 74
CHAPTER 12 - WORK WITH SCHEDULE DOWNLOAD 75
ADD SCHEDULE DOWNLOAD 75
MANAGE SCHEDULE DOWNLOAD 78
CHAPTER 13 – UPGRADE SITEVIEW AND FIRMARE 80
UPGRADE SITEVIEW 80
UPGRADE FIRMWARE 80
CHAPTER 14 - WORK WITH PLOT 82
BASIC VIEWS 83
Plot View 83
Tabular View 84
Statistics 84
ADD MORE SITEVIEW FILES 85
EXPORT 85
Save As Image File 85
Save as CSV File 86
Save as CSV File 86
CHANGE LOOK AND FEEL 86
Change Graph Pane Settings: 86
Save as CSV File 86
EDIT THE GRAPH 86
Add Annotation: 87
Add Comment: 87
Change Title: 87
Change Legend: 87
PRINT PLOT 88
CHANGE PLOT SETTINGS 88
Change Axis Settings 88
Change Line/Curve Settings 88
ZOOM PLOT 89
Zoom-In 89
Zoom Previous/Unzoom All 91
Zoom First 91
Zoom Next 91
Zoom Last 92
Navigate / Time-Zoom 92
ADD CUSTOM LINES 92
OTHER FEATURES OF PLOT 93
Apply Changes to Graph 93
Save Changes to SVF File 93
Copy Graph to Clipboard 94
Show Value 94
View Mouse-Point Values 94

Fast Draw Mode *94*

CHAPTER 15 - EQUATION REFERENCES 96

C# LANGUAGE SOURCE CODE REFERENCES 96
Basic data types *96*
Basic Operators *96*
Basic Math Methods *100*
ACCESSIBLE OBJECTS 101
EQUATION EXAMPLES 102
Dew Point Temperature *102*
Carbon Dioxide Transmitter (0 – 5000 PPM) *102*
External Thermistor *103*
Previous Hour Average *103*

Congratulations on using SiteView - the complete software package working closely with Site-Log and VersaLog series data loggers for device configuration, data downloading, plotting and analyzing.

Features

- Supports Serial Port, USB, Ethernet and Modem connections for easy local and remote access of data loggers.
- Allows downloading multiple data loggers simultaneously.
- Provides powerful custom equation functionality solving scientific and laboratory algorithm difficulties.
- Displays both tabular data and plot view. Zooming function provides detailed view of specific data section.
- Annotation/Comment highlights the important data points and sections.
- Custom channel and custom line allow adding more channels to the logger and plot lines to the plot view.
- Allows real-time chart and list views of the data logger, replacing paper chart recorder.
- Receives alarm notifications from data logger and takes actions like sending email, playing music etc.
- Access remote data loggers via LAN/Internet as if they were connected directly to the local computer.
- User Account Control to protect data loggers and important settings.

System Requirements

Computer:

CPU: 1.0 GHZ or above
Memory: 256M or above
Port: 1 USB port or 1 COM port
Hard Drive: 1GB or above

Operating System:

Window XP with SP2 or later, Windows Vista, Windows 7, 8

CHAPTER 1 - INSTALL SITEVIEW

NOTE: Before the installation, please make sure the product key is available.

Install SiteView

1. Configure for Windows 8 User:

   Please skip this section if your operating system is NOT Windows 8!

   For Windows 8 user, in order to install the USB Driver properly, the following steps must be followed before the installation of SiteView software:

   A. Mouse over the lower-right corner of the screen, then select Settings.
   B. Select Change PC Settings.
   C. Navigate to General and under Advanced Startup. Click Restart Now.
   D. Now Windows 8 will restart in the advanced menu options, click on Troubleshoot.
   E. Click on Advanced options.
   F. Click the Startup Settings option from the menu.
   G. The Startup Settings will allow you to change various Windows configuration options. Click Restart.

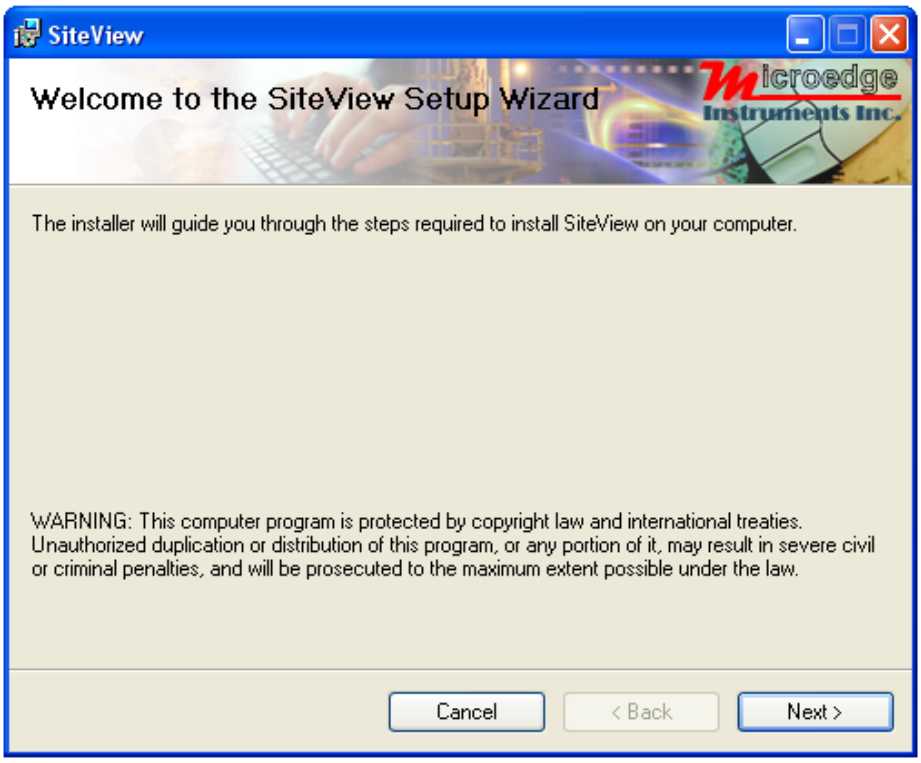
   H. Now Windows 8 will reboot. But instead of going to the Desktop it will start in the Startup Settings page. Choose option: 7) Disable driver signature enforcement by pressing F7 or the number 7. Then the windows will boot to the mode allowing the USB Driver to be installed.

   Windows 8 is now ready for SiteView installation.

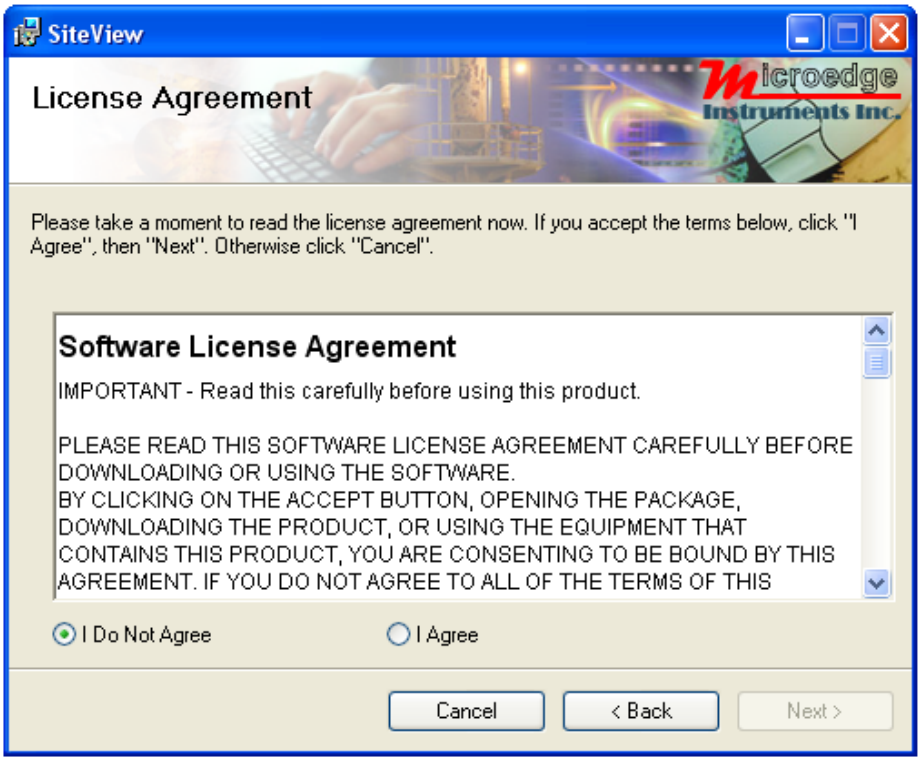
   For on-screen step by step configuration please visit:
   http://www.microedgeinstruments.com/Win8Configurations.pdf

2. Install SiteView and Data Logger USB Driver

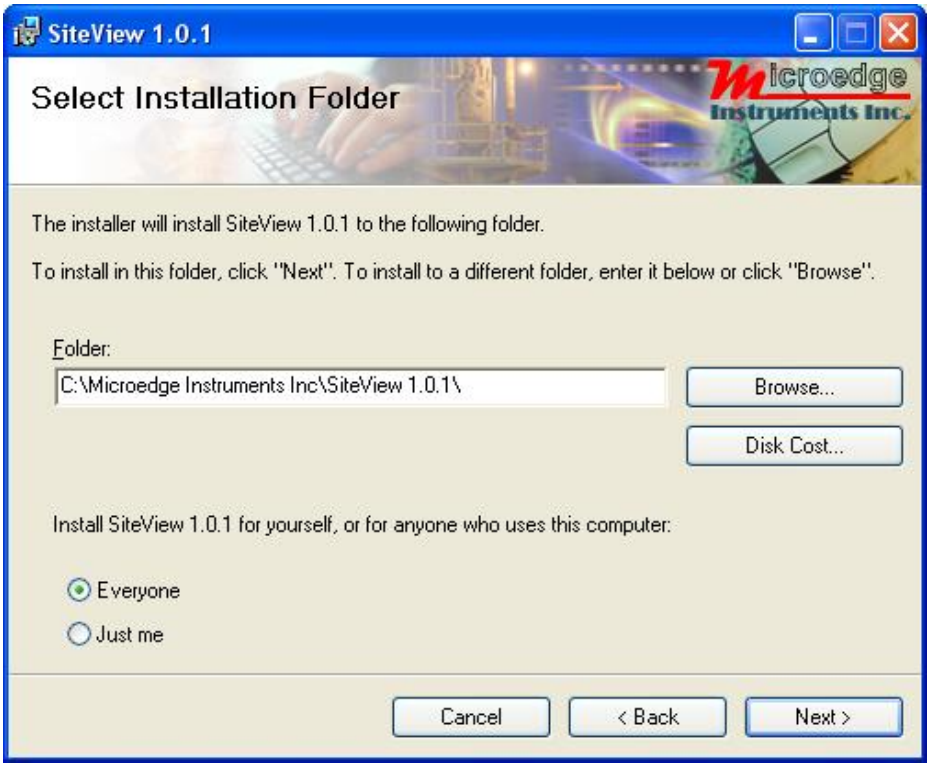
   Insert the included CD to the CD Drive. The installation should start to run automatically. Follow the on-screen instructions to complete the installation.



Click “Next >” button to proceed to the next page.

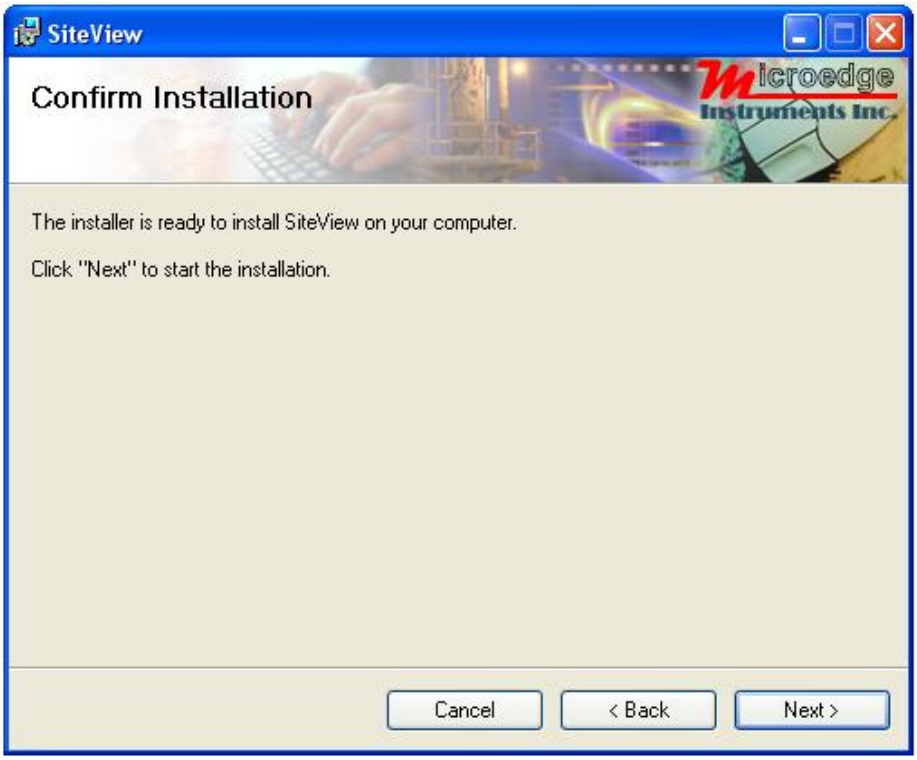


Please read the License Agreement carefully. If you accept the terms click “I Agree”, then click “Next >” button. Otherwise click “Cancel” to cancel the installation.

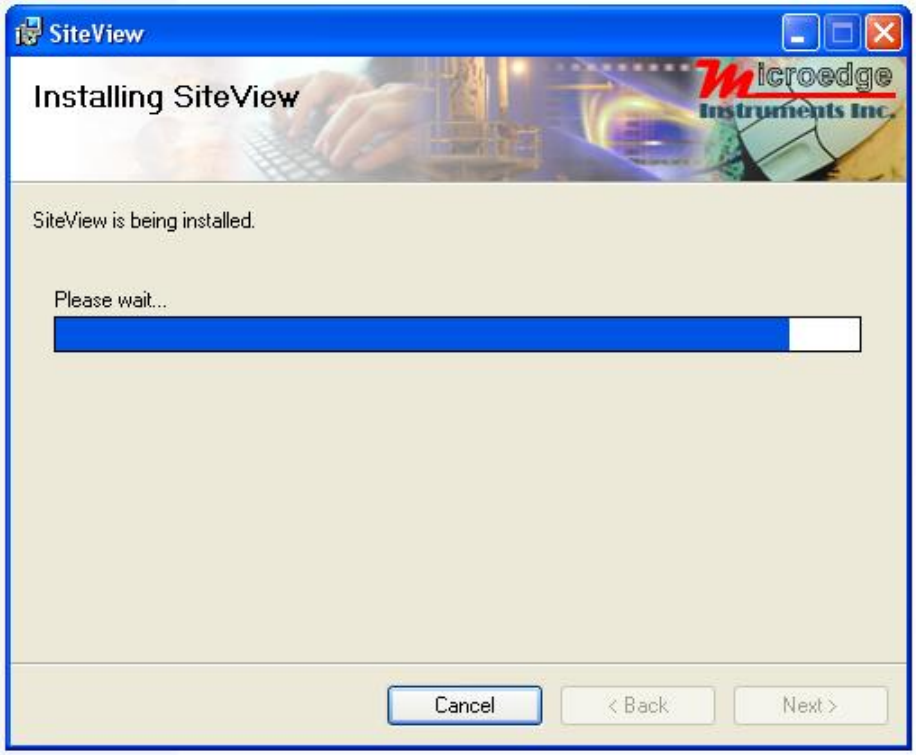


In this dialog select a destination folder where SiteView will be installed. We recommend you keep the default folder.

Once you are ready, click “Next >” button to proceed to the next page.

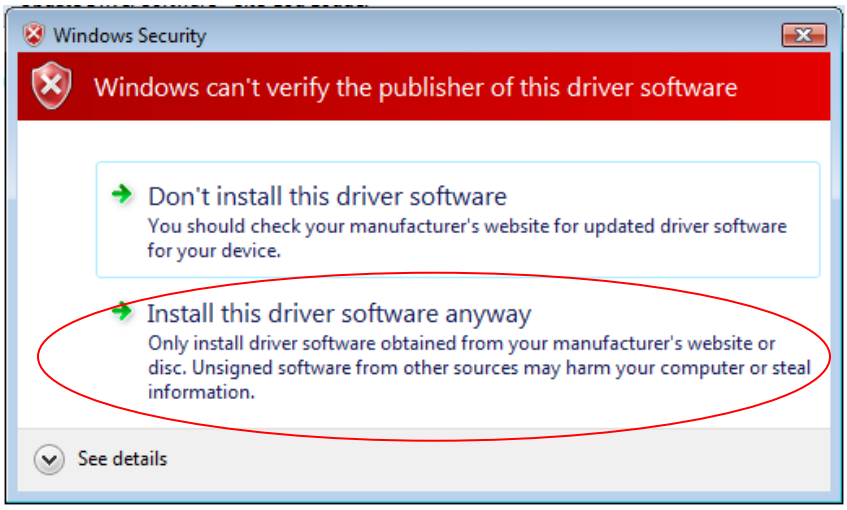


This confirmation page gives you the chance to modify previously selected options. Click “Next >” button to start the installation.

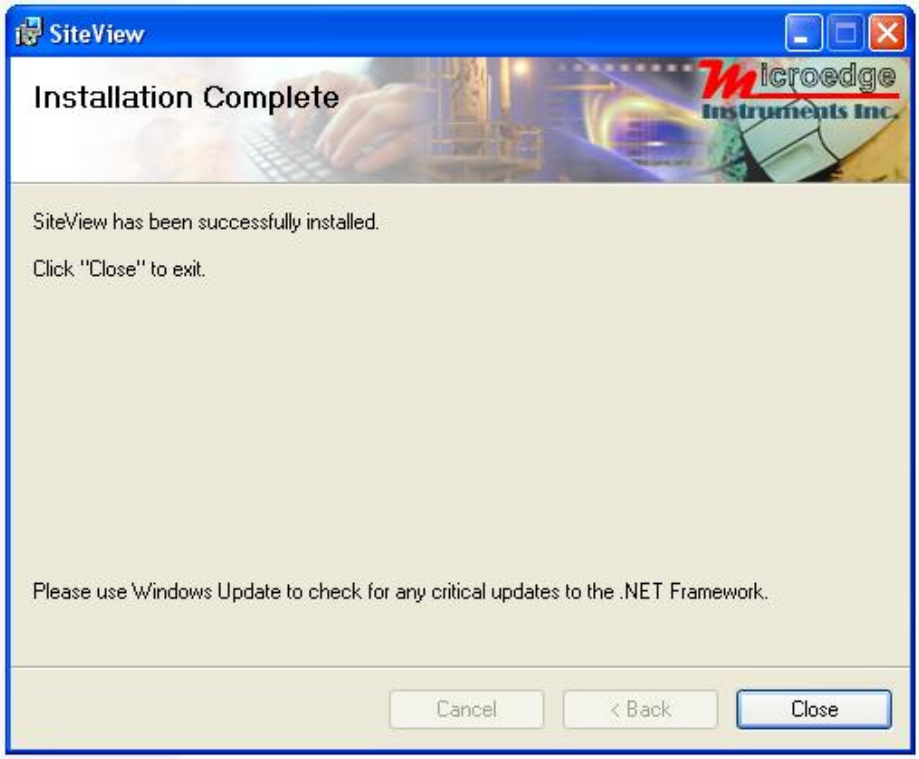


As SiteView is being installed the above dialog shows the installation progress by percentage.

Depending on the operating system, you may see the dialog similar to the one below displayed. Please select “Continue Anyway” or “Install this driver software anyway” to allow the software and the driver to be installed.



Once the installation is complete, the below dialog appears:



Click “Close” button to finish the installation and close the dialog.

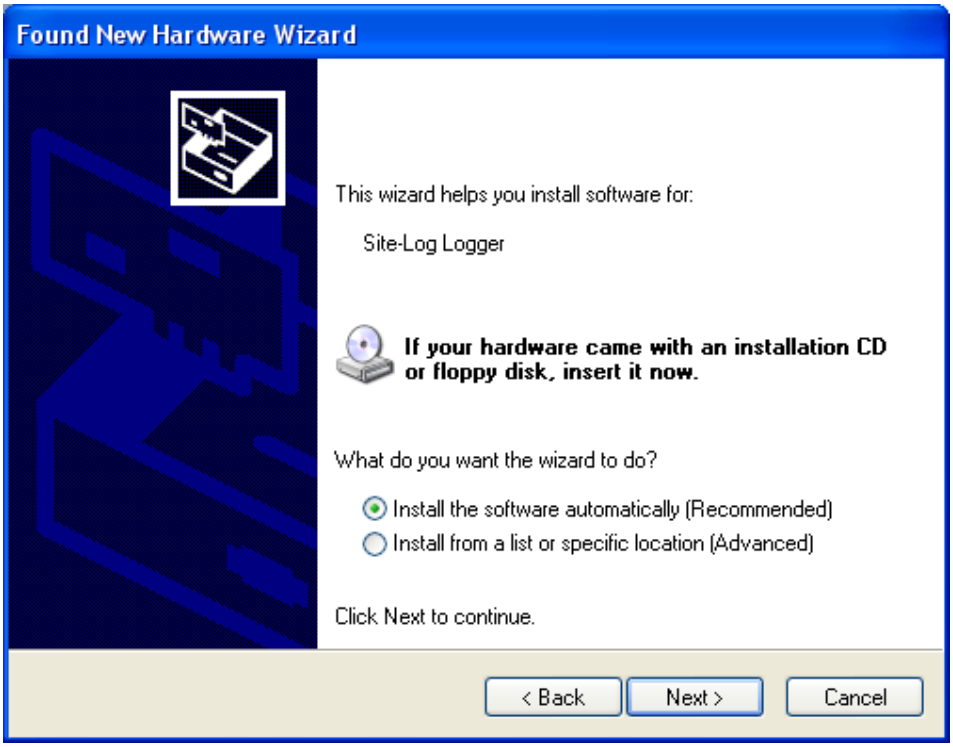
Connect Data Logger

Connect the logger to the computer's USB port. Windows Vista and Windows 7, 8 will automatically recognize the data logger.

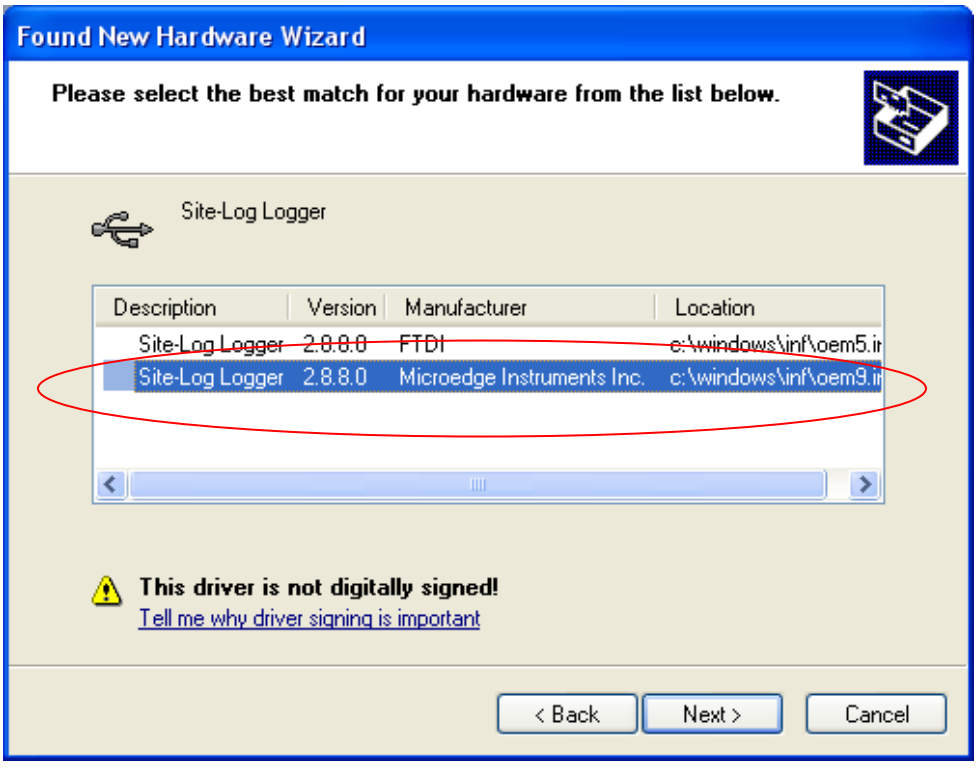
For Windows XP user, the following dialog window will appear:



Select "No, not this time" from options available and then Click "Next >" to proceed with the installation.

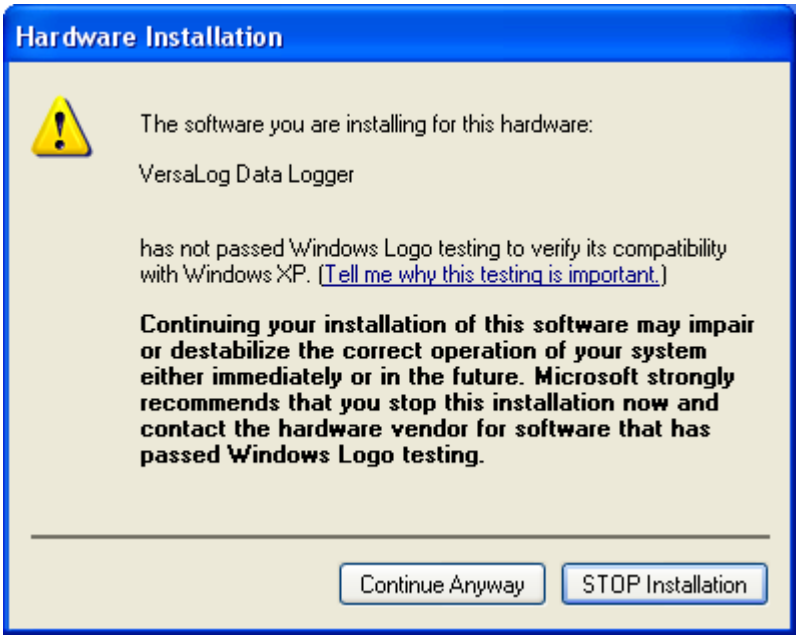


Select "Install the software automatically (Recommended)" as shown in the above figure and then click "Next >".

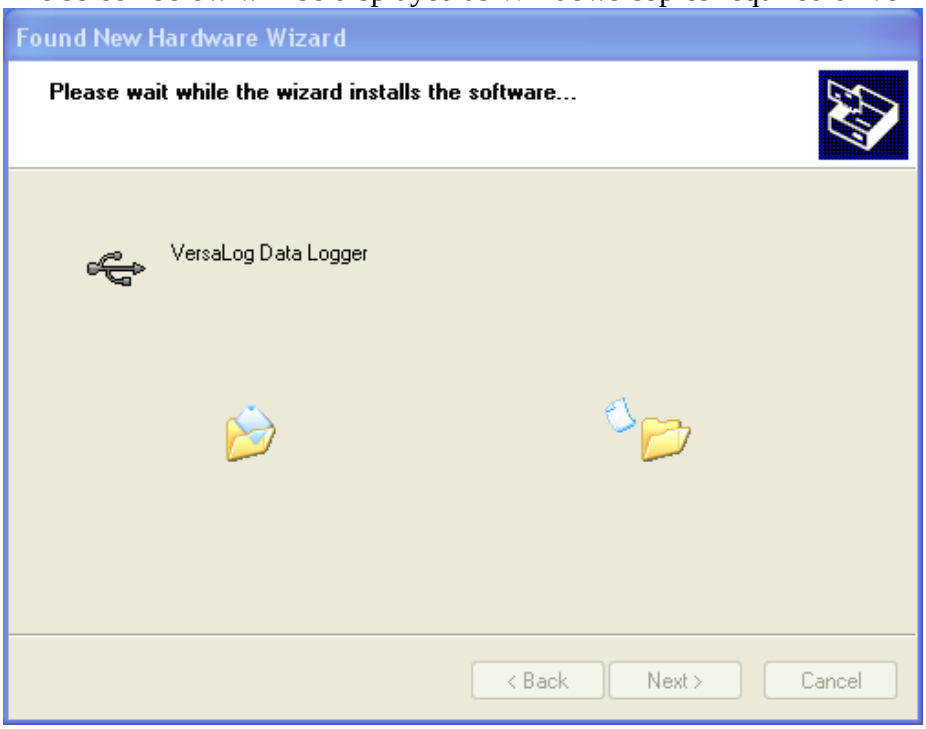


Select the item with Manufacturer of Microedge Instruments Inc and click “Next>” to proceed.

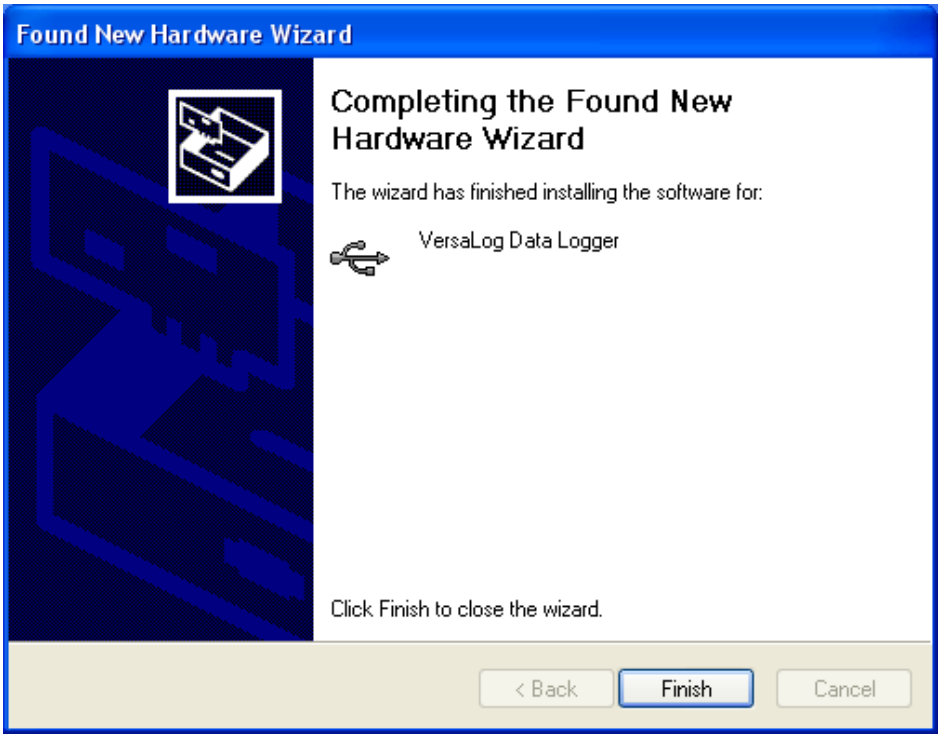
In the following message dialog, click "Continue Anyway" to continue with the installation:



The screen below will be displayed as Windows copies required driver files:



Windows should then display a message indicating the installation was successful:



Activate SiteView

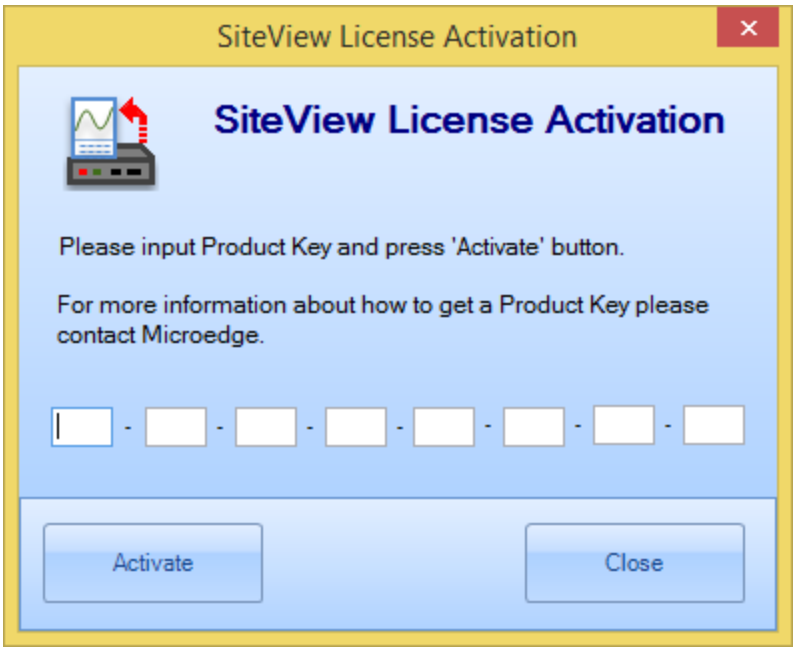
After the installation SiteView needs to be activated by the Product Key you obtained when you bought SiteView.

If the above installation of SiteView was successful, SiteView can be launched by either one of the following:
Double click on SiteView icon on the desktop:

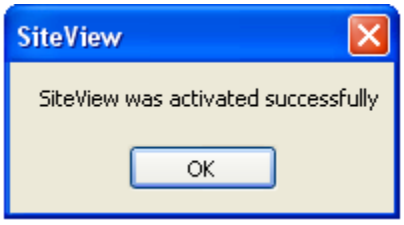


Or:
Using Windows Start Menu, select Start : All Programs: Microedge Instruments Inc.: SiteView.

Double click **SiteView** icon on the desktop, the following dialog appears:



Enter the Product Key, then click **Activate** button. If the Product Key is accepted the following confirmation dialog will appear:



Click **OK** button to finish the activation. From now you can start using SiteView.

CHAPTER 2 – PROTECT YOUR LOGGER

When SiteView is first installed there are no user account and password protections. We strongly recommend you to create user accounts as early as possible in order to protect your logger and system.

Types of User Account and Privilege

Administrator: Change all fields of the system and configure data logger. Add, modify and delete other users. You can only have one Administrator account in the system.

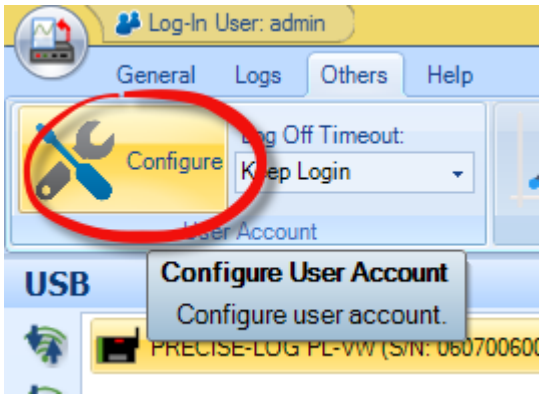
Master: Has the same privilege as Administrator except Master can not create, modify and delete other users.

Standard User: Can view logger status, download data and view plots. Some system settings are not allowed to view. Can not change most of settings.

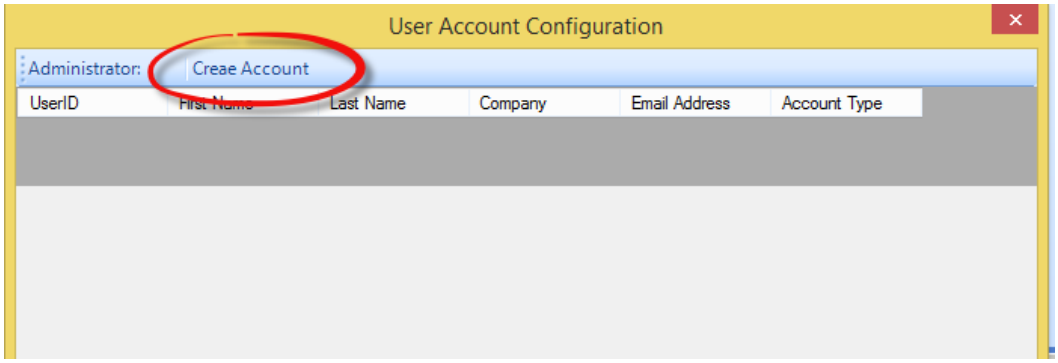
Create Accounts

To enable User Account and create one or more users with SiteView system:

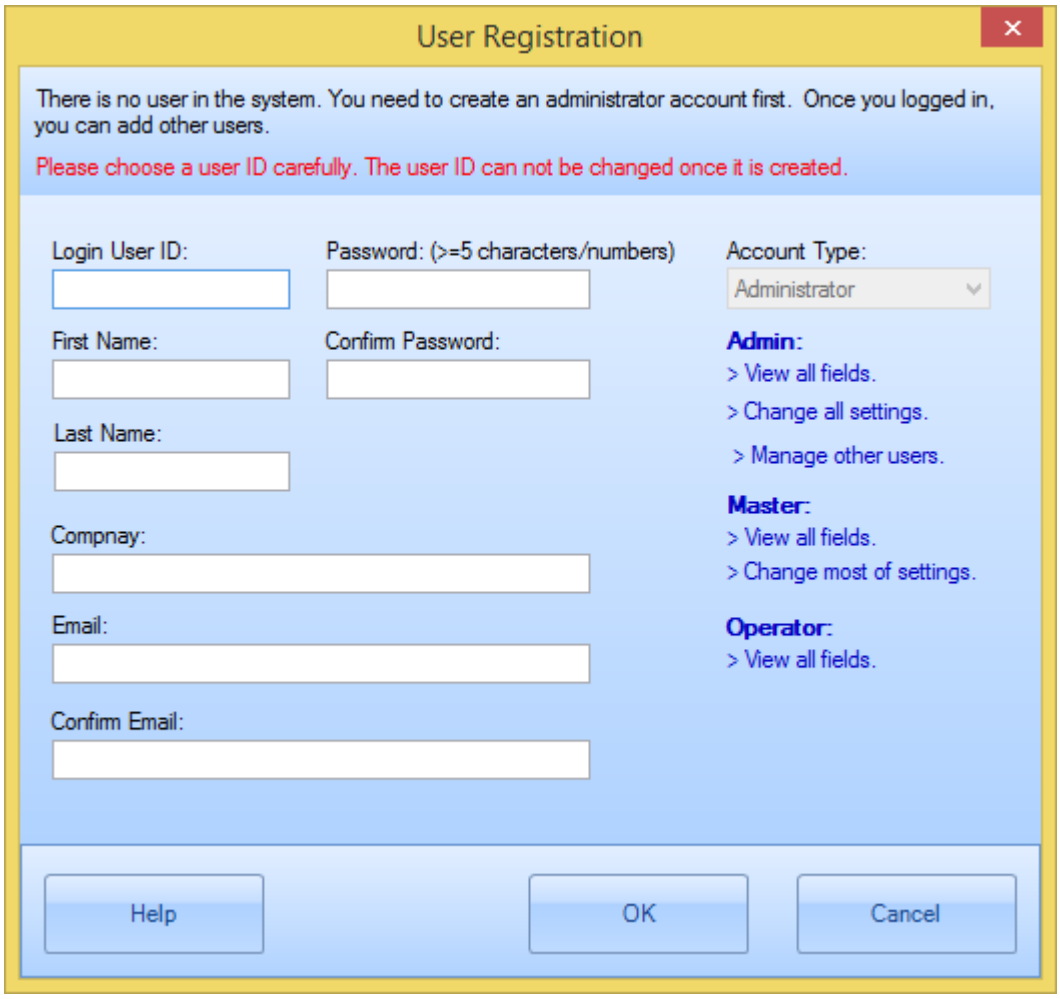
1. Navigate to Others tab and click 'Configure' button under User Account:



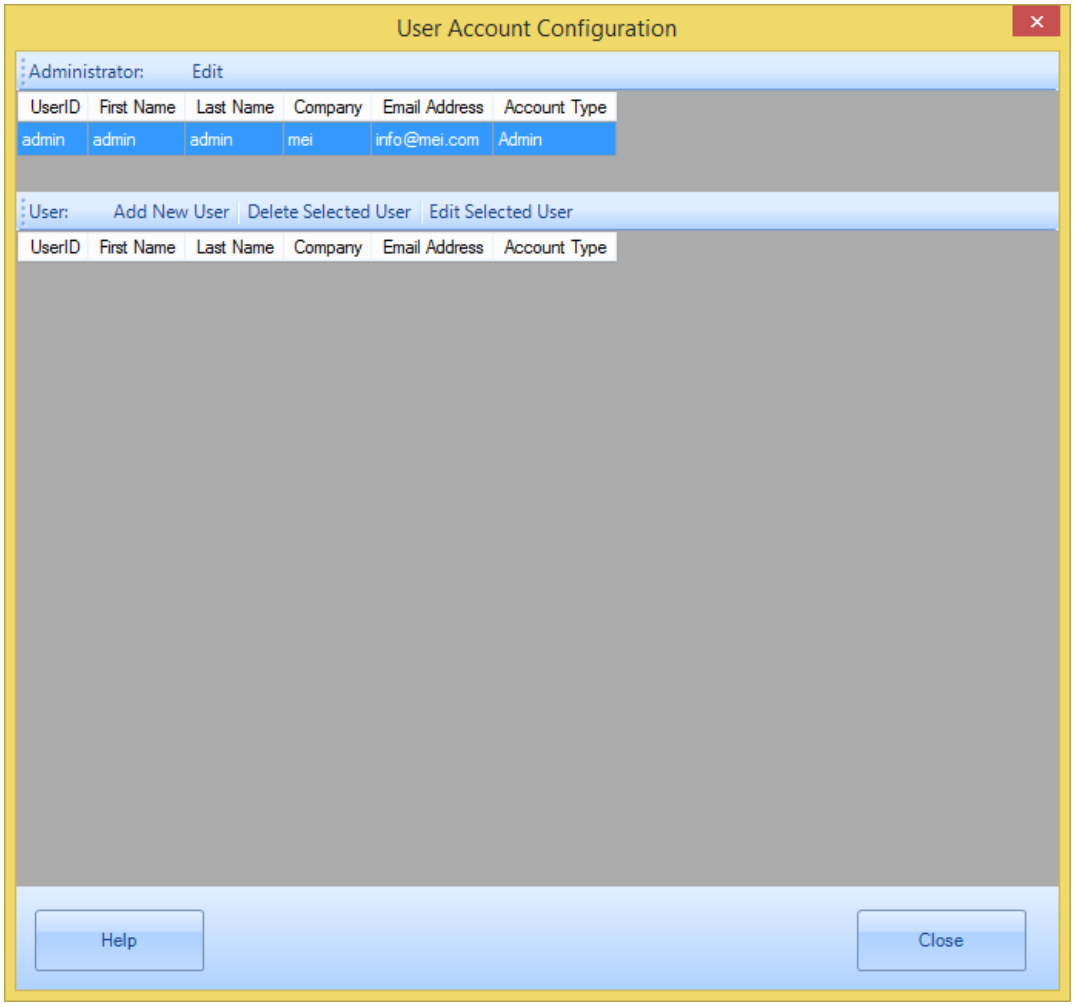
2. Click Create Account" button to create an Administrator account:



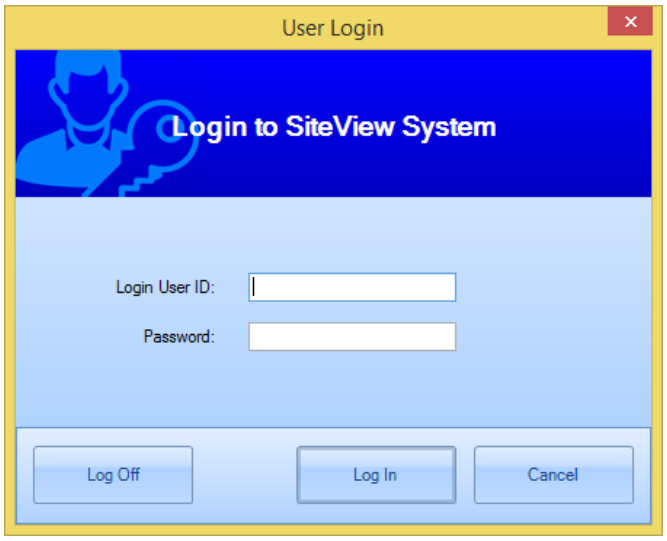
3. Fill out the registration dialog and click "OK" button. Make note of your user ID, password and put them in a safe place.



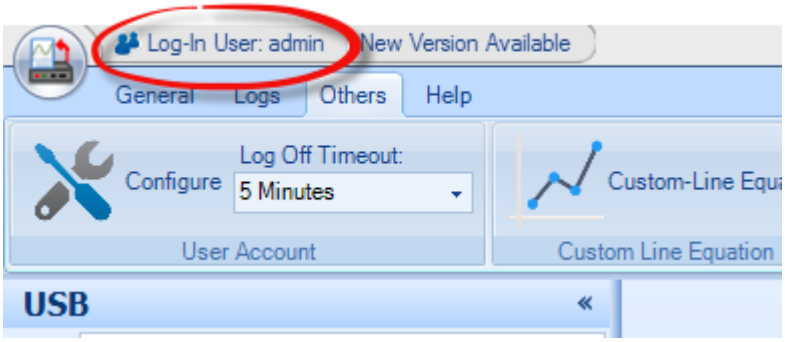
4. You may create other user accounts by clicking "Add New User" button after you have created the administrator account.



Once you have created users, on the next start of SiteView you are prompted with User Login dialog. Only valid users can log in to the system and start using SiteView:

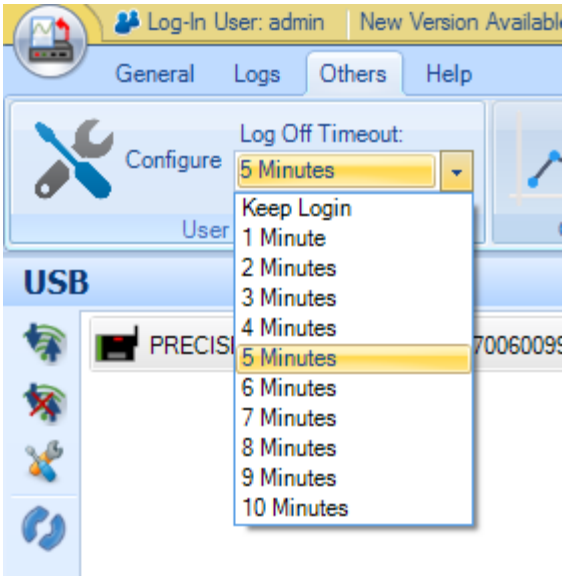


You can also display the above dialog to log off the system if you want to prevent other people from using SiteView. To display the above dialog within SiteView, click Log in/off button:



Then click "Log Off" button on the above User Login dialog.

The system will automatically log off if you have not interact with the system for a period of time that you can set from here:



Change "Log Off Timeout" to a value suits your need.

CHAPTER 3 - COMMUNICATE WITH LOGGER

All Site-Log series data loggers come with an USB and an AUX ports. The USB port is for connecting directly to the computer. The AUX port is for connecting to a serial communication device like a Modem or a Serial Device Server when the logger needs to be accessed remotely.

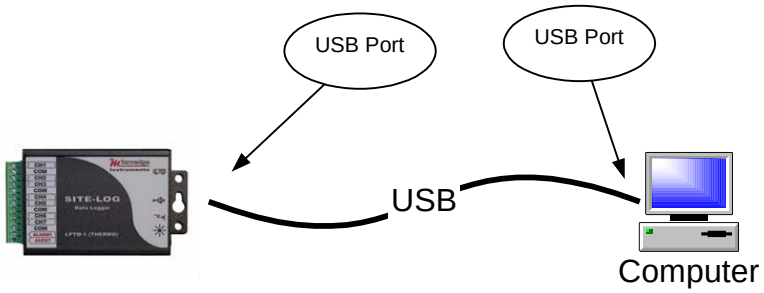
NOTE: Please make sure SiteView and USB driver are installed correctly. Refer to Chapter 2 for details on the installation.

USB Port Connection

Start Communication

To communicate with the logger via USB port:

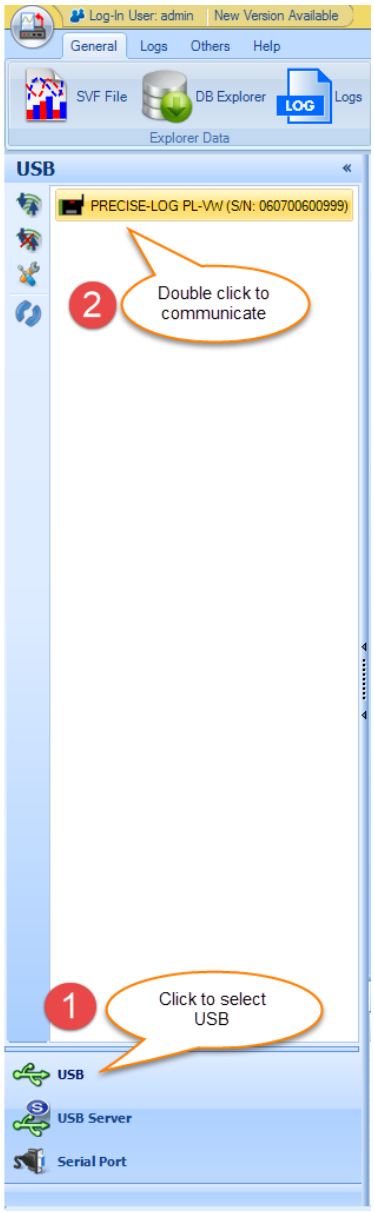
1. Connect accompanied USB cable from the logger to a computer's USB port.



2. Launch SiteView application by double clicking on SiteView icon on the desktop:



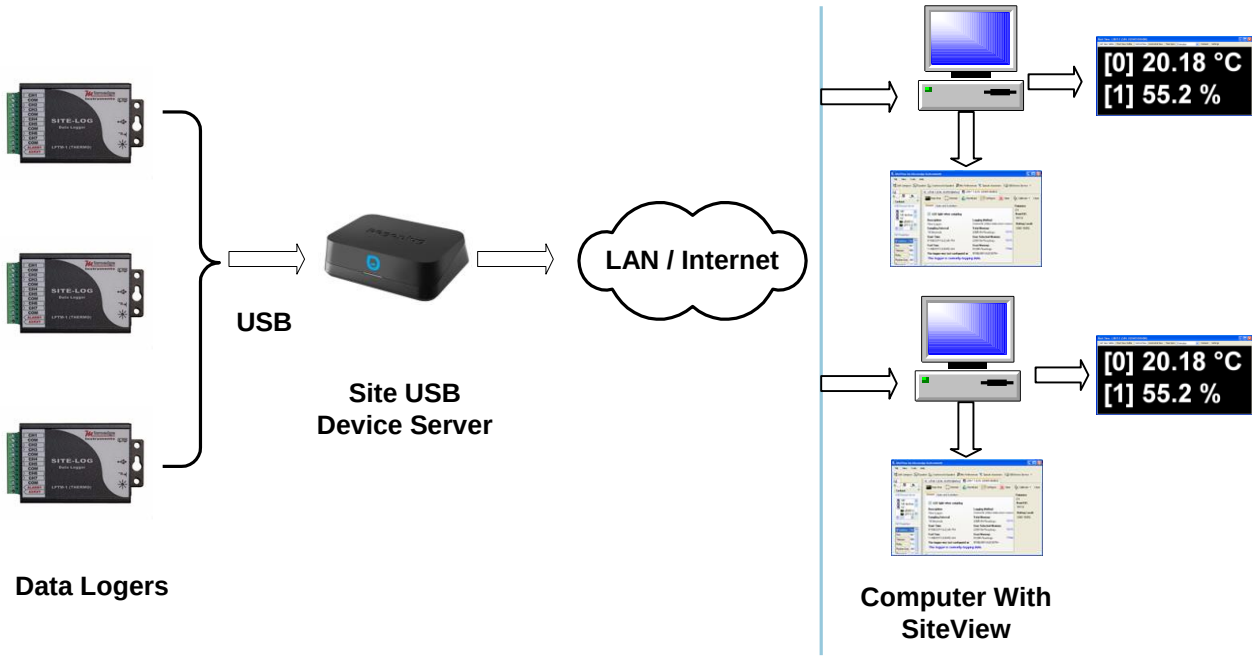
SiteView application starts running and the logger icon is showing in the USB tab page of the communication panel:



3. Double click the logger icon. If the communication is successful the logger's status page will appear.

USB Device Server Connection

USB Device Server Connection is for the communications with data logger via USB Device Server over LAN/Internet . A USB Device Server can be a Site USB Device Server hardware or PRECISE-LOG WIFI-enabled data loggers.



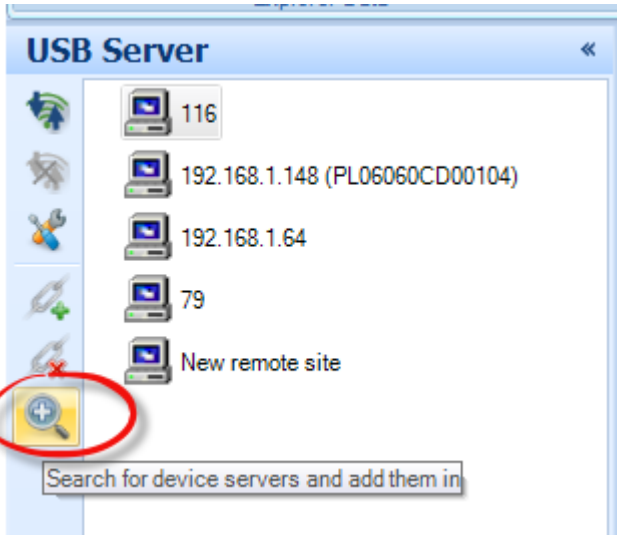
USB Device Server Connection with Site USB Device Server

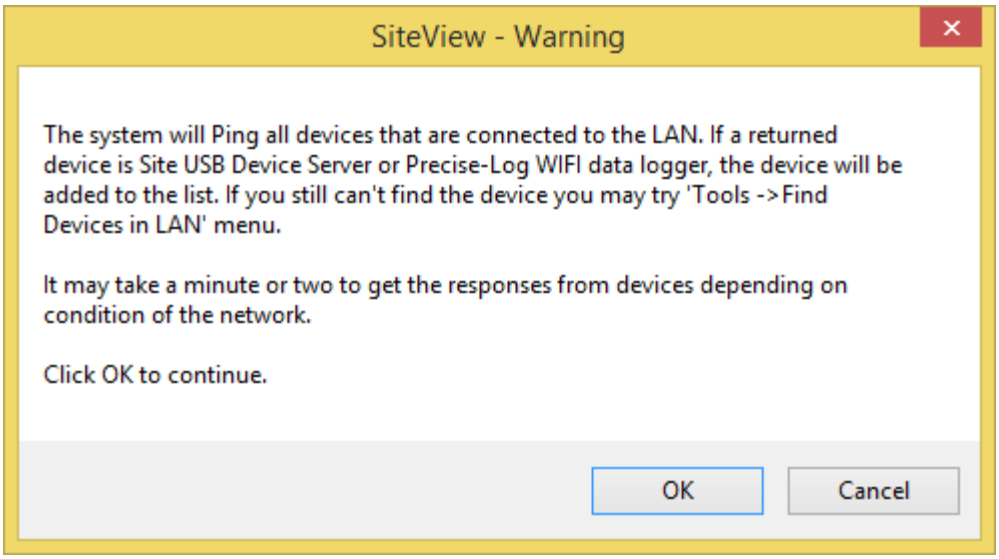
Communicate With Site USB Device Server or PRECISE-LOG Logger:

If PRECISE-LOG is connected to PC, you can find the IP address of it from the logger's status window. Please refer to logger status section for details.

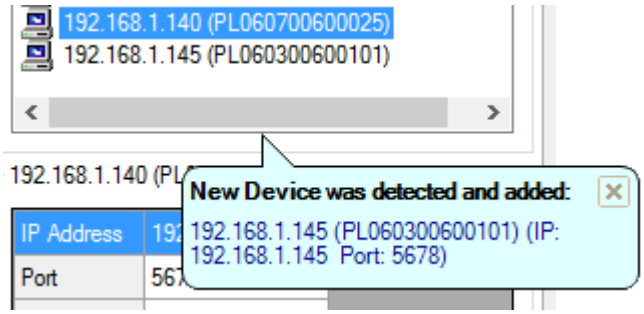
SiteView can scan for the network and find both Site USB Device Servers or PRECISE-LOG data loggers.

Click "Search" button and click "OK" button to continue.

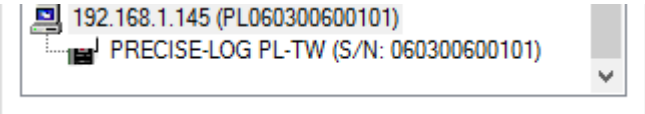




Within 30 seconds if a connection was found it will be added to the list:



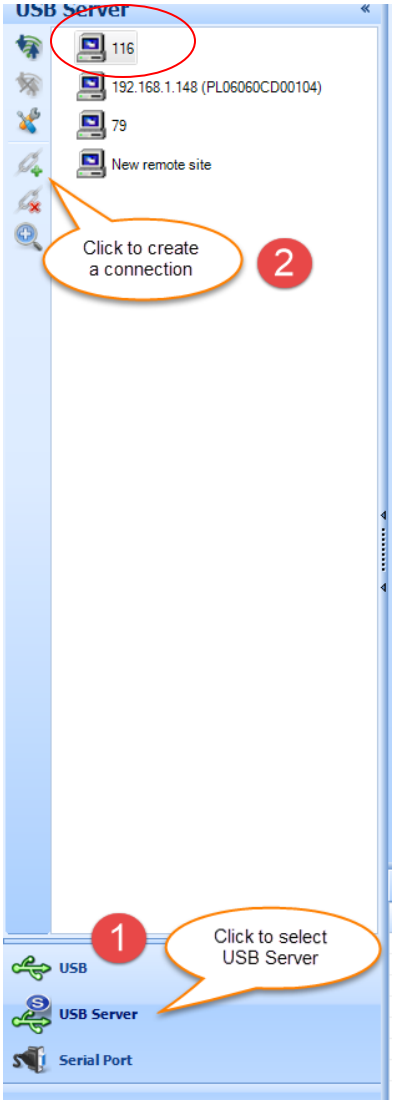
Double click the new added connection to entablish the connection with the device. If the communcation succeeded the data loggers will be listed under the connection:



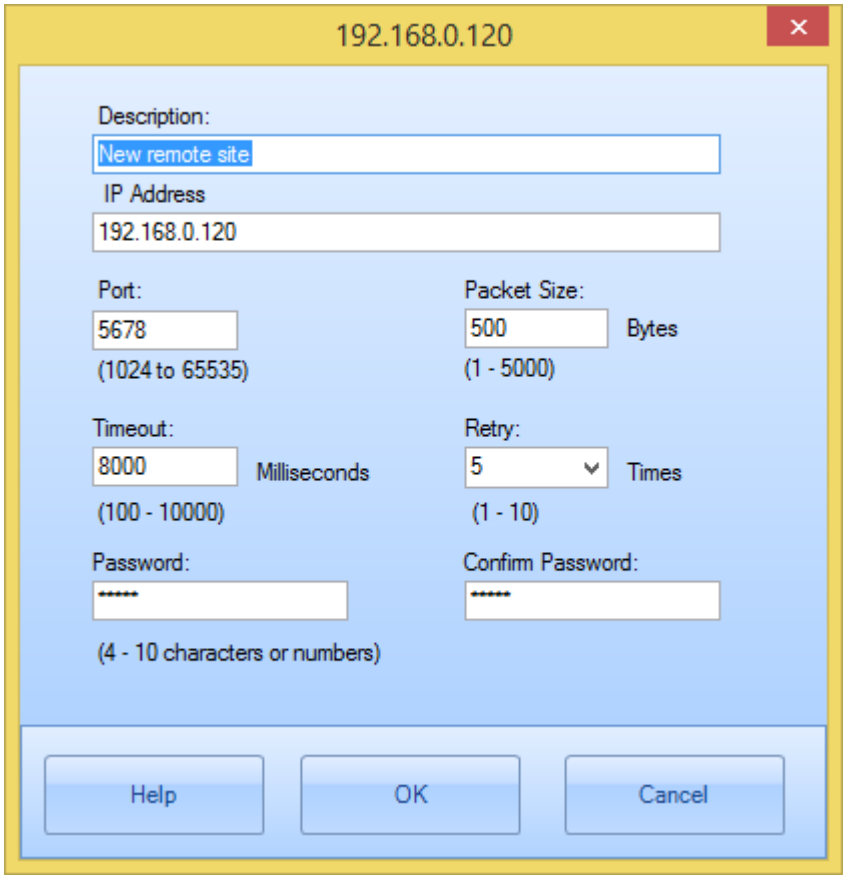
Start Communication

To communicate with the USB Device Server:

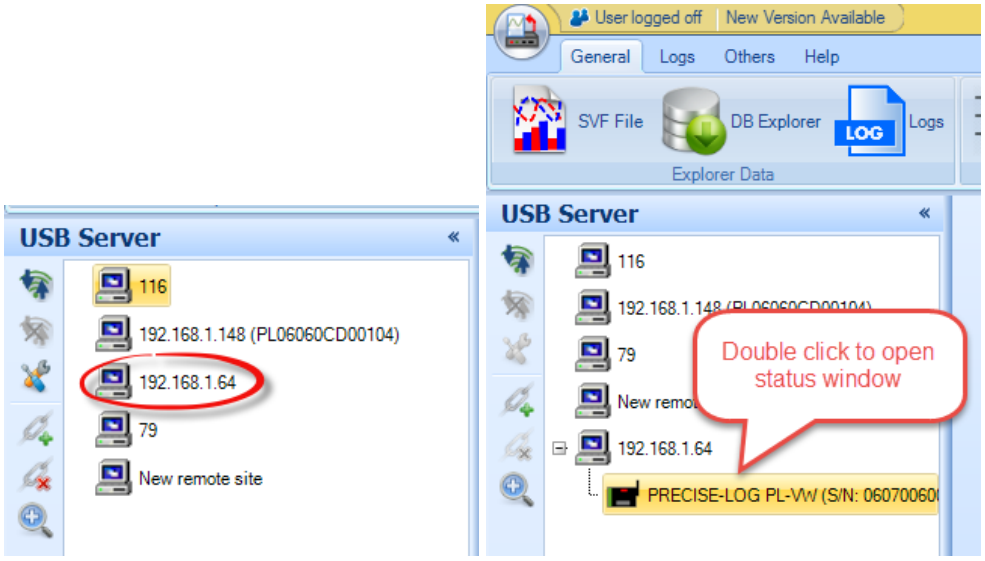
1. Launch SiteView. Click USB Device Server tab in the Communication panel



2. Click **New** button to create a new Ethernet connection:
   In the following pop-up dialog, enter the IP address and the port of the Site USB Device Server. Give a meaningful description of the connection, enter the password and click **OK** button to close the dialog.

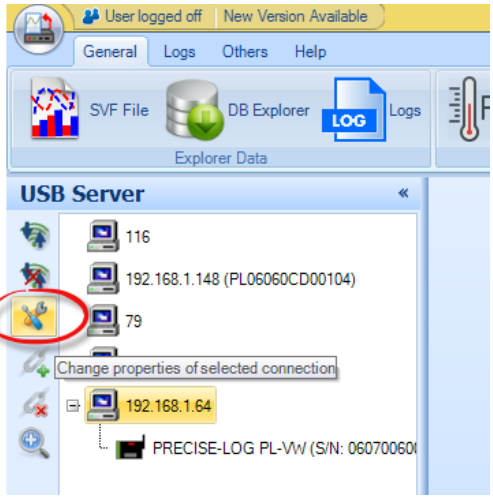


3. Double click on the icon to start the communication. If the communication is successful the logger's icon will appear under the connection you just created. Double click on the logger icon the logger status page will appear.



Adjust Ethernet Settings

You can click Configure button to change the settings of the current selected connection.

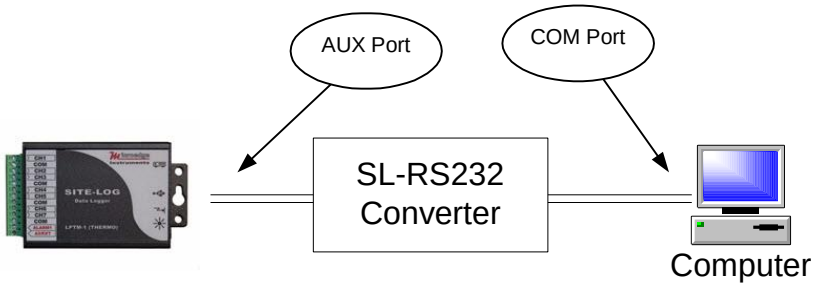


Serial Port Connection

Start Communication

To communicate with the logger via Serial Port:

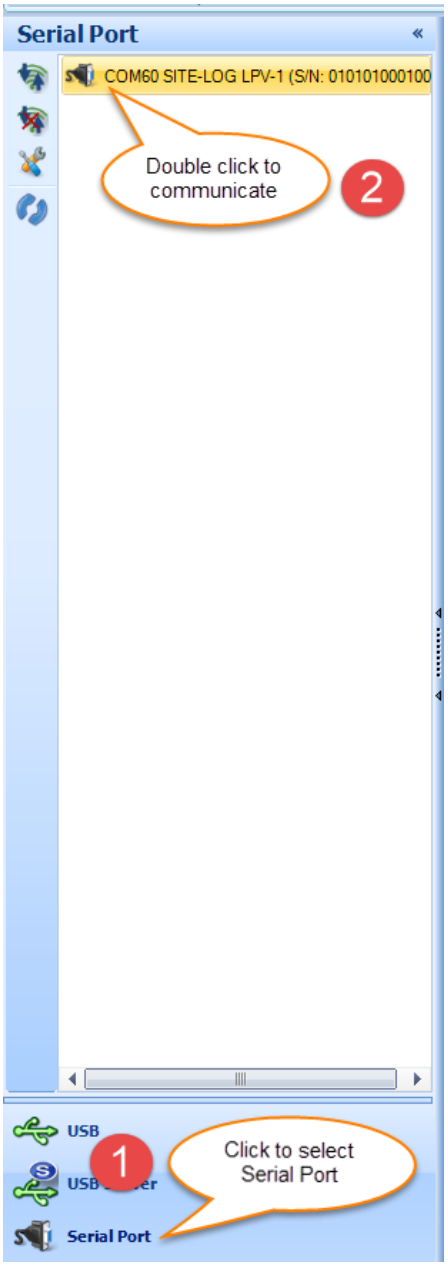
4. Connect one side of SL-RS232 Converter to the logger's AUX port, connect another side to one of the computer's COM port. If your computer does not have a COM port you may need to use a USB-Serial Converter.



5. Launch SiteView application by double clicking on SiteView icon on the desktop:



SiteView application starts running. Click **Serial Port** tab in the communication panel,



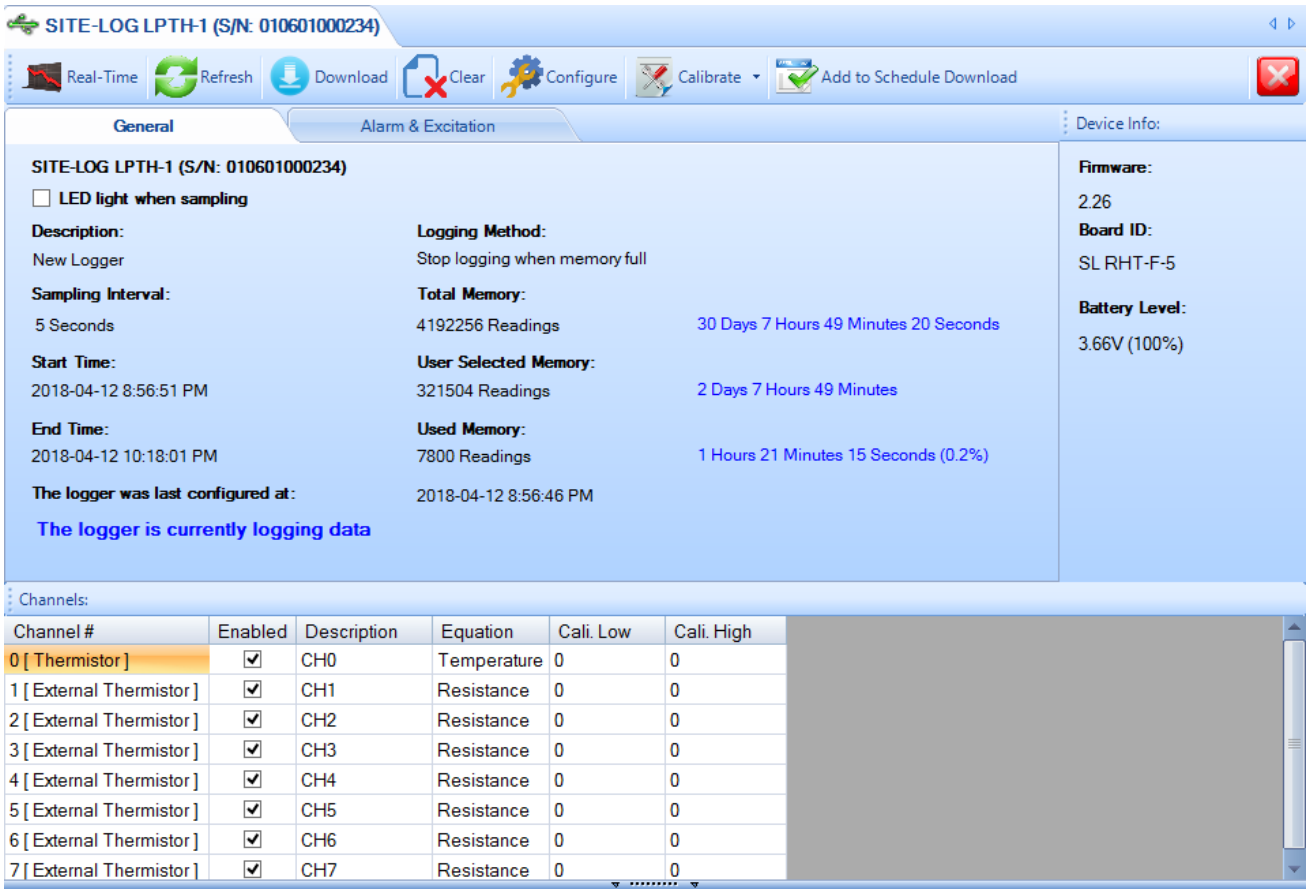
6. Double click on the correct COM port. If the communication is successful the logger's status page will be displayed.

CHAPTER 4 - VIEW STATUS OF LOGGER

What is the Status of Logger

The status of a logger is a set of properties that are saved inside the logger. The properties are used by the logger and SiteView software. When SiteView communicates with the logger, it first retrieves all properties of the logger, parses them into meaningful information and populates them on the graphical user interface.

If the communications between SiteView and the logger was established successfully from the above chapter, the status of the logger appears in a tab page illustrated below:



The tab page caption shows the name and the serial number of the logger to identify this tab page.

The status page shows the general, the channel level, the alarm and excitation properties grouped in sub-tab pages.

The status page is for viewing purpose only. To edit and save the properties, please go to **Logger Configuration** dialog by clicking the **Configure** tool bar button.

Through the tool bar buttons you can finish other tasks described in the following chapters.

Please refer to **User Interface References** chapter for the detailed explanation of each field.

General Status

This page specifies the basic logger status information like start and end time, memory usage, logging mode etc.

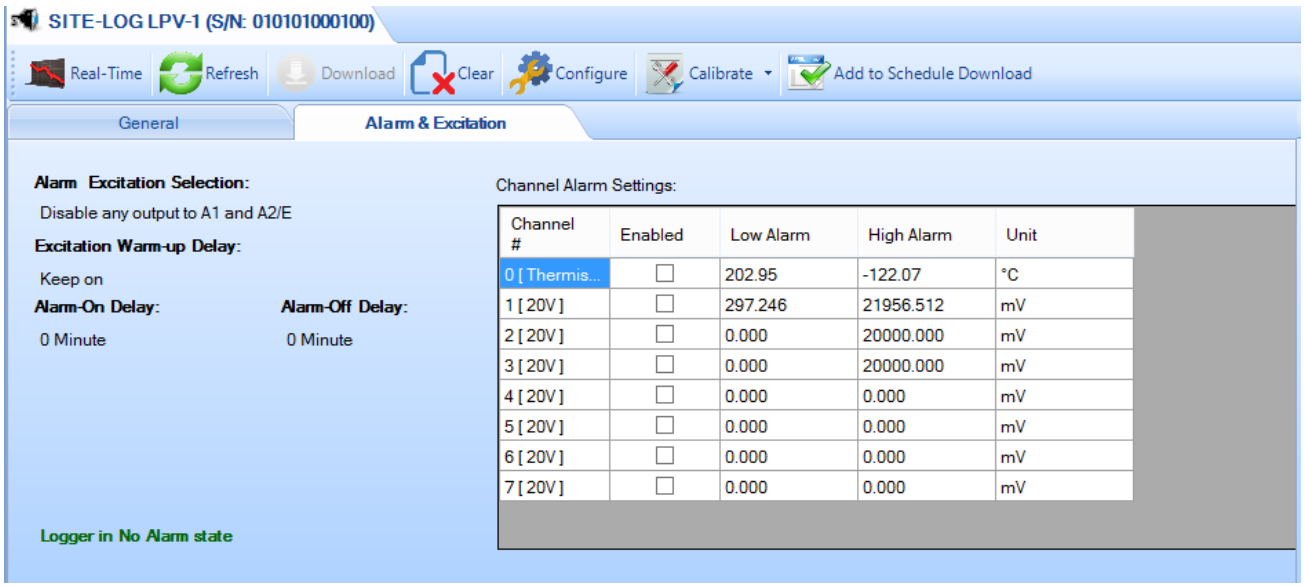
Channel properties specify how many channels the logger has and each channel's information such as if the channel is enabled or disabled, the description and the applied equation etc.

Alarm and Excitation Status

This page specifies how the logger acts if there is an alarm: dial-out to a Modem and send out the alarm notifications or send out the alarm notification directly via the port, or ignore the alarm. It also shows how each channel affects the alarm conditions.

Excitation Control status is displayed in this page like Excitation Warm-up Delay and if the excitation control connects to the terminal pole.

Please refer to **Receive Alarm Notifications** chapter for detailed instructions on how to set up the alarm information properly and receive alarm notifications within SiteView.



Know If Logger Operate Properly?

It is important to know that the logger is operating properly. What status can we use to tell if the logger has stopped logging data and is operating abnormally?

The first status you should look at is the blue bold section just above the Channel information:



This status tells you if the logger is logging data or has stopped. Other information it reports can be:

1. **The logger has not started logging data. It will start at XXXX.**
   The logger is in start-delay mode and is counting down the timer. Once the timer goes to zero the logger will start logging data.

   If you set **Time to Start** field to a time in the future you will see the above status. If you want the logger to record data right after the logger is configured you can set this field to now or a time in the past.

2. **The logger has stopped logging data and has been dormant for XXXX.**
   If the logger is in dormant mode, it stops logging data and waits for SiteView to download the data.

   Usually, this is because the **When Memory Full** field was set to **Stop Logging** when the logger was configured, and when the memory is full the logger will stop logging and in dormant mode.

   If you want the logger to keep recording data you can set **When Memory Full** field to **Continue Logging**.

3. **Data has rolled over and in FIFO mode**
   If the logger is in First-In-First-Out mode, the logger keeps overwriting the oldest data with the new measured data.

   If you are only interested in a specific time frame, you may need to set **When Memory Full** field to **Stop Logging**. In this case, the logger will stop logging when the time passed the **Time to End** parameter.

Another status you should focus is the battery level. If the on-board battery level is too low you will get the red warning sign indicating it's time to replace the battery.

CHAPTER 5 - DOWNLOAD LOGGER DATA

Downloading Logger Data is the process transferring the recorded measurements inside the logger to the computer and saving them in a file that SiteView can recognize – SiteView file (.svf).

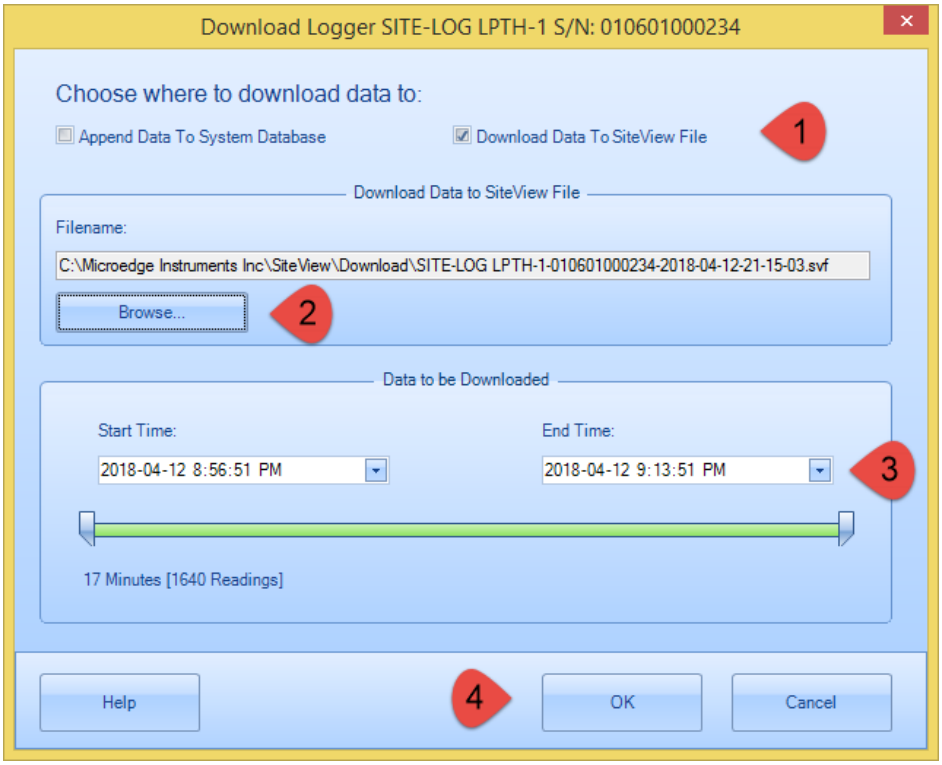
If the logger is in normal sampling mode (sampling interval >= 5 seconds), the downloading process does not interrupt the logging operation. If the logger is in fast sampling mode (sampling interval is less than 5 seconds) logger will stop logging data from the time SiteView communicates with the logger.

SiteView can choose to download whole available data or only the interesting section for the specific period of time.

Choose Filename and Time Span

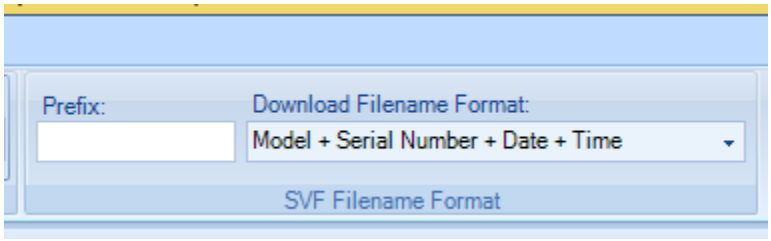
If you are already in logger status page, click **Download** button, **Download Logger** dialog window will appear:



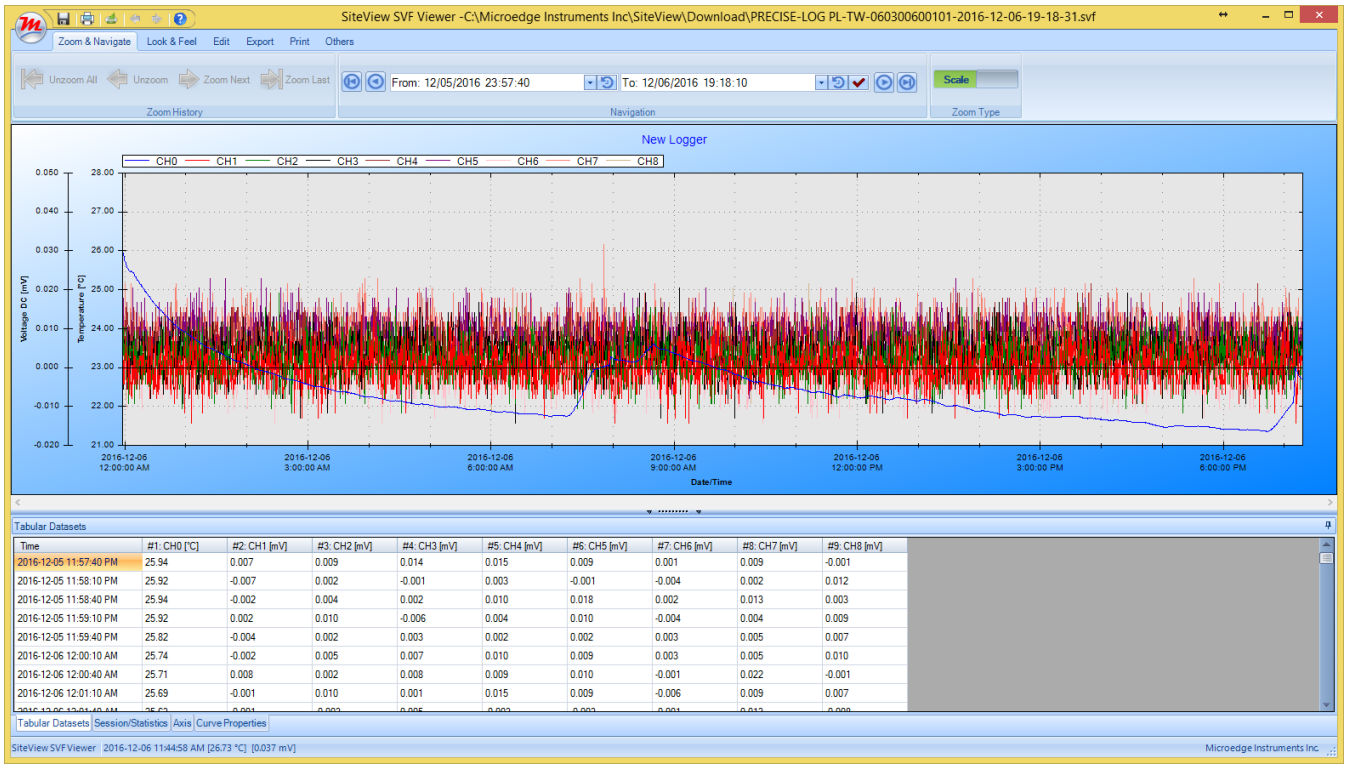


You can choose to download the data to a separate SVF file or to the system database by choosing the section#1 checkboxes. If you choose to download to SVF, you can browse for a filename in section#2. You may want also choose to download whole logger or just partial data by changing the fields in section#3. Then click OK button to start downloading data.

Each time when **Download Logger** dialog appears a default filename is created based on the properties on the main ribbon control:



After the download the plot and the tabular data will appear:

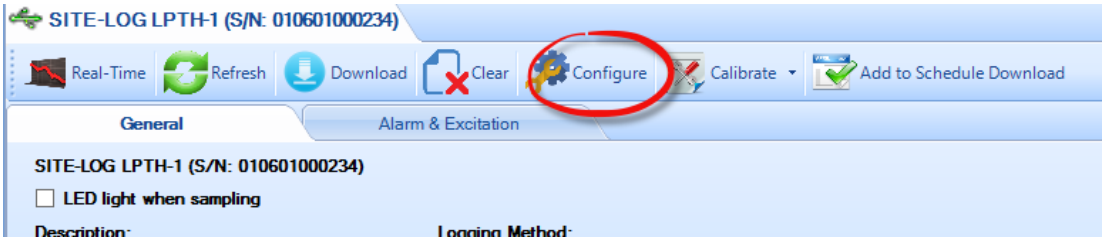


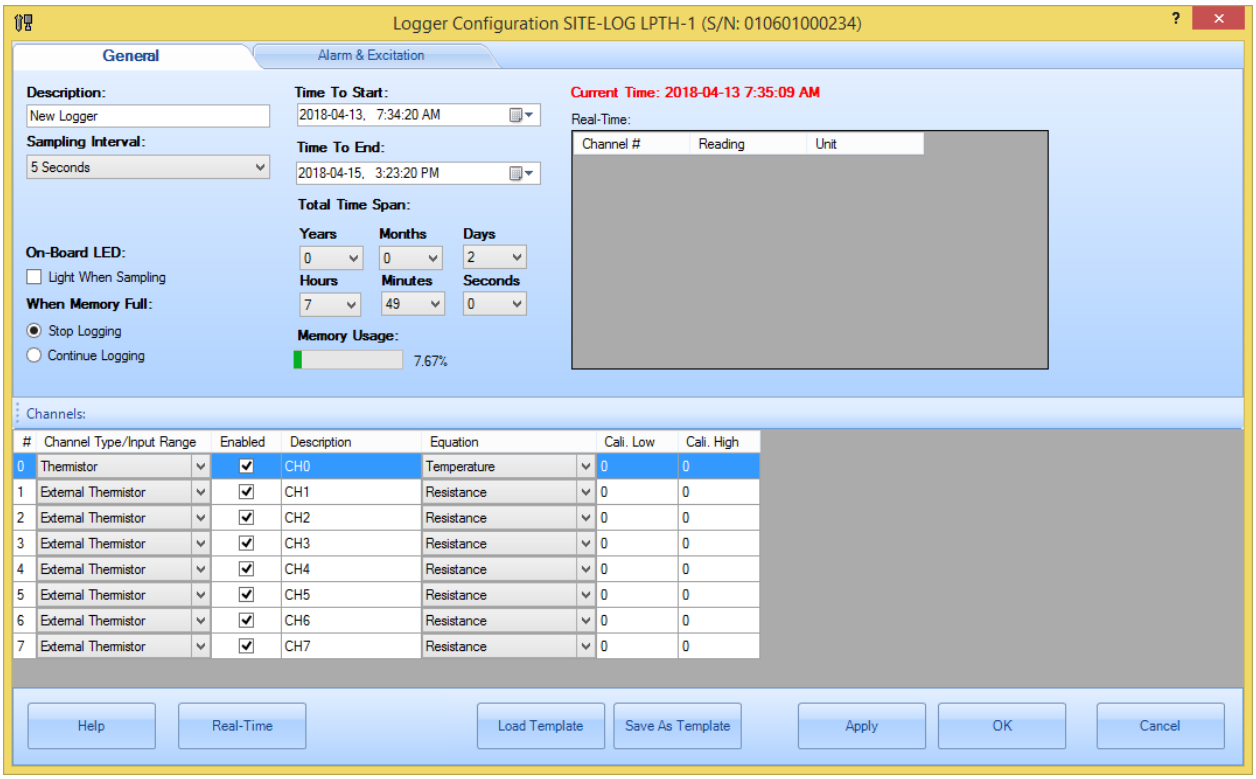
CHAPTER 6 - CONFIGURE LOGGER

WARNING: By clicking OK or Apply buttons, all recorded data in the logger will be lost. If the data is important please ALWAYS download the data before configuring the logger.

Configuration of the logger is the procedure to change the properties of the logger and start a new session of logging.

If you are already in the Logger Status page, clicking on the **Configure** button will bring up the **Logger Configuration** dialog:





Clock of Data Logger

Each Site-Log data logger synchronizes its clock with the computer which is used to configure the data logger. If you have multiple computers used to configure data loggers please make sure all computers are synchronized with the same clock source. Or only one computer will be used to start new logging session.

Decide When To Start and When To Stop Logging

The new session can be started immediately after the logger is configured or start in the future by adjusting the **Time to Start** field.

If you want the logger to stop at a specific time:

1. Adjust **Time to End** field to a time later than **Time to Start** field.
2. Set **When Memory Full** to **Stop Logging.**

If you want the logger to stop logging after a specific period of time:

1. Adjust **Total Time Span** to desired period of time.
2. Set **When Memory Full** to **Stop Logging.**

If you want the logger to continue logging for a specific period of time:

1. Adjust **Time to End** field to the time later than **Time to Start** field. You will **see Total Time Span** fields updated with the new set of values. Or you can adjust **Total Time Span** to a desired period of time.
2. Set **When Memory Full** to **Continue Logging.**

If the start time is unknown and you want to activate the new session in the field:

1. Adjust **Time to Start** field to a time far beyond the estimated start time (for example, one year ahead) so the logger will be in start-delay mode.
2. Adjust **Total Time Span** to desired period of time.
3. Set **When Memory Full** to **Stop Logging** or **Continue Logging** based on your application.
4. When you decide to activate the session, press the activation button located on the logger until the LED starts to blink. Release the button.

NOTE: The activation button is used for starting the session, not for stopping the session. Once the logger has started logging, the activation button is ignored.

Decide How Often the Logger Samples Sources

When the logger is operating, the logger samples the source channels in a pre-set time interval (sampling interval). Most of SITE-LOG and iLOG loggers can run as fast as sampling one channel every 20 milliseconds, or as slow as sampling all channels every 12 hours. PRECISE-LOG's sampling interval can be from one second to 12 hours.

For SITE-LOG loggers:

if the sampling interval is set 5 seconds or bigger, the logger will operate in normal sampling mode. In this mode, if the logger is logging data, the logger will continue operating while it is communicating with the host device.

If the sampling interval is set below 5 seconds, the logger will operate in fast sampling mode. In this mode, the logger needs the external power supply for the logging period and the communications with the logger will force the logger to stop logging.

You can power the logger via its USB port with either a standard 5VDC wall adapter or the computer where the logger is connected to.

For iLOG loggers, you can set the fast sampling mode interval to either 5 seconds or 1 second.

PRECISE-LOG series do not have fast sampling mode.

TIPS: **The proper steps to configure the logger for fast sampling mode is**:

1. Adjust the sampling interval to 4 seconds or less.
2. Adjust **Time to Start** to the time when you want the logger to start logging.
3. Apply the external supply to the logger before the logger starts logging.

If the logger tries to start fast logging and the external power supply is not applied, the logger will stop. Then you have to reconfigure the logger.

Decide Which Channels To Log On

When the logger is operating, the logger measures the input of each **ENABLED** channel. Be sure to enable the channel if you want the channel be recorded.

If one channel's measurement relies on other channels' measurements (A custom equation may use other channels' measurements for the current channel's calculation), be sure to enable those dependent channels.

Some of the Site-Log loggers are featured with software programmable channels. The input range of those channels can be changed via SiteView. When the range is changed to better fit the actual input signal's range, better resolution and accuracy can be obtained.

For instance, changing the **Input Range** of a programmable voltage channel to 0 – 2 V will get better resolution if you know the input source's range will be within 0 – 2 V.

Decide How to Convert To Physical Measurement

When the logger saves the data the logger saves the data in digital format. SiteView converts the digital values to the physical measurements after the data is downloaded to the computer.

Role of Equation

SiteView does the data conversions by using equations. An equation is a software entity handling the conversion from one data format to another. SiteView contains the built-in equations for those predefined channel types and the customer-defined equations that can be applied to all channel types.

A custome-defined equation (custom equation) is a piece of script (C# source code) in the format of function implementing the data conversion.

When a channel is configured, an equation is applied to the channel. After SiteView has retrieved the logger status SiteView locates the equation entity by the equation name saved inside the logger. Once the equation entity is identified the equation entity will handle the data conversion.

Decide What Equation to Use

This depends on the physical measurement and the input source parameters. If you are using 0 – 10 VDC channel to record a voltage source, you can use a built-in equation "VoltageDC". If you are recording a 0 – 10 VDC transducer as the source input, and the transducer has the measurement range of 0 – 5000 PPM CO2, you need to write your custom equation like this:

```
public double CO2Equation(double Input)
{
        double output;
        output = 5000 * Input  / 10 ;
        return output;
}
```

The above equation implements the relationship between the input voltage value and the output physical PPM value. A voltage is converted proportionally to a PPM value.

Please refer to **Work with Equations** chapter for detailed instructions on how to write a custom equation.

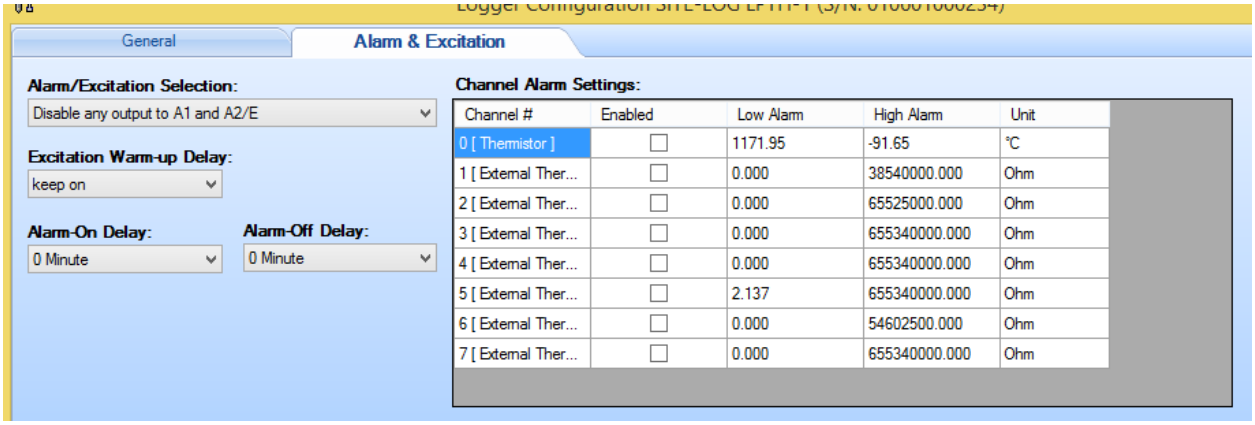
Manage Alarm and Excitation Control

Configure Channel Alarms

When the logger is recording data, it compares the current reading with Low/High Alarm values that is previously saved in the logger for each channel. If all the following conditions are met, the logger will be in Alarm state:

1. The current reading is beyond the Low/High Alarm values.
2. Alarm is enabled for that channel.
3. Alarm-On Delay's counter is counted down to zero.

In the figure illustrated below, you can check "Alarm Enabled" check-box if you want to enable the Alarm of the channel. And you can adjust "Low Alarm" and "High Alarm" values so that when the measurement is below "Low Alarm" or above "High Alarm" it will trigger the alarm.



Decide what to do when in Alarm State

If the logger is alarm state, the logger can energize Alarm1 and/or A2/E terminals in order to control the external devices like siren auto dialer etc.

At the left side of the above figure, you can change **Alarm/Excitation Selection** to decide which terminals the logger will work with when there is an alarm.

Configure Excitation Control

Excitation output is used when you need to save the electric power of the device that provides the signal source to the data logger. When there is no local power available and a battery pack is used to power the transducer, excitation control greatly reduces power consumption by turning on the transducer only when it samples the data and turning off the transducer after the sampling.

A2/E on the terminal strips can be configured by for excitation purpose.

In order to enable A2/E, one of the following **Alarm/Excitation Selection** must be selected:

Excitation control to A2/E, both high and low alarm to Alarm1
Excitation control to A2/E, low alarm to Alarm1
Excitation control to A2/E, high alarm to Alarm1

Excitation Warm-up Delay is used to specify how much delay will be set after the excitation terminal is activated and before the logger is taking the sample. If the measurement source device needs certain time to stabilize the signal output you may need to set this parameter so the logger will wait certain time before it takes the sample.

Please refer to **User Interface References** for the detailed explanation of each field.

Quick Way to Calibrate Logger

Although you can go through the procedure in **Calibrate Logger** chapter to calibrate a logger, you can also use **Logger Configuration** dialog to do a quick calibration for all channels of the logger.

Understand Cali. Low & Cali. High

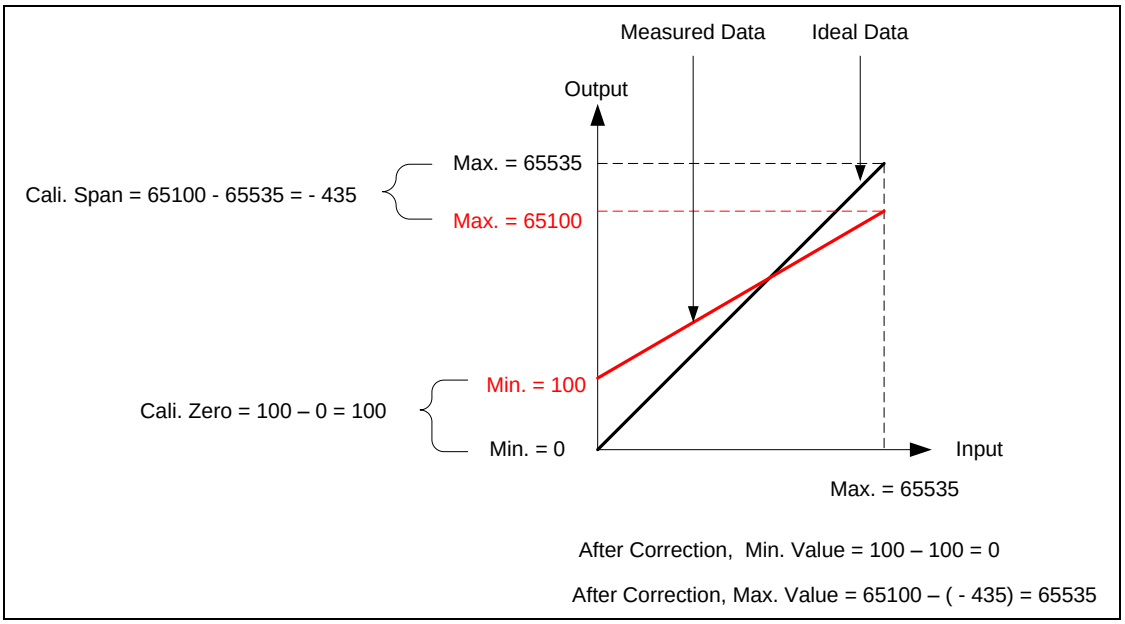
These two fields specify the calibration values that are used for measurement adjustment.

Cali. Low value specifies the digital value that is over zero when the input value is the lowest value (for 0 – 5 VDC channel the lowest value is zero volt). For instance, if you apply zero volt input and the logger measured 100 as the digital value, then Cali. Low should be 100 digits. The equation entity will subtract this value when resolving the correct lowest digital value.

Cali. High value specifies the digital value that is over 65535 when the input value is the highest value (for 0 – 5VDC channel the high range is 5 volt). For instance, if you apply 5 volt voltage to the channel and the logger measured 65100 as the digital value. Then Cali. High is "- 435" (calculated from 65100 – 65535). The equation entity will subtract this value (-435) from the digital value when resolving the highest digital value.

The valid range for these two parameters is from –32768 to 32767.

The following figure illustrates the relationship between an ideal data line and a measured data line and how Cali. Low and Cali. High correct the measured data line.



Calibrate Channel

Cali. Low and **Cali. High** parameters for each channel are editable **in Logger Configuration** dialog. You can simply change them and use real-time table to check if the parameters are changed correctly.

To calibrate a channel:

1. Click **Real-Time** button to enable **Real-Time** table. Notice the real-time readings are updated in **Reading** cells for all channels.
2. Check the difference between the reading you see and the reading it is supposed to be. Adjust **Cali. Low** and **Cali. High** parameters to make the readings as close as to the desired value.
3. If you are satisfied, click **Apply** button to save the parameters to the logger or click **OK** button to save the parameters and close the dialog.

Save Settings and Start New Session

Once you have finished making changes to the available settings, you can click **OK** button to save the settings to the logger. The logger will start to record data from the **Time to Start** field you have set.

Please refer to **User Interface References** for the detailed explanation of each field.

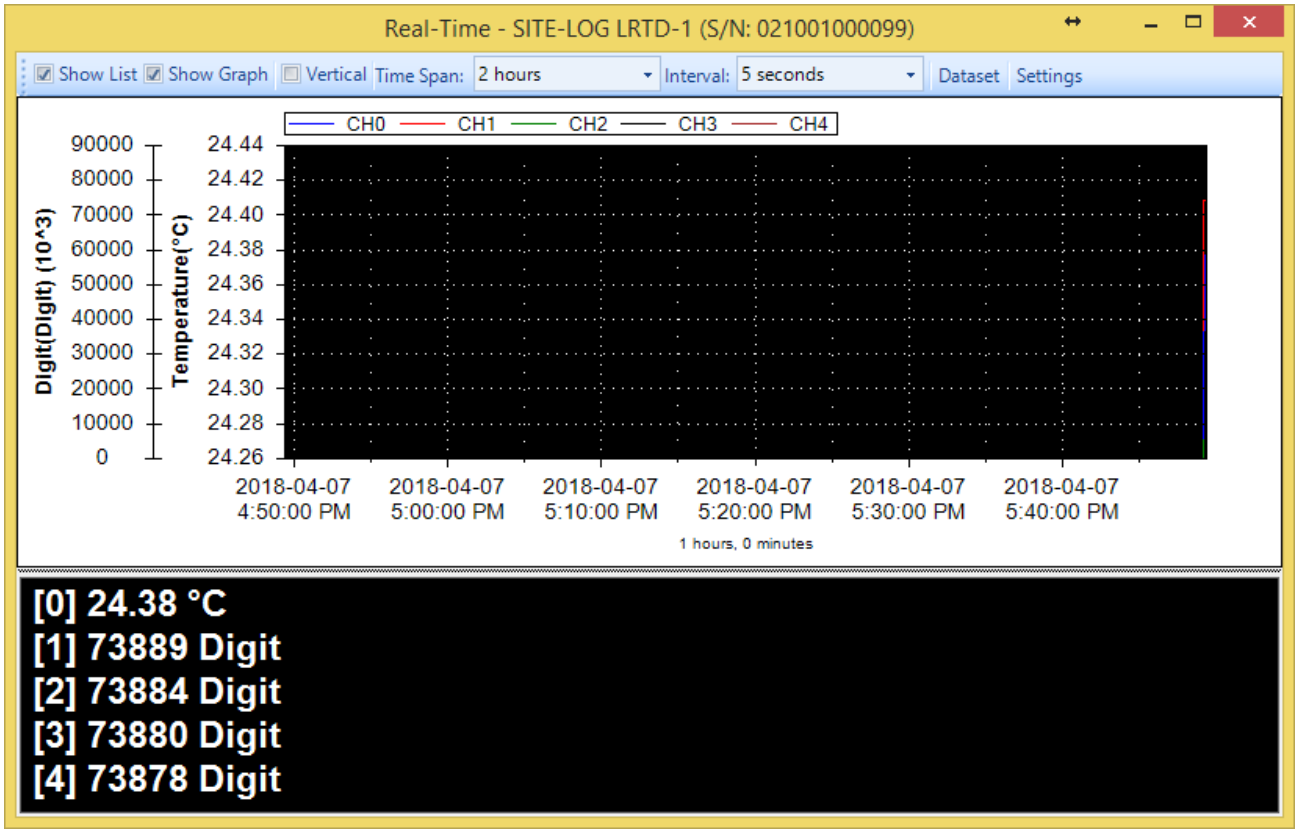
CHAPTER 7 - REAL-TIME CHART VIEWING/RECORDING

If the logger is in normal sampling mode, SiteView can view the real-time measurements while the logger is still logging data. The real-time display shows the list of the latest real-time measurements of all enabled channels, and the trend chart of the real-time measurements for a given latest period of time.

Display Real-Time Dialog

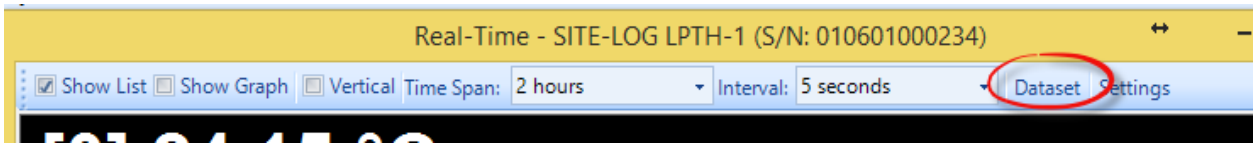
The **Real-Time** dialog can be displayed by clicking on **Real-Time** tool bar button in the logger status page.



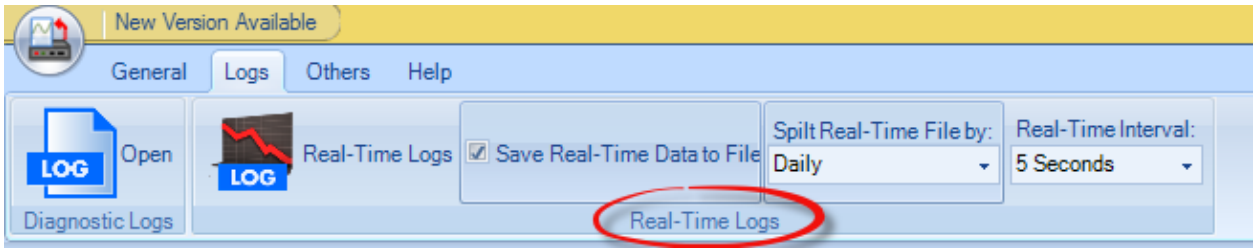


Save Real-Time Data

The real-time data can be saved in the pre-defined file and the tabular data can be viewed by clicking on **Dataset** button.



Real-Time Log section specifies if, where and how the real-time data will be saved.



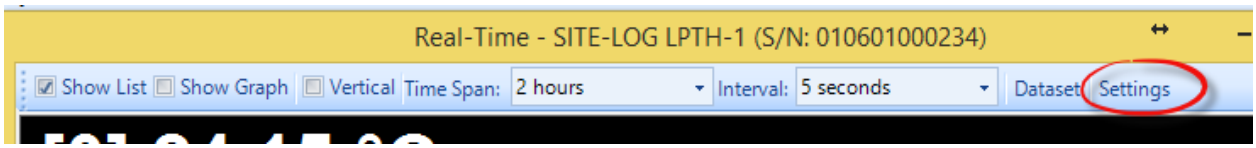
If you are real-time logging the data for more than a day, the real-time file can be split either daily or monthly.

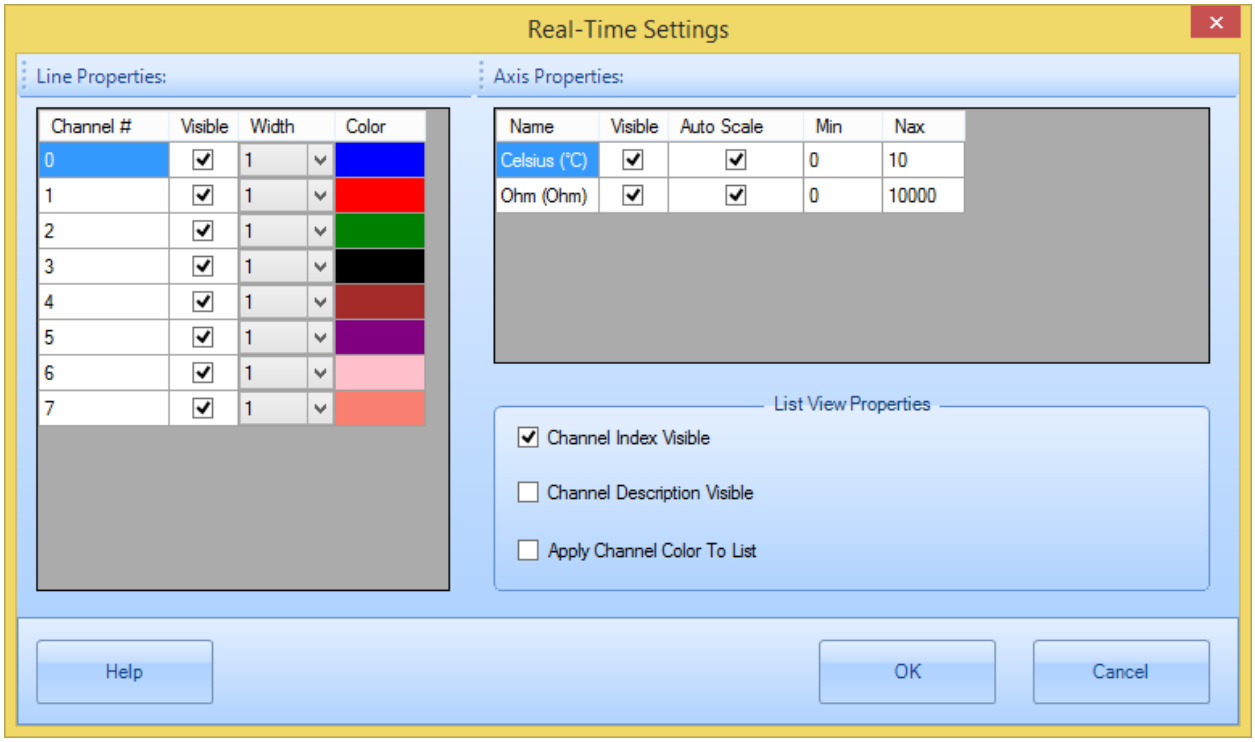
You can specify the folder to save the real-time data file.

Change Views Properties

Both List and Chart views can be displayed or hidden by toggling **List View Visible** and **Chart View Visible** buttons. They can be displayed either vertically or horizontally by switching between **Vertical View** and **Horizontal View** buttons.

More properties can be edited by clicking on **Settings** button:





Line Properties table specifies if a line will be displayed, the width and the colour of the line.

Axis Properties table specifies if a Y-Axis will be displayed, how the Y-axis scales the reading: **Auto Scale** or **Manual Scale** on the given **Min** and **Max** range.

List Properties section specifies if the channel index and description will be displayed and if the line colour will be applied to the colour of the list text.

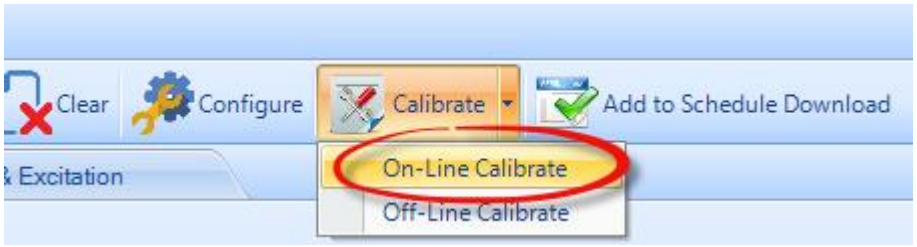
Click **OK** button to save the changes.

CHAPTER 8 - CALIBRATE LOGGER

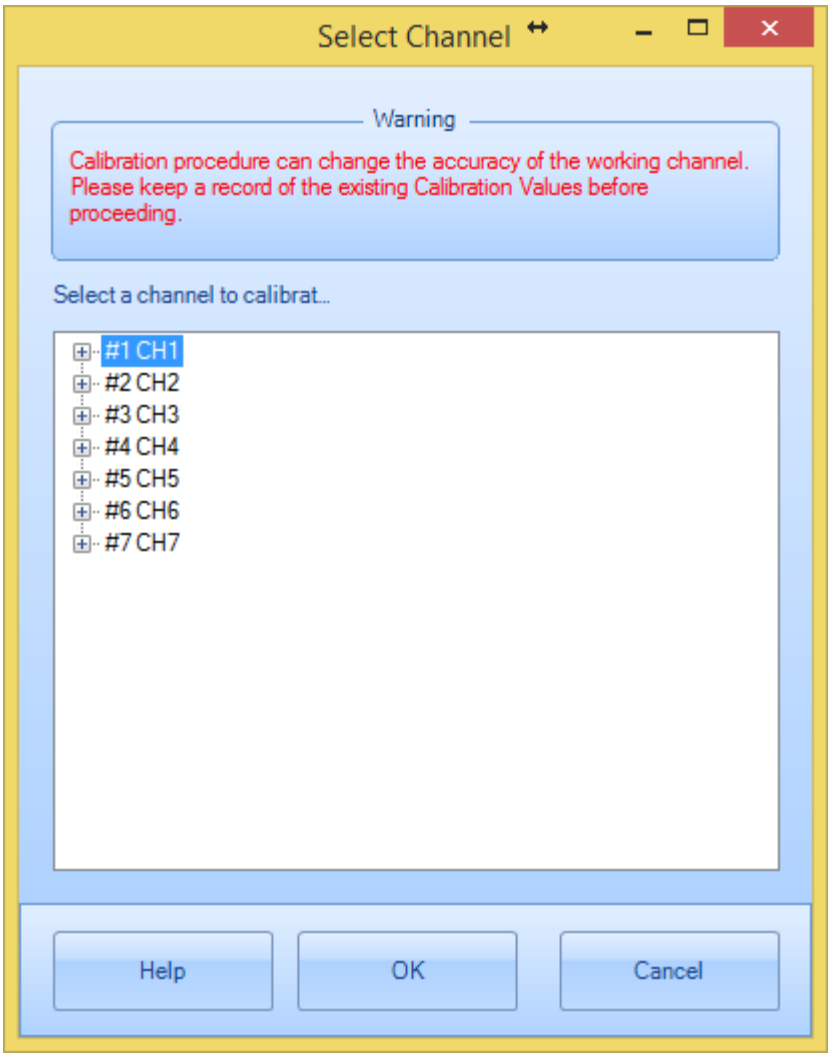
SiteView software provides two-point calibration for most of the loggers. If the source signal like voltage or current can be connected to the logger while the logger is connecting to the computer, you can calibrate the logger on-line. If the source signal like a temperature or relative humidity is not available for on-line calibration, you can calibrate the logger off-line after the logger has recorded the low and high point data.

On-Line Calibrate

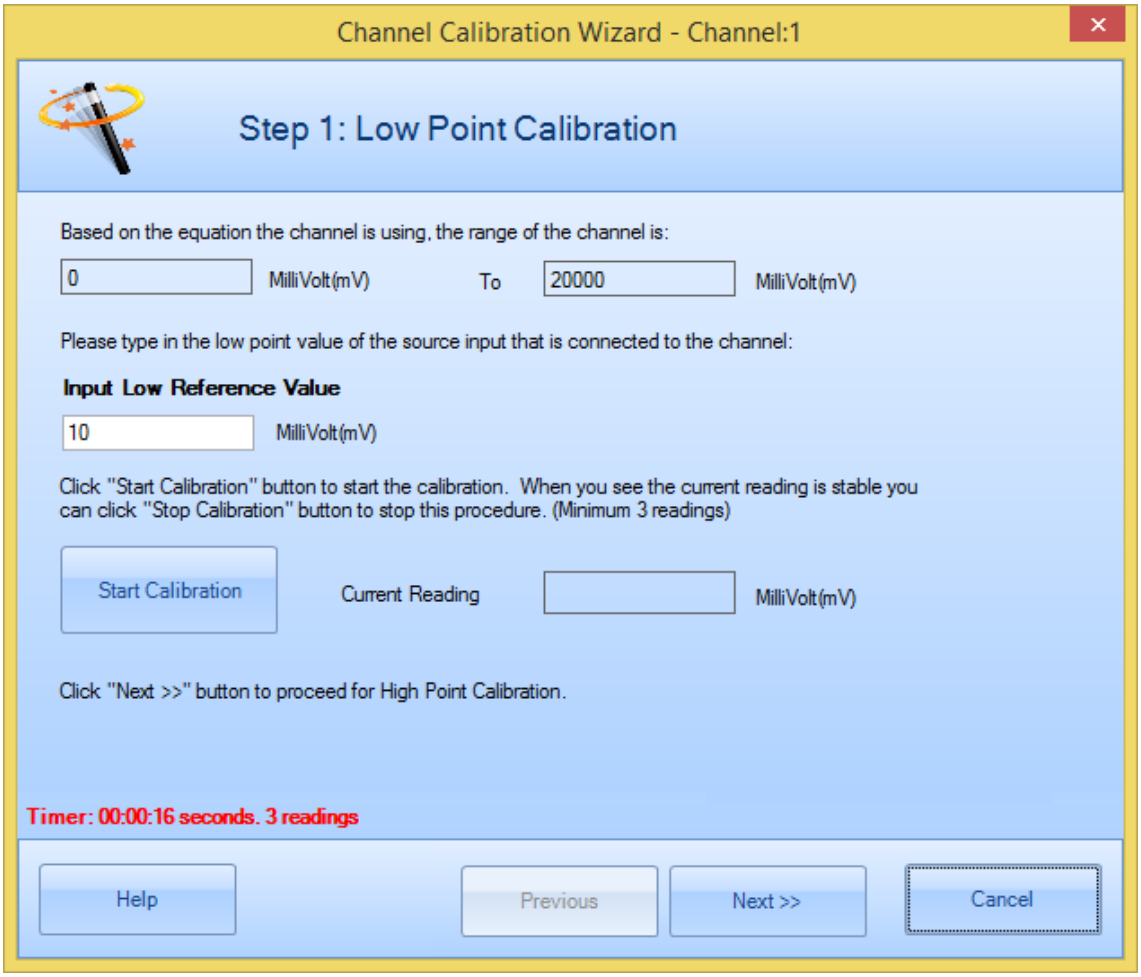
Click **Calibrate** button on the top of the logger status page in SiteView and choose **On-Line Calibrate** menu.



The following dialog appears:



Select the channel you want to calibrate on and click **OK** button. The following dialog appears:

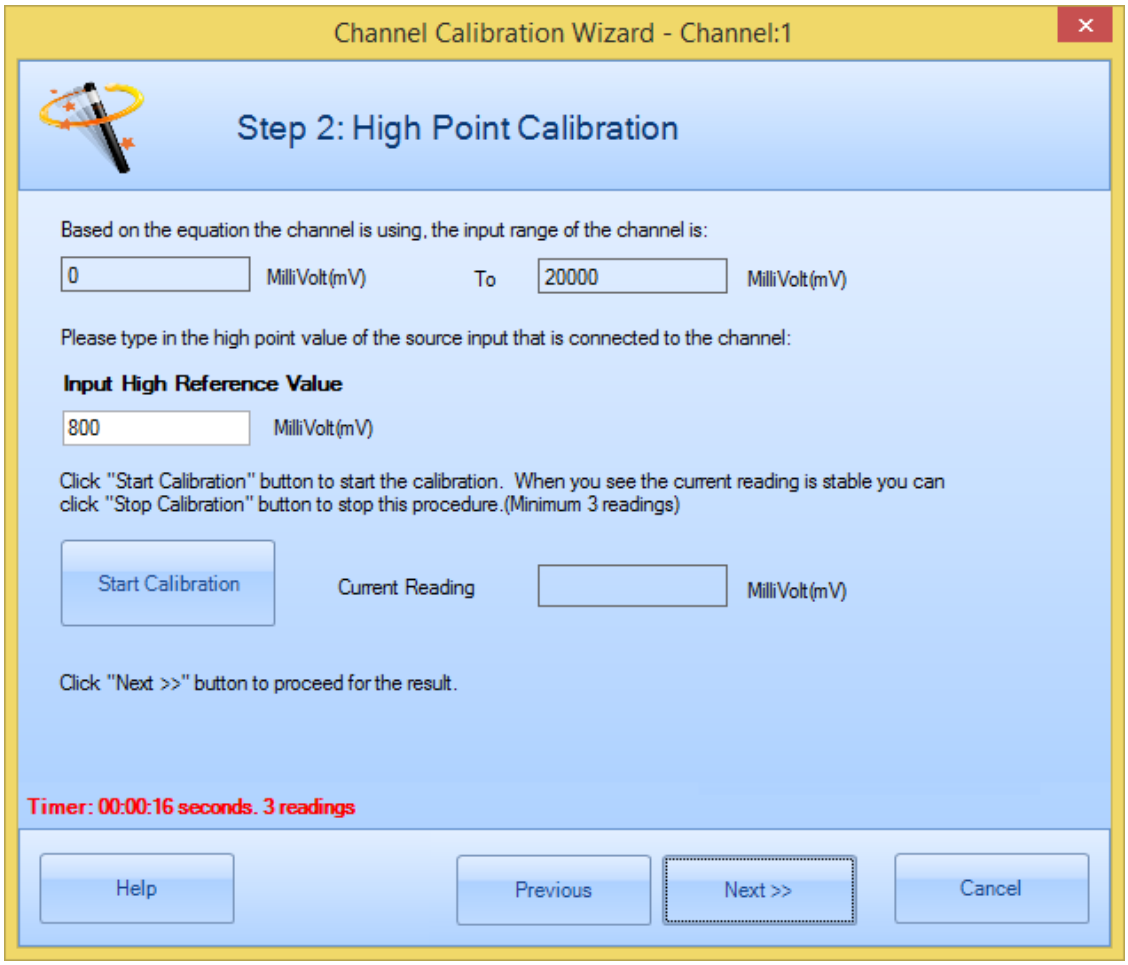


The above page allows you to calibrate the low point. Please adjust your input which connects to the channel terminal strip to a low point value closes enough to the lowest value of the channel. In the above example "0" is the lowest value.

Click **Start Calibration** button to start the low point calibration. After the click, **Start Calibration** button changed to **Stop Calibration**.

During the calibration process the current real-time value is showing in **Current Reading** field. If you think this value is stable you may click **Stop Calibration** button.

Click **Next** to proceed to the next page.

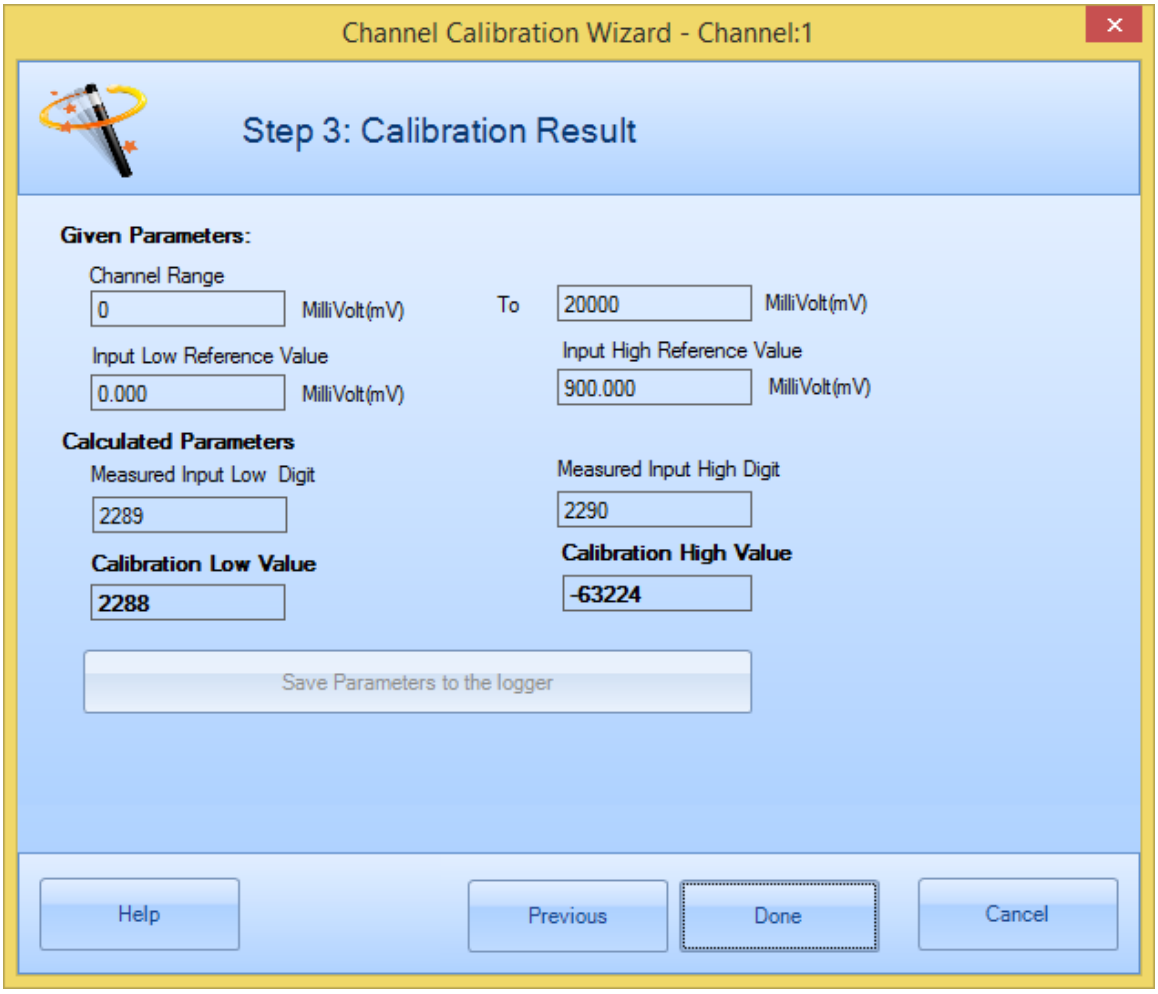


The above page allows you to calibrate the high point. Please adjust your input which connects to the channel terminal strip to a high point value closes enough to the highest value of the channel. In the above example “50000” mV is the highest value.

Click **Start Calibration** button to start the high point calibration. After the click, **Start Calibration** button changed to **Stop Calibration**.

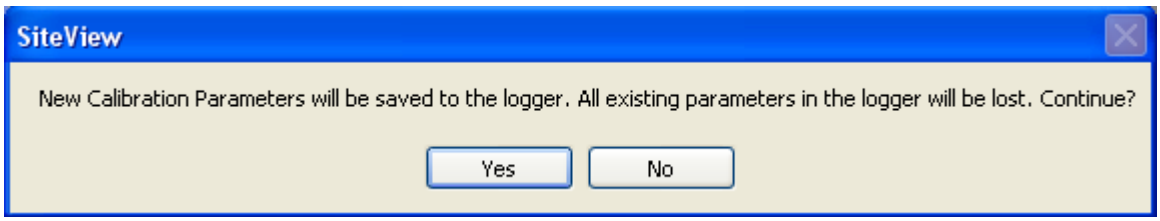
During the calibration process the current real-time value is showing in **Current Reading** field. If you think this value is stable you may click **Stop Calibration** button.

Click **Next>>** to proceed to the next page.



The above page shows all parameters you have input as well as the values the system have calculated. Two important values can be saved back to the logger by clicking **Save Parameters to the logger**. Those two parameters are: **Calibration Low Value** and **Calibration High Value**.

If you click **Save Parameters to the logger** button you will get the below warning dialog. Click Yes to confirm the saving process.



If the system saved the parameters back to the logger successfully, at the bottom side of the dialog **The calibration is finished!** will appear.

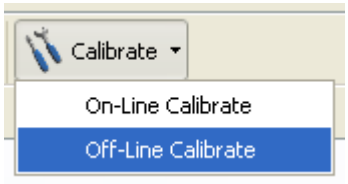


You may click **Done** button to close the dialog.
On the logger status page the Cali. Low and Cali High values for this channel were updated with the new values.

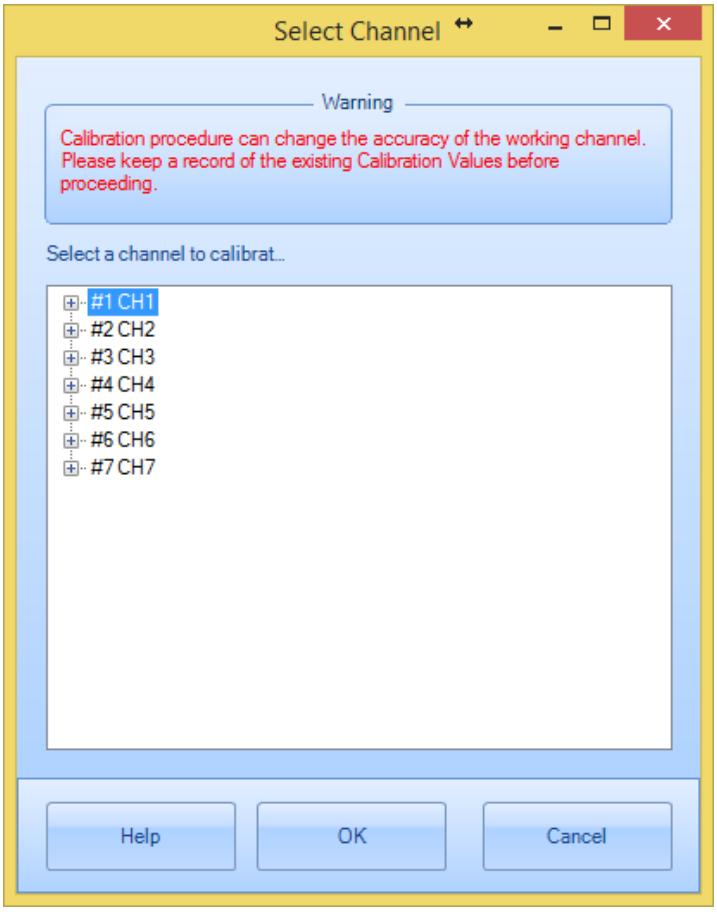
The calibration is finished!

Off-Line Calibrate

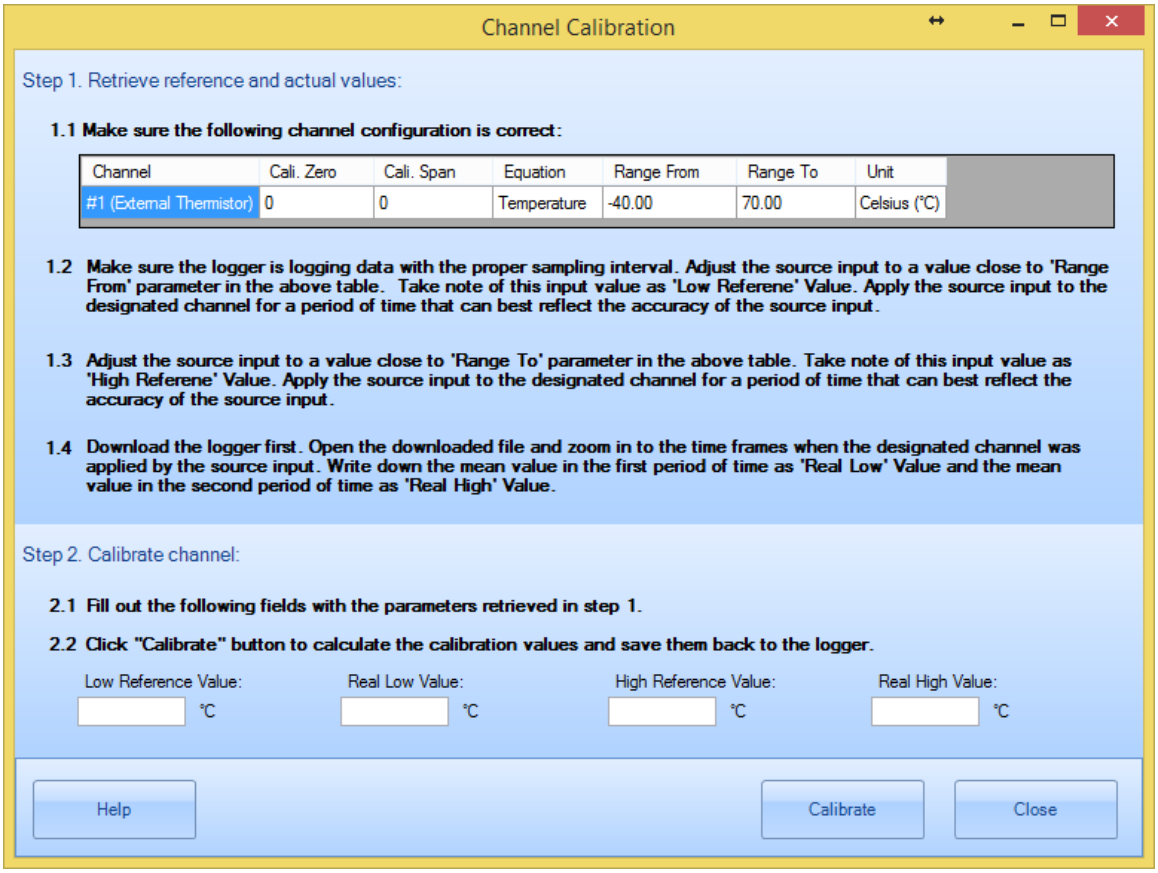
Click **Calibrate** button on the top of the logger status page in SiteView and choose **Off-Line Calibrate** menu.



The following dialog appears:

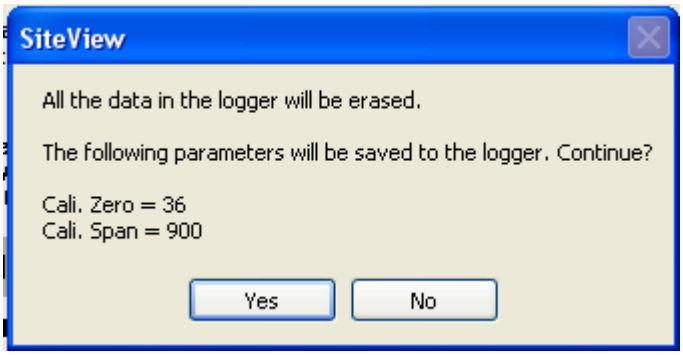


Choose a channel and click OK button. The following dialog shows:



In Step 1, it instructs you how to configure the logger to record low and high point values and retrieve them in the downloaded file.

Once you have obtained those four parameters, enter them into their fields respectively. Click Calibrate button to calculate the final parameters and save them back to the logger. The following dialog appears:



Click Yes button to save the parameters.

The calibration is finished!

CHAPTER 9 - WORK WITH EQUATIONS

What is Equation

Data logger records a channel input measurement in digital value, which does not represent the physical measurement. In order to do the correct conversion Equation is introduced.

Equation is a software functionality handling the conversion from one data format to another. SiteView uses equation name up to 16 characters to identify an equation. Each time when SiteView loads status of the logger it locates the equation by the equation name saved in the logger. If the equation is predefined (built-in equation), SiteView uses predefined function to convert the data. If the equation is customer defined (custom equation), SiteView loads the contents of the equation from the equation file and does the conversion.

Built-In Equations

The following tables contain all built-in equations:

Equations for Temperature Channels

Channel Type	Equation Name	Equation Description
Internal Thermistor		
	Temperature	Temperature
	Resistance	Resistance
External Thermistor		
	Temperature	Temperature
	Resistance	Resistance
PT100/500/1000		
	RTD_TCR_385	Temperature
	RTD_TCR_392	Temperature
Thermocouple		
	ThermocoupleB ThermocoupleE ThermocoupleJ ThermocoupleK ThermocoupleN ThermocoupleR ThermocoupleS ThermocoupleT	Thermocouple Equations
	VoltageDC	Voltage DC

Equations for Relative Humidity Channel

Channel Type	Equation Name	Equation Description
Relative Humidity	RelativeHumidity	Relative Humidity

Equaitons for Voltage Channels

Channel Range	Equation Name	Equation Description
0-2 VDC	VoltageDC	Voltage DC
0-5 VDC	VoltageDC	Voltage DC
0-10 VDC	VoltageDC	Voltage DC
0-20 VDC	VoltageDC	Voltage DC
-5 to + 5 VDC	VoltageDC	Voltage DC
-2 to +2 VDC	VoltageDC	Voltage DC

Equations for Current Channels

Channel Range	Equation Name	Equation Description
4-20 mA	Current DC	Current DC
0-50 mA	CurrentDC	Current DC

Equations for Pulse/State/Event Channels

Channel Type	Equation Name	Equation Description
Pulse	Pulse	Pulse
State	State	State
Event	Event	Event

If the physical measurement is same as the measurement that the built-in equation generates, you can pick the built-in equation when you configure the channel.

If built-in equations do not meet the requirement, you can create a custom equation.

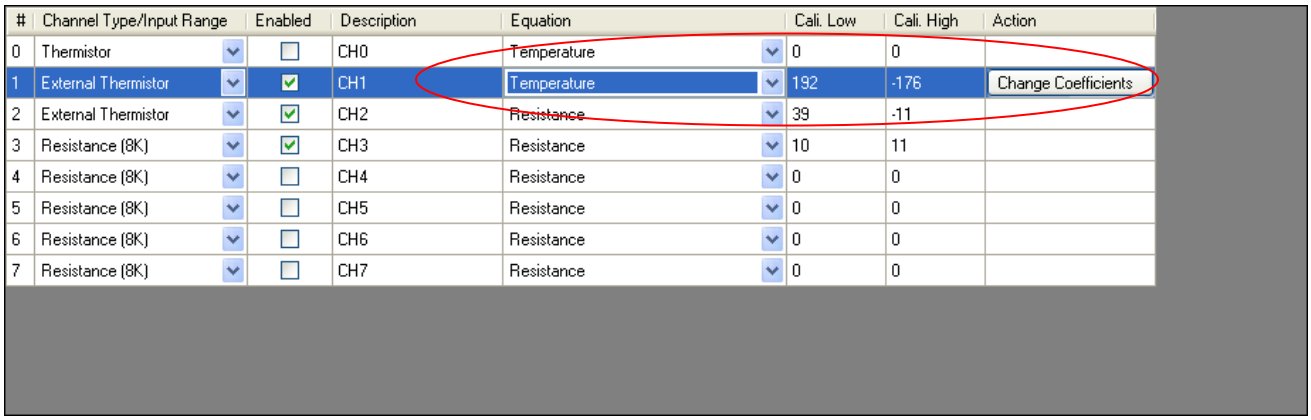
Temperature Equation For Thermistor

A thermistor is a type of resistor whose resistance varies significantly with temperature. All Site-Log data loggers except LRHT-1/2 have on-board thermistor channel to record the ambient temperature. External thermistor channels of LPTH-1 are for user to connect nearly any type thermistors.

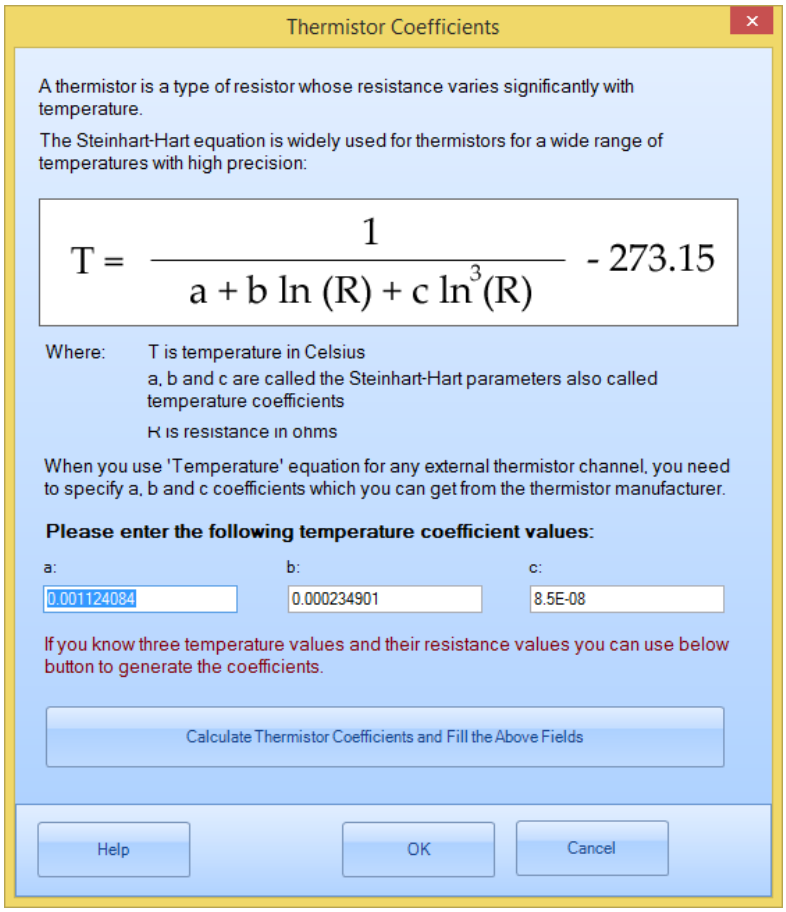
The Steinhart-Hart equation is widely used for thermistors for a wide range of temperatures with high precision:

$$T = \frac{1}{a + b \ln(R) + c \ln^3(R)} - 273.15$$

When you use 'Temperature' equation for an external thermistor channel, you need to specify a, b and c coefficients which you can get from the thermistor manufacturer or let the system to calcaulate for you.

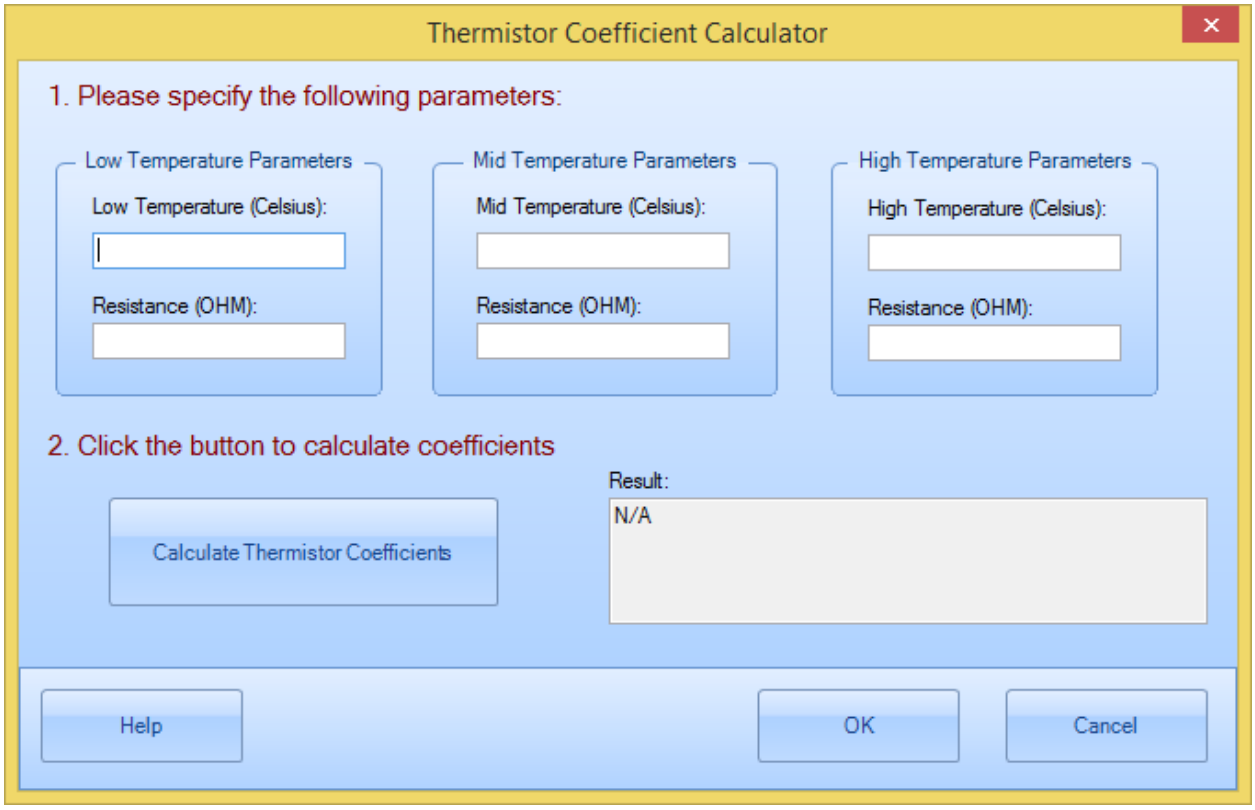


The above screenshot is part of Logger Configuration dialog. After you selected "Temperature" as the equation for channel #1 External Thermistor, "Change Coefficients" button will display in "Action" column to allow you change those a, b and c values:



After you changed those values and click "OK" button the above dialog will close. Then in the Logger Configuration Dialog once you applied the changes the equation will be transferred to the logger.

Click “Calculate Thermistor….” button if you need the system to calculate those a,b and c values:



Fill out the above fields and click Calculate Thermistor Coefficients button. The result will be in Result field. You can copy them to the Configuration dialog.

Custom Equation

A custom equation is a piece of script that user can create to implement the physical measurement conversion. SiteView uses .Net C# language as the script. The script or the source code is in the format of function call.

A function specifies the name of the function, the types and number of parameters it expects to receive, and its return type. The body of the function implements the conversion from one unit measurement to another. A simple custom equation looks like this:

```
public double CO2Equation(double Input)
{
        double output;
        output = (5000 / 10 ) * Input ;
```

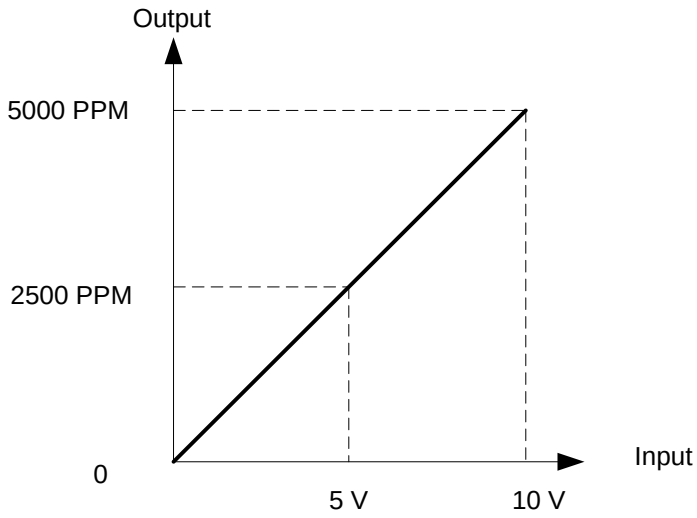
```
        return output;
}
```

The above equation has the name “CO2Equation”. The name must be unique and with maximum of 16 characters.

The function has one parameter named **Input**. This value is read-only and it is the result of the caller function or the conversion from digital value to the unit measurement for that channel type if there is no caller function. In the latter case, **Input** refers to a value within the range of 0 – 10 volt for a 0 – 10 VDC channel type.

The function must return a value, which is the result of the conversion.

The above equation is illustrated below. It indicates that for the input range 0 – 10, the output is proportional to the range of 0 – 5000. For instance, A CO2 transducer has output of 0 – 10 VDC representing 0 – 5000 PPM of CO2. The transducer is connected to the 0 – 10 VDC channel of the logger. When the transducer outputs 0 Volt, the physical measurement should be 0 PPM of CO2. When the transducer outputs 10Volt, the physical measurement should be 5000 PPM of CO2. When you apply the above equation to the channel you should get the correct conversion.



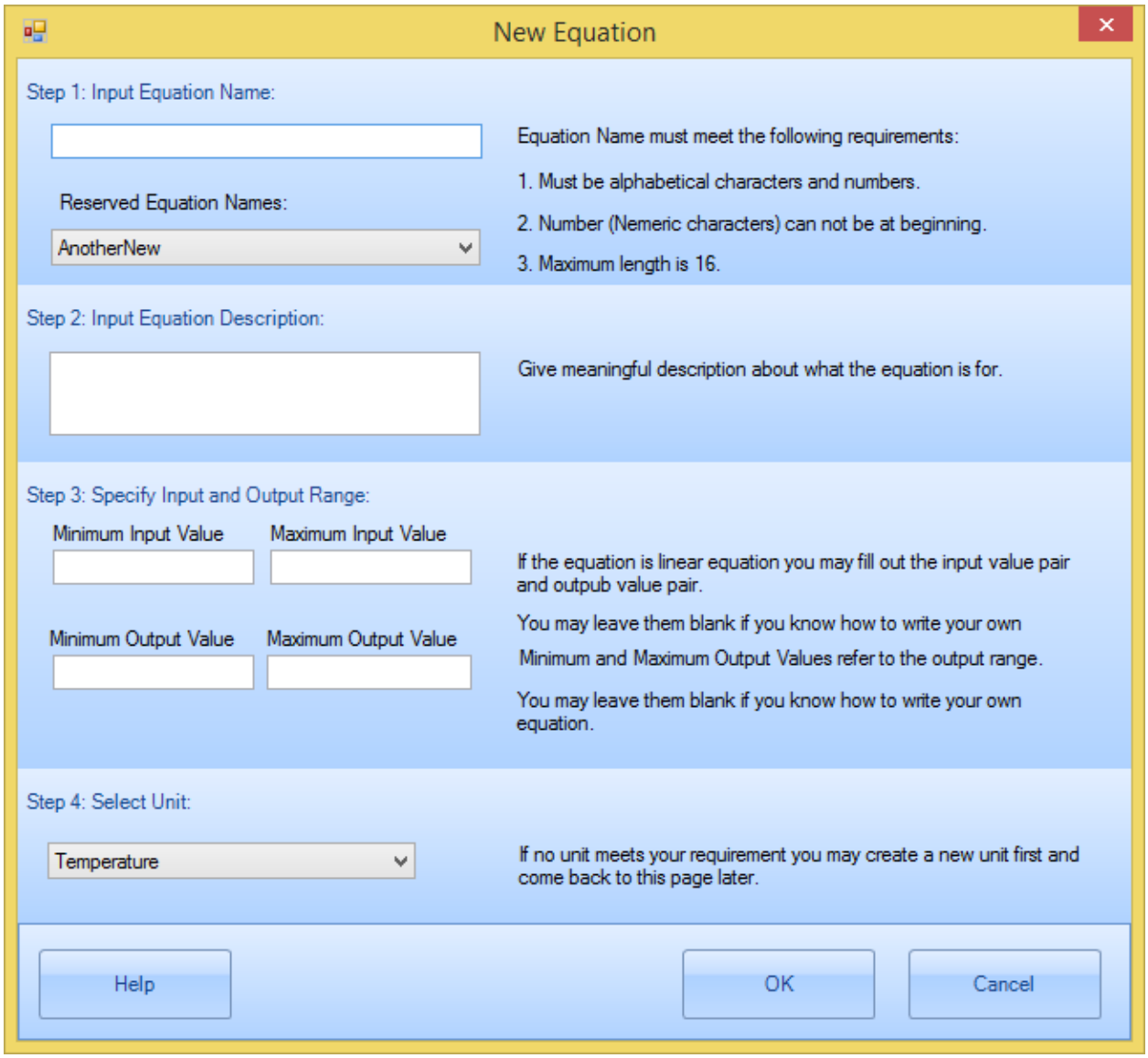
Output = (5000 / 10) * Input

Create Equation

To create a custom equation:

- Click **Equation** button from Main tool bar.

- In the equation dialog, click **Create** button to create a new equation:



In the pop-up dialog, enter the name and description of the equation.

If the equation is a linear equation, type in the Input Value pair and Output Value pair. In the above example, the correct parameters are:

Minimum Input Value = 0
Maximum Input Value = 10

Minimum Output Value = 0
Maximum Output Value = 5000

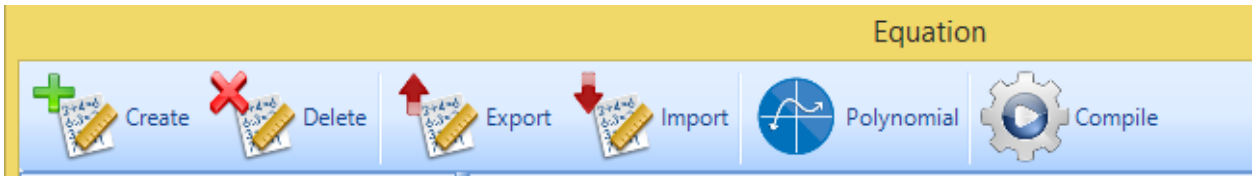
You need to choose a unit for the new equation. If this is a new unit you need to use **Unit Dialog** to create a unit prior to this dialog.

Click **OK** button to close the dialog and return to the Equation dialog.

The new equation is added to the equation list on the left-hand side and the contents of the equation are displayed on the right-hand side panel.

- Click **Apply** button to save the new created equation.

Import/Export Equations

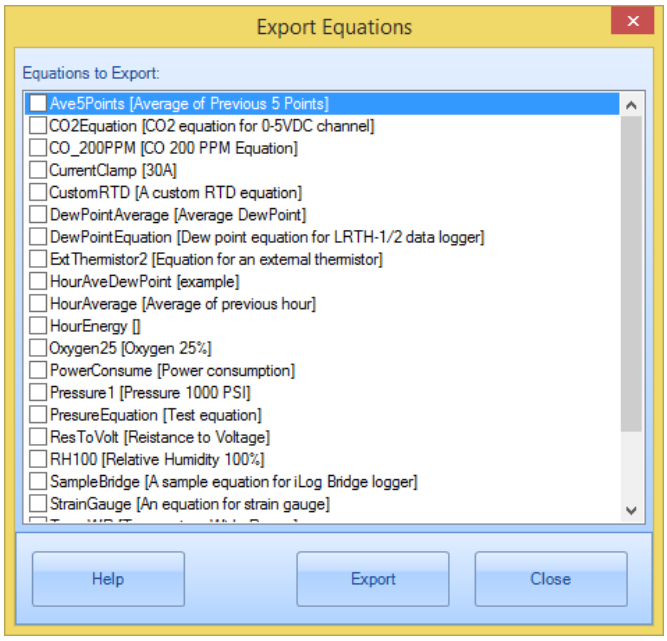


Import/export equation function is used when a batch of equations need to be copied from one SiteView system in one computer to another SiteView system in another computer.

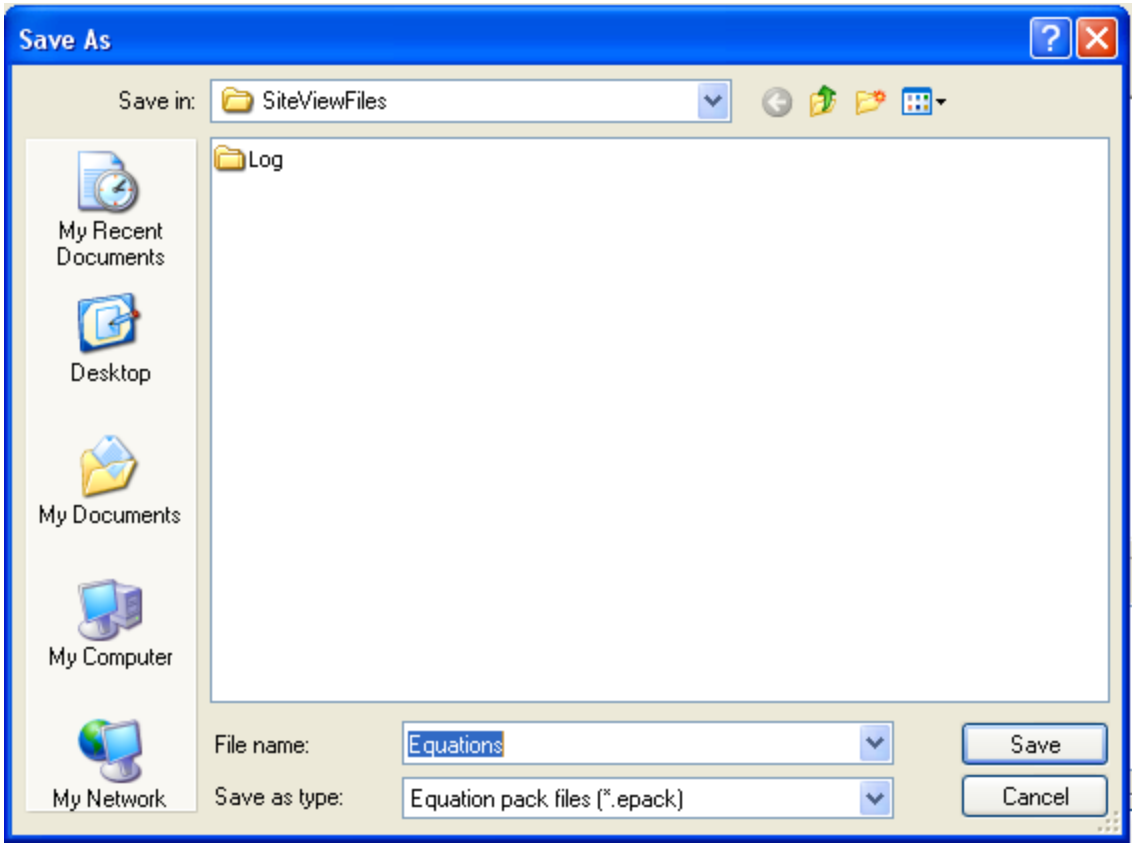
To export a series of equations:

- Click **Export** button.

  In the pop-up Export Equations dialog, check each equation you want to export and click **Export** button.



- In the **Save As** dialog give a filename to save and click **Save** button to close file-save dialog.

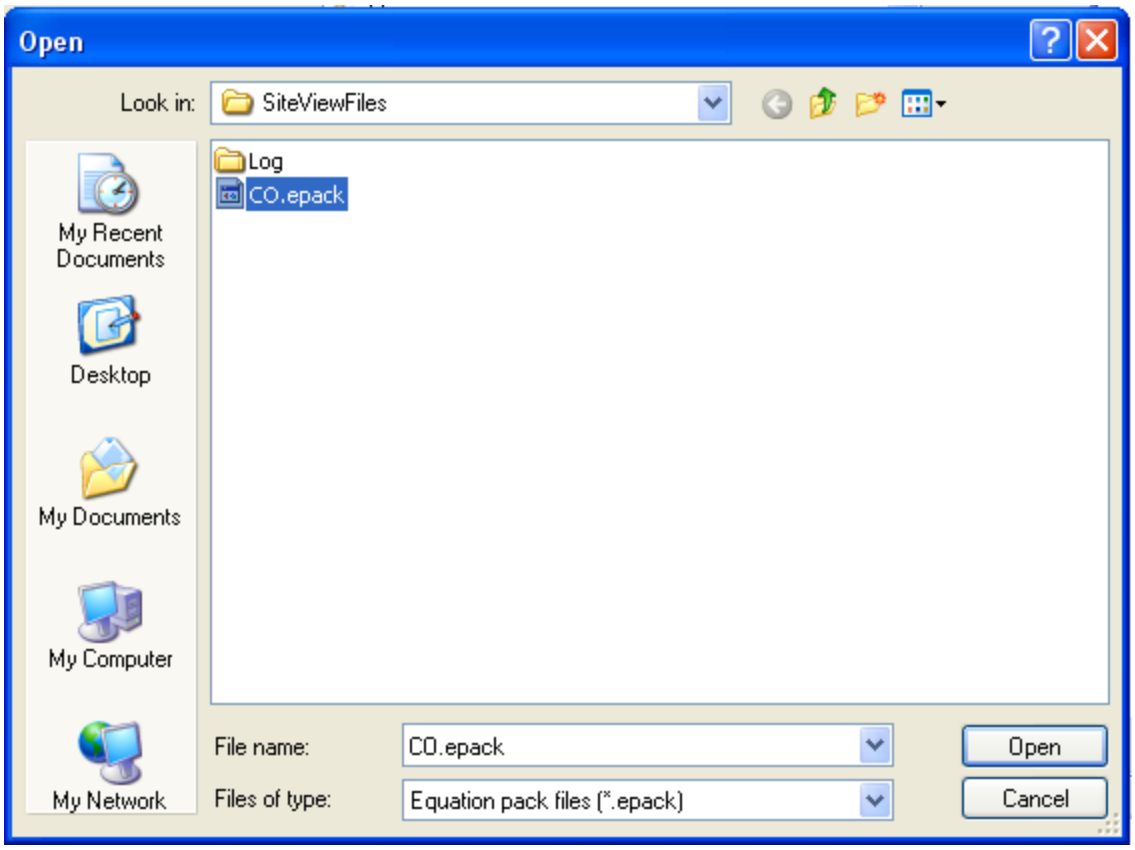


The equations were exported to an equation package file, which can be imported to other SiteView system.

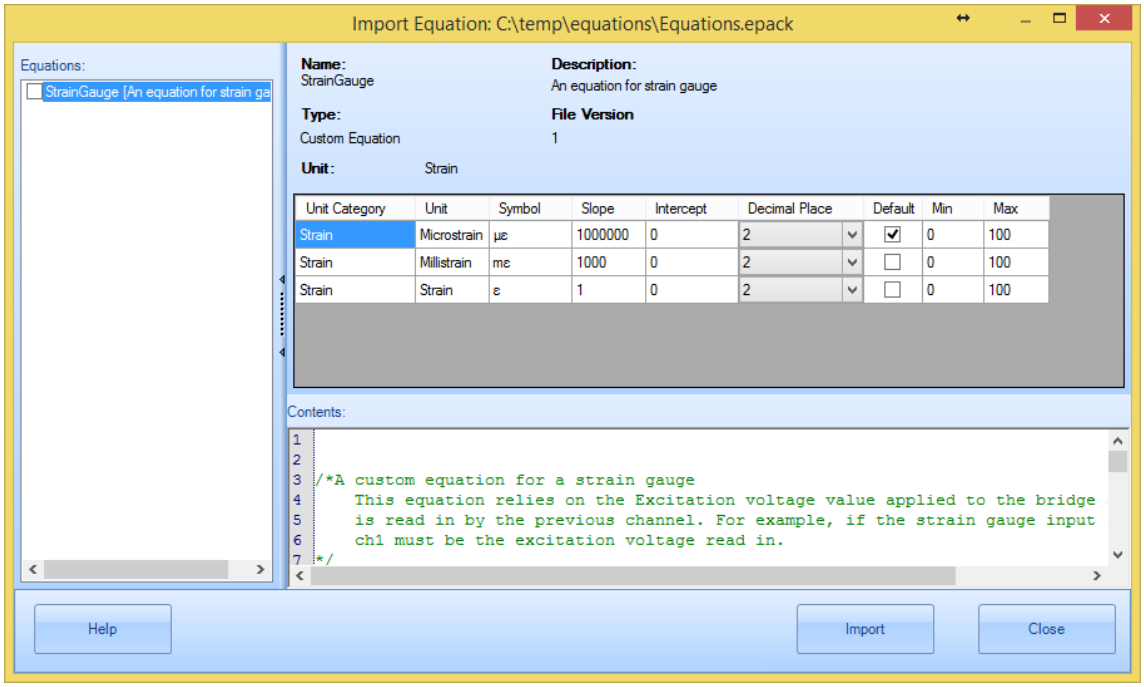
To import an equation package:

- Click **Import** button.

  Browse for the equation package file and click **Open** button to choose the file and close the File-Open dialog.



The following Import Equation dialog appears:

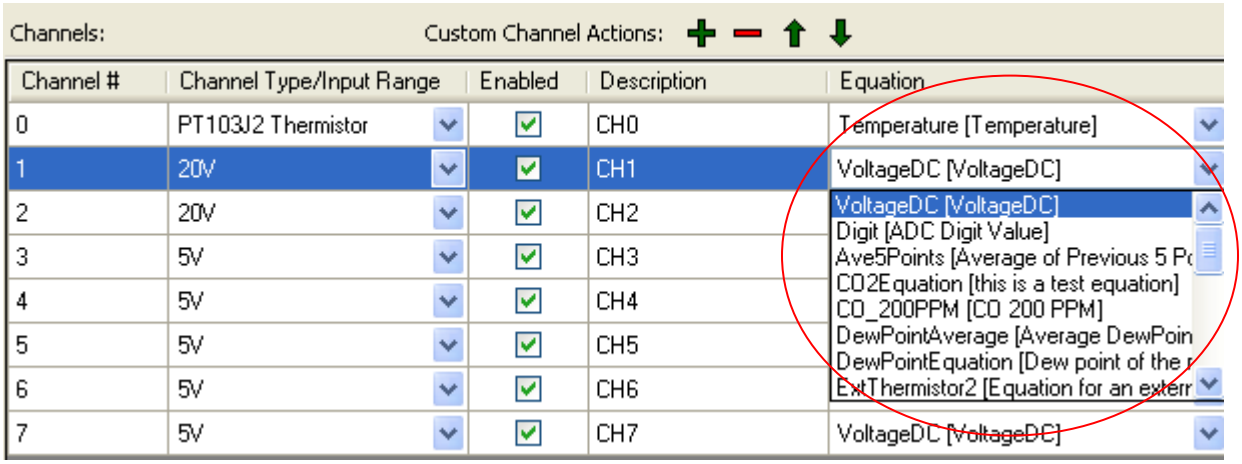


- Check the equations you want to import from the left-hand side list and click **Import** button to import.

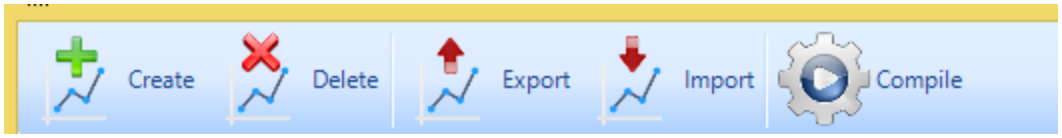
- Click **Close** button to close the Import Equation dialog.

Apply Equation to Logger

If you are in Logger Configuration dialog, when you click on the combo-list in the Equation column cell, all custom equations will be displayed in the list. Choose the one and click Apply button to save the equation information to the logger.



Create Custom-Line Equation

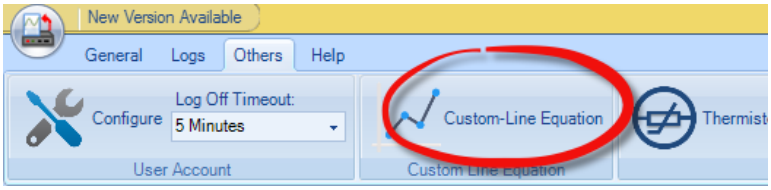


A custom-line equation is used when you add a custom line to the plot. The value of the new line relates to the values of other existing lines on the plot. The relationship is specified in the custom-line equation.

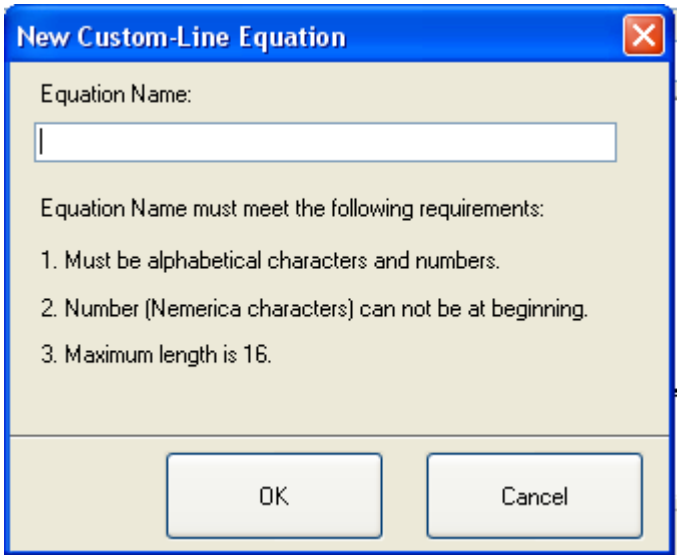
A custom-line equation is similar to a standard custom equation. The only difference is a custom equation accesses **Lines** object instead of **Logger** and **Channels** objects.

To create a custom-line equation:

- Click **Custom-Line Equation** button from Main tool bar.



- In the Custom-Line Equation dialog, click **Create** button to create a new equation:



In the pop-up dialog, type in the name and click "OK" button.

The new equation is added to the equation list on the left-hand side and the contents of the equation are displayed on the right-hand side panel.

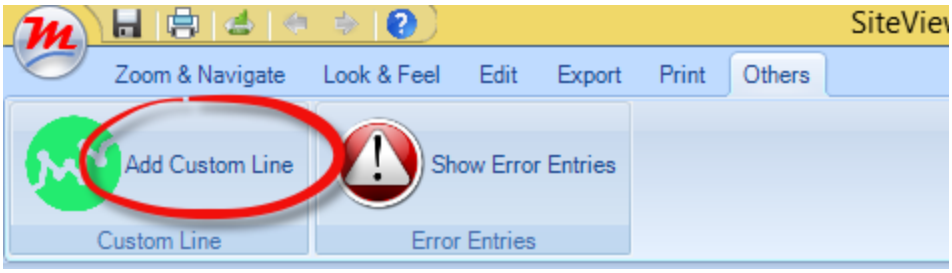
You may update the description of the equation and add your source code in the body of the equation.

- Click **Apply** button to save the new created equation.

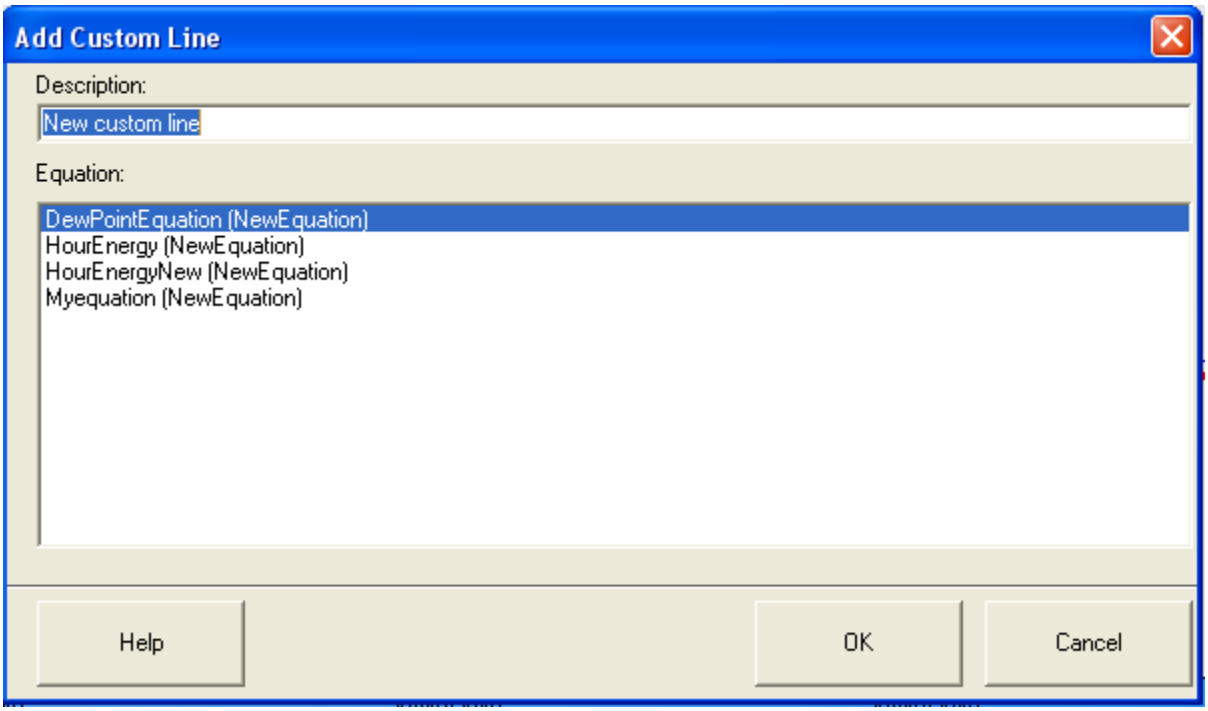
Add Custom-Line Equation to Plot

If you have created a custom line equation, you can apply it to a new created line:

1. Open a SiteView file that you want to add a new custom line to.
2. Click on **Add Custom Line** button under Other tab of the Graph View:



3. In the pop-up **Add Custom-Line** dialog pick the custom line equation you want to apply to the current plot and click **OK** button:

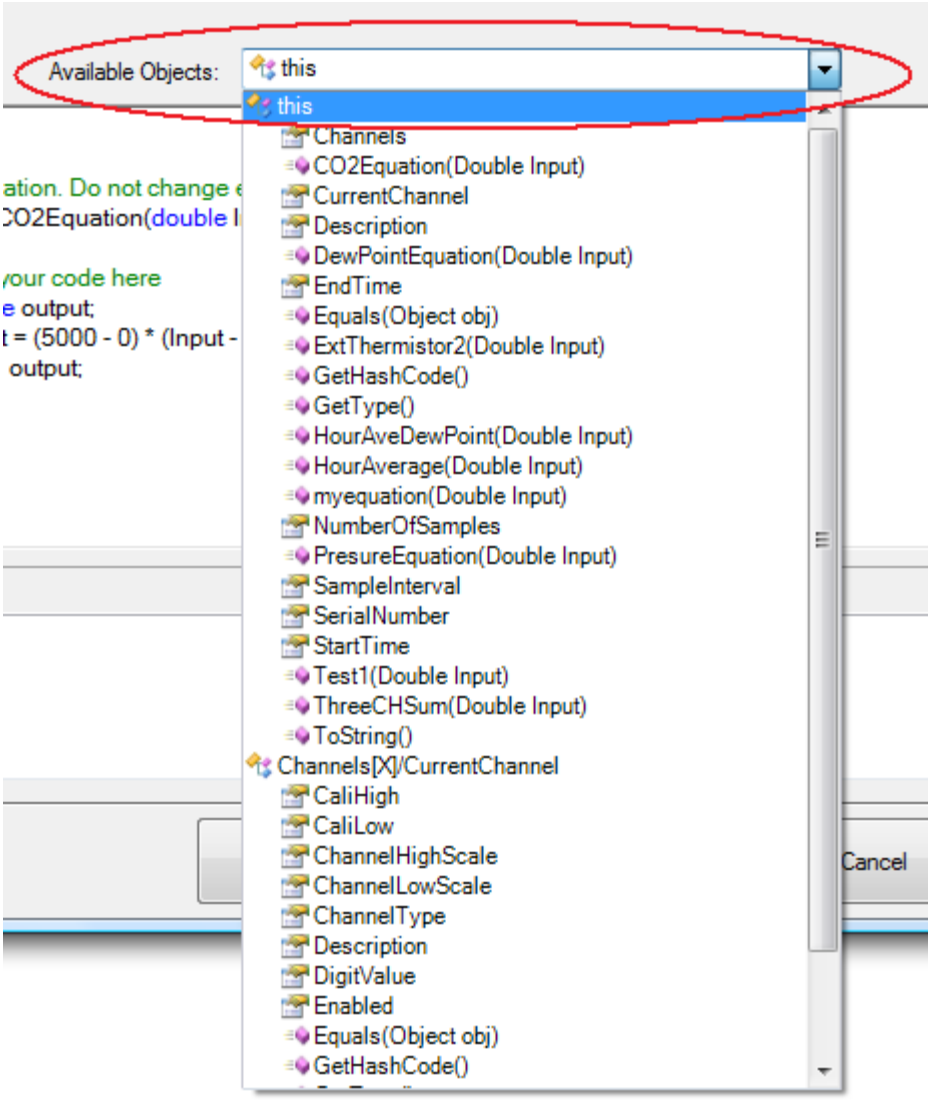


A new line was added to the plot.

Call/Invoke Other Custom Equations

If you have created a custom equation for certain measurement conversion and this conversion may be useful to other custom equations, then you can call/invoke this equation inside other equations.

All available custom equations are listed under **Available Objects** list:



For example, if you have created **DewPointEquation** to calculate the dew point value and **HourAverage** equation to calculate the previous hour average value, you can create a third equation to call these two equations for the previous hour average value of the dew point values like this:

```
//A custom equation for previous hour average of dew point.
public double HourAveDewPoint(double Input)
{
    double val = DewPointEquation(Input);
    val = HourAverage(val);
    return val;
}
```

CHAPTER 10 - WORK WITH UNITS

What is Unit

A Unit is a definite magnitude of a physical quantity, defined and adopted by convention and/or by law, that is used as a standard for measurement of the same physical quantity.

For example, Temperature is a physical quantity or a Unit Category. The Celsius is a unit of Temperature that represents a definite predetermined temperature. When we say 25 Celsius (or 25°C), we actually mean 25 times the definite predetermined temperature called "Celsius".

A unit category may have multiple units associated to it. For example, Fahrenheit and Kelvin are other two units under temperature category and their relationships are:

Fahrenheit = 1.8 * Celsius + 32
Kelvin = Celsius + 273

In the SiteView system, each unit category can have only one primary unit. In the above example, Celsius is defined as the primary unit. Only the primary unit has its slop = 1 and intercept = 0. All other units under the same unit category relate to the primary unit.

In SiteView system, each unit category can have one user selectable default unit. For example, if you are in the United States you may choose Fahrenheit as your default unit.

The following tables specify the SiteView built-in units for some unit category:

Temperature Category:

Unit	**Slop**	**Intercept**	
Celsius	1	0	
Fahrenheit	1.8	32	
Kelvin	1	273	

Voltage Category:

Unit	**Slop**	**Intercept**	
Volt	1	0	
Killovolt	0.001	0	
Millivolt	1000	0	
Microvolt	1000000	0	

Current Category:

Unit	**Slop**	**Intercept**	
Amp	1	0	
Milloamp	1000	0	

Microamp	1000000	0	

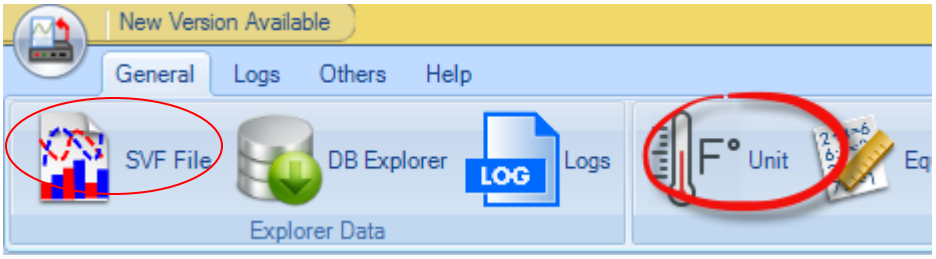
Relative Humidity Category:

Unit	**Slop**	**Intercept**	
RH	1	0	

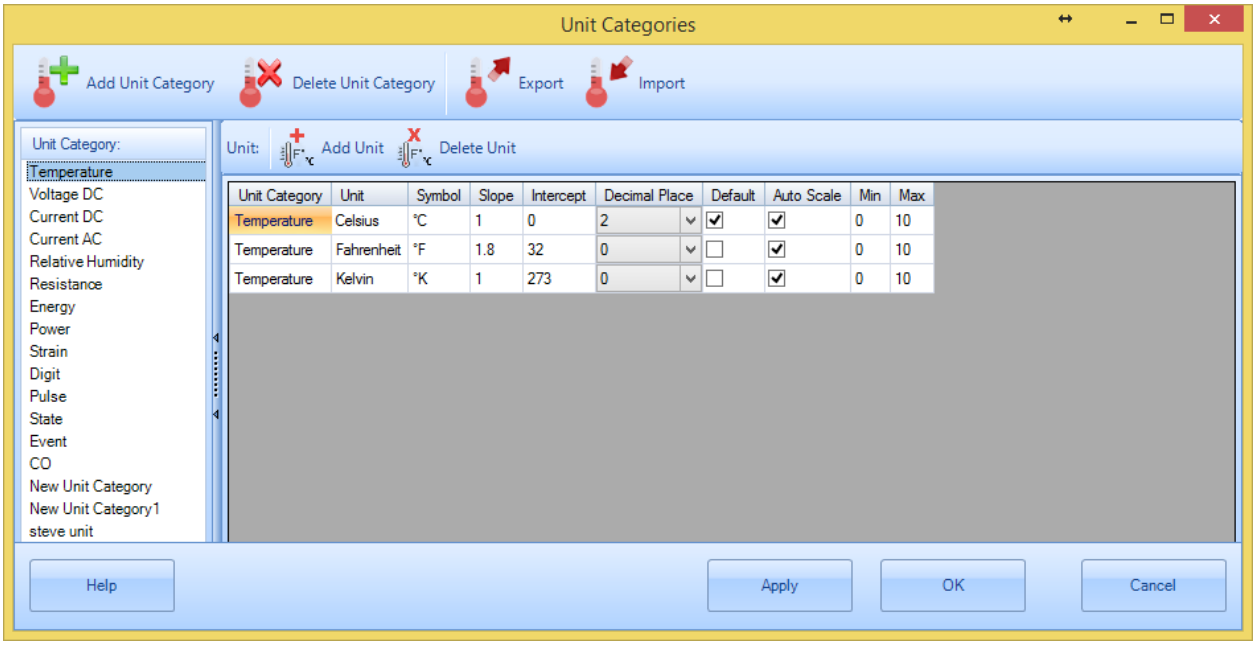
Unit category is used by an equation. Without the unit, the measurement calculated by the equation does not have meaning.

Open Unit Category Dialog

Click **Unit Category** button on main tool bar:



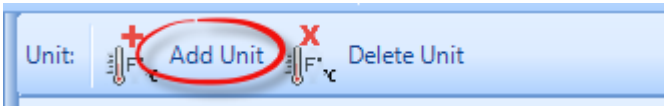
The following **Unit Category** dialog appears:



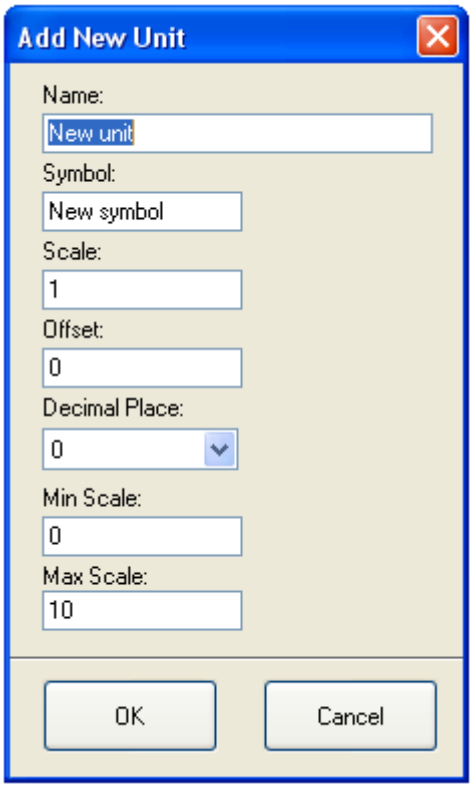
Create Unit

To create a unit under existing unit category:

- Click **Add Unit** button in **Unit Category** dialog:



The following **Add New Unit** dialog appears:

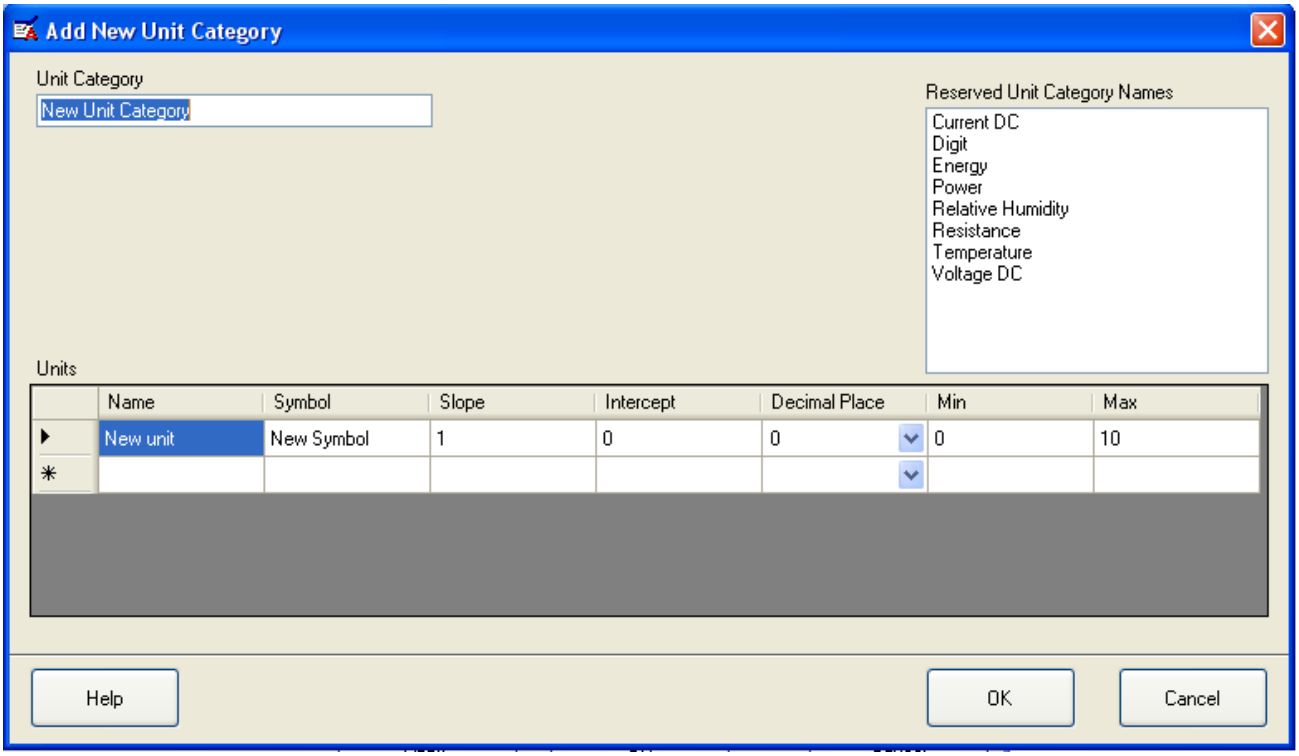


- Fill out the fields in the above dialog and click "OK" button to close **Add New Unit** dialog.

To create a unit and unit category:

- Click **Add Unit Category** button in **Unit Category** dialog:

  The following **Add New Unit Category** dialog appears:



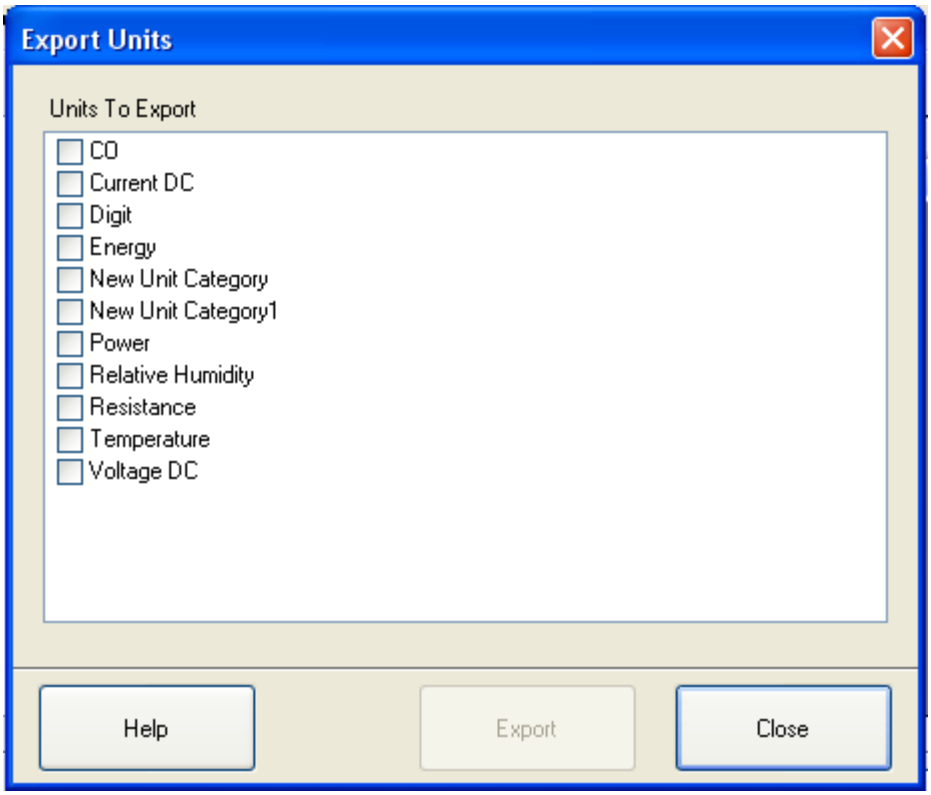
Add each unit under the new category and click **OK** button to close **Add New Unit Category** dialog.

Import/Export Units

To export unit package:

Click **Export Units** button in **Unit Category** dialog:

The following **Export Units** dialog appears:

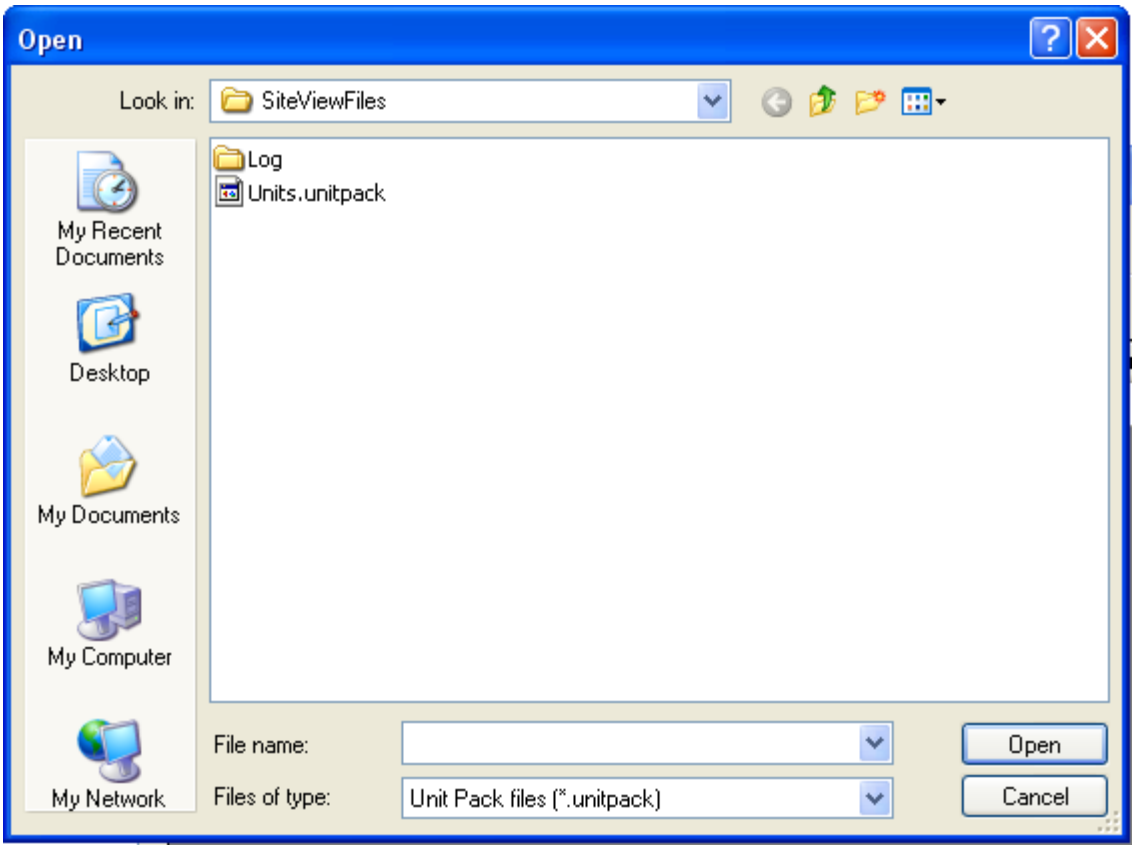


Check the units you want to export and click **Export** button to choose a file to save.

Click **Close** button to close **Export Units** dialog.

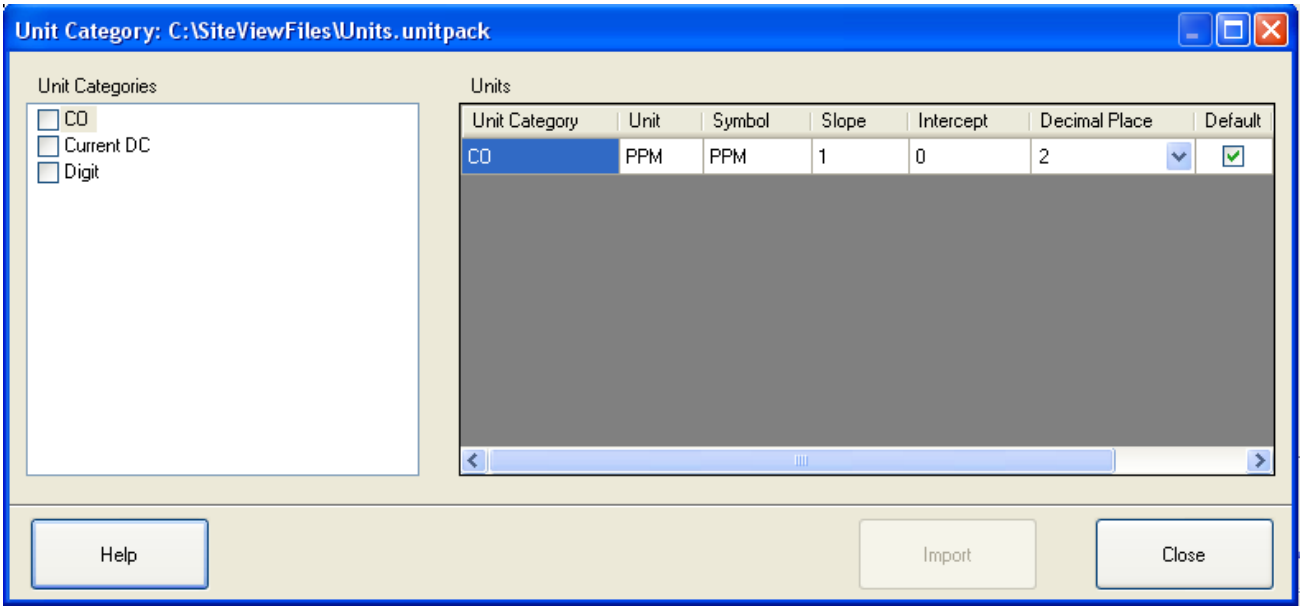
To import a unit package:

Click **Import Units** button in **Unit Category** dialog. The following Open dialog appears:



Browse for the unit package file in **Open** dialog.

The following **Import Unit** dialog appears:

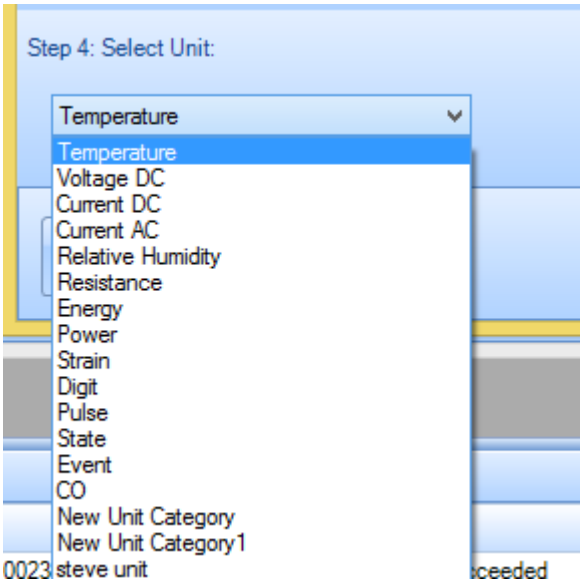


Check units you want to import to and click **Import** button to add the units to the system.

Use Unit

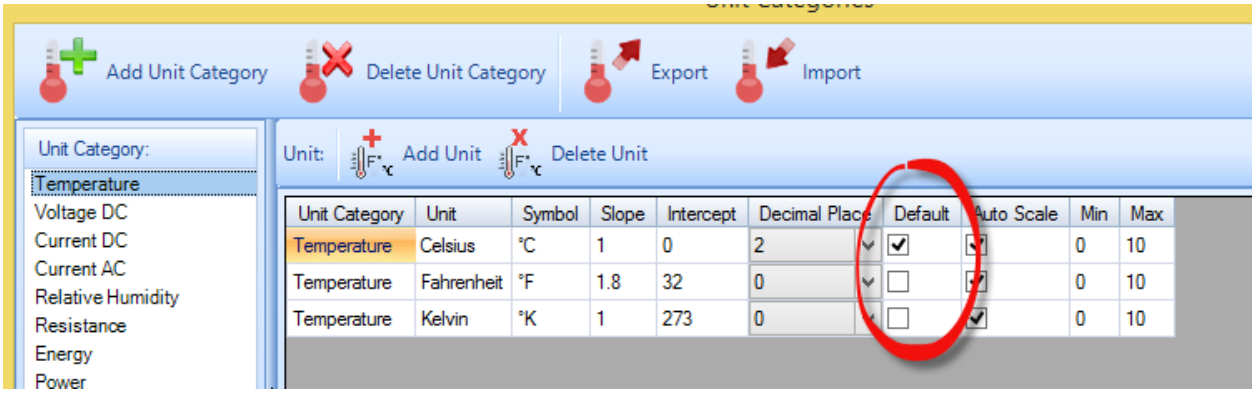
Apply Unit Category in Equation

A unit category is used by an equation. When you create an equation you need to specify what unit category you want the equation to use. You choose the unit in Step 4 of **New Equation** dialog:



Change Unit

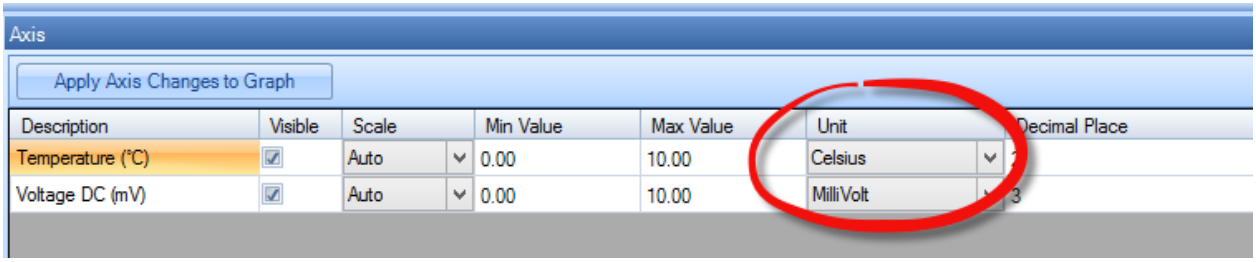
If you prefer other unit other than the existing default unit under Unit Category, you can change it in **Unit Category** dialog:



In the above diagram, unit Celsius is the current default unit under Temperature category. You can change this setting by checking Default check box for Fahrenheit or Kelvin row.

Change Unit in Plot

If you prefer a different unit for a channel displayed in the plot, you can change this by selecting a different unit under Unit column in Axis Tab:

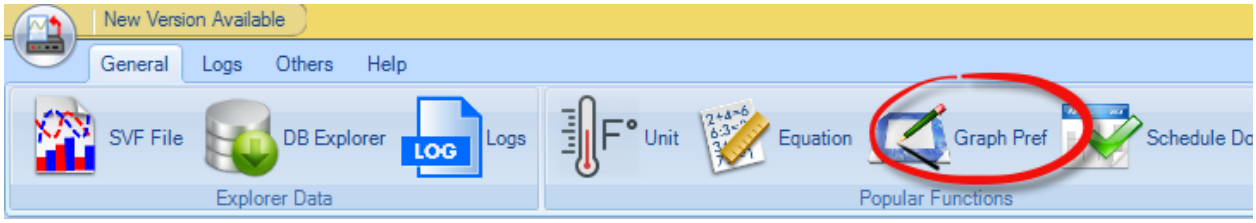


CHAPTER 11 - WORK WITH SETTINGS & PREFERENCES

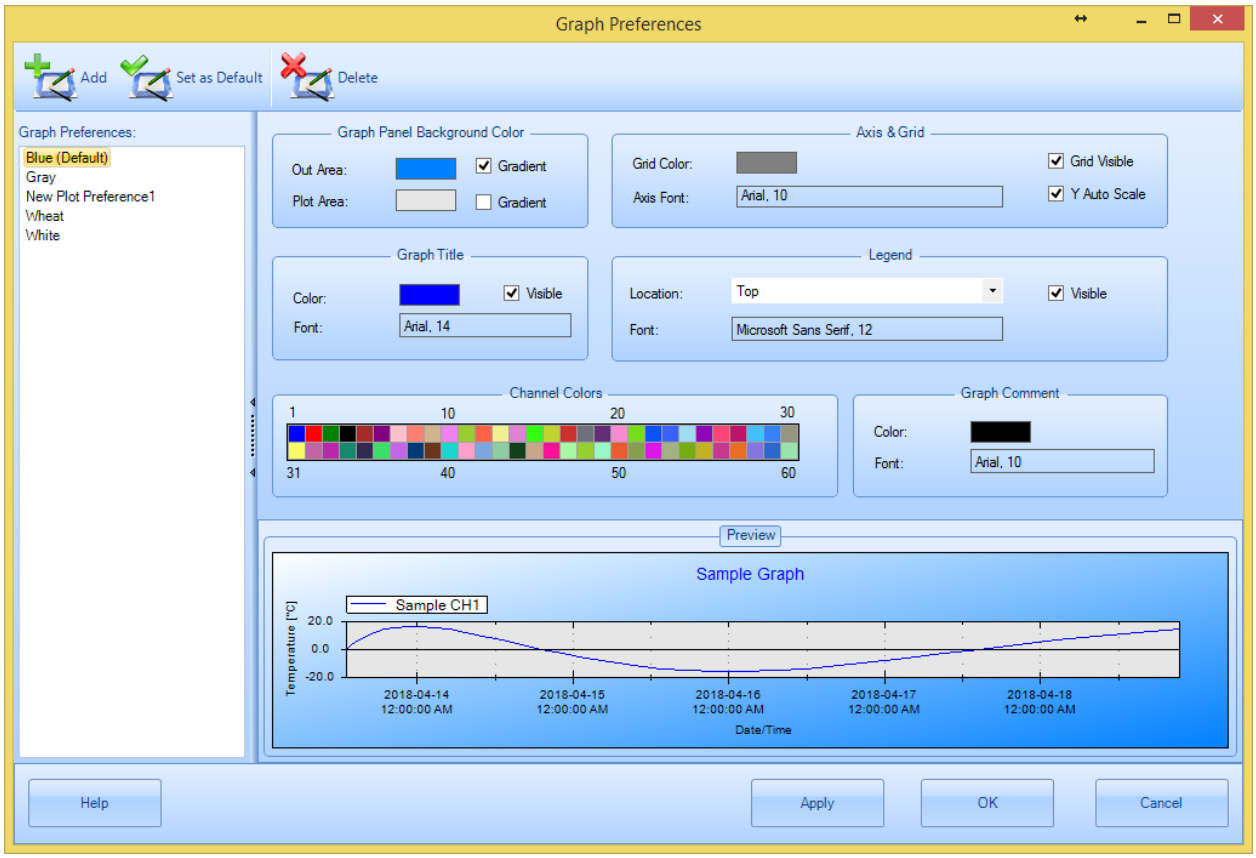
Graph Preferences

Graph Preferences are the properties regarding SiteView plot view. The default Graph Preferences are applied in a new created SiteView file.

All graph preferences are managed in **Graph Preferences** dialog opened by clicking **Graph Preferences** main tool bar button:



The following Plot Preferences appears:

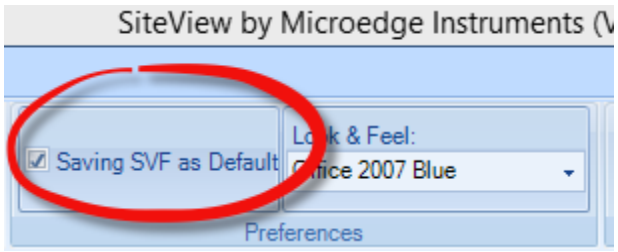


You may add, delete and set default for the selected plot preferences item in the left-hand side list.

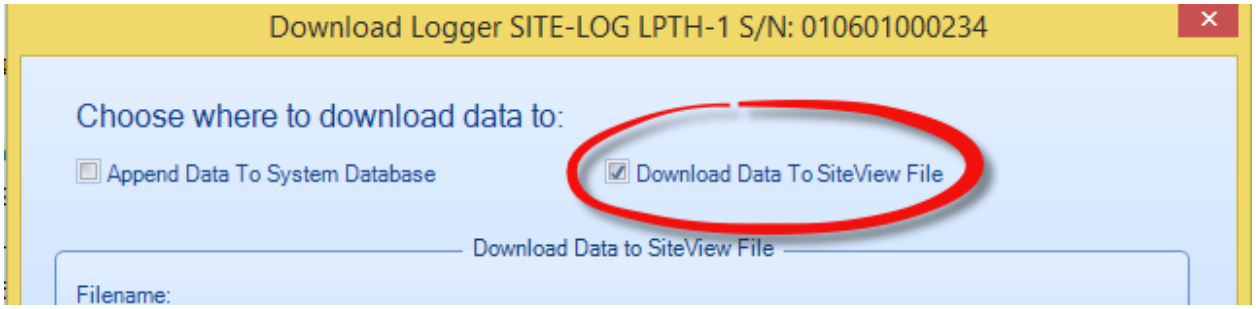
Any property you changed will reflect the changes in the Preview plot.

Click **OK** or **Apply** button to save the changes.

Saving SiteView File (SVF)

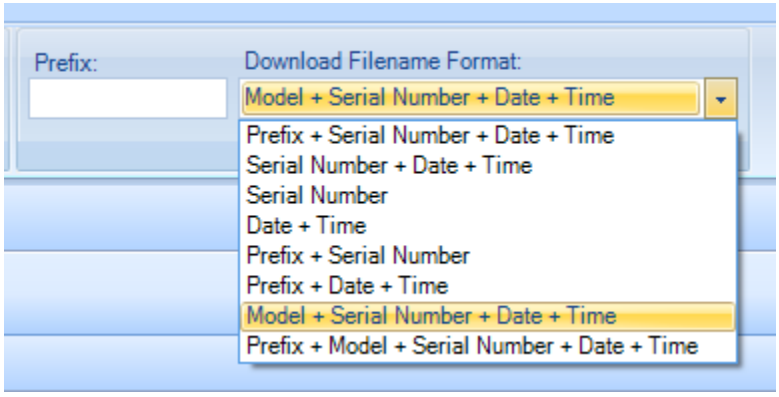


If you check "Saving SVF as Default" on the main ribbon control, in the download dialog, it will be selected as the default option:



SVF Filename Structure

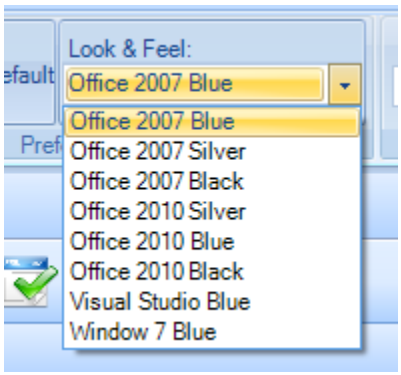
Under main ribbon control, there are two settings specify how the default SVF filename structured.



Each time when you download logger and if you choose to download to SVF, the default SVF filename will be structured based on the above settings.

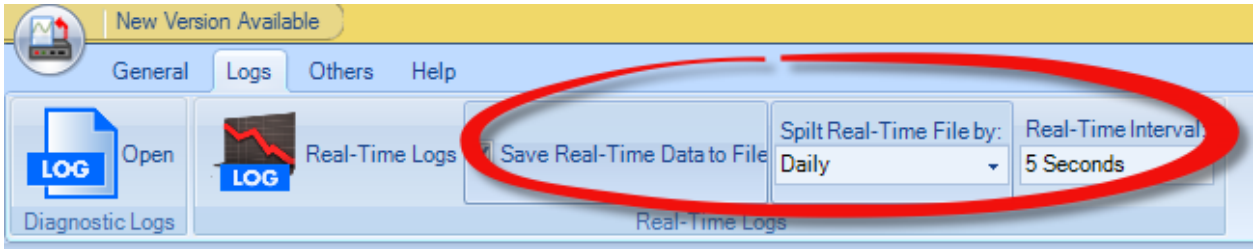
Look and Feel (Skin)

You may change the looks and feels of the application by selecting one of the available skins:



Real-Time Settings

The following settings specifies if you want to save the real-time data, how fast you want to sample the logger when doing the real-time and how you want to split the real-time log files.

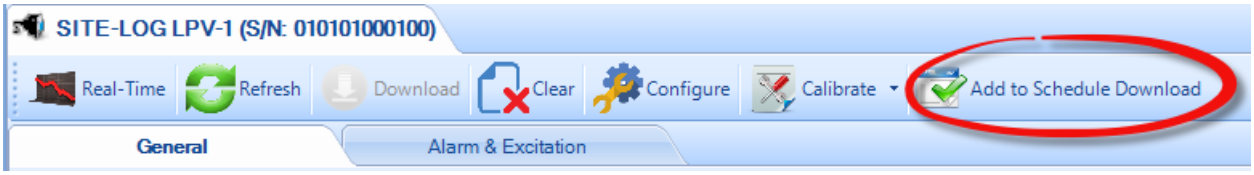


CHAPTER 12 - WORK WITH SCHEDULE DOWNLOAD

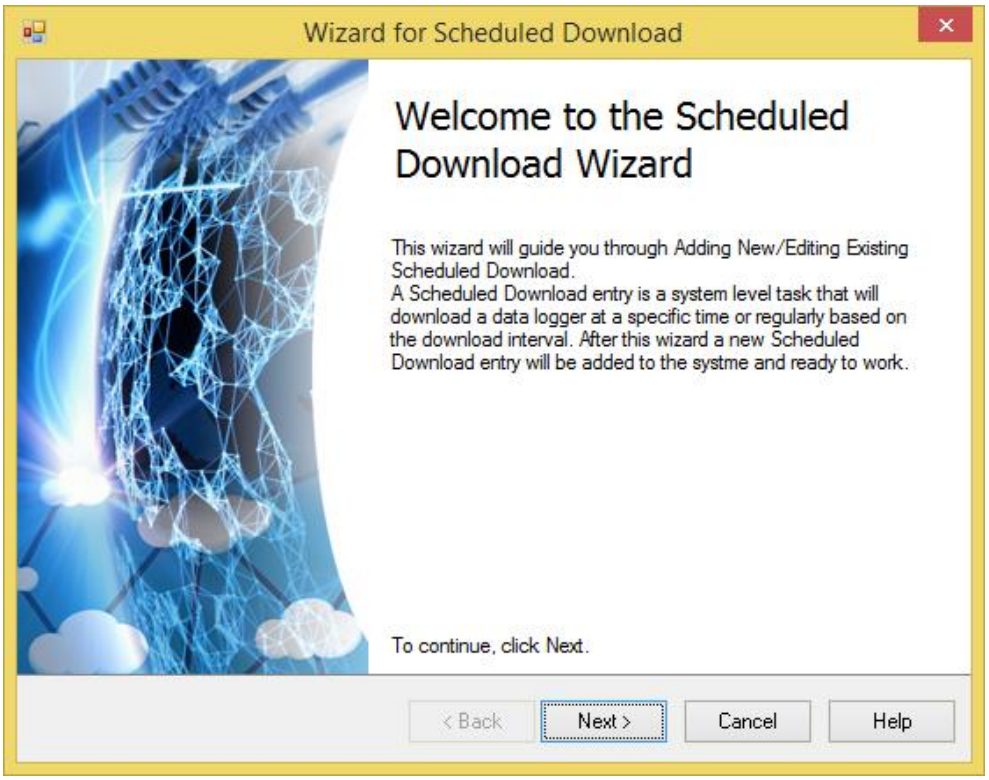
A scheduled download entry is a system level task that will automatically download a data logger at a specific time or regularly based on the download interval.

Add Schedule Download

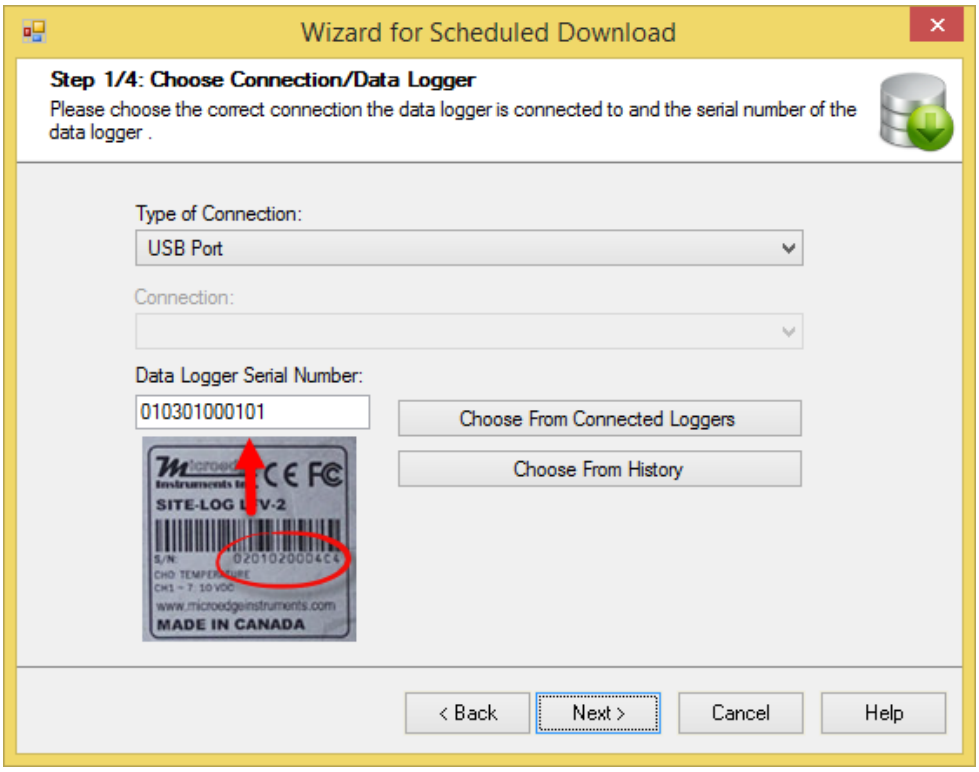
- With logger's status window opened, click "Add to Schedule Download" button:



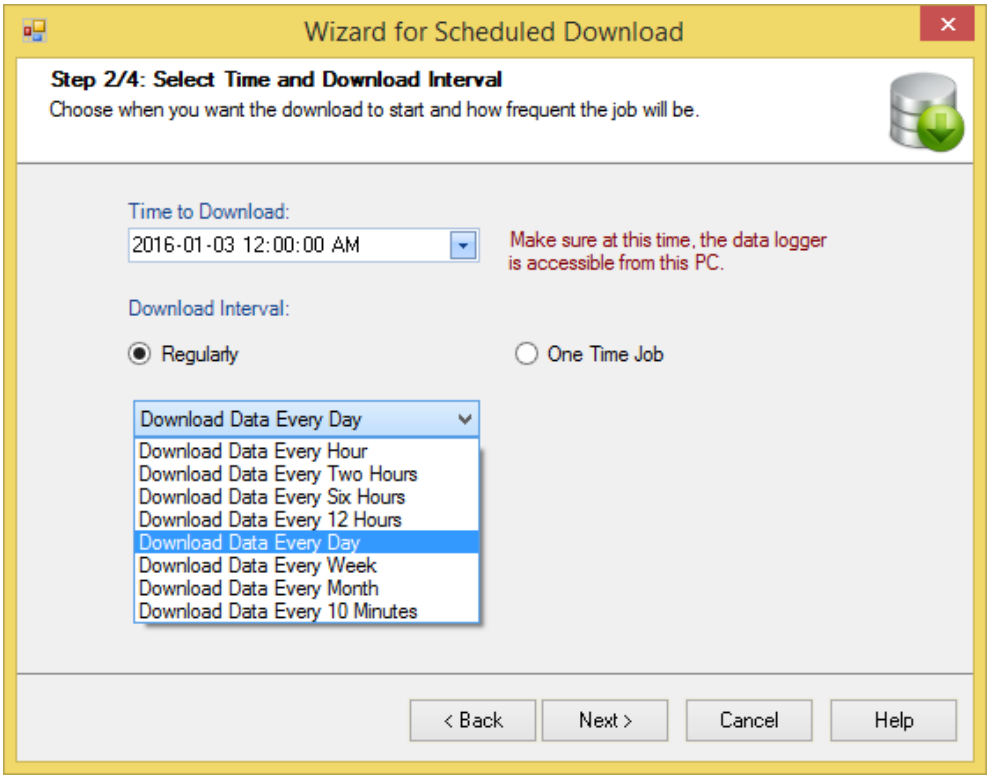
- Go through the Wizard:



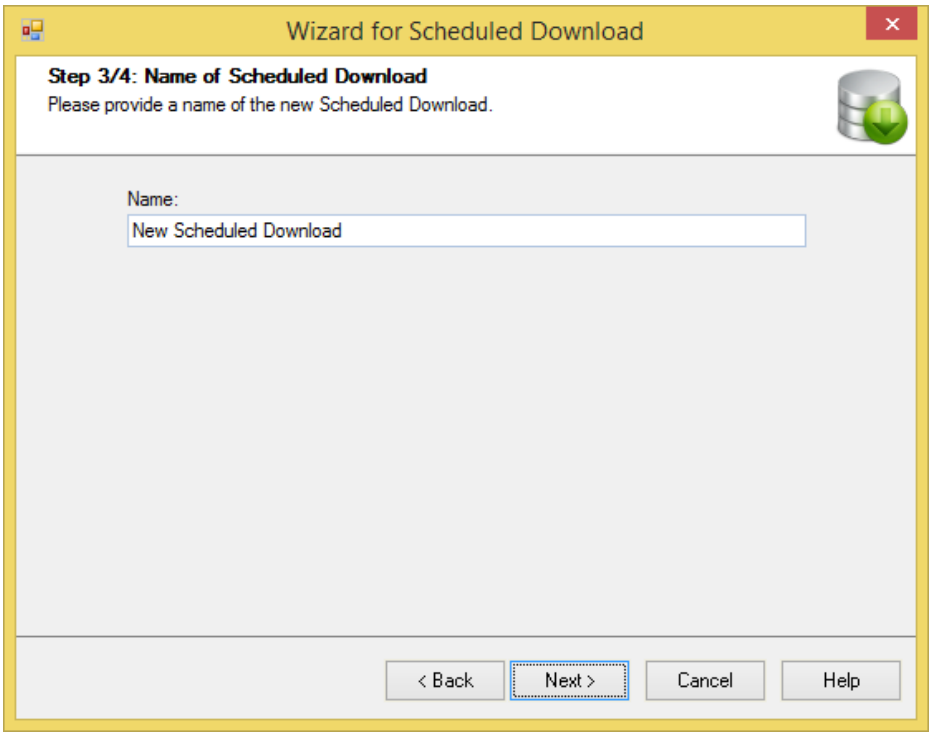
Click "Next" button to continue.



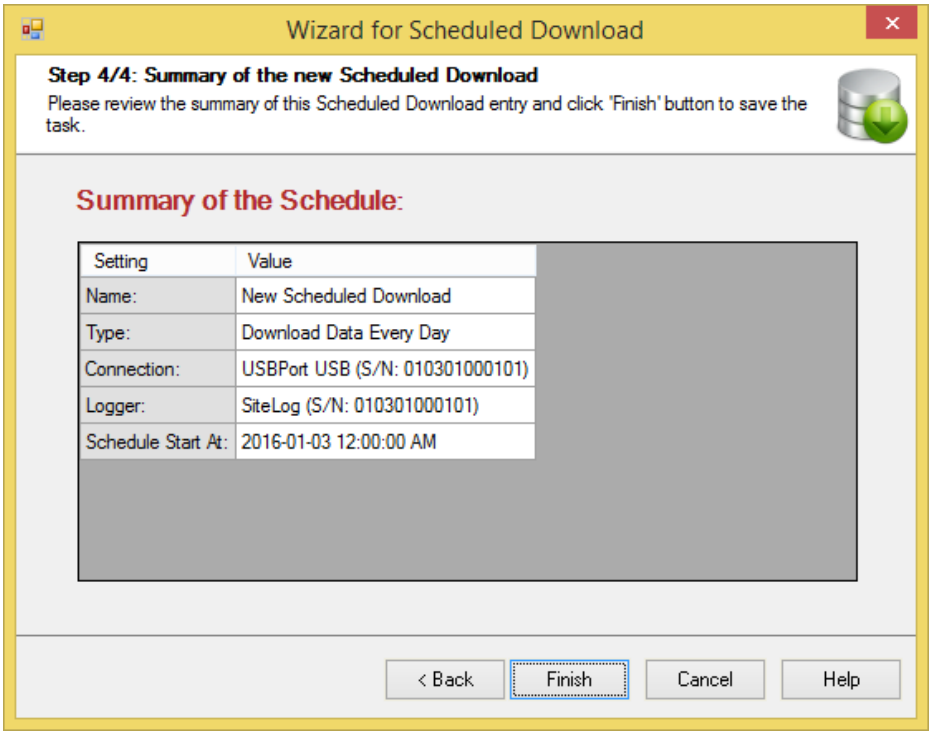
Click “Next” button to continue.



Choose a time to download the logger. Choose either is regular download with a download interval or a one time job. Then click “Next” button



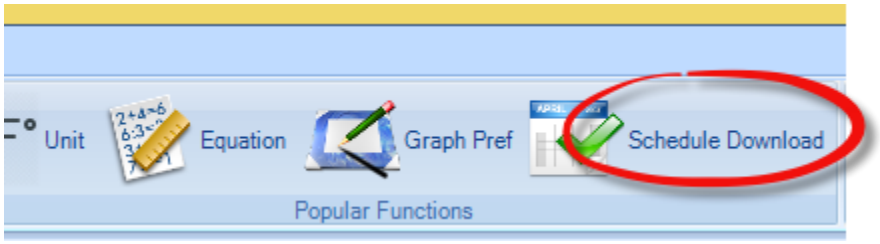
Give a name of this entry and click “Next” button.



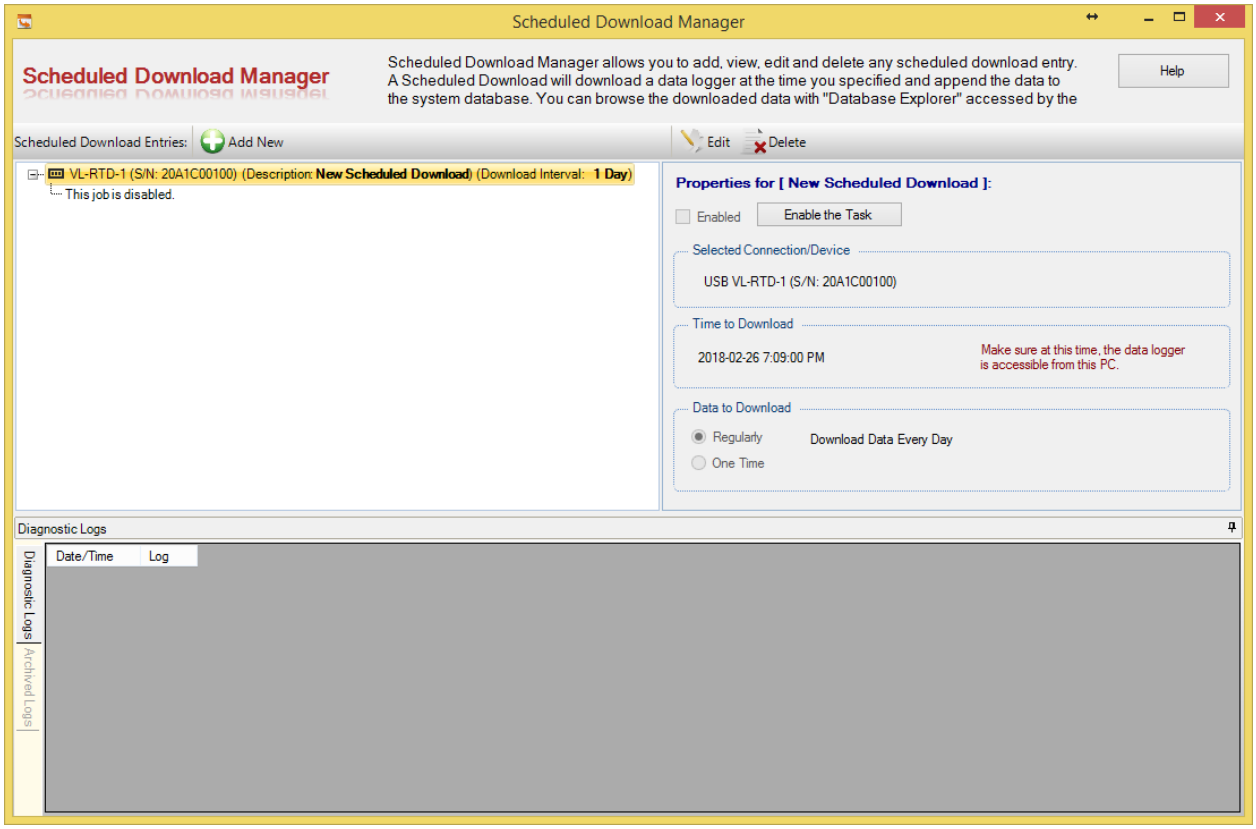
Review the summary of the entry and click “Finish” button to add the entry to the system.

Manage Schedule Download

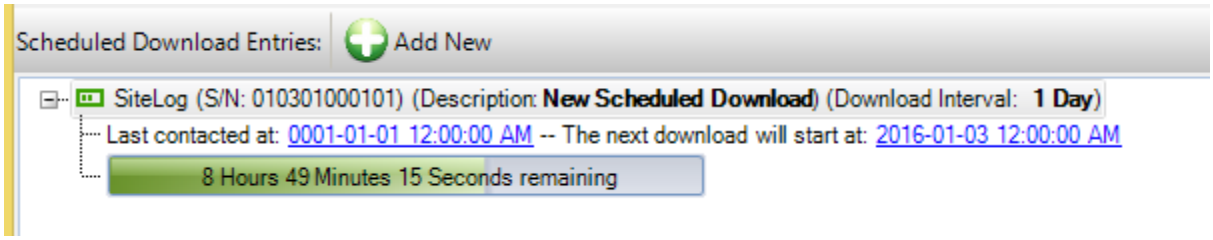
To manage all scheduled downloads, on the main tool bar, click “Schedule Downloads” button:



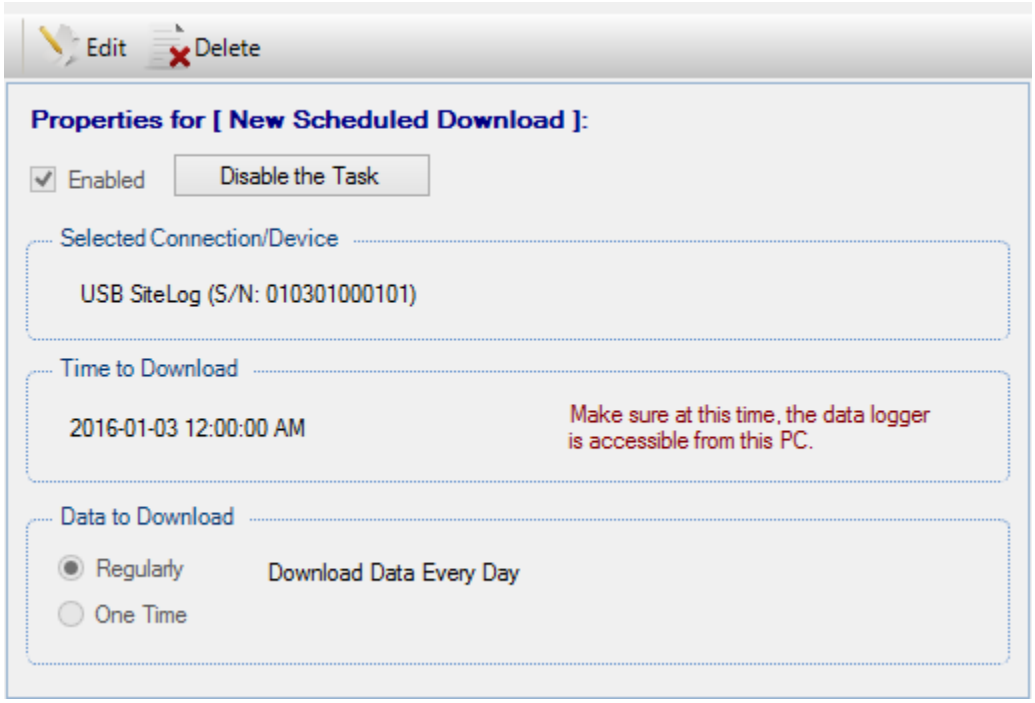
The following dialog shows:



Left side pane lists all scheduled download entries. Each entry contains the data logger serial number, the entry name and the download interval. If the entry is active it will show a progress bar indicating the remaining time left to the next download.

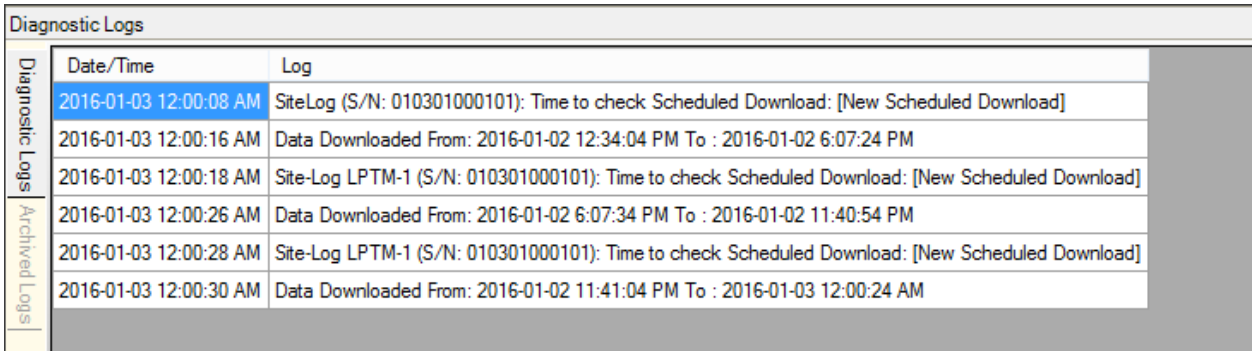


Right side pane shows the detailed information about the currently selected scheduled download:



You can edit, delete, disable or enable the entry.

Bottom side pane shows the diagnostic logs:

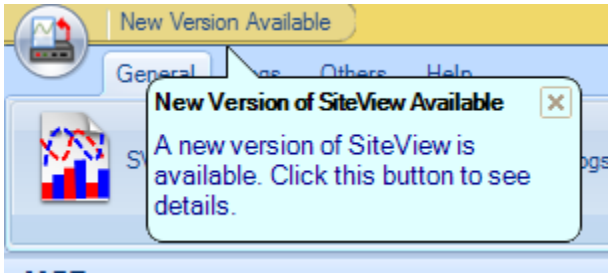


CHAPTER 13 – UPGRADE SITEVIEW AND FIRMARE

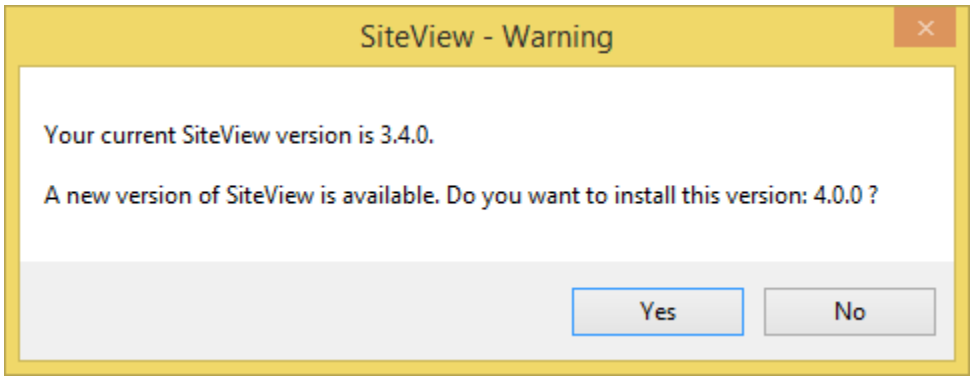
Upgrade SiteView

SiteView 4 or above has a new feature to automatically download the new version of SiteView if your computer has internet access and notify user for upgrading.

After you launch SiteView, if there is an update available, it will provide the notification like this:



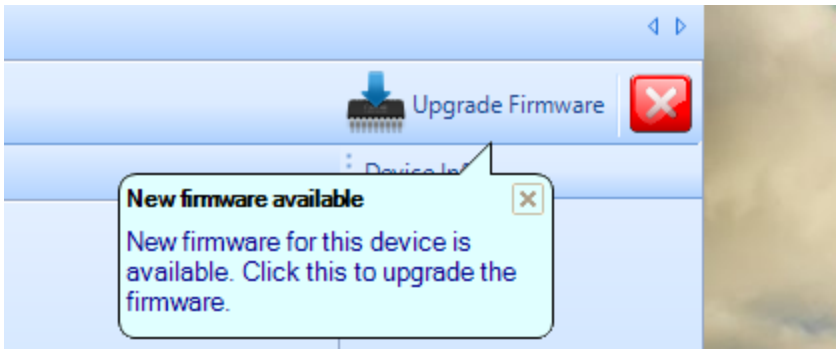
If you click "New Version Available" button, the following dialog shows:



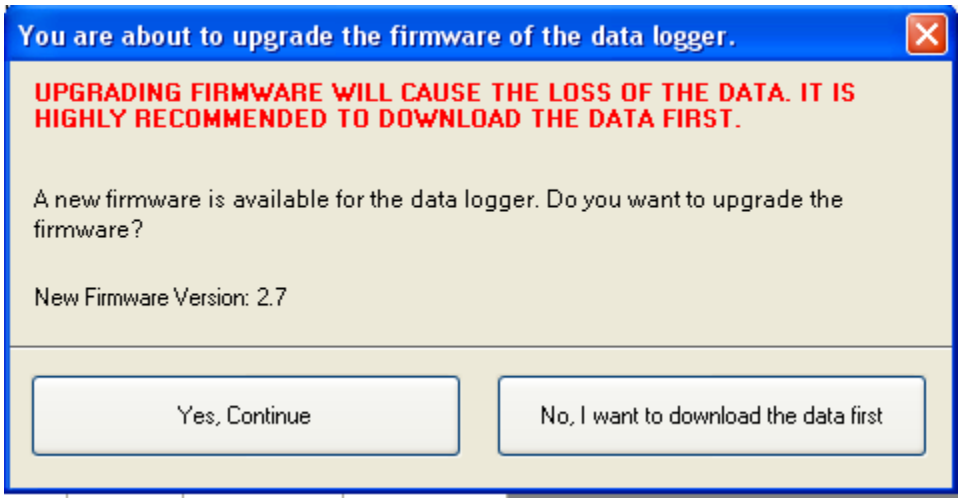
If you click "Yes" button, the system will start upgrading SiteView.

Upgrade Firmware

If SiteView found the current firmware of the connected data logger is older than the firmware SiteView has, SiteView will show "Upgrade Firmware" button at the right side of the status form and notify user for upgrading:



If you would like to upgrade the firmware click “Upgrade Firmware” button. The following dialog will show. If you decide to upgrade the firmware be sure to download the data first. Upgrading of the firmware will cause clearing of the data in the logger.

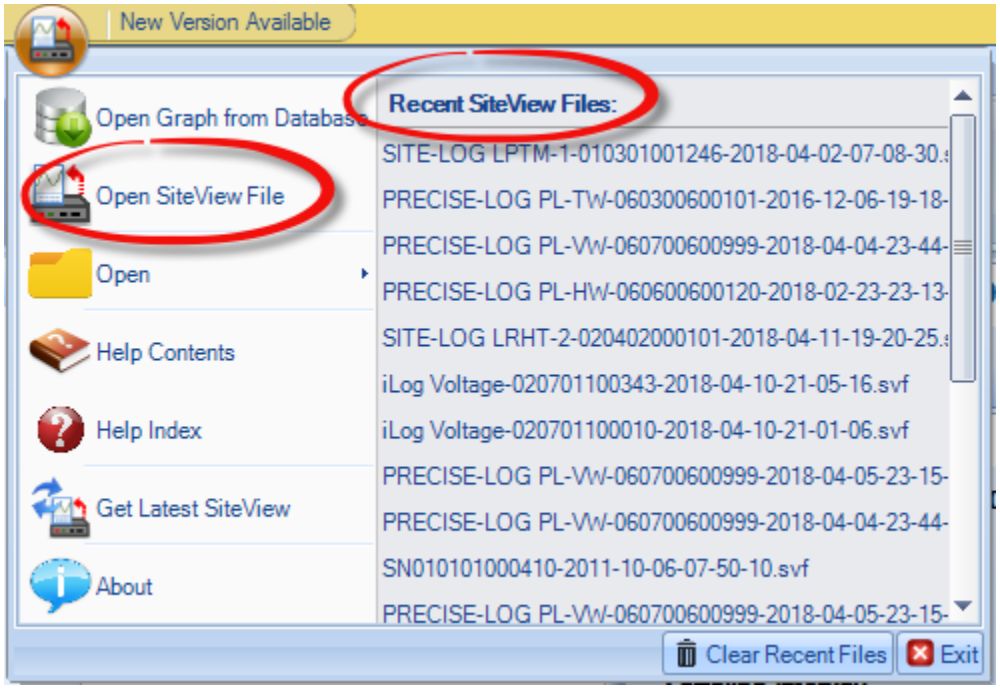


Click **Yes** button to upgrade the firmware.

CHAPTER 14 - WORK WITH PLOT

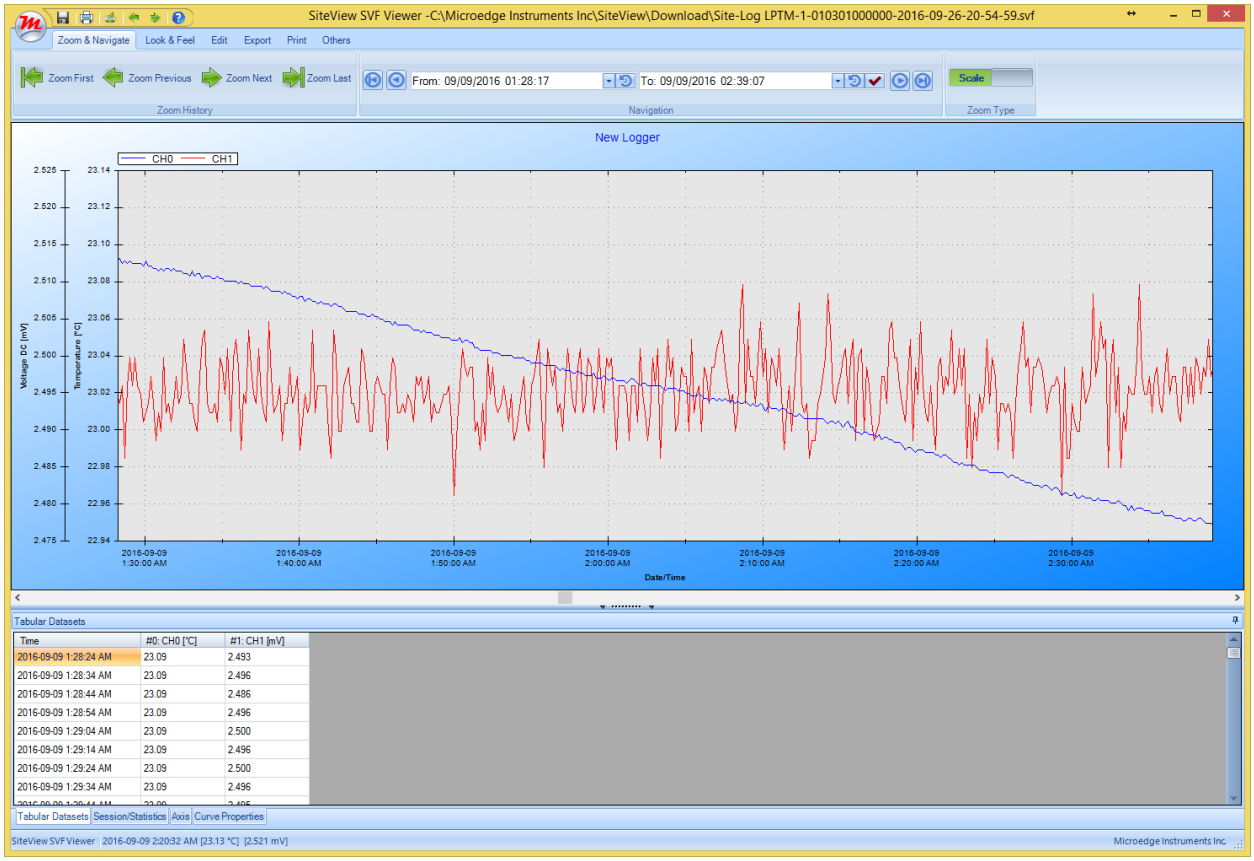
You can download data to either SVF file or database. The graph views for both downloadings are similar and we use SiteView SVF Viewer as an example.

From SiteView main frame, you can open a SVF from the application button:



You can click “Open SiteView File” to choose a file or click one of the files in “Recent SiteView Files” list.

Here is the user interface of SiteView SVF Viewer:

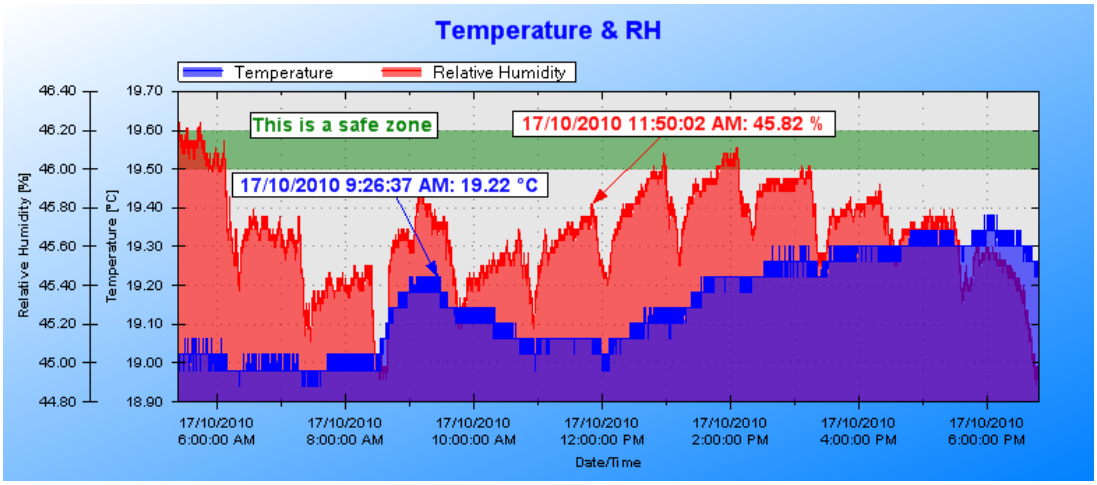


The top section is the plot view and the bottom section contains **Dataset, Statistics, Axis** settings, and **Line/Curve** settings.

Basic Views

The view of the plot contains Plot View, Tabular View and Statistics.

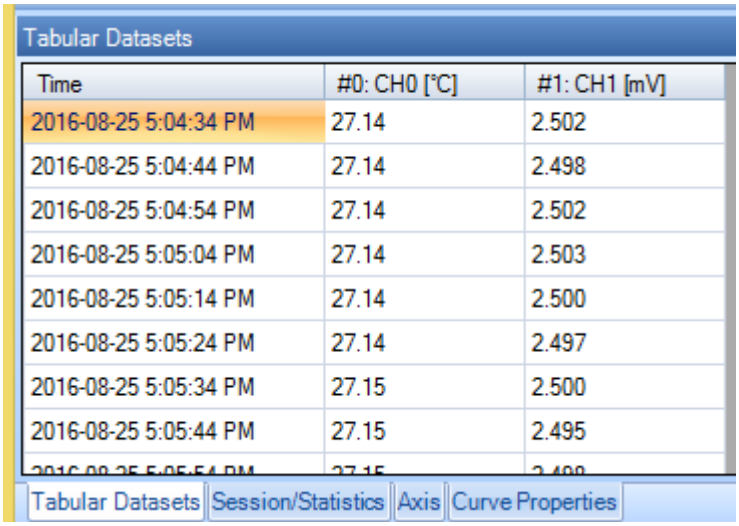
Plot View



The above plot view shows the downloaded data of a logger. X axis shows the date and time the data is within. Two Y axes show the measurement ranges with the units in the current time frame. Title of the plot is located at the top section. Below the Title is the Legend, then the actual plot. You can add curve annotations and labels in the plot area.

You can change the looks and feels by going through Change plot settings page.

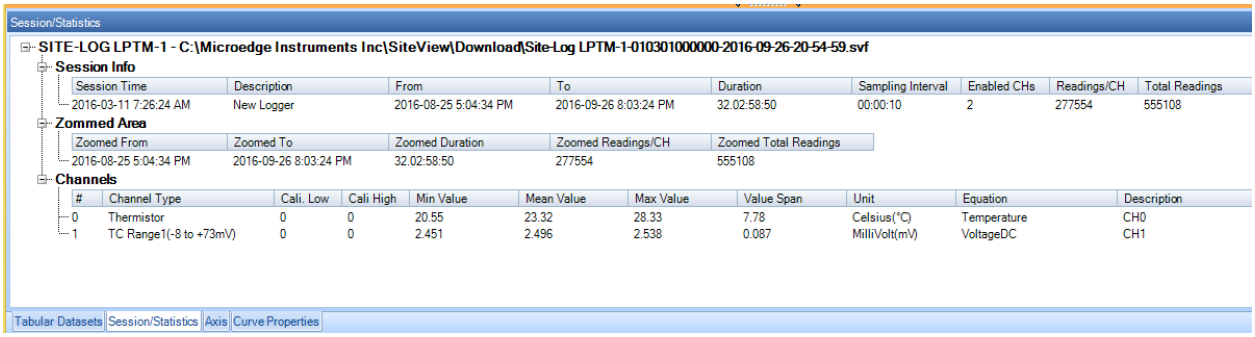
Tabular View



The above tabular view shows the downloaded data of the logger in the detailed tabular format. The first column shows the date and time when the measurement was taken, the following columns display the data values of all recorded channels.

Statistics

Plot statistics are a set of properties about the opened SiteView files and the current plot view. The statistics are under **Statistics** tab page:



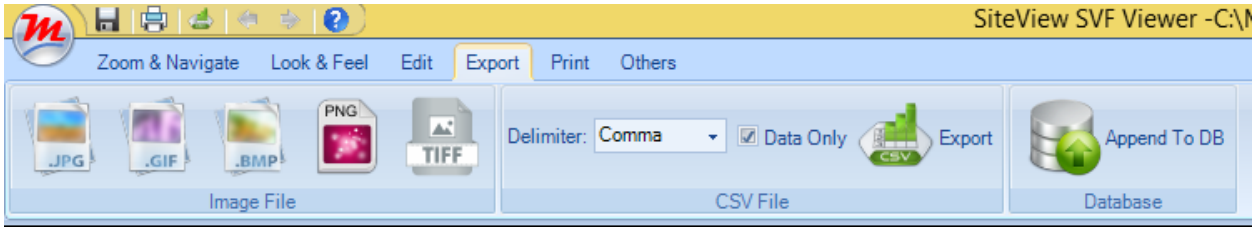
If you opened multiple files, each statistics information associated with its file is listed separately. Each statistics information starts with its file name. Then it specifies the logger type, sampling interval, logged time and total data points. If you have zoomed the plot, it specifies the properties for the zoomed view. At last it specifies the properties about each channel: channel type, calibration information, minimum, mean and maximum values etc.

Add More SiteView Files

If you are already in a SiteView SVF Viewer, you can add another SiteView files to the existing plot by clicking **Add SVF** button.



Export



Save As Image File

The plot view can be saved to the following image file formats:

Enhanced Metafile Format (EMF)
Portable Network Graphics (PNG)
Graphics Interchange Format (GIF)

Joint Photographic Experts Group (JPEG)
Tagged Image File Format (TIFF)
Bitmat (BMP)

Click one of the buttons in Image File section to save the graph as an image file.

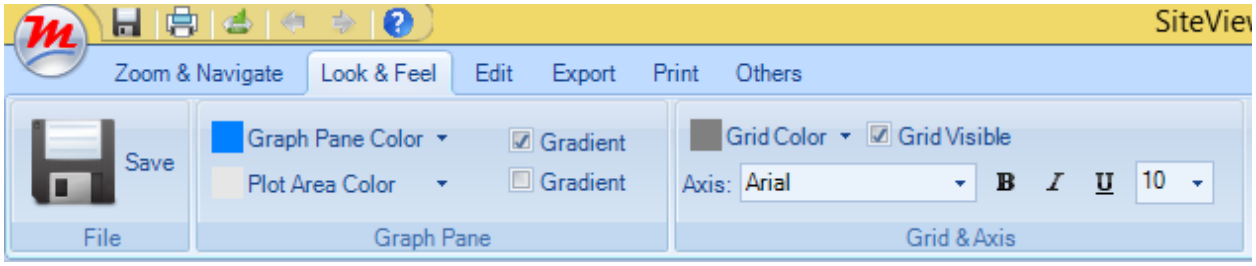
Save as CSV File

The logger and channel properties and the current tabular data can be saved in CSV file format. Choose a delimiter (Comma or Tab), check if exporting statistics as well and click “Export” button to save the graph as a CSV file.

Save as CSV File

You can append the graph to the system’s database by clicking “Append to DB” button.

Change Look and Feel



When a SiteView file was first created, the current default Graph Preferences entry was used to generate the properties of the plot view.

You can change those settings under Look and Feel ribbon control.

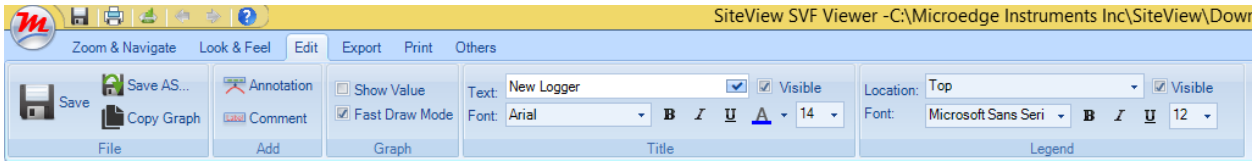
Change Graph Pane Settings:

You can change graph pane’s color, graph area’s color, change the color gradient settings by clicking on related buttons/checkboxes under Graph Pane.

Save as CSV File

You can change Grid and Axis’s settings like color, visibility, font’s name, size, color bold, italic, underline settings by changing related fields under Grid and Axis.

Edit the Graph



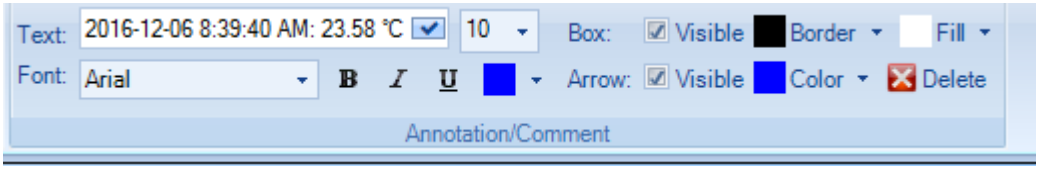
Add Annotation:

An annotation is a note (label) that user can add to the plot area to explain an associated data point. A comment is a note (label) that user can add to the plot area to explain the plot. The difference between an annotation and a comment are:

1. An annotation goes with the data point. If the data point is zoomed off the plot area, the associated annotation will be off the plot area. Whereas a comment does not associate to any data point, it associates to the plot. Thus the location of a comment refers to the coordinates of the plot area.
2. An annotation has an arrow links the annotation to the data point. Whereas a comment does not have an arrow.

To add an annotation, click "Annotation" button, move the mouse over a data point of a plot curve. Once the mouse pointer changed to + icon, click to add an annotation.

Then highlight the added annotation, on the Annotation tab section, you can change the related settings of it or delete it:



Add Comment:

Click "Comment" button to add a comment on the graph. Refer to Add Annotation section for details.

Change Title:

Plot Title is the text that is displayed on the top of the plot view. When the SiteView file was first created the description of the logger was chosen to be the plot title.

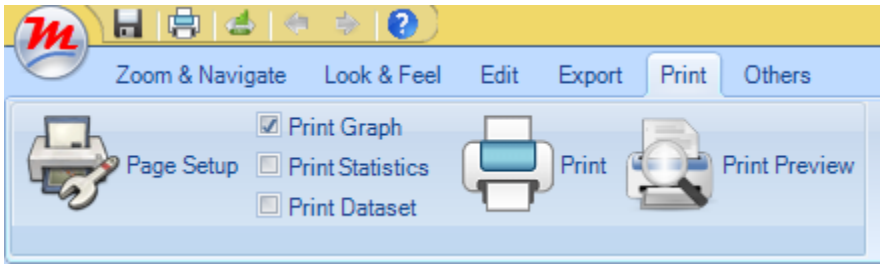
You can change title's text, font, visible etc. from the related fields under Title.

Change Legend:

Each plot view contains a legend shows each line's name/description. By default the descriptions of all channels were selected to be the legend when the SiteView file was first created.

You can change legend's location, font, visible from the related fields under Legend.

Print Plot



There are three sections that SiteView can print: The graph, the statistics and the dataset.
In Print ribbon section you can change Page's setting, choose which sections you want to print, review the print and print the document.

Change Plot Settings

Change Axis Settings



A plot view contains one X Axis indicating the time frame of the current view and one or more Y Axis indicating the current line scales of the current view.

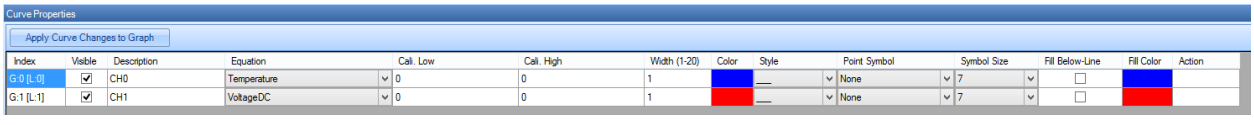
Each plot curve/line must associate to one X axis and one Y axis, if multiple lines share the same unit they will share the same Y axis.

A Y axis can be visible or hidden by toggling "Show" check box.

A Y axis can be in **Auto Scale** mode: the Y axis will automatically scale to the current range of the line. Or **Manual Scale** mode: the Y axis will use "Min Value" and "Max Value" as the scale.

The Y axis can use different unit under the same unit category. For example you can choose Fahrenheit or Celsius as the unit for a temperature axis.

Change Line/Curve Settings



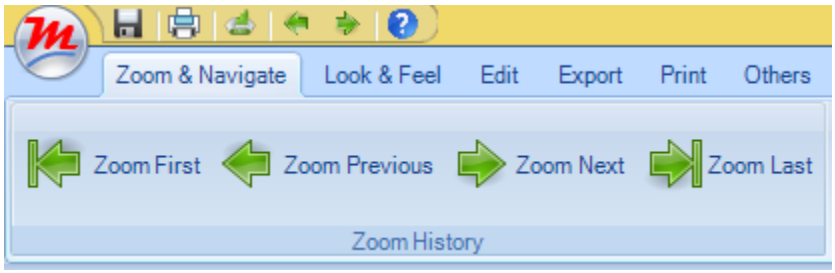
A line is the representation of the readings of a channel for the current time frame.

The line can be visible or hidden by toggling **Visible** check box.

The description of the line shows in the legend area of the plot.

You may change to a different equation to force the readings of the line to be recalculated based on the new equation.

Zoom Plot



Zooming of the plot is to adjust the scales of axes.

Zoom-In

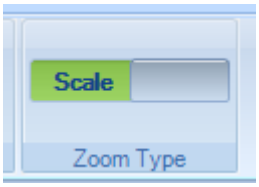
Zoom-In is to focus on one section of the plot so it can be displayed in details.

There are two types of Zoom-In:

Box Zoom:
Zoom the plot to the enclosed area, which involves both X and Y axes' changing.

Scale Zoom:
Zoom the plot to the enclosed area, which only affects the time axis (X axis). The Y axis will be automatically adjusted based on the scale settings.

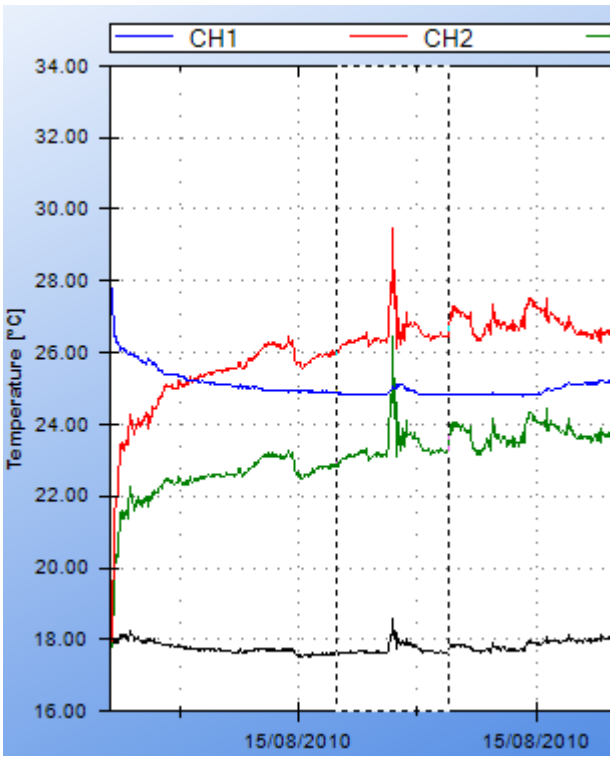
Switching between Box Zoom and Scale Zoom can be achieved by toggling Zoom Type button:



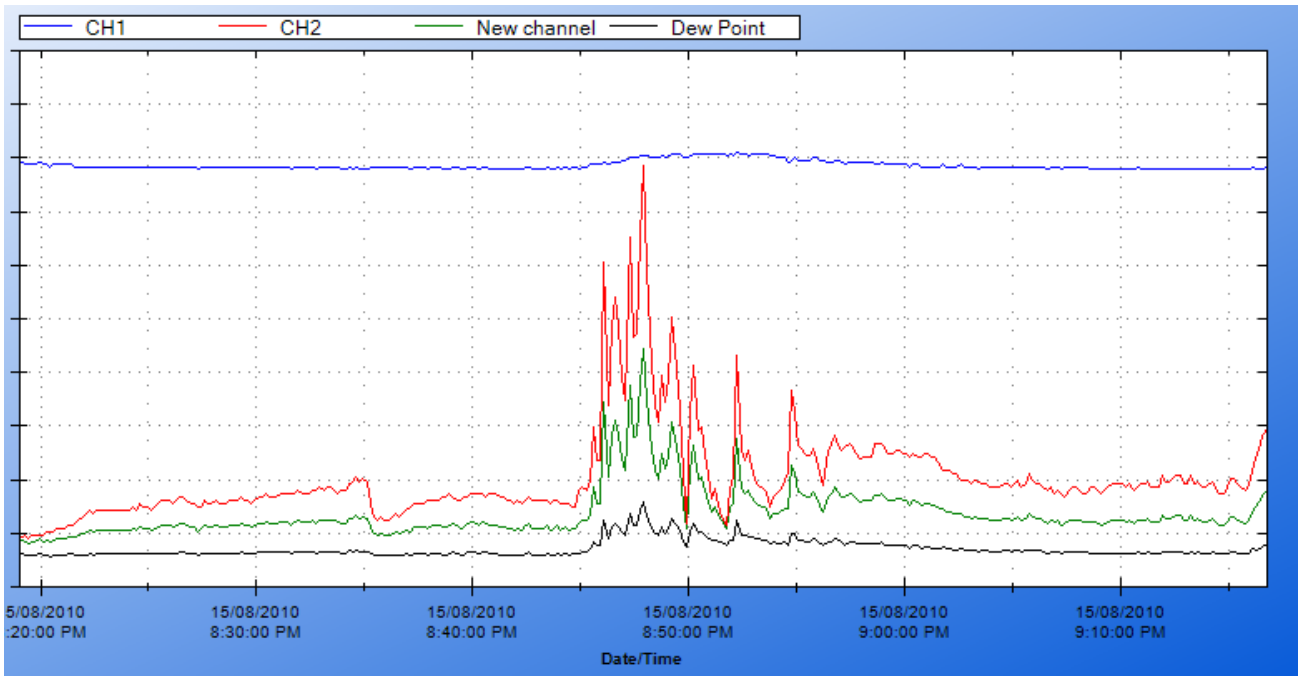
To Zoom In:

Press down the mouse at a spot of the plot, drag the mouse to make a rectangle, release the mouse. The plot will be zoomed into the enclosed area:

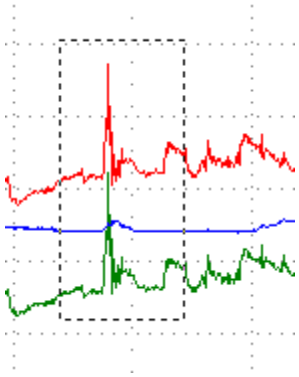
Before Scale Zoom:



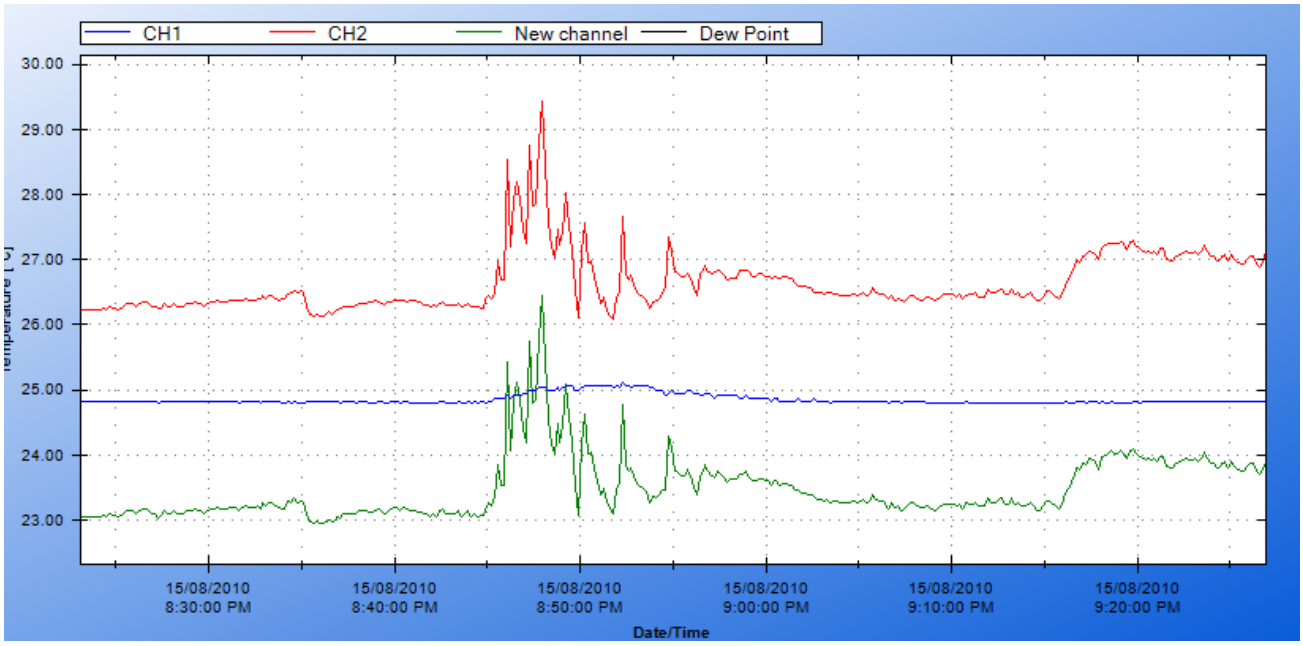
After Scale Zoom:



Before Box Zoom:



After Box Zoom:



Zoom Previous/Unzoom All

Click to restore the axes' scales to the previous view.

Zoom First

Click to restore the axes' scales to the first view.

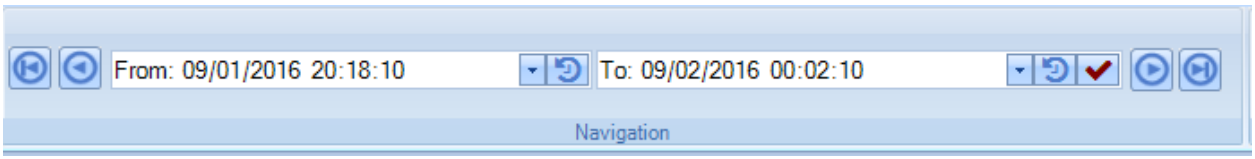
Zoom Next

Click to zoom to the next view.

Zoom Last

Click to zoom to the last view.

Navigate / Time-Zoom



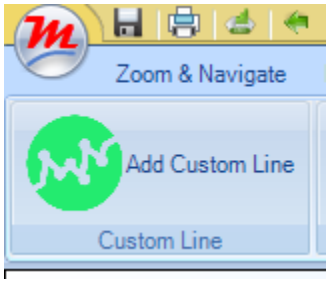
You use the above fields to navigate the graph to a specific time frame.

Add Custom Lines

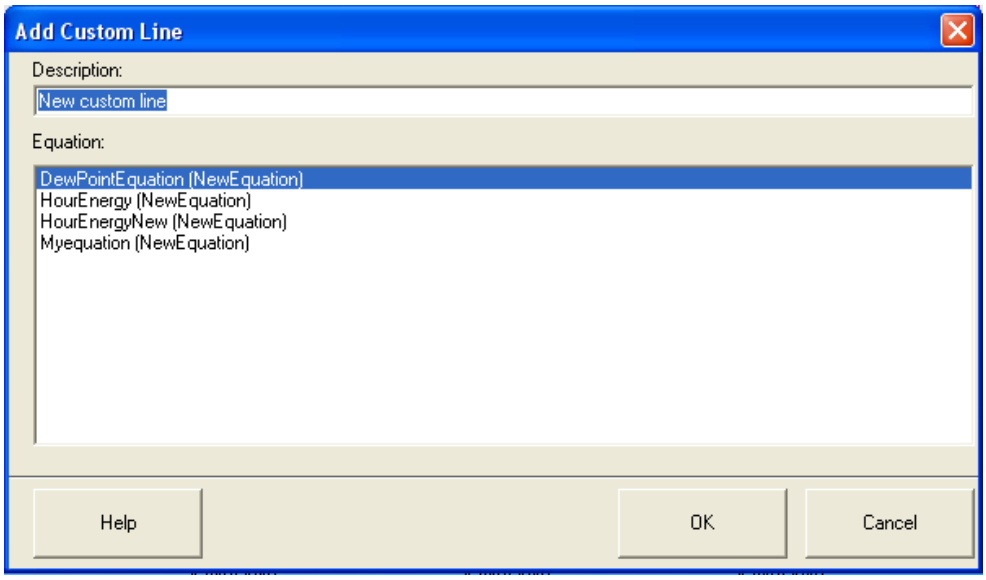
A custom Line is a line/curve that can be added to the plot and resolves its line values from the existing lines in the plot. For example, if there are two lines representing voltage and current readings, you can add the third line representing the power consumption for the current time frame.

To add a custom Line:

- Click **Add Custom Line** menu item under **Tools** menu:



- Choose an equation in **Add Custom Line** dialog and click **OK** button:

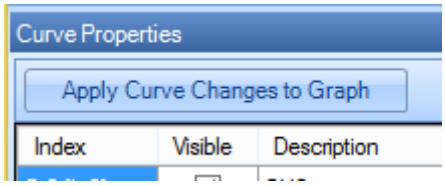


Other Features of Plot

Apply Changes to Graph

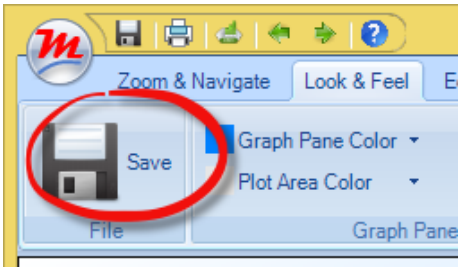
In both Axis and Curve tabs, after you changed the settings you need to click Apply Changes button to apply the changes to the graph:

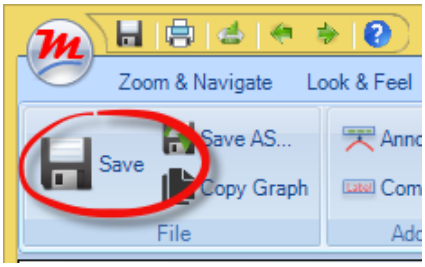




Save Changes to SVF File

In multiple places, you can find “Save” buttons:



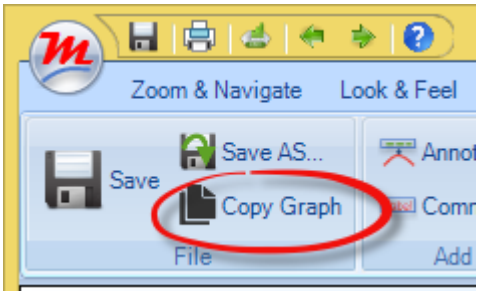




They are used to save the changes in the graph to the SVF file.

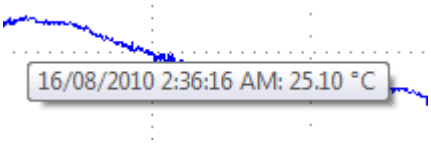
Copy Graph to Clipboard

The plot view can be copied to the clipboard by clicking on **Copy Graph** button:

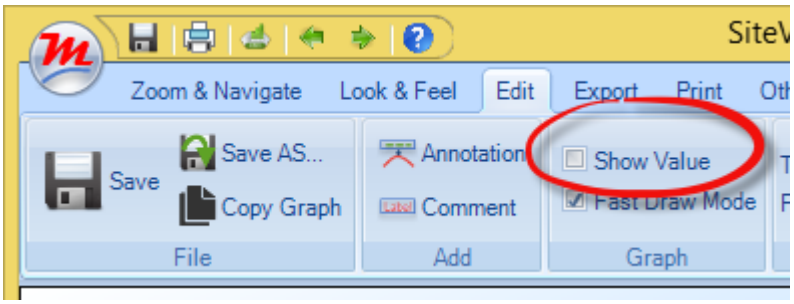


Show Value

If you turn on **Show Value**, when the mouse is hovering on any data point on the plot the time and the value will be displayed in the tip box:

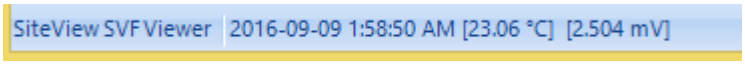


To toggle on/off **Show Value** property, check/uncheck **Show Value** check box:



View Mouse-Point Values

When the mouse is moving on the plot area, the status bar of the plot window will display each line's value at the time stamp where the mouse is pointing at:

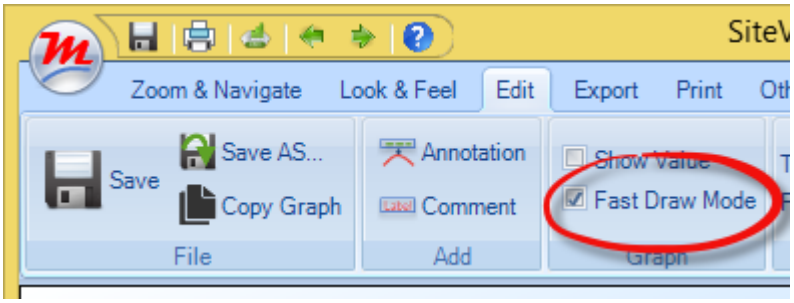


Fast Draw Mode

If the plot is in **Fast Draw Mode**, the plot will figure out the appropriate number of points to draw based on the current view port size. This will save dramatic drawing time if the plot contains big amount of data points.

Note: **In Fast Draw Mode, there is a chance where some spike data points may be missed out.**

To toggle on/off **Fast Draw Mode**, check/uncheck **Fast Draw Mode** check box:



CHAPTER 15 - EQUATION REFERENCES

C# Language Source Code References

Basic data types

Name	Description	Size (byte)
int	Signed Integral type	4
uint	Unsigned integral type	4
short	Signed short integral type (-32768 to + 32767)	2
ushort	Unsigned short integral type (0 to 65535)	2
long	Signed long integral type	8
ulong	Unsigned long integral type	8
double	64-bit floating point type	8
float	32-bit floating point type	4
String/string	A sequence of zero or more Unicode characters.	
Byte/byte	0 – 255 integral value	1
Char/char	Unicode character	2
Boolean/bool	Boolean type (true or false)	
enum	Enumeration type	
Object/object	Any type	

Basic Operators

Name	Description	Example
.	The dot operator (**.**) is used for member access. The dot operator specifies a member of a type or namespace	Class1.y = 1;

()	Parentheses specify the order of operations in an expression.
	Parentheses are used to specify casts, or type conversions
		Y = (1 + 2)/ 3;
		double value1 = 1.5;
		int value2 = (int) value1;

[]	Square brackets (**[]**) are used for arrays, indexers, and attributes. They can also be used with pointers.	Int [] array = new int[5];
++	The increment operator (**++**) increments its operand by 1. The increment operator can appear before or after its operand:	Int i = 0; I++;
--	The decrement operator (**--**) decrements its	Int I = 0;

	operand by 1.	i--;
new	Used to create objects and invoke constructors	Class1 c = new Class1();
+	The **+** operator can function as either a unary or a binary operator. Unary **+** operators are predefined for all numeric types. The result of a unary **+** operation on a numeric type is just the value of the operand. Binary **+** operators are predefined for numeric and string types. For numeric types, + computes the sum of its two operands. When one or both operands are of type string, + concatenates the string representations of the operands.	Int a; a = 5 + 5;
-	The **-** operator can function as either a unary or a binary operator.	Int a; a = 5 – 5;

!	The logical negation operator (**!**) is a unary operator that negates its operand. It is defined for **bool** and returns **true** if and only if its operand is **false**.	bool val = true;
		if(!val)
		{
		
		}

~	The **~** operator performs a bitwise complement operation on its operand, which has the effect of reversing each bit	byte a = 0x10; a = ~a;
&	The & operator can function as either a unary or a binary operator. The unary & operator returns the address of its operand. Binary & operators are predefined for the integral types and **bool**. For integral types, & computes the logical bitwise AND of its operands. For **bool** operands, & computes the logical AND of its operands; that is, the result is **true** if and only if both its operands are **true**.	byte a = 0x10; a = a & 0x01;
*	The multiplication operator (*****), which computes the product of its operands. Also, the dereference operator, which allows reading and writing to a pointer.	int a = 1; a = 5 * 10;
/	The division operator (**/**) divides its first operand by its second. All numeric types have predefined division operators.	int a; a = 10 /5;
%	The modulus operator (**%**) computes the remainder after dividing its first operand by its second. All numeric types have predefined modulus operators.	int a ; a = 10 % 5;
<<	The left-shift operator (**<<**) shifts its first operand left by the number of bits specified by its second operand.	int a = 10; a <<= 8;
>>	The right-shift operator (**>>**) shifts its first operand	int a = 10;

	right by the number of bits specified by its second operand.	a >>= 1;

<	All numeric and enumeration types define a "less than" relational operator (**<**) that returns **true** if the first operand is less than the second, **false** otherwise.	int a = 1;
		if(a < 2)
		{
		
		}

>	All numeric and enumeration types define a "greater than" relational operator (**>**) that returns **true** if the first operand is greater than the second, **false** otherwise.	int a = 1;
		if(a > 2)
		{
		
		}

<=	All numeric and enumeration types define a "less than or equal" relational operator (**<=**) that returns **true** if the first operand is less than or equal to the second, **false** otherwise.	int a = 1;
		if(a <= 2)
		{
		
		}

>=	All numeric and enumeration types define a "greater than or equal" relational operator, **>=** that returns **true** if the first operand is greater than or equal to the second, **false** otherwise.	int a = 1;
		if(a >= 2)
		{
		
		}

==	For predefined value types, the equality operator (**==**) returns true if the values of its operands are equal, **false** otherwise. For reference types other than string, **==** returns **true** if its two operands refer to the same object. For the **string** type, **==** compares the values of the strings.	int a = 1;
		if(a == 2)
		{
		
		}

!=	The inequality operator (**!=**) returns false if its operands are equal, true otherwise. Inequality operators are predefined for all types, including string and object. User-defined types can overload the **!=** operator.	int a = 1;
		if(a != 2)
		{
		
		}

&	The & operator can function as either a unary or a binary operator. Binary & operators are predefined for the integral types and **bool**. For integral types, & computes the logical bitwise AND of its operands. For **bool** operands, & computes the logical AND of its operands; that is, the result is **true** if and only if both its operands are **true**.	int a = 1; a = a & 0x03;

^	Binary **^** operators are predefined for the integral types and **bool**. For integral types, **^** computes the bitwise exclusive-OR of its operands. For **bool** operands, **^** computes the logical exclusive-or of its operands; that is, the result is **true** if and only if exactly one of its operands is **true**.	byte a = 0xf8;
		a = a ^ 0x3f;
		(a = 0xc7)

|	Binary **|** operators are predefined for the integral types and **bool**. For integral types, **|** computes the bitwise OR of its operands. For **bool** operands, **|** computes the logical OR of its operands; that is, the result is **false** if and only if both its operands are **false**.	byte a = 1;
		a = a | 2;
		(a = 3)

&&	The conditional-AND operator (**&&**) performs a logical-AND of its **bool** operands, but only evaluates its second operand if necessary.	byte a = 1, b = 0;
		if(a == 1 && b == 0)
		{
		
		}

||	The conditional-OR operator (**||**) performs a logical-OR of its **bool** operands, but only evaluates its second operand if necessary.	byte a = 1, b = 0;
		if(a == 1 || b == 0)
		{
		
		}

=	The assignment operator (**=**) stores the value of its right-hand operand in the storage location, property, or indexer denoted by its left-hand operand and returns the value as its result. The operands must be of the same type (or the right-hand operand must be implicitly convertible to the type of the left-hand operand).	byte a = 1, b; b = a;

+=	The addition assignment operator.	int a = 1;
		a += 2;
		(a = 3)

-=	The subtraction assignment operator.	int a = 1;
		a -= 1;
		(a = 0)

*=	The binary multiplication assignment operator.	int a = 2;
		a *= 5;
		(a = 10)

/=	The division assignment operator.	int a = 20;
		a /= 5;
		(a = 4)

%=	The modulus assignment operator.	int a = 20;
		a %=2;
		(a = 0)

&=	The AND assignment operator.	byte a = 0x0f;
		a &= 0xf0;
		(a = 0)

|=	The OR assignment operator.	byte a = 0x0f;
		a |= 0xf0;
		(a = 0xff)

^=	The exclusive-OR assignment operator.	byte a = 0x0f;
		a ^= 0xf0;
		(a = 0xff)

<<=	The left-shift assignment operator.	byte a = 0x0f;
		a <<= 4;
		(a = 0xf0)

>>=	The right-shift assignment operator.	byte a = 0x0f;
		a >>= 1;
		(a = 0x07)

Basic Math Methods

Name	Description	Example
Abs	Returns the absolute value of a specified number	int a = -10; a = Math.Abs(a);
Acos	Returns the angle whose cosine is the specified number.	
Asin	Return the angle whose sine in the specified number.	
Atan	Returns the angle whose tangent is the specified number.	
Cos	Returns the cosine of the specified angle.	
Exp	Return e raised to the specified power.	double a ; a = Math.Exp(1);
Floor	Returns the largest integer less than or equal to the specified number.	double a; a = Math.Floor(2);
Log	Returns the logarithm of a specified number.	double a; a = Math.Log(2);
Log10	Returns the base 10 logarithm of a specified number.	double a; a = Math.Log10(2);
Max	Returns the larger of two specified numbers.	int a = Math.Max(1,2);
Min	Returns the smaller of two numbers.	int a = Math.Min(1, 2);
Pow	Returns a specified number raised to the specified power.	double a = Math.Pow(10,2);
Round	Rounds a value to the nearest integer or specified number of decimal places.	
Sign	Returns a value indicating the sign of a number.	
Sin	Returns the sine of the specified angle.	
Sinh	Returns the hyperbolic sine of the specified number.	
Sqrt	Returns the square root of a specified	

	number.	
Tan	Returns the tangent of the specified angle.	
Tanh	Returns the hyperbolic tangent of the specified angle.	
Truncate	Calculates the integral part of a number.	

Accessible Objects

When you write a custom equation, the following objects can be accessed:

For Custom Equation:

Name	**Description**
this	Current logger object.
Channels	The collection of all channels.
Channels[x]	The channel object specified by the index x.
this.Channels	Same as Channels.
this.CurrentChannel	The current channel object.
this.Description	The description of the current logger object.
this.StartTime	The data start time in DateTime data type.
this.EndTime	The data end time in DateTime data type.
this.NumberOfSamples	The total number of samples the logger contain.
this.SampleInterval	The sampling interval in second the logger has.
this.SerialNumber	The serial number of the logger in string data type.
this.Channel[x].CaliLow	The low calibration value of the specified channel.
this.Channels[x].CaliHigh	The high calibration value of the specified channel.
this.Channels[x].ChannelHighScale	The high scale value of the specified channel.
this.Channels[x].ChannelLowScale	The low scale value of the specified channel.
this.Channels[x].ChannelType	The channel type of the specified channel.
this.Channels[x].Description	The description of the specified channel.
his.Channels[x].DigitValue	The digital value of the specified channel.
this.Channels[x].Enabled	If the specified channel is enabled or disabled.
tthis.Channels[x].Index	The index of the specified channel.
this.Channels[x].Measurement	The physical measurement of the specified channel.

For Custom-Line Equation:

Name	**Description**
this	Current logger object.
Lines	The collection of all lines.
Lines[x]	The line object specified by the index x.
this.Description	The description of the current logger object.
this.StartTime	The data start time in DateTime data type.
this.EndTime	The data end time in DateTime data type.
this.NumberOfSamples	The total number of samples the logger contain.

this.SampleInterval	The sampling interval in second the logger has.
this.Linesl[x].Value	The physical measurement of the specified line.

Equation Examples

Dew Point Temperature

The dew point temperature is the temperature at which the air can now longer hold all of its water vapour, and some of the water vapour must condense into liquid water.

Because dew point temperature can be derived from the relative humidity and the temperature readings, the following equation can be used for the dew point temperature measurement.

This equation is for Site-Log LRHT-1/2 data logger. In the Logger Configuration dialog, add a new custom channel to the logger and apply this equation to the channel.

```
  // A custom equation for dew point temperature.
  // Condition:
  //     channel#0 of the logger must be for temperature.
  //     channel#1 of the logger must be for relative humidity.
  //     both channels must be enabled.
  public double DewPointEquation(double Input)
  {
      double logEx, dew_point, rh, temperature;
      temperature = Channels[0].Measurement;
      rh = Channels[1].Measurement;

      logEx = 0.66077 + 7.5 * temperature / (237.3 + temperature) +
(Math.Log10(rh) - 2);
      dew_point = (logEx - 0.66077) * 237.3 / (0.66077 + 7.5 - logEx);
      return dew_point;
  }
```

Carbon Dioxide Transmitter (0 – 5000 PPM)

This equation is for a CO2 transmitter with the following specifications:

Measurement Range: 0– 5000 PPM of CO2
Output 0 – 10 VDC

This equation can be used on 0 – 10 VDC or 0 – 20 VDC channel.

```
  //A custom equation for CO2 transmitter
  // Transmitter specifications
  //    Measurement  Range: 0 - 5000 PPM
  //    Output: 0 - 10 VDC
  public double CO2Equation(double Input)
  {
      double output;
      output = 5000 * Input / 10;
      return output;
  }
```

External Thermistor

This equation can be used for any of the external channel of LRTH-1 data logger. The logger has seven external thermistor channels that can accommodate any kind of thermistors.

The key parameters in this equation are a, b and c coefficients that can be obtained from the thermistor manufacturer. You may change them based on the thermistor type you are using.

```
//A custom equation for thermistor temperature
public double ExtThermistor2(double Input)
{
    //digit value must be 65534
    double dig_range = 65535;
    //load resistor must be 10000 ohm
    double load_resistor = 10000;
    double a, b, c, lgr, Output = 0;
    //different thermistor will have different a, b, c values
    a = 0.001028444; ;
    b = 0.000239244;
    c = 0.000000156;

    Output = CurrentChannel.DigitValue;

    if (Input >= dig_range)
        Output = dig_range - 1;
    if (Input < 1)
        Output = 1;

    double Rt = load_resistor * Output / (dig_range - Output);

    lgr = Math.Log(Rt);

    Output = 1f / (a + b * lgr + c * lgr * lgr * lgr) - 273.15f;

    return Output;
  }
```

Previous Hour Average

This equation can be used to calculate the averaged value for the previous hours. It can be easily modified for a day or other time frame averages.

```
 DateTime CurrentTime;
bool FirstIn = true;
int HourIndex = 0;
double AverageValue = 0;
double SumValue = 0;
int PreviousHour = 0;
//Equation to calculate the average value of the previous hour
public double HourAverage(double Input)
{
    //first time get in this function, initialize some variables.
```

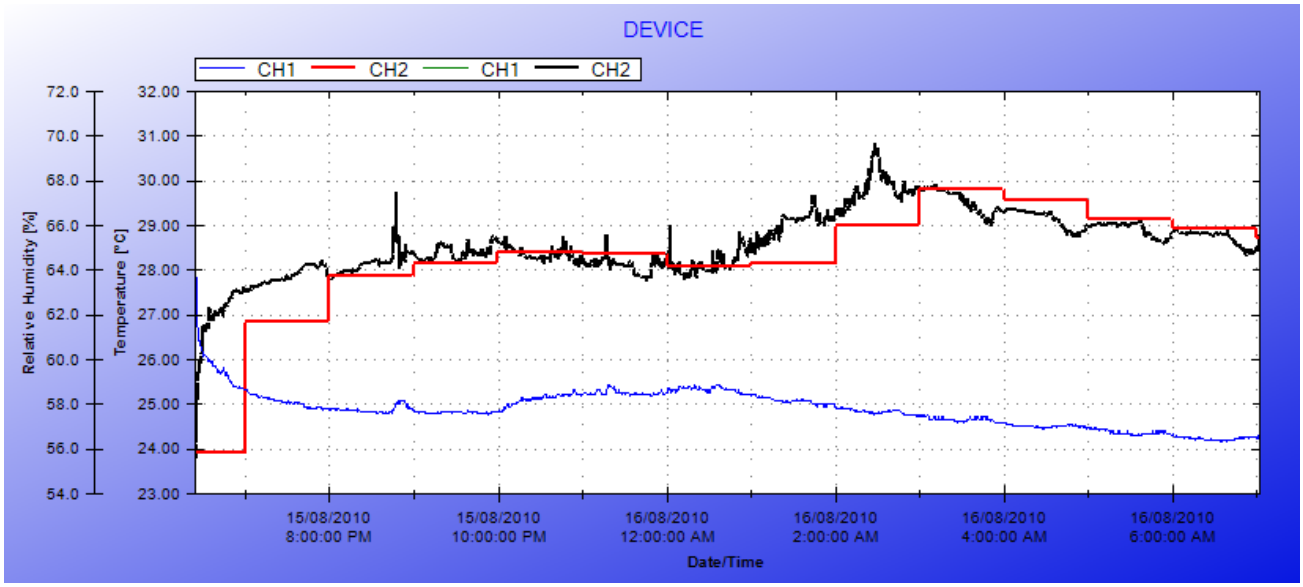
```
        if (FirstIn)
        {
            FirstIn = false;
            SumValue = Input;
            AverageValue = Input;
            PreviousHour = this.StartTime.Hour;
            CurrentTime = this.StartTime;
        }
        else
        {
            CurrentTime = CurrentTime.AddSeconds(this.SampleInterval);
            if (CurrentTime.Hour != PreviousHour)
            {
                PreviousHour = CurrentTime.Hour;
                AverageValue = SumValue / HourIndex;
                SumValue = 0;
                HourIndex = 0;

            }

            SumValue += Input;
        }

        HourIndex++;
        //Average value of the previous hour.
        //Note: the first hours value is always the first reading
        return AverageValue;
}
```

The following figure illustrates the result after the above equation is applied:



Note the red curve is the hour average of the black curve.