

# 3900 ControLog

By Thunder Scientific Corporation

3900  
ControLog<sup>®</sup>

Humidity Generation and Calibration Equipment  
**THUNDER SCIENTIFIC CORPORATION** The Humidity Source

"Powered by HumiCalc with Uncertainty"<sup>®</sup>



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# Getting Started

This section will provide the user with general information on the 3900 ControLog® application, information on where to obtain technical support, the required hardware specifications to run ControLog, instructions on how to install ControLog and instructions on how to start ControLog for the first time. Following sections will provide further details on how to use and operate ControLog.

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## About ControLog

ControLog is a Windows based software application that fully automates the operation of a Thunder Scientific 3900 Humidity Generator and allows various device connections through a number of different interfaces. Data from the generator and attached devices is automatically retrieved and stored for viewing in either numerical or graphical format in real time or post process.

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## Technical Support

If the user requires assistance with any aspect of the ControLog application, technical support can be obtained by contacting Thunder Scientific Corporation by any of the following means:

[www.ThunderScientific.com](http://www.ThunderScientific.com)

Tel: 505.265.8701

FAX: 505.266.6203

[support@thunderscientific.com](mailto:support@thunderscientific.com)

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# ControLog Minimum System Requirements

The following specifications are the required PC minimum system requirements to run ControLog.

- 1.6 GHz or greater Intel® Pentium® or equivalent processor (2.66 GHz Multi Core or better is recommended when connecting multiple devices)
- 512 MB or greater of RAM (4 GB or more is recommended when connecting multiple devices)
- Minimum 800 x 600 screen resolution
- Microsoft® Windows 7 (x86 or x64), Microsoft Windows Vista® SP2 (x86 or x64), Microsoft Windows XP® SP3 (x86 only)
- Microsoft .NET Framework version 4.0
- Internet Browser

If the user desires to connect multiple RS-232 devices or RS-485 devices to ControLog, then the following interface is recommended:

- MOXA® UPort® 1450 USB-to-serial converter

If the user desires to connect a GPIB device to ControLog, then the following interface is required:

- National Instruments® GPIB-USB-HS USB-to-488.2 converter

If the user desires to connect Analog devices to ControLog, then the following data acquisition equipment is required:

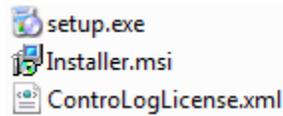
- Agilent® 34970A Data Acquisition/Switch Unit
- Agilent® 34901A 20-Channel Multiplexer

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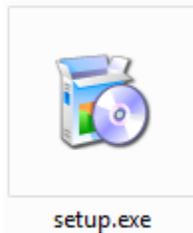
## Installing ControLog

The following instructions give a step by step process to install the ControLog application on a PC.

1. Insert the ControLog CD or locate the downloaded ControLog installation package. The ControLog installation package will consist of the following files:



2. Click the setup.exe file to begin the installation.



*Note: The user must have administrative rights to install the application*

3. Follow the on screen installer directions.
4. If using a MOXA® UPort 1450 USB-to-serial converter then install the appropriate drivers according to the manufactures instructions.
5. If using a National Instruments® GPIB-USB-HS USB-to-488.2 converter then install the appropriate drivers according to the manufacturer's instructions.

*Warning: PC anti-virus software can interfere with ControLog operation. It is recommended to avoid anti-virus scanning during ControLog operation.*

---

## Data Backup

ControLog does not require any direct backup of its operating files. If for any reason a need to restore the software occurs, simply reinstall the application as described in the [Installing ControLog](#) section.

It is recommended to perform a periodic backup on any user generated files such as uncertainty solutions for the generator, profiles, device setups and/or data files.

The default location for user data is under the follow directory: ...Documents\Thunder Scientific\3900 ControLog\

*Warning: The user has full control as to where to save data and the above directory may not be the location they choose.*

---

# Interface Connections

The following instructions provide details to connect the Thunder Scientific Model 3900, MOXA® UPort® USB-to-serial converter, National Instruments® 488.2 and the Agilent® 34970A to the ControLog PC.

- **Connecting to the 3900**

ControLog communicates with the 3900 through an RS-232 communication connection on any available COM port. To connect the 3900 to the ControLog PC use a 9 pin cable and connect the computer's 9 pin male serial port connector to the 9 pin female console port connector of the 3900.

- **Connecting the MOXA® UPort® 1450 USB-to-serial converter**

To connect the USB-to-serial converter, plug the USB cable that is supplied with the converter into an open USB port on the ControLog PC. Please refer to the manufacturer's documentation for further information.

- **Connecting the National Instruments® GPIB-USB-HS USB-to-488.2 converter**

To connect the National Instruments® USB-to-488.2 converter, plug the USB end of the converter into an open USB port on the ControLog PC. Please refer to the manufacturer's documentation for further information.

- **Connecting to the Agilent® 34970A**

ControLog can communicate with an Agilent® 34970A to record analog devices through an RS-232 communication connection on any available COM port. To connect a 34970A to the ControLog PC use a 9 pin cable and connect the computer's 9 pin male serial port connector to the 9 pin female on the back of the 34970A. Please refer to the manufacturer's documentation for further information and on how to connect and select the RS-232 interface for communication.

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# Starting ControLog

This section is intended to quickly familiarize the user with the operation of starting ControLog.

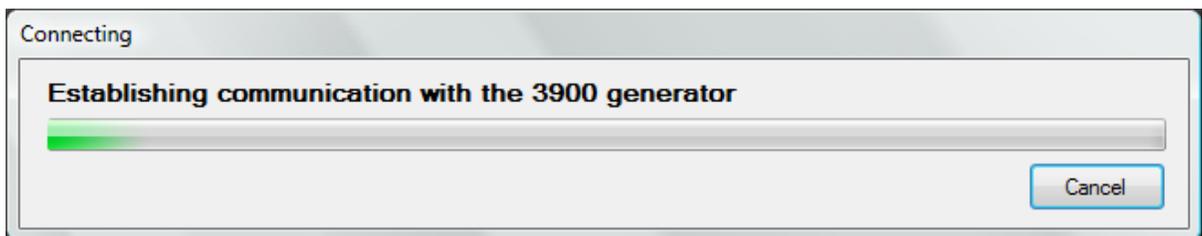
1. Ensure that the computer's serial port is properly connected to the 3900 and all desired interfaces are connected.
2. Locate and double-click the ControLog icon.



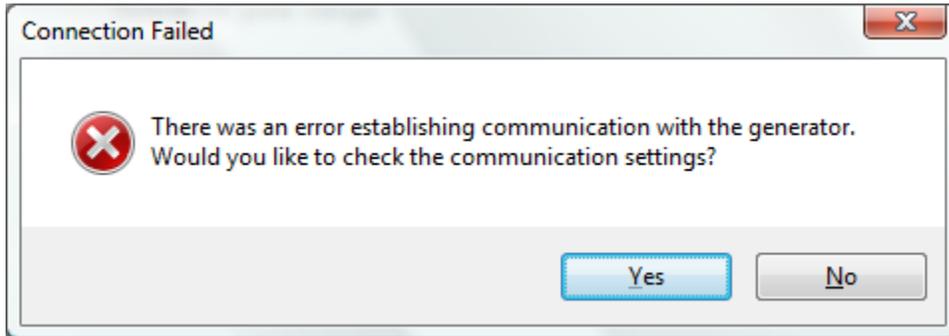
3. The splash screen will appear once the program is initialized. Note: It may take some time for the program to initialize the first time after installing the application.
4. The splash screen will display a loading status near the bottom, once loading is complete the splash screen will close and the main window will be displayed.
5. A ControLog Product Key Dialog will appear the first time ControLog starts if no valid license is present.



6. Enter your "Name", "Organization" and the "Product Key" from the back of the ControLog CD case or as received in the email receipt when purchasing ControLog online.
7. Click Ok to save the license information.
8. Upon completion of loading, ControLog will automatically attempt to establish communication with the 3900 using the last known or default communication settings.



9. If ControLog is unable to establish communication with the 3900 generator a message will be displayed to inform the user. The message will also ask the user if they would like to check the communication settings.



10. Selecting yes, will open the 3900 communication settings.

3900 Settings

Select the port the 3900 is connected to

Connect using COM1

Select the port settings for the 3900

Baud Rate 2400

Data Bits 8

Parity None

Stop Bits 1

Handshake None

Enable RTS  Enable DTR

< Back Next > Finish Cancel

11. In the 3900 settings, select the COM port that is connected to the 3900 along with the port settings for the 3900. Refer to your 3900 manual to check the current port settings for your 3900.

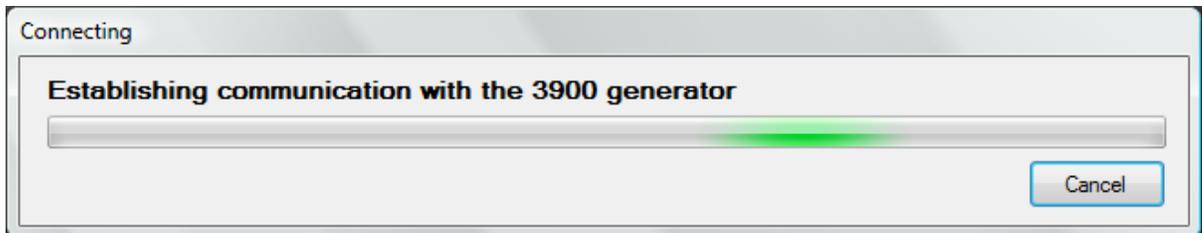
Default 3900 Port Settings:

Baud Rate: **2400**  
Data Bits: **8**  
Parity: **None**  
Stop Bits: **1**  
Handshake: **None**  
Enable RTS: **Yes**  
Enable DTR: **No**

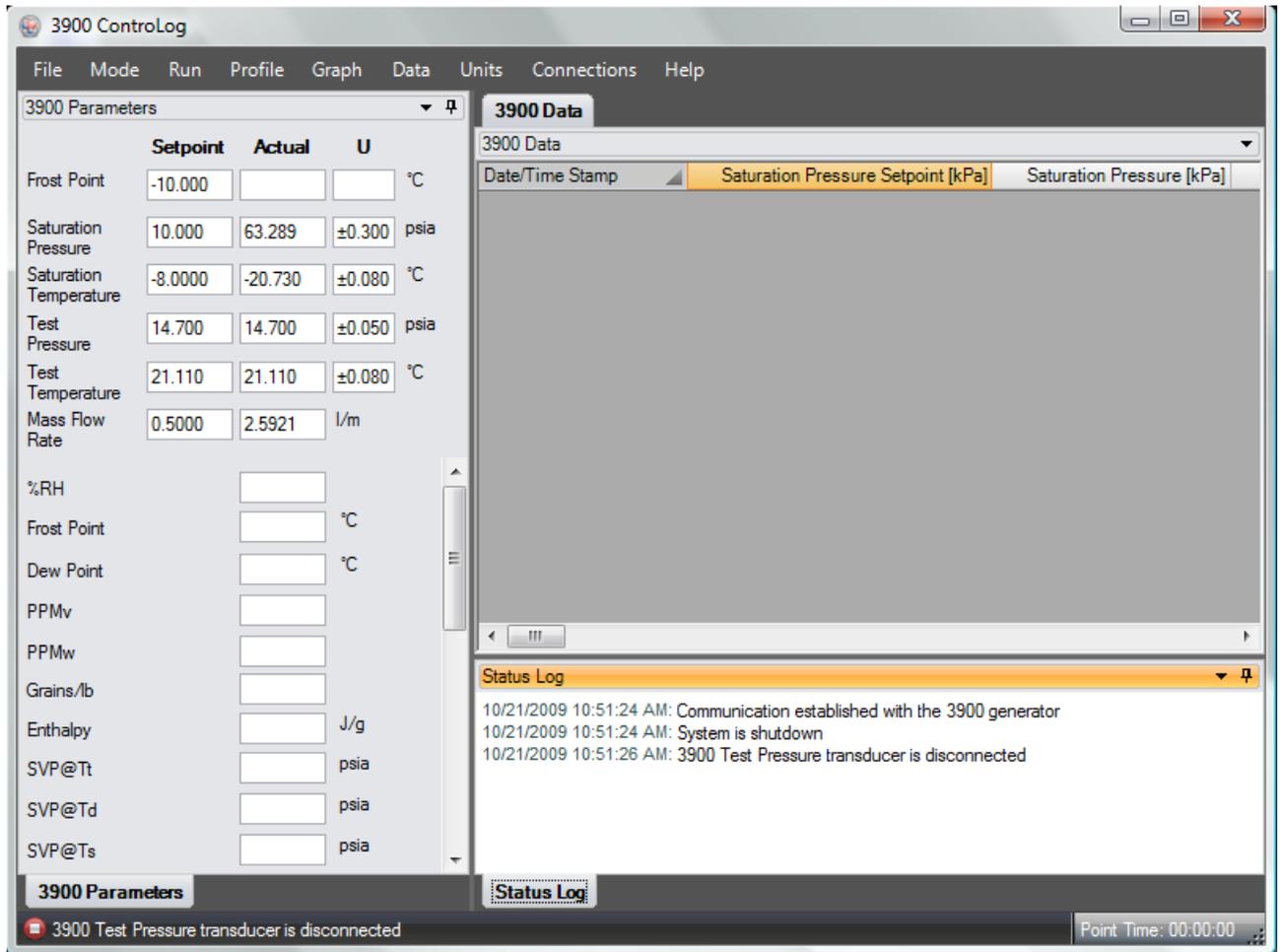
12. Selecting the “Next” button will display the access interval for the 3900. The access interval is the rate at which ControLog sends and receives commands to and from the 3900. It is recommended to leave the access interval at the default 1.5 seconds.



13. Selecting the “Finish” button will result in ControLog attempting to establish communication with the 3900 using the new communication settings.



- Once Communication is established, the 3900 parameter tab will appear along with a 3900 data tab. The status log will also show that communication has been established.

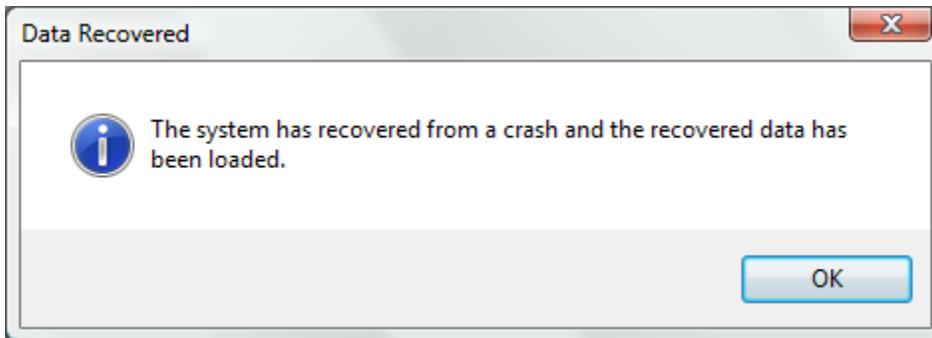


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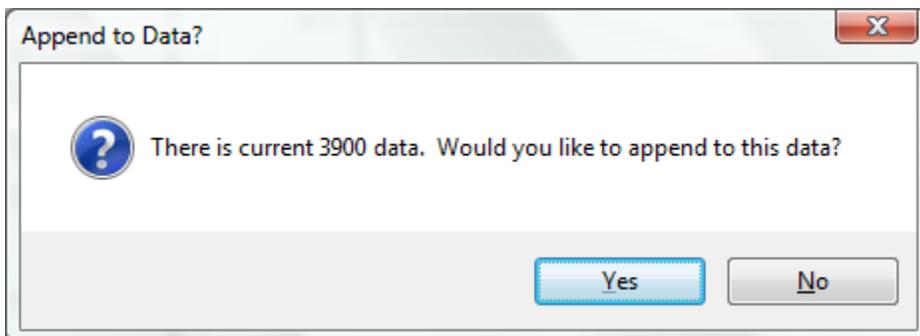
## Crashes and Data Recovery

If for any reason the PC crashes or power is interrupted, ControLog will automatically load all unsaved data on the next successful startup. ControLog actively stores all device data to Tab delimited text files using a \*.backup file extension during normal operation. These files reside in a “Backup” folder and upon a successful closing of the application this folder is removed. If on startup the “Backup” folder exists, then all residing backup files will be automatically loaded to allow the user to save or append the data.

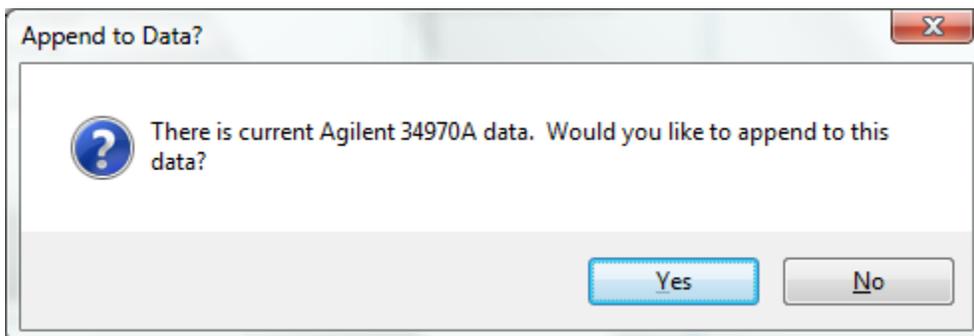
ControLog will display a message telling the user that data has been recovered.



If the generator is running, ControLog will ask the user if they would like to append the data for the generator. If “Yes” is selected, all new data recordings will be appended to the current data. If “No” is selected, ControLog will prompt the user to save the data before clearing it.



If a device is connected, ControLog will ask the user if they would like to append the data for the device. If “Yes” is selected, all new data recordings will be appended to the current data. If “No” is selected, ControLog will prompt the user to save the data before clearing it.



Individual Data Tabs for each backup file will be automatically loaded and the status log will record the event.

The screenshot displays the 3900 ControLog software interface. On the left, the '3900 Parameters' section lists various variables with their setpoints, actual values, and units. The '3900 Data' section shows a table of recorded data for Agilent 34970A. The 'Status Log' section provides a chronological record of system events, including a recovery from a crash and subsequent valve status reports.

Date/Time	Setpoint [kPa]	Saturation Pressure [kPa]	Setpoint [kPa]
11/9/2009 8:57:22 AM	68.947573	429.82882	
11/9/2009 8:57:27 AM	68.947573	431.37738	
11/9/2009 8:57:32 AM	68.947573	433.01696	
11/9/2009 8:57:37 AM	68.947573	433.94017	
11/9/2009 8:57:42 AM	68.947573	434.51105	
11/9/2009 8:57:47 AM	68.947573	435.32463	
11/9/2009 8:57:52 AM	68.947573	436.08099	
11/9/2009 8:57:52 AM	68.947573	436.56983	

**Status Log**

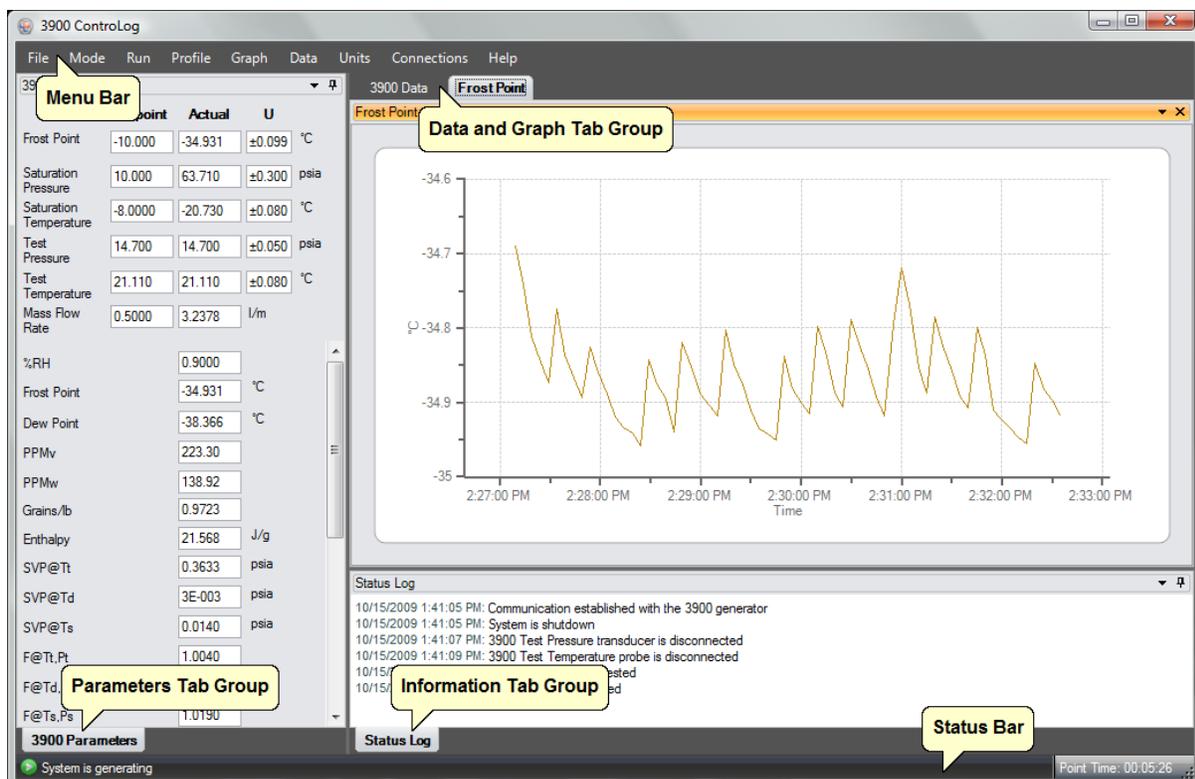
- 11/9/2009 9:06:23 AM: The system has recovered from a crash and the recovered data has been loaded
- 11/9/2009 9:06:38 AM: Communication established with the 3900 generator
- 11/9/2009 9:06:38 AM: System is ready for operation
- 11/9/2009 9:06:41 AM: 3900 Test
- 11/9/2009 9:06:43 AM: 3900 Test
- 11/9/2009 9:06:44 AM: 3900 Reported Expansion Valve Not Closing
- 11/9/2009 9:06:44 AM: 3900 Reported Flow Valve Not Closing



# ControLog Interface

This section will provide the user with a detailed overview of ControLog's layout and design. It is intended to allow the user to gain familiarity with ControLog's user interface. The sections following will provide a deeper operational view of the functionality that ControLog offers. However, fundamental operation of the Model 3900 is assumed, and may be found in the Operation and Maintenance Manual provided with the 3900 generator.

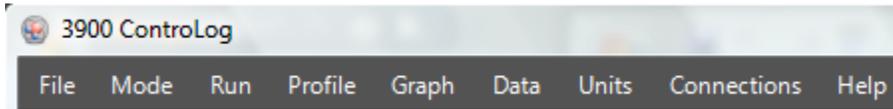
The ControLog program is composed of five basic features: Menu Bar, Parameters Tab Group, Data and Graph Tab Group, Information Tab Group and the Status Bar. Each feature is designed to be intuitive to use and to provide the user with detail information on the operation of the generator and/or connected device(s).



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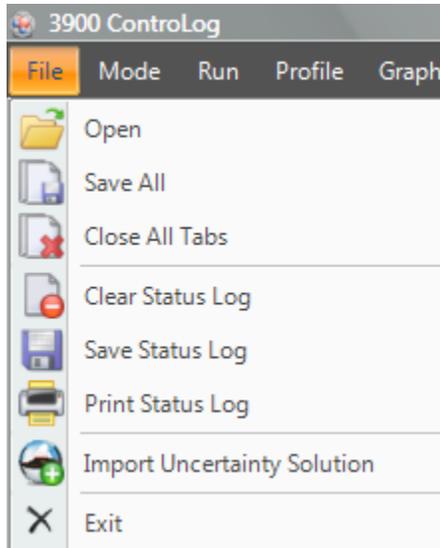
## Menu Bar

The **Menu Bar** is located at the top of the application and contains various dropdown menus, which provide access to the different ControLog functions and controls. The Profile, Graph, Data menus are dynamic and can change depending on which tab is selected. For example, the Data menu has operations that are specific to the selected data tab and will hide those specific operations when another non-data tab is selected.



## File Menu

The **File Menu** allows the user to perform file specific commands. It allows the user to open previous data files, save all open data, close all open data or graph tabs, clear the status log, save the status log, print the status log, import uncertainty solutions and exit the application.



### Open Data File

The **Open** file menu command allows the user to open previous data files for further review and analysis. Selecting this command will open a file dialog that will allow the user to browse to the desired location for the file to open. ControLog can open data saved in the follow type and format:

- Text File (Comma Delimited) (\*.csv;\*.txt)
- Text File (Tab Delimited) (\*.dat;\*.txt)
- Excel Workbook (\*.xlsx;\*.xls)
- Backup ControLog File (\*.backup)

### Save All Data

The **Save All** file menu command allows the user to save all current open data tabs to individual files using a common name. This feature allows the user to quickly save multiple data tabs in a single operation. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. ControLog can save data in the following type and format:

- Comma-Separated Values (\*.csv)
- Text File (Comma Delimited) (\*.txt)
- Text File (Tab Delimited) (\*.txt)
- Excel Workbook (\*.xlsx)
- Excel 97-2003 Workbook (\*.xls)

**Example:** If the user had two data tabs open, one called “3900 Data” and the other called “Agilent 34970A Data” and the user wanted to save the files as Excel Workbooks using the name “Test Data 10Aug09”. ControLog would save two files to the user specified location with the follow names:

*Test Data 10Aug09 (3900).xls*  
*Test Data 10Aug09 (Agilent 34970A).xls*

### **Close All Data Tabs**

The **Close All** Tabs file menu command allows the user to close all open data and graph tabs. ControLog will ask the user to confirm before closing the tabs and any unsaved data tab will also prompt the user to save the data before the tab is closed.

*Note: The 3900 must be shutdown or disconnected before this command becomes available.*

### **Clear Status Log**

The **Clear Status Log** file menu command allows the user to clear all current entries in the status log. The user will be asked to save the status log data before the log is cleared.

### **Save Status Log**

The **Save Status Log** file menu command allows the user to save the current entries in the status log. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All status log files are saved in HTML format (\*.html).

### **Print Status Log**

The **Print Status Log** file menu command allows the user to print the current entries in the status log. Selecting this command will open a print dialog that will allow the user to select the desired print options.

### **Import Uncertainty Solution**

The **Import Uncertainty Solution** file menu command allows the user to import a HumiCalc with Uncertainty solution into ControLog to define the uncertainty for the 3900 generator. Selecting this command will open an “Import Uncertainty” dialog that will step the user through a two step import process. The 3900 uses two pressure ranges, one pressure transducer for saturation pressures below 50 psia and one pressure transducer for saturation pressures above 50 psia. These pressure transducers have different uncertainties and therefore require different HumiCalc solutions. Refer to your HumiCalc with Uncertainty reference manual for more information on creating uncertainty solutions.



**Below 50 psia range**

Browse

Select the name and location of the HumiCalc solution file for the given generator pressure range.

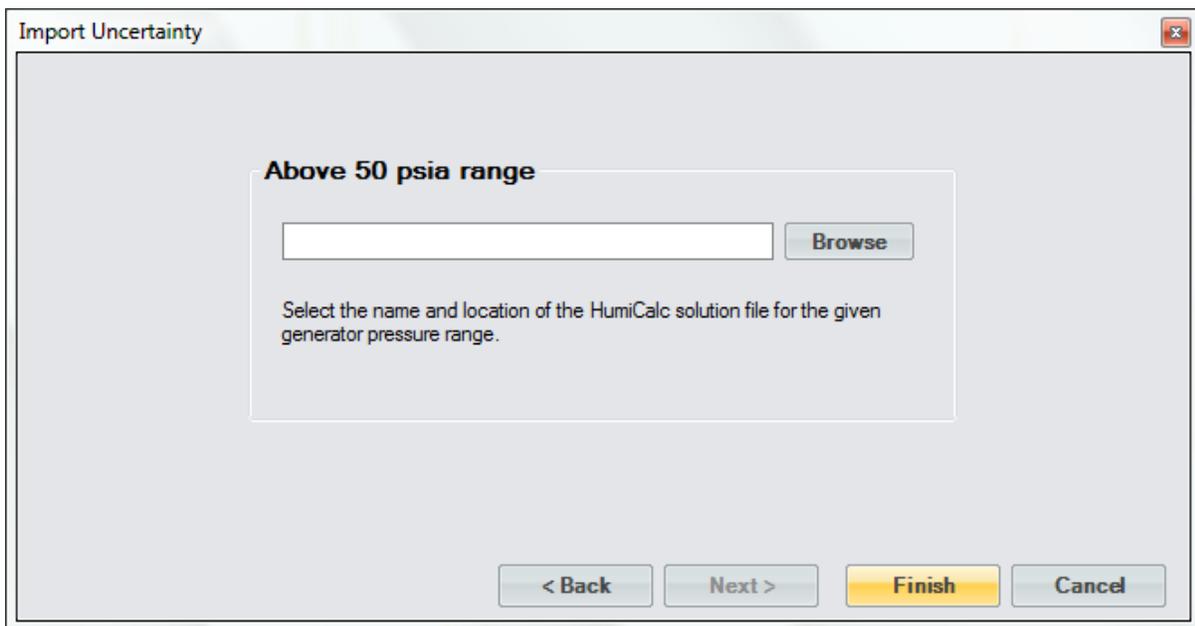
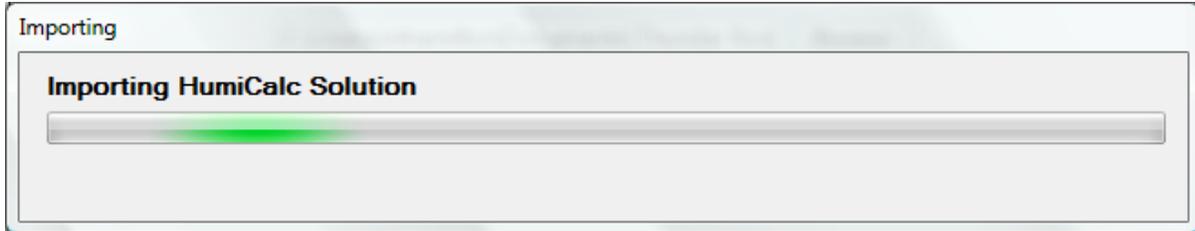
< Back

Next >

Finish

Cancel

The first step in the import process is to select the uncertainty solution for the 3900 when it is operating below 50 psia. Clicking the “Browse” button will open a file dialog that will allow the user to browse to the desired location for the solution file to open. Once a file has been selected, clicking the “Next” button will display a status dialog as the first solution is imported into ControlLog.



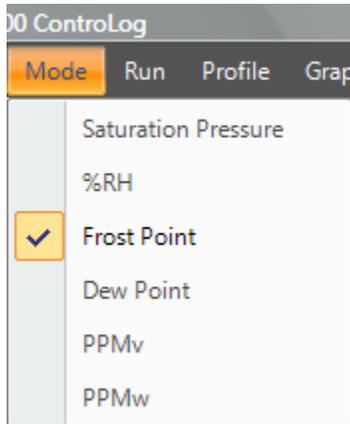
The second step in the import process is to select the uncertainty solution for the 3900 when it is operating above 50 psia. Clicking the “Browse” button will open a file dialog that will allow the user to browse to the desired location for the solution file to open. Once a file has been selected, clicking the “Finish” button will complete the import process and will display a status dialog as the second solution is imported into ControlLog.

### **Exit ControlLog**

The **Exit** file menu command allows the user to exit the application. If there is current data that has yet to be saved the user will be asked to save the data before the application closes.

## Mode Menu

The **Mode Menu** allows the user to change the operating mode of the 3900. It allows the user to select between Frost Point, Dew Point, PPMv, PPMw, Percent Relative Humidity and Saturation Pressure. The current mode is indicated by a checkmark.



### **Saturation Pressure Control Mode**

The Saturation Pressure Control Mode,  $P_s$ , is controlled at a constant value independent of any other pressure, temperature, or humidity value. While saturation pressure is held constant, all humidity parameters may vary.

### **Percent Relative Humidity Control Mode**

The Percent Relative Humidity Control Mode or %RH Control Mode, %RH, is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ , test temperature,  $T_t$ , or test pressure,  $P_t$ . While %RH is held constant, all other humidity parameters may vary. While in %RH control mode, the saturation temperature setpoint is automatically determined.

### **Frost Point Control Mode**

The Frost Point Control Mode,  $T_f$ , is controlled at a constant value by varying the saturation pressure,  $P_s$ , to compensate for changes in either saturation temperature,  $T_s$ , or test pressure,  $P_t$ . While Frost Point is held constant other humidity parameters may vary. While in Frost Point control mode, the saturation temperature setpoint is automatically determined. Frost Point is independent of test temperature.

### **Dew Point Control Mode**

The Dew Point Control Mode,  $T_d$ , is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in either saturation temperature,  $T_s$ , or test pressure,  $P_t$ . While Dew Point is held constant, other humidity parameters may vary. While in Dew Point control mode, the saturation temperature setpoint is automatically determined. Dew Point control mode is valid both above and below 0 °C, and Dew Point is independent of test temperature.

### **PPMv Control Mode**

The PPMv Control Mode is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ . While PPMv is held constant, other humidity parameters may vary. While in PPMv control mode, the saturation temperature setpoint is automatically determined. PPMv is independent of test pressure and test temperature.

### ***PPMw Control Mode***

The PPMw Control Mode is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ . While PPMw is held constant, other humidity parameters may vary. While in PPMw control mode, the saturation temperature setpoint is automatically determined. PPMw is independent of test pressure and test temperature.

## Run Menu

The **Run Menu** allows the user to run the 3900 manually in purge mode or generate mode. The Run menu also allows the user to manually shutdown the 3900. The current run mode is highlighted.



### Purge Mode

Selecting **Purge** from the run menu commands the 3900 into purge mode. The purge mode is generally used to prevent icing within the saturator and dry the saturator outlet after movement (transportation), storage (power off, no gas flow, etc.), after performing the saturator fill procedure, or while transitioning the saturator from higher to lower temperatures. When the system is not being used (power off, no gas flow, etc.), the saturator is closed off and the gas within is static. As thermal equilibrium is reached, water vapor will condense on all inner surfaces between the saturator outlet and the expansion valve inlet. The Purge mode counteracts this condition by allowing the carrier gas to flow in the opposite direction (expansion valve to saturator), drying the affected sections of tubing. This is a necessary preparatory step in any low humidity system. As a general rule, when starting from an ambient condition the system should be purged for 24 hours or more before attempting to operate in the Generate mode. If sufficient purge time is not allowed, condensed or trapped water will remain and system accuracy will suffer. Insufficient purge time is usually indicated by higher than normal (wetter than normal) indications of the device under test. These indications can be as little as a few tenths of a degree to as much as several degrees dew/frost point. Purging should also be performed while transitioning from warmer to colder saturation temperatures, and for approximately 5 hours after each 500 hours of continuous Generate mode operation. During Purge mode, both flow control and saturation temperature control are active, but saturation pressure control is disabled. The generator will attempt to achieve the indicated flow and saturation temperature setpoint values.

*Note: When the saturation temperature is lowered, the fluid jacket surrounding the saturator cools in order to reduce the saturation temperature to its new setpoint value. As the saturator cools during this transition period, temperature gradients will exist between the inside of the saturator and the fluid jacket that surrounds it. The saturator outlet passes through this fluid jacket and will also exhibit temperature gradients along its length. If gas is allowed to flow normally through the saturator during this cooling period, the 100% humidified gas of the saturator may condense at the colder saturator outlet. Therefore, Purge mode should be used while cooling the saturator to lower temperatures. For this reason, the lowest humidity of a generation sequence or profile should be performed first. This low to high order requires that a Purge be performed only once prior to the generation sequence when cooling to the lowest saturation temperature. Then, as humidity values are increased, warming the saturator to higher values, further purging is not required.*

*Note: During Purge, no gas flows to the 3900 Conditioned Gas Outlet, and consequently no gas flows through the device under test if connected.*

### Generate Mode

Selecting **Generate** from the run menu commands the 3900 into generate mode. Generate mode is used to operate the system when exact humidity points or associated time intervals have not been determined, when data must be viewed and/or verified manually before proceeding to the next humidity point, or when more immediate control over the generated humidity is required. When in the Generate mode of operation, the system will control at the currently entered setpoint indefinitely. Any time a setpoint is changed, the system immediately begins adjusting to that new value, and will

control at the new point indefinitely. Generate mode offers the flexibility to change the setpoint at any time, and does not force you into any set sequence or for any prescribed amount of time. The Generate mode also allows you to change the humidity control mode at any time. For instance, the system may be controlling Frost Point, then immediately switched to PPMv control mode.

## **Shutdown**

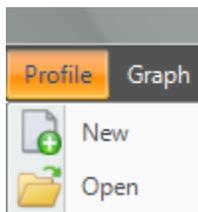
Selecting **Shutdown** from the run menu commands the 3900 to shutdown. The 3900 may be shutdown while either generating or purging. When stopped, all system functions shutdown, pressure is vented, and the idle Control/Display screen is shown. During this idle time when the 3900 is stopped, gas is not flowing through the saturator. After extended periods of this idle time, the 3900 must be purged again prior to further use.

## Profile Menu

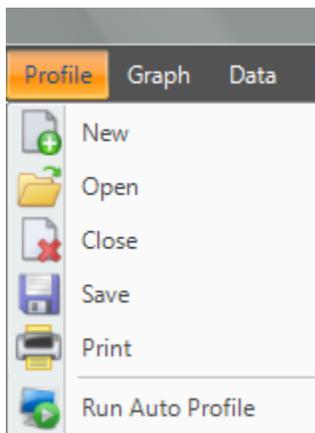
The **Profile Menu** allows the user to Open, Save, and create new Auto Profiles. Auto Profiles give the user the ability to program a set of humidity and temperature test points and dwell times that will automate the 3900 generation process. The profile menu is dynamic and has operations that are specific to the profile tab. Specific operations will be hidden when another non-profile tab is selected.

The Auto Profiling feature is very similar to the Generate mode with the main exception that profiling relies on a predefined list of setpoints referred to as a profile. The user configurable profile is used as ControLog's road map during Auto Profile operation. It defines which setpoint values to go to, at what rate to go from one setpoint to another, and how long to stay at a specific setpoint before moving to the next one.

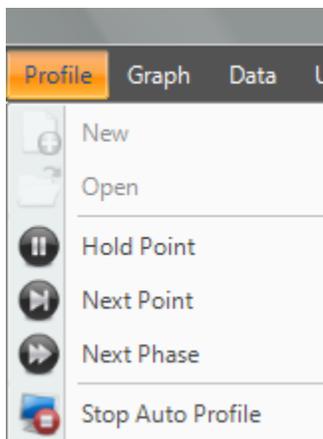
For more information, see [Profiling](#).



Profile menu when the Profile tab is not selected



Profile Menu when the Profile tab is selected



Profile Menu when running an Auto Profile

## ***New Profile***

The **New** profile menu command allows the user to create a new Auto Profile. This operation is always available.

## ***Open Profile***

The **Open** profile menu command allows the user to open a saved Auto Profile. Selecting this command will open a file dialog that will allow the user to browse to the desired location for the file to open. This operation is always available.

## ***Close Profile***

The **Close** profile menu command allows the user to close the Profile tab. Selecting this command will close the Profile tab, but if the profile has not been saved, ControLog will ask the user to save the profile before closing the Profile tab.

## ***Save Profile***

The **Save** profile menu command allows the user to save the currently opened Profile. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. ControLog Auto Profiles are saved in XML format with a \*.profile extension. This operation is available only when the Profile tab is selected.

## ***Print Profile***

The **Print** profile menu command allows the user to print the currently opened Profile. Selecting this command will open a print dialog that will allow the user to select the desired print options.

## ***Run Auto Profile***

The **Run Auto Profile** command allows the user to start an Auto Profile. Selecting this command will open the Profile Starting Point dialog which allows the user to select which point in the profile they would like to start the profile on.

## ***Hold Profile Point***

The **Hold Point** profile menu command allows the user to hold or pause the current Auto Profile point. Selecting Hold Point pauses the current point, allowing the system to remain indefinitely at the current point. While in a hold mode, the system is prevented from completing the ramp, assurance, or soak phases for a point. To resume the profile point, select the menu item again. This re-enables the point and allows the profile to resume normal operation.

## ***Next Profile Point***

The **Next Point** profile menu command allows the user to skip to the next point in the Auto Profile. Selecting Next Point manually advances to the next point, skipping any remaining ramp, assurance, or soak phase.

## ***Next Profile Phase***

The **Next Phase** profile menu command allows the user to skip to the next phase in the Auto Profile. Selecting Next Phase manually advances to the next phase. It causes Ramp Phase to proceed to the Assurance or Soak Phase, Assurance to proceed to Soak, or Soak to proceed to Ramp of the next profile point. This allows for early manual termination of any phase within a profile point.

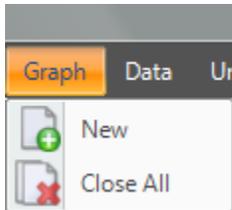
## ***Stop Auto Profile***

The **Stop Auto Profile** command allows the user to stop the Auto Profile where it is at. The setpoints will remain where the profile stopped and the generator will continue in its current mode of operation.

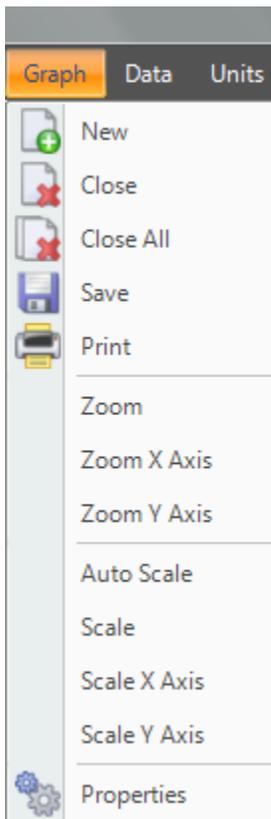
## Graph Menu

The **Graph Menu** allows the user to create a New graph, Close the selected graph, Close All graphs, Save the selected graph, Print the selected graph, Zoom, Scale and set the Properties for the selected graph. The graph menu is dynamic and has operations that are specific to the selected graph tab. Specific operations will be hidden when another non-graph tab is selected.

For more information, see [Graphing](#).



Graph menu when another non-graph tab is selected



Graph menu when a graph tab is selected.

### ***New Graph***

The **New** graph menu command allows the user to create a new graph. Selecting this command will open a New Graph Wizard dialog that will step the user through the selection process of what data the user would like to include in the new graph. This operation is always available.

## **Close Graph**

The **Close** graph menu command allows the user to close the selected graph. Selection will result in a confirmation message to assure the user wants to close the graph. This operation is only available when a graph tab is selected.

## **Close All Graphs**

The **Close All** graphs menu command allows the user to close all open graphs. Selection will result in a confirmation message to assure the user wants to close all graphs. This operation is available whenever a graph tab is open.

## **Save Graph**

The **Save** graph menu command allows the user to save the selected graph. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. ControLog graphs can be saved in following graphic file types:

- Bitmap (\*.bmp)
- Graphics Interchange Format (\*.gif)
- Joint Photographic Experts Group (\*.jpg)
- W3C Portable Network Graphics (\*.png)
- EMF Enhanced Metafile Format (\*.emf)

This operation is available only when a graph tab is selected.

## **Print Graph**

The **Print** graph menu command allows the user to print the selected graph. Selecting this command will open a print dialog that will allow the user to select the desired print options. This operation is available only when a Graph tab is selected.

## **Zoom Graph**

The **Zoom** graph menu command allows the user to zoom a rectangular area of the graph. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to create a rectangular area on the graph that will be zoomed. This operation is available only when a Graph tab is selected.

## **Zoom Graph's X Axis**

The **Zoom X Axis** graph menu command allows the user to zoom along the X Axis of the graph. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to create a section area on the graph that will be zoomed along the X Axis. This operation is available only when a Graph tab is selected.

## **Zoom Graph's Y Axis**

The **Zoom Y Axis** graph menu command allows the user to zoom along the Y Axis of the graph. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to create a section area on the graph that will be zoomed along the Y Axis. This operation is available only when a Graph tab is selected.

## **Auto Scale Graph**

The **Auto Scale** graph menu command allows the user to reset the graph view to encompass all data. Selecting this command will automatically reset both axis of the graph so that the entire data set of each item is contained within the boundaries of the graph. This operation is available only when a Graph tab is selected.

## **Scale Graph**

The **Scale** graph menu command allows the user to scale both the X and Y axis. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to scale. Dragging the cursor up scales the

display in (zooms in) and dragging the cursor down scales the display out (zoom out). This operation is available only when a Graph tab is selected.

### **Scale Graph's X Axis**

The **Scale X Axis** graph menu command allows the user to scale the X axis. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to scale. Dragging the cursor up scales the X Axis in (zooms X Axis in) and dragging the cursor down scales the X Axis out (zooms X Axis out). This operation is available only when a Graph tab is selected.

### **Scale Graph's Y Axis**

The **Scale Y Axis** graph menu command allows the user to scale the Y axis. Selecting this command checks the operation in the menu and allows the user to use the left mouse button to scale. Dragging the cursor up scales the Y Axis in (zooms Y Axis in) and dragging the cursor down scales the Y Axis out (zooms Y Axis out). This operation is available only when a Graph tab is selected.

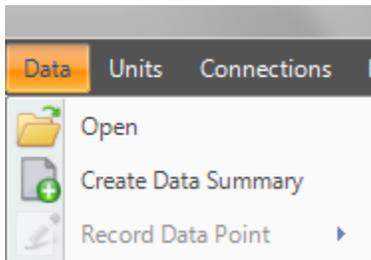
### **Graph Properties**

The graph **Properties** graph menu command allows the user to modify the properties of the selected graph. Selecting this command opens the Graph Properties dialog that allows the user to make changes to what data is graphed, the display properties for each line and the axis values. This operation is available only when a Graph tab is selected.

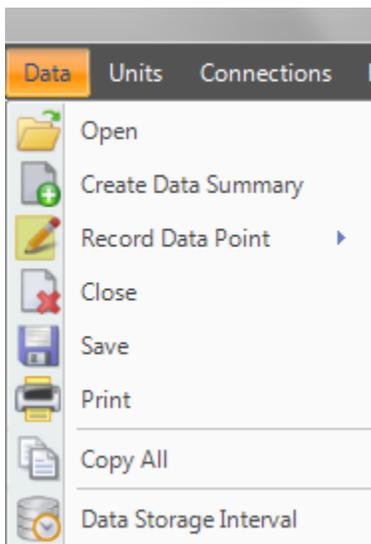
## Data Menu

The **Data Menu** allows the user to Open, Create a Data Summary, Record Data Point, Close, Clear, Save, Print, Copy and change the Data Storage Interval. The data menu is dynamic and has operations that are specific to the selected data tab. Specific operations will be hidden when another non-data tab is selected.

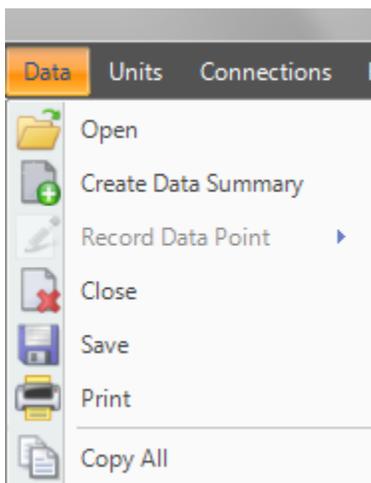
For more information, see [Data and Data Summary](#)



Data menu when another non-data tab is selected



Data menu when a data tab is selected and a device is connected



Data menu when a data tab is selected and no device is connected

## Open Data File

The **Open** data menu command allows the user to open previous data files for further review and analysis. This command has the same functionality as the Open command under the file menu. Selecting this command will open a file dialog that will allow the user to browse to the desired location for the file to open. ControLog can open data saved in the following types and formats:

- Text File (Comma Delimited) (\*.csv;\*.txt)
- Text File (Tab Delimited) (\*.dat;\*.txt)
- Excel Workbook (\*.xlsx;\*.xls)
- Backup ControLog File (\*.backup)

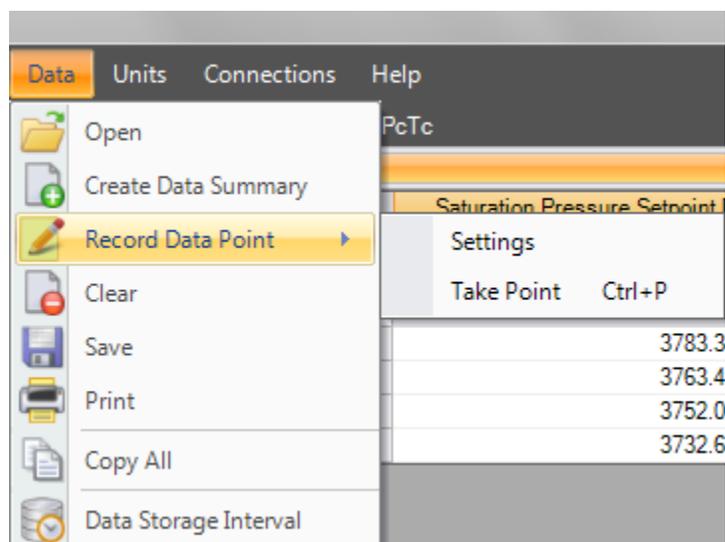
This operation is always available.

## Create Data Summary

The **Create Data Summary** data menu command allows the user to create a summary of any currently opened data. The feature lets the user specify what items from which device and at what intervals to include in the data summary. The data summary can also calculate error between the specified standard and the device under test. This operation is available whenever there is an open Data tab that contains data.

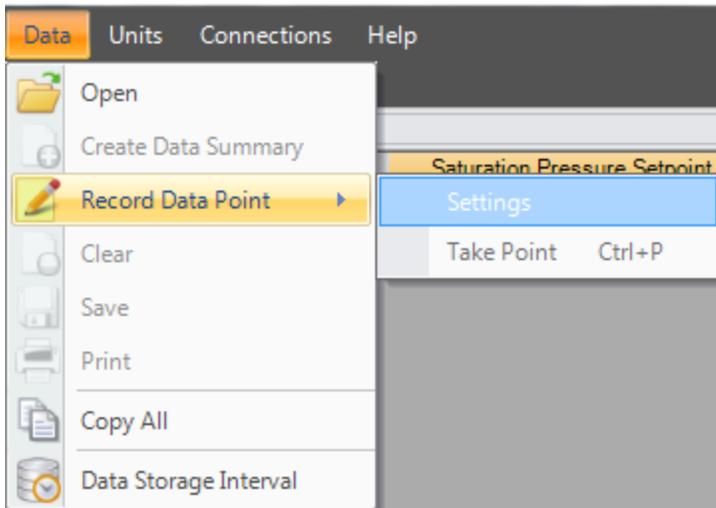
## Record Data Point

The **Record Data Point** data menu command allows the user to record certain data items from any currently connected device either manually, with each manual device entry or at the completion of each soak phase in an auto profile. The user can specify the number of piror data points to include and has the option to automatically calculate average and or standard deviation of the piror data points. There are two submenus for this menu command; **Settings** and **Take Point**. This operation is available whenever device or generator data is being logged.



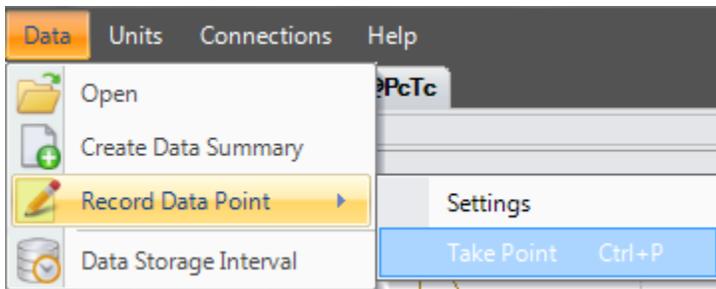
## Settings

The **Settings** submenu allows the user to define which data items from which connected device they would like to record when a point is taken. They can also define the number of points piror to include and weather to calcaule average and or standard deviation. The user can also configure when to take points, either manually, at the end of a profiles soak phase or when a manual device entry is taken.

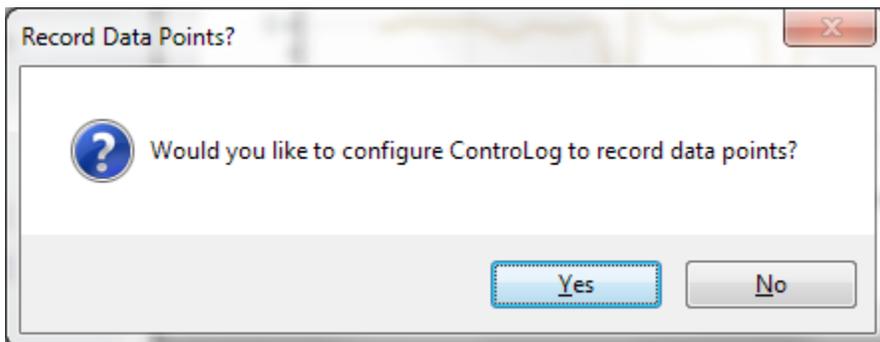


## Take Point Ctrl-P

The **Take Point** submenu allows the user to take a data point manually. The user can even use the shortcut key “Ctrl-P” to take a point without the need to access the menu.



If the user has not configured the system to record data points then ControlLog will ask the user if they would like to define the settings before taking a point.



For more information on record data point settings, see [Data and Data Summary](#)

## **Close Data**

The **Close** data menu command allows the user to close the selected data tab. ControLog will ask the user to confirm before closing the tab and any unsaved data tab will also prompt the user to save the data before the tab is closed. This operation is available only when a Data tab is selected and the device for the selected data tab is disconnected.

## **Clear Data**

The **Clear** data menu command allows the user to clear the selected data tab. ControLog will ask the user to save any unsaved data tab before the tab is cleared. This operation is available only when the device for the select data tab is connected and there is at least one data point recorded in the selected data tab.

## **Save Data**

The **Save** data menu command allows the user to save the selected data tab. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. ControLog can save data in the following type and format:

- Comma-Separated Values (\*.csv)
- Text File (Comma Delimited) (\*.txt)
- Text File (Tab Delimited) (\*.txt)
- Excel Workbook (\*.xlsx)
- Excel 97-2003 Workbook (\*.xls)

This operation is available only when a Data tab with data is selected.

## **Print Data**

The **Print** data menu command allows the user to print the selected data tab. Selecting this command will open a print dialog that will allow the user to select the desired print options. This operation is available only when a Data tab is selected.

## **Copy All Data**

The **Copy All** data menu command allows the user to copy all the data from the selected tab to the clipboard. Selecting this command will copy all data in the selected data tab to the clipboard in a tab delimited format. This data may then be pasted into another program. This operation is available only when a Data tab is selected.

## **Data Storage Interval**

The **Data Storage Interval** data menu command allows the user to change the storage interval that data is recorded at. This is the rate at which data is recorded to the data tabs for all connected devices. Selecting this command will open the “Data Storage Interval” dialog that will allow the user to change the data storage interval during both purge and generate operations. This operation is available only when a device is connected.

*Warning: Storing and maintaining data can become a time consuming process. The more data that is stored in the data tab, the slower and less responsive the computer may seem. For this reason, some consideration should be given to the amount of data desired, the overall time span of the data (i.e. hours, days, possibly weeks), and ultimately the data interval.*

*Note: Data is only recorded while the 3900 is either in generate or purge mode. Data is also stored at the generate rate whenever a device is connected and the 3900 is not connected. This gives the user the ability to*

*use ControLog as a logging application for any device they can connect without the need of a 3900 generator.*

**Data Storage Interval**

**Data storage interval for all devices during generate**

5 seconds

This is the rate at which ControLog will record and graph data from all devices during generate.

**Data storage interval for all devices during purge**

5 seconds

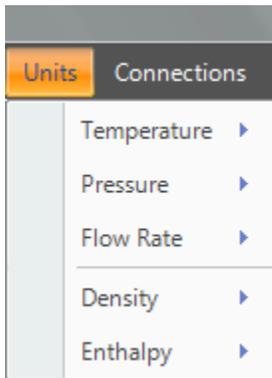
This is the rate at which ControLog will record and graph data from all devices during purge.

Ok Cancel

## Units Menu

The **Units Menu** allows the user to change ControLog's displayed units. The Temperature, Pressure, Flow Rate, Density and Enthalpy units can be changed.

*Note: All parameter tabs and graph tabs will be updated with the selected unit but the data tabs will not change. All data tab values remain in SI units which provide a consistent unit base for saved data.*



### Temperature Unit

The **Temperature Unit** allows the user to change the displayed units for temperatures. The selected Unit will be checked.



## Pressure Unit

The **Pressure** Unit allows the user to change the displayed units for pressure. The selected Unit will be checked.

<input checked="" type="checkbox"/>	psia
<input type="checkbox"/>	atm
<input type="checkbox"/>	Pa
<input type="checkbox"/>	hPa
<input type="checkbox"/>	kPa
<input type="checkbox"/>	MPa
<input type="checkbox"/>	bar
<input type="checkbox"/>	millibar
<input type="checkbox"/>	Torr
<input type="checkbox"/>	in Hg
<input type="checkbox"/>	cm Hg
<input type="checkbox"/>	mm Hg
<input type="checkbox"/>	in H2O
<input type="checkbox"/>	cm H2O
<input type="checkbox"/>	mm H2O

## Flow Unit

The **Flow** Unit allows the user to change the displayed units for flow. The selected Unit will be checked.

<input checked="" type="checkbox"/>	l/m
<input type="checkbox"/>	l/h
<input type="checkbox"/>	cfm
<input type="checkbox"/>	cfh

## Density Unit

The **Density** Unit allows the user to change the displayed units for density. The selected Unit will be checked.

<input type="checkbox"/>	g/l
<input checked="" type="checkbox"/>	g/m <sup>3</sup>
<input type="checkbox"/>	lb/ft <sup>3</sup>

## ***Enthalpy Unit***

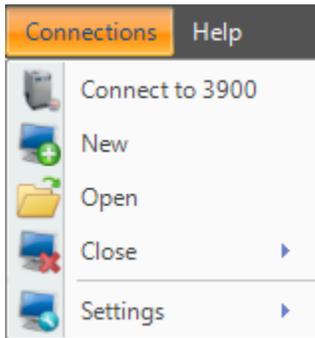
The **Enthalpy** Unit allows the user to change the displayed units for enthalpy. The selected Unit will be checked.

	btu/lb
<input checked="" type="checkbox"/>	J/g

## Connections Menu

The **Connections Menu** allows the user to create New connections, Open saved connections, Close connections and change the Settings of a connection.

For more information, see [Connections](#)



### **Connect to 3900**

The **Connect to 3900** connection menu command allows the user to connect to the 3900 generator. Selecting this command will cause ControLog to begin establishing communication with the 3900. This operation is available only when the 3900 is disconnected.

### **New Connection**

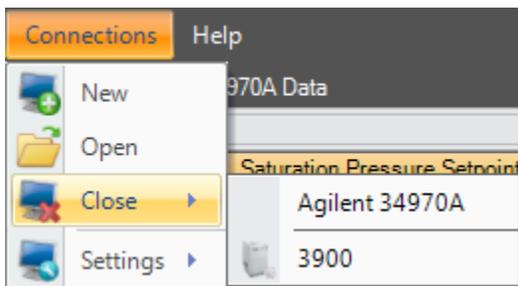
The **New** connection menu command allows the user to create a new device connection. Selecting this command will open a Connection Wizard dialog that will step the user through the process of creating a new connection to a device.

### **Open Connection**

The **Open** connection menu command allows the user to open previous saved device connections. Device connection files are user saved configurations for a specific device. Selecting this command will open a file dialog that will allow the user to browse to the desired location for the file to open. Device files are saved in an XML format with the (\*.device) extension.

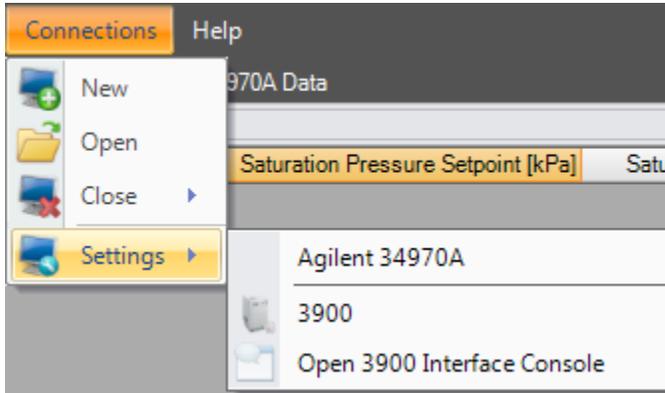
### **Close Connection**

The **Close** connection menu command allows the user to close a specific connection. ControLog will ask the user to confirm before closing the connection.



## Settings

The **Settings** connection menu command allows the user to change the settings for a specific connection. Selecting this command will open the Connection Wizard dialog for the selected connection, allowing the user to change connection settings as desired.

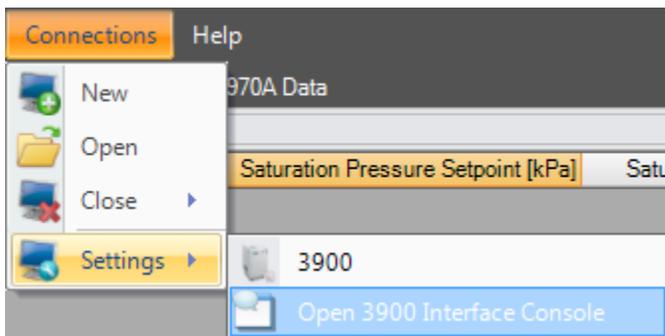


### Open 3900 Interface Console

The **Open 3900 Interface Console** connection menu command under Settings allows the user to open a 3900 console tab. The 3900 console tab allows the user to send and receive commands to and from the 3900.

*Warning: Interfacing with the 3900 using the Console should only be attempted if instructed to do so by Thunder Scientific.*

*Note: This menu command is only available when the 3900 is connected.*



Once a valid password is entered the selection will open a 3900 Interface Console tab in the information tab group.



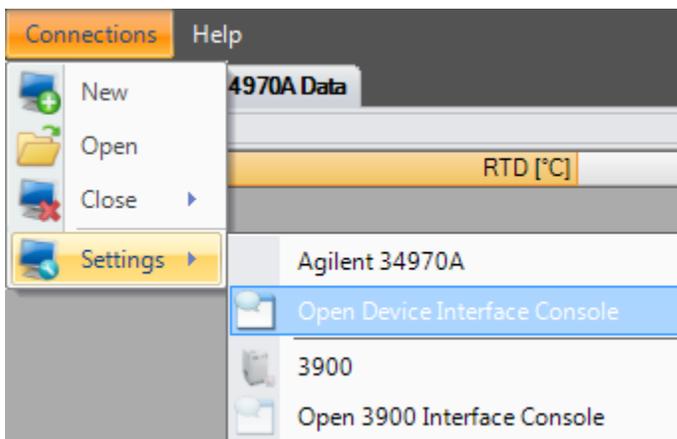
Commands are entered in the bottom text area of the console tab and the 3900 responses are displayed in the upper text area of the console tab.



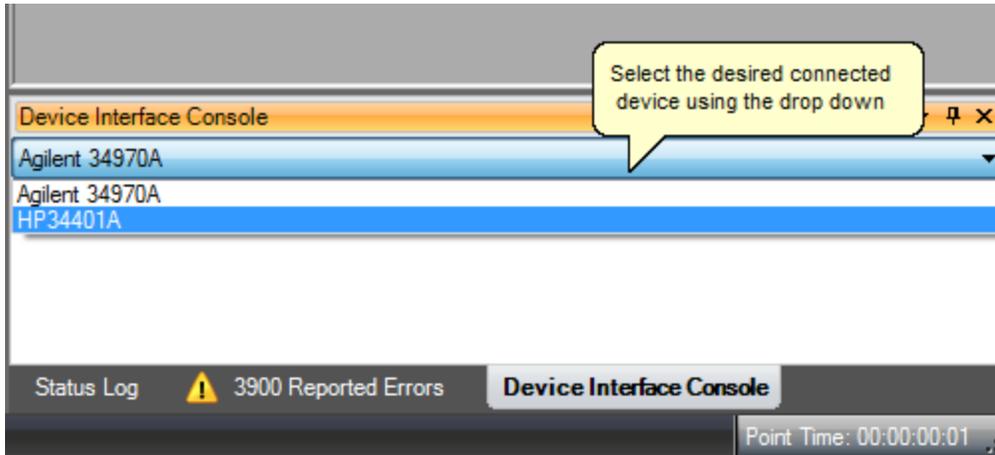
### Open Device Interface Console

The **Open Device Interface Console** connection menu command under Settings allows the user to open a device console tab. The device console tab allows the user to view the commands being sent to and received from any given connected device.

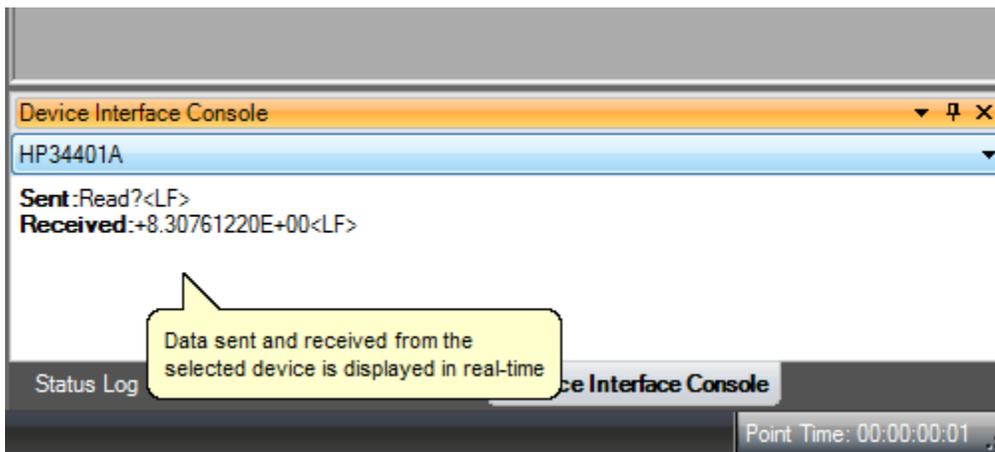
*Note: This menu command is only available when at least one device is connected.*



The user can select which connected device to view using the drop down selection at the top of the tab.

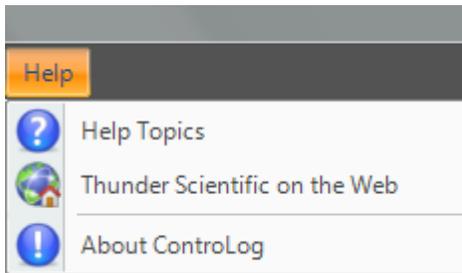


The data sent to and received from the selected device is displayed in the lower text area of the console tab.



## Help Menu

The **Help Menu** allows the user to access the Help Topics, visit Thunder Scientific on the Web and get information About ControLog.



### ***Help Topics***

The **Help Topics** help menu command allows the user to open the 3900 ControLog User manual (this document). The user manual is opened in an easy to use help format that allows the user to search and navigate through the entire 3900 ControLog User manual.

### ***Thunder Scientific on the Web***

The **Thunder Scientific on the Web** help menu command opens the Thunder Scientific Website using the default internet browser.

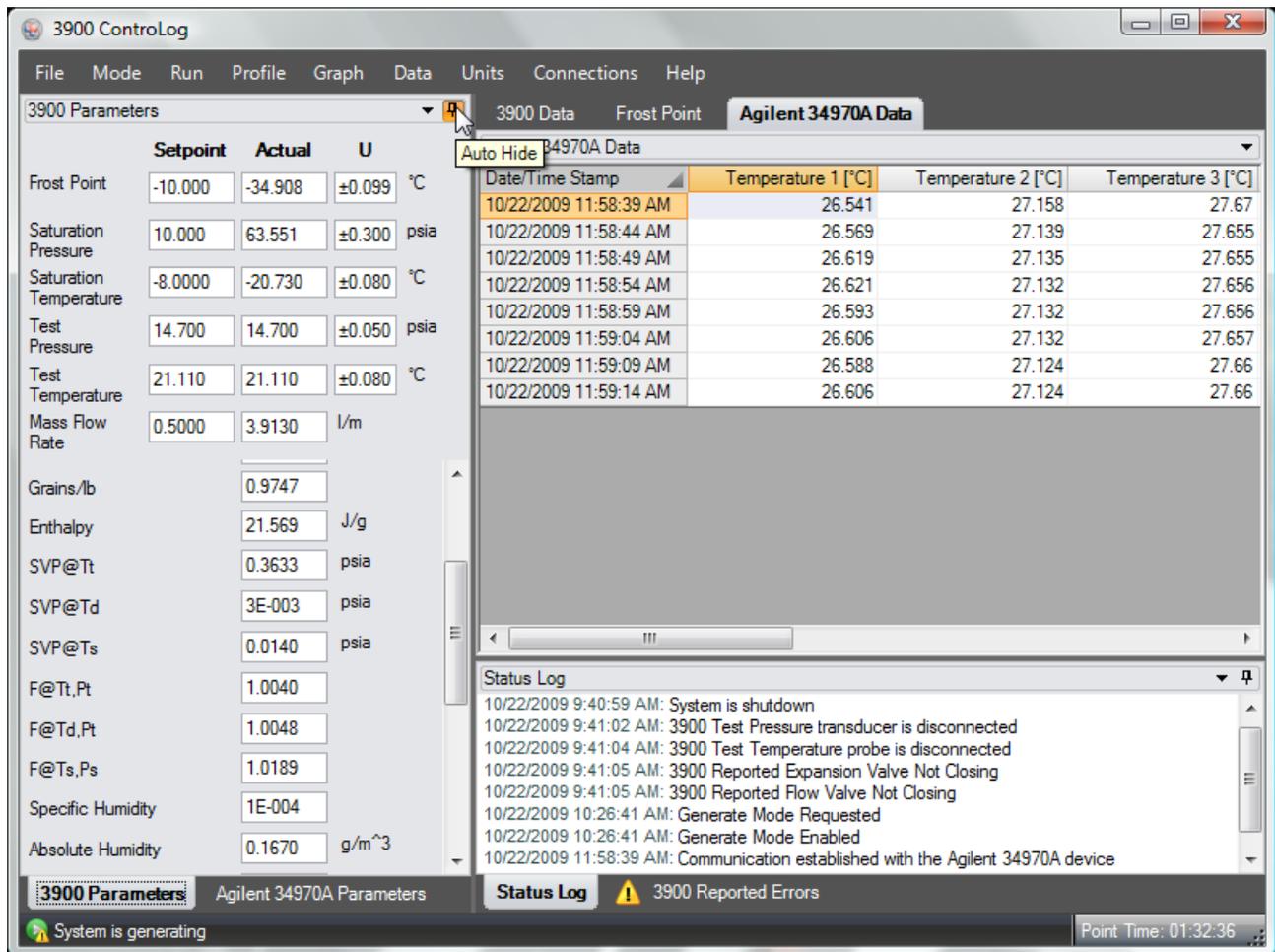
### ***About ControLog***

The **About ControLog** help menu command opens a dialog giving information on the ControLog application including version number.

# Parameters Tab Group

The **Parameter Tab Group** is located on the left side of the application and contains a parameter tab for each connected device. Each parameter tab displays the current data for its particular device. The parameter tabs are a docking style window that can be “pinned” open or allowed to close when not active. A particular parameter tab can be selected by clicking its tab label at the bottom of the group.

By clicking the pin icon on a parameter tab the user can unpin the Parameter tabs.



Once the parameter tabs are unpinned they will automatically hide.

The screenshot displays the 3900 ControLog software interface. The main window title is "3900 ControLog". The menu bar includes File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. The interface is divided into several sections:

- Navigation Bar:** Shows "3900 Data", "Frost Point", and "Agilent 34970A Data".
- Agilent 34970A Data Table:** A table with columns for Date/Time Stamp, Temperature 1 [°C], Temperature 2 [°C], Temperature 3 [°C], Temperature 4 [°C], and Temperature 5 [°C]. The data is as follows:
 

Date/Time Stamp	Temperature 1 [°C]	Temperature 2 [°C]	Temperature 3 [°C]	Temperature 4 [°C]	Temperature 5 [°C]
10/22/2009 11:58:39 AM	26.541	27.158	27.67	25.376	25.025
10/22/2009 11:58:44 AM	26.569	27.139	27.655	25.35	25.014
10/22/2009 11:58:49 AM	26.619	27.135	27.655	25.334	25.019
10/22/2009 11:58:54 AM	26.621	27.132	27.656	25.328	25.016
10/22/2009 11:58:59 AM	26.593	27.132	27.656	25.328	25.019
10/22/2009 11:59:04 AM	26.606	27.132	27.657	25.333	25.022
10/22/2009 11:59:09 AM	26.588	27.124	27.66	25.353	25.025
10/22/2009 11:59:14 AM	26.606	27.124	27.66	25.349	25.027
- Status Log:** A list of system events:
  - 10/22/2009 9:40:59 AM: System is shutdown
  - 10/22/2009 9:41:02 AM: 3900 Test Pressure transducer is disconnected
  - 10/22/2009 9:41:04 AM: 3900 Test Temperature probe is disconnected
  - 10/22/2009 9:41:05 AM: 3900 Reported Expansion Valve Not Closing
  - 10/22/2009 9:41:05 AM: 3900 Reported Flow Valve Not Closing
  - 10/22/2009 10:26:41 AM: Generate Mode Requested
  - 10/22/2009 10:26:41 AM: Generate Mode Enabled
  - 10/22/2009 11:58:39 AM: Communication established with the Agilent 34970A device
- Status Bar:** Shows "System is generating" and "Point Time: 01:32:38".

The user can access the hidden tabs by clicking the desired parameter label on the left.

The screenshot shows the 3900 ControLog software interface. On the left, a vertical sidebar contains a list of parameter labels: 3900 Parameters, Agilent 34970A Parameters, and a scroll bar. The main window displays a table with columns for Setpoint, Actual, and U. Below this, a data table shows temperature readings for five different points. At the bottom, a status bar indicates 'System is generating' and 'Point Time: 01:32:38'.

	Setpoint	Actual	U	
Frost Point	-10.000	-34.809	±0.099	°C
Saturation Pressure	10.000	62.859	±0.300	psia
Saturation Temperature	-8.0000	-20.730	±0.080	°C
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	21.110	21.110	±0.080	°C
Mass Flow Rate	0.5000	3.0856		l/m
Grains/lb		0.9853		
Enthalpy		21.573		J/g
SVP@Tt		0.3633		psia
SVP@Td		3E-003		psia
SVP@Ts		0.0140		psia
F@Tt,Pt		1.0040		
F@Td,Pt		1.0048		
F@Ts,Ps		1.0187		
Specific Humidity		1E-004		
Absolute Humidity		0.1688		g/m <sup>3</sup>
Dry Air Density		1199.6		g/m <sup>3</sup>

	Temperature 2 [°C]	Temperature 3 [°C]	Temperature 4 [°C]	Temperature 5 [°C]
	27.158	27.67	25.376	25.025
	27.139	27.655	25.35	25.014
	27.135	27.655	25.334	25.019
	27.132	27.656	25.328	25.016
	27.132	27.656	25.328	25.019
	27.132	27.657	25.333	25.022
	27.124	27.66	25.353	25.025
	27.124	27.66	25.349	25.027

Tabs can also be accessed via the drop down selection by clicking on the arrow icon. The currently selected tab is indicated by a check mark in the drop down list.

The screenshot displays the 3900 ControLog software interface. At the top, there is a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are several tabs: '3900 Parameters' (selected), '3900 Data', 'Frost Point', and 'Agilent 34970A Data'. A dropdown menu is open under the '3900 Parameters' tab, showing a checkmark next to '3900 Parameters' and 'Agilent 34970A Parameters' below it.

The main display area is divided into two sections. The left section shows a list of parameters with their Setpoint, Actual, and U values. The right section shows a table of data points for Temperature 1, 2, and 3 in degrees Celsius.

Parameter	Setpoint	Actual	U	Units
Frost Point	-10.000	-34.885	±0.099	°C
Saturation Pressure	10.000	63.387	±0.300	psia
Saturation Temperature	-8.0000	-20.730	±0.080	°C
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	21.110	21.110	±0.080	°C
Mass Flow Rate	0.5000	3.9146		l/m
Grains/lb		0.9772		
Enthalpy		21.570		J/g
SVP@Tt		0.3633		psia
SVP@Td		3E-003		psia
SVP@Ts		0.0140		psia
F@Tt,Pt		1.0040		
F@Td,Pt		1.0048		
F@Ts,Ps		1.0189		
Specific Humidity		1E-004		
Absolute Humidity		0.1675		g/m <sup>3</sup>

The right section shows a table of data points for Temperature 1, 2, and 3 in degrees Celsius. The data points are as follows:

Date/Time	Temperature 1 [°C]	Temperature 2 [°C]	Temperature 3 [°C]
10/22/2009 11:58:44 AM	26.541	27.158	27.67
10/22/2009 11:58:49 AM	26.569	27.139	27.655
10/22/2009 11:58:54 AM	26.619	27.135	27.655
10/22/2009 11:58:59 AM	26.621	27.132	27.656
10/22/2009 11:59:04 AM	26.593	27.132	27.656
10/22/2009 11:59:09 AM	26.606	27.132	27.657
10/22/2009 11:59:14 AM	26.588	27.124	27.66
10/22/2009 11:59:19 AM	26.606	27.124	27.66
10/22/2009 11:59:24 AM	26.598	27.126	27.662
10/22/2009 11:59:29 AM	26.598	27.125	27.664
10/22/2009 11:59:34 AM	26.572	27.126	27.668
10/22/2009 11:59:34 AM	26.574	27.128	27.668

Below the data table is a 'Status Log' window showing the following entries:

- 10/22/2009 9:40:59 AM: System is shutdown
- 10/22/2009 9:41:02 AM: 3900 Test Pressure transducer is disconnected
- 10/22/2009 9:41:04 AM: 3900 Test Temperature probe is disconnected
- 10/22/2009 9:41:05 AM: 3900 Reported Expansion Valve Not Closing
- 10/22/2009 9:41:05 AM: 3900 Reported Flow Valve Not Closing
- 10/22/2009 10:26:41 AM: Generate Mode Requested
- 10/22/2009 10:26:41 AM: Generate Mode Enabled
- 10/22/2009 11:58:39 AM: Communication established with the Agilent 34970A device

At the bottom of the interface, there are several status indicators: '3900 Parameters', 'Agilent 34970A Parameters', 'Status Log', and '3900 Reported Errors'. A 'System is generating' icon is visible on the left, and the 'Point Time: 01:32:54' is shown on the right.

Each Parameter tab can also be torn out by dragging the tab label upward. This allows multiple parameter tabs to be visible at once. To place the tab back into the list, drag the tabs label back to the bottom.

The screenshot displays the 3900 ControLog software interface. The main window is titled "3900 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are several tabs: "3900 Parameters", "3900 Data", "Frost Point", and "Agilent 34970A Data".

The "3900 Parameters" tab is active, showing a table with columns for "Setpoint", "Actual", and "U". The parameters listed are:

Parameter	Setpoint	Actual	U	Unit
Frost Point	-10.000	-34.796	±0.099	°C
Saturation Pressure	10.000	62.765	±0.300	psia
Saturation Temperature	-8.0000	-20.730	±0.080	°C
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	21.110	21.110	±0.080	°C
Mass Flow Rate	0.5000	2.8842		l/m

Below this table, there is a section for "Agilent 34970A Parameters" showing "Actual" values for seven temperatures:

Temperature	Actual Value	Unit
Temperature 1	26.590	°C
Temperature 2	27.133	°C
Temperature 3	27.667	°C
Temperature 4	25.360	°C
Temperature 5	25.044	°C
Temperature 6	25.858	°C
Temperature 7	24.475	°C

The "Agilent 34970A Data" tab is also visible, showing a table with columns for "Date/Time Stamp", "Temperature 1 [°C]", "Temperature 2 [°C]", and "Temperature 3 [°C]". The data rows show temperature readings from 10/22/2009 11:58:39 AM to 10/22/2009 11:59:39 AM.

At the bottom of the interface, there is a "Status Log" section with a list of events, including system shutdowns, disconnections, and mode changes. A status bar at the bottom indicates "System is generating" and "Point Time: 01:33:01".

All Parameter Tabs have a context menu that can be displayed by right clicking in the tab. The context menu allows quick access to the device related functions that are available in the Connections menu.

The screenshot displays the 3900 ControLog software interface. The main window is titled "3900 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are several tabs: "3900 Parameters", "3900 Data", "Frost Point", "Agilent 34970A Data", and "Agilent 34970A backup". The "Agilent 34970A Data" tab is currently active, showing a table of data with columns for "Date/Time Stamp", "Temperature 1 [°C]", "Temperature 2 [°C]", and "Temperature 3 [°C]". A context menu is open over this tab, displaying two options: "Connection Settings" and "Close Connection".

The "3900 Parameters" tab is also visible, showing a list of parameters with their respective Setpoint, Actual, and U values. The parameters include Frost Point, Saturation Pressure, Saturation Temperature, Test Pressure, Test Temperature, Mass Flow Rate, %RH, Dew Point, PPMv, PPMw, Grains/lb, Enthalpy, SVP@Tt, SVP@Td, and SVP@Ts.

The "Status Log" tab is also visible, showing a list of status messages. The messages include:

- 10/22/2009 9:41:04 AM: 3900 Test Temperature probe is disconnected
- 10/22/2009 9:41:05 AM: 3900 Reported Expansion Valve Not Closing
- 10/22/2009 9:41:05 AM: 3900 Reported Flow Valve Not Closing
- 10/22/2009 10:26:41 AM: Generate Mode Requested
- 10/22/2009 10:26:41 AM: Generate Mode Enabled
- 10/22/2009 11:58:39 AM: Communication established with the Agilent 34970A device
- 10/22/2009 11:59:53 AM: Communication terminated with the Agilent 34970A device
- 10/22/2009 1:25:06 PM: Communication established with the Agilent 34970A device

The bottom status bar shows "System is generating" and "Point Time: 02:59:50".

## 3900 Parameter Tab

The **3900 Parameter Tab** is the primary 3900 interface for the user and is visible whenever the 3900 is connected. From this tab the user can set setpoints, view actual values and view real-time uncertainty values. The 3900 Parameters tab is divided into two different areas; the Control Parameters and the Calculated Humidity Parameters.

The screenshot shows the 3900 ControLog software interface. The main window is titled "3900 ControLog" and has a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, Help. The interface is divided into several sections:

- 3900 Parameters:** A table with columns for Setpoint, Actual, and U (uncertainty). It lists various parameters such as Frost Point, Saturation Pressure, Saturation Temperature, Test Pressure, Test Temperature, Mass Flow Rate, %RH, Dew Point, PPMv, PPMw, Grains/lb, Enthalpy, SVP@Tt, SVP@Td, and SVP@Ts.
- 3900 Data:** A section titled "Agilent 34970A Data" showing a table of temperature readings over time. The table has columns for Date/Time Stamp, Temperature 1 [°C], Temperature 2 [°C], and Temperature 3 [°C].
- Status Log:** A section showing a list of events and errors, including "Test Temperature probe is disconnected", "3900 Reported Expansion Valve Not Closing", "3900 Reported Flow Valve Not Closing", "Communication established with the Agilent 34970A device", and "Generate Mode Requested".

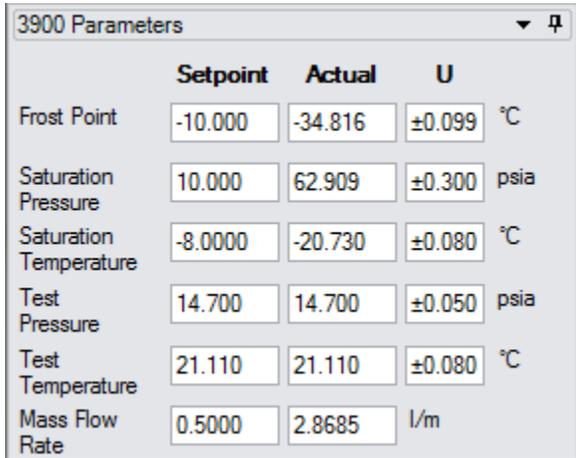
Callout boxes in the image highlight the following sections:

- Control Parameters:** Points to the Saturation Temperature and Test Temperature rows in the 3900 Parameters table.
- Calculated Humidity Parameters:** Points to the %RH, Dew Point, PPMv, PPMw, Grains/lb, Enthalpy, SVP@Tt, SVP@Td, and SVP@Ts rows in the 3900 Parameters table.
- 3900 Generator Parameter Tab:** Points to the SVP@Ts row in the 3900 Parameters table.

The bottom status bar shows "System is generating" and "Point Time: 00:11:22".

## Control Parameters

The Control Parameters contain all the control and measurement parameters critical to the operation of the humidity generator. Notice that each parameter consists of a brief title, unit of measurement, and the data values for Setpoint, Actual, and Uncertainty as applicable.



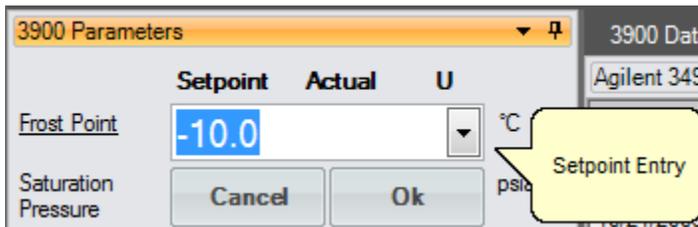
	Setpoint	Actual	U	
Frost Point	-10.000	-34.816	±0.099	°C
Saturation Pressure	10.000	62.909	±0.300	psia
Saturation Temperature	-8.0000	-20.730	±0.080	°C
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	21.110	21.110	±0.080	°C
Mass Flow Rate	0.5000	2.8685	l/m	

All parameters are listed in an order similar to the generator's display with the exception of the first listed parameter. The first parameter on the Control Parameters is the active humidity control parameter. For instance, if ControLog were set to control the generator on dew point, then Dew Point would be listed as the first parameter rather than Frost Point.

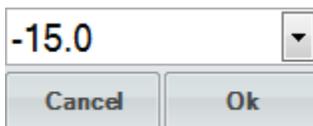
In the Setpoint column is the list of the system controlled parameters. The Actual column lists the current values for each of the measured temperatures, pressures, and flow values. The Uncertainty column is a representation of the current uncertainty calculated in real-time by HumiCalc with Uncertainty using the uncertainties solutions imported into ControLog.

## Changing Setpoints

To change a setpoint, click on the setpoint field that you would like to change. A Setpoint Entry box will appear and the title of the setpoint being changed will be underlined. For example, to change the Frost Point setpoint click on the Frost Point setpoint field.



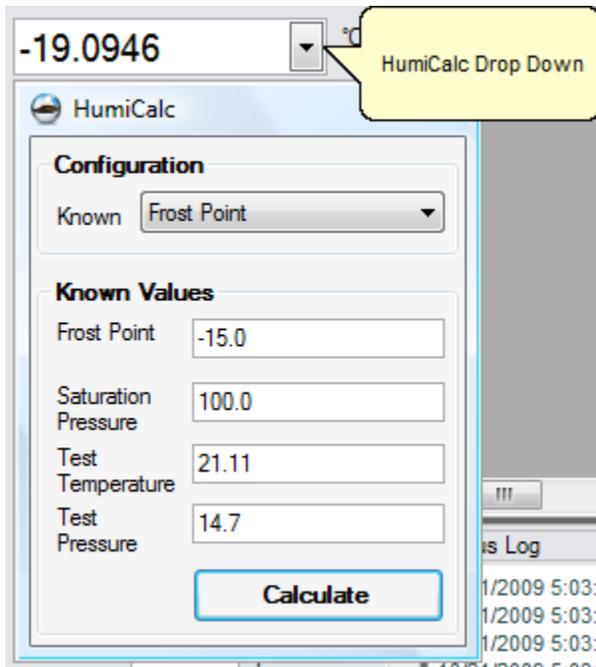
Enter the new value into the Setpoint Entry box and select Ok.



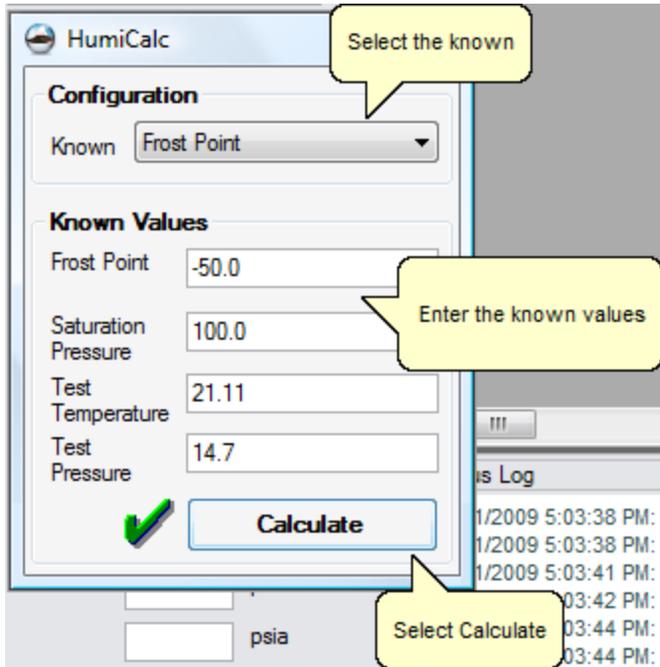
Notice that the Frost Point setpoint field updates to the new value and the values in the Actual column begin moving toward the new setpoint.

	Setpoint	Actual	U	
Frost Point	-15.000	-34.710	±0.099	°C
Saturation Pressure	10.000	62.178	±0.300	psia
Saturation Temperature	-8.0000	-20.730	±0.080	°C
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	21.110	21.110	±0.080	°C
Mass Flow Rate	0.5000	1.9939		l/m

The user can also drop down a Mini version of HumiCalc to help calculate the desired setpoint by clicking the drop down arrow on the Setpoint Entry box. For example, let's say the user wants to calculate the required Saturation Temperature needed to generate a -50.0° Frost Point with a limited supply pressure of only 100 psia. Start by clicking the Saturation Temperature setpoint field and then click the dropdown at the right of the Setpoint Entry box.



Next, select the known to be Frost Point and enter the know values for both Frost Point and Saturation Pressure.



Clicking the “Calculate” button will result in the calculated Saturation Temperature being placed in the Setpoint Entry Box and will close the HumiCalc dropdown.

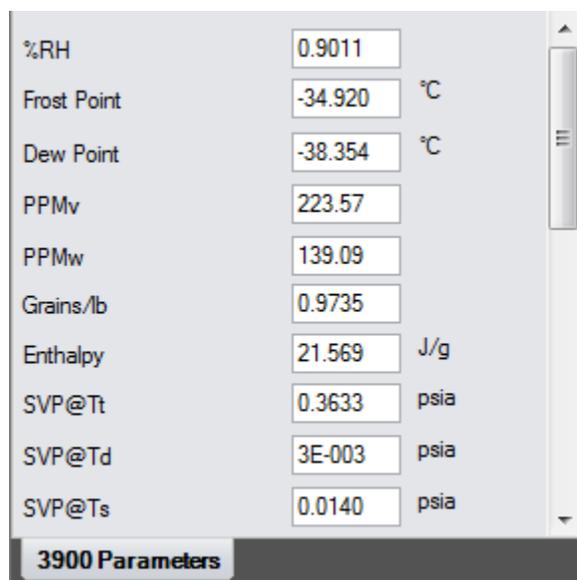


Clicking “Ok” will close the setpoint entry and will send the setpoint to the 3900 generator.



## Calculated Humidity Parameters

The Calculated Humidity Parameters contain values of the currently generated humidity calculated from current system temperatures and pressures. The calculated humidity parameters will also display a scrollbar as needed to allow for varying display sizes without loss of data.



The screenshot shows a software interface window titled "3900 Parameters". It contains a list of humidity-related parameters, each with a text input field and a unit indicator. A vertical scrollbar is visible on the right side of the list.

%RH	0.9011	
Frost Point	-34.920	°C
Dew Point	-38.354	°C
PPMv	223.57	
PPMw	139.09	
Grains/lb	0.9735	
Enthalpy	21.569	J/g
SVP@Tt	0.3633	psia
SVP@Td	3E-003	psia
SVP@Ts	0.0140	psia

### %RH

Percent Relative Humidity (%RH) is the ratio of the amount of water vapor in a given sample to the maximum amount possible at the same temperature and pressure.

### Frost Point

Frost Point Temperature is the temperature to which a gas must be cooled in order to just begin condensing water vapor in the form of frost or ice, and therefore only exists at values below 0.01 °C. When operating the system with indicated Frost Points above 0.01 °C, the values indicated are to be interpreted as Dew Points. However, Frost Point is not the same as Dew Point for values below freezing. Frost Point is independent of test chamber temperature.

### Dew Point

Dew Point Temperature is the temperature to which a gas must be cooled in order to just begin condensing water vapor in the form of dew. Generally, Dew Point exists at temperatures above freezing. In many instances, Dew Point may actually exist at indicated values below freezing (super-cooled dew). However, it is important to note that Dew Point is not the same as Frost Point. Dew Point is independent of test chamber temperature.

### PPMv

Parts per Million by Volume is a ratio of the number of molecules of water vapor to the number of molecules of the other constituents in the gas. Once established, PPMv is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## PPMw

Parts per Million by Weight is a ratio of the weight of the water vapor in a sample to the weight of the remaining constituents in the gas. Once established, PPMw is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## Grains/lb

Grains per pound is a ratio of the weight, in grains, of water vapor to the weight, in pounds, of the other constituents in the gas. (7000 grains = 1 pound). Once established, Grains/lb is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## Enthalpy

Enthalpy is a measure of the amount of energy required to change a gas from one temperature/humidity value to another. In application, enthalpy is not used as an absolute value, but rather it is the difference in enthalpy between two distinct points which are of interest. The datum point which results in zero enthalpy was therefore arbitrarily chosen at a test temperature of 0 °C and 0 %RH. Applying enthalpy is a matter of computing the difference in enthalpy between two or more distinct data points.

## SVP@Tt

Saturation Vapor Pressure (SVP) computed at the Test Temperature.

## SVP@Td

Saturation Vapor Pressure (SVP) computed at the Dew/Frost Point Temperature.

## SVP@Ts

Saturation Vapor Pressure (SVP) computed at the Saturation Temperature.

## F@Tt.Pt

Enhancement Factor at Test Temperature and Pressure.

## F@Td.Pt

Enhancement Factor at Dew/Frost Point Temperature and Test Pressure.

## F@Ts.Ps

Enhancement Factor at Saturation Temperature and Pressure.

## Specific Humidity

Specific Humidity is a ratio of the weight of the water vapor to the total weight of the humidified gas. Specific Humidity is independent of test chamber temperature.

## Absolute Humidity

Absolute Humidity is the weight of the water vapor per unit volume of humidified gas.

## Dry Air Density

Dry Air Density is the *partial* density in weight per unit volume of only the dry air portion of a moist air sample. In other words, if the water vapor were removed from a fixed volume of air, the remaining dry air would exhibit this density.

## Moist Air Density

Moist Air Density is the total weight per unit volume of a moist air sample. This density includes both the weight of the air and the weight of the water vapor.

## Wet Bulb Temperature

Wet Bulb temperature is used in wet bulb/dry bulb aspirated Psychrometry, and is the temperature measured by a temperature probe whose tip is coated with water (typically by being covered with a wet sock). When aspirated at a constant air velocity, the wet bulb will cool due to evaporation of the water from the probe. The cool temperature, to which it equilibrates, is used in the calculation of humidity parameters.

## Mixing Ratio by Volume

Mixing Ratio by Volume is a ratio of the partial pressure of the water vapor to the partial pressure of the remaining constituents in the sample. Mixing Ratio by Volume is independent of test chamber temperature.

## Mixing Ratio by Weight

Mixing Ratio by Weight is a ratio of the weight of the water vapor to the weight of the remaining constituents in the sample. Mixing Ratio by Weight is independent of test chamber temperature.

## Percent by Volume

Percent by Volume is a ratio (expressed as a percentage) of the partial pressure of the water vapor to the total pressure of the sample. Percent by Volume is independent of test chamber temperature.

## Percent by Weight

Percent by Weight is a ratio (expressed as a percentage) of the weight of the water vapor to the total weight of the sample. Percent by Weight is independent of test chamber temperature.

## Vapor Mole Fraction

Vapor Mole Fraction is the mole fraction of water vapor in a sample.

## Dry Air Mole Fraction

Dry Air Mole Fraction is the mole fraction of the dry air portion of a sample. The dry air portion is considered to be all constituents in a gas exclusive of the water vapor.

## Supply Pressure

Supply pressure is the regulated pressure reading of the gas supply.

*Note: The supply pressure value is gauge pressure.*

## Device Parameter Tabs

The **Device Parameter Tabs** show the current actual values for the given device. The tabs are visible whenever the device is connected. The Device Parameters will display a scrollbar as needed to allow for varying display sizes without loss of data.

The screenshot displays the 3900 ControLog software interface. The main window is titled "3900 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are several tabs: "Agilent 34970A Parameters", "3900 Data", "Frost Point", "Agilent 34970A Data", and "Agilent 34970A.backup".

The "Agilent 34970A Parameters" tab is active, showing a list of parameters under the heading "Actual":

- Temperature 1: 27.081 °C
- Temperature 2: 27.876 °C
- Temperature 3: 28.388 °C
- Temperature 4: 25.638 °C
- Temperature 5: 25.345 °C
- Temperature 6: 26.295 °C
- Temperature 7: 24.736 °C
- Temperature 8: 23.456 °C
- Voltage: 8.6673
- RTD: 24.182 °C

The "Agilent 34970A Data" tab is also visible, displaying a table of data points:

Date/Time Stamp	Temperature 1 [°C]	Temperature 2 [°C]	Temperature 3 [°C]
10/22/2009 1:25:11 PM	27.154	27.84	28.393
10/22/2009 1:25:16 PM	27.199	27.842	28.391
10/22/2009 1:25:21 PM	27.188	27.841	28.392
10/22/2009 1:25:26 PM	27.081	27.844	28.392
10/22/2009 1:25:31 PM	27.123	27.852	28.39
10/22/2009 1:25:36 PM	27.149	27.857	28.389
10/22/2009 1:25:41 PM	27.136	27.862	28.387
10/22/2009 1:25:46 PM	27.128	27.867	28.386
10/22/2009 1:25:51 PM	27.16	27.873	28.387
10/22/2009 1:25:56 PM	27.191	27.873	28.387
10/22/2009 1:26:01 PM	27.225	27.874	28.387
10/22/2009 1:26:06 PM	27.136	27.875	28.388

Below the data table is a "Status Log" section with the following entries:

- 10/22/2009 9:41:04 AM: 3900 Test Temperature probe is disconnected
- 10/22/2009 9:41:05 AM: 3900 Reported Expansion Valve Not Closing
- 10/22/2009 9:41:05 AM: 3900 Reported Flow Valve Not Closing
- 10/22/2009 10:26:41 AM: Generate Mode Requested
- 10/22/2009 10:26:41 AM: Generate Mode Enabled
- 10/22/2009 11:58:39 AM: Communication established with the Agilent 34970A device
- 10/22/2009 11:59:53 AM: Communication terminated with the Agilent 34970A device
- 10/22/2009 1:25:06 PM: Communication established with the Agilent 34970A device

At the bottom of the interface, there is a status bar with the text "System is generating" and "Point Time: 02:59:28". A yellow callout box labeled "Device Parameters" points to the parameter list, and another yellow callout box labeled "Device Parameter Tab" points to the "Agilent 34970A Parameters" tab.

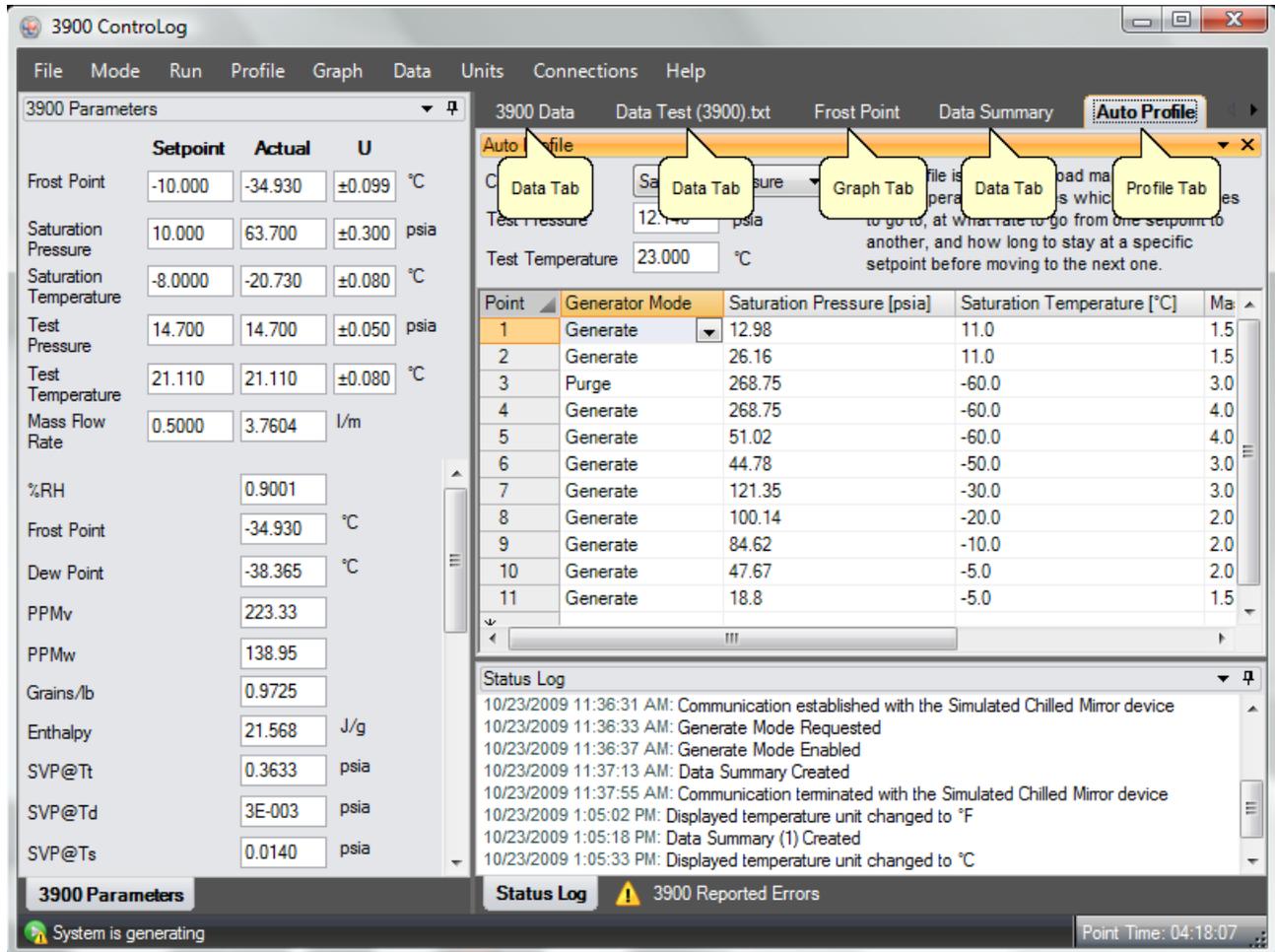
## Device Parameters

Device Parameters contain all the most recent actual measurement parameters received from the device. Notice each parameter consists of a brief title, unit of measurement and the Actual data value.

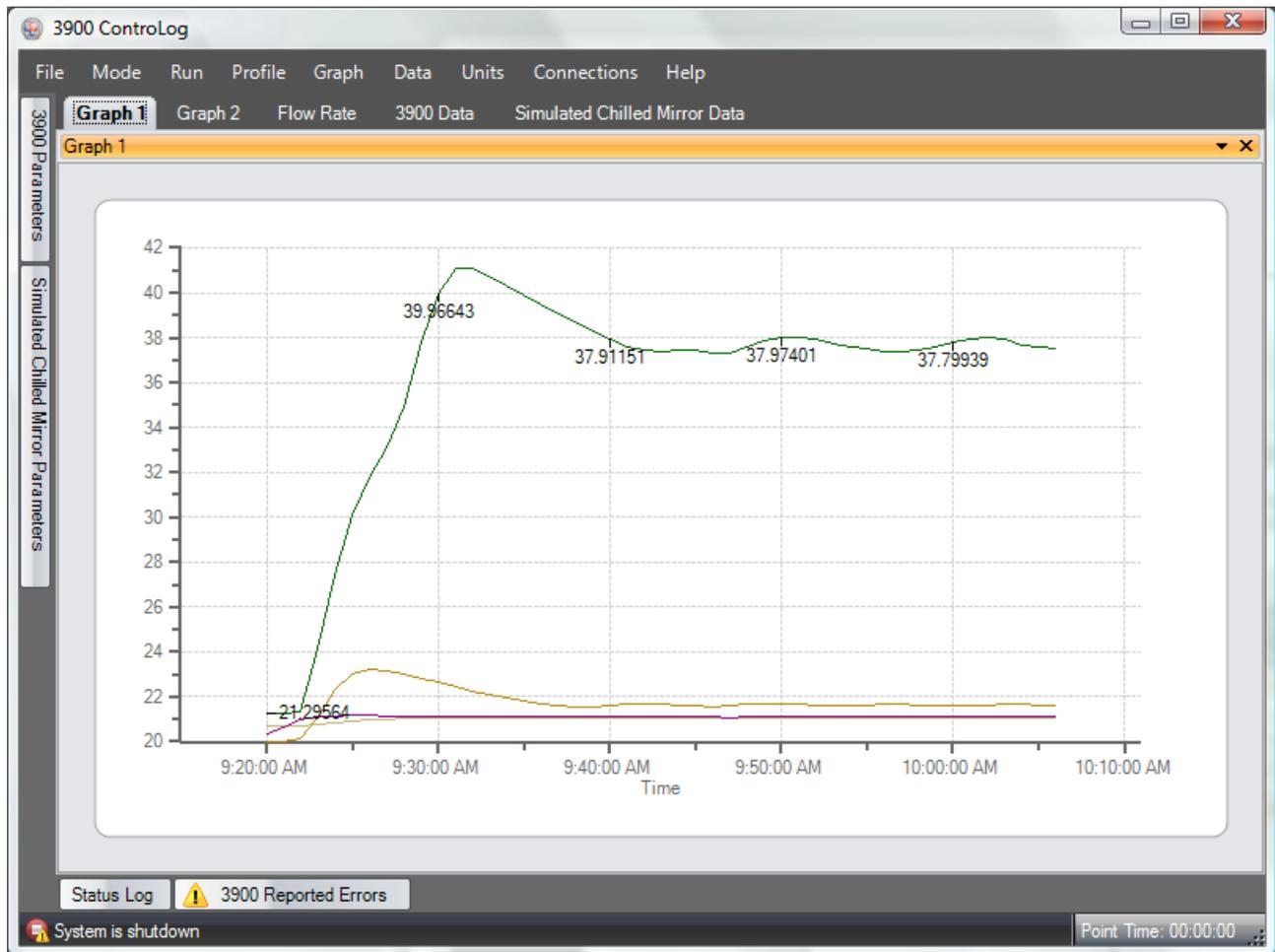
Agilent 34970A Parameters		
	Actual	
Temperature 1	27.065	°C
Temperature 2	27.880	°C
Temperature 3	28.389	°C
Temperature 4	25.625	°C
Temperature 5	25.339	°C
Temperature 6	26.290	°C
Temperature 7	24.721	°C
Temperature 8	23.451	°C
Voltage	8.6673	
RTD	24.185	°C

# Data and Graph Tab Group

The **Data and Graph Tab Group** is located in the middle right of the application and can contain data, graph, and profile tabs. Data and Graph tabs are fixed tab style windows that can be selected by clicking the desired tab labels at the top.



Data and Graph Tabs will expand to fill the available area as tabs around are collapsed and hidden.



Data and Graph Tabs can also be selected using the drop down arrow in the upper right hand corner. The currently selected tab is indicated by a check mark in the drop down list.

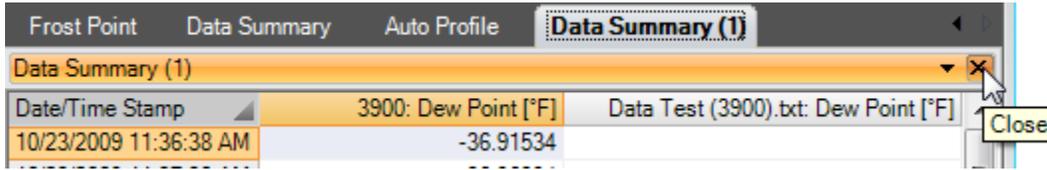
The 'Auto Profile' configuration window includes the following settings:

- Control Mode: Saturation Pressure
- Test Pressure: 12.140 psia
- Test Temperature: 23.000 °C

The profile points table is as follows:

Point	Generator Mode	Saturation Pressure [psia]	Saturation Temperature [°C]
1	Generate	12.98	11.0
2	Generate	26.16	11.0
3	Purge	268.75	-60.0
4	Generate	268.75	-60.0

Data and Graph Tabs can be closed depending on the state of the device or generator using the “X” in the upper right hand corner.



## Data Tabs

**Data Tabs** contain a spreadsheet type view of data.

For more information, see [Data and Data Summary](#)

## Graph Tabs

**Graph Tabs** contain a pictorial view of data.

For more information, see [Graphing](#)

## Profile Tab

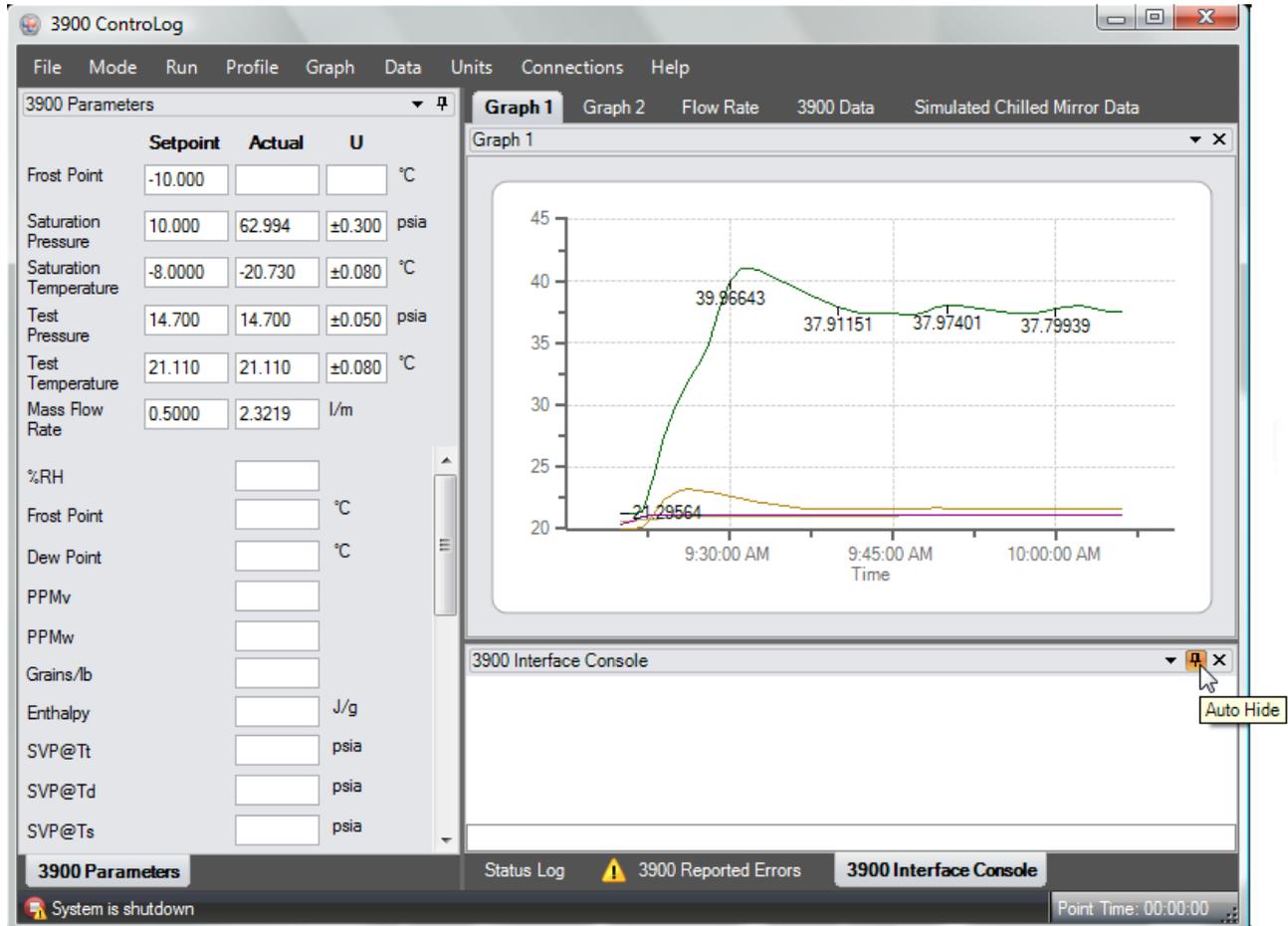
The **Profile Tab** contains the profile point definitions for an auto profile.

For more information, see [Profiling](#)

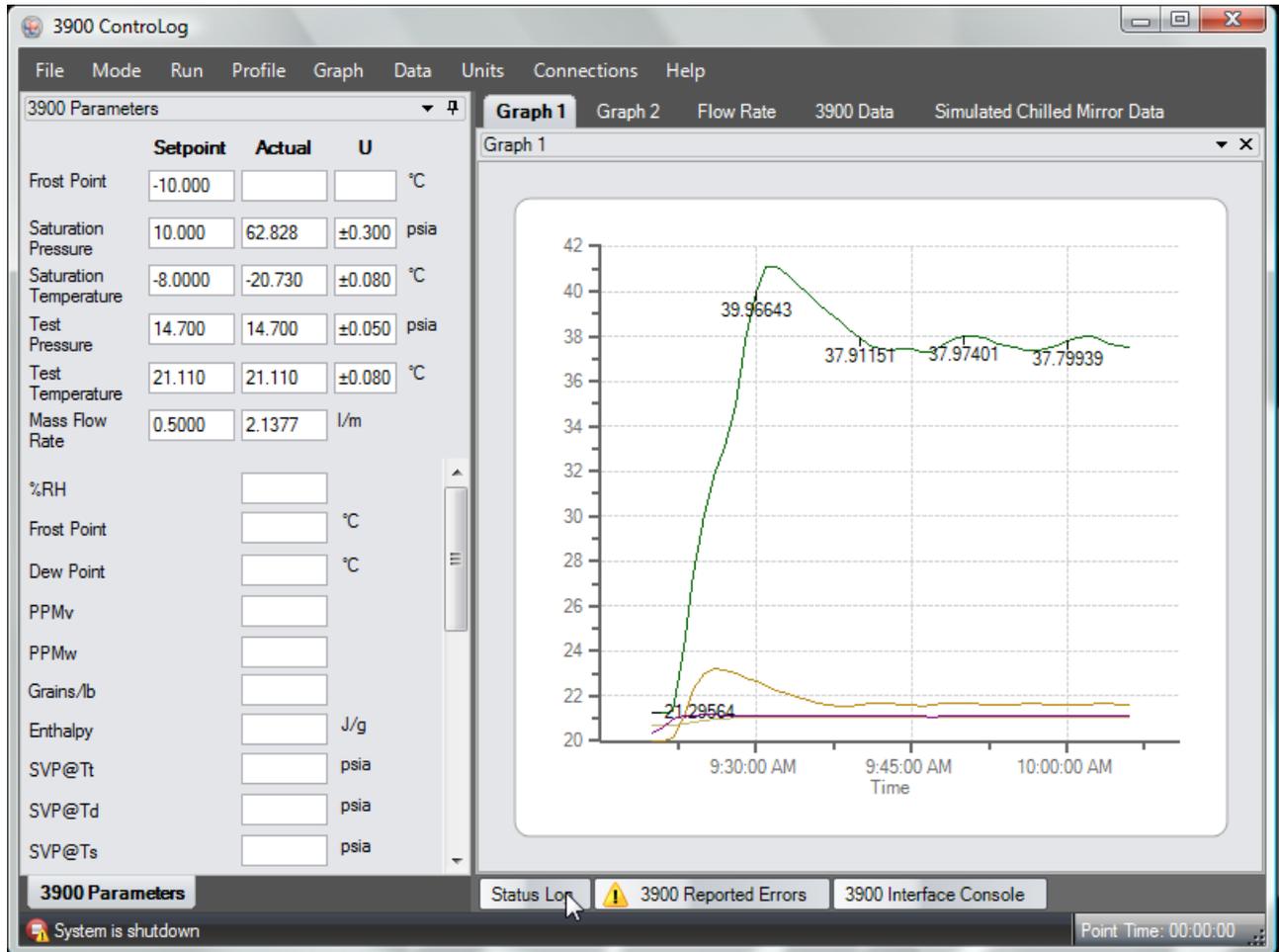
# Information Tab Group

The **Information Tab Group** is located on the bottom right hand side of the application. This is a docking style window that can be “pinned” open or allowed to close when not active. A particular information tab is selected by clicking its tab label at the bottom of the group. The Information Tab Group contains status information about the operation of the generator and its connected devices. The group can consist of a Status Log tab, 3900 Reported Errors tab and Interface Console tabs.

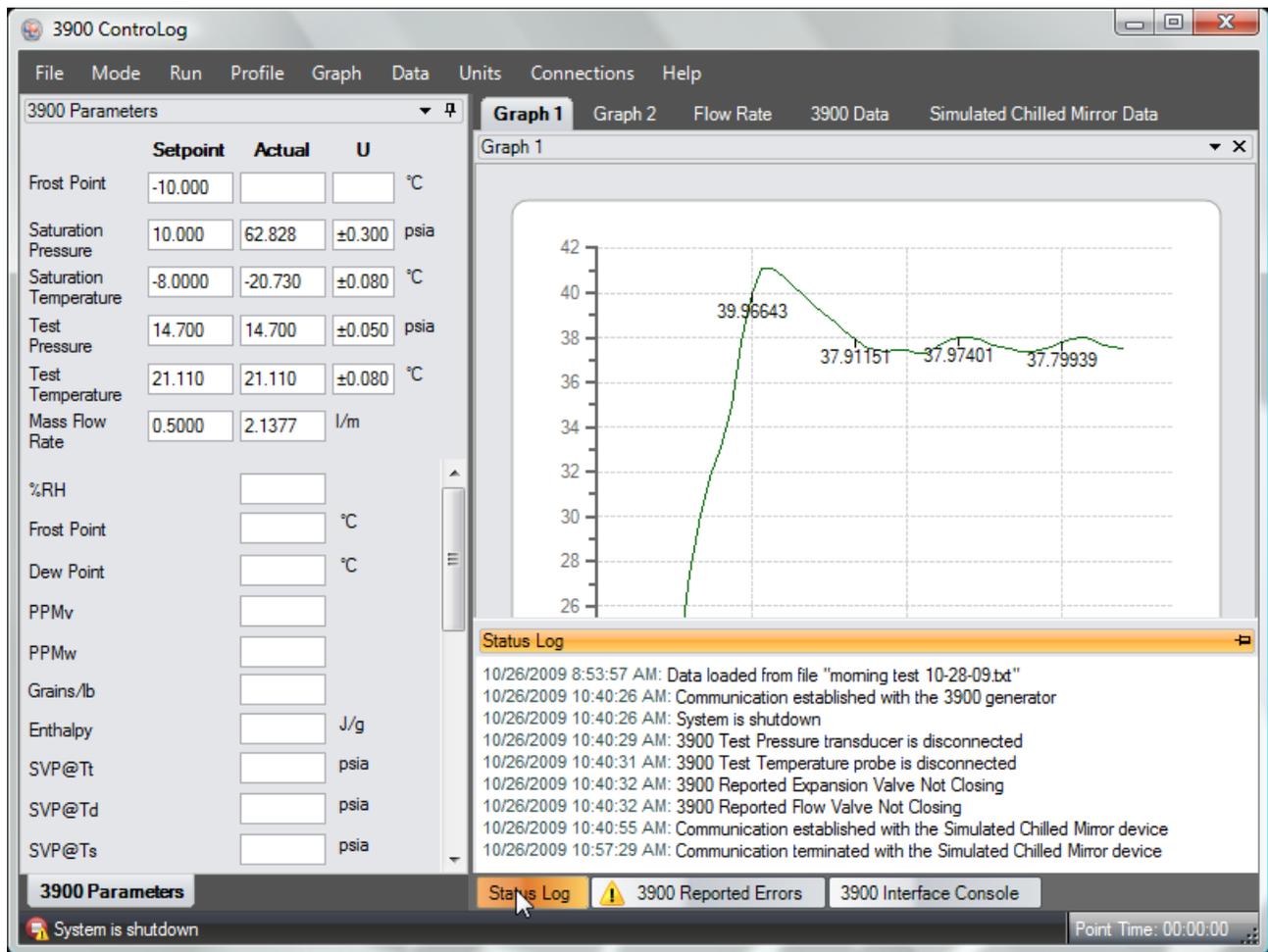
By clicking the pin icon on any information tab the user can unpin the Information tabs.



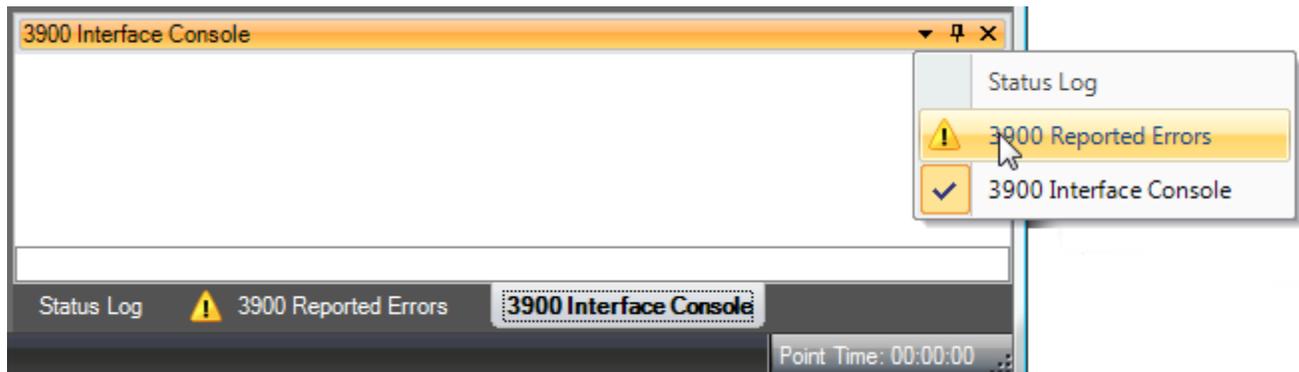
Once the information tabs are un-pinned they will automatically hide.



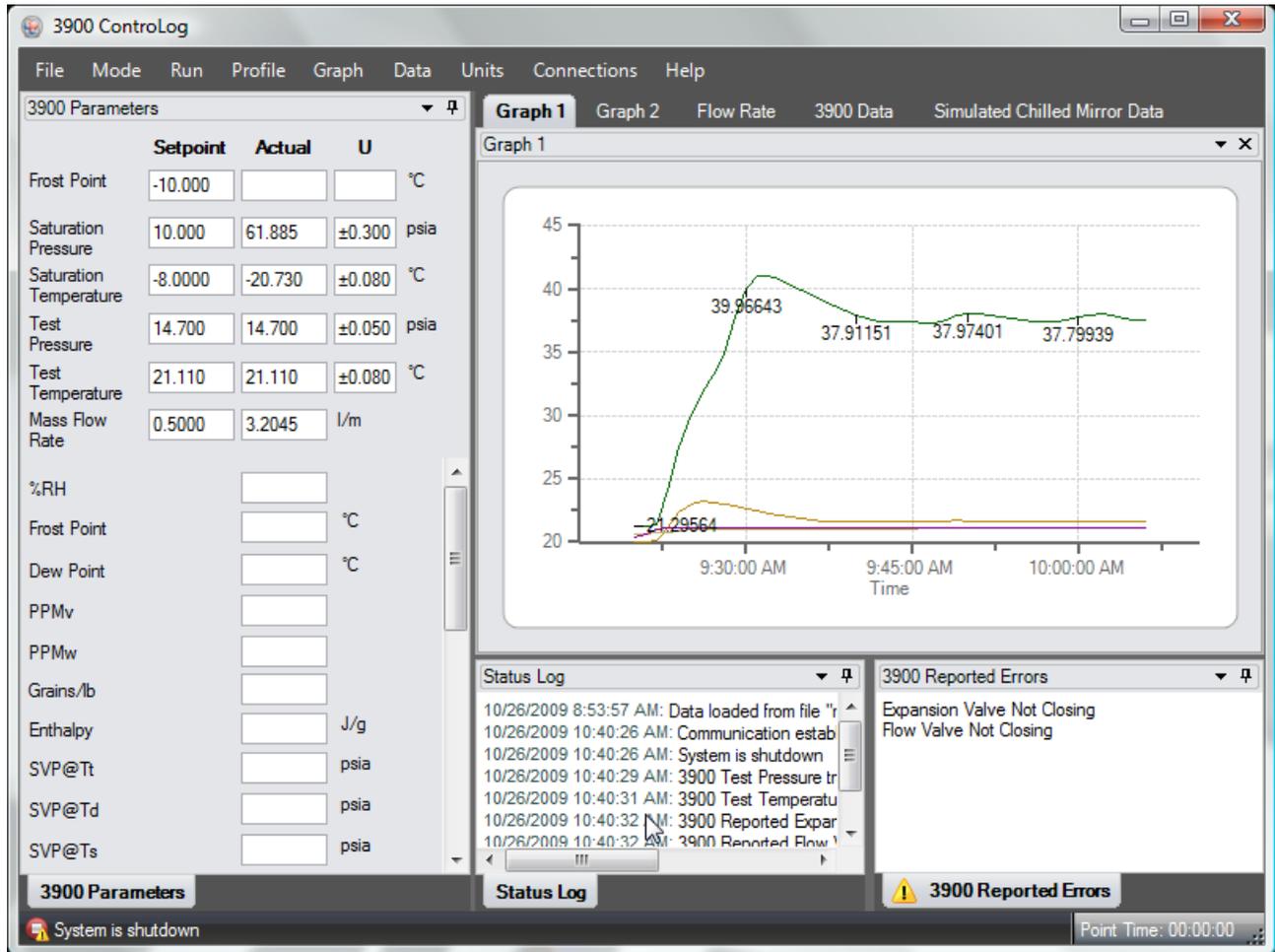
The user can access the hidden tabs by clicking the desired information tab label at the bottom.



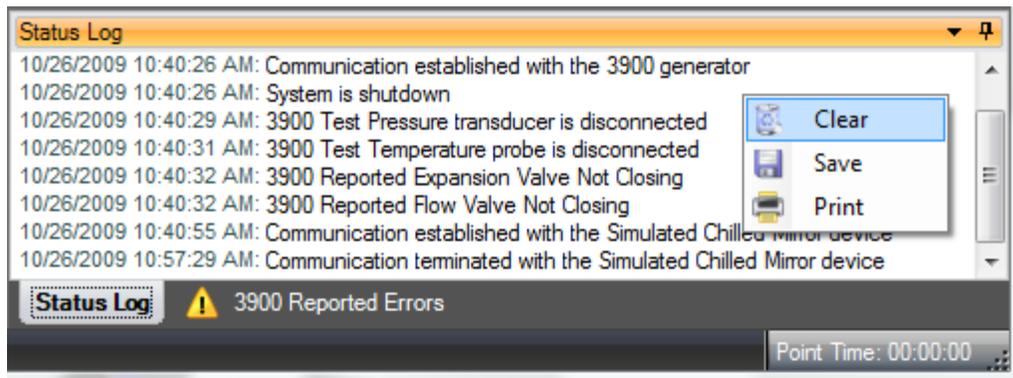
Tabs are also accessed via the drop down selection by clicking on the arrow icon. The currently selected tab is indicated by a check mark in the drop down list.



Each Information tab can be torn out by dragging the tab label upward. This allows multiple information tabs to be visible at once. To place the tab back into the list, drag the tabs label back to the bottom.

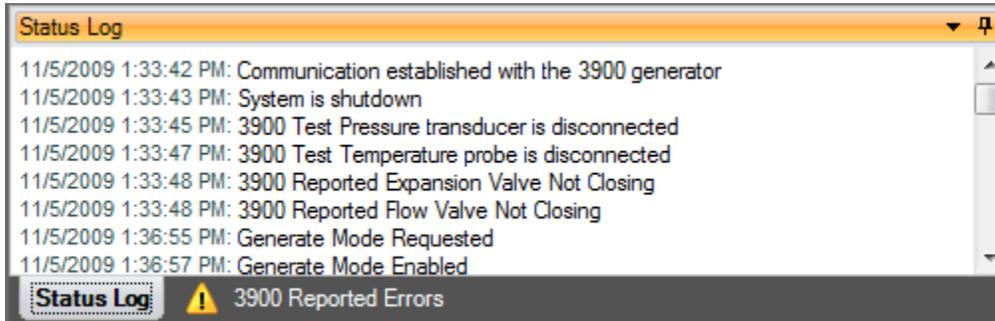


All Information Tabs have a context menu that is displayed by right clicking in the tab. The context menu allows quick access to functions that can clear, save and print the information.



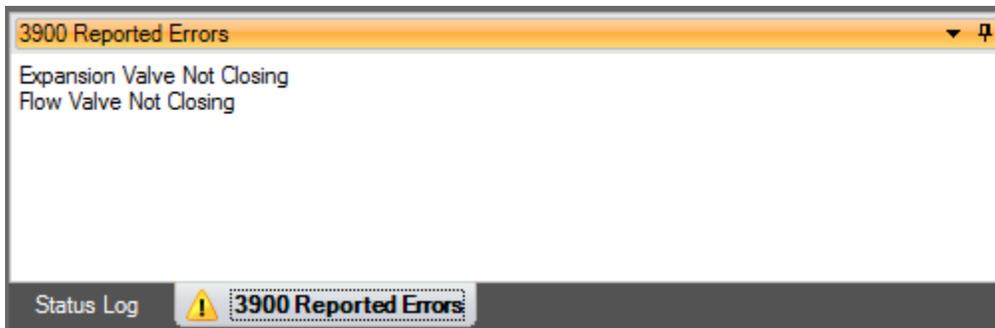
## Status Log

The **Status Log** tab contains chronological information about the system status, changes in operational modes, changes in setpoints, and runtime errors due to communication or mechanical difficulties encountered by the generator.



## 3900 Reported Errors

The **3900 Reported Errors** tab only appears when the 3900 reports an error. This is a very important information tab because it reports 3900 system errors to the user. These types of errors can cause the 3900 to shutdown and require immediate attention by the operator. The icon will be displayed to help draw the attention of the user to the reported 3900 errors.



## System timing

The **System Timing** tab shows information about the current timing associated with the current operation such as elapsed run time at current conditions. This window may be shown at any time by clicking the “Point Time” in the status bar and is automatically shown when an Auto Profile is started. The tab gives detailed information on the Auto Profile as it runs. Elapsed and remaining Phase, Point and Total time are listed along with the detailed assurance conditions values and tolerances.

	Elapsed (dd:hh:mm:ss)	Remaining (dd:hh:mm:ss)	Assurance Condition	Actual Value	Min Value	Max Value	Std Dev	Std Dev Limit
Phase Time:	00:00:00:49	00:00:00:00	Saturation Temperature (2500)	-87.869	24.900	25.100	5.5845E-004	0.2000
Point Time:	00:00:00:49	00:01:00:00	Saturation Pressure (2500)	-23.779	0.3797	0.5797	0.0310	0.1000
Total Time:	00:00:00:49	00:04:00:00						

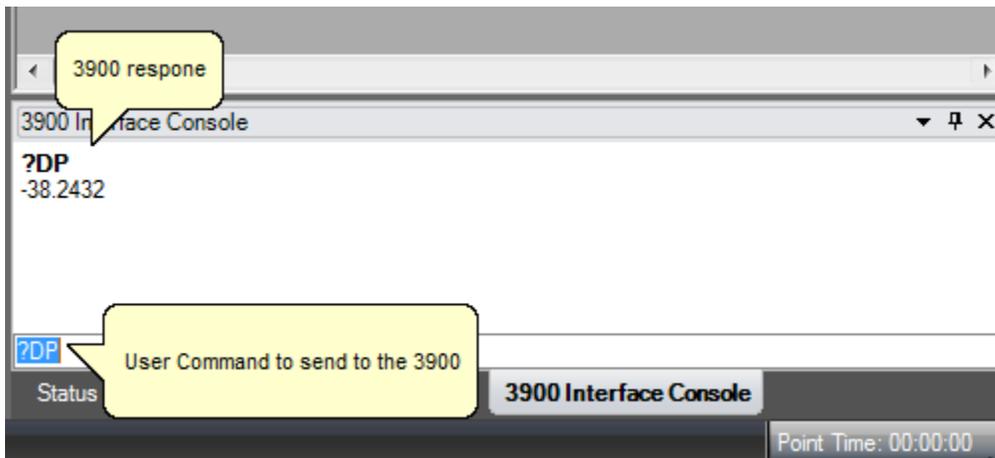
Status Log 2500 Reported Errors **System Timing**

## 3900 Interface Console

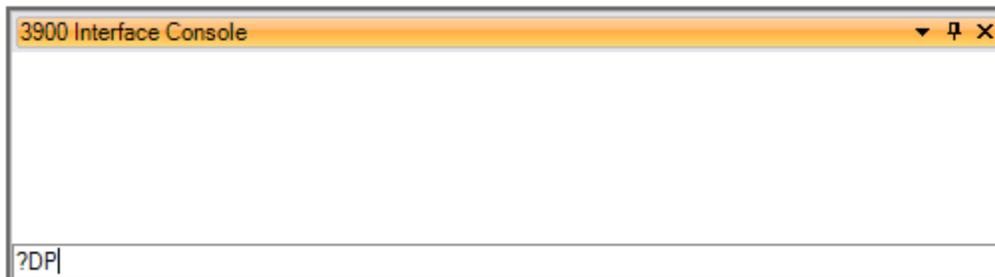
The **3900 Interface Console** tab allows the user to send and receive commands to and from the 3900. The console tab is opened by selecting “Open 3900 Interface Console” from the Connections>Settings menu whenever the 3900 is connected.

*Warning: Interfacing with the 3900 using the Console should only be attempted if instructed to do so by Thunder Scientific.*

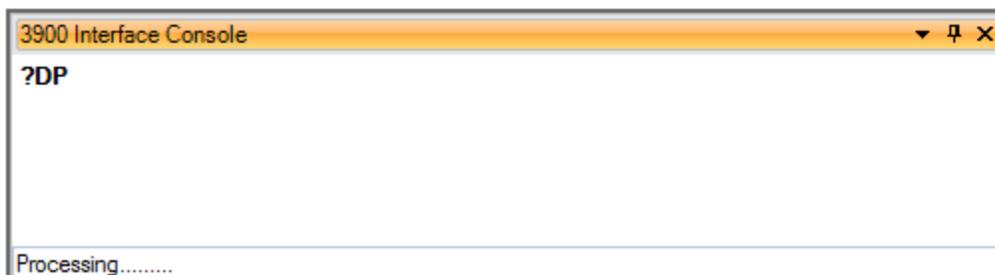
Commands are entered in the bottom text area of the console tab and the 3900 responses are displayed in the upper text area of the console tab.



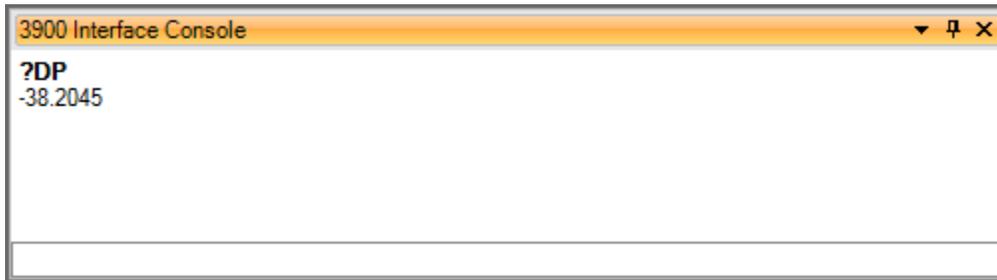
To enter a command, type the desired command in the bottom text area and press return.



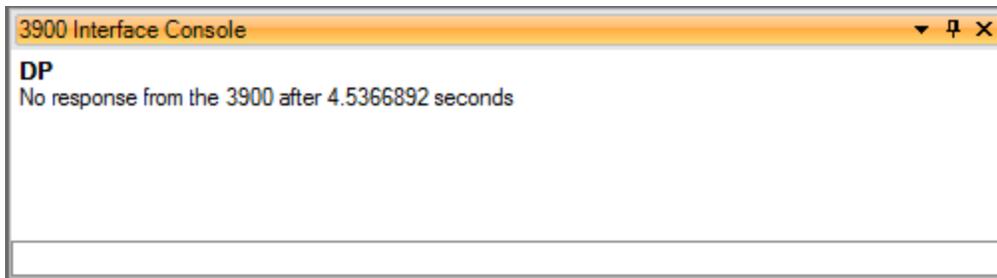
Once the command has been entered it will appear in bold in the upper text area. A processing status will be indicated in the bottom text area while ControLog sends and waits for the response from the 3900. The user is not allowed to enter another command until the previous command has been processed.



Once the command has been successfully processed the 3900 response will appear in the upper text area right below the command sent.



If ControLog does not receive a response from the 3900 within a given time frame an error message will be displayed.



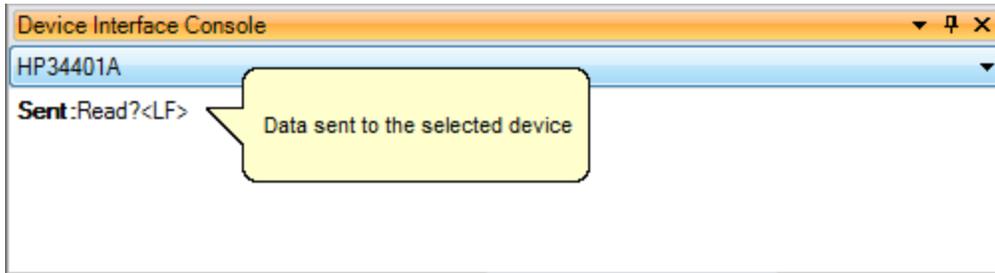
## Device Interface Console

The **Device Interface Console** tab allows the user to view the commands being sent to and received from any given connected device. The device console tab is opened by selecting “Open Device Interface Console” from the Connections>Settings menu whenever the a device is connected.

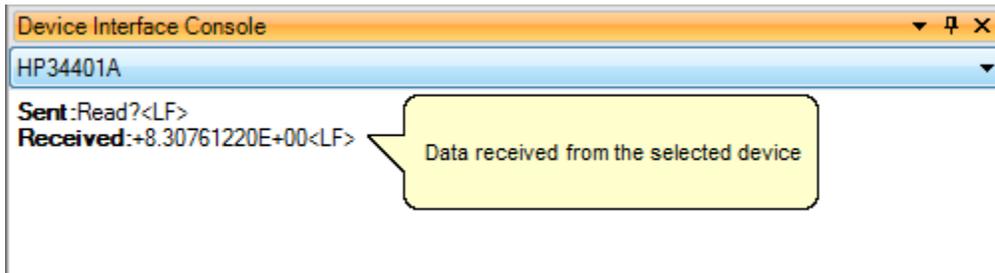
The user can select which connected device to view using the drop down selection at the top of the tab.



The data sent to the device is indicated by a bold “**Sent:**” label in the lower text area of the console tab.

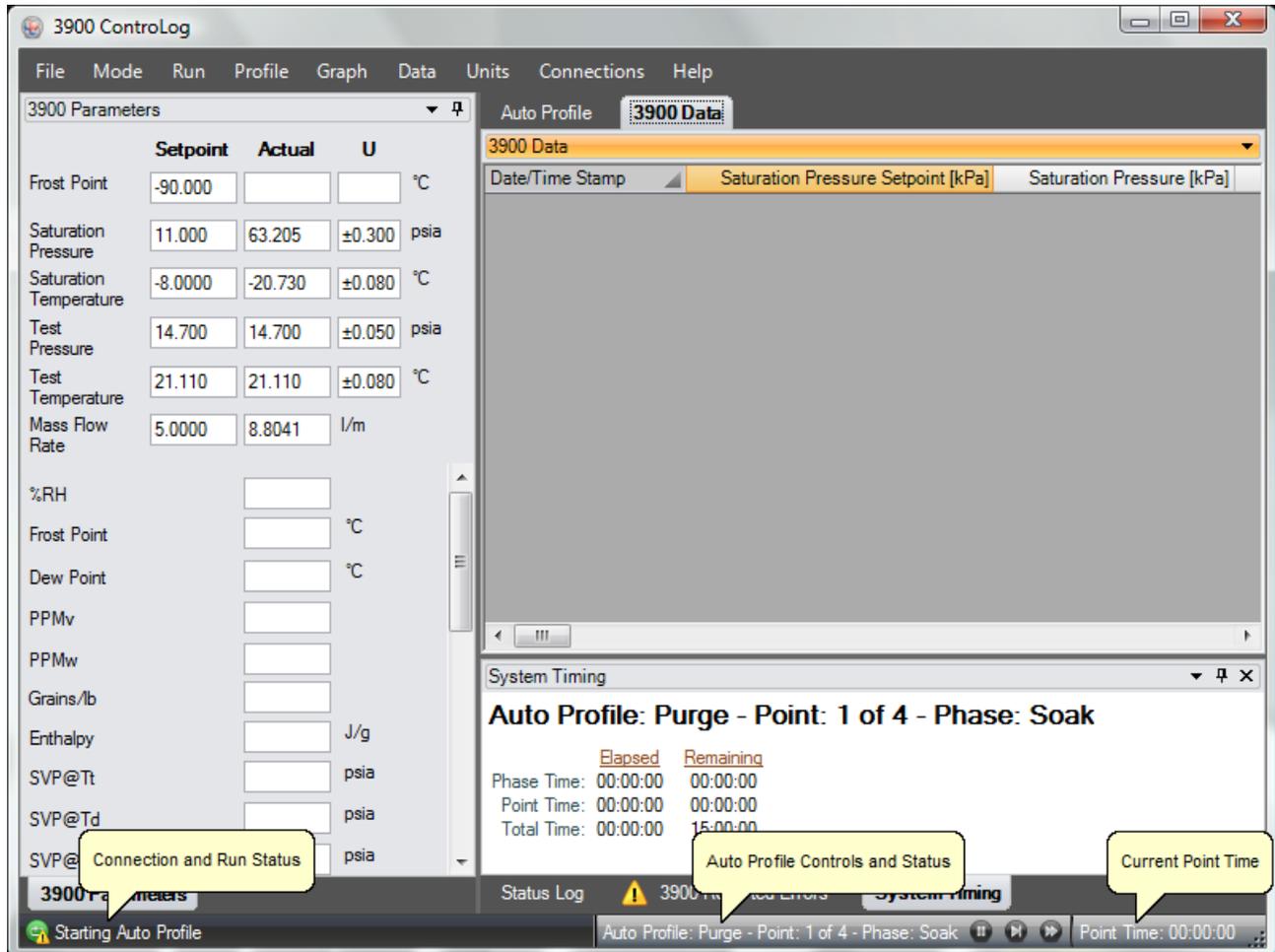


The data received from the device is indicated by a bold “**Received:**” label in the lower text area of the console tab.



# Status Bar

The **Status Bar** is located on the bottom of the application window. The Status Bar displays the current Connection and Run Status of the generator, Auto Profile Controls and Status, and current Point Time.

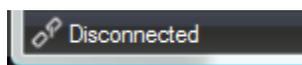


## Connection and Run Status

The **Connection and Run Status** is shown on the left hand side of the status bar and gives the user a quick visual and textual reference to the current state of the 3900 generator. As new events are recorded into the Status Log, the event will be displayed for a short period of time in the status bar to inform the user of the new event.

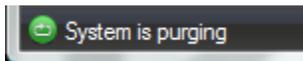
### *Disconnected*

The status bar will show a broken link icon and “Disconnected” when the 3900 is not connected to ControlLog:

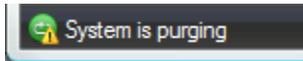


## Purging

The status bar will show a green circular arrow icon and “System is purging” when the 3900 is purging.

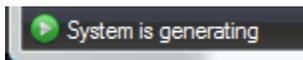


If the 3900 is reporting an error, the green circular arrow icon will also appear with a small yellow warning.

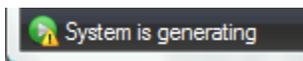


## Generating

The status bar will show a green forward arrow icon and “System is generating” when the 3900 is generating.

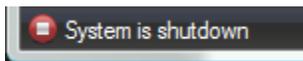


If the 3900 is reporting an error, the green forward arrow icon will also appear with a small yellow warning.

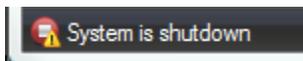


## Shutdown

The status bar will show a red stop icon and “System is shutdown” when the 3900 is shutdown.

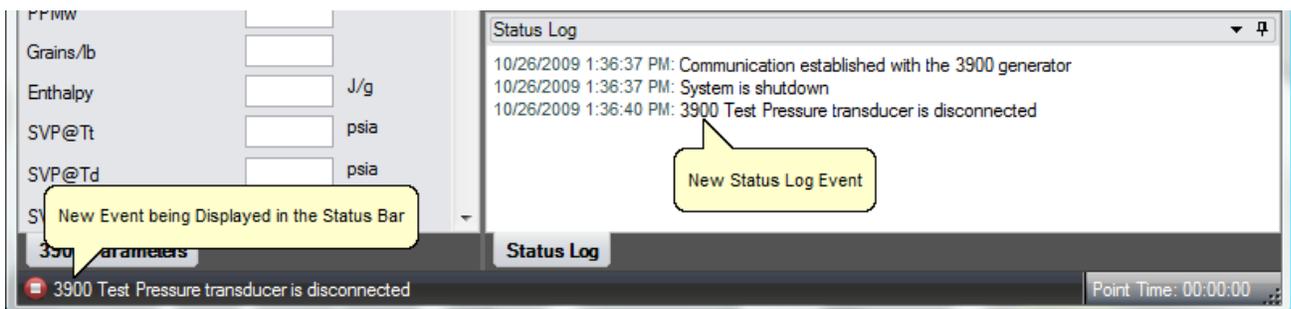


If the 3900 is reporting an error, the red stop icon will also appear with a small yellow warning.



## New Event

During any state the most recent status log event will be shown briefly in the status bar.



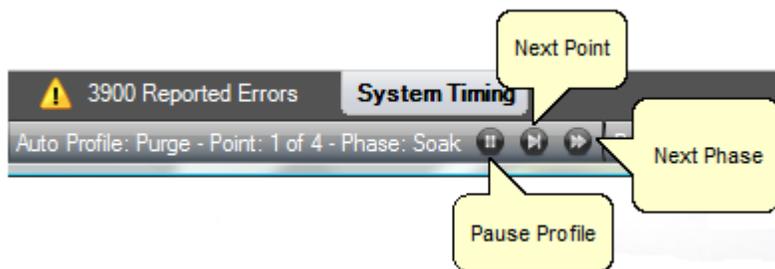
## Auto Profile Controls and Status

The **Auto Profile Controls and Status** is shown on the right hand side of the status bar and gives the user quick controls and status over a running profile. The Auto Profile consists of three status parts and three control parts.

For more information, see [Auto Profiling](#)

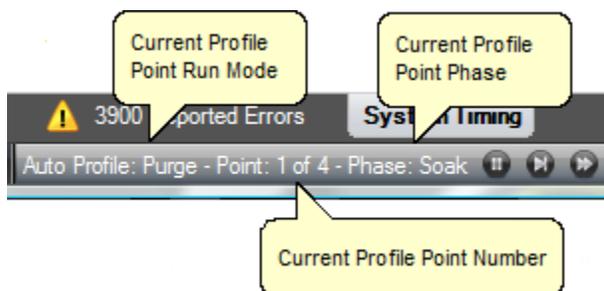
### Auto Profile Controls

The Auto Profile controls consist of a “Pause” button, “Next Point” button and a “Next Phase” button.



### Auto Profile Status

The Auto Profile status consists of the generator “Run Mode” for the current profile point, the “Profile Point” the system is currently running and the “Phase” of the current point.

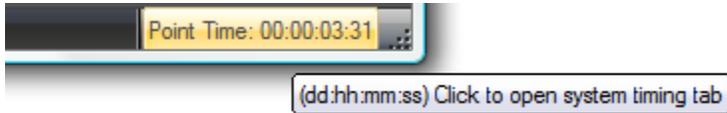


## Current Point Time

The **Current Point Time** is shown on the right hand side of the status bar and gives the user a quick display to the amount of time the system has been at point. Point Time is not the amount of time at setpoint but simply the amount of time since the last setpoint or mode change.



The user can click the point time to open the system timing tab.





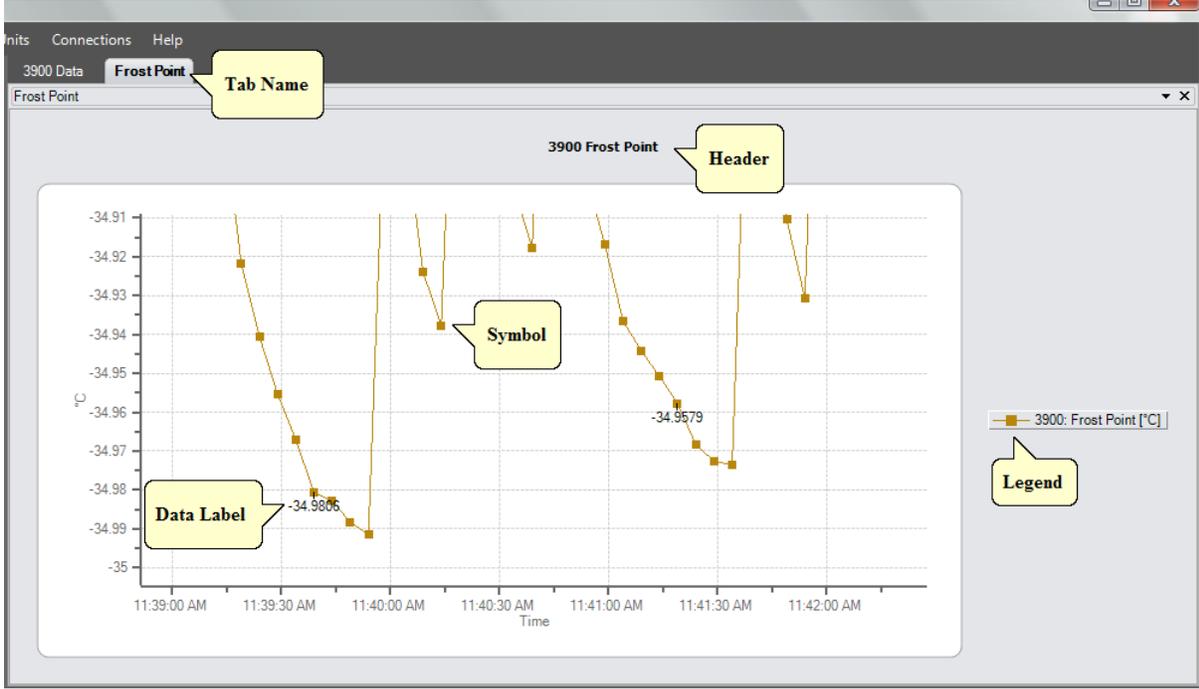
# Graphing

Graphing is a powerful tool used to view previously recorded data or to monitor the current data in real time. The graph works hand in hand with the data tabs. While the generator is in operation, data tabs store the most recent data points from the connected devices at the desired interval. A graph can be used to create a visual picture of this stored data.

Graph operations can be accessed by two means, either by selecting the desired command from the graph menu at the top or by right clicking a graph tab and opening a context menu. The functionality of the commands are the same regardless of which method is used, but remember that the menu commands are dynamic and reflect operations that can be performed on the selected graph tab.

*Note: ControLog has a limit of ten graph tabs opened at any given time.*

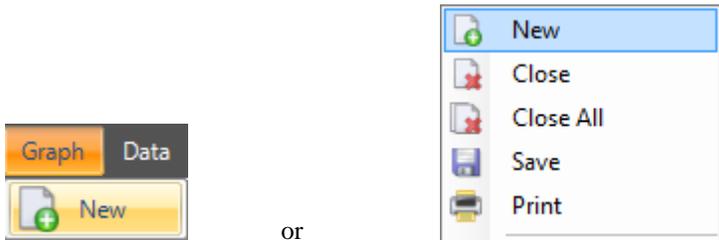
Each graph tab consists of a two dimension plot across an X and Y Axis. The graph can be customized to display different point symbols, various line colors, a legend and a header.



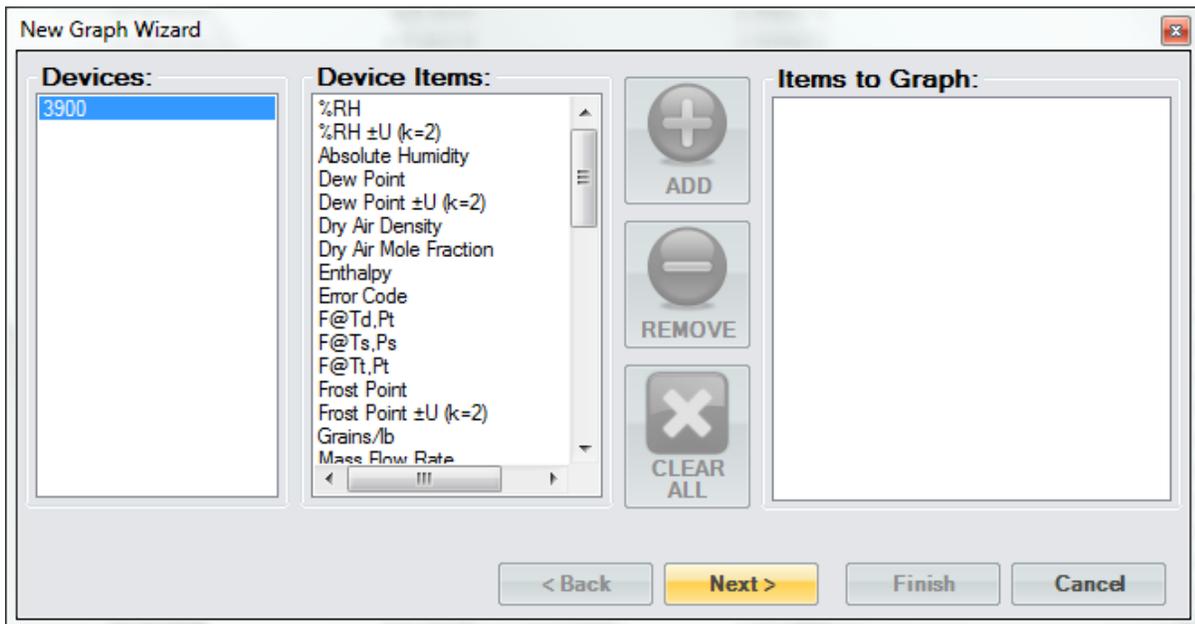
# Creating a New Graph

A new graph can be created using the New Graph Wizard dialog. The wizard will step the user through the selection process of what data the user would like to include in the new graph and how it should look.

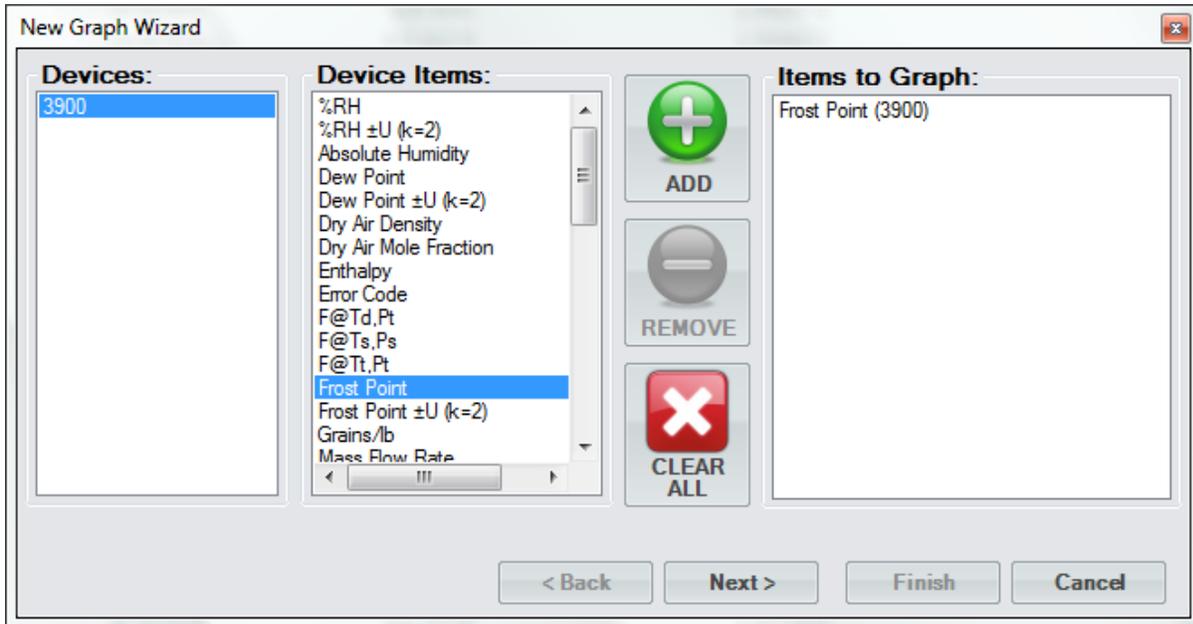
To create a new graph, select “New” from the main menu or right click a graph tab and select “New” from its context menu.



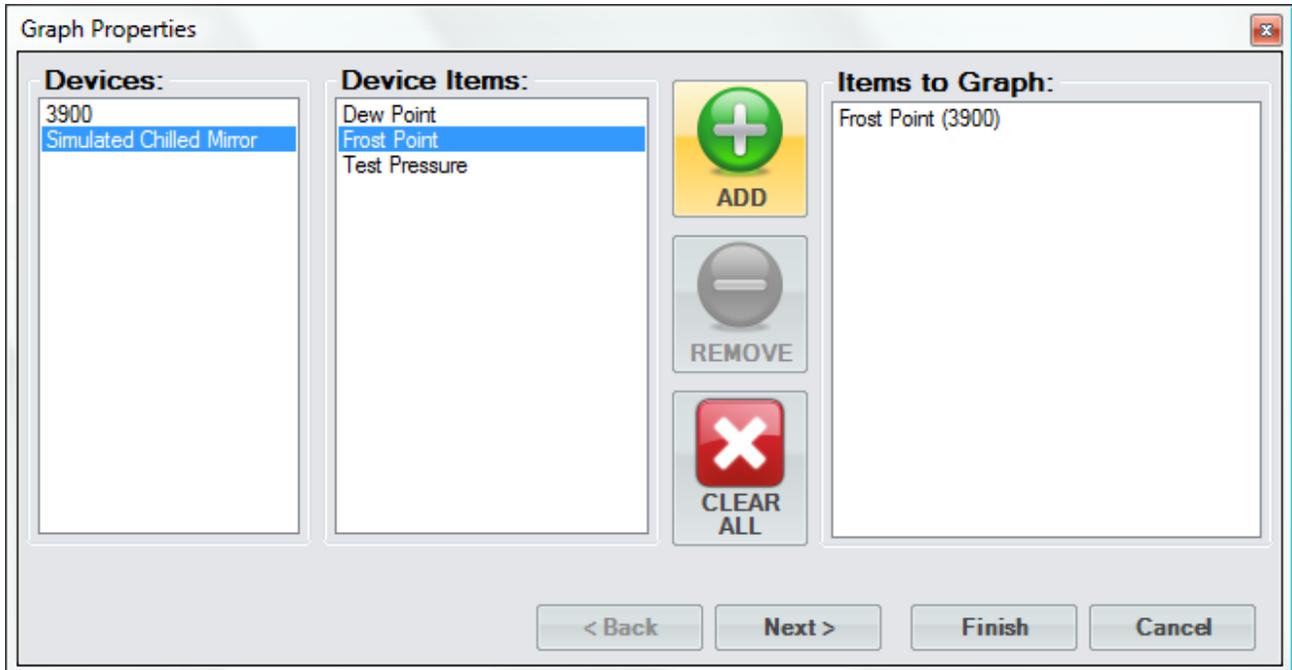
A “New Graph Wizard” dialog will appear.



The first page of the New Graph Wizard is where the user selects which device items they would like to include in the graph. On the left hand side is a list of all available devices. Selecting a device will result in the “Device Items” list being updated to reflect the available items for the selected device. To add an item, highlight the desired item or items in the “Device Items” list and click the “Add” button.

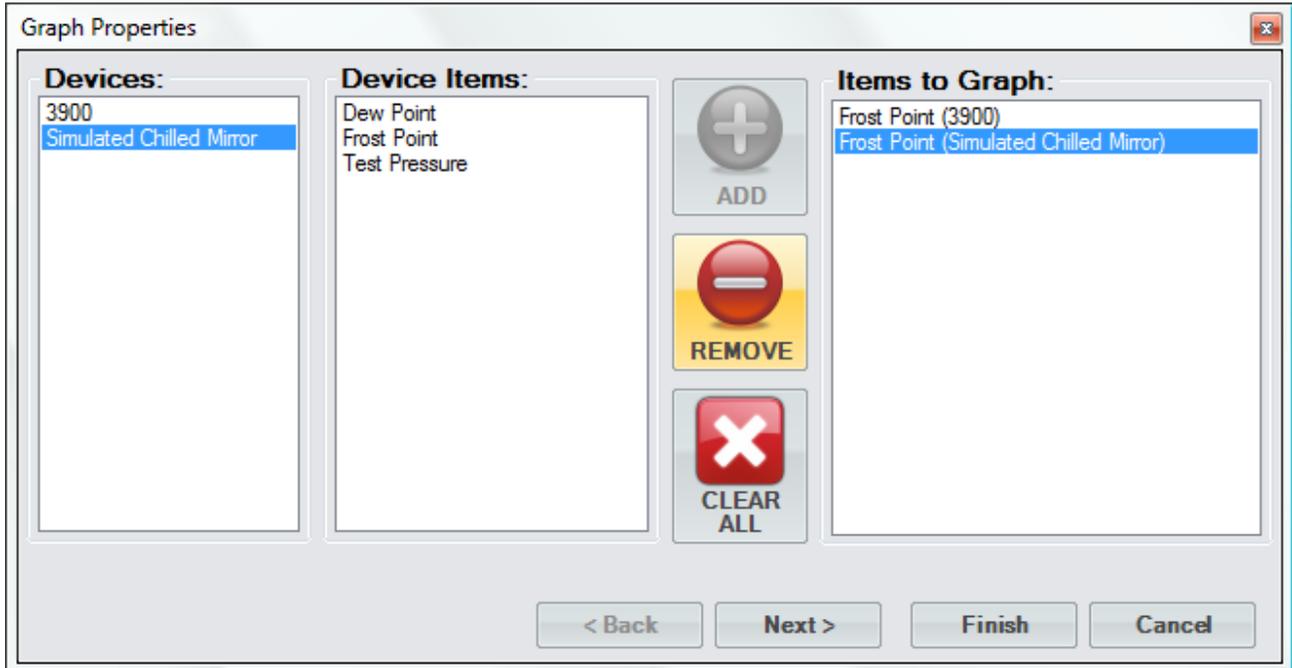


Repeat this process until all the desired items are listed on the right side.

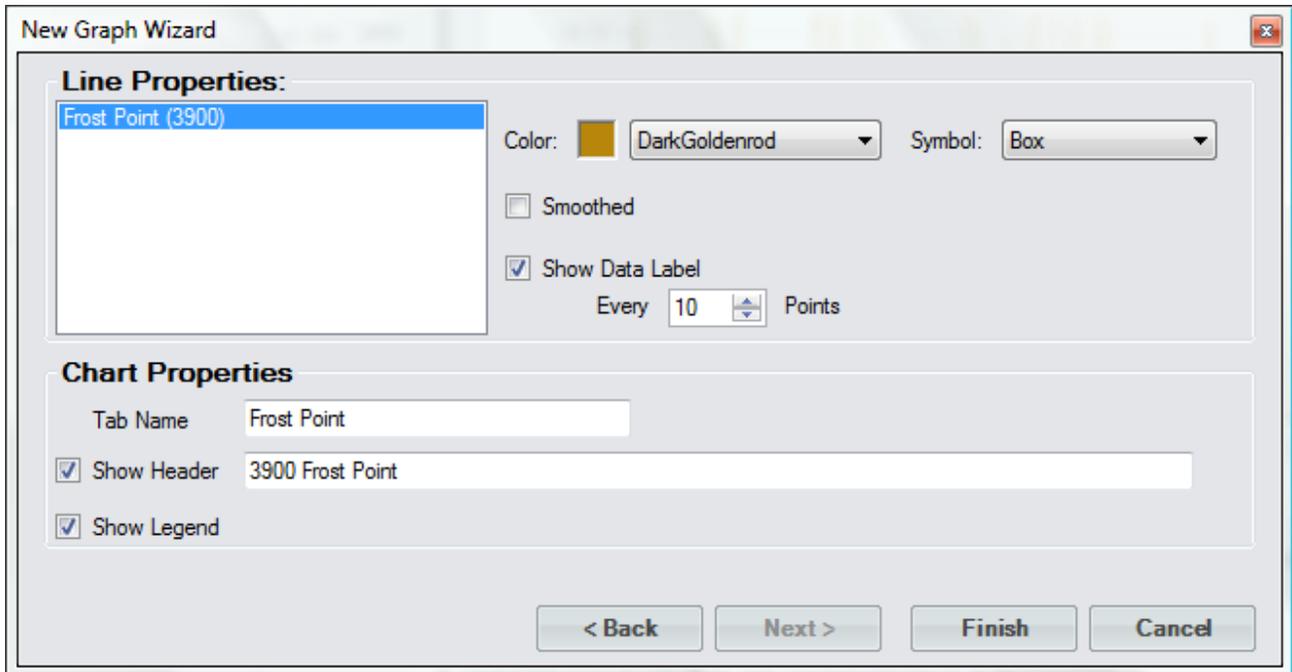


*Note: The user can invert any selection by right clicking. This will highlight all items that are not currently highlighted and will remove highlight from any items that are currently highlighted.*

To remove an item from the list of items to graph the user can either click the “Clear All” button to remove all items or simply select the desired item from the “Items to Graph” list and click the “Remove” button.



Once complete, clicking the “Next” button will bring up the Properties page. From the properties page the user can customize the look of each graphed line along with the chart itself.



**Line Properties** define the color and point symbol for the selected line. Select the desired line from the selection box and set the Color, Symbol, whether to smooth the line, and whether to show data labels and how often to show them.

**Color** defines the color that the line will be drawn in. To change the color, select the desired color from the drop down list. A sample of the selected color is displayed in the small box to the left of the drop down.

**Symbol** defines the symbol drawn at each point. The symbol will be the same color as the line and will be shown at each data point. To change the symbol, select the desired symbol from the drop down list.

**Smoothed** defines whether to smooth the line between points. This will remove any sudden angles between points and will draw a smooth flowing line between points.

**Show Data Label** defines whether to show data labels and how often to show them. Data labels are small labels appearing next to a point displaying the value at the point.

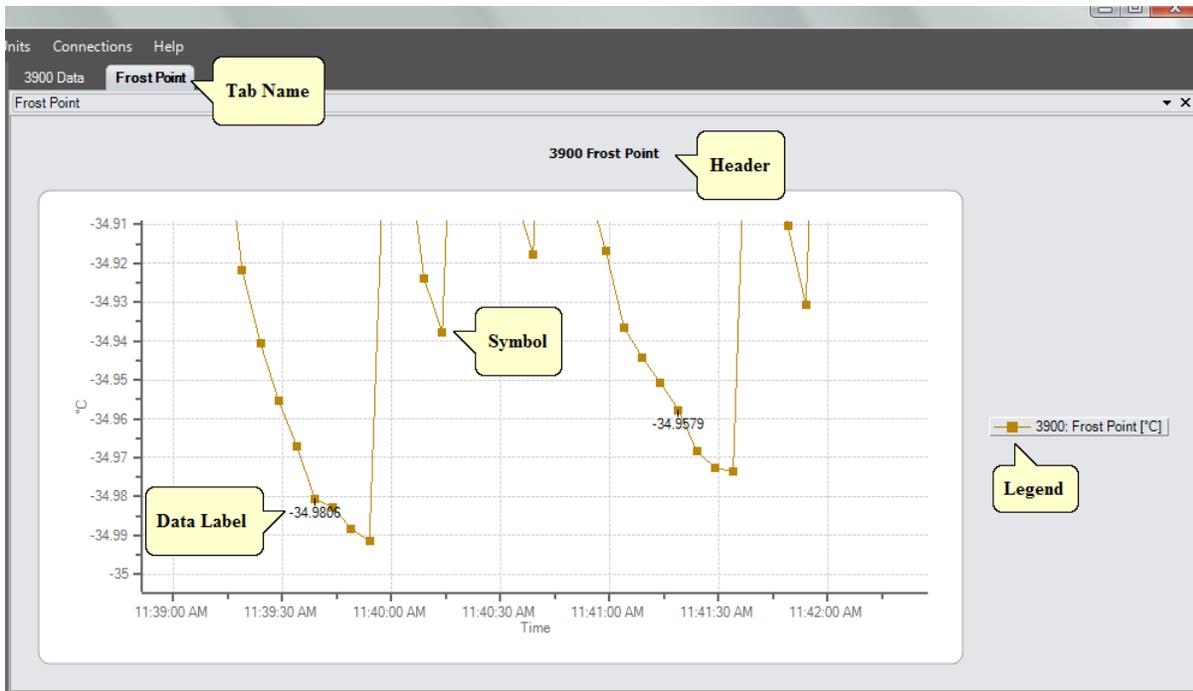
**Chart Properties** define the name of the graph tab, indicated whether to show a header on the graph and whether to show a legend of the lines plotted.

**Tab Name** defines the name of the graph tab. This is the name the user will see appear in the Data and Graph Tab Group.

**Show Header** defines the header that will appear at the top of the graph. To add a header to the graph check the checkbox and enter the desired text description for the header.

**Show Legend** defines whether a legend will be displayed on the right hand side of the graph indicating which colored line is which data item.

Once complete, clicking the “Finish” button will display the new graph in the Data and Graph Tab Group.



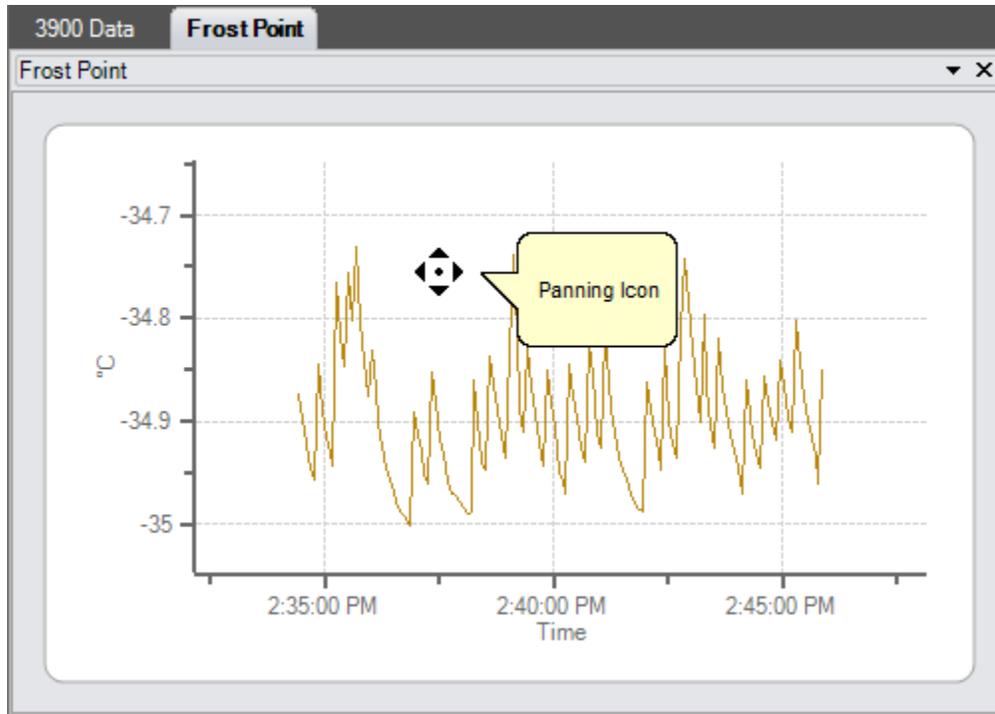
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## Customizing a Graph

Each graph tab can be customized to display the data in different means. The user can Pan, Zoom and Scale the graph to the desired appearance.

### Pan

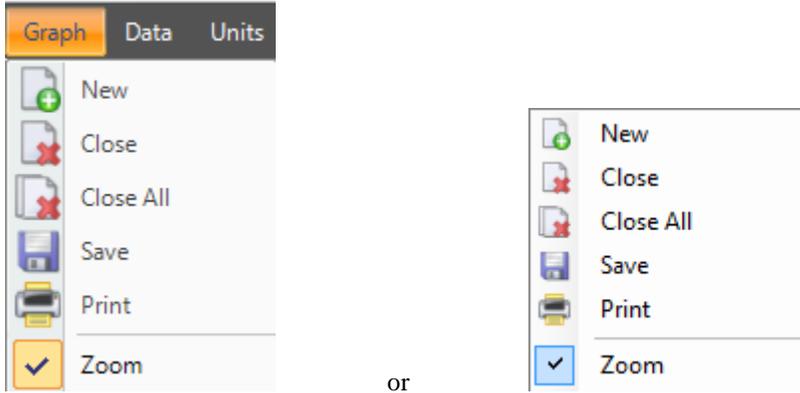
The graph can be panned up and down as well as left and right by a left click and hold of the mouse button while the user moves the cursor around. Panning is useful when you have zoomed the graph and want to view different parts of the data without changing the scaling.



## Zoom

Selecting the **Zoom** command checks the operation in the menu and then allows the user to use the left mouse button to create a rectangular area on the graph that will be zoomed. This operation is available only when a Graph tab is selected.

To perform the zoom, select “Zoom” from the main menu or right click a graph tab and select “Zoom”.



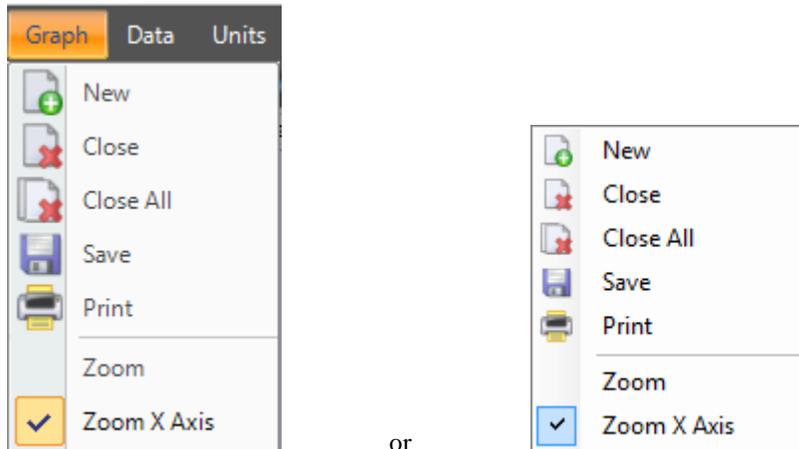
Move the cursor to the graph, left click and drag the cursor to create a box around the portion to zoom and release the left mouse button. The portion of the graph within the drag box will expand to fill the entire graph. The time and Y-axis limits update accordingly.



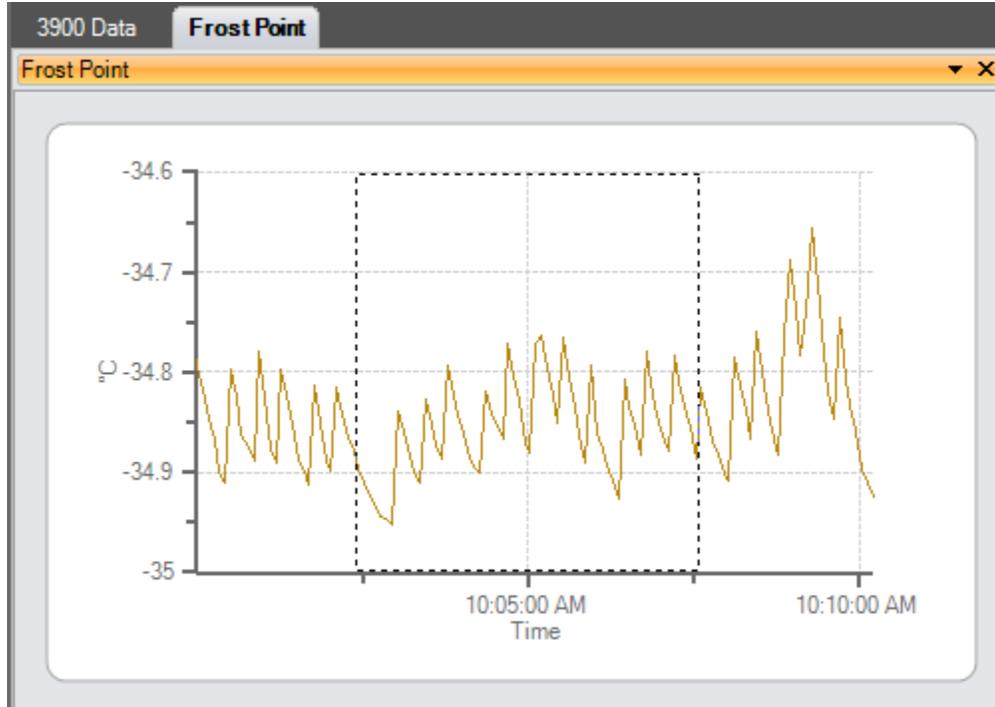
## Zoom Graph's X Axis

Selecting the **Zoom X Axis** command checks the operation in the menu and then allows the user to use the left mouse button to create a section area on the graph that will be zoomed along the X Axis. This operation is available only when a Graph tab is selected.

To perform the zoom, select “Zoom X Axis” from the main menu or right click a graph tab and select “Zoom X Axis”.



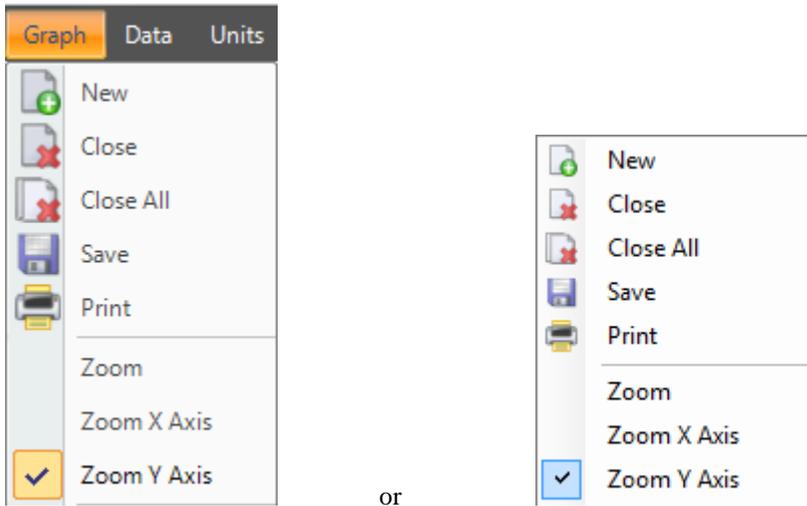
Left click on the graph and drag the cursor so that the portion of the X-axis (time axis) of interest is contained within the two vertical dashed lines. The portion contained within this region will expand to fill the entire X-axis. The Y-axis remains unchanged.



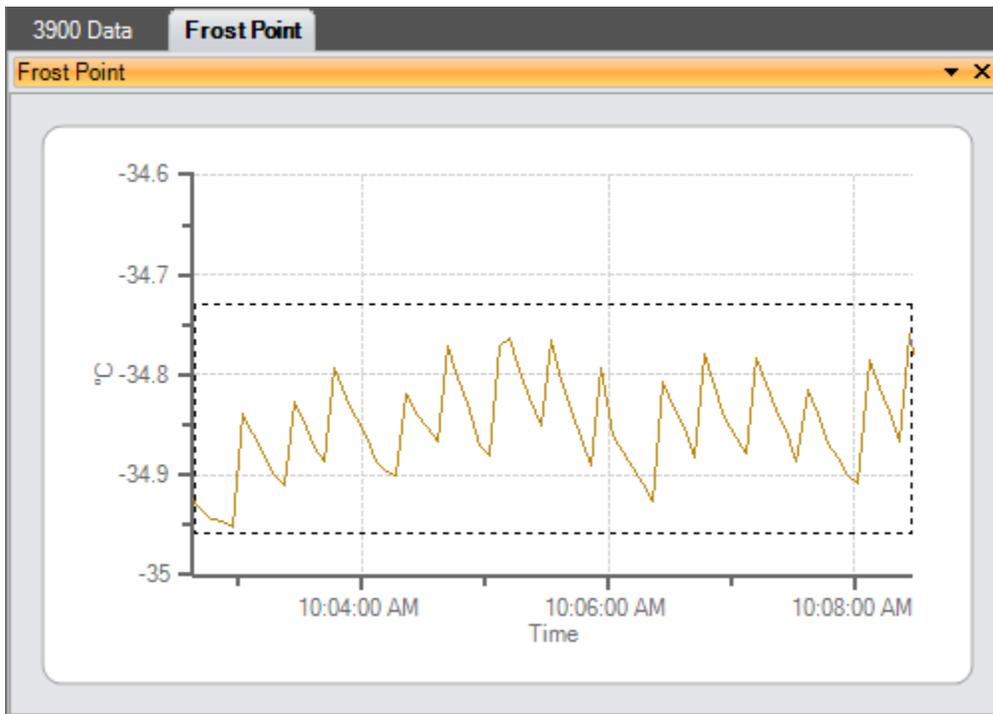
## Zoom Graph's Y Axis

Selecting the **Zoom Y Axis** command checks the operation in the menu and then allows the user to use the left mouse button to create a section area on the graph that will be zoomed along the Y Axis. This operation is available only when a Graph tab is selected.

To perform the zoom, select “Zoom Y Axis” from the main menu or right click a graph tab and select “Zoom Y Axis”.



Left click on the graph and drag the cursor so that the portion of the Y-axis of interest is contained within the two horizontal dashed lines. The portion contained within this region will expand to fill the entire Y-axis. The X-axis remains unchanged.



## Auto Scale

Selecting the **Auto Scale** command will automatically reset both axis of the graph so the entire data set for each selected item is contained within the boundaries of the graph. This operation is available only when a Graph tab is selected.

## Scale

Selecting the **Scale** command checks the operation in the menu and allows the user to use the left mouse button to scale. Dragging the cursor up scales the display in (zooms in) and dragging the cursor down scales the display out (zoom out). This operation is available only when a Graph tab is selected.

## Scale X Axis

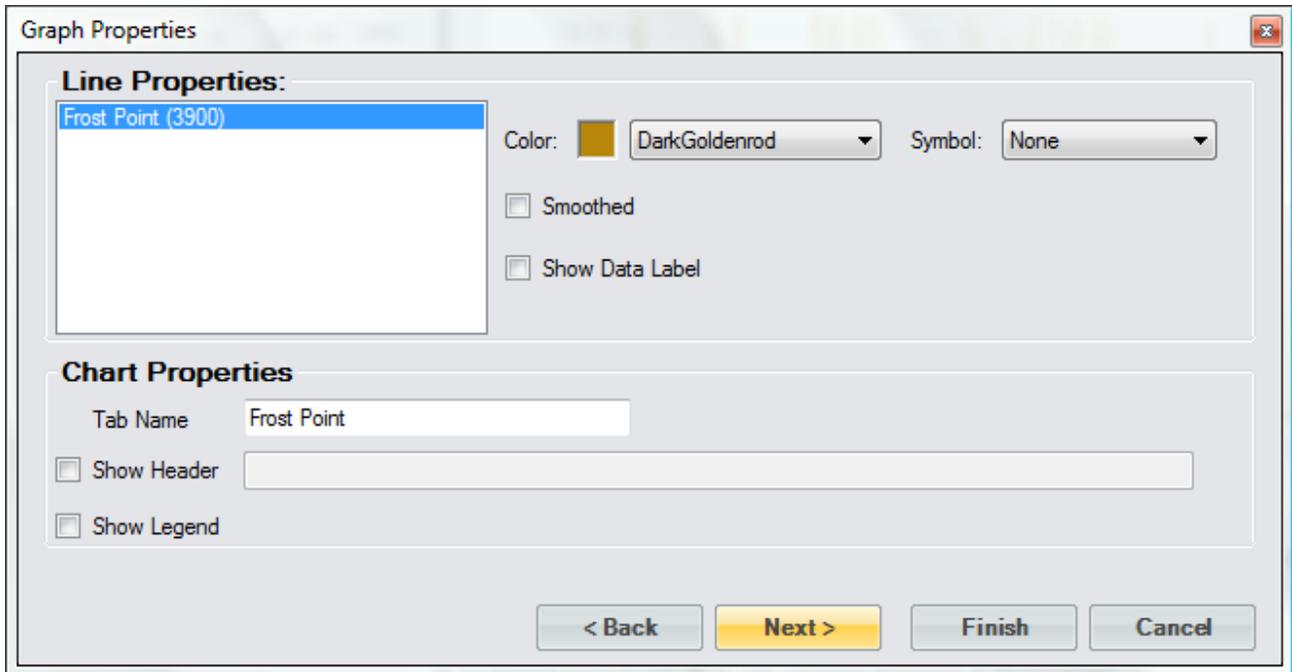
The **Scale X Axis** command allows the user to scale the X axis. Selecting the command checks the operation in the menu and then allows the user to use the left mouse button to scale. Dragging the cursor up scales the X Axis in (zooms X Axis in) and dragging the cursor down scales the X Axis out (zooms X Axis out). This operation is available only when a Graph tab is selected.

## Scale Y Axis

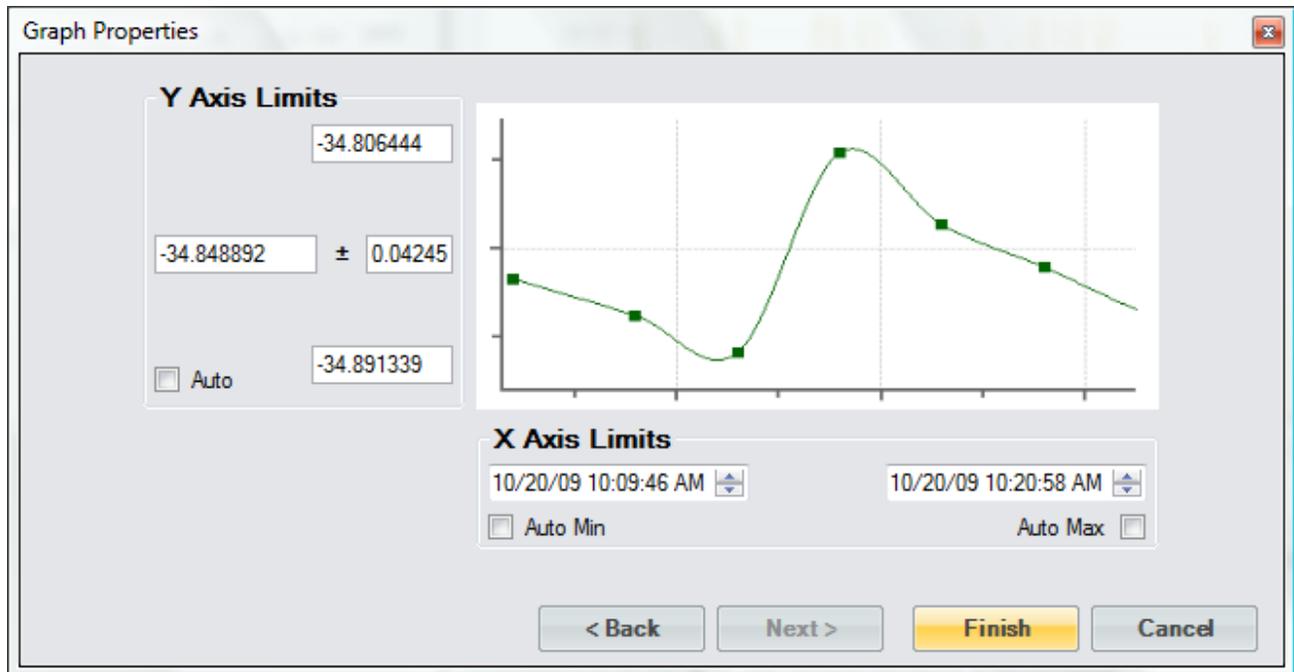
The **Scale Y Axis** command allows the user to scale the Y axis. Selecting the command checks the operation in the menu and then allows the user to use the left mouse button to scale. Dragging the cursor up scales the Y Axis in (zooms Y Axis in) and dragging the cursor down scales the Y Axis out (zooms Y Axis out). This operation is available only when a Graph tab is selected.

## Graph Properties

The graph **Properties** command allows the user to modify the properties of the selected graph. Selecting the command opens the Graph Properties dialog that allows the user to make changes to what data is graphed, line properties and axis values. This operation is available only when a Graph tab is selected.



The first two pages of the Graph Properties dialog are the same as the New Graph Wizard that is used to create new graphs. The Graph Properties dialog starts on the properties page from which the user can customize the look of each graphed line as well as the chart itself. Clicking the “Back” button will move back to the data selection page where the user can select which device items they would like to include in the graph. Clicking the “Next” button will move to the Axis page where the user can specify the starting and ending X and Y axis values.



**Y Axis Limits** defines the maximum, minimum, middle and span values for the Y Axis.

The **Maximum** value defines the maximum Y value for the Y Axis. No values beyond this maximum will be displayed on the graph.

The **Minimum** value defines the minimum Y value for the Y Axis. No values below this minimum will be displayed on the graph.

The **Middle** value defines the middle Y value for the Y Axis.

The **Span** value defines the amount above and below the middle value where the maximum and minimum Y values lie.

The **Auto** check box tells ControLog to automatically calculate the best Y Axis limits to encompass the current data.

*Note: The maximum, minimum, middle and span values are interrelated and changing any one value may result in another value automatically changing to assure all values mathematically equate.*

**X Axis Limits** defines the maximum and minimum values for the X Axis.

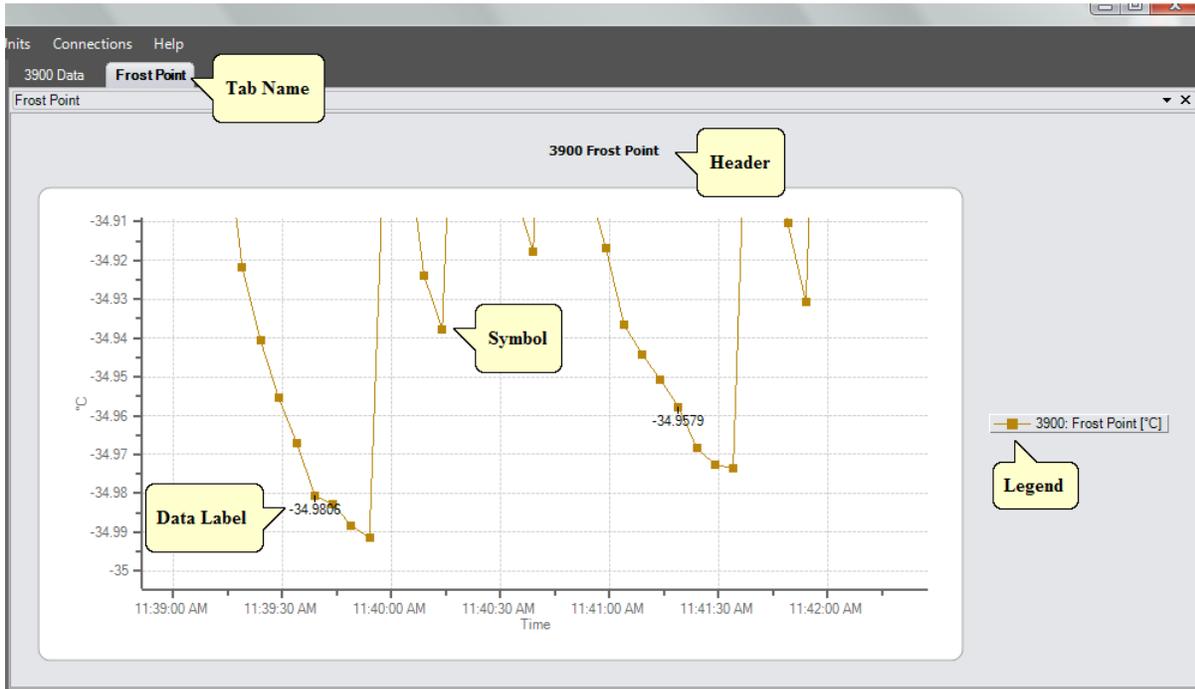
The **Minimum** value defines the minimum date and time for the X Axis. No values below this minimum date and time will be displayed on the graph.

The **Auto Min** check box tells ControLog to automatically use the starting date and time for the current data as the X Axis minimum.

The **Maximum** value defines the maximum date and time for the X Axis. No values above this maximum date and time will be displayed on the graph.

The **Auto Max** check box tells ControLog to automatically use the last date and time for the current data as the X Axis maximum. The graph will constantly expand as new data points are recorded.

Once complete, clicking the “Finish” button will display the graph in the same tab with the new property settings.



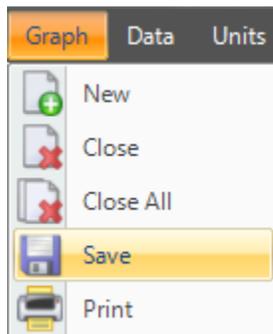
---

## Saving a Graph

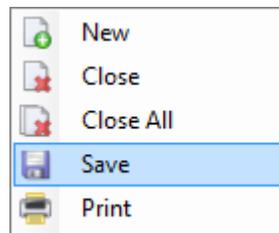
Each graph tab can be saved to a file in any of the following graphic file types:

- Bitmap (\*.bmp)
- Graphics Interchange Format (\*.gif)
- Joint Photographic Experts Group (\*.jpg)
- W3C Portable Network Graphics (\*.png)
- EMF Enhanced Metafile Format (\*.emf)

To perform the save, select “Save” from the main menu or right click a graph tab and select “Save”.

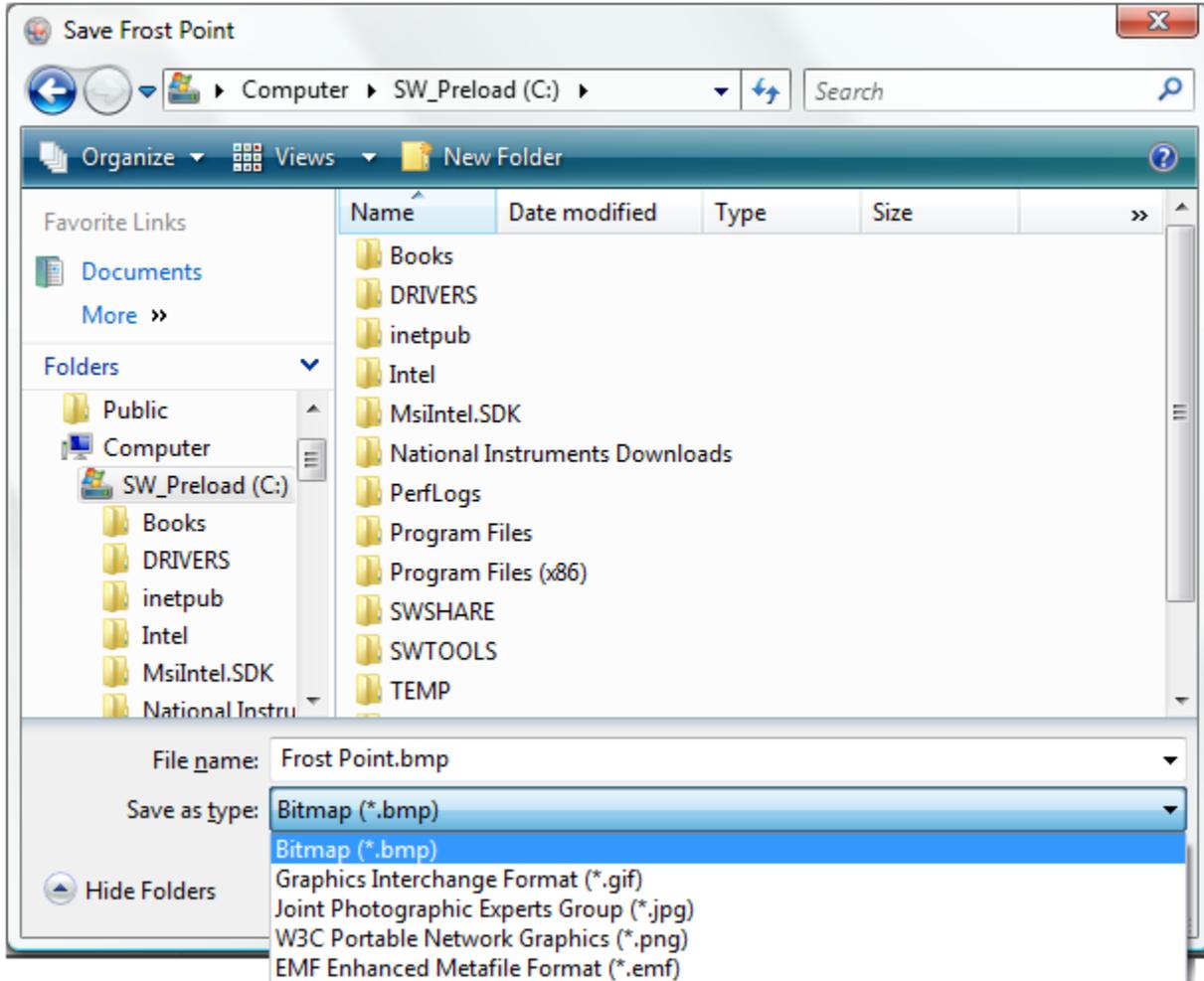


or



Using the “Save” dialog, select the location, name and graphic type you want to save the graph as.

*Note: ControLog defaults the file name to the name of the graph tab.*



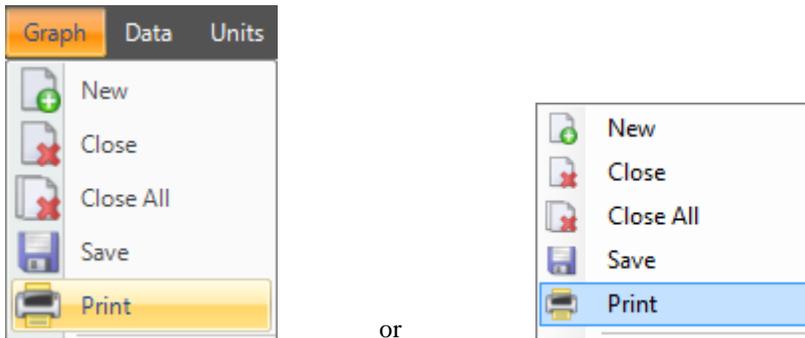
---

# Printing a Graph

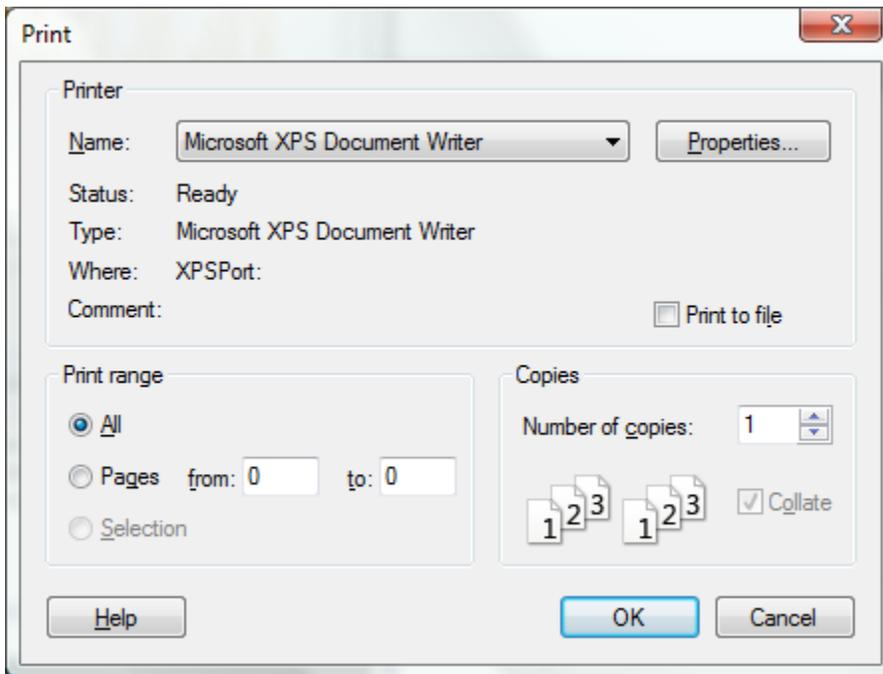
Each graph tab can be printed to any of the PC's installed printers.

*Note: You must have a printer installed before you can print using ControlLog.*

To perform the print, select "Print" from the main menu or right click a graph tab and select "Print".



Using the "Print" dialog, select the desired printer, range and number of copies you want to print.



# Data and Data Summary

ControLog stores data into individual Data Tabs. Each data tab contains a spreadsheet type view that consists of a date/time stamp and the measured data items corresponding to that date/time stamp. Data tabs consist of three similar but different types: Device Data, File Data and Data Summary. Each type has the same spreadsheet type view and operation, but all three have different data sources.

*Note: The data tab data is always stored in SI units regardless of the current system unit settings. The only exception is for Data Summary tabs which are created using currently selected system units but will not update on further unit changes.*

Date/Time Stamp	Saturation Pressure Setpoint [kPa]	Saturation Pressure [kPa]
10/23/2009 11:36:38 AM	68.947573	435.648
10/23/2009 11:37:08 AM		.71763
10/23/2009 11:37:38 AM		.86837
10/23/2009 11:38:08 AM		.43736
10/23/2009 11:38:38 AM	68.947573	431.9924
10/23/2009 11:39:08 AM	68.947573	429.57234
10/23/2009 11:39:38 AM	68.947573	434.17114
10/23/2009 11:40:08 AM	68.947573	439.35186
10/23/2009 11:40:38 AM		437.19863
10/23/2009 11:41:08 AM		432.04893
10/23/2009 11:41:38 AM		435.03436
10/23/2009 11:42:08 AM	68.947573	433.47822
10/23/2009 11:42:38 AM	68.947573	432.09375
10/23/2009 11:43:08 AM	68.947573	434.48761
10/23/2009 11:43:38 AM	68.947573	432.3261
10/23/2009 11:44:08 AM	68.947573	438.90784

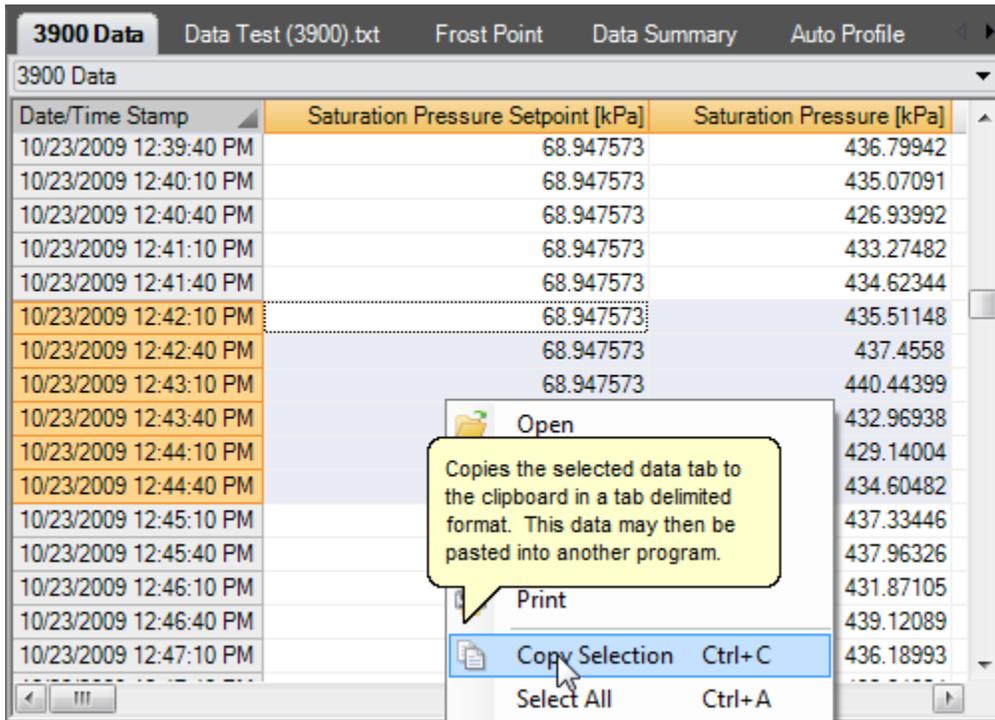
The user can navigate through the data using the scroll bars .

Date/Time Stamp	Sat Point $\pm U$ (k=2) [°C]	Dew Point [°C]	Dew Point $\pm U$ (k=2) 2)
10/23/2009 11:36:38 AM	0.098796176	-38.2863	0.1006363
10/23/2009 11:37:08 AM	0.098792679	-38.2879	0.1006262
10/23/2009 11:37:38 AM	0.098735141	-38.3133	0.1005555
10/23/2009 11:38:08 AM			0.1004040
10/23/2009 11:38:38 AM			0.1008636
10/23/2009 11:39:08 AM			0.101010
10/23/2009 11:39:38 AM			0.1007272
10/23/2009 11:40:08 AM	0.098612551	-38.3681	0.1004040
10/23/2009 11:40:38 AM	0.098718715	-38.3206	0.1005353
10/23/2009 11:41:08 AM	0.098979286	-38.2061	0.1008686
10/23/2009 11:41:38 AM	0.098827066	-38.2727	0.1006767
10/23/2009 11:42:08 AM	0.098906007	-38.2381	0.1007676
10/23/2009 11:42:38 AM	0.098976977	-38.2071	0.1008585
10/23/2009 11:43:08 AM	0.098854703	-38.2605	0.1007070
10/23/2009 11:43:38 AM	0.098965018	-38.2123	0.1008484
10/23/2009 11:44:08 AM	0.098634311	-38.3583	0.1004343

The user can also select specific data by clicking and dragging the desired cells.

Date/Time Stamp	Saturation Pressure Setpoint [kPa]	Saturation Pressure [kPa]
10/23/2009 12:39:40 PM	68.947573	436.79942
10/23/2009 12:40:10 PM	68.947573	435.07091
10/23/2009 12:40:40 PM	68.947573	426.93992
10/23/2009 12:41:10 PM	68.947573	433.27482
10/23/2009 12:41:40 PM	68.947573	434.62344
10/23/2009 12:42:10 PM	68.947573	435.51148
10/23/2009 12:42:40 PM	68.947573	437.4558
10/23/2009 12:43:10 PM	68.947573	440.44399
10/23/2009 12:43:40 PM	68.947573	432.96938
10/23/2009 12:44:10 PM	68.947573	429.14004
10/23/2009 12:44:40 PM	68.947573	434.60482
10/23/2009 12:45:10 PM	68.947573	437.33446
10/23/2009 12:45:40 PM	68.947573	437.96326
10/23/2009 12:46:10 PM	68.947573	431.87105
10/23/2009 12:46:40 PM	68.947573	439.12089
10/23/2009 12:47:10 PM	68.947573	436.18993

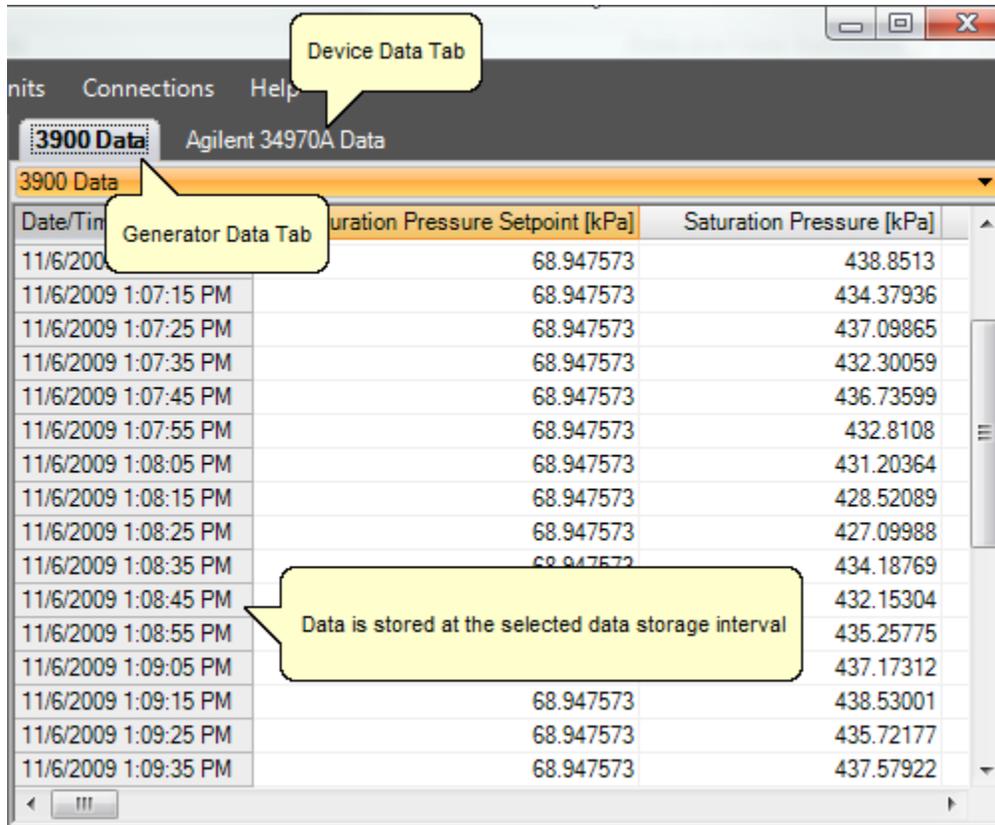
The user can then copy selected data to the clipboard by selecting “Copy Selection” from the context menu or by using the keyboard shortcut combination of Ctrl+C.



## Device Data Tabs

The **Device Data Tabs** contain stored data values obtained by the connected generator or device. After establishing communication with the generator or device an individual data tab for the device will be created. These tabs store the data readings from the connected device at the specified data storage interval.

*Note: Data is only recorded while the 3900 is either in generate or purge mode. Data is also stored at the generate rate whenever a device is connected and the 3900 is not connected. This gives the user the ability to use ControLog as a logging application for any device they connect without the need of a 3900 generator.*



The screenshot shows a software window titled "Agilent 34970A Data" with a menu bar containing "Units", "Connections", and "Help". There are two tabs: "3900 Data" (selected) and "Generator Data Tab". The "3900 Data" tab displays a table with the following columns: "Date/Time", "Duration Pressure Setpoint [kPa]", and "Saturation Pressure [kPa]". The table contains 15 rows of data. A callout points to the "3900 Data" tab, another to the "Generator Data Tab", and a third to the table with the text "Data is stored at the selected data storage interval".

Date/Time	Duration Pressure Setpoint [kPa]	Saturation Pressure [kPa]
11/6/2009	68.947573	438.8513
11/6/2009 1:07:15 PM	68.947573	434.37936
11/6/2009 1:07:25 PM	68.947573	437.09865
11/6/2009 1:07:35 PM	68.947573	432.30059
11/6/2009 1:07:45 PM	68.947573	436.73599
11/6/2009 1:07:55 PM	68.947573	432.8108
11/6/2009 1:08:05 PM	68.947573	431.20364
11/6/2009 1:08:15 PM	68.947573	428.52089
11/6/2009 1:08:25 PM	68.947573	427.09988
11/6/2009 1:08:35 PM	68.947573	434.18769
11/6/2009 1:08:45 PM	68.947573	432.15304
11/6/2009 1:08:55 PM	68.947573	435.25775
11/6/2009 1:09:05 PM	68.947573	437.17312
11/6/2009 1:09:15 PM	68.947573	438.53001
11/6/2009 1:09:25 PM	68.947573	435.72177
11/6/2009 1:09:35 PM	68.947573	437.57922

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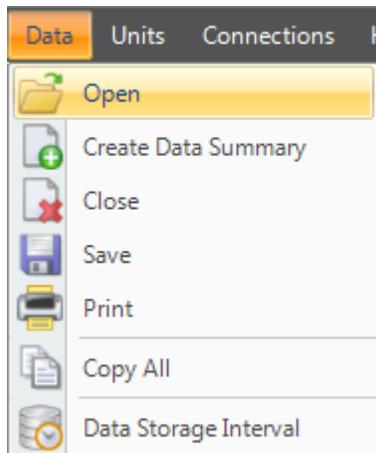
## File Data Tabs

The **File Data Tabs** contain data values loaded from a previously saved Device Data Tab. ControLog can open data saved in the following types and formats:

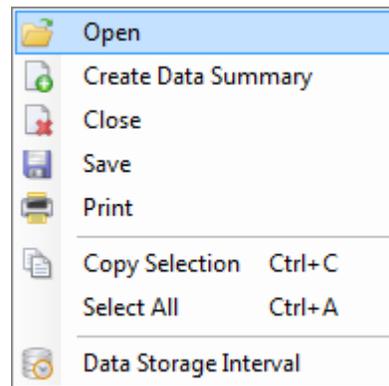
- Text File (Comma Delimited) (\*.csv;\*.txt)
- Text File (Tab Delimited) (\*.dat;\*.txt)
- Excel Workbook (\*.xlsx;\*.xls)
- Backup ControLog File (\*.backup)

The only requirement for loading data from the above mentioned data files is the data must be formatted so date/time values appear in the first column and all other columns contain numeric values.

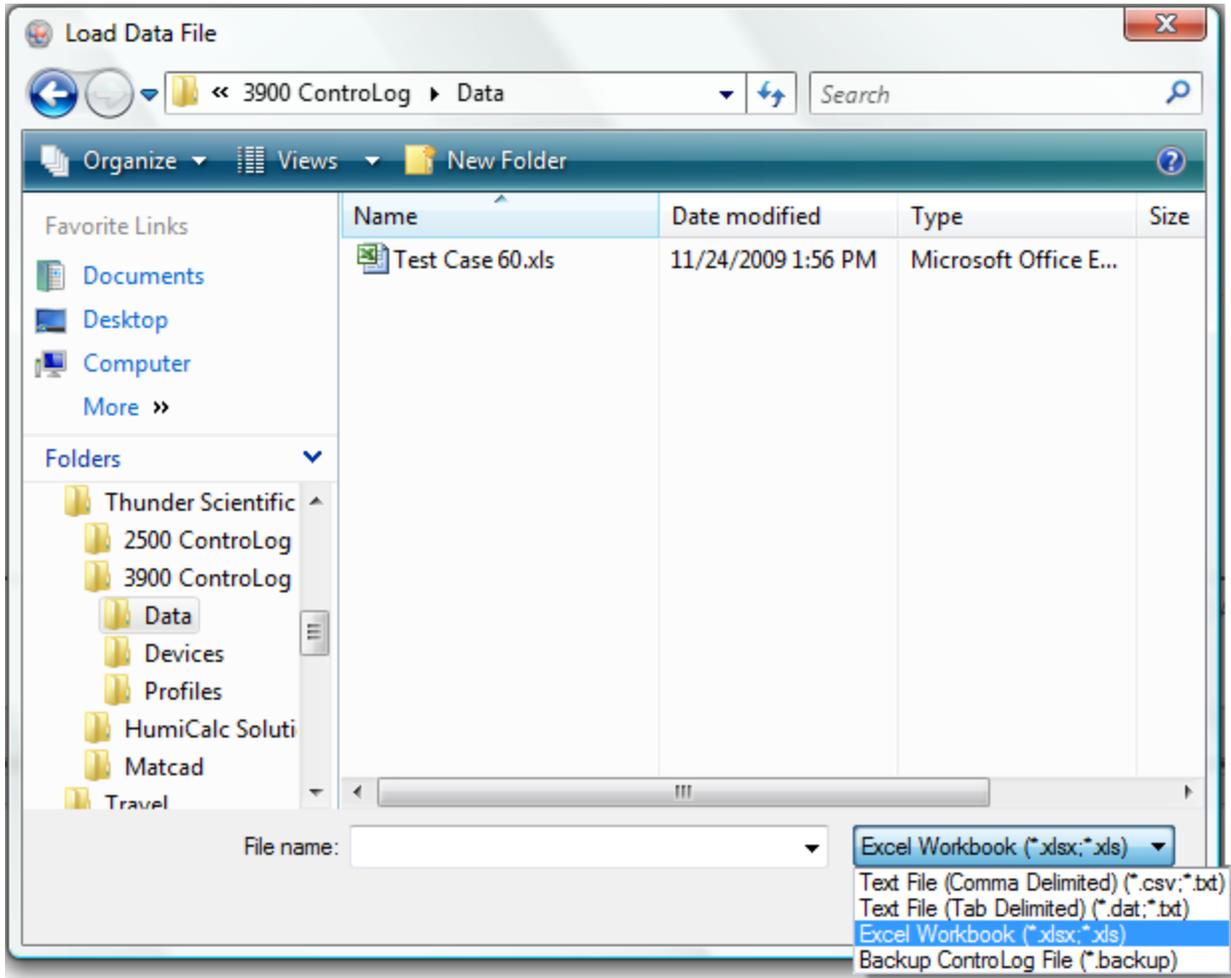
To open a data file, select “Open” from the main menu or right click a data tab and select “Open”.



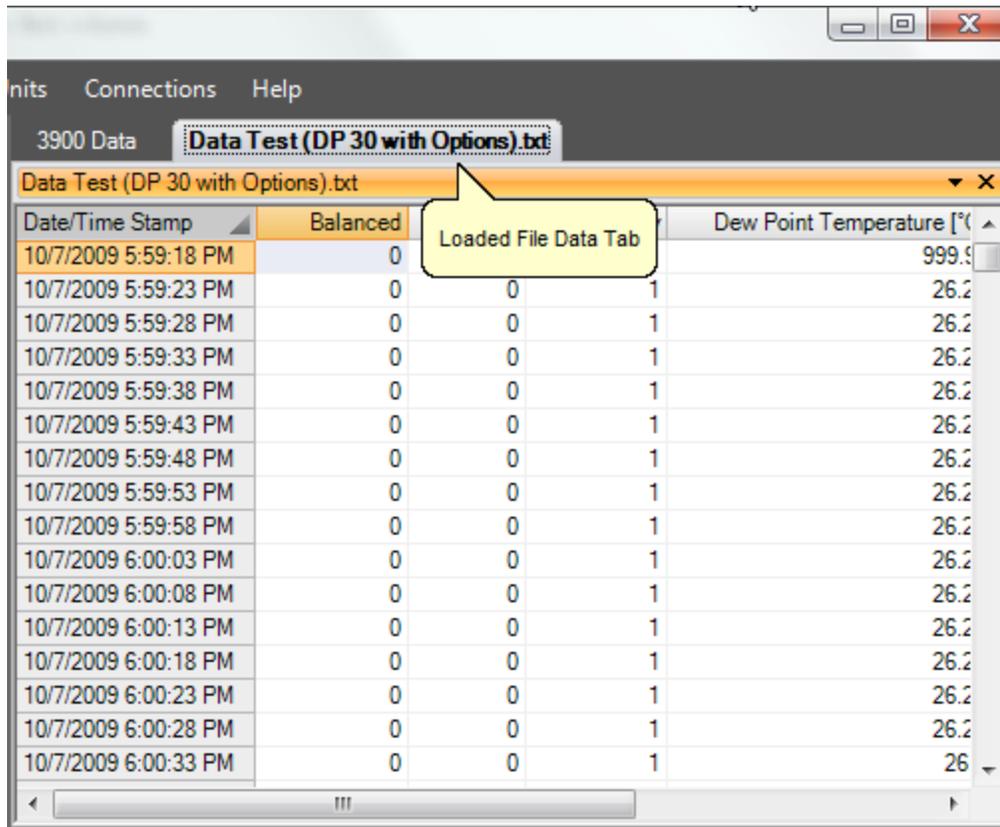
or



Using the “Load Data File” dialog, browse and select the data file you want to open.



Once the load is complete the loaded file data tab will be displayed.



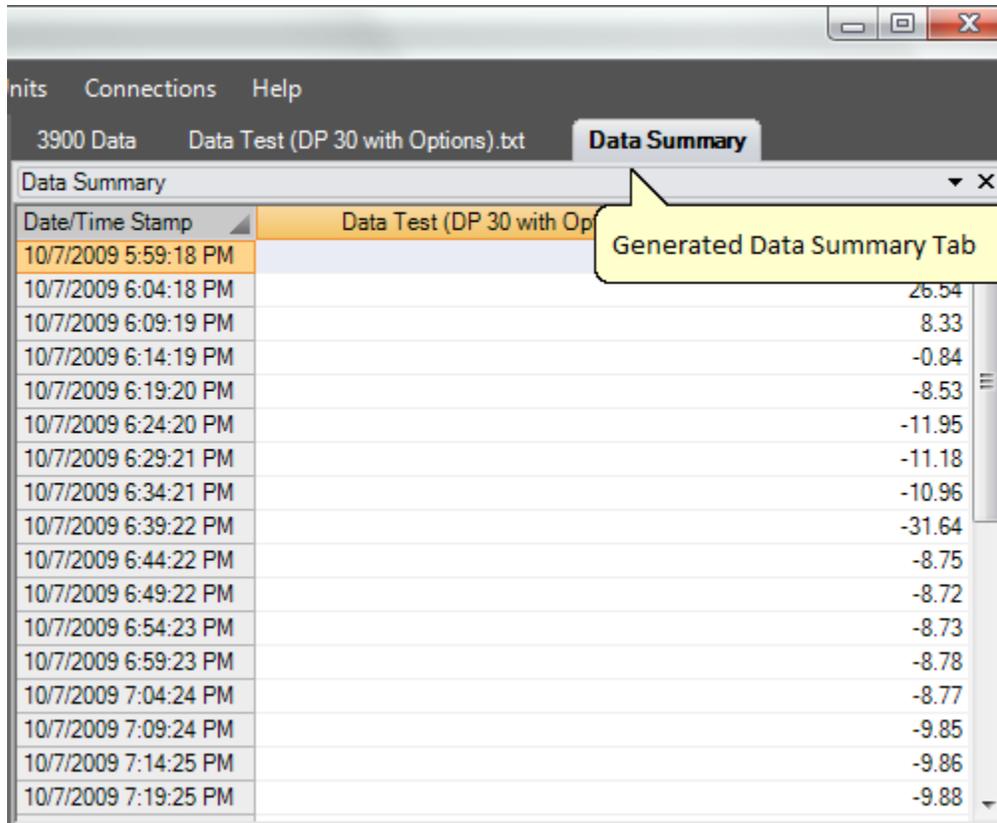
The screenshot shows a software window with a menu bar (Units, Connections, Help) and a title bar (3900 Data). A tab titled "Data Test (DP 30 with Options).txt" is active. Below the tab is a table with the following columns: "Date/Time Stamp", "Balanced", "Loaded File Data Tab", and "Dew Point Temperature [°C]". The table contains 17 rows of data, with the first row highlighted in orange. A yellow callout bubble points to the "Loaded File Data Tab" header.

Date/Time Stamp	Balanced	Loaded File Data Tab	Dew Point Temperature [°C]	
10/7/2009 5:59:18 PM	0		999.9	
10/7/2009 5:59:23 PM	0	0	1	26.2
10/7/2009 5:59:28 PM	0	0	1	26.2
10/7/2009 5:59:33 PM	0	0	1	26.2
10/7/2009 5:59:38 PM	0	0	1	26.2
10/7/2009 5:59:43 PM	0	0	1	26.2
10/7/2009 5:59:48 PM	0	0	1	26.2
10/7/2009 5:59:53 PM	0	0	1	26.2
10/7/2009 5:59:58 PM	0	0	1	26.2
10/7/2009 6:00:03 PM	0	0	1	26.2
10/7/2009 6:00:08 PM	0	0	1	26.2
10/7/2009 6:00:13 PM	0	0	1	26.2
10/7/2009 6:00:18 PM	0	0	1	26.2
10/7/2009 6:00:23 PM	0	0	1	26.2
10/7/2009 6:00:28 PM	0	0	1	26.2
10/7/2009 6:00:33 PM	0	0	1	26.2

# Data Summary Tabs

The **Data Summary Tabs** contain data values generated from a Data Summary. The data summary allows the user to summarize the available data into a single data tab. The data summary also allows the user to calculate error or differences between a selected standard values and selected device values.

*Note: Data Summary tabs are the only types of Data Tabs that are created using the currently selected system units instead of SI units.*

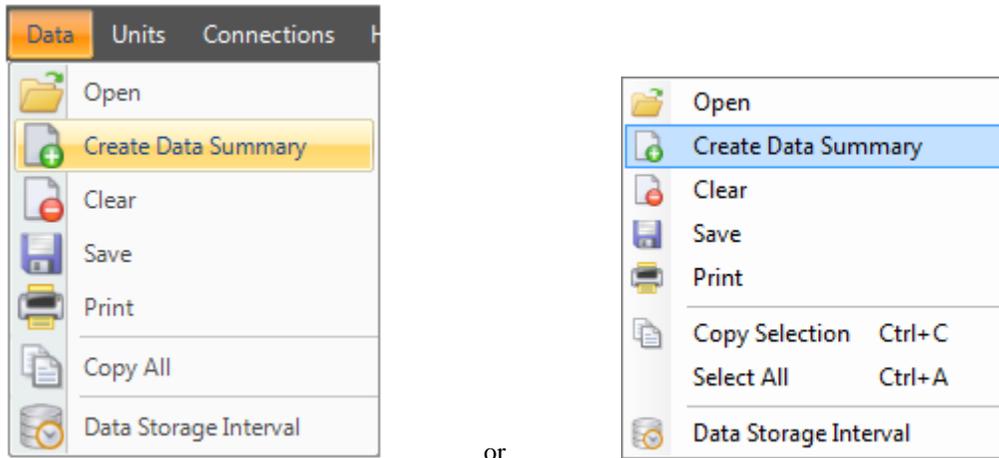


The screenshot shows a software window with a menu bar (Units, Connections, Help) and a tabbed interface. The active tab is 'Data Summary'. Below the tab is a table with two columns: 'Date/Time Stamp' and 'Data Test (DP 30 with Options)'. The table contains 16 rows of data. A yellow callout box with a pointer to the 'Data Summary' tab contains the text 'Generated Data Summary Tab'.

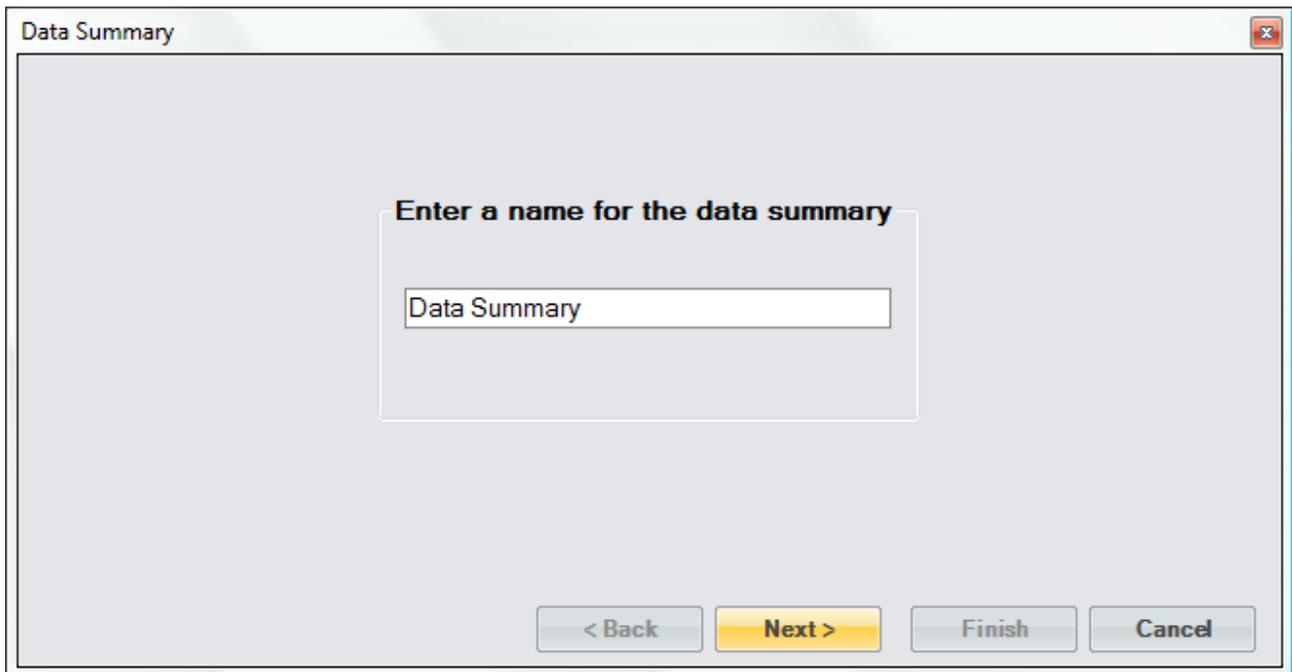
Date/Time Stamp	Data Test (DP 30 with Options)
10/7/2009 5:59:18 PM	
10/7/2009 6:04:18 PM	26.54
10/7/2009 6:09:19 PM	8.33
10/7/2009 6:14:19 PM	-0.84
10/7/2009 6:19:20 PM	-8.53
10/7/2009 6:24:20 PM	-11.95
10/7/2009 6:29:21 PM	-11.18
10/7/2009 6:34:21 PM	-10.96
10/7/2009 6:39:22 PM	-31.64
10/7/2009 6:44:22 PM	-8.75
10/7/2009 6:49:22 PM	-8.72
10/7/2009 6:54:23 PM	-8.73
10/7/2009 6:59:23 PM	-8.78
10/7/2009 7:04:24 PM	-8.77
10/7/2009 7:09:24 PM	-9.85
10/7/2009 7:14:25 PM	-9.86
10/7/2009 7:19:25 PM	-9.88

## Creating a Data Summary

To create a Data Summary, select “Create Data Summary” from the main menu or right click a data tab and select “Create Data Summary”. Selection will open the Data Summary Wizard dialog that will step the user through the creation process.



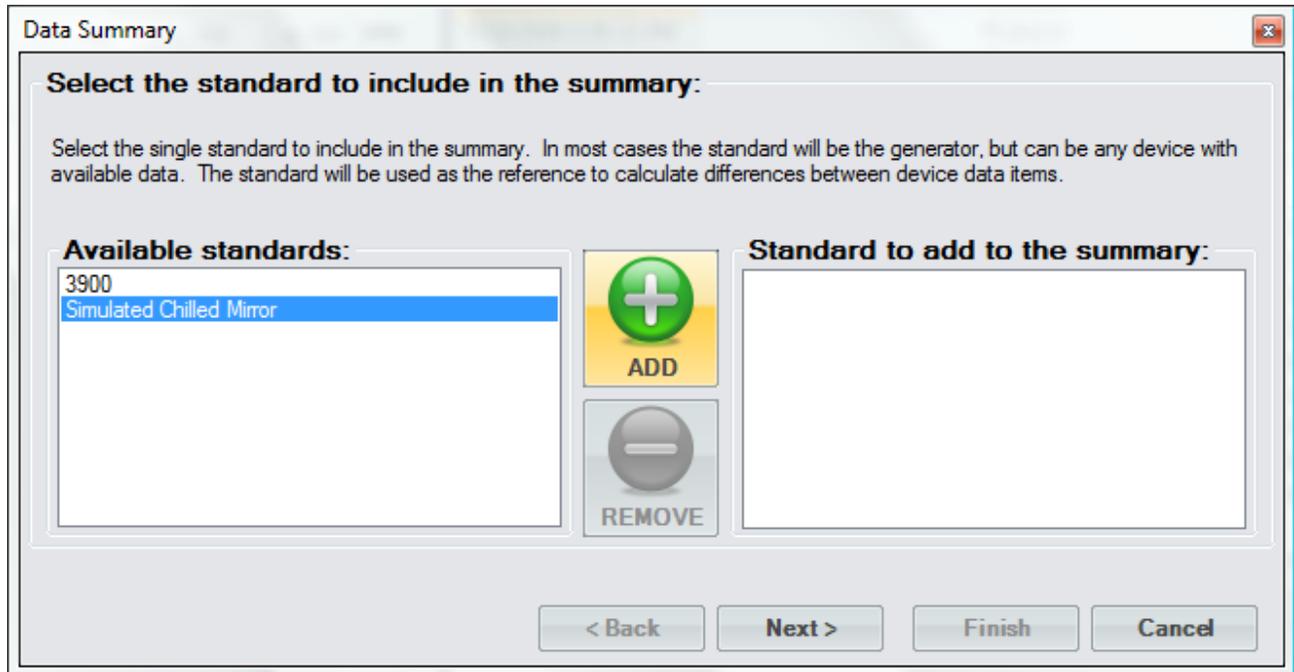
The first step in the data summary creation process is to give the data summary a name. This will be the name of the tab that appears in the Data and Graph Tab Group.



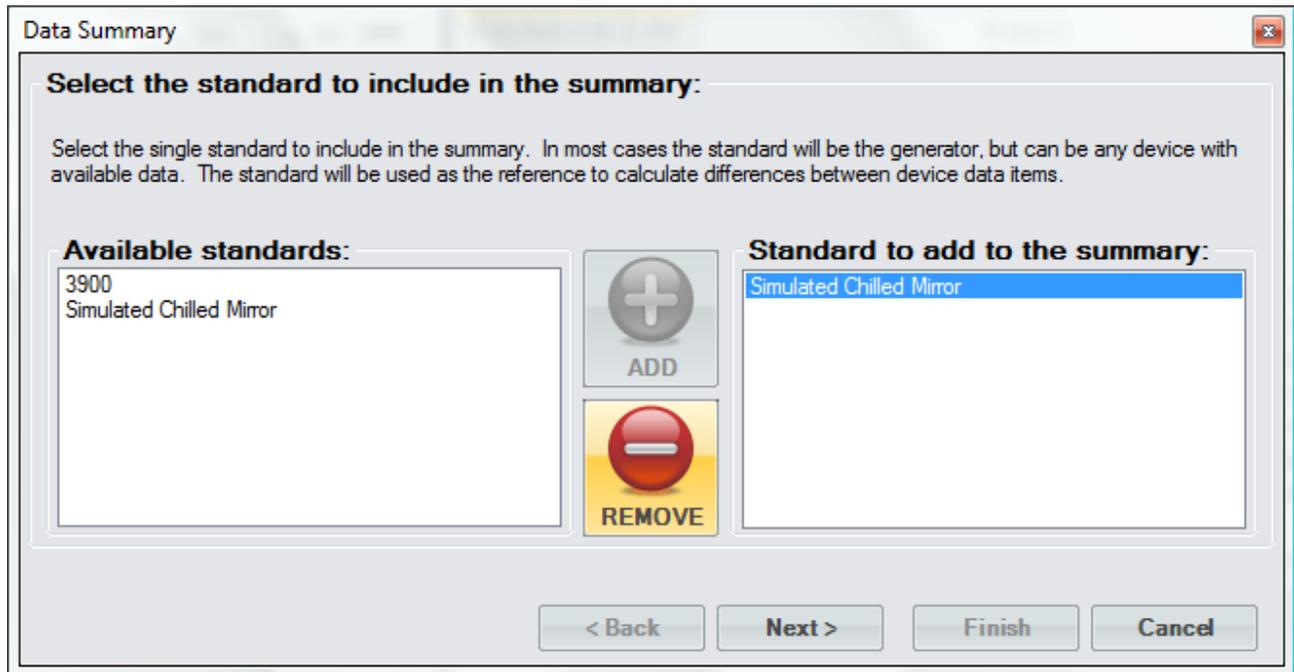
The next step in the data summary creation process is to select the standard. The standard will be used as the reference to calculate differences between the device data items if the user chooses to do so.

On the left hand side is the available devices to choose from and on the right hand side is the selected standard to add to the summary. To select a device, highlight it and click the “Add” button. In almost all cases the standard will be the 3900.

*Note: Only one device can be selected as the standard for the summary.*

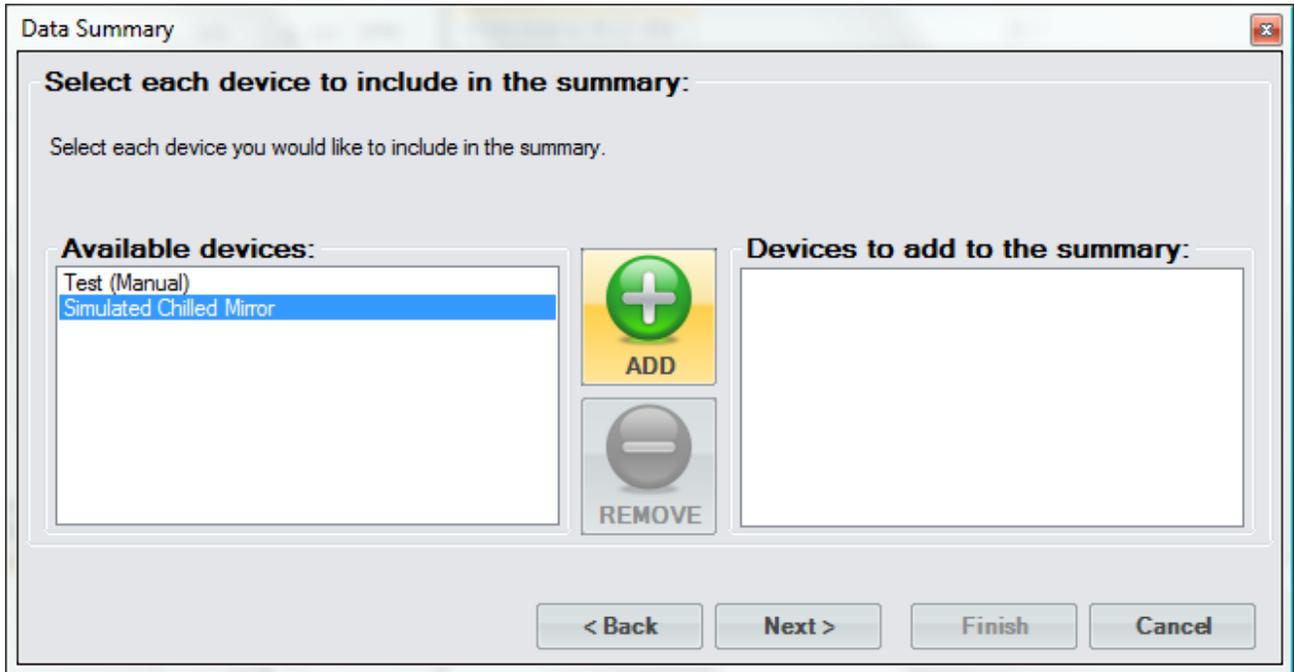


To remove an item as the selected standard, select the desired item from the right hand side and click the “Remove” button.



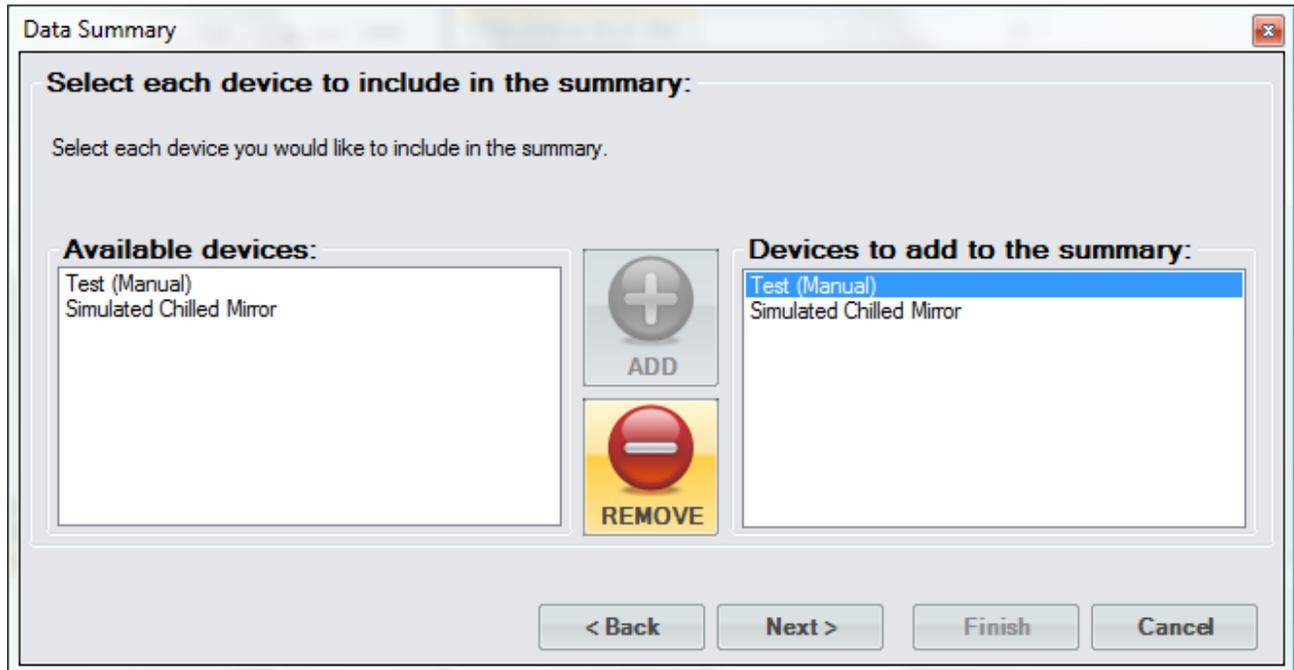
Once complete, selecting the “Next” button will allow the user to select each device they would like to include in the summary. On the left hand side are the available devices to choose from and on the right hand side are the selected devices to add to the summary. To select a device, highlight it and click the “Add” button.

*Note: Multiple devices can be selected and added to the summary.*

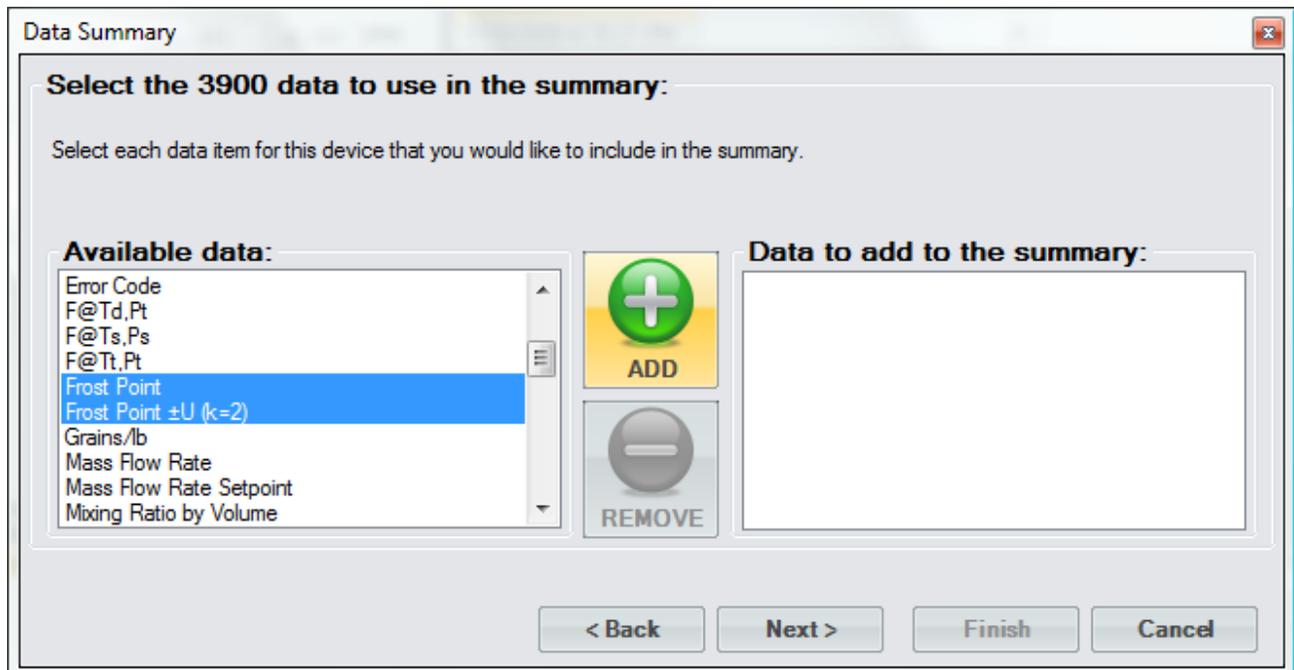


*Note: The user can invert any selection by right clicking. This will highlight all items that are not currently highlighted and will remove highlight from any items that are currently highlighted.*

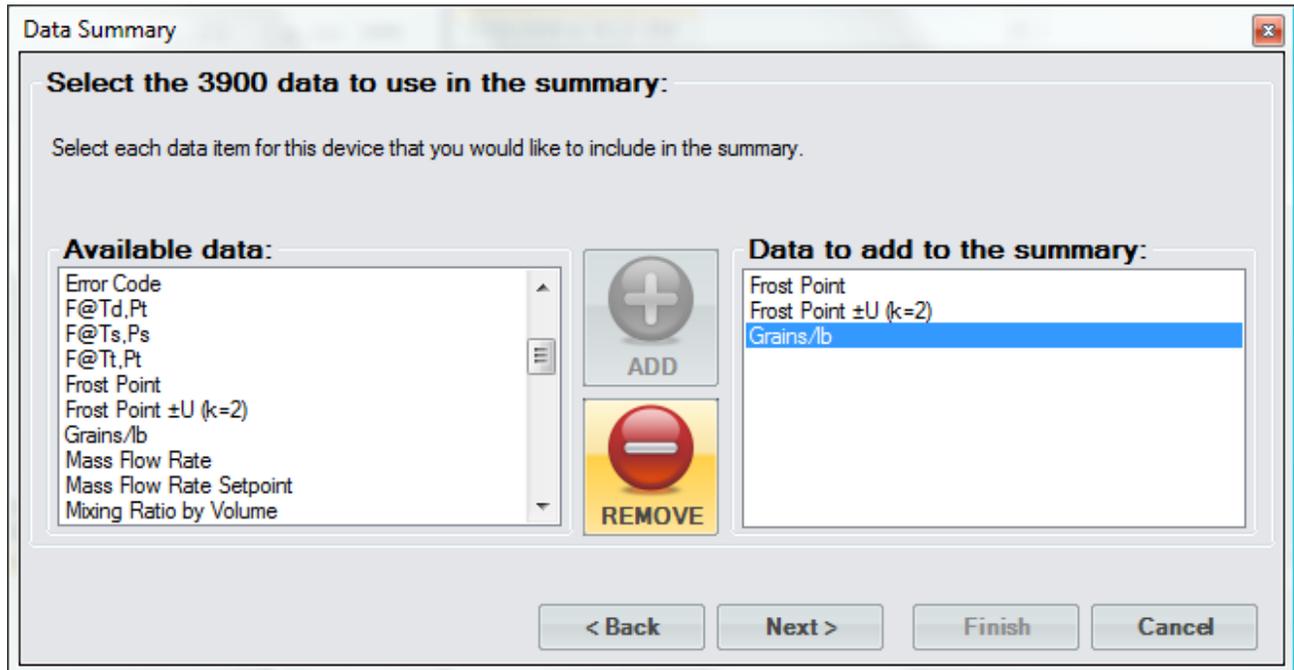
To remove an item from the list of devices, select the desired item or items from the right hand side and click the “Remove” button.



Once complete, selecting the “Next” button will allow the user to select the standard’s data items they would like to include in the summary. On the left hand side are the available data items to choose from and on the right hand side are the selected data items to add to the summary. To select a data item or items, highlight them and click the “Add” button.



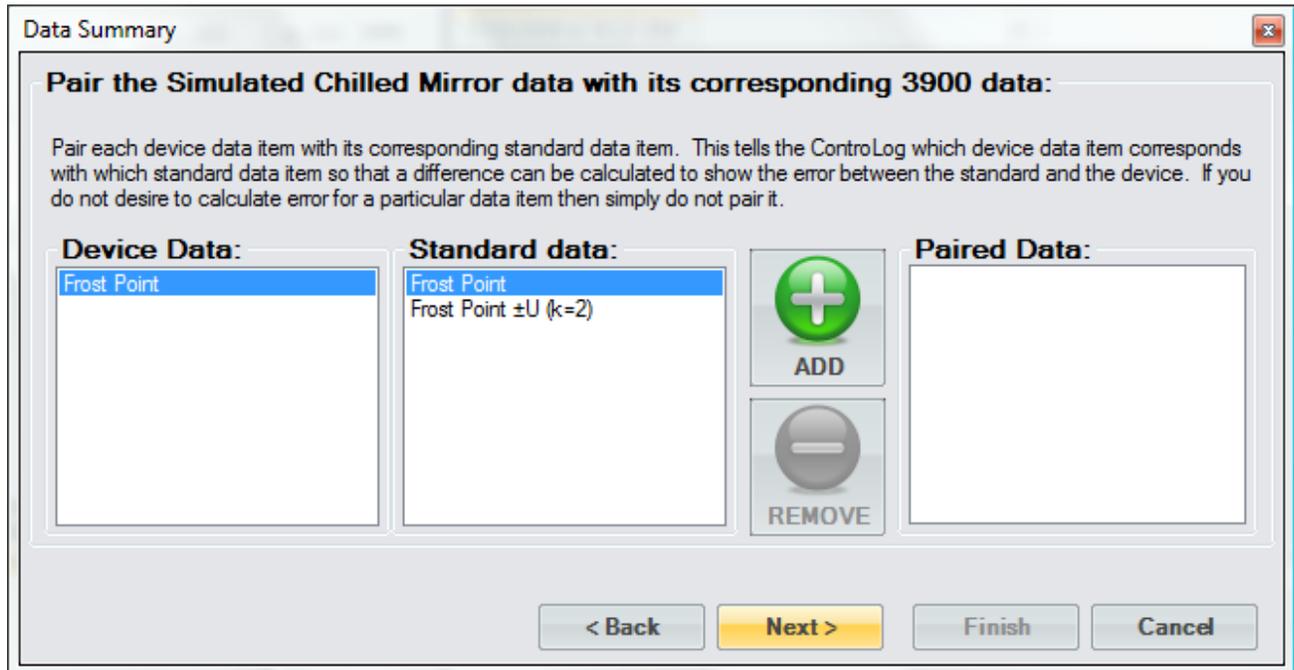
To remove an item or items from the list of data items, select the desired item or items from the right hand side and click the “Remove” button.



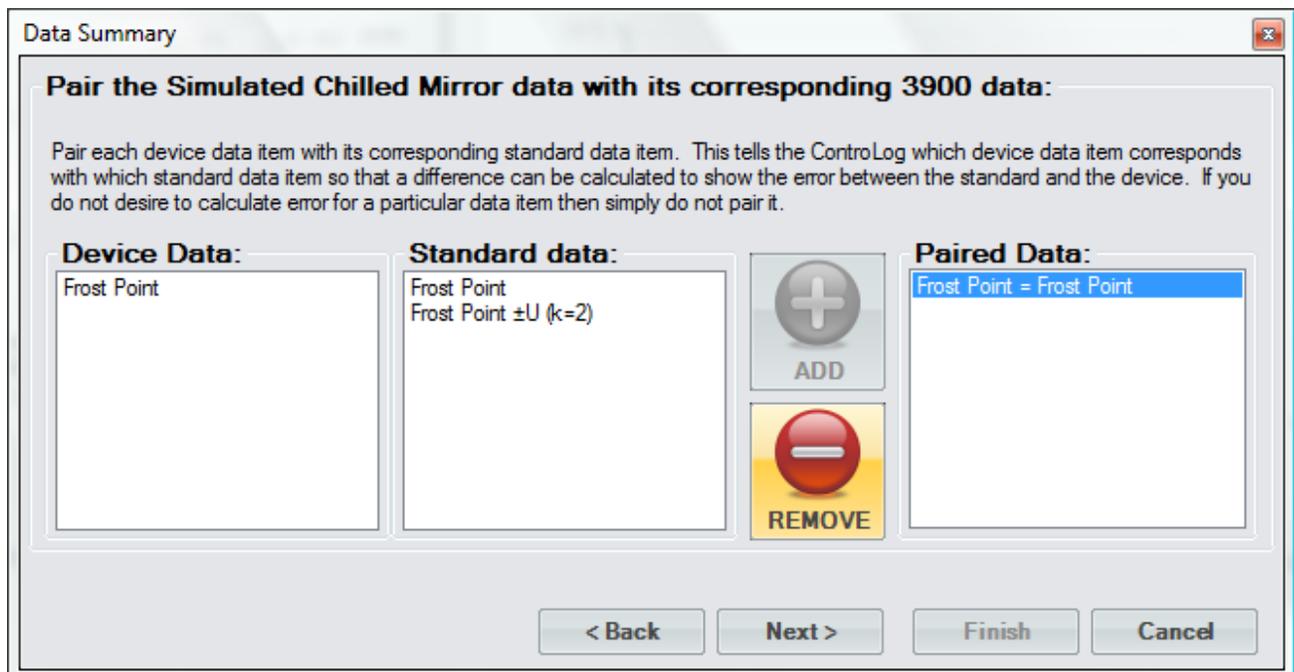
Selecting the “Next” button will repeat the process of selecting data for the next device in the series. This will continue until the user defines all the device data they wish to include in the data summary.

Once the user has completed selecting data, ControLog will ask the user to pair each device data item with its corresponding standard data item. This tells ControLog which device data item corresponds with which standard data item so that a difference can be calculated and the error between the standard and the device can be included in the summary. If the user does not desire to calculate error for a particular data item they simple need not pair it.

To pair a data item, select the desired device data item and the standard data item you would like to pair it with. Select “Add” to create the pairing.



To remove a data item pairing, select the desired pair or pairings from the right hand side and click the “Remove” button.



Selecting the “Next” button will repeat the process of pairing data for the next device in the series. This will continue until the user defines all the desired data pairs they wish to include in the data summary.

Once data pairing is complete, the user will be asked to select the time range and interval that the data summary will cover. The selected device’s time range will be used to determine which points to include. The data will begin at the

closest point to the selected start time and will end at the closest point to the selected end time. The summary will include all available data points between the start and end times at the closest points to the specified interval. If a particular device does not have a corresponding time for a given base time, then the value fields will be left blank for that device for that given time.

*Note: For manual devices it is recommended to select the manual device as the bases of the time range. It is also recommended to select a small time interval (1 second) to assure all data is encompassed because often manual devices have irregular time intervals between points.*

**Data Summary**

**Select the time range the summary will cover:**

Select the device for which you want to base the data summary's time range on. The data will begin at the closest point to the selected start time and will end at the closest point to the selected end time. The summary will include all available data points between the start and end times at the closest points to the specified interval.

**Device Time Range to Use:**

- 3900
- Simulated Chilled Mirror

**Start Time:** 10/29/09 12:09:14 PM

**End Time:** 10/29/09 1:10:47 PM

**Time Interval:** 1 minutes

Note: For manual devices it is recommend to select the manual device as the bases of the time range. It is also recommended to select a small time interval (1 second) to assure all data in encompassed because often manual devices have irregular time intervals between points.

< Back    Next >    **Finish**    Cancel

Upon clicking the “Finish” button, ControlLog will open a new data tab with the newly created data summary

Date/Time Stamp	3900: Frost Point [°C]	3900: Frost Point ±U (k=2) [°C]	Simulated Chilled Mirror: Frost Point [°C]	Simulated Chilled Mirror: Frost Point Error [°C]
10/29/2009 12:09:14 PM	-34.7702	0.099005483	-37.033	-2.262
10/29/2009 12:10:14 PM	-34.7	0.0989675	-37.022	-2.236
10/29/2009 12:11:14 PM	-34.8	0.098922345	-37.16	-2.358
10/29/2009 12:12:14 PM	-34.8737	0.098753913	-37.19	-2.316
10/29/2009 12:13:14 PM	-34.908	0.098671535	-37.248	-2.340
10/29/2009 12:14:14 PM	-34.8649	0.098774875	-37.164	-2.299
10/29/2009 12:15:14 PM	-34.8046	0.098921358	-37.136	-2.331
10/29/2009 12:16:14 PM	-34.7917	0.098952794	-37.128	-2.336
10/29/2009 12:17:14 PM	-34.8689	0.098765386	-37.194	-2.325
10/29/2009 12:18:14 PM	-34.7075	0.099160918	-37.117	-2.409
10/29/2009 12:19:14 PM	-34.8555	0.098797631	-37.087	-2.231
10/29/2009 12:20:14 PM	-34.7558	0.099041336	-37.068	-2.312
10/29/2009 12:21:14 PM	-34.7884	0.098993469	-37.184	-2.414
10/29/2009 12:22:14 PM	-34.7884	0.098993469	-37.035	-2.225
10/29/2009 12:23:14 PM	-34.7884	0.098993469	-37.145	-2.250
10/29/2009 12:24:15 PM	-34.7884	0.098993469	-37.024	-2.199
10/29/2009 12:25:15 PM	-34.843	0.098827831	-37.04	-2.197
10/29/2009 12:26:15 PM	-34.7787	0.098984689	-37.142	-2.364

# Recorded Data Points Tab

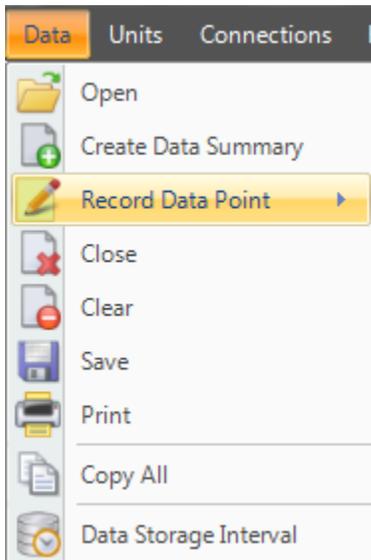
The **Recorded Data Points Tab** contains the recorded data points that have been taken either manually by the user, after a manual device entry or at the completion of a soak phase during an auto profile. Each data point can also calculate the average and or standard deviation for the defined number of prior points taken with each recorded data point.

*Note: Each entry point in the Recorded Data Points tab is created using the currently selected system units.*

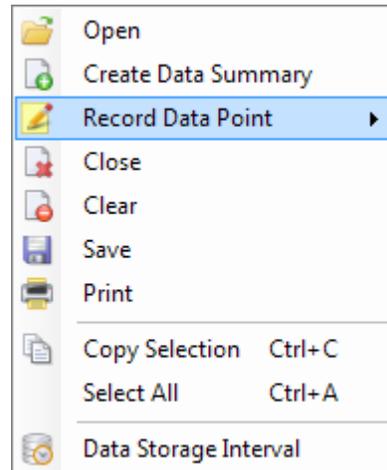
Point 1	2500	
Date/Time Stamp	Dry Air Density [g/m <sup>3</sup> ]	
8/27/2012 1:32:31 PM	37.572888	0.466373
8/27/2012 1:32:36 PM	37.600163	0.466694
8/27/2012 1:32:41 PM	37.897638	0.470621
8/27/2012 1:32:46 PM	37.897638	0.470621
8/27/2012 1:32:51 PM	38.159161	0.473587
8/27/2012 1:32:56 PM	38.42108	0.47691
8/27/2012 1:33:01 PM	38.298111	0.475418
8/27/2012 1:33:06 PM	38.370131	0.476314
8/27/2012 1:33:11 PM	38.370131	0.476314
8/27/2012 1:33:13 PM	38.459779	0.477408
Average	38.104672	0.473026
Std Dev	0.33839308	0.0041882154

## How to Record a Data Point

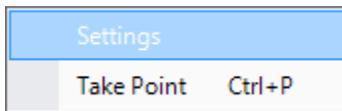
To Record a Data Point, select “Record Data Point” from the main menu or right click a data tab and select “Record Data Point”.



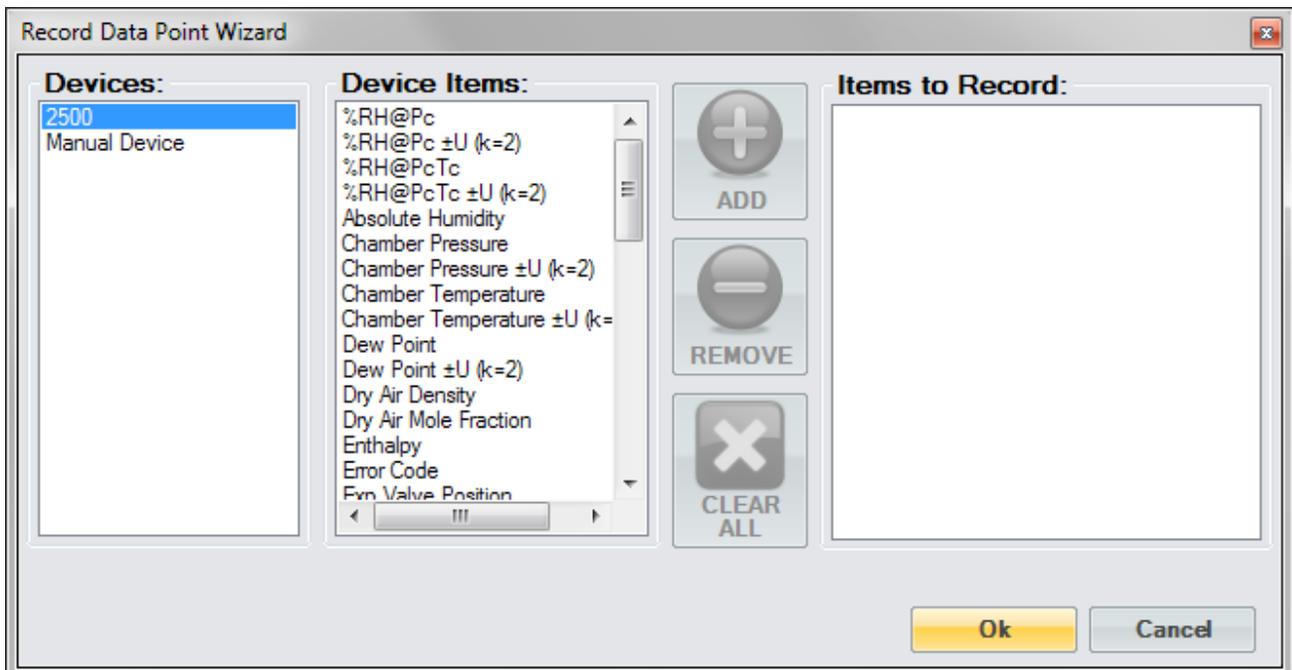
or



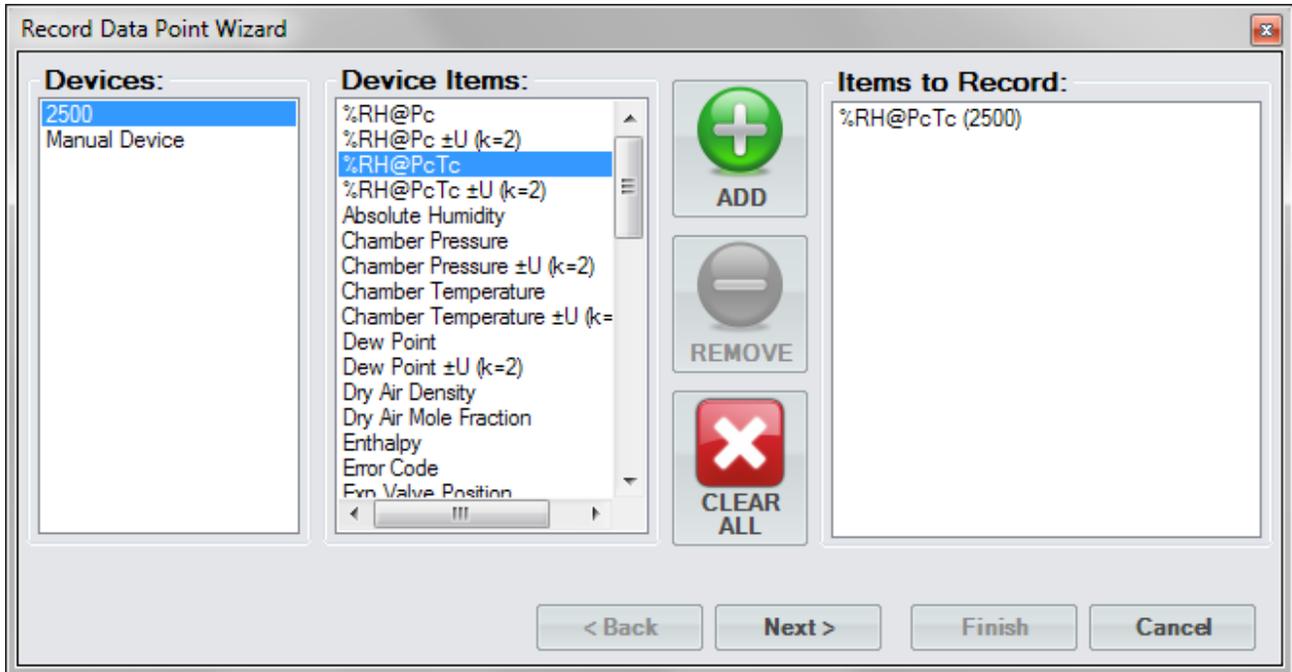
The first step in recording data points is to configure what and how to take each point. Use the Settings menu to open the Record Data Point Wizard to define the data points to be taken.



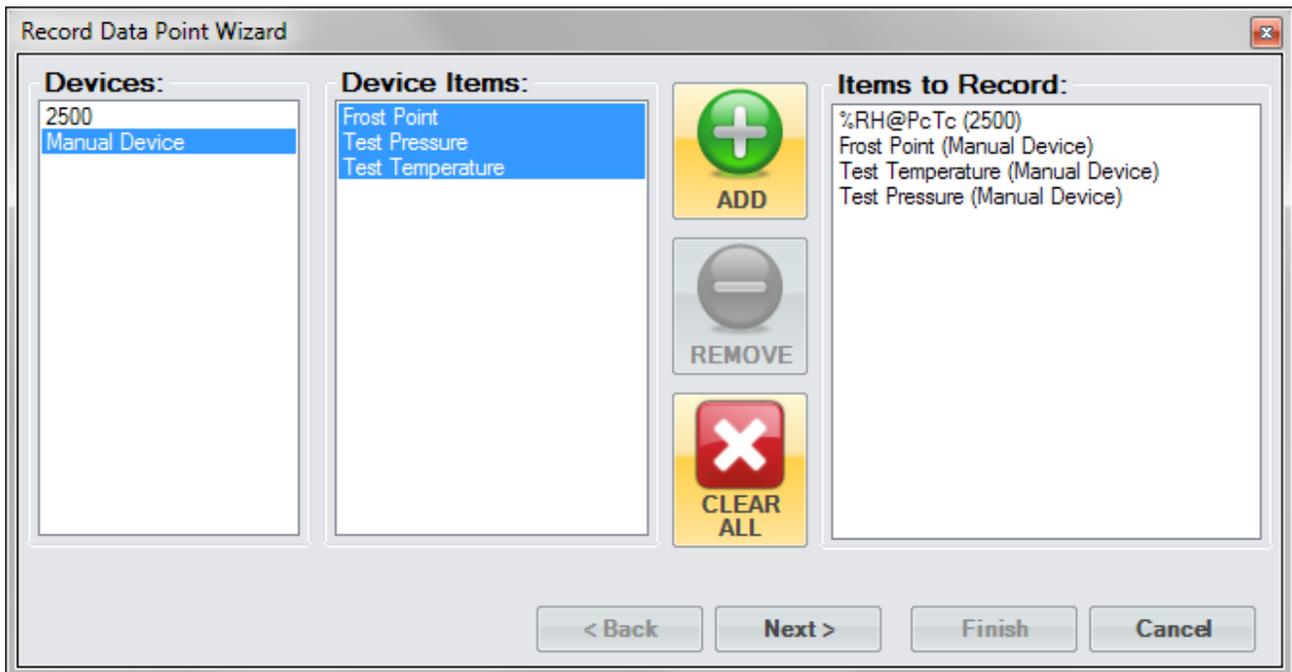
A “Record Data Point Wizard” dialog will appear.



The first page of the Record Data Point Wizard is where the user selects which device items they would like record. On the left hand side is a list of all available devices. Selecting a device will result in the “Device Items” list being updated to reflect the available items for the selected device. To add an item, highlight the desired item or items in the “Device Items” list and click the “Add” button.

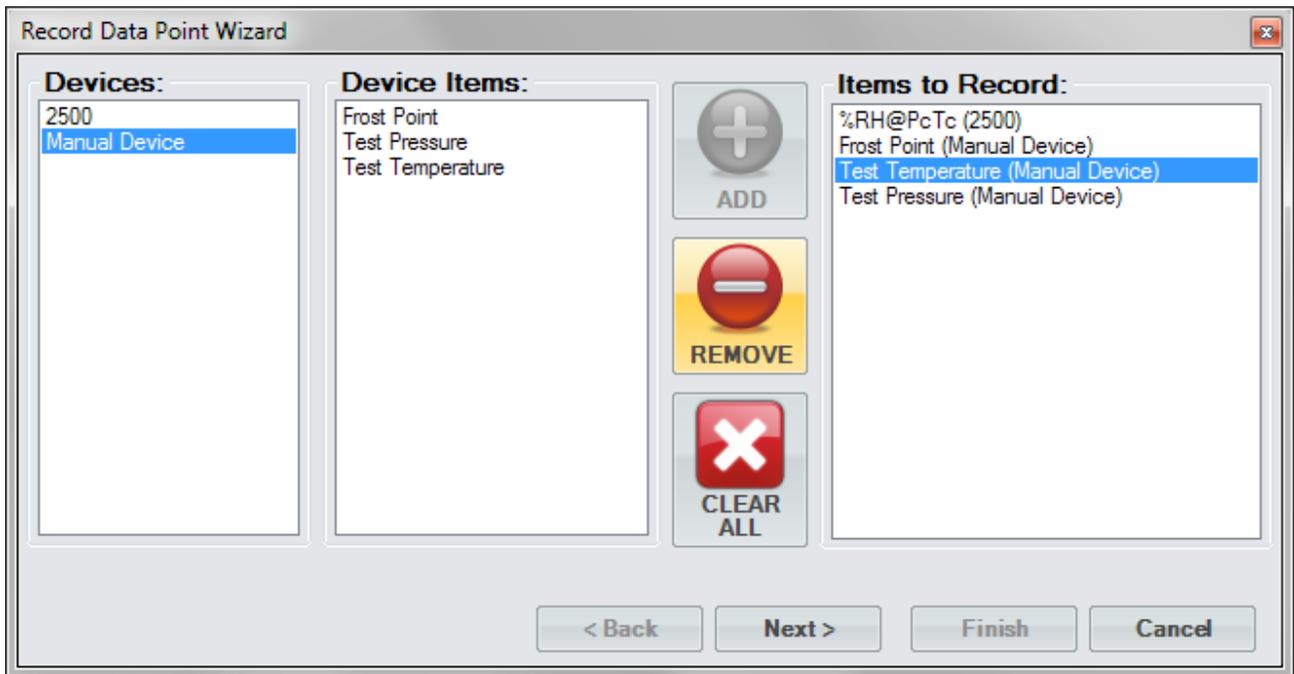


Repeat this process until all the desired items are listed on the right side.

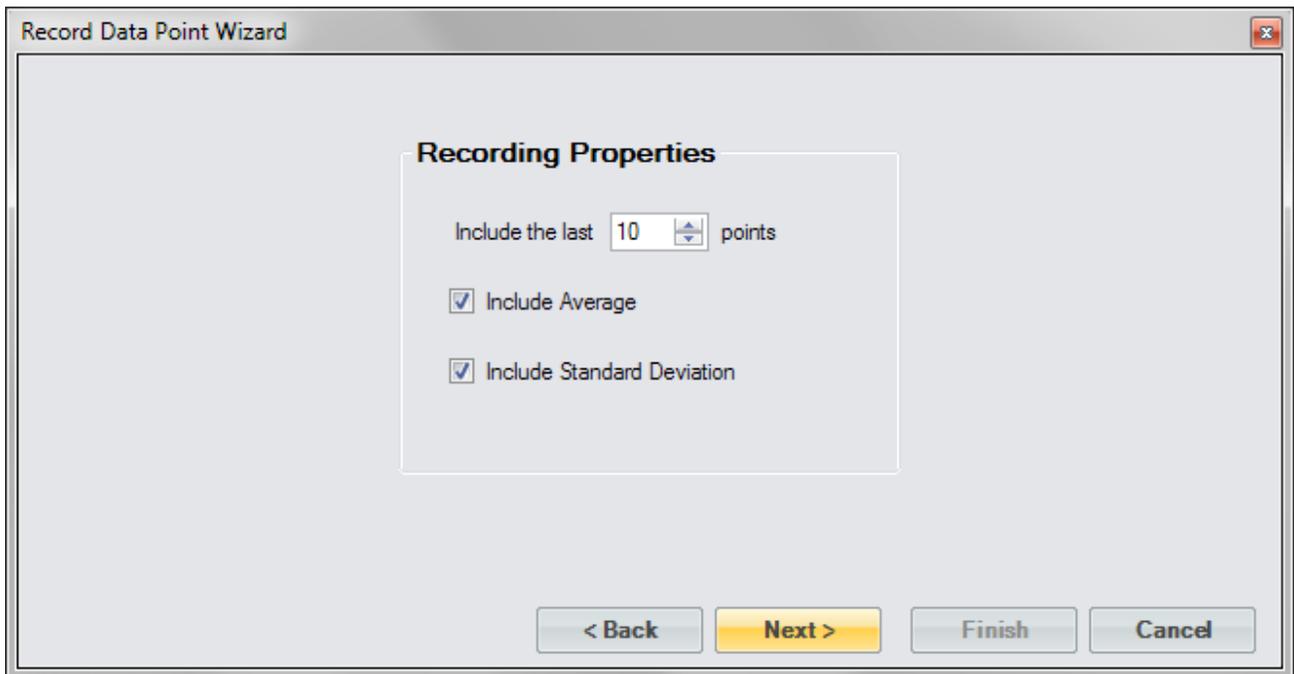


*Note: The user can invert any selection by right clicking. This will highlight all items that are not currently highlighted and will remove highlight from any items that are currently highlighted.*

To remove an item from the list of items to record, the user can either click the “Clear All” button to remove all items or simply select the desired item from the “Items to Record” list and click the “Remove” button.



Once complete, clicking the “Next” button will bring up the Properties page. From the properties page the user can define what will be recorded for each point.



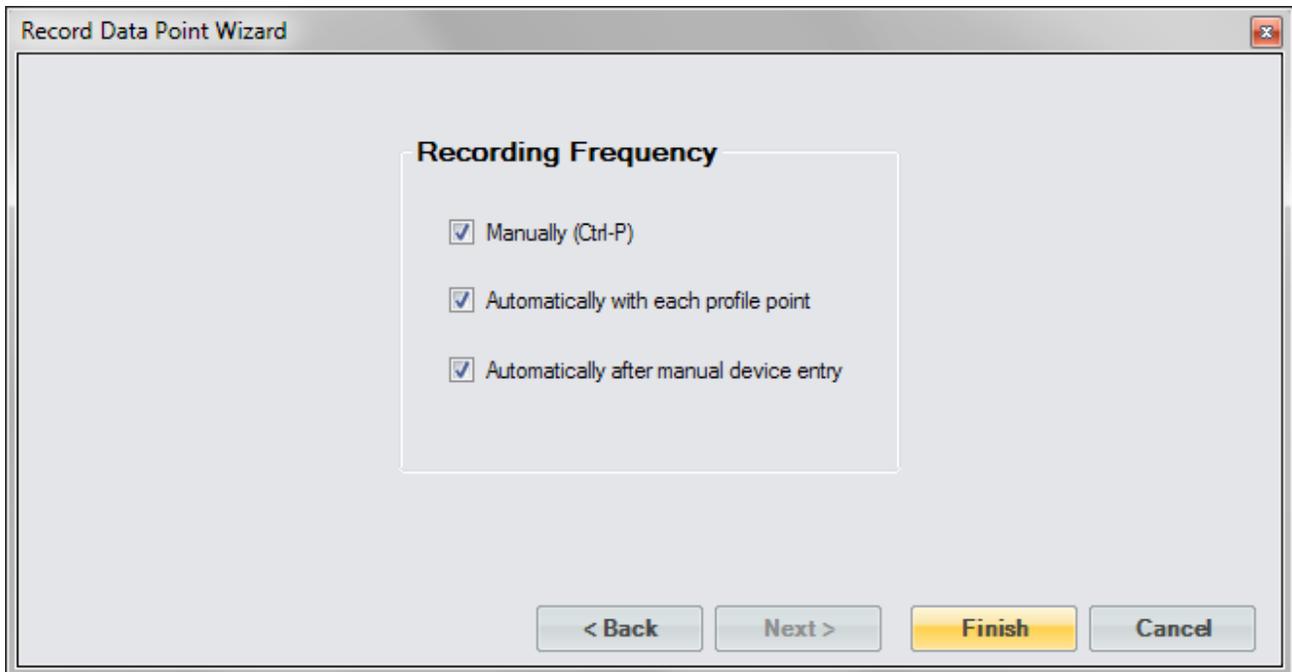
**Recording Properties** define the number of prior (last) points to include and whether to calculate the average and or standard deviation for the defined number of prior points taken with each recorded data point.

**Include the last ... points** defines the number of prior points to include with each recorded data point. The prior points are determined from the Data Tab for each point being recorded. ControLog will include the number of prior (last) points directly using the entries in the Data Tab for the given point from the time the data point was recorded.

**Include Average** defines whether to include an average of the defined number of prior points for the recorded data items for each point taken.

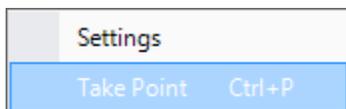
**Include Standard Deviation** defines whether to include the standard deviation of the defined number of prior points for the recorded data items for each point taken.

Once complete, clicking the “Next” button will bring up the frequency page. From the frequency page the user can define when and how to take a data point.



**Recording Frequency** defines when and how the system will take a data point. The user should select (place check mark) by each method they would like to use.

**Manually** indicates that the user will manually take points when they want, using either the “Take Point” menu item or by pressing the Ctrl-P key combination on the keyboard.



**Automatically with each profile point** indicates that a point will be taken automatically at the completion of each profile soak phase.

*Note: If the user manually bypasses the soak phase using the manual profile control buttons, an automatic point will NOT be taken regardless of the selection of “Automatically with each profile point” setting.*

*Automatically after manual device entry* indicates that a point will be taken automatically when the user completes a manual device entry.

Once complete, clicking the “Finish” will close the wizard and save the user selection for recording data points.

2500 Data		Auto Profile		Manual Device Data		%RH@PcTc		Recorded Data Points	
Recorded Data Points									
Manual Device Entry Point 1		2500		2500		Manual Device		Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]	Test Pressure [psia]	Test Temperature [°C]	All recorded data points will appear in the Recorded Data Points tab			
9/11/2012 1:57:46 PM	-0.46677127	25.000000	9.3924	12.128	20.127	Points taken automatically after data entry for a manual device will be labeled "Point" followed by the number taken			
9/11/2012 1:58:16 PM	-0.47586164	24.995000	9.3924	12.128	20.127				
9/11/2012 1:58:46 PM	-0.47233929	24.995000	9.3924	12.128	20.127				
Average	9.3914635	50.006167	9.3924	12.128	20.127				
Std Dev	0.0017532385	0.0039106692	0	0	0				
Point 1		2500		2500		Manual Device		Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]	Test Pressure [psia]	Test Temperature [°C]	Points taken manually by the user will be labeled "Point" followed by the number taken			
9/11/2012 1:57:46 PM	-0.46677127	50.0105	9.3924	12.128	20.127				
9/11/2012 1:58:16 PM	-0.47586164	50.0051	9.3924	12.128	20.127				
9/11/2012 1:58:46 PM	-0.47233929	50.0051	9.3924	12.128	20.127				
Average	9.3906544	50.0069	9.3924	12.128	20.127				
Std Dev	0.001965995	0.0031176915	0	0	0				
Profile Point 1		2500		2500		Manual Device		Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]	Test Pressure [psia]	Test Temperature [°C]	Average and Standard Deviation can be calculated for each data item in each point			
9/11/2012 1:57:46 PM	-0.46677127	25.000000	9.3924	12.128	20.127				
9/11/2012 1:58:16 PM	-0.47586164	24.995000	9.3924	12.128	20.127				
9/11/2012 1:58:46 PM	-0.47233929	24.995000	9.3924	12.128	20.127				
Average	-0.4716574	24.9944	0	0	0				
Std Dev	0.0045833863	0.010877959	0	0	0				
Profile Point 2		2500		2500		Manual Device		Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]	Test Pressure [psia]	Test Temperature [°C]	Points taken automatically after an autoprofile soak phase will be labeled "Profile Point" followed by the profile point number			
9/11/2012 2:09:16 PM	-0.46677127	25.000000	9.357444	49.988	20.127				
9/11/2012 2:09:46 PM	-0.47586164	24.995000	9.3583322	49.9935	20.127				
9/11/2012 2:10:16 PM	-0.47233929	24.995000	9.3583322	49.9935	20.127				

# Auto Profiling

The Auto Profiling feature is very similar to the Generate and Purge modes with the main exception that profiling relies on a predefined list of setpoints referred to as a profile. The user configurable profile is used as ControLog's road map during Auto Profile operation. It defines which setpoint values to go to, at what rate to go from one setpoint to another, and how long to stay at a specific setpoint before moving to the next setpoint.

*Note: Before attempting to operate the system in an Auto Profile mode, you should become thoroughly familiar with the manual Generate and Purge mode of operation.*

The Profile Tab is used to create and modify auto profiles. The tab consists of drop downs, entry fields and a data grid.

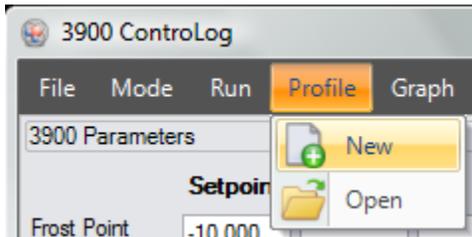
The screenshot shows the 'Auto Profile' configuration window. The 'Control Mode' is set to 'Dew Point'. The 'Test Pressure' is 14.700 psia and the 'Test Temperature' is 23.000 °C. The data grid below contains the following information:

Point	Generator Mode	Dew Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Warning	-90	0.5	0		Yes
2		-90	0.5	0		No
3	Generate	-80	0.5	0		No
4	Generate	-85	0.5	0	minutes 1 hours	No
*						

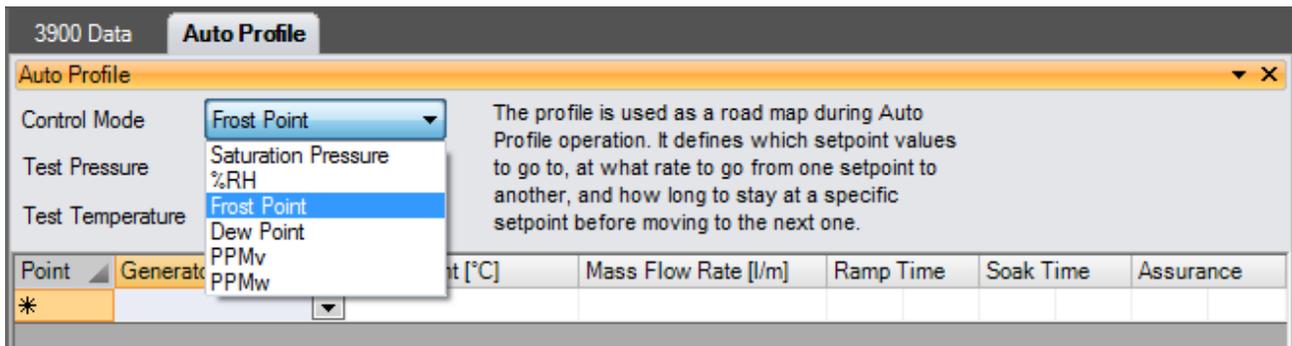
# Creating a New Profile

A profile is a list of humidity, temperature, pressure, flow, and time parameters that are used during automated control of the 3900 generator. The profile essentially programs the computer/controller operations.

Open a new profile tab by selecting “New” from the profile menu.

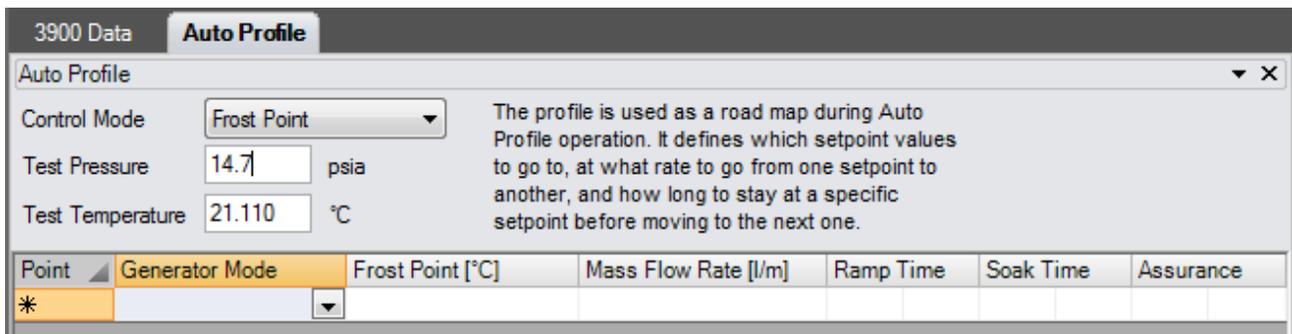


Select the desired **Control Mode** for the entire profile. The Control Mode is what the user would like to generate during the profile. The control modes are the same modes available during manual operation.

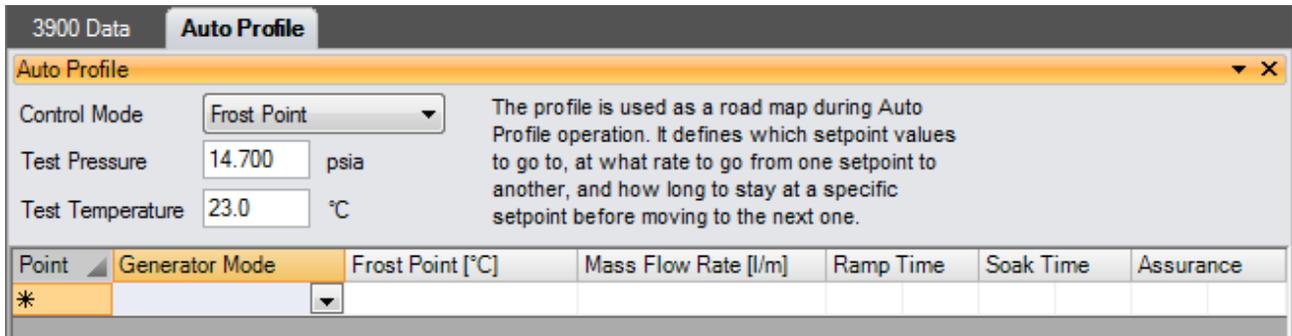


For more information, see [Mode Menu](#).

Enter the **Test Pressure** to be used during the entire profile. This value is not required and is ignored if the 3900 test pressure transducer is plugged in. When the test pressure transducer is not plugged in, calculations of Frost Point, Dew Point, and %RH are referenced to this user entered test pressure value rather than a measured value. For accurate humidity generation under these conditions, the absolute pressure at the device under test should be entered as the test pressure.

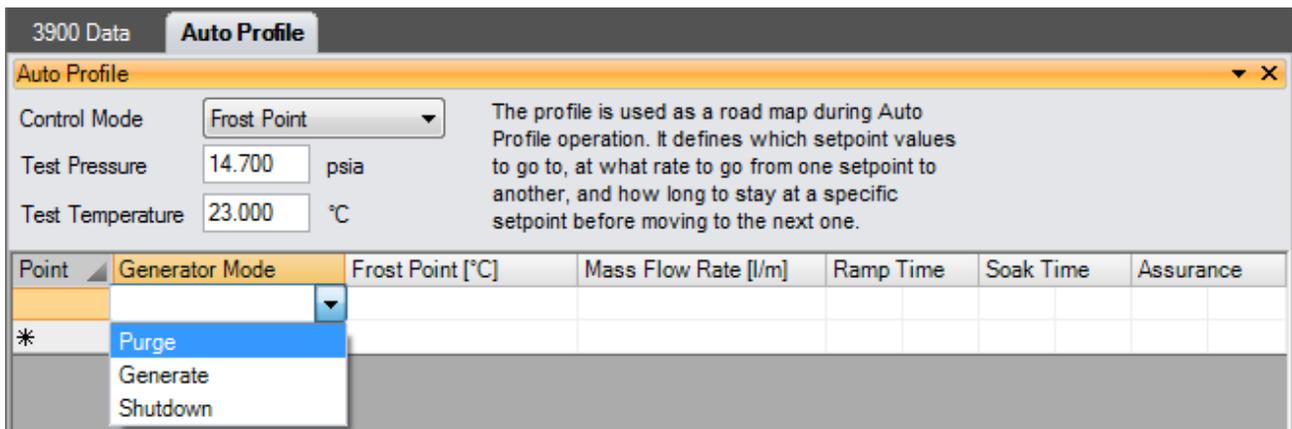


Enter the **Test Temperature** to be used during the entire profile. This value is not required and is ignored if the 3900 test temperature probe is plugged in. When the test temperature probe is not plugged in, calculations of %RH are referenced to this user entered test temperature value rather than a measured value. For accurate humidity generation under these conditions, the temperature at the device under test should be entered as the test temperature.



The first column, next to the point numbers, is the Generator Mode. The generator mode defines the run mode that the 3900 will operate in for this profile point. The generator modes are the same run modes available during manual operation.

*Note: Shutdown is only available for the last point.*



For more information, see [Run Menu](#).

The first column next to the Generator Mode contains the humidity value to generate and is titled at the top according to the currently selected control mode. In the example shown, the profile control mode is set to Dew Point. Whenever the profile control mode is changed, the title on this column changes to reflect the control mode selected.

The screenshot shows the 'Auto Profile' window for the 3900 Data. The 'Control Mode' is set to 'Dew Point'. The 'Test Pressure' is 14.700 psia and the 'Test Temperature' is 23.000 °C. A text box explains that the profile is used as a road map during Auto Profile operation, defining setpoint values, rates, and soak times. Below this is a table with the following data:

Point	Generator Mode	Dew Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
	Purge	-90				
*						

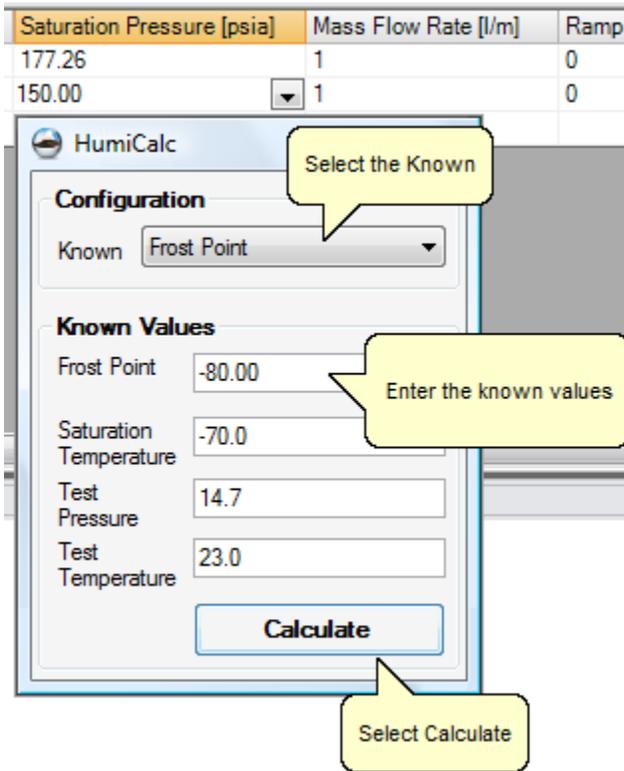
When the Control Mode is set to Saturation Pressure, the first column next to the Generator Mode contains the Saturation Temperature followed by the Saturation Pressure. In this control mode the user can also drop down a Mini version of HumiCalc to help calculate the desired Saturation Temperature or Pressure by clicking the drop down arrow on the desired cell. For example, let's say the user wants to calculate the required Saturation Pressure needed to generate a -80.0 °C Frost Point with a Saturation Temperature of -70.0 °C. Start by entering a -70.0 °C Saturation Temperature and then click the Saturation Pressure HumiCalc drop down at the right of the cell box.

The screenshot shows the 'Auto Profile' window for the 3900 Data with the 'Control Mode' set to 'Saturation Pressure'. The 'Test Pressure' is 14.700 psia and the 'Test Temperature' is 23.000 °C. A text box explains the profile's function. The table below shows the profile data:

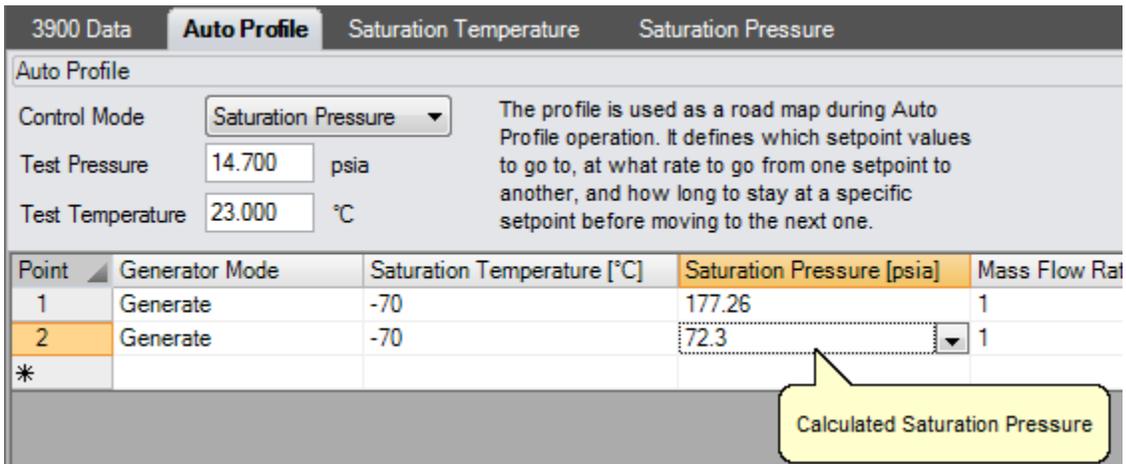
Point	Generator Mode	Saturation Temperature [°C]	Saturation Pressure [psia]	Mass Flow Rate [l/m]
1	Generate	-70	177.26	1
2	Generate	-70	150	1
*				

A callout box labeled 'HumiCalc Drop Down' points to a small dropdown arrow in the Saturation Pressure cell for Point 2.

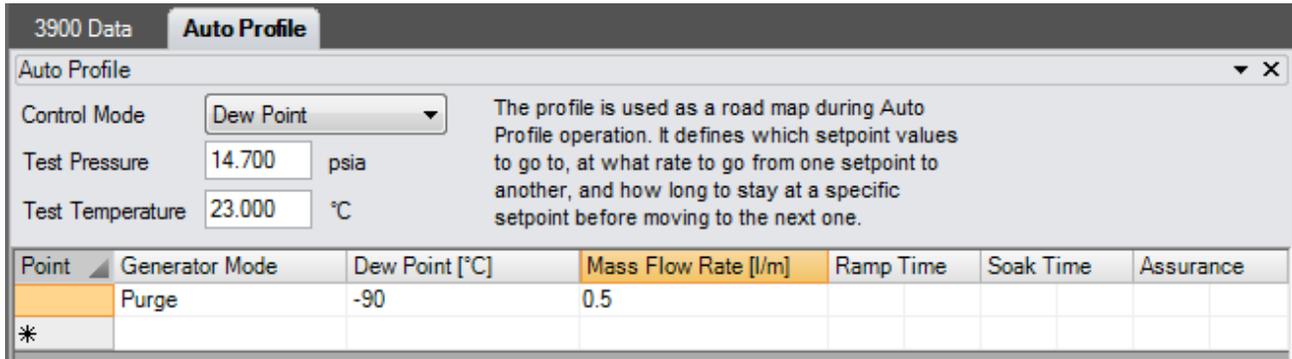
Next, select the known to be Frost Point and enter the desired Frost Point temperature of -80.0 °C. Notice that ControLog automatically entered the other known values based on the already entered profile values.



Clicking the “Calculate” button will result in the calculated Saturation Pressure being placed in the profile cell and the HumiCalc dropdown will close.

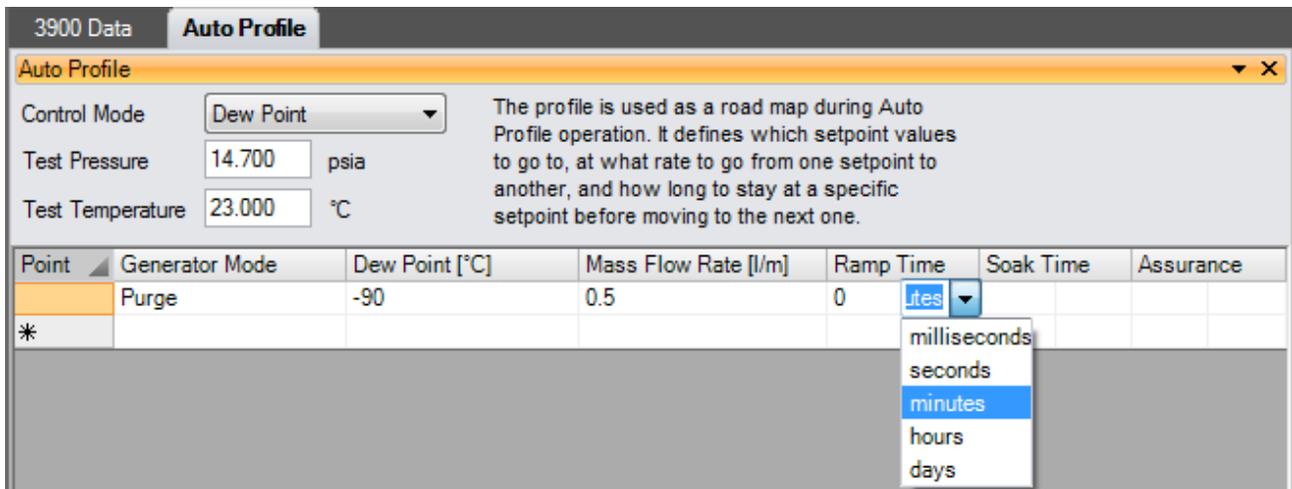


The **Mass Flow Rate** column contains values of the air flow at which the generator will operate. Although not affecting the generated value of humidity, flow rate does affect the air exchange rate, equilibration time of the instruments under test and permeation.

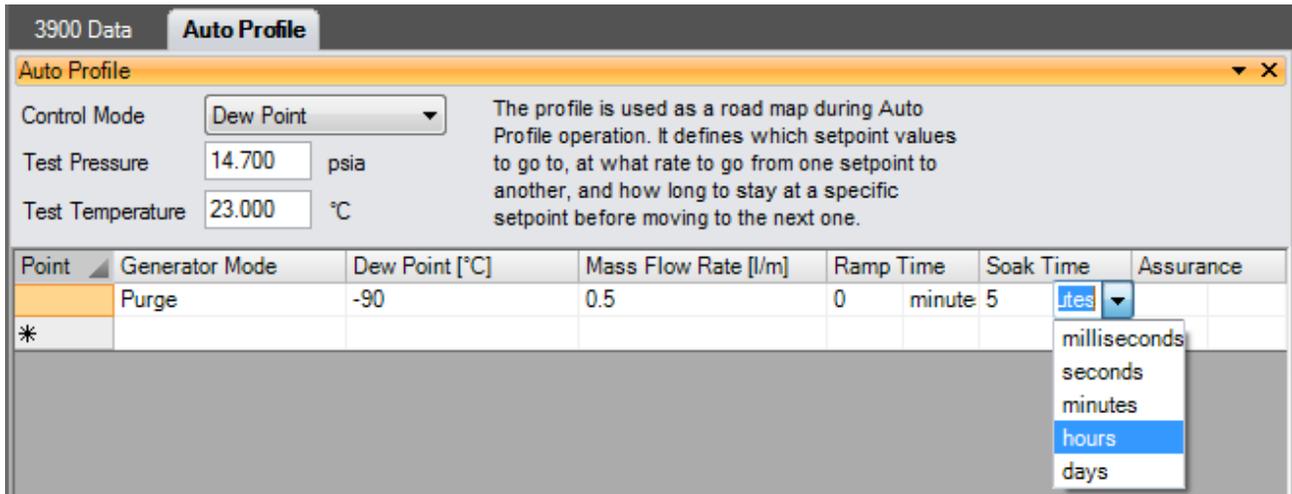


**Ramp Time** is the desired amount of time the 3900 should take to transition from one profile test point to another. Setting a ramp time of zero instructs the 3900 to make the transition as quickly as possible. Zero is the setting used for most profiles.

*Note: The first point should not have a ramp time, because the starting setpoints can vary.*

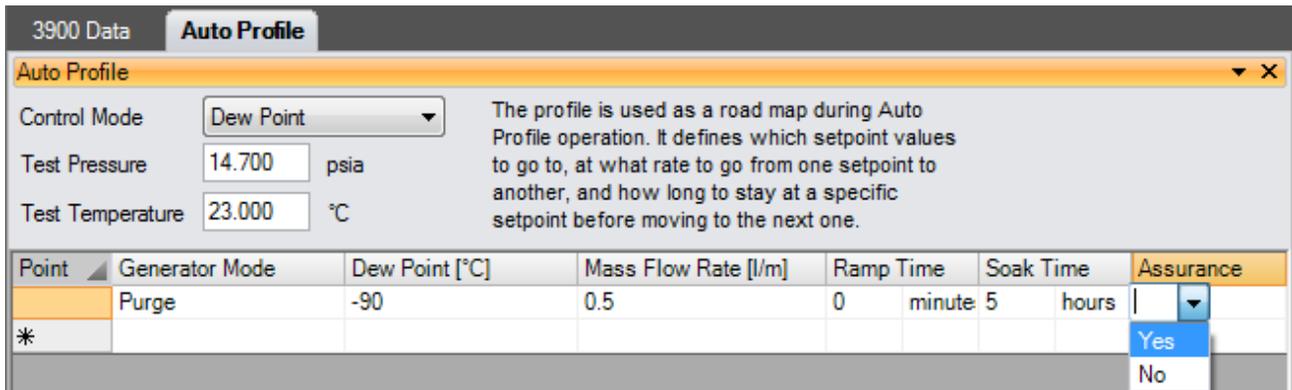


**Soak Time** is the desired amount of time to generate at a particular profile point. The soak time required depends on the application, but should be a significant amount of time based upon the humidity measurement devices being calibrated.

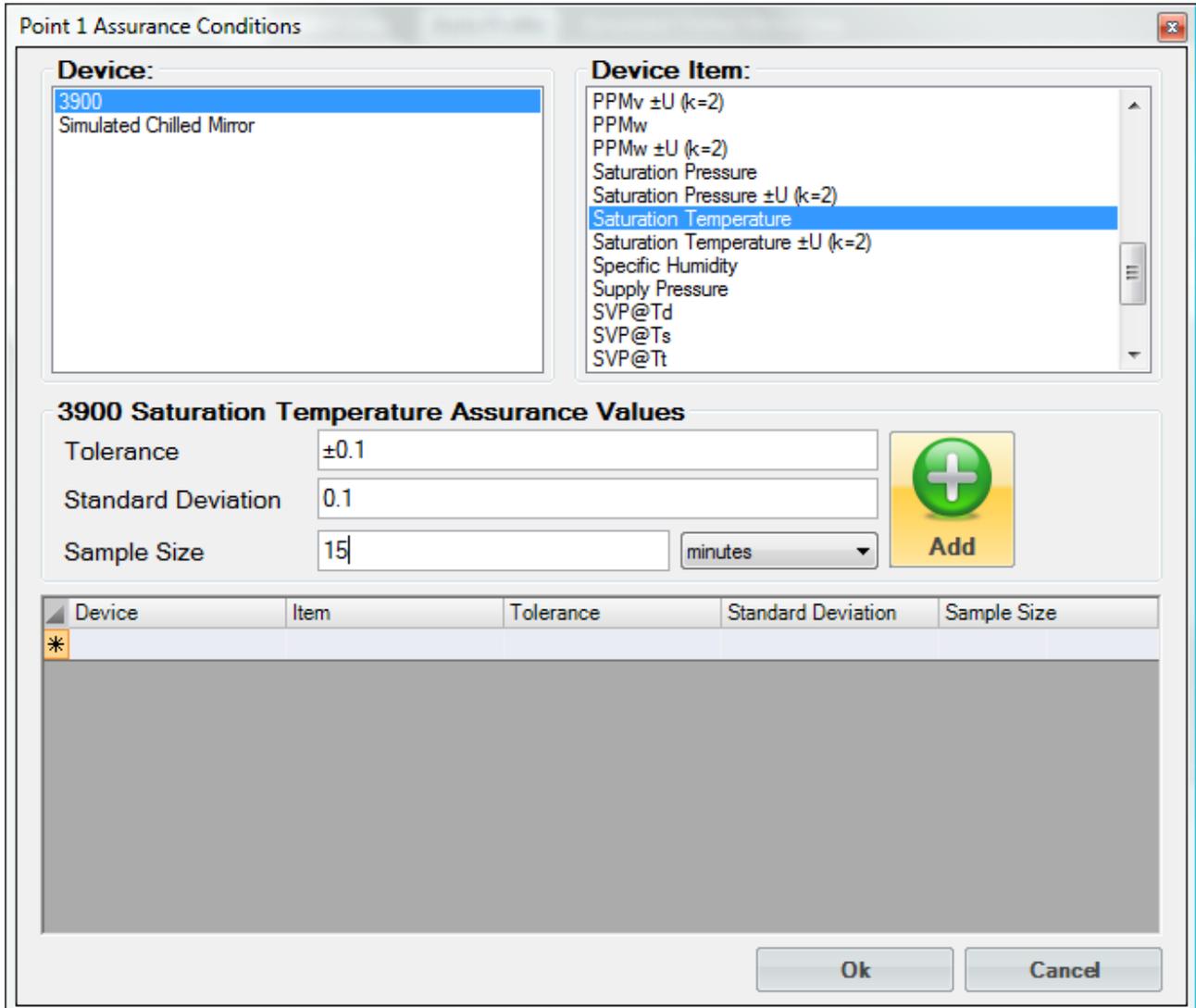


*Note: Both Ramp Time and Soak Time are limited to a maximum time of 24.8551348032407 days.*

**Assurance**, if set to “Yes”, forces the system to wait until the measured values are within a specified tolerance and stability before ControLog will start the Soak Phase. If “No” is set, the Soak Phase will start immediately upon completion of the Ramp Phase.



If Assurance is set to “Yes”, a small “Add” button will appear on the right hand side. Clicking the “Add” button will open the “Assurance Conditions” dialog for the point. The dialog allows the user to enter various assurance conditions for the profile point.



On the upper left hand side is a list of all available devices. Clicking a device will result in the Device Items list being updated to reflect the available items for the selected device. To add an item, highlight the desired item in the Device Item list, enter the desired Tolerance and/or Standard Deviation and click the “Add” button. For quicker assurance times, increase the Tolerance and/or the Standard Deviation values. Tighter tolerances or standard deviations (smaller values) result in longer assurance times. Setting these values too small could prevent assurance conditions from being met, therefore preventing the system from advancing to the next profile point.

The **Tolerance** is the allowable variation between the setpoint and the actual. This is best thought of as a window based on a minimum and maximum value, the minimum being the setpoint minus the tolerance and the maximum being the setpoint plus the tolerance. Once the actual value is within the window the tolerance portion of the condition is considered met.

*Note: Tolerances can only be entered for 3900 setpoints. The field will be grayed out for all other non 3900 setpoint device items. This is because ControlLog can only assure a tolerance for an item that it has the ability to control.*

**Standard Deviation** is a statistic used to measure the variation in the actual data and can be thought of as how spread out or stable the data is. ControLog calculates the Standard Deviation from the device data tab for the points within the given **Sample Size**. When the actual standard deviation is less than the defined limit, the standard deviation portion of the condition is considered met.

*Note: The sample size should always be carefully considered based on the data storage interval. Too small of a sample size in relation to the data storage interval will result in a small number of points used to calculate the Standard Deviation.*

To update an assurance condition, select the desired condition from the list at the bottom, make the desired changes and select the Update button. To delete an assurance condition, select the desired condition from the list at the bottom and select the Delete button.

**Point 1 Assurance Conditions**

**Device:**  
3900

**Device Item:**  
Mixing Ratio by Volume  
Mixing Ratio by Weight  
Moist Air Density  
Percent by Volume  
Percent by Weight  
PPMv  
PPMv ±U (k=2)  
PPMw  
PPMw ±U (k=2)  
Saturation Pressure  
Saturation Pressure ±U (k=2)  
Saturation Temperature

**3900 Saturation Temperature Assurance Values**

Tolerance: ±0.1  
Standard Deviation: 0.1  
Sample Size: 15.0 minutes

**Update** **Delete**

Device	Item	Tolerance	Standard Deviation	Sample Size
3900	Saturation Temperature	±0.1	0.1	15 minutes
*				

**Ok** **Cancel**

Once all assurance conditions have been completed, select the “Ok” button to close the dialog.

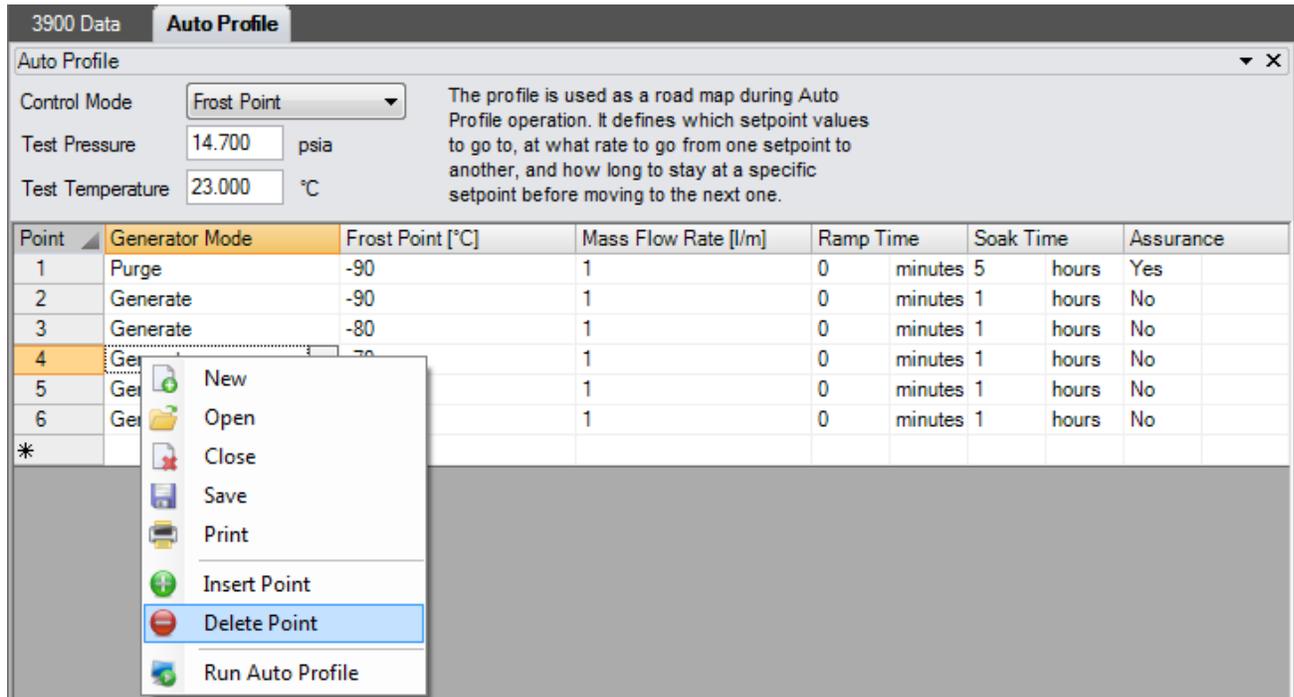
Adding more points to the auto profile is the same process as entering the first point, but the user can let ControLog help fill in values for the new point by simply entering the desired values and then by selecting the new point line (indicated by the \* asterisk). ControLog will predict values for any empty field by either copying the values from the point above or by continuing the pattern from the previous points. For example if the previous Frost Points were -90 °C and -80 °C ControLog will automatically use -70 °C for the next point if the user leaves that field empty.

Point	Generator Mode	Frost Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Purge	-90	0.5	0 minutes	5 hours	Yes
2	Generate	-90	0.5	0 minutes	1 hours	No
3	Generate	-80	0.5	0 minutes	1 hours	No
4	Generate	-70	0.5	0 minutes	1 hours	No
*						

New points can also be inserted between existing points by right clicking and selecting “Insert Point” from the context menu. ControLog will insert a new point at the selected location and will automatically predict the values.

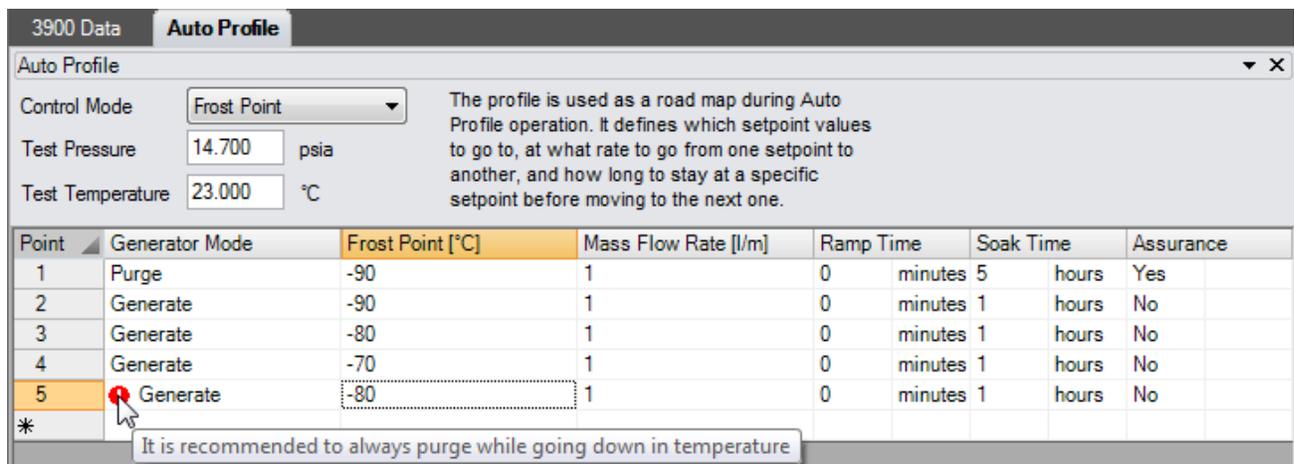
Point	Generator Mode	Frost Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Purge	-90	1	0 minutes	5 hours	Yes
2	Generate	-90	1	0 minutes	1 hours	No
3	Generate	-80	1	0 minutes	1 hours	No
4	Gen		1	0 minutes	1 hours	No
5	Ger		1	0 minutes	1 hours	No
*						

Existing points can also be deleted by selecting the desired point and then by right clicking and selecting “Delete Point” from the context menu.



Profile points that cause operational issues for the 3900 are automatically flagged by ControLog and are indicated by a red circle with an explanation point . An explanation of the issue will display once the user places the mouse cursor over the warning icon.

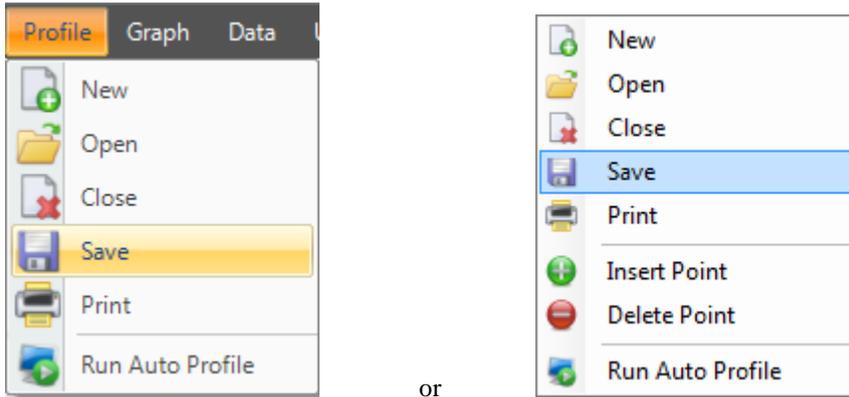
*Warning: The user should address and resolve all issues before attempting to run the Auto Profile.*



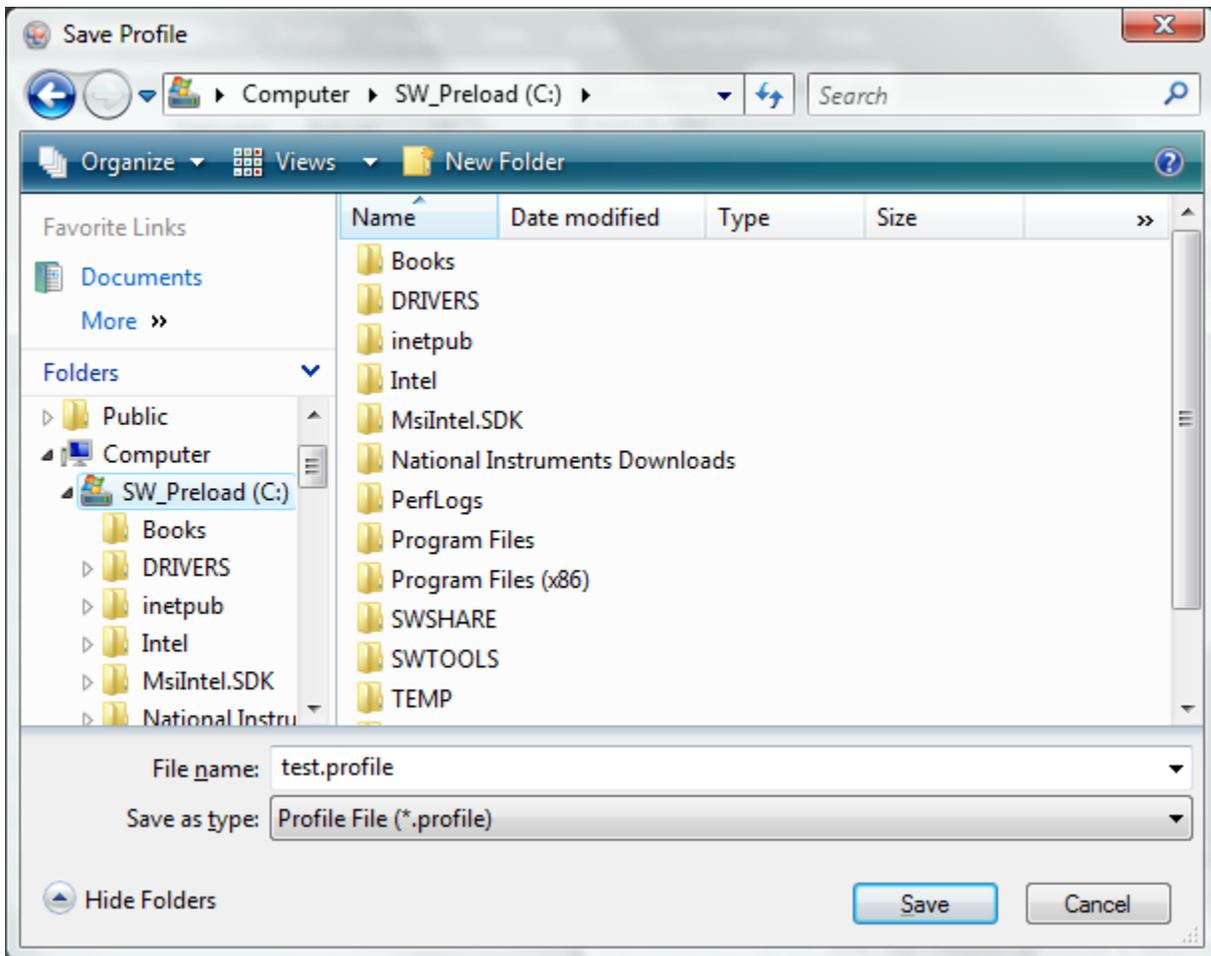
# Saving a Profile

The Profile tab can be saved to file for future recall. ControLog Auto Profiles are saved in XML format with a \*.profile extension.

To perform the save, select “Save” from the main menu or right click a profile tab and select “Save”.



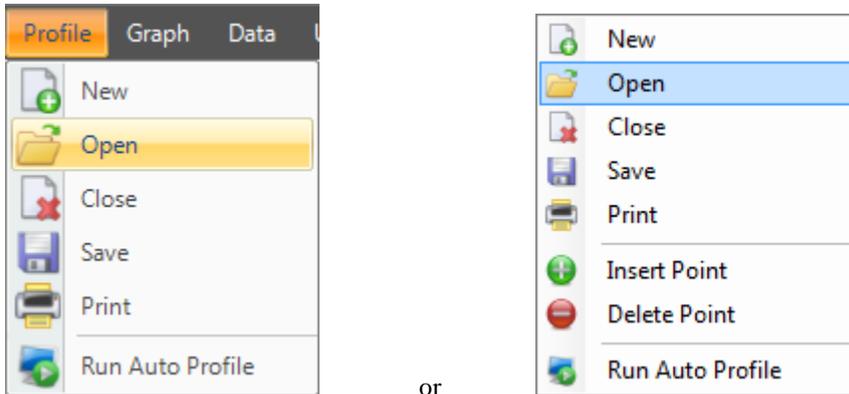
Using the “Save Profile” dialog, select the location and name you want to save the profile as.



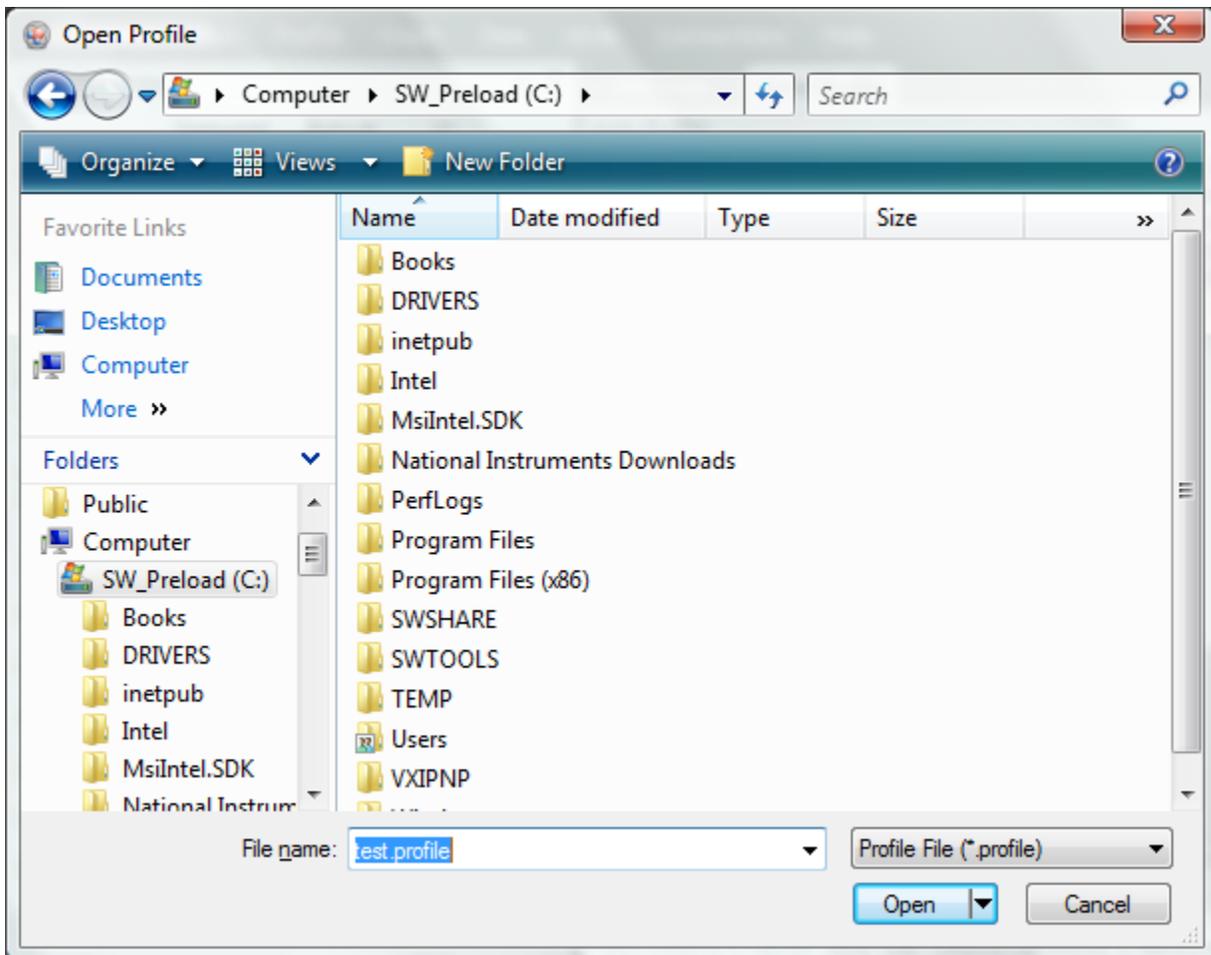
# Opening a Profile

Profiles can be loaded from previously saved profile files.

To perform the open, select “Open” from the main menu or right click a profile tab and select “Open”.



Using the “Open Profile” dialog, browse and select the profile file that you want to open.



Once the load is complete the profile tab will be displayed with the loaded profile points.

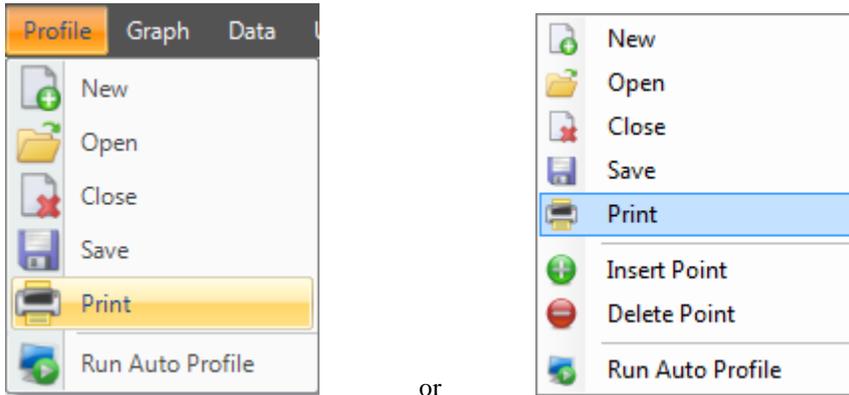
---

## Printing a Profile

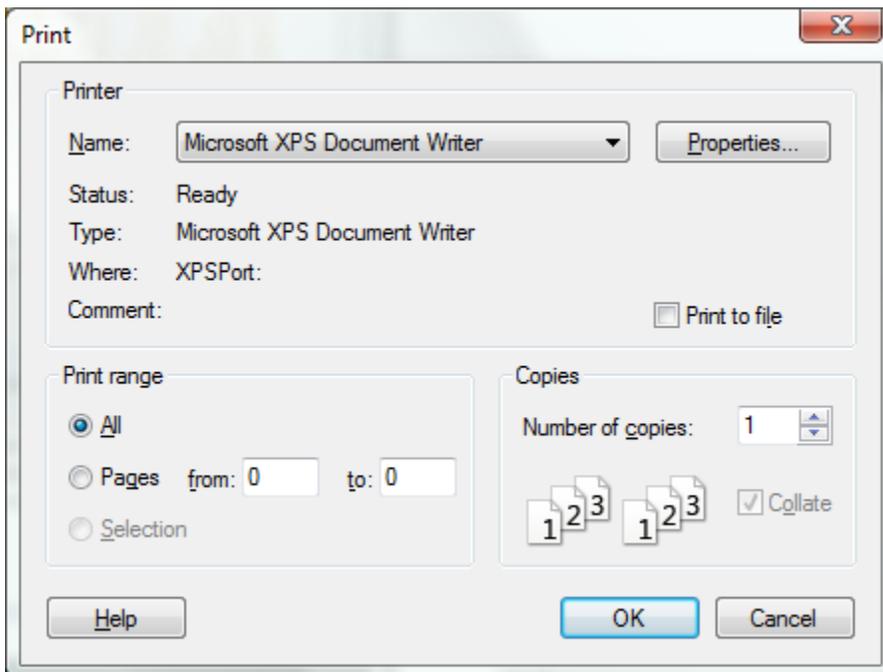
The profile tab can be printed to any of the PC's installed printers.

*Note: You must have a printer installed before you can print using ControlLog.*

To perform the print, select "Print" from the main menu or right click a profile tab and select "Print".



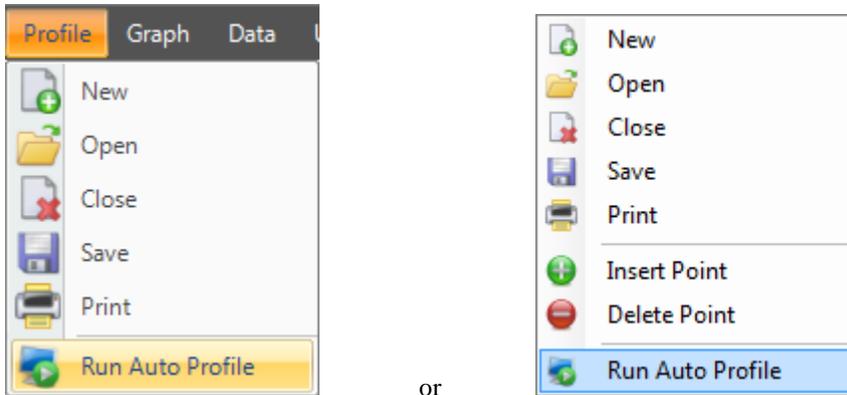
Using the "Print" dialog, select the desired printer, range and number of copies you want to print.



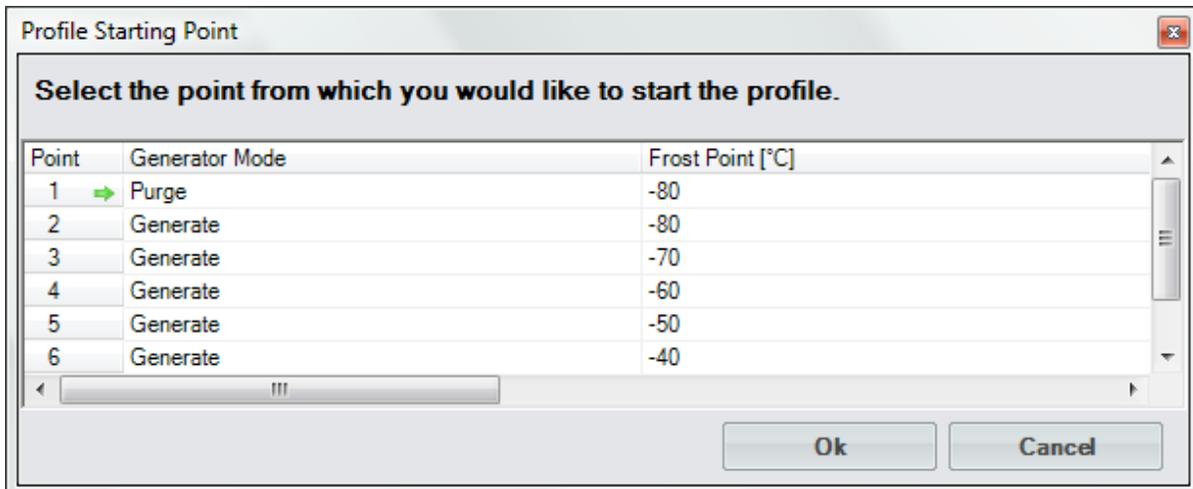
# Running an Auto Profile

To run an auto profile, select “Run Auto Profile” from the main menu or right click a profile tab and select “Run Auto Profile”.

*Note: While operating the system in the Auto Profile mode, manual setpoint and mode changes are not allowed. Also, if changes are made with the 3900 keypad directly, they will quickly be overridden by ControLog.*

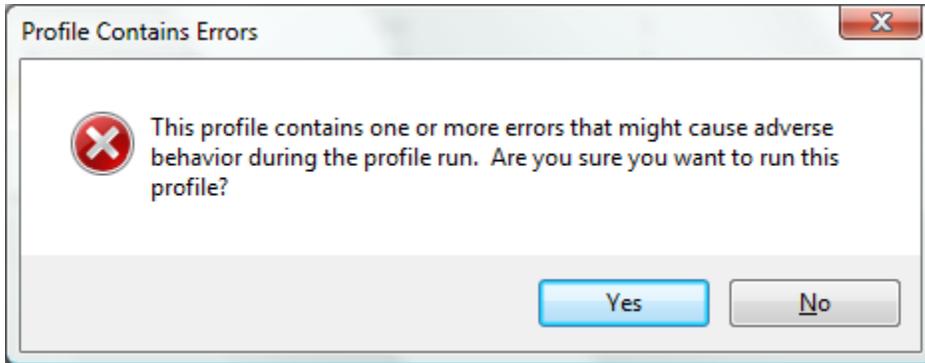


Selection will open the “Profile Starting Point” dialog which allows the user to select which point in the profile they would like to start the profile on. This feature provides more flexibility by allowing the user to skip ahead to a desired point within the auto profile.



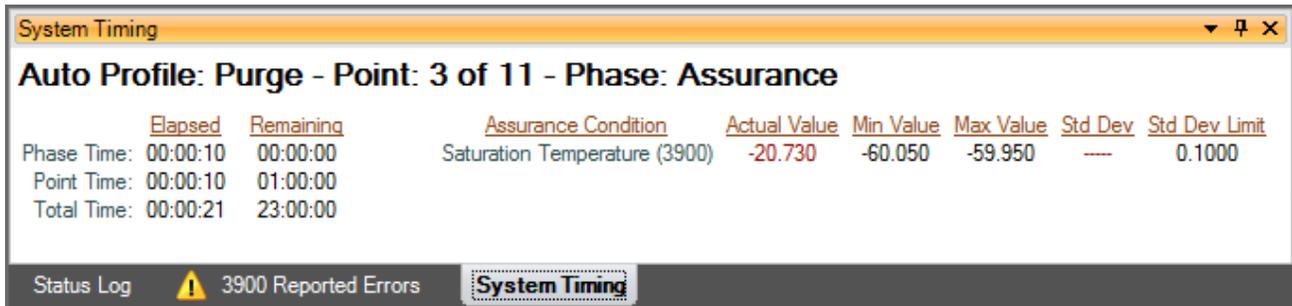
If the profile contained errors, which were indicated by a red circle with an explanation point  on the profile, a warning message will appear when the user tries to run the profile.

*Warning: Running a profile with errors may cause adverse behavior during the profile run. The user is strongly encouraged to address and fix all profile issues before attempting to run the profile.*

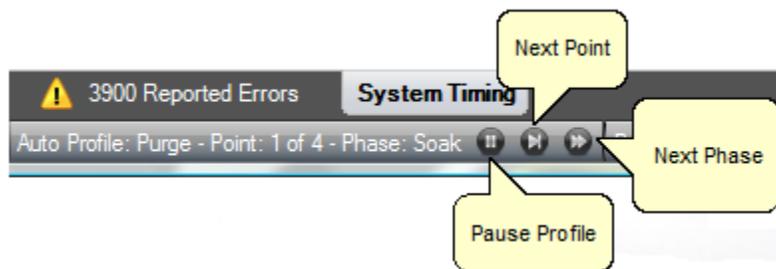


Once the auto profile begins, ControLog will begin sending the commands and setpoints for the starting profile point. The System Timing tab will be displayed in the information tab group and the Auto Profile Controls and Status will appear in the status bar.

The **System Timing** tab gives detailed information on the Auto Profile as it runs. The elapsed and remaining Phase, Point and Total time are listed along with the detailed assurance conditions values and tolerances.



The **Auto Profile Controls and Status** consist of the generator run state for the current profile point, the profile point the system is currently running and the phase of the current point. It also consists of three shortcut buttons to control the operation of the auto profile. There is a "Pause Profile" button, advance to "Next Point" button and advance to the "Next Phase" button. These are the same commands that are available in the profile menus.



## Understanding Profile Phases

Each profile point consists of three distinct phases; Ramp, Assurance and Soak. Each phase accomplishes a specified task.

### Ramp Phase

The **Ramp Phase** is used to linearly transition from one point to the next point in a given amount of time.

### Assurance Phase

The **Assurance Phase** forces the system to wait until measured parameters and setpoint values are within a specified tolerance and/or stability before the computer starts the Soak Phase.

During the assurance phase, assurance conditions that have not been met will be displayed in yellow on the parameter tab of the device containing the condition.

	Setpoint	Actual	U	
Frost Point	-90.000	-34.896	±0.099	°C
Saturation Pressure	11.0	63.465	+0.300	psia
Saturation Temperature				
Test Pressure	14.700	14.700	±0.050	psia
Test Temperature	23.000	23.000	±0.080	°C
Mass Flow Rate	1.0000	2.8601		l/m

The system timing tab provides a detailed view of each assurance condition for the current point. The actual value of each condition will be displayed in red if it has yet to be met and will be displayed in green once the condition has been met. The system timing tab also displays criteria the condition needs to meet for both tolerance and standard deviation.

	Elapsed	Remaining	Assurance Condition	Actual Value	Min Value	Max Value	Std Dev	Std Dev Limit
Phase Time:	00:07:56	00:00:00	Frost Point (3900)	-34.744	-90.100	-89.900	0.0485	0.1000
Point Time:	00:07:56	01:00:00						
Total Time:	00:07:56	04:00:00						

*Note: The assurance phase will be active for a minimum of 30 seconds. This delay allows the 3900 to calculate setpoints before ControLog begins to assure each condition.*

## Soak Phase

The **Soak phase** is the desired amount of time to generate at a particular point before proceeding to the next point.

### Example 1

Point	Generator Mode	Frost Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Generate	-80	1	0 minutes	1 hours	No

Example 1 causes the Soak phase to begin immediately at the start of the profile point, even though the 3900 may still be adjusting to the point. The next point will start after the 1 hour soak phase.

### Example 2

Point	Generator Mode	Frost Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Generate	-80	1	0 minutes	1 hours	Yes

Example 2 causes the Assurance phase to begin immediately at the start of the profile point. Measured values are continually compared with the setpoint values until they agree with the set tolerance and/or the measured values are stable to within the specified degree. Once assured (tolerances met) the Soak phase begins. Total time required for this point varies and depends upon the amount of time that is required for assurance (dictated by tolerances). Total time for example 2 is elapsed assurance time plus 1 hour.

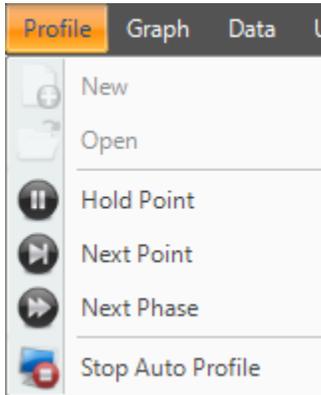
### Example 3

Point	Generator Mode	Frost Point [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
2	Generate	-80	1	0.5 minutes	1 hours	Yes

The Ramp phase (Ramp Timer) begins at the start of the point. The system adjusts slowly toward the setpoint, taking 30 minutes. Once the ramp time has elapsed, assurance starts and waits for tolerances to be met. When tolerances are met, the soak phase begins and lasts 1 hour. Total time for example 3 is 30 minutes, plus elapsed assurance time, plus 1 hour. assurance time is a variable and depends on tolerances.

## Manual Override of Profile

Although the system is operating automatically, some manual control is allowed using the Hold Point, Next Phase and Next Point menu items on the Run menu or Status Bar.



or

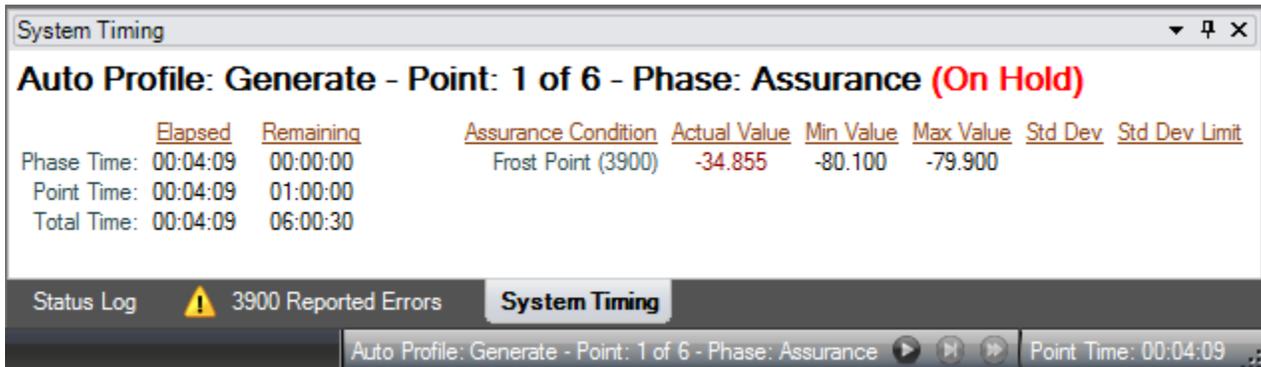


### Holding the Profile

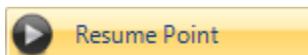
Selecting **Hold Point** from the profile menu or status bar will stop the current "Remaining Time" timers, allowing the system to remain indefinitely at the current point. While in a hold mode, the system is prevented from completing the ramp, assurance, or soak phases of a point.



When holding, a hold indicator appears in the System Timing tab and the hold menu buttons change into resume buttons.



To resume the profile point, select the **Resume Point** from the profile menu or status bar. This re-enables the timing functions and allows the profile to resume normal operation.



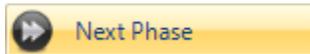
### ***Advancing to the Next Point***

Selecting **Next Point** from the Run menu manually duplicates the action which automatically occurs when the Point time counter reaches zero.



### ***Advancing to the Next Phase***

Selecting **Next Phase** from the profile menu or status bar manually duplicates the action which automatically occurs when a Remaining Ramp or Soak Time counter reaches zero, or when the assurance conditions are met. In other words, it causes Ramp Phase to proceed to the Assurance or Soak Phase, Assurance to proceed to Soak, or Soak to proceed to Ramp of the next profile point. This allows for early manual termination of any phase within a profile point.



### ***Stopping the Auto Profile***

Selecting **Stop Auto Profile** from the profile menu or context menu will terminate the profile at the current point and the generator will continue at its current setpoints for Saturation Pressure, Saturation Temperature and Flow. Another way to exit the Auto Profile is to switch from Auto Profile to Generate, Purge or Shutdown.

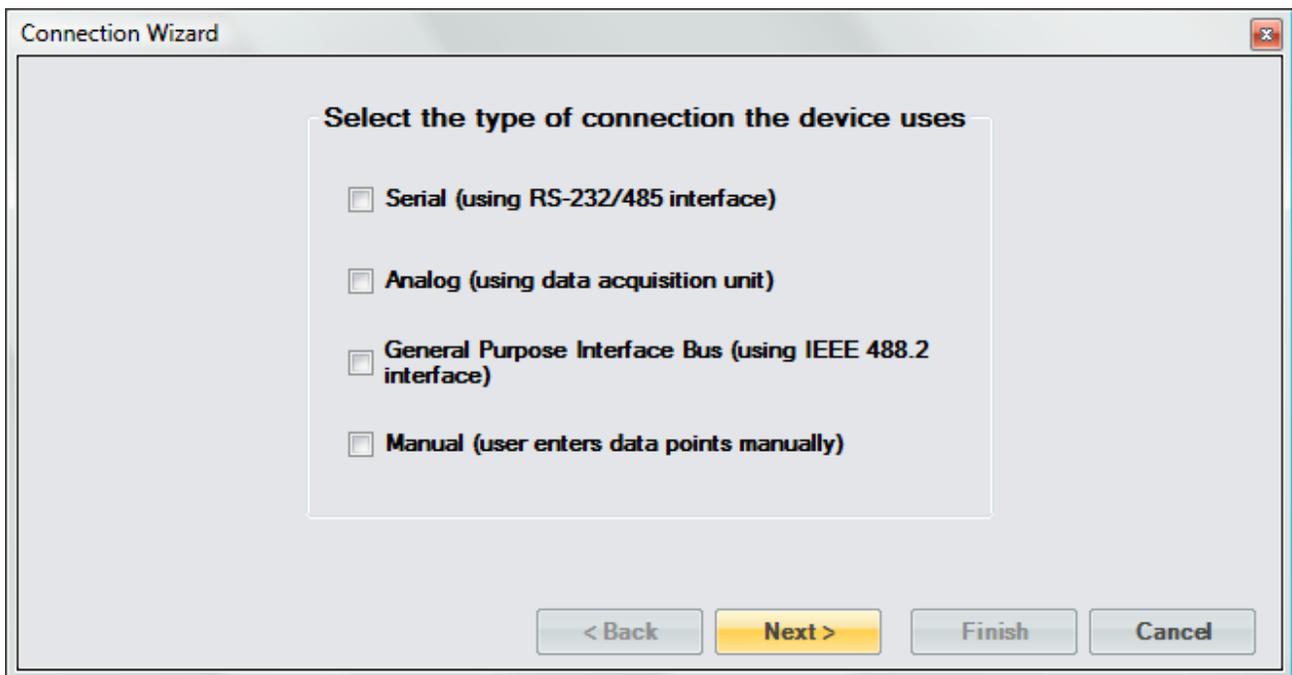


# Connections

ControLog supports a customizable interface that works with most devices. ControLog will allow the user to create a new device connection using the “Connection Wizard” or open previously saved connections. The wizard will open a separate dialog window containing various steps that will guide the user in defining the communication required to receive the desired data items from the device. The user can create as many (up to 60) or as few data items as they see fit for any one device. Each data item can be uniquely named and once connected will be recorded in its own parameter and data tab. ControLog also allows the user to save these interfaces for future use.

*Note: ControLog has a limit of ten devices connected at any given time.*

The “Connection Wizard” allows the user to step through the connection configuration. Using the “Next” and “Back” buttons the user is allowed to progress through the connection configuration steps. At any time the user may cancel the new connection or opening of a connection by selecting the “Cancel” button. Once the last step has been completed the “Finish” button will be available to complete the new connection.



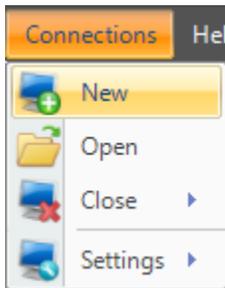
*Note: It is always recommended to have the manufactures documentation for the device being connected handy while creating the new connection. It is also recommended to use a terminal based application to test the various commands before creating a new connection.*

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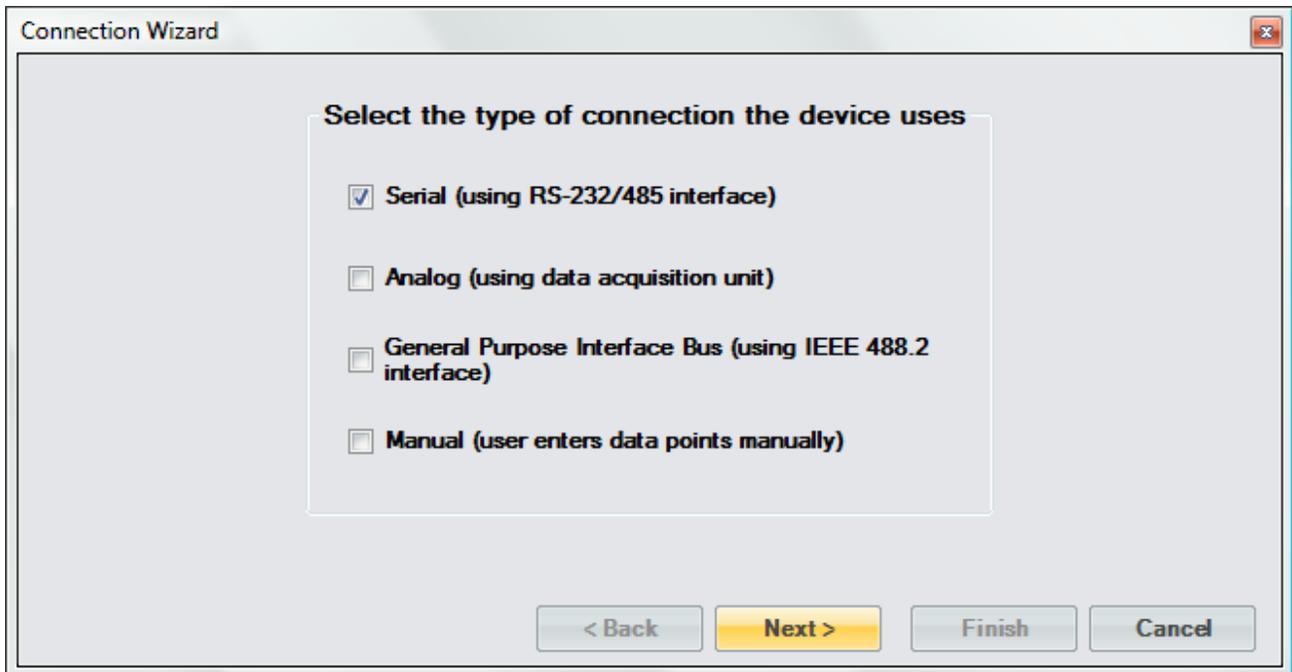
## Serial Connection

A Serial Connection uses either an RS-232 or RS-485 interface to acquire data from a given ASCII based serial device. The customizable interface provided by ControlLog allows the user to define the ASCII commands that are sent and/or received through the RS-232/485 interface to communicate with the serial device. The system supports both request to receive type of communication as well as receive only type of communication.

To create a new serial connection, select “New” from the Connections menu. This will open a “Connection Wizard” dialog that will step the user through the connection definition process.



Select “Serial” as the type of connection the device uses.



Enter a unique name for the device.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a single-line text input field. At the bottom, there are four buttons: "< Back" (disabled), "Next >" (highlighted in yellow), "Finish" (disabled), and "Cancel" (disabled).

Select whether the device requires a setup command or commands. Setup commands are only sent once at the start of communication. These commands are only required if you need to send special commands to configure the device before data request and response commands are processed.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Do you need to send a setup command or commands to configure this device?" followed by two radio button options: "Yes" (unchecked) and "No" (checked). Below the options is explanatory text: "Select 'Yes' if you need to send a setup command or commands to configure the device. Setup commands are only sent once at the start of communication. These commands are only required if you need to send special commands to configure the device before data request and response commands are processed." and "Select 'No' if you don't need to send any setup commands." At the bottom, there are four buttons: "< Back" (disabled), "Next >" (highlighted in yellow), "Finish" (disabled), and "Cancel" (disabled).

If setup commands are required, then enter the ASCII setup command or commands that will be sent at the start of communication. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All setup commands are case sensitive.*

*Note: End of Line (EOL) or End of Transmission (EOT) characters such as carriage returns and/or line feeds are very important and are the leading cause to failed communication. Refer to the manufacturer's documentation for the device to verify the required EOL or EOT characters.*



Enter the number of responses you expect to receive from the device. This is the amount of response messages that you will receive from the device, not necessarily the number of data items. A device response message could contain multiple data items. Later you will select the number of data items that each response message contains.

For example, if you need to send three commands to receive three response messages, then you would enter three. Or if your device automatically sends one message periodically you would only have a single response and you would enter one.

Connection Wizard

**How many responses do you expect to receive?**

1

Enter the number of response messages you expect to receive from the device. For example if you need to send three commands to receive three response messages, then you would have three responses. Another example would be if your device automatically sends one message periodically, you would only have a single response. Remember this is only the amount of response messages that you receive from the device, not the amount of data items. Later you will select the number of data items that each response contains.

< Back   Next >   Finish   Cancel

Select whether a command needs to be sent to request a response. If the device requires a command to be sent to receive a response then select “Yes”. If the device automatically outputs data without any request then select “No”.

Connection Wizard

**Do you need to send a command to receive a response from this device?**

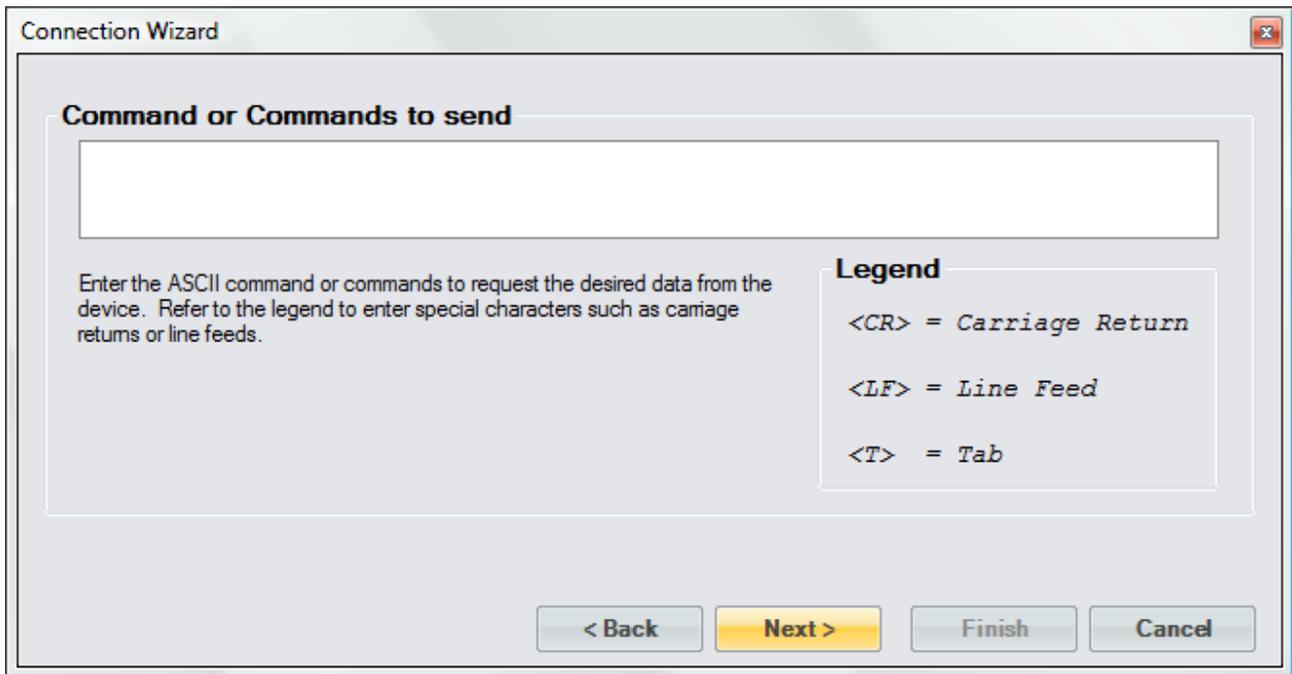
Yes  
 No

Select 'Yes' if you need to send a command to request data from the device.  
Select 'No' if the device automatically transmits data periodically.

< Back   Next >   Finish   Cancel

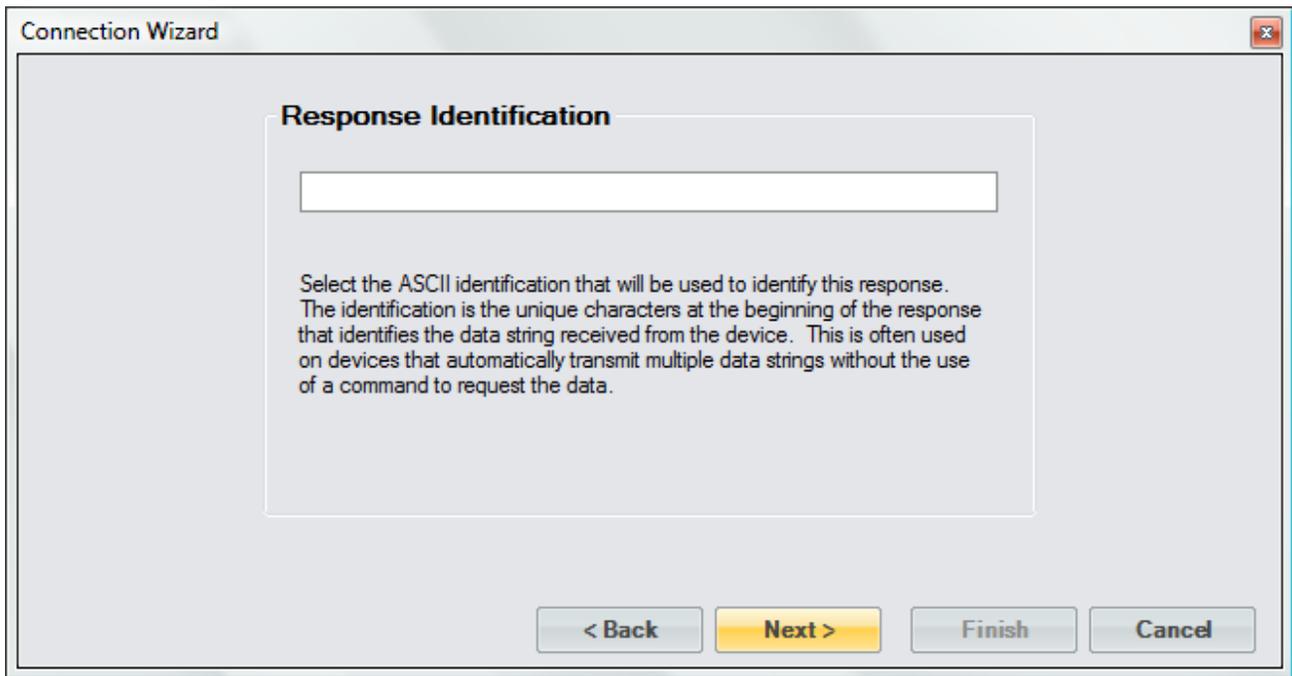
If a command was required then enter the ASCII Command or Commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All commands are case sensitive.*



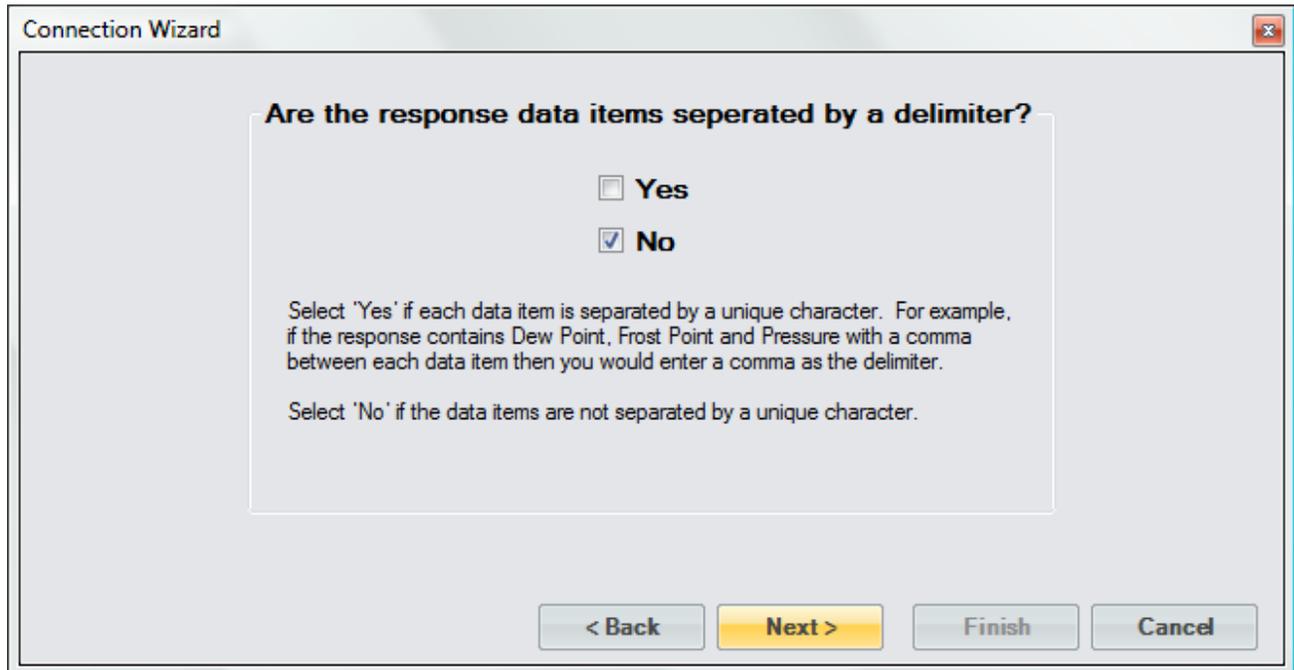
The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Command or Commands to send" and contains a large empty text input field. Below the field, there is instructional text: "Enter the ASCII command or commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns or line feeds." To the right of this text is a "Legend" box containing the following entries: "<CR> = Carriage Return", "<LF> = Line Feed", and "<T> = Tab". At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select the ASCII identification that will be used to identify the response if no command is required but the device automatically sends messages periodically. The identification is the unique characters at the beginning of the message that identifies the response received. This is often used on devices that automatically transmit multiple data messages without the use of a command to request data.

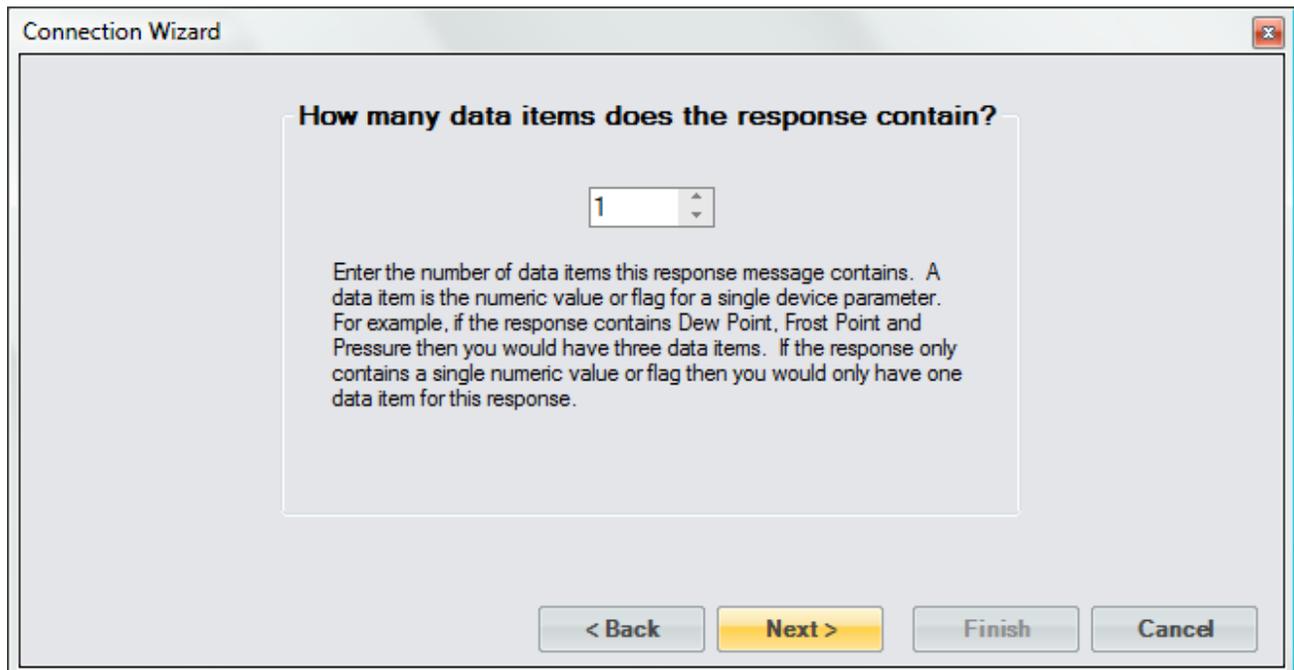


The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Response Identification" and contains a large empty text input field. Below the field, there is instructional text: "Select the ASCII identification that will be used to identify this response. The identification is the unique characters at the beginning of the response that identifies the data string received from the device. This is often used on devices that automatically transmit multiple data strings without the use of a command to request the data." At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select whether the response has a delimiter that is separating each data item. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then each item is separated by a comma delimiter.



Enter the number of data items the response message contains. A data item is the numeric value or flag portion for a single device parameter within the response message. For example, if the response contains Dew Point, Frost Point and Pressure then you would have three data items. If the response only contains a single numeric value or flag then you would only have one data item for this response.



Enter a name or description for the data item and define the syntax, unit and scaling. The data item syntax is defined using the symbols in the Legend. Use the “X” symbol to indicate a character that should be ignored, use the “N” symbol to represent a numeric ASCII character and the “A” symbol to indicate a flag or any ASCII character. This dialog will repeat for each data item in the response.

*Note: The syntax cannot contain both a Flag and a Numeric syntax definition. If the user requires both, then create another data item to define them separately.*

**Connection Wizard**

**Data Item Name**

**Data Item Syntax**

**Data Item Unit**

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Scaling	
Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

< Back   **Next >**   Finish   Cancel

When defining a numeric syntax enter an “N” for each possible digit in the response. For example, if you know the device returns a six digit numeric value you would enter “NNN.NNN”. The decimal point is not required and its location is not important. Decimal points, plus signs and minus signs are treated the same as an “N” and are allowed merely to help make the syntax resemble a number value.

*Note: It is important to have sufficient numeric definition to assure all possible numeric responses will be covered, especially when a device responds with scientific notation or varying precession.*

**Connection Wizard**

**Data Item Name:** Data Point

**Data Item Syntax:** NNN.NNNN

**Data Item Unit:** None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Scaling	
Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax:** NNN.NNNN

< Back   Next >   Finish   Cancel

It is possible to scale a numeric data item response. The scaling consists of a two point definition for a linear scaling or a three to seven point definition for polynomial interpolation scaling. The number of points determines the degree of the polynomial used to scale the data item response. Lagrangian Interpolation is used to determine the coefficients of the polynomial. Each point definition consists of a signal value and a data value. The signal value represents the “raw” output signal from the device. The data value represents the actual value or real world value at the given signal value.

Scaling allows the user to scale a numeric data item response into a given humidity value. For example, if you have a numeric data item response that ranges from -1 to 1 and it is known that 0 corresponds to -100 and 1 corresponds to 100. The user can then enter these scaling values and ControlLog will automatically apply the scaling to the data item whenever it is displayed or logged.

The screenshot shows the 'Connection Wizard' dialog box. At the top, there are three input fields: 'Data Item Name' (containing 'Data Point'), 'Data Item Syntax' (containing 'NNN.NNNN'), and 'Data Item Unit' (a dropdown menu set to 'None'). Below these is a text area with instructions: 'Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.'

The 'Scaling' section contains a table:

Signal Value	Data Value
-1	-100
1	100

To the right of the scaling table is a 'Legend' section with the following definitions:

- X = Ignore
- N = Numeric
- A = Flag

At the bottom, there is a 'Response Syntax' field containing 'NNN.NNNN' in green text. Navigation buttons at the bottom include '< Back', 'Next >', 'Finish', and 'Cancel'.

Selecting the unit for the data item will allow ControlLog to convert the value to the selected system units for display in the parameter tab and record the value in the default SI units in the data tab. Remember this is the unit the device is sending the data item in, not the unit you wish to display the data item as. If "None" is selected then ControlLog will treat the data item as a simple number and will display and record the value exactly as it is received.

This screenshot shows the 'Connection Wizard' dialog box with the 'Data Item Unit' dropdown menu open. The 'Data Item Name' is 'Data Point' and the 'Data Item Syntax' is 'NNN.NNNN'. The 'Data Item Unit' dropdown is currently set to 'Temperature', and its list of options is expanded to show: 'Temperature', 'Temperature', 'Pressure', 'Enthalpy', 'Density', 'FlowRate', and 'None'. To the right of the dropdown is another dropdown menu for units, currently set to '°C', with options for '°F', '°C', and 'K'. The 'Scaling' table and 'Legend' section are visible in the background, identical to the previous screenshot.

Navigation buttons at the bottom include '< Back', 'Next >', 'Finish', and 'Cancel'.

When defining flag type syntax enter an “A” for each character in the response that represents the flag. The Flag Definitions define what each possible ASCII flag represents. The user must enter a numeric value for each flag definition which will be recorded in the data tab and a description for the flag that will be shown in the parameters tab.

**Connection Wizard**

**Data Item Name**: Stable

**Data Item Syntax**: XXXA

**Data Item Unit**: None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

XXXA

< Back   Next >   Finish   Cancel

Enter the End of Transmit (EOT) character that is sent after the response. This is the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

**Connection Wizard**

**End of Transmit (EOT) character sent after the response**

Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.

**Legend**

- <CR> = Carriage Return
- <LF> = Line Feed
- <T> = Tab

< Back   Next >   Finish   Cancel

Select the name and location to save the new serial connection. Selecting the “Browse” button will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All device connection files are saved in XML format with a (\*.device) extension.



Next, the user can select whether to connect to the device now or to exit without connecting.

*Note: The user can connect at any time by loading the device from the Connections menu.*



Select the communication port that the device is connected to and select the port settings for the device.

*Warning: Incorrect RTS and DTR settings can prohibit communication. Refer to the device manufacturer's documentation to verify all device port settings.*

Connection Wizard

**Select the port the device is connected to**

Connect using

**Select the port settings for the device**

Baud Rate

Data Bits

Parity

Stop Bits

Handshake

Enable RTS  Enable DTR

< Back    Next >    Finish    Cancel

Select the access rate at which ControLog will communicate with the device.

*Note: It is always recommended to start with the default 1.5 second access interval and to modify later as needed.*

*Warning: Do not set the access interval too small. If the device is not capable of communicating at the set interval then ControLog may inadvertently think communication has been lost when the device does not reply within the desired amount of time.*

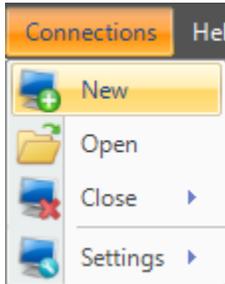


Select "Show Interface Console" to automatically open a Device Interface Console tab once communication has been established with the device.

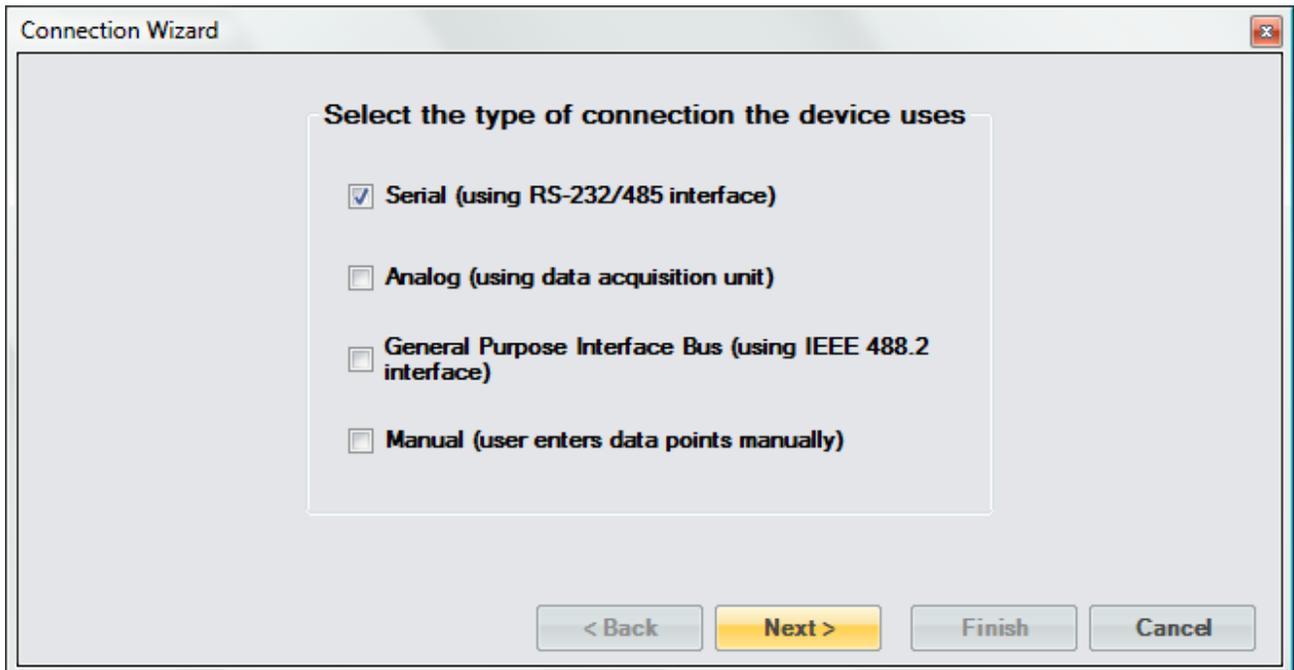
## Serial Connection Example 1

This example will demonstrate the creation of a serial connection to an RH Systems® 373 Dew Point Mirror. We will request the Frost Point temperature and Atmospheric Pressure from the mirror as data items.

Start by selecting “New” from the Connections menu.



Select “Serial” as the type of device connection.



Enter “373 Dew Point Mirror” as the name for the device.



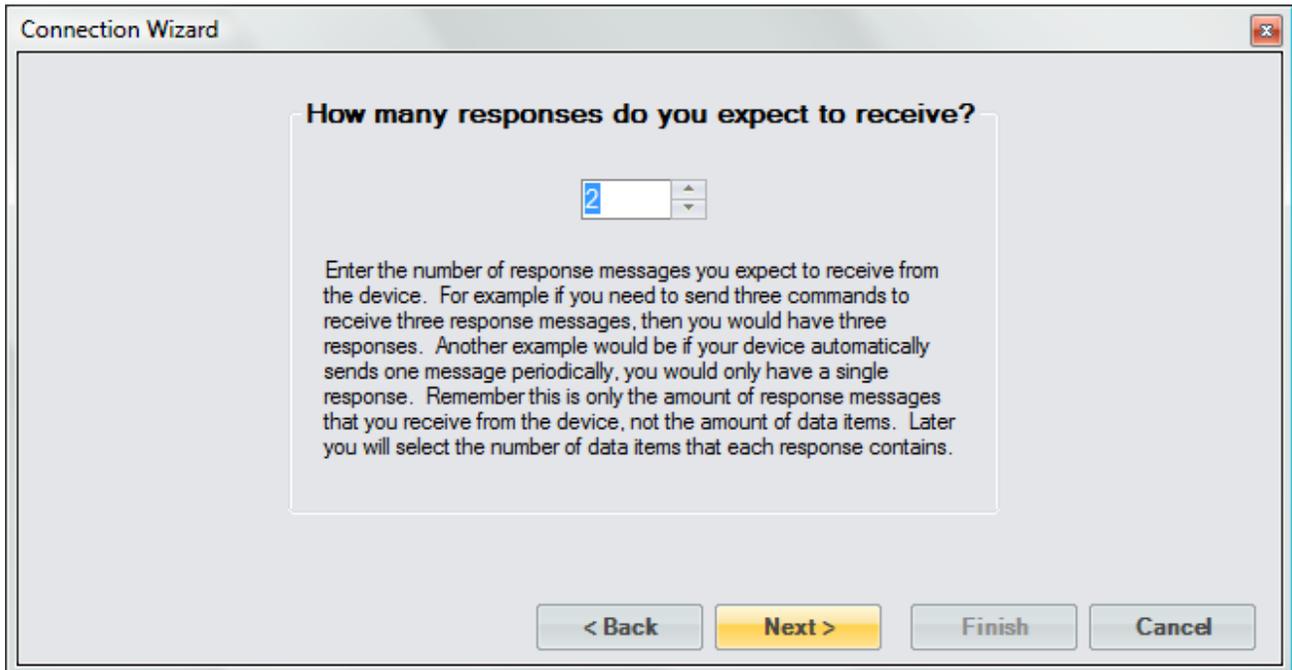
The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a text input field. The input field contains the text "373 Dew Point Mirror". At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

For the 373 we do not need to send any setup commands.

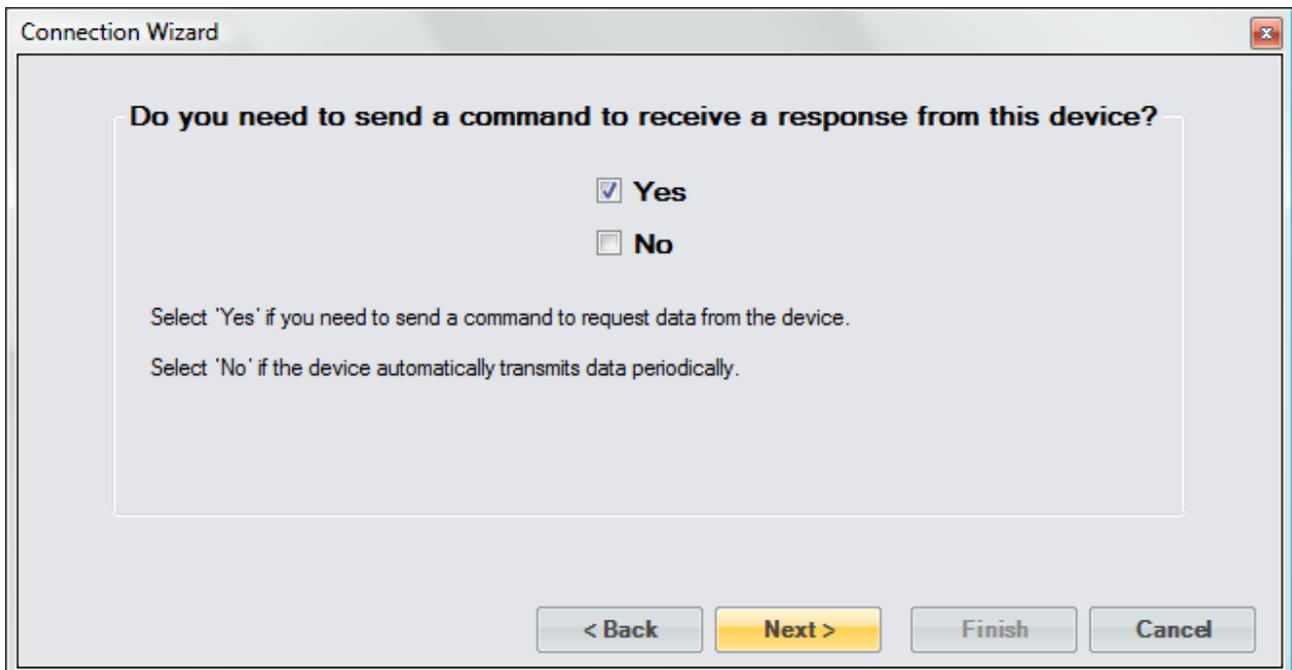


The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Do you need to send a setup command or commands to configure this device?" followed by two radio button options: "Yes" (unchecked) and "No" (checked). Below the options is a paragraph of text: "Select 'Yes' if you need to send a setup command or commands to configure the device. Setup commands are only sent once at the start of communication. These commands are only required if you need to send special commands to configure the device before data request and response commands are processed." Below this is another paragraph: "Select 'No' if you don't need to send any setup commands." At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

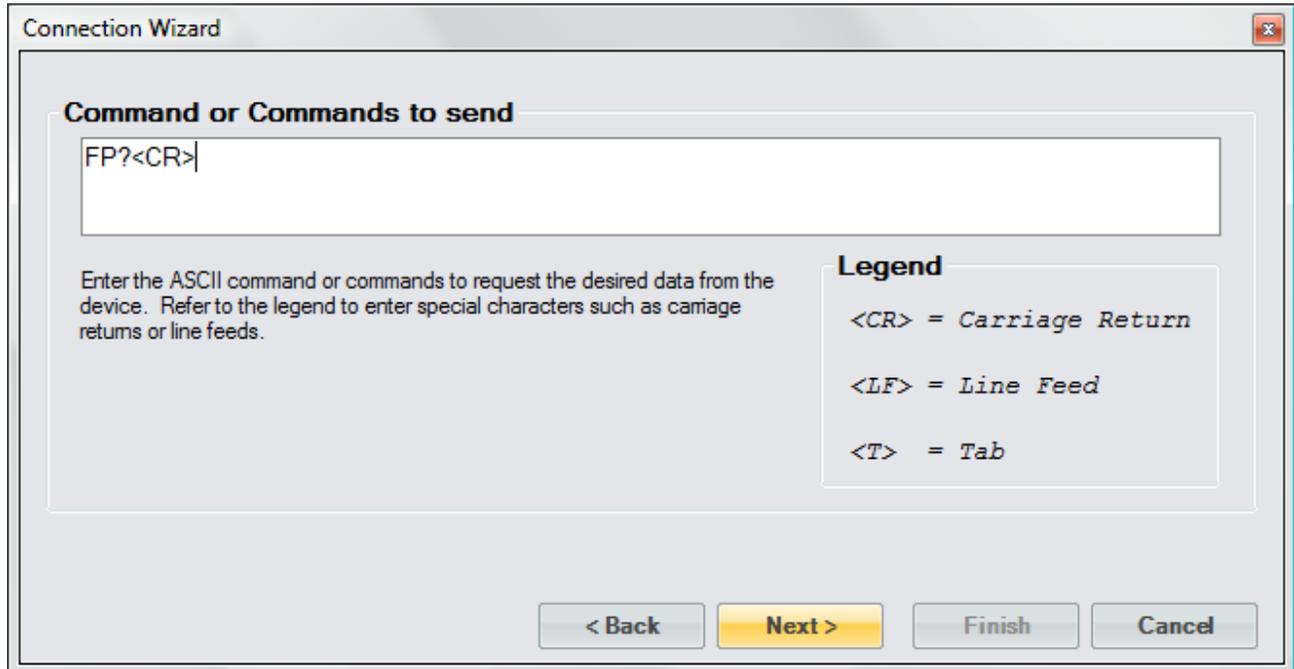
The 373 will send two responses; one with the requested Frost Point value and the other with the requested Atmospheric Pressure value.



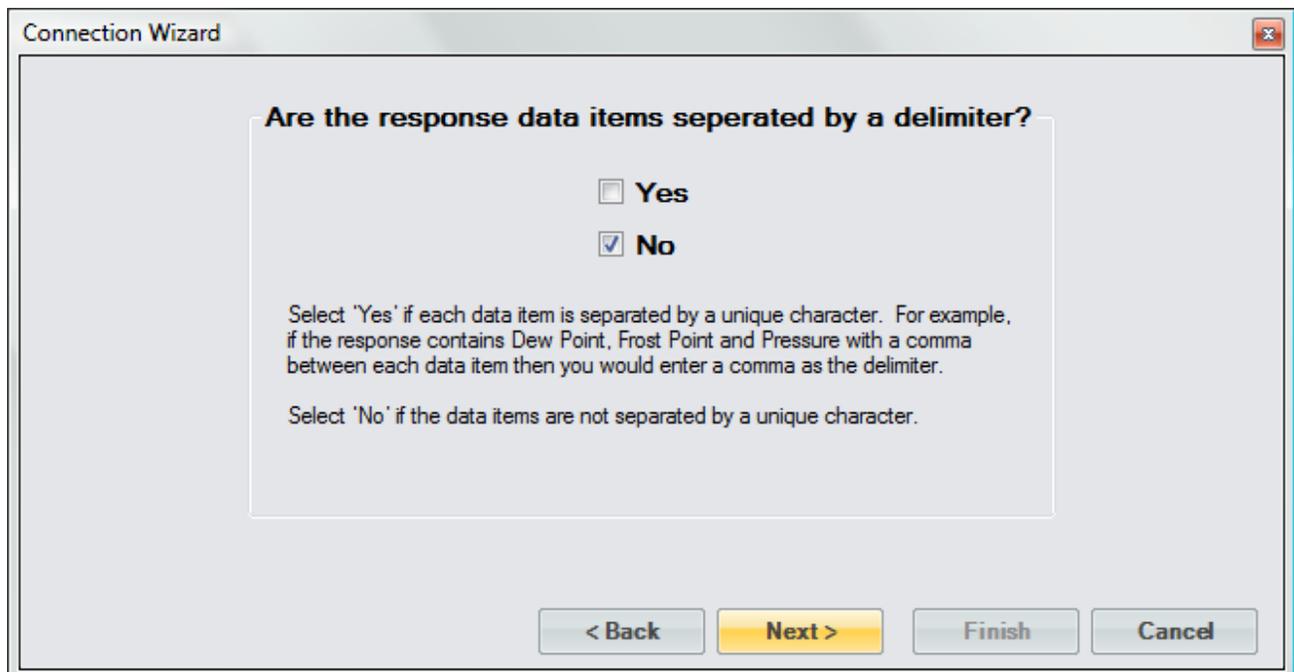
The 373 requires a request command to be sent to receive either the Frost Point value or the Atmospheric Pressure value.



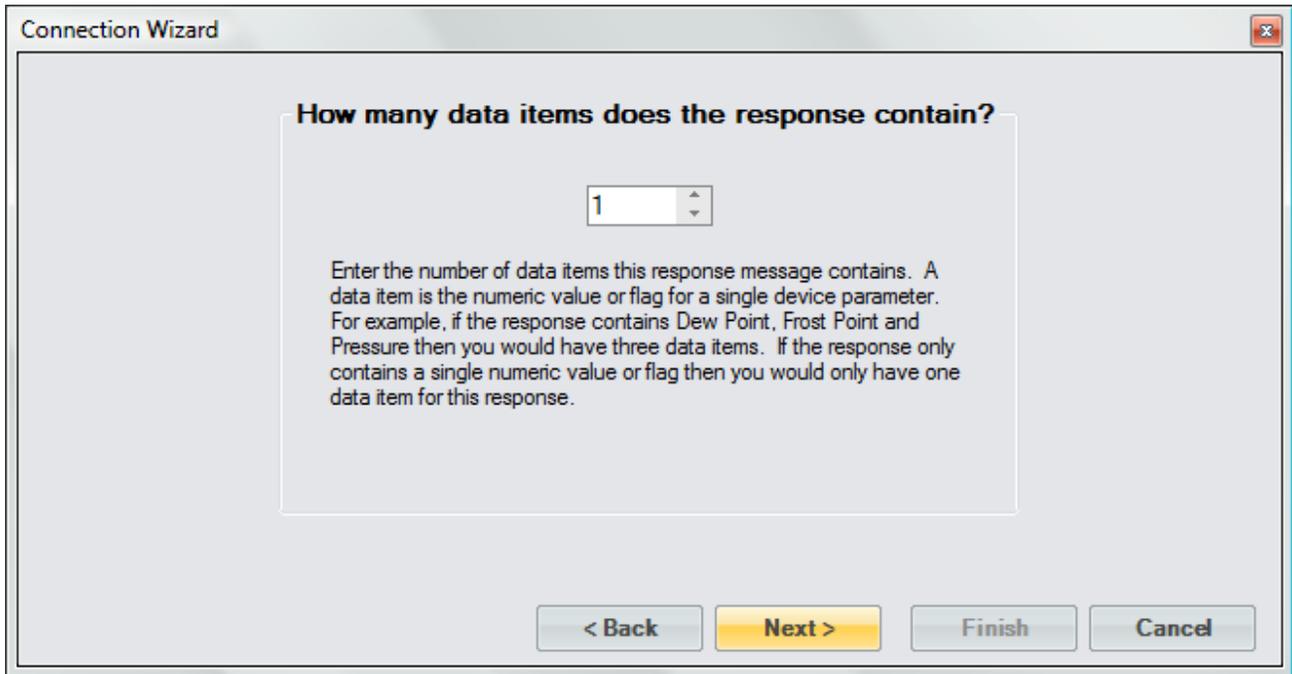
The 373 documentation tells us we need to send the frost point command to receive the Frost Point value. The documentation also states the command must be terminated with a carriage return or a carriage return line feed combination.



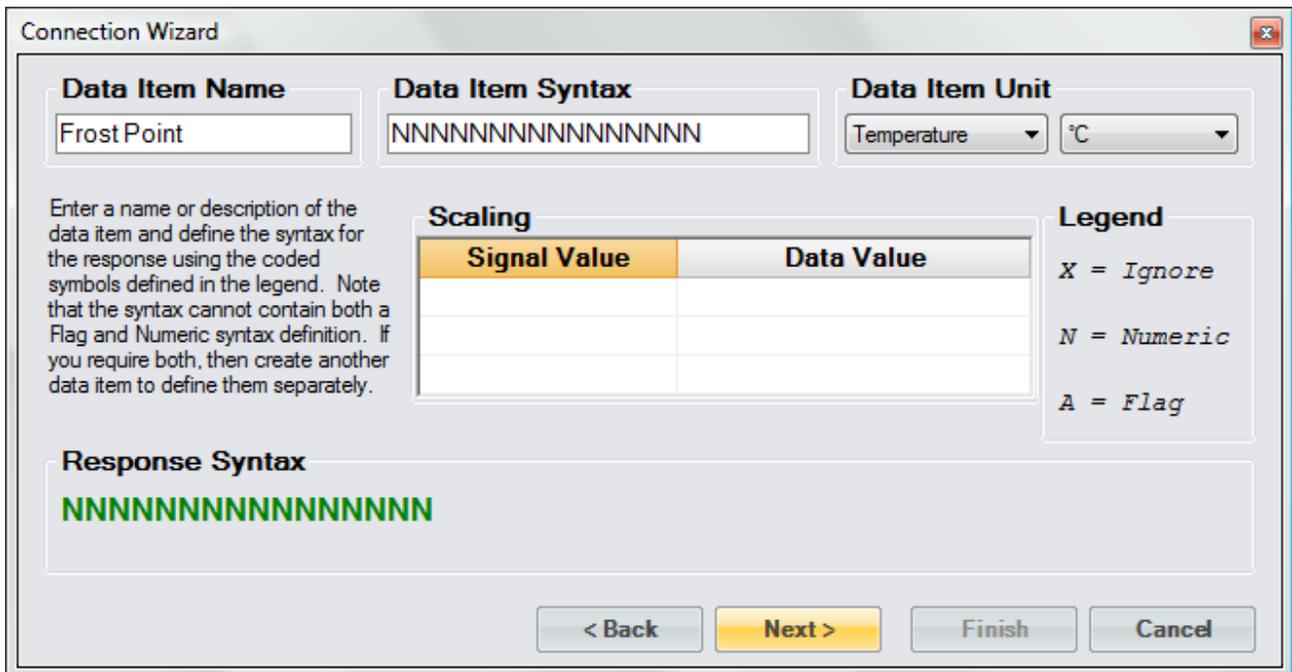
The 373 will respond to the frost point command with a single numeric value and therefore no delimiter is used.



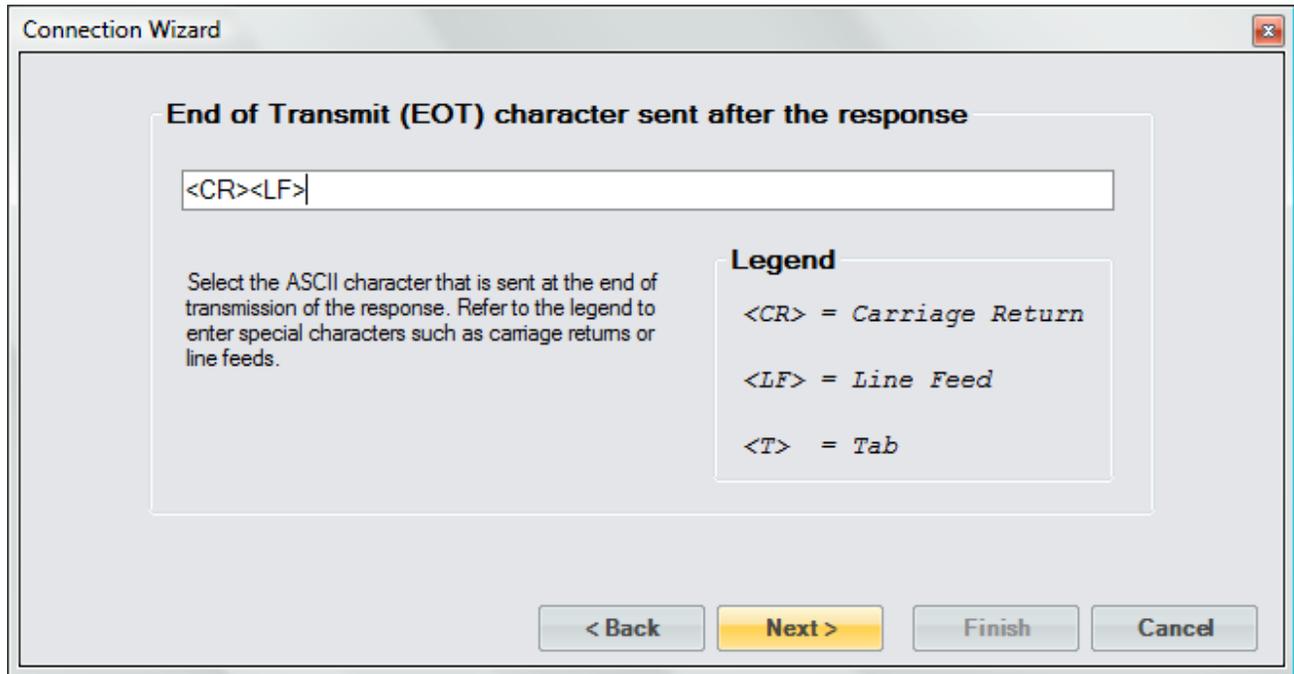
The response from the frost point command will only contain a single numeric value.



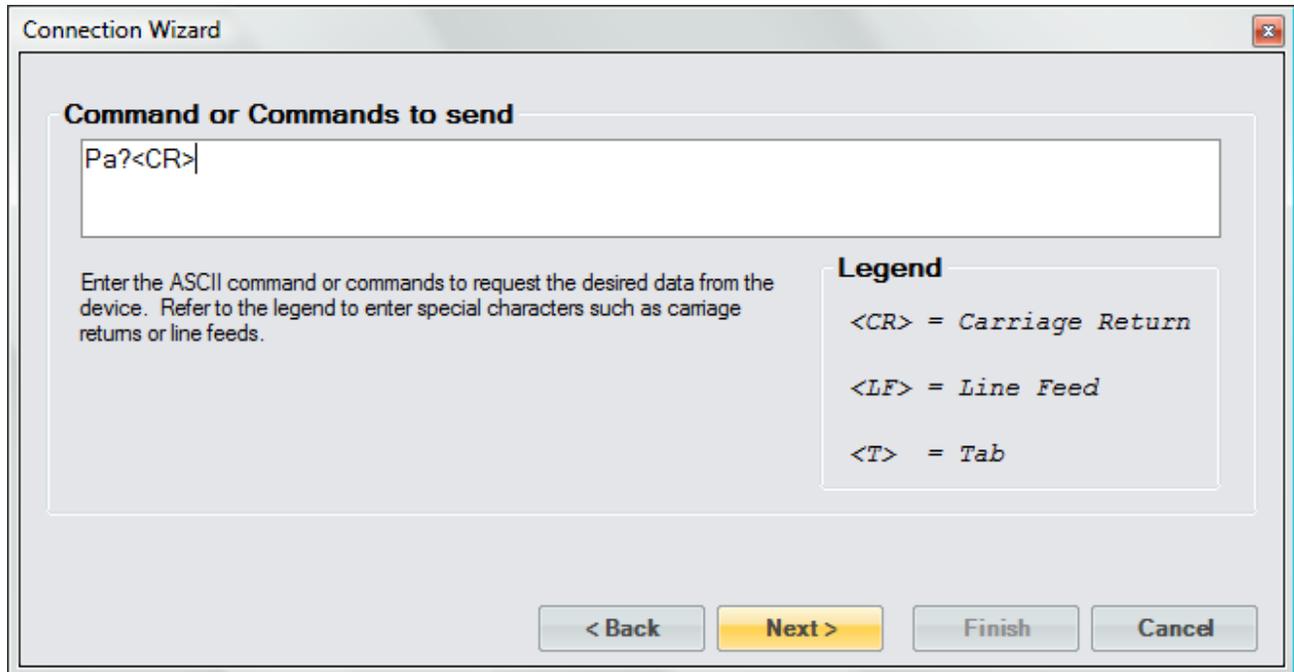
The first item is given the name Frost Point. The 373 can respond with a high precision numeric value so the Data Item Syntax was defined with the maximum digits possible that the 373 can respond with. The Data Item's Unit was defined as a temperature in degrees Celsius as stated in the documentation for the 373. The response value is the actual value so there is no need to define any type of scaling.



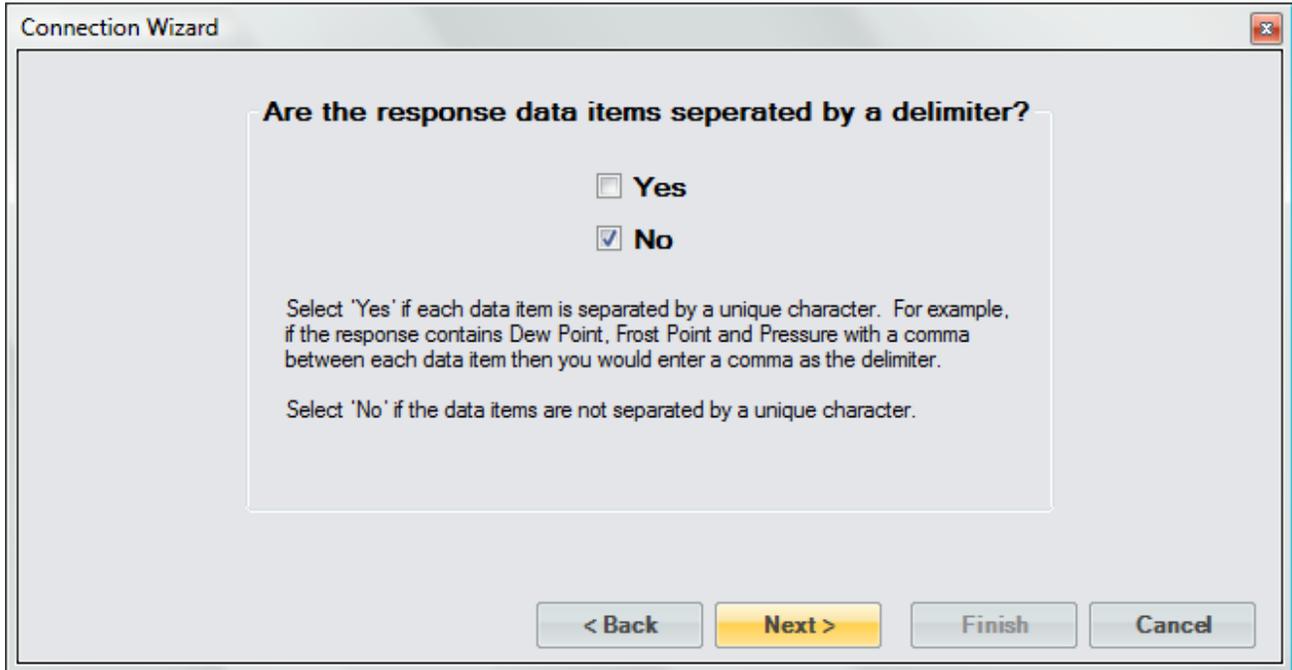
According to the 373 documentation, each response is terminated with a carriage return and line feed.



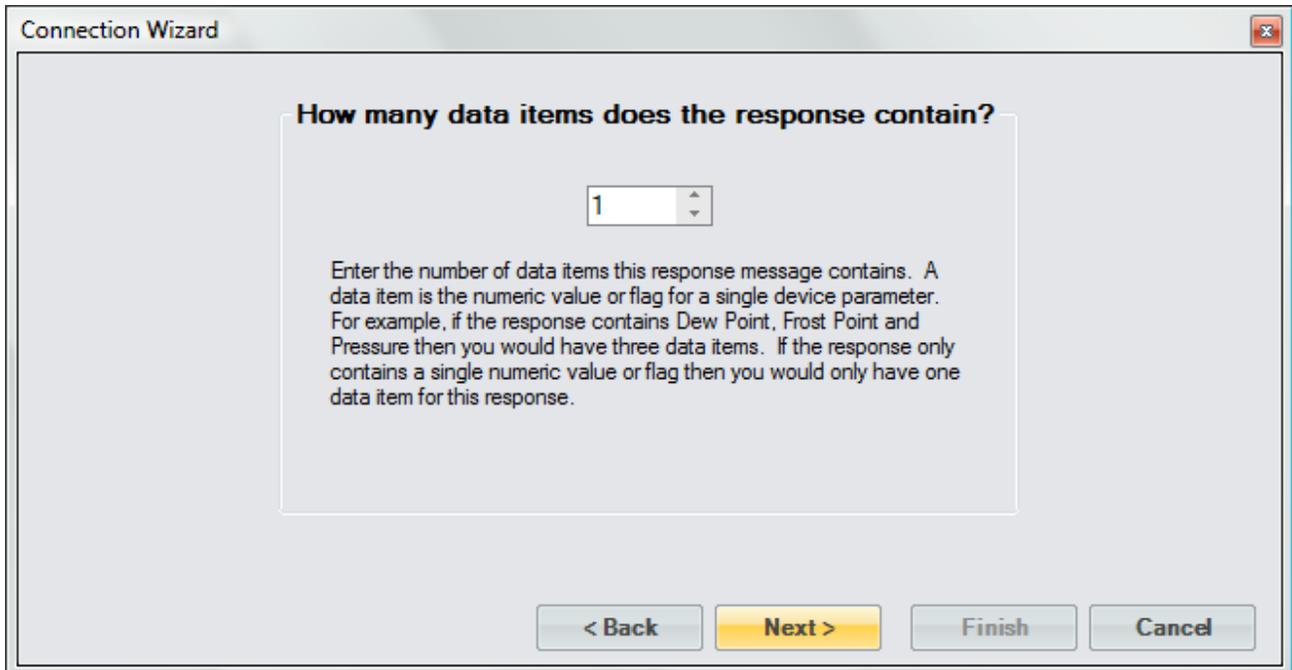
Next we define the command for the second response. Referring to the 373 documentation we enter the command for atmospheric pressure. Again the command must be terminated with a carriage return or carriage return line feed combination.



The 373 will respond to the atmospheric pressure command with a single numeric value and therefore no delimiter is used.



The response from the atmospheric pressure command will only contain a single numeric value.



The second item is given the name Pressure. Again the Data Item Syntax was defined with the maximum digits possible that the 373 can respond with. The Data Item's Unit was defined as a pressure in Pascal's as stated in the documentation. The response value is the actual value so there is no need to define any type of scaling.

The screenshot shows the 'Connection Wizard' dialog box. It has three main input fields at the top: 'Data Item Name' containing 'Pressure', 'Data Item Syntax' containing 'NNNNNNNNNNNNNNNNNN', and 'Data Item Unit' with a dropdown menu set to 'Pressure' and a unit dropdown set to 'Pa'. Below these is a text area with instructions: 'Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.' To the right of this text is a 'Scaling' table with two columns: 'Signal Value' and 'Data Value'. Below the table is a 'Legend' box containing: 'X = Ignore', 'N = Numeric', and 'A = Flag'. At the bottom left is a 'Response Syntax' field containing 'NNNNNNNNNNNNNNNNNN' in green text. At the bottom right are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

The response is terminated with a carriage return and line feed.

The screenshot shows the 'Connection Wizard' dialog box at a different step. The title is 'End of Transmit (EOT) character sent after the response'. There is a text input field containing '<CR><LF>'. Below this is a text area with instructions: 'Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.' To the right is a 'Legend' box containing: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom right are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

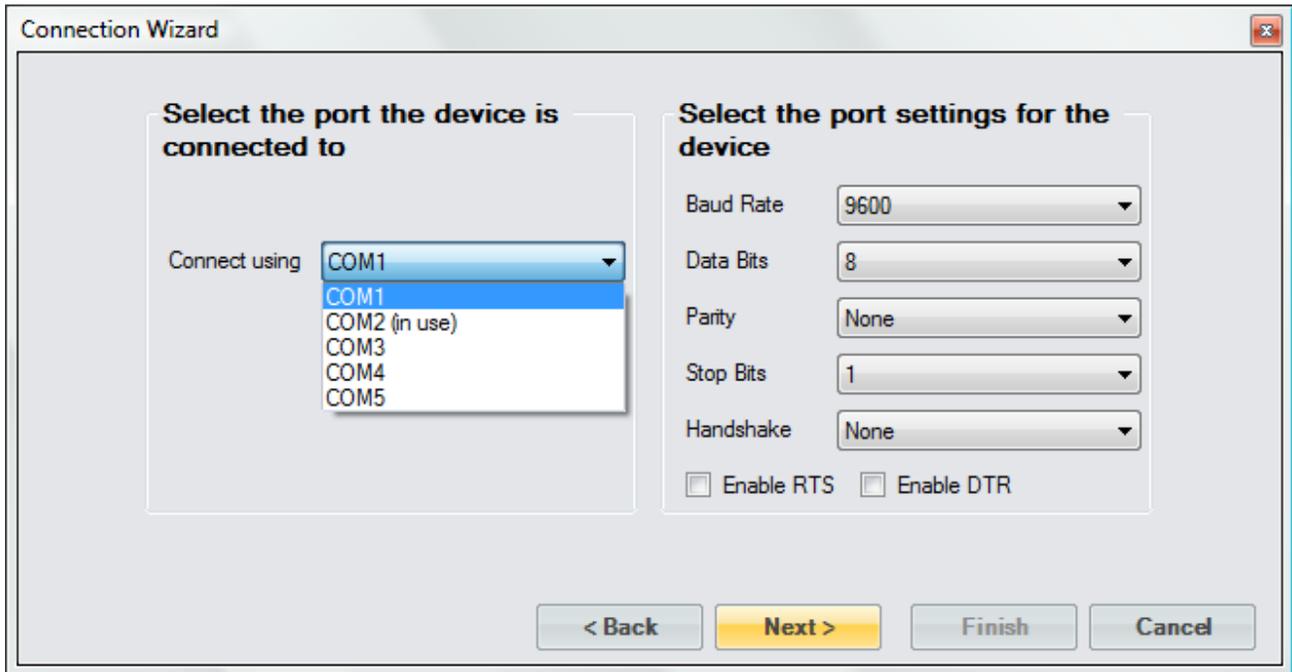
Save the newly created device to a file so that it can be recalled at a later time.



Select to connect to the device now.



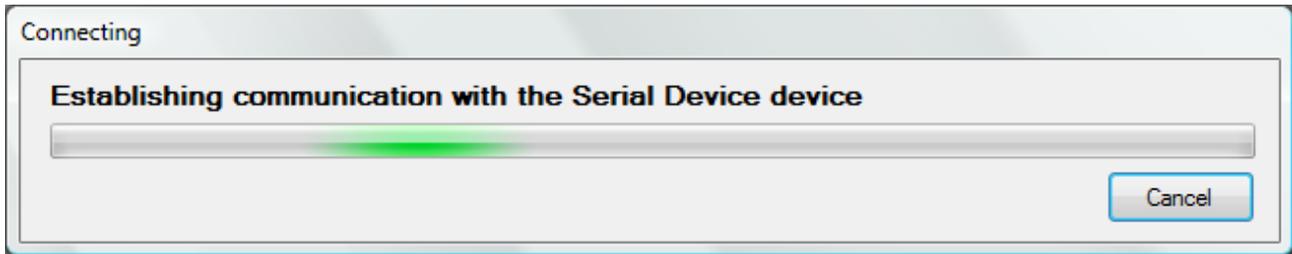
Select the port the 373 is connected to. Notice that ControLog indicates which ports are in use. Refer to the 373 documentation for specific port settings:



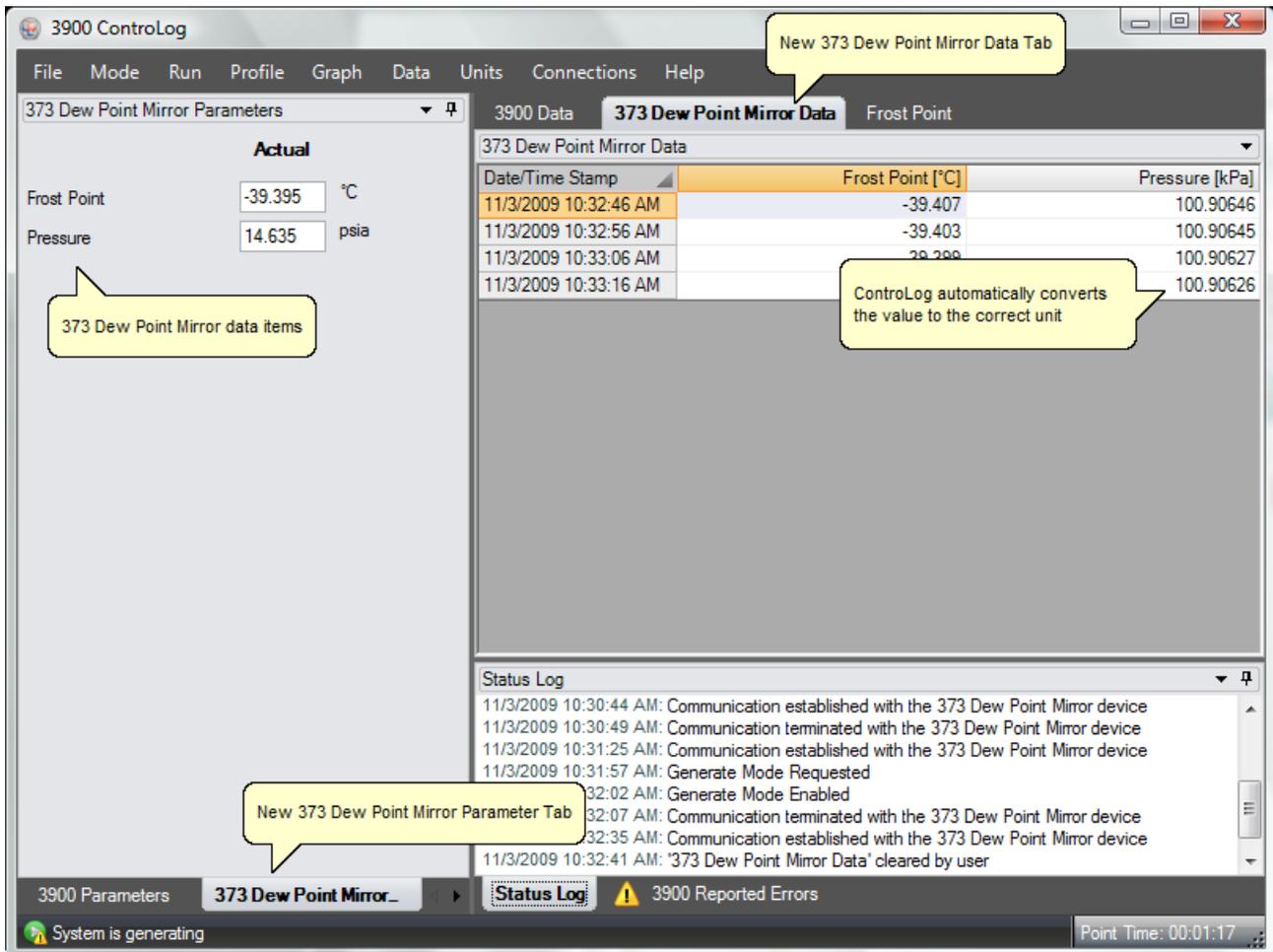
The default access interval of 1.5 seconds is entered.



Once completed, ControLog will attempt to establish communication with the 373.



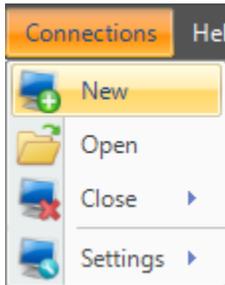
Once communication is successfully established with the 373, a new parameter tab and data tab will be created. Note that both the parameter tab and data tab have the two data items we defined. Notice that since we defined what unit the data items were received in, ControLog is able to convert the values into the selected units for easy reading.



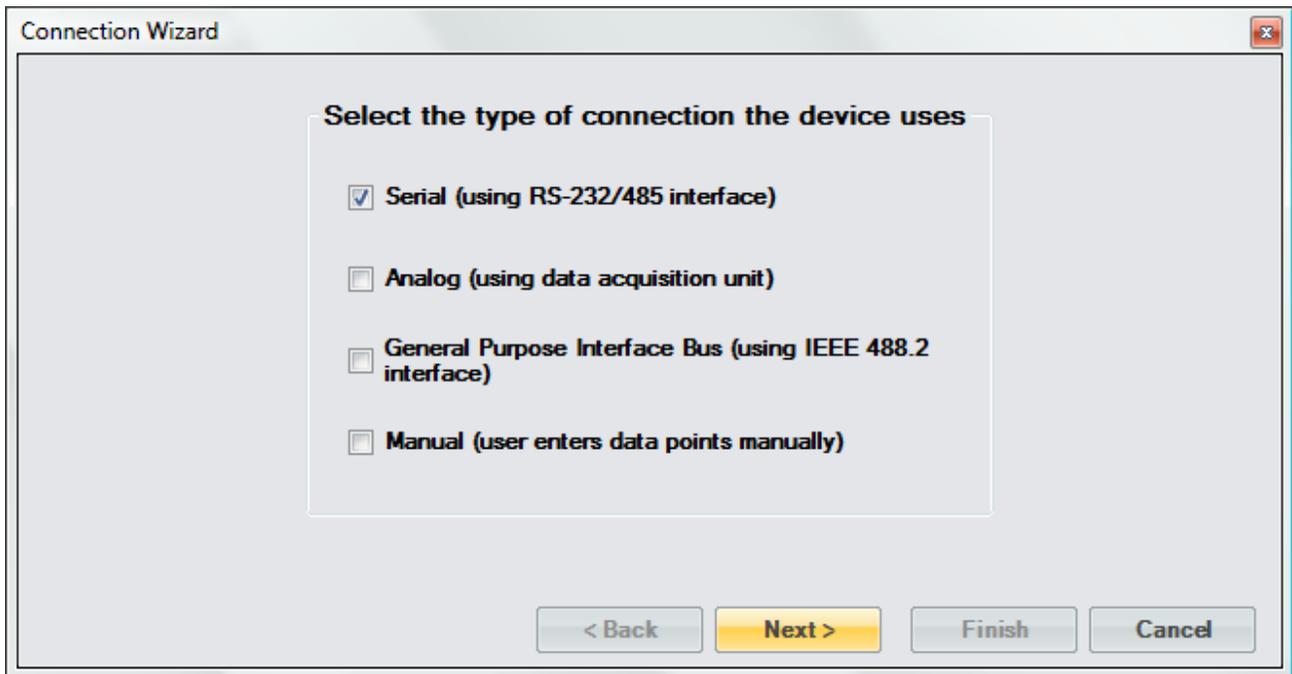
## Serial Connection Example 2

This example will demonstrate the creation of a serial connection to an MBW<sup>®</sup> DP-30 Precision Dew Point Hygrometer. This example will be working with a DP-30 that has the temperature and pressure option. The DP-30 does not require any request to receive data. Instead, it constantly outputs three data messages at a periodic rate.

Start by selecting “New” from the Connections menu.



Select “Serial” as the type of device connection.



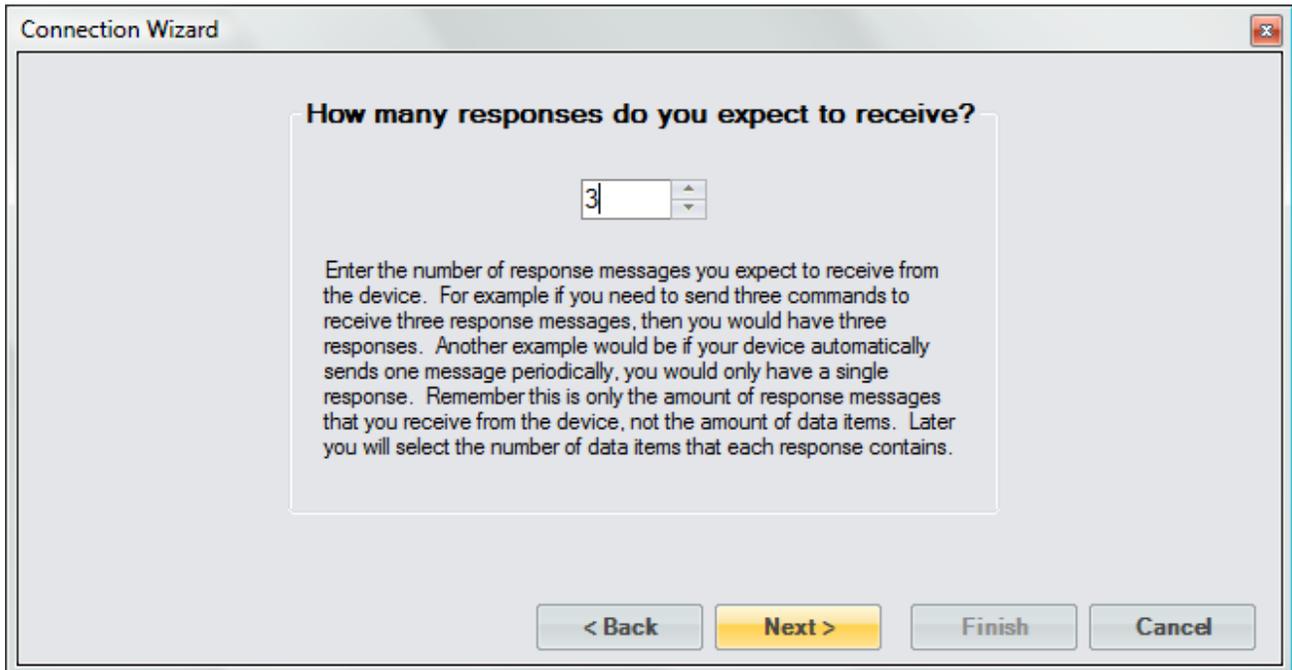
Enter “DP 30 with Options” as the name for the device.



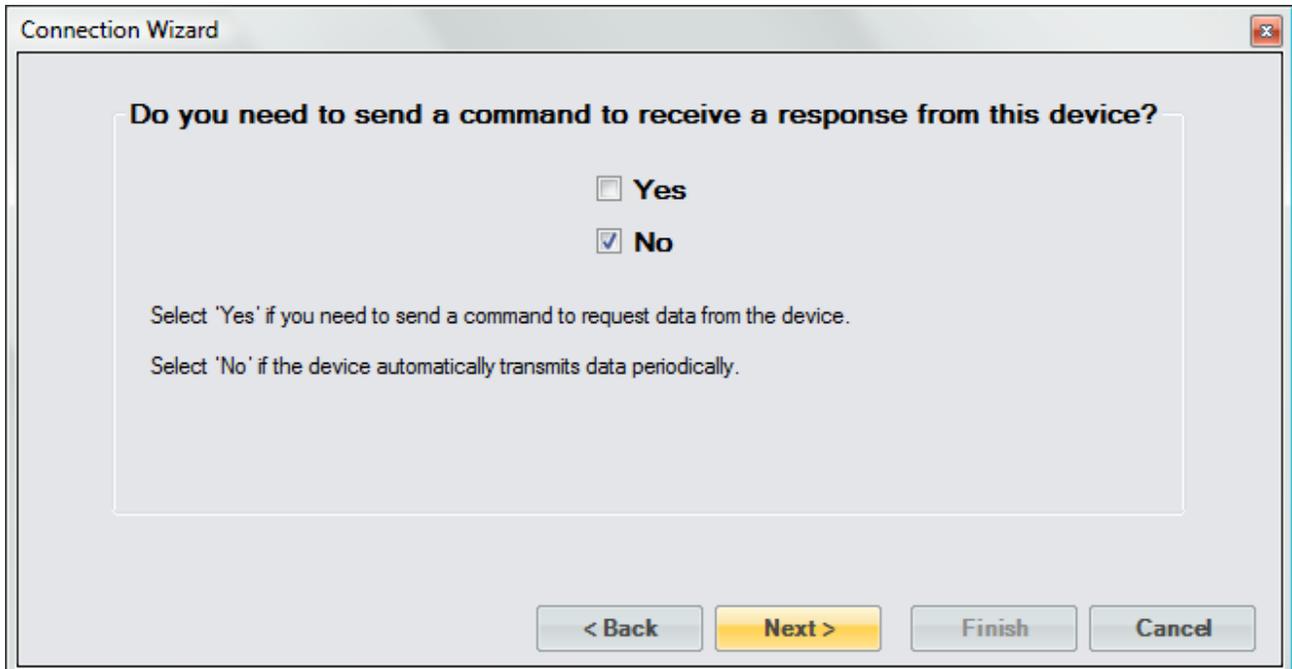
For the DP-30 we do not need to send any setup commands.



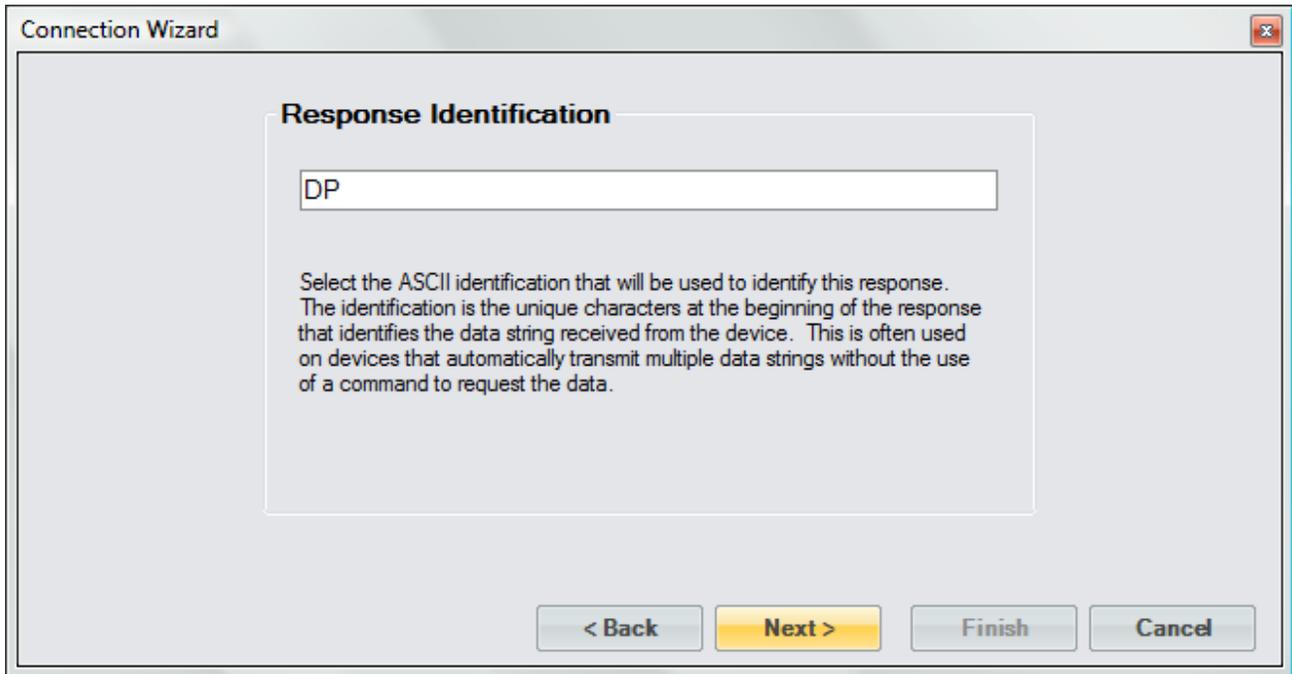
We will receive three responses from the DP-30; one with the Dew Point Temperature value and Status, one with the Dry Temperature value and one with the Pressure value.



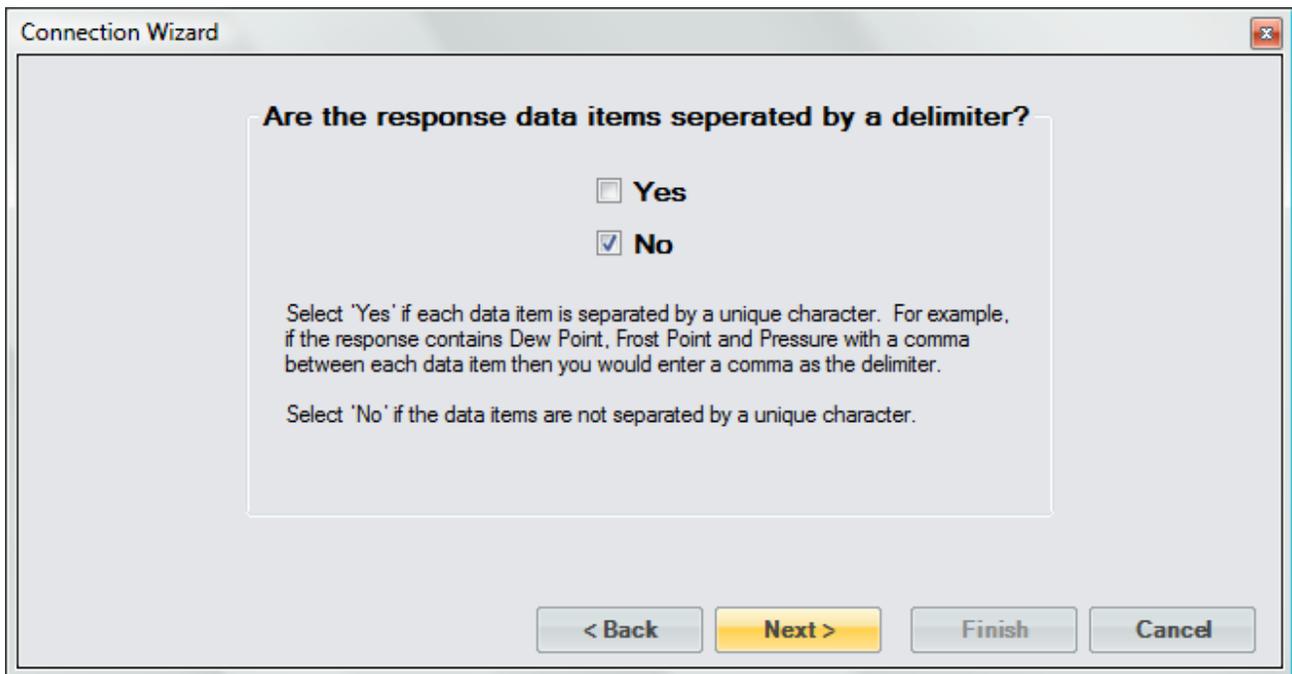
The DP-30 does not require any command to be sent to receive a response. The DP-30 automatically transmits the messages.



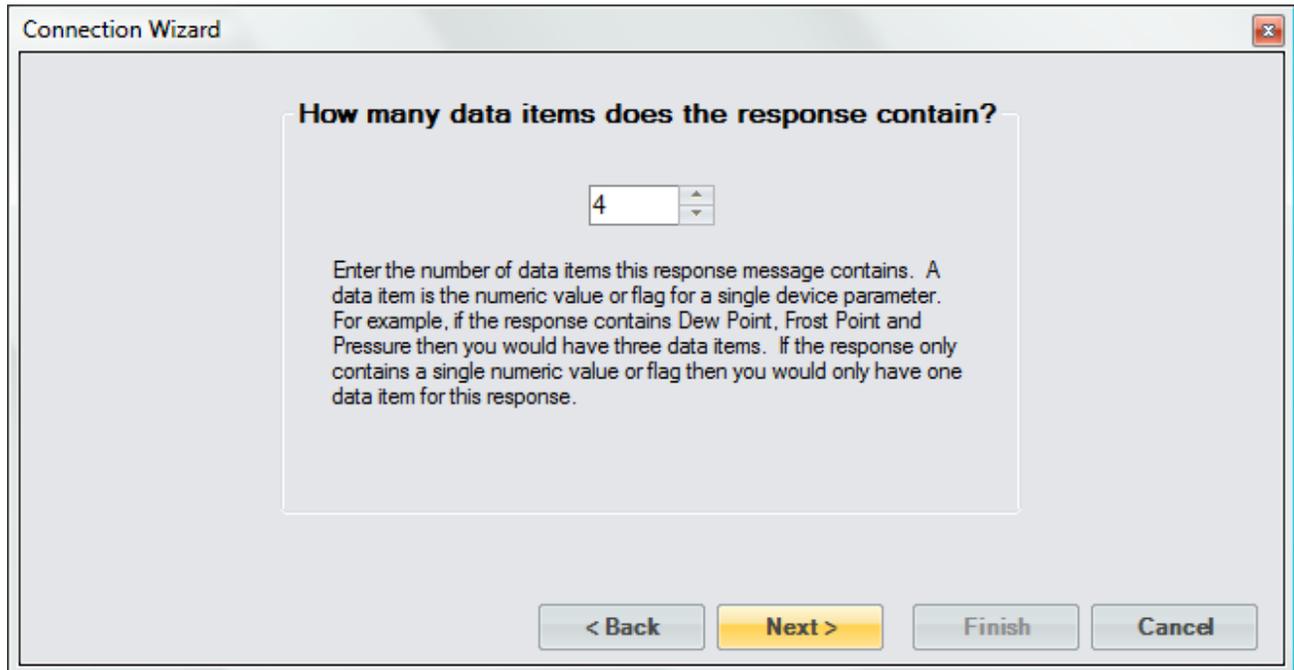
For the first message we enter the response identification of the Dew Point Temperature message.



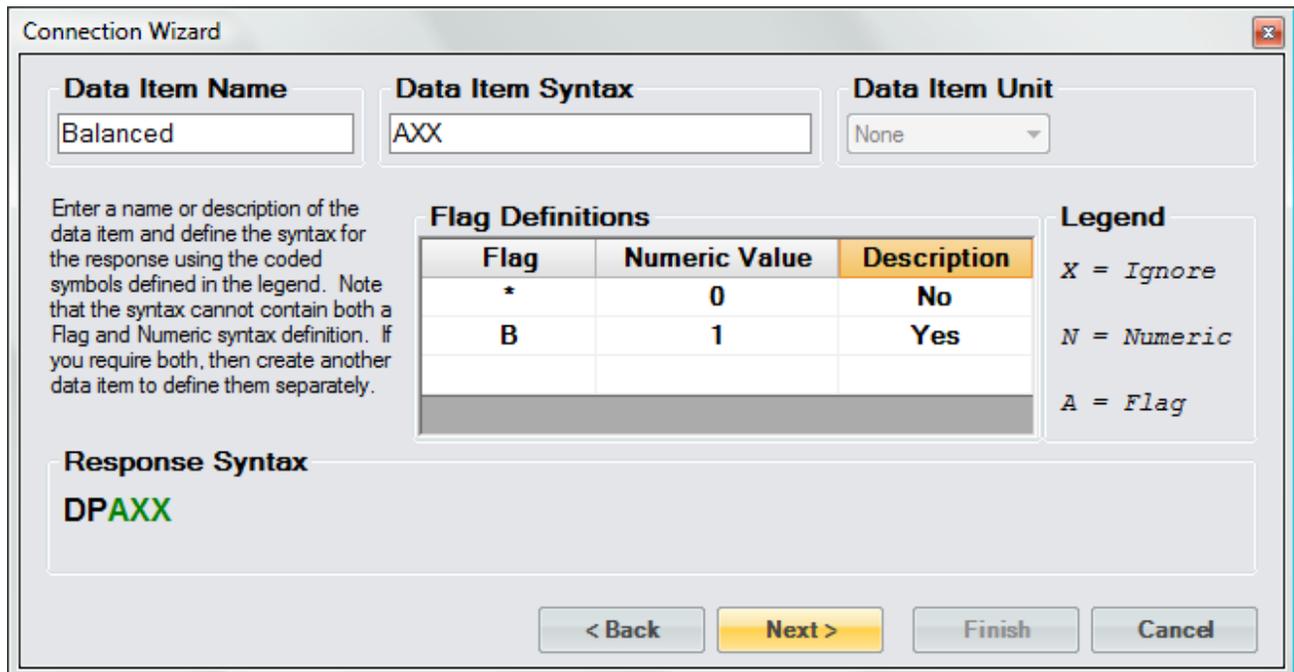
The DP-30 Dew Point Temperature message is of a fixed format and does not use any delimiter.



The Dew Point Temperature message contains three flags and one value that results in a total of four data items for this response.



The first data item is a flag indicating whether the DP-30 is balanced. The DP-30 will send a “\*” indicating that it is not balanced or a “B” indicating that it is balanced. Since we are not interested in the next two characters after this flag in the message we will tell ControLog to ignore them by adding two “X”s after the flag symbol. Next we define these flag definitions and give them a simple “Yes” or “No” description to allow the user to easily determine their state in the parameter tab.



The second data item is a flag indicating whether the DP-30 is running. The DP-30 will send a “\*” indicating that it is not running or an “S” indicating that it is running. We again define these flag definitions and give them a simple “Yes” or “No” description to allow the user to easily determine the state in the parameter tab.

**Connection Wizard**

**Data Item Name**: Run

**Data Item Syntax**: A

**Data Item Unit**: None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Flag	Numeric Value	Description
*	0	No
R	1	Yes

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

DPAXXA

< Back   Next >   Finish   Cancel

The third data item is a flag indicating whether the DP-30 is in standby. The DP-30 will send a “\*” indicating that it is not in standby or an “S” indicating that it is in standby. We again define these flag definitions and give them a simple “Yes” or “No” description to allow the user to easily determine the state in the parameter tab.

**Connection Wizard**

**Data Item Name**: Standby

**Data Item Syntax**: A

**Data Item Unit**: None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

DPAXXAA

< Back   Next >   Finish   Cancel

The fourth data item is the dew point temperature value. The DP-30 will send a numeric value indicating the dew point temperature in degrees Celsius. We define the syntax exactly as the DP-30 documentation specifies. The response value is the actual value so there is no need to define any type of scaling.

**Connection Wizard**

**Data Item Name:** Dew Point

**Data Item Syntax:** +NNN.NN

**Data Item Unit:** Temperature °C

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Scaling	
Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

**DPAXXAA+NNN.NN**

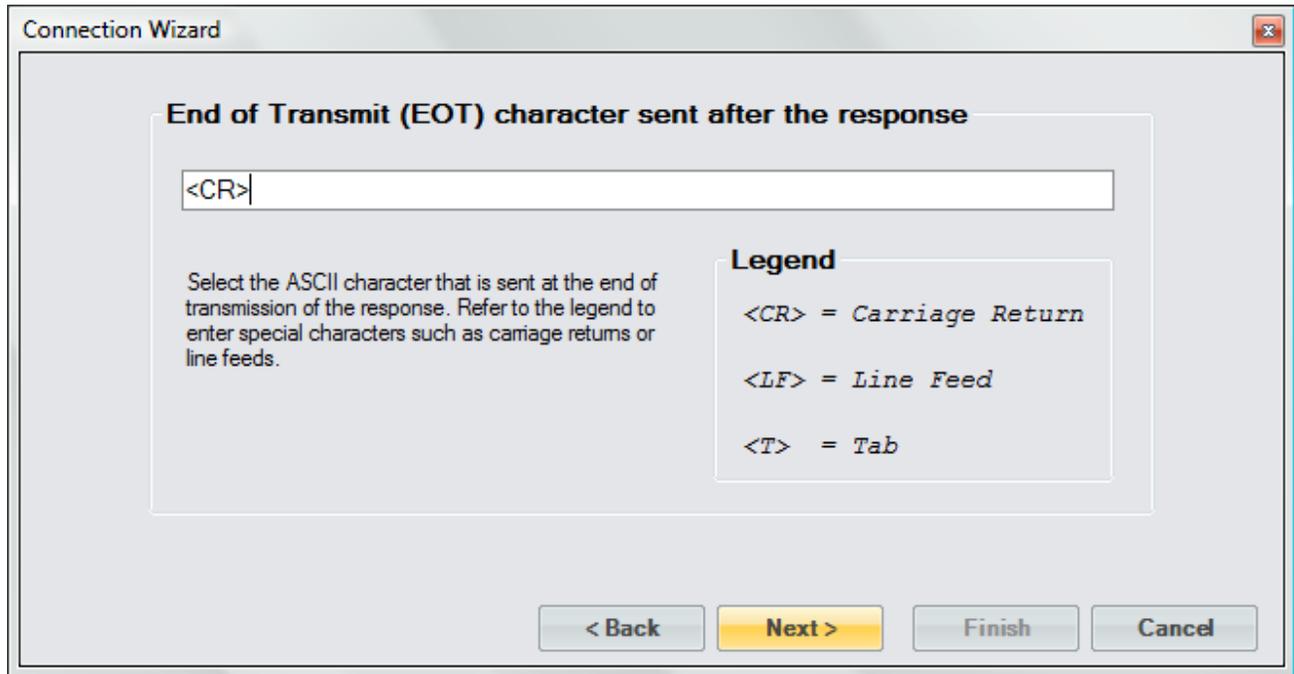
< Back   Next >   Finish   Cancel

Notice that ControlLog shows the combined response syntax for this message at the bottom of the form. This syntax will closely resemble the syntax defined in the DP-30 documentation for the dew point temperature message. The bold portion of the syntax is the current data item's syntax within the response message.

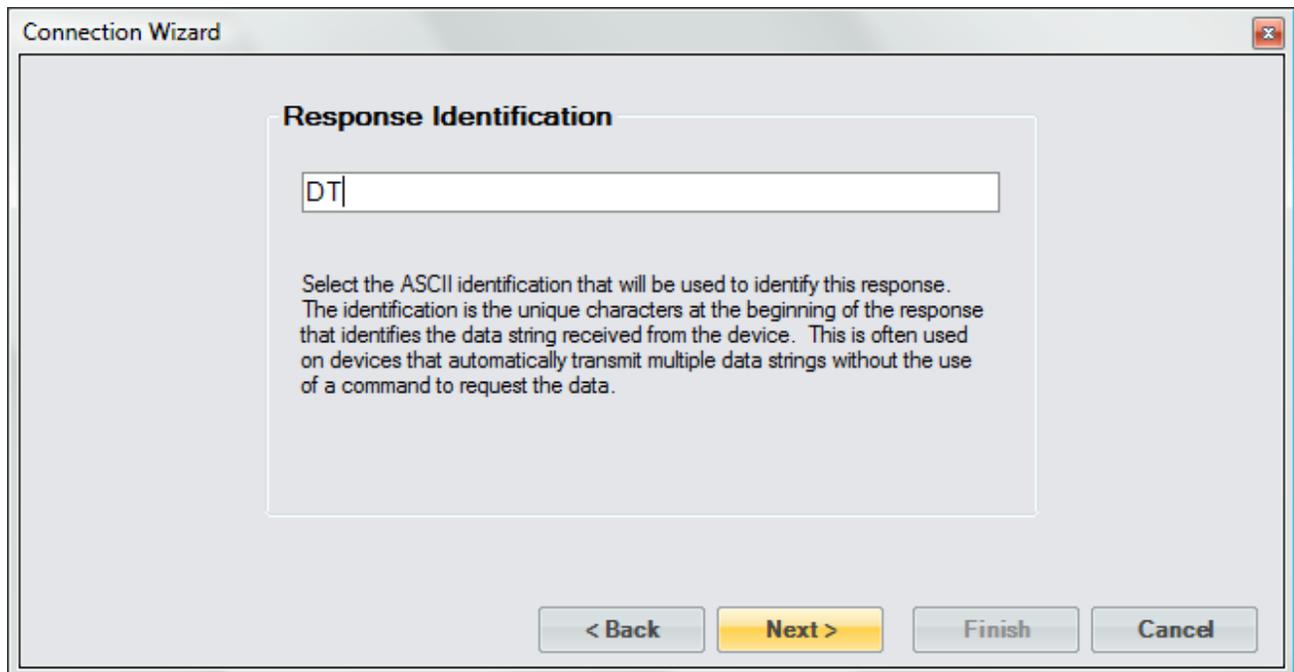
**Response Syntax**

**DPAXXAA+NNN.NN**

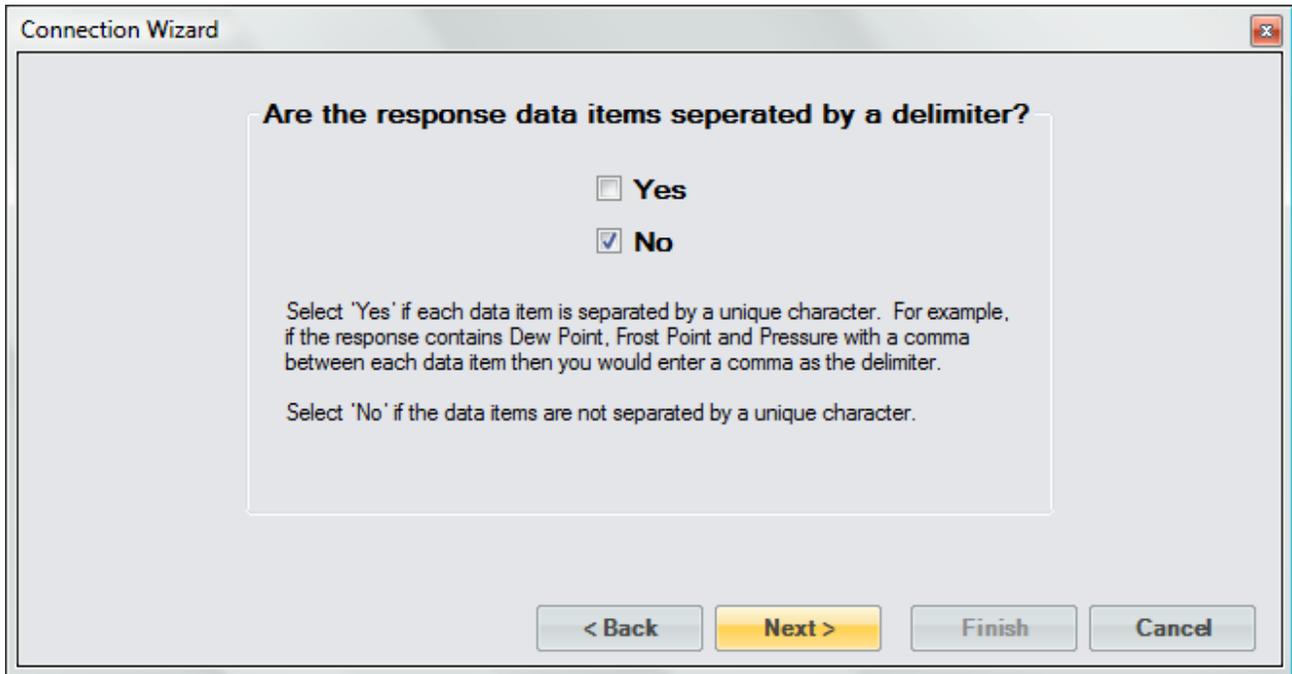
The Dew Point Temperature message is terminated with a carriage return.



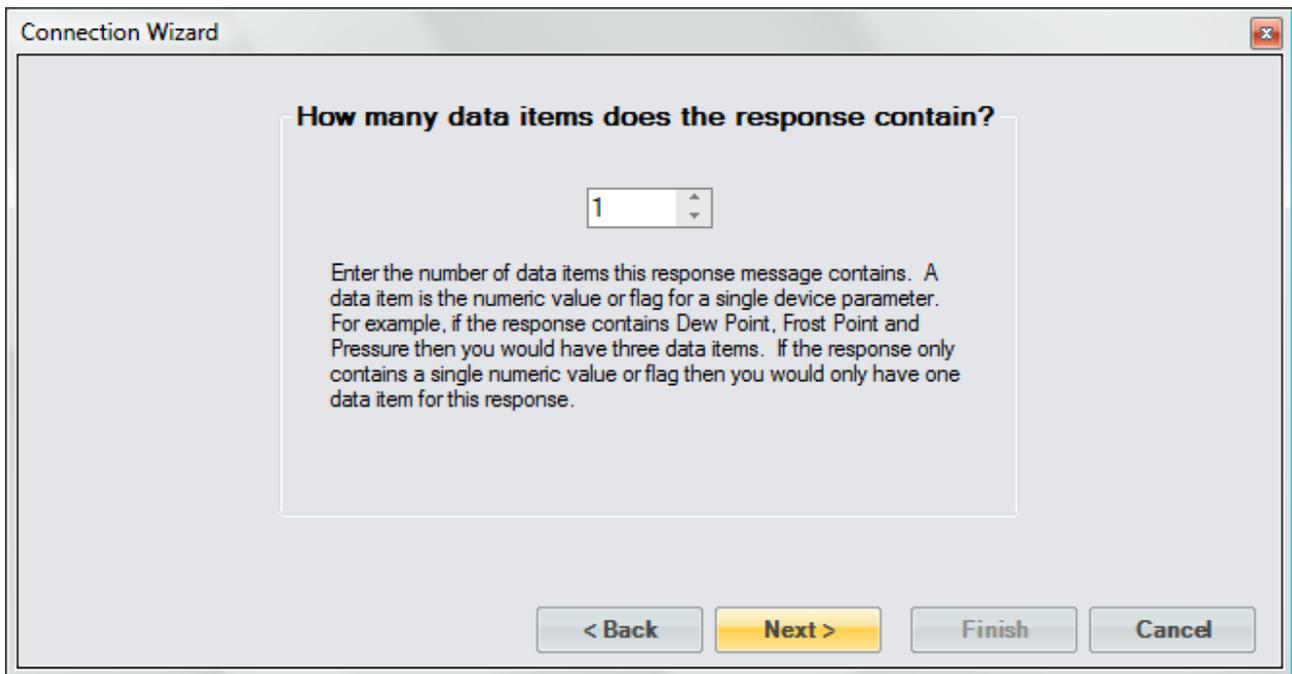
Next we define the response identification for the second message. Referring to the DP-30 documentation we enter the identification for the Dry Temperature message.



The DP-30 Dry Temperature message is of a fixed format and does not use any delimiter.



The Dry Temperature message contains only one numeric value therefore there is only one data item for this response.



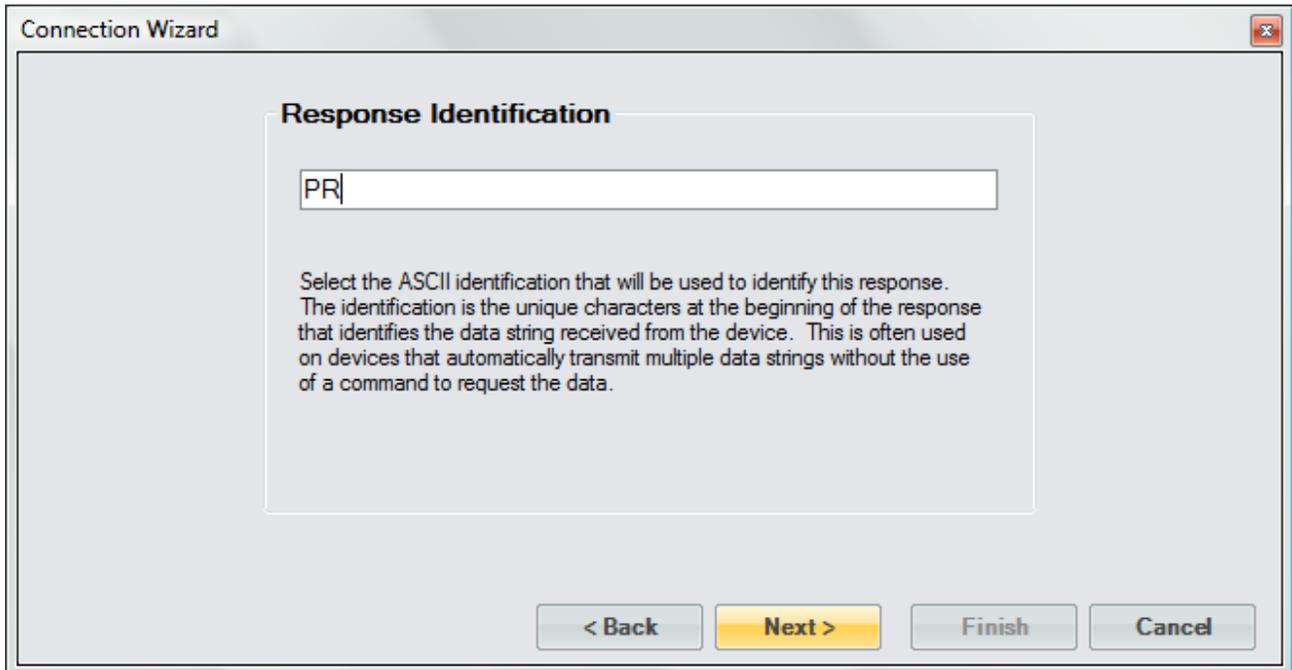
The message is lead by a number of ASCII characters that we do not have any interest in. We will tell ControLog to ignore these leading characters by defining the syntax with five “X” characters then the numeric syntax. We define the numeric syntax exactly as the DP-30 documentation specifies. Again, the response value is the actual value so there is no need to define any type of scaling.

The screenshot shows the 'Connection Wizard' dialog box. It has three main input fields at the top: 'Data Item Name' containing 'Temperature', 'Data Item Syntax' containing 'XXXXX+NNN.NN', and 'Data Item Unit' with a dropdown menu set to 'Temperature' and a unit dropdown set to '°C'. Below these is a text area with instructions: 'Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.' To the right of this text is a 'Scaling' table with two columns: 'Signal Value' and 'Data Value'. Below the table is a 'Legend' box containing: 'X = Ignore', 'N = Numeric', and 'A = Flag'. At the bottom left, there is a 'Response Syntax' field containing 'DTXXXXX+NNN.NN'. At the bottom right, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

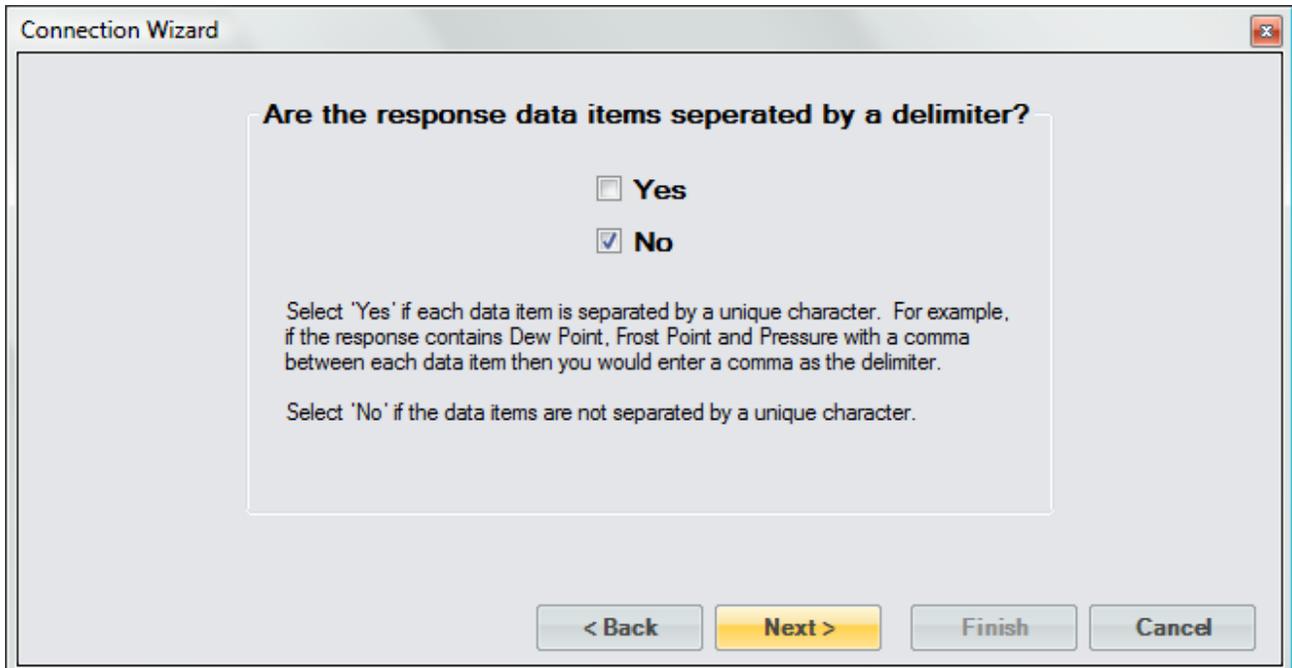
The Dry Temperature message is terminated with a carriage return.

The screenshot shows the 'Connection Wizard' dialog box at a later step. The title is 'End of Transmit (EOT) character sent after the response'. There is a text input field containing '<CR>'. Below this is a text area with instructions: 'Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.' To the right is a 'Legend' box containing: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom right, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

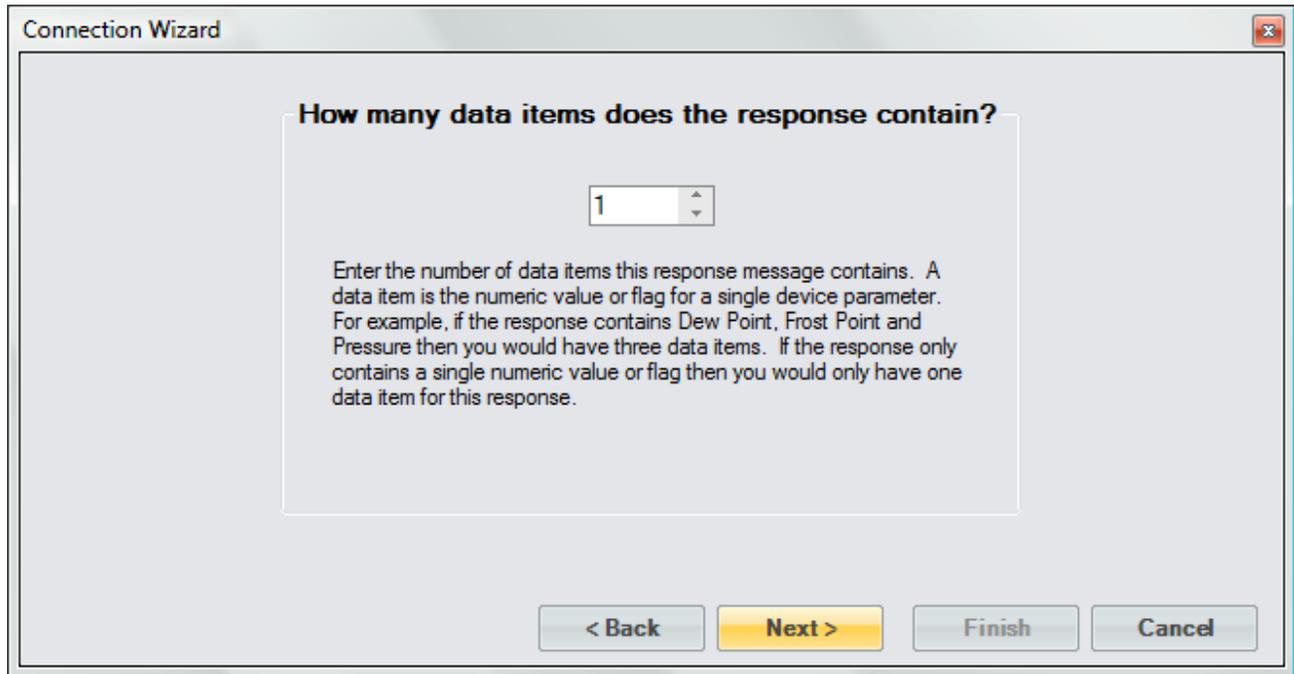
We now define the response identification for the third and last message. Referring to the DP-30 documentation we enter the identification for the Pressure message.



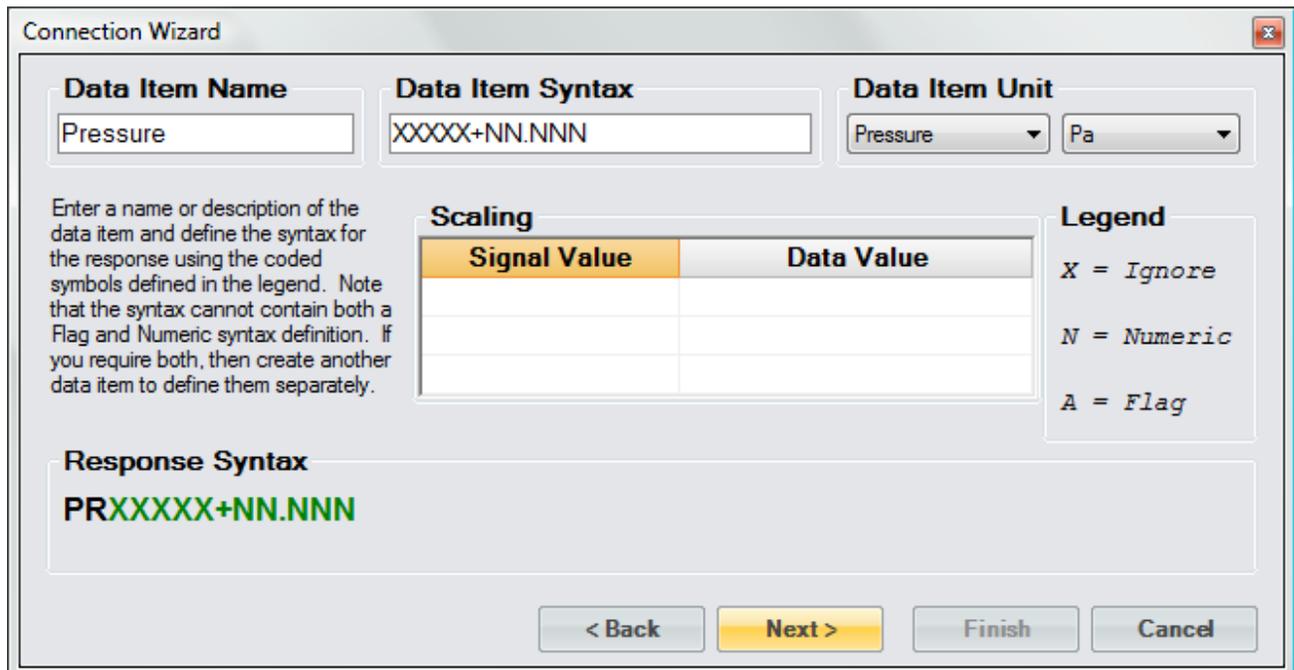
The DP-30 Pressure message is of a fixed format and does not use any delimiter.



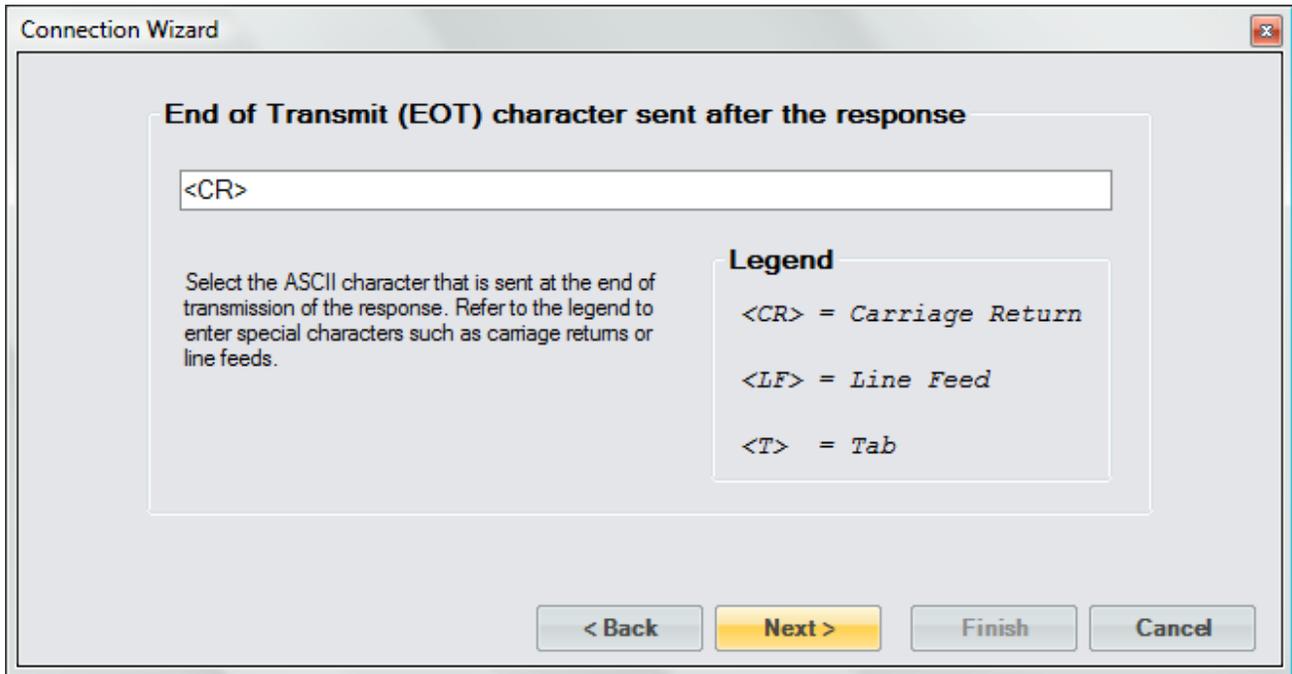
The Pressure message contains only one numeric value therefore there is only one data item for this response.



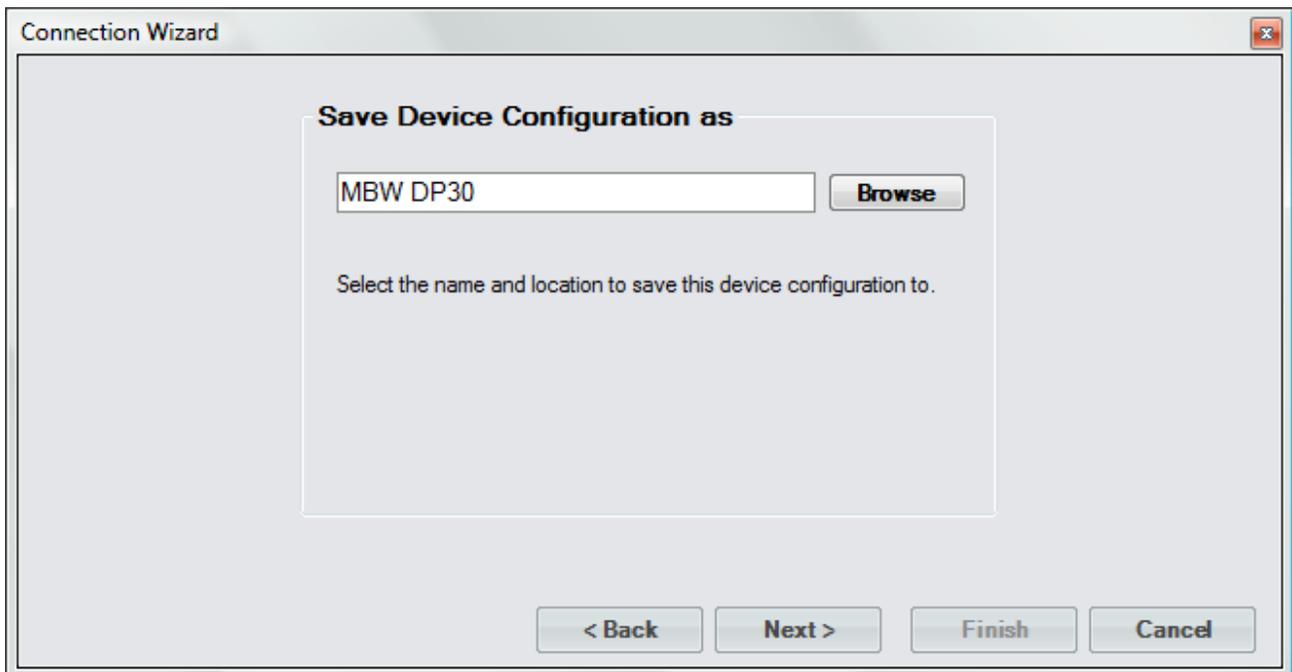
Again the message is lead by a number of ASCII characters that we do not have any interest in. We will tell ControlLog to ignore these leading characters by defining the syntax with five “X” characters then the numeric syntax. We define the numeric syntax exactly as the DP-30 documentation specifies. Note that we set the data item unit to the unit specified in the DP-30 documentation. This allows ControlLog to convert the reading into a more desired unit if needed. Again, the response value is the actual value so there is no need to define any type of scaling.



The Pressure message is terminated with a carriage return.



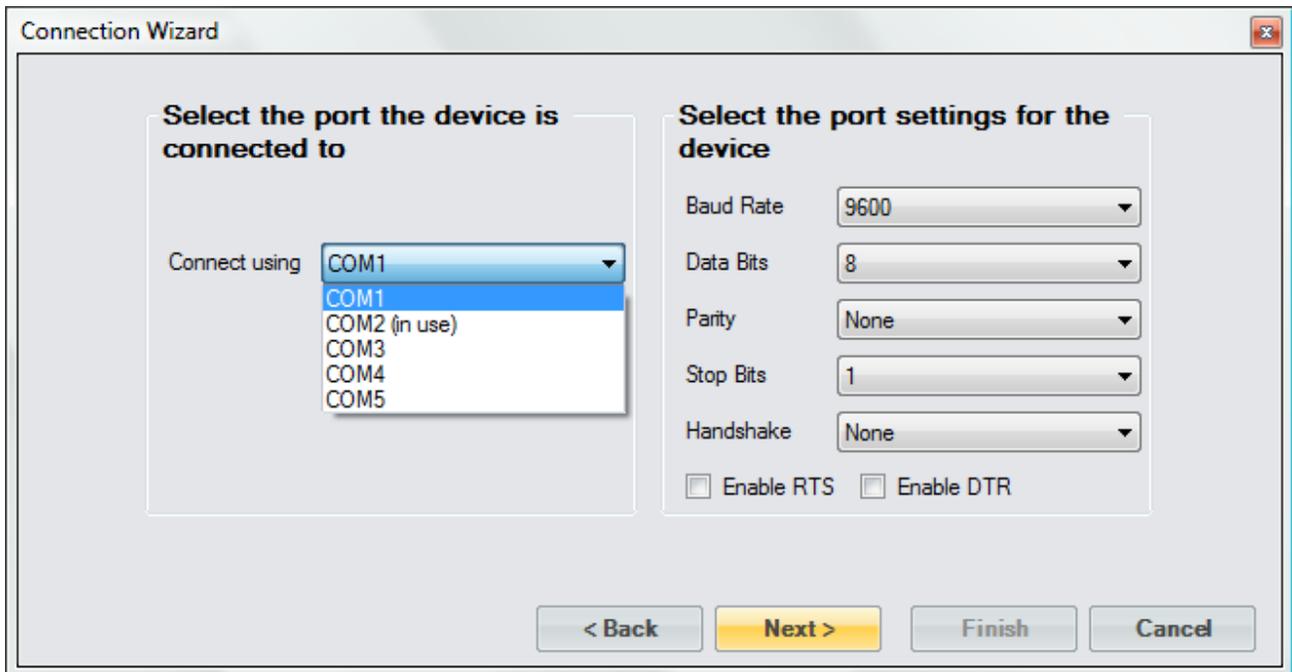
Save the newly created device to a file so that it can be recalled at a later time.



Select to connect to the device now.



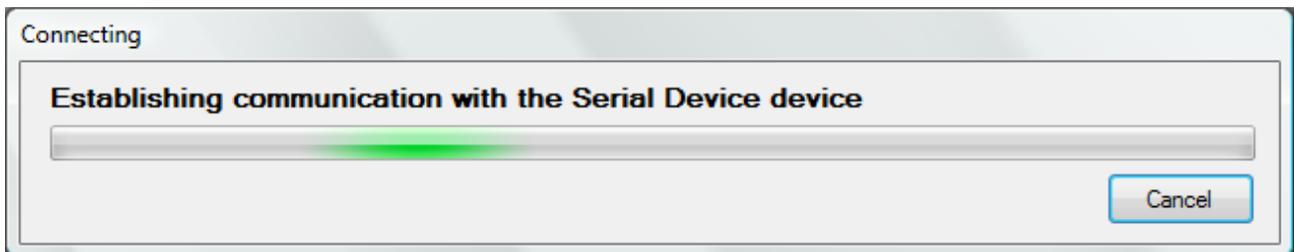
Select the port the DP-30 is connected to. Notice that ControLog indicates which ports are in use. Refer to the DP-30 documentation for the RS-232 port settings:



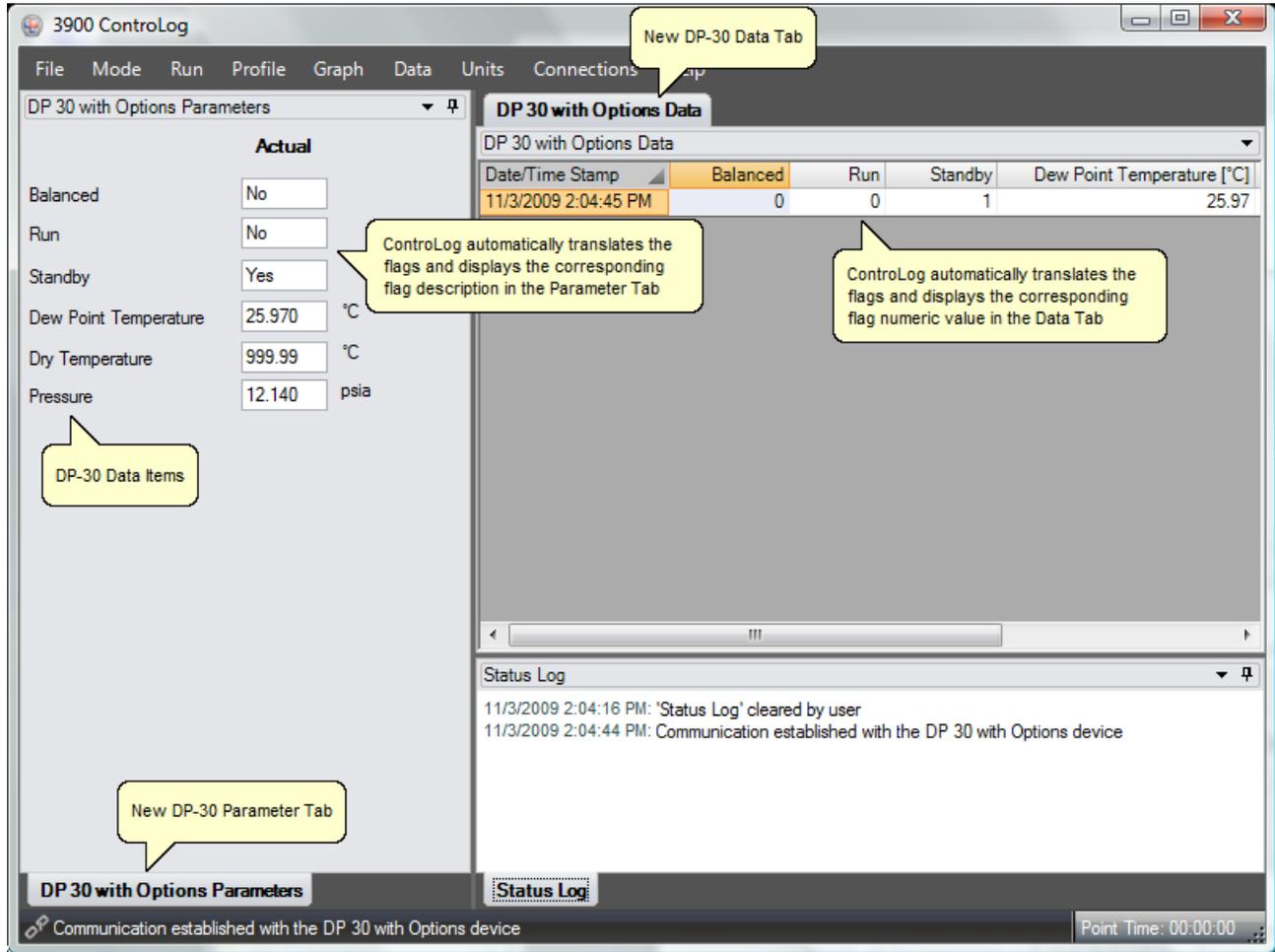
Use the default access rate of 1.5 seconds.



Once completed, ControLog will attempt to establish communication with the DP-30.



Once communication is successfully established with the DP-30, a new parameter tab and data tab will be created. Notice that ControLog automatically translates the ASCII flags based on the definitions described when creating the data items for the connection.

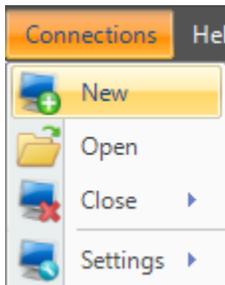


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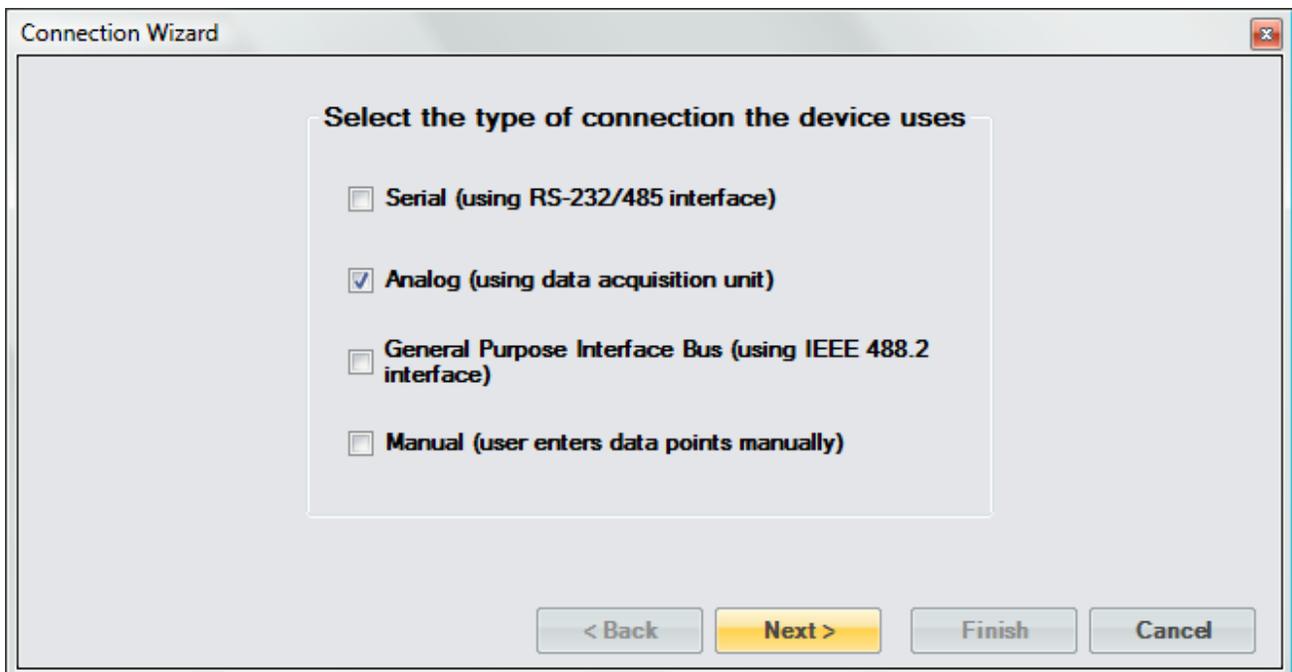
## Analog Connection

An Analog Connection uses the Agilent® 34970A Data Acquisition/Switch Unit to acquire data from a single or multiple analog devices. The customizable interface provided by ControLog allows the user to define different analog types and scales to read various analog signals. Refer to the Agilent® documentation for more information on connecting analog devices to the Data Acquisition Unit.

To create a new analog connection, select “New” from the Connections menu. This will open a “Connection Wizard” dialog that will step the user through the connection definition process.



Select “Analog” as the type of connection the device uses.

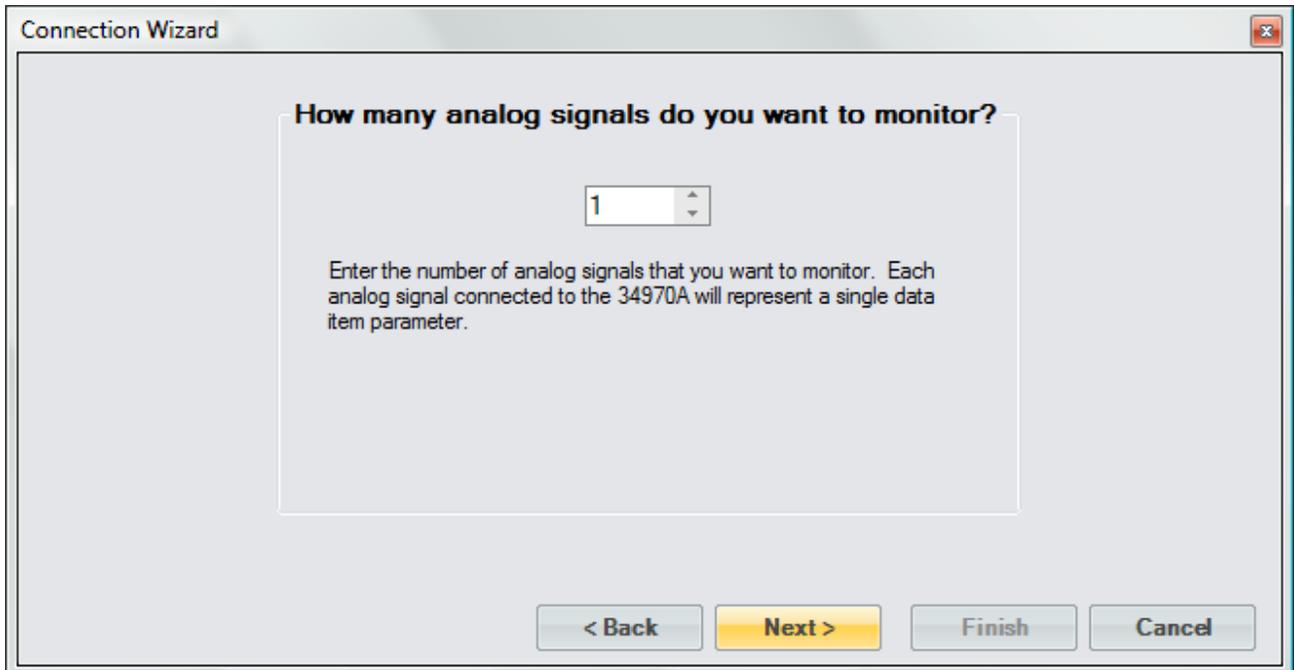


Enter a unique name for the analog device or devices.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a text input field. At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Enter the number of analog signals you want to monitor. This is the combined amount of analog signals from each device you wish to monitor. Each analog signal connected to the 34970A will represent a single data item parameter.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "How many analog signals do you want to monitor?" above a spin box containing the number "1". Below the spin box is the text: "Enter the number of analog signals that you want to monitor. Each analog signal connected to the 34970A will represent a single data item parameter." At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. This dialog will repeat for each monitored signal.

**Connection Wizard**

**Data Item Name**

**Channel** 101

**Function** Volts DC

**Range** 300 V

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

**Data Item Unit** None

Signal Value	Data Value

< Back   Next >   Finish   Cancel

The function defines what type of analog signal the device uses.

**Connection Wizard**

**Data Item Name**

**Channel** 101

**Function** Volts DC

**Range** 300 V

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

**Data Item Unit**

Signal Value	Data Value

< Back   Next >   Finish   Cancel

The range specifies the range for which the analog signal operates within. The available range selection changes automatically to reflect what is available for the selected function. For example, the Resistance function has a Range from 100 Ohms to 100 Mega Ohms.

**Connection Wizard**

**Data Item Name**

**Channel** 101

**Function** Resistance

**Range** 100 MΩ

**Data Item Unit** None

**Scaling**

Signal Value	Data Value

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

< Back   Next >   Finish   Cancel

Selecting the unit for the data item will allow ControLog to convert the value to the selected system units for display in the parameter tab and record the value in the default SI units in the data tab. Remember this is the unit the device is sending the data item in, not the unit you wish to display the data item as. If “None” is selected then ControLog will treat the data item as a simple number and will display and record the value exactly as it is received.

**Connection Wizard**

**Data Item Name**

**Channel** 101

**Function** Volts DC

**Range** 10 V

**Data Item Unit** °C

**Scaling**

Signal Value	Data Value

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

< Back   Next >   Finish   Cancel

It is possible to scale an analog signal. The scaling consists of a two point definition for a linear scaling or a three to seven point definition for polynomial interpolation scaling. The number of points determines the degree of the polynomial used to scale the analog signal. Lagrangian Interpolation is used to determine the coefficients of the polynomial. Each point definition consists of a signal value and a data value. The signal value represents the “raw” analog signal. The data value represents the actual value or real world value at the given signal value.

Scaling allows the user to scale an analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0 %RH and 5 volts corresponds to 100 %RH. The user can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

**Connection Wizard**

**Data Item Name**

**Channel** 101

**Function** Volts DC

**Range** 10 V

**Data Item Unit** None

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

Signal Value	Data Value
0	0
5	100

< Back   **Next >**   Finish   Cancel

Select the name and location to save the new analog connection. Clicking the “Browse” button will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All device connection files are saved in XML format with a (\*.device) extension.



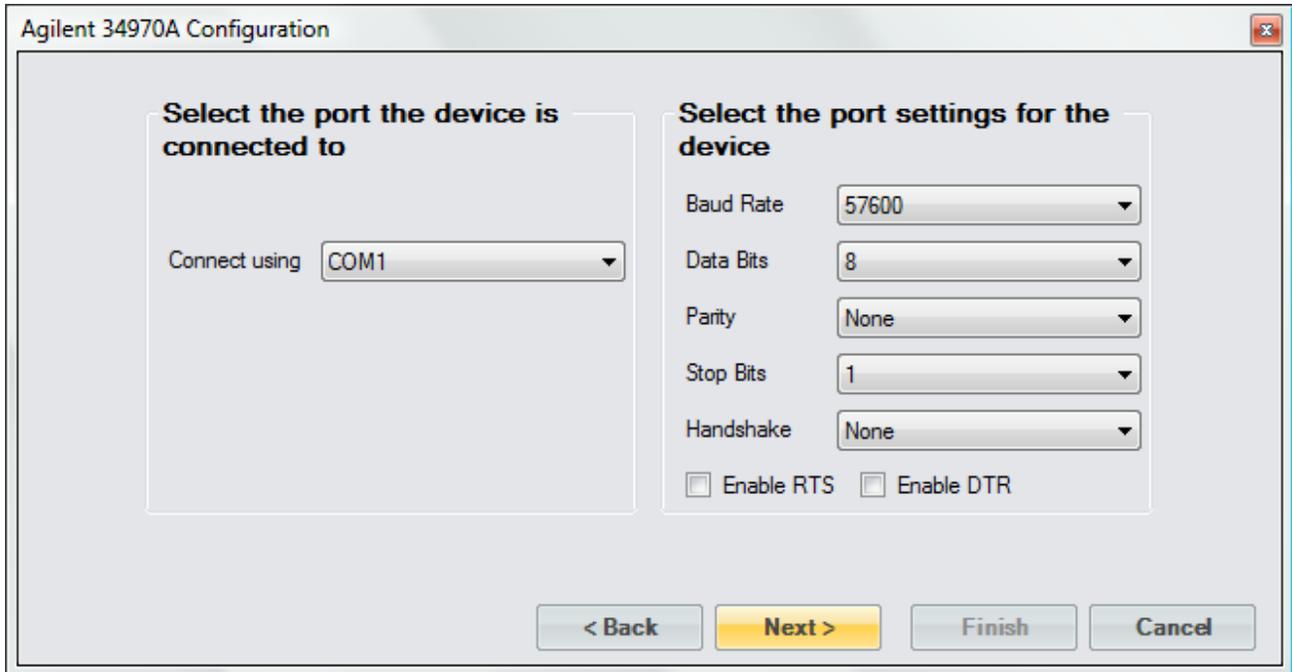
Next the user can select whether to connect to the device now or to exit without connecting.

*Note: The user can connect at any time by loading the device from the Connections menu.*



Select the communication port that the Agilent® 34970A Data Acquisition/Switch Unit is connected to and select the port settings for the 34970A.

*Note: ControLog defaults to the default port settings for the Agilent® 34970A Data Acquisition/Switch Unit. Refer to the Agilent® documentation for instructions on viewing or setting the Data Acquisition RS-232 settings.*



The image shows a software configuration window titled "Agilent 34970A Configuration". It is divided into two main sections. The left section, titled "Select the port the device is connected to", contains a label "Connect using" and a dropdown menu currently set to "COM1". The right section, titled "Select the port settings for the device", contains five dropdown menus: "Baud Rate" (57600), "Data Bits" (8), "Parity" (None), "Stop Bits" (1), and "Handshake" (None). Below these are two checkboxes: "Enable RTS" and "Enable DTR", both of which are unchecked. At the bottom of the window are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select the access rate to communicate with the Agilent® 34970A Data Acquisition/Switch Unit.

*Note: Because of the nature of the 34970A and how it operates it is critical to specify an access interval that is long enough to allow the 34970A to complete its scan list within the specified interval. As a general rule of thumb, use 1.5 seconds per every 10 signals connected to the Data Acquisition Unit with a minimum access interval of 1.5 seconds.*

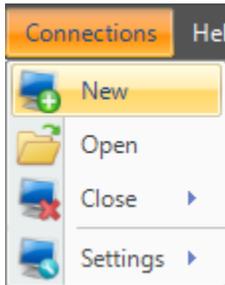


Select "Show Interface Console" to automatically open a Device Interface Console tab once communication has been established with the device.

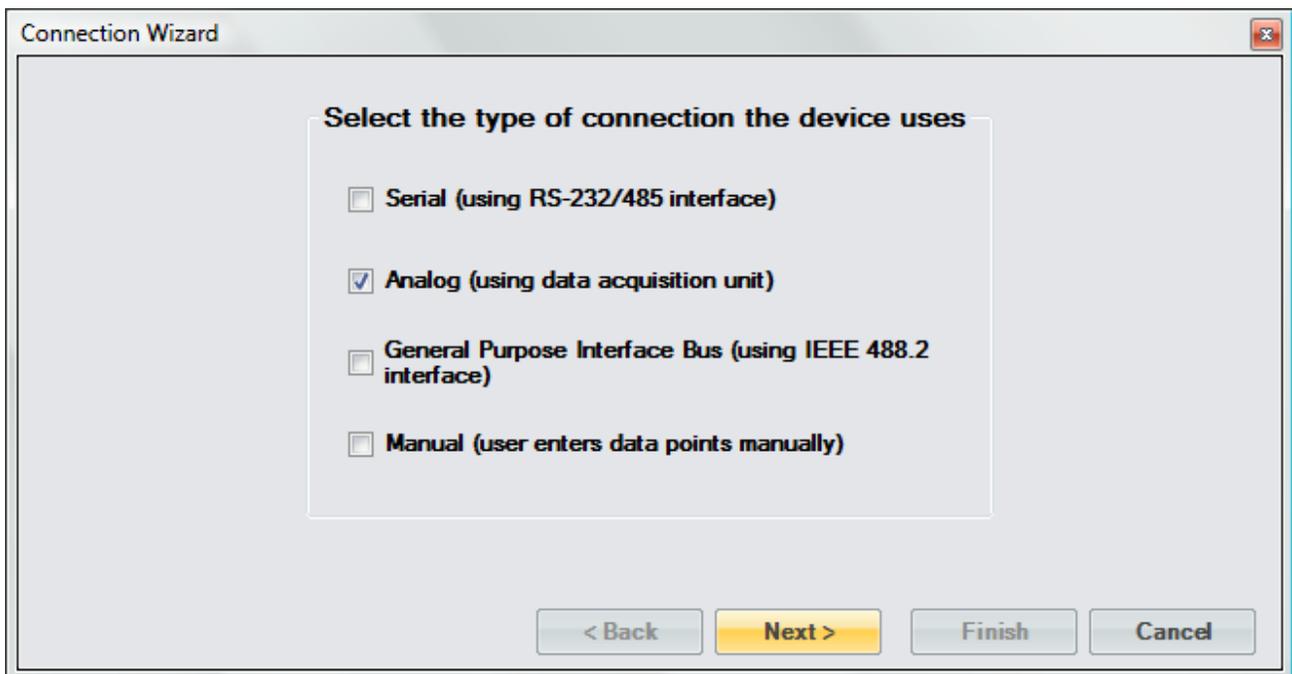
## Analog Connection Example

This example will demonstrate the creation of an analog connection. This example will be working with a -10 to +10V input signal that we will scale to a Dew Point/Frost Point Temperature, a Temperature Thermistor and a 4-wire Temperature RTD.

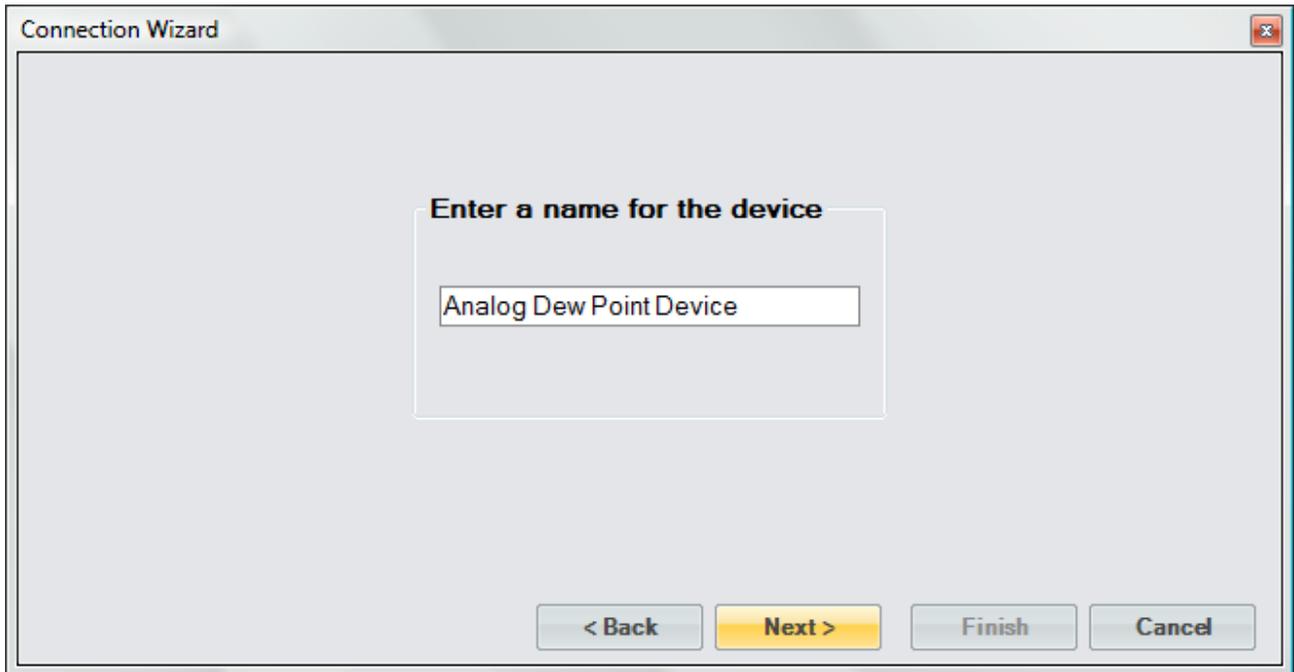
Start by selecting “New” from the Connections menu.



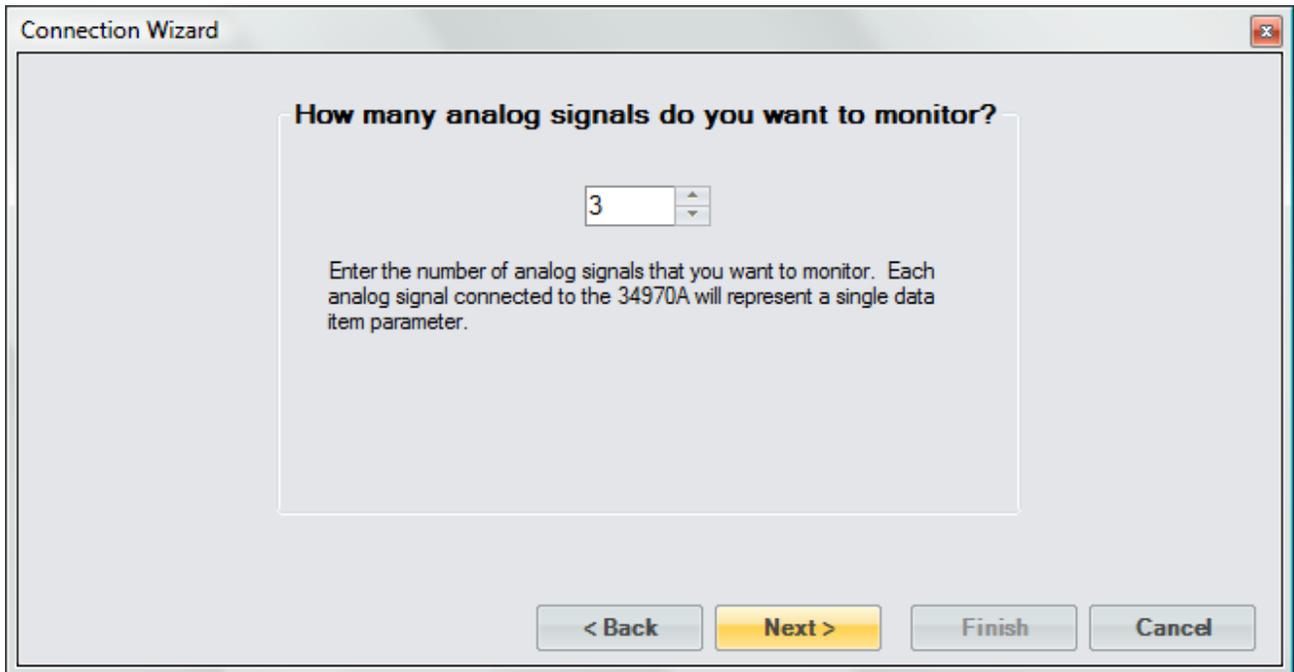
Select “Analog” as the type of device connection.



Enter “Analog Dew Point Device” as the name for the device.



In this example we have three signals that we want to monitor; a voltage, thermistor and an RTD.



The first item is given the name “Dew/Frost Point”. We select the Channel number that the signal is connected to and since the signal is a voltage we select “Volts DC” as the function. The range is set to “10V” and we know the signal corresponds to a temperature in degrees Celsius. We also scale the value since we know -10V corresponds to a Frost Point temperature of -100 °C and +10V corresponds to a Dew Point temperature of +100 °C. By entering scaling ControLog will automatically scale the signal for display in the parameter tab and when recorded in the data tab.

The screenshot shows the 'Connection Wizard' dialog box with the following settings:

- Data Item Name:** Dew/Frost Point
- Channel:** 109
- Function:** Volts DC
- Range:** 10 V
- Data Item Unit:** Temperature, °C
- Scaling Table:**

Signal Value	Data Value
-10	-100
10	100

Buttons at the bottom: < Back, Next >, Finish, Cancel.

The second item is given the name “Temperature 1”. We select the Channel number that the signal is connected to. Notice ControLog indicates which channels have already been configured and are in use.

The screenshot shows the 'Connection Wizard' dialog box with the following settings:

- Data Item Name:** Temperature 1
- Channel:** 110 (dropdown menu is open showing channels 101-201, with 109 marked as '(in use)')
- Function:** Volts DC
- Range:** 10 V
- Data Item Unit:** None
- Scaling Table:**

Signal Value	Data Value

Buttons at the bottom: Next >, Finish, Cancel.

The function is set to “Temperature Thermistor” and we set the Range to “10k” based on the type of Thermistor we are connecting. Notice that ControLog automatically selects temperature as the unit type but allows the user to select the desired temperature unit. Since the signal value is the actual temperature value, no scaling is required for this data item.

The screenshot shows the 'Connection Wizard' dialog box. The 'Data Item Name' is 'Temperature 1', 'Channel' is '102', 'Function' is 'Temperature Thermistor', and 'Range' is '10k'. The 'Data Item Unit' is 'Temperature' with a unit of '°C'. A 'Scaling' table is present with columns 'Signal Value' and 'Data Value'. Navigation buttons include '< Back', 'Next >', 'Finish', and 'Cancel'.

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

Signal Value	Data Value

The third item is given the name “Temperature 2”. The function is set to “Temperature RTD (4 Wire)” and we set the Range to “100 ohms, 85” based on the type of RTD we connected. Next, select the Channel number the RTD is connected to. Notice the channel list is smaller because 4-wire signals are automatically paired with the selected channel plus 10 to provide the source and sense connections for an RTD. Given this, the RTD in this example will occupy both channel 110 and 120 to complete its 4-wire connection.

The screenshot shows the 'Connection Wizard' dialog box. The 'Data Item Name' is 'Temperature 2', 'Channel' is '110', 'Function' is 'Temperature RTD (4 Wire)', and 'Range' is '100 ohms, 91'. The 'Data Item Unit' is 'Temperature' with a unit of '°C'. A 'Scaling' table is present with columns 'Signal Value' and 'Data Value'. Navigation buttons include 'Next >', 'Finish', and 'Cancel'.

Enter a name or description of the data item and define the analog channel for it. The channel is the corresponding instrument channel that the device is connected to. For 4-wire measurements, the instrument automatically pairs channel n with channel n+10 to provide the source and sense connections. The function defines what type of analog signal the device uses. The range specifies the range for which the analog signal operates within. The scaling allows you to scale the analog signal into a given humidity value. For example, if you have an analog signal that ranges from 0 volts to 5 volts and it is known that 0 volts corresponds to 0% RH and 5 volts corresponds to 100%RH. You can then enter these scaling values and ControLog will automatically apply the scaling to the data item whenever it is displayed or logged.

Signal Value	Data Value

Again, notice that ControLog automatically selects temperature as the unit type but allows the user to select the desired temperature unit. Since the signal value is the actual temperature value, no scaling is required for this data item.

The screenshot shows the 'Connection Wizard' dialog box. It has four main sections: 'Data Item Name', 'Channel', 'Function', and 'Range'. Below these is a detailed instruction block, followed by 'Data Item Unit' and 'Scaling' sections. At the bottom are navigation buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

Signal Value	Data Value

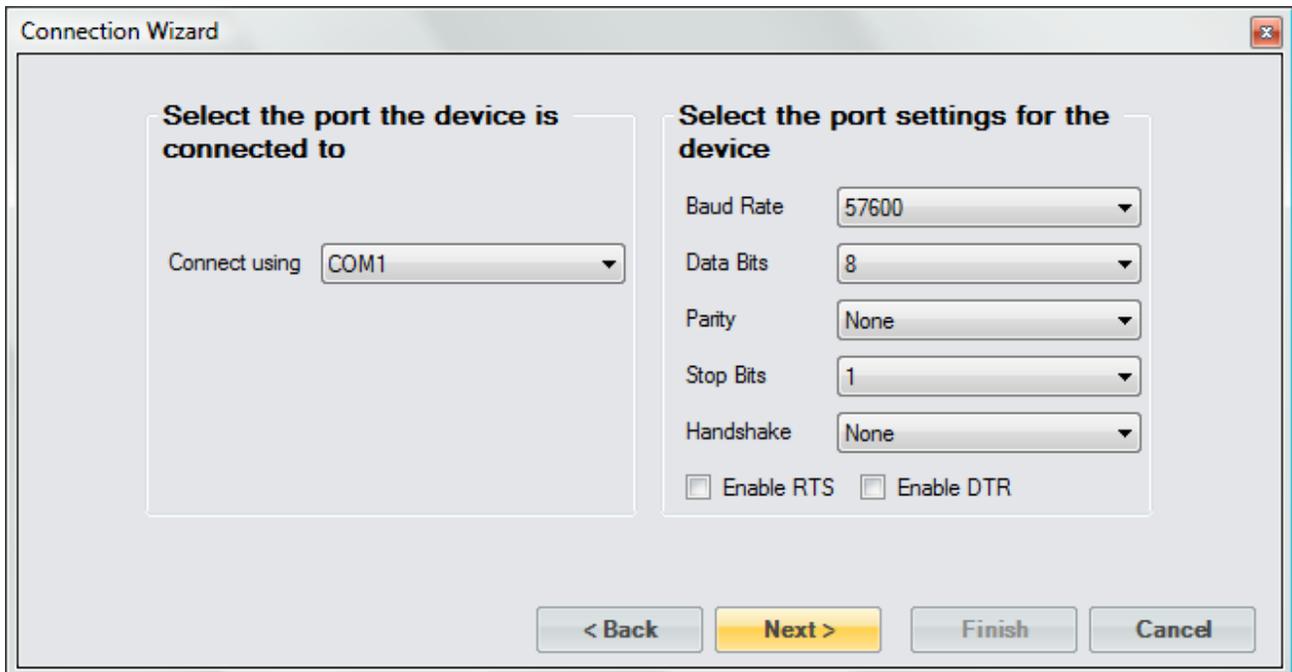
Save the newly created device to a file so it can be recalled at a later time.

The screenshot shows the 'Connection Wizard' dialog box at the 'Save Device Configuration as' step. It features a text input field containing 'Analog Dew Point Device' and a 'Browse' button. Below the input field is the instruction: 'Select the name and location to save this device configuration to.' At the bottom are navigation buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

Select to connect to the device now.



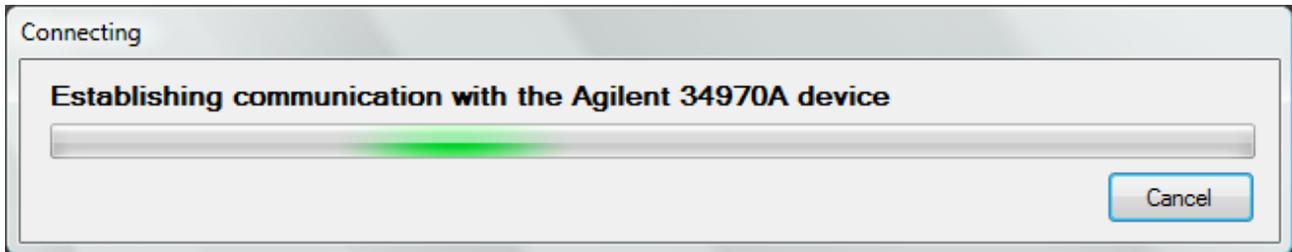
Select the communication port that the Agilent® 34970A Data Acquisition/Switch Unit is connected to and select the port settings for the 34970A.



Enter a sufficient access interval for the amount of signals being monitored. In this example we have less than 10 signals so we can start with the minimum access interval of 1.5 seconds.



Once completed, ControLog will attempt to establish communication with the Agilent® 34970A Data Acquisition/Switch Unit.



Once communication is successfully established with the 34970A a new parameter tab and data tab will be created. Notice that ControLog automatically scales the voltage signal based on the definitions described when defining the data item.

The screenshot displays the 3900 ControLog software interface. The main window is titled "3900 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. The interface is divided into several sections:

- Left Panel:** Titled "Analog Dew Point Device Parameters", it shows "Actual" values for:
  - Temperature 1: 25.391 °C
  - Dew/Frost Point: -86.616 °C
  - Temperature 2: 23.508 °C
- Top Right Panel:** Titled "Analog Dew Point Device Data", it displays a table of data points. A callout bubble points to the "Analog Dew Point Device Data" header with the text "New Analog Dew Point Device Data Tab".
- Table:** Contains the following data:
 

Date/Time Stamp	Temperature 1 [°C]	Dew/Frost Point [°C]	Temperature 2 [°C]
	25.372	-86.616266	23.475
	25.377	-86.616239	23.494
	25.378	-86.616266	23.497
	25.378	-86.616198	23.499
- Bottom Right Panel:** Titled "Status Log", it shows a list of system events:
  - 11/4/2009 9:46:55 AM: Communication established with the Analog Dew Point Device device
  - 11/4/2009 9:47:24 AM: Communication established with the 3900 generator
  - 11/4/2009 9:47:24 AM: System is shutdown
  - 11/4/2009 9:47:27 AM: 3900 Test Pressure transducer is disconnected
  - 11/4/2009 9:47:28 AM: 3900 Test Temperature probe is disconnected
- Bottom Bar:** Shows the current active tab as "Analog Dew Point Device Parameters" and a status indicator: "3900 Test Temperature probe is disconnected". A "Point Time: 00:00:00" display is also present.

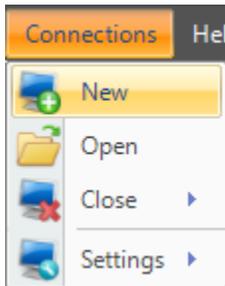
Additional callout bubbles include "Analog Signal Data Items" pointing to the parameter list and "ControLog automatically scales the signal" pointing to the Dew/Frost Point value.

# GPIB Connection

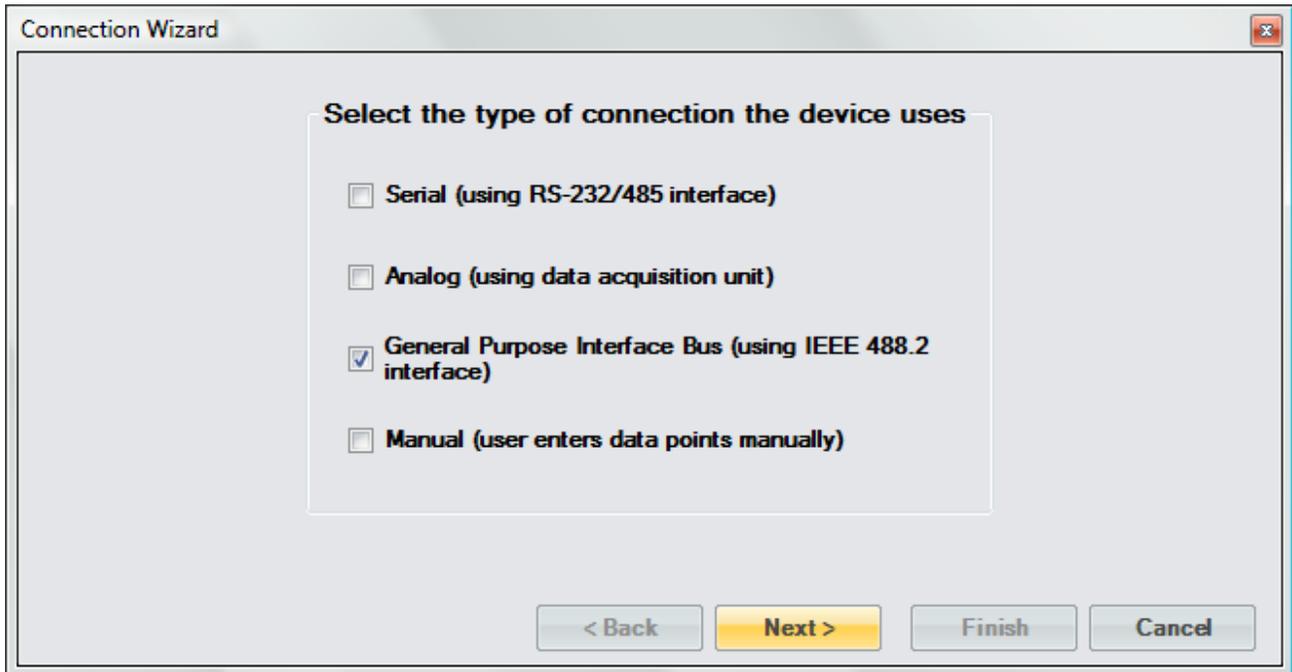
GPIB Connections use the National Instruments® GPIB-USB-HS USB-to-488.2 converter to acquire data from a given GPIB device. The customizable interface provided by ControlLog allows the user to define the ASCII commands that are sent and/or received through the IEEE 488.2 interface to communicate with the GPIB device. The system supports both a request to receive type of communication as well as a receive only type of communication.

*Note: The setup dialog for a GPIB device is virtually identical to the setup dialog for a Serial device. The only difference being the interface used to transmit and receive the data.*

To create a new GPIB connection, select “New” from the Connections menu. This will open a “Connection Wizard” dialog that will step the user through the connection definition process.



Select “General Purpose Interface” as the type of connection the device uses.



Enter a unique name for the device.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a single-line text input field. At the bottom, there are four buttons: "< Back" (disabled), "Next >" (highlighted in yellow), "Finish" (disabled), and "Cancel" (disabled).

Select whether the device requires a setup command or commands. Setup commands are only sent once at the start of communication. These commands are only required if you need to send special commands to configure the device before data request and response commands are processed.

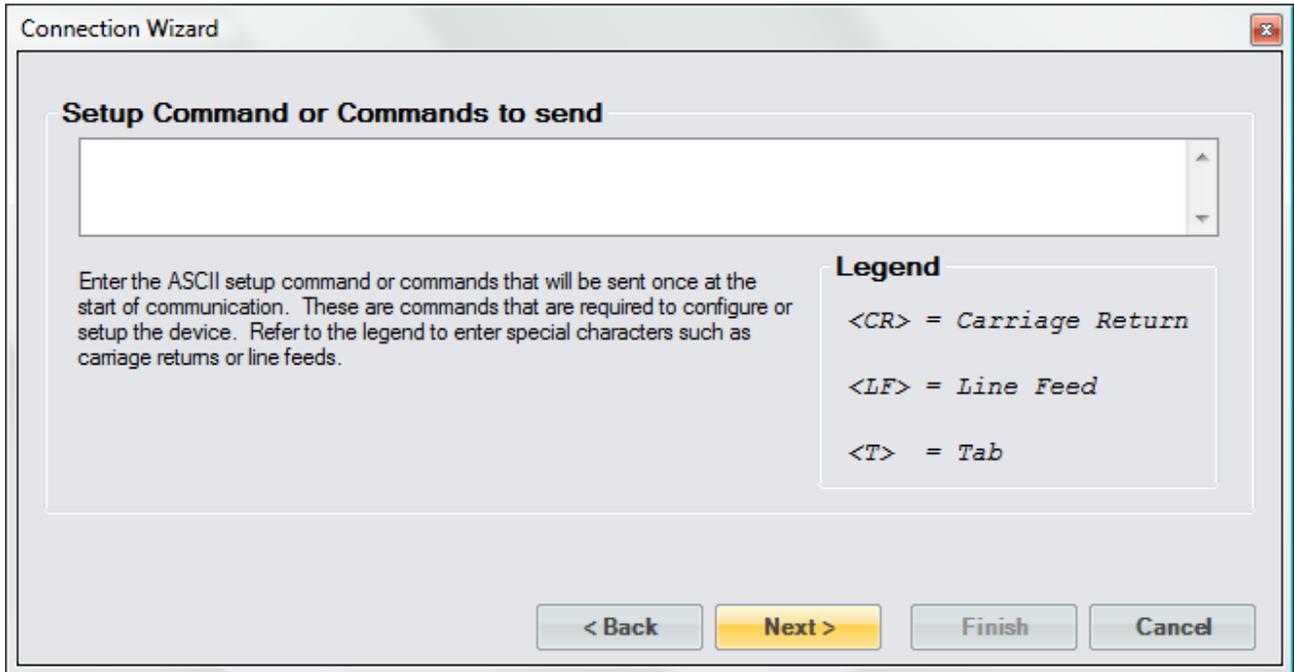


The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Do you need to send a setup command or commands to configure this device?" followed by two radio button options: "Yes" (unchecked) and "No" (checked). Below the options is explanatory text: "Select 'Yes' if you need to send a setup command or commands to configure the device. Setup commands are only sent once at the start of communication. These commands are only required if you need to send special commands to configure the device before data request and response commands are processed." and "Select 'No' if you don't need to send any setup commands." At the bottom, there are four buttons: "< Back" (disabled), "Next >" (highlighted in yellow), "Finish" (disabled), and "Cancel" (disabled).

If setup commands are required then enter the ASCII setup command or commands that will be sent at the start of communication. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All setup commands are case sensitive.*

*Note: End of Line (EOL) or End of Transmission (EOT) characters such as carriage returns and/or line feeds are very important and are the leading cause to failed communication. Refer to the manufacturer's documentation for the device to verify the required EOL or EOT characters.*



Enter the number of responses you expect to receive from the device. This is the amount of response messages you will receive from the device, not necessarily the number of data items. A device response message could contain multiple data items. Later you will select the number of data items that each response message contains.

For example, if you need to send one command to receive one response message then you would enter one. Or if your device automatically sends three messages periodically you would have three responses and you would enter three.

**How many responses do you expect to receive?**

1

Enter the number of response messages you expect to receive from the device. For example if you need to send three commands to receive three response messages, then you would have three responses. Another example would be if your device automatically sends one message periodically, you would only have a single response. Remember this is only the amount of response messages that you receive from the device, not the amount of data items. Later you will select the number of data items that each response contains.

< Back   Next >   Finish   Cancel

Select whether a command needs to be sent to request a response. If the device requires a command to be sent to receive a response then select “Yes”. If the device automatically outputs data without any request then select “No”.

**Do you need to send a command to receive a response from this device?**

Yes

No

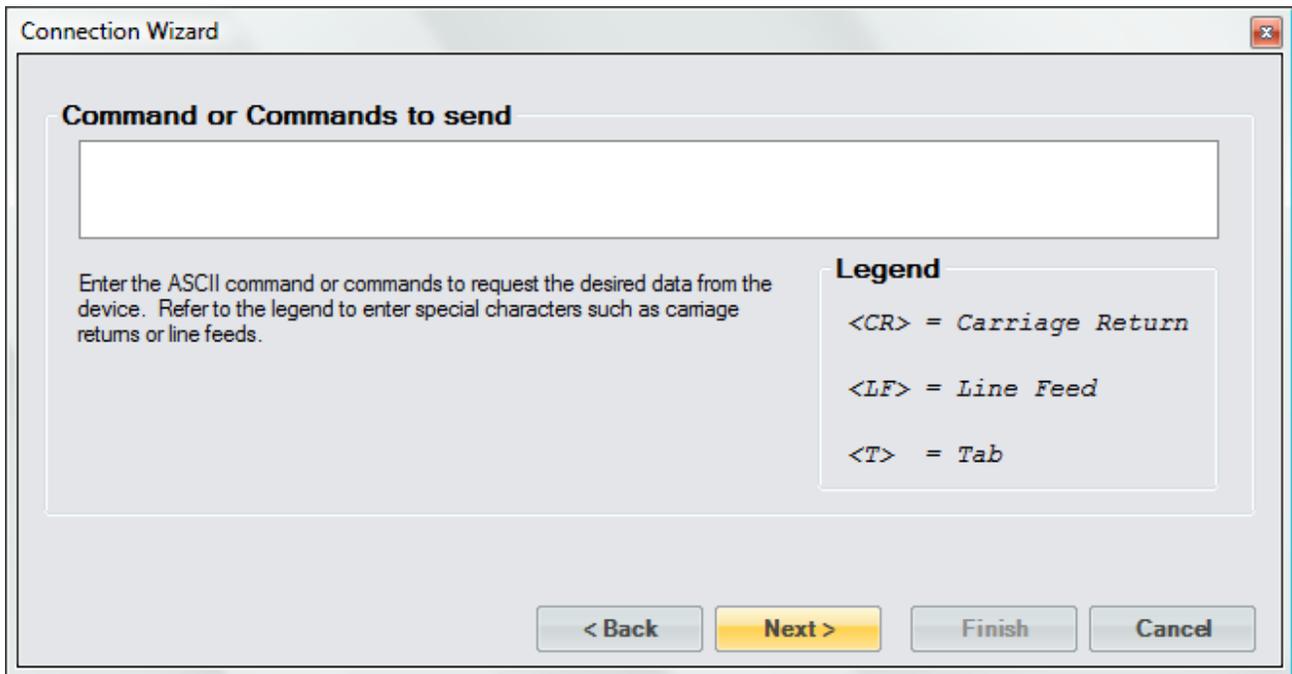
Select 'Yes' if you need to send a command to request data from the device.

Select 'No' if the device automatically transmits data periodically.

< Back   Next >   Finish   Cancel

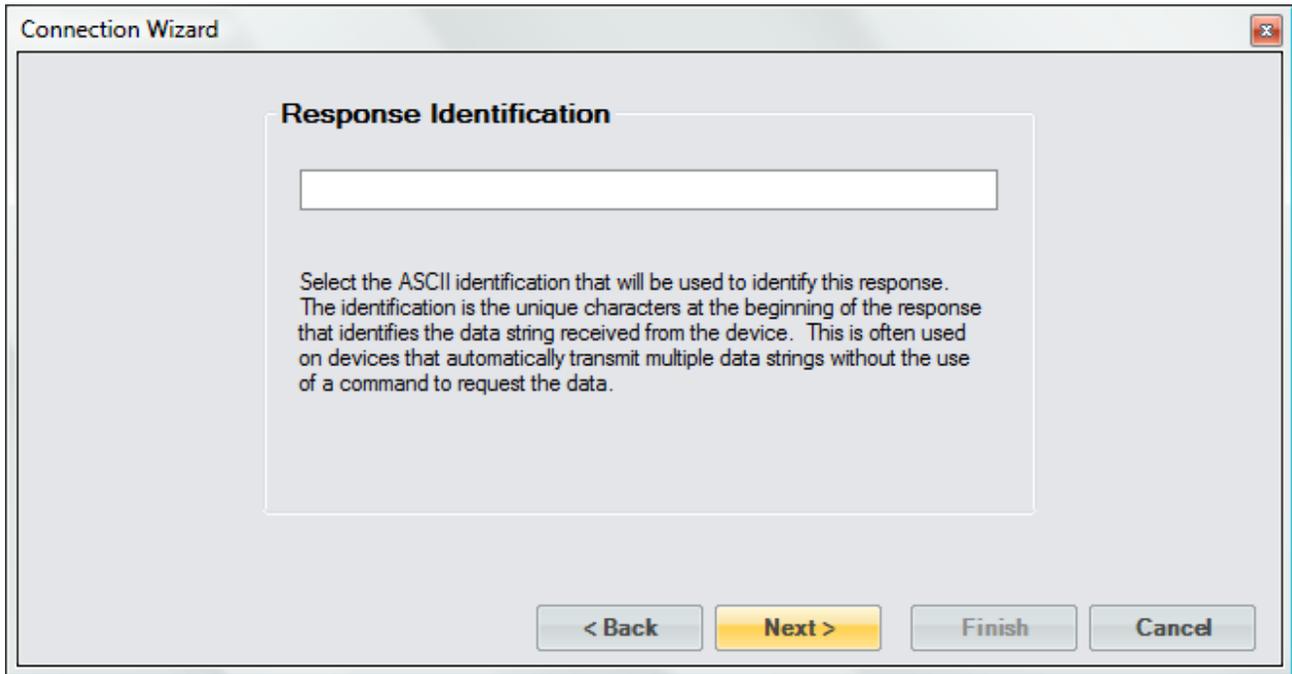
If a command was required, then enter the ASCII Command or Commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All commands are case sensitive.*



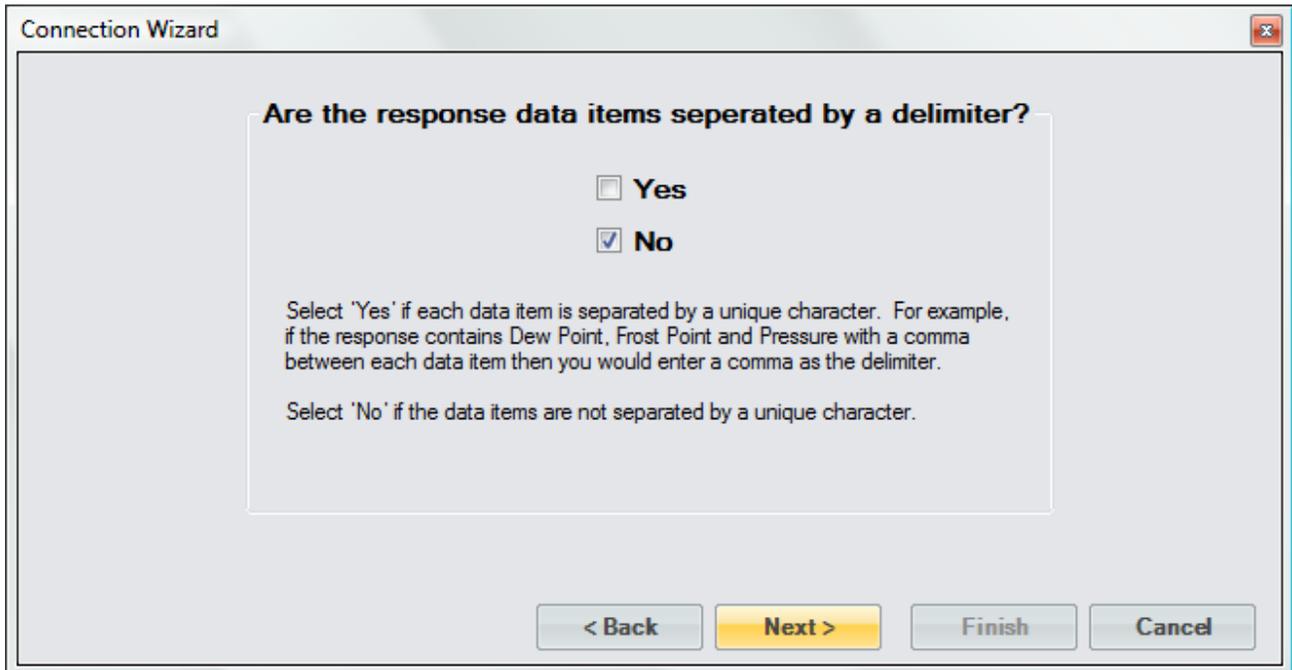
The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Command or Commands to send" and contains a large empty text input field. Below the input field, there is a paragraph of text: "Enter the ASCII command or commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns or line feeds." To the right of this text is a "Legend" box containing three entries: "<CR> = Carriage Return", "<LF> = Line Feed", and "<T> = Tab". At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select the ASCII identification that will be used to identify the response if no command is required but the device automatically sends messages periodically. The identification is the unique characters at the beginning of the message that identifies the response received. This is often used on devices that automatically transmit multiple data messages without the use of a command to request the data.

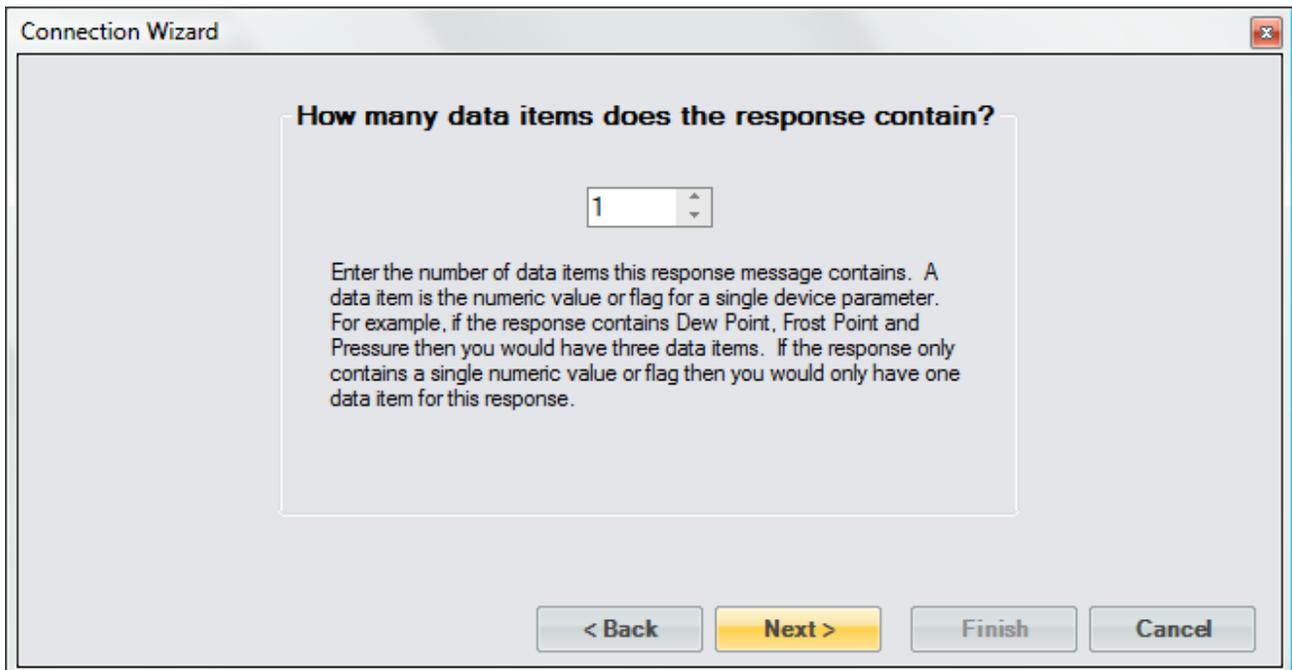


The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Response Identification" and contains a large empty text input field. Below the input field, there is a paragraph of text: "Select the ASCII identification that will be used to identify this response. The identification is the unique characters at the beginning of the response that identifies the data string received from the device. This is often used on devices that automatically transmit multiple data strings without the use of a command to request the data." At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select whether the response has a delimiter that is separating each data item. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then each item is separated by a comma delimiter.



Enter the number of data items the response message contains. A data item is the numeric value or flag portion for a single device parameter within the response message. For example, if the response contains Dew Point, Frost Point and Pressure then you would have three data items. If the response only contains a single numeric value or flag then you would only have one data item for this response.



Enter a name or description for the data item and define the syntax, unit and scaling. The data item syntax is defined using the symbols in the Legend. Use the “X” symbol to indicate a character should be ignored, use the “N” symbol to represent a numeric ASCII character and the “A” symbol to indicate a flag or any ASCII character. This dialog will repeat for each data item in the response.

*Note: The syntax cannot contain both a Flag and a Numeric syntax definition. If the user requires both, then create another data item to define them separately.*

**Connection Wizard**

**Data Item Name**  **Data Item Syntax**  **Data Item Unit**

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Scaling	
Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

< Back   **Next >**   Finish   Cancel

When defining a numeric syntax enter an “N” for each possible digit in the response. For example, if you know the device returns a six digit numeric value you would enter “NNN.NNN”. The decimal point is not required and its location is not important. Decimal points, plus signs and minus signs are treated the same as an “N” and are allowed merely to help make the syntax resemble a number value.

*Note: It is important to have sufficient numeric definition to assure all possible numeric responses will be covered, especially when a device responds with scientific notation or varying precession.*

**Connection Wizard**

**Data Item Name:** Data Point

**Data Item Syntax:** NNN.NNNN

**Data Item Unit:** None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Scaling	
Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax:** NNN.NNNN

< Back   Next >   Finish   Cancel

It is possible to scale a numeric data item response. The scaling consists of a two point definition for a linear scaling or a three to seven point definition for polynomial interpolation scaling. The number of points determines the degree of the polynomial used to scale the data item response. Lagrangian Interpolation is used to determine the coefficients of the polynomial. Each point definition consists of a signal value and a data value. The signal value represents the “raw” output signal from the device. The data value represents the actual value or real world value at the given signal value.

Scaling allows the user to scale a numeric data item response into a given humidity value. For example, if you have a numeric data item response that ranges from -1 to 1 and it is known that 0 corresponds to -100 and 1 corresponds to 100. The user can then enter these scaling values and ControlLog will automatically apply the scaling to the data item whenever it is displayed or logged.

**Connection Wizard**

**Data Item Name**: Data Point

**Data Item Syntax**: NNN.NNNN

**Data Item Unit**: None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Signal Value	Data Value
-1	-100
1	100

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

NNN.NNNN

< Back   Next >   Finish   Cancel

Selecting the unit for the data item will allow ControlLog to convert the value to the selected system units for display in the parameter tab and record the value in default SI units in the data tab. Remember this is the unit that the device is sending the data item in, not the unit you wish to display the data item as. If “None” is selected then ControlLog will treat the data item as a simple number and will display and record the value exactly as it is received.

**Connection Wizard**

**Data Item Name**: Data Point

**Data Item Syntax**: NNN.NNNN

**Data Item Unit**: Temperature (dropdown menu open showing: Temperature, Temperature, Pressure, Enthalpy, Density, FlowRate, None)

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Signal Value	Data Value
-1	-1
1	100

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

NNN.NNNN

< Back   Next >   Finish   Cancel

When defining flag type syntax enter an “A” for each character in the response that represents the flag. The Flag Definitions define what each possible ASCII flag represents. The user must enter a numeric value for each flag definition which will be recorded in the data tab and a description for the flag that will be shown in the parameters tab.

**Connection Wizard**

**Data Item Name:** Stable

**Data Item Syntax:** XXXA

**Data Item Unit:** None

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax:** XXXA

< Back   **Next >**   Finish   Cancel

Enter the End of Transmit (EOT) character that is sent after the response. This is the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

**Connection Wizard**

**End of Transmit (EOT) character sent after the response**

Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.

**Legend**

- <CR> = Carriage Return
- <LF> = Line Feed
- <T> = Tab

< Back   Next >   Finish   Cancel

Select the name and location to save the new GPIB connection. Clicking the “Browse” button will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All device connection files are saved in XML format with a (\*.device) extension.



Next, the user selects whether to connect to the device now or to exit without connecting.

*Note: The user can connect at any time by loading the device from the Connections menu.*



Select the GPIB Board ID and addresses for the device. Refer to the device's documentation for further information on these GPIB settings.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main content area is titled "Select the GPIB settings for the device" and contains three input fields:

- Board ID: A spin box with the value "0".
- Primary Address: A spin box with the value "9".
- Secondary Address: A dropdown menu with the value "None".

At the bottom of the window, there are four buttons: "< Back" (disabled), "Next >" (highlighted in yellow), "Finish" (disabled), and "Cancel" (disabled).

Select the access rate at which ControLog will communicate with the device.

*Note: It is always recommended to start with the default 1.5 second access interval and to modify later as needed.*

*Warning: Do not set the access interval to small. If the device is not capable of communicating at the set interval then ControLog may inadvertently think communication has been lost when the device does not reply within the desired amount of time.*

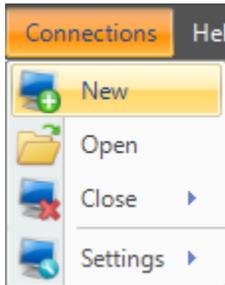


Select "Show Interface Console" to automatically open a Device Interface Console tab once communication has been established with the device.

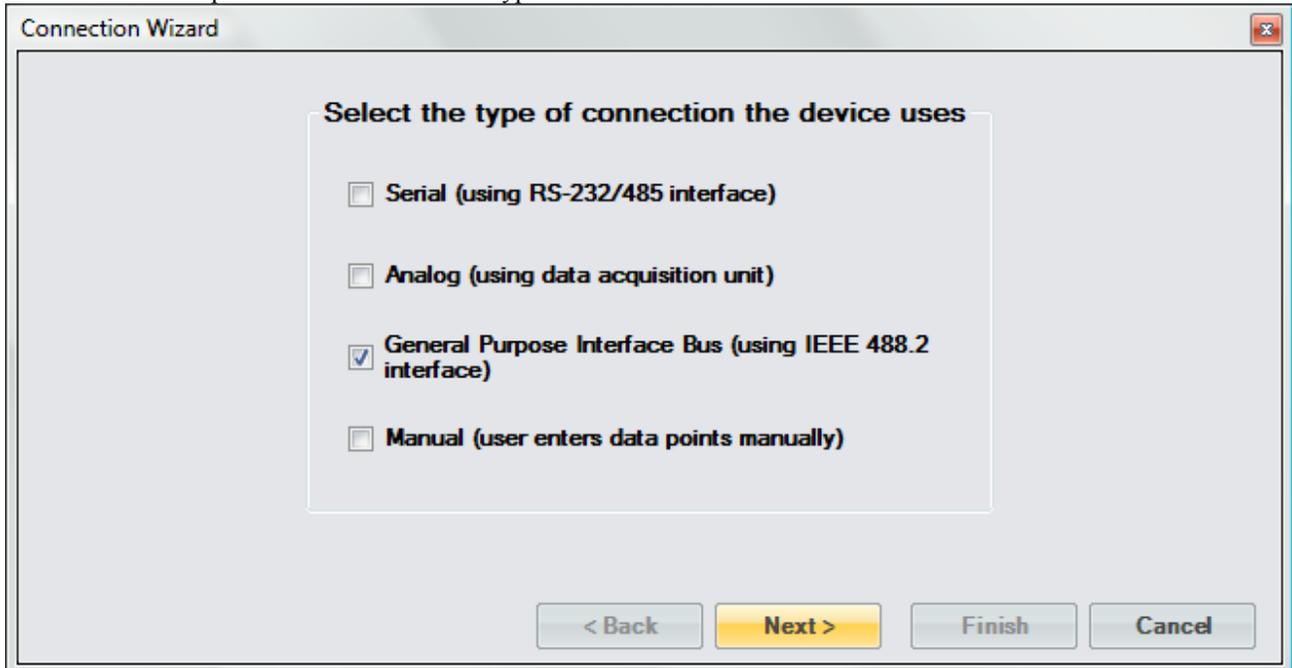
## GPIB Connection Example

This example will demonstrate the creation of a GPIB connection to an Agilent® 34401A Digital Multimeter (DMM) used to read the analog output of an MBW® K-1806. We will request the voltage reading from the DMM and scale it accordingly for the K-1806's Dew Point Temperature.

Start by selecting “New” from the Connections menu.



Select “General Purpose Interface Bus” as the type of device connection.



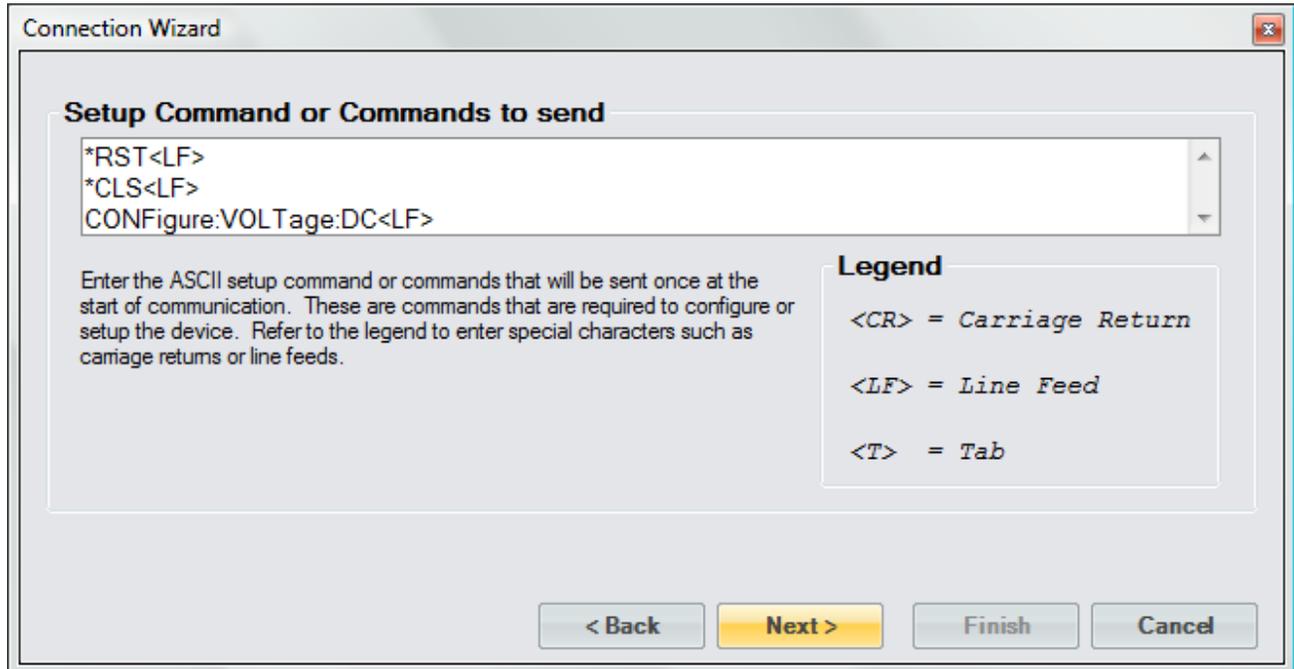
Enter “K-1806 (HP34401A)” as the name for the device.



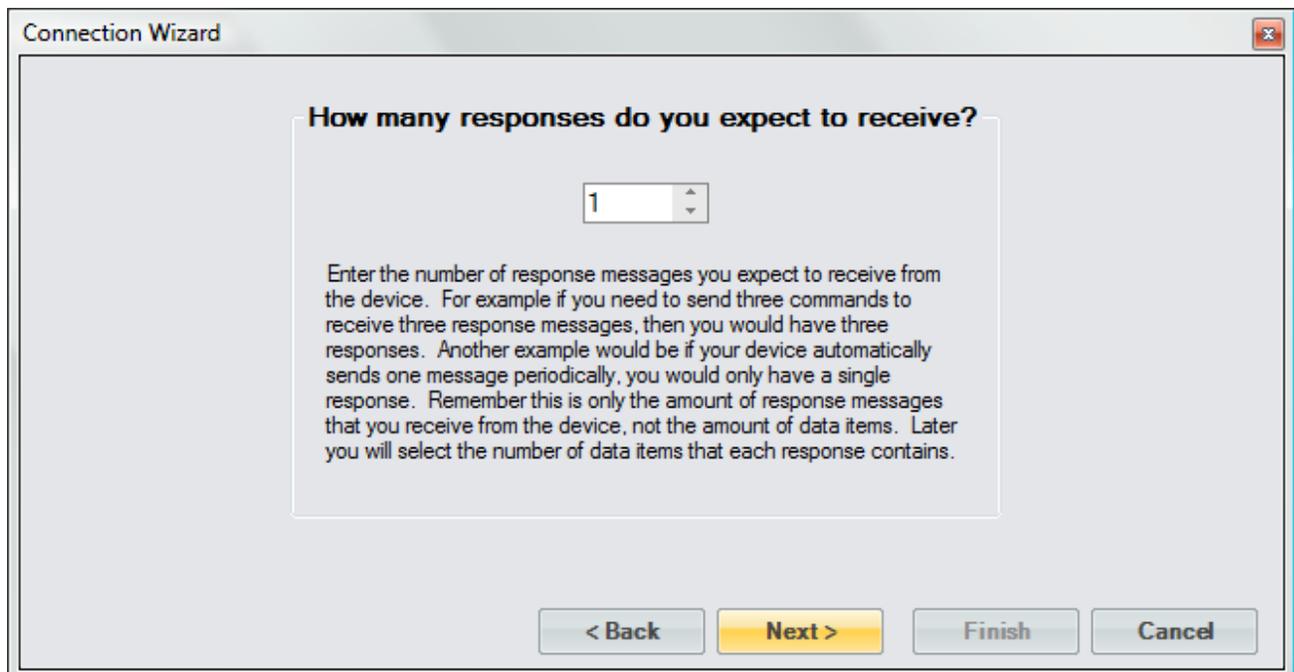
The DMM requires special setup commands before we can begin to take readings



There are three setup commands to configure the DMM that we need to include. The first setup command resets the DMM, the second command clears the DMM and the third command configures the DMM to read DC voltage. Based on the DMM documentation each command must be terminated by a Line Feed.



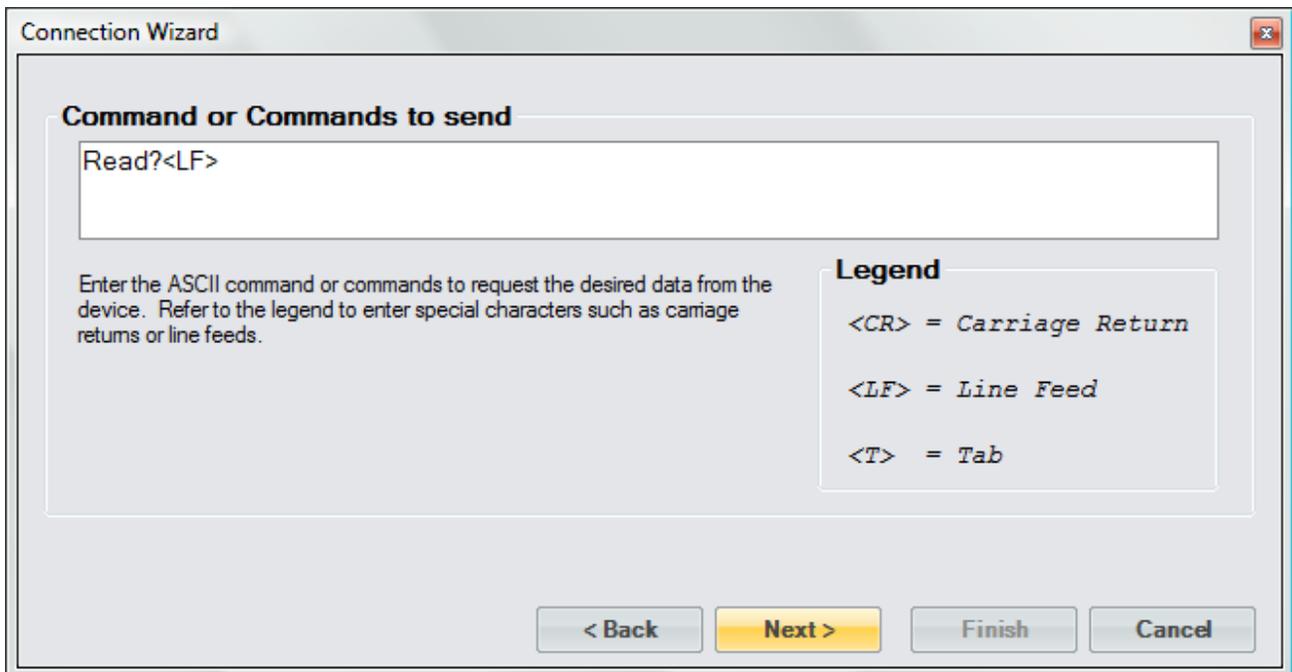
We expect to only receive a single response message from the DMM.



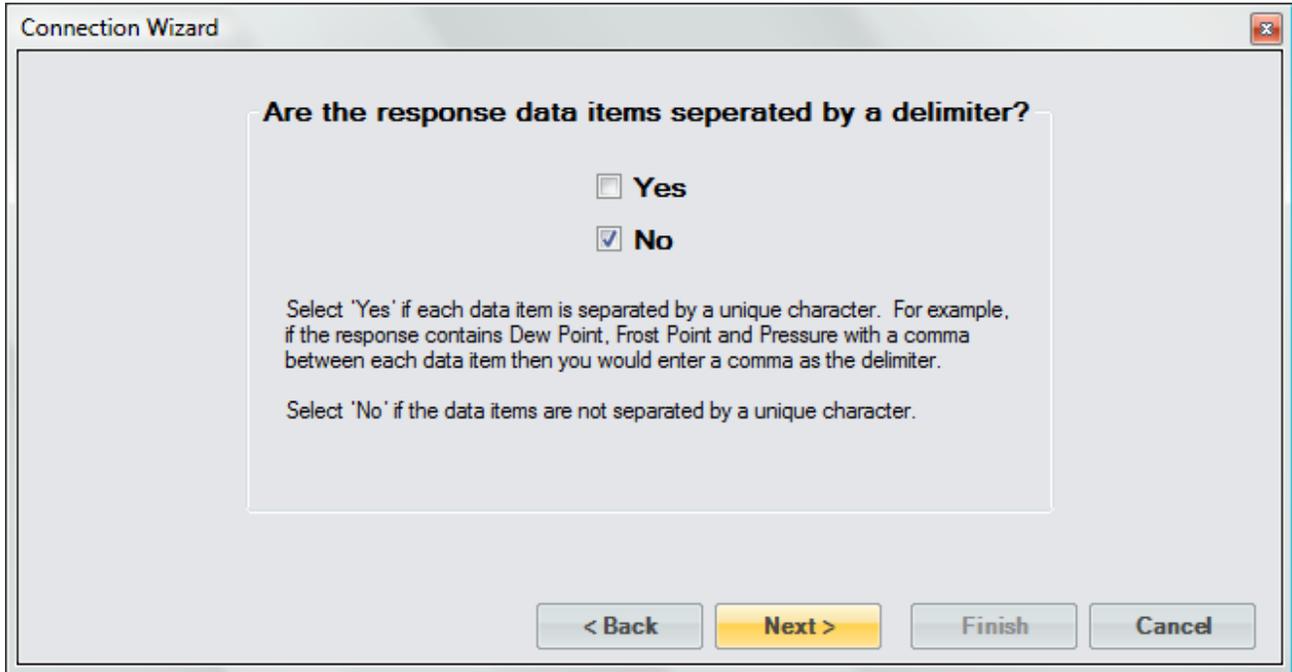
We need to request the DMM to take a voltage reading.



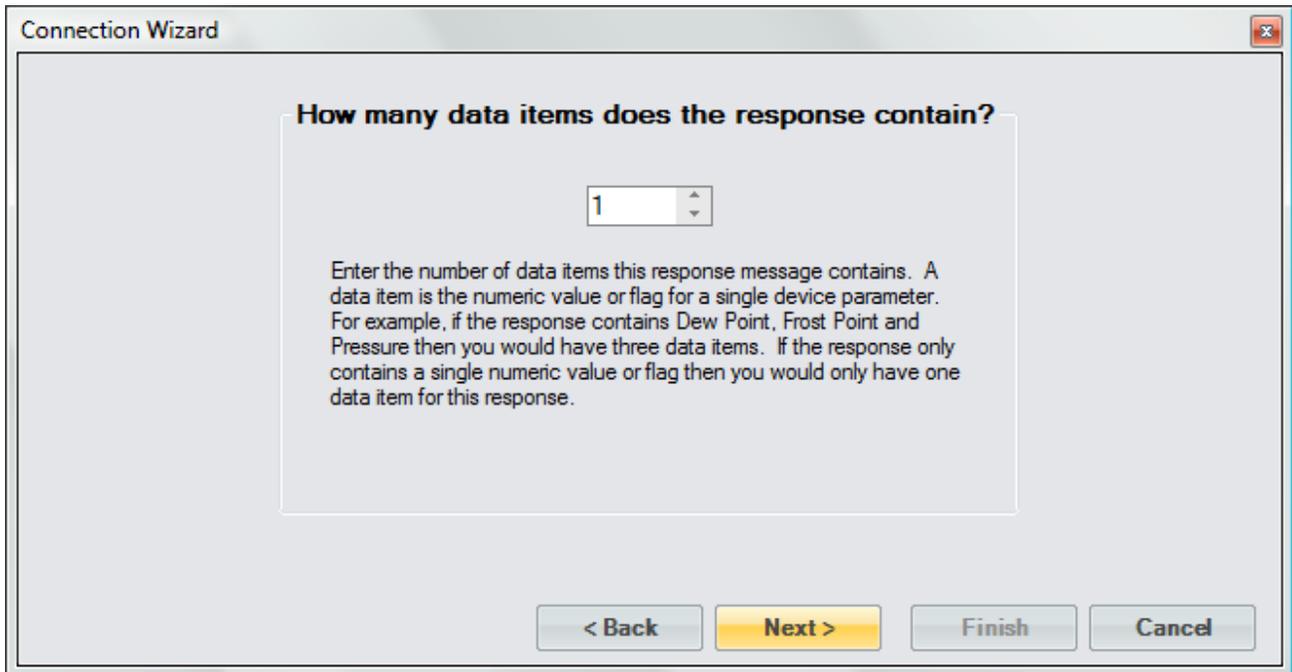
We will use the read command to request the voltage reading from the DMM. Again we must terminate the command with a Line Feed.



The DMM response is not separated by any delimiter.



The DMM response will contain a single voltage reading.



We will name the data item “Dew/Frost Point” based on the signal we are reading from the K-1806. The Data Item Syntax will be of numeric format. The Data Item’s Unit is defined as a Temperature in degrees Celsius based on the K-1806 documentation. We will apply a scaling to allow ControLog to scale the signal into terms of Dew/Frost Point. Minus one volt represents -100 °C Frost Point and plus one volt represents +100 °C Dew Point.

**Connection Wizard**

**Data Item Name:** Dew/Frost Point

**Data Item Syntax:** +N.NNNNNNNNNNNNN

**Data Item Unit:** Temperature °C

Enter a name or description of the data item and define the syntax for the response using the coded symbols defined in the legend. Note that the syntax cannot contain both a Flag and Numeric syntax definition. If you require both, then create another data item to define them separately.

Signal Value	Data Value

**Legend**

- X = Ignore
- N = Numeric
- A = Flag

**Response Syntax**

+N.NNNNNNNNNNNNN

< Back   Next >   Finish   Cancel

The DMM documentation states the response will be terminated with a Line Feed.

**Connection Wizard**

**End of Transmit (EOT) character sent after the response**

<LF>

Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.

**Legend**

- <CR> = Carriage Return
- <LF> = Line Feed
- <T> = Tab

< Back   Next >   Finish   Cancel

Save the newly created device to a file so that it can be recalled at a later time.



Select to connect to the device now.



Select the GPIB Board ID and addresses for the DMM. Refer to the DMM's documentation for further information on these GPIB settings.



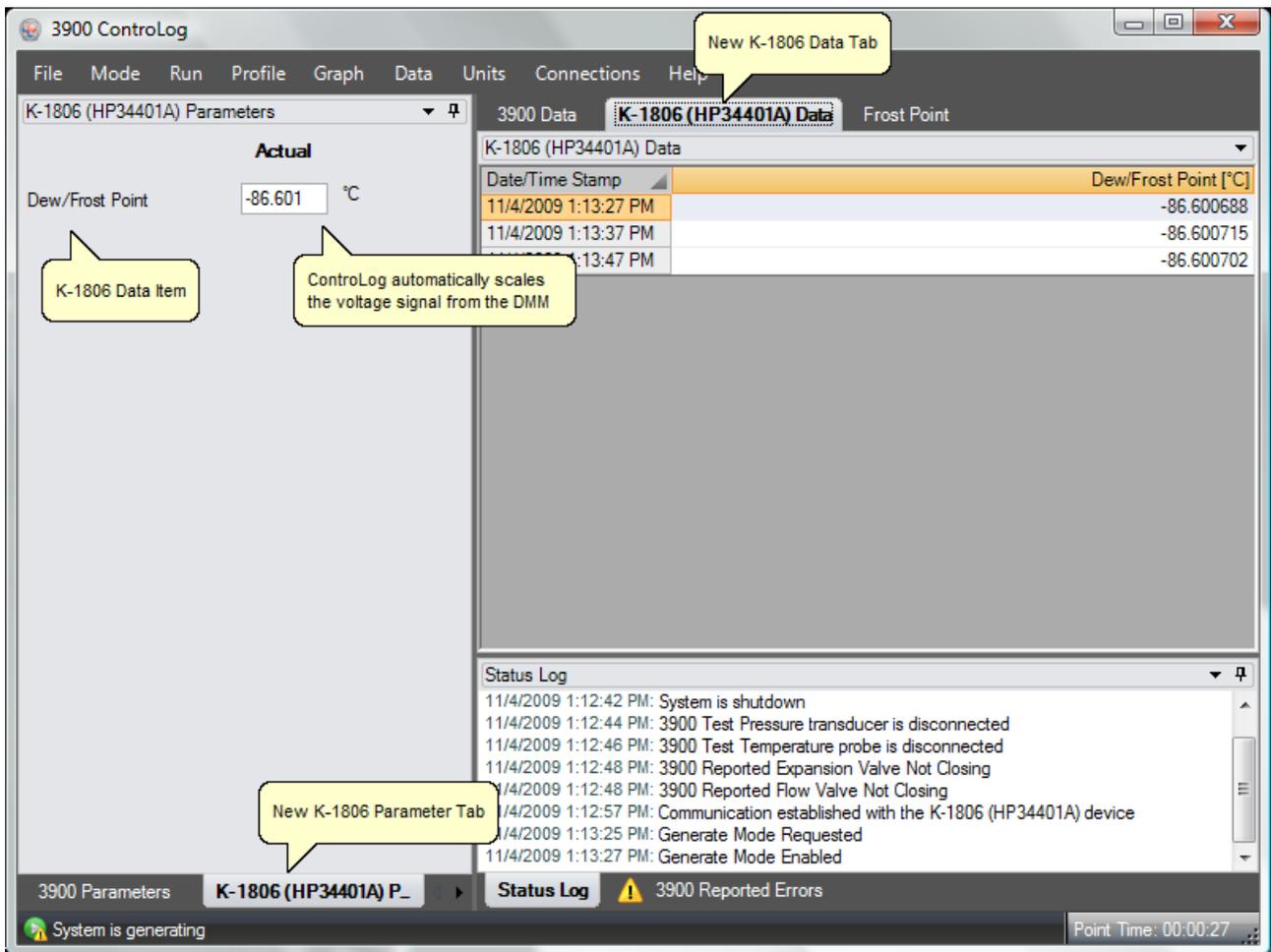
Select the default access interval.



Once completed, ControlLog will attempt to establish communication with the DMM.



Once communication is successfully established with the DMM a new parameter tab and data tab will be created. Notice ControlLog automatically scales the voltage signal into a Dew/Frost Point temperature value based on the definitions described when defining the data item.

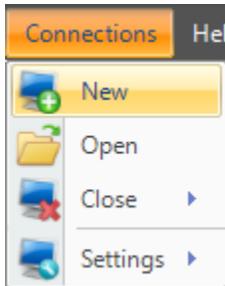


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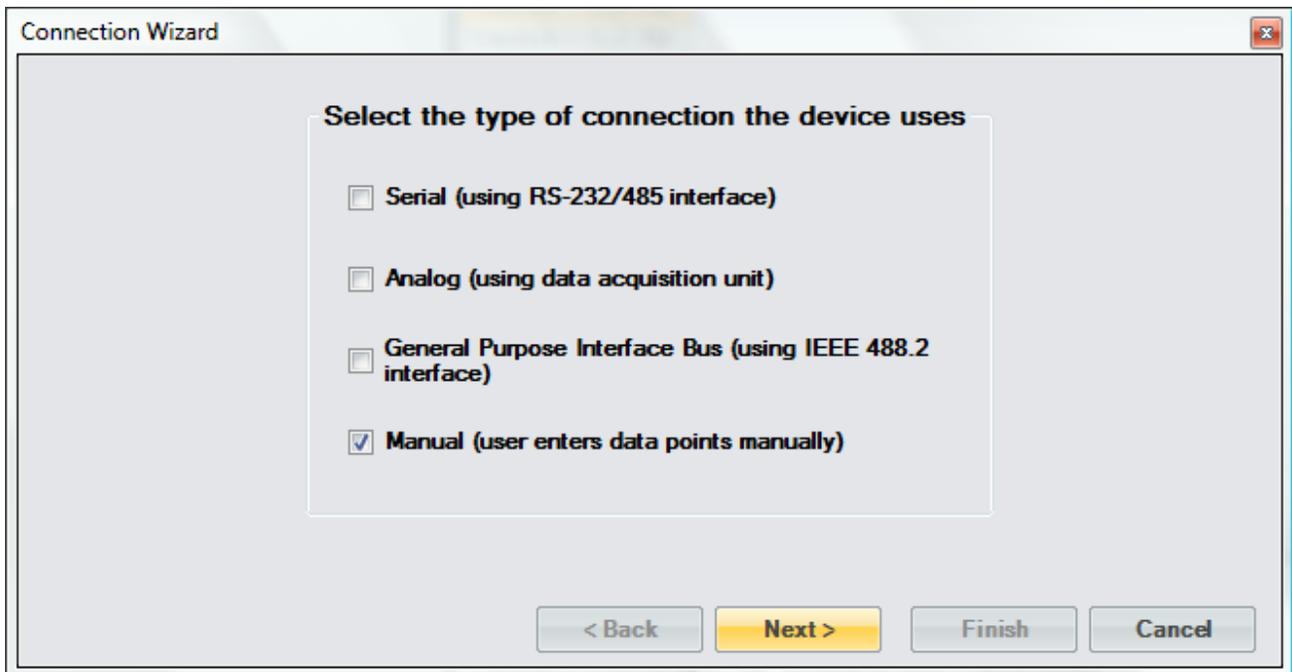
# Manual Connection

A Manual Connection allows the user to manually record data items for a device that either has no interface or has an interface that is not supported by ControLog. Manual devices still have their own parameter and data tab but the data values are manually entered by the user. When the user wants to record values they simply click on the actual field for the data item in the parameter tab and enter the value. Once all data items for the device have been entered, ControLog will record the values into the data tab for the device.

To create a manual connection, select “New” from the Connections menu. This will open a “Connection Wizard” dialog that will step the user through the connection definition process.



Select “Manual” as the type of connection the device uses.

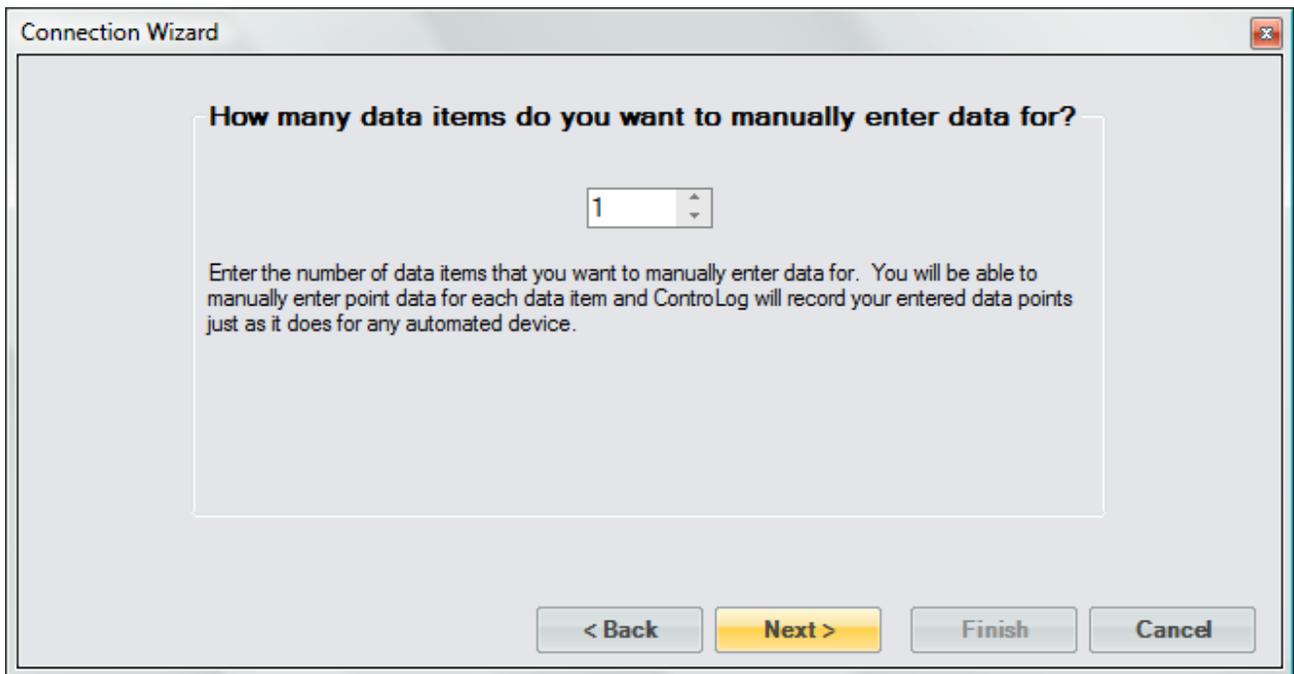


Enter a unique name for the device.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a single-line text input field. At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select the number of manual data entries.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "How many data items do you want to manually enter data for?" above a spin box containing the number "1". Below the spin box is a paragraph of text: "Enter the number of data items that you want to manually enter data for. You will be able to manually enter point data for each data item and ControLog will record your entered data points just as it does for any automated device." At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Enter a name or description of the manual device data item and specify the type of unit that you will be entering the data in.

Connection Wizard

**Data Item Name**

**Data Item Unit**  
None

Enter a name or description of the manual device data item and specify the type of unit that you will be entering the data in.

< Back   Next >   Finish   Cancel

The user only selects the type of unit because all manual entries are entered in the currently selected system unit. For example, if the user creates a manual data item that is a temperature and has the system units set to degrees Celsius, then the user will enter manual values in degrees Celsius. If the system units are set to degrees Fahrenheit then the user will be required to enter manual values in degrees Fahrenheit.

Connection Wizard

**Data Item Name**

**Data Item Unit**  
None  
Temperature  
Pressure  
Enthalpy  
Density  
FlowRate  
None

Enter a name or description of the manual device data item and specify the type of unit that you will be entering the data in.

< Back   Next >   Finish   Cancel

Select the name and location to save the new manual connection. Clicking the “Browse” button will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All device connection files are saved in XML format with a (\*.device) extension.



Last, the user selects whether to connect to the device now or to exit without connecting.

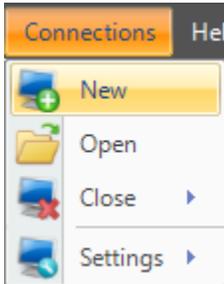
*Note: The user can connect at any time by loading the device from the Connections menu.*



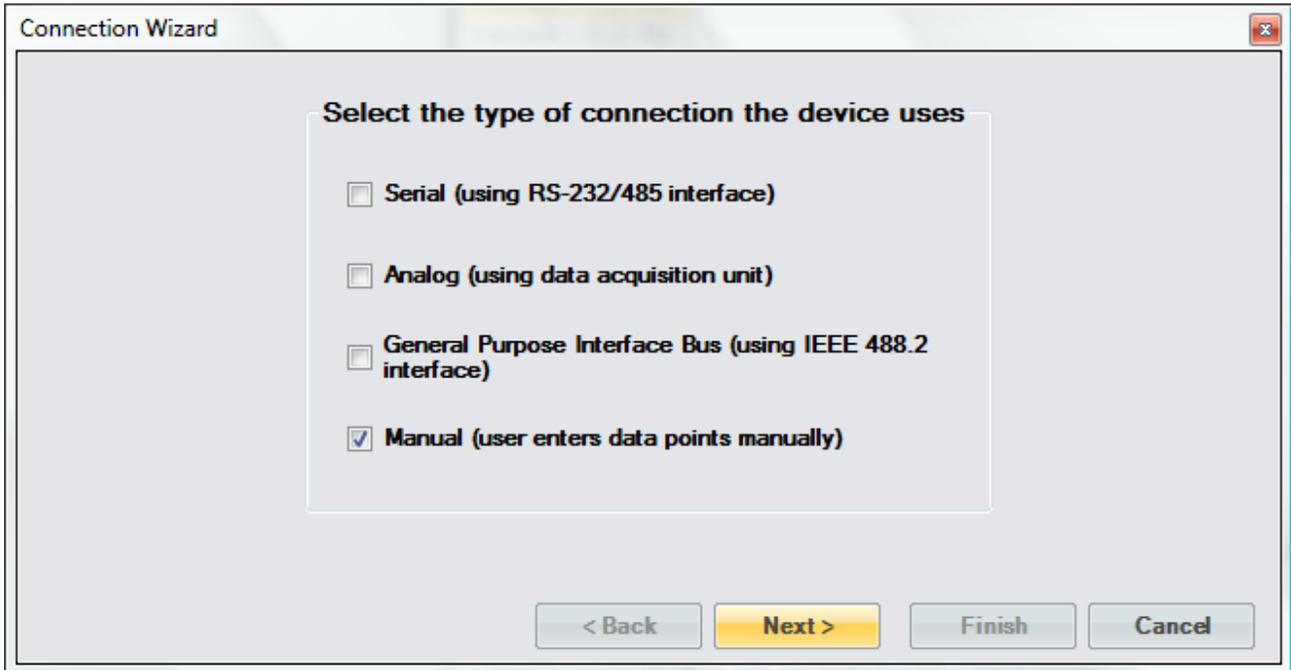
## Manual Connection Example

This example will demonstrate the creation of a Manual connection that will consist of three data items: Frost Point, Test Pressure and Test Temperature.

Start by selecting “New” from the Connections menu.



Select “Manual” as the type of connection the device uses.

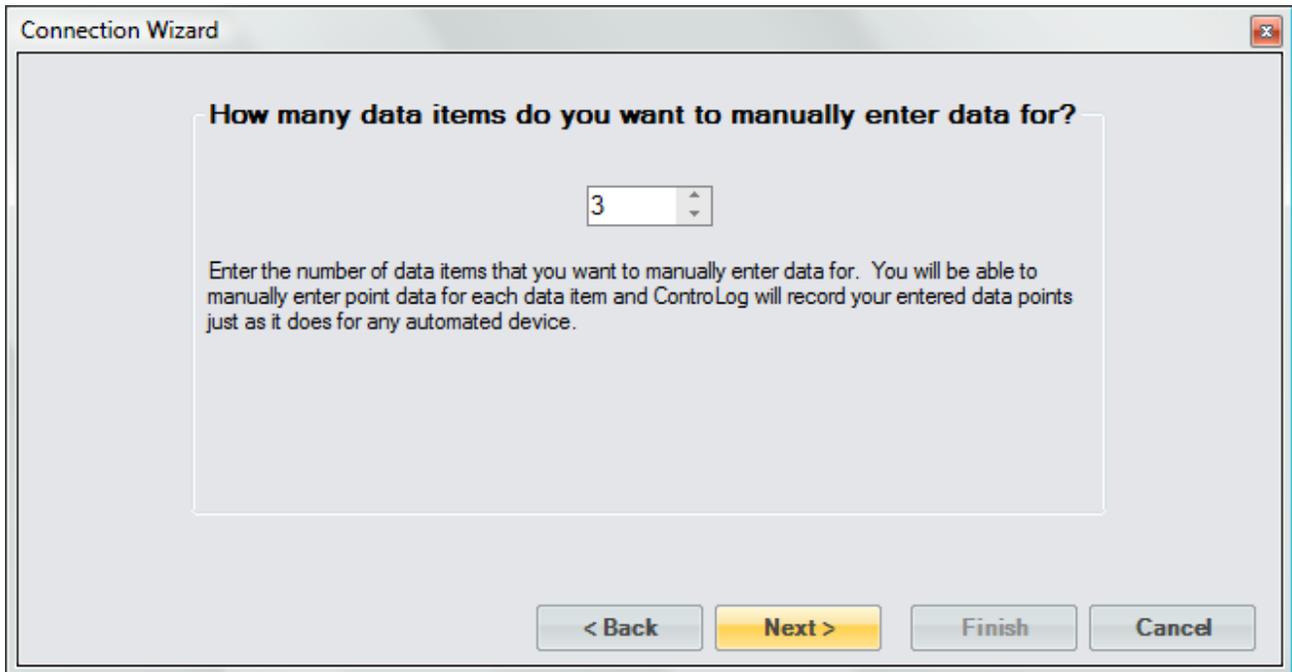


Enter “Manual Device” as the name for the device.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "Enter a name for the device" above a text input field containing "Manual Device". At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

We have three data items that we want to manually enter for this device.



The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains the text "How many data items do you want to manually enter data for?" above a spin box containing the number "3". Below the spin box is a paragraph of text: "Enter the number of data items that you want to manually enter data for. You will be able to manually enter point data for each data item and ControLog will record your entered data points just as it does for any automated device." At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

The first point is Frost Point and it will be of the temperature unit type.

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. Inside the window, there are two input fields: "Data Item Name" containing the text "Frost Point" and "Data Item Unit" which is a dropdown menu currently showing "Temperature". Below these fields is a text instruction: "Enter a name or description of the manual device data item and specify the type of unit that you will be entering the data in." At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

The second point is Test Pressure and it will be of the pressure unit type.

The screenshot shows the same "Connection Wizard" window. The "Data Item Name" field now contains "Test Pressure" and the "Data Item Unit" dropdown menu now shows "Pressure". The text instruction and the bottom buttons remain the same as in the previous screenshot.

The third point is Test Temperature and it will be of the temperature unit type.

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains two input fields: "Data Item Name" with the text "Test Temperature" and "Data Item Unit" with a dropdown menu showing "Temperature". Below these fields is a text instruction: "Enter a name or description of the manual device data item and specify the type of unit that you will be entering the data in." At the bottom of the window are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

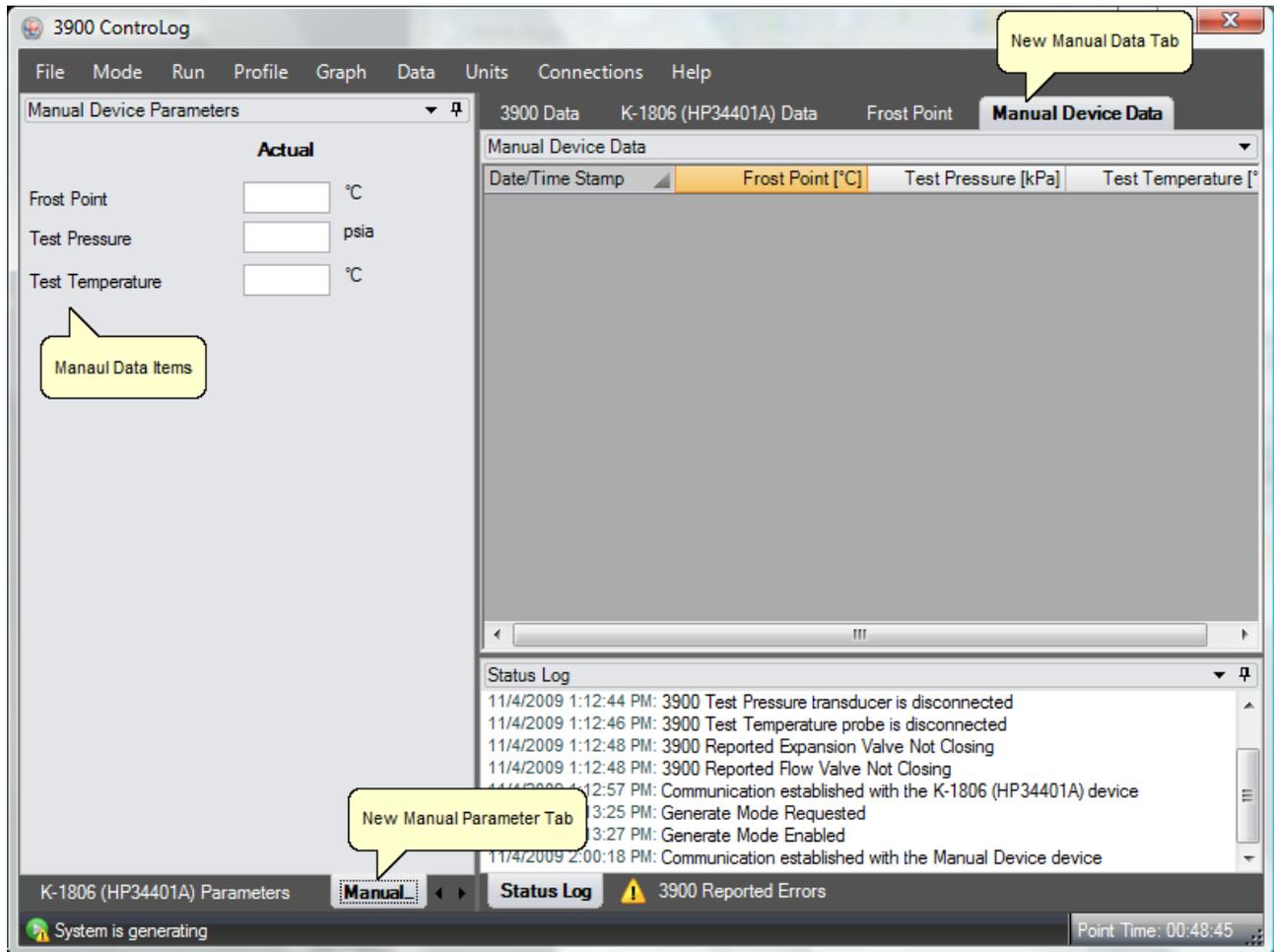
Save the newly created device to a file so that it can be recalled at a later time.

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains a text input field with "Manual Device" and a "Browse" button. Below this is a text instruction: "Select the name and location to save this device configuration to." At the bottom of the window are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

Select to connect to the device now.

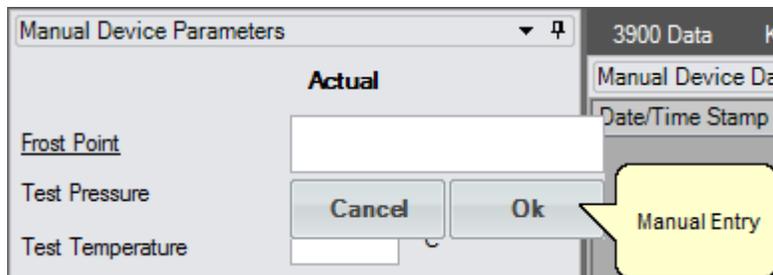


Once completed a new parameter tab and data tab will be created.



To manually enter a value, click on the actual field you would like to enter. A Manual Entry box will appear and the title of the manual item being entered will be underlined. For example, to enter a manual value for the Frost Point item click on the Frost Point Actual field.

*Note: The manual entries will not be recorded in the data tab until all data item values have been manually entered.*



Enter the manual value into the Manual Entry box and select Ok.

-80.1235	
Cancel	Ok

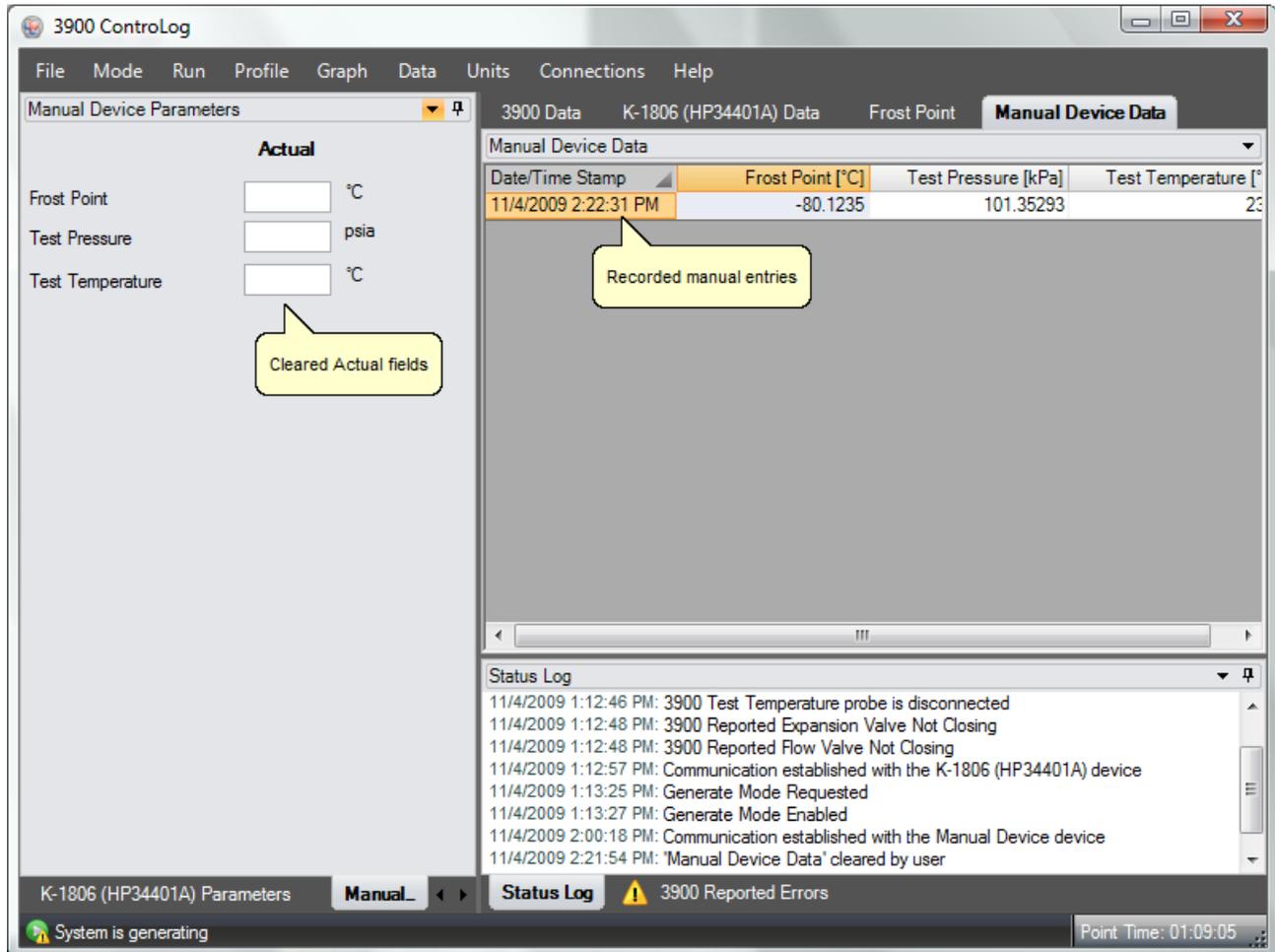
The manual entry will now be displayed in the actual field of the parameter tab.

Manual Device Parameters		
<b>Actual</b>		
Frost Point	-80.124	°C
Test Pressure		psia
Test Temperature		°C

Repeat the process for the remaining data items.

Manual Device Parameters		
<b>Actual</b>		
Frost Point	-80.124	°C
Test Pressure	14.700	psia
Test Temperature	23.500	°C

Once all data items have been manually entered, ControLog will record the values and clear out the Actual fields in preparation for the next set of manual entries.





# Glossary of Terms

## **%RH**

See Percent Relative Humidity

## **Absolute Humidity**

Absolute Humidity is the weight of the water vapor per unit volume of humidified gas.

## **Access Interval**

The access interval is the rate to which ControLog sends and receives commands to and from a specific device.

## **ASCII**

American Standard Code for Information Interchange or ASCII is a set of codes that represent text characters.

## **Assurance Condition**

An Assurance Condition forces an Auto Profile to wait until the measured values are within a specified tolerance and stability before the profile will start the Soak Phase.

## **Auto Profile**

An Auto Profile is used as a road map to automatically control the 3900 generator. The profile defines which setpoint values to go to, at what rate to go from one setpoint to another, and how long to stay at a specific setpoint before moving to the next one.

## **Dew Point**

Dew Point Temperature is the temperature to which a gas must be cooled in order to just begin condensing water vapor in the form of dew. Generally, Dew Point exists at temperatures above freezing. In many instances, Dew Point may actually exist at indicated values below freezing (super-cooled dew). However, it is important to note that Dew Point is not the same as Frost Point. Dew Point is independent of test chamber temperature.

## **Dew Point Control Mode**

The Dew Point control mode,  $T_d$ , is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in either saturation temperature,  $T_s$ , or test pressure,  $P_t$ . While Dew Point is held constant, other humidity parameters may vary. While in Dew Point control mode, the saturation temperature setpoint is automatically

determined. Dew Point control mode is valid both above and below 0 °C, and Dew Point is independent of test temperature.

## **DMM**

Digital Multimeter.

## **Dry Air Density**

Dry Air Density is the partial density in weight per unit volume of only the dry air portion of a moist air sample. In other words, if the water vapor were removed from a fixed volume of air, the remaining dry air would exhibit this density.

## **Dry Air Mole Fraction**

Dry Air Mole Fraction is the mole fraction of the dry air portion of a sample. The dry air portion is considered to be all constituents in a gas exclusive of the water vapor.

## **DTR**

Data Terminal Ready (DTR) is a signal indicating that the serial device is ready for transmission.

## **Enhancement Factor**

The enhancement factor corrects for the non-ideal behavior of a gas admixed with water vapor. The enhancement factor is a function of two independent variables, pressure and temperature.

## **Enthalpy**

Enthalpy is a measure of the amount of energy required to change a gas from one temperature/humidity value to another. In application, enthalpy is not used as an absolute value, but rather it is the difference in enthalpy between two distinct points which are of interest. The datum point which results in zero enthalpy was therefore arbitrarily chosen at a test temperature of 0 °C and 0 %RH. Applying enthalpy is a matter of computing the difference in enthalpy between two or more distinct data points.

## **F@Td.Pt**

Enhancement Factor at Dew/Frost Point Temperature and Test Pressure.

## **F@Ts.Ps**

Enhancement Factor at Saturation Temperature and Pressure.

## **F@Tt.Pt**

Enhancement Factor at Test Temperature and Pressure.

## **Frost Point**

Frost Point Temperature is the temperature to which a gas must be cooled in order to just begin condensing water vapor in the form of frost or ice, and therefore only exists at values below 0.01 °C. When operating the system with indicated Frost Points above 0.01 °C, the values indicated are to be interpreted as Dew Points. However, Frost Point is not the same as Dew Point for values below freezing. Frost Point is independent of test chamber temperature.

## **Frost Point Control Mode**

The Frost Point control mode,  $T_f$ , is controlled at a constant value by varying the saturation pressure,  $P_s$ , to compensate for changes in either saturation temperature,  $T_s$ , or test pressure,  $P_t$ . While Frost Point is held constant other humidity parameters may vary. While in Frost Point control mode, the saturation temperature setpoint is automatically determined. Frost Point is independent of test temperature.

## **GPIB**

General Purpose Interface Bus or GPIB also known as IEEE-488 is a digital communications bus specification.

## **Grains/lb**

Grains per pound is a ratio of the weight, in grains, of water vapor to the weight, in pounds, of the other constituents in the gas. (7000 grains = 1 pound). Once established, Grains/lb is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## **HumiCalc**

HumiCalc® is a form-based, high-accuracy humidity calculator by Thunder Scientific Corporation. The software application is designed using high accuracy equations to compute complex humidity conversions and uncertainty. The user may select known values to be used in solving for twenty-six humidity parameters. The user may also select the dimensional units, whether or not to use enhancement factors, vapor pressure over ice or water and ITS-90/IPTS-68 temperature scales.

## **Mixing Ratio by Volume**

Mixing Ratio by Volume is a ratio of the partial pressure of the water vapor to the partial pressure of the remaining constituents in the sample. Mixing Ratio by Volume is independent of test chamber temperature.

## **Mixing Ratio by Weight**

Mixing Ratio by Weight is a ratio of the weight of the water vapor to the weight of the remaining constituents in the sample. Mixing Ratio by Weight is independent of test chamber temperature.

## **Moist Air Density**

Moist Air Density is the total weight per unit volume of a moist air sample. This density includes both the weight of the air and the weight of the water vapor.

## **Percent by Volume**

Percent by Volume is a ratio (expressed as a percentage) of the partial pressure of the water vapor to the total pressure of the sample. Percent by Volume is independent of test chamber temperature.

## **Percent by Weight**

Percent by Weight is a ratio (expressed as a percentage) of the weight of the water vapor to the total weight of the sample. Percent by Weight is independent of test chamber temperature.

## Percent Relative Humidity

Percent Relative Humidity (%RH) is the ratio of the amount of water vapor in a given sample to the maximum amount possible at the same temperature and pressure.

## Percent Relative Humidity Control Mode

The Percent Relative Humidity (%RH) control mode, %RH, is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ , test temperature,  $T_t$ , or test pressure,  $P_t$ . While %RH is held constant, all other humidity parameters may vary. While in %RH control mode, the saturation temperature setpoint is automatically determined.

## Permeation

Permeation refers to a continuous influx from or outgas to the humidity of the surrounding environment (such as the air within the laboratory) through small leaks or semi-permeable surfaces through the walls, fittings, valves, and dead spaces within the system.

## PPMv

Parts Per Million by Volume is a ratio of the number of molecules of water vapor to the number of molecules of the other constituents in the gas. Once established, PPMv is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## PPMv Control Mode

The PPMv control mode is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ . While PPMv is held constant, other humidity parameters may vary. While in PPMv control mode, the saturation temperature setpoint is automatically determined. PPMv is independent of test pressure and test temperature.

## PPMw

Parts Per Million by Weight is a ratio of the weight of the water vapor in a sample to the weight of the remaining constituents in the gas. Once established, PPMw is pressure and temperature insensitive, and is therefore independent of test chamber temperature and test chamber pressure.

## PPMw Control Mode

The PPMw control mode is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ . While PPMw is held constant, other humidity parameters may vary. While in PPMw control mode, the saturation temperature setpoint is automatically determined. PPMw is independent of test pressure and test temperature.

## Ramp Time

The Ramp Time is the desired amount of time that the 3900 should take to transition from one profile test point to another. Setting a ramp time of zero instructs the 3900 to make the transition as quickly as possible. Zero is the setting used for most applications.

## RTD

Resistance thermal devices or resistance thermal detectors (RTD) are temperature sensors that are based on the predictable change in electrical resistance of a material (usually platinum) with changes in temperature. Platinum RTDs are often called platinum resistance thermometers (PRT).

## RTS

Request to Send (RTS) is a serial signal sent to verify that the other device is ready for data.

## Sample Size

The sample size is the time span that defines the sample points to use in the Standard Deviation calculation. The sample size should always be carefully considered based on the data storage interval. Too small of a sample size in relation to the data storage interval will result in a small number of points used to calculate the Standard Deviation.

## Saturation Pressure Control Mode

The Saturation Pressure control mode, Ps, is controlled at a constant value independent of any other pressure, temperature, or humidity value. While saturation pressure is held constant, all humidity parameters may vary.

## Saturation Vapor Pressure (SVP)

Saturation Vapor Pressure is a function of temperature. The function can best be described by a lab setup. Imagine a chamber whose temperature T can be controlled. The chamber is partially filled with water. Initially, the remaining space is a vacuum. The pressure P of the space over the water can be measured. At a fixed temperature, water molecules will leave the water and enter the space above at a fixed rate. As water molecules accumulate over the liquid water, the pressure there will increase, and molecules will re-enter the liquid at an increasing rate. Finally, water molecules will be entering and leaving the liquid at the same rate, giving equilibrium and a constant pressure P over the water. The equilibrium pressure P is the Saturation Vapor Pressure at temperature T.

## Soak Time

The Soak Time is the desired amount of time to generate at a particular profile point. The soak time required depends on the application, but should be a significant amount of time based upon the humidity measurement devices being calibrated.

## Specific Humidity

Specific Humidity is a ratio of the weight of the water vapor to the total weight of the humidified gas. Specific Humidity is independent of test chamber temperature.

## Standard Deviation

Assurance condition Standard Deviation is a statistic used to measure the variation in the actual data and can be thought of as how spread out or stable the data is. ControLog calculates Standard Deviation from the device data tabs along the selected Sample Size. Once the actual standard deviation is less than the defined limit the standard deviation portion of the condition is considered meet.

## Supply Pressure

Supply pressure is the regulated pressure reading of the gas supply. The supply pressure value is in gauge.

## **SVP@Td**

Saturation Vapor Pressure (SVP) computed at the Dew/Frost Point Temperature.

## **SVP@Ts**

Saturation Vapor Pressure (SVP) computed at the Saturation Temperature.

## **SVP@Tt**

Saturation Vapor Pressure (SVP) computed at the Test Temperature.

## **Thermistor**

A thermistor is a type of resistor whose resistance varies with temperature. Thermistors are generally made of a ceramic or polymer type material.

## **Tolerance**

An assurance condition Tolerance is the allowable variation between the setpoint and the actual. This is best thought as a window based on a minimum and maximum value, the minimum being the setpoint minus the tolerance and the maximum being the setpoint plus the tolerance. Once the actual value is within the window the tolerance portion of the condition is considered met.

## **Vapor Mole Fraction**

Vapor Mole Fraction is the mole fraction of water vapor in a sample.

## **Wet Bulb Temperature**

Wet Bulb temperature is used in wet bulb / dry bulb aspirated Psychrometry, and is the temperature measured by a temperature probe whose tip is coated with water (typically by being covered with a wet sock). When aspirated at a constant air velocity, the wet bulb will cool due to evaporation of the water from the probe. The cool temperature, to which it equilibrates, is used in the calculation of humidity parameters.

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