

# **Ametek 9900-Series Analyzers Configurator Software User's Guide**



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# 1 Introduction

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This Guide describes the Configurator software for Ametek 9900-series Analyzers. It is used to configure and calibrate the analyzer, and to graph and log data from the analyzer. The Configurator can also be used while performing maintenance or while troubleshooting the analyzer.

Ametek 9900-series analyzers can be also configured from the front panel, and a few operations can only be performed using the front panel.

You can view the configuration settings by connecting the analyzer to a web browser.

For information about the analyzer itself, including how to configure it from the front panel, please refer to document PN 903-8726: Model 9900<sup>RM</sup> (Rack Mount) Analyzer User Manual.

## About This Guide

This Guide is for the following AMETEK Western Research analyzers:

- Model 9900<sup>RM</sup>
- Model 9933<sup>RM</sup>
- Model 992x<sup>WM</sup>
- Model 993x<sup>WM</sup>



*The Configurator screens in this manual are example screens only. Some of the screens are only available if you have installed optional hardware in your analyzer.*

## How This Guide is Organized

This Guide starts with a description of the user interface conventions used by the software, and how to view the documentation.

It's followed by a description of how to configure the analyzer, screen by screen.

Next is a description of the data acquisition and charting functions.

Appendix I covers software installation.

Appendix II is intended for factory use and advanced users, and describes the Modbus Register map spreadsheet.

Appendix III describes the Configurator Preference settings, and how to set up communications ports. It is intended for all users of the software.

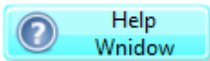
# Getting Help

## Help Window

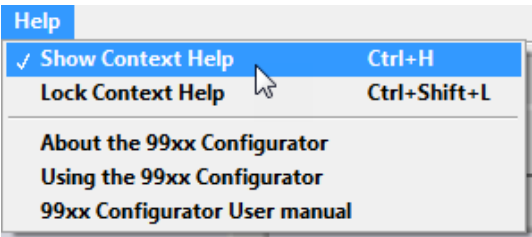
There are several levels of help available in the Configurator.

If you hover the cursor over a control or table, a tip strip pops up with a short description.

For more detailed documentation, you can display a floating help window by clicking the Help button (it turns blue when the floating help window is visible):



You can also display the floating help window by selecting *Show Context Help* from the Help menu, or by pressing Ctrl-H on the keyboard:



The Help window contains information specific to whatever the cursor is hovering over. In many cases, the text is taken from this Guide.

For example, if the cursor is hovering over the Oxygen table on the Home screen:

Oxygen	0.00	%
O2 Temp	0.00	deg C

The floating help window shows you more about the table, and the Modbus registers that the information comes from:

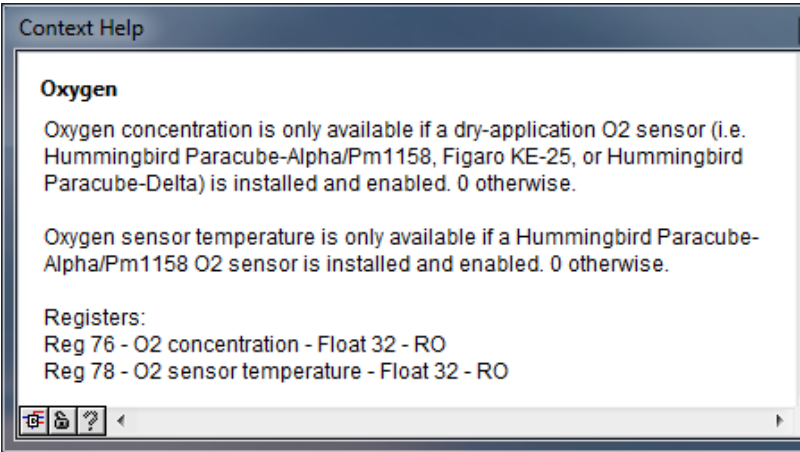


Figure 1 – The Context Help window



For each register, you see:

- The register number, using standard 1-based numbers. For more information, please refer to the Modbus specification in the analyzer's User Manual.
- The name of the register as found in the Modbus Register Map (see Appendix II).
- The data type of the register, and any scaling factors that will be applied to the register value if it is an integer data type.
- The access level (read, write, or read/write)

## More Help

You can also get general help about using the configurator from the Help menu:

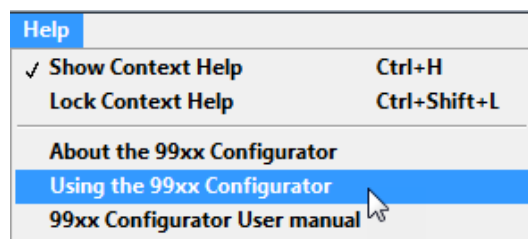
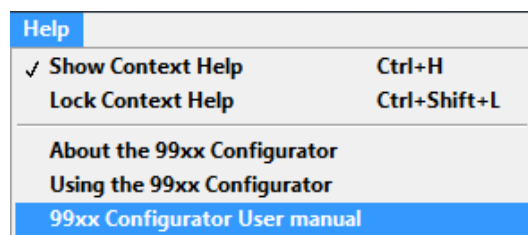


Figure 2 – The Help menu

## User's Guide

The User's Guide to the configurator (this document) is installed along with the software. You can launch it from the Help menu:



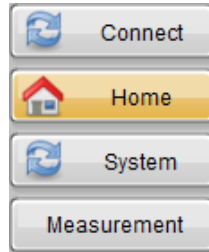
## Controls

This section describes the items that can appear in a configurator window, and how they work. One important difference between this configurator and others that you may have used is that everything is live. When you make a change to a screen, any new values are sent to the connected analyzer right away, so there's no "Apply" or "Send" button. If you make a mistake and want to undo it, you'll need to either power cycle the analyzer, or restore the configuration from the "Undo file" that's automatically created every time you connect to an analyzer (you can also restore from configuration files that you create manually – please see page 1-7 for more information).

## Buttons

Buttons trigger an action.

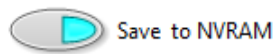
The left-hand part of the Configurator window has buttons that control what's displayed in the main part of the window (there are more buttons than are shown here):



The active selection is amber.

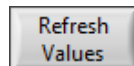
## Combination Buttons

Some buttons contain an LED that shows the current state of the action that the button controls. For example, the *Save to NV Memory* button illuminates if there are unsaved changes. Clicking the button saves the current analyzer settings to the analyzer's non-volatile memory:



## Refresh

Most of the configuration screens have a Refresh button:



When you click it, it turns temporarily darker and reads "Refreshing Values" while the screen contents are being read from the analyzer.

It's primarily useful if changes have been made using the analyzer's front panel controls, and you'd like them to be reflected in the Configurator.

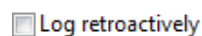
## LEDs

LEDs show the status of an operation, action, or task.

A dark LED means that the state isn't present on the analyzer.  
Green means OK,  
Amber means Warning, and  
Red means Fault.

## Checkboxes

Checkboxes work just like you'd expect them to:



If the inside of the checkbox is white, you can change the setting.  
If it's grey, you can't.

## Menus

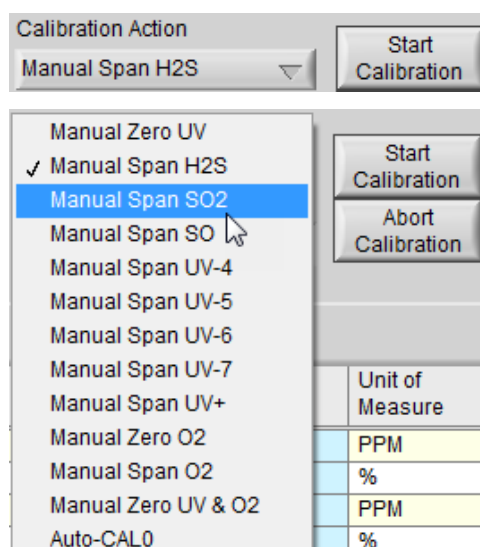
Pop-up menus usually have a little downward pointing triangle:



When you click one, a menu appears. You select an item by clicking it.

Most pop-up menu selections, such as those in the dashboard, take effect right way.

In some cases where a time-consuming process is involved, such as calibration, there is an action button to the right of the pop-up menu that starts the action:



## Tables

Temperature Zone					
	Bench	Cell		Bench Board	O2
Control setpoint (deg C)	0.0	0.0			
Kp (deg C)	0.0	0.0			
Ti (sec)	0.0	0.0			
Duty cycle (%)	0	0			
Present reading (deg C)	28.26	24.76		27.89	0.00

Much of the information in the configurator is shown in tables, such as the one above. When you change an item, the new value is immediately sent to the analyzer, but not saved in its non-volatile memory.

Cells with a light blue background are live value cells. You can't change them.

Cells with a grey background are disabled. Any changes you make to them are ignored.

You can move between cells using the tab key, the return key, or the arrow keys. Live value cells and disabled cells are skipped over. Or you can just click in a cell that you want to change.

The light yellow stripes on alternate lines are a visual aid to help you follow lines of the table. If you don't like them, you can switch them off in the Preferences window (see Appendix III – Preferences).

## Graphs

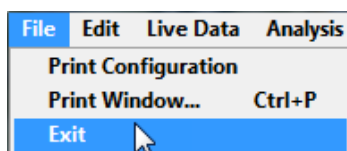
Graphs have so many options that they have their own section in this User's Guide – please refer to the Data Logging and Charting section on page 3-3-1.

## Exiting from the Configurator

To exit from the Configurator, click the Exit button, or the window's close icon:



You can also select “Exit” from the File menu:



If you haven't saved your changes to Non-volatile memory, you'll get a reminder alert and a chance to save them before the Configurator actually exits.

## Connecting to an Analyzer

If you haven't already installed the software, please refer to Appendix I – Installing the Configurator Software.

Appendix III describes the Preferences screen, which lets you specify communication settings, and contains some tips for troubleshooting connection issues.

When you launch the configurator, the *Connect* panel is displayed:

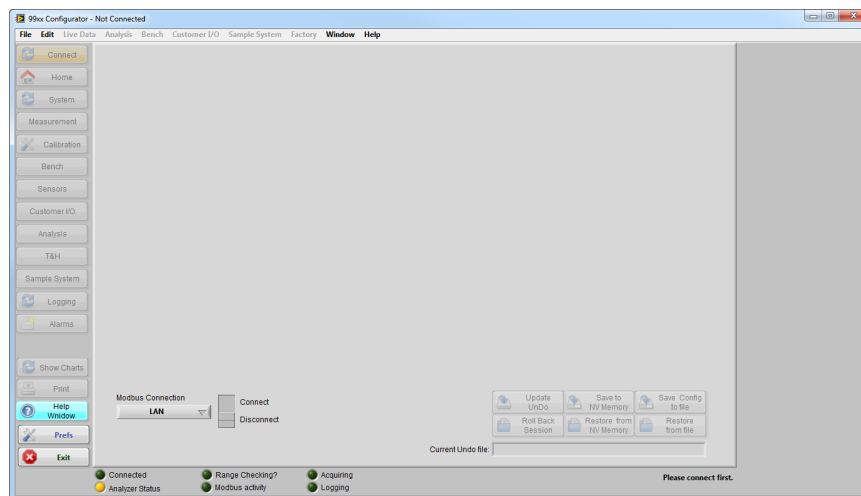



Figure 3 – The Connect Panel

If this is the first time you are using the Configurator, this would be a good time to review the connections that are listed in the *Preferences* window, and make sure that they include the way you intend to connect to an analyzer. Click  **Prefs**, and turn to Appendix III for more information.

In most cases, you can just pick the connection that you'd like to use from the pop-up menu shown below, and click the connection switch:

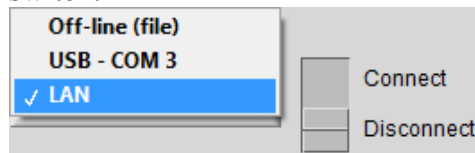


Figure 4 – Choosing a Modbus connection

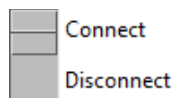


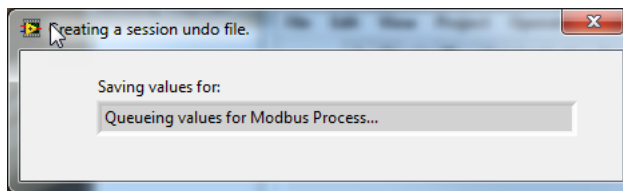
Figure 5 – The Connect switch

The Connect switch and the Connected LED turn green when the analyzer is connected:



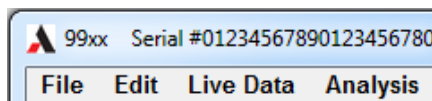
For your convenience, the Configurator remembers your connection choice, and initially positions the pop-up menu to the connection you used last time.

You should briefly see a message as the Configurator establishes communications with the analyzer. After that, you'll see a new window appear briefly while the configurator reads every register on the analyzer. This snapshot of the analyzer's configuration is saved as an *Undo file*.



If all goes well, the Configurator will take you to the *Home* screen: a quick visual summary of the analyzer's state. It's described on page 2-1.

The window's title bar is updated to show the analyzer model and serial number:



If things don't go well, it's likely that the communication settings are incorrect. Please refer to *Appendix III — Preferences* for ways to resolve communications issues.

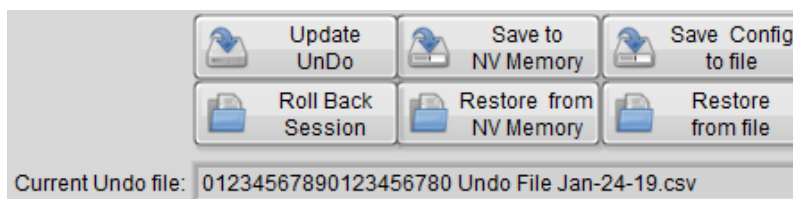
## Undo files

When you make changes to a Configurator screen, the new values are immediately sent to the analyzer. This is why there are no buttons labeled "Send to Analyzer", or "Apply".

Every time you connect to an analyzer, the entire configuration is read from the analyzer, and is written to a spreadsheet-format file. This file is located in the directory you specify for settings in *Preferences*, in a subdirectory named *Saved Configurations*. The file name has the form:

*Analyzer serial number Undo File date – sequence number.csv*

The name of the Undo file is shown on the Connect panel:



To restore all configuration settings from the most recent Undo File, click “Roll Back Session”.

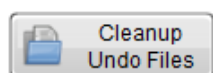
To create an updated Undo file, click “Update Undo”. A new Undo file is created, with an incremented sequence number at the end of the name.

*Oops!*

If you make a mistake and don’t remember what the original value was, you have several options:

- Click “Roll Back Session” to restore the analyzer configuration from an Undo file.
- Click “Restore from file” to restore from an older Undo file, or another saved configuration.
- Click “Restore from NV Memory”.
- Power cycle the analyzer.

## Cleaning up Undo files



Over time, you may accumulate quite a few Undo files. You can remove them manually, or you can click *Cleanup Undo Files* to bring up a dialog that shows how many undo files are in the *Saved Configurations* directory. You also see how many there are for the currently connected analyzer:

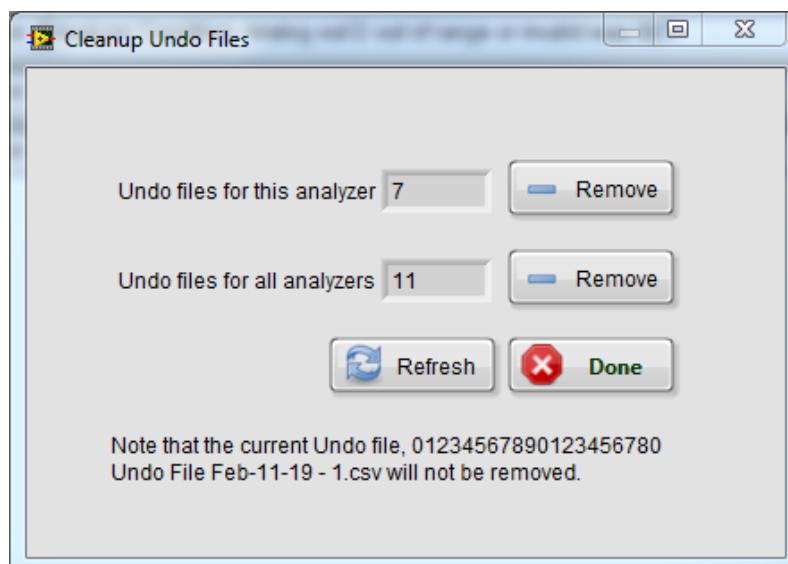


Figure 6 – Cleaning up unused Undo files

You can remove just the Undo files for the currently connected analyzer, or all of the accumulated Undo files. In either case, the current Undo file will be left alone.

## Saving and Restoring Analyzer settings

You can also save the analyzer's configuration at any time by clicking "Save Config to File". You'll be asked to name the file. By default, it will be saved in the same directory as the Undo files.



To restore from either a session undo file, or from a snapshot you made yourself, click "Restore from File". You'll be asked to locate the file, after which all of the writable registers in the analyzer will be set to the values that were stored in the file. To retain these through power cycling the analyzer, don't forget to click **Save to NV Memory**.



*We recommend that you make a reference copy of the analyzer configuration parameters from time to time. This file can then be used to restore all parameters to their original settings in the event of an EEPROM failure, such as it being physically or electrically damaged, or if it is being replaced.*

## NV Memory

The analyzer stores all of its configuration parameters in non-volatile memory. On power-up, it transfers all of those values into working memory.

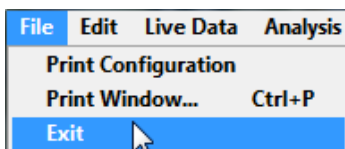
To save all of the changes that you've made in the analyzer's working memory into non-volatile memory, click "Save to NV Memory". To copy a saved configuration from non-volatile memory into working memory, click "Restore from NV Memory".

## Exiting from the Configurator

To exit from the Configurator, click the Exit button, or the window's close icon:



You can also select "Exit" from the File menu:



If you haven't saved your changes to Non-volatile memory, you'll get a reminder.



## Configurator Overview

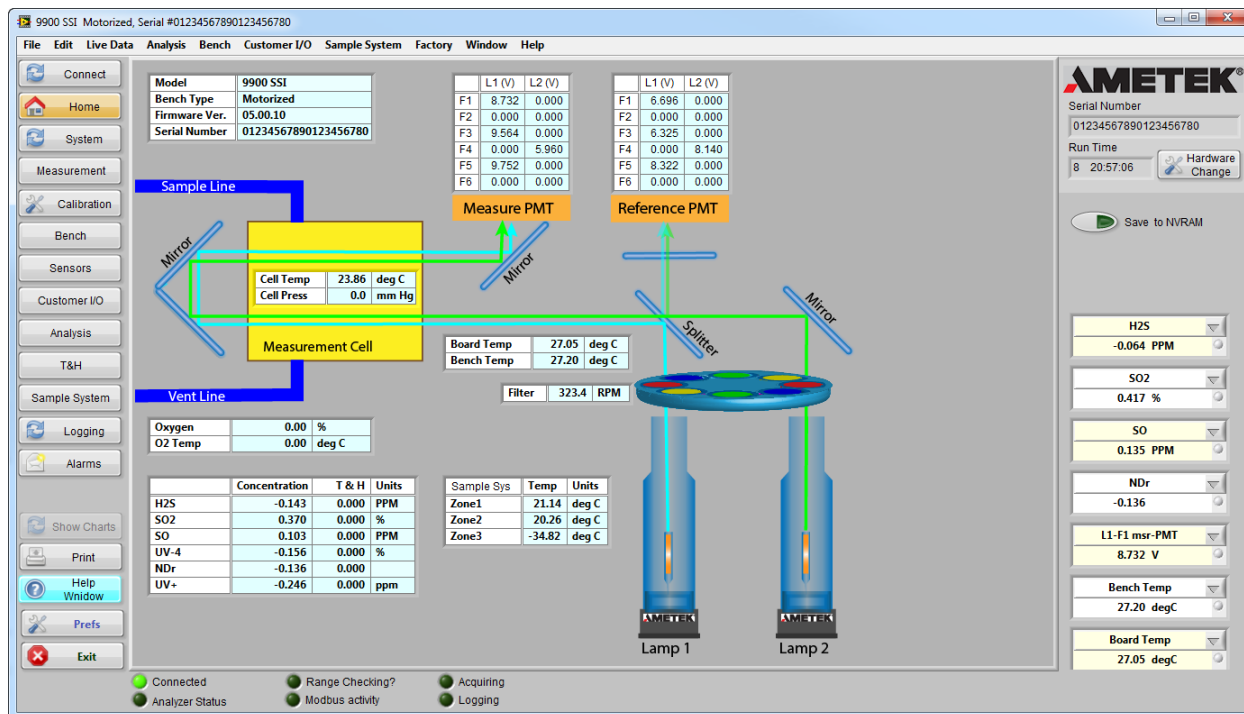


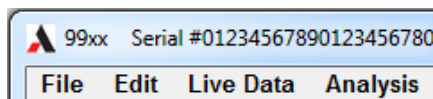
Figure 7 – The Configurator window, showing the Home panel

If you haven't already installed the software, please refer to Appendix I — Installing the Software. You'll need "local administrator" security privileges to install the software, but you don't need to be an administrator to run the software.

Before beginning, you should have already installed and commissioned the analyzer (and set up additional hardware, if required) as explained in the analyzer *User Manual*.

Once you've installed the software and connected to an analyzer (see the previous section), you'll see the Home panel shown above.

The model and serial number of the analyzer are shown in the title bar:



The right-hand part of the window shows the *Dashboard* – a customizable area that shows information about the analyzer, half a dozen live values, and whether you have made changes that have not been saved to non-volatile memory. It's covered in more detail in the next section.

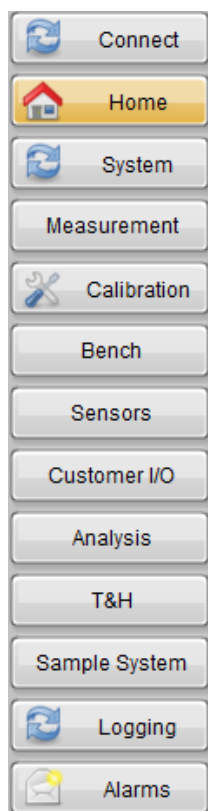
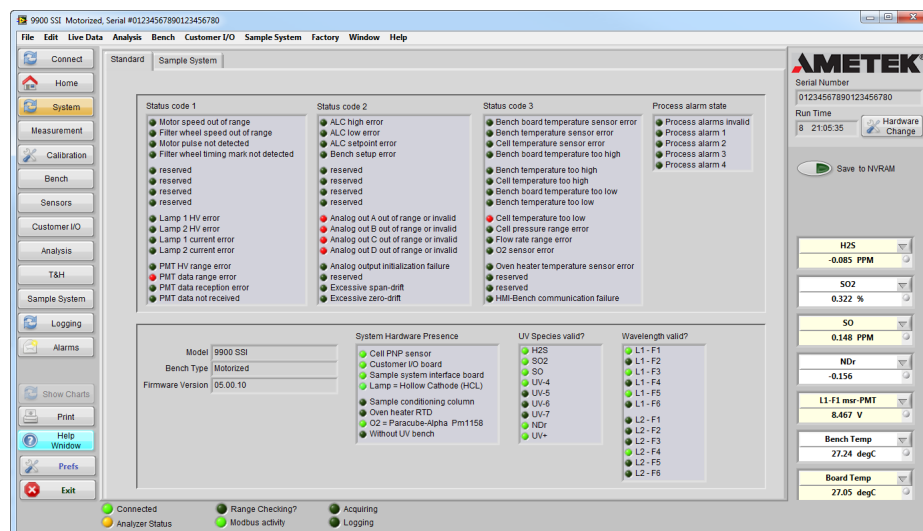


Figure 8 – Menu buttons

The main part of the window displays panels that you select using the buttons on the left hand side of the window (or the menu bar).

In Figure 7 above, the Home button has been selected, so the Home panel is visible.

In the following figure, the System Status panel has been selected:



You can also select which panel to view using the menu bar at the top of the window:

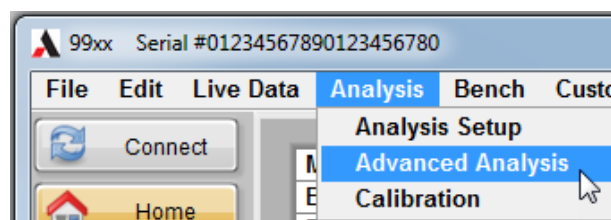


Figure 9 – The Menu bar

## Status LEDs

The bottom part of the window contains several status LEDs:

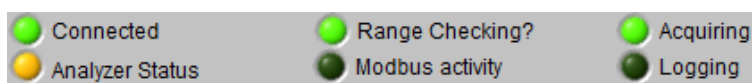


Figure 10 – Status LEDs

Connected	The Connected LED should be green while you are working with an analyzer. If it isn't, you'll need to select the Connect panel, and re-connect to the analyzer.
Analyzer Status	Green: OK Amber: Warning Red: Fault
Range Checking?	Green if the Configurator is currently checking Range (Alarm) limits
Modbus Activity	Flashes green when Modbus packets are read or written
Acquiring	Green when the Configurator is acquiring data for logging or graphing
Logging	Green if values are being logged to a spreadsheet file

## The Dashboard

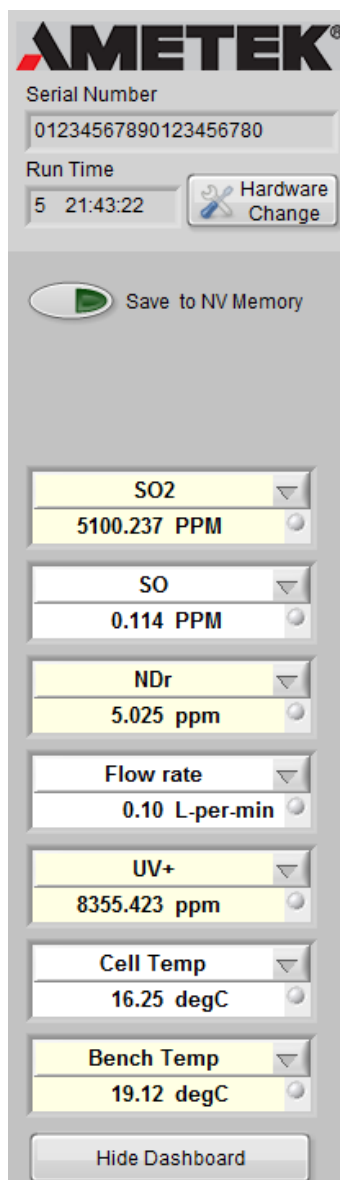
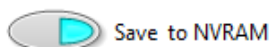


Figure 11 – The Dashboard

The Dashboard gives you a quick overview of the system status.

At the top is the analyzer serial number, and how long it has been running (days hours: minutes: seconds).



The Save to NVRAM button lights up if you have made changes to the analyzer configuration, but haven't saved them to non-volatile memory (NVRAM). Click the button to save them.

You can display seven items in the lower part of the dashboard by simply picking them from the pop-up menus (click the little downward pointing triangles):

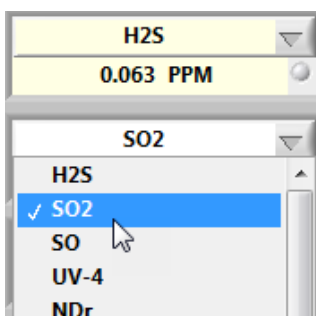


Figure 12 – Selecting a Dashboard signal

The software remembers your selections, and restores them the next time you run the configurator. The small LED to the right of each item shows whether it's inside the alarm limits (green) or not (amber or red). If you haven't set up alarms for a signal, the LED will be grey.

The signals that appear in the pop-up menu are determined by the Modbus register map: they are the rows with "Yes" in the *Dashboard?* column. You can add or remove Dashboard signals by editing the register map – see Appendix III for more information.

Additionally, only species that are currently marked as being valid by the analyzer appear in the menu (you can see which of them have been marked valid by looking at the System Status panel – see page 2-4).

If you find the dashboard to be distracting, you can hide the live values by clicking "Hide Dashboard". This also eliminates the associated Modbus traffic.

## The Connect Panel

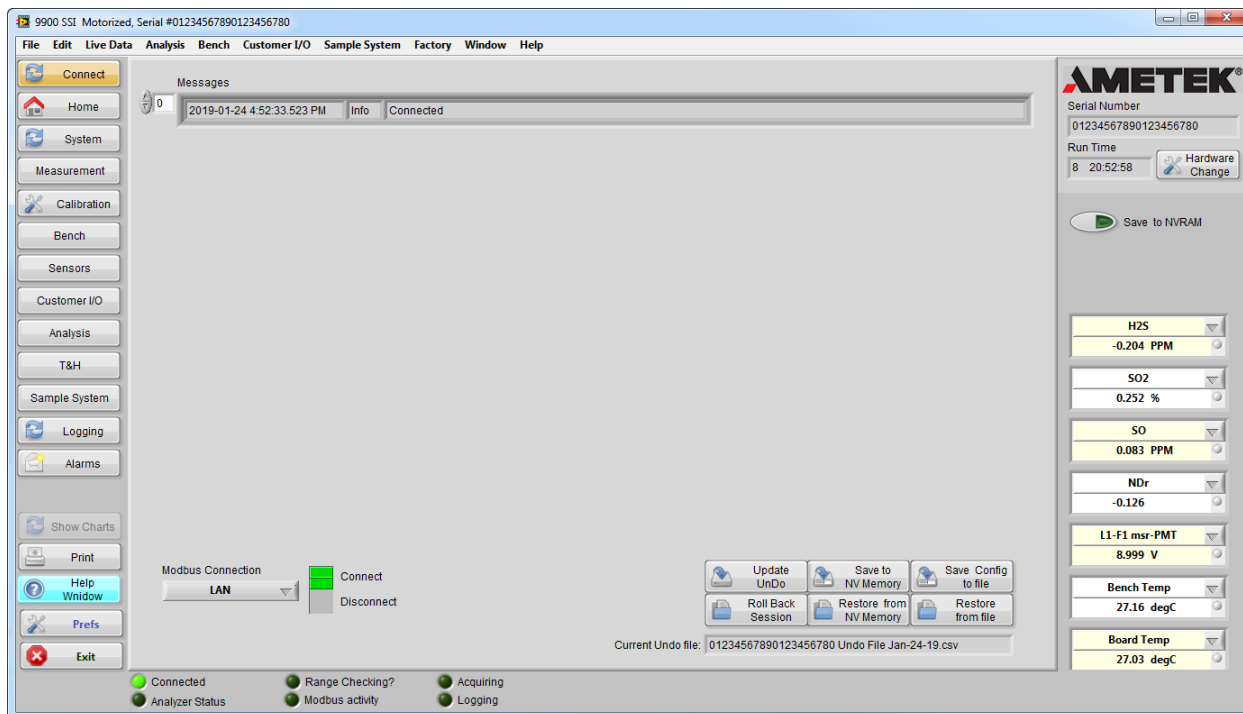


Figure 13 – The Connect panel, showing the Messages area

Most of the items in the Connect panel were covered in *Connecting to an Analyzer*, on page 1-7.

There is a *Messages* area that displays error and information messages. These messages are also logged in a directory named *Messages*, which is a subdirectory of the *Test Logs* directory specified by your preferences (see Appendix III – Preferences – by default, *c:\Ametek Configurator\99XX\Test Logs\Messages*).

You can use the Configurator even when you are not connected to an analyzer. For more information, please see the “Off-line Mode” chapter on page 4-1.



## 2 Configuring the Analyzer

### The Home Panel

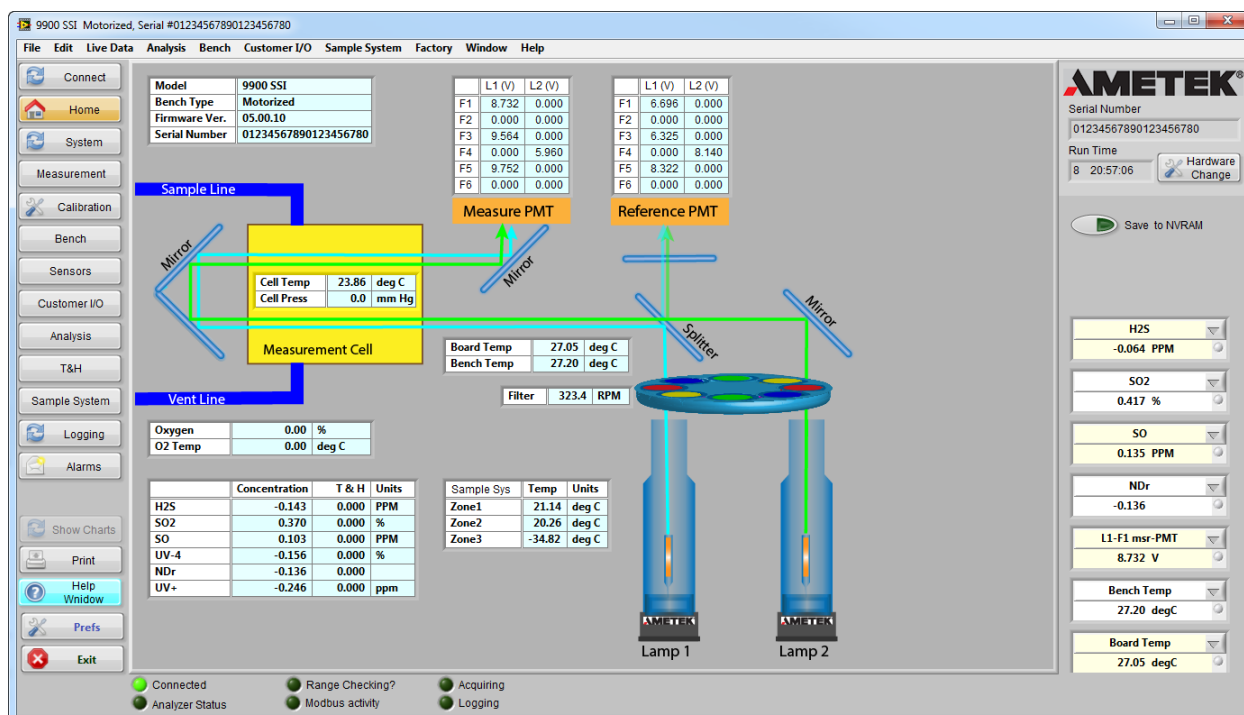


Figure 14 – The Home panel

The Home panel is intended to provide an overall picture of the analyzer's operation. The diagram is a functional view of the Optical Bench.

You can't change the values displayed on this screen (the registers are read only). For information about each of the items in the Home screen, remember that you can hover the cursor over them. You can also display a floating help window to show more information, such as which Modbus registers provide the values.

All measurements are in SI units of measure<sup>1</sup>.

### Analyzer Model

Model	99xx
Bench Type	Motorized
Firmware Ver	05.00.12
Serial Numbe	01234567890123456780

<sup>1</sup> Strictly speaking, the analyzer does not use SI-10 base units. It uses cm for length, deg C for temperature, and mm Hg for pressure.

Depending on the model, some items will not be displayed. For example, filter wheel information is only displayed when connected to an analyzer with a motorized Optical Bench.

## Cell Conditions

Cell Temp	25.68	deg C
Cell Press	0.0	mm Hg

Measurement cell pressure and temperature are available for all models of the 99xx that contain an optical bench, but only if optional sensors have been installed (they are zero otherwise). See page 2-9 for more information.

## UV Species Concentrations

	Concentration	T & H	Units
H2S	-0.795	0.000	PPM
SO2	0.072	0.000	%
SO	0.193	0.000	PPM
UV-4	0.497	0.000	%
NDr	-0.287	0.000	
UV+	-0.989	0.000	ppm

This table only shows species that have been marked as being valid by the analyzer. To see which species have been so marked, please see the System Status panel described on page 2-5.

## Sample System temperatures

Sample Sys	Temp	Units
Zone1	23.33	deg C
Zone2	22.45	deg C
Zone3	-34.82	deg C

This table is only visible if the optional sample system has been installed. You can assign names to each of the three temperature zones (see page 2-43). Temperature measurements are always shown in degrees Celsius. If an oven temperature RTD has been installed, the oven temperature is also displayed.

## PMT Voltages

	L1 (V)	L2 (V)		L1 (V)	L2 (V)
F1	8.853	0.000	F1	7.223	0.000
F2	0.000	0.000	F2	0.000	0.000
F3	9.435	0.000	F3	6.531	0.000
F4	0.000	6.390	F4	0.000	8.346
F5	9.834	0.000	F5	8.157	0.000
F6	0.000	0.000	F6	0.000	0.000
Measure PMT			Reference PMT		

The 99xx contains two photomultiplier tubes that measure ultraviolet light intensity. On motorless analyzers, the wavelengths used are L1F1, L1F2, and L2F6. On motorized analyzers, all six



possible filter positions are shown, even if they are not configured for that analyzer. To see which wavelengths are valid for each lamp + filter combination, please see the System Status panel (the next section).

### Filter Wheel Speed

The measured speed of the filter wheel. Nominally 325 RPM.

## System Status Panel

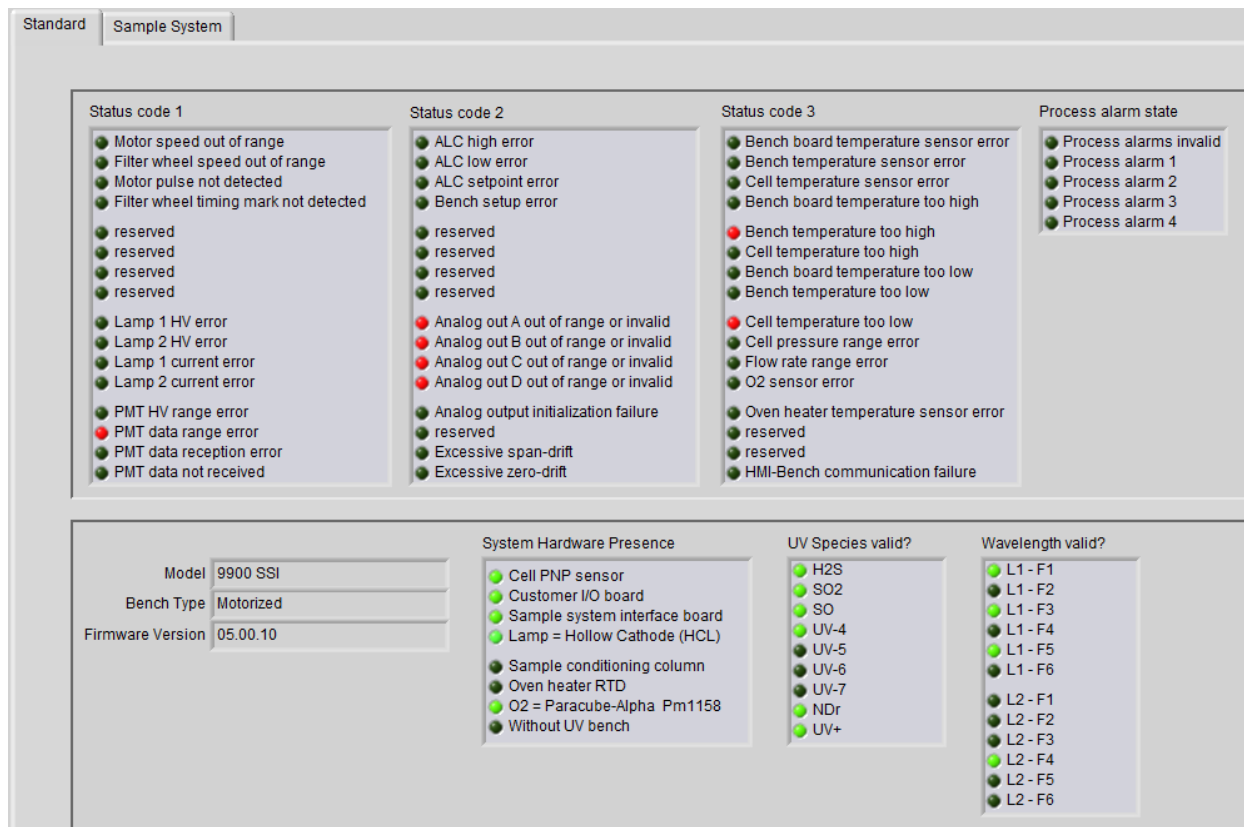
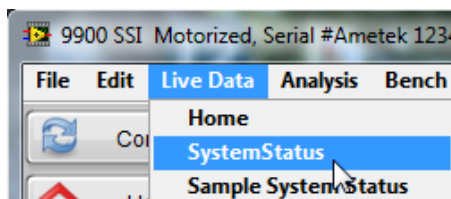


Figure 15 – System Status panel (Standard)

The System Status panel gives you an overall indication of the analyzer's health. To view it, select "System" from the buttons on the left side of the window, or select *System Status* from the menu bar:



*What does each indicator mean?*

If the meaning of an indicator isn't immediately clear, you can display the Context Help Window (Ctrl-H), and hover the cursor over that indicator to get more information about it.

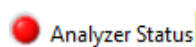
### Status codes

The three status codes all signal error conditions on the attached analyzer. They are red when the condition is present, and dark otherwise.

When a status code changes, a message is generated and displayed in the Messages part of the Connect panel. In addition, the message is logged in a spreadsheet file located in the *Messages* subdirectory of the Test Logs directory (see Appendix III – Preferences for the location of this directory).

These status codes are monitored by the analyzer. When a status code changes, and the particular item has been assigned a “warning” or “error” status in the Customer I/O – Relays panel (see page 2-27), the “Relay Status Output Bitmask” register is updated by the analyzer. The color of the Analyzer Status LED at the bottom of the Configurator window is determined by this register.

The Analyzer Status LED is red if faults are present, amber if warnings but no faults are present, and green otherwise.



#### Valid Species

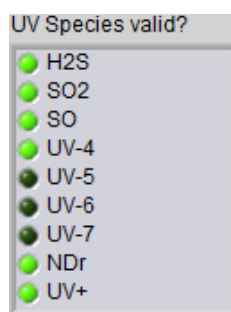


Figure 16 – Valid UV Species

The analyzer maintains a list of UV-absorbing species that it considers to be valid (register 231), based on the analysis matrix and the analysis algorithm.

The Configurator will only show the names of valid species in pop-up menus, and will only let you acquire and chart valid species.

#### Valid Wavelengths

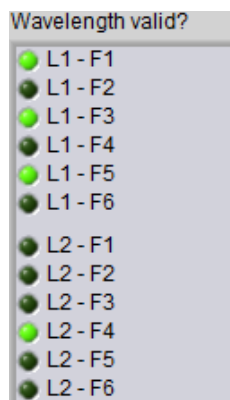


Figure 17 – Valid wavelengths

The analyzer also maintains a list of valid wavelengths (register 230), based on the analysis matrix.

The Configurator will let you select any lamp and filter combination, regardless of whether it is valid or not.

## Sample System Status Panel

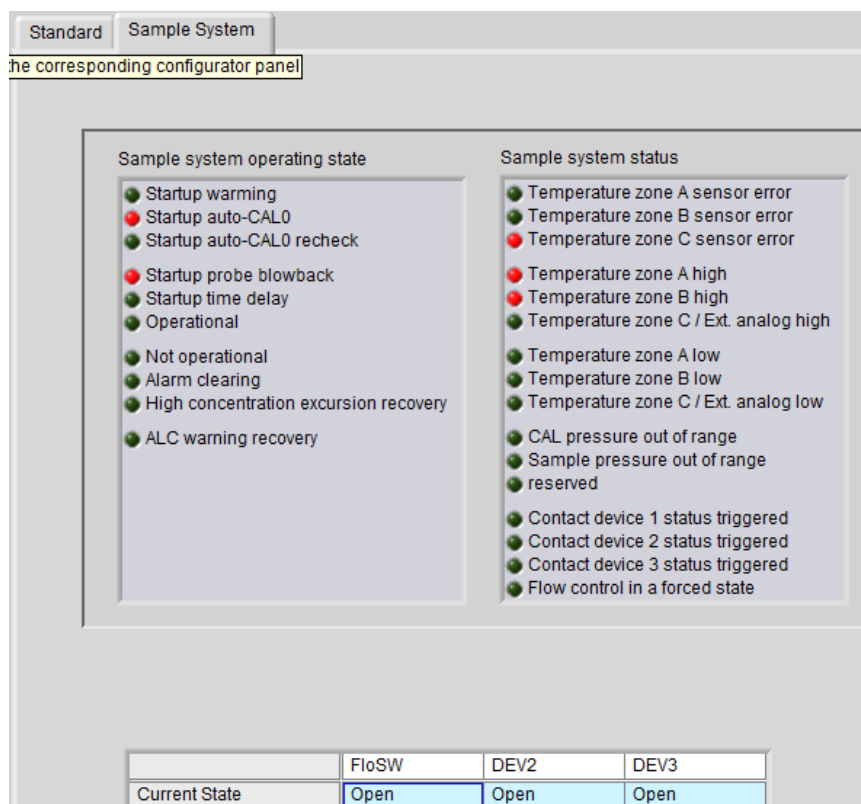
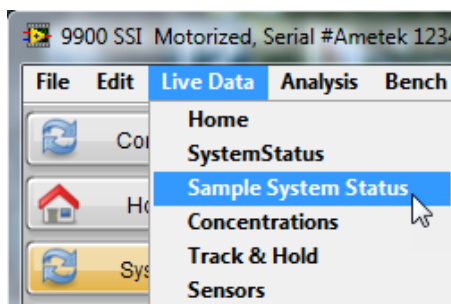


Figure 18 – Sample System Status panel

If the optional Sample System has been installed, the Sample system tab can be selected by clicking the Sample System tab on the System Status panel, or from the main menu:



You can see the operating state of the sample system, and any fault conditions that the analyzer has detected.

The sample system has three input dry contacts, each of which can be assigned a name (in the Sample System panel, under the Status Trigger tab).

This panel shows whether the contact is currently open or closed. You can specify whether the contact is normally open or closed in the Sample System panel, under the Status Trigger tab.

## Measurement Panel

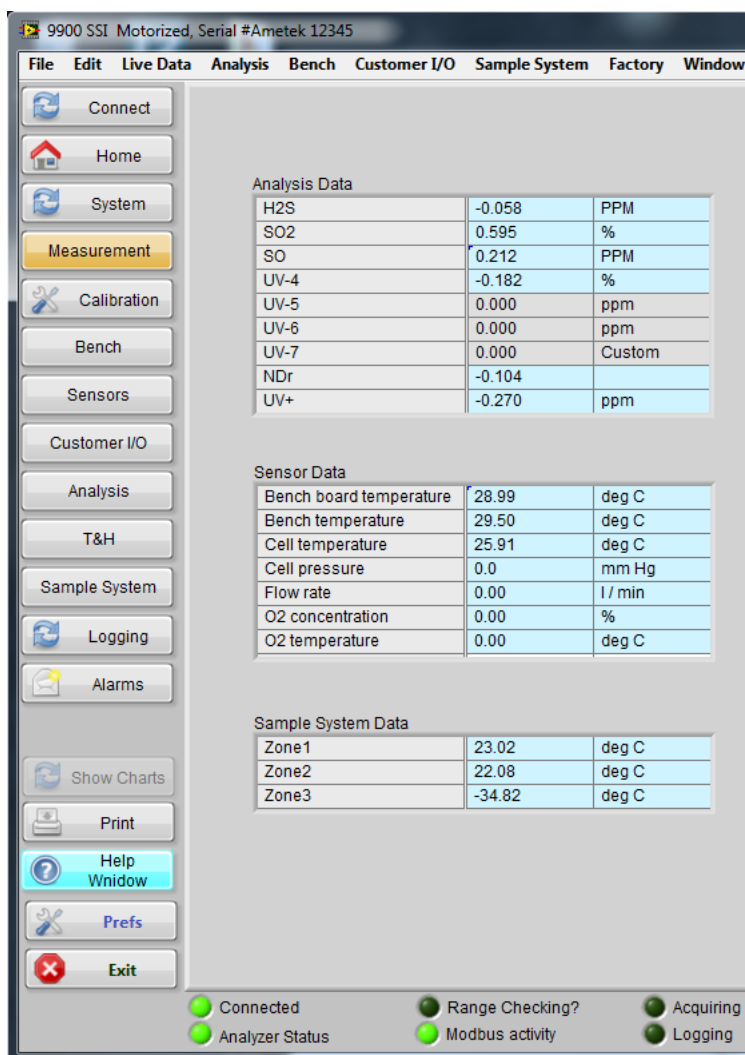


Figure 19 – Measurement Panel

The Measurement panel shows the current concentrations of each species. Species that the analyzer has not marked as being valid are greyed out.

### Analysis Data

This table shows the concentrations and units of measure for the UV-absorbing gas species that are currently configured for this analyzer, plus the aggregated Species concentration.

When NO<sub>x</sub> measurement is enabled in the Algorithm bitmask (register #321.b3), the aggregated Species is NO<sub>x</sub>, which is the sum of Species2 (NO<sub>2</sub>) and Species3 (NO) concentrations.

When the Advanced Analysis panel is available and NO<sub>x</sub> measurement is not enabled in the Algorithm bitmask, the Species

to be aggregated is defined by the Aggregated Species inclusion bitmask (REG#761) and the Species Factors (register #802-816).

For more information on Aggregated Analysis, please refer to Aggregated UV Results Setup on page 2-35.

## Sensor Data

Sensor Data values are measured by dedicated sensors.

Cell temperature is only shown if an Ametek ACT or DCT sample cell pressure transducer is installed and enabled.

Flow rate is only present if an Omron MEM sample gas flow sensor is installed and enabled.

Oxygen concentration is only available if a dry-application O2 sensor (i.e. Hummingbird Paracube-Alpha/Pm1158, Figaro KE-25, or Hummingbird Paracube-Delta) has been installed and enabled.

Oxygen sensor temperature is only available if a Hummingbird Paracube-Alpha/Pm1158 O2 sensor has been installed and enabled.

## Sample System Data

Sample System temperatures are only displayed if an optional Sample System has been installed. The temperature zone names, current temperature, and temperature unit of measure are displayed.

The oven heater plate temperature is only displayed if an oven heater RTD is installed (register #248.b9).

## Calibration Panel

The Calibration panel lets you calibrate UV-absorption gas concentrations.

REVIEW DRAFT

Refresh Values

Calibration Averaging Duration  sec

Calibration Action  
Manual Zero UV Start Calibration

Time Remaining  Abort Calibration

	Span Concentration	Span Factor	Zero Drift Result	Zero Drift Limit	Span Drift Result	Span Drift Limit	Present Reading	Unit of Measure
H2S	0.00	0.0000	0.00	0.00	0.00	0.00	-0.173	PPM
SO2	0.00	0.0000	0.00	0.00	0.00	0.00	0.482	%
SO	0.00	0.0000	0.00	0.00	0.00	0.00	0.138	PPM
UV-4	0.00	0.0000	0.00	0.00	0.00	0.00	-0.154	%
UV-5	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	ppm
UV-6	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	ppm
UV-7	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	Custom
NDr							-0.046	
UV+	0.00		0.00	0.00	0.00	0.00	-0.311	ppm

	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5	L1-F6	L2-F1	L2-F2	L2-F3	L2-F4	L2-F5	L2-F6
Zero transmittance	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	Span Concentration	Span Factor	Zero Offset	Zero Drift Result	Zero Drift Limit	Span Drift Result	Span Drift Limit	Elevated Z-Cal Concentration	Present Reading
Oxygen (%)	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 20 – Calibration Panel

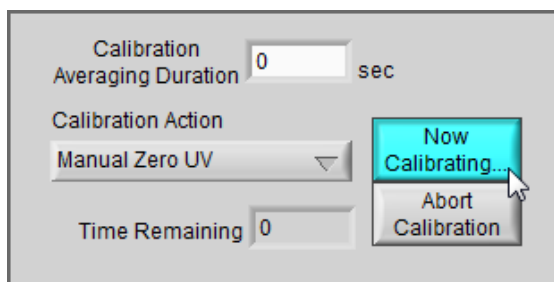
### Manual Calibration

If the analyzer will be used to measure a sample concentration that is significantly different from that of the original (factory-set) range, Ametek recommends re-spanning the analyzer.

To re-span each gas species:

- Enter the concentrations of the components in the Calibration Gas in the “Span Concentration” column of the table.
- Let Zero Gas flow through the analyzer, and adjust the Zero Gas regulator to:  
< 35 kPa gage @ 1 litre/min (<5 psig @ 2.0 scfh).
- When the live concentration value stabilizes, perform a Manual Zero by selecting “Manual Zero UV” from the Calibration Action menu, and clicking “Start Calibration”:





The button changes to read “Now Calibrating”, and the “Time remaining” counts down to zero.

- The Zero-Drift result will be updated on the screen.
- Let Span Gas flow through the analyzer, and adjust the Span Gas regulator to:  
< 35 kPag @ 1 litre/min (<5 psig @ 2.0 scfh).
- Wait for the live reading to stabilize (the value should be close to the concentration in the Span gas).
- Perform a manual Span for the gas species being calibrated by selecting the species to be calibration from the Calibration Action menu and clicking “Start Calibration”:

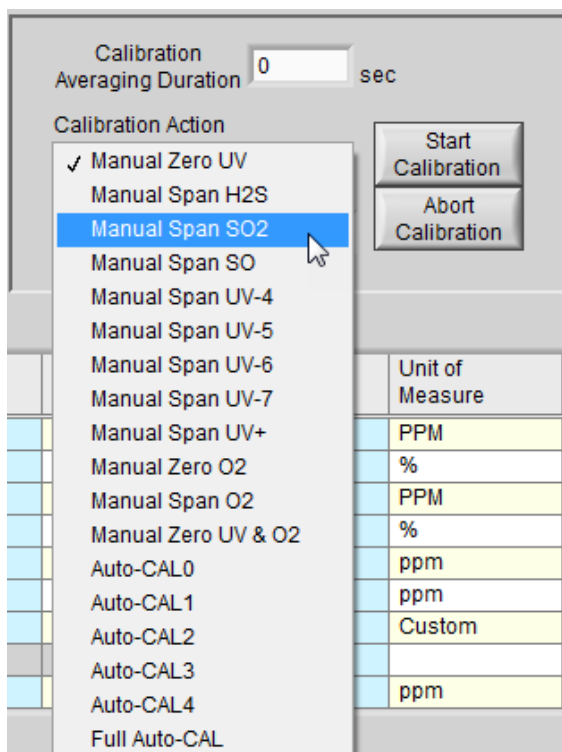


Figure 21 – Calibration options

- The Span-Drift result will be updated on the screen.
- Oxygen can also be zeroed at the same time as the UV-absorbent species (requires an oxygen sensor to be installed, and requires the Zero Gas to be nitrogen). This table is only visible if an oxygen sensor has been installed.

## Abort

You can abort a calibration by clicking “Abort Calibration”. The “Calibration in Progress” indicator will remain on the screen until the calibration has been aborted (this may take a few seconds).

## Auto Calibration

The analyzer can also perform calibration actions automatically if the Zero gas and Calibration gas supply valves are actuated by (optional) solenoids in the analyzer.

These solenoids are part of the optional Sample System module. For information about assigning the solenoids to auto calibration tasks, please refer to Sample System Panel — Solenoids on page 2-45.

The analyzer will introduce Zero Gas into the sample system by energizing the Zero Gas Solenoid, and wait for a configurable time for Zero gas to flow through the analyzer (you set this up using the Sample System – Auto CAL panel: see page 2-46).

The Zero Offset values are adjusted based on the average reading during the *Calibration Averaging Duration*.

The analyzer will introduce calibration gas into the sample system by energizing the corresponding solenoid, and wait for it to flow through the analyzer.

The span is automatically adjusted based on the average reading during the Calibration Averaging Duration.

### Auto-CAL 0...4

Up to four species can be calibrated automatically. Auto-CAL 0 is reserved for Zero Gas calibration.

### Full Auto Calibration

The analyzer will automatically cycle sequentially through all of the Auto-CAL functions.

The zero offsets and calibrations will be adjusted automatically.

### Triggered Calibrations

If the optional Customer I/O board has been installed, dry contact inputs can trigger auto-CAL functions. Please refer to page 2-25 for more information (Customer I/O Panel — Contact Inputs).

## The Calibration Table

	Span Concentration	Span Factor	Zero Drift Result	Zero Drift Limit	Span Drift Result	Span Drift Limit	Present Reading	Unit of Measure
H2S	0.00	0.0000	0.00	0.00	0.00	0.00	0.005	PPM
SO2	0.00	0.0000	0.00	0.00	0.00	0.00	-0.244	%
SO	0.00	0.0000	0.00	0.00	0.00	0.00	-0.054	PPM
UV-4	0.00	0.0000	0.00	0.00	0.00	0.00	0.109	%
UV-5	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	ppm
UV-6	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	ppm
UV-7	0.00	0.0000	0.00	0.00	0.00	0.00	0.000	Custom
NDr							0.334	
UV+	0.00		0.00	0.00	0.00	0.00	0.059	ppm

### Span Concentration

Enter the concentration of each species in the calibration gas.

### Span Factor

At the end of a calibration, the analyzer calculates a new Span Factor. However, it is possible to override the calculated Span Factor. If you enter your own Span Factor, no validation is performed on the new Span Factor.

Please note that if the calculated span factor is not reasonably close to 1.0 (typically between 0.85 and 1.15), it is likely that either the old calibration or the new calibration is invalid.

### Zero Drift Result

At the end of a calibration, the analyzer calculates the difference between the new zero calibration and the previous one.

### Zero Drift Limit

If the Zero Drift Result is greater than the Zero Drift Limit, at the end of a zero calibration, the calibration is considered to have excessive drift, and is discarded.

### Span Drift Result

At the end of a calibration, the analyzer calculates the difference between the new Span Factor and the previous one.

### Span Drift Limit

At the end of a calibration, the analyzer calculates the difference between the new Span Factor and the previous one. If this difference is greater than the Span Drift Limit, the calibration is considered to have excessive drift, and is discarded.

## Zero Transmittance Table

	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5	L1-F6	L2-F1	L2-F2	L2-F3	L2-F4	L2-F5	L2-F6
Zero transmittance	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

When the analyzer performs a zero calibration, it also automatically measures the transmittance at each filter position.

The zero transmittance values can be changed manually if necessary, but this should not normally be necessary.

Ametek suggests recording these values for long-term diagnostics.

## Oxygen Calibration Table

	Span Concentration	Span Factor	Zero Offset	Zero Drift Result	Zero Drift Limit	Span Drift Result	Span Drift Limit	Elevated Z-Cal Concentration	Present Reading
Oxygen (%)	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00

If an optional Oxygen sensor has been installed, it can be calibrated in the same way as the UV-absorbent species.

Note that if you wish to Zero the Oxygen sensor in the same sequence as a UV-absorbent species, the Zero gas must be Nitrogen.

Ametek suggests recording these values for long-term diagnostics.

## Bench Setup Panel

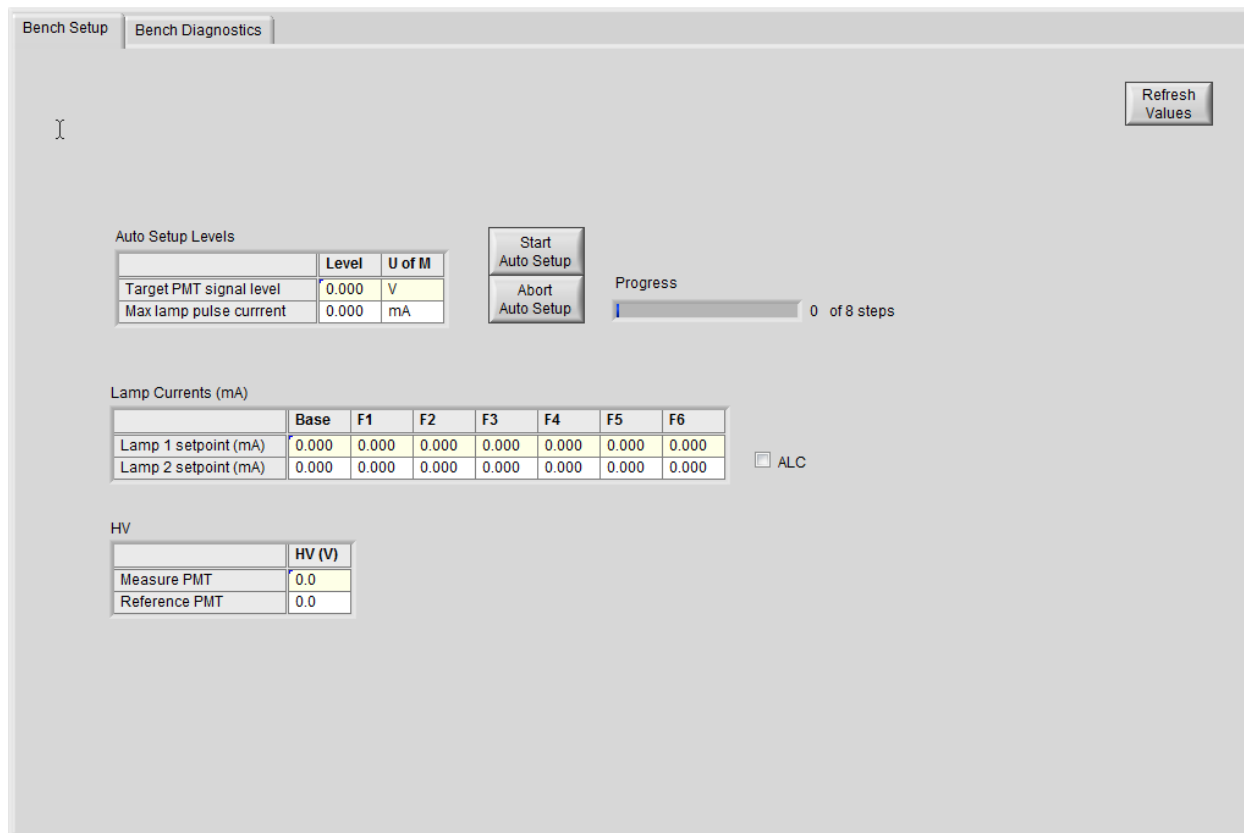
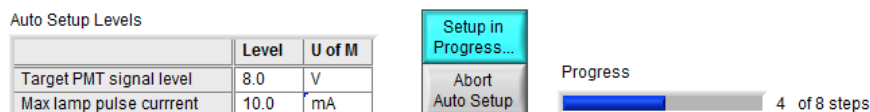


Figure 22 – Bench Setup panel

### Auto Setup



#### Start Auto Setup

Auto Setup optimizes the PMT gains and source lamp currents, and takes approximately three minutes. Always perform an Auto-Setup after any lamps, optical filters, or PMTs have been installed or replaced.

When you click *Start Auto Setup*, the button changes to read *Setup in Progress...* and the Progress bar is updated as the auto setup progresses.

#### Abort Auto Setup

It can take a few seconds to abort the setup sequence if you choose to click *Abort Auto Setup*.

### Auto Setup Levels

Target PMT Signal is the maximum PMT signal level (volts) that will be used during Auto Setup (0..10 V).

Max Lamp Pulse is the maximum pulse current that will be applied to the key filter during Auto setup (0..14 mA).

**AMETEK recommends leaving Auto Setup Levels at the factory defaults.**

## Lamp Currents

Lamp Currents (mA)

	Base	F1	F2	F3	F4	F5	F6
Lamp 1 setpoint (mA)	2000	5500	6000	10000	8500	7500	9000
Lamp 2 setpoint (mA)	2000	5500	6000	9500	8500	7200	9200

☒ ALC

### Base (mA)

The base-current set point (the minimum operating current) for each source lamp. This is the “simmer” current when the lamp is not being pulsed. Ametek does not recommend changing it.

Lamp 1 is closest to the Measuring Cell  
Lamp 2 is farthest from the Measuring Cell

### Lamp Setpoint (mA)

Defines the source lamp pulse current control signal for each filter. The normal operating range is between the Lamp Base and the Lamp Max settings. The control signal for the key filter is Lamp Max.

The Automatic Lamp Control Setpoint signal is automatically calculated from the Reference PMT for each filter when Auto-Setup completes. The Automatic Lamp Control function adjusts the lamp pulses to maintain the Reference PMT signals.

The filter with the highest current level is the *weakest wavelength* for each lamp. This is the filter position that you should choose when aligning a new UV lamp.

If a filter position is not being used, the auto-setup procedure will set the current at that filter position to the Base current.

### ALC

The Automatic Lamp Control automatically turns on at the completion of an Auto-Setup function, and should be on during normal operation. It should be turned off while performing a lamp alignment.

## High Voltage

HV

	HV (V)
Measure PMT	550
Reference PMT	750

The high voltage range is 300...800V for each lamp, and can be measured at test points HV1 and HV2 on the PMT Supply board.

After an auto setup completes, Ametek recommends recording the values on this panel for diagnostic purposes.

## Bench Diagnostics Panel

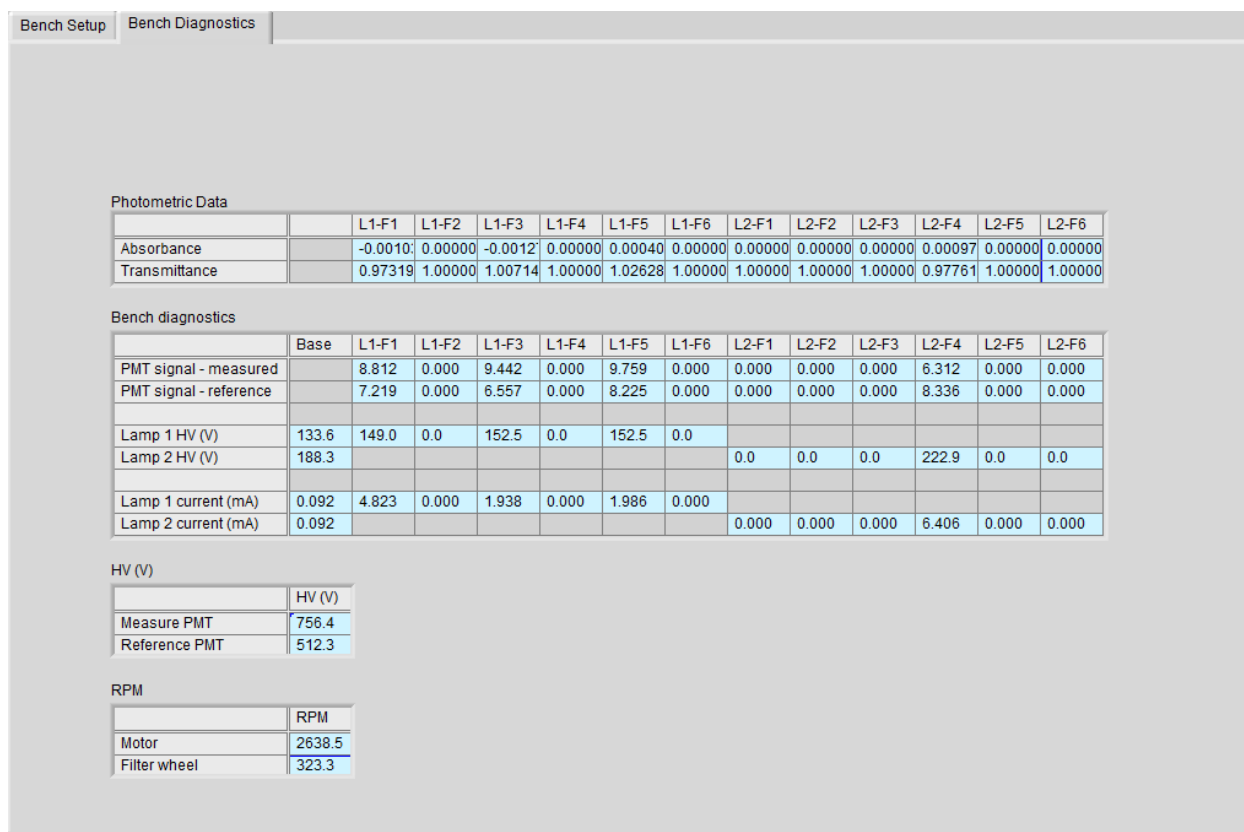


Figure 23 – The Bench Diagnostics panel for a multi-species analyzer

This panel lets you compare photometric results with the lamp control parameters and PMT signal levels at each filter position. It is particularly useful when performing diagnostics on the analyzer. Information in this panel is not user-adjustable.

### Photometric Data

Absorbance and transmittance values for each filter position.

$$\text{Transmittance } T_p = \left( \frac{\text{Measure PMT}}{\text{Reference PMT}} \right)$$

$$\text{Absorbance} = -\log \left( \frac{T_p}{T_z} \right)$$

where:

$T_p$  is the transmittance with process gas @ lamp + filter  
filter

$T_z$  is the transmittance with zero gas @ lamp + filter

## Bench Diagnostics

The Measure and Reference PMT voltage at each Filter position (test points TP3 and TP5 on the PMT signal board).

The Lamp excitation pulse voltages and currents are shown at each filter position.

## HV

The voltages at the PMT supply board (they can be read at test points HV1 and HV2, and should be in the range 300...800V).

## RPM

Applicable to motorized (multi-species) analyzers only.



## Sensors Panel

The analyzer can optionally be equipped with dedicated sensors to measure cell temperature and pressure, oxygen concentration, and flow rate.

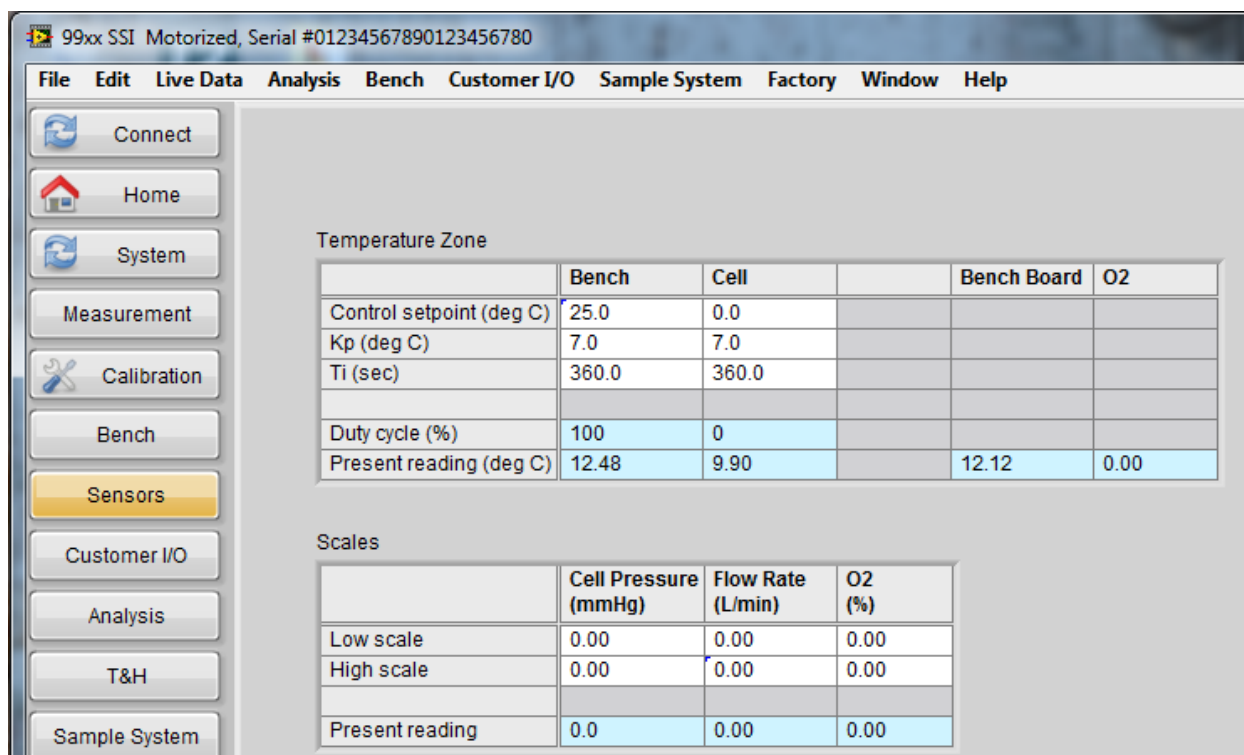


Figure 24 – The Sensors panel

## Heaters

Temperature Zone					
	Bench	Cell		Bench Board	O2
Control setpoint (deg C)	0.0	0.0			
Kp (deg C)	0.0	0.0			
Ti (sec)	0.0	0.0			
Duty cycle (%)	0	0			
Present reading (deg C)	29.16	26.00		29.27	0.00

Figure 25 – Temperature control coefficients

The bench and (optionally) cell are equipped with heating elements to allow their temperatures to be controlled to be above ambient temperature and the process gas dew point.

The bench board may be similarly equipped. The Bench Board temperature provides a general indication of the analyzer electronics cabinet temperature. If the bench board temperature is not available, the reading is displayed as zero.

If the optional PM1158 Oxygen sensor has been installed, its temperature reading is displayed in the O2 column (it is zero otherwise)

The heater control algorithm is PI.

## Scales

Scales

	Cell Pressure (mmHg)	Flow Rate (L/min)	O2 (%)
Low scale	760.0	0.00	0.00
High scale	1500.0	20.00	15.00
Present reading	760.0	0.00	10.00

The cell pressure transducer (optional), flow rate sensor (optional), and oxygen sensor (optional) can each be assigned a scale range.

If a sensor is not installed, the corresponding High scale value must be set to zero.

## Customer I/O Panel — Analog Outputs

REVIEW DRAFT

	Channel A (none)	Channel B (none)	Channel C (none)	Channel D (none)
Low scale	0.00	0.00	0.00	0.00
High scale	0.00	0.00	0.00	0.00
Zero Calibration (V/mA)	0.000	0.000	0.000	0.000
Span Calibration (V/mA)	0.000	0.000	0.000	0.000
Assigned data reading	n/a	n/a	n/a	n/a

Output type: 0 - 5 V    0 - 5 V    0 - 5 V    0 - 5 V

Clamp to min/max? ☐    ☐    ☐    ☐

Calibration

- Zero Calibration
- Span Calibration
- 25% Span Check
- 50% Span Check
- 75% Span Check

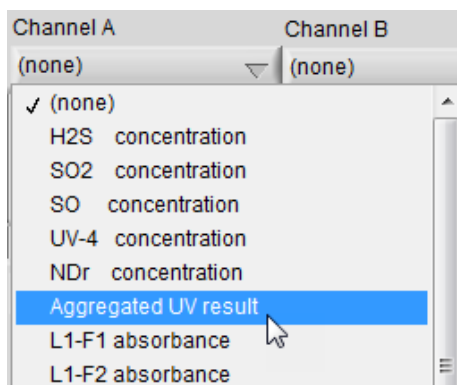
Figure 26 – The Customer I/O panel — Analog Outputs

Ametek 99xx analyzers can be configured with an optional Customer Input / Output system, which allows up to four analog output channels to be configured.

Sample System signals are only available if the optional Sample System Interface board is installed.

Channel A  
(none)

The pop-up menus at the top of the panel let you select from a large number of signals. The specific signals that are available depends on how you have configured the analyzer, but generally includes the measured gas concentrations, lamp PMT values, sensor readings, track & hold readings, and sample system temperatures:



## Scaling

You can (and should) map the signal of interest into the voltage or current range of the output channel.

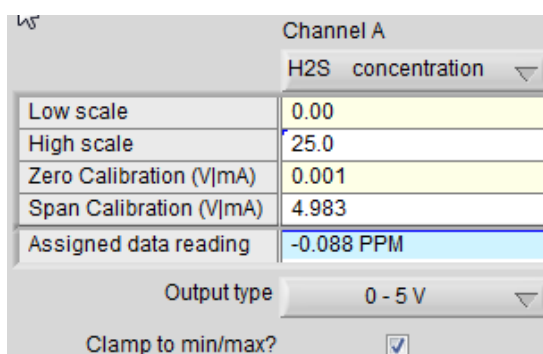
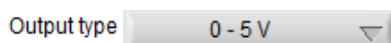


Figure 27 – Scaling an analog output signal

Here, the measured H2S concentration will be mapped to a voltage range. The range of 0..25% H2S concentration will be scaled to fill the 0..5V range of the output channel. Values outside that range will be clamped to the specified output range if *Clamp to min/max?* is checked.

## Output Type



You can set the analog output signal type to any of:

- 0..5 V
- 1..5 V
- 0..20 mA
- 4..20 mA

*If changing a channel's output setting from voltage to current, or current to voltage, the corresponding dip switch on the Customer I/O board must first be changed to the required setting, followed by changing the Output Type on the screen. Refer to the **Customer I/O** board drawing in the analyzer User Manual.*

*If the output Type is changed, the channel must be re-calibrated.*

## Calibrating Analog Outputs

The 4–20 mA outputs are isolated.

The low end of each analog output range can be non-zero.

To obtain the best accuracy from the analog output signal, you can check the linearity of each channel.

Calibration

Zero Calibration
Span Calibration
25% Span Check
50% Span Check
75% Span Check

Click any of the Calibration buttons to generate a calibration signal:

Calibration

Zero Calibration
Span Calibration
25% Span Check
50% Span Check
75% Span Check

Read the actual voltage or current level at the analog output terminal for the Zero Calibration and Span Calibration, and enter those values in the Zero Calibration (V|mA) and Span Calibration (V|mA) rows.

The 25%, 50%, and 75% span check readings are not recorded in the analyzer, but can be used to manually confirm linearity of the output channel using a voltage or current meter.

Click the selected Calibration button again to deselect it and return the analog output system to normal operation.

	Channel A	Channel B	Channel C	Channel D
	H2S concentration ▾	SO2 concentration ▾	Bench temperature ▾	Cell temperature ▾
Low scale	0.00	0.00	10	10
High scale	25.00	20	50	60
Zero Calibration (V mA)	0.001	4.001	0.001	0
Span Calibration (V mA)	4.983	19.96	19.98	20
Assigned data reading	-0.055 PPM	-0.248 %	29.00 degC	25.75 degC
Output type	0 - 5 V ▾	4 - 20 mA ▾	0 - 20 mA ▾	1 - 5 V ▾
Clamp to min/max?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 28 – Calibrating analog outputs

### High Scale

The value, in engineering units, that should correspond with the maximum output of the channel (nominally 20 mA for current loops, and 5 V for voltage outputs).

### Zero Calibration (V|mA)

The actual (measured) voltage or current when the output is set to zero scale during the Zero calibration procedure.

To measure current, it may be necessary to add a precision sampling resistor across the current loop, and measure the voltage drop across the sampling resistor. In this case, the current in mA is:

$$I = V/R$$

where:

I is the current in amps

V is the voltage drop across the sampling resistor

R is the sampling resistor value in ohms

### Span Calibration V|mA)

The actual (measured) voltage or current (mA) when the output is set to full-scale during the Span calibration procedure.

### Assigned data reading

Displays the current value of the signals, in engineering units.

*For example, if the Channel 1 signal is the SO<sub>2</sub> concentration in PPM, and the maximum expected SO<sub>2</sub> concentration is 1000 PPM, you would set the Full-Scale value for channel 1 to 1000. This means that when the SO<sub>2</sub> concentration is 1000 PPM, the current will nominally be 20 mA, and when the SO<sub>2</sub> concentration is 0 PPM, the current will nominally be 4 mA.*

*The next step is to measure the actual current produced at the nominal current levels of 4 mA and 20 mA (which you generate by clicking the appropriate button). The values you measured with a current meter go into the Zero Calibration (mA) and Span Calibration (mA) lines.*

## Customer I/O Panel — Contact Inputs

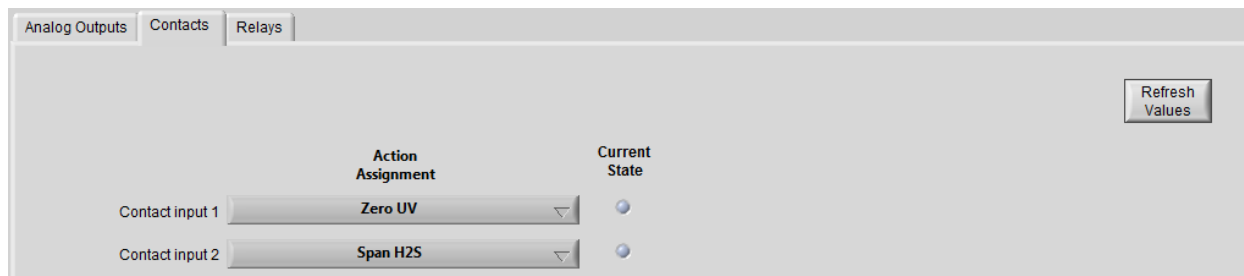


Figure 29 – Contact Inputs panel – Ametek 9900<sup>RM</sup>

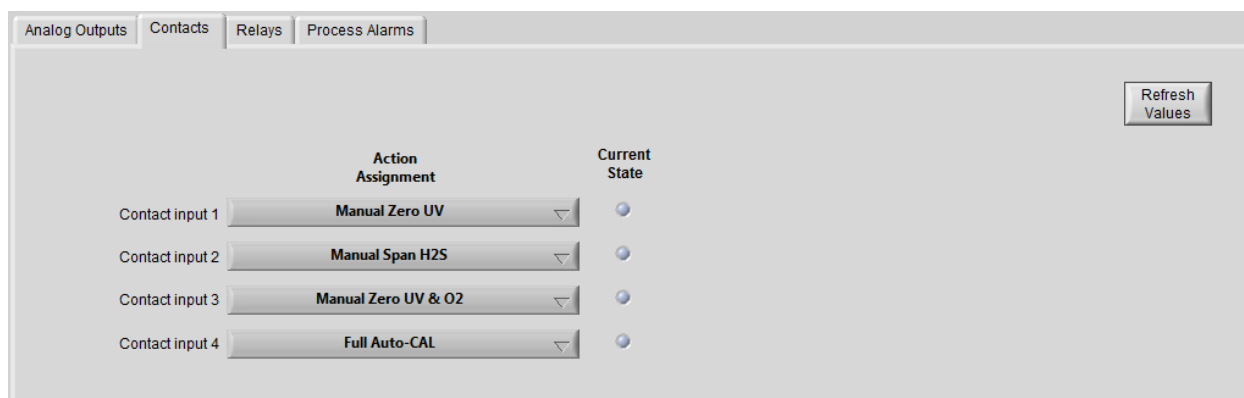


Figure 30 – Contact Inputs panel – Ametek 99XX

The Ametek 9900<sup>RM</sup> provides two dry-contact inputs, which can be used to trigger a variety of actions.

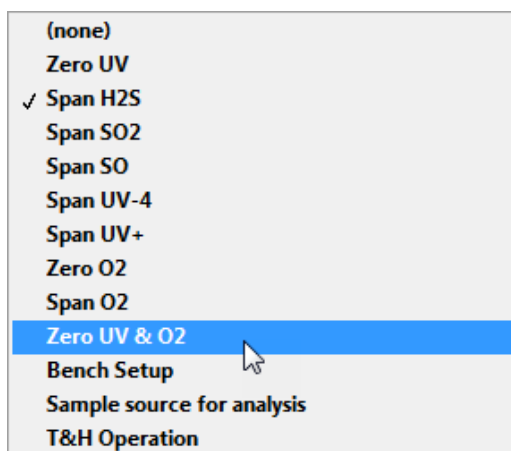


Figure 31 – Contact assignments - Ametek 9900<sup>RM</sup>

The optional Customer I/O module for the Ametek 99xx provides four dry-contact inputs. A number of actions can be assigned to each of them:

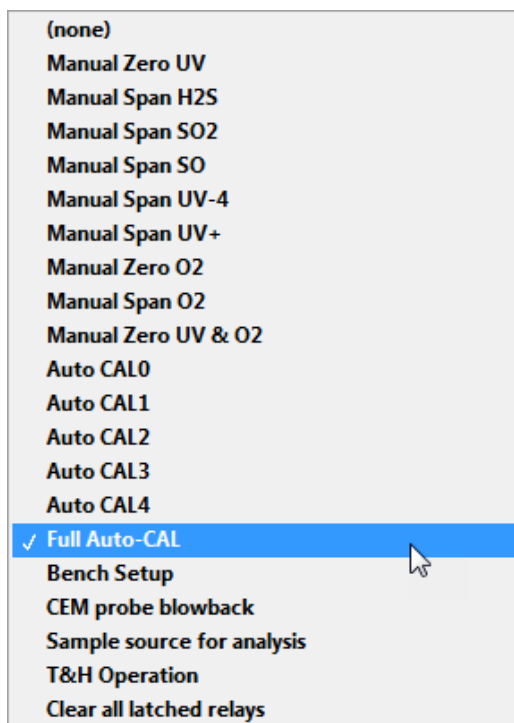


Figure 32 – Contact assignments with optional Customer I/O module

The *Current State* LEDs to the right of each pop-up menu are illuminated (in red) if the contact is currently closed.



## Customer I/O Panel — Relays

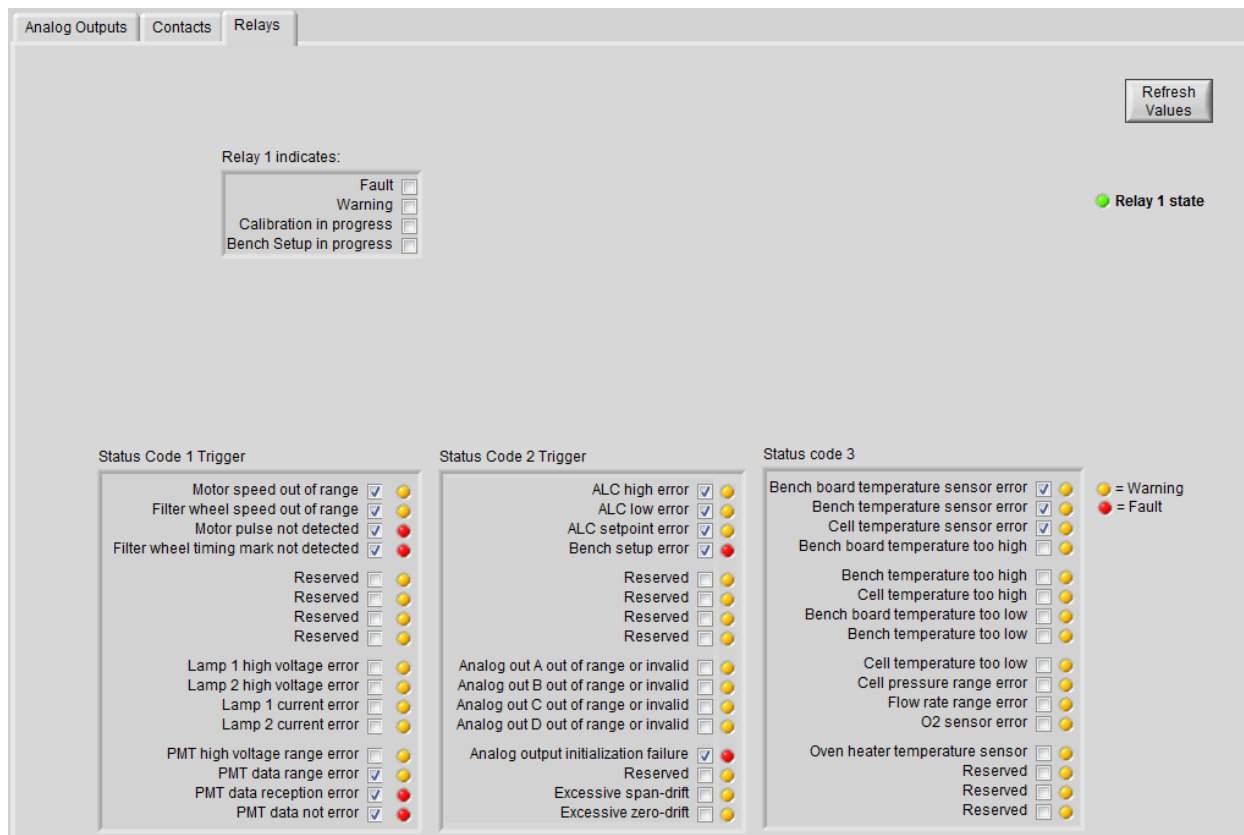


Figure 33 – Customer I/O Relays, Model 101

### Model 101

The Ametek 9900<sup>RM</sup> analyzer contains one configurable relay, and the 99xx contains five.

The 9900<sup>RM</sup> relay can be triggered by any combination of the following conditions:

Relay 1 indicates:

Fault ☐

Warning ☐

Calibration in progress ☐

Bench Setup in progress ☐

There are three Status Code Triggers in the lower part of the panel. For each item within them, you can:

- Include the condition (checkmark the checkbox)
- Treat the conditions as a Warning (set the LED to amber)
- Treat the condition as a Fault (set the LED to red)

For example, here are the first four items in Status Code 1 Trigger:

Motor speed out of range ☐ ●

Filter wheel speed out of range ☒ ●

Motor pulse not detected ☒ ●

Filter wheel timing mark not detected ☒ ●

*Motor speed out of range* will be ignored, because the checkbox has been left unchecked.

*Filter wheel speed out of range* will trigger a Warning condition, because the checkbox is checked, and the LED is amber (click the LED to toggle it between amber and red).

*Motor pulse not detected* will trigger a Fault condition.

*Filter wheel timing mark not detected* will also trigger a Fault.

Here, Relay 1 will be triggered if either a Fault or a Warning occurs:

Relay 1 indicates:

Fault	<input checked="" type="checkbox"/>
Warning	<input checked="" type="checkbox"/>
Calibration in progress	<input type="checkbox"/>
Bench Setup in progress	<input type="checkbox"/>

If Relay 1 should be triggered for Faults but not for Warnings, simply uncheck *Warning*.

## Model 102

The Ametek 99xx Analyzer provides more relays, and more control over what can trigger each relay:

The screenshot displays the configuration interface for the Ametek 99xx Analyzer, specifically the 'Relays' tab. It shows five relay output indicators (Relay 1 through Relay 5) and three status code triggers (Status Code 1, 2, and 3). Each relay indicator has a list of conditions that can trigger it, with checkboxes for 'Fault' and 'Warning' and a 'Refresh Values' button. The status code triggers also have a list of conditions with checkboxes for 'Warning' and 'Fault'.

Relay 1 Output Indicators:	Relay 2 Output Indicators:	Relay 3 Output Indicators:	Relay 4 Output Indicators:	Relay 5 Output Indicators:
Fault <input type="checkbox"/>	Fault <input type="checkbox"/>	Fault <input type="checkbox"/>	Fault <input type="checkbox"/>	Fault <input type="checkbox"/>
Warning <input type="checkbox"/>	Warning <input type="checkbox"/>	Warning <input type="checkbox"/>	Warning <input type="checkbox"/>	Warning <input type="checkbox"/>
Calibration in progress <input type="checkbox"/>	Calibration in progress <input type="checkbox"/>	Calibration in progress <input type="checkbox"/>	Calibration in progress <input type="checkbox"/>	Calibration in progress <input type="checkbox"/>
Bench Setup in progress <input type="checkbox"/>	Bench Setup in progress <input type="checkbox"/>	Bench Setup in progress <input type="checkbox"/>	Bench Setup in progress <input type="checkbox"/>	Bench Setup in progress <input type="checkbox"/>
Process alarms invalid <input type="checkbox"/>	Process alarms invalid <input type="checkbox"/>	Process alarms invalid <input type="checkbox"/>	Process alarms invalid <input type="checkbox"/>	Process alarms invalid <input type="checkbox"/>
Process alarm 1 <input type="checkbox"/>	Process alarm 1 <input type="checkbox"/>	Process alarm 1 <input type="checkbox"/>	Process alarm 1 <input type="checkbox"/>	Process alarm 1 <input type="checkbox"/>
Process alarm 2 <input type="checkbox"/>	Process alarm 2 <input type="checkbox"/>	Process alarm 2 <input type="checkbox"/>	Process alarm 2 <input type="checkbox"/>	Process alarm 2 <input type="checkbox"/>
Process alarm 3 <input type="checkbox"/>	Process alarm 3 <input type="checkbox"/>	Process alarm 3 <input type="checkbox"/>	Process alarm 3 <input type="checkbox"/>	Process alarm 3 <input type="checkbox"/>
Process alarm 4 <input type="checkbox"/>	Process alarm 4 <input type="checkbox"/>	Process alarm 4 <input type="checkbox"/>	Process alarm 4 <input type="checkbox"/>	Process alarm 4 <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>
Energize when triggered <input type="checkbox"/>	Energize when triggered <input type="checkbox"/>	Energize when triggered <input type="checkbox"/>	Energize when triggered <input type="checkbox"/>	Energize when triggered <input type="checkbox"/>
Latching <input type="checkbox"/>	Latching <input type="checkbox"/>	Latching <input type="checkbox"/>	Latching <input type="checkbox"/>	Latching <input type="checkbox"/>

Status Code 1 Trigger	Status Code 2 Trigger	Status Code 3
Motor speed out of range <input checked="" type="checkbox"/>	ALC high error <input checked="" type="checkbox"/>	Bench board temperature sensor error <input checked="" type="checkbox"/>
Filter wheel speed out of range <input checked="" type="checkbox"/>	ALC low error <input checked="" type="checkbox"/>	Bench temperature sensor error <input checked="" type="checkbox"/>
Motor pulse not detected <input checked="" type="checkbox"/>	ALC setpoint error <input checked="" type="checkbox"/>	Cell temperature sensor error <input checked="" type="checkbox"/>
Filter wheel timing mark not detected <input checked="" type="checkbox"/>	Bench setup error <input checked="" type="checkbox"/>	Bench board temperature too high <input checked="" type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Bench temperature too high <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Cell temperature too high <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Bench board temperature too low <input type="checkbox"/>
Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>	Bench temperature too low <input type="checkbox"/>
Lamp 1 high voltage error <input type="checkbox"/>	Analog out A out of range or invalid <input type="checkbox"/>	Cell temperature too low <input type="checkbox"/>
Lamp 2 high voltage error <input type="checkbox"/>	Analog out B out of range or invalid <input type="checkbox"/>	Cell pressure range error <input type="checkbox"/>
Lamp 1 current error <input type="checkbox"/>	Analog out C out of range or invalid <input type="checkbox"/>	Flow rate range error <input type="checkbox"/>
Lamp 2 current error <input type="checkbox"/>	Analog out D out of range or invalid <input type="checkbox"/>	O2 sensor error <input type="checkbox"/>
PMT high voltage range error <input type="checkbox"/>	Analog output initialization failure <input checked="" type="checkbox"/>	Oven heater temperature sensor <input type="checkbox"/>
PMT data range error <input checked="" type="checkbox"/>	Reserved <input type="checkbox"/>	Reserved <input type="checkbox"/>
PMT data reception error <input checked="" type="checkbox"/>	Excessive span-drift <input type="checkbox"/>	Reserved <input type="checkbox"/>
PMT data not error <input checked="" type="checkbox"/>	Excessive zero-drift <input type="checkbox"/>	Reserved <input type="checkbox"/>

Legend:   
● = Warning   
● = Fault

Figure 34 – Customer I/O Relays, Ametek 99xx

#### Relay 1 Output Indicates:

Fault	<input type="checkbox"/>
Warning	<input type="checkbox"/>
Calibration in progress	<input type="checkbox"/>
Bench Setup in progress	<input type="checkbox"/>
Process alarms invalid	<input type="checkbox"/>
Process alarm 1	<input type="checkbox"/>
Process alarm 2	<input type="checkbox"/>
Process alarm 3	<input type="checkbox"/>
Process alarm 4	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Energize when triggered	<input type="checkbox"/>
Latching	<input type="checkbox"/>

You can see which relays are currently triggered:

- Relay 1 state
- Relay 2 state
- Relay 3 state
- Relay 4 state
- Relay 5 state

The LEDS are red if the relay has been energized, and grey otherwise (they are not color-coded to indicate the severity of the condition that the relay is signaling).

## Customer I/O Panel — Process Alarms

REVIEW DRAFT

Analog Outputs | Contacts | Relays | Process Alarms

Refresh Values

Signal Assignment	Alarm 1 H2S concentration ▾	Alarm 2 L1-F2 absorbance ▾	Alarm 3 Bench temperature ▾	Alarm 4 Zone1 reading ▾	Alarm Invalid
ON threshold	2.5	0.85	35	45	
OFF threshold	2.0	0.8	25	23	
Trigger delay (sec)	2	0	5	10	
Assigned data reading	-0.076 PPM	0.00000 -	30.42 degC	24.08 oC	
Current state	Off	Off	Off	Off	Off

The Ametek 99xx analyzer, if equipped with the optional Customer I/O module, can monitor up to four signals while the analyzer is in normal operation. It is not necessary for the Configurator to be connected.

### Alarm 3

Bench temperature ▾

The specific signals that can be monitored depend on how the analyzer has been configured, and which optional components have been installed. In general though, it includes all of the measured UV-absorbance species concentrations, photometric data, sensor data, and track & hold signals.

### Alarm Limits

ON threshold	2.50
OFF threshold	2.00
Trigger delay (sec)	2
Assigned data reading	0.045
Current state	Off

Separate ON and OFF thresholds are provided, so you can provide some hysteresis to prevent repeated triggering of alarms when the signal level is close to the alarm threshold. For the same reason, you can require the condition to be continuously present for some period of time before an alarm is asserted.

If the ON threshold is higher than the OFF threshold, the alarm is considered to be a HIGH limit alarm. If the ON threshold is lower than the OFF threshold, the alarm is treated as a LOW alarm limit.

You can also see the current value of the signal that you selected from the pop-up menu for that alarm, and whether the alarm is currently asserted.

## Analysis Panel

Standard Advanced

Cell length 12 cm  
Nominal cell temperature 32 degC  
Nominal cell pressure 860 mm.Hg

Cell T&P Compensation  
Dynamic cell temperature ☒  
Dynamic cell pressure ☐

Adaptive Filtering

	Sigma	Min Gain
Absorbance	0.0000	0.0000
Neutral drift	0.0000	0.0000

Compressibility 0.0000  
Alpha factor 0.0000  
Sample source Not process stream

Analysis Algorithm

Neutral drift compensation ☒  
Linearization 1 ☐  
Linearization 2 ☐  
NOx measurement ☐  
SO2 dual-range blending ☐  
SO2 triple-range extension ☐  
SO2 crosstalk ☐  
MeSH correction ☐  
Hot application ☐  
Liquid measurement ☐  
Reserved ☐  
Reserved ☐  
Reserved ☐  
Reserved ☐  
Zero abs every peak analysis ☒

	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5	L1-F6	L2-F1	L2-F2	L2-F3	L2-F4	L2-F5	L2-F6
Absorbance offset	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	1	2	3	4	5	6	7
Linearization coefficients	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Analysis matrix

	Species Name	Unit Name	Unit Conversion	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5	L1-F6	L2-F1	L2-F2	L2-F3	L2-F4	L2-F5	L2-F6
UV species 1	H2S	PPM	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 2	SO2	%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 3	SO	PPM	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 4	UV-4	%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 5	UV-5	ppm	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 6	UV-6	ppm	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 7	UV-7	Custom	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 8	NDr			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aggregated UV	UV+	ppm	1.0000												

Refresh Values

The Analysis panel lets you configure the concentration analysis process.

## Measurement Cell

Cell length 12 cm  
Nominal cell temperature 32 degC  
Nominal cell pressure 860 mm.Hg

You can specify the cell length (on the transmittance axis) and nominal operating conditions (ie: the values that are used if a sensor has not been installed).

## Cell T&P Compensation

The measurement cell can be compensated for the measured pressure and temperature if pressure and temperature transducers have been installed. Leave them unchecked to use the nominal values described in the previous section.

### Cell temperature compensation

- ☐ static or pseudo-dynamic via Modbus master update
- ☒ dynamic using the cell temperature measurement

## Cell pressure compensation

- ☐ static or pseudo-dynamic via Modbus master update
- ☒ dynamic using the cell pressure measurement

## Adaptive Filtering

### Adaptive Filtering

	Sigma	Min Gain
Absorbance	2.56	1.0
Neutral drift	1.254	0.0000

You can apply an adaptive filter to absorbance and neutral drift.

**These values should not be changed unless advised by Ametek.**

## Correction Factors

Compressibility	<input type="text" value="0.0000"/>
Alpha factor	<input type="text" value="0.0000"/>
Sample source	<input type="text" value="Process stream"/>

The super compressibility factor, usually notated Z, is a function of the molar composition of the sample gas. It is normally calculated from a molar analysis using an equation of state calculation such AGA-8, AGA-10 or SGERG. If it is unknown, enter 1.0 to simply use ideal gas law. The analyzer does not perform an equation of state calculation.

$$Concentration_{corrected} = Concentration / Z$$

The analyzer automatically calculates the Dual-range SO<sub>2</sub> blending alpha correction factor when the SO<sub>2</sub> crosstalk procedure is performed.

**Do not change it unless advised by Ametek.**

The Sample source can be set to either of:

- Process stream
- non Process stream

### Analysis Algorithm

Neutral drift compensation	<input checked="" type="checkbox"/>
Linearization 1	<input type="checkbox"/>
Linearization 2	<input type="checkbox"/>
NOx measurement	<input type="checkbox"/>
SO2 dual-range blending	<input type="checkbox"/>
SO2 triple-range extension	<input type="checkbox"/>
SO2 crosstalk	<input type="checkbox"/>
MeSH correction	<input type="checkbox"/>
Hot application	<input type="checkbox"/>
Liquid measurement	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Reserved	<input type="checkbox"/>
Zero abs every peak analysis	<input checked="" type="checkbox"/>

The Analysis algorithm can include a variety of optional calculations:

Neutral drift compensation

NOx measurement requires a motorized filter wheel

SO2 dual-range blending requires a motorized filter wheel

SO2 extended range requires a motorized filter wheel

SO2 crosstalk correction requires a motorized filter wheel

MeSH (methyl mercaptan) correction requires the analyzer to be configured to measure MeSH

Hot application enables the analyzer to perform additional calculations in a hot wet gas sample, and requires an optional oven to be installed

Liquid application is for liquid samples

**Ametek cautions that the Analysis Algorithm should only be modified by service personnel.**

### Absorbance Offsets

Every lamp + filter position can be assigned a linear offset.

	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5
Absorbance offset	0.00000	0.00000	0.00000	0.00000	0.00000

**These values should not be changed unless advised by Ametek.**

### Linearization Coefficients

There are seven coefficients that can be used for either linearization or interference polynomial compensation.

	1	2	3	4	5	6	7
Linearization coefficients	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

They are used if the analysis algorithm includes Linearization-1 or Linearization-2.

**These values should not be changed unless advised by Ametek.**

### Analysis Matrix

One of the challenges of UV-absorbance spectroscopy is that a species that absorbs UV light will generally do so at multiple wavelengths. This means that multiple UV-absorbent species may affect UV absorption within the wavelength range of an analyzer filter.

The Analysis Matrix is responsible for partially calculating the concentration output and negating the effects of cross-talk by interfering gas species.

If the row for a species is empty, that species will be flagged as not valid, and will not be displayed in pop-up menus. It cannot be acquired or logged.

Only two rows can be used for non-motorized analyzers, as only L1-F2 and L2-F6 are available.

Analysis matrix

	Species Name	Unit Name	Unit Conversion	L1-F1	L1-F2	L1-F3	L1-F4	L1-F5	L1-F6	L2-F1	L2-F2	L2-F3	L2-F4	L2-F5	L2-F6
UV species 1	H2S	PPM	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 2	SO2	%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 3	SO	PPM	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 4	UV-4	%	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 5	UV-5	ppm	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 6	UV-6	ppm	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 7	UV-7	Custom	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UV species 8	NDR			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aggregated UV	UV+	ppm	1.0000												

Figure 35 – The Analysis Matrix

For each species, you set the name of the species and the unit of measure here. The matrix coefficients are normally calculated by Ametek to produce concentration results in ppm. To change the concentration unit of measure to % or other unit of measure such as  $mg/m^3$ , an appropriate unit conversion factor can be supplied.

The unit conversion factor is normally set at the factory to scale concentrations to the customer's desired units of measure.

**Please consult Ametek if a different unit of measure is required.**

#### Dual-range naming convention

By convention, if the analyzer is configured to have both a high range and a low range calibration for a species, the species name for the low range is in lower case letters (eg: so2) and the high range is in upper case (eg: SO2).



## Analysis Panel — Advanced

Standard Advanced

Refresh Values

Aggregated UV Results Setup

	H2S	SO2	SO	UV-4	UV-5	UV-6	UV-7
Included? (Y/N)	No	No	No	No	No	No	No
Multiplication factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Offset factor: 0.0000

Crosstalk Correction Factor

	SO
H2S	0.0000
SO2	0.0000

Dilution factor: 0.0000

Figure 36 – The Advanced Analysis panel

A few more aspects of the species analysis can be configured in the Advanced tab of the Analysis panel.

### Aggregated UV Results Setup

The aggregated UV concentration is the sum of each of the individual gas species concentrations times the aggregation factor for that species:

$$\text{Aggregated UV Result} = \left( \sum_{i=1}^7 (C_i F_i) \right) + \text{Offset factor}$$

where:

$C_i$  is the concentration result for UV species  $i$

$F_i$  is the multiplication factor for UV species  $i$  in Figure 37

To include or exclude a species, press the "y" or "n" key to indicate "Yes" or "No", or press the spacebar to toggle between them.

If NOx analysis is selected in the Analysis Algorithm, the aggregated UV species is NOx, which is the sum of Species 2 (NOx) and Species 3 (NO) concentrations, and this control is disabled.

Aggregated UV Results Setup

	H2S	SO2	SO	UV-4	UV-5	UV-6	UV-7
Included? (Y/N)	No	No	No	No	No	No	No
Multiplication factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Offset factor: 0.0000

Figure 37 – Aggregated UV analysis setup

### Crosstalk Correction Factor

The Crosstalk Correction Factors are used to correct the cross interference of UV Species 3 onto UV Species 1 and UV Species 2.

They are typically used when MeSH is assigned as UV Species 3 and the MeSH correction algorithm is enabled.

Crosstalk Correction Factor	
	SO
H2S	0.0000
SO2	0.0000

### Dilution Factor

In CEM applications with very high concentration, a dilution probe might be used to dilute the sample gas flowing into the analyzer. Each dilution probe has a Dilution Factor.

Dilution factor	0.0000
-----------------	--------

## Track and Hold Panel

T&H Data

	Value	U of M	Hold Time (secs)
H2S	0.000	PPM	60
SO2	0.000	%	60
SO	0.000	PPM	60
UV-4	0.000	%	0
UV-5	0.000	ppm	0
UV-6	0.000	ppm	0
UV-7	0.000	Custom	0
NDr	0.000		200
UV+	0.000	ppm	200
O2	0.00	%	60

☐ Not holding  
☒ Holding

Figure 38 – The Track and Hold panel

This panel lets you specify how long concentration results will be held in the Track and Hold registers. The Track and Hold concentration results are used when live results are unavailable during a calibration.

If the hold time for a species is 0, the corresponding concentration result is held until the analyzer stops holding concentration results.

If the hold time for a species has a positive value, the result is held for the time specified and returns to tracking when the time expires, unless at the end of the specified hold time, the command register is still set. In that case, the hold continues until the command register is cleared.

The 99xx Configurator treats the command register as read-only, so it is possible to view the command state, but it cannot be changed. If you wish to change the holding state, it's necessary to use the analyzer's HMI:

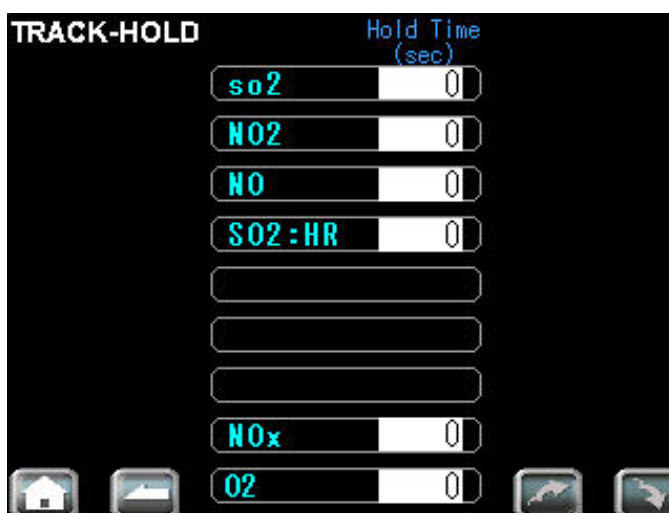


Figure 39 – Setting Hold times using the analyzer's HMI

## Sample System Panel — Status Trigger

REVIEW DRAFT

Legend:   
● = warning   
● = fault

Sample System Trigger

Temperature Zone A sensor error	<input checked="" type="checkbox"/>	●
Temperature Zone B sensor error	<input checked="" type="checkbox"/>	●
Temperature Zone C sensor error	<input type="checkbox"/>	●
Temperature Zone A high	<input type="checkbox"/>	●
Temperature Zone B high	<input type="checkbox"/>	●
Temperature Zone C / ext input high	<input type="checkbox"/>	●
Temperature Zone A low	<input type="checkbox"/>	●
Temperature Zone B low	<input type="checkbox"/>	●
Temperature Zone C / Ext. Input low	<input type="checkbox"/>	●
CAL pressure out of range	<input type="checkbox"/>	●
Sample pressure out of range	<input type="checkbox"/>	●
reserved	<input type="checkbox"/>	●
Contact Device 1 status triggered	<input type="checkbox"/>	●
Contact Device 2 status triggered	<input type="checkbox"/>	●
Contact Device 3 status triggered	<input type="checkbox"/>	●
Flow Control in a forced state	<input type="checkbox"/>	●

Contact Input Device Trigger Setup

Device Name	FloSW	DEV2	DEV3
Normal State (O / C)	Open	Open	Open
Trigger Delay (secs)	0	0	0

Refresh Values

Flow Control State

Automatic control by analyzer

	Time to Next
Full Auto-CAL	0 00:00:00
Auto-CAL 0	0 00:00:00

Contact Inputs

FloSW	DEV2	DEV3
Open	Open	Open

Solenoids

SOL1	SOL2	SOL-3	SOL-4	Sol-5	Sol-6	Sol-7	Sol-08
●	●	●	●	●	●	●	●

Start Blowback    
Abort Blowback    
Blowback in Progress? ●

Figure 40 – The Sample System — Status Trigger panel

The Ametek 99xx can be configured with an optional Sample System, which can measure the temperature in three zones. Three dry contact inputs can also be monitored.

Each of these can optionally trigger a change to the Sample System status:

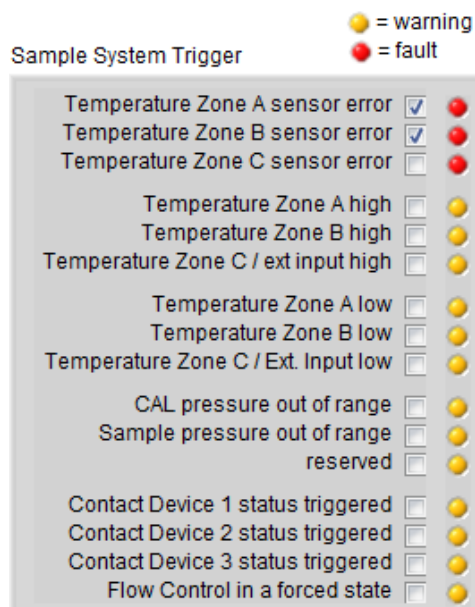


Figure 41 – Setting up faults and warnings

If an item is checked, the analyzer will monitor it. You can toggle whether the condition is to be treated as a warning or as a fault by clicking the LED. When the LED is amber, the condition is treated as a warning. When it's red, the condition is treated as a fault.

### Contact Inputs

The Sample System has three dry contact inputs. You can give each of them a six character name, and specify whether the normal state is open or closed (press the “o” or “c” key to set it to “Open” or “Closed”).

If you specify a Trigger Delay, the contact will not be asserted until it has been the new state for the specified time (in seconds).

#### Contact Input Device Trigger Setup

Device Name	FloSW	DEV2	DEV3
Normal State (O / C)	Open	Open	Open
Trigger Delay (secs)	0	0	0

## Sample System Panel — Common Items

Flow Control State

Automatic control by analyzer ▼ Apply

	Time to Next
Full Auto-CAL	0 03:21:00
Auto-CAL 0	0 00:30:00

Contact Inputs	Name-1	Name-2	Name-3
Current State	Open	Open	Open

Solenoids	SOL1	SOL2	SOL3	SOL4	SOL5	SOL6	SOL7	SOL8
Current State	●	●	●	●	●	●	●	●

Start Blowback

Abort Blowback

	Time to Next
End of Blowback	0 00:00:10
Auto-Blowback	0 00:40:00

Blowback in Progress? 🟡

Figure 42 – The Sample System panel — Common Items

The lower part of the Sample System panel contains items that are visible regardless of which tab is selected.

### Flow Control State

Flow Control State

Automatic control by analyzer ▼ Apply

- ✓ Automatic control by analyzer
- Non-sampling state
- Continuous normal sampling flow state
- Continuous auto-CAL0
- Continuous auto-CAL1
- Continuous auto-CAL2
- Continuous auto-CAL3
- Continuous auto-CAL4
- Continuous CEM probe isolation
- Continuous CEM probe air flow
- Continuous CEM probe blowback
- Continuous sample conditioning column A flow
- Continuous sample conditioning column B flow
- De-energize all solenoids
- Energize solenoid 1 only
- Energize solenoid 2 only
- Energize solenoid 3 only
- Energize solenoid 4 only
- Energize solenoid 5 only
- Energize solenoid 6 only
- Energize solenoid 7 only
- Energize solenoid 8 only

Figure 43 – Flow control options

This menu lets you introduce Zero Gas or Calibration Gas into the system. You can also return flow control back to the Analyzer for normal operation.

*Depending on the analyzer you are working with, certain Flow Control modes listed here may not be available. Only the Flow Control modes available for the analyzer you are working with are displayed in the software.*

## Automatic Control by Analyzer

Lets the analyzer automatically determine and set the mode of operation (sampling, calibration, or backpurge) by monitoring the state of the Fault alarm relay contacts.

### Non-sampling state

The Sample System is inactive (shut in, shut off, or in backpurge).

### Continuous normal sampling

If the optional sample conditioning columns have been installed, the "continuous normal sampling" flow control state will switch the columns as configured in the Sample Column tab (page 2-41 — REG#922-#924).

### Continuous auto-CAL

Continuous auto-CALx flow state, where x can be 0..4.

### CEM probe

If installed, the CEM probe can be forced into continuous isolation, flow, or blowback. In the "continuous CEM probe blowback" flow control state, the blowback air will be pulsed as configured in the Sample Probe tab

### Sample Column

Flow through the sample system can be forced to either of the sample conditioning columns.

### Solenoids

You can force all of the solenoids to be de-energized, or you can energize them selectively.

## Timers and Contact State

You can also see when the next calibration or blowback is scheduled to occur, and the current state of the contact inputs.

### Auto-CAL timers

	Time to Next
Full Auto-CAL	0 03:21:00
Auto-CAL 0	0 00:30:00





The time to the next full auto calibration, or auto-CAL 0 is shown in format: days hours:minutes:seconds.

Input Contacts

	Name-1	Name-2	Name-3
Current State	Open	Open	Open

You can see the current state of each contact, but not whether it's currently in the normal or active state.

Solenoid Status

Solenoids	SOL1	SOL2	SOL3	SOL4
Current State				

Similarly, you can observe the state of each of the 8 solenoids (not all pictured above).

Blowback State

If a sample conditioning column has not been installed, you can initiate or abort a CEM probe blowback, and see when the current blowback will end and when the next one will start. The time format is: days hours:minutes:seconds.

Start Blowback

Abort Blowback

	Time to Next:
End of Blowback	0 00:00:10
Auto-Blowback	0 00:40:00


Blowback in Progress? 

Figure 44 – CEM probe blowback

Sample Column Switch

If a Sample Conditioning Column has been installed, you can see which column is current active (or “Neither”), and when the next automatic Column Switch will occur:

Time to Next Column Switch

52 s

Current Active Column

B

The time remaining to the next automatic sample conditioning column switch is in seconds by default, but you can edit the unit of measure to any time unit by right-clicking the unit of measure and selecting your preferred temporal unit of measure.



## Sample System Panel – Temperature Zones

REVIEW DRAFT

Status Trigger | Temperature Zone | Flow Control | Auto-CAL | Sample Column

Refresh Values

Sample System Temperature Zone Setup

Temperature Zone Names	Zone1	Zone2	Zone3
Setpoint (deg C)	25	30	35
Kp (deg C)	0.75	0.70	0.60
Ti (sec)	4	4	4
Nominal Value (deg C)	25	30	25
Duty Cycle (%)	0	0	0
Present Reading (deg C)	23.45	22.58	-34.82

Zone C temperature / External input setting ☒ RTD ☐ External Input

Sample System External Input Setup

External Input Name	
Engineering Unit	
Low Scale	
High Scale	
Nominal Value	
Low Status Trigger	
High Status Trigger	
Present Reading	

Figure 45 – The Sample System — Temperature Zone panel

The Sample System can control the temperature of three zones:

### Sample System Temperature Zone Setup

Temperature Zone Names	Zone1	Zone2	Zone3
Setpoint (deg C)	25.00	30.00	35.00
Kp (deg C)	1.10	0.00	0.60
Ti (sec)	0.70	4.00	4.00
Nominal Value (deg C)	4.00	25.00	25.00
Duty Cycle (%)	0	0	0
Present Reading (deg C)	23.64	22.76	-34.82

You can provide a six-character name for each heating zone.

The control algorithm is PI. For each zone, you provide:

- Setpoint      The desired temperature, in deg C
- Kp              The duty cycle changes as a Proportion of the difference between the current temperature and the setpoint. Ametek suggests leaving this at the factory setting.
- Ti                The Integral constant in PI, expressed as an integration time constant. The Ti value helps to prevent slow temperature drift away from the setpoint. Ametek suggests leaving this at the factory setting.

The analyzer can be configured to use either:

- An RTD to measure the Zone C temperature, or
- An external transducer that produces a voltage or current output

Switch SW4 on the Sample System Interface board determines the temperature input type, which is shown on the screen as a radio button. Modbus register 893 contains the switch setting:

0 = RTD

1 = External analog input

To switch from one to the other, it's necessary to physically change switch SW4.

### External Temperature

If SW4 has been set to "External", the External Input Setup table becomes active:

Sample System Temperature Zone Setup

Temperature Zone Names	Zone1	Zone2	
Setpoint (deg C)	50.00	50.00	
Kp (deg C)	25.00	30.00	
Ti (sec)	10	30.00	
Nominal Value (deg C)	10.00	25.00	
Duty Cycle (%)	0	0	
Present Reading (deg C)	23.77	22.89	

Sample System External Input Setup

External Input Name	Zone-3
Engineering Unit	deg C
Low Scale	-10.00
High Scale	50.00
Nominal Value	25.00
Low Status Trigger	15.00
High Status Trigger	40.00
Present Reading	34.82

Figure 46 – External temperature setup

Note that if an external temperature measurement is used for Zone 3, the analyzer will not attempt to control the temperature.

## Sample System Panel — Solenoids

Sample System Flow Control Setup ☑ = Energised

Solenoid Name	SOL1	SOL2	SOL3	SOL4	Sol-5	Sol-6	Sol-7	Sol-08
Non-Sampling State								
Normal Sampling Flow								
Auto-CAL0 Flow								
Auto-CAL1 Flow								
Auto-CAL2 Flow								
Auto-CAL3 Flow								
Auto-CAL4 Flow								

Figure 47 – The Sample System — Solenoids panel

The Sample System contains 8 solenoids, which can allow some actions to be carried out automatically.

### Non-Sampling State

The analyzer energizes the checked solenoids in this row during warm-up and upon detecting a fault.

### Normal Sampling Flow

The analyzer energizes the solenoids that are checked in this row after warming up or completing an auto-CAL action, and upon all faults being cleared.

### Auto Calibration

If auto calibration has been enabled (see Auto Calibration on pages 2-12 and 2-46), this table specifies which solenoid(s) will be activated to enable Zero Gas to flow for Auto-CAL 0, and to allow Span Gas flow for Auto-CAL 1, 2, 3, and 4.

It is possible to actuate more than one solenoid for any of the Auto-CAL actions.

## Sample System Panel – Auto-CAL

REVIEW DRAFT

Status Trigger | Temperature Zone | Flow Control | **Auto-CAL** | Sample Column

Refresh Values

Sample System Auto-CAL Setup ☒ = Span

	Auto-CAL 0	Auto-CAL 1	Auto-CAL 2	Auto-CAL 3	Auto-CAL 4
None to Adjust	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H2S		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SO2		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SO		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
UV-4		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-6		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-7		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV+		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2 included	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2 Cal type	Zero <input checked="" type="radio"/> Span <input type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>
Duration (sec)	20	20	20	25	30

Sample return/flush delay  s  
 Periodic full auto-CAL interval  h  
 Periodic auto-CAL 0 interval  min  
 Start-up repeated auto-CAL0 interval  min

Figure 48 – Sample System Panel – Auto-CAL

If the optional Sample System module has been installed, automatic calibrations can be performed at regular intervals.

### Auto-CAL Setup

Sample System Auto-CAL Setup ☒ = Span

	Auto-CAL 0	Auto-CAL 1	Auto-CAL 2	Auto-CAL 3	Auto-CAL 4
None to Adjust	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H2S		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SO2		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SO		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
UV-4		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-6		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV-7		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UV+		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2 included	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O2 Cal type	Zero <input checked="" type="radio"/> Span <input type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>	Zero <input type="radio"/> Span <input checked="" type="radio"/>
Duration (sec)	20	20	20	25	30

Figure 49 – Auto Calibration setup

You can define up to five automatic calibrations, and select which species are to be calibrated for each of them. In general, it will be necessary to actuate valves to allow the appropriate Zero Gas or Span Gas to flow through the analyzer. These are controlled by solenoids, and you can define which solenoids are activated for each of the Auto-CALs using the Flow Control tab, which is described in the previous section on page 2-45.

Auto-CAL 0 is used for Zero Gas calibration of all species.

**Note:** If a zero calibration is performed for a Paramagnetic or Electrochemical Oxygen sensor, the Zero gas must be Nitrogen.

## Auto-CAL Timers

Sample return/flush delay	5	s
Periodic full auto-CAL interval	24	h
Periodic auto-CAL 0 interval	120	min
Start-up repeated auto-CAL 0 interval	20	min

### *Sample return/flush delay*

The analyzer waits this long before returning to on-line status, for sample gas to fill the system after an auto-CAL action, clearing of fault conditions or CEM probe blowback.

Similarly, it waits this long for sample gas to be flushed from the sample system, including the sample cell, before an auto-CAL action.

### *Periodic full auto-CAL interval*

Set the time interval to 0 to disable the corresponding auto-CAL function.

While this is expressed in hours by default, you can right-click on the unit of measure ('h') to select a different temporal unit.

### *Periodic auto-CAL 0 interval*

Your environment determines how often you should perform a Zero Gas calibration. You can perform a manual Zero periodically, and monitor the Zero-CAL drift to determine how often to perform an automatic Zero-Gas calibration. You can change the unit of measure if desired.

Set to 0 to disable periodic Zero Gas calibration.

### *Start-up repeated Auto-CAL 0 interval*

The analyzer can automatically perform a repeated Zero Gas calibration as necessary during analyzer start-up.

## Sample System Panel – Sample Columns

Sample System Conditioning Column Setup

Solenoid Name	SOL1	SOL2	SOL3	SOL4	Sol-5	Sol-6	Sol-7	Sol-08
Column A Flow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Column B Flow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Column Switching Interval  s (0 to disable auto-column switching)

**Figure 50 – Sample System Panel – Sample Columns**

If optional sample conditioning columns have been installed, you can specify how often the analyzer should switch from one sample system conditioning column to the other, and which solenoids should be actuated to accomplish the switch.

## Alarms panel

You can monitor any of the *Dashboard Variables*, to see if they are within limits that you set.

These variables are only monitored while the Configurator is connected to an analyzer. Please note that they are independent from the analyzer's Process Alarms described on page 2-30.

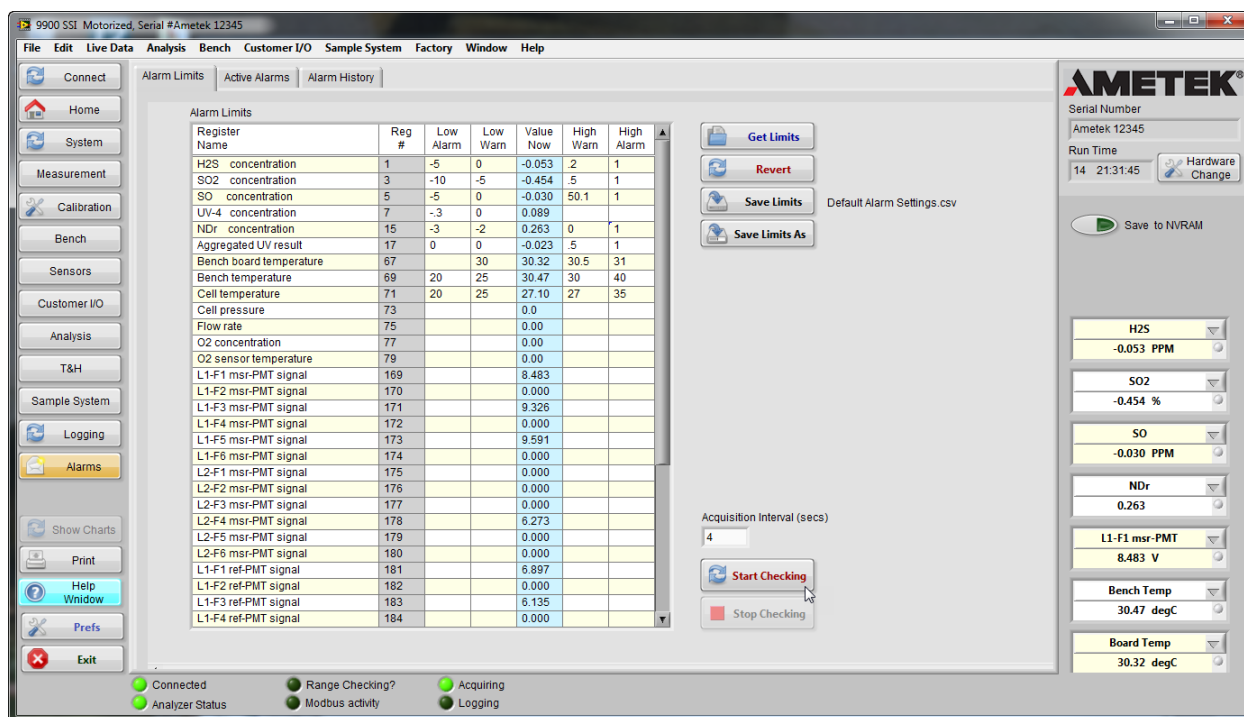


Figure 51 – Alarms panel — Setting Alarm Limits

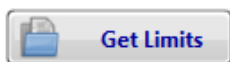
The dashboard variables are defined in the Modbus Register Map, which is discussed in Appendix II.

When you first view this panel, all of the dashboard variables appear in the table shown above, along with their register numbers, and current values (the light blue column).

For each row, you can enter both alarm and warning limits. If you don't wish to use warning levels, just leave them blank. If you don't wish to check a particular variable, just leave the limits blank.

When you've defined a set of alarm limits, you can save them as a spreadsheet format file by clicking either *Save* or *Save As*. You can also revert this table to its last saved values.


The next time you wish to monitor the same set of alarm limits, you can retrieve them:



## Start Checking

When you're ready to start checking the alarm limits, set the interval between checks and click *Start Alarms*.

As long as you are running the alarm checking process, the alarm status LEDs in the dashboard will be updated, and the *Range Checking?* LED at the bottom of the Configuration window will be green.

 Range Checking?

### Stop Checking

Click *Stop Alarms* when you wish to stop checking for alarm conditions:

*While this tab is displayed, the configurator reads every possible Dashboard variable so that it can display their current values. This adds to the Modbus traffic load, so you may wish to navigate to a different panel or a different tab in the Alarms panel when you're done using this panel.*

### Active Alarms tab

Alarm Limits	Active Alarms	Alarm History
Active Alarms		
	Reg #	Live Value
SO2 Concentration	1	107
H2S Concentration	2	418

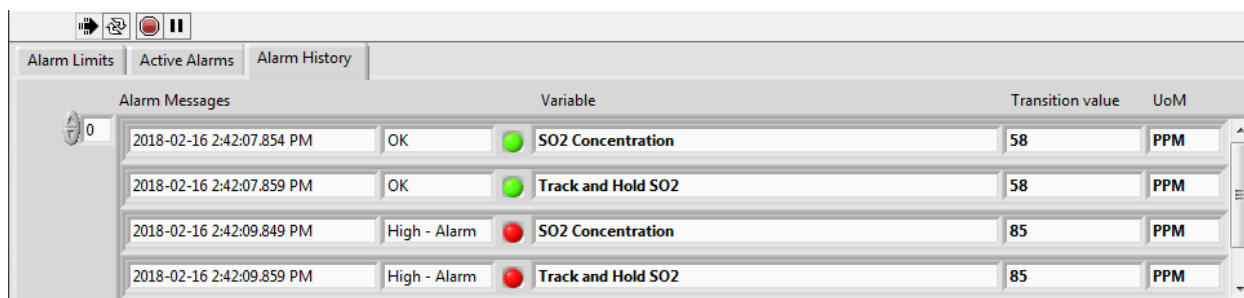
Figure 52 – Currently active alarms

The Active Alarms tab shows which variables are currently in either a warning or alarm state, and their current values.

### Alarm History tab

You can also monitor the history of when variables enter or leave alarm or warning states by selecting the *Alarm History* tab:





Alarm Messages		Variable	Transition value	UoM
2018-02-16 2:42:07.854 PM	OK	SO2 Concentration	58	PPM
2018-02-16 2:42:07.859 PM	OK	Track and Hold SO2	58	PPM
2018-02-16 2:42:09.849 PM	High - Alarm	SO2 Concentration	85	PPM
2018-02-16 2:42:09.859 PM	High - Alarm	Track and Hold SO2	85	PPM

Figure 53 – Alarm history

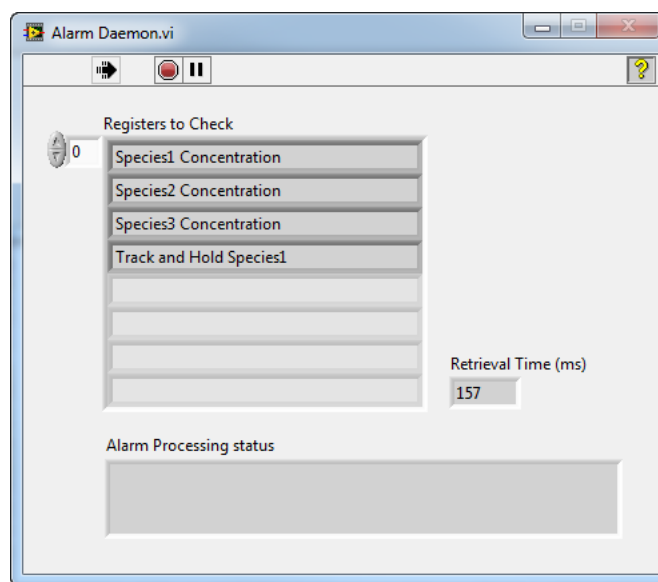
This information is also logged to a spreadsheet-format file located in an *Alarms* subdirectory of the test logs directory.

The file name format is:

*Serial Number – Alarm Log – Timestamp.csv*

## Alarm Daemon

The alarm logging processing task is normally minimized, but you can select it from the Windows menu, or the Windows task bar:



This window shows which registers are being checked, and the length of time it takes to retrieve them from the analyzer.

Naturally, the more variables you check, the longer it will take to retrieve them. This can slow the configuration screens down, and can also affect the maximum speed at which data logging can occur, even though data logging runs at a higher priority than alarm processing and configuration tasks.



### 3 Data Logging and Charting

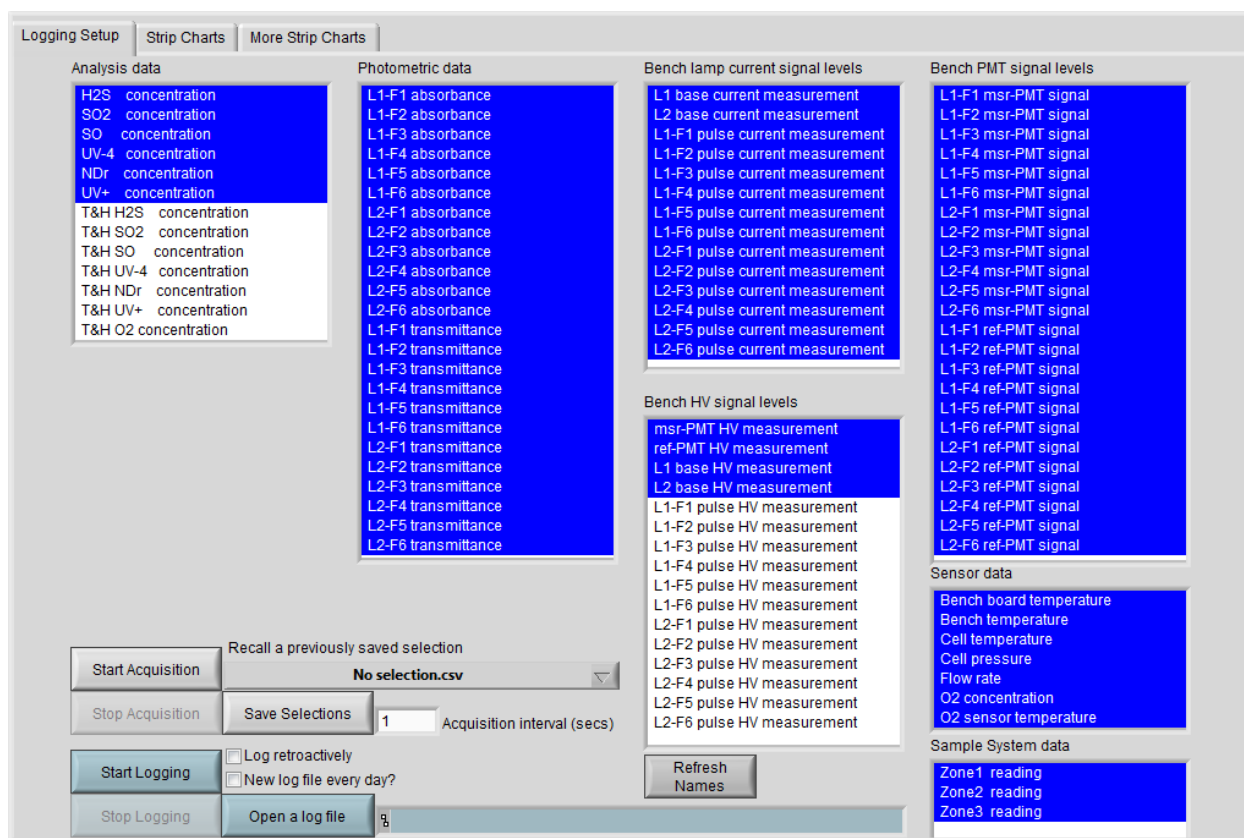


Figure 54: The Logging Setup panel

The 99xx Configurator can read your choice of variables at regular intervals, and optionally log them to a spreadsheet file.

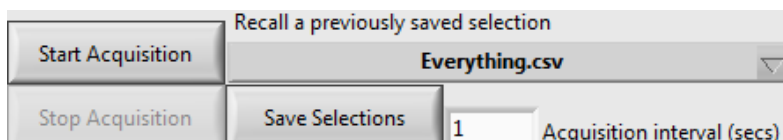
You can also display powerful graphs.

Start by selecting the “Logging” panel of the Configurator.

### Data Acquisition

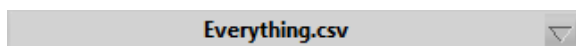
The first step is to start reading the signals that you are interested in. In Figure 54 above, you can see a list of signals, grouped into 7 *categories*. The specific signals that appear in each of these categories are specified in the Modbus Register Map (see Appendix II for details).

In this figure, most of the available signals have been selected. You can select any combination you’d like. Within each category, shift-click and control-click extend your selection.



If you’ve made a selection of signals that you’d like to use again, click the *Save Selections* button to save them as a spreadsheet file.

All of your previously saved selection sets are contained in the pop-up menu:



As soon as you choose an item from this menu, your saved selections are restored. Pick *No Selection* to unselect everything. In many cases, you might just choose to acquire all of the available signals. This option is predefined as “Everything.csv”.

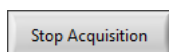
Decide how often you’d like the signals to be acquired (in the figure above, it’s set to every second), and click *Start Acquisition*.

The data acquisition task is started immediately.

You can configure and troubleshoot the analyzer while data acquisition is in progress, but your response times may suffer, depending on how many signals you are acquiring, and how frequently they are read from the analyzer.

Once you’ve started data acquisition, a “Strip Charts” tab and a “More Strip Charts” tab appear. They are described on page 3-6.

### Stopping Data Acquisition



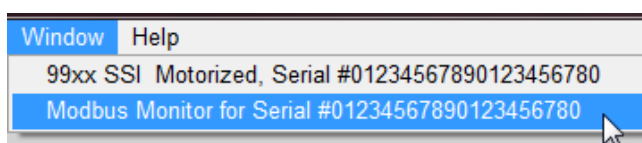
Stop Acquisition doesn’t destroy the in-memory buffers used for charting, so any charts that are running will simply stop updating.

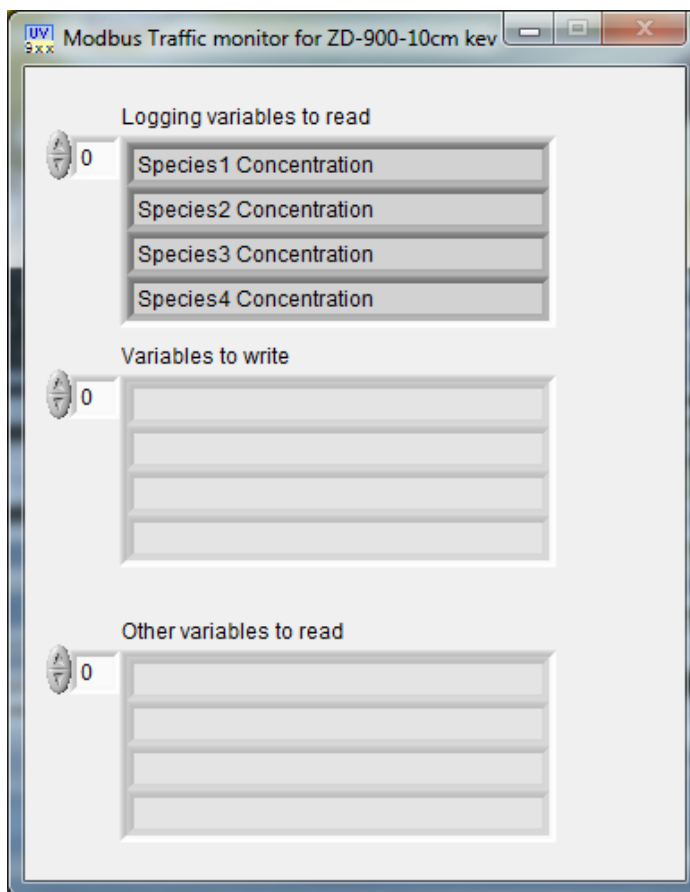
### Modbus Traffic

Modbus traffic is prioritized into three different queues:

- Variables being logged (highest priority)
- Variables being written to the analyzer
- Configuration tasks (lowest priority)

When you start data acquisition, a new Modbus Traffic monitor window is created. It’s initially minimized, but you can select it from the Windows task bar, or from the Windows menu:





This window lets you see the variables being sent to the Modbus data acquisition process. In the example above, we see that the concentration values are being requested by the data logging process.

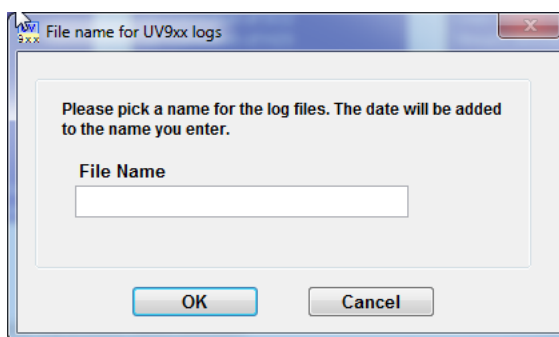
## Data Logging

It's not necessary to log data in order to graph it.



Once data acquisition has started, you can begin logging. All of the variables being acquired will be logged in .csv spreadsheet format in the Test Logs directory (see Appendix III – Preferences to see where that is).

You'll be asked to enter a name for the log file(s):



There are a couple options:

- ☐ Log retroactively
- ☐ New log file every day?

The analyzer's serial number is prepended to the file name you specify, to help you keep track of which log files are from which analyzer.

### *Log retroactively*

It's possible that you want to start logging, but wish that you'd started it earlier. If you select *Log retroactively*, the data in the circular memory buffer that is used for graphing will be written out to the log file first, allowing you to log variables that were acquired before you started logging.

### *New log file every day?*

You can split a long session into calendar days. This helps to keep the file sizes manageable, and provides some insurance against computer mishaps.

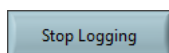
## Recall a Previous Session

If you haven't started data acquisition, you can open a previously saved log file, and graph the data:



The name of the file you selected is shown to the right of the button. This is handy for off-line demos (see the chapter on Demo Mode for more details).

### *Stop Logging*



Stop Logging does just what you'd expect. Data acquisition continues, so stopping data logging doesn't affect graphing.

## Charting

Once you've started data acquisition, a *Strip Charts* tab and a *More Strip Charts* tab appear, and you can start charting.

### Strip Charts

The *Strip Charts* tab lets you quickly create a couple of synchronized strip charts:

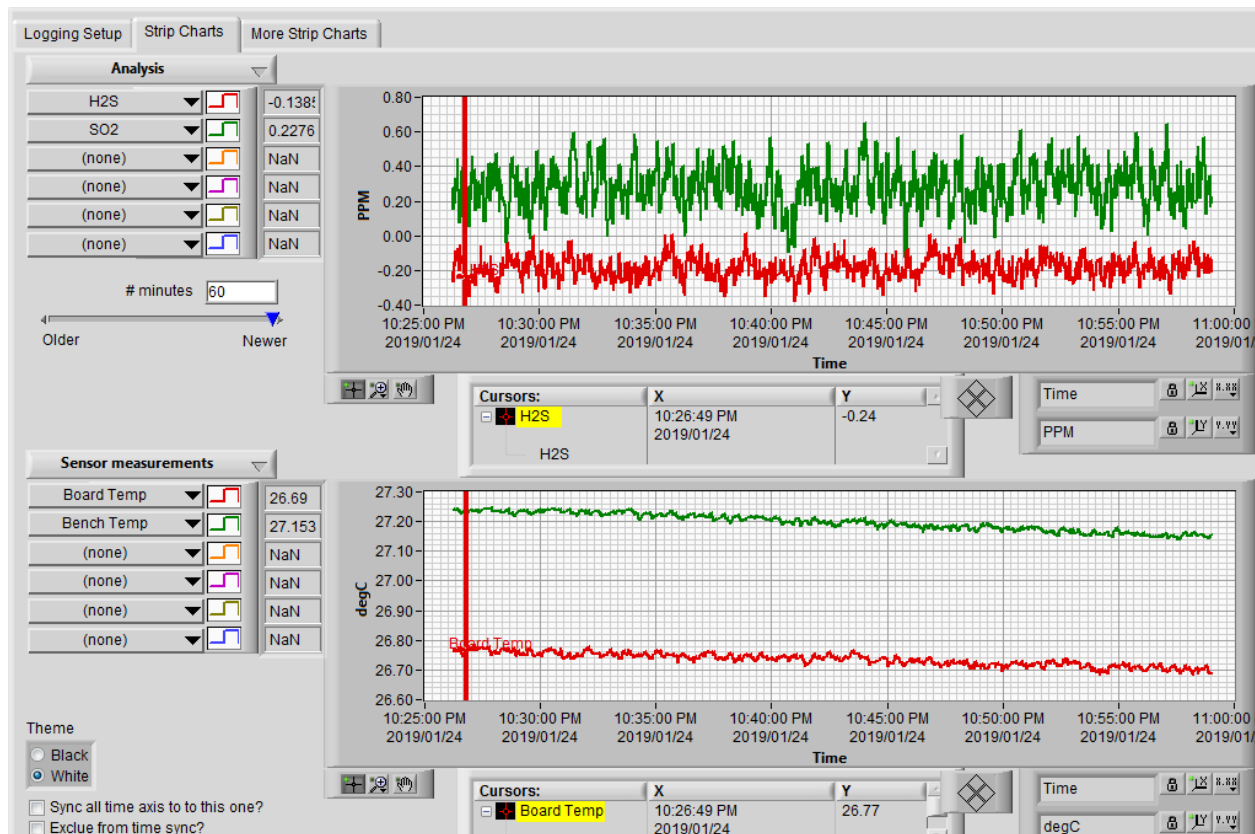


Figure 55 – Simple Strip Charts

This tab gives you the same controls as the more advanced strip charts described in the next section, but is designed to require fewer mouse clicks and be a bit easier to use.

You can use them either alone, or in conjunction with the flexible charting options on the *More Strip Charts* tab.

The graph controls are described in detail in the following sections.



## More Strip Charts

The *More Strip Charts* tab lets you create arbitrary sets of charting windows that you can arrange and size to suit your requirements. You can save and restore any number of sets of windows.

There are several predefined sets of windows – when you select one of them, the windows will be sized and arranged to fit your largest monitor.

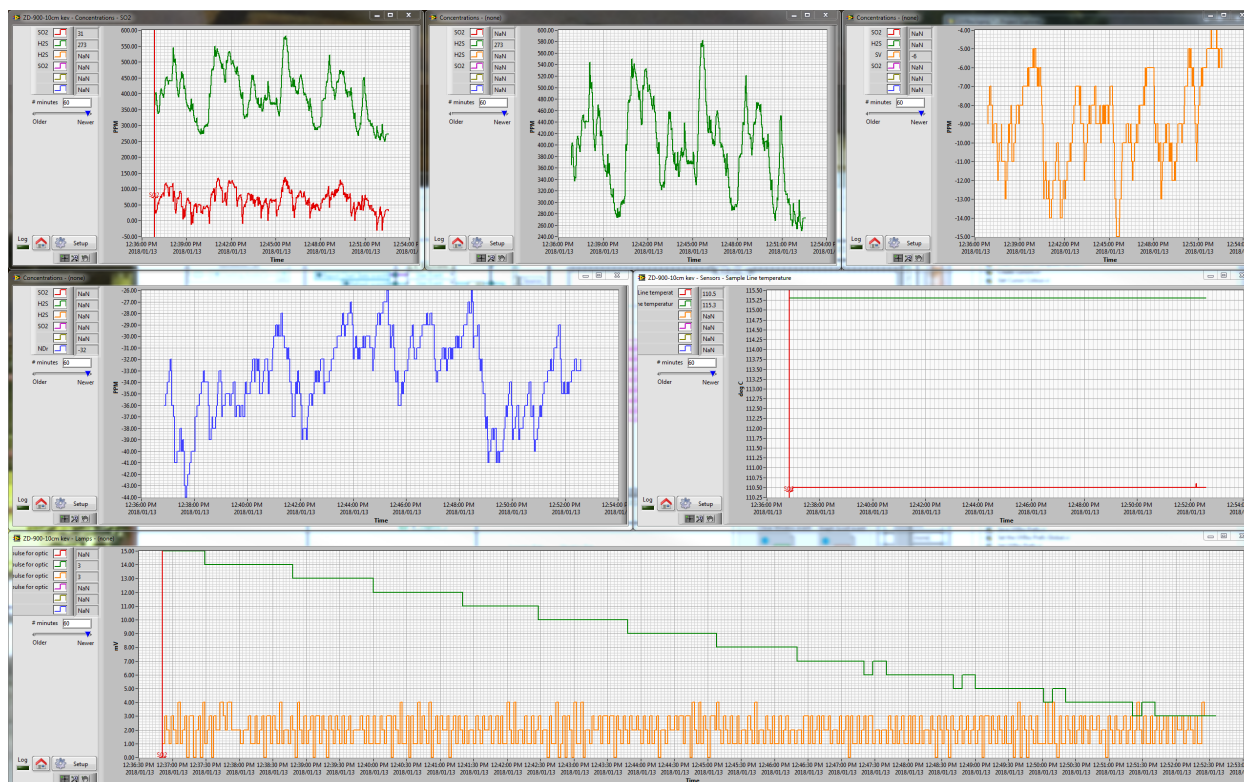


Figure 56 – Six charts, sized to fit your largest monitor

You can also create your own sets of charts. In the *More Strip Charts* tab, you can choose either one of the predefined sets of charts, or one of your own saved window sets:

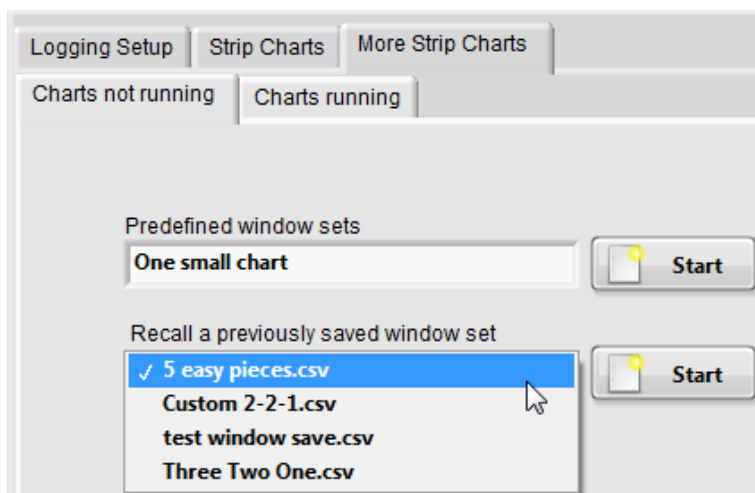
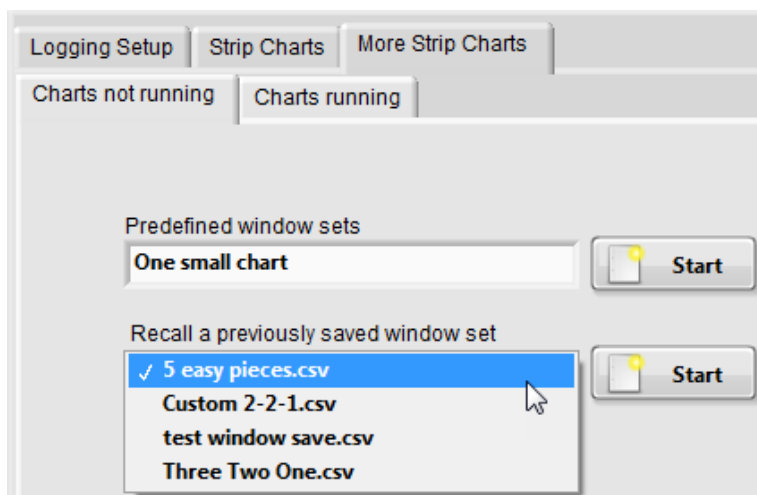
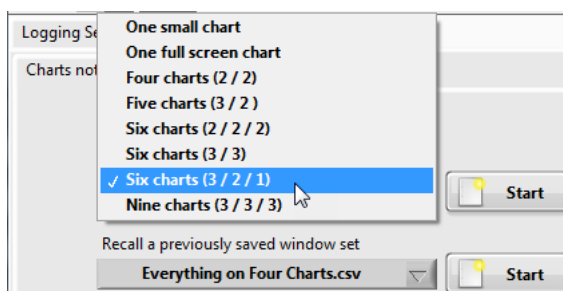


Figure 57 – Predefined and User-Defined Sets of Charts



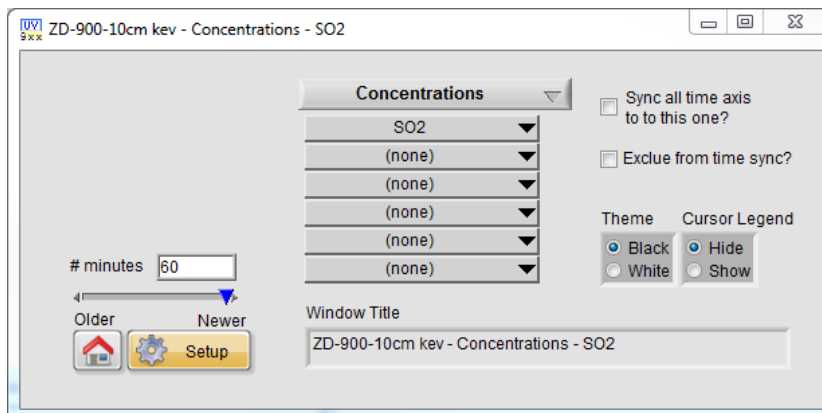
## A New Set of Charts

The first time you use the configurator, there won't be any saved chart sets, so you would choose one of the pre-defined layouts:



The charts will be tiled and sized to fill your largest monitor. If you have more than one monitor that is the same size, the charts will be placed on a secondary monitor.

Each of them will initially show the configuration options:



The upper pop-up menu lets you select a logging group (these are defined in the Modbus Register Map, and are discussed in Appendix II):

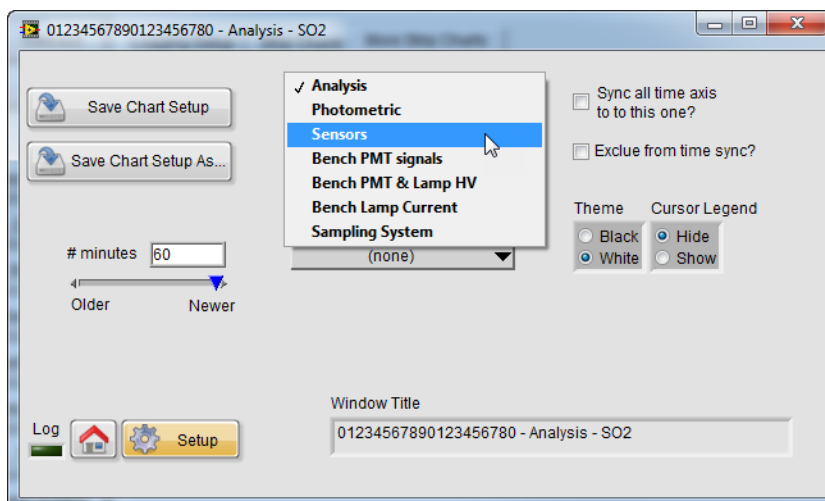


Figure 58 – Choosing a logging group to chart

You can select up to six different signals from the six pop-up menus below the logging group:

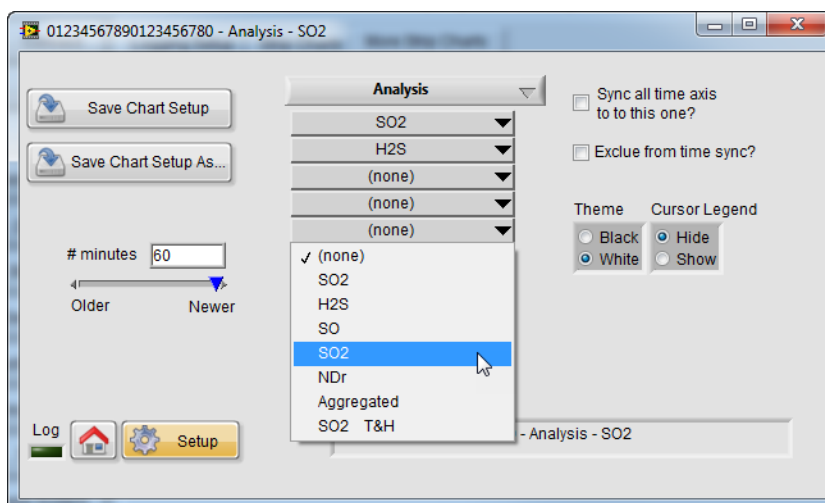
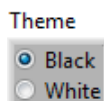


Figure 59 – Choosing signals to chart

### Chart Themes

It's possible to change many aspects of the chart appearance, but two main visual schemes have been predefined:



Selecting *Black* gives you a black background with brightly colored traces.

Selecting *White* gives you a white background with darker traces.

Both themes have the same functionality, but the white theme is better suited to printing on most printers.

## Synching Charts

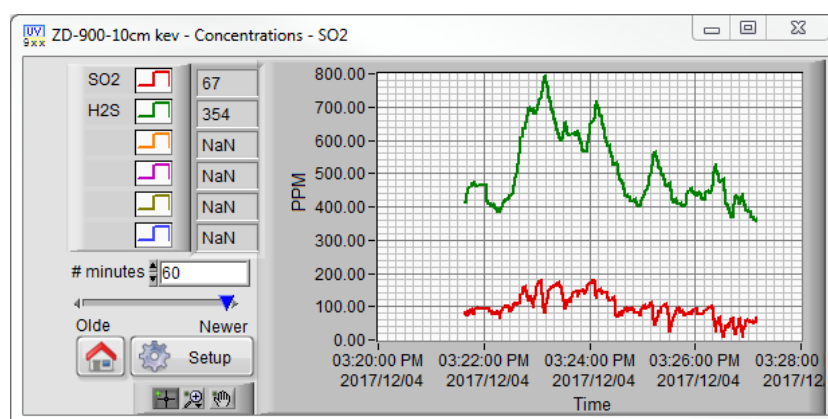
Two checkboxes are devoted to synchronizing the time axis of all of the charts that are currently running:

- ☐ Sync all time axis to to this one?
- ☐ Exclude from time sync?

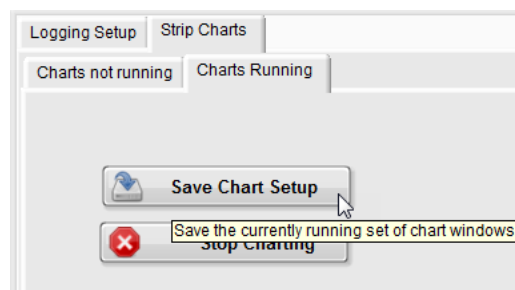
If you check *Sync all time axis to this one?*, all of the other charts will follow any changes you make to the X-axis on this chart. It's OK to select this option on more than one chart. If you do, each of them will act as the master if you change its time axis.

If you check *Exclude from time sync?*, this chart will ignore time axis changes that are initiated from other charts.

If you click Setup, the graph becomes visible:



You can resize the graph windows, move them around, and save the new layout (along with what you want to have logged in each window). To save the current group of chart windows, select *Save Chart Setup* in the main window:









## Chart Options

The charts have many configuration options.

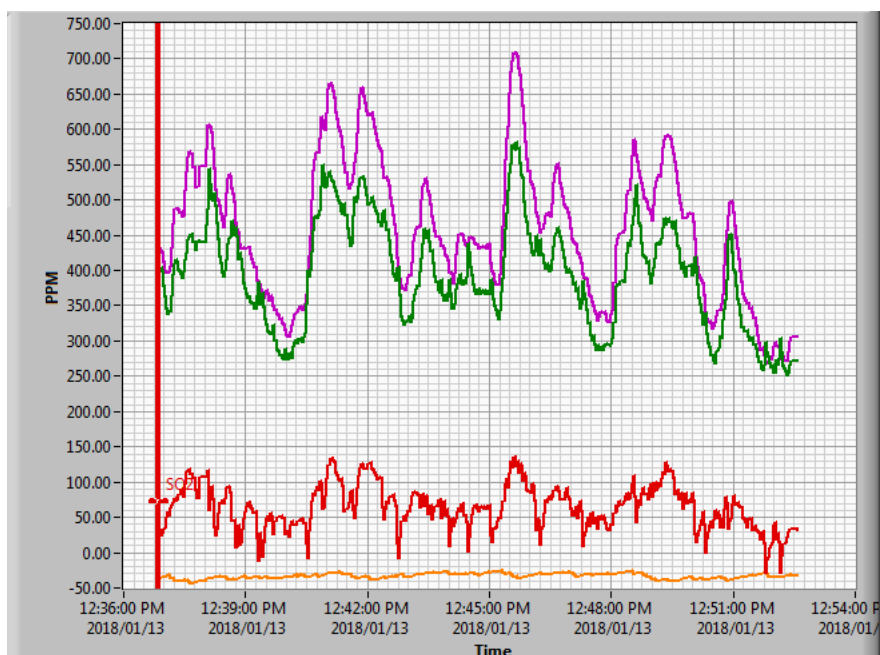
### Plot Legend

The upper left-hand portion of the graph window shows the plot legend:

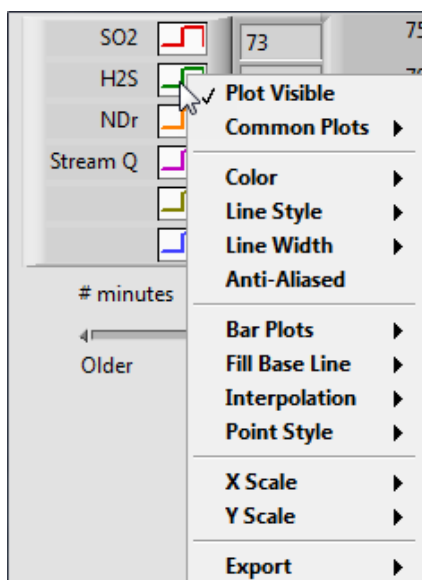
SO2		31
H2S		273
NDr		-32
Stream Q		305
		NaN
		NaN

The *Short Name* of each signal is shown at the left. These short names are defined in the Modbus register map, and you can change them to suit your needs. For more details, please refer to Appendix II — The Modbus Register Map.

*Live values* are displayed at the right. The units of measure can be seen on the Y-axis scale:



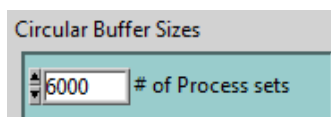
If you click inside one of the coloured legend boxes, a pop-up menu appears:



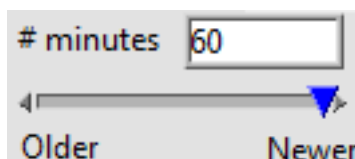
From here, you can configure the appearance of the plot traces, and export the underlying data values to the clipboard or to an Excel-format file.

## Data Scrolling

As long as data acquisition is running, all of the variables being acquired are accumulated in circular buffers in main memory. You can specify how large you wish these buffers to be in *Preferences* (see Appendix III – Preferences):



In most cases, these buffers hold much more information than is convenient to view at once, so each chart has a control that lets you specify which portion of the circular buffer you wish to view:



If you change these settings in one of the graphs, they will be reflected in every running graph.

By the way, data logging isn't affected by the size of the circular buffers. The only limit on the number of data points you can log is your available disk space.

## Home Button



If you are using a single monitor computer, the chart windows are likely to fill the entire screen.

If you click the Home button on any of the graphs, they will all be hidden, and the configuration window will become visible if it was hidden.

To hide the configuration window (on a single monitor system) and view the graphs again, click “Show Graphs” on the configuration window.

The graphs continue to run while the configuration window is visible, and you can make them visible individually by selecting them from the Windows Task Bar.



The Log LED is illuminated if data is being logged to a spreadsheet (you control this from the Logging Setup tab).

## Cursors

You can create as many cursors as you want. They can be configured to snap to a particular trace, to snap to any trace, or to be unconstrained.

The easiest way to create a cursor is to click anywhere in a graph. A cursor is created and moved to the time value of the mouse location. This cursor is initially set to snap to the first signal you’ve set up for that graph. A similar cursor is created in every graph window.

As long as you keep the primary mouse button pressed, the *live values* area will display the values at the timestamp where you clicked.

This is done for every graph that’s running, including the simple strip charts.

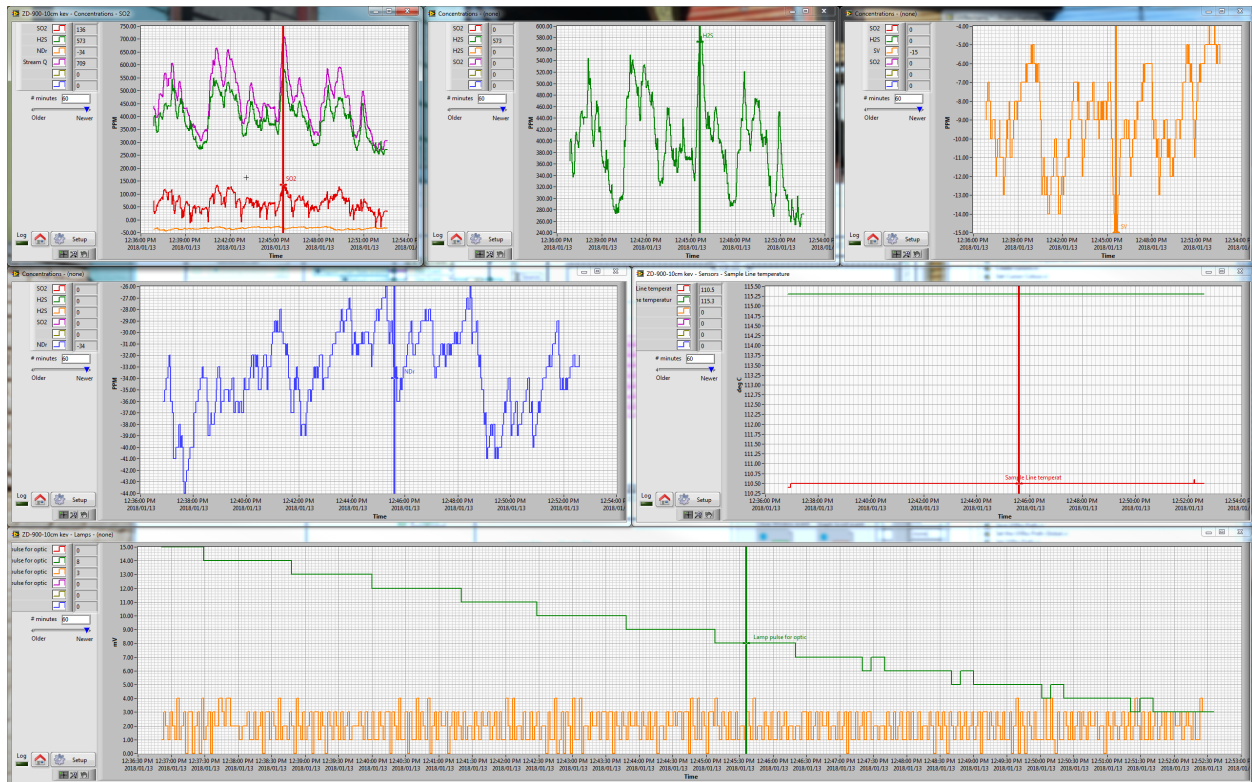


Figure 60 – Click inside any graph to create cursors in every graph at that timestamp

You can drag any of the cursors, and the cursors in all of the other graphs will follow. As you drag, the live values area in every window shows the values at the cursors. Note that you have to release the mouse button, and then click again to “grab” the cursor.

## The Graph Palette

The Graph Palette has three main controls, which determine what the cursor does:



The active control is “depressed”.

The first tool is for moving cursors around the graph.

The second tool lets you refine what’s displayed on the graph. It has a fly-out menu containing selection tools:

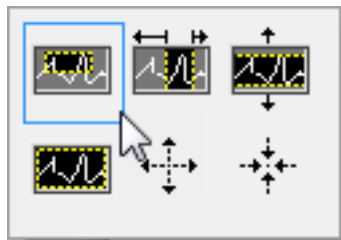


Figure 61 – Graph Selection Tools



- The marquee tool lets you draw a rectangle around an area of interest in the graph. When you release the mouse button, the graph is redrawn to fit your selection. X-axis and Y-axis auto-scaling are turned off.
- The second tool lets you pick a time range. X-axis auto-scaling is turned off. If you selected time-axis synchronization, the other graphs are updated to show the same time range.
- The third tool lets you select a Y-axis range. Y-axis auto-scaling is turned off.
- The fourth tool resets the zoom to its original values.
- The fifth tool zooms in around the cursor, and the sixth tool zooms out.

To turn auto-scaling back on, you can right-click on the time axis, and select *Autoscale X*, or right click on the Y-axis, and select *Autoscale Y*.

## Graph Annotations

You can also add annotations to a graph. Right-click at a point of interest, and select “Add Annotation”:

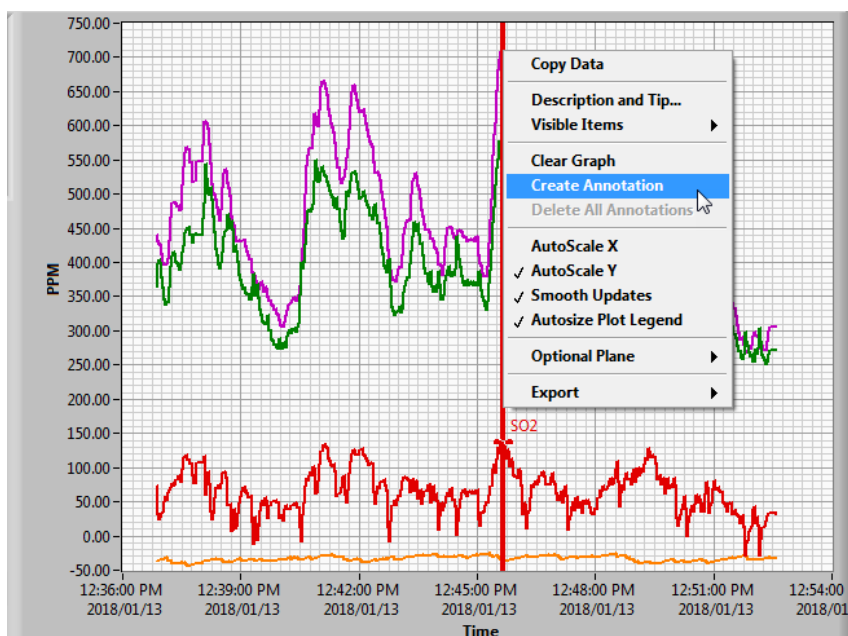
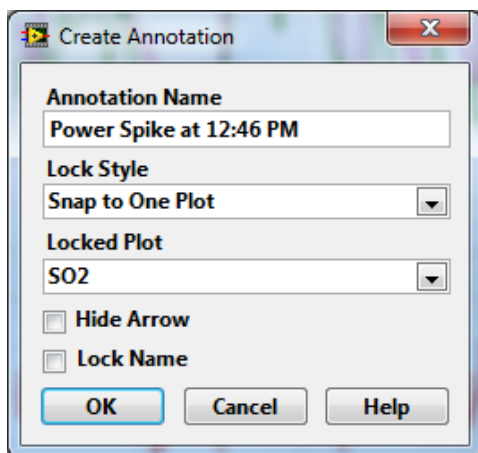


Figure 62 - Annotating a graph



If you right-click the origin of the annotation, you can change the colour and other features of the annotation:

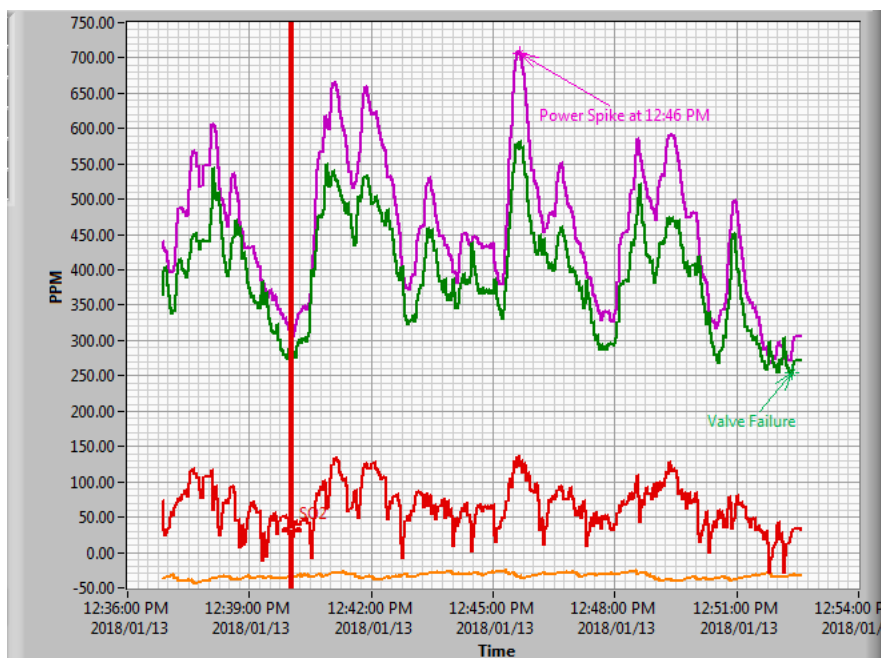
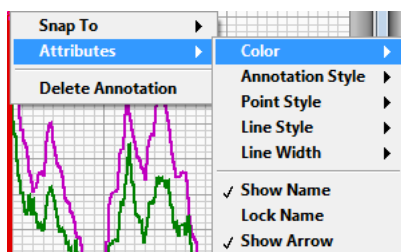
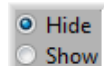


Figure 63 – A graph with annotations

Cursor Legend



If you display the Cursor Legend, a number of additional controls become visible:

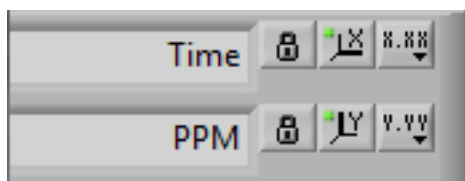
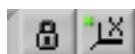
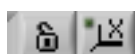


Figure 64 – Changing an axis name

For each axis, you can change the axis name. The lock icon is “locked” when the axis is being auto-scaled, and a little green “LED” is displayed on the icon to the right:



Autoscale on



Autoscale off

The effect is the same as right-clicking on an axis and checking or unchecking Autoscale.

The right-most icon lets you specify more axis options:

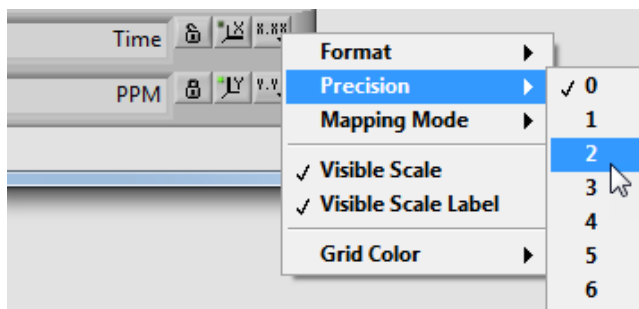


Figure 65 – Customizing a graph axis

You can add additional cursors by right-clicking inside the cursor legend:

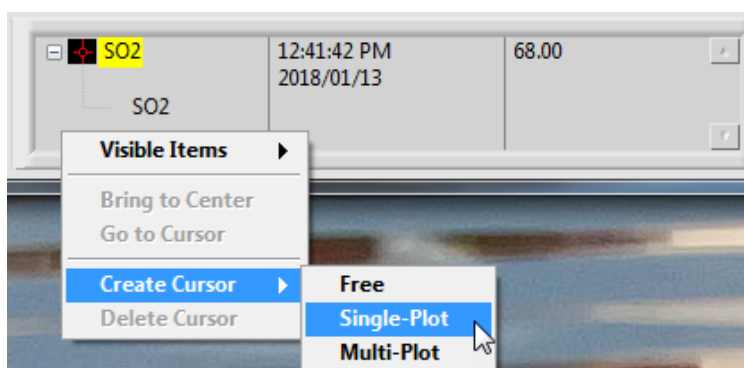
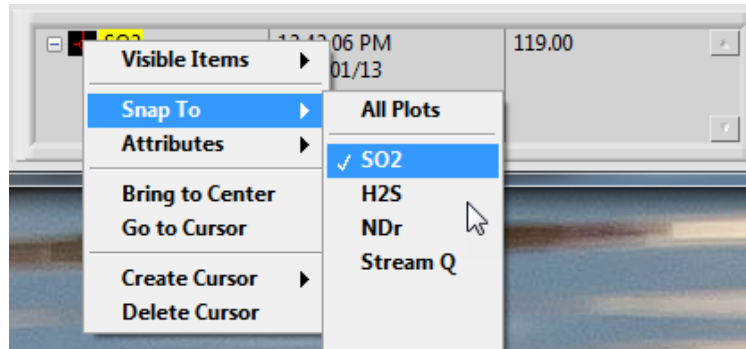


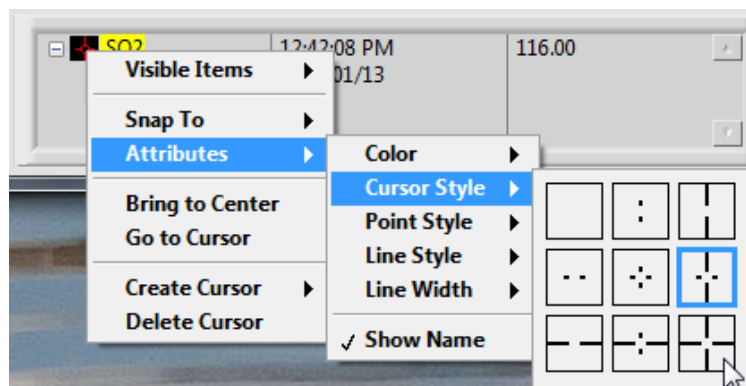
Figure 66 – Adding cursors to a graph

For Single-Plot cursors, you can specify which plot the cursor will snap to. This is the kind of cursor that is automatically created when you click inside the graph frame.

You can also right-click an existing cursor, and configure it to follow a specific plot:



You can also configure many aspects of the cursor's appearance:

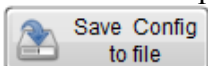


## 4 Offline (demo) Mode

You can use the Configurator without being connected to an analyzer. To do so, you'll need a configuration file for the specific analyzer that you wish to simulate.

The easiest way to do this is to connect to a working analyzer with the same configuration that you wish to simulate while offline, and save the configuration to a spreadsheet-format text file.

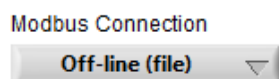
In the Connect panel, click:



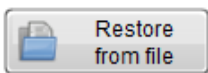
and save the configuration file with a name that describes the configuration. This configuration file contains the current value of every Modbus register in the attached analyzer.

### Offline mode

Now you can use the Configurator offline. Start the Configurator, and select "Offline" from the Modbus Connection menu:



Next, click:



and select the configuration file that you created while you were online.

At this point, you can view any of the panels. You can change values and they will be remembered the next time you want to view that data element. You can even initiate actions, such as calibration, but they will not complete successfully, because offline mode does not attempt to simulate the response you would get from a live analyzer.

### Preparing for Offline Charts

Before using charts offline, it's necessary to collect information over a period of time, so that there will be something to graph when you are offline.

Start by going to the Logging panel, and selecting the signals that you wish to acquire. Here, we suggest that you acquire all of the available signals every second:

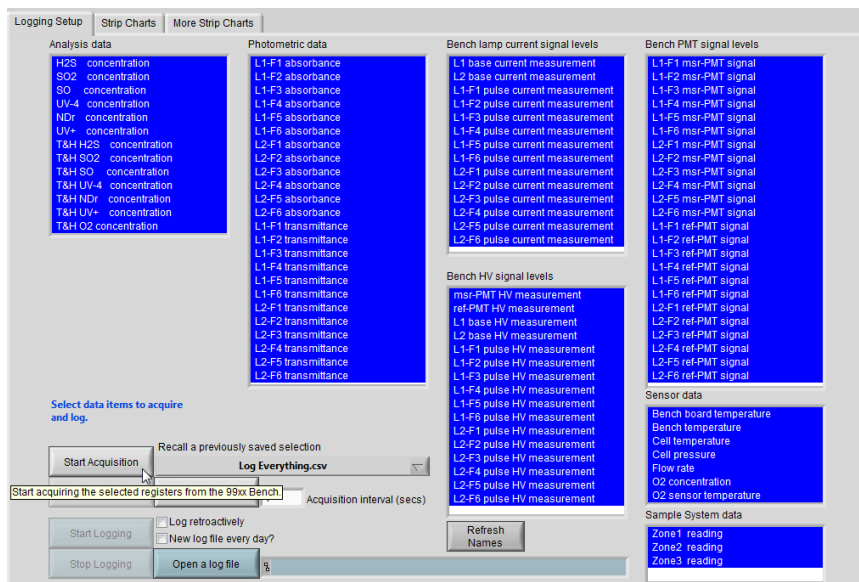
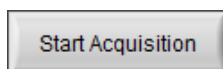
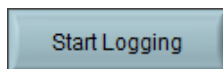


Figure 67 – Deciding which signals to acquire and log

Start acquisition:



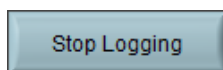
and then start logging:



Save the log file with a suitable name. The name you pick will be prefixed by the serial number of the analyzer that you are connected to.

We suggest that you collect several hours of information. If you wish to demonstrate or analyze interesting events, it should prove helpful to create those conditions while you are logging.

Click “Stop Logging” when you have logged enough information:



## Offline Charts

While you are in offline mode, you can select the Logging panel, and open the log file that you saved in the previous step:



Now you can navigate to the “Strip Charts” tab or the “More Strip Charts” tab. You can select any combination of signals that you would like to chart, and you can restore a saved charting windows set.

All of the charting function described in the Data Logging and Charting chapter on page 4-3-6 can be used. The time axis will be the time that each data point was collected.

You can pan and zoom the graphs, synchronize the time axis, drag the time axis synchronization cursor around, and graph whatever you wish (provided that it was acquired and logged while the analyzer was online).

#### Uses for offline mode

Offline mode can be useful for diagnosing issues at a remote site. To do this, create an appropriate configuration file and logging file, and send them to domain experts for evaluation.

Offline mode may also be useful as a sales tool.

It is not strictly necessary to use the Configurator to create configuration and logging files. If data has been collected in some other way, it can be formatted as a spreadsheet file in the required format (it's almost certainly easiest to start with a logging file that was created by the Configurator, and then change the contents of the data columns and timestamp column so that they contain the data of interest).





## 5 Web Server

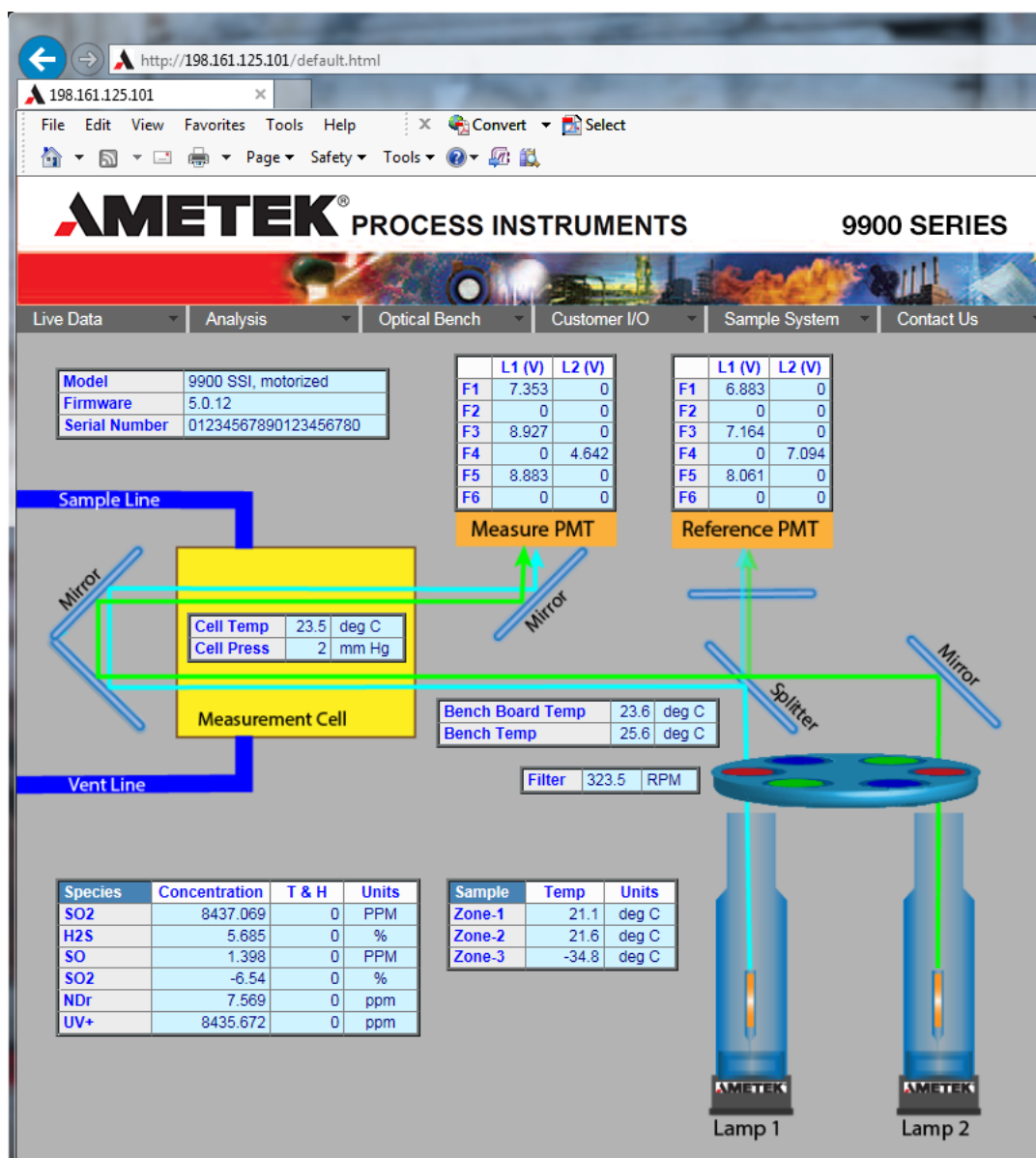
The analyzer's HMI unit can be used to configure the analyzer without using the Configurator.

The HMI unit also includes a web server that serves up read-only versions of all of the Configurator's screens.

### Getting Started

You can connect to the 99xx analyzer using any standard web browser. Make sure that the analyzer is reachable from your browser, and enter its IP address in the web address bar.

You should see the Home screen:



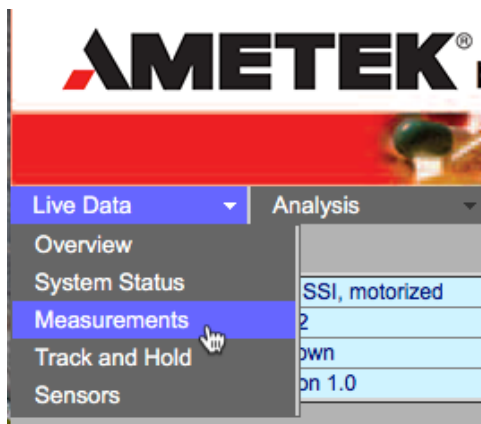
## Finding the IP Address

In case you do not know the IP address of your analyzer, here's how to find out.

1. Tap the upper right-hand corner of the HMI screen, and then tap the lower left-hand corner within one second. If you've done this correctly, a system menu bar will appear at the bottom of the screen.
2. Tap the *Offline* button.
3. Tap the *Main Unit* button near the top of the display.
4. Tap the *Ethernet* button.
5. Make a note of the IP Address.

## Navigating

Use the drop-down menu bar near the top of the window to select webpages to display:



The webpages look very similar to the Configurator screens, so they are not reproduced here.

Because the webpages are display-only, most of the table cells have a light blue background, indicating that they are live values.

The appearance of the pages adapts to the configuration of the analyzer. If you attempt to view a page that isn't applicable to the analyzer model you are connected to, you will see a page explaining that the feature is not available on that analyzer.

## Appendix I – Installing the Software

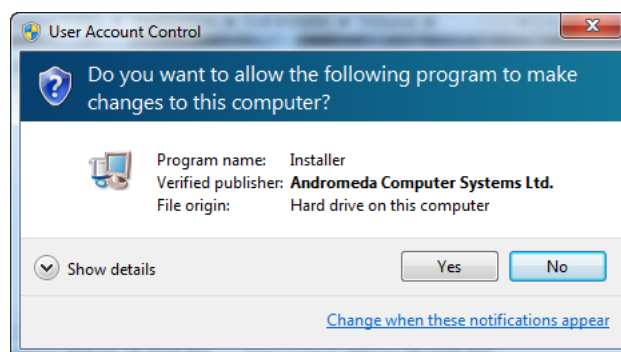
### A Full Install

The 99xx Configurator software was developed using the National Instruments LabVIEW platform. When you run the full installer, the configurator software and its data files are installed, along with a LabVIEW run-time engine.

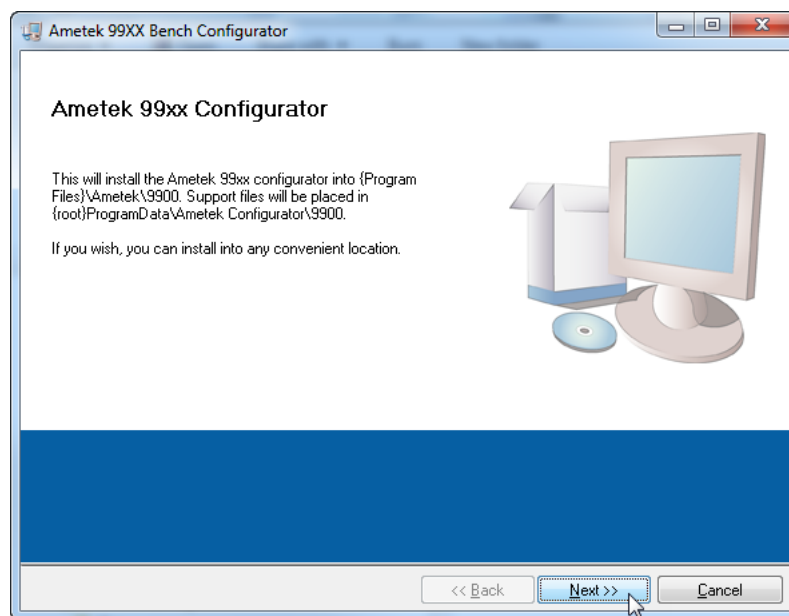
Once the initial installation has been done, a local administrator can usually simply replace the executable file 9900.exe in {Program Files (x86)}\Ametek Configurator\9900.

The full installer is normally in a directory named “Ametek 99xx Full Installer”. Open this folder, and then open the “Volume” subfolder. From there, run “setup.exe”.

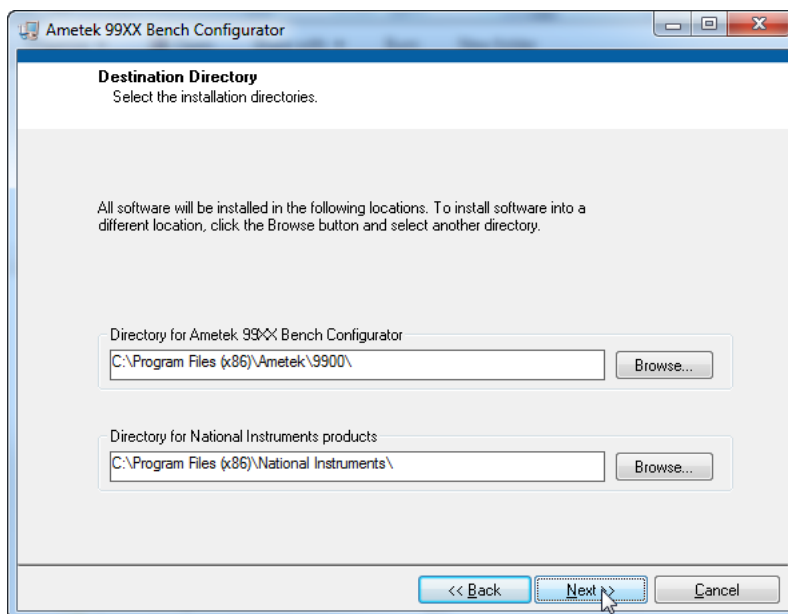
Windows will ask for permission to run the installer:



With your permission, the installer will launch:



You can install the software in any convenient location, but unless you have a specific need to install it in a particular location, we suggest that you use the default locations.



However, if security considerations prevent you from installing into the suggested locations, you can install the configurator software elsewhere. You will still need local administrator privileges to install the LabVIEW run-time engine, but the configurator software can be run from any location.

The data files can be installed anywhere, but you'll need to update your preferences to point to them.

The installer will place shortcuts on the computer all-users desktop, and in the all-users Start menu.

#### File Locations

The following files are installed along with the configurator software (not including the LabVIEW run-time files):

```

Program Files (x86)
  Ametek
    9900
      9900.exe
      9900.ini
      9900.aliaeses

{Root}
  Ametek Configurator
    99XX
      Test Logs
        This is where data logs are stored.
      Alarms
      Messages
  
```

## Saved Configurations

*Contains undo files, and any saved analyzer configurations (names and values of all Modbus registers).*

## Logging Selections

*Saves sets of variables to be acquired and logged.*

## Chart Window Configurations

*Saves locations and characteristics of sets of charting windows.*

## Alarm Settings

*Contains sets of alarm limits.*

## Dashboards

Saved dashboard.csv

*Saves the dashboard settings.*

Saved connection.csv

*Remembers your last connection.*

{Root}\ProgramData

. Ametek Configurator

9900 Register Map.csv

*Defines the Modbus register map, units of measure, scaling factors, etc. See Appendix II for more information.*

99XX Prefs.dat

*Stores the contents of the Preferences window (file locations, communication settings, etc.).*

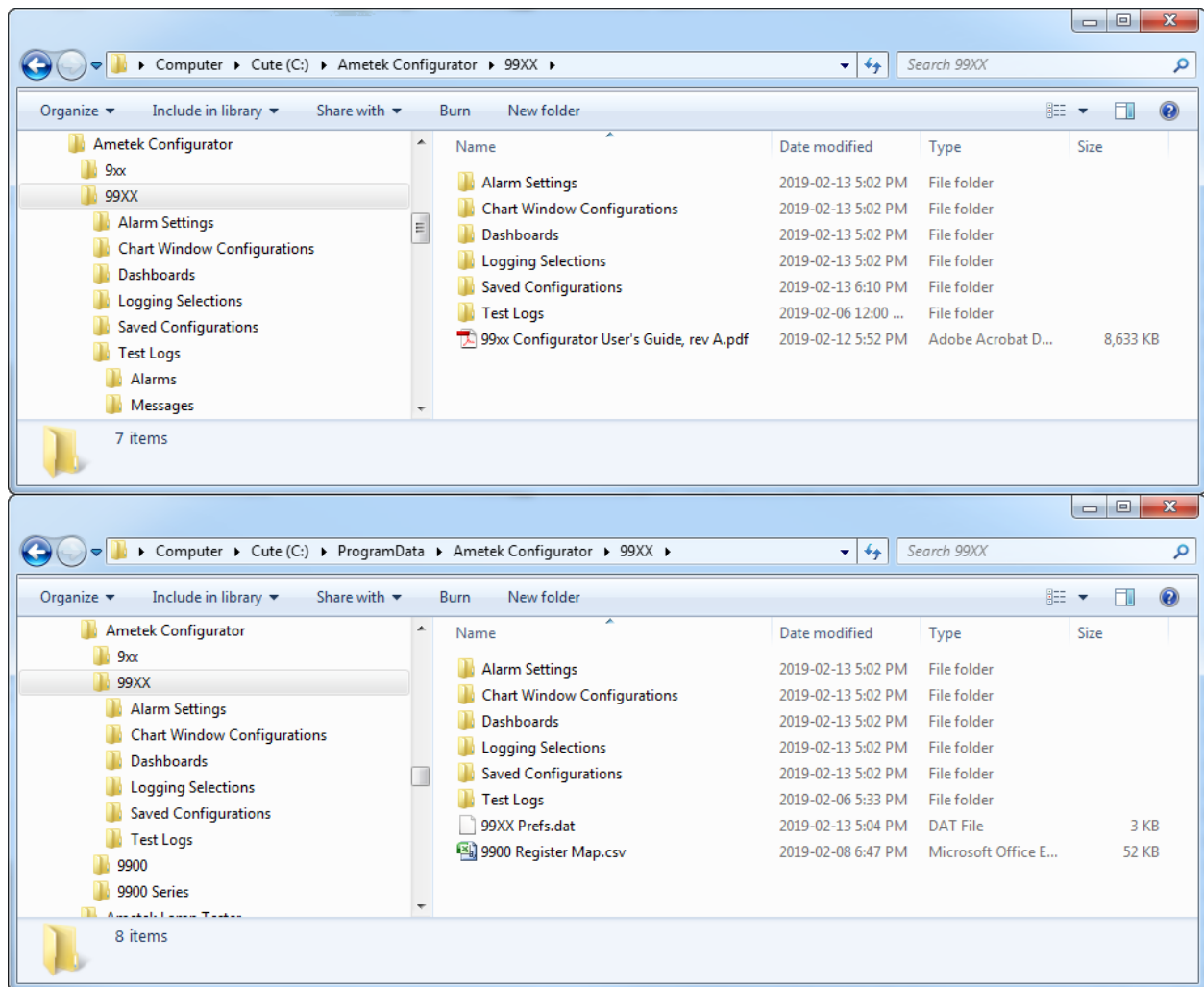


Figure 68— Data files and directories created by the installer

## Appendix II – The Modbus Register Map

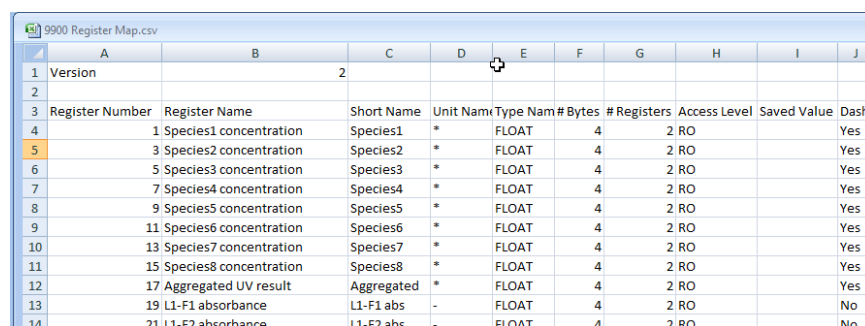
The Modbus register map file contains the register numbers available in the 99xx analyzers, along with information about scaling factors and units of measure.

For detailed information about the Modbus registers used by the analyzer, please refer to document *Serial Communications Interface (Modbus) Manual Supplement* – **PN 903-8652**

The Modbus register map is normally installed in:

C:\ProgramData\Ametek Configurator\99XX\9900 Register map.csv

Spreadsheet columns



1	Version	2								
3	Register Number	Register Name	Short Name	Unit Name	Type Name	# Bytes	# Registers	Access Level	Saved Value	Dash
4	1	Species1 concentration	Species1	*	FLOAT	4	2 RO		Yes	
5	3	Species2 concentration	Species2	*	FLOAT	4	2 RO		Yes	
6	5	Species3 concentration	Species3	*	FLOAT	4	2 RO		Yes	
7	7	Species4 concentration	Species4	*	FLOAT	4	2 RO		Yes	
8	9	Species5 concentration	Species5	*	FLOAT	4	2 RO		Yes	
9	11	Species6 concentration	Species6	*	FLOAT	4	2 RO		Yes	
10	13	Species7 concentration	Species7	*	FLOAT	4	2 RO		Yes	
11	15	Species8 concentration	Species8	*	FLOAT	4	2 RO		Yes	
12	17	Aggregated UV result	Aggregated	*	FLOAT	4	2 RO		Yes	
13	19	L1-F1 absorbance	L1-F1 abs	-	FLOAT	4	2 RO		No	
14	21	L1-F2 absorbance	L1-F2 abs	-	FLOAT	4	2 RO		No	

By column, the spreadsheet contains:

### Register Number

The Modbus register number, using standard 1-based numbering (ie: the convention used by most Modbus utilities).

### Register Name

The name of the Modbus register. When these register names are displayed by the configurator, the text “Species $n$ ” is replaced with the species name currently configured in the analyzer (where  $n$  is the species number).

**Don’t change any of the names in this column**, as the configurator requires these exact names.

### Short Name

In most cases, the short name is what you see in the configurator screens. You can change the short names to suit your preferences. Again, the text “Species $n$ ” is replaced by the species name for species 1..8 (the species names are contained in Modbus registers 593-617).

### Unit Name

The Si Unit of Measure. Allowable units are:

- % (percent)
- %% (forces percent regardless of the % vs. ppm setting)

- ppm (parts per million)
- sec (seconds)
- deg C (degrees Celcius)
- mm H2O (mm of water, gage)
- mm Hg) (mm of mercury, gage)
- RPM (revolutions per minute)
- mV (millivolt)
- mA (milliamp)
- Varies Depends on the analyzer configuration  
Change to your particular units of measure.

#### Data Type

The storage convention used by the analyzer. Do not change the values in this column.

#### # Bytes

The number of bytes used to store the value. Do not change the values in this column.

#### # Registers

The number of sequential Modbus registers used to store the value. Do not change the values in this column.

#### Access Level

Shows whether the register is read-only, write-only, or read-write. You cannot force a read-only register to be writable by changing this value, as write access is enforced by the analyzer.

#### Saved Value

When you save an analyzer configuration, the saved data file has the same format as the Modbus register file (this file). This column is used to store the saved values. The values are strings, and can contain decimal places to represent floating point numbers.  
You can edit these values if you wish to restore an analyzer to specific settings.

#### Dash

This column contains the word “Yes” for variables that can be displayed in the Dashboard section of the main screen. These can be changed to suit your preferences. The short name of every register containing “Yes” in this column is added to the pop-up menus in the dashboard.

#### Category

The category is for information only, and shows in general terms what the register is used for.

#### Logging Group

This is the logging / graphing group name. If you do not wish to be able to log or graph a particular variable, you can blank out the logging group name. You can also move a register from one logging group to another, but this may cause the register selection screen to run out of space for



the new logging group (this isn't harmful, but may make it difficult to select the variables you wish to acquire).

#### Decimal Places

This specifies the displayed decimal precision of the variable.



## Appendix III – Preferences



You can specify communication settings, set the locations where tests are to be logged, and a variety of other settings by clicking the “Prefs” button in the main window:

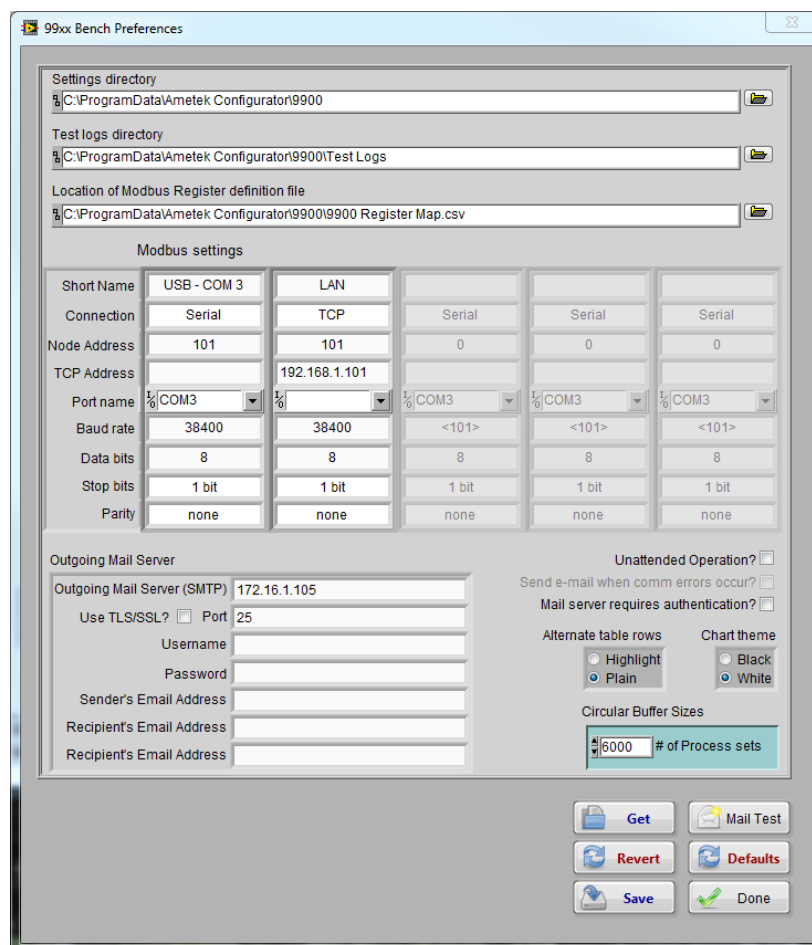


Figure 69 – The Preferences Window

This window will float above any other windows until you click “Done”, and will be hidden if you switch to another application.

In most cases, the directory settings at the top of the window should be fine as they are. If you wish to use different locations, you can either type them in, or click the little folder icon to browse to the location where you want to store the files.

Microsoft has historically recommended that files that are to be shared by different computer users should be placed in the “ProgramData” folder in the root of the boot volume. However, Microsoft now hides this directory by default, so you may wish to use a different location. By default, the installer will suggest a directory named “Ametek Configurator\99XX” at the root level of your boot volume.

The installer creates several subdirectories inside the settings directory. If you decide to change the location of the settings directory after installing the software, you should create the following subdirectories inside your new directory:

- Alarm Settings
- Chart Window Configurations
- Dashboards
- Logging Selections
- Saved Configurations
- Test Logs
- Test Logs \Alarms
- Test Logs \Messages

The user preferences are stored in {root}\ProgramData, as is the Modbus register map. Subdirectories are also created to hold settings and test logs, in the event that your organization wishes to store them in {root}\ProgramData. If so, you simply need to change your preferences to point to that location.

## Communication Settings

Most of the time, you'll use the Preferences window to set up communication settings. You can have several of these, each of which appears in the pop-up menu in the connection window:

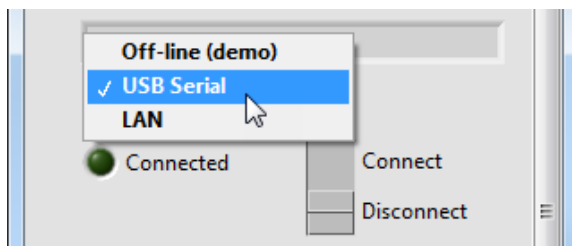


Figure 70 – Picking a communications port

For each communications port you give it a name, and the Modbus node address of your analyzer:

Modbus settings	
Short Name	USB - COM 3
Connection	Serial
Node Address	101
TCP Address	
Port name	COM3
Baud rate	38400
Data bits	8
Stop bits	1 bit
Parity	none

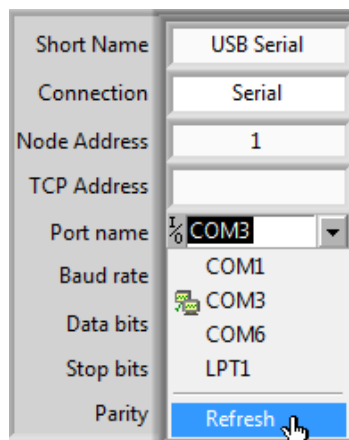
Figure 71 – Communications settings

You can create more communications settings by clicking in the grey area to the right of the last one:

## Serial Modbus

In Figure 71 above, this port will be named “USB – COM 3”. It’s a serial port, and the Modbus address is 1. You should create names that are meaningful for you – these are the names that appear in the pop-up menu in Figure 71 – Communications settings. For example, you could have called the connections “Red Cable” and “Blue Cable” if that was useful in your environment.

If you’re not sure what serial ports are available, you can pull down the Port name menu, and select “Refresh...”:



This will cause the list of available com ports to be refreshed.

The serial settings for a 99xx analyzer should normally be:

38400 baud

8 data bits

1 stop bit

no parity

If you have difficulty connecting to an analyzer, you may wish to use the analyzer’s HMI to confirm that the analyzer is using the same communications settings. You can’t change the analyzer’s serial port settings using the Configurator – you must use the analyzer’s HMI to do that:

From the analyzer’s *HOME* screen press the *Config* button to view the Configuration sub-menu. Press the *UV Bench Modbus* button to view the *UV Bench Modbus Communication* screen:

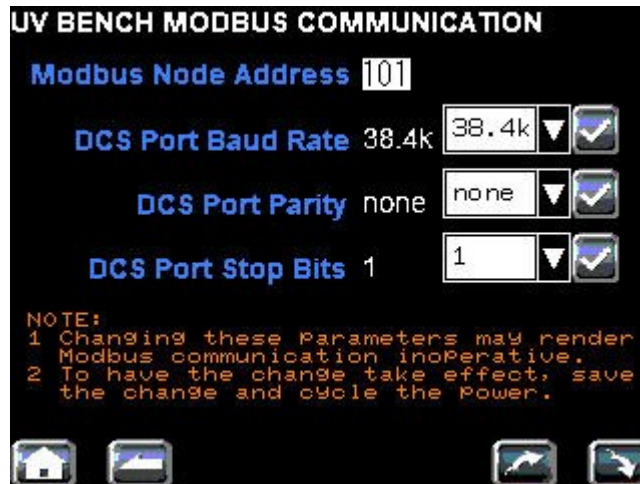
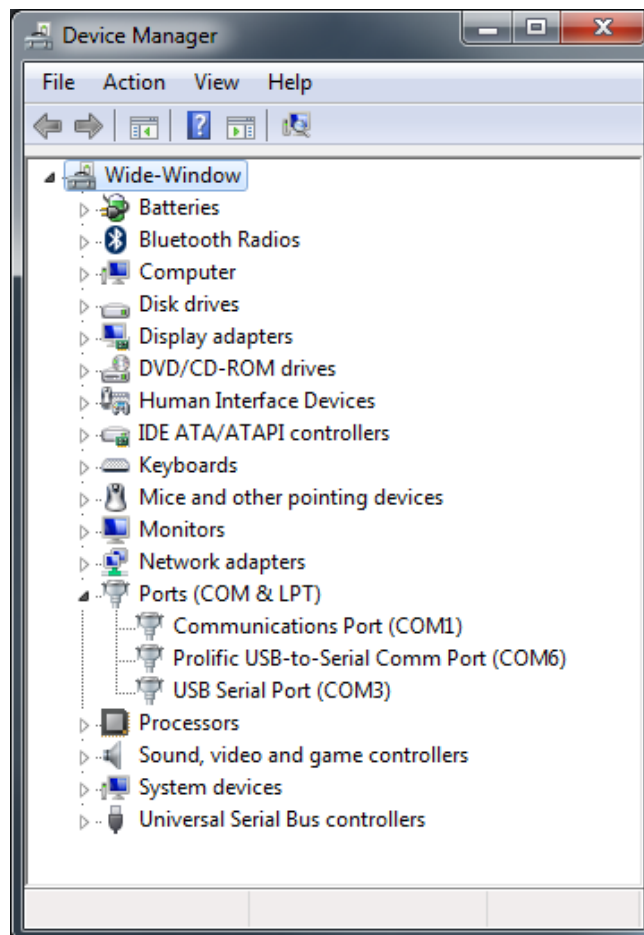


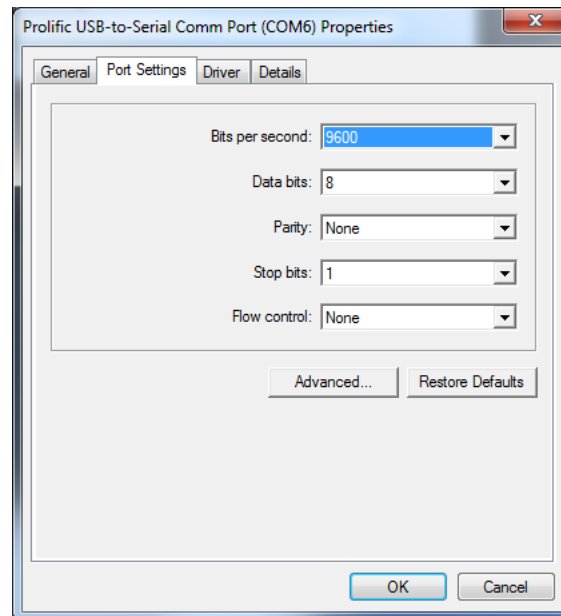
Figure 72 – Communications settings in the analyzer's HMI

*If you are unsure of the Modbus address assigned to the analyzer, you can enter 255 in the Node Address field. Every connected analyzer will reply to this “broadcast address”.*

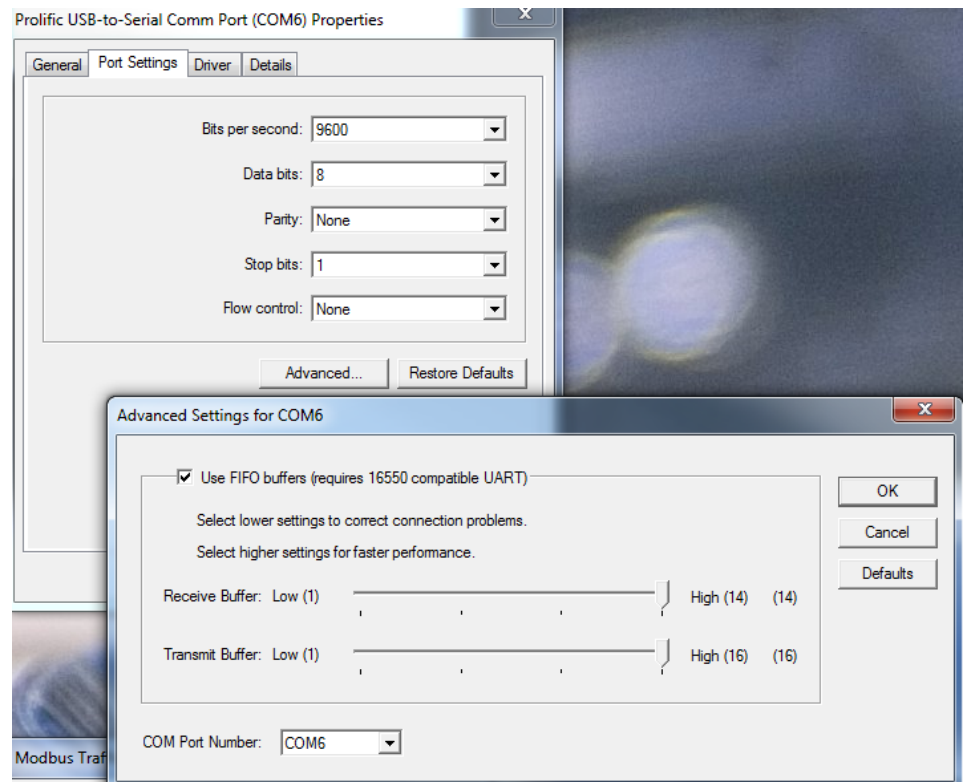
If you are using USB serial port adapters, you can configure the port name from the Windows Device Manager:



If you expand the Ports list, you can see which ports are currently configured (note that COM1 is reserved, and can't be used by the Configurator). You can right-click on a port, and set its properties, including the Com port name:



The setting here are unimportant, as the Configurator will set them. Click "Advanced...", to change the port name:



## Modbus/TCP

If you are using Modbus/TCP, you will normally be connected to a Modbus/TCP gateway such as an MGate MB3270. The manufacturer provides a utility that allows you to configure settings such as the IP address:

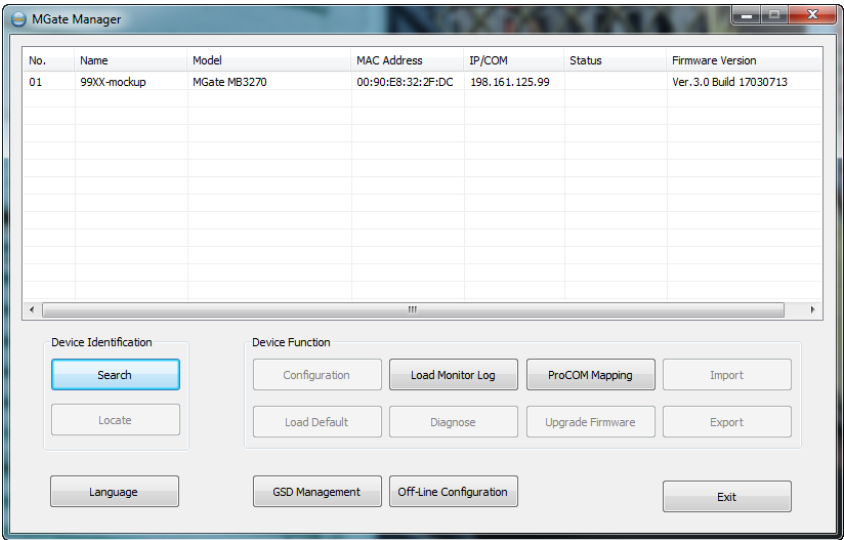


Figure 73 – The MGate Manager

### Adding a new connection

To add a new communication setting, click in the first greyed-out setting:

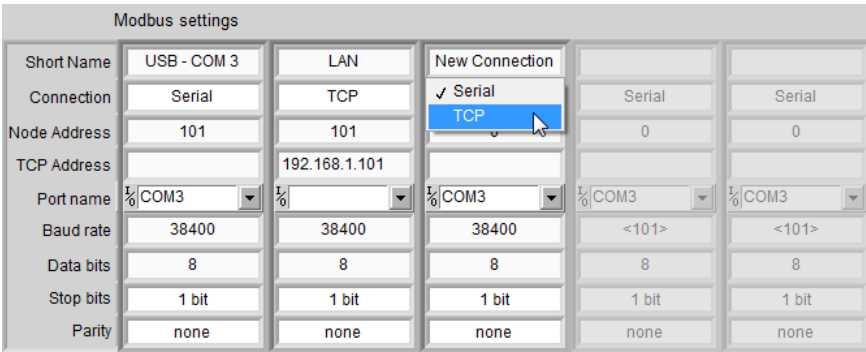


Figure 74 – Adding a new communication settings

To remove one, right-click on the one you wish to remove, and select “Delete Element”:



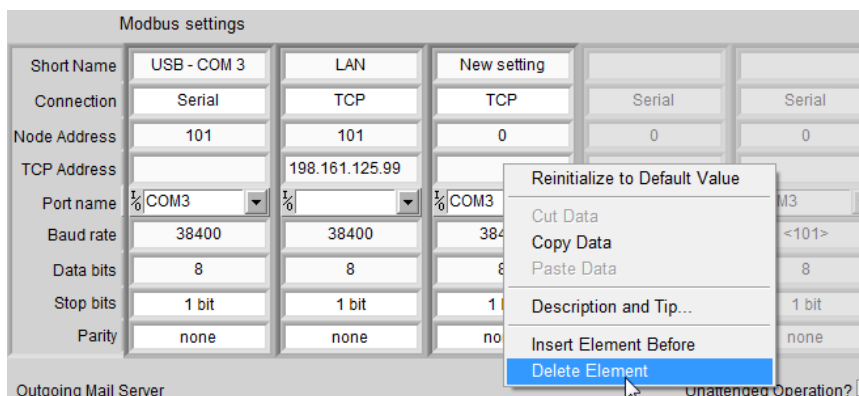


Figure 75 – Removing a communication setting

Similarly, you can add a communication setting between two existing settings by right-clicking and selecting “Insert Element Before”.

### Email Alerts

The e-mail section of the Preferences window allows an automated e-mail to be sent in the event that the data logging task fails.



To use it, you will need access to an SMTP server, and appropriate credentials on the server. You can optionally use TLS/SSL (which uses a secure link layer in the ISO protocol stack).

If you select “Unattended Operation”, Modbus communication will use longer timeouts and more retries in an attempt to recover from communication failures.



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