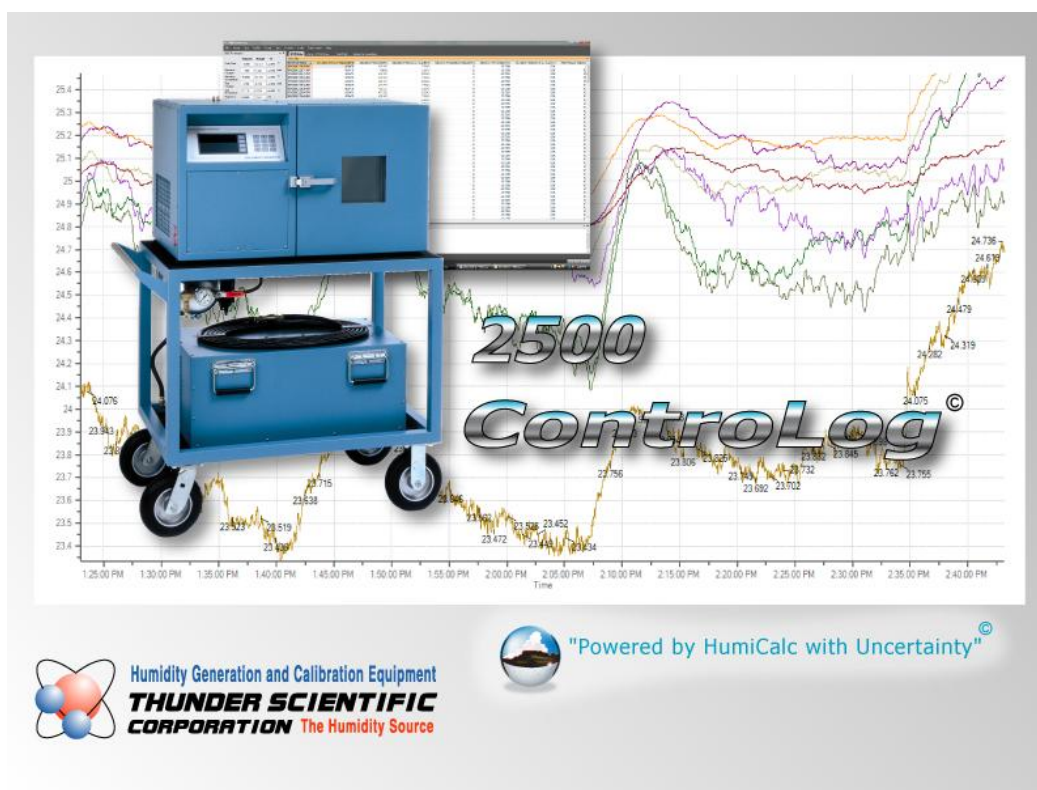


# 2500 ControLog

By Thunder Scientific Corporation





# Contents

<b>Getting Started</b>	<b>1</b>
About ControLog .....	1
Notice.....	1
Technical Support.....	1
License Agreement .....	2
Warranty .....	3
Copyright .....	3
Trademark.....	3
ControLog Minimum System Requirements .....	4
Installing ControLog.....	5
Data Backup .....	5
Interface Connections .....	6
Starting ControLog .....	7
Crashes and Data Recovery .....	12
 <b>ControLog Interface</b>	 <b>15</b>
Menu Bar .....	16
File Menu .....	16
Mode Menu .....	20
Run Menu .....	22
Profile Menu.....	23
Graph Menu.....	25
Data Menu .....	28
Units Menu .....	33
Connections Menu.....	36
Help Menu.....	40
Parameters Tab Group .....	41
2500 Parameter Tab.....	47
Data and Graph Tab Group.....	57
Data Tabs.....	59
Graph Tabs .....	59
Profile Tab.....	59
Information Tab Group.....	60
Status Log.....	64
2500 Reported Errors .....	64
System timing .....	64
2500 Interface Console.....	65
Device Interface Console .....	66
Status Bar.....	68
Connection and Run Status .....	68
Auto Profile Controls and Status .....	70
Current Point Time .....	71
 <b>Graphing</b>	 <b>73</b>

Creating a New Graph .....	74
Customizing a Graph .....	78
Pan .....	78
Zoom .....	79
Zoom Graph's X Axis .....	80
Zoom Graph's Y Axis .....	81
Auto Scale .....	82
Scale .....	82
Scale X Axis .....	82
Scale Y Axis .....	82
Graph Properties .....	83
Saving a Graph .....	86
Printing a Graph .....	88
 <b>Data and Data Summary</b>	 <b>89</b>
Device Data Tabs .....	92
File Data Tabs .....	93
Data Summary Tabs .....	96
Creating a Data Summary .....	97
Recorded Data Points Tab .....	106
How to Record a Data Point .....	107
 <b>Auto Profiling</b>	 <b>113</b>
Creating a New Profile .....	114
Saving a Profile .....	124
Opening a Profile .....	125
Printing a Profile .....	126
Running an Auto Profile .....	127
Understanding Profile Phases .....	129
Manual Override of Profile .....	131
 <b>Connections</b>	 <b>133</b>
Serial Connection .....	134
Serial Connection Example 1 .....	148
Serial Connection Example 2 .....	159
Analog Connection .....	175
Analog Connection Example .....	183
GPIB Connection .....	191
GPIB Connection Example .....	205
Manual Connection .....	214
Manual Connection Example .....	218
 <b>Glossary of Terms</b>	 <b>227</b>
 <b>Index</b>	 <b>233</b>

# Getting Started

This section will provide the user with general information on the 2500 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 2500 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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## Trademark

*ControLog* is a trademark of Thunder Scientific Corporation.

*HumiCalc* is a trademark of Thunder Scientific Corporation.

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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

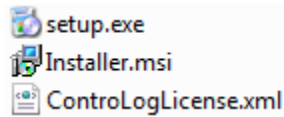


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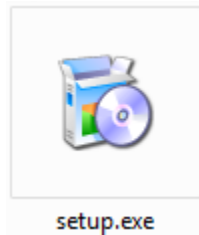
# Installing ControLog

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\2500 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 2500, MOXA® UPort® USB-to-serial converter, National Instruments® 488.2 and the Agilent® 34970A to the ControLog PC.

- **Connecting to the 2500**

ControLog communicates with the 2500 through an RS-232 communication connection on any available COM port. To connect the 2500 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 2500.

- **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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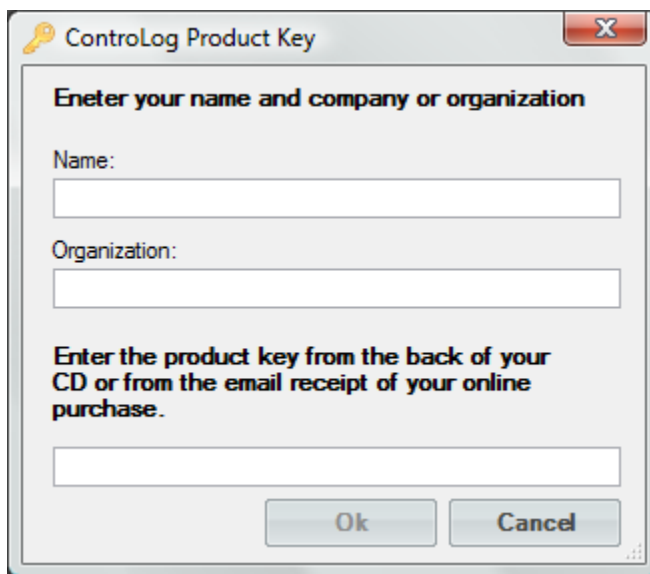
# Starting ControLog

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

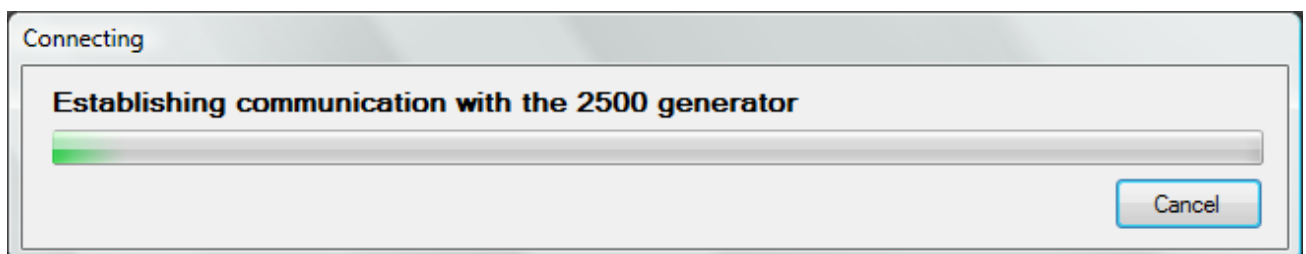
1. Ensure that the computer's serial port is properly connected to the 2500 and all desired interfaces are connected.
2. Locate and double-click the ControLog icon.



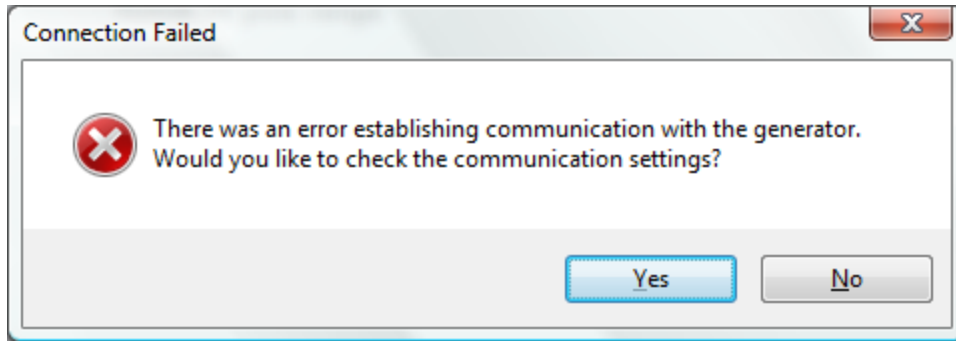
3. The splash screen will appear once the program is initialized. Note: It may take some time for the program to initialize the first time after installing the application.
4. The splash screen will display a loading status near the bottom, once loading is complete the splash screen will close and the 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 2500 using the last known or default communication settings.



9. If ControLog is unable to establish communication with the 2500 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 2500 communication settings.

**2500 Settings**

**Select the port the 2500 is connected to**

Connect using **COM1**

**Select the port settings for the 2500**

Baud Rate **2400**

Data Bits **8**

Parity **None**

Stop Bits **1**

Handshake **None**

☒ Enable RTS ☐ Enable DTR

**< Back** **Next >** **Finish** **Cancel**

11. In the 2500 settings, select the COM port that is connected to the 2500 along with the port settings for the 2500. Refer to your 2500 manual to check the current port settings for your 2500.

**Default 2500 Port Settings:**

Baud Rate: **2400**

Data Bits: **8**

Parity: **None**

Stop Bits: **1**

Handshake: **None**

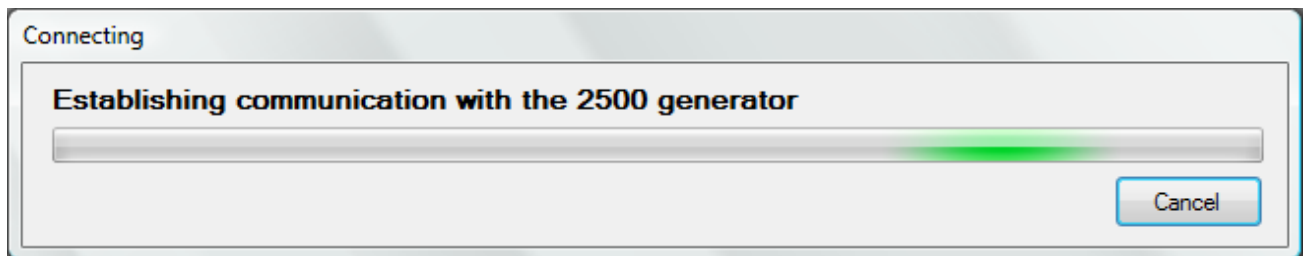
Enable RTS: **Yes**

Enable DTR: **No**

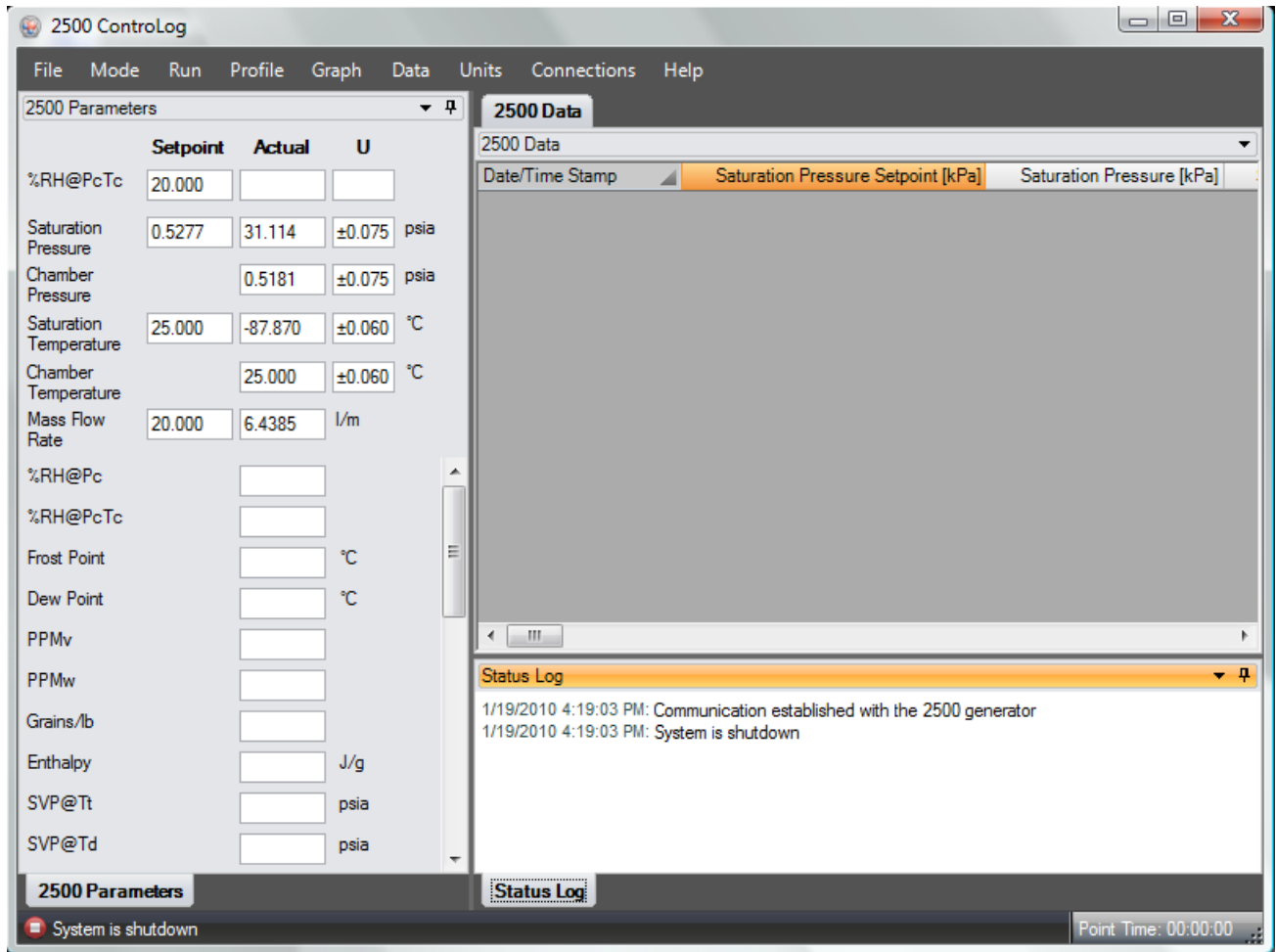
12. Selecting the “Next” button will display the access interval for the 2500. The access interval is the rate at which ControLog sends and receives commands to and from the 2500. It is recommended to leave the access interval at the default 1.5 seconds.



13. Selecting the “Finish” button will result in ControLog attempting to establish communication with the 2500 using the new communication settings.



14. Once Communication is established, the 2500 parameter tab will appear along with a 2500 data tab. The status log will also show that communication has been established.

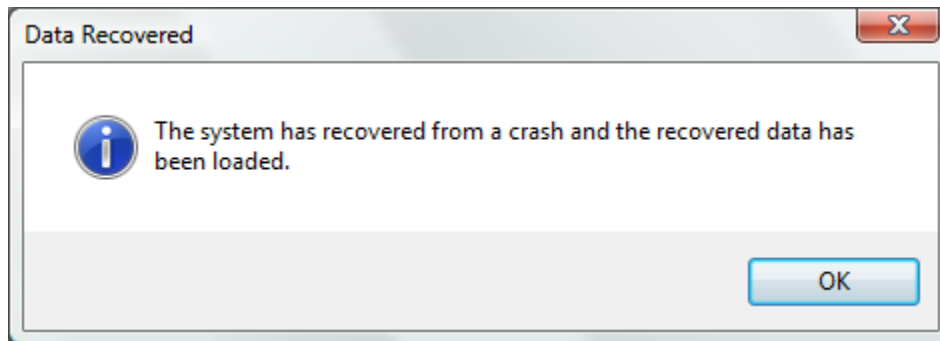


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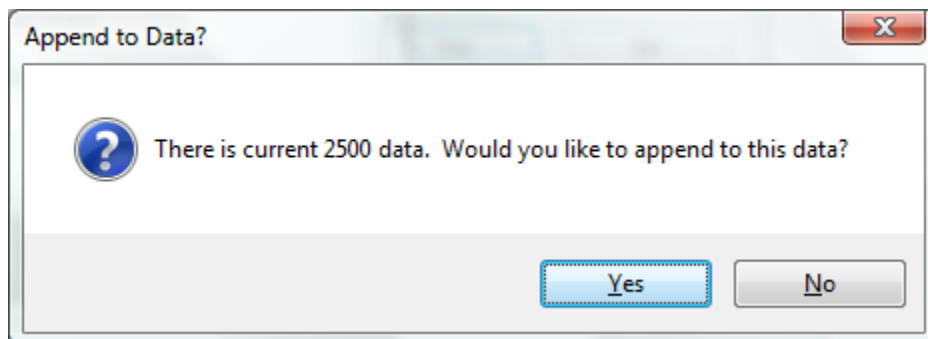
## Crashes and Data Recovery

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.

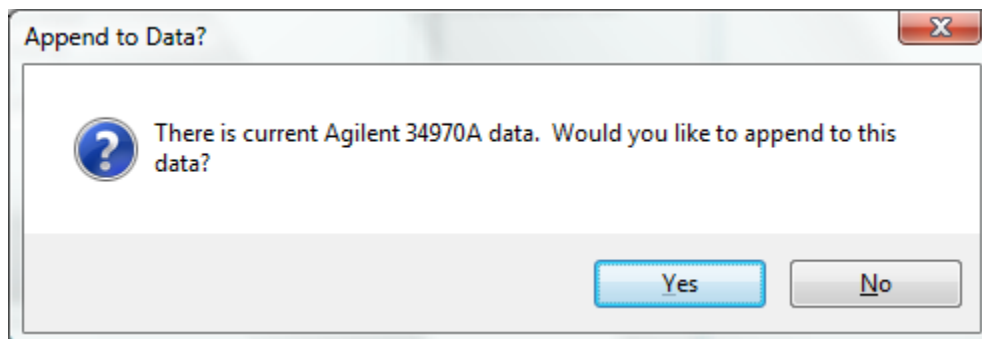
ControLog will display a message telling the user that data has been recovered.



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 2500 ControLog software interface. The main window is titled "2500 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:

- 2500 Parameters:** A list of parameters with Setpoint, Actual, and U (Uncertainty) columns. Parameters include %RH@PcTc, Saturation Pressure, Chamber Pressure, Saturation Temperature, Chamber Temperature, Mass Flow Rate, %RH@Pc, %RH@PcTc, Frost Point, Dew Point, PPMv, PPMw, Grains/lb, Enthalpy, SVP@Tt, and SVP@Td.
- 2500 Data:** A tab showing data for Agilent 34970A. It includes a table with columns for Date/Time, Setpoint [kPa], and Saturation Pressure [kPa]. A yellow callout box points to the "Recovered Data is loaded into Data Tabs" message.
- Status Log:** A log showing system events. A yellow callout box points to the message "Status Log shows the recovered data has been loaded".
- System Status:** A bar at the bottom indicates "System is shutdown" and "2500 Reported Errors".

The "2500 Data" table contains the following data:

Date/Time	Setpoint [kPa]	Saturation Pressure [kPa]
1/19/2010 5:05:27 PM	3.7581874	216.16305
1/19/2010 5:05:29 PM	3.7581874	216.16305
1/19/2010 5:05:31 PM	3.7587252	216.16305
1/19/2010 5:05:37 PM	3.7805057	216.18925
1/19/2010 5:05:42 PM	3.7743625	216.18925
1/19/2010 5:05:47 PM	3.7743625	210.43282

The Status Log contains the following entries:

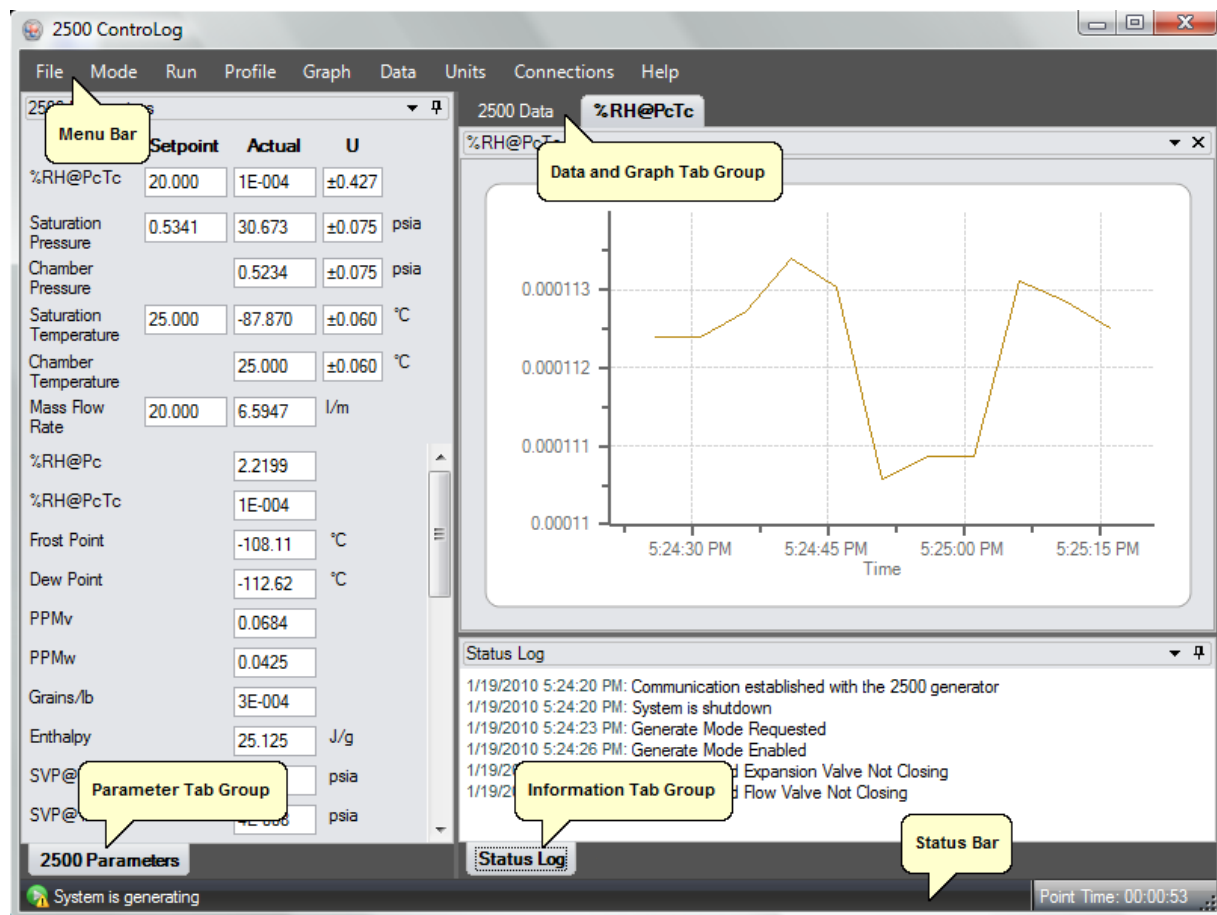
- 1/19/2010 5:06:58 PM: The system has recovered from a crash and the recovered data has been loaded.
- 1/19/2010 5:07:18 PM: Communication established with the 2500 generator
- 1/19/2010 5:07:18 PM: System is
- 1/19/2010 5:07:27 PM: 2500 Re
- 1/19/2010 5:07:27 PM: 2500 Re



# 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 2500 is assumed, and may be found in the Operation and Maintenance Manual provided with the 2500 generator.

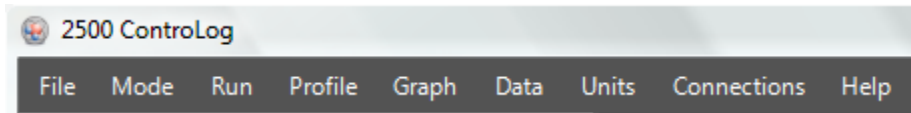
The ControLog program is composed of five basic features: Menu Bar, Parameters Tab Group, Data and Graph Tab Group, Information Tab Group and the Status Bar. Each feature is designed to be intuitive to use and to provide the user with detail information on the operation of the generator and/or connected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



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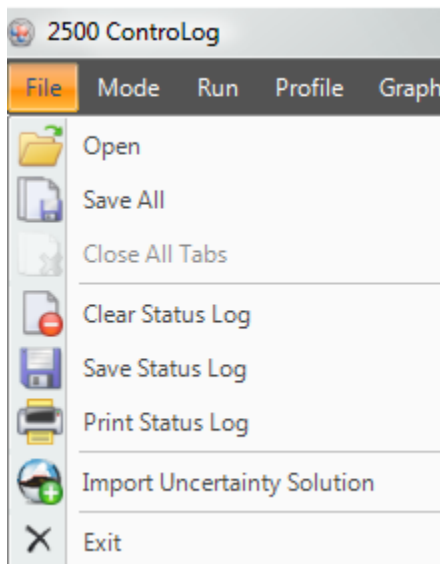
# Menu Bar

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 “2500 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 (2500).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 2500 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

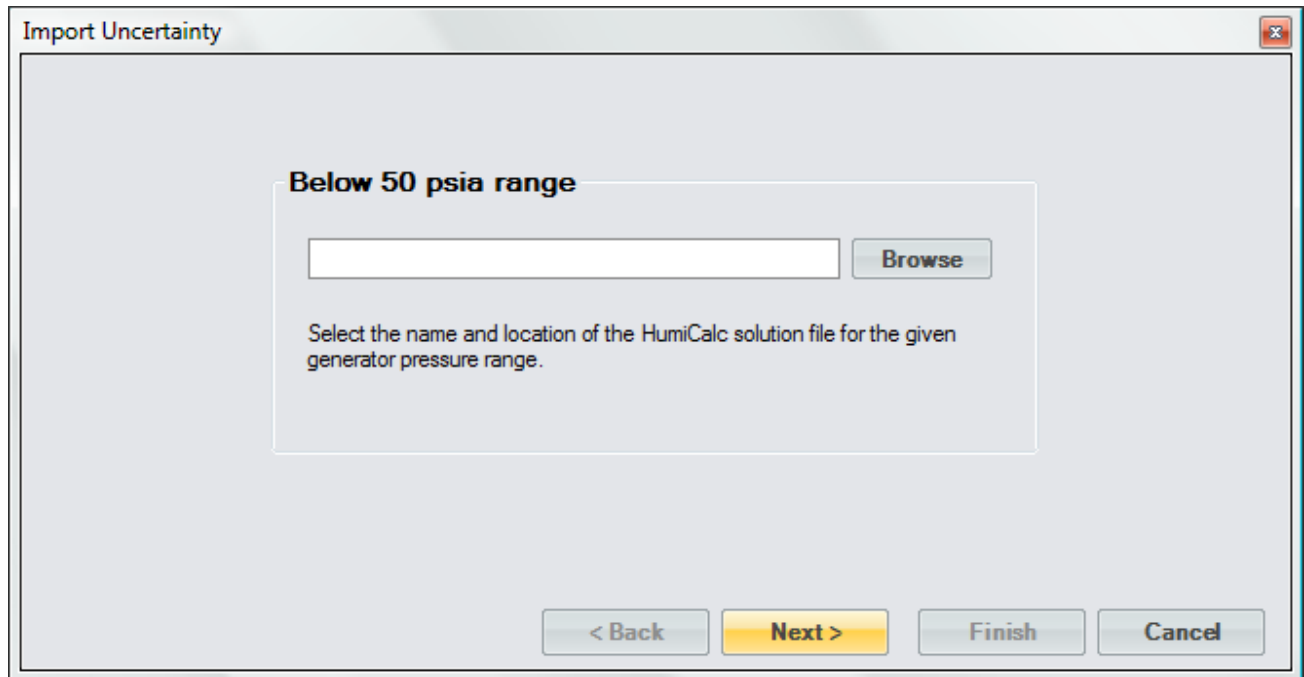
The **Save Status Log** file menu command allows the user to save the current entries in the status log. Selecting this command will open a save file dialog that will allow the user to specify the name and browse to the desired location to save the file. All status log files are saved in HTML format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

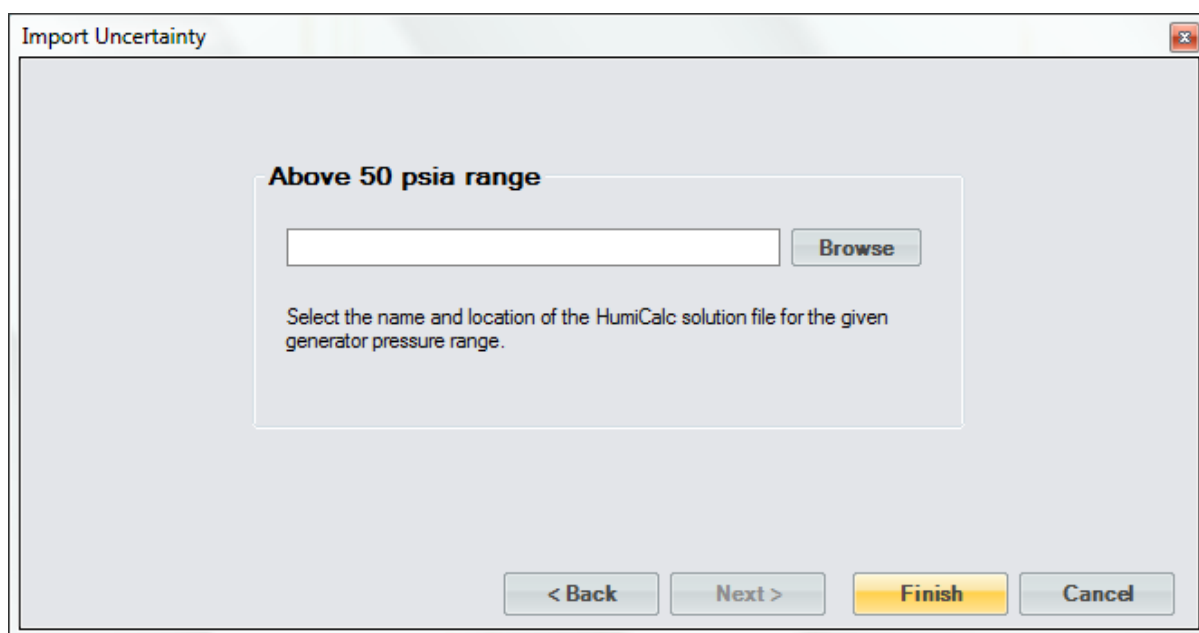
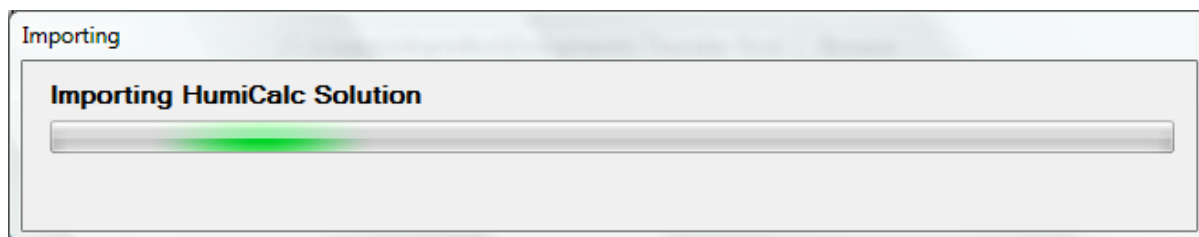
## Import Uncertainty Solution

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 2500 generator. Selecting this command will open an “Import Uncertainty” dialog that will step the user through a two step import process. The 2500 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.



The image shows a software dialog box titled "Import Uncertainty". Inside the dialog, there is a section titled "Below 50 psia range". Below this title is a text input field and a "Browse" button. Below the input field, there is a line of text: "Select the name and location of the HumiCalc solution file for the given generator pressure range." At the bottom of the dialog, there are four buttons: "< Back", "Next >" (which is highlighted in yellow), "Finish", and "Cancel".

The first step in the import process is to select the uncertainty solution for the 2500 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 ControLog.



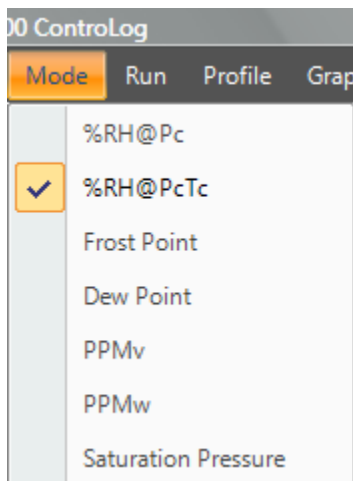
The second step in the import process is to select the uncertainty solution for the 2500 when it is operating above 50 psia. Clicking the “Browse” button will open a file dialog that will allow the user to browse to the desired location for the solution file to open. Once a file has been selected, clicking the “Finish” button will complete the import process and will display a status dialog as the second solution is imported into ControLog.

## Exit ControLog

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 2500. It allows the user to select between %RH@Pc, %RH@PcTc, Frost Point, Dew Point, PPMv, PPMw, and Saturation Pressure. The current mode is indicated by a checkmark.



### ***%RH@Pc Control Mode***

The %RH@Pc Control Mode, %RH, is controlled at a constant value by varying saturation pressure, Ps, to compensate for any changes in saturation temperature, Ts or test pressure, Pt. While %RH is held constant, all other humidity parameters may vary.

### ***%RH@PcTc Control Mode***

The %RH@PcTc Control Mode, %RH, is controlled at a constant value by varying saturation pressure, Ps, to compensate for any changes in saturation temperature, Ts, test temperature, Tt, or test pressure, Pt. While %RH is held constant, all other humidity parameters may vary.

### ***Frost Point Control Mode***

The Frost Point Control Mode, Tf, is controlled at a constant value by varying the saturation pressure, Ps, to compensate for changes in either saturation temperature, Ts, or test pressure, Pt. While Frost Point is held constant other humidity parameters may vary. Frost Point is independent of test temperature.

### ***Dew Point Control Mode***

The Dew Point Control Mode, Td, is controlled at a constant value by varying saturation pressure, Ps, to compensate for any changes in either saturation temperature, Ts, or test pressure, Pt. While Dew Point is held constant, other humidity parameters may vary. 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, Ps, to compensate for any changes in saturation temperature, Ts. While PPMv is held constant, other humidity parameters may vary. PPMv is independent of test pressure and test temperature.



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

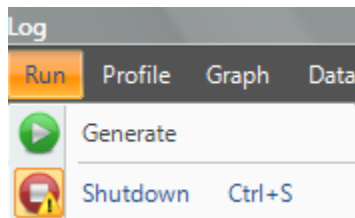
The PPMw Control Mode is controlled at a constant value by varying saturation pressure,  $P_s$ , to compensate for any changes in saturation temperature,  $T_s$ . While PPMw is held constant, other humidity parameters may vary. PPMw is independent of test pressure and test temperature.

### ***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.

## Run Menu

The **Run Menu** allows the user to run the 2500 manually in generate mode. The Run menu also allows the user to manually shutdown the 2500. The current run mode is highlighted.



### ***Generate Mode***

Selecting **Generate** from the run menu commands the 2500 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***

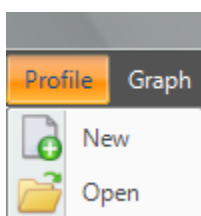
Selecting **Shutdown** from the run menu commands the 2500 to shutdown. The 2500 may be shutdown while generating. When stopped, all system functions shutdown, pressure is vented, and the idle Control/Display screen is shown. During this idle time when the 2500 is stopped, gas is not flowing through the saturator.

## Profile Menu

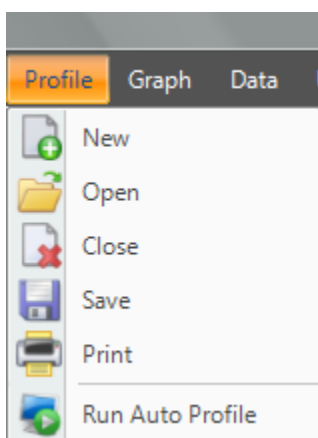
The **Profile Menu** allows the user to Open, Save, and create new Auto Profiles. Auto Profiles give the user the ability to program a set of humidity and temperature test points and dwell times that will automate the 2500 generation process. The profile menu is dynamic and has operations that are specific 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.

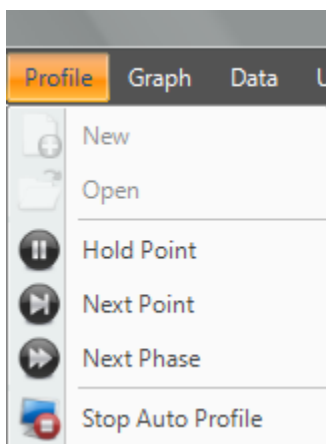
For more information, see [Profiling](#).



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.

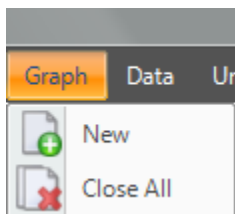
## **Stop Auto Profile**

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.

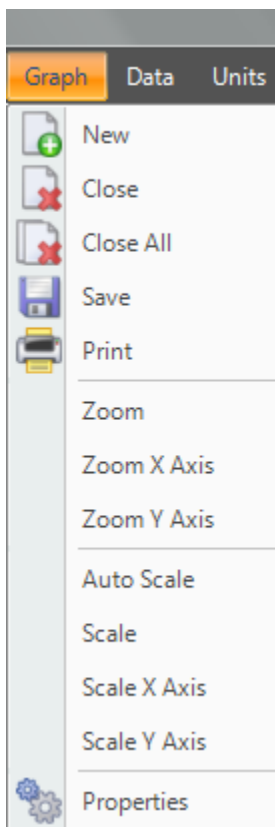
## Graph Menu

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.

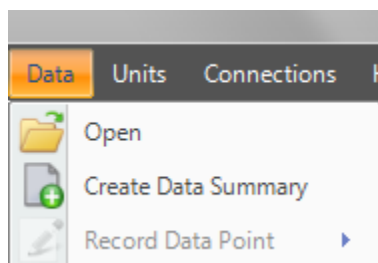
### ***Graph Properties***

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.

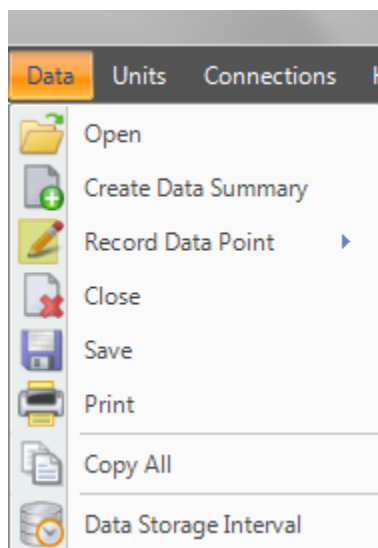
## Data Menu

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.

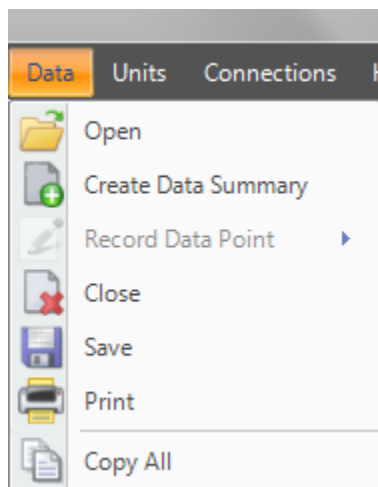
For more information, see [Data and Data Summary](#)



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)

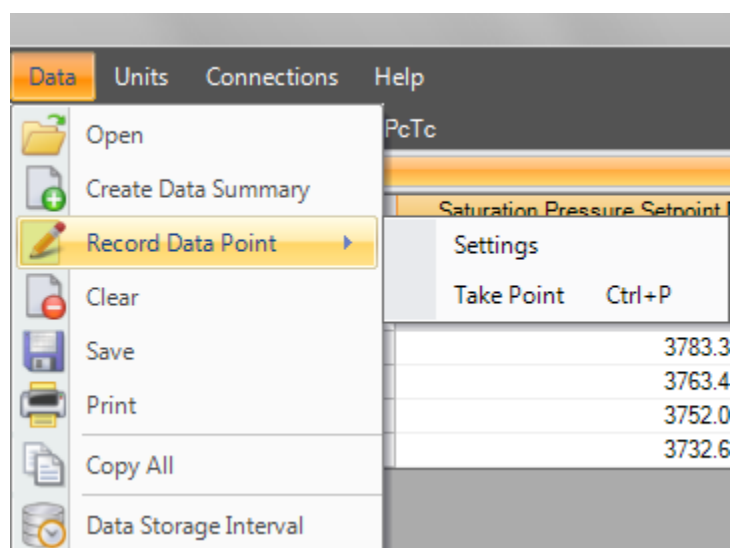
This operation is always available.

## 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.

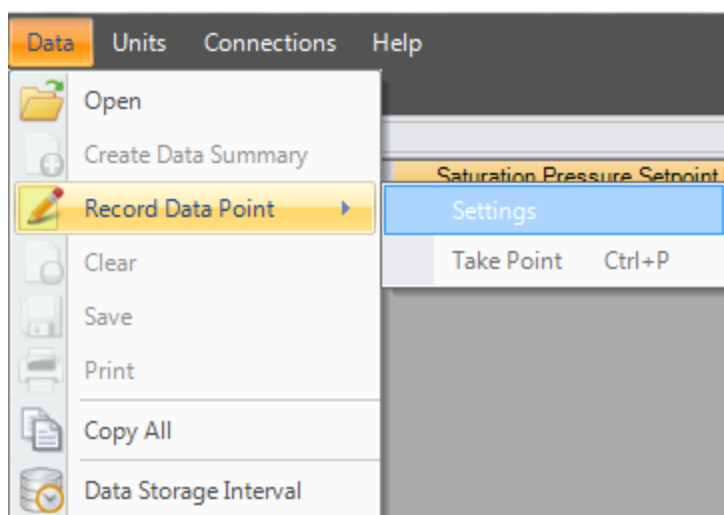
## Record Data Point

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.



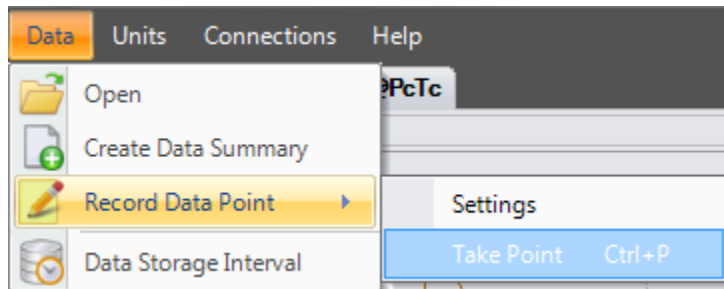
## Settings

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.

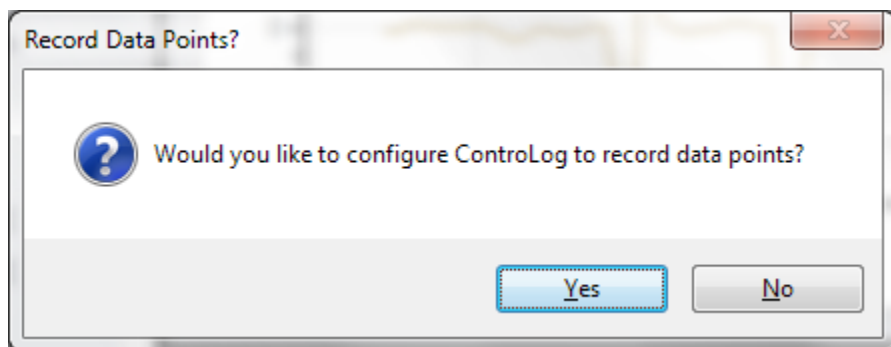


## Take Point Ctrl-P

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 ControLog 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***

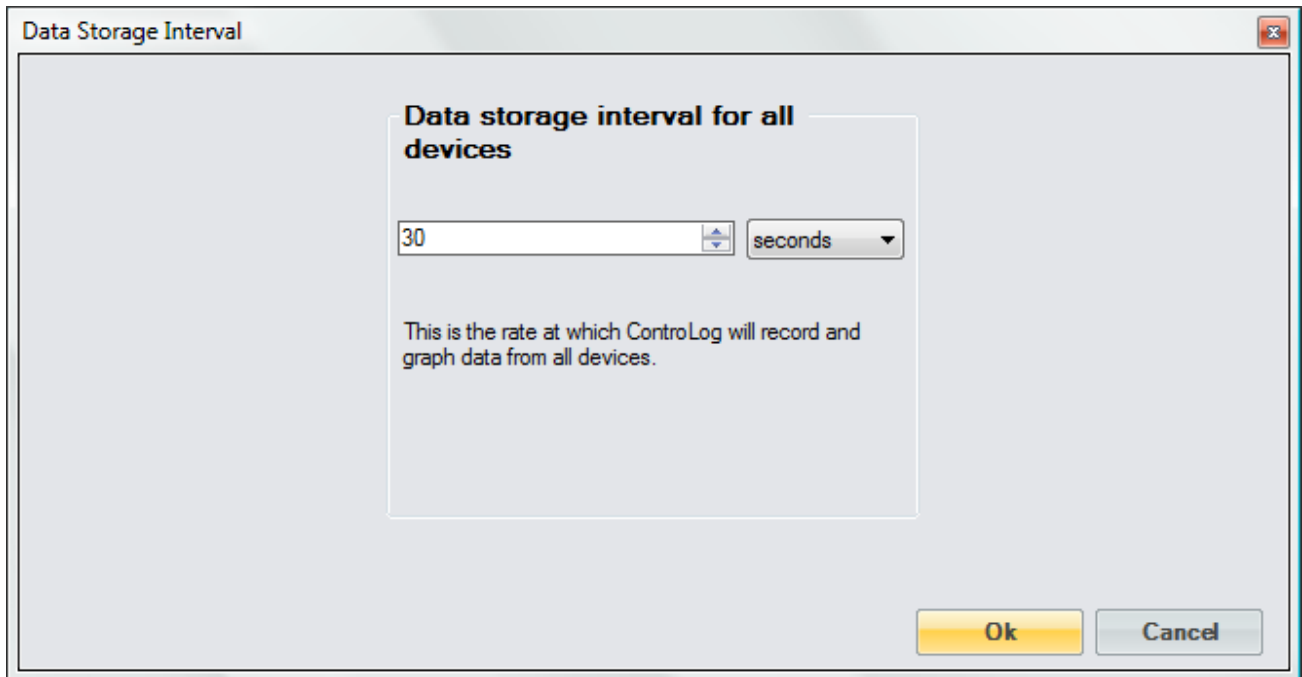
The **Copy All** data menu command allows the user to copy all the data from the selected tab to the clipboard. Selecting this command will copy all data in the selected data tab to the clipboard in a tab delimited format. This data may then be pasted into another program. This operation is available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

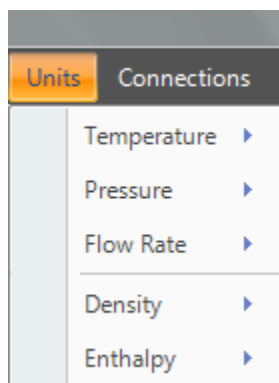
*Note: Data is only recorded while the 2500 is in generate mode. Data is also stored at the generate rate whenever a device is connected and the 2500 is not connected. This gives the user the ability to use ControLog as a logging application for any device they can connect without the need of a 2500 generator.*



## Units Menu

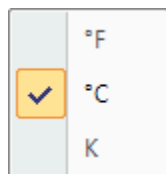
The **Units Menu** allows the user to change ControLog's displayed units. The Temperature, Pressure, Flow Rate, Density and Enthalpy units can be changed.

*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***

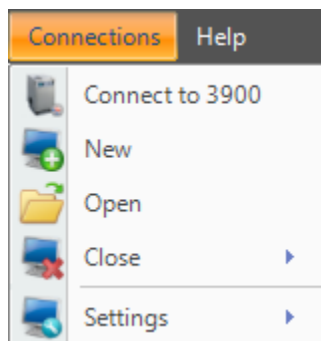
The **Enthalpy** Unit allows the user to change the displayed units for enthalpy. The selected Unit will be checked.

	btu/lb
✓	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 2500

The **Connect to 2500** connection menu command allows the user to connect to the 2500 generator. Selecting this command will cause ControLog to begin establishing communication with the 2500. This operation is available only when the 2500 is disconnected.

### New Connection

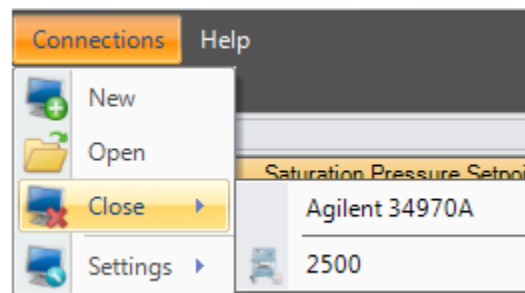
The **New** connection menu command allows the user to create a new device connection. Selecting this command will open a Connection Wizard dialog that will step the user through the process of creating a new connection to a device.

### 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

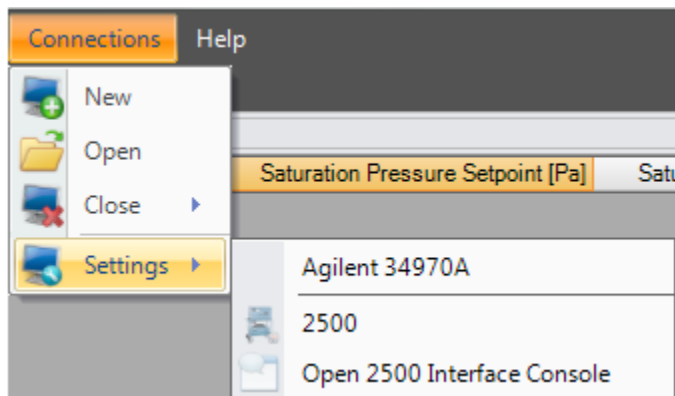
The **Close** connection menu command allows the user to close a specific connection. ControLog will ask the user to confirm before closing the connection.





## 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.

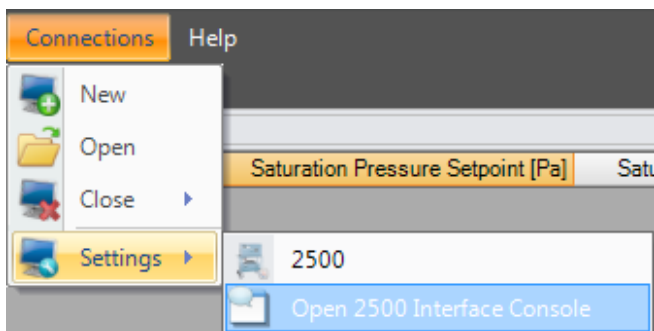


## Open 2500 Interface Console

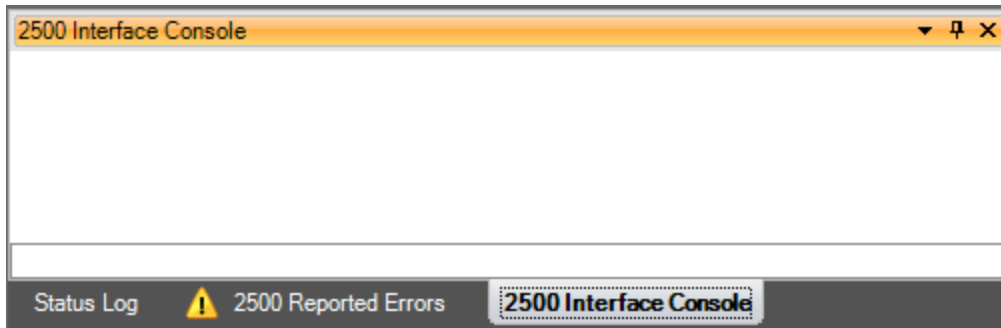
The **Open 2500 Interface Console** connection menu command under Settings allows the user to open a 2500 console tab. The 2500 console tab allows the user to send and receive commands to and from the 2500.

*Warning: Interfacing with the 2500 using the Console should only be attempted if instructed to do so by Thunder Scientific.*

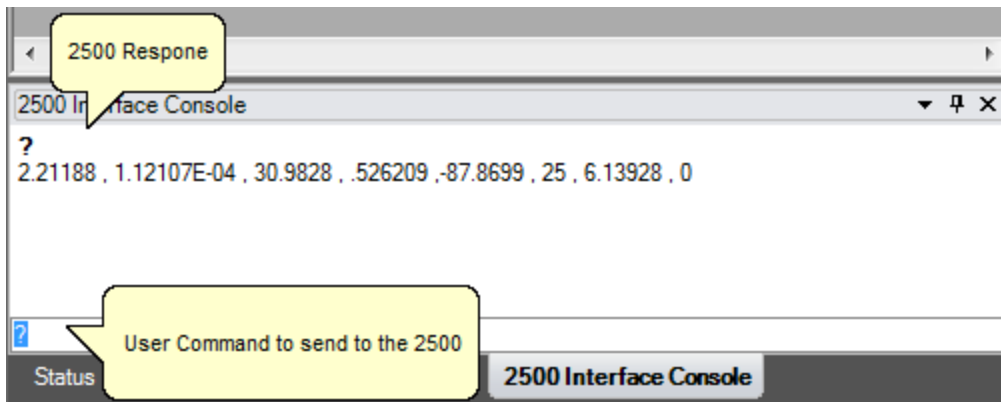
*Note: This menu command is only available when the 2500 is connected.*



Once a valid password is entered the selection will open a 2500 Interface Console tab in the information tab group.



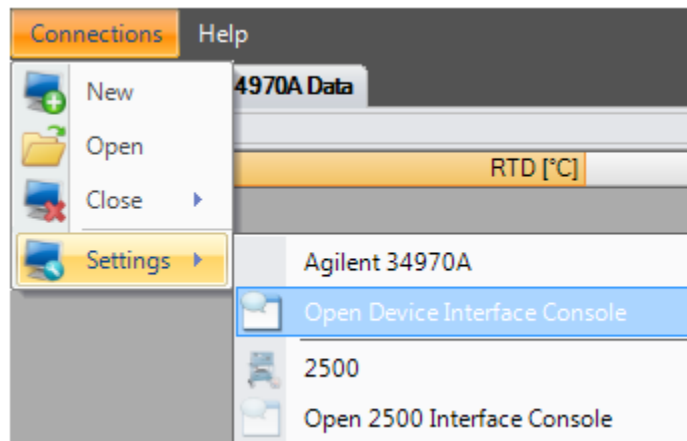
Commands are entered in the bottom text area of the console tab and the 2500 responses are displayed in the upper text area of the console tab.



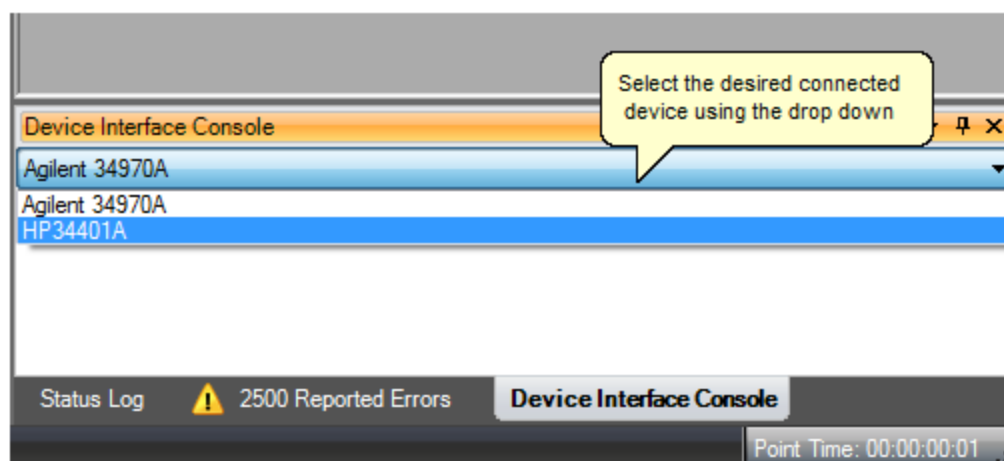
## Open Device Interface Console

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.

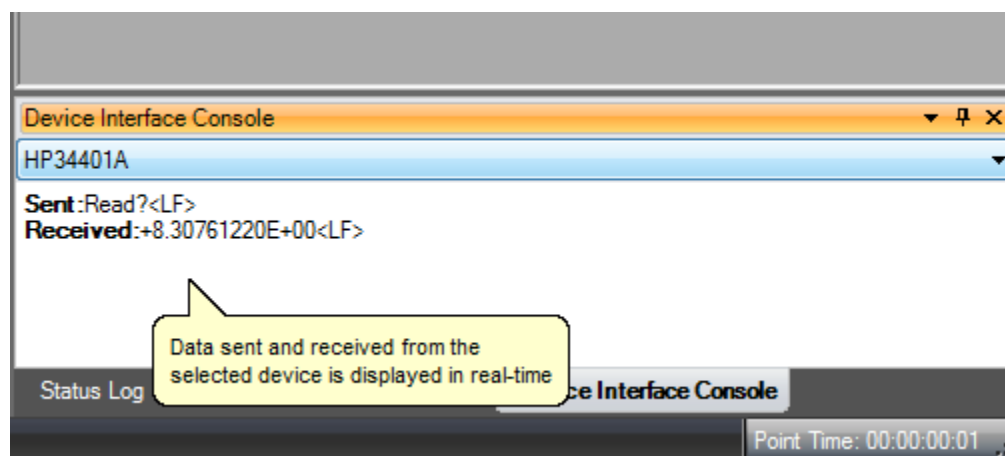
*Note: This menu command is only available when at least one device is connected.*



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

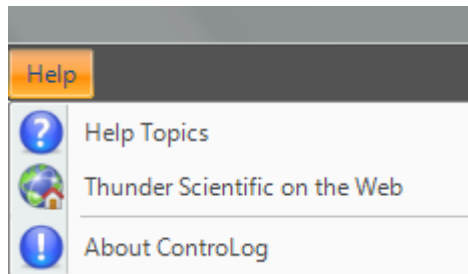


The data sent to and received from the selected device is displayed in the lower text area of the console tab.



## 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 2500 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 2500 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.

The screenshot displays the 2500 ControLog software interface. On the left, the '2500 Parameters' tab is active, showing a list of parameters with their Setpoint, Actual, and U values. On the right, the '2500 Data' tab is active, displaying a table of data points. Below the data table is a 'Status Log' section showing system events. At the bottom, there are tabs for '2500 Parameters', 'Agilent 34970A Parameters', and 'Status Log', along with a '2500 Reported Errors' section.

Parameter	Setpoint	Actual	U	Unit
%RH@PcTc	10.000	1E-004	±0.429	
Saturation Pressure	0.5383	30.509	±0.075	psia
Chamber Pressure		0.5283	±0.075	psia
Saturation Temperature	25.000	-87.870	±0.060	°C
Chamber Temperature		25.000	±0.060	°C
Mass Flow Rate	20.000	6.5517		l/m
%RH@Pc		2.2449		
%RH@PcTc		1E-004		
Frost Point		-108.04		°C
Dew Point		-112.56		°C
PPMv		0.0687		
PPMw		0.0428		
Grains/lb		3E-004		
Enthalpy		25.125		J/g
SVP@Tt		0.4598		psia
SVP@Td		4E-008		psia

Date/Time Stamp	Saturation Pressure Setpoint [Pa]	Saturation Pressure [Pa]
1/25/2010 1:49:45 PM	3708.0832	213649.22
1/25/2010 1:50:15 PM	3721.8451	215621.81
1/25/2010 1:50:45 PM	3674.1472	214491.76
1/25/2010 1:51:15 PM	3671.3066	210432.82
1/25/2010 1:51:45 PM	3725.6786	215141.94
1/25/2010 1:52:15 PM	3686.4406	210348.01
1/25/2010 1:52:45 PM	3725.8027	215102.64
1/25/2010 1:53:15 PM	3780.8505	211309.83
1/25/2010 1:53:45 PM	3722.4588	215403.94
1/25/2010 1:54:15 PM	3724.9133	212415.75
1/25/2010 1:54:45 PM	3743.343	215585.27
1/25/2010 1:55:16 PM	3785.4424	213447.21
1/25/2010 1:55:46 PM	3706.7663	215851.41
1/25/2010 1:56:16 PM	3743.736	214238.72
1/25/2010 1:56:46 PM	3741.5297	209988.8
1/25/2010 1:57:16 PM	3768.4537	214871.66

Status Log

- 1/25/2010 1:46:32 PM: Communication established with the 2500 generator
- 1/25/2010 1:46:32 PM: System is shutdown
- 1/25/2010 1:46:40 PM: Communication established with the Agilent 34970A device
- 1/25/2010 1:46:41 PM: 2500 Reported Expansion Valve Not Closing
- 1/25/2010 1:46:41 PM: 2500 Reported Flow Valve Not Closing
- 1/25/2010 1:46:43 PM: Generate Mode Requested
- 1/25/2010 1:46:45 PM: Generate Mode Enabled

System is generating

Point Time: 00:10:55

Once the parameter tabs are unpinned they will automatically hide.

The screenshot displays the 2500 ControlLog software interface. The main window has a menu bar with File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are tabs for 2500 Data, Agilent 34970A Data, and %RH@PcTc. The 2500 Data tab is active, showing a table with the following columns: Date/Time Stamp, Saturation Pressure Setpoint [Pa], Saturation Pressure [Pa], Saturation Pressure  $\pm U$  (k=2) [Pa], and Chamber Pres. The table contains 18 rows of data. Below the table is a Status Log section with a list of events. At the bottom, there is a Status Log button, a warning icon, and the text '2500 Reported Errors'. The bottom status bar shows 'System is generating' and 'Point Time: 00:10:58'.

Date/Time Stamp	Saturation Pressure Setpoint [Pa]	Saturation Pressure [Pa]	Saturation Pressure $\pm U$ (k=2) [Pa]	Chamber Pres.
1/25/2010 1:49:45 PM	3708.0832	213649.22	517.1068	:
1/25/2010 1:50:15 PM	3721.8451	215621.81	517.1068	3
1/25/2010 1:50:45 PM	3674.1472	214491.76	517.1068	3
1/25/2010 1:51:15 PM	3671.3066	210432.82	517.1068	3
1/25/2010 1:51:45 PM	3725.6786	215141.94	517.1068	3
1/25/2010 1:52:15 PM	3686.4406	210348.01	517.1068	3
1/25/2010 1:52:45 PM	3725.8027	215102.64	517.1068	3
1/25/2010 1:53:15 PM	3780.8505	211309.83	517.1068	3
1/25/2010 1:53:45 PM	3722.4588	215403.94	517.1068	3
1/25/2010 1:54:15 PM	3724.9133	212415.75	517.1068	3
1/25/2010 1:54:45 PM	3743.343	215585.27	517.1068	3
1/25/2010 1:55:16 PM	3785.4424	213447.21	517.1068	3
1/25/2010 1:55:46 PM	3706.7663	215851.41	517.1068	3
1/25/2010 1:56:16 PM	3743.736	214238.72	517.1068	3
1/25/2010 1:56:46 PM	3741.5297	209988.8	517.1068	3
1/25/2010 1:57:16 PM	3768.4537	214871.66	517.1068	3

Status Log

- 1/25/2010 1:46:32 PM: Communication established with the 2500 generator
- 1/25/2010 1:46:32 PM: System is shutdown
- 1/25/2010 1:46:40 PM: Communication established with the Agilent 34970A device
- 1/25/2010 1:46:41 PM: 2500 Reported Expansion Valve Not Closing
- 1/25/2010 1:46:41 PM: 2500 Reported Flow Valve Not Closing
- 1/25/2010 1:46:43 PM: Generate Mode Requested
- 1/25/2010 1:46:45 PM: Generate Mode Enabled

Status Log 2500 Reported Errors

System is generating Point Time: 00:10:58

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

The screenshot displays the 2500 ControLog software interface. The left sidebar shows a list of parameters under the '2500 Parameters' tab. The main window is divided into two sections: a parameter configuration table on the left and a data table on the right.

**Parameter Configuration Table:**

	Setpoint	Actual	U
%RH@PcTc	10.000	1E-004	±0.429
Saturation Pressure	0.5383	30.509	±0.075 psia
Chamber Pressure		0.5283	±0.075 psia
Saturation Temperature	25.000	-87.870	±0.060 °C
Chamber Temperature		25.000	±0.060 °C
Mass Flow Rate	20.000	6.5517	l/m
%RH@Pc		2.2449	
%RH@PcTc		1E-004	
Frost Point		-108.04	°C
Dew Point		-112.56	°C
PPMv		0.0687	
PPMw		0.0428	
Grains/lb		3E-004	
Enthalpy		25.125	J/g
SVP@Tt		0.4598	psia
SVP@Td		4E-008	psia
SVP@Ts		2E-006	psia

**Data Table:**

t [Pa]	Saturation Pressure [Pa]	Saturation Pressure ±U (k=2) [Pa]	Chamber Pres
0832	213649.22	517.1068	:
8451	215621.81	517.1068	3
1472	214491.76	517.1068	3
3066	210432.82	517.1068	3
6786	215141.94	517.1068	3
4406	210348.01	517.1068	3
8027	215102.64	517.1068	3
8505	211309.83	517.1068	3
4588	215403.94	517.1068	3
9133	212415.75	517.1068	3
3343	215585.27	517.1068	3
4424	213447.21	517.1068	3
7663	215851.41	517.1068	3
3736	214238.72	517.1068	3
5297	209988.8	517.1068	3
4537	214871.66	517.1068	3

The bottom status bar indicates 'System is generating' and 'Point Time: 00:10:58'.

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 shows the 2500 ControlLog software interface. The main window has a menu bar (File, Mode, Run, Profile, Graph, Data, Units, Connections, Help) and a toolbar. The '2500 Parameters' tab is selected, and a dropdown menu is open, showing '2500 Parameters' (checked) and 'Agilent 34970A Parameters'. The interface displays various parameters in a table format, including Setpoint, Actual, and U values. The 'Status Log' tab is also visible at the bottom, showing a list of system events.

Parameter	Setpoint	Actual	U	Units
%RH@PcTc	10.000	1E-004	±0.430	
Saturation Pressure	0.5424	30.474	±0.075	psia
Chamber Pressure		0.5315	±0.075	psia
Saturation Temperature	25.000	-87.870	±0.060	°C
Chamber Temperature		25.000	±0.060	°C
Mass Flow Rate	20.000	8.0405		l/m
%RH@Pc		2.2575		
%RH@PcTc		1E-004		
Frost Point		-108.01		°C
Dew Point		-112.53		°C
PPMv		0.0688		
PPMw		0.0428		
Grains/lb		3E-004		
Enthalpy		25.125		J/g
SVP@Tt		0.4598		psia
SVP@Td		4E-008		psia

**Status Log**

- 1/25/2010 1:46:32 PM: Communication established with the 2500 generator
- 1/25/2010 1:46:32 PM: System is shutdown
- 1/25/2010 1:46:40 PM: Communication established with the Agilent 34970A device
- 1/25/2010 1:46:41 PM: 2500 Reported Expansion Valve Not Closing
- 1/25/2010 1:46:41 PM: 2500 Reported Flow Valve Not Closing
- 1/25/2010 1:46:43 PM: Generate Mode Requested
- 1/25/2010 1:46:45 PM: Generate Mode Enabled

System is generating Point Time: 00:11:04



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 2500 ControLog software interface. The main window is titled "2500 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help.

On the left side, there are two parameter tabs. The top tab, "2500 Parameters", is active and shows a table with columns: Setpoint, Actual, U, and units. The parameters listed are:

Parameter	Setpoint	Actual	U	Units
%RH@PcTc	10.000	1E-004	±0.421	
Saturation Pressure	0.5458	31.057	±0.075	psia
Chamber Pressure		0.5349	±0.075	psia
Saturation Temperature	25.000	-87.870	±0.060	°C
Chamber Temperature		25.000	±0.060	°C
Mass Flow Rate	20.000	5.3778		l/m

Below this table is a sub-tab "2500 Parameters" and another tab "Agilent 34970A Parameters". The "Agilent 34970A Parameters" tab shows a "Dew Point" parameter with an "Actual" value field and a unit of °C.

The right side of the interface features a "2500 Data" tab, which is active. It displays a table with columns: Date/Time Stamp, Saturation Pressure Setpoint [Pa], and Saturation Pressure [Pa]. The data is as follows:

Date/Time Stamp	Saturation Pressure Setpoint [Pa]	Saturation Pressure [Pa]
1/25/2010 1:50:15 PM	3721.8451	215621.81
1/25/2010 1:50:45 PM	3674.1472	214491.76
1/25/2010 1:51:15 PM	3671.3066	210432.82
1/25/2010 1:51:45 PM	3725.6786	215141.94
1/25/2010 1:52:15 PM	3686.4406	210348.01
1/25/2010 1:52:45 PM	3725.8027	215102.64
1/25/2010 1:53:15 PM	3780.8505	211309.83
1/25/2010 1:53:45 PM	3722.4588	215403.94
1/25/2010 1:54:15 PM	3724.9133	212415.75
1/25/2010 1:54:45 PM	3743.343	215585.27
1/25/2010 1:55:16 PM	3785.4424	213447.21
1/25/2010 1:55:46 PM	3706.7663	215851.41
1/25/2010 1:56:16 PM	3743.736	214238.72
1/25/2010 1:56:46 PM	3741.5297	209988.8
1/25/2010 1:57:16 PM	3768.4537	214871.66
1/25/2010 1:57:46 PM	3739.5923	210354.22

Below the data table is a "Status Log" tab, which shows a list of system events:

- 1/25/2010 1:46:32 PM: Communication established with the 2500 generator
- 1/25/2010 1:46:32 PM: System is shutdown
- 1/25/2010 1:46:40 PM: Communication established with the Agilent 34970A device
- 1/25/2010 1:46:41 PM: 2500 Reported Expansion Valve Not Closing
- 1/25/2010 1:46:41 PM: 2500 Reported Flow Valve Not Closing
- 1/25/2010 1:46:43 PM: Generate Mode Requested
- 1/25/2010 1:46:45 PM: Generate Mode Enabled

At the bottom of the interface, there is a "Status Log" tab with a warning icon and the text "2500 Reported Errors". The bottom status bar shows "System is generating" and "Point Time: 00:11:23".

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 2500 ControlLog software interface. The main window is titled "2500 ControlLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. The interface is divided into several panes:

- 2500 Parameters:** A table with columns for Setpoint, Actual, and U. It lists various parameters such as %RH@PcTc, Saturation Pressure, Chamber Pressure, Saturation Temperature, Chamber Temperature, Mass Flow Rate, %RH@Pc, Frost Point, Dew Point, PPMv, PPMw, Grains/lb, Enthalpy, SVP@Tt, and SVP@Td.
- 2500 Data:** A table with columns for Date/Time Stamp, Saturation Pressure Setpoint [Pa], and Saturation Pressure [Pa]. It displays a list of data points with timestamps and corresponding pressure values.
- Status Log:** A log of system events, including communication establishment, system shutdown, and valve status reports.
- Bottom Bar:** Includes a "System is generating" status indicator, a "Point Time: 00:11:09" display, and a "2500 Reported Errors" section.

A context menu is open over the "2500 Data" tab, showing two options: "Connection Settings" and "Close Connection".

## 2500 Parameter Tab

The **2500 Parameter Tab** is the primary 2500 interface for the user and is visible whenever the 2500 is connected. From this tab the user can set setpoints, view actual values and view real-time uncertainty values. The 2500 Parameters tab is divided into two different areas; the Control Parameters and the Calculated Humidity Parameters.

**2500 ControlLog**

File Mode Run Profile Graph Data Units Connections Help

**2500 Parameters** 2500 Data Agilent 34970A Data %RH@PcTc

	Setpoint	Actual	U	
%RH@PcTc	10.000	1E-004	±0.429	
Saturation Pressure	0.5383	30.509	±0.075	psia
Chamber Pressure		0.5283	±0.075	psi
Saturation Temperature	25.000	-87.870	±0.060	°C
Chamber Temperature		25.000	±0.060	°C
Mass Flow Rate	20.000	6.5517		l/m
%RH@Pc		2.2449		
%RH@PcTc		1E-004		
Frost Point		-108.04		°C
Dew Point		-112.56		°C
PPMv		0.0687		
PPMw		0.0428		
Grains/lb		3E-004		
Enthalpy		25.125		J/g
SVP@Tt				
SVP@Td				

**2500 Data**

Date/Time Stamp	Saturation Pressure Setpoint [Pa]	Saturation Pressure [Pa]
1/25/2010 1:49:45 PM	3708.0832	213649.22
1/25/2010 1:50:45 PM	3721.8451	215621.81
1/25/2010 1:51:45 PM	3674.1472	214491.76
1/25/2010 1:52:45 PM	3671.3066	210432.82
1/25/2010 1:53:45 PM	3725.6786	215141.94
1/25/2010 1:54:45 PM	3686.4406	210348.01
1/25/2010 1:55:45 PM	3725.8027	215102.64
1/25/2010 1:56:45 PM	3780.8505	211309.83
1/25/2010 1:57:45 PM	3722.4588	215403.94
1/25/2010 1:58:45 PM	3724.9133	212415.75
1/25/2010 1:59:45 PM	3743.343	215585.27
1/25/2010 2:00:45 PM	3785.4424	213447.21
1/25/2010 2:01:45 PM	3706.7663	215851.41
1/25/2010 2:02:45 PM	3743.736	214238.72
1/25/2010 2:03:45 PM	3741.5297	209988.8
1/25/2010 2:04:45 PM	3768.4537	214871.66

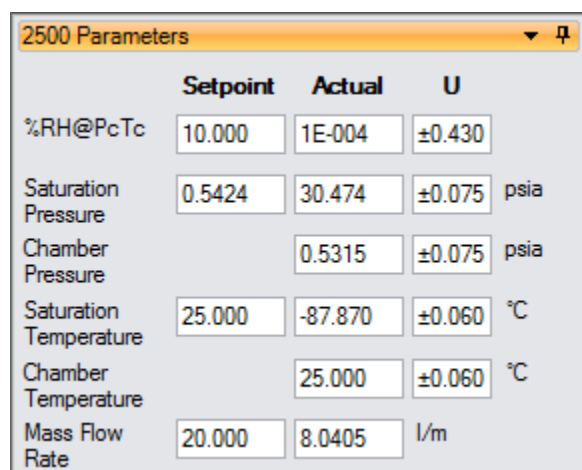
**2500 Generator Parameter Tab**

**Status Log** 2500 Reported Errors

System is generating Point Time: 00:10:54

## 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.



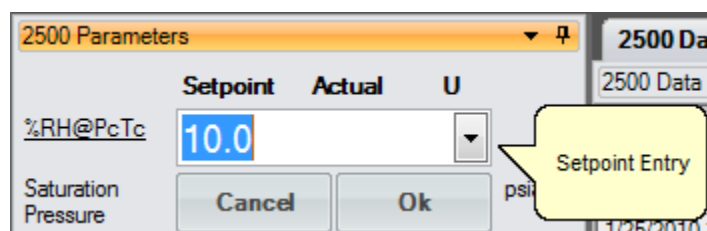
	Setpoint	Actual	U	
%RH@PcTc	10.000	1E-004	±0.430	
Saturation Pressure	0.5424	30.474	±0.075	psia
Chamber Pressure		0.5315	±0.075	psia
Saturation Temperature	25.000	-87.870	±0.060	°C
Chamber Temperature		25.000	±0.060	°C
Mass Flow Rate	20.000	8.0405	l/m	

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.

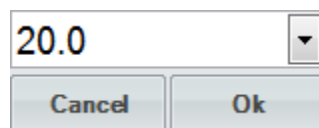
In the Setpoint column is the list of the system controlled parameters. The Actual column lists the current values for each of the measured temperatures, pressures, and flow values. The Uncertainty column is a representation of the current uncertainty calculated in real-time by HumiCalc with Uncertainty 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 Percent Relative Humidity setpoint click on the %RH@PcTc setpoint field.



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



20.0	▼
Cancel	Ok

Notice that the Percent Relative Humidity setpoint field updates to the new value and the values in the Actual column begin moving toward the new setpoint.

	Setpoint	Actual	U
%RH@PcTc	20.000	1E-004	±0.418
Saturation Pressure	0.5386	31.265	±0.075 psia
Chamber Pressure		0.5278	±0.075 psia
Saturation Temperature	25.000	-87.870	±0.060 °C
Chamber Temperature		25.000	±0.060 °C
Mass Flow Rate	20.000	4.7823	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.

-19.0946

°C

HumiCalc Drop Down

HumiCalc

Configuration

Known Frost Point

Known Values

Frost Point -15.0

Saturation Pressure 100.0

Test Temperature 21.11

Test Pressure 14.7

Calculate

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

The screenshot shows the 'HumiCalc' window. A yellow callout bubble points to the 'Known' dropdown menu, which is set to 'Frost Point'. Another yellow callout bubble points to the 'Frost Point' and 'Saturation Pressure' input fields, which contain the values '-50.0' and '100.0' respectively. A third yellow callout bubble points to the 'Calculate' button. Below the input fields, there are fields for 'Test Temperature' (21.11) and 'Test Pressure' (14.7). A green checkmark icon is visible next to the 'Calculate' button. In the background, a 'Status Log' window is partially visible, showing a list of events with timestamps.

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

The screenshot shows a 'Setpoint Entry Box' with a text field containing the value '-33.5803'. Below the text field are two buttons: 'Cancel' and 'Ok'.

Clicking “Ok” will close the setpoint entry and will send the setpoint to the 2500 generator.

The screenshot shows a 'Status Log' window with a single entry: '10/21/2009 5:06:43 PM: Saturation Temperature Setpoint set to -33.58 °C'. The window has a title bar and a 'Status Log' button.

## 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.

%RH@Pc	2.2062	
%RH@PcTc	1E-004	
Frost Point	-108.14	°C
Dew Point	-112.66	°C
PPMv	0.0676	
PPMw	0.0421	
Grains/lb	3E-004	
Enthalpy	25.125	J/g
SVP@Tt	0.4598	psia
SVP@Td	4E-008	psia

2500 Parameters

### %RH@Pc

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. %RH@Pc is the %RH calculated at the chamber pressure. This calculation ignores the chamber temperature and assumes that the chamber is at saturation temperature.

### %RH@PcTc

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. %RH@PcTc is the %RH calculated at the chamber pressure and chamber temperature relative to the saturation temperature. This is the most accurate calculation of %RH at the point in the immediate vicinity of the chamber temperature probe. Placing the chamber temperature probe at the humidity sensing point of the devices under test gives the actual value of the relative humidity being imposed on the devices, as it is dependent on both pressure and temperature.

Viewing the difference between %RH@Pc and %RH@PcTc gives a good indication of the gradient which exists between the humidity at the walls of the chamber (since they are at saturation temperature) and the humidity at the chamber temperature probe.

### 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.

## **Flow Value Position**

The Flow Value Position indicates the step position of the 2500's Flow value. This value is not a humidity value, but is related to the operation of the 2500. This step position is mainly used for trouble shooting.

## **Exp Value Position**

The Exp Value Position indicates the step position of the 2500's Expansion value. This value is not a humidity value, but is related to the operation of the 2500. This step position is mainly used for trouble shooting.

## 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.

**2500 ControLog**

File Mode Run Profile Graph Data Units Connections Help

Agilent 34970A Parameters ▾

**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	24.185	°C

2500 Data %RH@PcTc **Agilent 34970A Data**

Agilent 34970A Data

Date/Time Stamp	Temperature 1 [°C]	Temperature 2 [°C]	Temperature 3 [°C]
1/25/2010 3:37:59 PM	27.081	27.876	28.388

Status Log ▾

- 1/25/2010 1:46:41 PM: 2500 Reported Flow Valve Not Closing
- 1/25/2010 1:46:43 PM: Generate Mode Requested
- 1/25/2010 1:46:45 PM: Generate Mode Enabled
- 1/25/2010 2:38:29 PM: %RH@PcTc Setpoint set to 20.0
- 1/25/2010 2:43:57 PM: Communication terminated with the Agilent 34970A device
- 1/25/2010 3:17:25 PM: Communication established with the Simulated Chilled Mirror device
- 1/25/2010 3:34:51 PM: Communication terminated with the Simulated Chilled Mirror device
- 1/25/2010 3:36:41 PM: Communication established with the Agilent 34970A device

2500 Parameters **Agilent 34970A Parameters** Status Log ⚠ 2500 Reported Errors

System is generating Point Time: 00:59:30

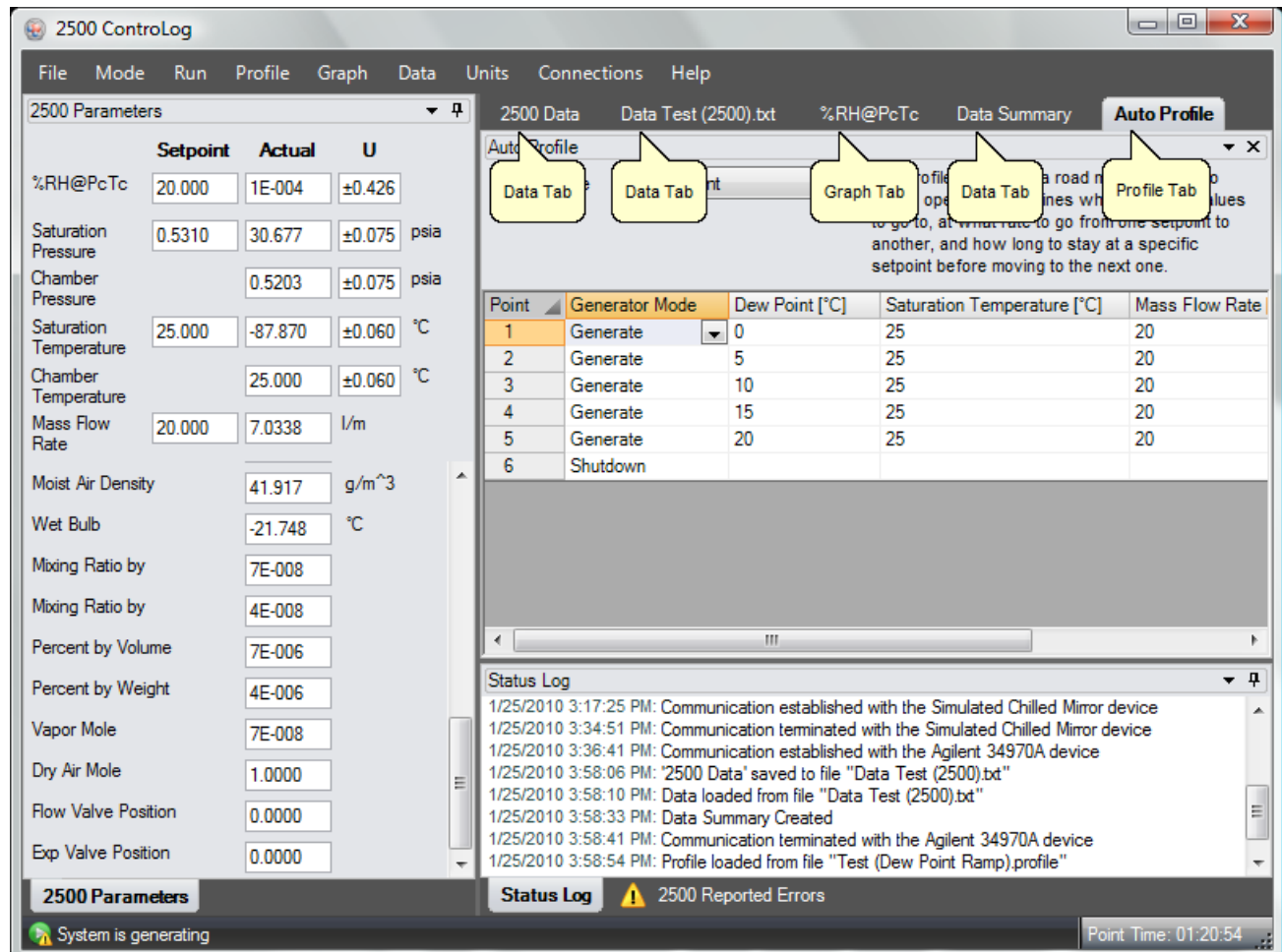
## Device Parameters

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.

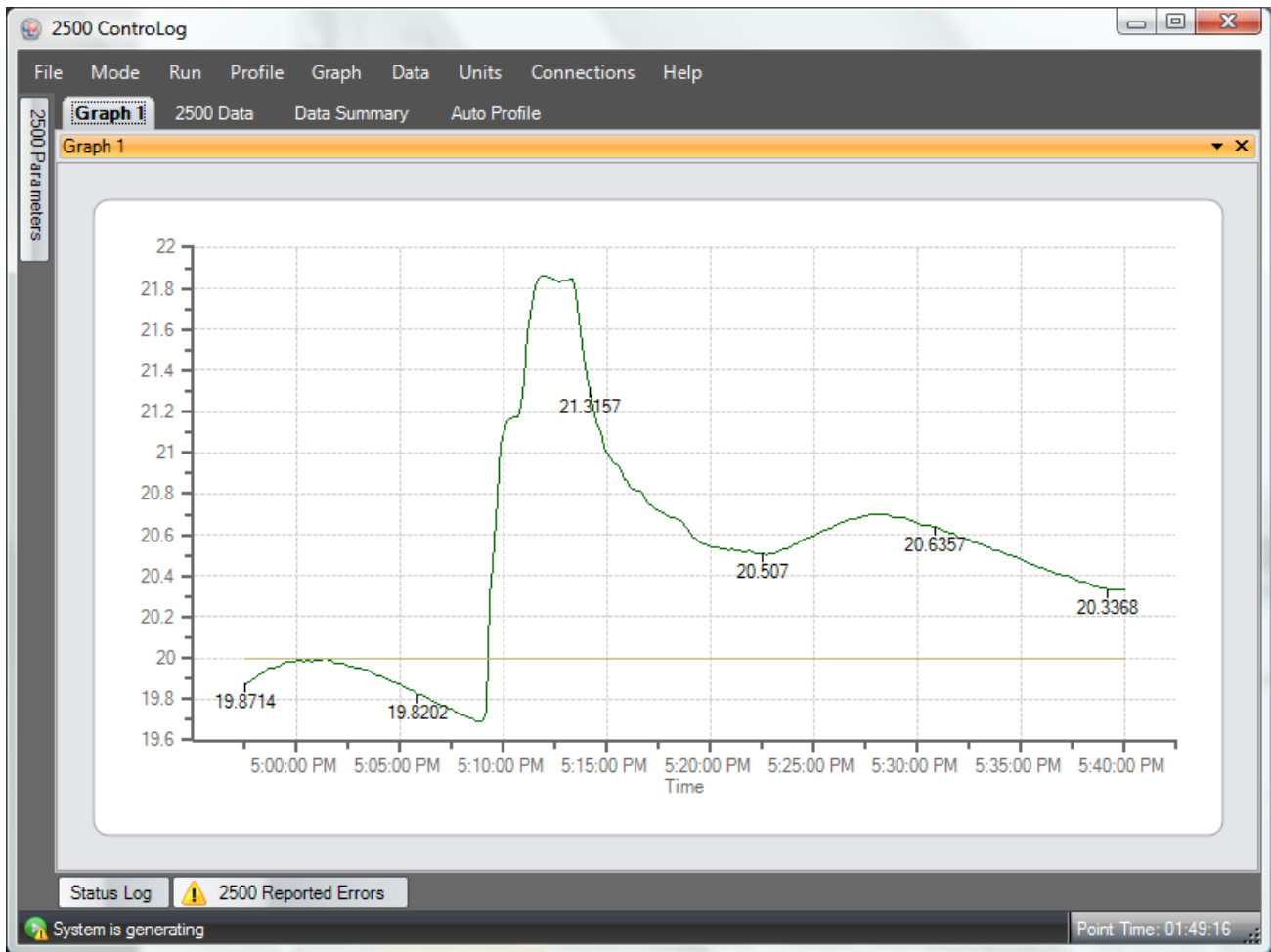
Agilent 34970A Parameters ▼ ⓘ		
Actual		
Temperature 1	27.065	°C
Temperature 2	27.880	°C
Temperature 3	28.389	°C
Temperature 4	25.625	°C
Temperature 5	25.339	°C
Temperature 6	26.290	°C
Temperature 7	24.721	°C
Temperature 8	23.451	°C
Voltage	8.6673	
RTD	24.185	°C

# Data and Graph Tab Group

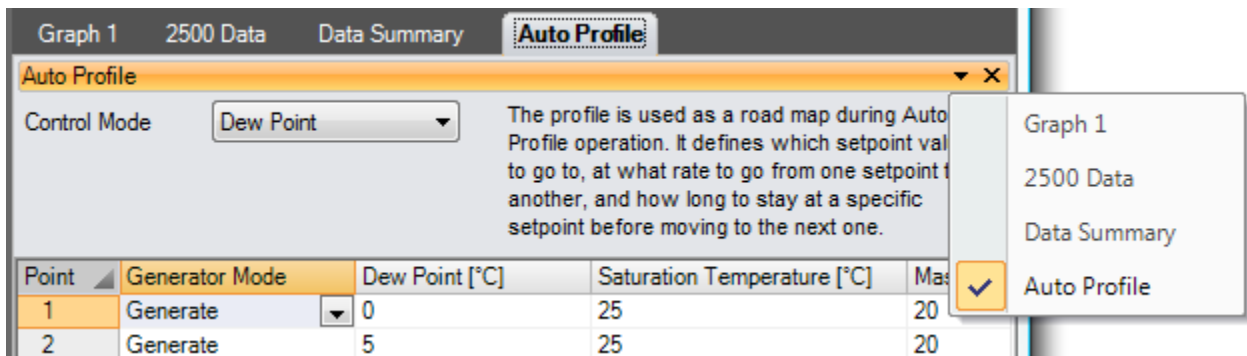
The **Data and Graph Tab Group** is located in the middle right of the application and can contain data, graph, and profile tabs. Data and Graph tabs are fixed tab style windows that can be selected by clicking the desired tab labels at the top.



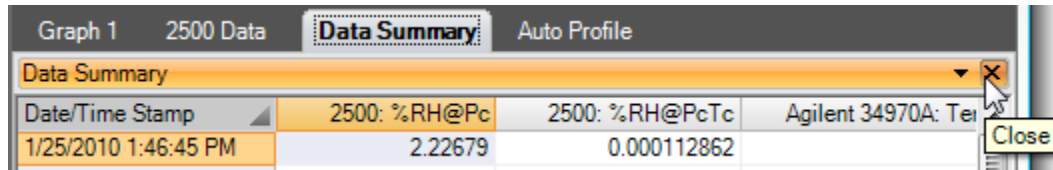
Data and Graph Tabs will expand to fill the available area as tabs around are collapsed and hidden.



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.



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

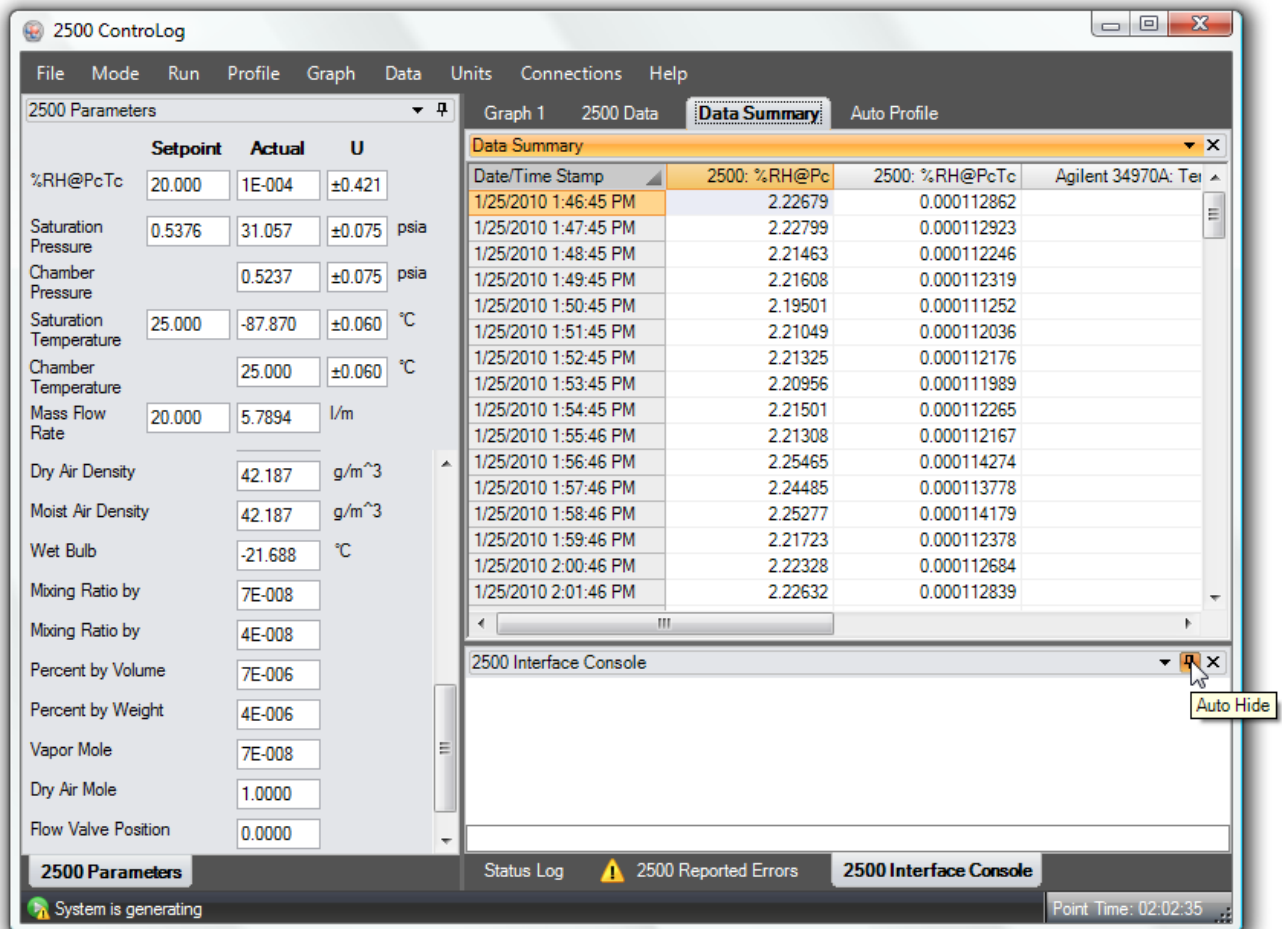
The **Profile Tab** contains the profile point definitions for an auto profile.

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, 2500 Reported Errors tab and a 2500 Interface Console tab.

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





Once the information tabs are unpinned they will automatically hide.

The screenshot displays the 2500 ControLog software interface. The main window is titled "2500 ControLog" and features a menu bar with options: File, Mode, Run, Profile, Graph, Data, Units, Connections, and Help. Below the menu bar, there are tabs for "2500 Parameters", "Graph 1", "2500 Data", "Data Summary", and "Auto Profile". The "Data Summary" tab is currently selected, showing a table of data points.

The "2500 Parameters" tab is also visible, showing a list of parameters with their Setpoint, Actual, and U values. The parameters include:

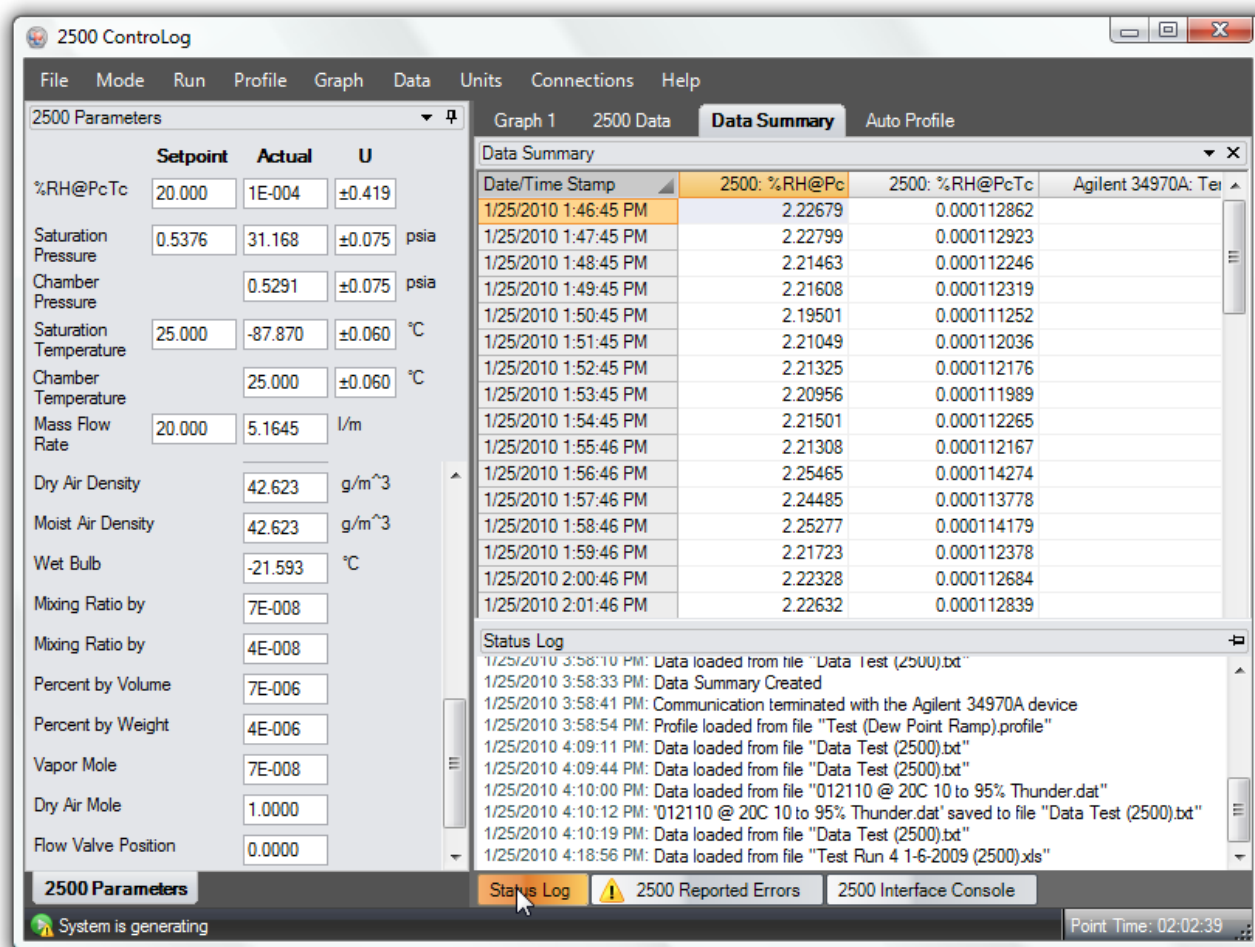
- %RH@PcTc: Setpoint 20.000, Actual 1E-004, U ±0.419
- Saturation Pressure: Setpoint 0.5376, Actual 31.168, U ±0.075 psia
- Chamber Pressure: Setpoint 0.5291, Actual ±0.075 psia
- Saturation Temperature: Setpoint 25.000, Actual -87.870, U ±0.060 °C
- Chamber Temperature: Setpoint 25.000, Actual ±0.060 °C
- Mass Flow Rate: Setpoint 20.000, Actual 5.1645, U l/m
- Dry Air Density: Setpoint 42.623, Actual g/m<sup>3</sup>
- Moist Air Density: Setpoint 42.623, Actual g/m<sup>3</sup>
- Wet Bulb: Setpoint -21.593, Actual °C
- Mixing Ratio by: Setpoint 7E-008
- Mixing Ratio by: Setpoint 4E-008
- Percent by Volume: Setpoint 7E-006
- Percent by Weight: Setpoint 4E-006
- Vapor Mole: Setpoint 7E-008
- Dry Air Mole: Setpoint 1.0000
- Flow Valve Position: Setpoint 0.0000

The "Data Summary" tab shows a table with the following columns: Date/Time Stamp, 2500: %RH@Pc, 2500: %RH@PcTc, and Agilent 34970A: Tei. The table contains 20 rows of data, with the first row highlighted in orange. The data points are as follows:

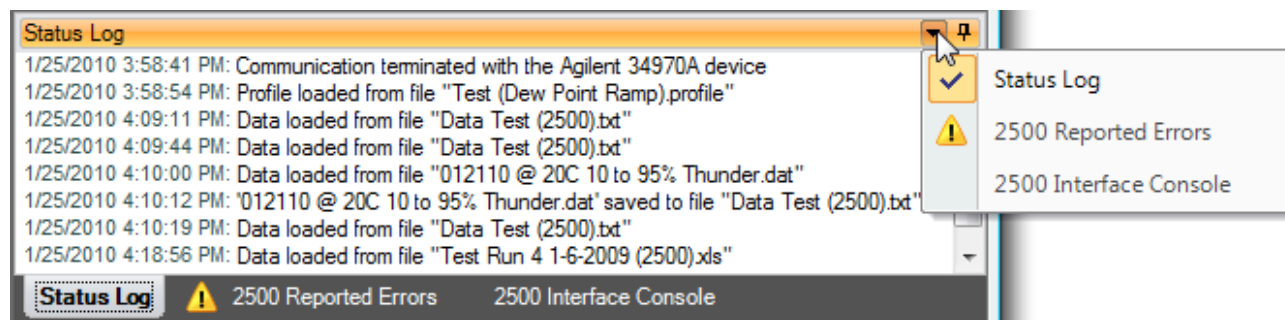
Date/Time Stamp	2500: %RH@Pc	2500: %RH@PcTc	Agilent 34970A: Tei
1/25/2010 1:46:45 PM	2.22679	0.000112862	
1/25/2010 1:47:45 PM	2.22799	0.000112923	
1/25/2010 1:48:45 PM	2.21463	0.000112246	
1/25/2010 1:49:45 PM	2.21608	0.000112319	
1/25/2010 1:50:45 PM	2.19501	0.000111252	
1/25/2010 1:51:45 PM	2.21049	0.000112036	
1/25/2010 1:52:45 PM	2.21325	0.000112176	
1/25/2010 1:53:45 PM	2.20956	0.000111989	
1/25/2010 1:54:45 PM	2.21501	0.000112265	
1/25/2010 1:55:46 PM	2.21308	0.000112167	
1/25/2010 1:56:46 PM	2.25465	0.000114274	
1/25/2010 1:57:46 PM	2.24485	0.000113778	
1/25/2010 1:58:46 PM	2.25277	0.000114179	
1/25/2010 1:59:46 PM	2.21723	0.000112378	
1/25/2010 2:00:46 PM	2.22328	0.000112684	
1/25/2010 2:01:46 PM	2.22632	0.000112839	
1/25/2010 2:02:46 PM	2.20179	0.000111595	
1/25/2010 2:03:46 PM	2.22512	0.000112778	
1/25/2010 2:04:46 PM	2.18795	0.000110894	
1/25/2010 2:05:46 PM	2.18245	0.000110615	
1/25/2010 2:06:46 PM	2.19994	0.000111502	
1/25/2010 2:07:46 PM	2.25603	0.000114344	
1/25/2010 2:08:46 PM	2.27383	0.000115247	
1/25/2010 2:09:46 PM	2.25631	0.000114359	
1/25/2010 2:10:46 PM	2.22210	0.000112320	

The bottom status bar shows "System is generating" and "Point Time: 02:02:37".

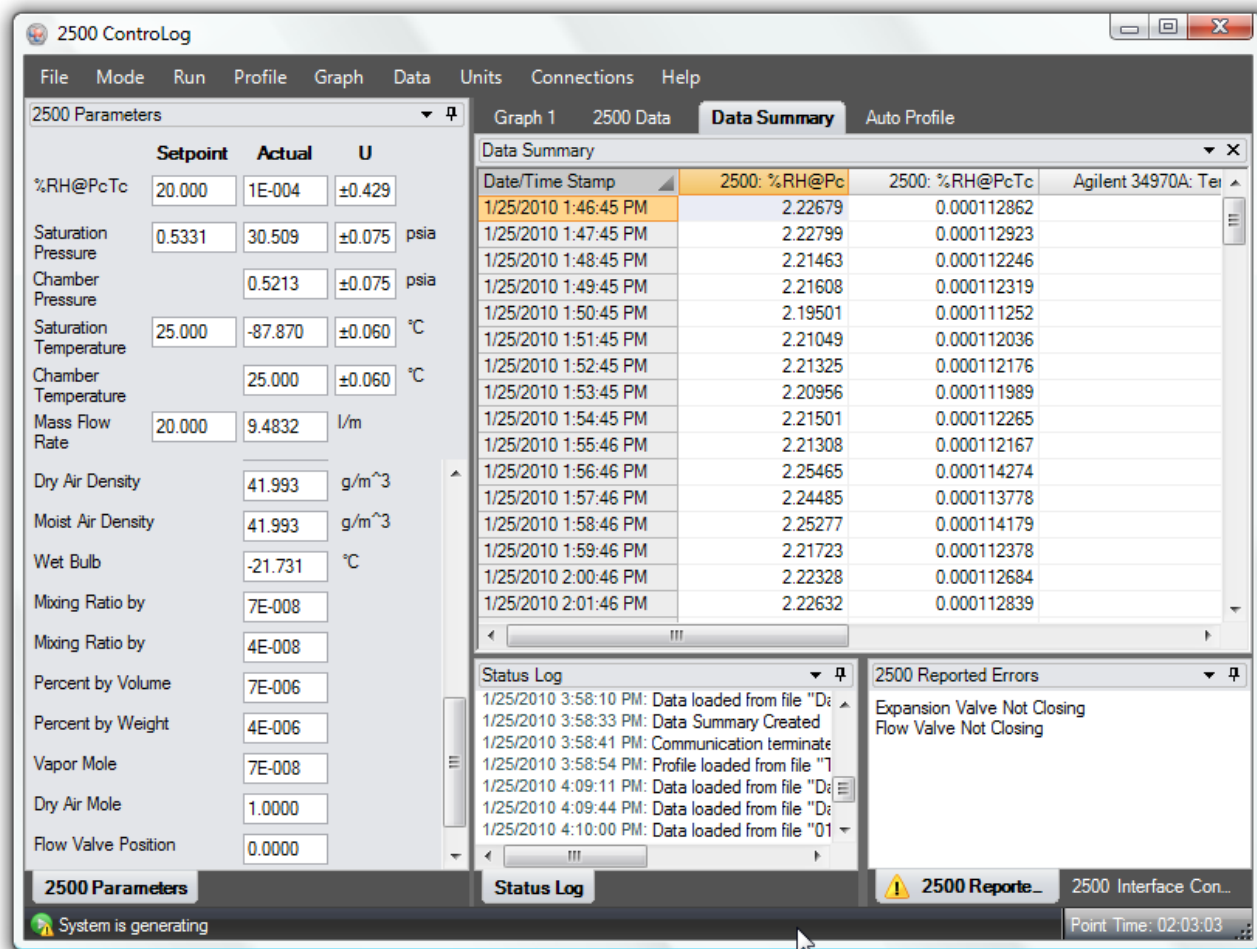
The user can access the hidden tabs by clicking the desired information tab label at the bottom.



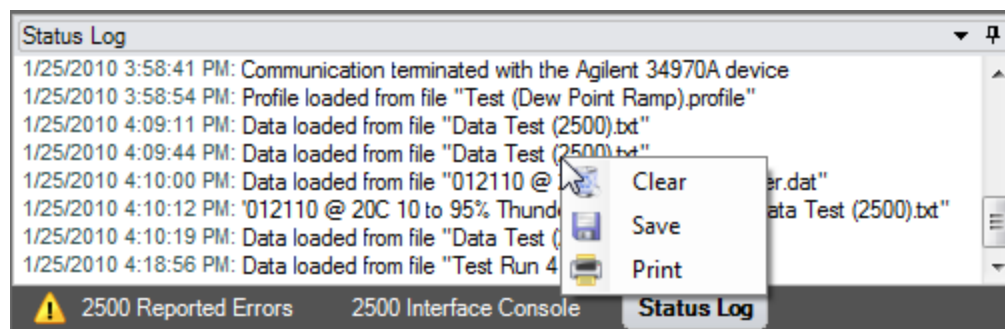
Tabs are also accessed via the drop down selection by clicking on the arrow icon. The currently selected tab is indicated by a check mark in the drop down list.



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.

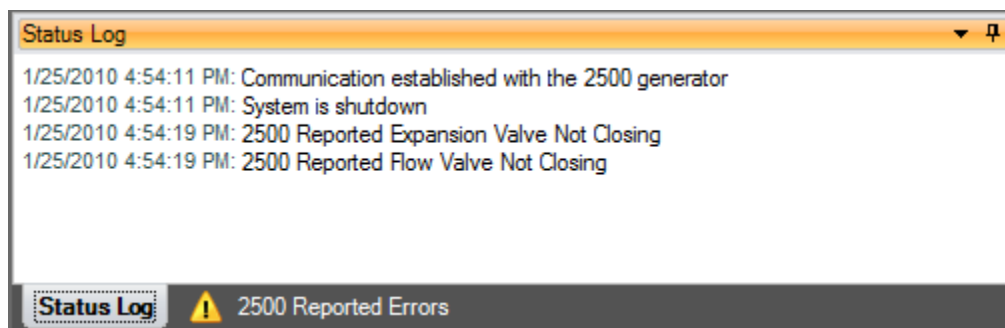


All Information Tabs have a context menu that is displayed by right clicking in the tab. The context menu allows quick access to functions that can clear, save and print the information.




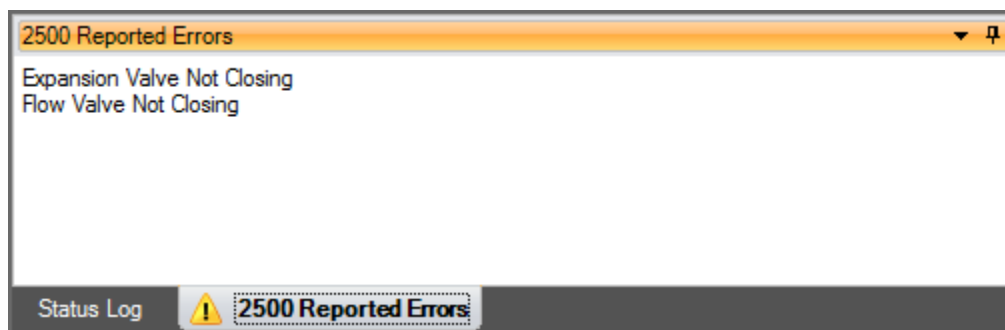
## Status Log

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.



## 2500 Reported Errors

The **2500 Reported Errors** tab only appears when the 2500 reports an error. This is a very important information tab because it reports 2500 system errors to the user. These types of errors can cause the 2500 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 2500 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						

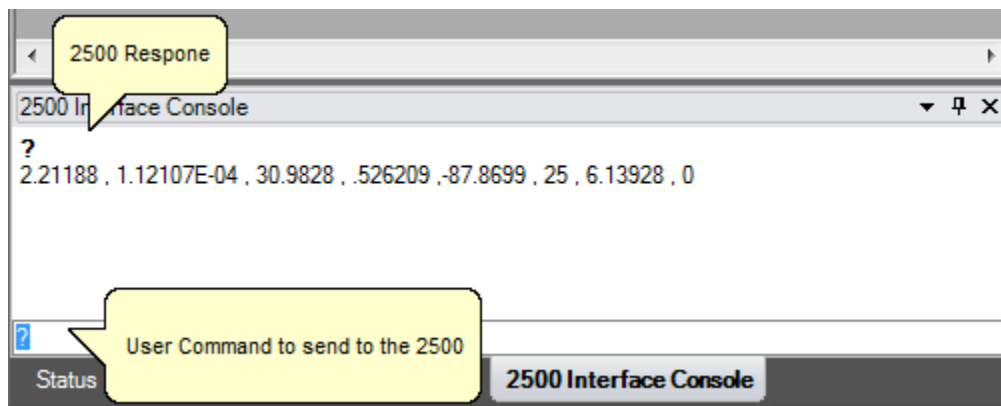
The bottom status bar shows the **Status Log** tab selected, a yellow warning icon, the text **2500 Reported Errors**, and the **System Timing** tab selected.

## 2500 Interface Console

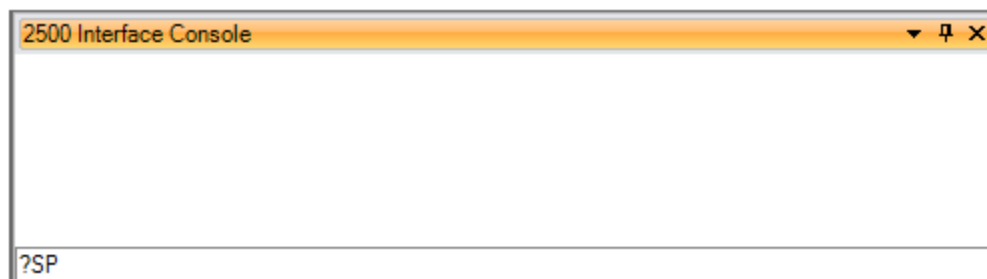
The **2500 Interface Console** tab allows the user to send and receive commands to and from the 2500. The console tab is opened by selecting “Open 2500 Interface Console” from the Connections>Settings menu whenever the 2500 is connected.

*Warning: Interfacing with the 2500 using the Console should only be attempted if instructed to do so by Thunder Scientific.*

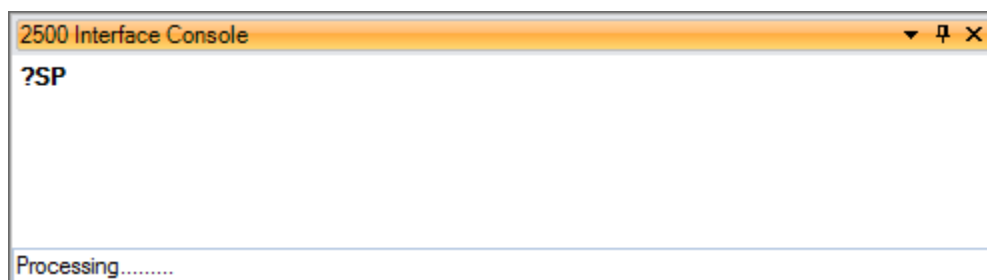
Commands are entered in the bottom text area of the console tab and the 2500 responses are displayed in the upper text area of the console tab.



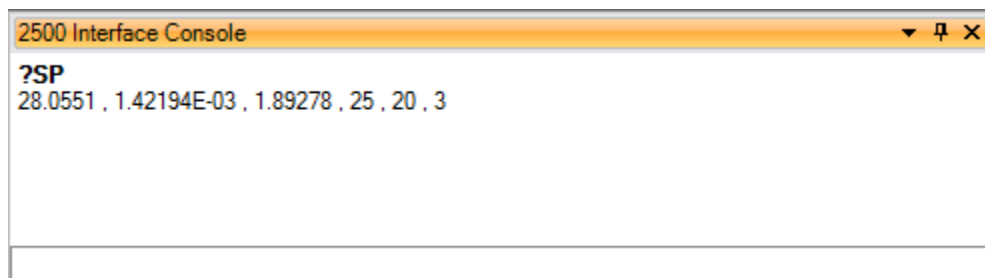
To enter a command, type the desired command in the bottom text area and press return.



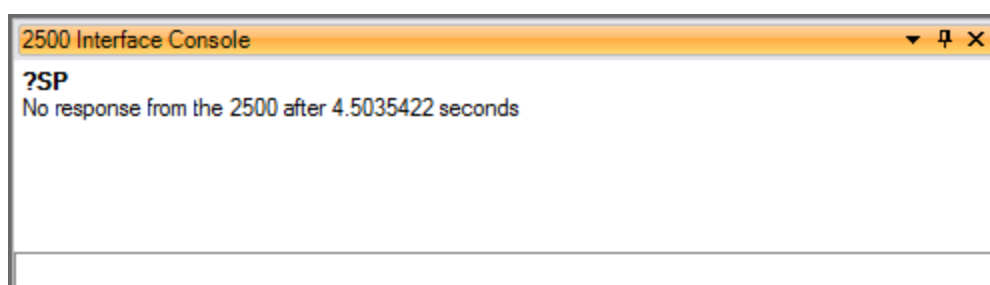
Once the command has been entered it will appear in bold in the upper text area. A processing status will be indicated in the bottom text area while ControLog sends and waits for the response from the 2500. The user is not allowed to enter another command until the previous command has been processed.



Once the command has been successfully processed the 2500 response will appear in the upper text area right below the command sent.



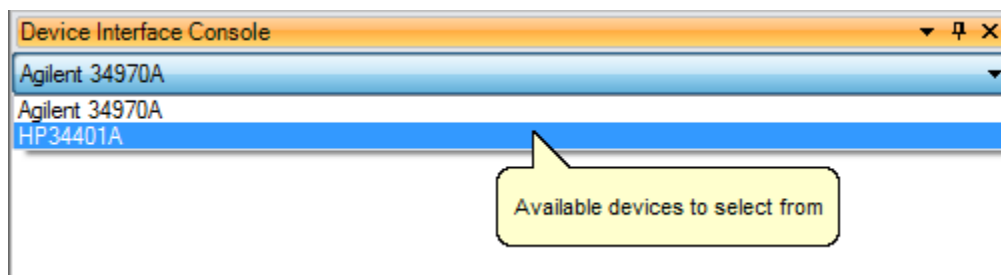
If ControLog does not receive a response from the 2500 within a given time frame an error message will be displayed.



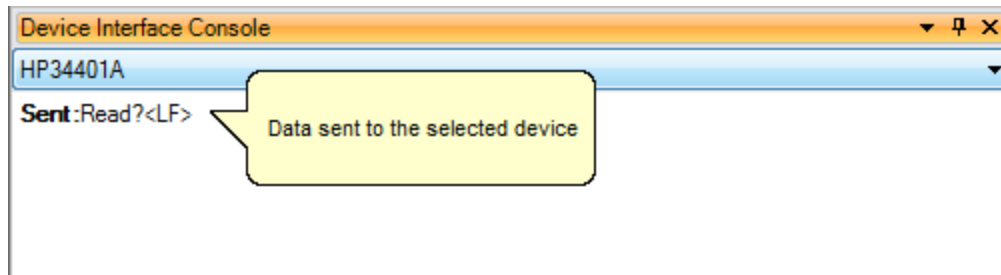
## Device Interface Console

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.

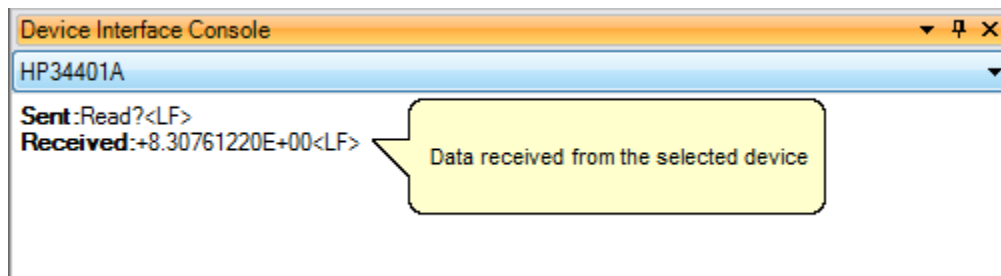
The user can select which connected device to view using the drop down selection at the top of the tab.



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

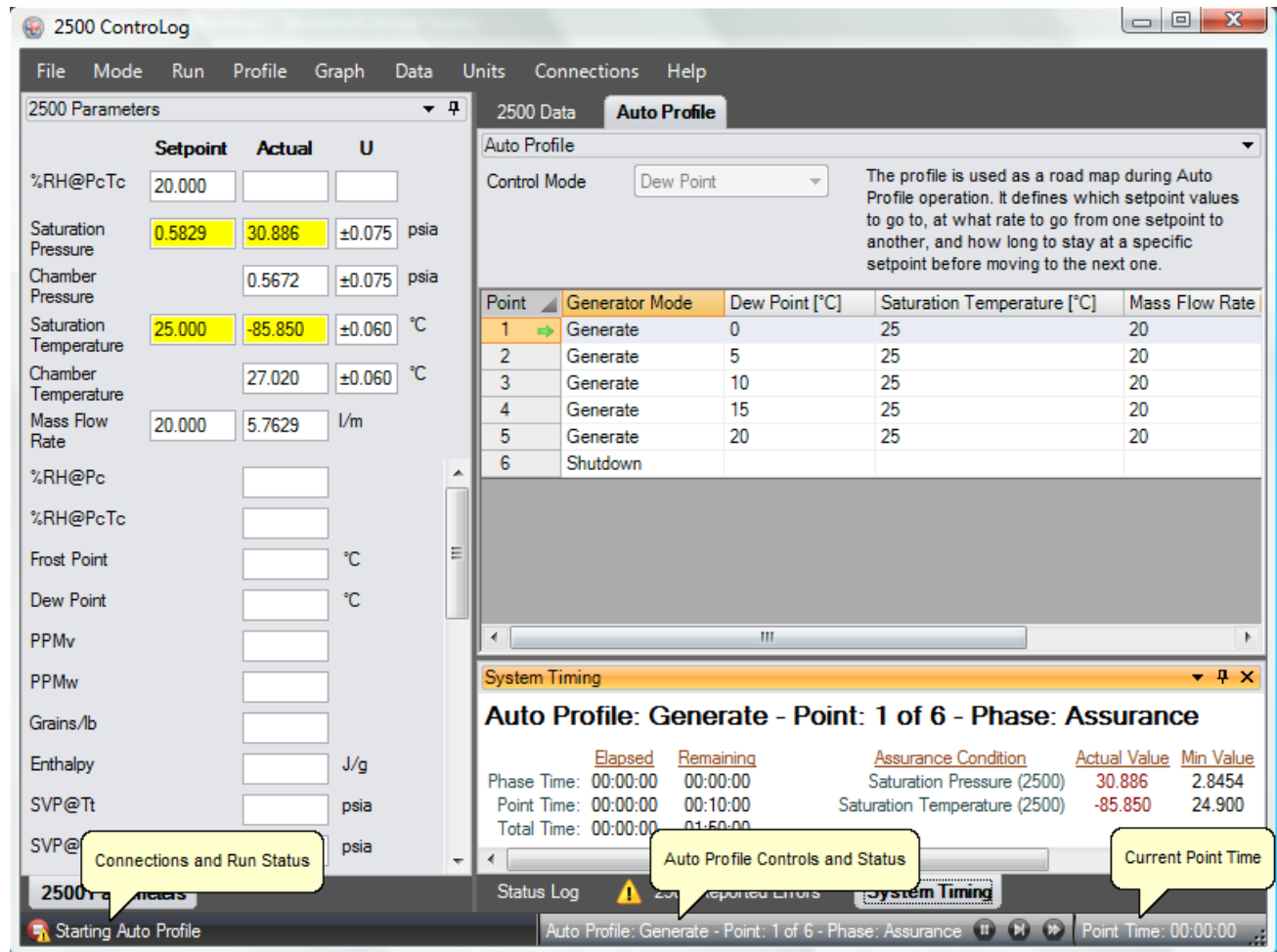


The data received from the device is indicated by a bold “**Received:**” label in the lower text area of the console tab.



# 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.

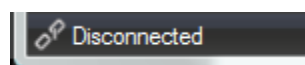


## Connection and Run Status

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 2500 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

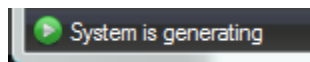
The status bar will show a broken link icon and "Disconnected" when the 2500 is not connected to ControlLog;



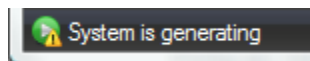


## Generating

The status bar will show a green forward arrow icon and “System is generating” when the 2500 is generating.

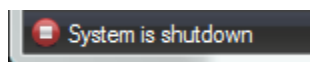


If the 2500 is reporting an error, the green forward arrow icon will also appear with a small yellow warning.

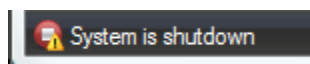


## Shutdown

The status bar will show a red stop icon and “System is shutdown” when the 2500 is shutdown.

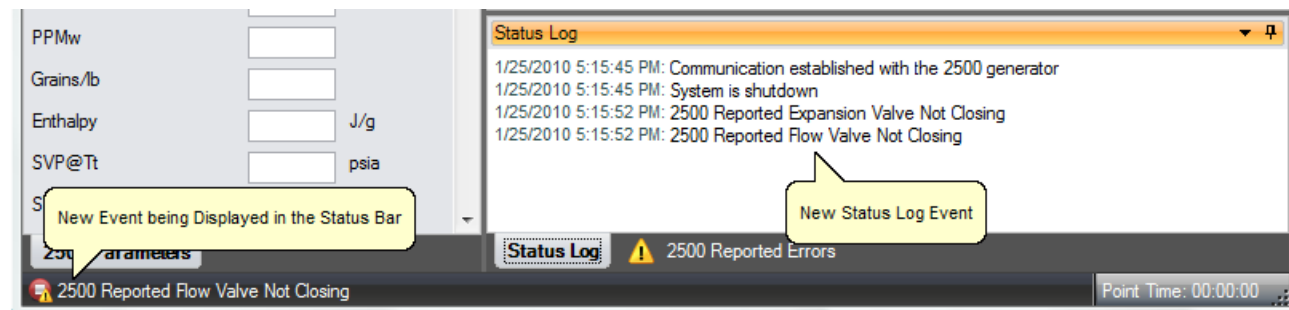


If the 2500 is reporting an error, the red stop icon will also appear with a small yellow warning.



## New Event

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



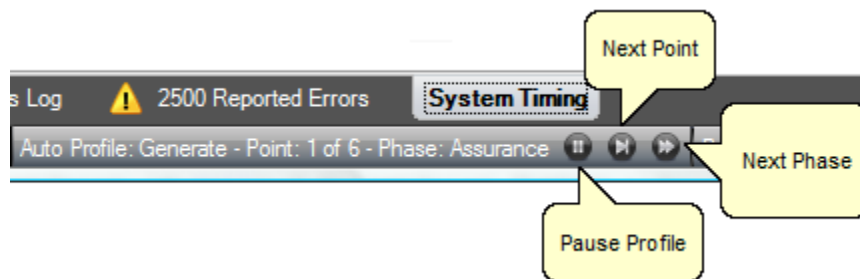
## Auto Profile Controls and Status

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](#)

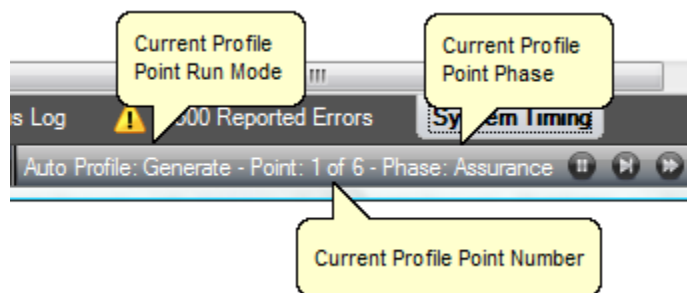
### Auto Profile Controls

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.

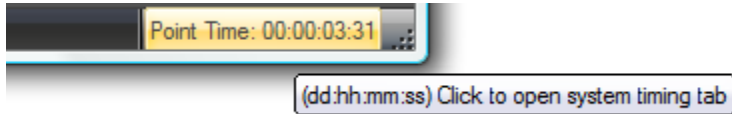


## Current Point Time

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.





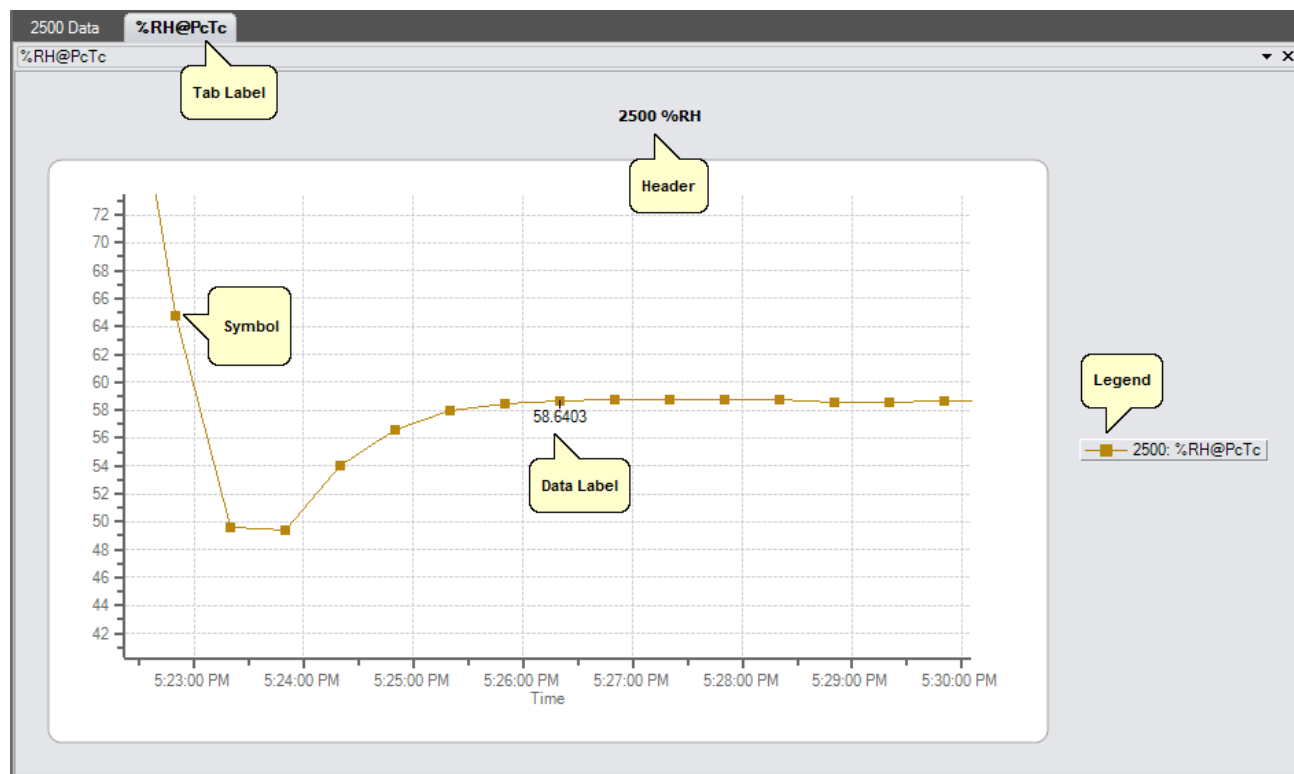
# Graphing

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.*

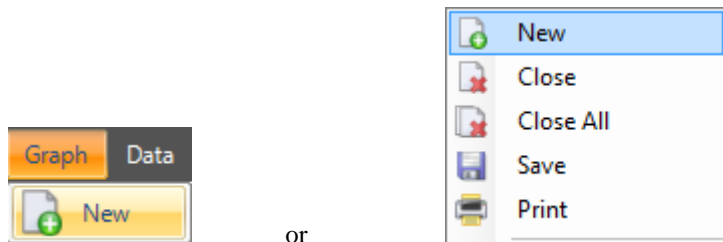
Each graph tab consists of a two dimension plot across an X and Y Axis. The graph can be customized to display different point symbols, various line colors, a legend and a header.



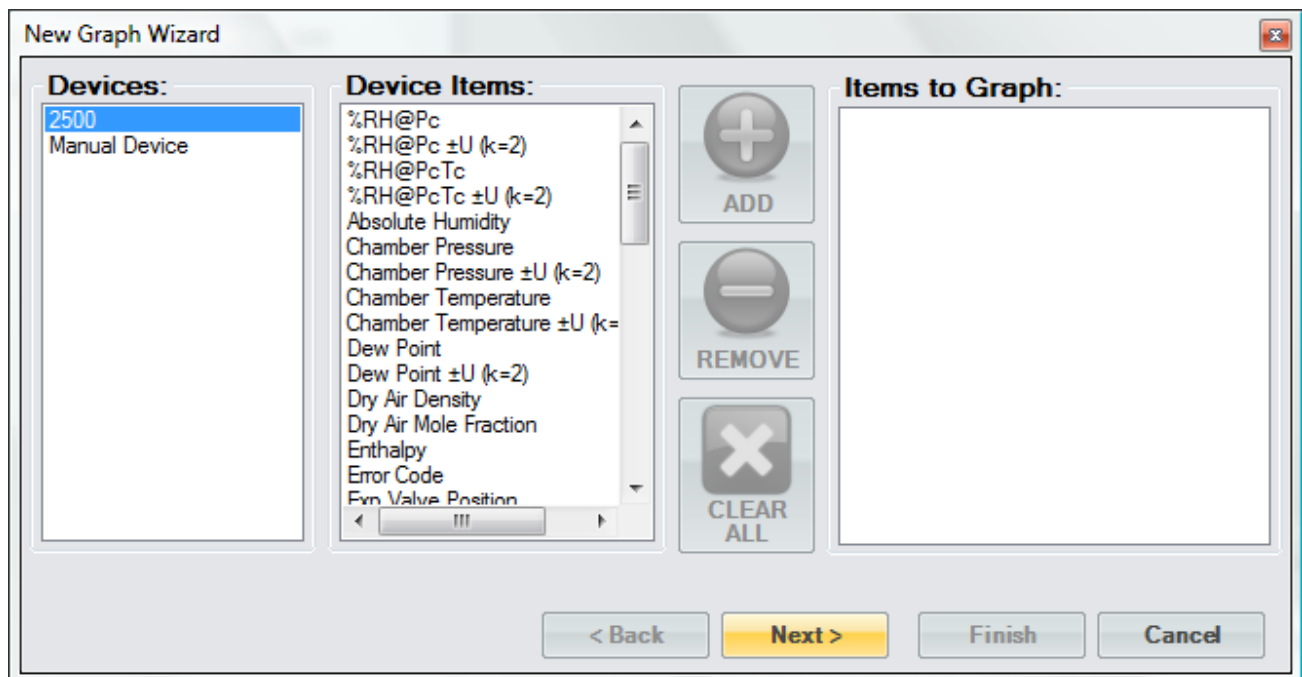
## Creating a New Graph

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.

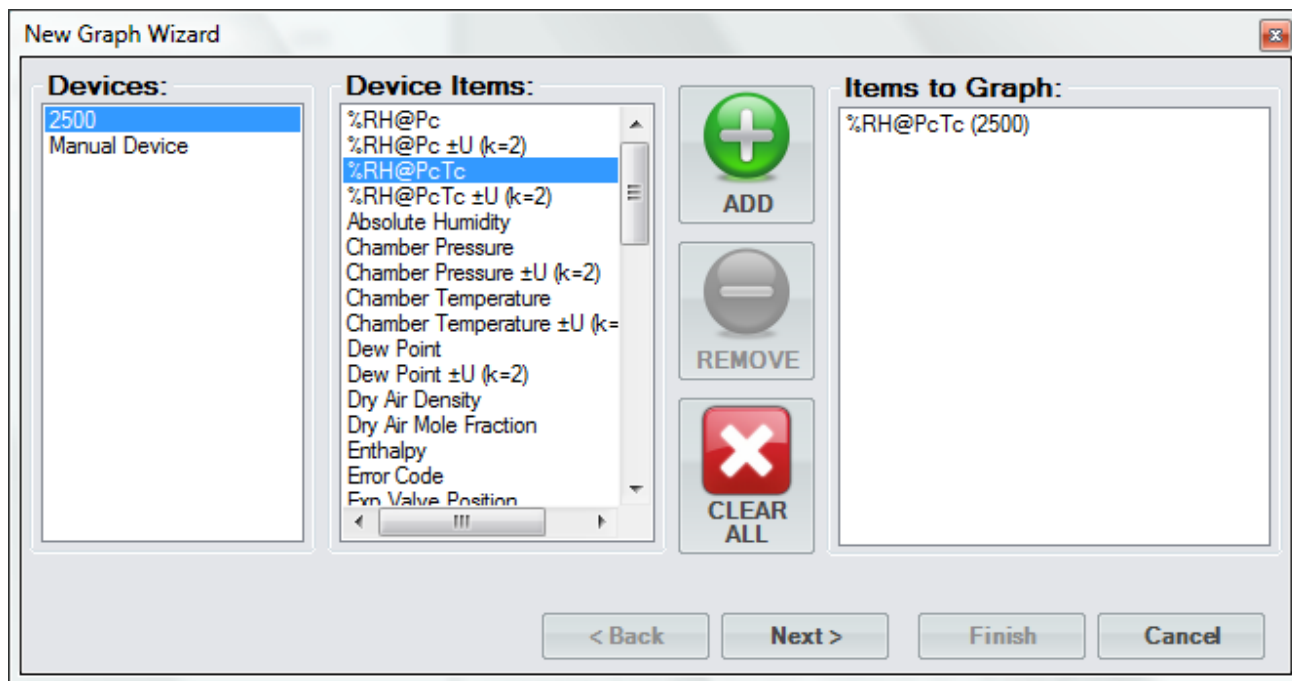
To create a new graph, select “New” from the main menu or right click a graph tab and select “New” from its context menu.



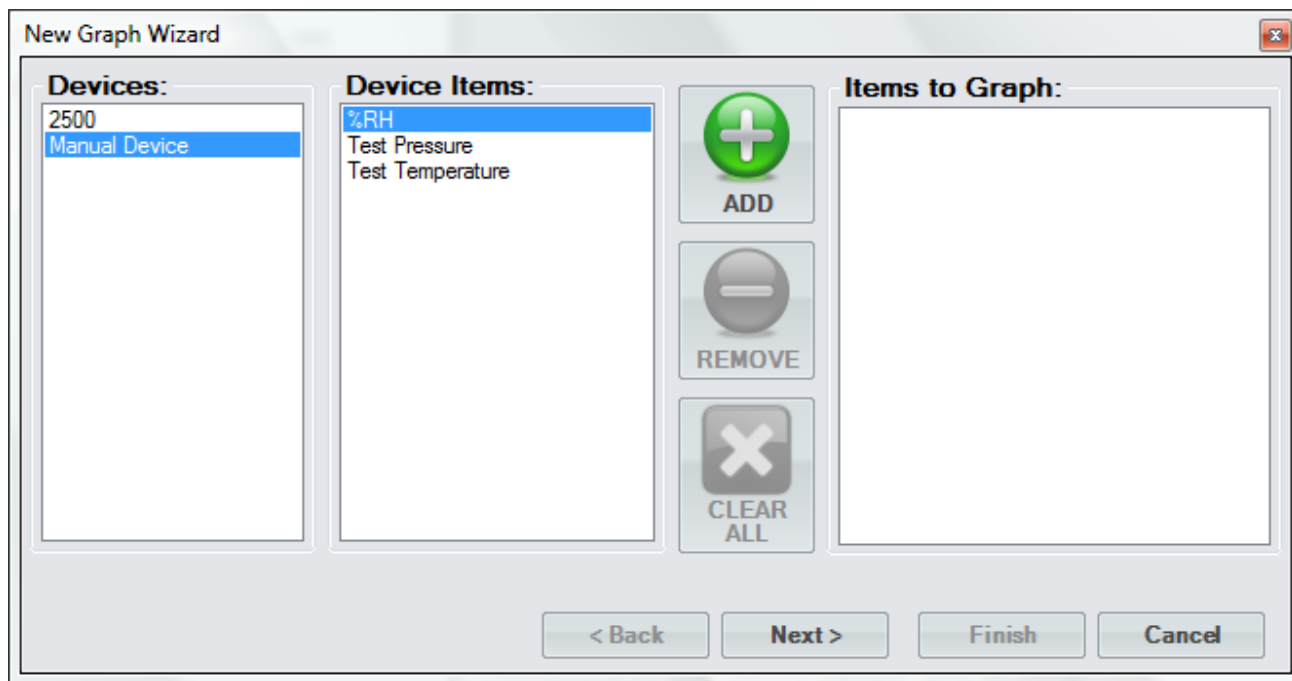
A “New Graph Wizard” dialog will appear.



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.

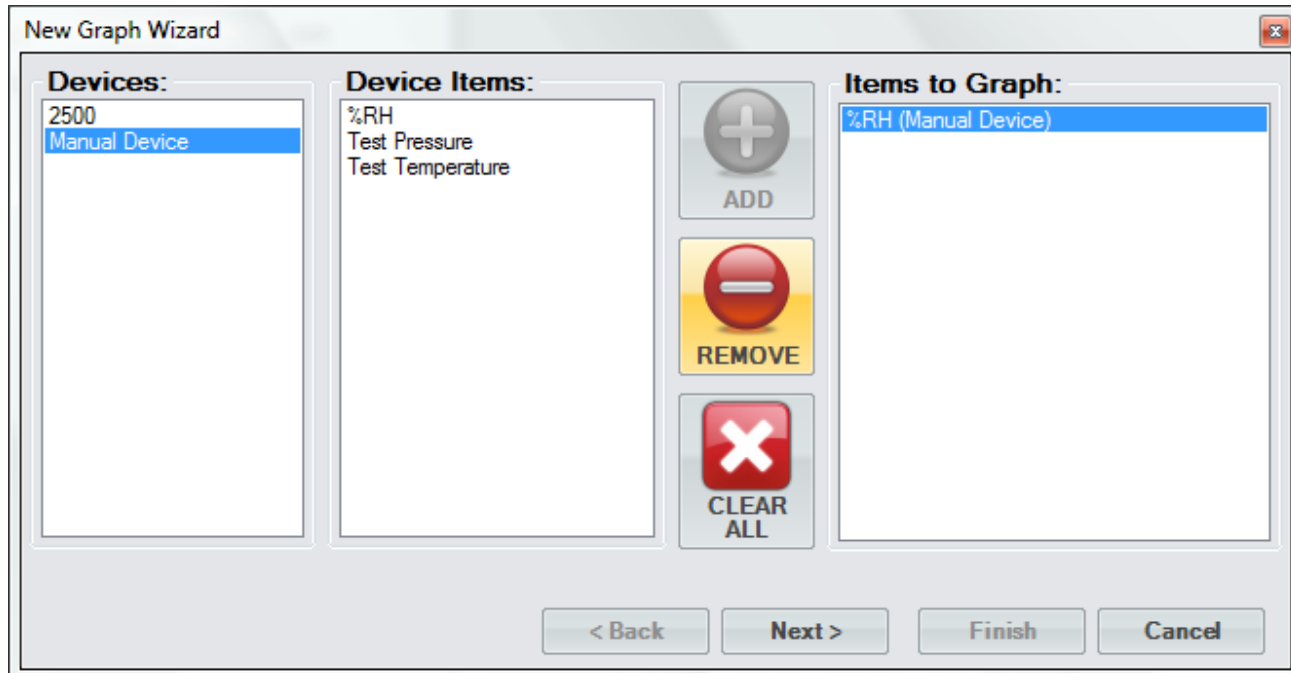


Repeat this process until all the desired items are listed on the right side.

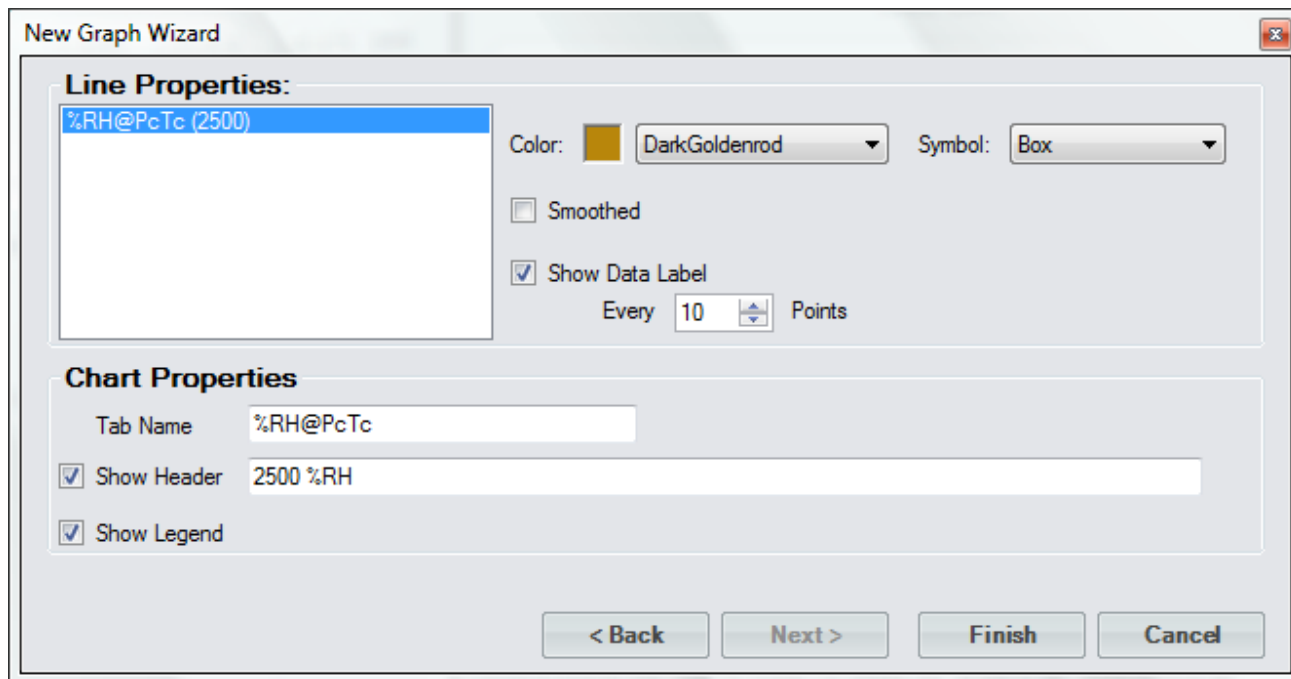


*Note: The user can invert any selection by right clicking. This will highlight all items that are not currently highlighted and will remove highlight from any items that are currently highlighted.*

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.

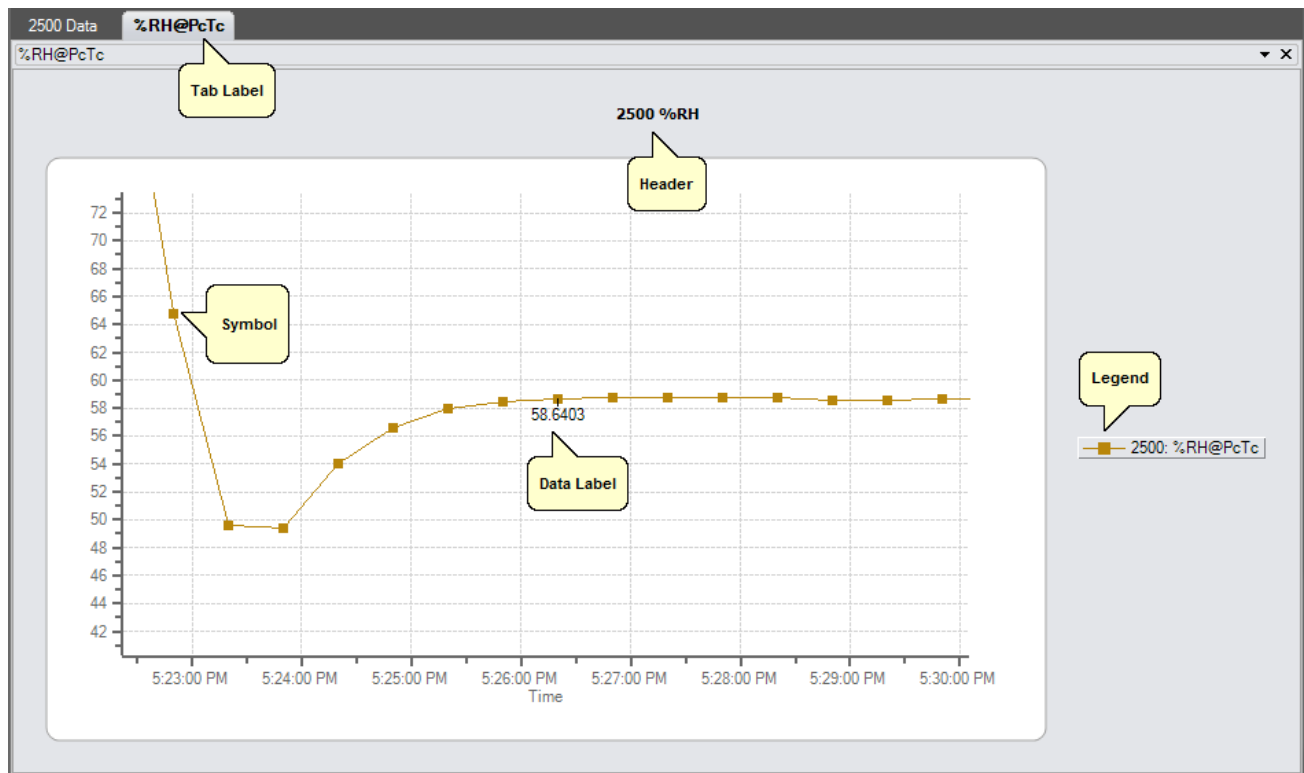
**Chart Properties** define the name of the graph tab, indicated whether to show a header on the graph and whether to show a legend of the lines plotted.

**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.



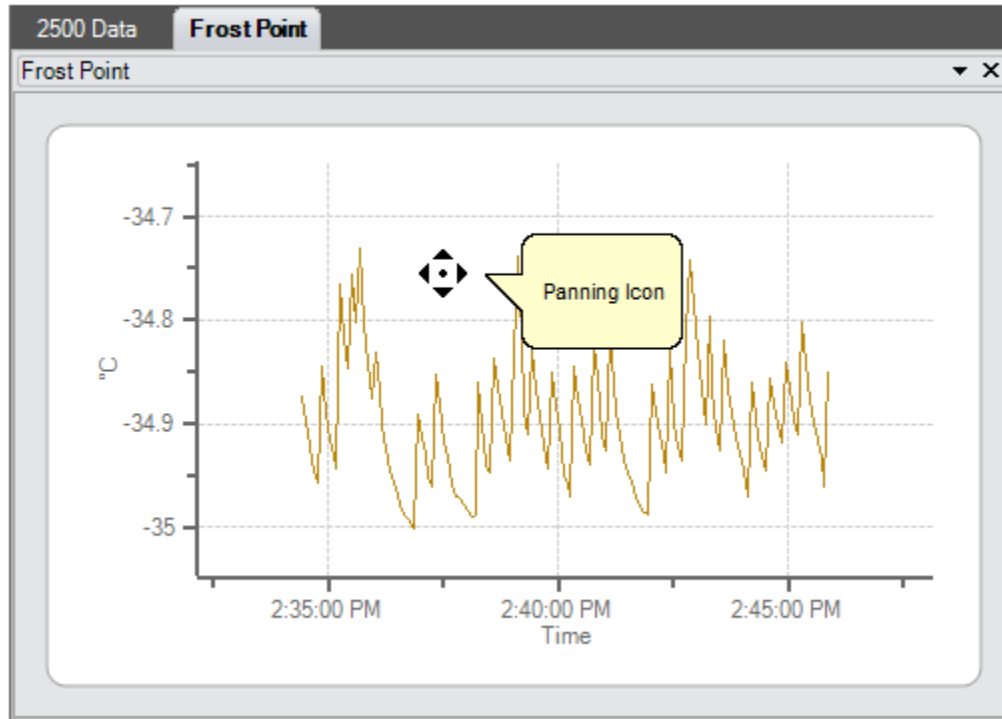
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## Customizing a Graph

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

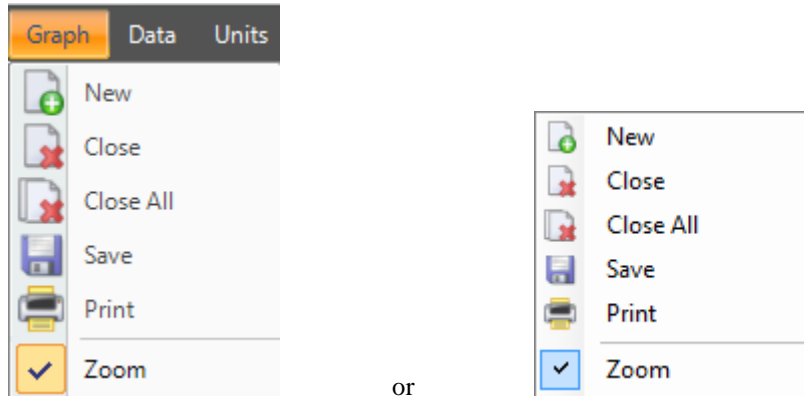
The graph can be panned up and down as well as left and right by a left click and hold of the mouse button while the user moves the cursor around. Panning is useful when you have zoomed the graph and want to view different parts of the data without changing the scaling.



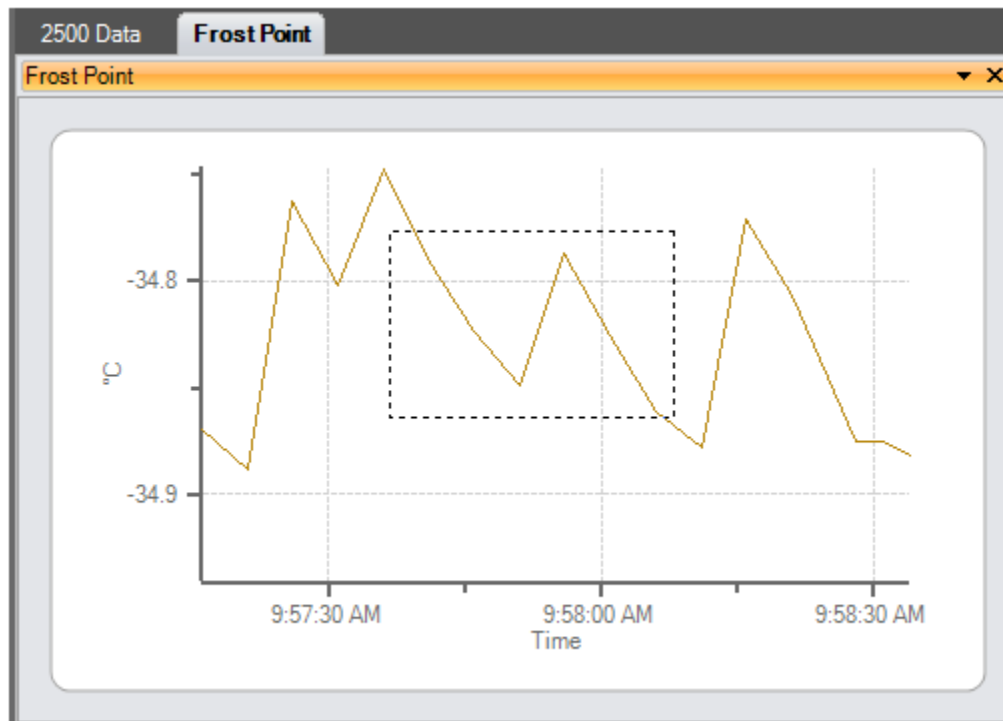
## Zoom

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”.



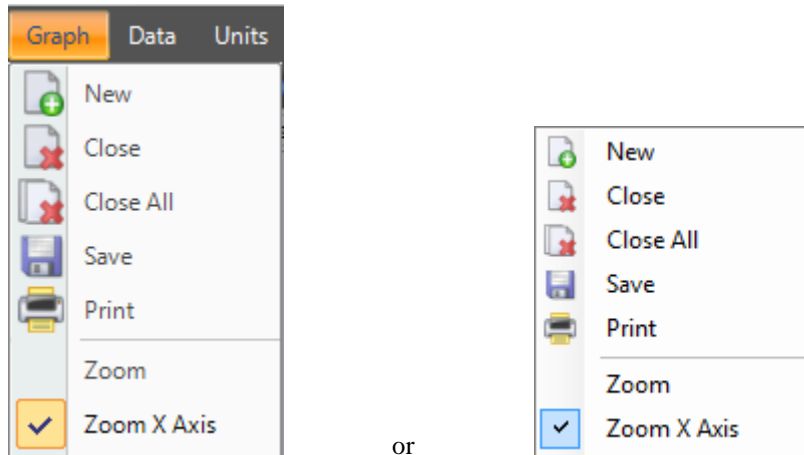
Move the cursor to the graph, left click and drag the cursor to create a box around the portion to zoom and release the left mouse button. The portion of the graph within the drag box will expand to fill the entire graph. The time and Y-axis limits update accordingly.



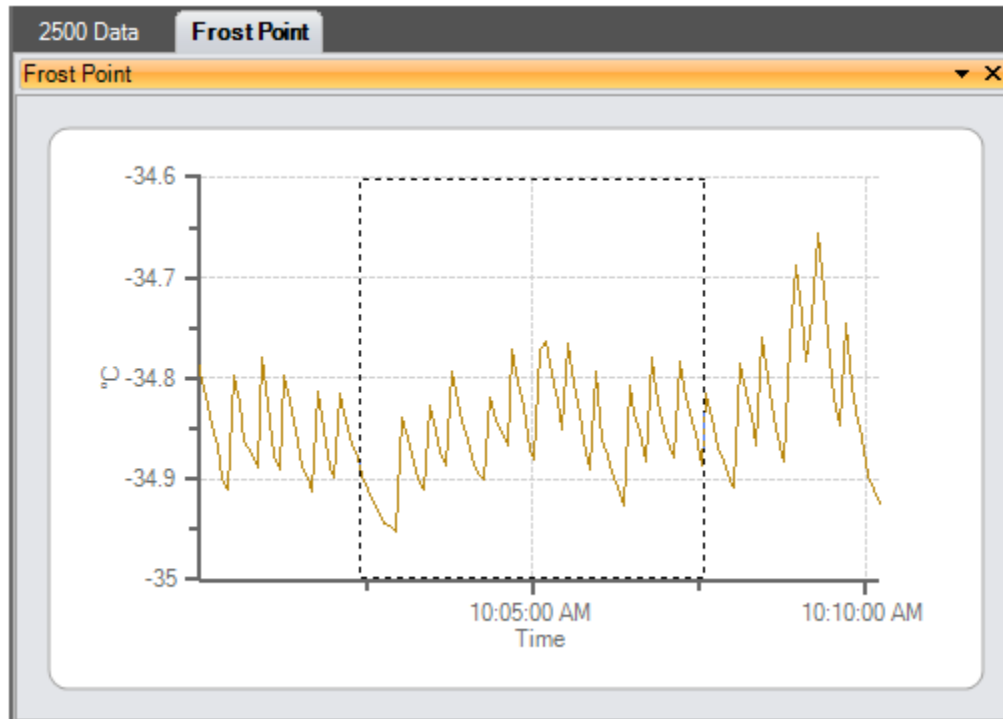
## Zoom Graph's X Axis

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”.



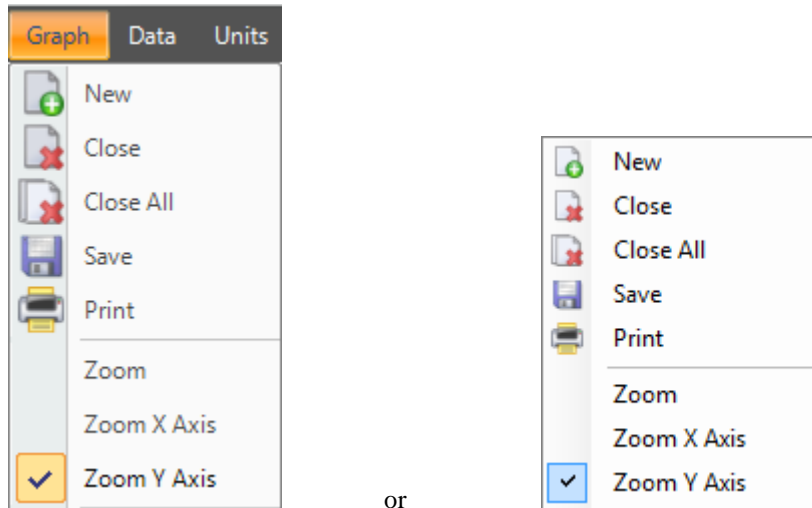
Left click on the graph and drag the cursor so that the portion of the X-axis (time axis) of interest is contained within the two vertical dashed lines. The portion contained within this region will expand to fill the entire X-axis. The Y-axis remains unchanged.



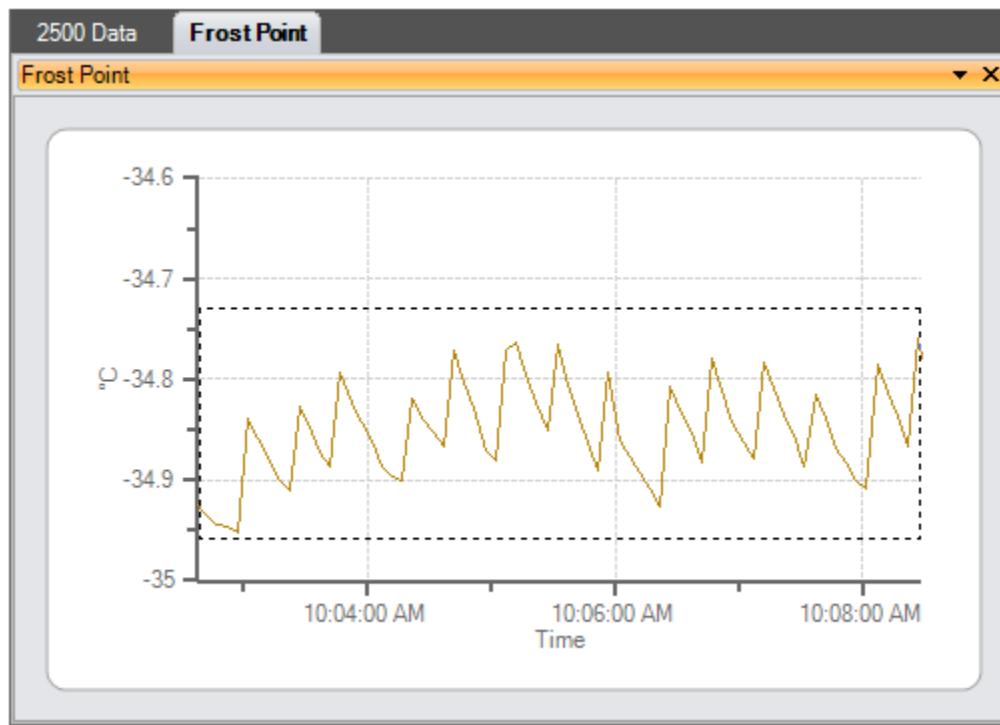
## Zoom Graph's Y Axis

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 image shows a 'New Graph Wizard' dialog box with two main sections: 'Line Properties' and 'Chart Properties'.

**Line Properties:**

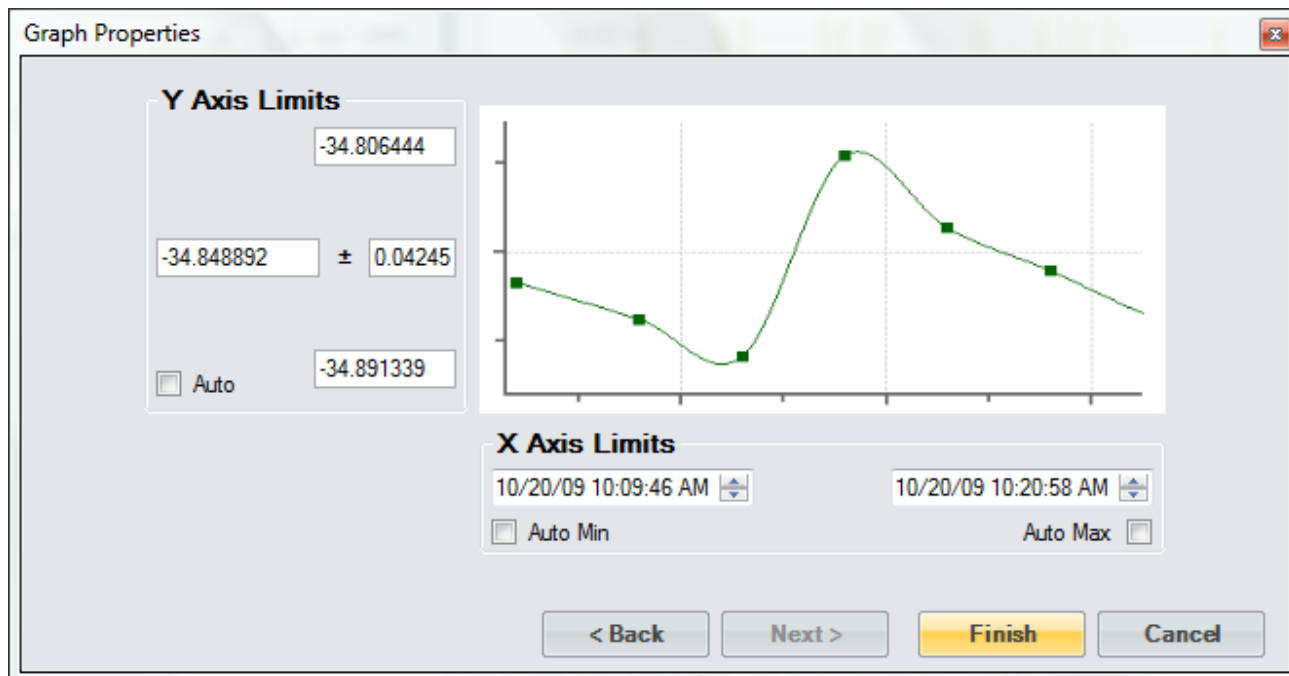
- A list box on the left contains 'Frost Point (2500)'.
- To the right, there is a 'Color' section with a color swatch and a dropdown menu set to 'DarkGoldenrod'.
- Next to it is a 'Symbol' dropdown menu set to 'None'.
- Below these are two unchecked checkboxes: 'Smoothed' and 'Show Data Label'.

**Chart Properties:**

- A 'Tab Name' text field contains 'Frost Point'.
- Below it are two unchecked checkboxes: 'Show Header' and 'Show Legend'.

At the bottom of the dialog are four buttons: '< Back', 'Next >', 'Finish' (highlighted in yellow), and 'Cancel'.

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.

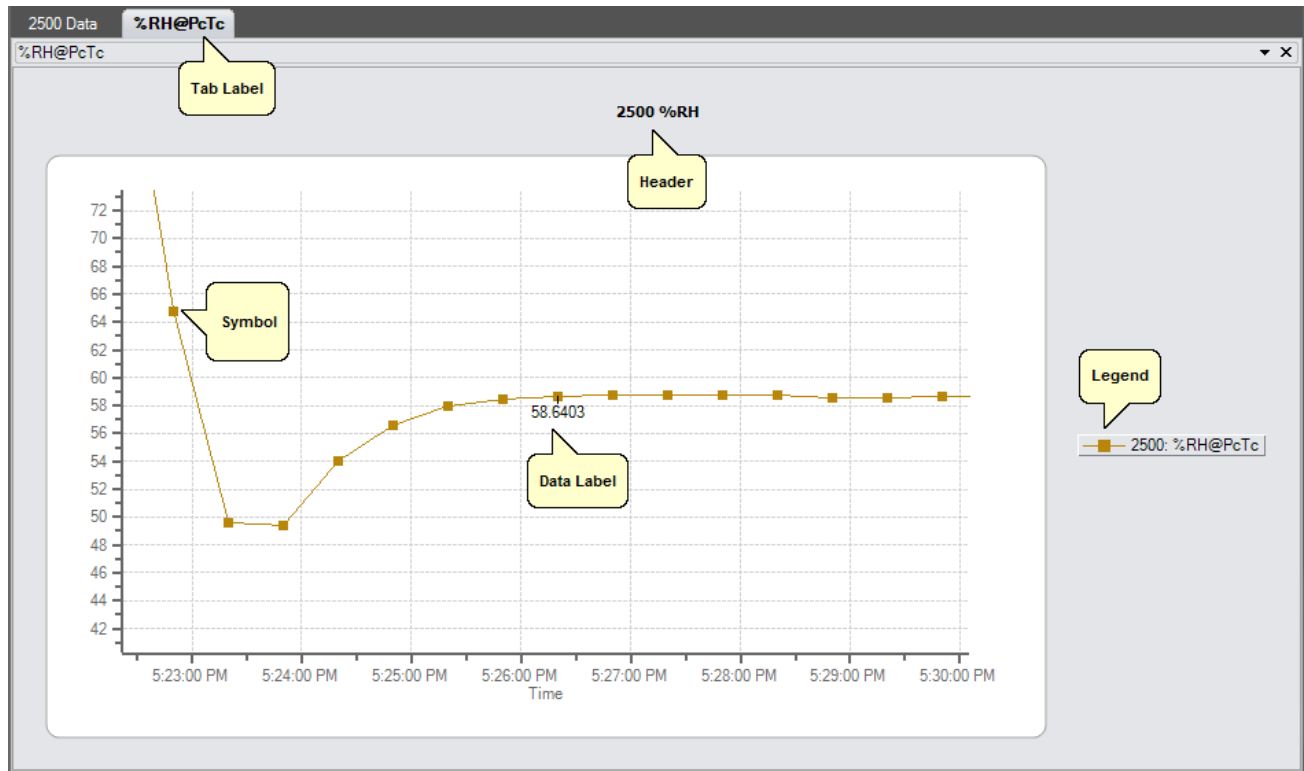
The **Auto Min** check box tells ControLog to automatically use the starting date and time for the current data as the X Axis minimum.

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.



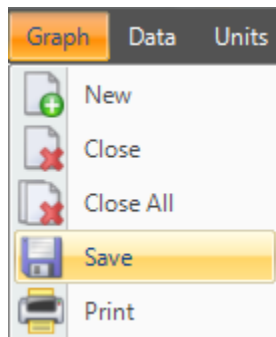
---

## Saving a Graph

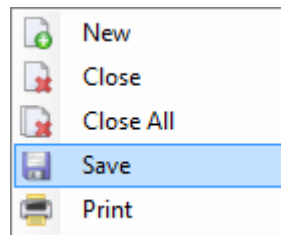
Each graph tab can be saved to a file in any of the following graphic file types:

- 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”.

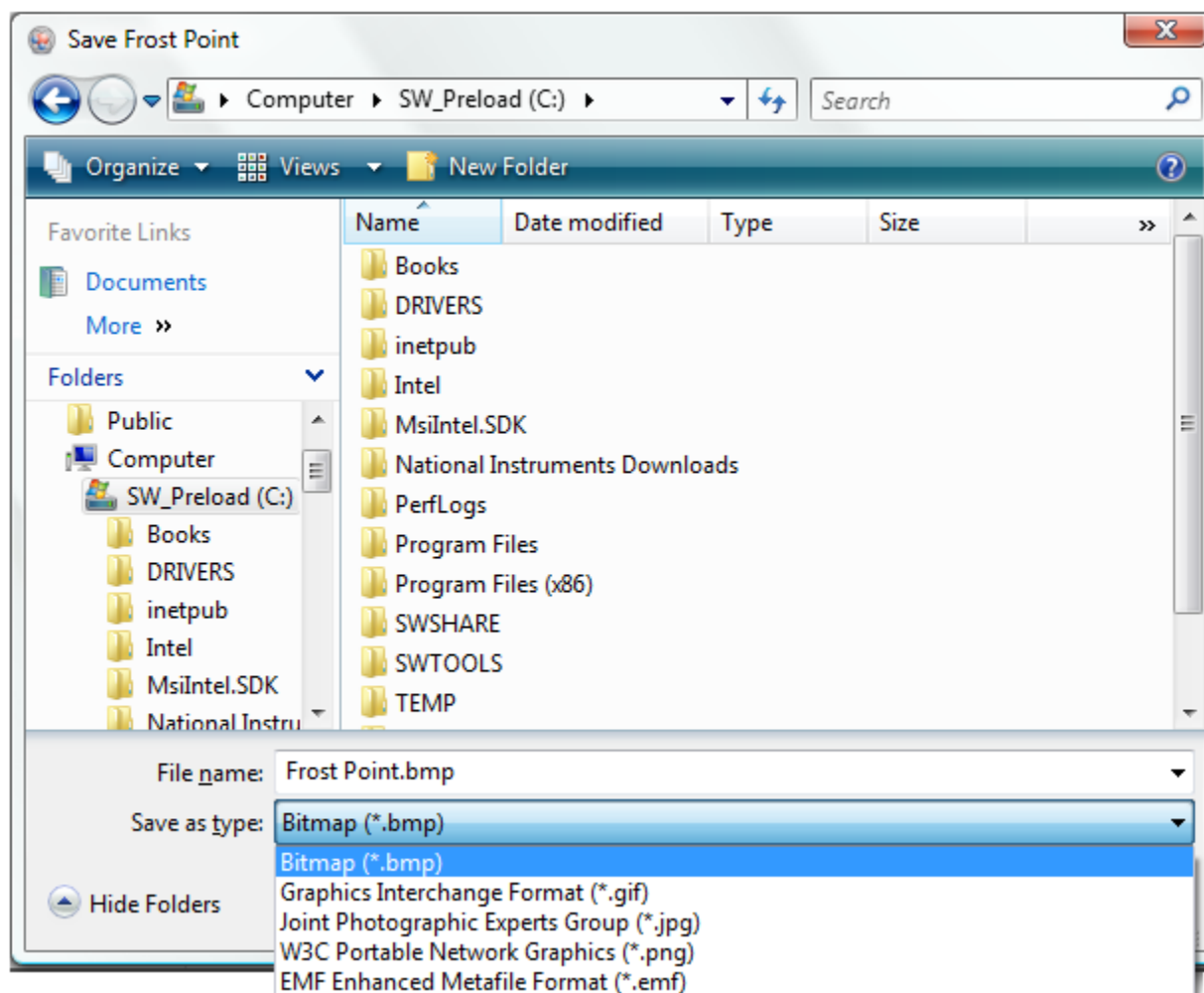


or



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.*



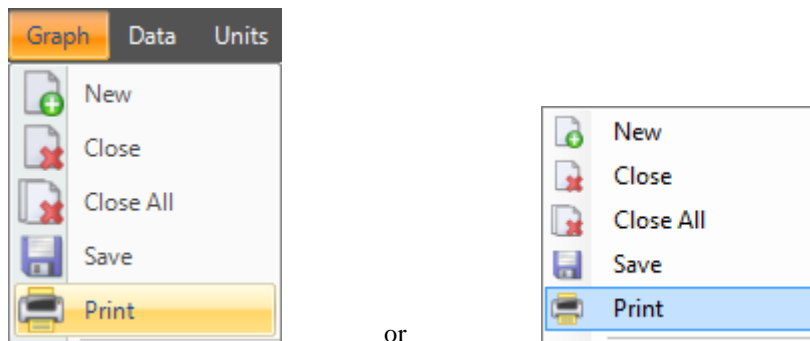
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## Printing a Graph

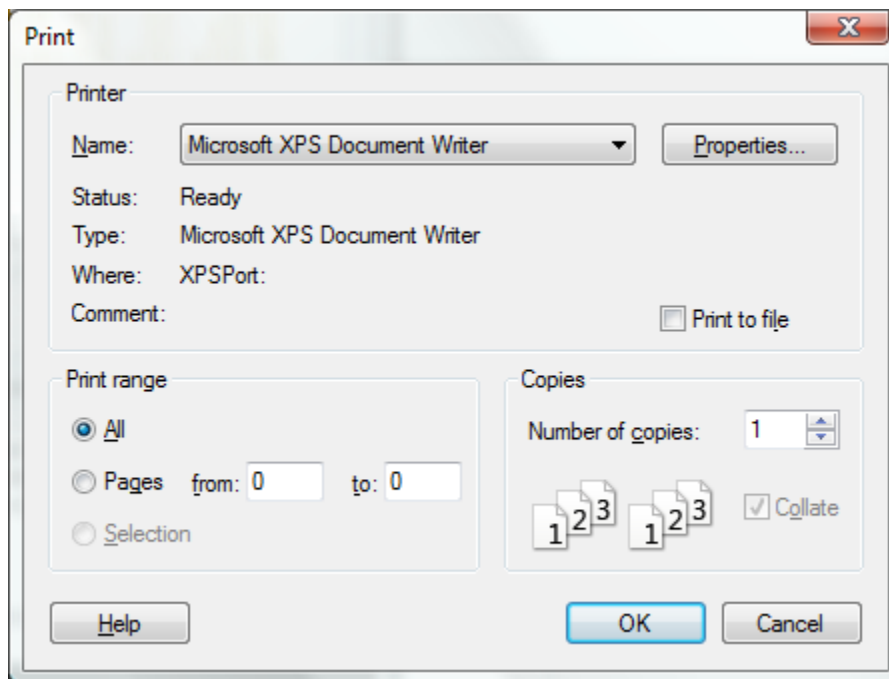
Each graph tab can be printed to any of the PC's installed printers.

*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”.



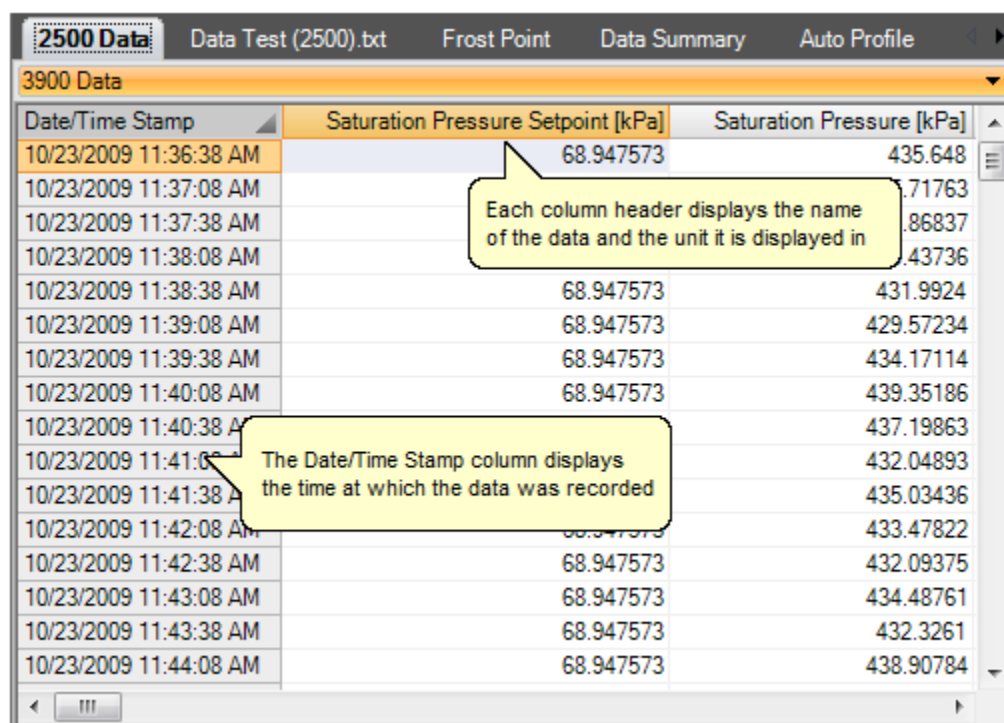
Using the “Print” dialog, select the desired printer, range and number of copies you want to print.



# Data and Data Summary

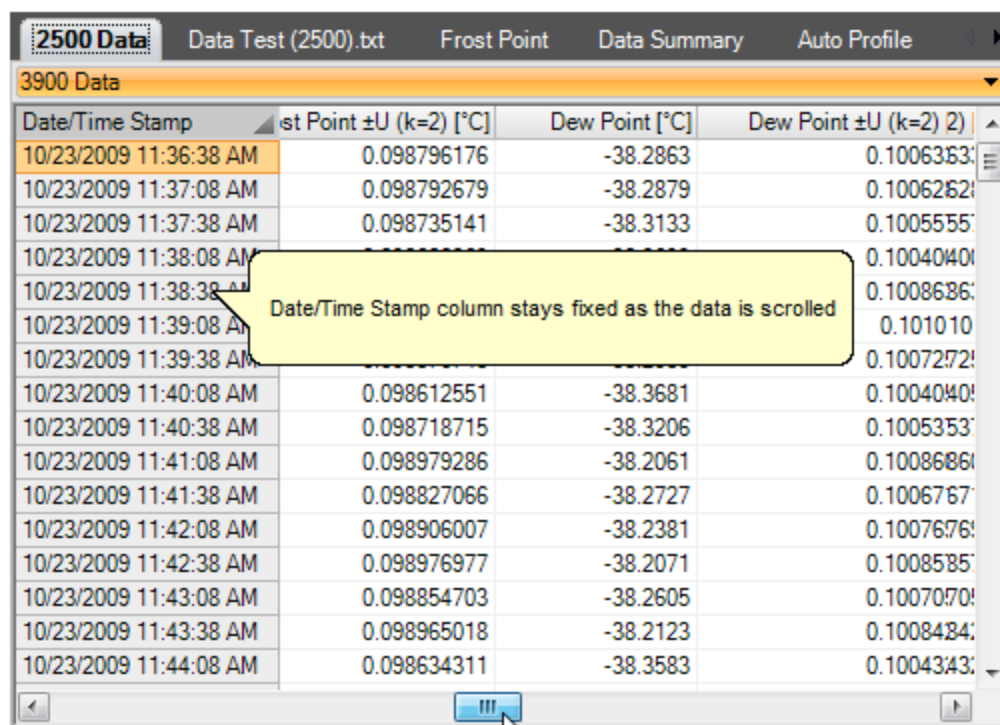
ControLog stores data into individual Data Tabs. Each data tab contains a spreadsheet type view that consists of a date/time stamp and the measured data items corresponding to that date/time stamp. Data tabs consist of three similar but different types: Device Data, File Data and Data Summary. Each type 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		435.71763
10/23/2009 11:37:38 AM		435.86837
10/23/2009 11:38:08 AM		435.43736
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 .



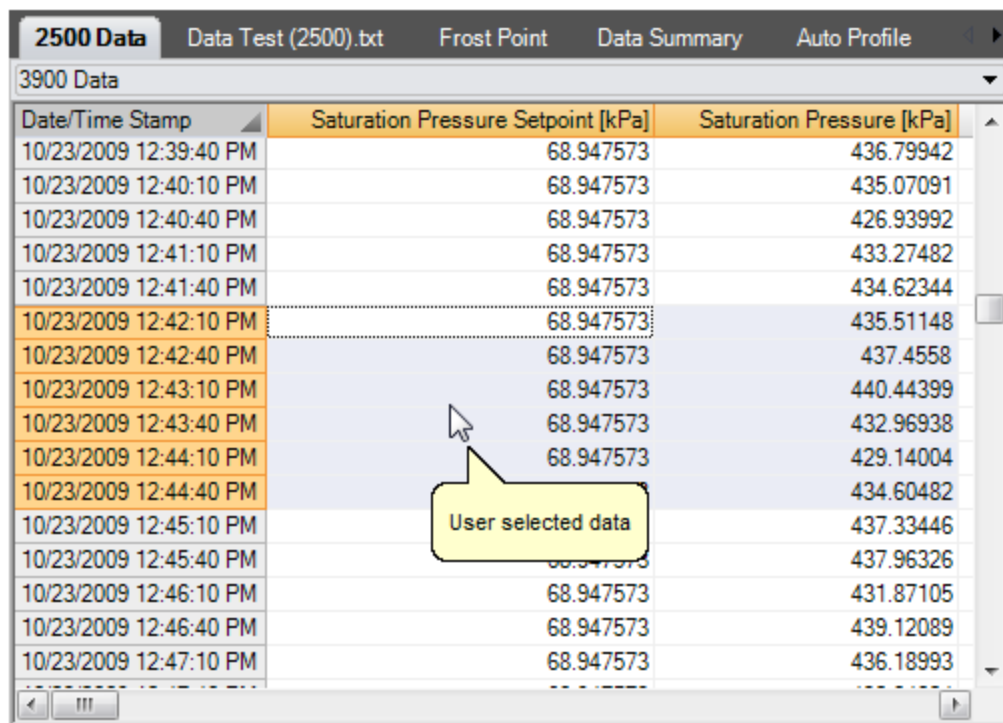
**2500 Data** | Data Test (2500).txt | Frost Point | Data Summary | Auto Profile

3900 Data

Date/Time Stamp	Frost Point $\pm U$ (k=2) [°C]	Dew Point [°C]	Dew Point $\pm U$ (k=2) [°C]
10/23/2009 11:36:38 AM	0.098796176	-38.2863	0.1006353
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

Date/Time Stamp column stays fixed as the data is scrolled

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



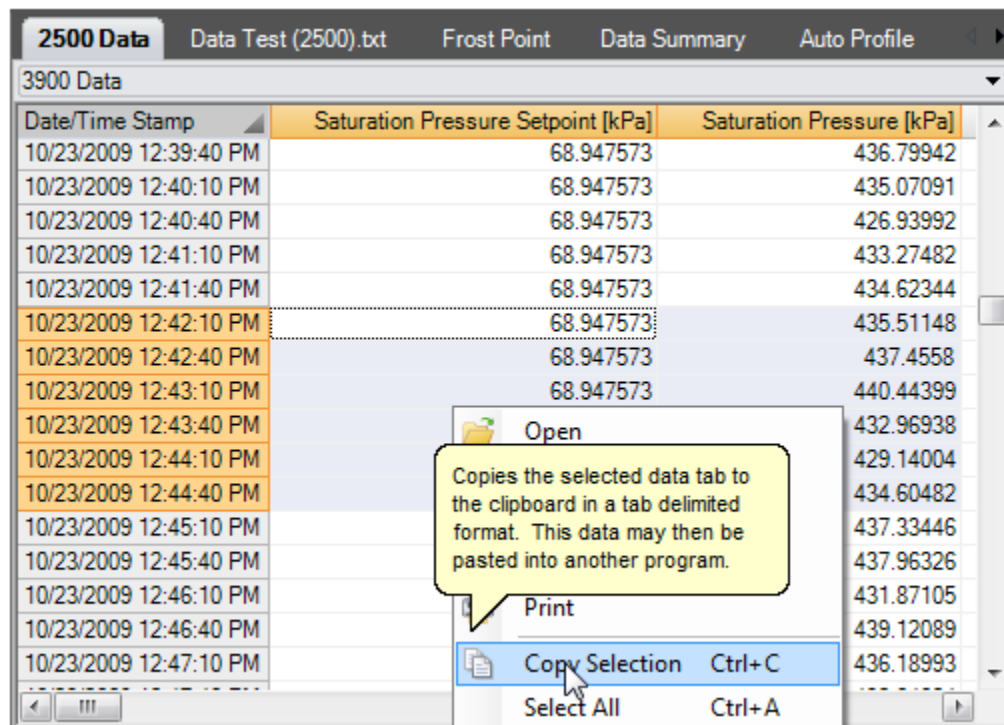
**2500 Data** | Data Test (2500).txt | Frost Point | Data Summary | Auto Profile

3900 Data

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

User selected data

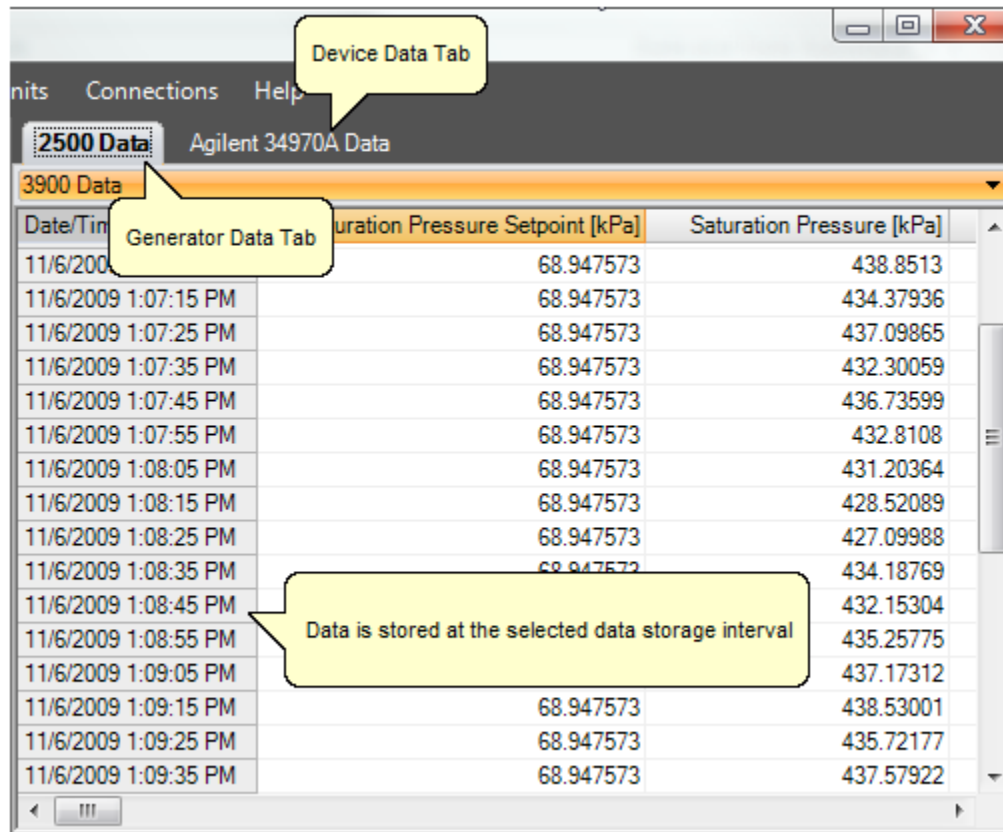
The user can then copy selected data to the clipboard by selecting “Copy Selection” from the context menu or by using the keyboard shortcut combination of Ctrl+C.



## 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 2500 is in generate mode. Data is also stored at the generate rate whenever a device is connected and the 2500 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 2500 generator.*



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



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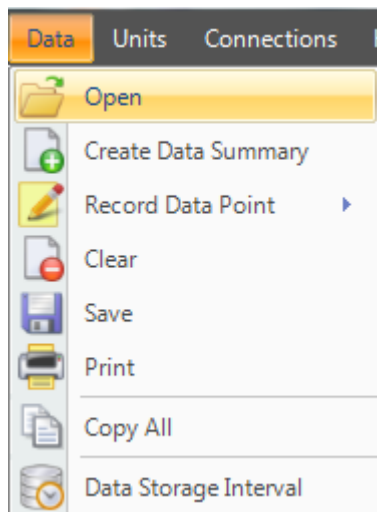
## File Data Tabs

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:

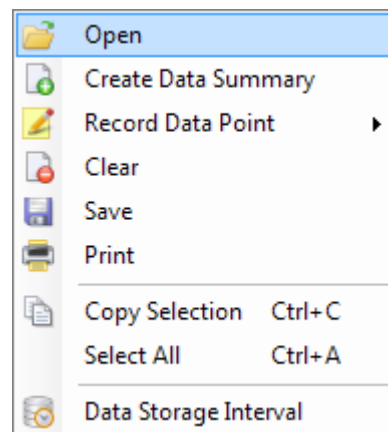
- Text File (Comma Delimited) (\*.csv;\*.txt)
- Text File (Tab Delimited) (\*.dat;\*.txt)
- Excel Workbook (\*.xlsx;\*.xls)
- Backup ControLog File (\*.backup)

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.

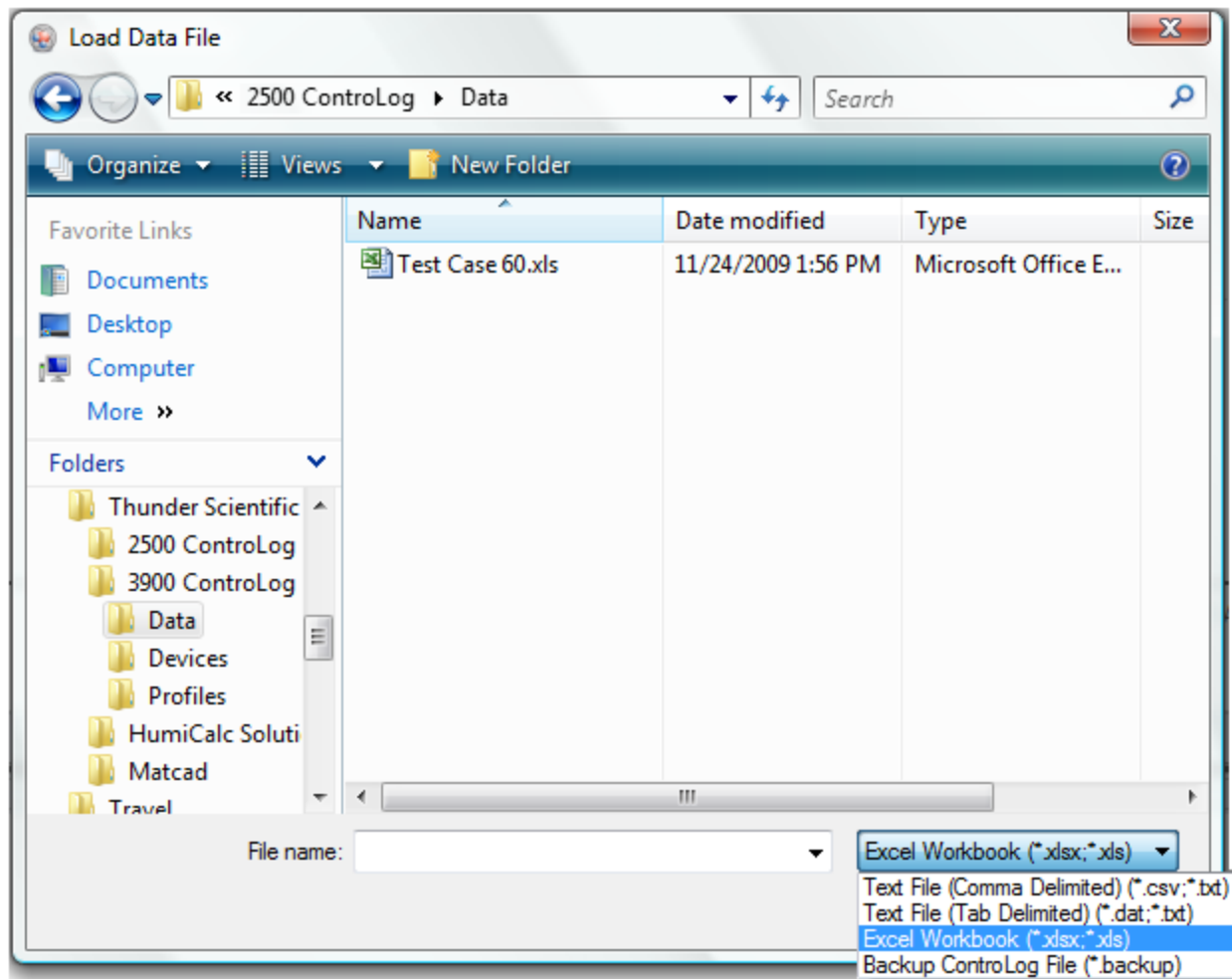
To open a data file, select “Open” from the main menu or right click a data tab and select “Open”.



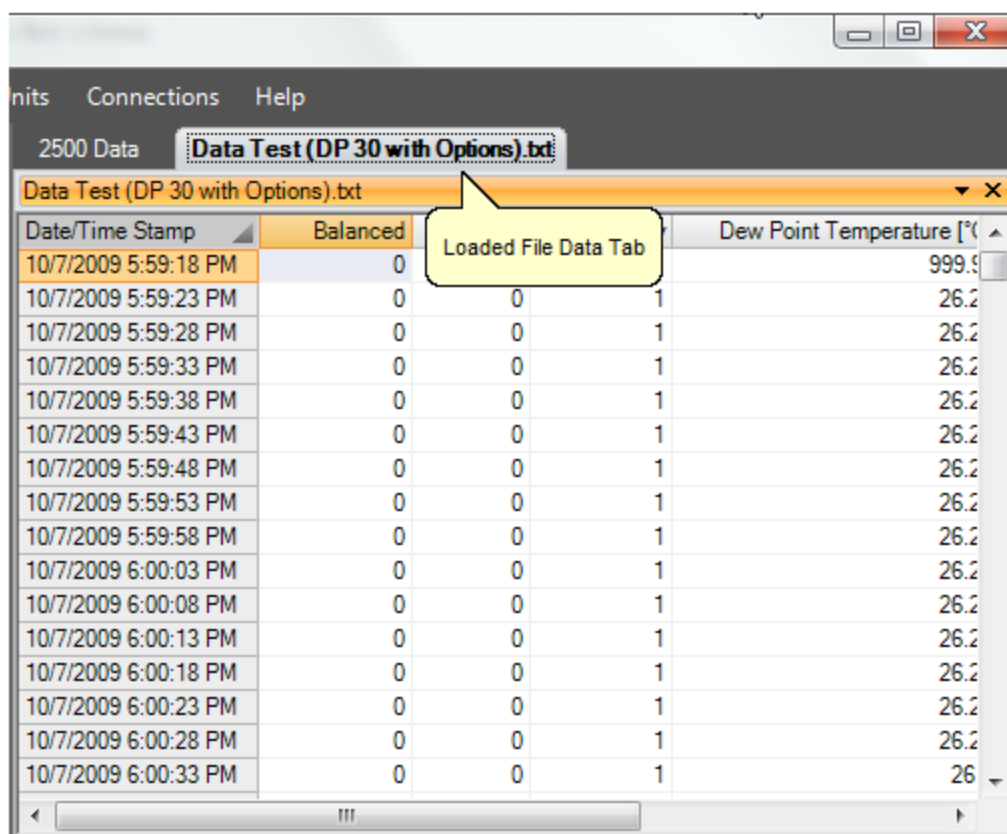
or



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.



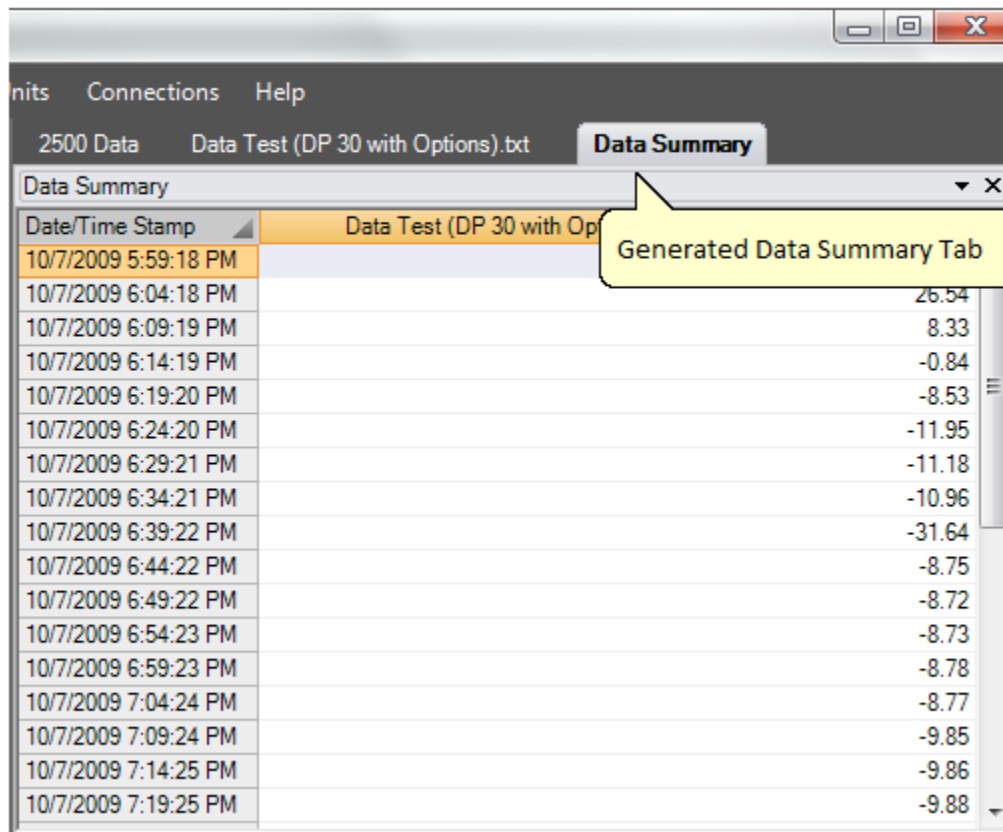
The screenshot shows a software window titled '2500 Data' with a menu bar containing 'Units', 'Connections', and 'Help'. The active tab is 'Data Test (DP 30 with Options).txt'. The table below displays data from this file, with columns for 'Date/Time Stamp', 'Balanced', and 'Dew Point Temperature [°C]'. A yellow callout bubble points to the tab with the text 'Loaded File Data Tab'.

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

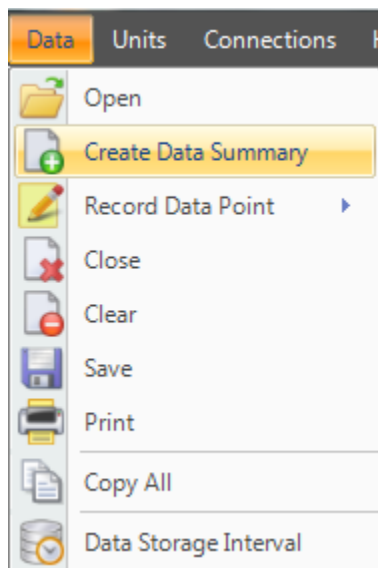
*Note: Data Summary tabs are created using the currently selected system units instead of SI units.*



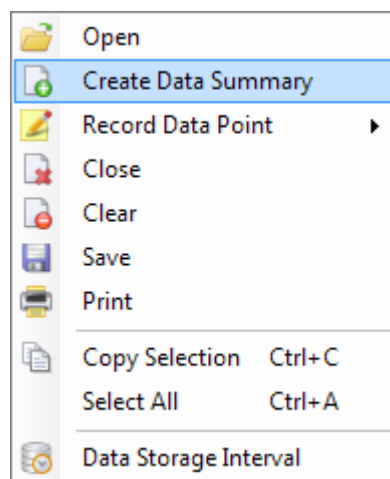
Date/Time Stamp	Data Test (DP 30 with Op
10/7/2009 5:59:18 PM	
10/7/2009 6:04:18 PM	26.54
10/7/2009 6:09:19 PM	8.33
10/7/2009 6:14:19 PM	-0.84
10/7/2009 6:19:20 PM	-8.53
10/7/2009 6:24:20 PM	-11.95
10/7/2009 6:29:21 PM	-11.18
10/7/2009 6:34:21 PM	-10.96
10/7/2009 6:39:22 PM	-31.64
10/7/2009 6:44:22 PM	-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

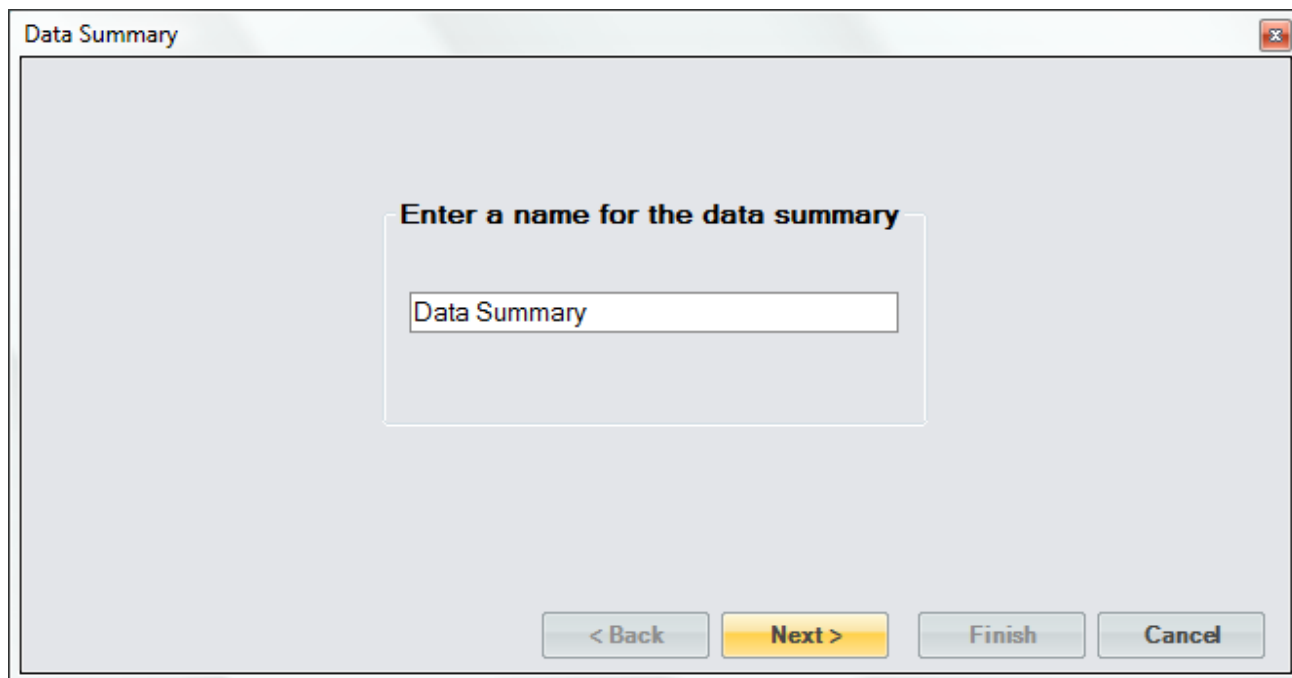
To create a Data Summary, select “Create Data Summary” from the main menu or right click a data tab and select “Create Data Summary”. Selection will open the Data Summary Wizard dialog that will step the user through the creation process.



or



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.

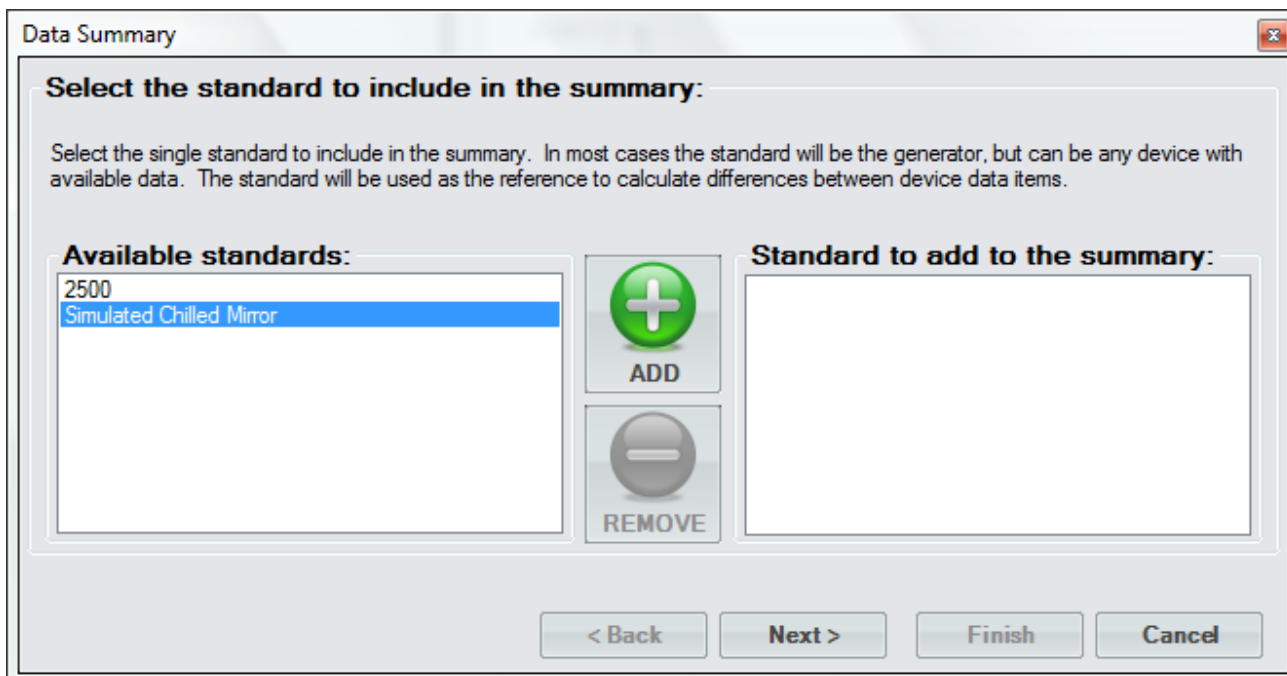


The next step in the data summary creation process is to select the standard. The standard will be used as the reference to calculate differences between the device data items if the user chooses to do so.



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 2500.

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



**Data Summary**

**Select the standard to include in the summary:**

Select the single standard to include in the summary. In most cases the standard will be the generator, but can be any device with available data. The standard will be used as the reference to calculate differences between device data items.

**Available standards:**

- 2500
- Simulated Chilled Mirror**

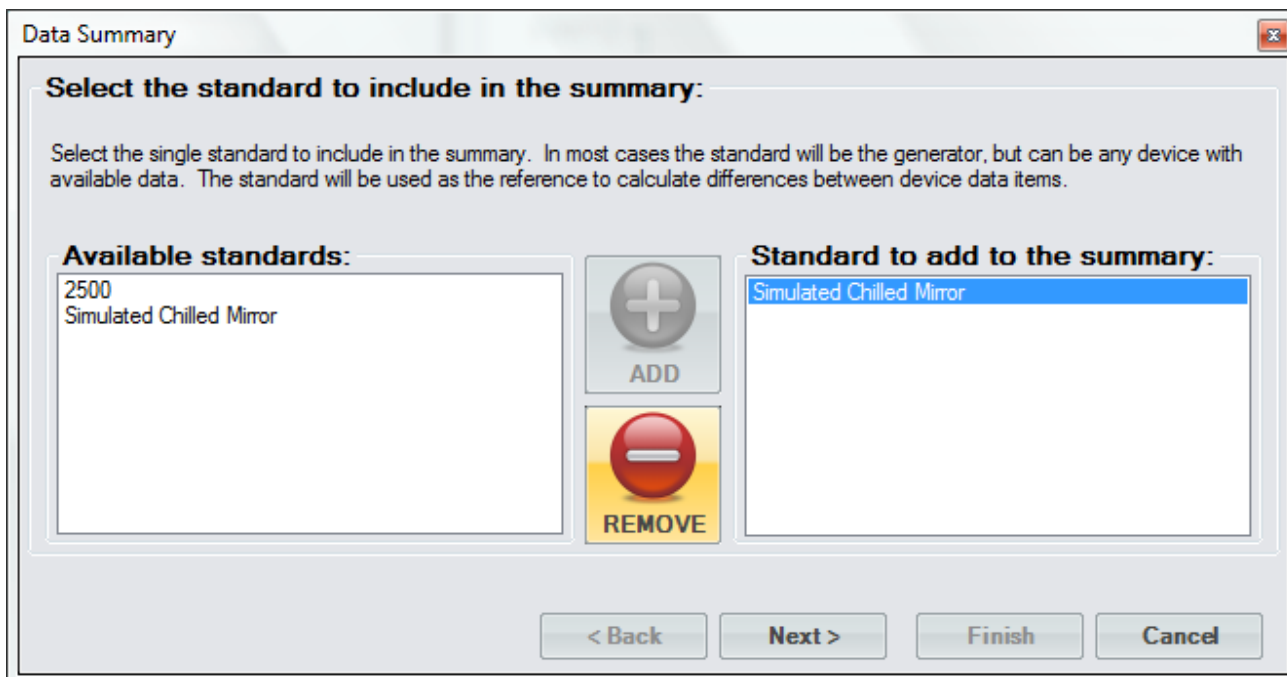
**Standard to add to the summary:**

**ADD**

**REMOVE**

**< Back** **Next >** **Finish** **Cancel**

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



**Data Summary**

**Select the standard to include in the summary:**

Select the single standard to include in the summary. In most cases the standard will be the generator, but can be any device with available data. The standard will be used as the reference to calculate differences between device data items.

**Available standards:**

- 2500
- Simulated Chilled Mirror

**Standard to add to the summary:**

- Simulated Chilled Mirror**

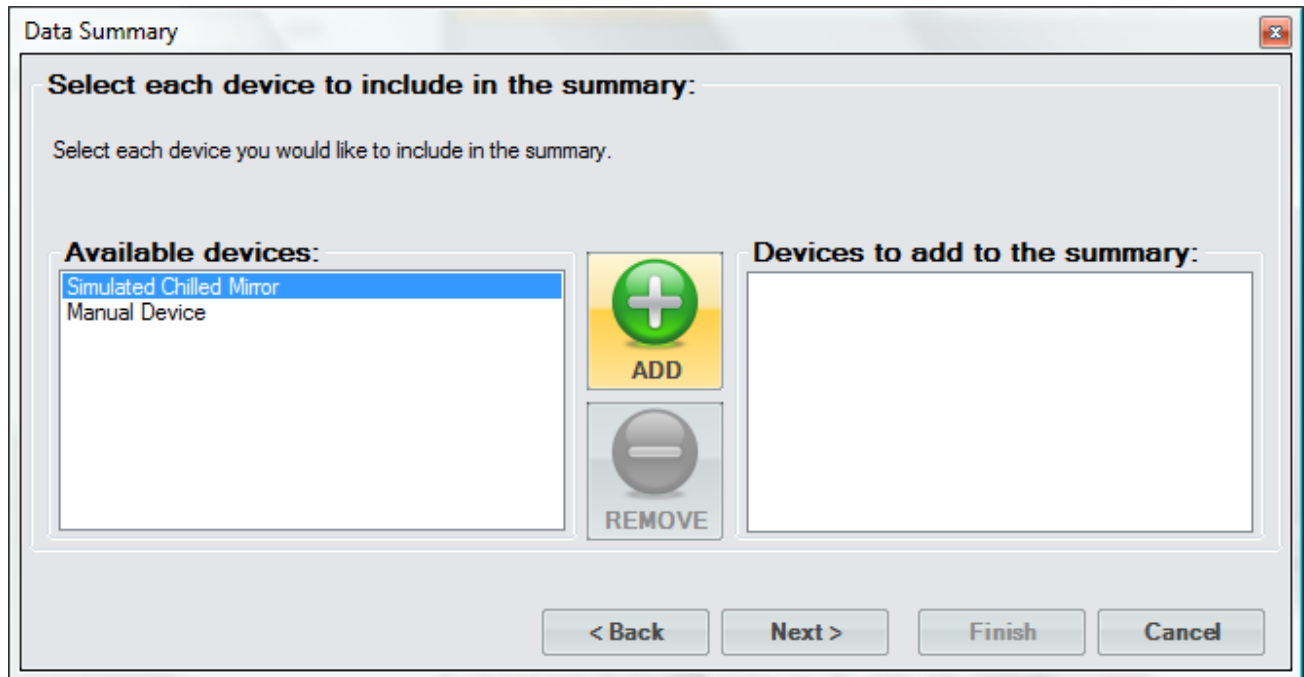
**ADD**

**REMOVE**

**< Back** **Next >** **Finish** **Cancel**

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.

The dialog box is titled "Data Summary" and contains the instruction "Select each device to include in the summary:". Below this is a sub-instruction: "Select each device you would like to include in the summary." The interface is divided into two main sections. On the left, under the heading "Available devices:", there is a list box containing "Simulated Chilled Mirror" and "Manual Device". On the right, under the heading "Devices to add to the summary:", there is a list box containing "Simulated Chilled Mirror" and "Manual Device", with "Manual Device" currently selected and highlighted in blue. Between these two list boxes are two buttons: a grey button with a plus sign and the text "ADD", and a red button with a minus sign and the text "REMOVE". At the bottom of the dialog are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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.

The dialog box is titled "Data Summary" and contains the instruction "Select the 2500 data to use in the summary:". Below this is a sub-instruction: "Select each data item for this device that you would like to include in the summary." The interface is divided into two main sections. On the left, under the heading "Available data:", there is a list box containing several data items: "Exp Valve Position", "F@Td,Pt", "F@Ts,Ps", "F@Tt,Pt", "Flow Valve Position", "Frost Point", "Frost Point  $\pm U$  ( $k=2$ )", "Grains/lb", "Mass Flow Rate", and "Mass Flow Rate Setpoint". The item "Frost Point  $\pm U$  ( $k=2$ )" is currently selected and highlighted in blue. On the right, under the heading "Data to add to the summary:", there is an empty list box. Between these two list boxes are two buttons: a green button with a plus sign and the text "ADD", and a grey button with a minus sign and the text "REMOVE". At the bottom of the dialog are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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.

**Data Summary**

**Select the 2500 data to use in the summary:**

Select each data item for this device that you would like to include in the summary.

**Available data:**

- Exp Valve Position
- F@Td,Pt
- F@Ts,Ps
- F@Tt,Pt
- Flow Valve Position
- Frost Point
- Frost Point  $\pm U$  ( $\kappa=2$ )
- Grains/lb
- Mass Flow Rate
- Mass Flow Rate Setpoint

**Data to add to the summary:**

- Frost Point
- Frost Point  $\pm U$  ( $\kappa=2$ )
- Grains/lb

**Buttons:** ADD, REMOVE, < Back, Next >, Finish, Cancel

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.

The screenshot shows a window titled "Data Summary" with a close button in the top right corner. The main heading is "Pair the Simulated Chilled Mirror data with its corresponding 2500 data:". Below this is a paragraph of instructions: "Pair each device data item with its corresponding standard data item. This tells the ControLog which device data item corresponds with which standard data item so that a difference can be calculated to show the error between the standard and the device. If you do not desire to calculate error for a particular data item then simply do not pair it." The interface is divided into three columns. The first column, "Device Data:", contains a list with "Frost Point" selected. The second column, "Standard data:", contains a list with "Frost Point" and "Frost Point  $\pm U$  ( $k=2$ )". Between these columns are two buttons: a green "ADD" button with a plus sign and a grey "REMOVE" button with a minus sign. The third column, "Paired Data:", is currently empty. At the bottom are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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

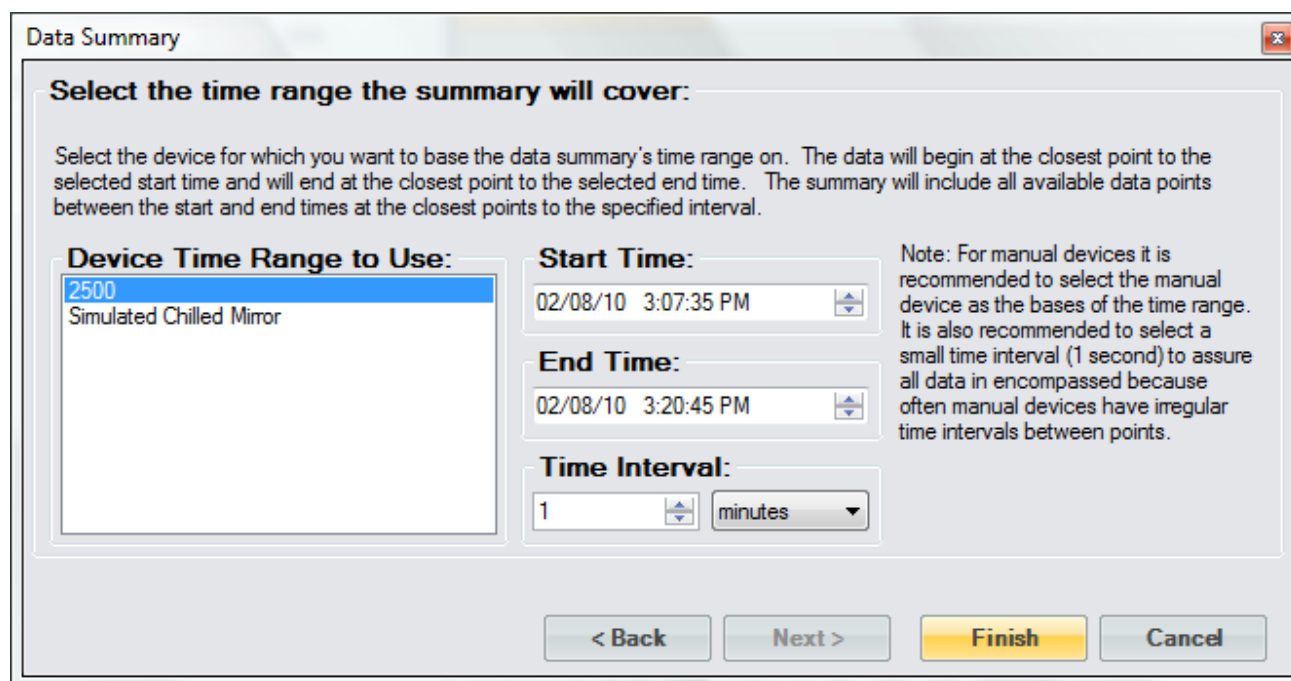
This screenshot shows the same "Data Summary" window after a pair has been added. The "Device Data:" list still has "Frost Point" selected. The "Standard data:" list remains the same. The "ADD" button is now grey and the "REMOVE" button is red. The "Paired Data:" list now contains the entry "Frost Point = Frost Point", which is selected. The rest of the interface, including the instructions and bottom buttons, is identical to the previous screenshot.

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.*



The image shows a 'Data Summary' dialog box with a title bar and a close button. The main content area is titled 'Select the time range the summary will cover:' and contains a paragraph of instructions. Below this, there are three sections: 'Device Time Range to Use:' with a list box containing '2500' and 'Simulated Chilled Mirror'; 'Start Time:' with a date/time picker set to '02/08/10 3:07:35 PM'; 'End Time:' with a date/time picker set to '02/08/10 3:20:45 PM'; and 'Time Interval:' with a numeric input set to '1' and a unit dropdown set to 'minutes'. A note on the right side of the dialog repeats the recommendation for manual devices. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish' (highlighted in yellow), and 'Cancel'.

**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:**

- 2500
- Simulated Chilled Mirror

**Start Time:** 02/08/10 3:07:35 PM

**End Time:** 02/08/10 3:20:45 PM

**Time Interval:** 1 minutes

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.

< Back   Next >   **Finish**   Cancel

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

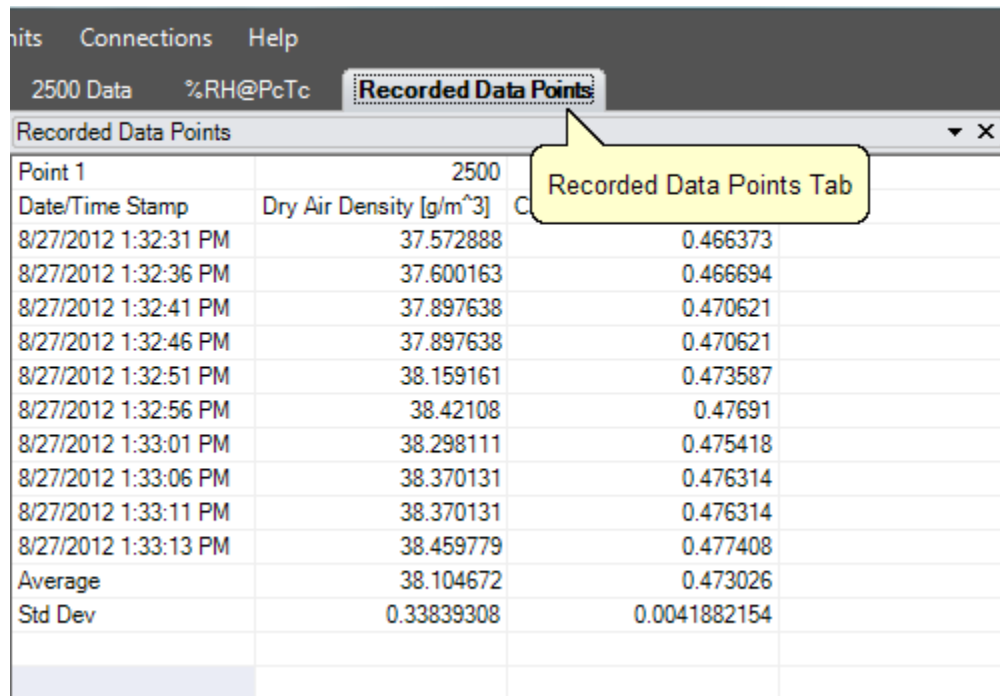
2500 Data	Simulated Chilled Mirror Data	Data Summary			
Data Summary					
Date/Time Stamp	2500: Frost Point [°C]	2500: Frost Point ±U (k=2) [°C]	Simulated Chilled Mirror: Frost Point [°C]	Simulated Chilled Mirror: Frost Point Error [°C]	
2/8/2010 12:01:44 PM	22.898162	0.058283867	7.91527		-14.982877133
2/8/2010 12:02:44 PM	17.1527	0.061679509	8.21814		-8.934560000
2/8/2010 12:03:44 PM	6.3913	0.073535071	7.83975		1.448450000
2/8/2010 12:04:44 PM	2.77367	0.075801606	6.07941		3.305740000
2/8/2010 12:05:44 PM	0.31789726	0.076895309	4.15031		3.832412740
2/8/2010 12:06:44 PM	-1.6132425	0.102711111	2.21171		3.824952525
2/8/2010 12:07:44 PM	-0.78872401	0.076761227	0.577885		1.366508011
2/8/2010 12:08:44 PM	-1.1060906	0.076606865	0.427492		1.533582506
2/8/2010 12:09:44 PM	-3.5486213	0.1002761	-0.738492		2.810129213
2/8/2010 12:10:44 PM	-5.7165978	0.096610858	-2.1407		3.575897800
2/8/2010 12:11:44 PM	-7.5858933	0.09360889	-13.4593		-5.873406067
2/8/2010 12:12:44 PM	-8.1340282	0.093137647	-2.16953		5.964492900
2/8/2010 12:13:44 PM	-8.3681172	0.093087411	-2.87721		5.490905151
2/8/2010 12:14:44 PM	-8.5986886	0.092995616	-2.97092		5.627769488
2/8/2010 12:15:44 PM	-8.8160462	0.092883509	-7.2164		1.597642218
2/8/2010 12:16:44 PM	-8.9862445	0.092806153	-7.59427		1.392017722
2/8/2010 12:17:44 PM		0.092719853	-7.92248		1.036245553
2/8/2010 12:18:44 PM		0.092709582	-8.20852		0.741834418
2/8/2010 12:19:44 PM		0.092695128	-8.43746		0.545565472
2/8/2010 12:20:44 PM	-9.4759007	0.092660395	-8.64098		0.834916609
2/8/2010 12:21:44 PM	-9.5675252	0.092637418	-8.81619		0.751333333
2/8/2010 12:22:44 PM	-9.6585699	0.092610259	-8.97635		0.682214340
2/8/2010 12:23:44 PM	-9.7286898	0.092587895	-9.11371		0.615070102
2/8/2010 12:24:44 PM	-9.7980482	0.092564417	-9.24095		0.558231718

---

## 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.

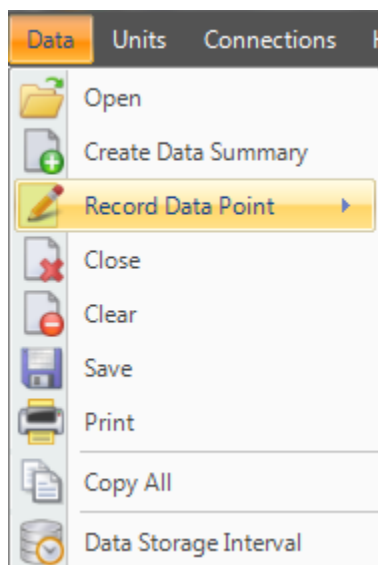
*Note: Each entry point in the Recorded Data Points tab is created using the currently selected system units.*



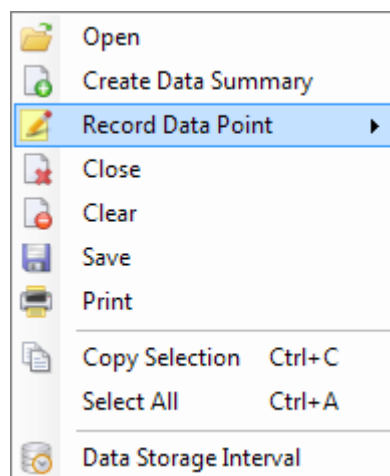
Recorded Data Points			
Point 1	2500		
Date/Time Stamp	Dry Air Density [g/m^3]		
8/27/2012 1:32:31 PM	37.572888		0.466373
8/27/2012 1:32:36 PM	37.600163		0.466694
8/27/2012 1:32:41 PM	37.897638		0.470621
8/27/2012 1:32:46 PM	37.897638		0.470621
8/27/2012 1:32:51 PM	38.159161		0.473587
8/27/2012 1:32:56 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

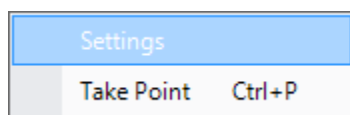
To Record a Data Point, select “Record Data Point” from the main menu or right click a data tab and select “Record Data Point”.



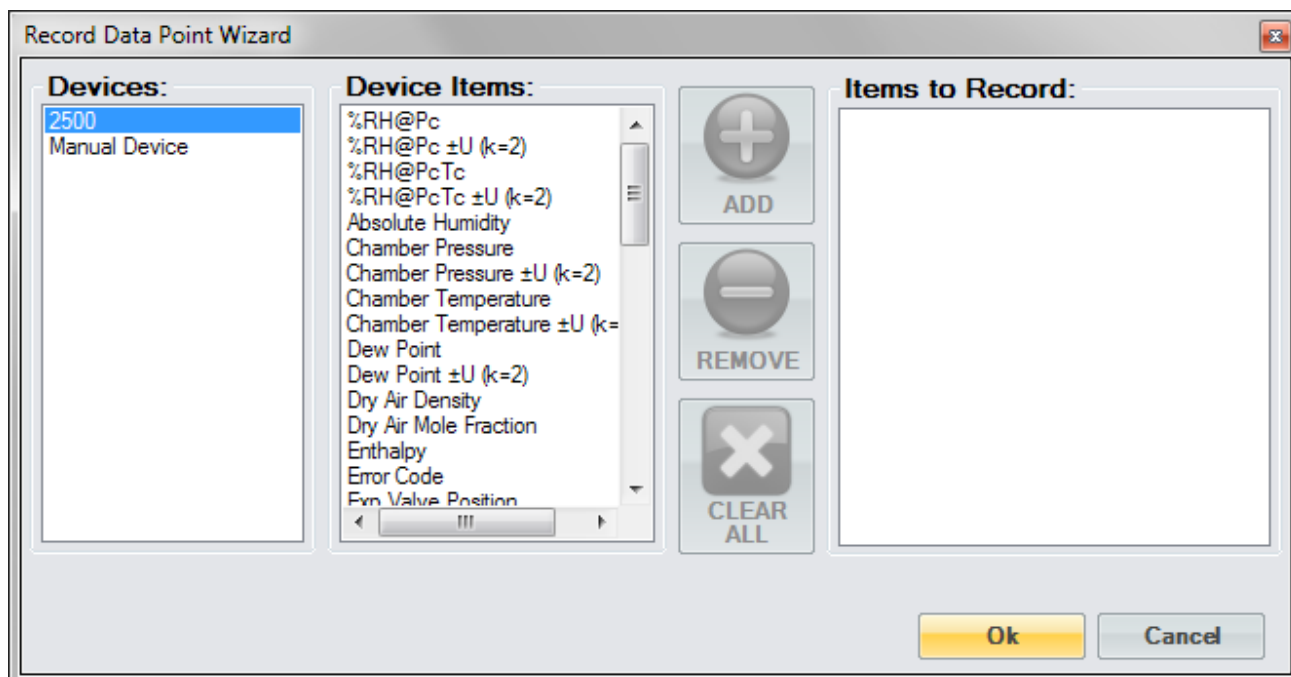
or



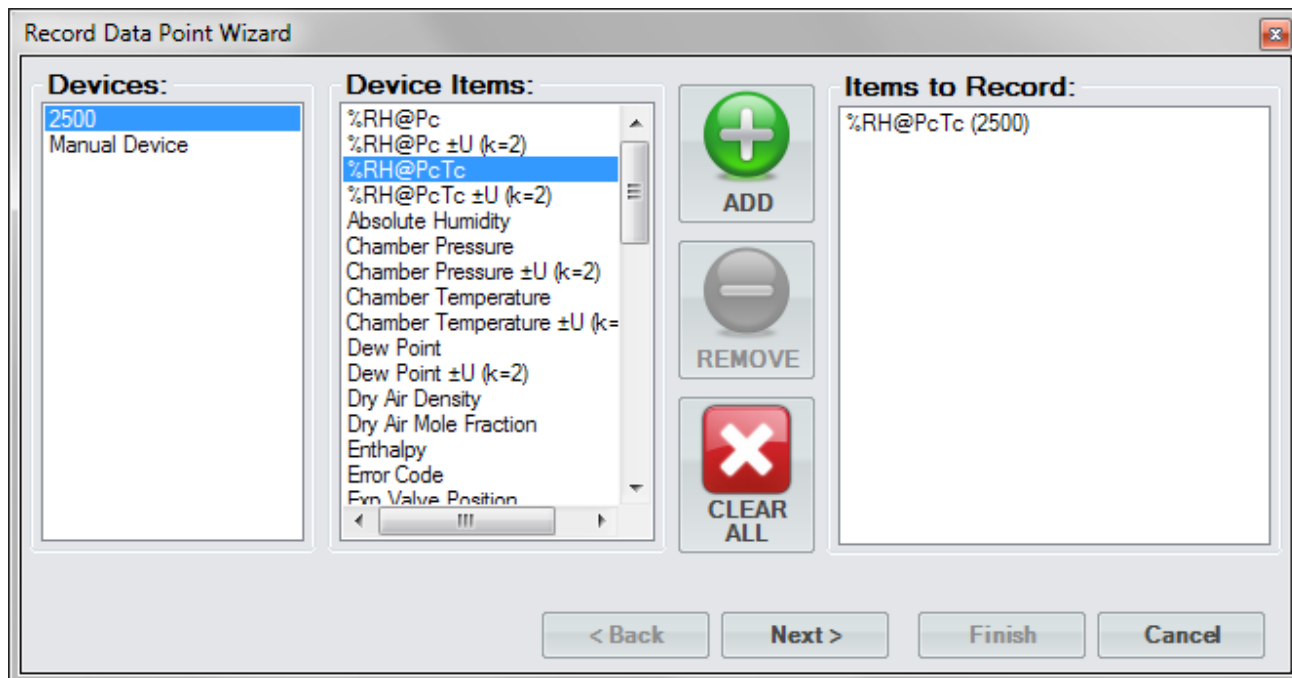
The first step in recording data points is to configure what and how to take each point. Use the Settings menu to open the Record Data Point Wizard to define the data points to be taken.



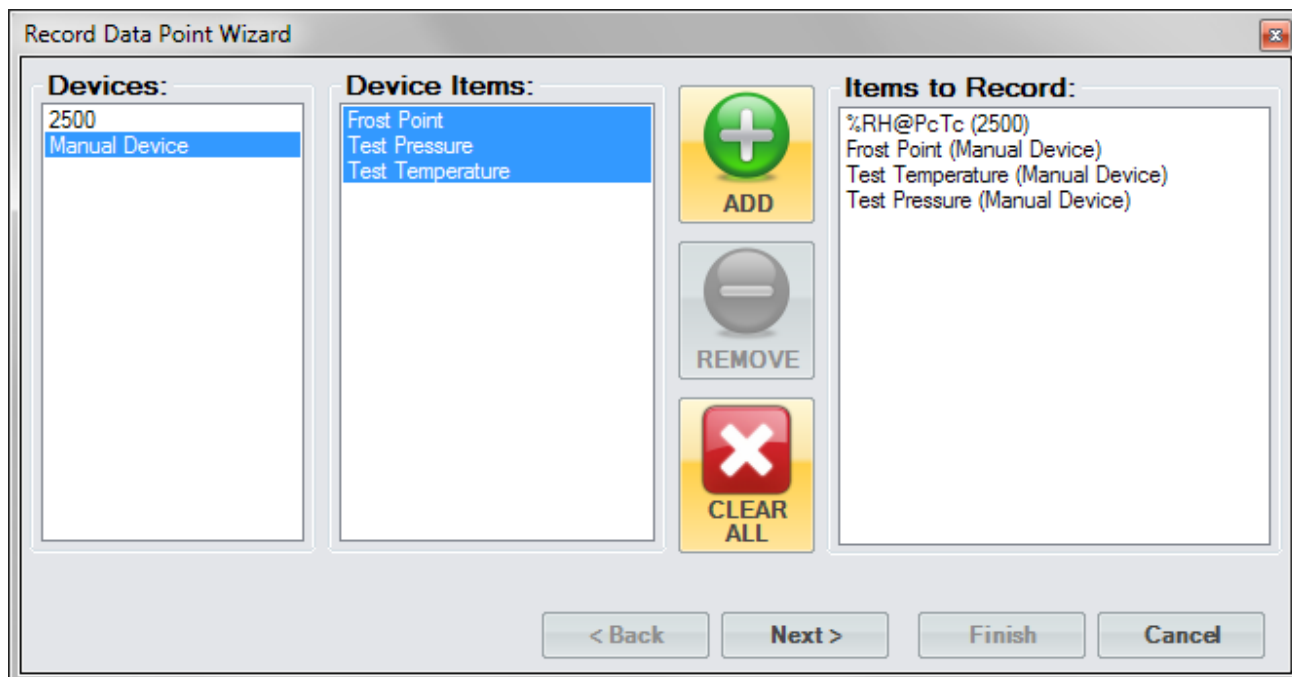
A “Record Data Point Wizard” dialog will appear.



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.

The "Record Data Point Wizard" dialog box is shown. It has three main sections: "Devices:", "Device Items:", and "Items to Record:". The "Devices:" section contains a list with "2500" and "Manual Device" (selected). The "Device Items:" section contains a list with "Frost Point", "Test Pressure", and "Test Temperature". The "Items to Record:" section contains a list with "%RH@PcTc (2500)", "Frost Point (Manual Device)", "Test Temperature (Manual Device)" (selected), and "Test Pressure (Manual Device)". Between the "Device Items:" and "Items to Record:" sections are three buttons: "ADD" (with a plus icon), "REMOVE" (with a minus icon), and "CLEAR ALL" (with a red X icon). At the bottom are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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.

The "Record Data Point Wizard" dialog box is shown, displaying the "Recording Properties" section. It contains a text box "Include the last" followed by a spinner box set to "10" and the text "points". Below this are two checked checkboxes: "Include Average" and "Include Standard Deviation". At the bottom are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

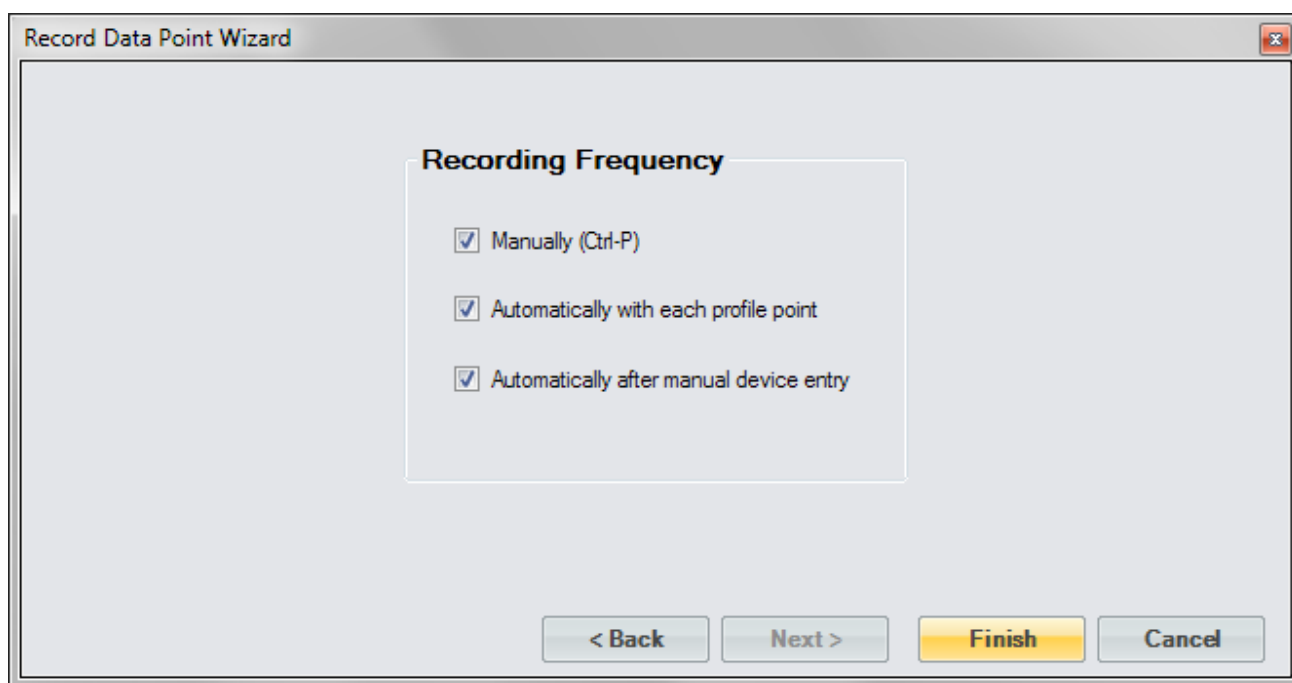
**Recording Properties** define the number of prior (last) points to include and whether to calculate the average and or standard deviation for the defined number of prior points taken with each recorded data point.

***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.

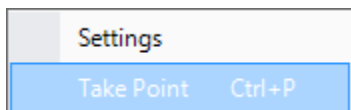
***Include Standard Deviation*** defines whether to include the standard deviation of the defined number of prior points for the recorded data items for each point taken.

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	All recorded data points will appear in the Recorded Data Points tab		
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]			[°C]
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	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	Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc	Frost Point [°C]	Test Pressure [psia]	Test Temperature [°C]	
9/11/2012 1:57:46 PM	-0.46677127	50.0105				
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				
Average	9.3906544	50.0069	9.3924	12.128	20.127	
Std Dev	0.001965995	0.0031176915	0	0	0	
Profile Point 1	2500				Manual Device	
Date/Time Stamp	Frost Point [°C]	%RH@PcTc		Test Pressure [psia]	Test Temperature [°C]	
9/11/2012 1:57:46 PM	-0.46677127	25.000000				
9/11/2012 1:58:16 PM	-0.47586164	24.995000				
9/11/2012 1:58:46 PM	-0.47233929	24.995000				
Average	-0.4716574	24.9944	0	0	0	
Std Dev	0.0045833863	0.010877959	0	0	0	
Profile Point 2					Manual Device	
Date/Time Stamp					Test Temperature [°C]	
9/11/2012 2:09:16 PM						
9/11/2012 2:09:46 PM	9.357444	49.988				
9/11/2012 2:10:16 PM	9.3583322	49.9935				



# Auto Profiling

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 setpoint.

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

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

2500 Data   Simulated Chilled Mirror Data   **Auto Profile**

Auto Profile

Control Mode: %RH@PcTc Mode

The profile is used as a 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.

Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate	Ramp Time	Soak Time	Assurance
1	Generate	20	25	20	30		Yes
2	Generate	30	25	20	30		No
3	Generate	40	25	20	30		No
4	Generate	50	25	20	30	minutes 1   hours	No
*							

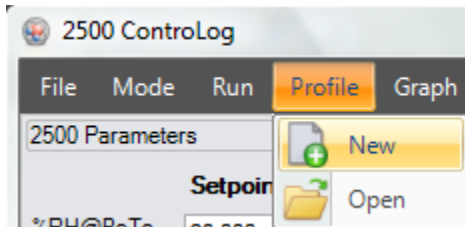
Warning Assurance Conditions New Point Line

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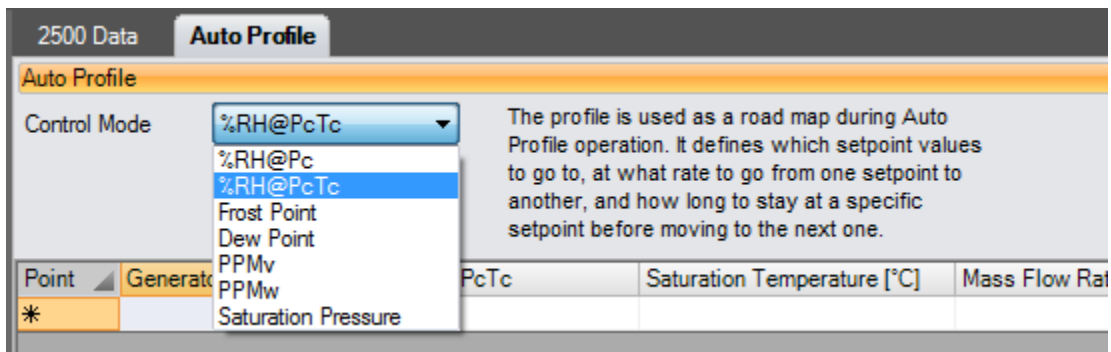
# Creating a New Profile

A profile is a list of humidity, temperature, pressure, flow, and time parameters that are used during automated control of the 2500 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](#).

The first column, next to the point numbers, is the Generator Mode. The generator mode defines the run mode that the 2500 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.*

**2500 Data** **Auto Profile**

**Auto Profile**

Control Mode: %RH@PcTc

The profile is used as a 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.

Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rat
*	Generate Shutdown			

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 %RH@PcTc. Whenever the profile control mode is changed, the title on this column changes to reflect the control mode selected.

2500 Data **Auto Profile**

**Auto Profile**

Control Mode %RH@PcTc ▼

The profile is used as a 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.

Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]
	Generate	20		
*				

When the Control Mode is set to Saturation Pressure, the first column next to the Generator Mode contains the Saturation Pressure followed by the Saturation Temperature. In this control mode the user can also drop down a Mini version of HumiCalc to help calculate the desired Saturation Pressure by clicking the drop down arrow on the cell. For example, let's say the user wants to calculate the required Saturation Pressure needed to generate a 25 %RH with a Saturation Temperature of 25.0 °C. Start by entering a 25.0 °C Saturation Temperature and then click the Saturation Pressure HumiCalc drop down at the right of the cell box.

2500 Data **Auto Profile**

**Auto Profile**

Control Mode Saturation Pressure ▼

The profile is used as a 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.

Point	Generator Mode	Saturation Pressure [psia]	Saturation Temperature [°C]	Mass Flow Rate [l/m]
1	Generate	50	25	20
2	Generate	50 ▼	25	20
*				

HumiCalc Drop Down



Next, select the known to be %RH and enter the desired percent relative humidity of 25.0. Notice that ControLog automatically entered the other known values based on the already entered profile values.

The screenshot shows the HumiCalc dialog box. At the top, there are two input fields: "Saturation Pressure [psia]" with the value 50 and "Saturation Temperature [°C]" with the value 25. Below these, a dropdown menu is set to 25.0. The main section is titled "Configuration" and contains a "Known" dropdown menu set to "%RH". Below this is a "Known Values" section with four input fields: "%RH" (25.0), "Saturation Temperature" (25.0), "Chamber Pressure" (14.7), and "Chamber Temperature" (25.0). At the bottom is a "Calculate" button. Three yellow callout boxes are present: one pointing to the "Known" dropdown with the text "Select the Known", one pointing to the "%RH" input field with the text "Enter the Known Values", and one pointing to the "Calculate" button with the text "Select Calculate".

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

The screenshot shows the "Auto Profile" section of the software interface. At the top, there are two tabs: "2500 Data" and "Auto Profile". Below the tabs, there is a "Control Mode" dropdown menu set to "Saturation Pressure". To the right of this is a text box explaining the profile: "The profile is used as a 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." Below this is a table with the following data:

Point	Generator Mode	Saturation Pressure [psia]	Saturation Temperature [°C]	Mass Flow Rate [l/m]
1	Generate	50	25	20
2	Generate	59.313	25	20
*				

A yellow callout box points to the "59.313" value in the "Saturation Pressure [psia]" column for Point 2, with the text "Calculated Saturation Pressure".

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.

2500 Data **Auto Profile**

Auto Profile

Control Mode Saturation Pressure

The profile is used as a 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.

Point	Generator Mode	Saturation Pressure [psia]	Saturation Temperature [°C]	Mass Flow Rate [l/m]
1	Generate	50	25	20
2	Generate	59.313	25	20
*				

**Ramp Time** is the desired amount of time the 2500 should take to transition from one profile test point to another. Setting a ramp time of zero instructs the 2500 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.*

The profile is used as a 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.

Saturation Pressure [psia]	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time		
50	25	20	0	minutes	60
59.313	25	20	15	minutes	1

milliseconds  
 seconds  
 minutes  
 hours  
 days

**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.

road map during Auto  
es which setpoint values  
go from one setpoint to  
to stay at a specific  
to the next one.

	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time		Soak Time		As
	25	20	0	minutes	60	minutes	No
	25	20	15	minutes	1	hours	No

milliseconds

seconds

minutes

hours

days

*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/or stability before ControLog will start the Soak Phase. If “No” is set, the Soak Phase will start immediately upon completion of the Ramp Phase.

during Auto  
setpoint values  
ne setpoint to  
specific  
one.

	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time		Soak Time		Assurance
		20	0	minutes	60	minutes	No
		20	15	minutes	1	hours	No

Yes

No

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.

**Point 2 Assurance Conditions**

**Device:**  
2500

**Device Item:**  
PPMv  
PPMv  $\pm U$  ( $k=2$ )  
PPMw  
PPMw  $\pm U$  ( $k=2$ )  
Saturation Pressure  
Saturation Pressure  $\pm U$  ( $k=2$ )  
**Saturation Temperature**  
Saturation Temperature  $\pm U$  ( $k=2$ )  
Specific Humidity  
SVP@Td  
SVP@Ts  
SVP@Tt

**2500 Saturation Temperature Assurance Values**

Tolerance:

Standard Deviation:

Sample Size:  minutes

**Add**

Device	Item	Tolerance	Standard Deviation	Sample Size
*				

**Ok** **Cancel**

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 2500 setpoints. The field will be grayed out for all other non 2500 setpoint device items. This is because ControLog 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 2 Assurance Conditions**

**Device:**  
2500



**Device Item:**  
PPMv  
PPMv  $\pm U$  ( $k=2$ )  
PPMw  
PPMw  $\pm U$  ( $k=2$ )  
Saturation Pressure  
Saturation Pressure  $\pm U$  ( $k=2$ )  
**Saturation Temperature**  
Saturation Temperature  $\pm U$  ( $k=2$ )  
Specific Humidity  
SVP@Td  
SVP@Ts  
SVP@Tt

**2500 Saturation Temperature Assurance Values**

Tolerance:

Standard Deviation:

Sample Size:

Device	Item	Tolerance	Standard Deviation	Sample Size
2500	Saturation Temperature	±0.1	0.2	15.0 minutes
*				

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 %RH points were 20% and 30% ControLog will automatically use 40% for the next point if the user leaves that field empty.

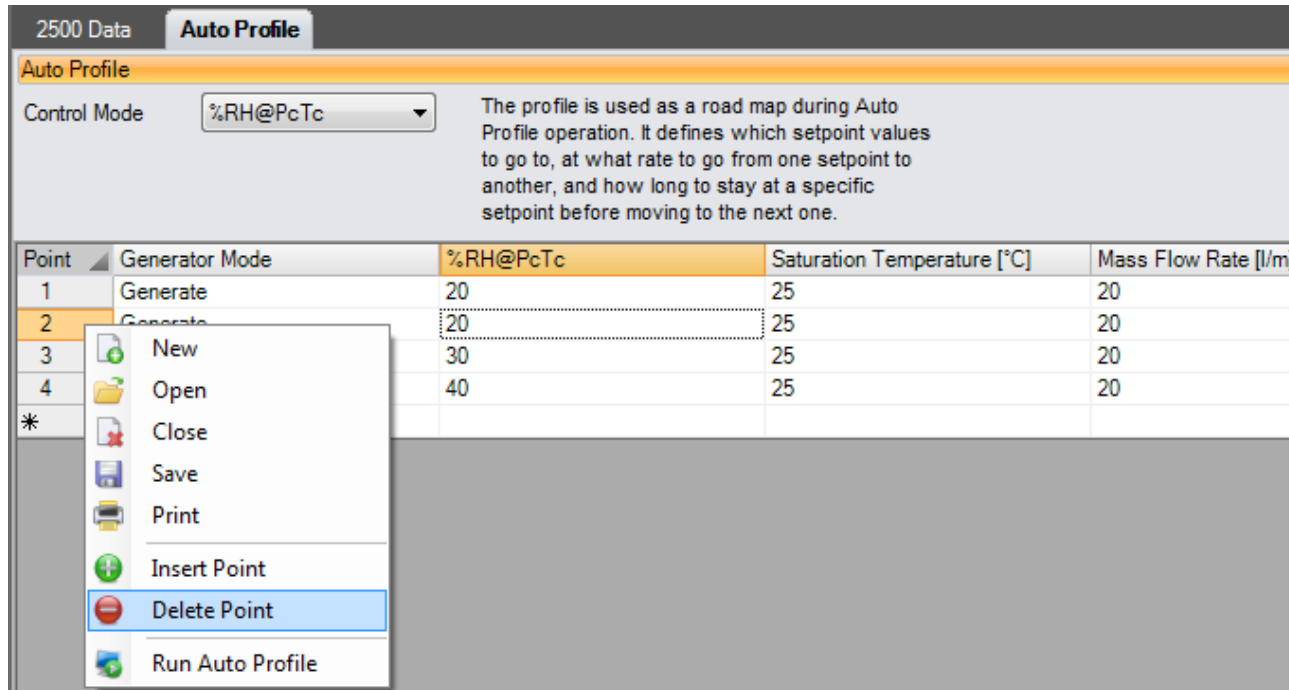
2500 Data <b>Auto Profile</b>				
Auto Profile				
Control Mode		%RH@PcTc	The profile is used as a road map during Auto Profile operation. It defines which setpoint values to go to, at what rate to go from one setpoint to another, and how long to stay at a specific setpoint before moving to the next one.	
Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]
1	Generate	20	25	20
2	Generate	30	25	20
3	Generate	40	25	20
*				

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.

2500 Data <b>Auto Profile</b>				
Auto Profile				
Control Mode		%RH@PcTc	The profile is used as a 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.	
Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]
1	Generate	20	25	20
2		30	25	20
3		40	25	20
*				

New  
Open  
Close  
Save  
Print  
Insert Point  
Delete Point  
Run Auto Profile

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 2500 are automatically flagged by ControlLog 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.*

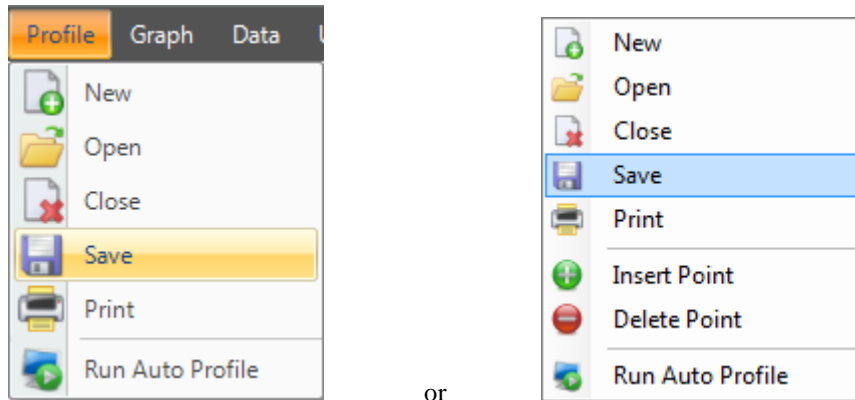
Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
20	1 minutes	60 minutes	No
20	minutes	60 minutes	No
20			
20	15 minutes	1 hours	Yes
20	15 minutes	1 hours	Yes

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

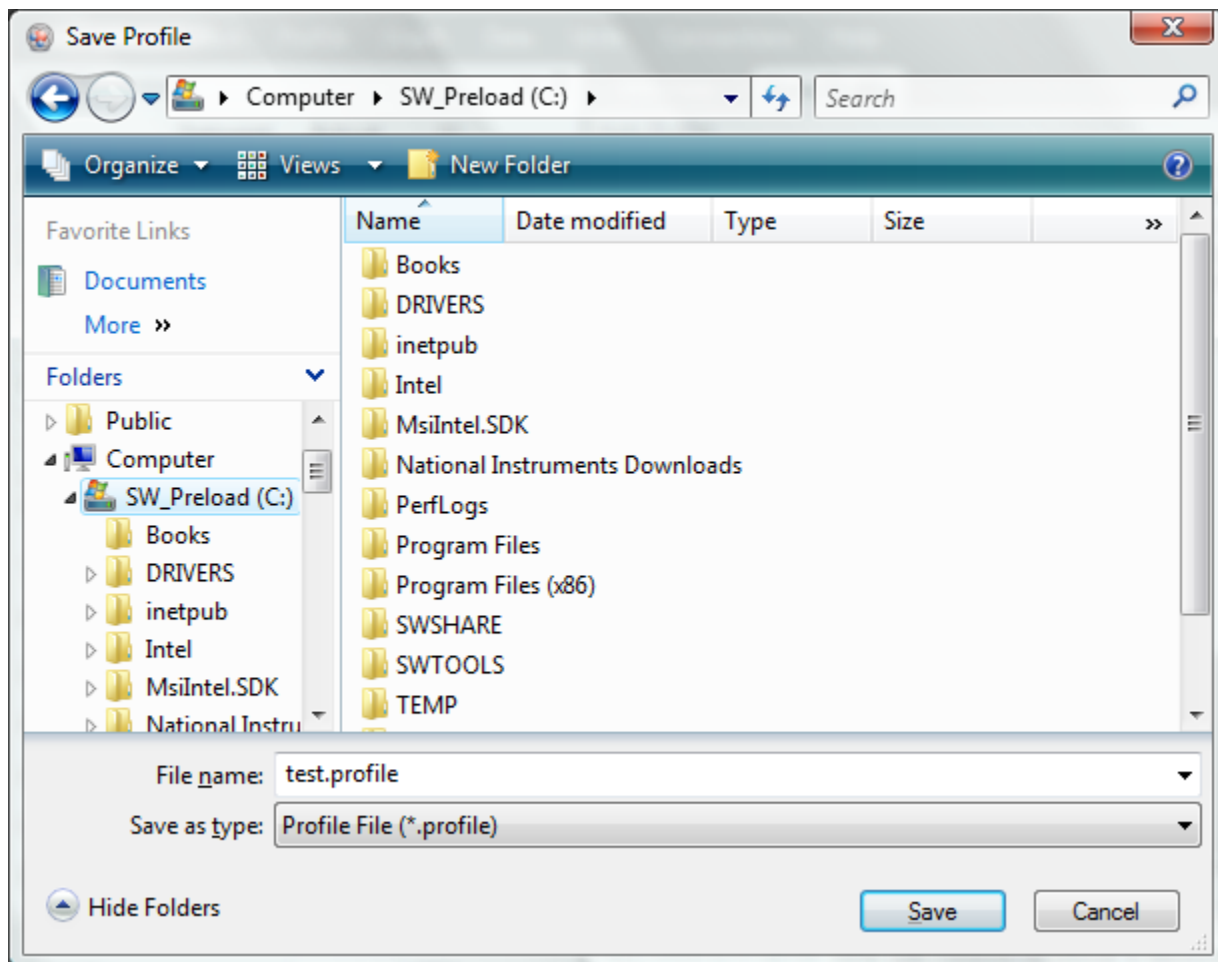
## Saving a Profile

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.

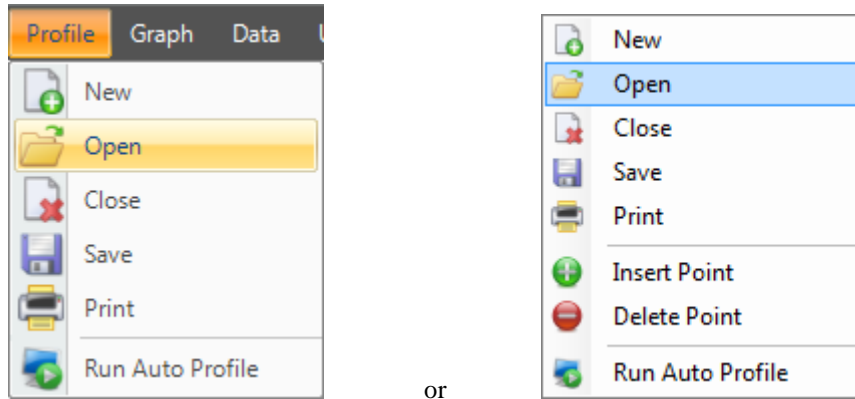




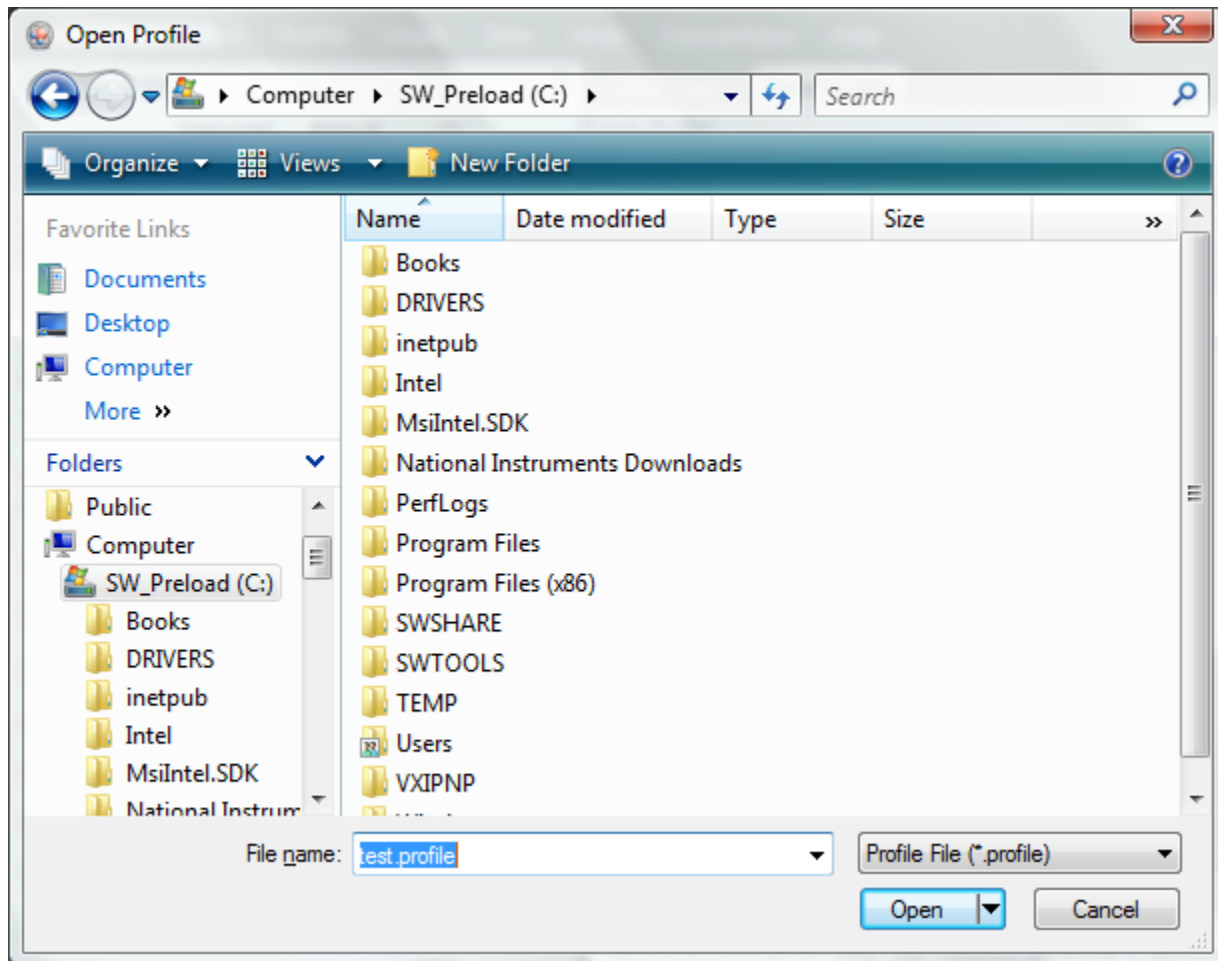
# Opening a Profile

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.

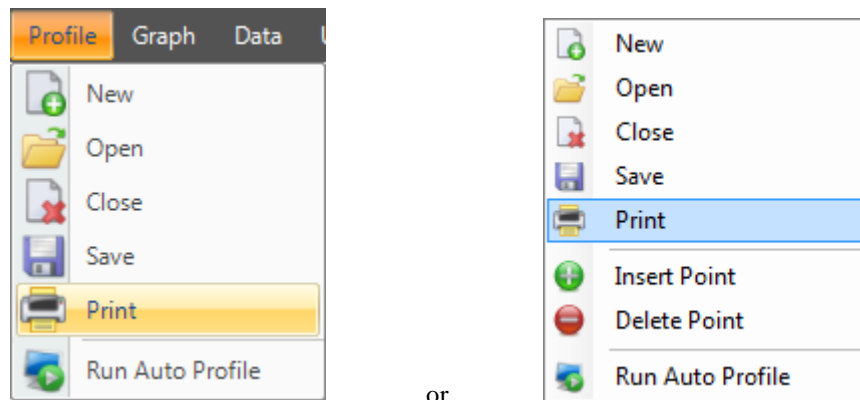
---

## Printing a Profile

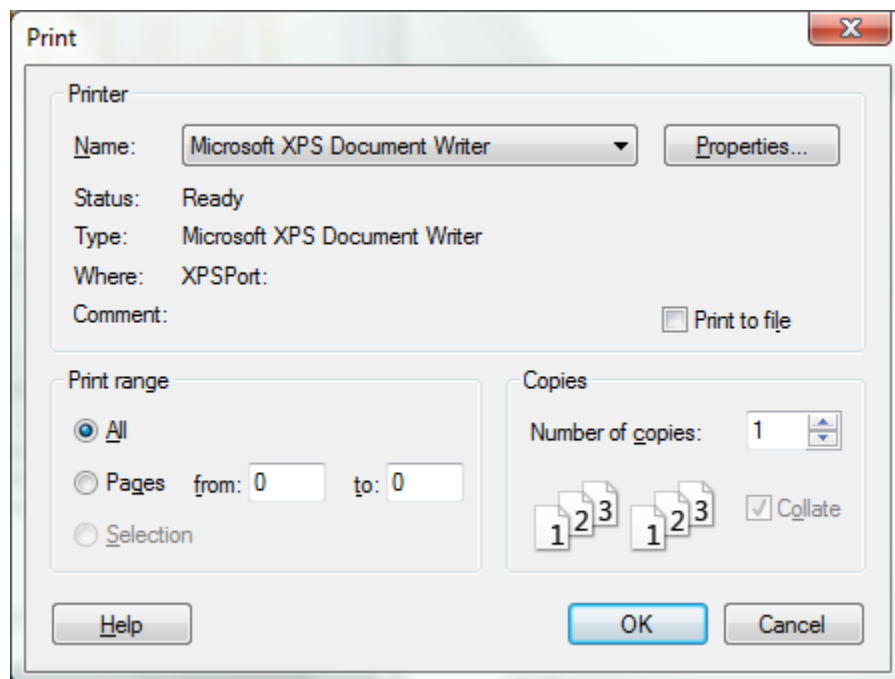
The profile tab can be printed to any of the PC's installed printers.

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

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



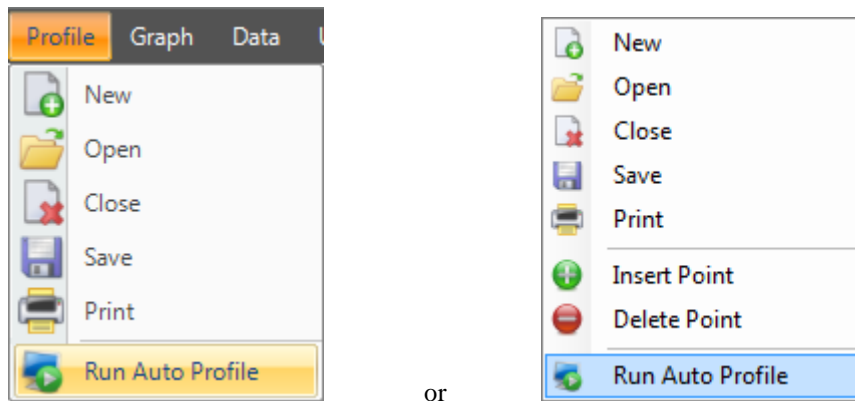
Using the “Print” dialog, select the desired printer, range and number of copies you want to print.



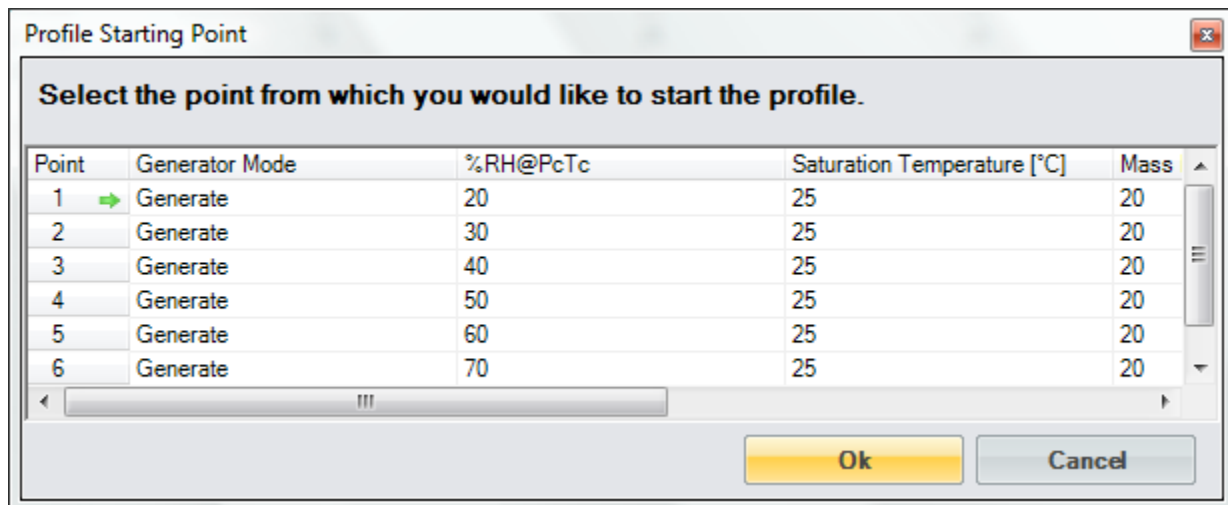
# Running an Auto Profile


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 2500 keypad directly, they will quickly be overridden by ControLog.*

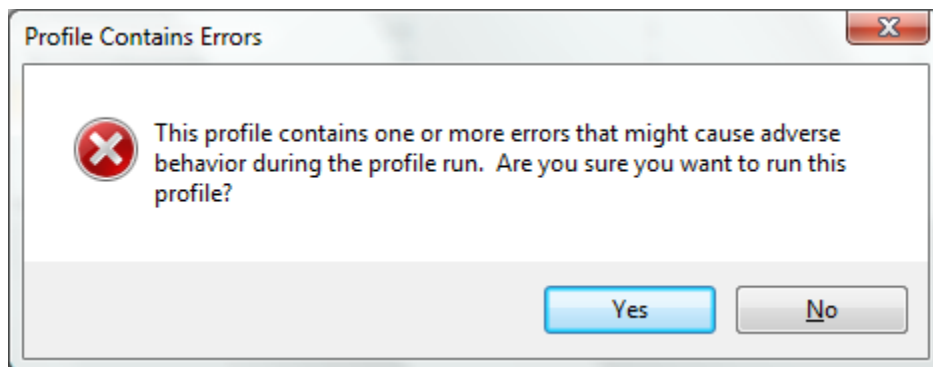


Selection will open the “Profile Starting Point” dialog which allows the user to select which point in the profile they would like to start the profile on. This feature provides more flexibility by allowing the user to skip ahead to a desired point within the auto profile.



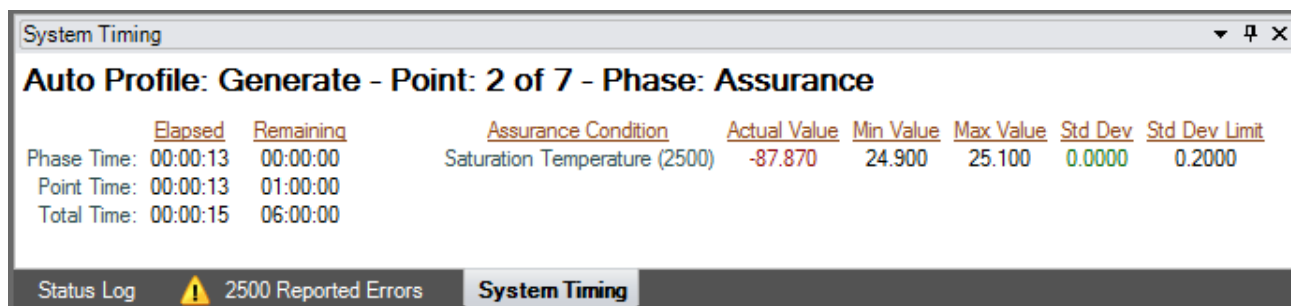
If the profile contained errors, which were indicated by a red circle with an explanation point  on the profile, a warning message will appear when the user tries to run the profile.

*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.*

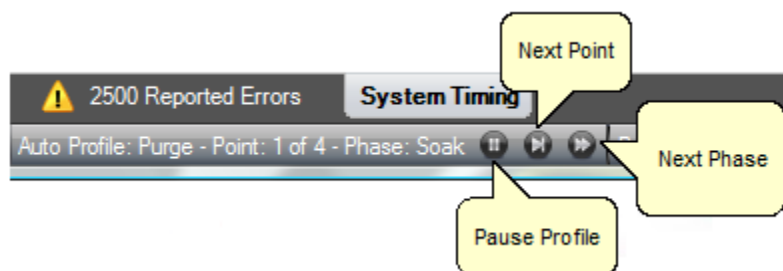


Once the auto profile begins, ControLog will begin sending the commands and setpoints for the starting profile point. The System Timing tab will be displayed in the information tab group and the Auto Profile Controls and Status will appear in the status bar.

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.

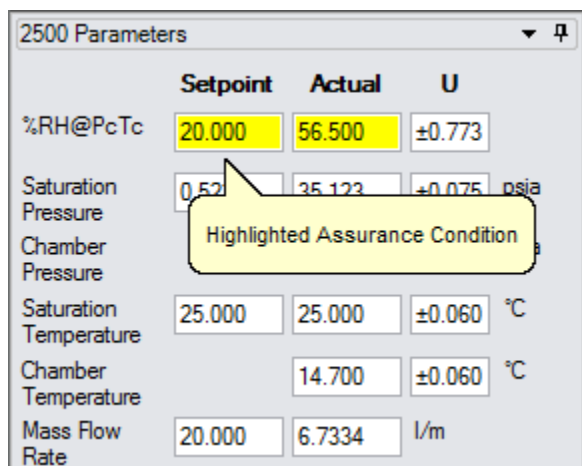
### Ramp Phase

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

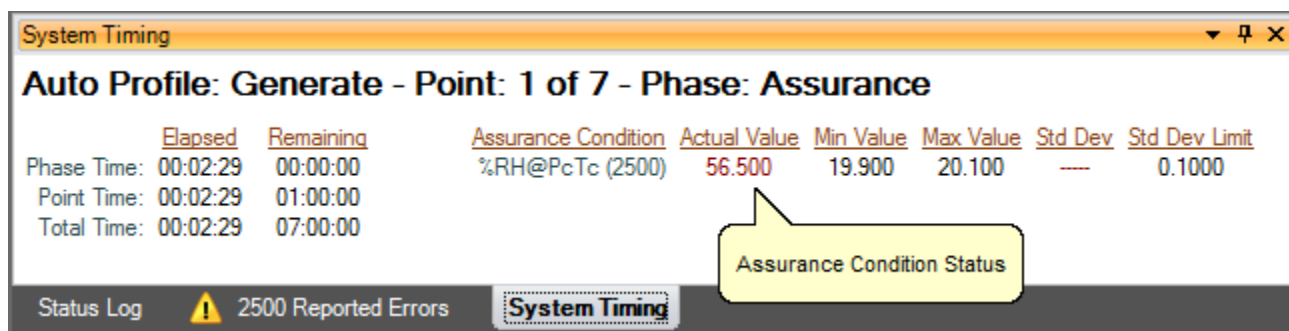
### Assurance Phase

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.



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.



*Note: The assurance phase will be active for a minimum of 30 seconds. This delay allows the 2500 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	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Generate	20	25	20	0 minutes	1 hours	No

Example 1 causes the Soak phase to begin immediately at the start of the profile point, even though the 2500 may still be adjusting to the point. The next point will start after the 1 hour soak phase.

### Example 2

Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
1	Generate	20	25	20	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.

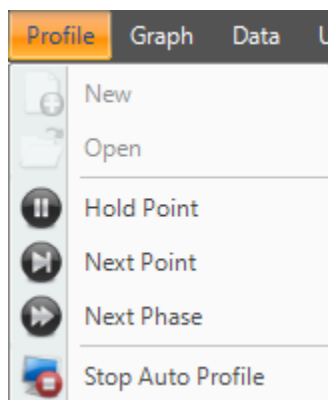
### Example 3

Point	Generator Mode	%RH@PcTc	Saturation Temperature [°C]	Mass Flow Rate [l/m]	Ramp Time	Soak Time	Assurance
2	Generate	30	25	20	15 minutes	1 hours	Yes

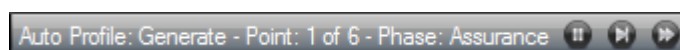
The Ramp phase (Ramp Timer) begins at the start of the point. The system adjusts slowly toward the setpoint, taking 15 minutes. Once the ramp time has elapsed, assurance starts and waits for tolerances to be met. When tolerances are met, the soak phase begins and lasts 1 hour. Total time for example 3 is 15 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.

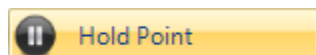


or

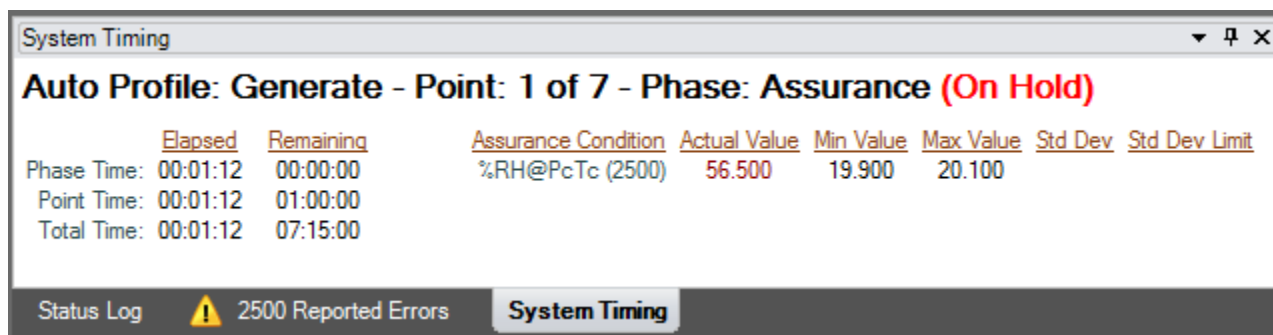


### Holding the Profile

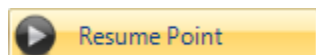
Selecting **Hold Point** from the profile menu or status bar will stop the current "Remaining Time" timers, allowing the system to remain indefinitely at the current point. While in a hold mode, the system is prevented from completing the ramp, assurance, or soak phases of a point.



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

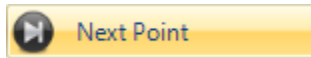


To resume the profile point, select the **Resume Point** from the profile menu or status bar. This re-enables the timing functions and allows the profile to resume normal operation.



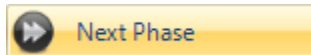
### ***Advancing to the Next Point***

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



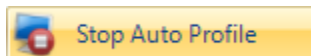
### ***Advancing to the Next Phase***

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 or Shutdown.



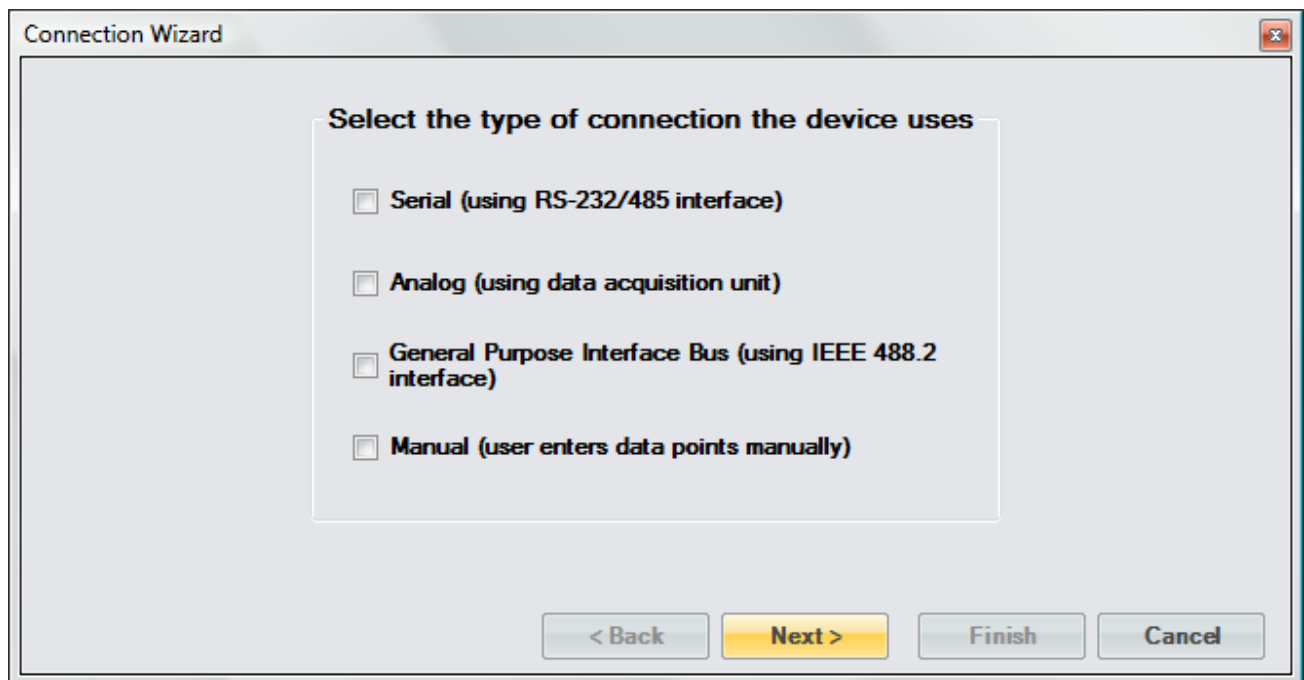


# Connections

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.



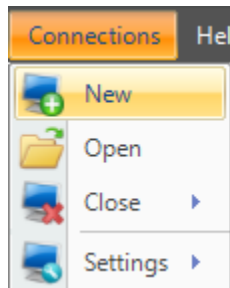
***Note:** It is always recommended to have the manufactures documentation for the device being connected handy while creating the new connection. It is also recommended to use a terminal based application to test the various commands before creating a new connection.*

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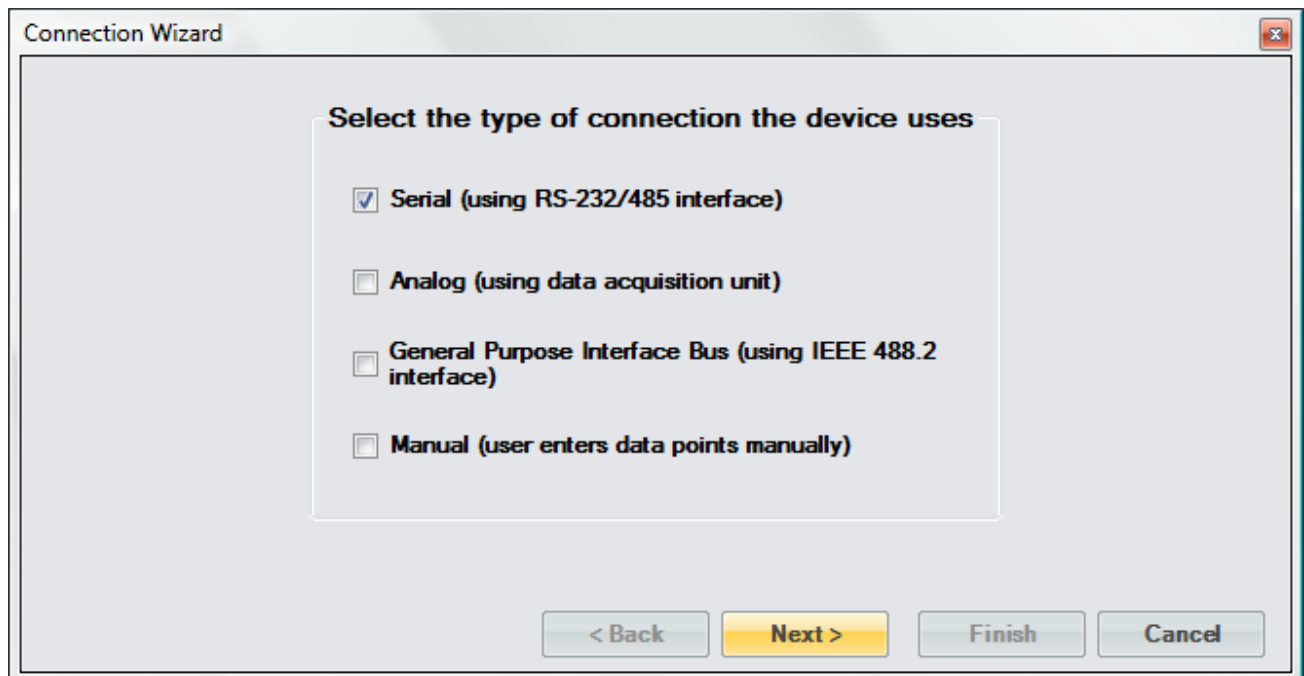
## Serial Connection

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 image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. 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' (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 image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. 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 these options is a detailed explanation: '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. 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.

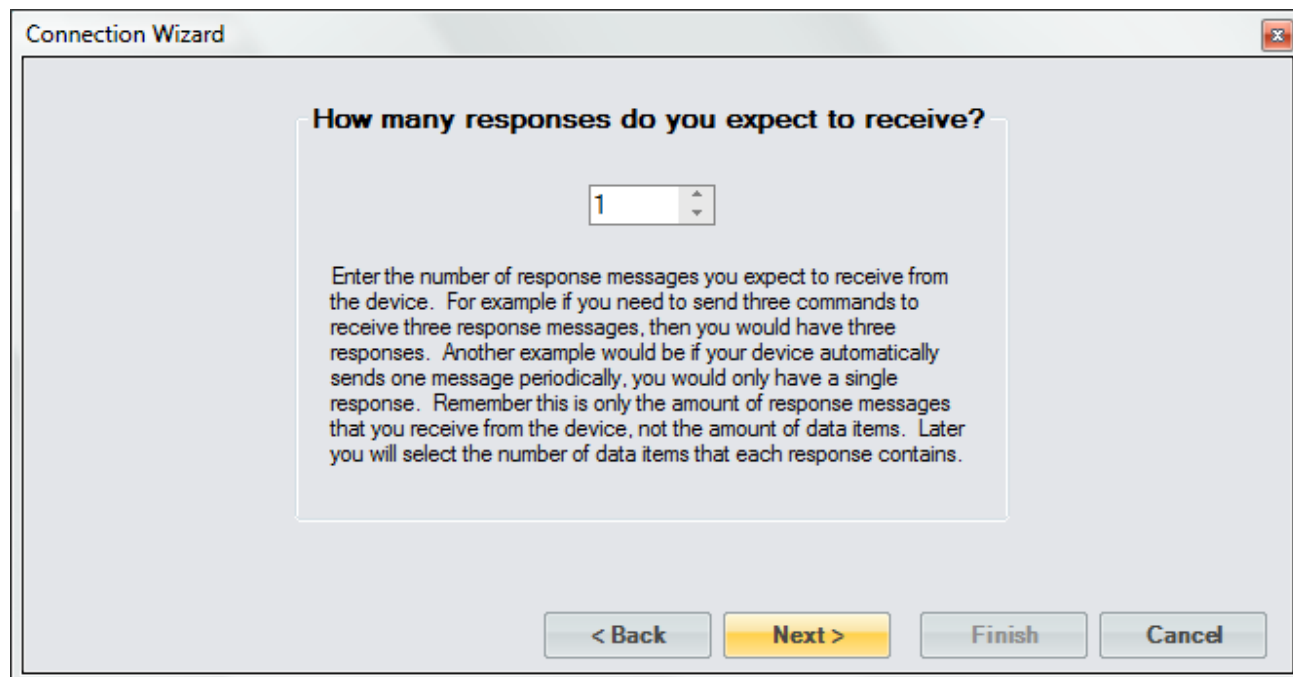
*Note: All setup commands are case sensitive.*

*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.*

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Setup Command or Commands to send" and contains a large text input field. Below the input field, there is instructional text: "Enter the ASCII setup command or commands that will be sent once at the start of communication. These are commands that are required to configure or setup 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".

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.



The dialog box is titled "Connection Wizard" and contains the question "How many responses do you expect to receive?". Below the question is a text input field with the number "1" and a small up/down arrow button. A detailed instruction block follows, explaining that the user should enter the number of response messages expected from the device, with examples for sending three commands or receiving one periodic message. At the bottom are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

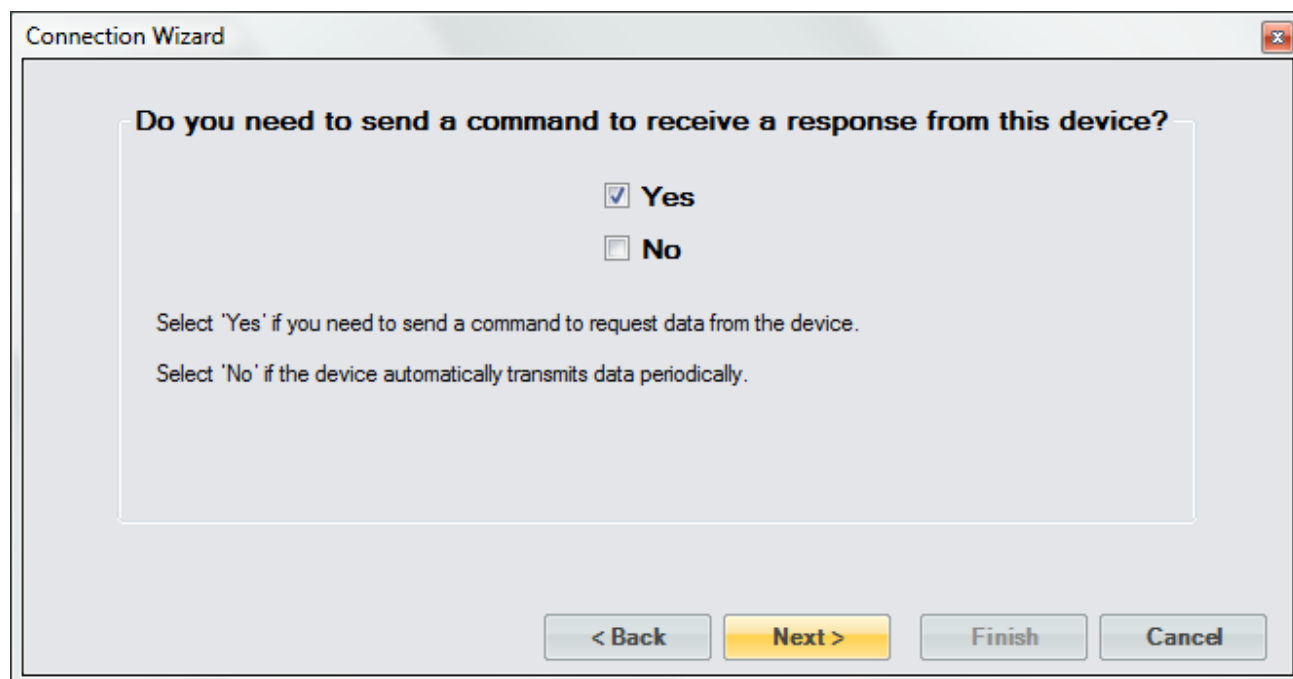
**How many responses do you expect to receive?**

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".



The dialog box is titled "Connection Wizard" and contains the question "Do you need to send a command to receive a response from this device?". Below the question are two radio button options: "Yes" (which is selected) and "No". A block of text provides instructions: "Select 'Yes' if you need to send a command to request data from the device." and "Select 'No' if the device automatically transmits data periodically." At the bottom are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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

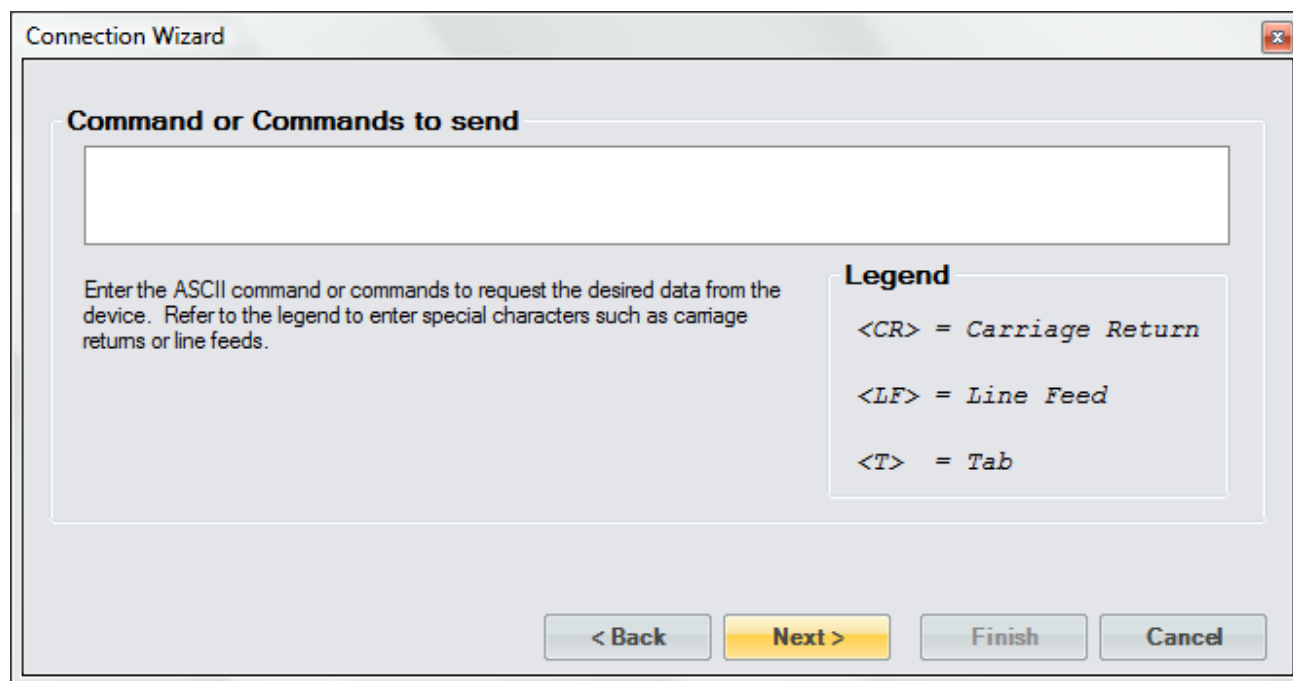
☒ Yes  
☐ No

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

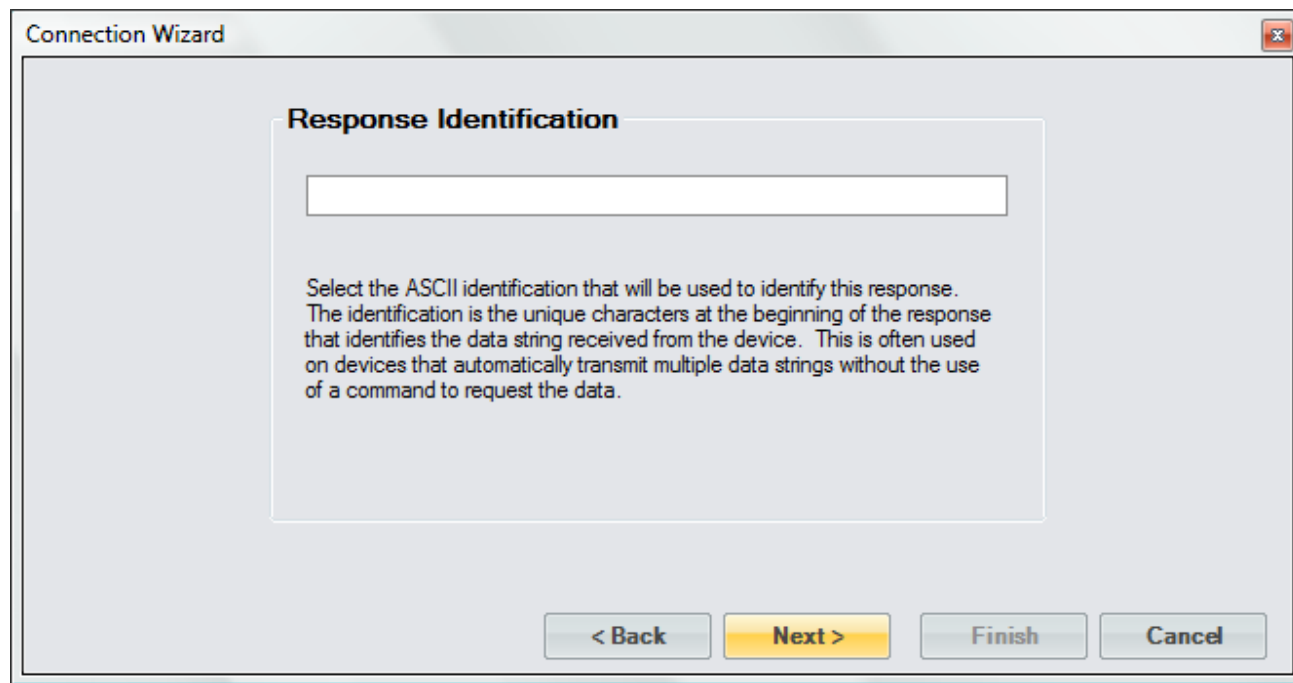
If a command was required then enter the ASCII Command or Commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All commands are case sensitive.*



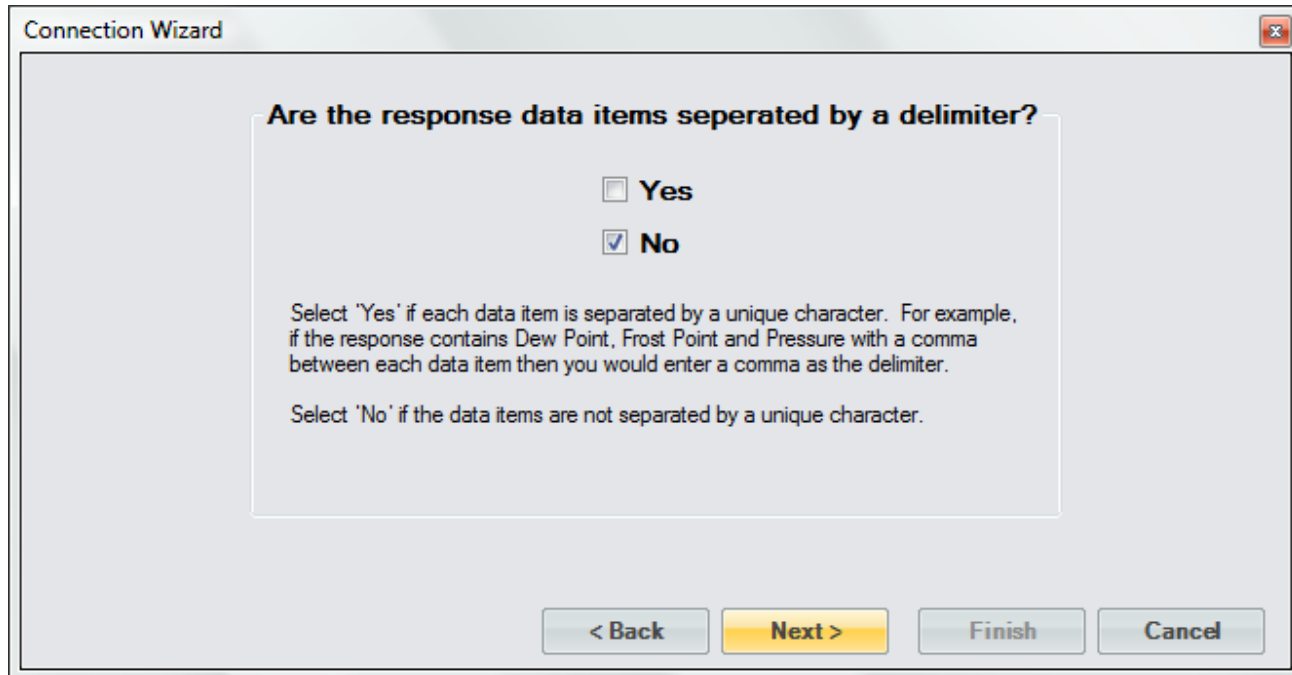
The screenshot shows the 'Connection Wizard' window with the title bar 'Connection Wizard' and a close button. The main area is titled 'Command or Commands to send' and contains a large text input field. Below the input field, there is instructional text: 'Enter the ASCII command or commands to request 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 the input field is a 'Legend' box containing the following entries: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom of the window 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.



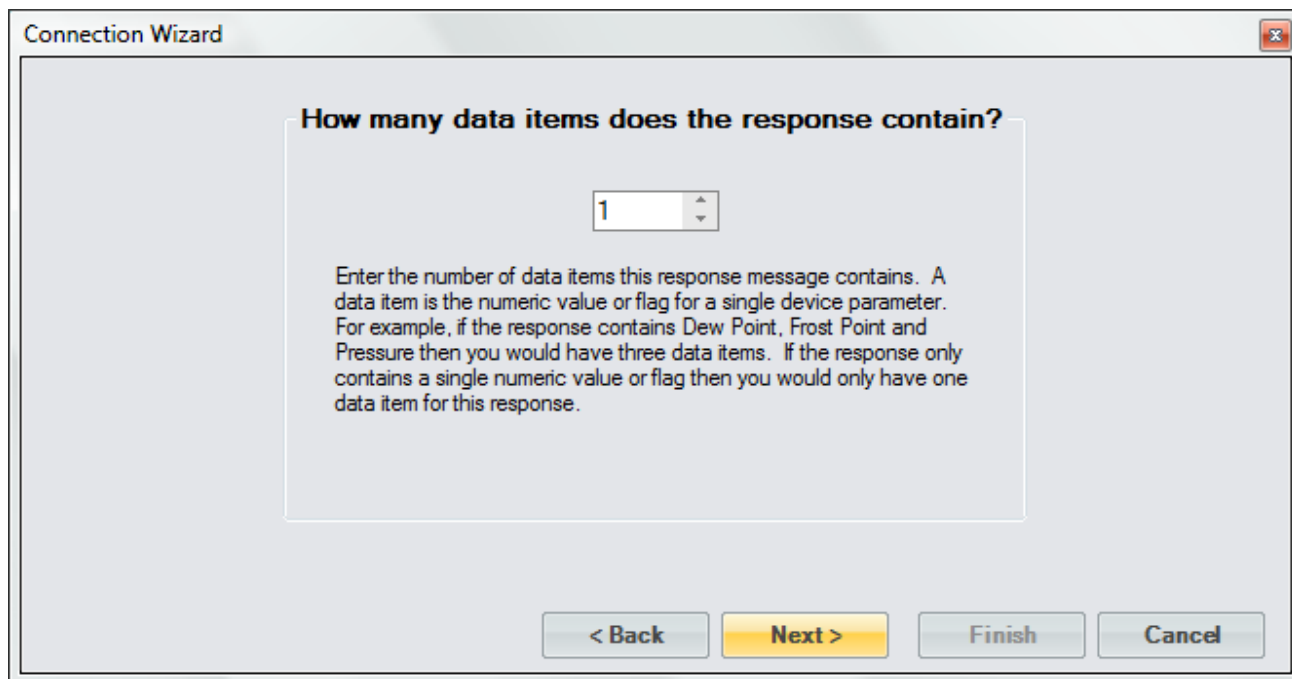
The screenshot shows the 'Connection Wizard' window with the title bar 'Connection Wizard' and a close button. The main area is titled 'Response Identification' and contains a text input field. Below the input field, there is instructional text: 'Select the ASCII identification that will be used to identify 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 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.



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main content area has a light gray background. At the top, the question 'Are the response data items separated by a delimiter?' is displayed in bold. Below this, there are two radio button options: 'Yes' (which is currently unselected) and 'No' (which is selected with a checkmark). A text box below the options provides instructions: 'Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.' and 'Select 'No' if the data items are not separated by a unique character.' At the bottom of the dialog, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

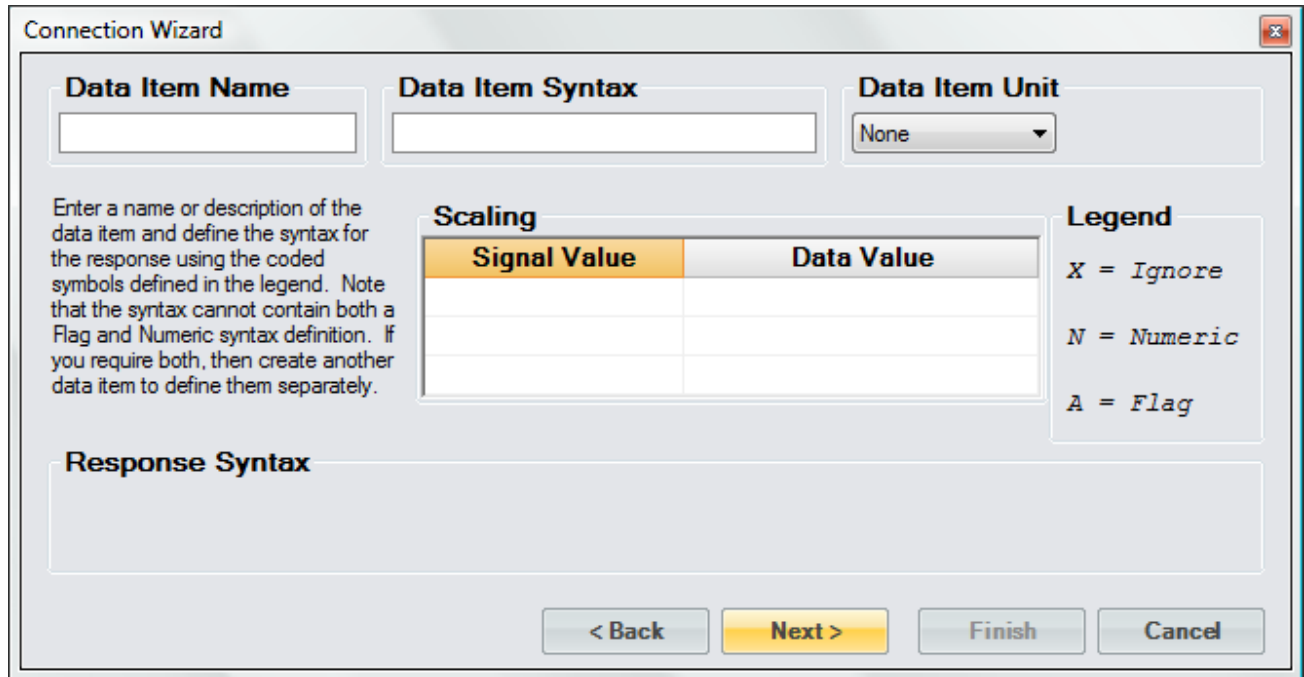
Enter the number of data items the response message contains. A data item is the numeric value or flag portion for a single device parameter within the response message. For example, if the response contains Dew Point, Frost Point and Pressure then you would have three data items. If the response only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



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main content area has a light gray background. At the top, the question 'How many data items does the response contain?' is displayed in bold. Below this, there is a spin box containing the number '1'. A text box below the spin box provides instructions: 'Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.' At the bottom of the dialog, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

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.*



The Connection Wizard dialog box is used to define a data item. It contains the following fields and sections:

- Data Item Name:** A text input field.
- Data Item Syntax:** A text input field.
- Data Item Unit:** A dropdown menu with "None" selected.
- Legend:** A list of symbols and their meanings:
  - X = Ignore
  - N = Numeric
  - A = Flag
- Scaling:** A table with two columns: Signal Value and Data Value.
- Response Syntax:** A large text area for defining the response syntax.
- Navigation Buttons:** < Back, Next >, Finish, and Cancel.

Signal Value	Data Value



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 responses 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. The 'Data Item Name' is 'Data Point', 'Data Item Syntax' is 'NNN.NNNN', and 'Data Item Unit' is 'None'. The 'Scaling' section contains a table with 'Signal Value' and 'Data Value' columns. The 'Response Syntax' is 'NNN.NNNN'. The 'Legend' shows 'X = Ignore', 'N = Numeric', and 'A = Flag'. Navigation buttons at the bottom include '< Back', 'Next >', 'Finish', and 'Cancel'.

Signal Value	Data Value
-1	-100
1	100

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 menu lists 'Temperature', 'Pressure', 'Enthalpy', 'Density', 'FlowRate', and 'None'. The 'Temperature' option is selected, and the unit is set to '°C'. The 'Scaling' table and 'Response Syntax' are the same as in the previous screenshot. The 'Legend' also remains the same. Navigation buttons at the bottom include '< Back', 'Next >', 'Finish', and 'Cancel'.

Signal Value	Data Value
-1	-100
1	100

In addition to reading a temperature, ControLog can compute a percent relative humidity (%RH) at the temperature. This is useful when compensating for temperature gradients within the chamber. To have ControLog automatically calculate the relative humidity at the temperature, simply select the corresponding checkbox. The newly calculated %RH will have the same name as the specified Data Item Name but will be preceded by “%RH@”. In the below example the calculated %RH will appear as “%RH@Data Point”.

**Connection Wizard**

**Data Item Name:** Data Point  
**Data Item Syntax:** NNN.NNNN  
**Data Item Unit:** Temperature °C

☒ **Also Calculate %RH at this Temperature**

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
-1	-100
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 Definitions**

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

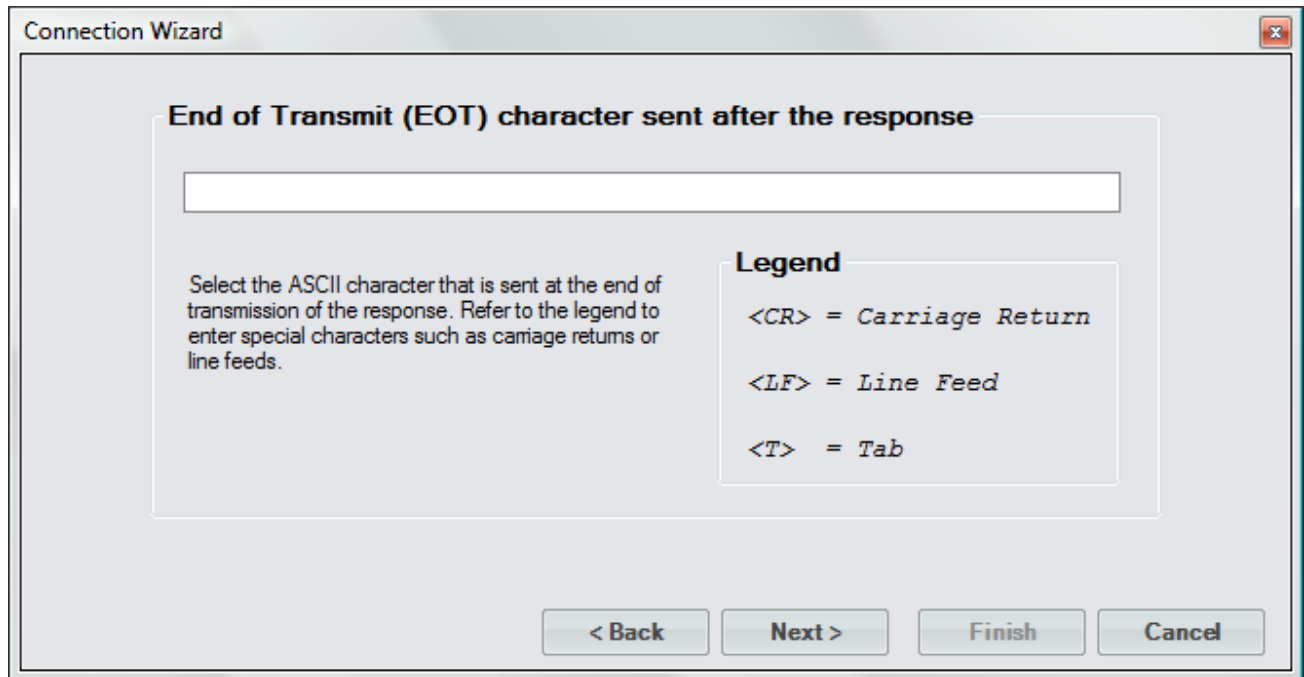
X = Ignore  
N = Numeric  
A = Flag

**Response Syntax**

XXXXA

< 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.



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area has a title 'End of Transmit (EOT) character sent after the response' above a text input field. Below the field is a legend box with the title 'Legend' and three entries: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

**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.



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area has a title 'Save Device Configuration as' above a text input field and a 'Browse' button. Below the field is the text 'Select the name and location to save this device configuration to.'. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

**Save Device Configuration as**

Select the name and location to save this device configuration to.

Browse

< Back   Next >   Finish   Cancel

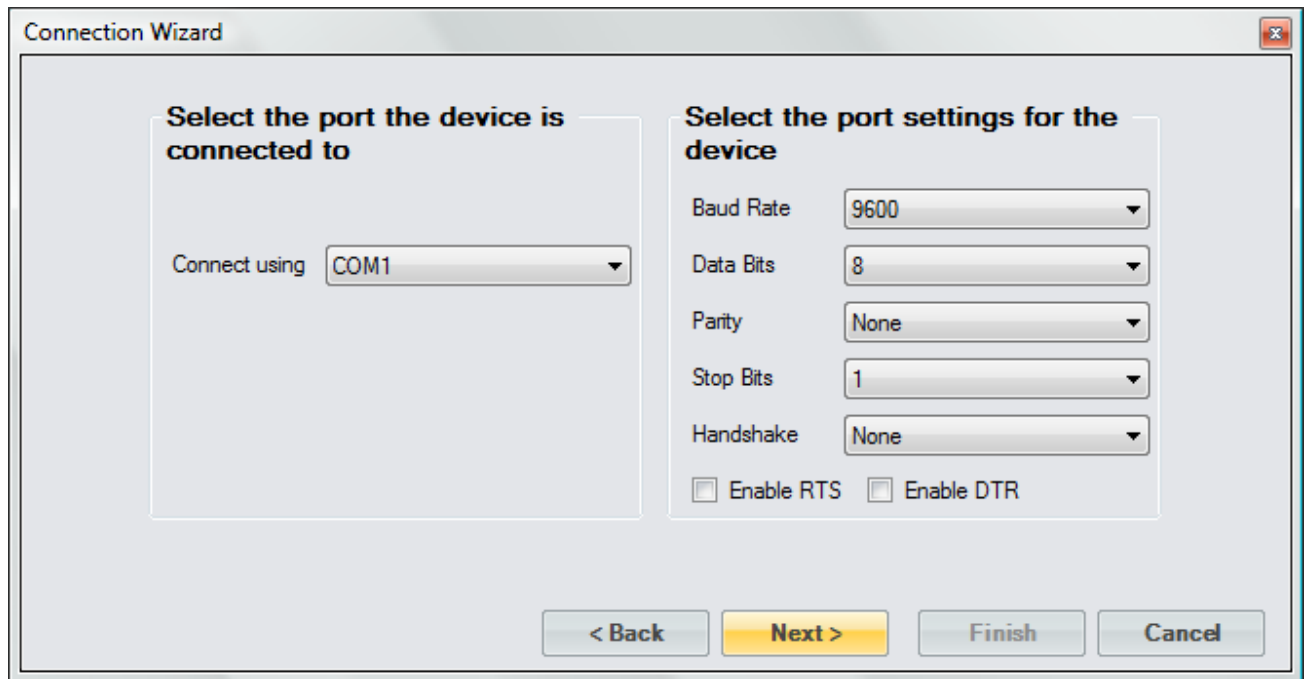
Next, the user can select whether to connect to the device now or to exit without connecting.

*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.*



The image shows a 'Connection Wizard' dialog box with a title bar and a close button. It is divided into two main sections. The left section, titled 'Select the port the device is connected to', contains a label 'Connect using' followed by a dropdown menu currently showing 'COM1'. The right section, titled 'Select the port settings for the device', contains five dropdown menus: 'Baud Rate' (9600), '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 dialog are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

Section	Setting	Value
Select the port the device is connected to	Connect using	COM1
Select the port settings for the device	Baud Rate	9600
	Data Bits	8
	Parity	None
	Stop Bits	1
	Handshake	None
	Enable RTS	<input type="checkbox"/>
	Enable DTR	<input type="checkbox"/>

< 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.*

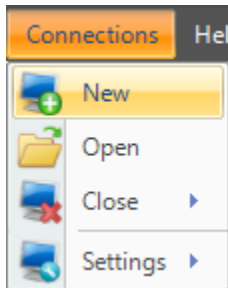


Select “Show Interface Console” to automatically open a Device Interface Console tab once communication has been established with the device.

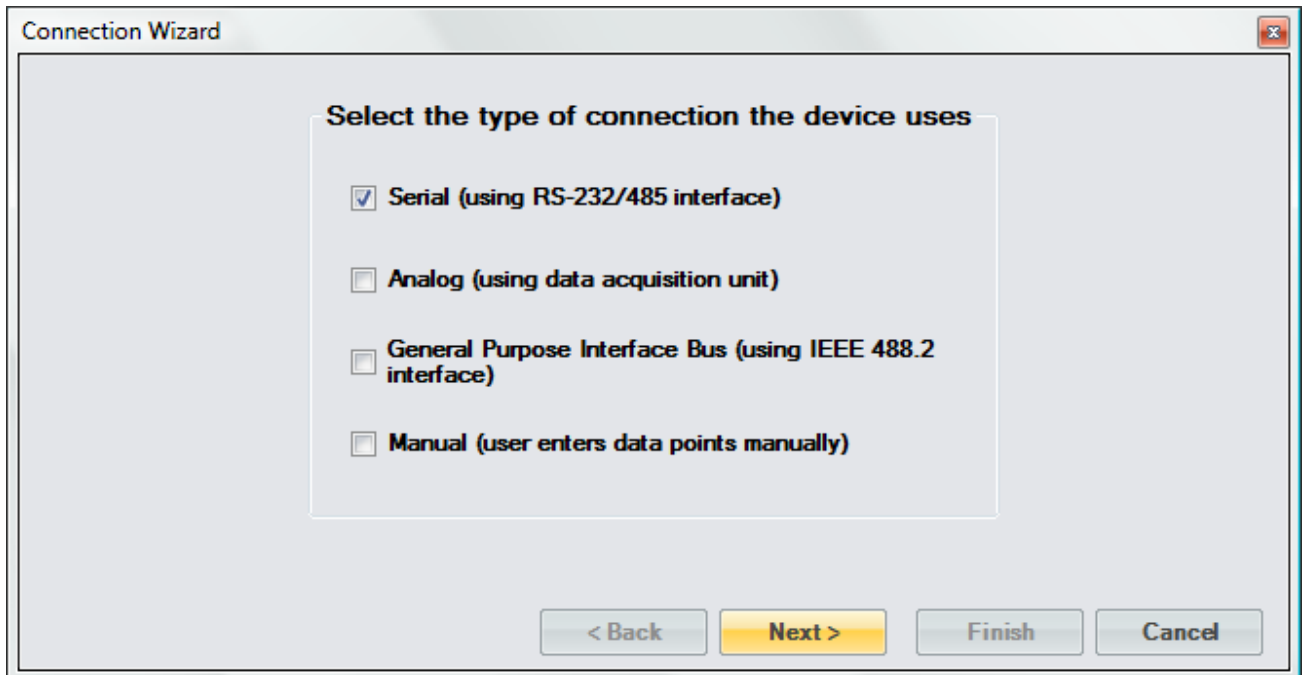
## Serial Connection Example 1

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.

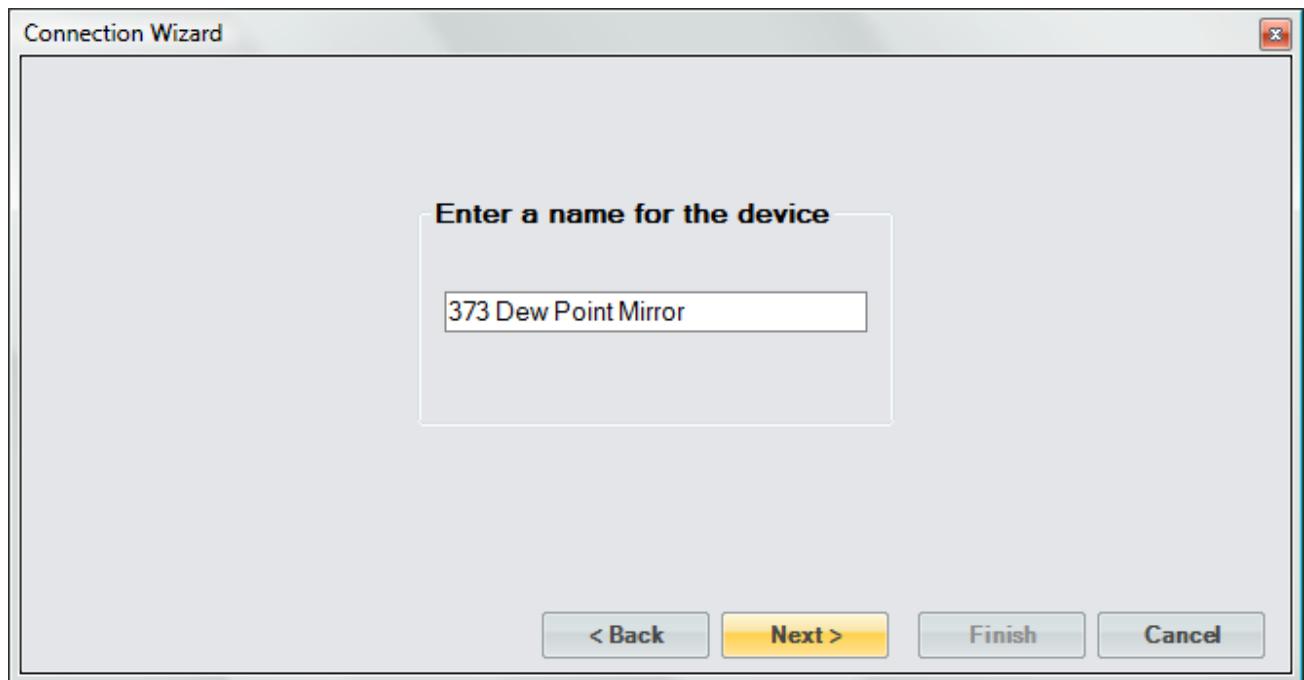


Select “Serial” as the type of device connection.





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



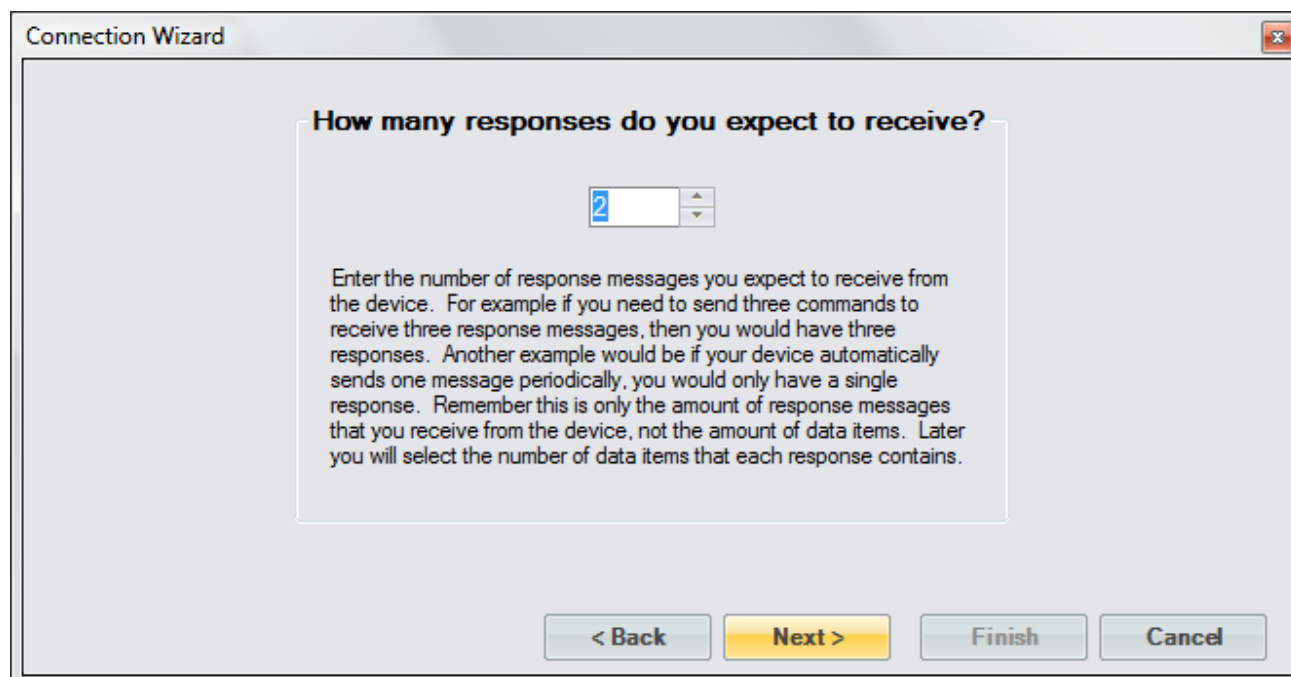
The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Enter a name for the device' and a text input field containing '373 Dew Point Mirror'. At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Do you need to send a setup command or commands to configure this device?'. Below the heading are two radio button options: 'Yes' (unselected) and 'No' (selected). 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. 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).

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



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main content area has a title 'How many responses do you expect to receive?' and a spin box with the value '2'. Below the spin box is a paragraph of text explaining the purpose of the input. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

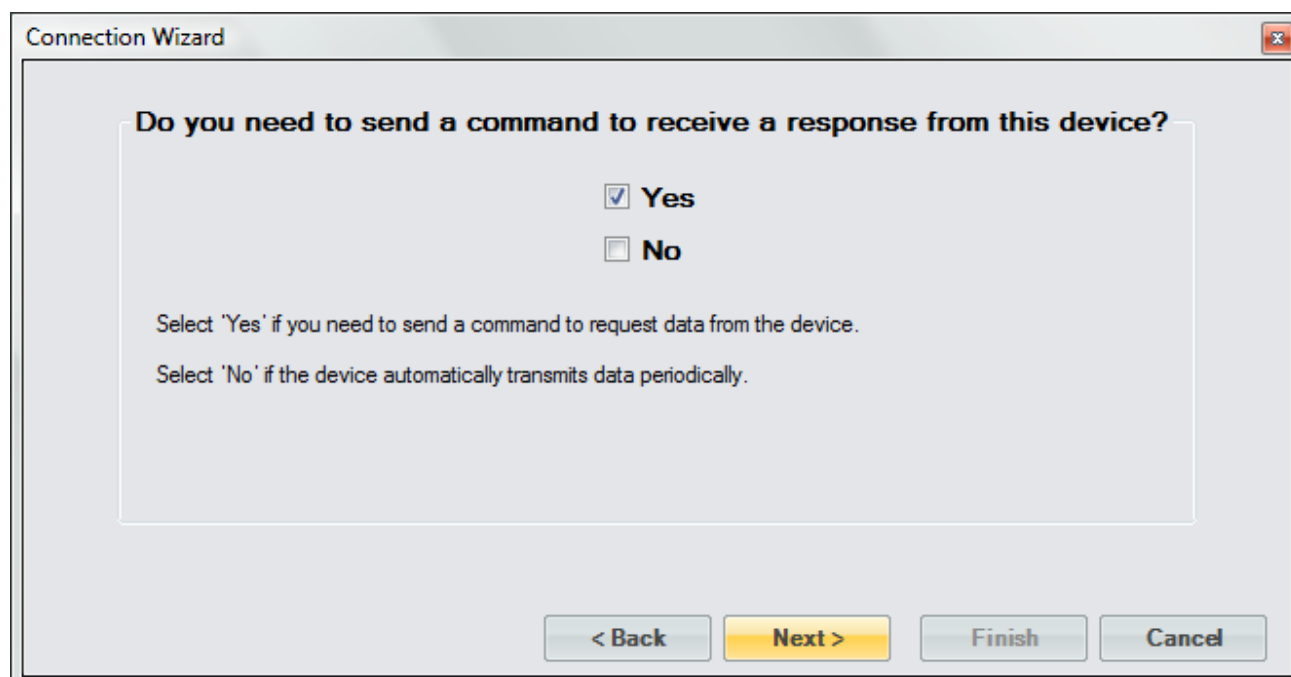
**How many responses do you expect to receive?**

2

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

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



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main content area has a title 'Do you need to send a command to receive a response from this device?' and two radio button options: 'Yes' (selected) and 'No'. Below the options is a paragraph of text explaining the choices. At the bottom are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

**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

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 screenshot shows the 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area is titled 'Command or Commands to send'. Below this title is a text input field containing 'FP?<CR>'. Below the input field is a legend box with the following text: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom of the dialog are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

**Command or Commands to send**

FP?<CR>

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.

**Legend**

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

< Back   Next >   Finish   Cancel

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

The screenshot shows the 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area is titled 'Are the response data items separated by a delimiter?'. Below this title are two radio button options: 'Yes' (unchecked) and 'No' (checked). Below the options is a text box with the following text: 'Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter. Select 'No' if the data items are not separated by a unique character.' At the bottom of the dialog are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

**Are the response data items separated by a delimiter?**

☐ Yes

☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

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

**Connection Wizard**

**How many data items does the response contain?**

1

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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.

**Connection Wizard**

**Data Item Name:** FrostPoint

**Data Item Syntax:** NNNNNNNNNNNNNNNNN

**Data Item Unit:** Temperature °C

☐ Also Calculate %RH at this Temperature

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**

NNNNNNNNNNNNNNNN

< Back   Next >   Finish   Cancel

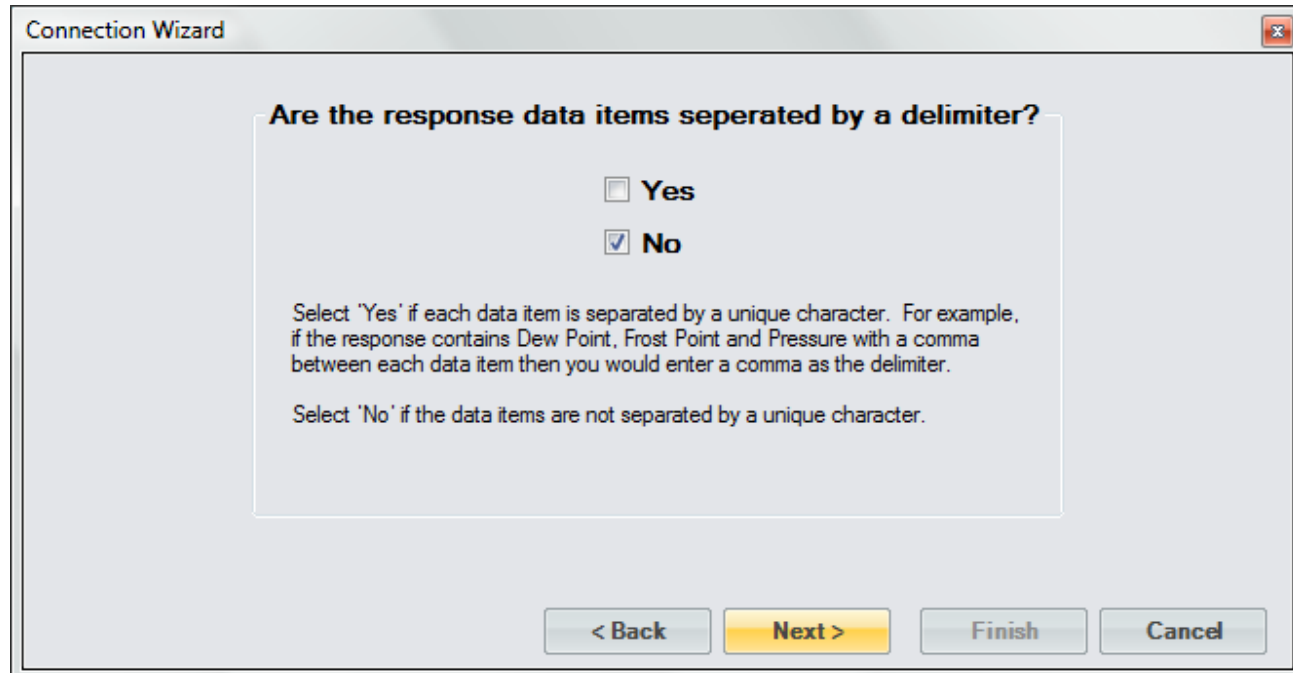
According to the 373 documentation, each response is terminated with a carriage return and line feed.

The dialog box is titled "Connection Wizard" and has a close button in the top right corner. The main heading is "End of Transmit (EOT) character sent after the response". Below this heading is a text input field containing the characters "<CR><LF>". To the left of the input field is a paragraph of text: "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 of the input field is a "Legend" box containing the following text: "<CR> = Carriage Return", "<LF> = Line Feed", and "<T> = Tab". At the bottom of the dialog box are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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 dialog box is titled "Connection Wizard" and has a close button in the top right corner. The main heading is "Command or Commands to send". Below this heading is a text input field containing the characters "Pa?<CR>". To the left of the input field 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 the input field is a "Legend" box containing the following text: "<CR> = Carriage Return", "<LF> = Line Feed", and "<T> = Tab". At the bottom of the dialog box are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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



Connection Wizard

**Are the response data items separated by a delimiter?**

☐ Yes

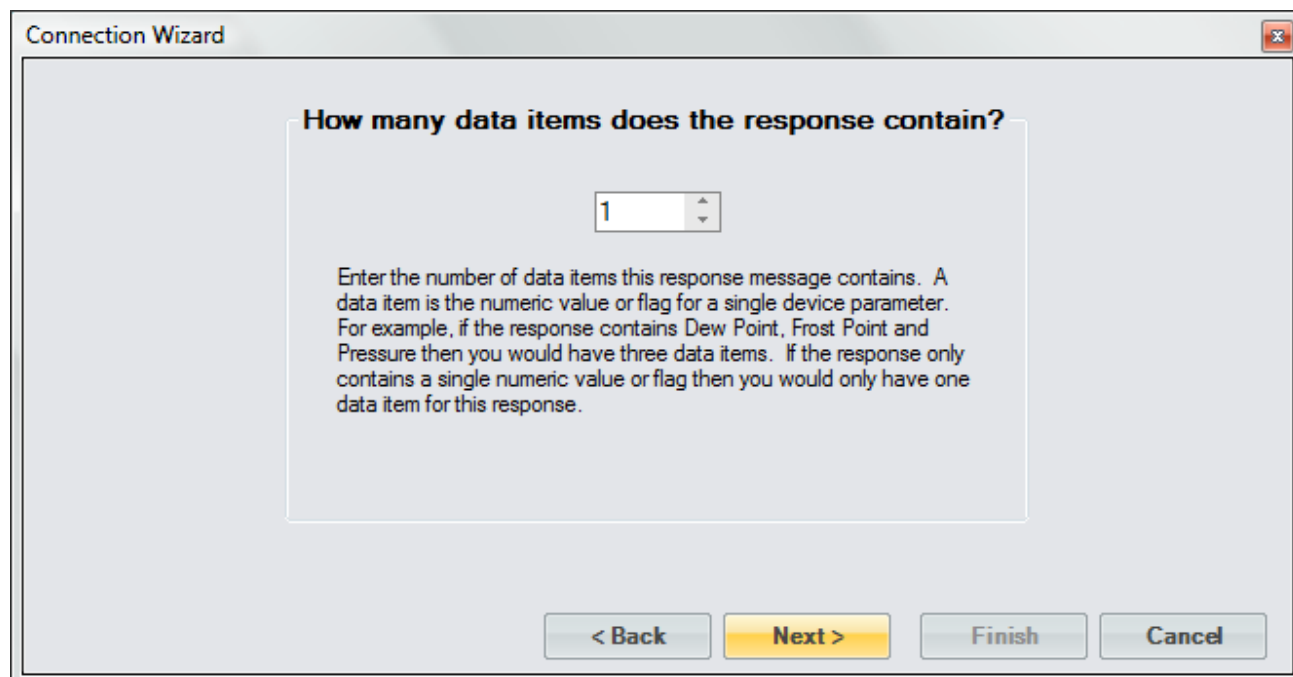
☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

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



Connection Wizard

**How many data items does the response contain?**

1

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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.

**Connection Wizard**

**Data Item Name:** Pressure

**Data Item Syntax:** NNNNNNNNNNNNNNNNN

**Data Item Unit:** Pressure (dropdown), Pa (dropdown)

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**

NNNNNNNNNNNNNNNN

< Back   Next >   Finish   Cancel

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

**Connection Wizard**

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

<CR><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 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 Connection Wizard dialog box is shown with the following settings:

- Select the port the device is connected to:**
  - Connect using: COM1 (selected from a dropdown menu showing COM1, COM2 (in use), COM3, COM4, and COM5)
- Select the port settings for the device:**
  - Baud Rate: 9600
  - Data Bits: 8
  - Parity: None
  - Stop Bits: 1
  - Handshake: None
  - ☐ Enable RTS ☐ Enable DTR

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

The default access interval of 1.5 seconds is entered.

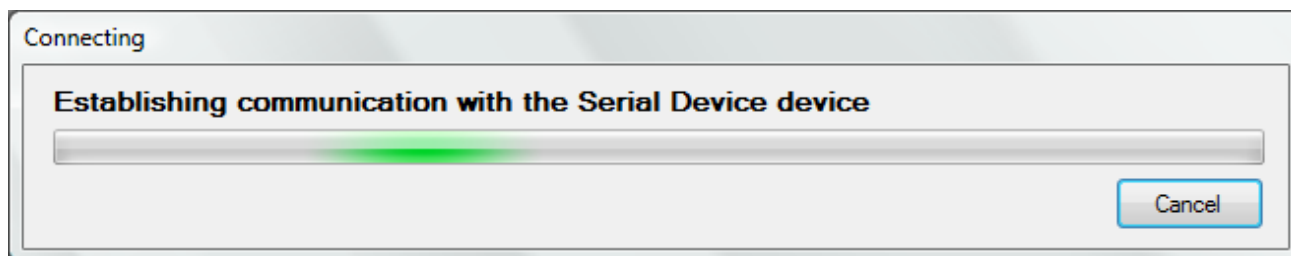
The Connection Wizard dialog box is shown with the following settings:

- Access interval to the device:**
  - Value: 1.5 (in a text box with a spinner)
  - Unit: seconds (in a dropdown menu)

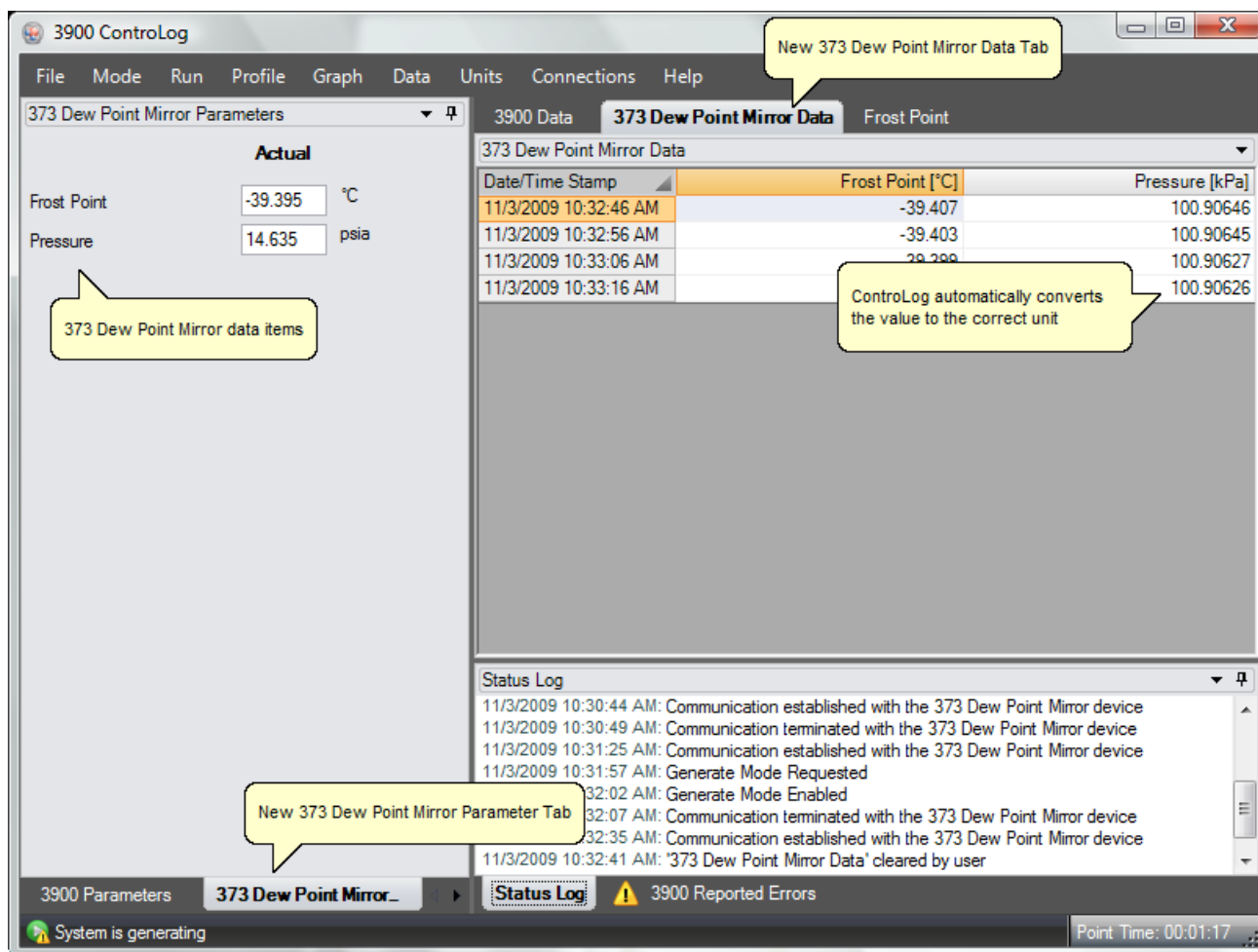
Below the input fields, the text reads: "This is the rate at which ControLog will communicate with the device."

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

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



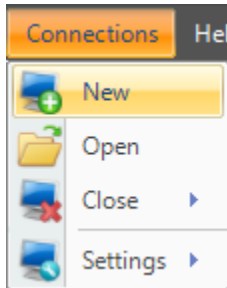
Once communication is successfully established with the 373, a new parameter tab and data tab will be created. Note that both the parameter tab and data tab have the two data items we defined. Notice that since we defined what unit the data items were received in, ControlLog is able to convert the values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



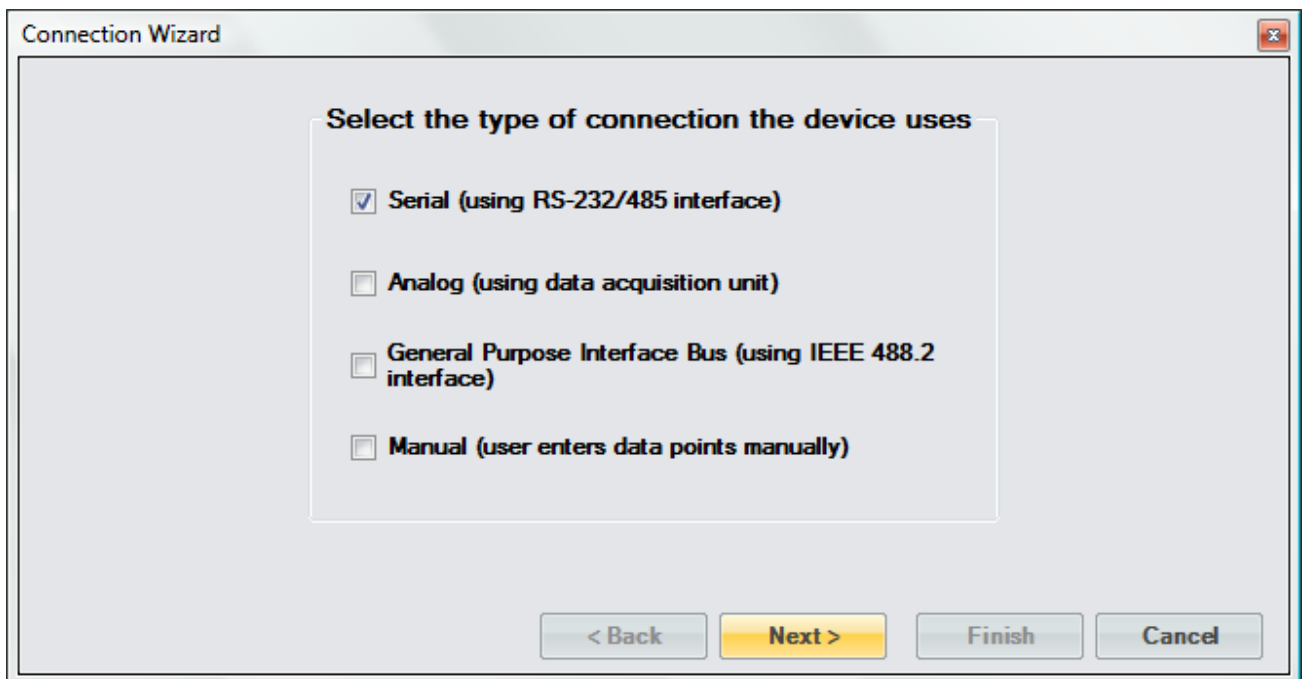
## Serial Connection Example 2

This example will demonstrate the creation of a serial connection to an MBW® 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.

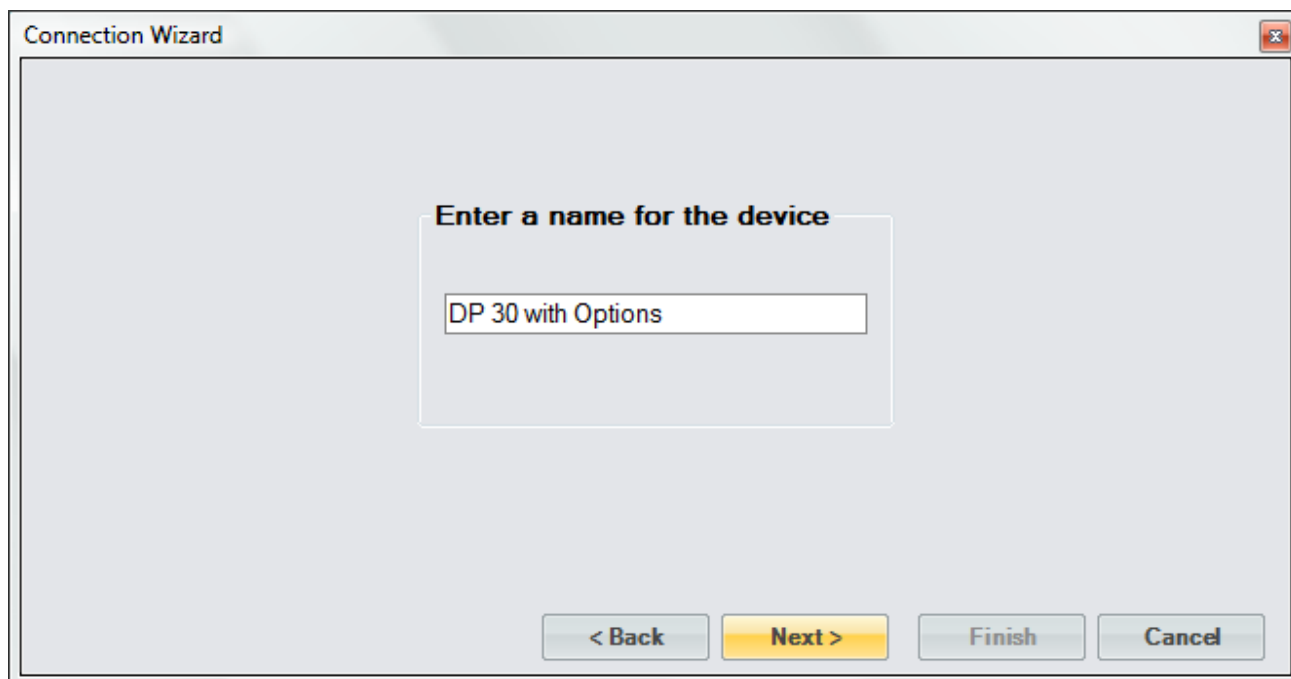
Start by selecting “New” from the Connections menu.



Select “Serial” as the type of device connection.



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



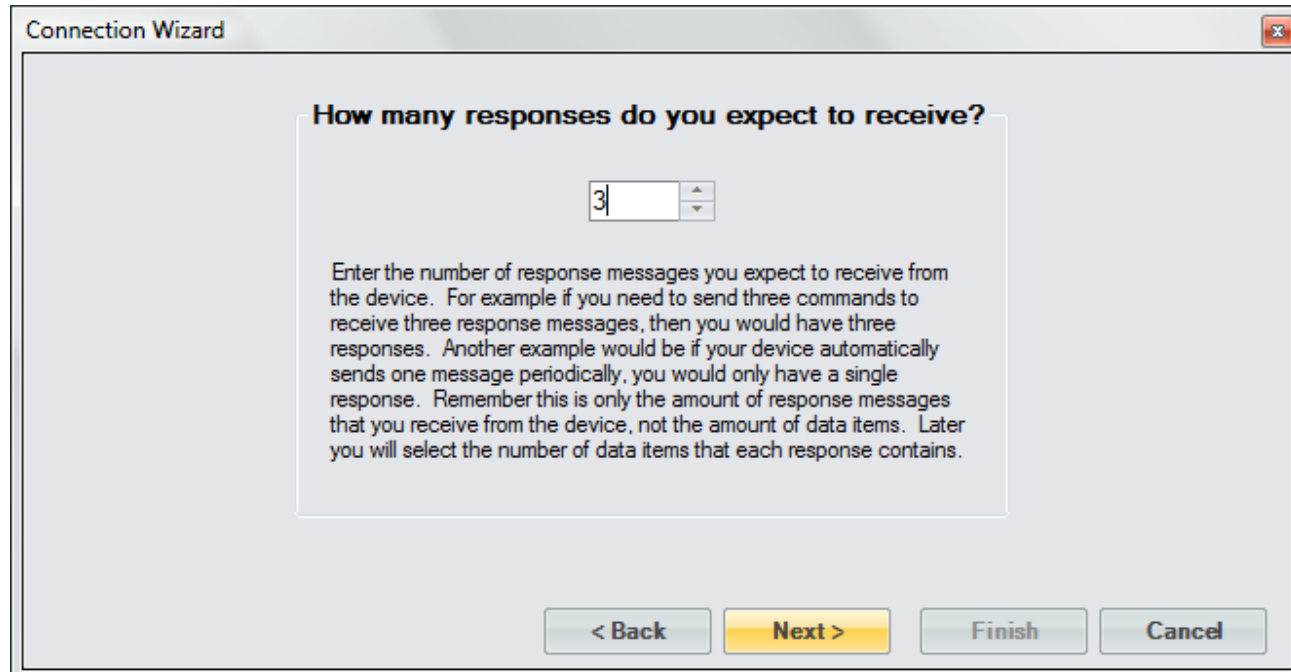
The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Enter a name for the device' and a text input field containing 'DP 30 with Options'. At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Do you need to send a setup command or commands to configure this device?'. Below this are two radio button options: 'Yes' (unselected) and 'No' (selected). 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. 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).

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 dialog box is titled "Connection Wizard" and contains the question "How many responses do you expect to receive?". Below the question is a text input field containing the number "3". A detailed instruction paragraph explains that the user should enter the number of response messages expected from the device, providing examples for three commands and periodic responses. At the bottom, there are four buttons: "< Back", "Next >", "Finish", and "Cancel".

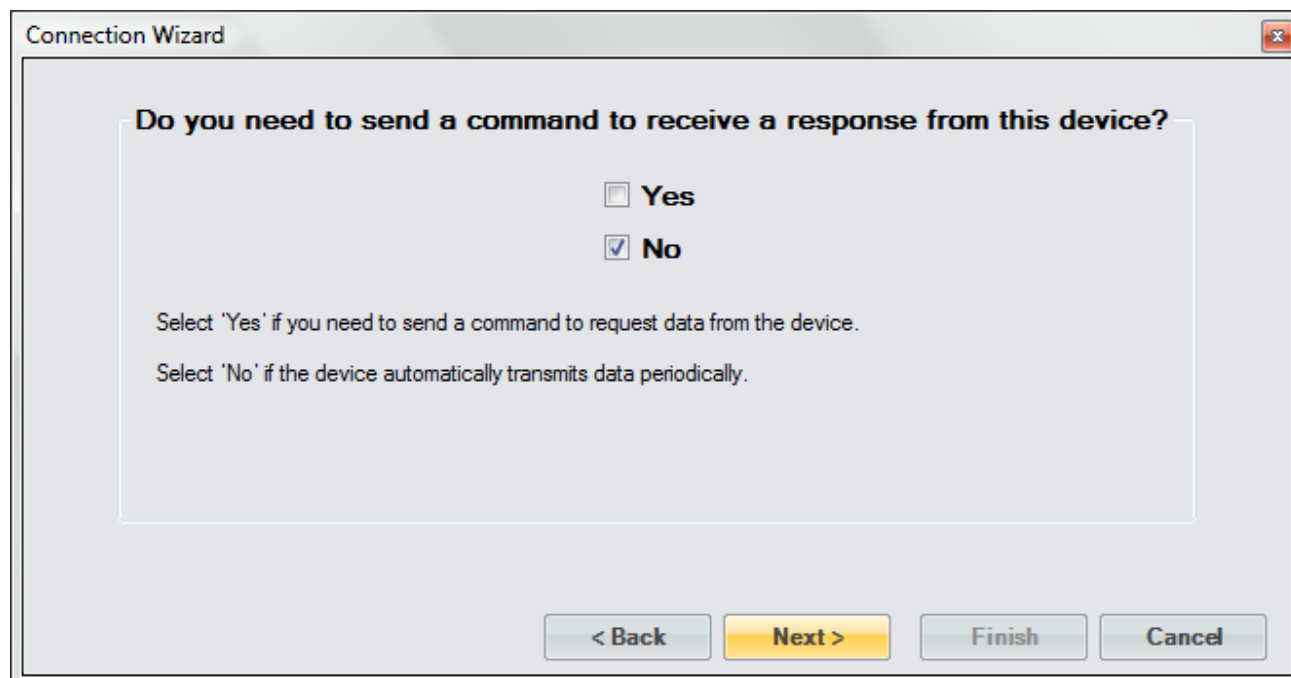
**How many responses do you expect to receive?**

3

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

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



The dialog box is titled "Connection Wizard" and contains the question "Do you need to send a command to receive a response from this device?". Below the question are two radio button options: "Yes" (unchecked) and "No" (checked). A detailed instruction paragraph explains that "Yes" is for devices requiring a command to request data, while "No" is for devices that transmit data periodically. At the bottom, there are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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

☐ Yes

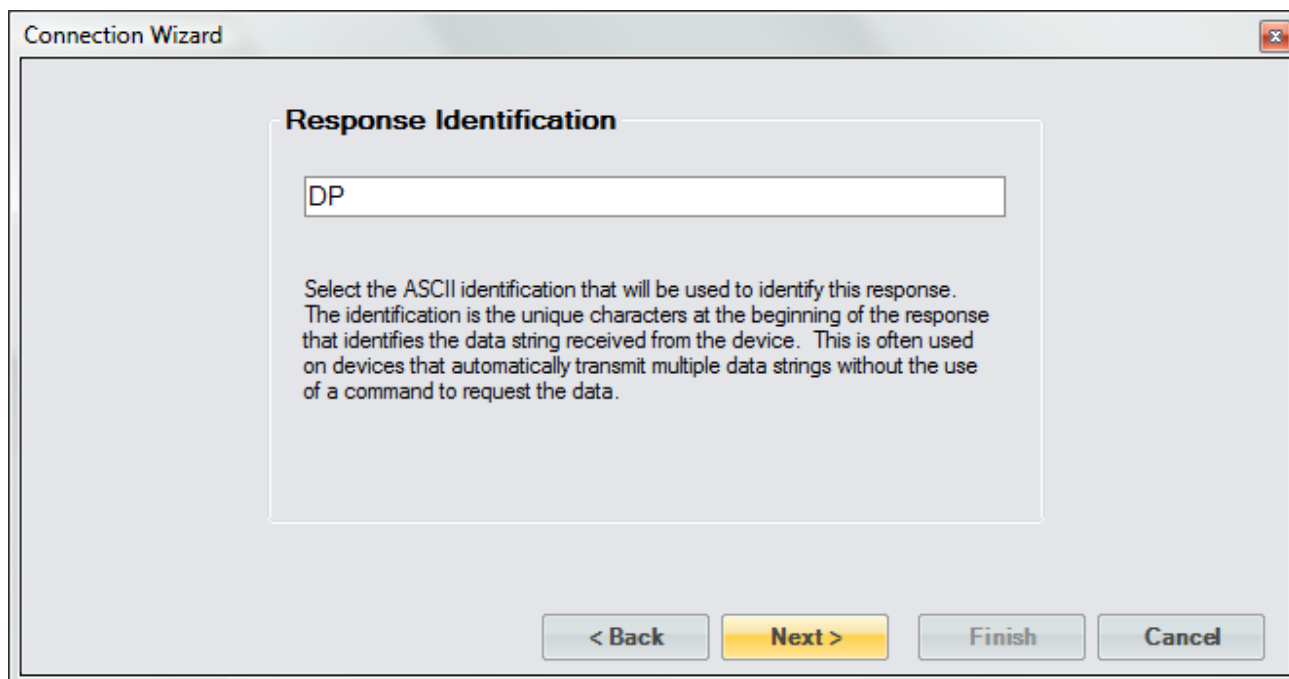
☒ No

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

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



The screenshot shows the 'Response Identification' step of the Connection Wizard. A text box contains the characters 'DP'. Below the text box, there is explanatory text about ASCII identification. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

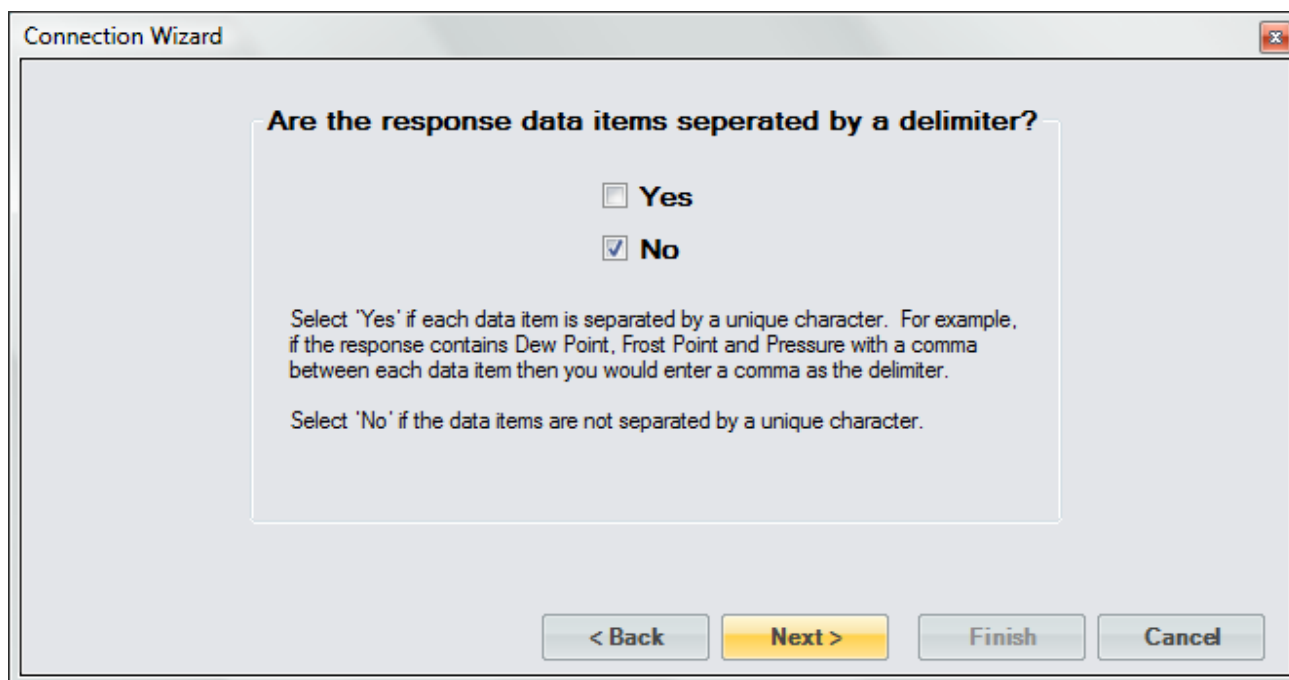
**Response Identification**

DP

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.

< Back   Next >   Finish   Cancel

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



The screenshot shows the 'Are the response data items separated by a delimiter?' step of the Connection Wizard. There are two radio button options: 'Yes' (unchecked) and 'No' (checked). Below the options, there is explanatory text about when to select 'Yes' or 'No'. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

**Are the response data items separated by a delimiter?**

☐ Yes

☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

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

**How many data items does the response contain?**

4

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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.

**Data Item Name**  
Balanced

**Data Item Syntax**  
AXX

**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
B	1	Yes

**Legend**  
*X = Ignore*  
*N = Numeric*  
*A = Flag*

**Response Syntax**  
 DPAXX

< Back   Next >   Finish   Cancel

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 “R” 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 Definitions**

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 Definitions**

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

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

**Response Syntax**

DPAXXA

< Back   Next >   Finish   Cancel



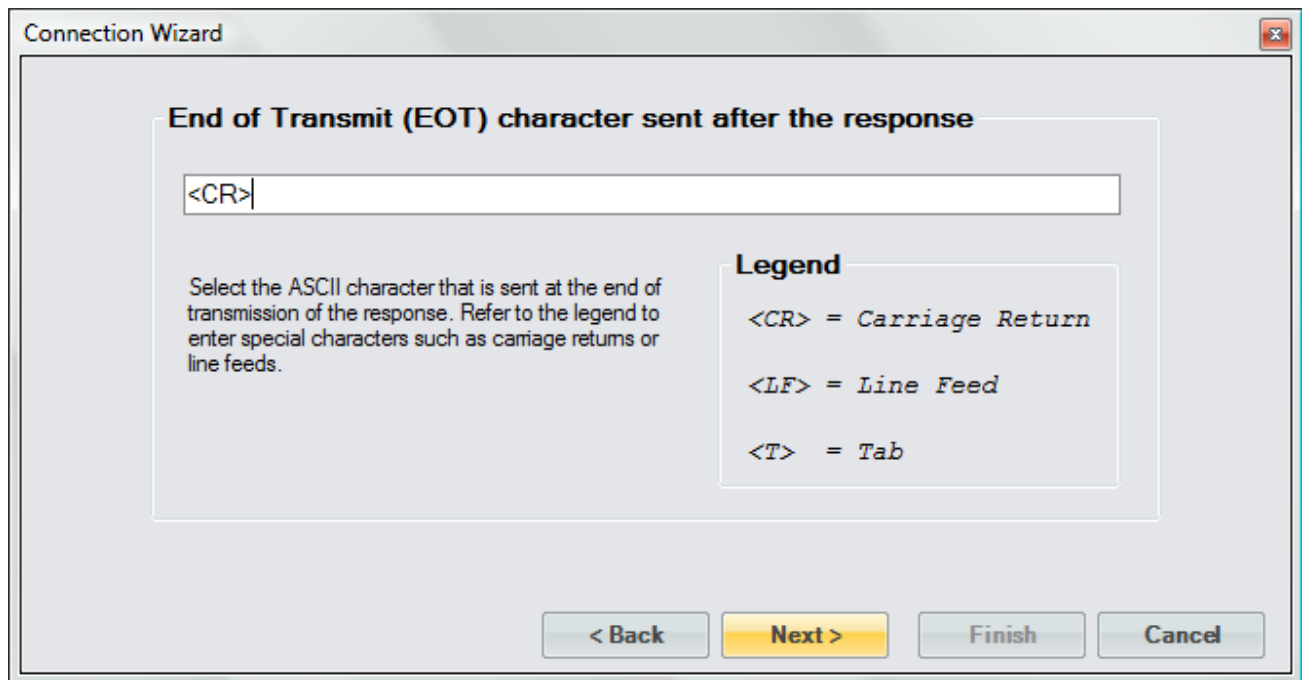
The fourth data item is the dew point temperature value. The DP-30 will send a numeric value indicating the dew point temperature in degrees Celsius. We define the syntax exactly as the DP-30 documentation specifies. The response value is the actual value so there is no need to define any type of scaling.

The screenshot shows the 'Connection Wizard' dialog box. It has three main input fields at the top: 'Data Item Name' with the value 'Dew Point', 'Data Item Syntax' with the value '+NNN.NN', and 'Data Item Unit' with a dropdown menu showing 'Temperature' and '°C'. Below these is a checkbox labeled 'Also Calculate %RH at this Temperature' which is unchecked. To the left of the 'Scaling' table is a text box 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' table has two columns: 'Signal Value' and 'Data Value', with three empty rows. To the right of the table is a 'Legend' box with the following text: 'X = Ignore', 'N = Numeric', and 'A = Flag'. Below the scaling table is a 'Response Syntax' field containing the text 'DPAXXAA+NNN.NN', where the '+NNN.NN' portion is highlighted in green. At the bottom of the dialog are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

Notice that ControLog 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 Green portion of the syntax is the current data item's syntax within the response message.

This is a close-up of the 'Response Syntax' field from the previous screenshot. It shows the text 'DPAXXAA+NNN.NN' with the '+NNN.NN' portion highlighted in green.

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



The screenshot shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'End of Transmit (EOT) character sent after the response'. Below this heading is a text input field containing '<CR>'. To the right of the input field is a 'Legend' box containing the following text: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. Below the input field and legend is a paragraph of text: '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.' At the bottom of the dialog are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

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

<CR>

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**

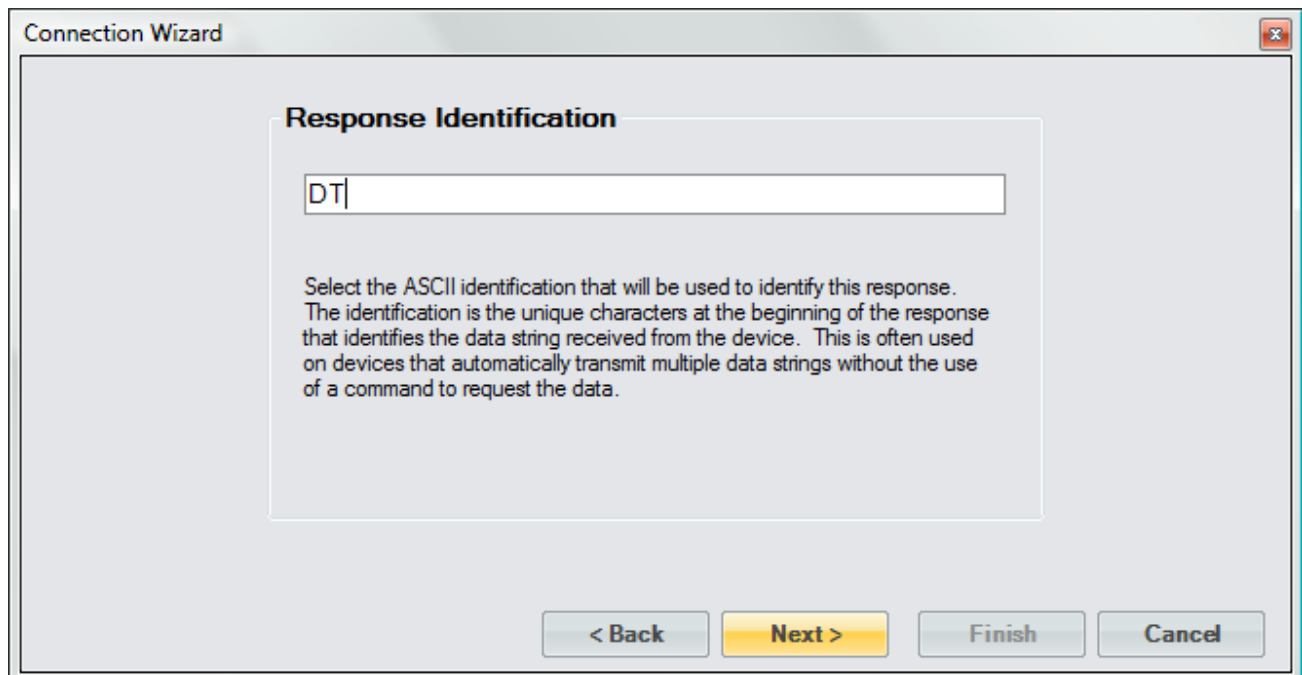
<CR> = Carriage Return

<LF> = Line Feed

<T> = Tab

< Back   Next >   Finish   Cancel

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 screenshot shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Response Identification'. Below this heading is a text input field containing 'DT'. Below the input field 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 dialog are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

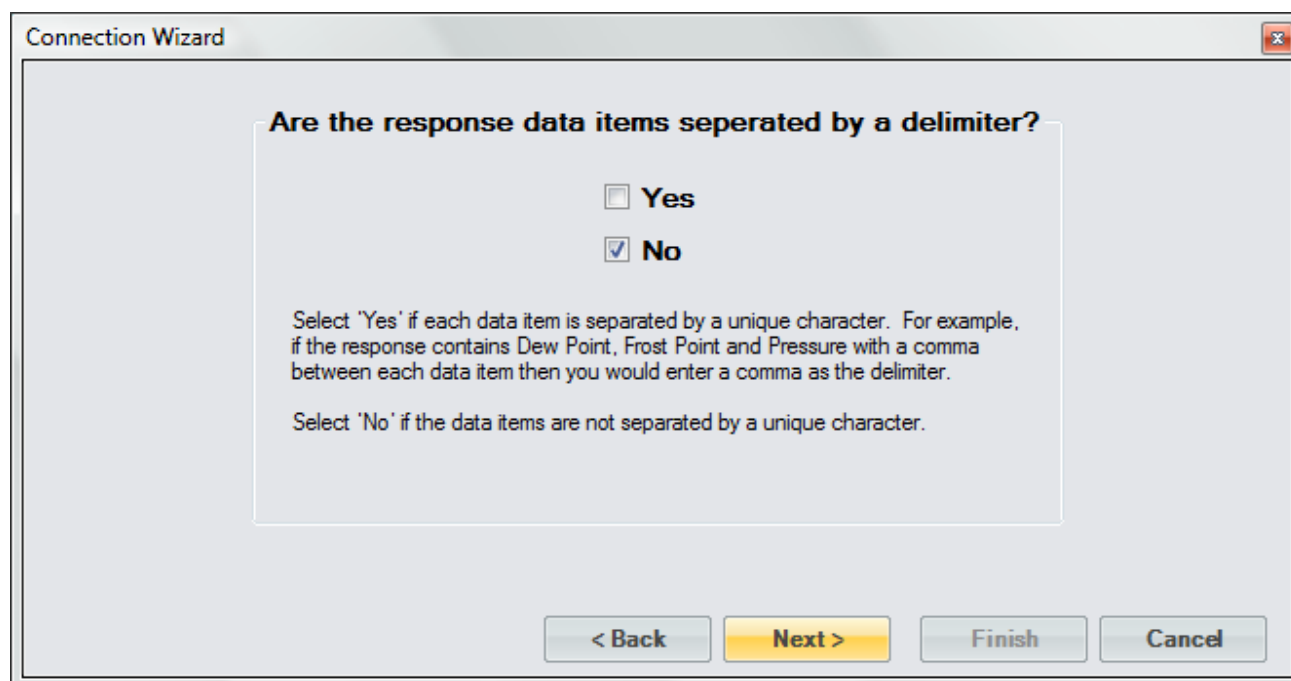
**Response Identification**

DT

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.

< Back   Next >   Finish   Cancel

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



Connection Wizard

**Are the response data items separated by a delimiter?**

☐ Yes

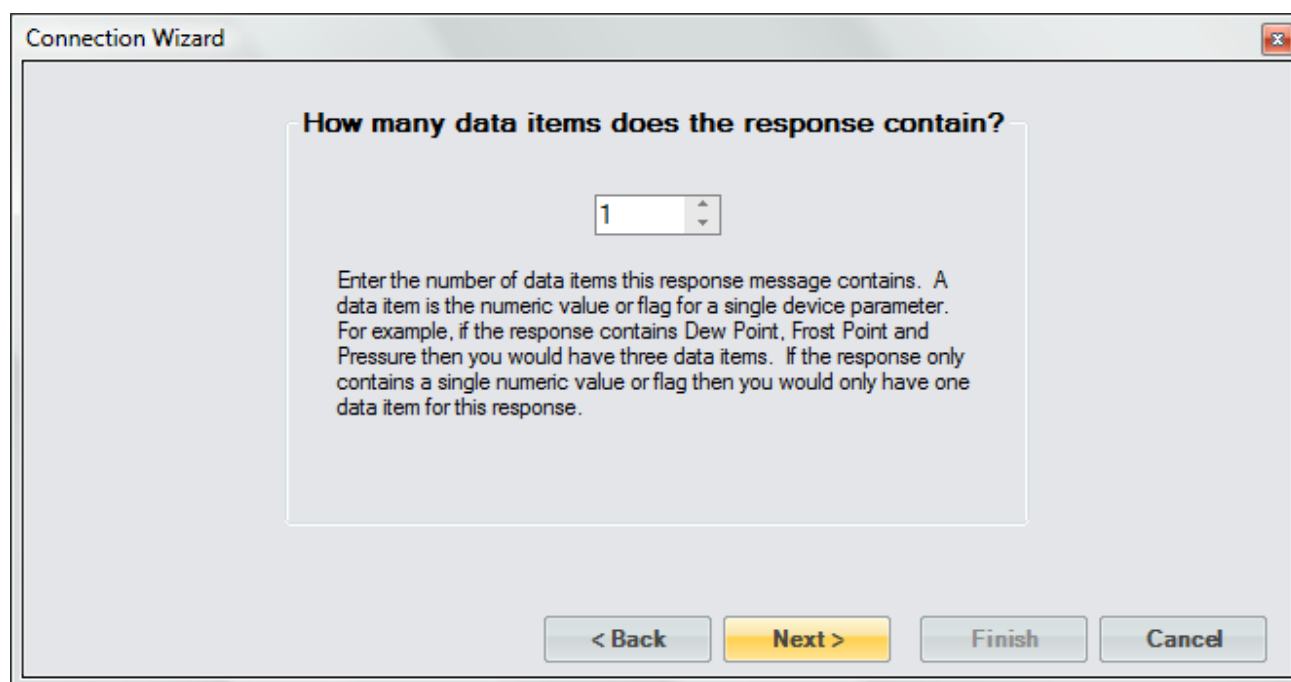
☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

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



Connection Wizard

**How many data items does the response contain?**

1

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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.

**Connection Wizard**

**Data Item Name:** Temperature

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

**Data Item Unit:** Temperature °C

☐ Also Calculate %RH at this Temperature

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**

DTXXXXX+NNN.NN

< Back   Next >   Finish   Cancel

The Dry Temperature message is terminated with a carriage return.

**Connection Wizard**

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

<CR>

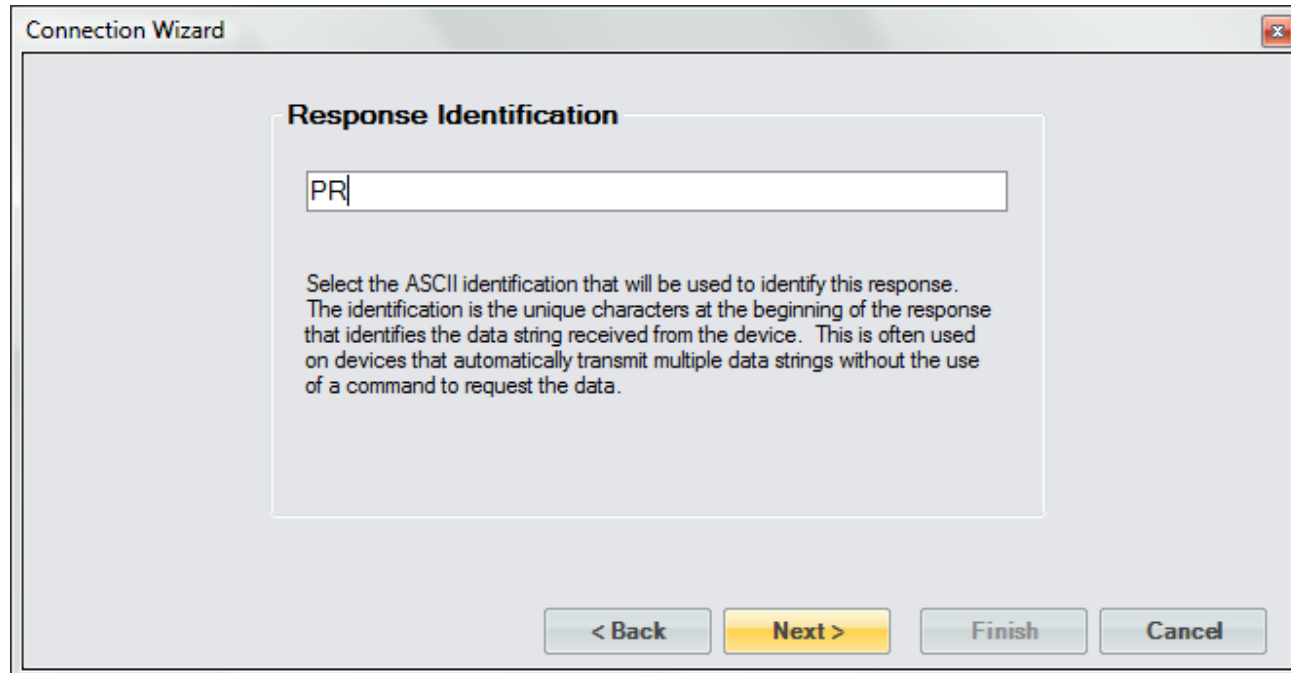
Select the ASCII character that is sent at the end of transmission of the response. Refer to the legend to enter special characters such as carriage returns or line feeds.

**Legend**

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

< Back   Next >   Finish   Cancel

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 image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area is titled 'Response Identification'. It features a text input field containing 'PR'. Below the field 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, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

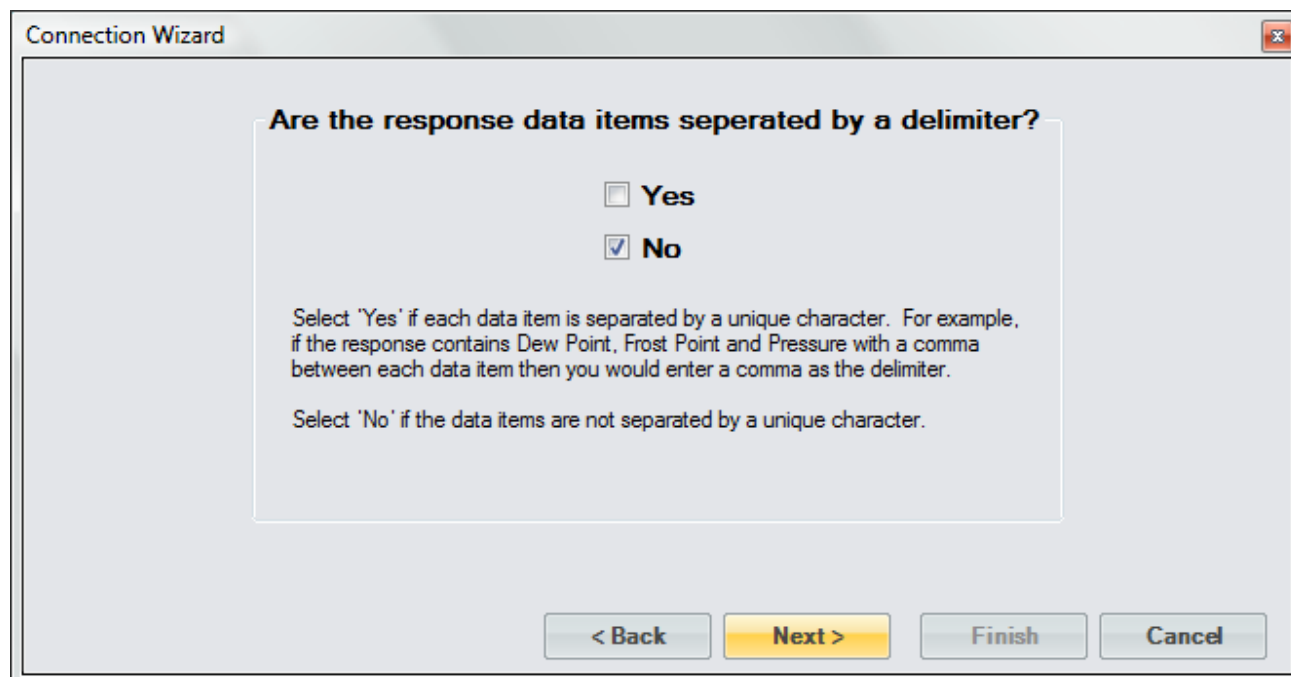
**Response Identification**

PR

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.

< Back   Next >   Finish   Cancel

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



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area is titled 'Are the response data items separated by a delimiter?'. It contains two radio button options: 'Yes' (unchecked) and 'No' (checked). Below these is a paragraph of text: 'Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.' followed by another paragraph: 'Select 'No' if the data items are not separated by a unique character.' At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

**Are the response data items separated by a delimiter?**

☐ Yes

☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

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

**Connection Wizard**

**How many data items does the response contain?**

1

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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.

**Connection Wizard**

**Data Item Name**  
Pressure

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

**Data Item Unit**  
Pressure   bar

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.

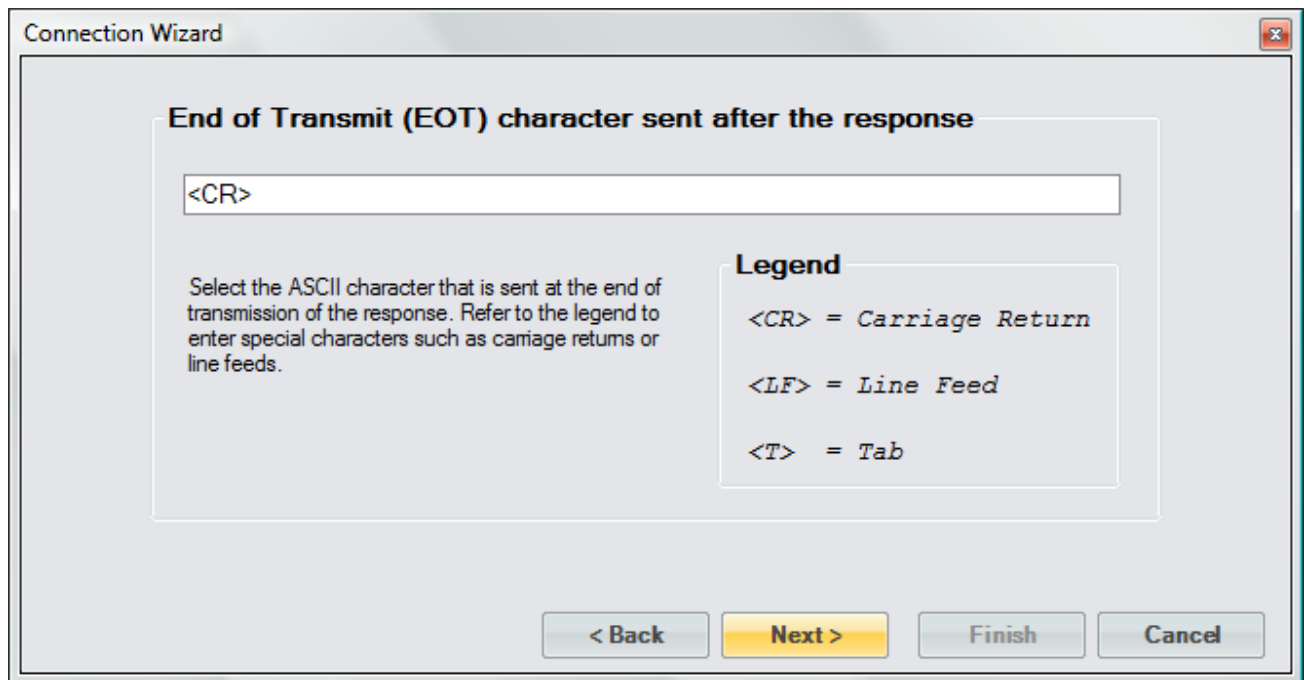
Scaling	
Signal Value	Data Value

**Legend**  
X = Ignore  
N = Numeric  
A = Flag

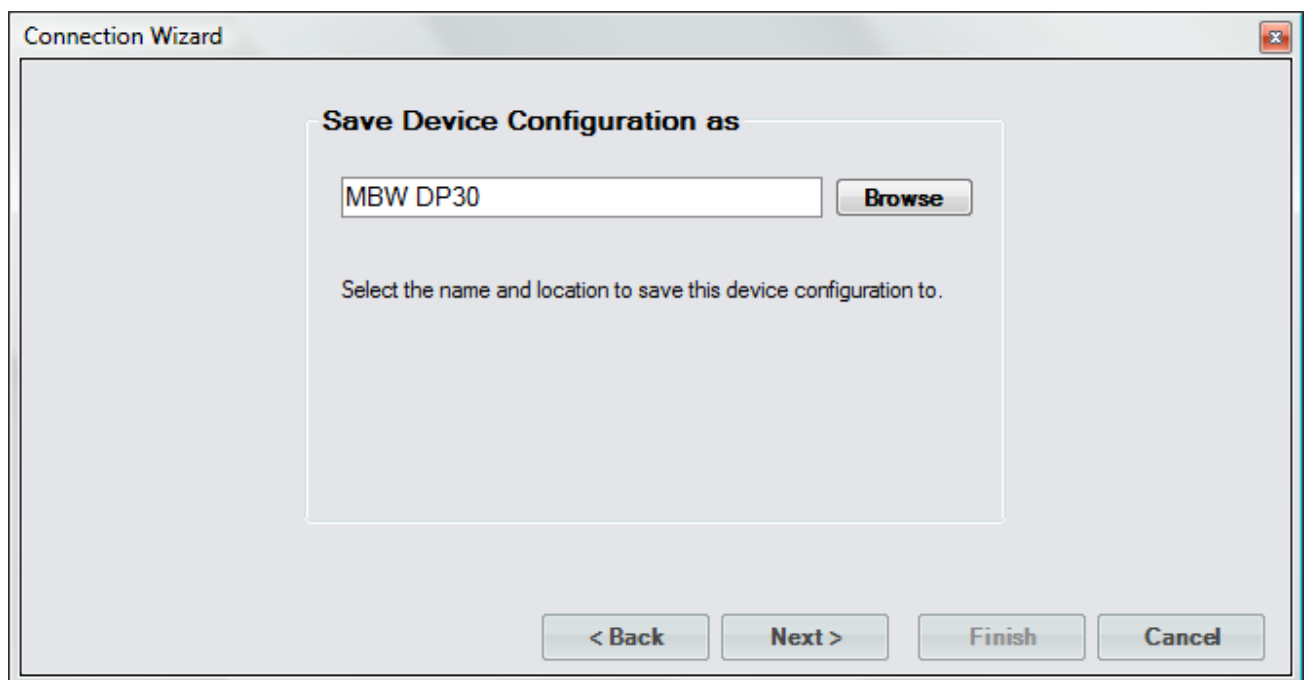
**Response Syntax**  
PRXXXXX+NNN.NN

< Back   Next >   Finish   Cancel

The Pressure message is terminated with a carriage return.



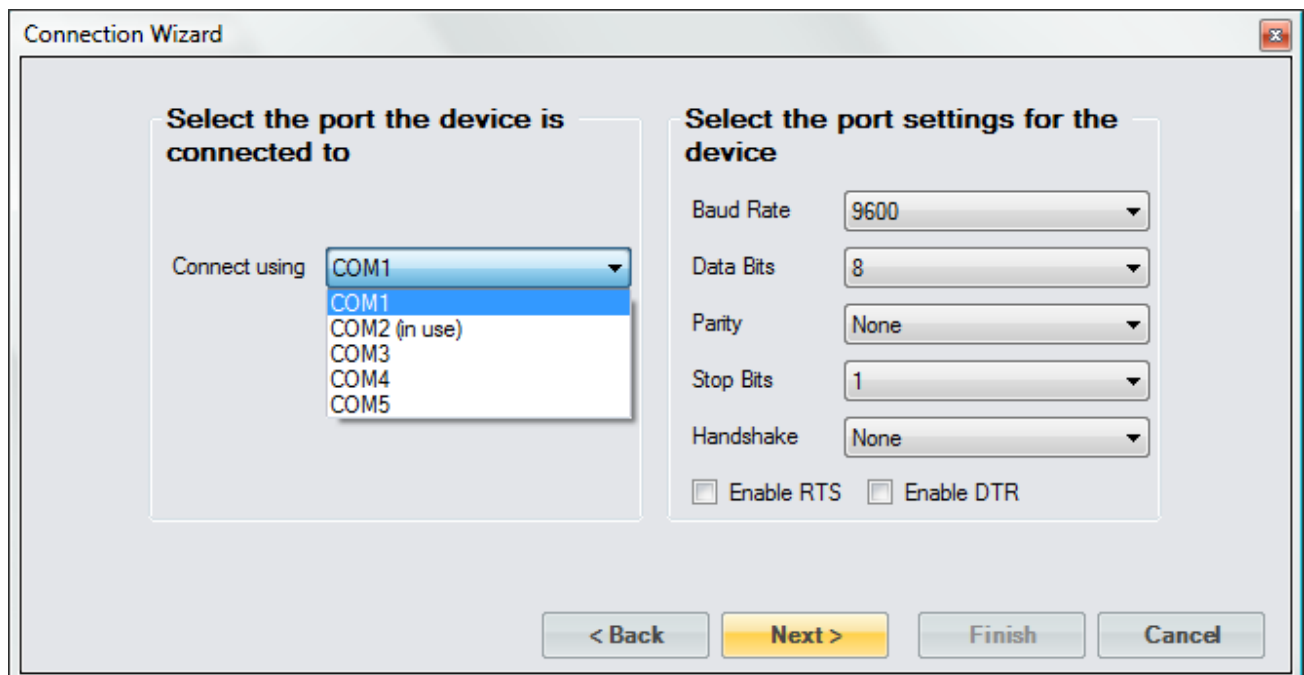
Save the newly created device to a file so that it can be recalled at a later time.



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:

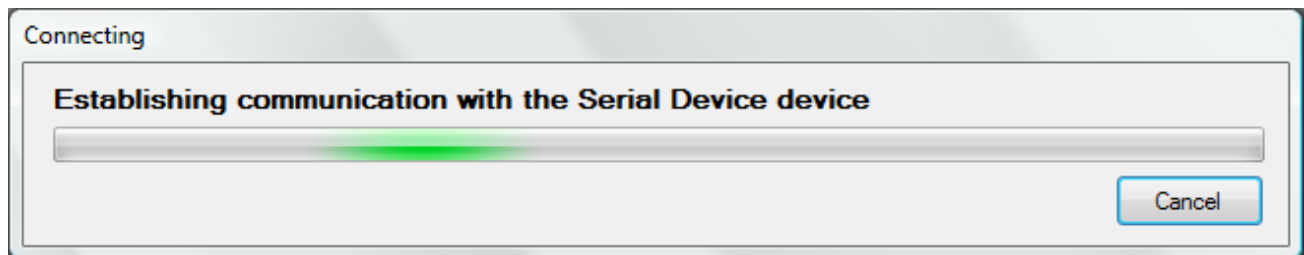




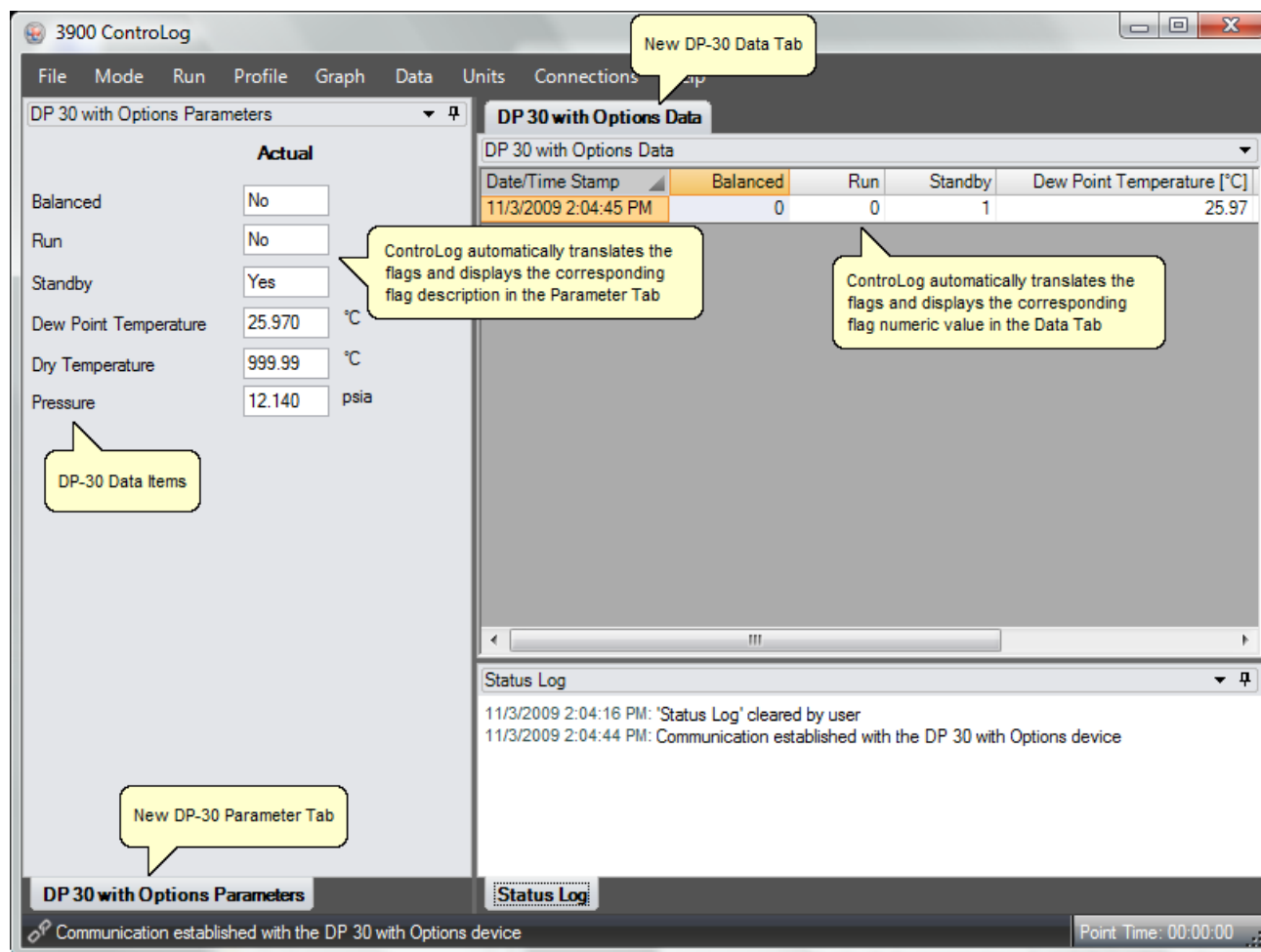
Use the default access rate of 1.5 seconds.



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.

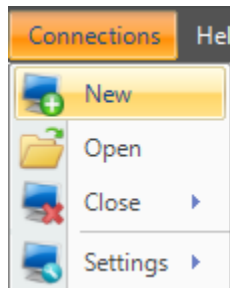


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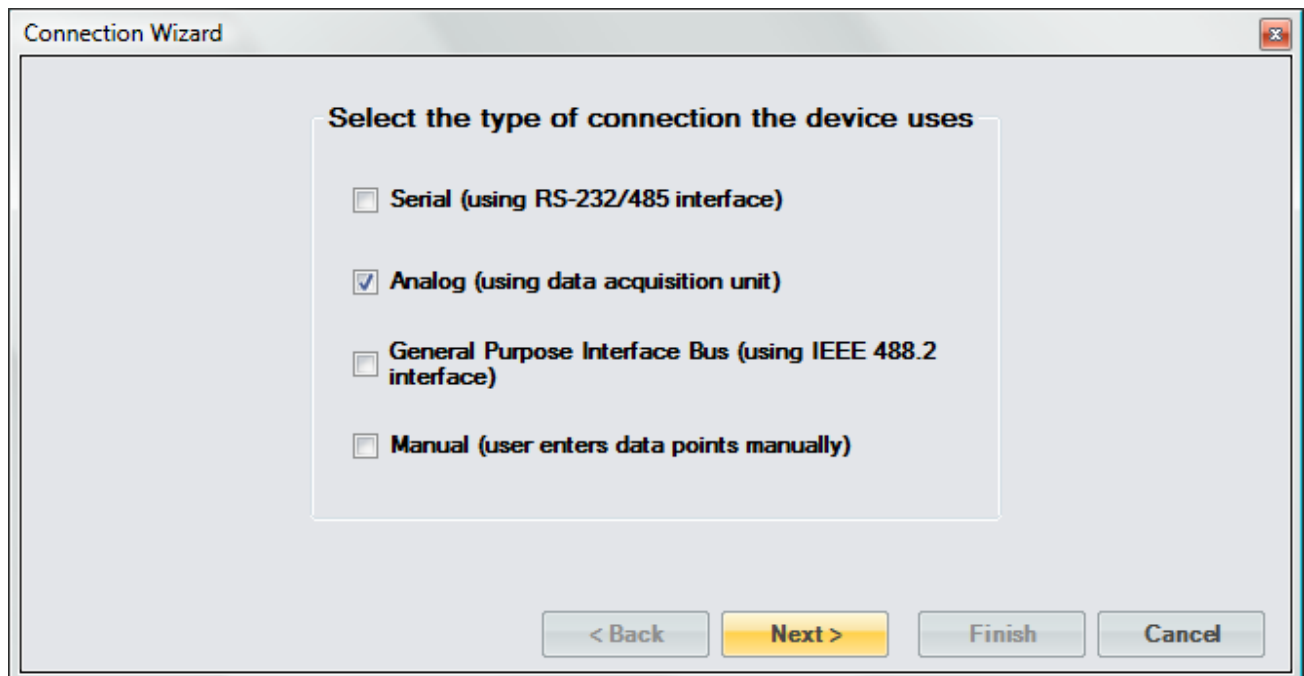
## Analog Connection

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.

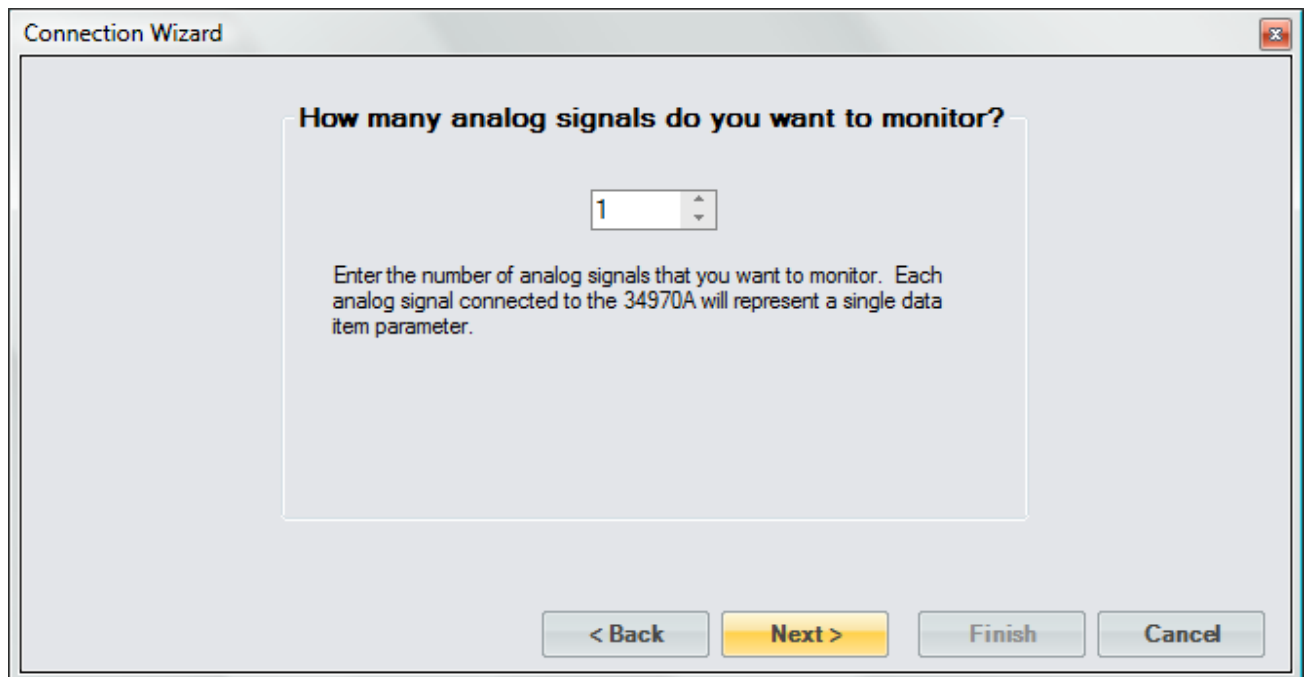


Enter a unique name for the analog device or devices.



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. 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 image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. 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, there is a text box with the instruction: '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

**Scaling**

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** None

**Scaling**

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

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

**Scaling**

Signal Value	Data Value

< 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

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**

Temperature °C

Temperature °F

Pressure °C

Enthalpy K

Density

FlowRate

None

**Scaling**

Signal Value	Data Value

< Back   Next >   Finish   Cancel

In addition to reading a temperature, ControLog can compute a percent relative humidity (%RH) at the temperature. This is useful when compensating for temperature gradients within the chamber. To have ControLog automatically calculate the relative humidity at the temperature, simply select the corresponding checkbox. The newly calculated %RH will have the same name as the specified Data Item Name but will be preceded by “%RH@”. In below example the calculated %RH will appear as “%RH@Temp Probe 1”.

**Connection Wizard**

**Data Item Name**: Temp Probe 1

**Channel**: 101

**Function**: Temperature RTD (4 Wire)

**Range**: 100 ohms, 91

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**: Temperature

Unit: °C

☒ **Also Calculate %RH at this Temperature**

**Scaling**

Signal Value	Data Value

< 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**

**Function**

**Range**

**Data Item Unit**

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.

**Connection Wizard**

**Save Device Configuration as**

Select the name and location to save this device configuration to.

< Back   Next >   Finish   Cancel



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

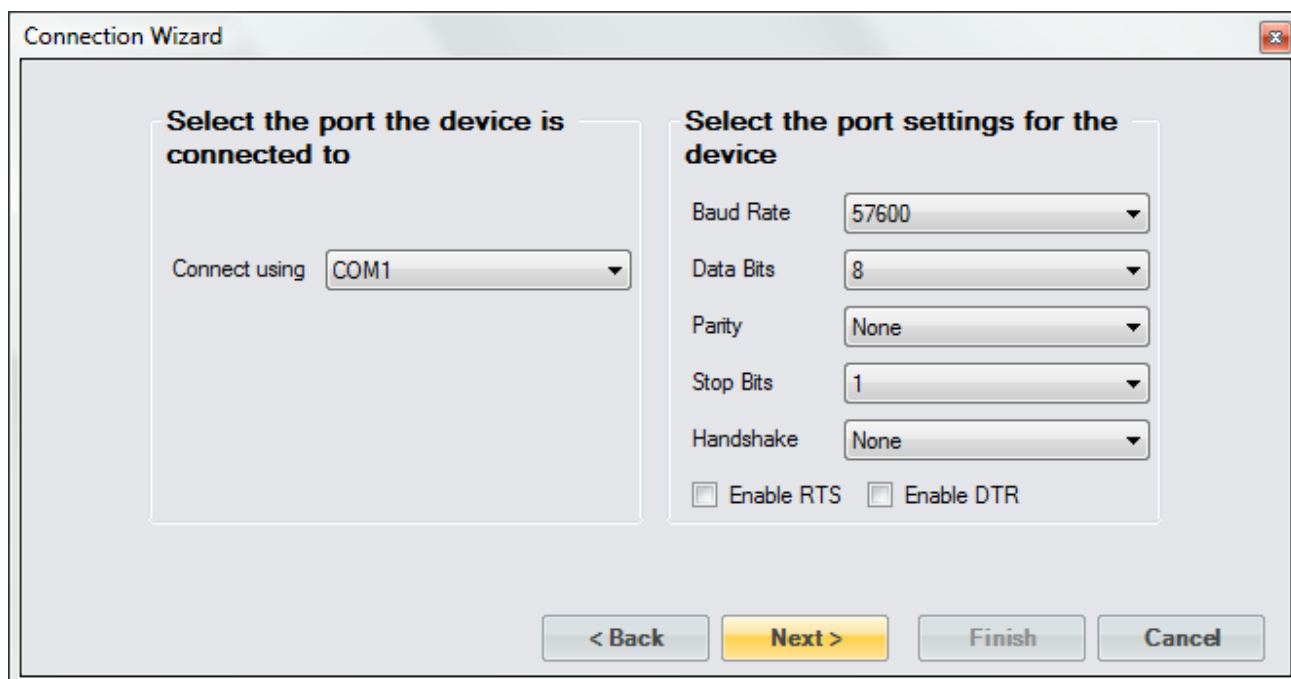
*Note: The user can connect at any time by loading the device from the Connections menu.*



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main content area has a heading 'Would you like to connect to this device now?'. Below this heading are two radio button options: 'Yes' (which is selected) and 'No'. Below the options is explanatory text: 'Select 'Yes' if you would like to connect to the device now.' and 'Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu.' At the bottom of the dialog are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

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 'Connection Wizard' dialog box with two main sections. The left section is titled 'Select the port the device is connected to' and contains a 'Connect using' label followed by a dropdown menu showing 'COM1'. The right section is titled 'Select the port settings for the device' and contains several settings: 'Baud Rate' (57600), 'Data Bits' (8), 'Parity' (None), 'Stop Bits' (1), and 'Handshake' (None). Each of these is a dropdown menu. Below these settings are two checkboxes: 'Enable RTS' and 'Enable DTR', both of which are unchecked. At the bottom of the dialog 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.*

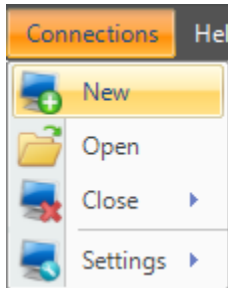


The screenshot shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main content area is titled 'Access interval to the device'. It features a numeric input field with the value '1.5' and a unit dropdown menu set to 'seconds'. Below the input field, a descriptive text states: 'This is the rate at which ControLog will communicate with the device.' At the bottom of the dialog, there are four buttons: '< Back', 'Next >', 'Finish' (highlighted in yellow), and 'Cancel'.

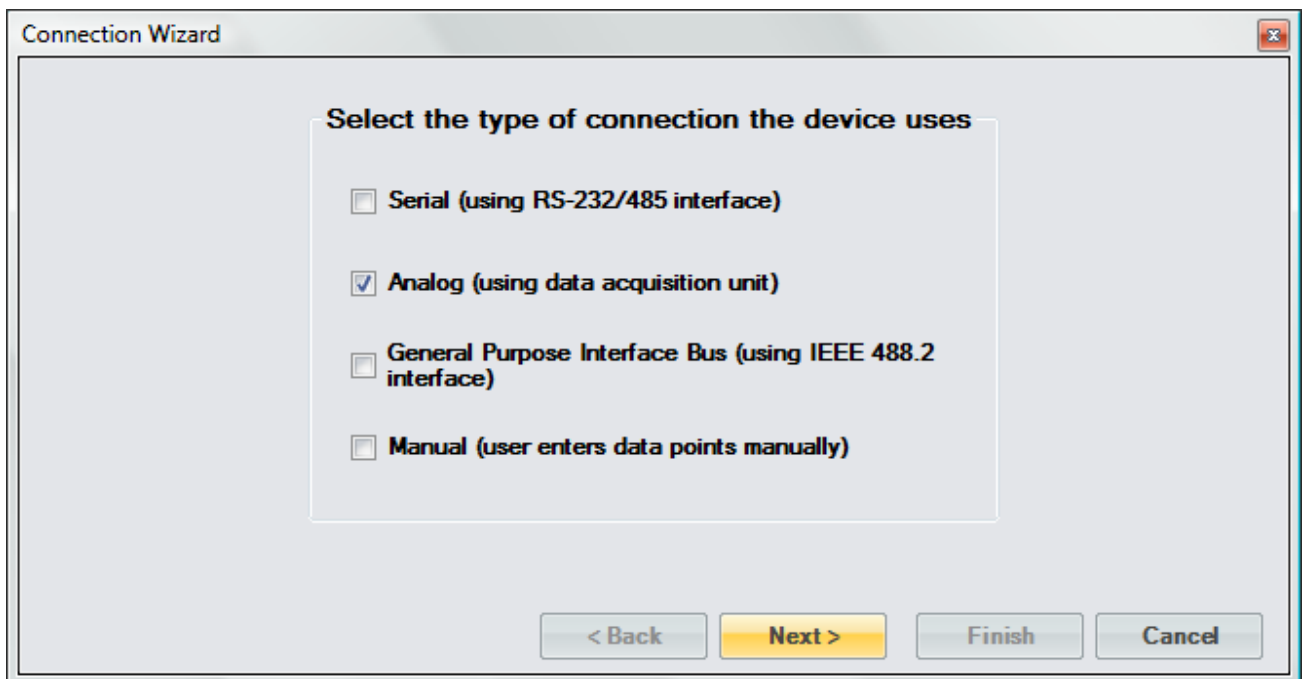
## Analog Connection Example

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.

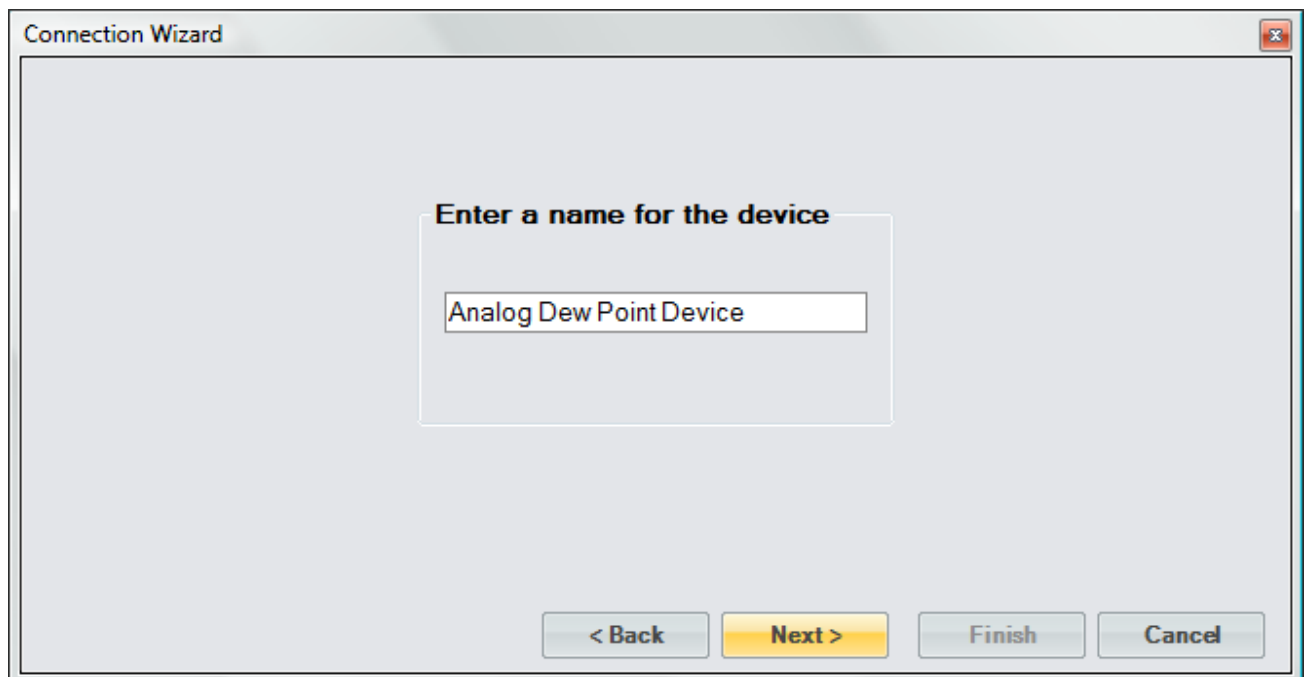
Start by selecting “New” from the Connections menu.



Select “Analog” as the type of device connection.

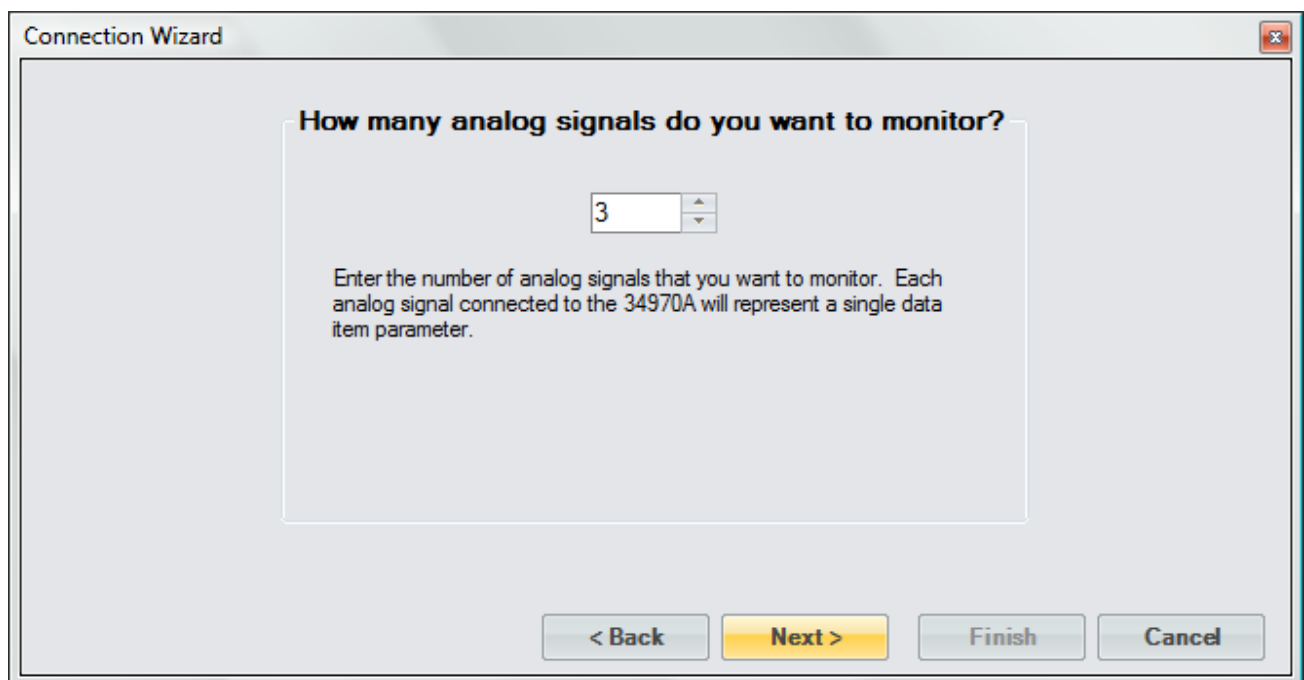


Enter “Analog Dew Point Device” as the name for the device.



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Enter a name for the device'. Below this heading is a text input field containing the text 'Analog Dew Point Device'. At the bottom of the dialog box, there are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'How many analog signals do you want to monitor?'. Below this heading is a spin box containing the number '3'. Under the spin box, there is a text box with the following 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 of the dialog box, there are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

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.

**Connection Wizard**

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

**Channel:** 109

**Function:** Volts DC

**Range:** 10 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:** Temperature °C

☐ Also Calculate %RH at this Temperature

**Scaling**

Signal Value	Data Value
-10	-100
10	100

< 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.

**Connection Wizard**

**Data Item Name:** Temperature 1

**Channel:** 110

**Function:** Volts DC

**Range:** 10 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

**Scaling**

Signal Value	Data Value

Next >   Finish   Cancel

Channel list (visible): 101, 102, 103, 104, 105, 106, 107, 108, 109 (in use), 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 201

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.

**Connection Wizard**

**Data Item Name:** Temperature 1

**Channel:** 102

**Function:** Temperature Thermistor

**Range:** 10k

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:** Temperature °C

☐ Also Calculate %RH at this Temperature

**Scaling**

Signal Value	Data Value

< Back   Next >   Finish   Cancel

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.

**Connection Wizard**

**Data Item Name:** Temperature 2

**Channel:** 103

**Function:** Temperature RTD (4 Wire)

**Range:** 100 ohms, 91

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:** Temperature °C

☐ Also Calculate %RH at this Temperature

**Scaling**

Signal Value	Data Value

Next >   Finish   Cancel

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 at the top: 'Data Item Name' with a text box containing 'Temperature 2'; 'Channel' with a dropdown menu showing '110'; 'Function' with a dropdown menu showing 'Temperature RTD (4 Wire)'; and 'Range' with a dropdown menu showing '100 ohms, 91'. Below these is a large text area with instructions: '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.' To the right of the text area is the 'Data Item Unit' section with a dropdown menu showing 'Temperature' and a unit dropdown showing '°C'. Below this is a checkbox labeled 'Also Calculate %RH at this Temperature' which is unchecked. At the bottom right is a 'Scaling' table with two columns: 'Signal Value' and 'Data Value'. The table has three empty rows. At the bottom of the dialog are four 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 box containing 'Analog Dew Point Device' and a 'Browse' button to its right. Below this is a line of text: 'Select the name and location to save this device configuration to.' At the bottom of the dialog are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

Select to connect to the device now.



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main content area has a light gray background. At the top, it asks 'Would you like to connect to this device now?'. Below this, there are two radio buttons: 'Yes' (which is selected) and 'No'. Below the radio buttons, there is a block of text: 'Select 'Yes' if you would like to connect to the device now. Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu.' At the bottom of the dialog, there are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

**Connection Wizard**

**Would you like to connect to this device now?**

☒ **Yes**

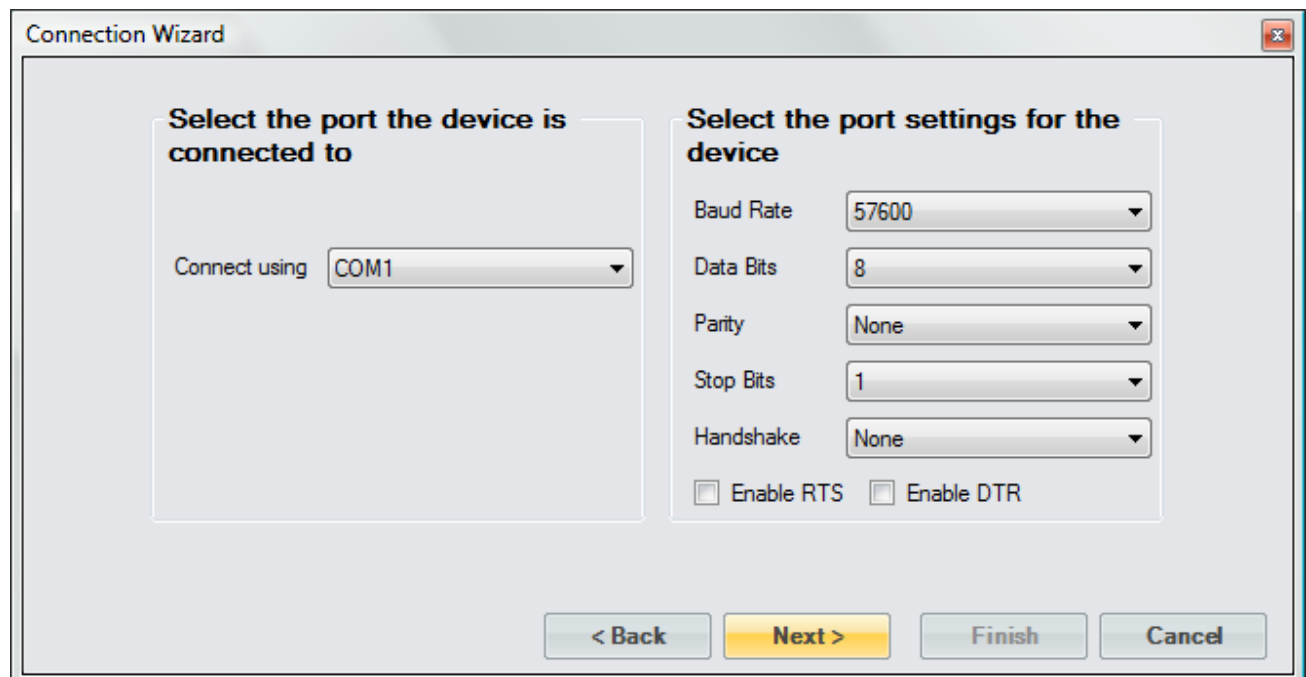
☐ **No**

Select 'Yes' if you would like to connect to the device now.

Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu.

< Back   **Next >**   Finish   Cancel

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main content area has a light gray background. It is divided into two main sections. The left section is titled 'Select the port the device is connected to' and contains a label 'Connect using' followed by a dropdown menu showing 'COM1'. The right section is titled 'Select the port settings for the device' and contains several settings: 'Baud Rate' (57600), 'Data Bits' (8), 'Parity' (None), 'Stop Bits' (1), and 'Handshake' (None). Each of these is a dropdown menu. Below these settings are two checkboxes: 'Enable RTS' and 'Enable DTR', both of which are unchecked. At the bottom of the dialog, there are four buttons: '< Back', 'Next >' (highlighted in yellow), 'Finish', and 'Cancel'.

**Connection Wizard**

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

Connect using **COM1**

**Select the port settings for the device**

Baud Rate **57600**

Data Bits **8**

Parity **None**

Stop Bits **1**

Handshake **None**

☐ Enable RTS   ☐ Enable DTR

< Back   **Next >**   Finish   Cancel

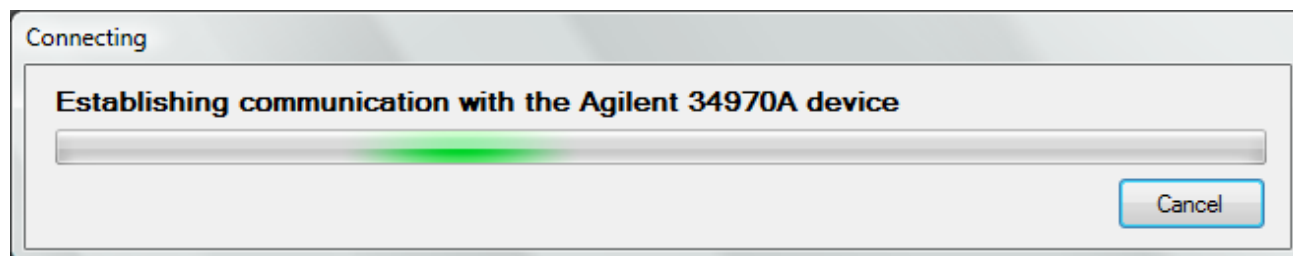


Enter a sufficient access interval for the amount of signals being monitored. In this example we have less than 10 signals so we can start with the minimum access interval of 1.5 seconds.



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. Inside, there's a section titled 'Access interval to the device'. Below this title, there is a text input field containing '1.5' and a dropdown menu set to 'seconds'. Below the input field, a note reads: 'This is the rate at which ControLog will communicate with the device.' At the bottom of the dialog, there are four buttons: '< Back', 'Next >', 'Finish' (highlighted in yellow), and 'Cancel'.

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



The image shows a 'Connecting' dialog box. The title bar says 'Connecting'. Inside, there's a section titled 'Establishing communication with the Agilent 34970A device'. Below this title, there is a progress bar that is partially filled with green. At the bottom right of the dialog, there is a 'Cancel' button.

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

**3900 ControlLog**

File Mode Run Profile Graph Data Units Connections Help

Analog Dew Point Device Parameters

**Actual**

Temperature 1	25.391	°C
Dew/Frost Point	-86.616	°C
Temperature 2	23.508	°C

Analog Signal Data Items

New Analog Dew Point Device Parameter Tab

New Analog Dew Point Device Data Tab

**Analog Dew Point Device Data** 3900 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

ControlLog automatically scales the signal

**Status Log**

- 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

Analog Dew Point Device Parameters 3... Status Log

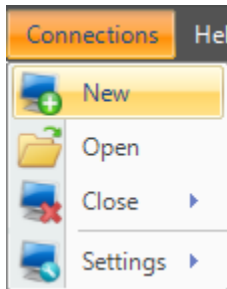
3900 Test Temperature probe is disconnected Point Time: 00:00:00

# GPIB Connection

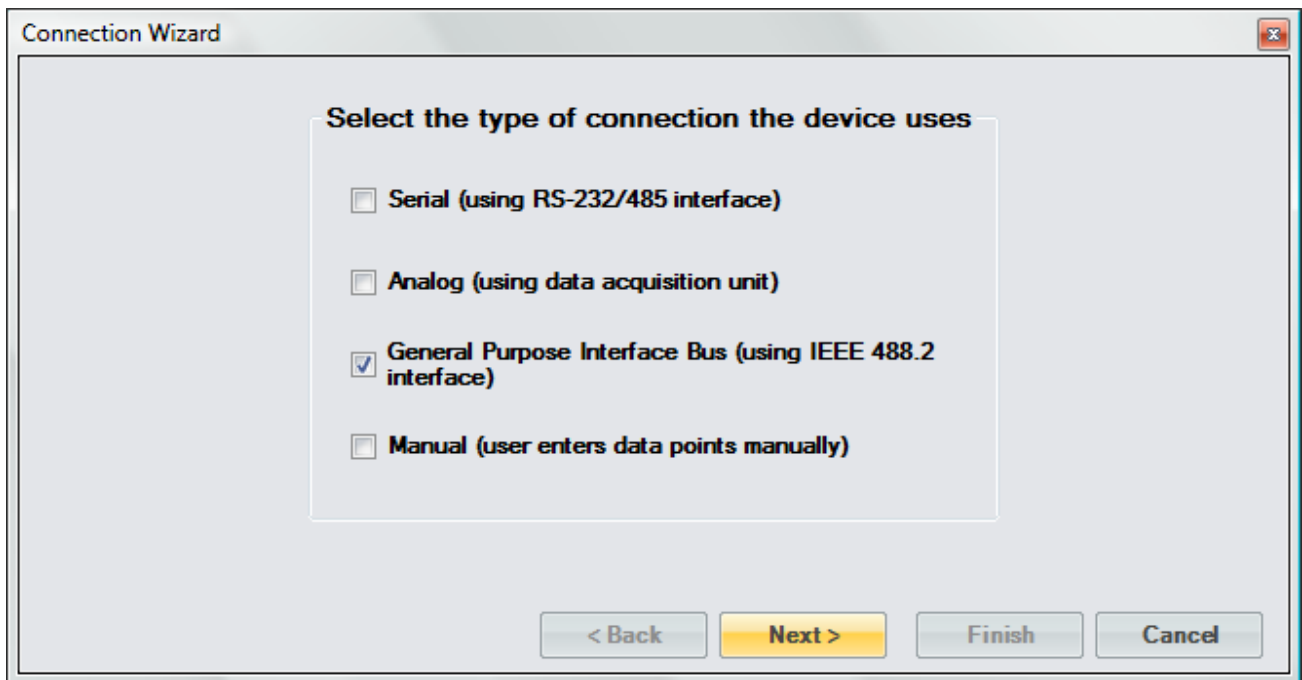
GPIB Connections use the National Instruments® GPIB-USB-HS USB-to-488.2 converter to acquire data from a given GPIB device. The customizable interface provided by ControLog allows the user to define the ASCII commands that are sent and/or received through the IEEE 488.2 interface to communicate with 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 image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard' with a close button. The main area has a light gray background. In the center, there is a white rectangular box with the text 'Enter a name for the device' above it. Below the text is a single-line text input field. At the bottom of the dialog, 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 image shows the next step of the 'Connection Wizard' dialog box. The title bar says 'Connection Wizard' with a close button. The main area has a light gray background. In the center, there is a white rectangular box. At the top of this box is the question 'Do you need to send a setup command or commands to configure this device?'. Below the question are two radio button options: 'Yes' (unselected) and 'No' (selected). Below these options is a block 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 text is another line of text: 'Select 'No' if you don't need to send any setup commands.' At the bottom of the dialog, 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.

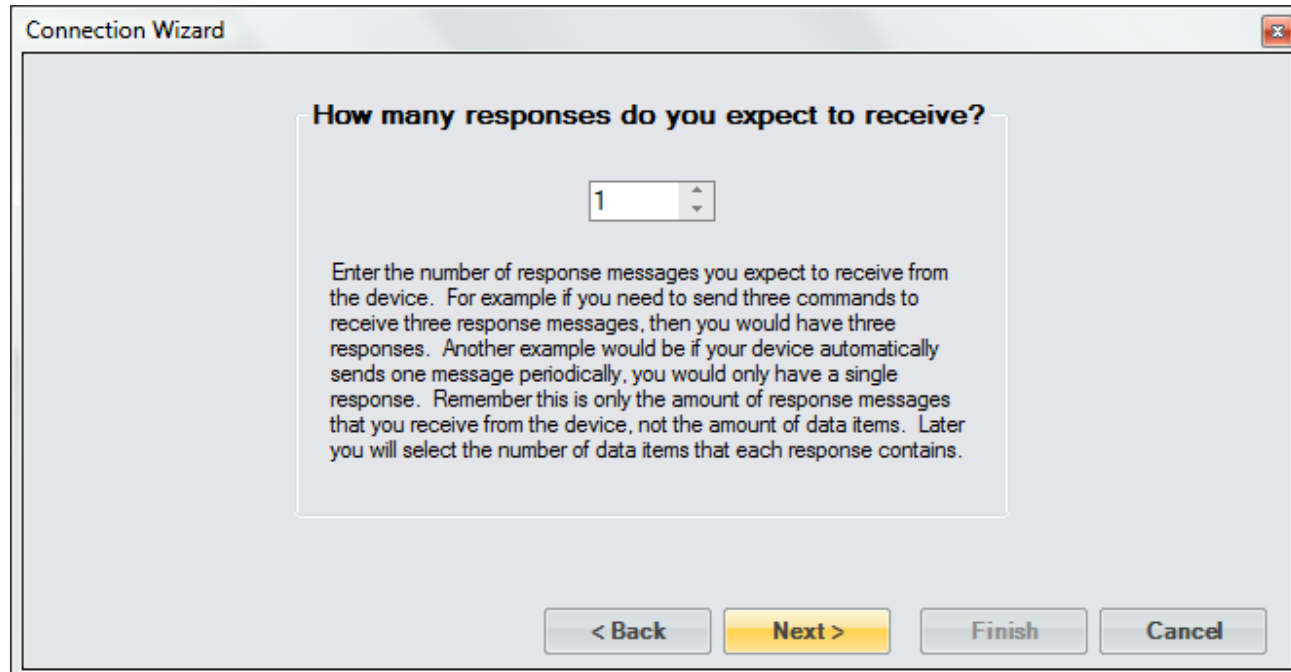
*Note: All setup commands are case sensitive.*

*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.*

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area is titled "Setup Command or Commands to send" and contains a large text input field. Below the input field, there is instructional text: "Enter the ASCII setup command or commands that will be sent once at the start of communication. These are commands that are required to configure or setup 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".

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.



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main content area has a question: 'How many responses do you expect to receive?'. Below the question is a text box containing the number '1'. Below the text box is a paragraph of explanatory text: '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.' At the bottom of the dialog box are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

**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".



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main content area has a question: 'Do you need to send a command to receive a response from this device?'. Below the question are two radio button options: 'Yes' (which is selected) and 'No'. Below the radio buttons is a paragraph of explanatory text: 'Select 'Yes' if you need to send a command to request data from the device. Select 'No' if the device automatically transmits data periodically.' At the bottom of the dialog box are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

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

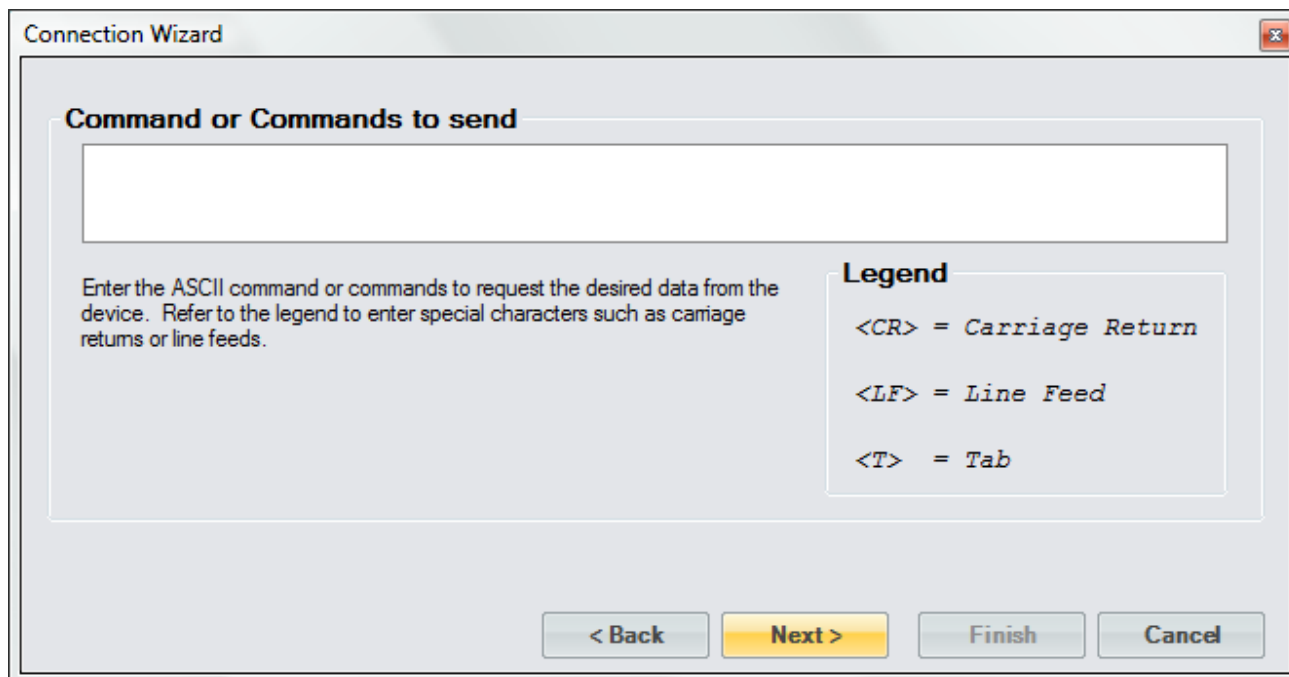
☒ Yes  
☐ No

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

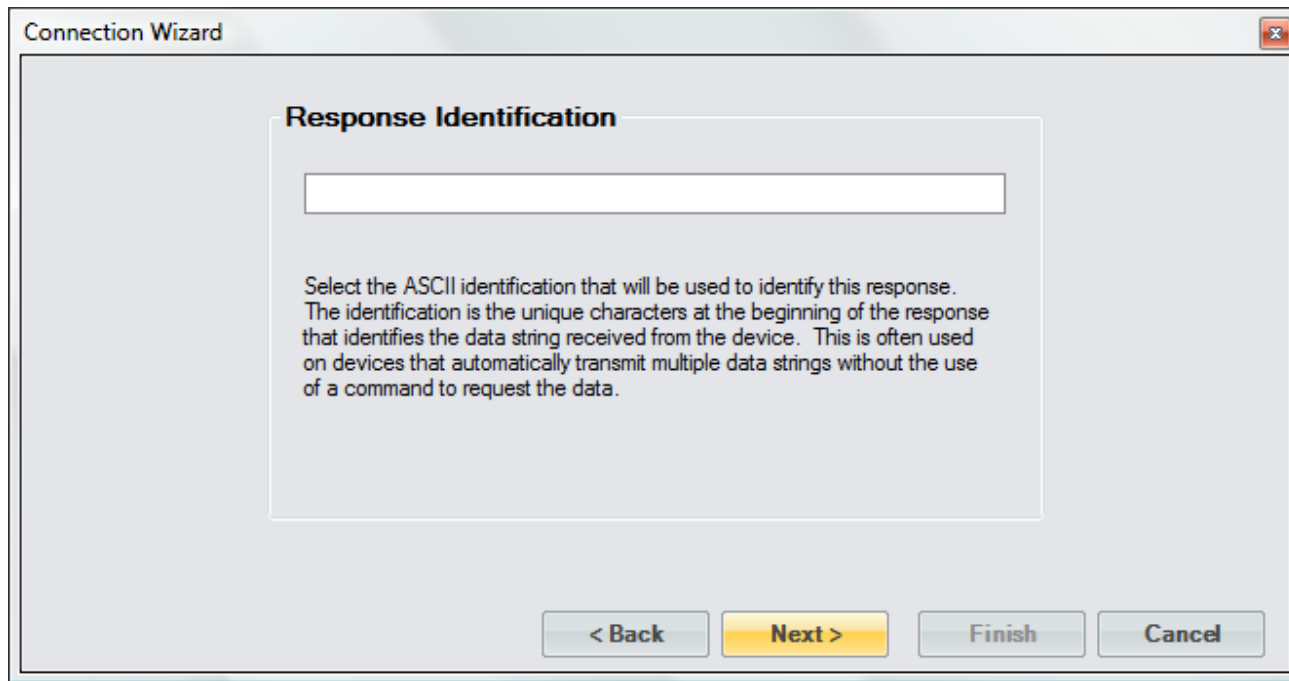
If a command was required, then enter the ASCII Command or Commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns and/or line feeds.

*Note: All commands are case sensitive.*



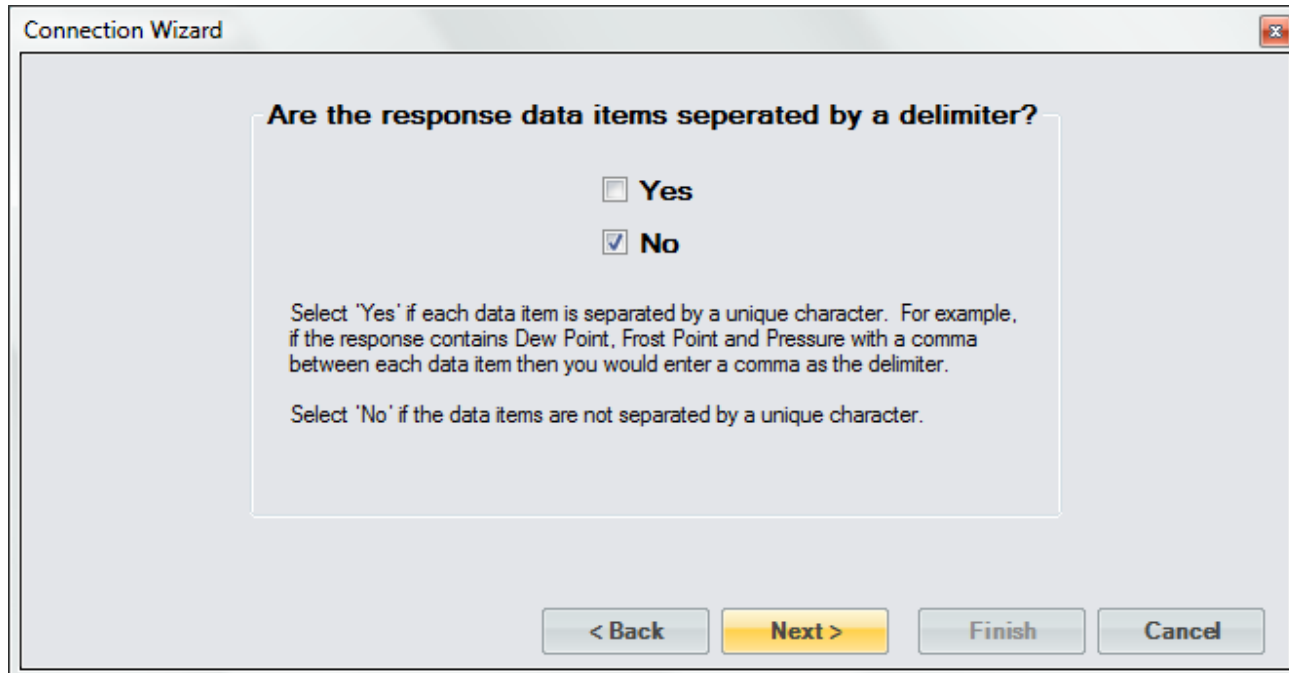
The screenshot shows the 'Connection Wizard' window with the title bar 'Connection Wizard' and a close button. The main area is titled 'Command or Commands to send' and contains a large text input field. Below the input field, there is instructional text: 'Enter the ASCII command or commands to request 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 the input field is a 'Legend' box containing the following entries: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom of the window 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.



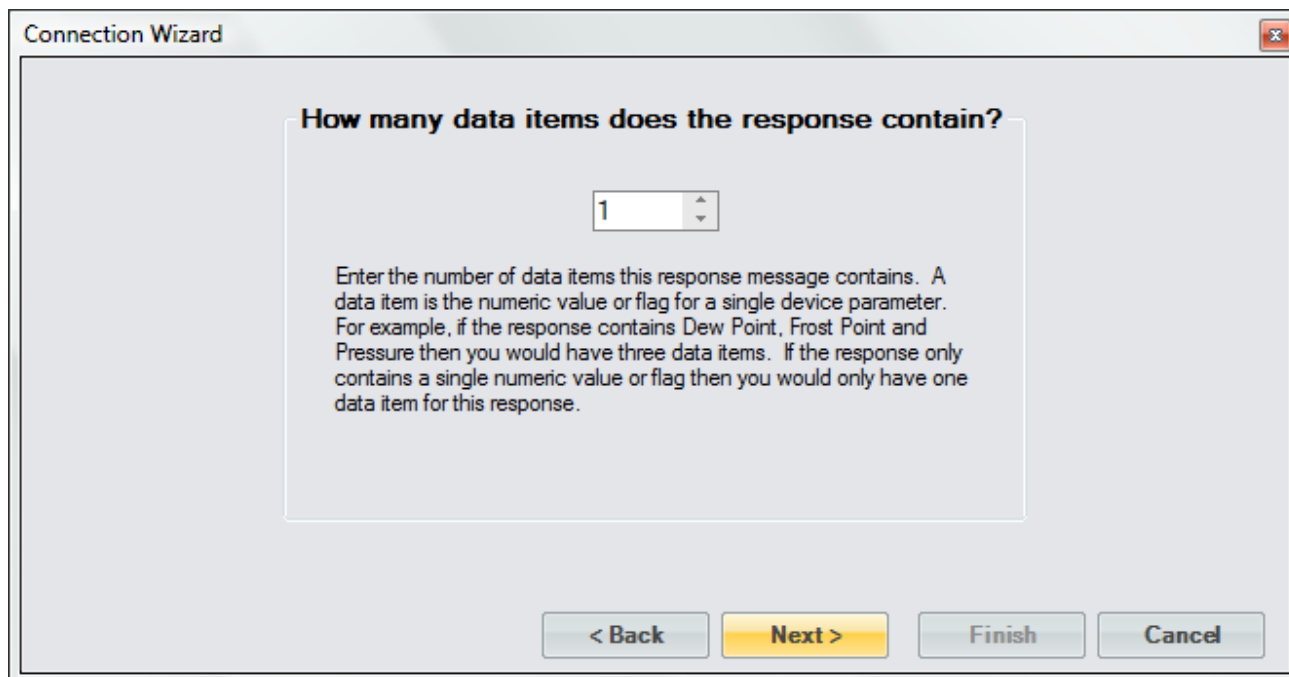
The screenshot shows the 'Connection Wizard' window with the title bar 'Connection Wizard' and a close button. The main area is titled 'Response Identification' and contains a text input field. Below the input field, there is instructional text: 'Select the ASCII identification that will be used to identify 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 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.



The dialog box is titled "Connection Wizard" and contains the question "Are the response data items separated by a delimiter?". It has two radio button options: "Yes" (unchecked) and "No" (checked). Below the options, there is explanatory text: "Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter." and "Select 'No' if the data items are not separated by a unique character." At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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.

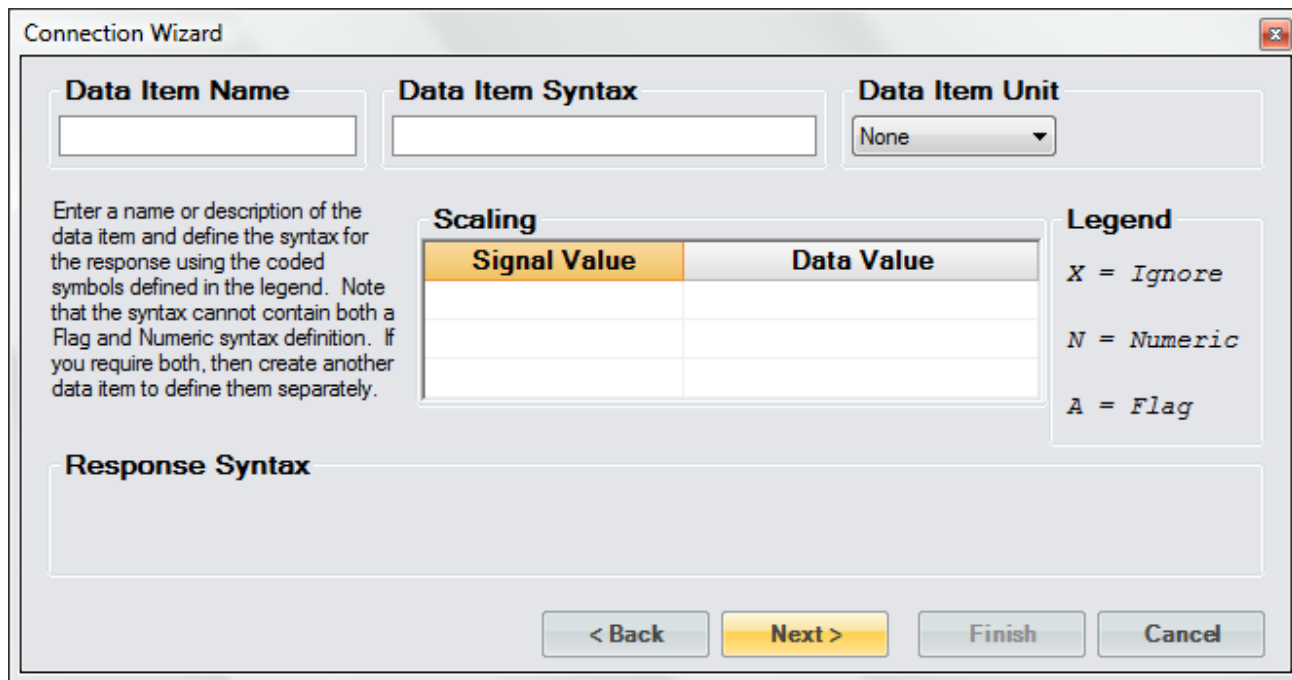


The dialog box is titled "Connection Wizard" and contains the question "How many data items does the response contain?". It features a spin box with the number "1" entered. Below the spin box, there is explanatory text: "Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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." At the bottom, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".



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.*



The Connection Wizard dialog box is used to define a data item. It contains the following fields and sections:

- Data Item Name:** A text input field.
- Data Item Syntax:** A text input field.
- Data Item Unit:** A dropdown menu with "None" selected.
- Legend:** A list of symbols and their meanings:
  - X = Ignore
  - N = Numeric
  - A = Flag
- Scaling:** A table with two columns: Signal Value and Data Value.
- Response Syntax:** A large text area for defining the response syntax.
- Navigation Buttons:** < Back, Next >, Finish, and Cancel.

Signal Value	Data Value

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 responses 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. The 'Data Item Name' is 'Data Point', 'Data Item Syntax' is 'NNN.NNNN', and 'Data Item Unit' is 'None'. The 'Scaling' section contains a table with 'Signal Value' and 'Data Value' columns. The 'Legend' section lists 'X = Ignore', 'N = Numeric', and 'A = Flag'. The 'Response Syntax' is 'NNN.NNNN'.

Signal Value	Data Value
-1	-100
1	100

Buttons at the bottom: < 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.

The screenshot shows the 'Connection Wizard' dialog box with the 'Data Item Unit' dropdown menu open. The menu lists 'Temperature', 'Pressure', 'Enthalpy', 'Density', 'FlowRate', and 'None'. The 'Data Item Unit' is set to 'Temperature' and the unit is '°C'. The 'Scaling' section contains a table with 'Signal Value' and 'Data Value' columns. The 'Legend' section lists 'X = Ignore', 'N = Numeric', and 'A = Flag'. The 'Response Syntax' is 'NNN.NNNN'.

Signal Value	Data Value
-1	-100
1	100

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

In addition to reading a temperature, ControLog can compute a percent relative humidity (%RH) at the temperature. This is useful when compensating for temperature gradients within the chamber. To have ControLog automatically calculate the relative humidity at the temperature, simply select the corresponding checkbox. The newly calculated %RH will have the same name as the specified Data Item Name but will be preceded by “%RH@”. In the below example the calculated %RH will appear as “%RH@Data Point”.

**Connection Wizard**

**Data Item Name:** Data Point  
**Data Item Syntax:** NNN.NNNN  
**Data Item Unit:** Temperature °C

☒ **Also Calculate %RH at this Temperature**

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
-1	-100
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 Definitions**

Flag	Numeric Value	Description
*	0	No
S	1	Yes

**Legend**

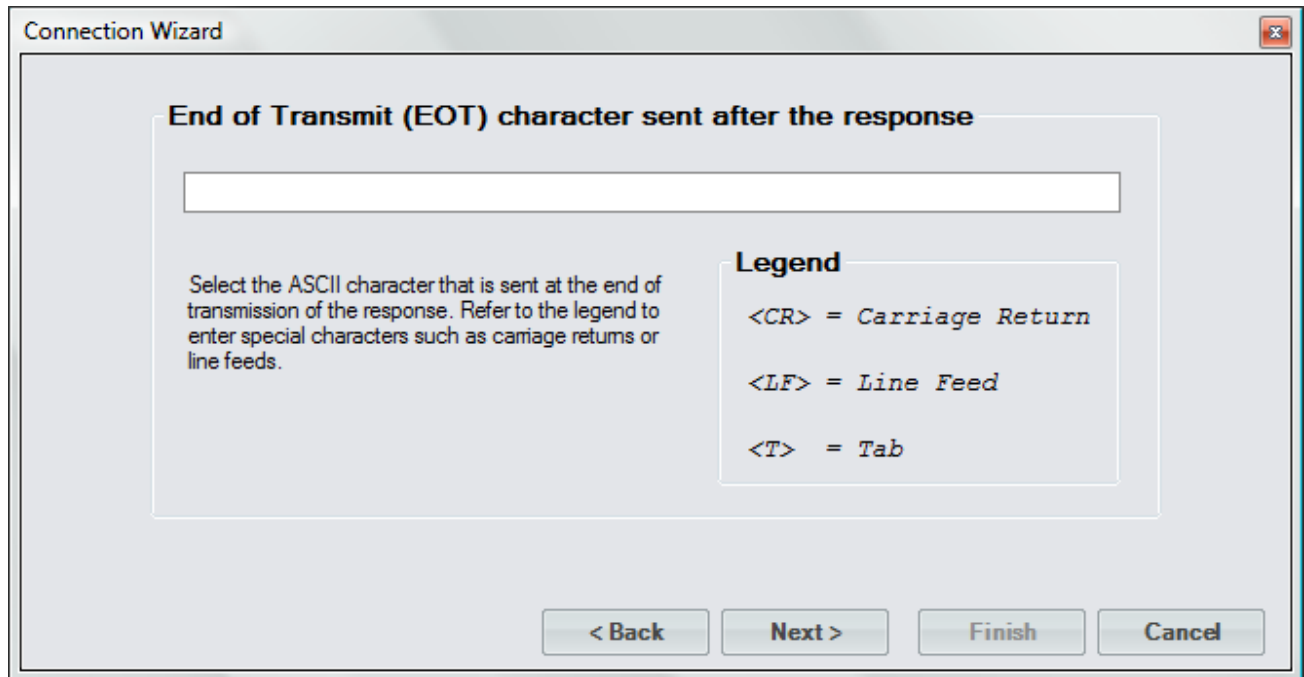
X = Ignore  
N = Numeric  
A = Flag

**Response Syntax**

XXXXA

< 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.



The dialog box is titled "Connection Wizard" and contains a section titled "End of Transmit (EOT) character sent after the response". Below this title is a text input field. To the right of the input field is a legend box with the following text:

**Legend**

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

Below the legend box is a text box with the following text:

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.

At the bottom of the dialog box are four buttons: "< Back", "Next >", "Finish", and "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.



The dialog box is titled "Connection Wizard" and contains a section titled "Save Device Configuration as". Below this title is a text input field and a "Browse" button. Below the input field and button is a text box with the following text:

Select the name and location to save this device configuration to.

At the bottom of the dialog box are four buttons: "< Back", "Next >", "Finish", and "Cancel".

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 image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area is titled 'Select the GPIB settings for the device'. It contains three settings: 'Board ID' with a spinner box set to 0, 'Primary Address' with a spinner box set to 9, and 'Secondary Address' with a dropdown menu set to 'None'. At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

Setting	Value
Board ID	0
Primary Address	9
Secondary Address	None

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.*



The screenshot shows a Windows-style dialog box titled "Connection Wizard". Inside the dialog, there is a section titled "Access interval to the device". This section contains a numeric input field with the value "1.5" and a dropdown menu set to "seconds". Below this, a text label reads: "This is the rate at which ControLog will communicate with the device." At the bottom right of the dialog, there is a checkbox labeled "Show Interface Console". At the bottom center, there are four buttons: "< Back", "Next >", "Finish" (highlighted in yellow), and "Cancel".

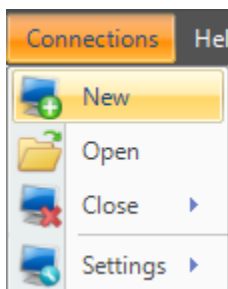
Select "Show Interface Console" to automatically open a Device Interface Console tab once communication has been established with the device.



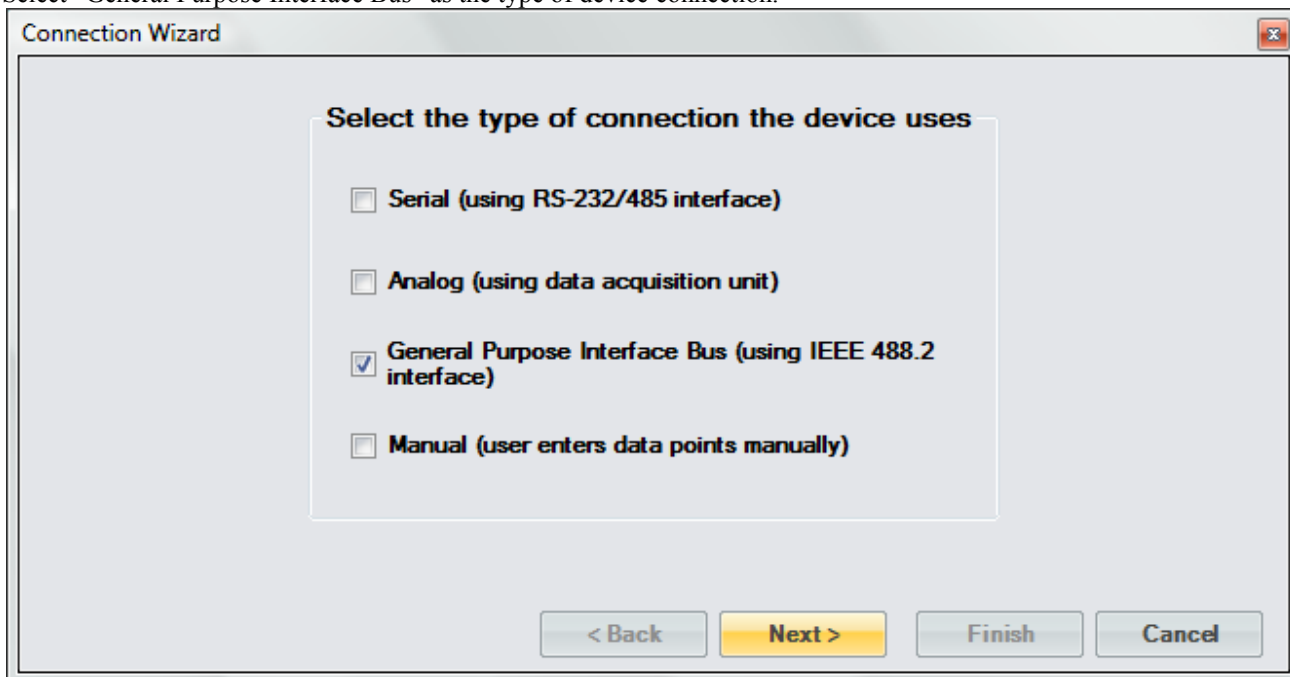
## GPIB Connection Example

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 image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Enter a name for the device' and a text input field containing 'K-1806 (HP34401A)'. At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a heading 'Do you need to send a setup command or commands to configure this device?'. Below the heading are two radio button options: 'Yes' (selected) and 'No'. 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. 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).

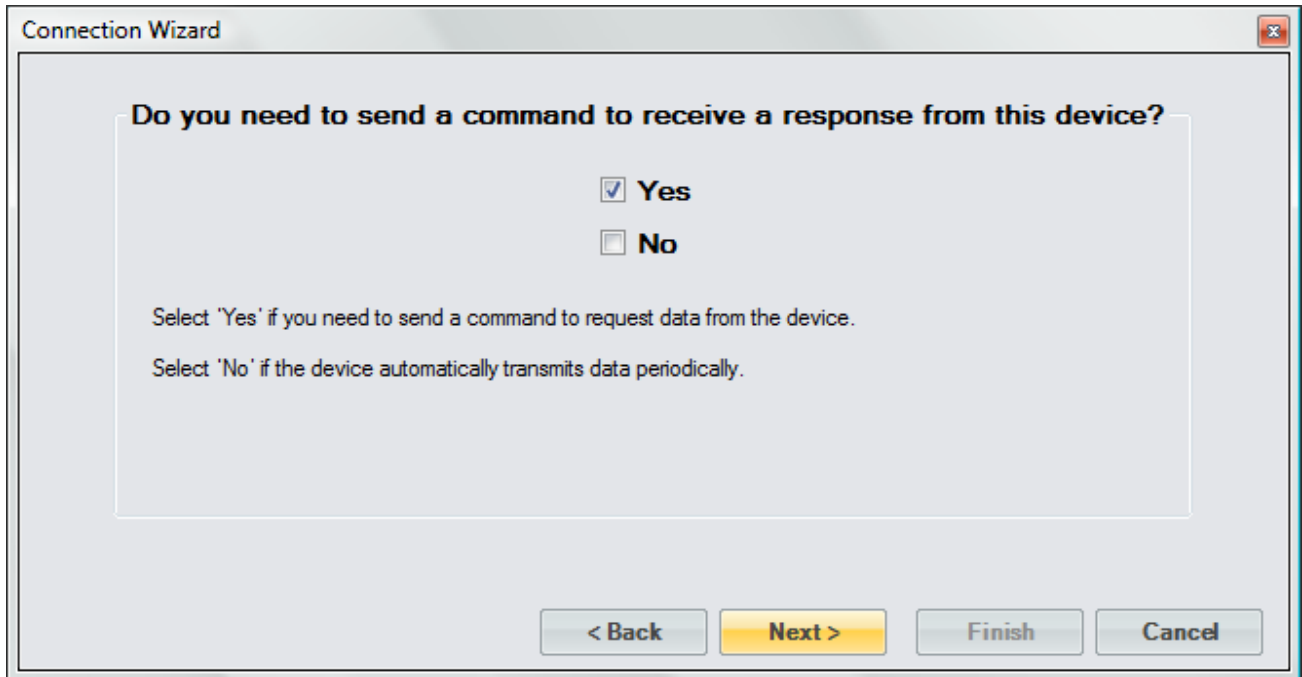
There are three setup commands to configure the DMM that we need to include. The first setup command resets the DMM, the second command clears the DMM and the third command configures the DMM to read DC voltage. Based on the DMM documentation each command must be terminated by a Line Feed.

The dialog box is titled "Connection Wizard" and has a close button in the top right corner. The main heading is "Setup Command or Commands to send". Below this is a text area containing the following commands: `*RST<LF>`, `*CLS<LF>`, and `CONFigure:VOLTage:DC<LF>`. To the left of the text area is a descriptive paragraph: "Enter the ASCII setup command or commands that will be sent once at the start of communication. These are commands that are required to configure or setup the device. Refer to the legend to enter special characters such as carriage returns or line feeds." To the right is a "Legend" box with the following entries: `<CR>` = Carriage Return, `<LF>` = Line Feed, and `<T>` = Tab. At the bottom are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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

The dialog box is titled "Connection Wizard" and has a close button in the top right corner. The main heading is "How many responses do you expect to receive?". Below this is a spin box containing the number "1". Below the spin box is a descriptive paragraph: "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." At the bottom are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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



The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main text asks: 'Do you need to send a command to receive a response from this device?'. There are two radio buttons: 'Yes' (which is selected) and 'No'. Below the radio buttons, there is explanatory text: 'Select 'Yes' if you need to send a command to request data from the device.' and 'Select 'No' if the device automatically transmits data periodically.' At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

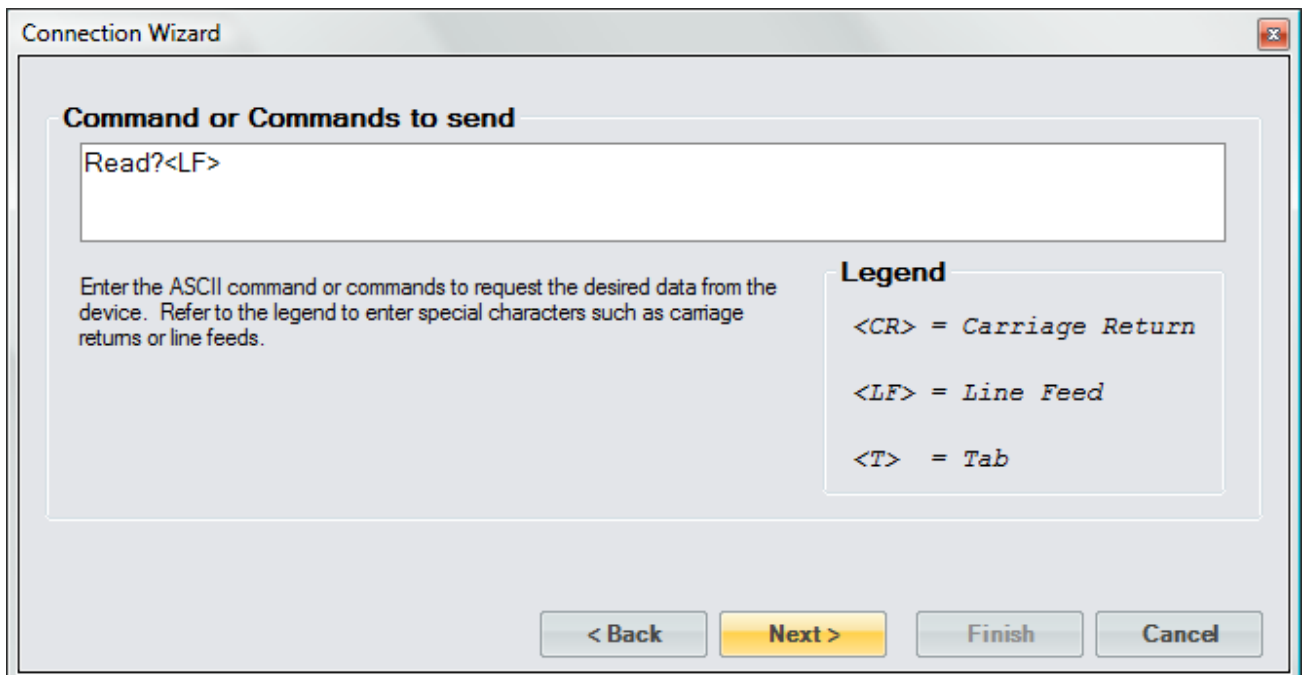
Do you need to send a command to receive a response from this device?

☒ 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

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 image shows the next step of the 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main text is 'Command or Commands to send'. There is a text input field containing 'Read?<LF>'. Below the input field, there is explanatory 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 the input field, there is a 'Legend' box with the following entries: '<CR> = Carriage Return', '<LF> = Line Feed', and '<T> = Tab'. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish', and 'Cancel'.

Command or Commands to send

Read?<LF>

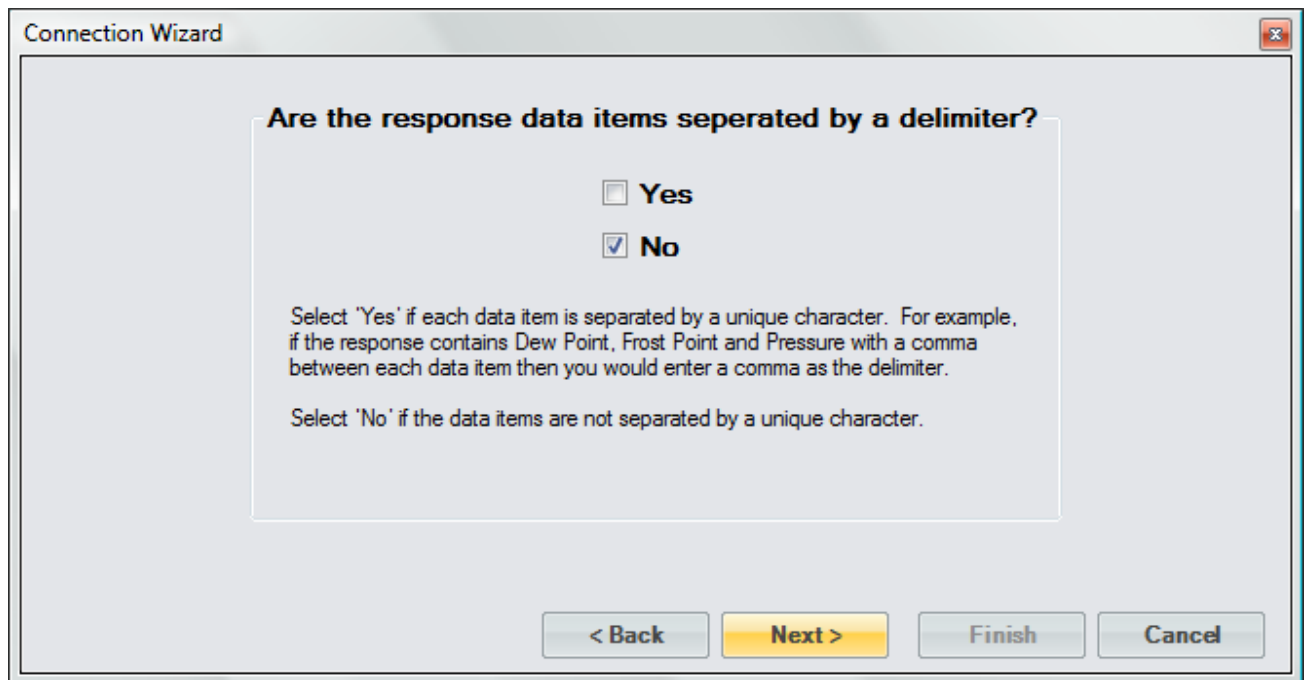
Enter the ASCII command or commands to request the desired data from the device. Refer to the legend to enter special characters such as carriage returns or line feeds.

**Legend**

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

< Back   Next >   Finish   Cancel

The DMM response is not separated by any delimiter.



Connection Wizard

**Are the response data items separated by a delimiter?**

☐ Yes

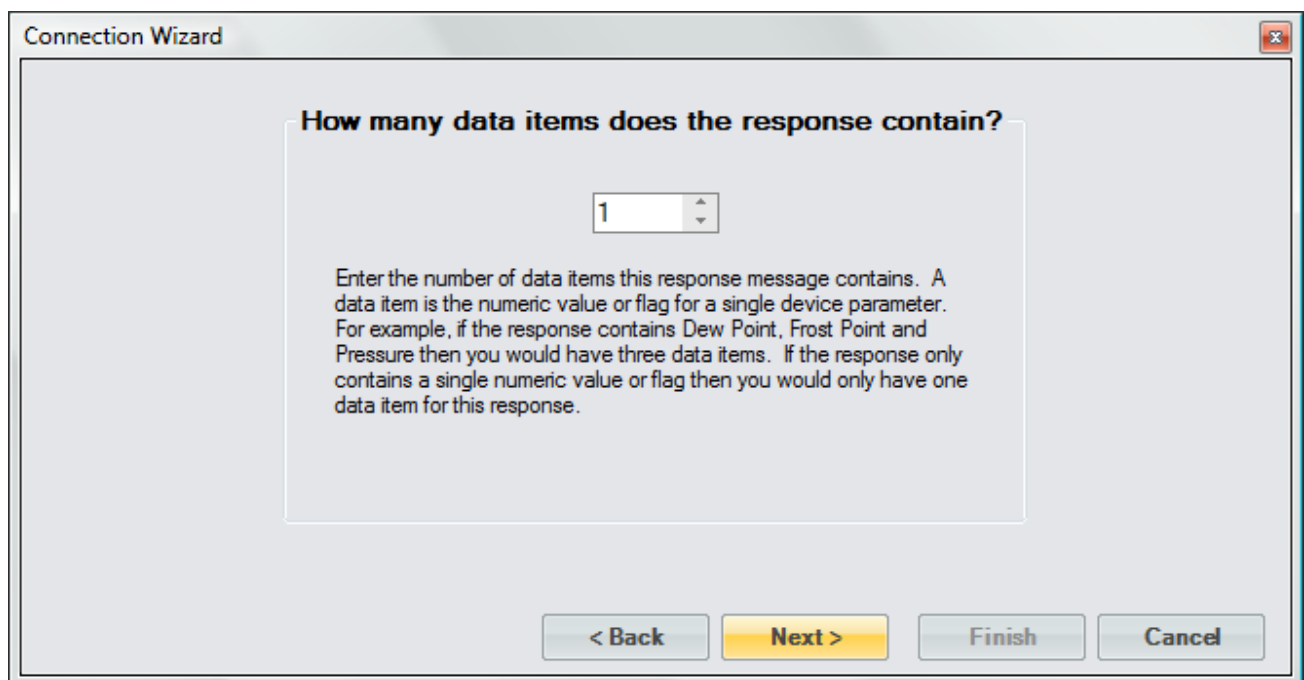
☒ No

Select 'Yes' if each data item is separated by a unique character. For example, if the response contains Dew Point, Frost Point and Pressure with a comma between each data item then you would enter a comma as the delimiter.

Select 'No' if the data items are not separated by a unique character.

< Back   Next >   Finish   Cancel

The DMM response will contain a single voltage reading.



Connection Wizard

**How many data items does the response contain?**

1

Enter the number of data items this response message contains. A data item is the numeric value or flag for a single device parameter. 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.

< Back   Next >   Finish   Cancel

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

☐ Also Calculate %RH at this Temperature

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**

+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.



The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area is titled 'Select the GPIB settings for the device'. It contains three settings: 'Board ID' with a numeric spinner set to 0, 'Primary Address' with a numeric spinner set to 22, and 'Secondary Address' with a dropdown menu set to 'None'. At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

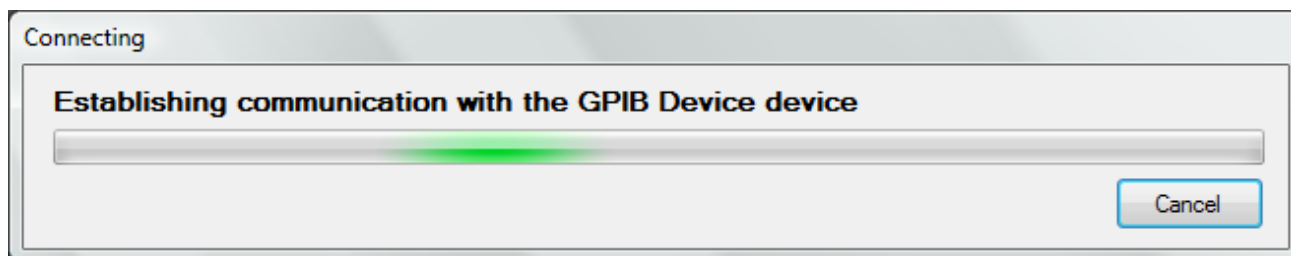
Select the default access interval.



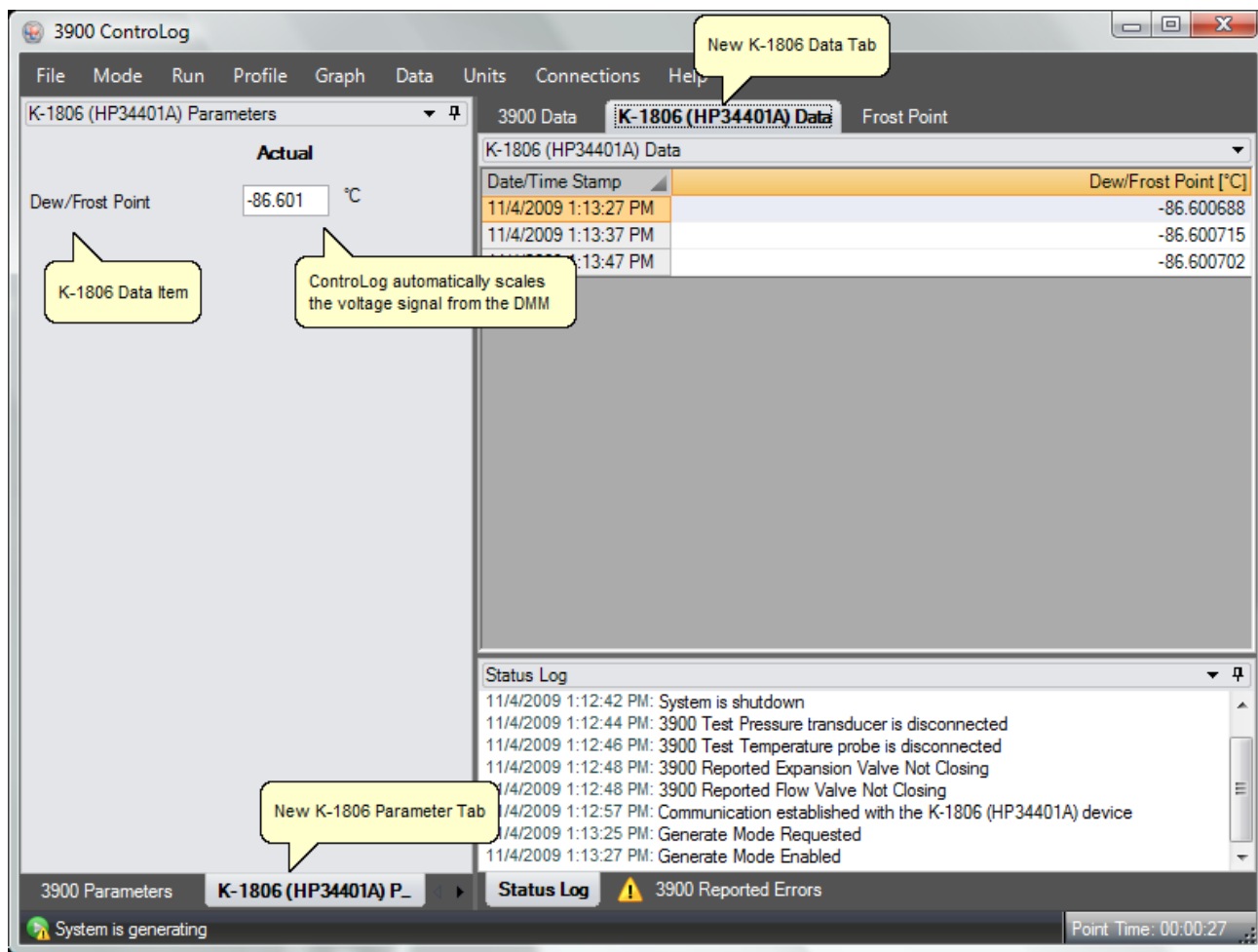
The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area is titled 'Access interval to the device'. It contains a numeric spinner set to 1.5 and a dropdown menu set to 'seconds'. Below these is the text: 'This is the rate at which ControLog will communicate with the device.' At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (disabled), 'Finish' (highlighted in yellow), and 'Cancel' (disabled).



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.

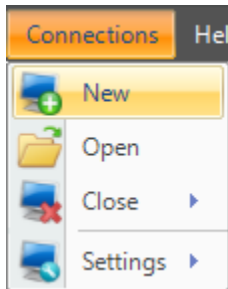


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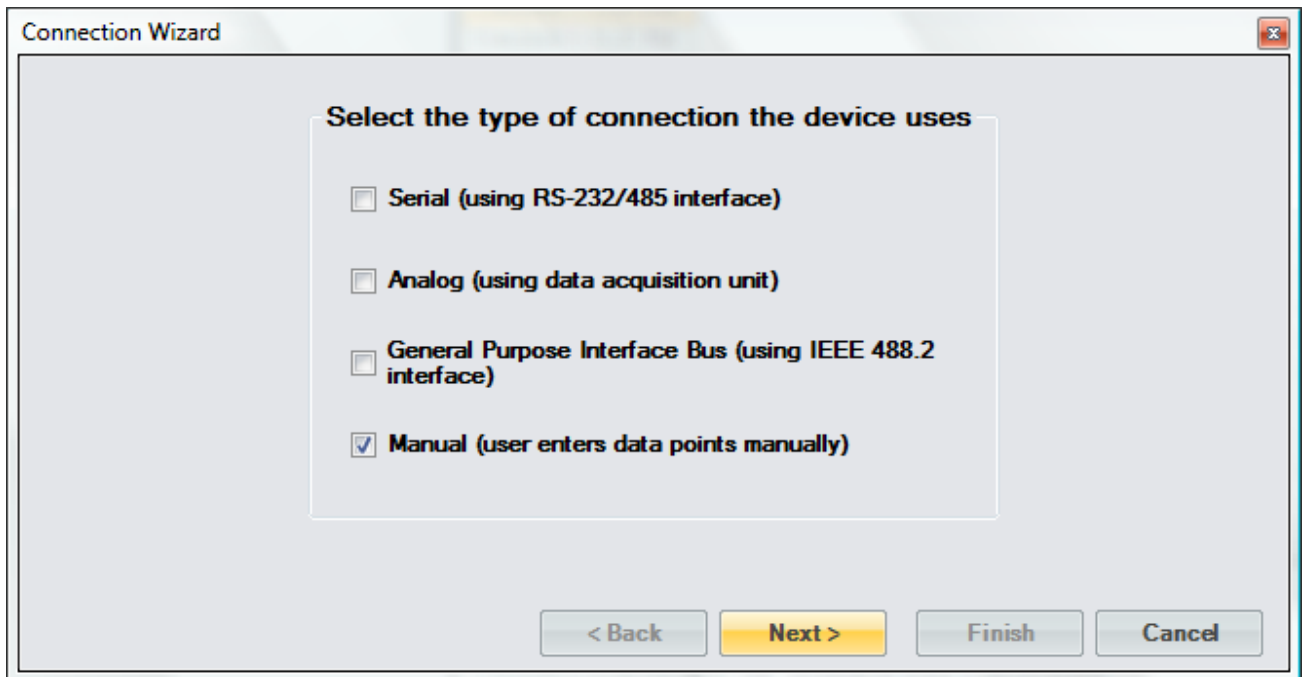
## Manual Connection

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.

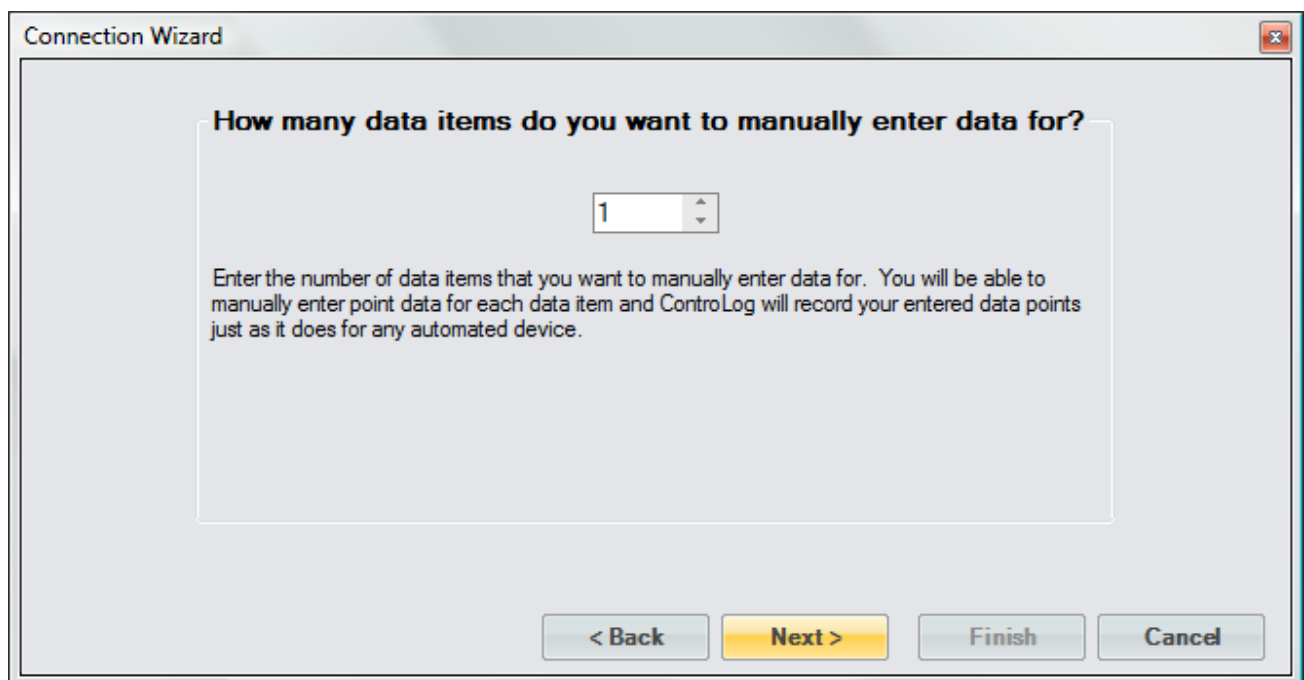


Enter a unique name for the device.



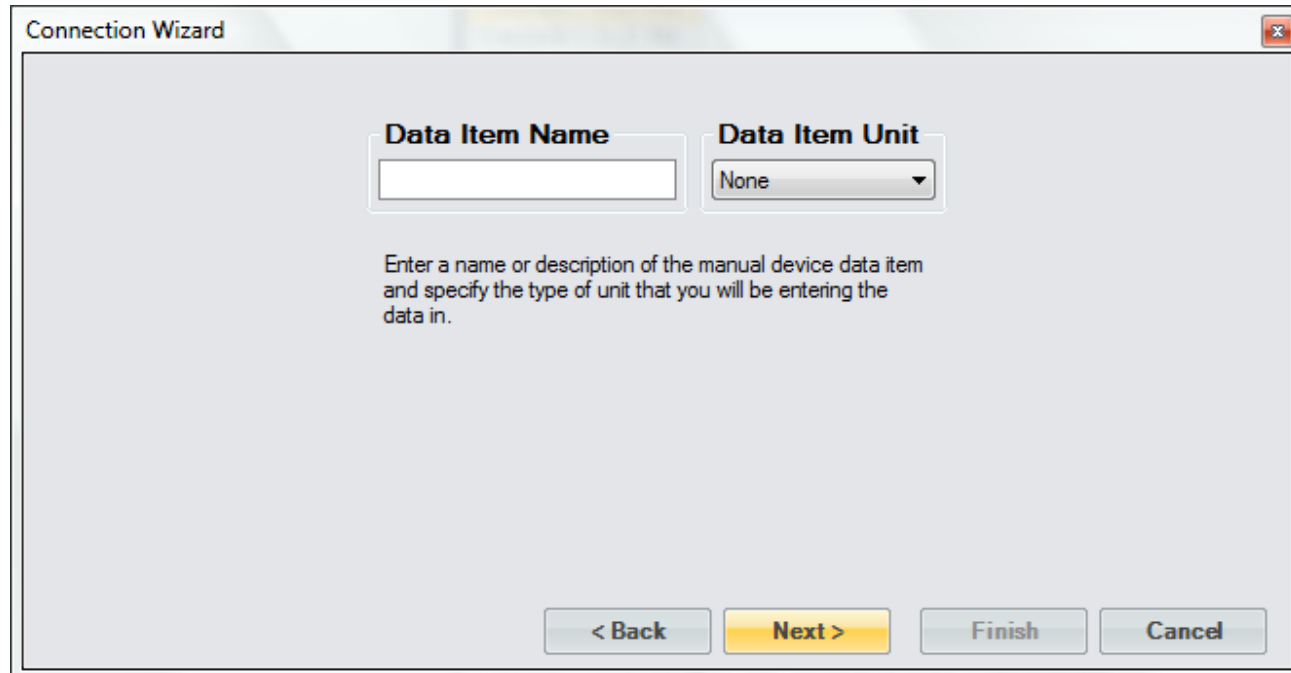
The image shows a 'Connection Wizard' dialog box. The title bar says 'Connection Wizard'. The main area has a light gray background. In the center, there is a white rectangular box with the text 'Enter a name for the device' in bold. Below this text is a single-line text input field. At the bottom of the dialog, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

Select the number of manual data entries.



The image shows the same 'Connection Wizard' dialog box, but at a different step. The title bar still says 'Connection Wizard'. The main area has a light gray background. In the center, there is a white rectangular box with the text 'How many data items do you want to manually enter data for?' in bold. Below this text is a spin box containing the number '1'. Underneath the spin box, there 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 of the dialog, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

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**

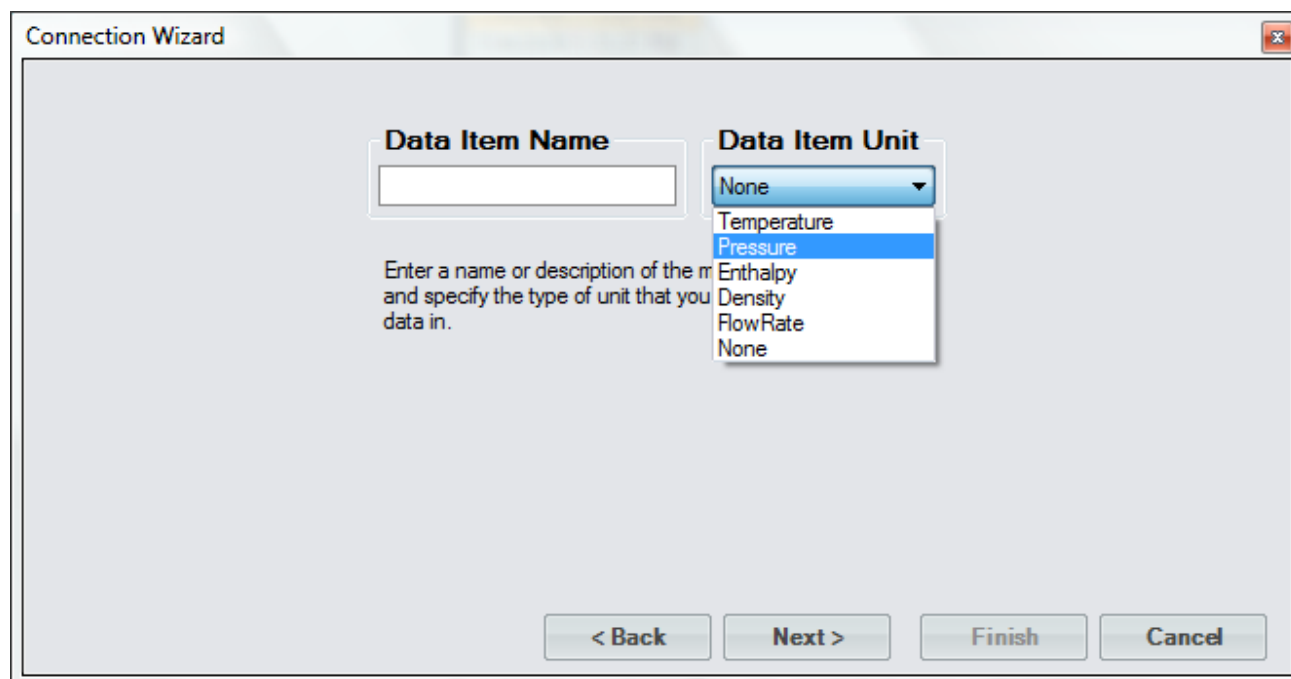
**Data Item Unit**

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.

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main content area is titled "Save Device Configuration as". It contains a text input field with the text "Manual Device" and a "Browse" button to its right. Below the input field, there is a line of text: "Select the name and location to save this device configuration to." At the bottom of the window, there are four buttons: "< Back", "Next >" (highlighted in yellow), "Finish", and "Cancel".

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

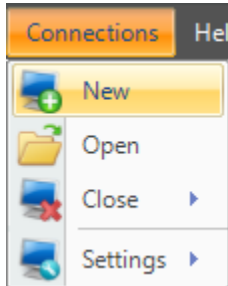
*Note: The user can connect at any time by loading the device from the Connections menu.*

The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main content area is titled "Would you like to connect to this device now?". It contains two radio button options: "Yes" (which is selected with a checkmark) and "No". Below these options, there is a line of text: "Select 'Yes' if you would like to connect to the device now." and another line of text: "Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu." At the bottom of the window, there are four buttons: "< Back", "Next >", "Finish" (highlighted in yellow), and "Cancel".

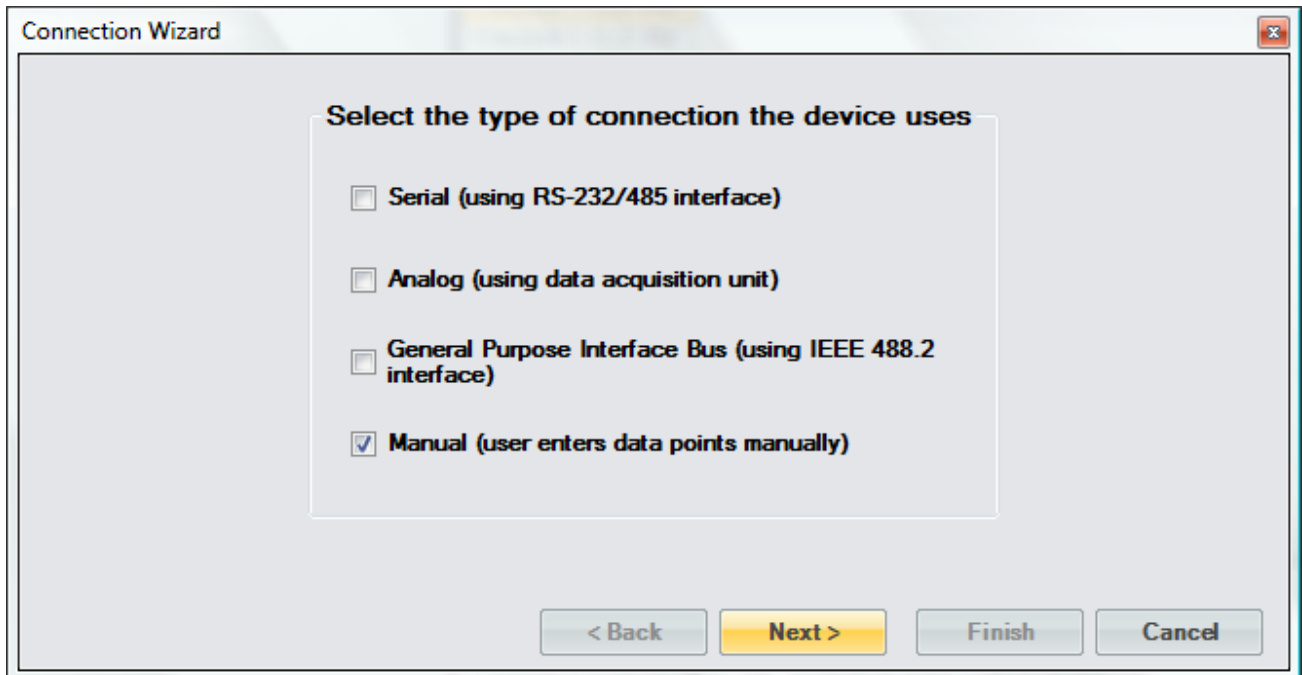
## Manual Connection Example

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.

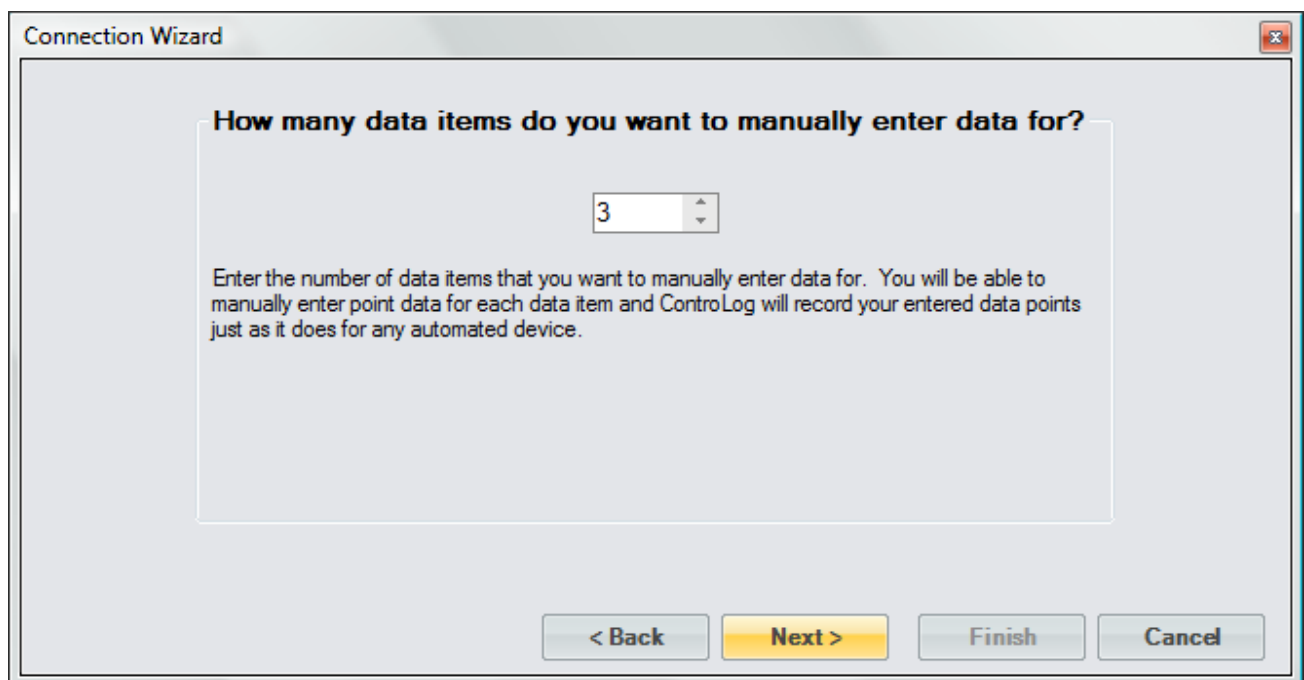


Enter “Manual Device” as the name for the device.



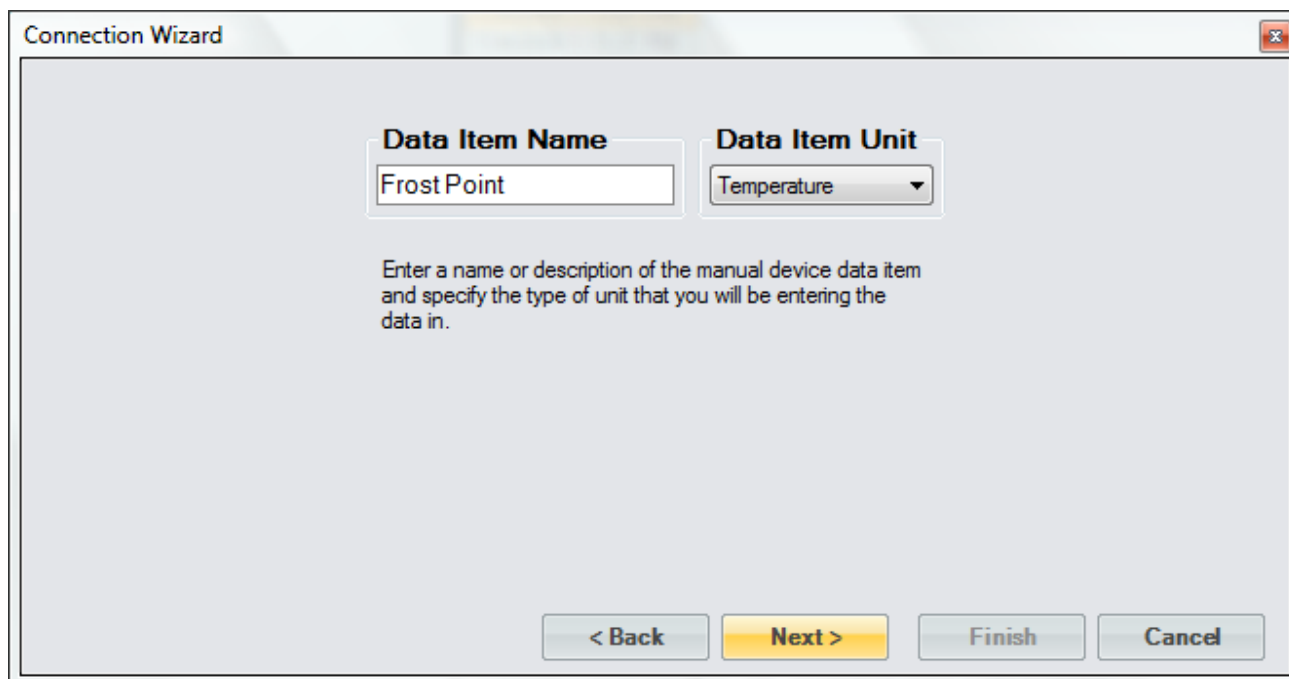
The screenshot shows a window titled "Connection Wizard" with a close button in the top right corner. The main area contains a text box with the label "Enter a name for the device" above it. The text box contains the text "Manual Device". At the bottom of the window, there are four buttons: "< Back", "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 a text box with the label "How many data items do you want to manually enter data for?" above it. The text box contains the number "3". Below the text box, there 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 of the window, 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 image shows a 'Connection Wizard' dialog box. It has a title bar with a close button. The main area contains two input fields: 'Data Item Name' with the text 'Frost Point' and 'Data Item Unit' with a dropdown menu showing 'Temperature'. Below these fields is a descriptive text: '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, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

**Connection Wizard**

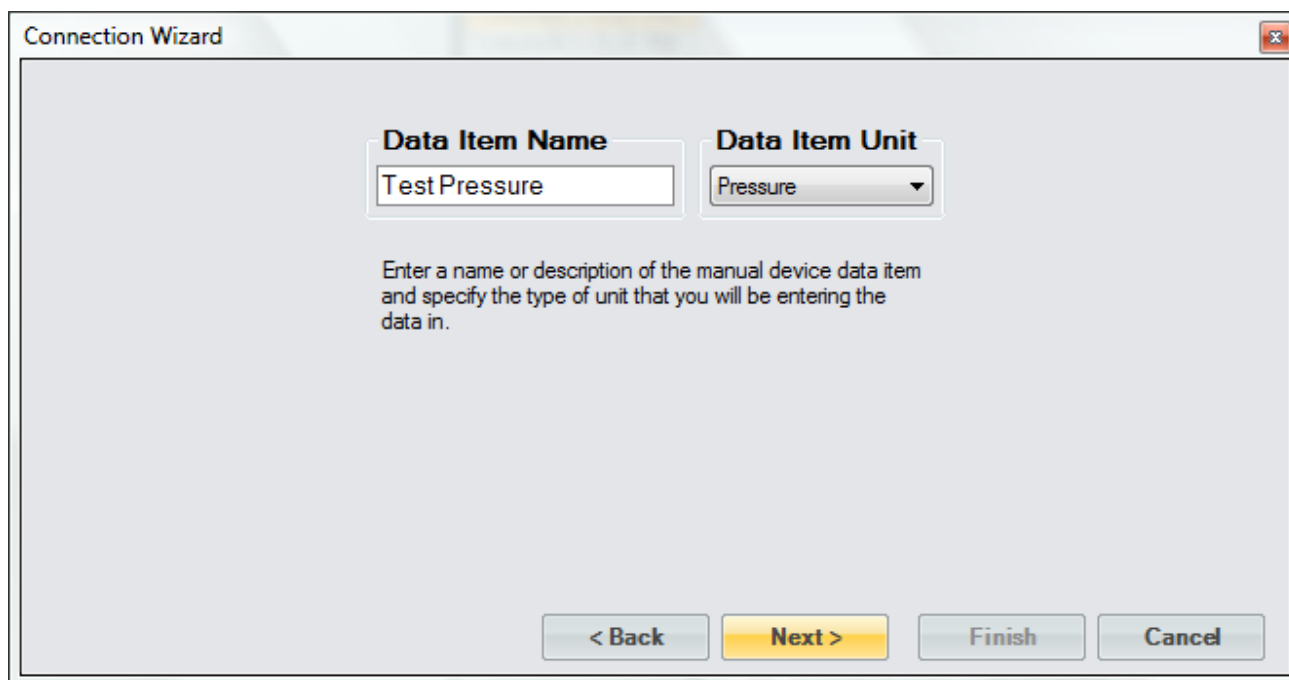
**Data Item Name**  
Frost Point

**Data Item Unit**  
Temperature ▼

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 second point is Test Pressure and it will be of the pressure unit type.



The image shows a 'Connection Wizard' dialog box. It has a title bar with a close button. The main area contains two input fields: 'Data Item Name' with the text 'Test Pressure' and 'Data Item Unit' with a dropdown menu showing 'Pressure'. Below these fields is a descriptive text: '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, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

**Connection Wizard**

**Data Item Name**  
Test Pressure

**Data Item Unit**  
Pressure ▼

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 third point is Test Temperature and it will be of the temperature unit type.

The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area has 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 descriptive text: '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, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

**Connection Wizard**

**Data Item Name**  
Test Temperature

**Data Item Unit**  
Temperature

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

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

The image shows a 'Connection Wizard' dialog box with a title bar containing a close button. The main area has a text box with 'Manual Device' and a 'Browse' button next to it. Below this is a descriptive text: 'Select the name and location to save this device configuration to.' At the bottom, there are four buttons: '< Back' (disabled), 'Next >' (highlighted in yellow), 'Finish' (disabled), and 'Cancel' (disabled).

**Connection Wizard**

**Save Device Configuration as**

Manual Device   **Browse**

Select the name and location to save this device configuration to.

< Back   **Next >**   Finish   Cancel

Select to connect to the device now.



The image shows a 'Connection Wizard' dialog box. It has a title bar with the text 'Connection Wizard' and a close button (X) in the top right corner. The main content area is light gray and contains a white rectangular box with a black border. Inside this box, the text 'Would you like to connect to this device now?' is displayed in bold. Below this text are two radio button options: 'Yes' (which is selected, indicated by a checkmark in the box) and 'No'. Below the radio buttons, there is a paragraph of text: 'Select 'Yes' if you would like to connect to the device now. Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu.' At the bottom of the dialog box, there are four buttons: '< Back', 'Next >', 'Finish' (which is highlighted in yellow), and 'Cancel'.

Connection Wizard

**Would you like to connect to this device now?**

☒ **Yes**

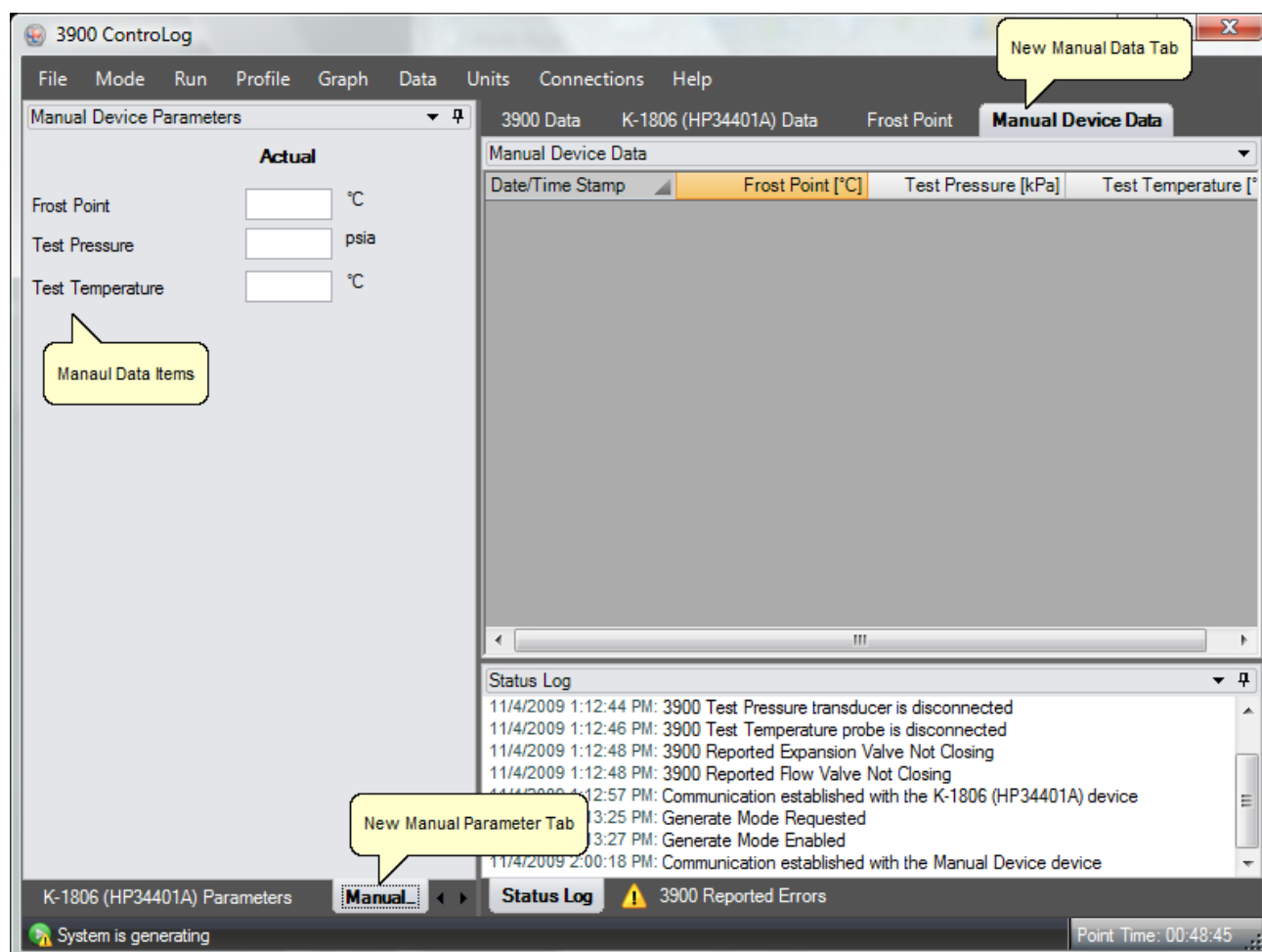
☐ **No**

Select 'Yes' if you would like to connect to the device now.

Select 'No' if you would like to exit without connecting to the device. Note you can connect at any time using by loading the device file from the Connections menu.

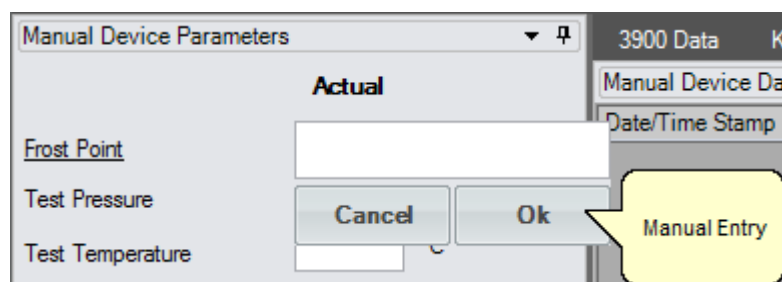
< Back   Next >   **Finish**   Cancel

Once completed a new parameter tab and data tab will be created.

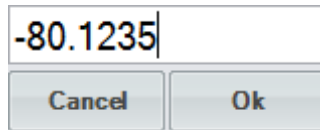


To manually enter a value, click on the actual field you would like to enter. A Manual Entry box will appear and the title of the manual item being entered will be underlined. For example, to enter a manual value for the Frost Point item click on the Frost Point Actual field.

*Note: The manual entries will not be recorded in the data tab until all data item values have been manually entered.*

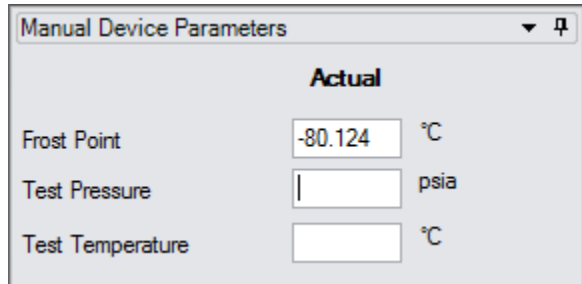


Enter the manual value into the Manual Entry box and select Ok.



A small dialog box with a text input field containing the value "-80.1235". Below the input field are two buttons: "Cancel" on the left and "Ok" on the right.

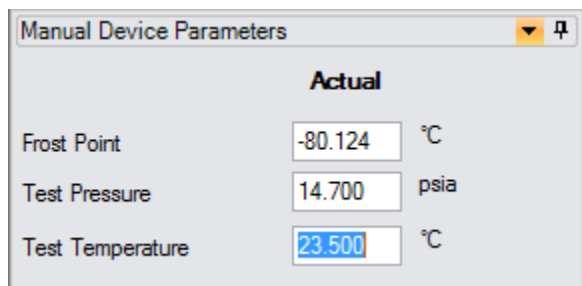
The manual entry will now be displayed in the actual field of the parameter tab.



A dialog box titled "Manual Device Parameters" with a dropdown arrow and a help icon. It contains a section labeled "Actual" with three rows of parameters:

Actual		
Frost Point	-80.124	°C
Test Pressure		psia
Test Temperature		°C

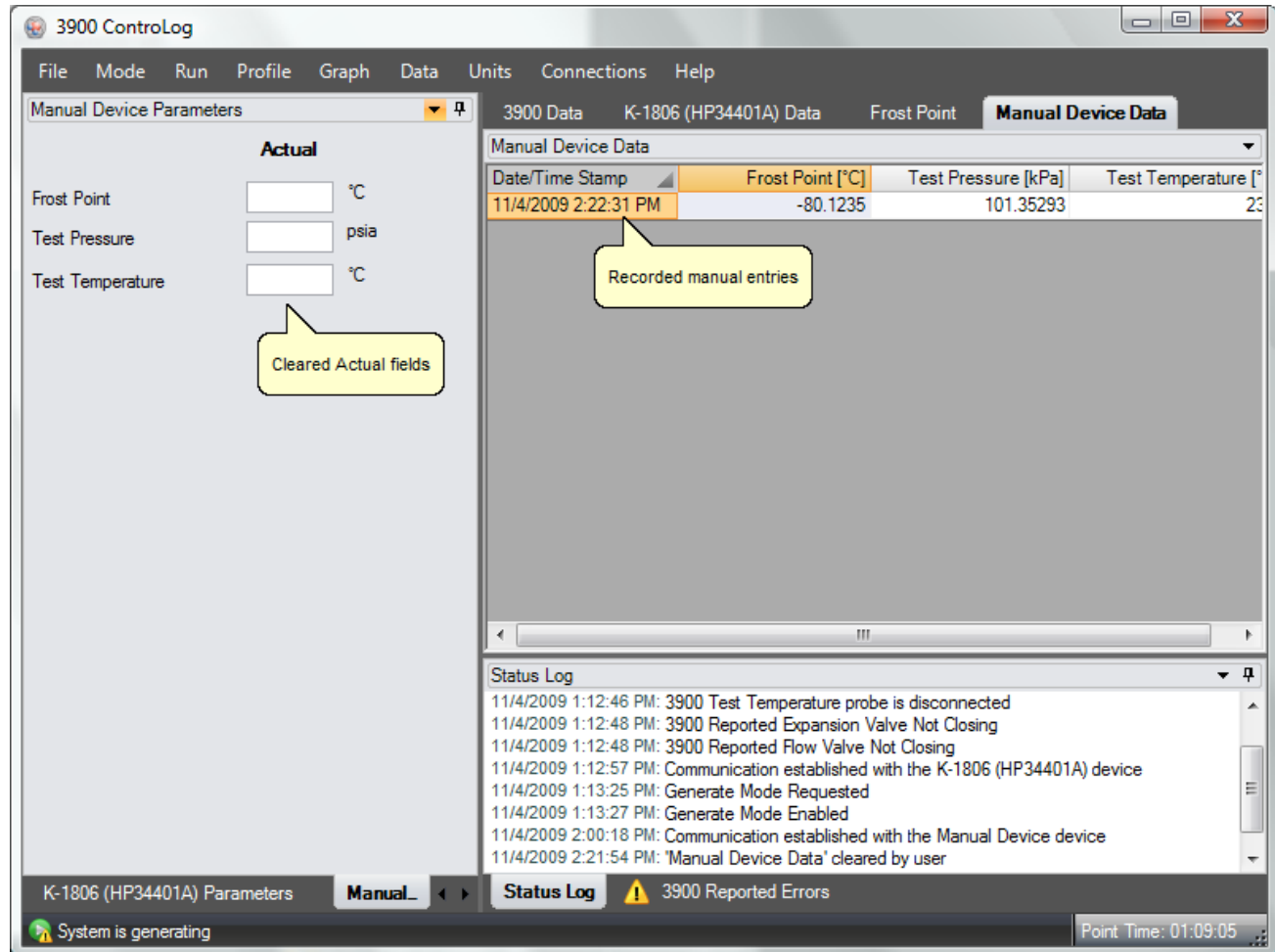
Repeat the process for the remaining data items.



A dialog box titled "Manual Device Parameters" with a dropdown arrow and a help icon. It contains a section labeled "Actual" with three rows of parameters:

Actual		
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 2500 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, Td, is controlled at a constant value by varying saturation pressure, Ps, to compensate for any changes in either saturation temperature, Ts, or test pressure, Pt. 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 2500 should take to transition from one profile test point to another. Setting a ramp time of zero instructs the 2500 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.

# Index

## %

%RH@Pc 51  
%RH@Pc Control Mode 20  
%RH@PcTc 51  
%RH@PcTc Control Mode 20

## /

/ 38, 66

## 2

2500 Interface Console 65  
2500 Parameter Tab 47  
2500 Reported Errors 64

## A

About ControLog 1, 40  
Absolute Humidity 51  
Advancing to the Next Phase 132  
Advancing to the Next Point 132  
Analog Connection 175  
Analog Connection Example 183  
Assurance 114  
Assurance Phase 129  
Auto Profile Controls 70  
Auto Profile Controls and Status 70  
Auto Profile Status 70  
Auto Profiling 113  
Auto Scale 82  
Auto Scale Graph 26

## C

Calculated Humidity Parameters 51  
Changing Setpoints 48  
Clear Data 31  
Clear Status Log 17  
Close All Data Tabs 27  
Close All Graphs 26

Close Connection 36  
Close Data 31  
Close Graph 26  
Close Profile 24  
Connect to 2500 36  
Connection and Run Status 68  
Connections Menu 36  
Control Mode 114  
Control Parameters 48  
ControLog Minimum System Requirements 4  
Copy All Data 31  
Copyright 3  
Crashes and Data Recovery 12  
Create Data Summary 29  
Creating a Data Summary 97  
Creating a New Graph 74  
Creating a New Profile 114  
Current Point Time 71  
Customizing a Graph 78

## D

Data and Graph Tab Group 57  
Data Backup 5  
Data Menu 28  
Data Storage Interval 31  
Data Summary Tabs 96  
Data Tabs 59  
Density Unit 34  
Device Data Tabs 92  
Device Interface Console 66  
Device Parameter Tabs 55  
Device Parameters 56  
Dew Point 51  
Dew Point Control Mode 20  
Disconnected 68  
Dry Air Density 51  
Dry Air Mole Fraction 51

## E

Enthalpy 51  
Enthalpy Unit 35  
Example 1 130  
Example 2 130  
Example 3 130  
Exit ControLog 19  
Exp Value Position 51

## F

F@Td.Pt 51  
F@Ts.Ps 51  
F@Tt.Pt 51  
File Data Tabs 93  
File Menu 16

Flow Unit 34  
Flow Value Position 51  
Frost Point 51  
Frost Point Control Mode 20

## **G**

Generate Mode 22  
Generating 69  
GPIB Connection 191  
GPIB Connection Example 205  
Grains/lb 51  
Graph Menu 25  
Graph Properties 27, 83  
Graph Tabs 59

## **H**

Help Menu 40  
Help Topics 40  
Hold Profile Point 24  
Holding the Profile 131  
How to Record a Data Point 107

## **I**

Import Uncertainty Solution 18  
Information Tab Group 60  
Installing ControlLog 5  
Interface Connections 6

## **L**

License 7  
License Agreement 2

## **M**

Manual Connection 214  
Manual Connection Example 218  
Manual Override of Profile 131  
Mass Flow Rate 114  
Menu Bar 16  
Mixing Ratio by Volume 51  
Mixing Ratio by Weight 51  
Mode Menu 20  
Moist Air Density 51

## **N**

New Connection 36  
New Event 69  
New Graph 25  
New Profile 24  
Next Profile Phase 24  
Next Profile Point 24

Notice 1

## **O**

Open 2500 Interface Console 37  
Open Connection 36  
Open Data File 16, 29  
Open Device Interface Console 38  
Open Profile 24  
Opening a Profile 125

## **P**

Pan 78  
Parameters Tab Group 41  
Percent by Volume 51  
Percent by Weight 51  
PPMv 51  
PPMv Control Mode 20  
PPMw 51  
PPMw Control Mode 21  
Pressure Unit 34  
Print Data 31  
Print Graph 26  
Print Profile 24  
Print Status Log 17  
Printing a Graph 88  
Printing a Profile 126  
Product Key 7  
Profile 113  
Profile Menu 23  
Profile Tab 59  
Profiling 113

## **R**

Ramp Phase 129  
Ramp Time 114  
Record Data Point 29  
Recorded Data Points Tab 106  
Run Auto Profile 24  
Run Menu 22  
Running an Auto Profile 127

## **S**

Sample Size 114  
Saturation Pressure Control Mode 21  
Save All Data 17  
Save Data 31  
Save Graph 26  
Save Profile 24  
Save Status Log 17  
Saving a Graph 86  
Saving a Profile 124  
Scale 82

- Scale Graph 26
- Scale Graph's X Axis 27
- Scale Graph's Y Axis 27
- Scale X Axis 82
- Scale Y Axis 82
- Serial Connection 134
- Serial Connection Example 1 148
- Serial Connection Example 2 159
- Settings 29, 37
- Shutdown 22, 69
- Soak Phase 130
- Soak Time 114
- Specific Humidity 51
- Standard Deviation 114
- Starting ControLog 7
- Status Bar 68
- Status Log 64
- Stop Auto Profile 24
- Stopping the Auto Profile 132
- SVP@Td 51
- SVP@Ts 51
- SVP@Tt 51
- System Requirements 4
- System timing 64

## **T**

- Take Point Ctrl-P 30
- Technical Support 1
- Temperature Unit 33
- Thunder Scientific on the Web 40
- Tolerance 114
- Trademark 3

## **U**

- Understanding Profile Phases 129
- Units Menu 33

## **V**

- Vapor Mole Fraction 51

## **W**

- Warranty 3
- Wet Bulb Temperature 51

## **Z**

- Zoom 79
- Zoom Graph 26
- Zoom Graph's X Axis 26, 80
- Zoom Graph's Y Axis 26, 81