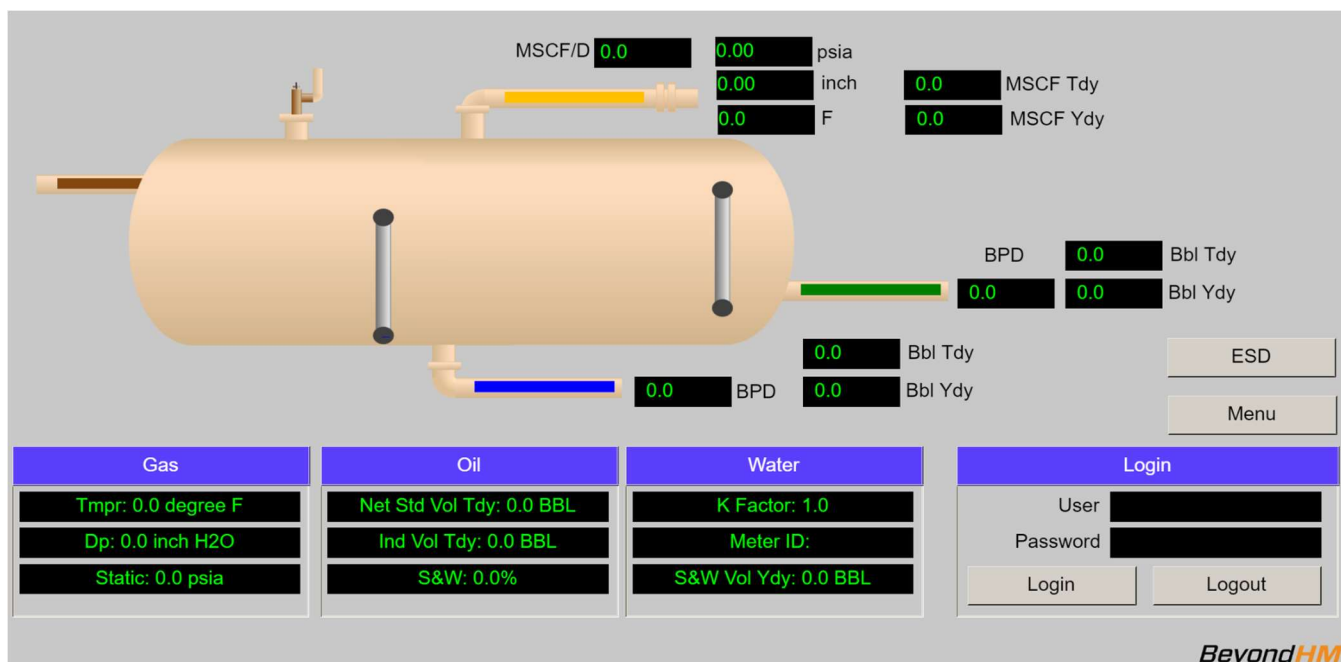


Separator Supervisor and Flow Computer Program User Manual



Overview

The Beyond HMI Separator Supervisor and Flow Computer Program (Sepervisor) for Wago PFC200 PLC is a comprehensive, configurable application for production separators. Sepervisor provides all features necessary to monitor a production separator through a configurable web-browser-based interface. This program includes gas and liquid flow computers and Modbus Serial and Modbus TCP features.

No PLC programming is required.

The flow computer features conform to API 21.1 standards for electronic flow measurement. Data is transferred from the PLC using industry-standard CFX files. These files can be directly imported into hydrocarbon accounting systems.

The flow computer supports a single (1) gas meter run and up to two (2) liquid meter runs. The liquid meters can be used to measure either crude oil or water.

The liquid flow computer performs API-compliant calculations for either custody-transfer (API 12) or allocation (API 20.1) meters. The gas flow computer performs AGA-3 (2013) calculations for orifice meters using AGA-8 GERG (2017) for thermodynamic properties.

*Beyond***HMI**

Although no PLC programming is required to implement Supervisor's features, end-users can add custom monitoring or control software using any IEC61131 programming language.

Supervisor utilizes runtime licensing. A license is required for each PLC which executes the code. The program will run for approximately 4 days in trial mode before a license is required. Licenses must be purchased from Beyond HMI, Inc.

Contents

.....	1
Overview	1
Configuring the Sepervisor Program.....	11
Initiating the Web Visualization Interface.....	11
Accessing Features of Sepervisor – Authentication and Authorization.....	11
Default Sepervisor “Splash” Screen	12
Login Section.....	12
Menu Button.....	12
Gas Meter Values	12
Oil Meter Values.....	13
Water Meter Values.....	13
Gas Meter BLM Scrolling Section.....	14
Oil Meter BLM Scrolling Section.....	14
Water Meter BLM Scrolling Section	15
Sepervisor Menu Screen.....	16
Meters Button.....	16
Signal Status Button	16
Configuration Button	16
Administration Button.....	16
Program Version Number	17
Analog Input History Screen.....	18
Enabled check box	18
AI point selection dropdown.....	18
Historical Maxima.....	18
Historical Minima.....	18
Historical Mean	19
Underrange/Overrange	19
Configuration Menu	20
Discrete Input Configuration Screen.....	21
DI Point selection dropdown.....	21
Input Point Tag	21

BeyondHMI

Enabled check box	21
Signal Source: Type	22
Signal Source: Point	22
Alarm Configuration: Type	22
Alarm Configuration: Alarm delay	22
Discrete Alarm State: Current state	22
Discrete Alarm State: Alarm delay counter	22
Discrete Alarm State: Latched alarm history	22
Discrete Input State: Current state	22
Discrete Input State: Time in state	22
Discrete Input State: Latched state history	22
Override: Clear Latched Button	22
Override: Override value	22
Override: Remaining override time	23
Analog Input Configuration Screen	24
AI Point selection dropdown	24
Input Point Tag	24
Enabled check box	24
Signal Source: Type	25
Signal Source: Point	25
Alarm Configuration: Type	25
Alarm Configuration: Setpoint	25
Alarm Configuration: Alarm delay	25
Alarm Configuration: Alarm deadband	25
Analog Alarm State: Current state	25
Analog Alarm State: Alarm delay counter	25
Analog Alarm State: Latched alarm history	25
Scaling Section	25
Current Values: Raw	26
Current Values: Scaled	26
Current Values: Underrange and Overrange	26
Override: Override value	26

BeyondHMI

Override: Remaining override time	26
Counter Input Configuration Screen.....	27
Counter Point selection dropdown	27
Input Point Tag	27
Enabled check box	27
Signal Source: Type.....	28
Signal Source: Point	28
Current Value: Raw.....	28
Discrete Output Configuration Screen.....	29
DO Point selection dropdown	29
Output Point Tag	29
Enabled check box	29
Signal Destination: Type.....	29
Signal Destination: Point.....	30
Signal Processing: Invert.....	30
Discrete Output State: Current Value	30
Override: Override value	30
Override: Remaining override time	30
Analog Output Configuration Screen	31
AO Point selection dropdown.....	31
Output Point Tag	31
Enabled check box	31
Signal Destination: Type.....	31
Signal Destination: Point.....	32
Scaling Section	32
Current Value:	32
Override: Override value	32
Override: Remaining override time	32
Default Value:.....	32
Modbus Serial Configuration Menu.....	33
Serial Port Configuration Screen	34
Port dropdown	34

Enabled check box	34
Port Number	34
Physical Layer.....	34
Baud Rate.....	34
Data Bits.....	34
Parity.....	35
Stop Bits.....	35
Handshake	35
Mode.....	35
Slave Address.....	35
Port status output text.....	35
Serial Modbus Master Polling Screen	36
Port dropdown	36
Requests dropdown.....	36
Scan Tag.....	36
Slave Address.....	36
Function Code.....	37
Start Register.....	37
# of Reg.....	37
Data Type.....	37
Conversion Type	37
Scratchpad Target	37
Result	38
First Value.....	38
Custom Modbus Slave Read-Only Registers Screen	39
Items dropdown	40
Item Number.....	40
Internal Input Register	40
External Input Register.....	40
# of Reg.....	40
Description.....	41
Current Value	41

BeyondHMI

Special note about exposing Internal Holding Registers as Input registers	41
Custom Modbus Slave Read/Write Registers Screen.....	42
Items dropdown	43
Item Number.....	43
Internal Holding Register.....	43
External Holding Register.....	43
# of Reg.....	43
Description.....	44
Current Value	44
Scratchpad Configuration Screen	45
Items dropdown	45
Tag	46
Value	46
User Calculations Configuration Screen.....	47
Illustration.....	47
Calc dropdown.....	47
Tag	47
Enabled check box	48
Value A: Type.....	48
Value A: Point Instance or Constant value.....	48
Value A: Value	48
Oper 1:.....	48
Value B:.....	48
Oper 2:.....	48
Value C:.....	48
Assign Result To:.....	49
User Calculation Operators:.....	49
Concerning the limited number of User Calculation Instances:.....	50
Separator Signal Configuration Screen	51
General Instructions	51
Color of the Dots	52
Alarm Levels (Discrete).....	52

BeyondHMI

Gas Meter	52
Oil Meter	52
Vessel.....	53
Water Meter	53
ESD Signals Button.....	53
Analog Level Button.....	53
Separator Analog Level Input Configuration Screen	54
Level Signals: Oil Level (Top)	54
Level Signals: Water Level (Intf).....	54
Alarm Thresholds (Levels).....	54
Color of the Dots	54
Separator ESD Signal Configuration Screen	55
Signal Alarms Which Trigger ESD	55
State.....	55
ESD Outputs.....	55
Enabled.....	55
Reset ESD.....	56
Color of the Dots	56
Tag List Review Screen	57
Administration Screen.....	58
BLM Display Scrolling.....	58
Aggregation Hour.....	58
Save Config to File.....	58
Restore Config from File.....	58
Licensing	59
Configuring the Flow Computer Library	60
Formatting Note	60
Main Menu	60
Gas Section.....	61
Liquid Meter Section.....	61
Generic Section	61
Other.....	61

BeyondHMI

Gas Station Screen - Values	62
Station Screen - Main	65
Station Screen - Quality	67
Station Screen - Diagnostic	70
Gas Meter Screen - Values	72
Gas Meter Screen - Main	75
Gas Meter Screen - Advanced	78
Gas Meter Screen - Ranges	80
Gas Meter Screen - Diagnostic	82
Gas Meter Screen – Cal Rpt Params	87
Gas Meter Screen - Calibration	88
Meter Verification Screen	90
Meter Calibration Screen	92
Verification and Calibration Report Description Screen	94
Gas Meter Current Day Periodic History Screen	95
Liquid Meter Screen – Custody Transfer (Custody Xfer)	98
Liquid meter Screen - Main	102
Liquid meter Screen - Advanced	105
Liquid meter Screen - Ranges	108
Liquid meter Screen - Diagnostic	110
Liquid meter Screen - Allocation	113
Liquid meter Screen – Cal Rpt Params	116
Liquid meter Screen - Calibration	118
Liquid meter Current Day Periodic History Screen	120
Event Screen	122
Alarms Screen	125
Admin Screen	127
Advanced Admin Screen	128
Licensing	130
Trial Mode	130
Steps to Obtain a Runtime License	130
Collecting CFX Files from the PLC	131

Configuring the Sepervisor Program

Sepervisor is designed to allow basic Separator monitoring features without the need for PLC programming. While the main host program can be modified, the core features are already provided with the program and associated libraries. Following initial setup, the separator functions and flow computing functions can be configured using a web browser.

This manual provides descriptions of the web-based interface provided with the base Sepervisor host program (called SpvrHost).

Initiating the Web Visualization Interface

The Web Visualization Interface is built into the Wago PLC program. This interface renders screens in HTML5. The Wago PLC provides these screens to any web browser via its built-in web server.

To initiate the Web Interface, open any modern web browser navigate the following URL:

`<IP address of the PLC>/Webvisu`

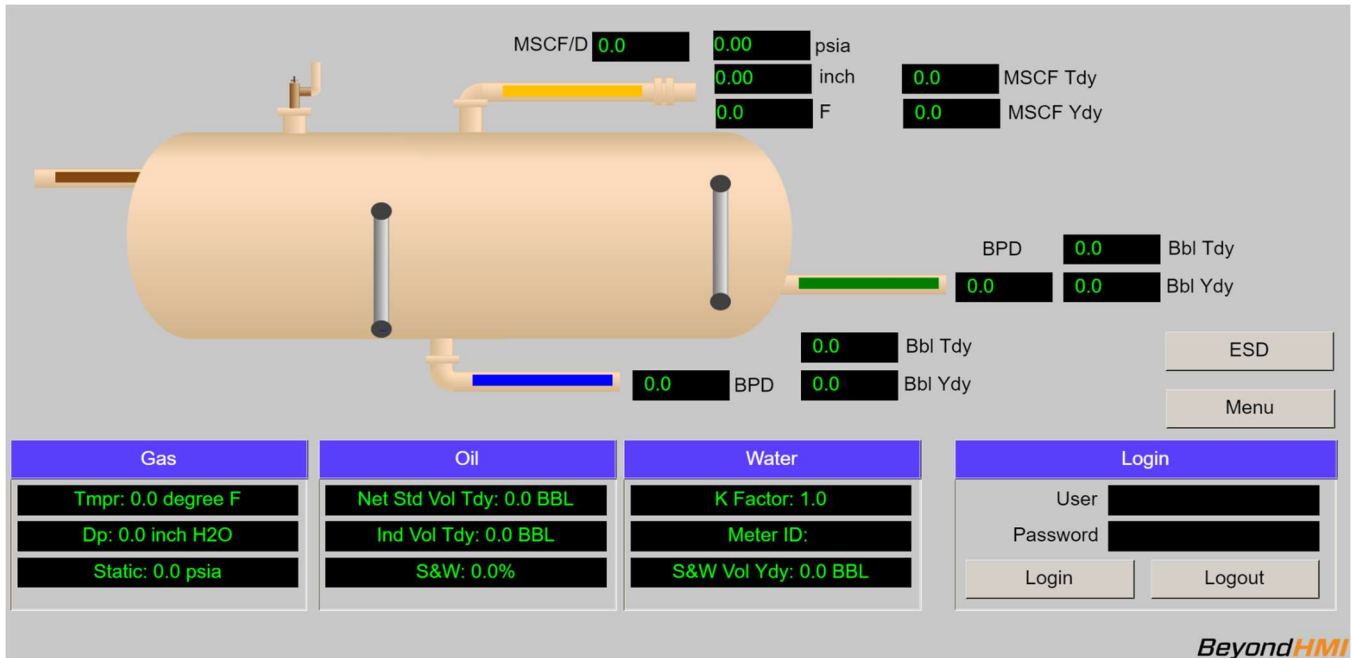
If the PLC is correctly configured, the “/Webvisu” portion is not needed, and you can simply use the IP address of the PLC.

Accessing Features of Sepervisor – Authentication and Authorization

Sepervisor uses password authentication and user permission authorization to control access to program features. Before you can access configuration features, you will need to have an authorized user name and password installed on the system. User authentication files for Sepervisor are created in .csv format then encrypted and installed on the PLC using Betony HMI's free **BLT** Windows program. **BLT** and its documentation can be downloaded from the Beyond HMI website.

Default Supervisor “Splash” Screen

The first screen displayed by your web Browser should look similar to the one displayed below



Supervisor Default Splash Visualization

Login Section

The section at the lower-right of the screen is used to log in or log out and change user. Login is required to proceed beyond this splash screen.

For more information about configuring users on your PLC, consult Beyond HMI’s **BLT** Windows program and its documentation. Both of these can be downloaded from the Beyond HMI website.

Menu Button

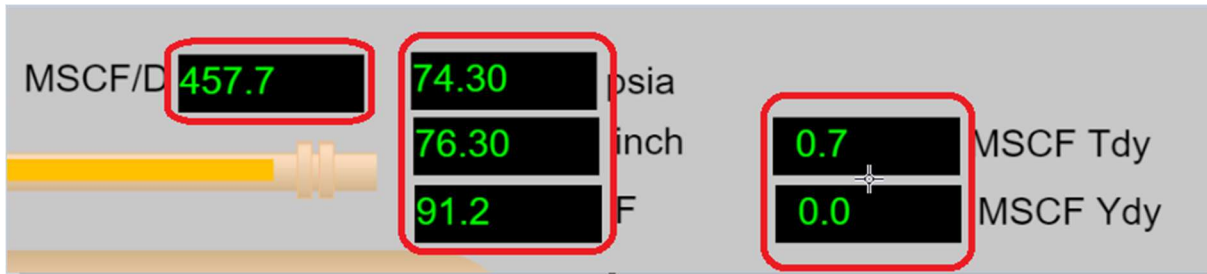
The menu button is only visible after a user has logged onto the system. This button is the doorway to accessing other features of Sepervisor.

Gas Meter Values

The section of boxes at the top-center of the screen displays the current flow rates and live input values for the gas meter.

This section contains “hot spots” for quick access to more detailed meter configuration and live value information. However, these “hot spots” are only active for authorized users.

You can rapidly jump to meter detail screens by clicking on the “hot spots”.



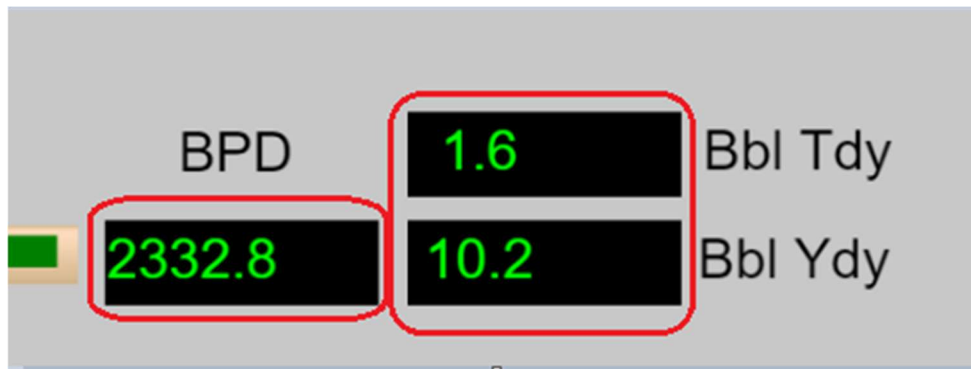
Gas Meter Section Hot-spots

Oil Meter Values

The section of boxes at the center-right of the screen displays the current flow rate and recent volume history of the oil meter.

This section contains “hot spots” for quick access to more detailed meter configuration and live value information. However, these “hot spots” are only active for authorized users.

You can rapidly jump to meter detail screens by clicking on the “hot spots”.



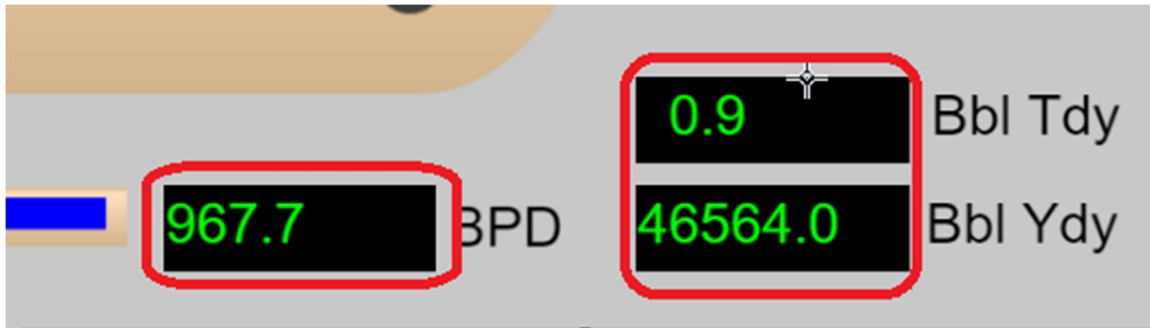
Oil Meter Section Hot-spots

Water Meter Values

The section of boxes at the bottom-center of the screen displays the current flow rate and recent volume history of the water meter.

This section contains “hot spots” for quick access to more detailed meter configuration and live value information. However, these “hot spots” are only active for authorized users.

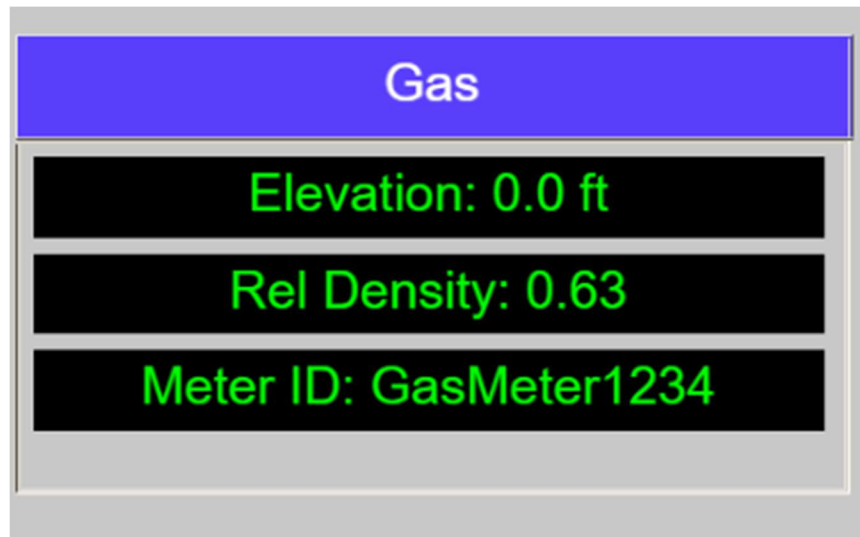
You can rapidly jump to meter detail screens by clicking on the “hot spots”.



Water Meter Section Hot-spots

Gas Meter BLM Scrolling Section

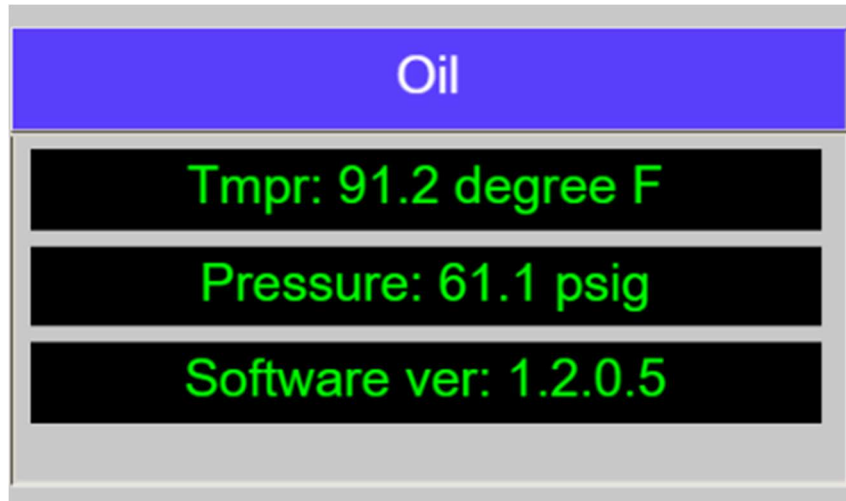
This section provides a scrolling list of values that BLM requires to be available to any user – without login and without any special devices for viewing. The values displayed in this section 'scroll'. Values first appear in the top text box, then rotate to the middle text box, then rotate to the bottom box, and then rotate off the screen. The speed of this scrolling is configurable on the "Administration" Screen. The items displayed in this scrolling list is NOT configurable.



Gas Meter "BLM Scrolling Display" Section

Oil Meter BLM Scrolling Section

This section provides a scrolling list of values that BLM requires to be available to any user – without login and without any special devices for viewing. The values displayed in this section 'scroll'. Values first appear in the top text box, then rotate to the middle text box, then rotate to the bottom box, and then rotate off the screen. The speed of this scrolling is configurable on the "Administration" Screen. The items displayed in this scrolling list is NOT configurable.



Oil Meter "BLM Scrolling Display" Section

Water Meter BLM Scrolling Section

This section provides a scrolling list of values that BLM requires to be available to any user – without login and without any special devices for viewing. The values displayed in this section 'scroll'. Values first appear in the top text box, then rotate to the middle text box, then rotate to the bottom box, and then rotate off the screen. The speed of this scrolling is configurable on the "Administration" Screen. The items displayed in this scrolling list is NOT configurable.



Water Meter "BLM Scrolling Display" Section

Sepervisor Menu Screen

The Sepervisor Menu screen is used to navigate the various aspects of the application.



Sepervisor Main Menu Screen

Meters Button

This button provides access to the flow computer features of Sepervisor:

- Gas Meter (Meter 1)
- Liquid Meter 2
- Liquid Meter 3

For details of the flow computer screens, please refer to the ['Configuring the Flow Computer Library'](#) section of this document

Signal Status Button

This button launches a screen which displays aggregate values and history of certain signals.

Configuration Button

This button accesses the Configuration menu where you can configure the basic (non-flow computing) features of Sepervisor.

Administration Button

This button provides access to advanced features for administrators.

BeyondHMI

Note: the Administration button will not be visible unless you are logged in as an administrator (access level = 7 or higher).

Program Version Number

This program version number is displayed in the lower-right corner of this screen.

Analog Input History Screen

This screen is accessed from the Signal Status menu. It displays aggregate history (minimum, maximum, average) for the physical analog inputs for various time periods

Analog Input History

AI Point Enabled

Historical Maxima				
	Second	Minute	Hour	Day
Current	0.00	0.00	0.00	0.00
Prior	0.00	0.00	0.00	0.00
2 Prior	0.00	0.00	0.00	0.00
3 Prior	0.00	0.00	0.00	0.00

Historical Mean				
	Second	Minute	Hour	Day
Current	0.00	0.00	0.00	0.00
Prior	0.00	0.00	0.00	0.00
2 Prior	0.00	0.00	0.00	0.00
3 Prior	0.00	0.00	0.00	0.00

Historical Minima				
	Second	Minute	Hour	Day
Current	0.00	0.00	0.00	0.00
Prior	0.00	0.00	0.00	0.00
2 Prior	0.00	0.00	0.00	0.00
3 Prior	0.00	0.00	0.00	0.00

Underrange /OverRange				
	Second	Minute	Hour	Day
Current	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Prior	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2 Prior	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3 Prior	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

BeyondHMI

Analog Input History Screen

Enabled check box

Use this check box to enable and disable statistical processing for the analog channel.

Note that disabling the processing cause all values to "freeze" until the point is re-enabled.

AI point selection dropdown

Use this list to select the analog input point that you want to view.

Historical Maxima

This section displays the current and historical maximum values for the selected analog input point. These aggregated values are grouped by 1-Second, 1-Minute, 1-Hour, and 1-Day periods. A "day" is determined by the system gauge-off time configured on the administration page.

Historical Minima

This section displays the current and historical minimum values for the selected analog input point. These aggregated values are grouped by 1-Second, 1-Minute, 1-Hour, and 1-Day periods. A "day" is determined by the system gauge-off time configured on the administration page.

BeyondHMI

Historical Mean

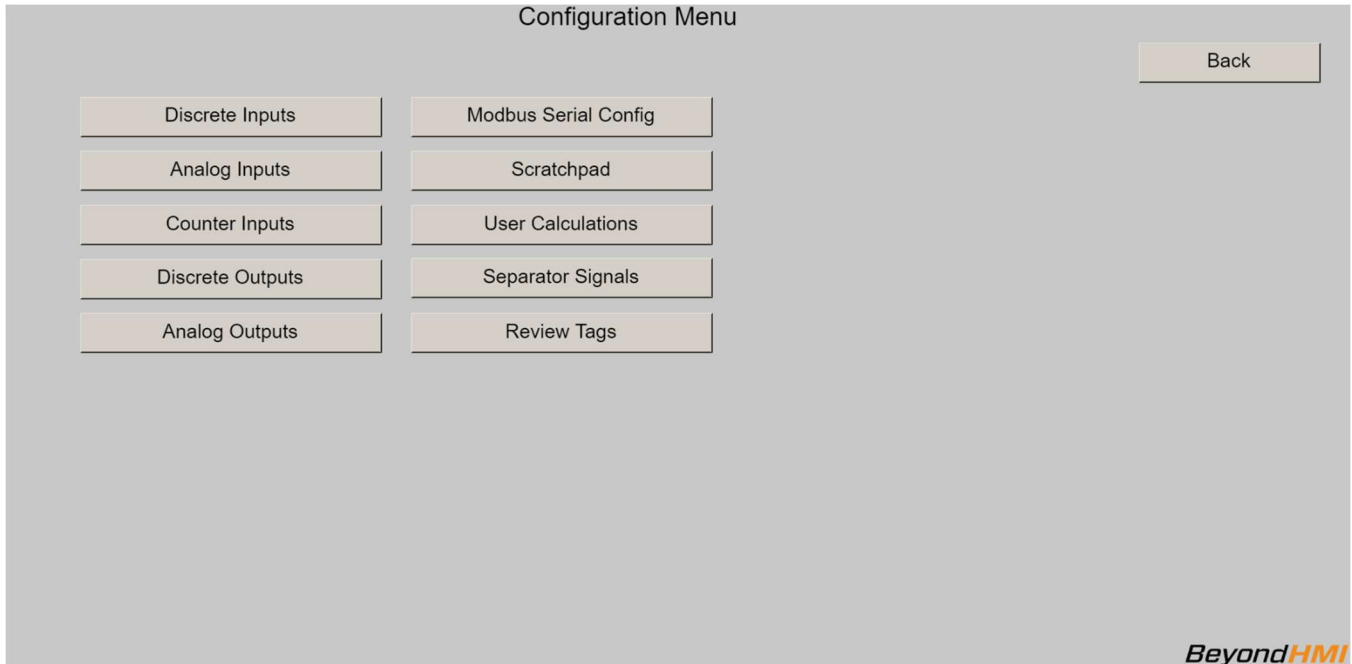
This section displays the current and historical mean (average) values for the selected analog input point. These aggregated values are grouped by 1-Second, 1-Minute, 1-Hour, and 1-Day periods. A “day” is determined by the system gauge-off time configured on the administration page.

Underrange/Overrange

This section displays whether the analog input experienced underrange or overrange during the aggregate period. For each pair of check boxes, the left box represents underrange and the right check box represents overrange.

Configuration Menu

This screen provides further access to core and advanced configuration features.



Configuration Menu Screen

Discrete Input Configuration Screen

This screen is used to tie a physical discrete input point or a scratchpad point from the Wago PLC to a Discrete Input object in the Sepervisor application. Normally, this feature would only be used with physical inputs (points wired to an I/O module on the PLC). However, if you are using “virtual” or “remote” I/O (via Modbus, for instance), you might want to configure a scratchpad point as a Discrete Input object.

Discrete Input Configuration Screen

DI Point selection dropdown

Use this list to select the point that you want to configure.

Input Point Tag



Use this box to create a useful tag for the input point. Upon initial program startup, the inputs are given default tags. However, you can change these names to fit your needs.

Note that once you associate this tag with the I/O point, the tag will be used in all further Sepervisor configuration.

Enabled check box

Use this check box to enable and disable processing of the selected input channel.

Note that disabling an input point will cause its value to “freeze” until the point is re-enabled.

Signal Source: Type

Use this list to select the whether the signal value will be read from a physical I/O point or from a scratchpad value. Scratchpad input values might be provided by communications (Modbus/TCP Slave, Serial Modbus Master, Serial Modbus Slave, etc.)

Signal Source: Point

Use this list to select the specific instance of physical I/O point or scratchpad point to use as input.

Alarm Configuration: Type

Use this list to select whether to alarm when the DI is high (on), alarm when the DI is low (off), or not alarm at all.

Alarm Configuration: Alarm delay

If alarming is enabled, the alarm can be delayed until after the signal has remained in the designated alarm state for a specific period of time (in seconds). This feature can be used to mitigate nuisance alarms.

Discrete Alarm State: Current state

Indicates (via the check box) whether the alarm is currently active.

Discrete Alarm State: Alarm delay counter

This box shows the status of the alarm delay timer as it counts down.

Discrete Alarm State: Latched alarm history

These check boxes display the latched alarm history for various time periods.

Discrete Input State: Current state

Indicates (via the check box) whether the discrete input is currently active.

Discrete Input State: Time in state

Displays the number of seconds that the input has been in its current state.

Discrete Input State: Latched state history

These check boxes display the latched history of the input for various time periods.

Override: Clear Latched Button

This button causes the latched alarm history to be cleared – for all periods.

Override: Override value

The selected input can be manually overridden for a limited period of time. Check or uncheck the **Override value** check box to indicate the override state for the input, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

BeyondHMI

Override: Remaining override time

The selected input can be manually overridden for a limited period of time. Check or uncheck the **Override value** check box to indicate the override state for the input, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Analog Input Configuration Screen

This screen is used to tie a physical analog input point or a scratchpad point from the Wago PLC to an Analog Input object in the Sepervisor application. Normally, this feature would only be used with physical inputs (points wired to an I/O module on the PLC). However, if you are using “virtual” or “remote” I/O (via Modbus, for instance), you might want to configure a scratchpad point as a Discrete Input object.

Analog Input Configuration

AI Point UserAI1 Enabled Back

Signal Source

Type Physical Point Slice 1 Chnl 1

Alarm Configuration

Type No Alarm Delay 0 [sec]
Setpoint 0.0 [Eng] Deadband 0.0 [Eng]

Analog Input Alarm State

Current state Alarm delay counter 0 [sec]

	Current	Prior	PriorPrior
1 Second latch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 Minute latch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 Hour latch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 Day latch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Scaling

	Minimum	Maximum
Raw	0.0	0.0
Engineering	0.0	0.0

Current Values

Raw 0.0 Scaled 0.0

Underrange Overrange

Override

Clear Latched

Override value 0.0 [Eng]
Remaining override time 0 [sec]

BeyondHMI

Analog Input Configuration Screen

AI Point selection dropdown

Use this list to select the point that you want to configure.

Input Point Tag

UserAI1

Use this box to create a useful tag for the input point. Upon initial program startup, the inputs are given default tags. However, you can change these names to fit your needs.

Note that once you associate this tag with the I/O point, the tag will be used in all further Sepervisor configuration.

Enabled check box

Use this check box to enable and disable processing of the selected input channel.

Note that disabling an input point will cause its value to “freeze” until the point is re-enabled.

Signal Source: Type

Use this list to select the whether the signal value will be read from a physical I/O point or from a scratchpad value. Scratchpad input values might be provided by communications (Modbus/TCP Slave, Serial Modbus Master, Serial Modbus Slave, etc.)

Signal Source: Point

Use this list to select the specific instance of physical I/O point or scratchpad point to use as input.

Alarm Configuration: Type

Use this list to select whether to alarm when the signal is high (value exceeds the setpoint), alarm when the signal is low (value falls below the setpoint), or not alarm at all.

Alarm Configuration: Setpoint

If alarming is enabled, this is the alarm threshold.

Alarm Configuration: Alarm delay

If alarming is enabled, the alarm can be delayed until after the signal has remained in the designated alarm state for a specific period of time (in seconds). This feature can be used to mitigate nuisance alarms.

Alarm Configuration: Alarm deadband

If alarming is enabled, this indicates the amount by which the signal must return beyond the setpoint to cause the alarm condition to clear. This feature can be used to mitigate nuisance toggling of alarms when the signal is moving in a range close to the alarm setpoint.

Analog Alarm State: Current state

Indicates (via the check box) whether the alarm is currently active.

Analog Alarm State: Alarm delay counter

This box shows the status of the alarm delay timer as it counts down.

Analog Alarm State: Latched alarm history

These check boxes display the latched alarm history for various time periods.

Scaling Section

Use this section to provide scaling of the analog input signal from raw A/D units to engineering units. Provide a minimum and maximum raw value range as well as a minimum and maximum Engineering units range.

Note that with most Wago Analog Input modules, the "raw" value will be an integer value of "counts" from the A/D converter. For example, most current input I/O modules will be designed for 0-20 ma. This range is scaled to 0-32767 "counts". So

BeyondHMI

the normal "raw" range for a 4-20ma sensor would be 6554 (raw minimum) to 32767 (raw maximum).

Current Values: Raw

Displays the current raw value.

Current Values: Scaled

Displays the current scaled (Engineering Units) value.

Current Values: Underrange and Overrange

If the raw signal falls below the configured minimum raw value (in the Scaling section), then the signal is in an underrange state.

If the raw signal exceeds the configured maximum raw value (in the Scaling section), then the signal is in an overrange state.

Override: Override value

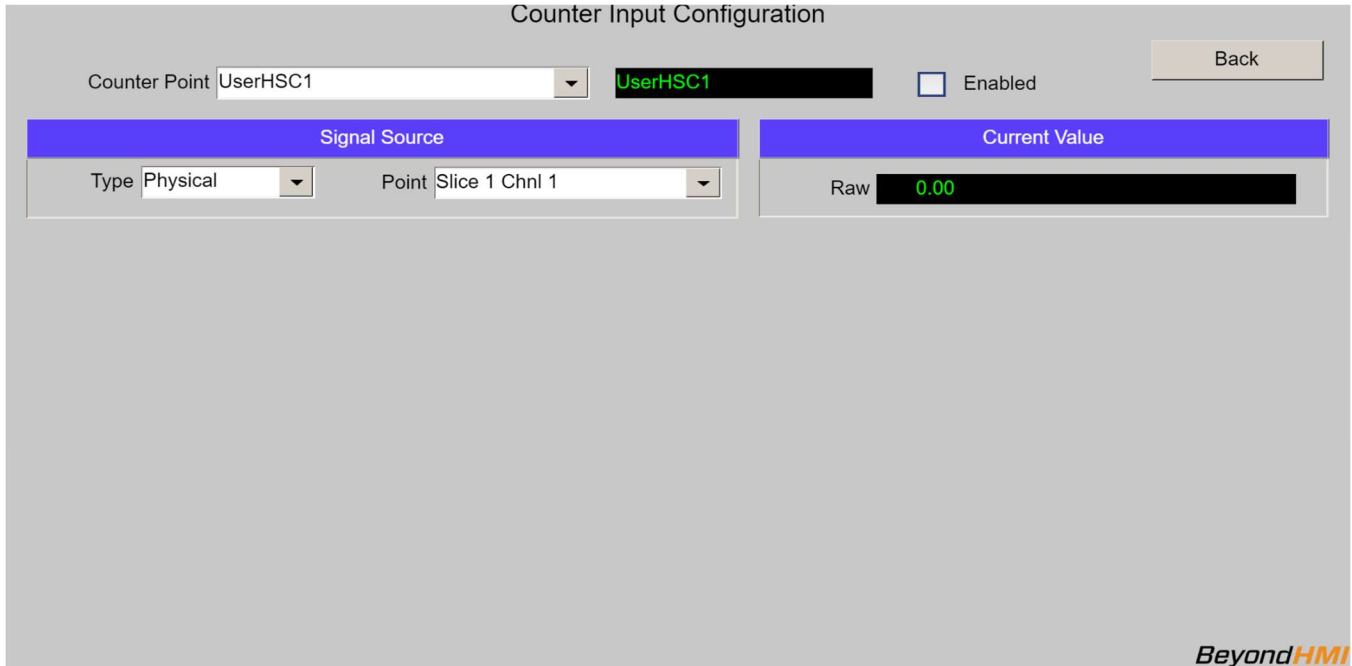
The selected input can be manually overridden for a limited period of time. Enter an override value (in Engineering Units) in the **Override value** box, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Override: Remaining override time

The selected input can be manually overridden for a limited period of time. Enter an override value (in Engineering Units) in the **Override value** box, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Counter Input Configuration Screen

This screen is used to tie a physical counter module or a scratchpad point from the Wago PLC to a Counter Input object in the Sepervisor application. Normally, this feature would only be used with physical inputs (points wired to an I/O module on the PLC). However, if you are using “virtual” or “remote” I/O (via Modbus, for instance), you might want to configure a scratchpad point as a Discrete Input object.



Counter Input Configuration Screen

Counter Point selection dropdown

Use this list to select the point that you want to configure.

Input Point Tag



Use this box to create a useful tag for the input point. Upon initial program startup, the inputs are given default tags. However, you can change these names to fit your needs.

Note that once you associate this tag with the I/O point, the tag will be used in all further Sepervisor configuration.

Enabled check box

Use this check box to enable and disable processing of the selected input channel.

Note that disabling an input point will cause its value to “freeze” until the point is re-enabled.

Signal Source: Type

Use this list to select the whether the signal value will be read from a physical I/O point or from a scratchpad value. Scratchpad input values might be provided by communications (Modbus/TCP Slave, Serial Modbus Master, Serial Modbus Slave, etc.)

Signal Source: Point

Use this list to select the specific instance of physical I/O point or scratchpad point to use as input.

Current Value: Raw

This box displays the raw value of the counter input.

Discrete Output Configuration Screen

This screen is used to tie a Supervisor discrete output object to a physical discrete output I/O channel on the Wago PLC.

Discrete Output Configuration

DO Point UserDO1 Enabled Back

Signal Destination

Type: Physical Point Slice 1 Chnl 1

Discrete Output State

Current state

Signal Processing

Invert

Override

Override value

Remaining override time 0 [sec]

BeyondHMI

Discrete Output Configuration Screen

DO Point selection dropdown

Use this list to select the point that you want to configure.

Output Point Tag

UserDO1

Use this box to create a useful tag for the output point. Upon initial program startup, the inputs are given default tags. However, you can change these names to fit your needs.

Enabled check box

Use this check box to enable and disable processing of the selected output channel.

Note that disabling an output point will cause its value to “freeze” until the point is re-enabled.

Signal Destination: Type

These objects always map to Physical Discrete out points (points on Wago Discrete Output modules).

Signal Destination: Point

Use this list to select the specific instance of physical I/O point to which the signal should be mapped.

Signal Processing: Invert

Check this box to cause the logical state of the Discrete Output object to be inverted while transferring its value to physical I/O.

Discrete Output State: Current Value

Check this box to cause the logical state of the Discrete Output object to be inverted while transferring its value to physical I/O.

Note that this is the LOGICAL state of the output. If the point is configured for Signal processing to invert the signal, then the actual I/O point will have the opposite value. For example, if this value appears as Checked (TRUE/"on") and the point is configured to "Invert", then the discrete output point will be "low"/"off".

Override: Override value

The selected output can be manually overridden for a limited period of time. Check or uncheck the **Override value** check box to indicate the override state for the output, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Note that this is override value is a LOGICAL state. If the point is configured for Signal processing to invert the signal, then the actual I/O point will have the opposite value. For example, if the override value box is checked - indicating (TRUE/"on") - and the point is configured to "Invert", then the discrete output point will be "low"/"off".

Override: Remaining override time

The selected output can be manually overridden for a limited period of time. Check or uncheck the **Override value** check box to indicate the override state for the output, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Analog Output Configuration Screen

This screen is used to tie a Supervisor analog output object to a physical analog output I/O channel on the Wago PLC.

Analog Output Configuration

AO Point: UserAO1 Enabled

Signal Destination

Type: Physical Point: Slice 1 Chnl 1

Scaling

	Minimum	Maximum
Raw	0.0	0.0
Engineering	0.0	0.0

Current Value

0.0 [EU]

Override

Override value	0.0 [EU]
Remaining override time	0 [sec]
Default value	0.0 [EU]

BeyondHMI

Analog Output Configuration Screen

AO Point selection dropdown

Use this list to select the point that you want to configure.

Output Point Tag

UserAO1

Use this box to create a useful tag for the output point. Upon initial program startup, the inputs are given default tags. However, you can change these names to fit your needs.

Enabled check box

Use this check box to enable and disable processing of the selected output channel.

*Note that if the analog output is disabled, the physical I/O will be assigned the **Default value** until the point is re-enabled.*

Signal Destination: Type

These objects always map to Physical Discrete out points (points on Wago Discrete Output modules).

Signal Destination: Point

Use this list to select the specific instance of physical I/O point to which the signal should be mapped.

Scaling Section

Use this section to provide scaling of the analog output signal from internal/Engineering units to raw D/A units. Provide a minimum and maximum raw value range as well as a minimum and maximum Engineering units range.

Current Value:

Displays the current EU value of the signal.

Override: Override value

The selected output can be manually overridden for a limited period of time. Enter an override value (in Engineering Units) in the **Override value** box, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Override: Remaining override time

The selected output can be manually overridden for a limited period of time. Enter an override value (in Engineering Units) in the **Override value** box, then enter a non-zero value (in seconds) for the override to be enforced. The system will automatically count down the override time and revert to normal operation when the **Remaining override time** reaches 0. To manually cancel the override, you can enter a zero in the **Remaining override time** box.

Default Value:

Use this field to specify the value that will be assigned to the Analog output channel when the point is disabled.

Note that the default value is an Engineering Units value. The scaling must be properly configured in order to facilitate proper setting of the default value to the output I/O point.

Modbus Serial Configuration Menu

Sepervisor supports up to one Modbus Serial “Master”/“Client” and up to one Modbus Serial “Slave”/“Server”. Sepervisor is specifically designed to be used on Wago 750-8212. This version of the PFC200 contains one on-board serial port. If desired, an additional serial port can be added in the form of a 750-652 module.

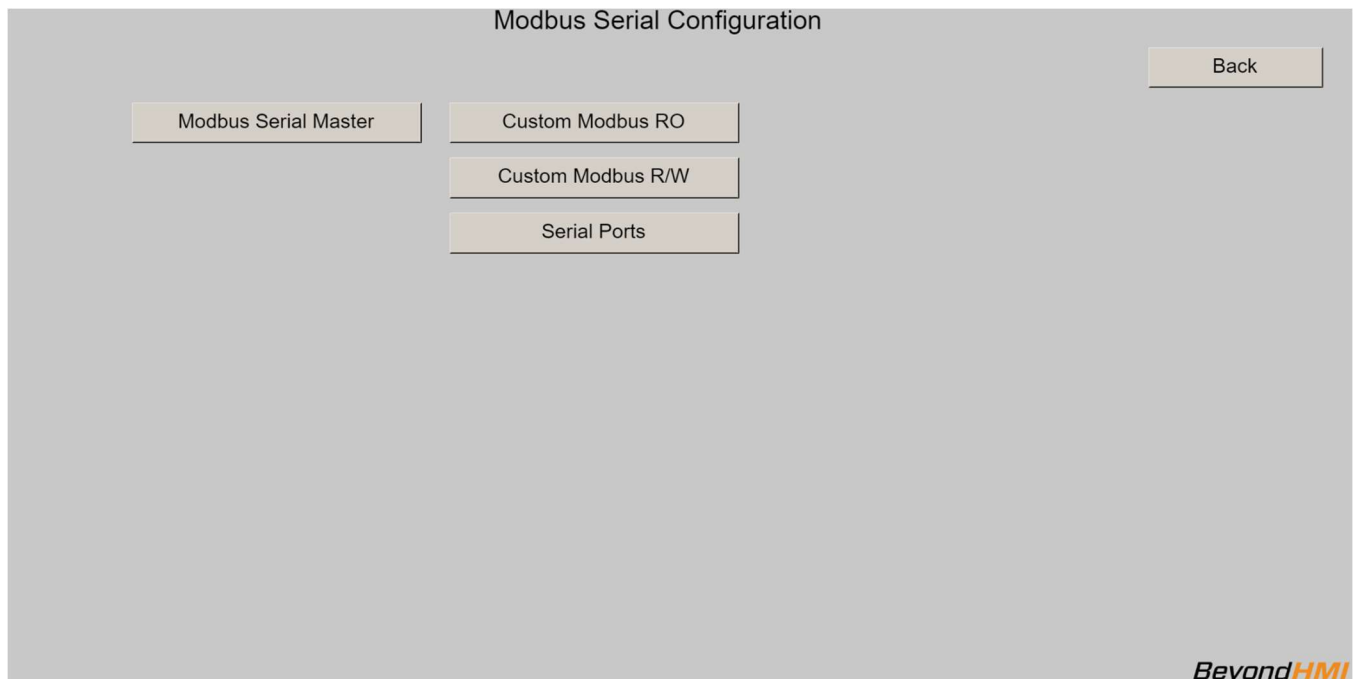
When only one serial port is available on the physical hardware, that single serial port can be used as either a Modbus Serial “Master”/“Client” or a Modbus Serial “Slave”/“Server”.

When two serial ports are available on the physical hardware, then one port (either port) can be used as a Modbus Serial “Master”/“Client” and the other port can be used as a Modbus Serial “Slave”/“Server”.

Sepervisor does not provide for multiple Modbus Serial “Master”/“Client” ports.

Sepervisor does not provide for multiple Modbus Serial “Slave”/“Server” ports.

The Modbus Serial Configuration menu screen provides links for configuring Serial Modbus features.



Modbus Serial Configuration Menu Screen

Serial Port Configuration Screen

This screen is used to configure the Serial Port(s).

Serial Ports

Port Enabled Port Number

Serial Port Settings

Physical Layer

Baud Rate

Data Bits

Parity

Stop Bits

Handshake

Mode

BeyondHMI

Serial Port Configuration Screen

Port dropdown

Use this list to select the port that you want to configure. This box should provide choices consistent with your physical hardware: either one option or two options.

Enabled check box

Use this check box to enable/disable activity on the port.

Port Number

Depending on your selection in the **Port dropdown**, this box will be populated with the appropriate port number.

Physical Layer

Select the physical layer for the port. Most common selections are “RS232” and “RS485 Half Duplex”.

Baud Rate

Enter one of the standard Serial baud rates – up to (and including) 115,200.

Data Bits

Select the number of data bits – usually 8.

Parity

Select the number of parity bits – usually “None”

Stop Bits

Select the number of stop bits – typically “1”.

Handshake

Select the hardware handshaking – typically “None”

Note that the Wago 750-652 module does not support hardware handshaking.

Mode

Select whether you want the port to act as a Modbus Serial “Master”/“Client” or a Modbus Serial “Slave”/“Server”.

Note that Sepervisor only supports up to one Modbus Serial “Master”/“Client” and up to one Modbus Serial “Slave”/“Server”. If you configure multiple ports of the same mode, only the on-board port will be serviced by Sepervisor.

Slave Address

If the port is configured for **Mode** “Slave/Server”, then this field becomes visible. Provide the Modbus slave address (aka “device ID”) that you want this port to respond to.

Port status output text

When the port is **Enabled**, the field at the bottom of this screen provides a text description of the port status. A status of **OK** represents normal operating condition.

Note if the port is disabled, this field will retain the last value from when the port was enabled.

Serial Modbus Master Polling Screen

This screen is used to configure the polling tasks to be performed by a serial port which is in **Mode** "Master/Client".

Note that each serial port has its own Modbus Master polling list – even though only one port can be a Master/Client at a time.

Serial Modbus Master Polling

Port
Requests
Back

Modbus Scans

Scan Tag	Slave Addr	Func Code	Start Register	# of Reg	Data Type	Conversion Type	Scratchpad Target	Result	First Value
Compressor Stat	1	3	3	1	UINT16	LEnd BS	Untagged 20	Success	0.0
VRU Run Cmd	1	16	7	1	UINT16	LEnd BS	Run VRU	Success	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0
	0	0	0	0	Select	LEnd BS	PrsPsia	Ignored	0.0

BeyondHMI

Serial Modbus Master Configuration Screen

Port dropdown

Use this list to select the port that you want to configure. This box should provide choices consistent with your physical hardware: either one option or two options.

Requests dropdown

Each Modbus Serial Master port can service up to 30 separate requests, but only 10 requests are displayed on the screen at one time. Use this list to select the "batch" of requests that you want to configure.

Scan Tag

This is a freeform text field for you to provide a useful description of the scan request.

Slave Address

Specify the Modbus slave address of the device you want to poll.

Function Code

Specify the function code to use for the request.

Use FC 4 to read Input (read-only) registers from a Modbus device

Use FC 3 to read Holding (read/write) registers from a Modbus device

Use FC 6 or 16 to write to Holding (read/write) registers in another Modbus device

Start Register

Specify the register number in the remote device where reading/writing should start.

There is inconsistency in the use of 0-based vs 1-based registers in various Modbus devices. Supervisor uses the literal register number that you enter. If you feel that the wrong data is being read, you may need to experiment with shifting addresses by +1 or -1.

of Reg

This field is used in conjunction with the **Data Type** field. Supervisor assumes that the Modbus "Slave"/"Server" is using 16-bit "registers". If you want to read multiple, consecutive registers from a slave device, configure the **# of Reg** field to be a multiple of the data size required to hold the configured data type. For example, if you want to read 3 consecutive 32-bit (single precision) floating point values from the slave device, then the **Data Type** should be selected as FLOAT32 and the **# of Reg** field should be set to 6 (3 values at 2 registers per item).

Data Type

Specify the data format of the data in the slave device.

This field is used in conjunction with the **# of Reg** field. Supervisor assumes that the Modbus "Slave"/"Server" is using 16-bit "registers". If you want to read multiple, consecutive registers from a slave device, configure the **# of Reg** field to be a multiple of the data size required to hold the configured data type. For example, if you want to read 3 consecutive 32-bit (single precision) floating point values from the slave device, then the **Data Type** should be selected as FLOAT32 and the **# of Reg** field should be set to 6 (3 values at 2 registers per item).

Conversion Type

Specify the "endian-ness" of the slave device. If you don't know this information, just try to read the register(s) and then check the value that appears in the **First Value** column. If the number is incorrect, try using different conversion types.

Scratchpad Target

All values read by the Serial Modbus Master feature of Supervisor are deposited in Scratchpad values. Specify which Scratchpad value to use for this scan. If you scan multiple values in a single request, those values will be placed in consecutive Scratchpad points. For example, if you want to read 3 consecutive 32-bit (single precision) floating point values from the slave device, then the **Data Type** should be selected as FLOAT32

BeyondHMI

and the **# of Reg** field should be set to 6 (3 values at 2 registers per item). If you set the **Scratchpad Target** for 30 51st Scratchpad item, then your scanned values will be deposited in the 51st, 52nd, and 53rd Scratchpad values.

When you are performing Write operations, the process works in reverse from reads. The data is pulled from the specified scratchpad values, coerced, and manipulated for endianness, then written to the slave device. It is possible to write multiple values into the slave in a single request if the source values are in consecutive Scratchpad points in Supervisor and you use function code 16.

Result

This field is populated by the serial port processing logic to provide the status of the request.

If the port is disabled, this field/column will not get updated until the port is re-enabled.

First Value

This field is populated by the serial port processing logic. It is populated with the first value retrieved from the device for the scan. If multiple values are read in a single scan, you will have to look at the scratchpad to see all of the values. If the request is a write request (function code 6 or 16), then this field is not populated and will remain at 0.0.

If the port is disabled, this field/column will not get updated until the port is re-enabled.

Custom Modbus Slave Read-Only Registers Screen

When one of the Serial ports is configured as a Modbus Slave/Server, a special, “Custom” register map is exposed to Serial Modbus Masters/Clients on that port.

Sepervisor’s Custom Modbus register feature allows you to expose up to 100 individual items as Input registers. These registers are Read-only and can be read by a Master/Client using Function code 4.

In addition, Sepervisor allows you to expose up to 100 individual items as Holding registers. Holding registers are Read/Write. They are read using function code 3. They can be written to using Function code 6 or Function code 16.

This configuration consists of up to 100 “items”. Each “item” can contain either a 1-register value (like a 16-bit integer) or a 2-register value (like a 32-bit, single-precision floating point number).

Since it is impossible to pre-determine the number of registers needed, Sepervisor allots 200 registers as a “worst case” (100 items at 2-registers each). This means that the custom register map may be “sparsely populated”. That is, it may contain registers that don’t ever contain a value.

As described above, the custom Input registers section is a collection of exactly 200 **External Input Registers**. These are “External” registers because another device uses these registers to access the data from Sepervisor.

Into this 200-register space, Sepervisor maps up to 100 “Items”. Each “item” to be exposed is identified by its Internal Register number. Internal register numbers are defined by the standard Modbus register map for the Sepervisor program. This register map is available as a separate document.

To configure Custom Modbus registers, follow these steps:

- Determine what data you want to expose to the Serial Slave port.
- Limit that list to 100 (or less) “read-only” data values and 100 (or less) “read/write” data values
- Obtain a copy of the Sepervisor Modbus register map.
- Consult this register map to find the Internal Input Register numbers for the read-only values and the Internal Holding register numbers for the read/write values that you want to expose.
- Use the **Custom Modbus Slave Read-Only Register Screen** to configure the Read-only (Input) registers that will be exposed
- Use the **Custom Modbus Slave Read/Write Register Screen** to configure the Read/Write (Holding) registers that will be exposed



Custom Modbus Slave Read-Only Registers Screen

Items dropdown

Up to 100 items can be configured but only 10 items are displayed on the screen at one time. Use this list to select the “batch” of items you want to configure.

Item Number

This is a read-only field identifying the item number (from 0 to 99)

Internal Input Register

Supply the Internal, Supervisor register number (from the Supervisor Modbus register map) representing the value that you want to expose. For example, if the gas meter calculation status/error code is a 16-bit (one register) integer value available at Input register 451, then enter 451 as the **Internal Input Register** and 1 in the **# of Reg** field. If oil meter current flow rate is a 32-bit (two register) floating point number at Input register 1802, enter 1802 as the **Internal Input Register** and 2 in the **# of Reg** field.

External Input Register

This is a read-only field identifying the register number that external Modbus Masters/Clients use to read the value of the item. Note that this number is always **Item Nbr** time 2.

of Reg

Use this to specify whether the value you are exposing is a 1-register value or a 2-register value. For example, if the gas meter calculation status/error code is a 16-bit (one register)

BeyondHMI

integer value available at Input register 451, then enter 451 as the **Internal Input Register** and 1 in the **# of Reg** field. If oil meter current flow rate is a 32-bit (two register) floating point number at Input register 1802, enter 1802 as the **Internal Input Register** and 2 in the **# of Reg** field.

Description

Use this field to provide a short, meaningful description of the item.

Current Value

This read-only field is populated by the custom modbus register logic as it copies values from the Internal registers to the external registers. The values are provided as 16-bit unsigned values in decimal form for a pair of registers.

Special note about exposing Internal Holding Registers as Input registers

Normally, you configure custom Modbus registers such that values which are – Internally to Supervisor – read-only Input registers are exposed as custom Input registers.

Similarly, you typically configure custom Modbus registers such that values which are – Internally to Supervisor – read/write Holding registers are exposed as custom Holding registers.

You may find a situation in which you want to expose a value that is – internally to Supervisor – a Holding register, but you don't want any Serial Modbus Master to be able to modify that value.

This is possible using a special syntax. If you want to expose a Supervisor Holding register as a custom Input register, you can do so by configuring it on the **Custom Modbus Slave Read-Only Register Screen** with an **Internal Input Register Value** of the Holding register number + 300000. For example, if the Orifice plate size is a Holding Register at register number 1234 and you want to allow a Serial Modbus slave to read that value but not modify it, then configure that value on the **Custom Modbus Slave Read-Only Register Screen** with an **Internal Input Register Value** of 301234 (1234 + 300000).

Custom Modbus Slave Read/Write Registers Screen

When one of the Serial ports is configured as a Modbus Slave/Server, a special, “Custom” register map is exposed to Serial Modbus Masters/Clients on that port.

Sepervisor’s Custom Modbus register feature allows you to expose up to 100 individual items as Input registers. These registers are Read-only and can be read by a Master/Client using Function code 4.

In addition, Sepervisor allows you to expose up to 100 individual items as Holding registers. Holding registers are Read/Write. They are read using function code 3. They can be written to using Function code 6 or Function code 16.

This configuration consists of up to 100 “items”. Each “item” can contain either a 1-register value (like a 16-bit integer) or a 2-register value (like a 32-bit, single-precision floating point number).

Since it is impossible to pre-determine the number of registers needed, Sepervisor allots 200 registers as a “worst case” (100 items at 2-registers each). This means that the custom register map may be “sparsely populated”. That is, it may contain registers that don’t ever contain a value.

As described above, the custom Input registers section is a collection of exactly 200 **External Input Registers**. These are “External” registers because another device uses these registers to access the data from Sepervisor.

Into this 200-register space, Sepervisor maps up to 100 “Items”. Each “item” to be exposed is identified by its Internal Register number. Internal register numbers are defined by the standard Modbus register map for the Sepervisor program. This register map is available as a separate document.

To configure Custom Modbus registers, follow these steps:

- Determine what data you want to expose to the Serial Slave port.
- Limit that list to 100 (or less) “read-only” data values and 100 (or less) “read/write” data values
- Obtain a copy of the Sepervisor Modbus register map.
- Consult this register map to find the Internal Input Register numbers for the read-only values and the Internal Holding register numbers for the read/write values that you want to expose.
- Use the **Custom Modbus Slave Read-Only Register Screen** to configure the Read-only (Input) registers that will be exposed
- Use the **Custom Modbus Slave Read/Write Register Screen** to configure the Read/Write (Holding) registers that will be exposed



Custom Modbus Slave Read/Write Registers Screen

Items dropdown

Up to 100 items can be configured but only 10 items are displayed on the screen at one time. Use this list to select the “batch” of items you want to configure.

Item Number

This is a read-only field identifying the item number (from 0 to 99)

Internal Holding Register

Supply the Internal, Supervisor register number (from the Supervisor Modbus register map) representing the value that you want to expose. For example, if the gas meter orifice plate size is a 32-bit (two register) floating point number at Holding register 1234, enter 1234 as the **Internal Holding Register** and 2 in the **# of Reg** field.

External Holding Register

This is a read-only field identifying the register number that external Modbus Masters/Clients use to read the value of the item. Note that this number is always **Item Nbr** time 2.

of Reg

Use this to specify whether the value you are exposing is a 1-register value or a 2-register value. For example, if the gas meter orifice plate size is a 32-bit (two register) floating point number at Holding register 1234, enter 1234 as the **Internal Holding Register** and 2 in the **# of Reg** field.

Description

Use this field to provide a short, meaningful description of the item.

Current Value

This read-only field is populated by the custom modbus register logic as it copies values from the Internal registers to the external registers. The values are provided as 16-bit unsigned values in decimal form for a pair of registers.

Scratchpad Configuration Screen

The Supervisor Scratchpad is a collection of 256 numbers that can be used for various purposes. Each of these numbers is held in the scratchpad as a double-precision (64-bit) number so they can contain any number encountered in normal automation activities.

Scratchpad values are held in volatile memory, so if the PLC is rebooted, the scratchpad values will all reset to 0.0. For this reason, you should not manually enter scratchpad values for parameters that you want the program to retain. Instead, you should utilize a “user calculation” to apply a constant number to a scratchpad value. For further details, consult the [User Calculation Configuration](#) section of this document.

The Scratchpad Configuration Screen is used to:

- Assign tag names to scratchpad values
- View the current value of a scratchpad item
- Temporarily manipulate the value of a scratchpad item



The screenshot shows the 'Scratchpad' configuration screen. At the top, there is a title 'Scratchpad' and a dropdown menu labeled 'Items' with the text 'Item 0 through Item 31'. A 'Back' button is located in the top right corner. Below this is a blue header bar labeled 'Scratchpad Items'. The main content is a table with 8 columns: 'Tag', 'Value', 'Tag', 'Value', 'Tag', 'Value', 'Tag', 'Value'. The table contains 32 rows of data. The first 8 rows have specific tag names and values, while the remaining 24 rows are labeled 'Untagged' with values of 0.0.

Tag	Value	Tag	Value	Tag	Value	Tag	Value
PrsPsia	74.3000030	WGrav	8.89999961	Untagged 16	0.0	Untagged 24	0.0
PrsPsig	61.1000032	WSw	100.0	Untagged 17	0.0	Untagged 25	0.0
Tmpr	91.1999969	Untagged 10	0.0	Run VRU	0.0	Untagged 26	0.0
DiffP	76.3000030	Untagged 11	0.0	Untagged 19	0.0	Untagged 27	0.0
OPulses	17445982.5	Untagged 12	0.0	Untagged 20	0.0	Untagged 28	0.0
OGrav	34.5	Untagged 13	0.0	Untagged 21	0.0	Untagged 29	0.0
OSw	1.20000004	Untagged 14	0.0	Untagged 22	0.0	Untagged 30	0.0
WPulses	7236851.87	Untagged 15	0.0	Untagged 23	0.0	Untagged 31	0.0

Scratchpad Configuration Screen

Items dropdown

The scratchpad consists of 256 items, but only 32 items are displayed on the screen at one time. Use this dropdown to select the “batch” of scratchpad items that you want to configure.

BeyondHMI

Tag

Assign a meaningful tag to each scratchpad item you use. During initial program startup, each scratchpad item is assigned a default tag, but you can change these tags to fit your needs. Unlike scratchpad values, scratchpad tags are persistent. They will be held in the PLC – even if the unit is rebooted.

Value

Scratchpad item values are usually assigned by either Modbus features or by user calculations. Scratchpad item values are volatile. When the PLC is rebooted, scratchpad item values will be reset to 0.0.

You can modify scratchpad item values on this screen, but your changes may be overwritten by a Modbus feature (Serial Modbus Master, Serial Modbus slave, Modbus/TCP Slave) or by a user calculation.

User Calculations Configuration Screen

The Supervisor User calculations consist of a set of 32 flexible calculation instances. Each instance can perform up to 2 mathematical/logical operations on up to 3 operands. The result of the operations is assigned to either a Scratchpad item or a physical Output (AO/DO) point

The User Calculation Configuration Screen is used to configure these calculation instances.

The screenshot shows the 'User Calculations' configuration interface. At the top, there is a 'Calc' dropdown menu set to 'APIfromGperCC', a 'Tag' field containing 'APIfromGperCC', and a 'Back' button. Below this is an 'Enabled' checkbox which is checked. The main configuration area is divided into five columns: 'Value A', 'Oper 1', 'Value B', 'Oper 2', and 'Value C'. Each column has a 'Type' dropdown, a 'Point' dropdown (where applicable), and a 'Value' field. Value A is a Constant with value 141.3608. Oper 1 is a division operator '/'. Value B is a Scratchpad with point 'OilGperCC' and value 9.99016e-1. Oper 2 is a subtraction operator '-'. Value C is a Constant with value 131.5. Below these columns is an 'Assign Result To' section with a dropdown set to 'Scratchpad' and a value of 10.0000300969982. The BeyondHMI logo is in the bottom right corner.

User Calculation Configuration Screen

Illustration...

The figure above shows a calculation for converting density in g/cc to API gravity. This is a simplification of the following relationships:

$$\text{Specific gravity} = \text{density}[\text{g/cc}] * 1000/999.016 \quad (\text{eqn 1})$$

$$\text{API gravity} = (141.5/\text{specific gravity}) - 131.5 \quad (\text{eqn 2})$$

It is commonly known that API gravity of 10 is the same as specific gravity of 1.0

Combining equations 1 and 2 produces:

$$\text{API gravity} = (141.3608 / \text{density} [\text{g/cc}]) - 131.5 \quad (\text{eqn 3})$$

Calc dropdown

Use this list to select the calculation instance that you want to configure.

Tag

Assign a meaningful tag to each calculation instance that you use.

Enabled check box

Use this check box to enable and disable processing of the user calculation.

Note that disabling a calculation instance will cause its output variable to no longer be updated until the instance is re-enabled.

Value A: Type

Select which type of variable you want as the first operand. Options are:

None: no further processing will be performed – even if the calculation is enabled

Physical AI: the operand will be derived from an analog input object

Physical DI: the operand will be derived from a discrete input object

Scratchpad: the operand will be derived from a scratchpad instance

Constant: you can enter a constant value for this operand

Value A: Point Instance or Constant value

If the point type is selected as Physical AI, Physical DI, or Scratchpad, then a dropdown list box is provided to select the instance of the point type which will be used as the operand.

Value A: Value

This read-only field is populated by the User Calculation logic to show the actual value being used as the operand value.

Oper 1:

Select the operation to be applied to Value A (operand 1) and Value B (operand 2). Most of the operations involve 2 operands, but some only utilize a single (the previous) operand. See table below for details of each operator.

Value B:

Select and specify the second operand. If no second operand is needed, select a type of None.

Oper 2:

Select the operation to be applied to the result of (Value A > Operator 1 < Value B) and value C (operand 3). Most of the operations involve 2 operands, but some only utilize a single (the previous) operand. See table below for details of each operator.

Value C:

Select and specify the third operand. If no second operand is needed, select a type of None.

Assign Result To:

Select where the result of the calculation should be written.

Options are:

Scratchpad: the result will be written to a scratchpad instance

Physical AO: the result will be written to an analog output object

Physical DO: the result will be written to a discrete output object

After selecting the type of output target, select the instance from the dropdown list

At the bottom of this group of controls, the screen displays the calculation result value

User Calculation Operators:

Operator	Description	# of Operands
None	Result = left operand (or result of prior operation if "Oper2" is set to None)	2
+	Result = left operand + right operand	2
-	Result = left operand - right operand	2
*	Result = left operand * right operand	2
/	Result = left operand / right operand	2
^	Result = left operand raised to the <right operand> power	2
>	Result = 1 if left operand is greater than right operand, otherwise 0	2
<	Result = 1 if left operand is less than right operand, otherwise 0	2
>=	Result = 1 if left operand is greater than or equal to right operand, otherwise 0	2
<=	Result = 1 if left operand is less than or equal to right operand, otherwise 0	2
=	Result = 1 if left operand is equal to right operand, otherwise 0	2
AND	Result = bitwise AND of left operand and right operand	2
OR	Result = bitwise OR of left operand and right operand	2
XOR	Result = bitwise XOR of left operand and right operand	2
MAX	Result = the greater value of left operand and right operand	2
MIN	Result = the lesser value of left operand and right operand	2
SHL	Result = bits in operand 1 shifted to the left by <operand 2> number of bits. Same as multiply operand by 2 raised to the <operand 2> power	2
SHR	Result = bits in operand 1 shifted to the right by <operand 2> number of bits. Same as divide operand by 2 raised to the <operand 2> power	2
ROL8	Result = the operand 1 (treated as an 8-bit integer) rolled to the left right by <operand 2> number of bits.	2
ROL16	Result = the operand 1 (treated as a 16-bit integer) rolled to the left right by <operand 2> number of bits.	2
ROL32	Result = the operand 1 (treated as a 32-bit integer) rolled to the left right by <operand 2> number of bits.	2

BeyondHMI

ROL64	Result = the operand 1 (treated as a 64-bit integer) rolled to the left right by <operand 2> number of bits.	2
ROR8	Result = the operand 1 (treated as an 8-bit integer) rolled to the right by <operand 2> number of bits.	2
ROR16	Result = the operand 1 (treated as a 16-bit integer) rolled to the right by <operand 2> number of bits.	2
ROR32	Result = the operand 1 (treated as a 32-bit integer) rolled to the right by <operand 2> number of bits.	2
ROR64	Result = the operand 1 (treated as a 64-bit integer) rolled to the right by <operand 2> number of bits.	2
NOTx	Result = 1 if operand 1 is 0 or FALSE if operand 1 is not zero	1
NOT8	Result = bitwise NOT of each bit in operand 1. Operand 1 is treated as an 8-bit integer.	1
NOT16	Result = bitwise NOT of each bit in operand 1. Operand 1 is treated as a 16-bit integer.	1
NOT32	Result = bitwise NOT of each bit in operand 1. Operand 1 is treated as a 32-bit integer.	1
NOT64	Result = bitwise NOT of each bit in operand 1. Operand 1 is treated as a 64-bit integer.	1
toAPI	Result = operand 1 (assumed to be a density in g/cc) to API gravity	1

Concerning the limited number of User Calculation Instances:

The user calculation feature within Sepervisor is not mean to be a “programming language” for building applications. It is only intended for limited use for converting units of measure or making simple logical decisions from input data.

Supervisor is – essentially - an IEC61131 “skeleton” program built in Codesys (Wago’s e!Cockpit). As an end user, you are free to develop additional programming logic in Codesys in any IEC61131 programming language. Your program will have access to all of the I/O signals and internal data structures of Sepervisor. Therefore, if you have logic that you want to implement at your site, you should implement this logic as an enhancement to the Sepervisor core logic (another IEC61131 program run on another PLC task).

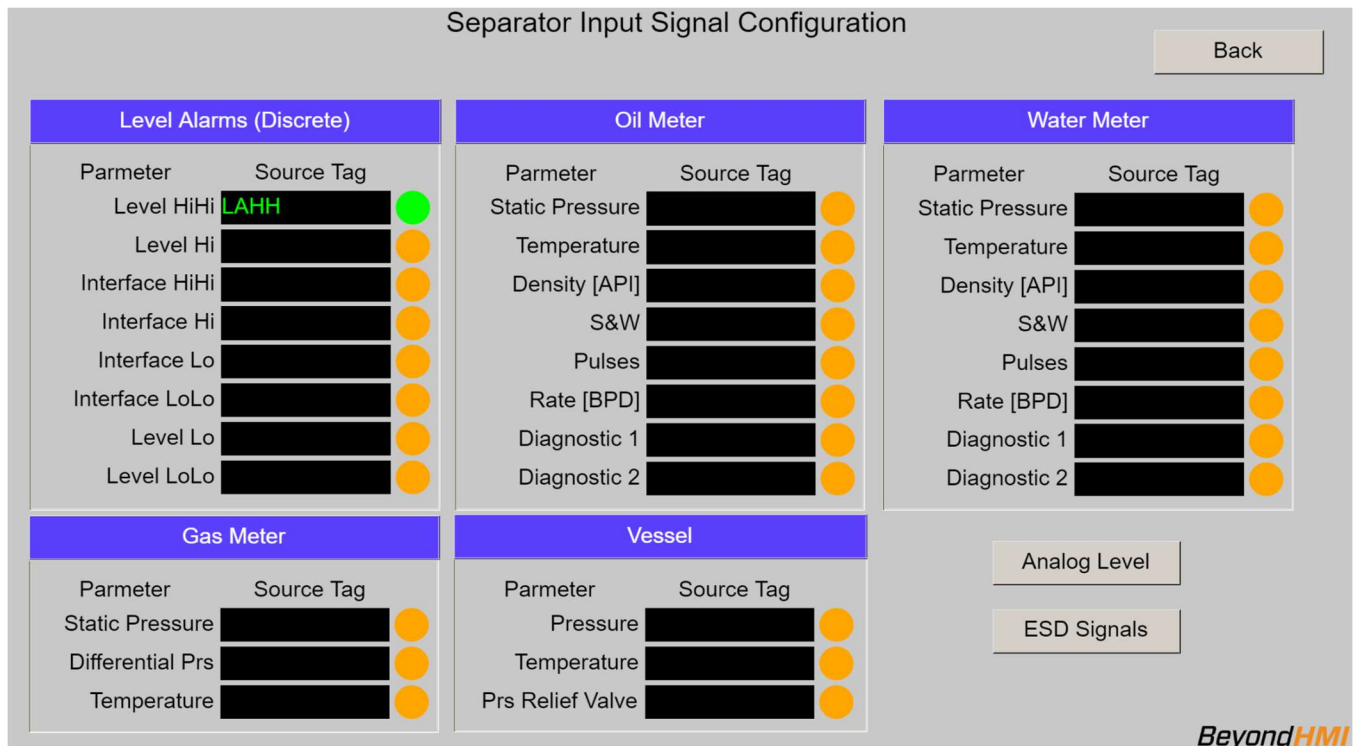
You should only employ the User Calculation instances for very simple and very limited calculations.

Separator Signal Configuration Screen

At the core of the Sepervisor application is a “Separator” object. Sepervisor defines a number of signals that might be measured or sensed by various instruments. Supervisor provides a means of connecting input signals - from physical I/O and from Modbus communication – to each of these potential instrument input signals.

The Separator Signal Configuration Screen is used to associate incoming instrument values with signals defined for the Separator object.

Note that Sepervisor attempts to provide a “superset” of all possible instrumentation signals associated with a production separator, but you are not required to provide all of these signals to Sepervisor. You only need to configure the signals that are actually available at your installation.



Separator Input Signal Configuration Screen

General Instructions

You can tie any Physical Input or Scratchpad signal to the Separator object using its tag name. On this screen, you provide the tag names of input signals to associate them with the Separator object within Sepervisor.

Tag names are case-sensitive.

BeyondHMI

You do not need to specify the type of signal – only the tag. Supervisor requires that tags be unique – across data sources. Behind the scenes, Supervisor checks for duplicated tag names and provides warnings when it finds a duplicated tag.

Color of the Dots

Each signal is associated with a “dot”/circle to its right. If the item is configured with a known tag, then the dot is displayed as green. If the tag is not configured or if the tag text is not recognized as a known tag, then the dot will appear as orange.

Alarm Levels (Discrete)

The Separator object within Supervisor is capable of accepting a number of discrete input signals indicating different levels within the separator vessel. Assign those I/O points in this section.

Gas Meter

The AGA-3 gas meter requires three live input signals. Assign the appropriate variables (in the appropriate units of measure) in this section. If your sensors do not supply values in the required units of measure, employ a User calculation instance to convert to the appropriate units of measure.

Signal	Required units of measure for input signal
Static Pressure	The gas meter can accept either psig or psia. The distinction is based on the configuration of the meter – within the flow computer section
Differential Pressure	Inches of H2O
Temperature	Degrees F

Oil Meter

The oil meter object accepts multiple signals – some required and some optional.

Signal	Required units of measure for input signal	Signal Required?
Static Pressure	psig	Required
Temperature	Degrees F	Required
Density [API] (live, flowing density)	API gravity	Required
S&W	percent	Required
Pulses	Raw meter pulses	You must provide <u>either</u> a running pulse count or a rate – depending upon configuration of the meter – within the flow computer section
Rate [BPD]	BPD	You must provide <u>either</u> a running pulse count or a rate – depending upon configuration of the meter – within the flow computer section

BeyondHMI

Diagnostic 1	dimensionless	Not required. When Coriolis meter is used, supply drive gain
Diagnostic 2	dimensionless	Not required

Vessel

If sensors are available, associate the signals in this section.

Water Meter

The water meter object accepts multiple signals – some required and some optional.

Signal	Required units of measure for input signal	Signal Required?
Static Pressure	psig	Required
Temperature	Degrees F	Required
Density [API] (live, flowing density)	API gravity	Required
S&W	percent	Required
Pulses	Raw meter pulses	You must provide <u>either</u> a running pulse count or a rate – depending upon configuration of the meter – within the flow computer section
Rate [BPD]	BPD	You must provide <u>either</u> a running pulse count or a rate – depending upon configuration of the meter – within the flow computer section
Diagnostic 1	dimensionless	Not required. When Coriolis meter is used, supply drive gain
Diagnostic 2	dimensionless	Not required

ESD Signals Button

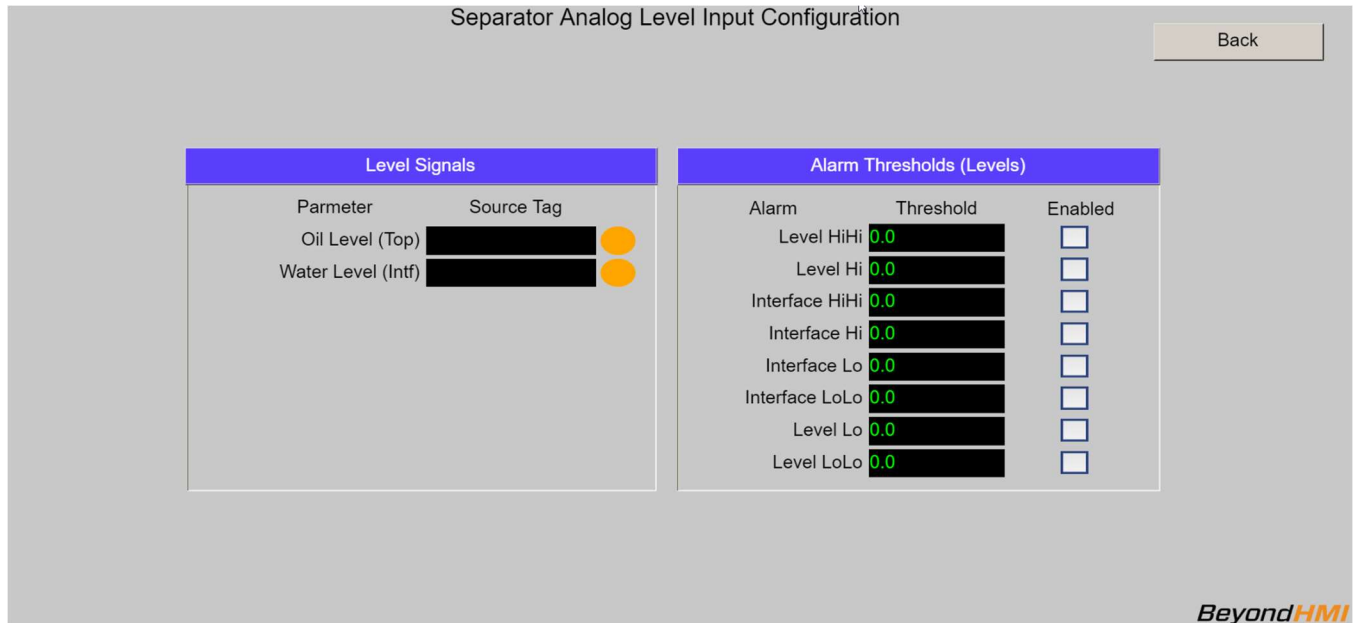
Use this button to view the **Separator ESD Signals** screen to configure ESD signals and view ESD status.

Analog Level Button

If the separator is equipped with level sensing equipment to sense the internal liquid level(s) within the vessel, use this button to view the **Separator Analog Level Input Configuration** screen to configure those signals.

Separator Analog Level Input Configuration Screen

Supervisor's internal "Separator" object can accept analog level signals from level sensing equipment. If such instrumentation signals are available, configure them on the Separator Analog Level Input Signal screen.



Separator Analog Level Input Configuration Screen

Level Signals: Oil Level (Top)

If an instrument signal for the vessel liquid top level is available, provide its tag name here.

Level Signals: Water Level (Intf)

If an instrument signal for the vessel liquid interface level is available, provide its tag name here.

Alarm Thresholds (Levels)

If analog level signals are available and level "switch" inputs are not available, you can configure the system to trigger level alarms based on the analog signal(s). Provide the alarm threshold levels here and check the associated **Enabled** check box

Note: if you have both analog level and level switches, configure the level switches on the Separator Input Signal Configuration screen and do not enable alarm thresholds here

Color of the Dots

Each signal is associated with a "dot"/circle to its right. If the item is configured with a known tag, then the dot is displayed as green. If the tag is not configured or if the tag text is not recognized as a known tag, then the dot will appear as orange.

Separator ESD Signal Configuration Screen

Supervisor's tag-based ESD logic can utilize up to eight input signals to determine ESD status and can write ESD status to up to three outputs.



Separator ESD Signal Configuration Screen

Signal Alarms Which Trigger ESD

Provide the tags for up to eight signals which are used to trigger ESD. The signals can be either Analog Inputs, Discrete Inputs, or Scratchpad values. For Analog and Discrete Inputs, the ESD status is determined from the **Alarm** state of the input point. If a scratchpad value is use in the ESD logic, a signal **value** greater than zero will trigger ESD.

State

This screen will display the current state of alarm and the latched state of the alarm for each signal. For Scratchpad points, a value greater than zero is considered to be an alarm state. Scratchpad values have no latched state – only instantaneous states.

ESD Outputs

Provide the tags of up to three output signals where the state of the ESD will be written. Output signals can be either Discrete Outputs or Scratchpad values.

Enabled

Use this check box to enable/disable the ESD logic.

BeyondHMI

Reset ESD

Use this button to reset the ESD condition and clear all latched alarms for the ESD input signals. Not that if any of the input signals are still in alarm, the ESD will not be cleared.

Color of the Dots

Each signal is associated with a “dot”/circle to its right. If the item is configured with a known tag, then the dot is displayed as green. If the tag is not configured or if the tag text is not recognized as a known tag, then the dot will appear as orange.

Tag List Review Screen

This screen is for reference only. It is a single location where you can review tags from different variable types. Not configuration is done on this screen.

The screenshot displays a 'Tag List' review screen with a 'Back' button in the top right corner. The screen is organized into two rows of three dropdown menus each. The first row contains 'Physical DI' (LAHH), 'Physical DO' (UserDO1), and 'Physical HSC' (UserHSC1). The second row contains 'Physical AI' (UserAI1), 'Physical AO' (UserAO1), and 'Scratchpad' (PrsPsia). The BeyondHMI logo is visible in the bottom right corner of the interface.

Physical DI	Physical DO	Physical HSC
LAHH	UserDO1	UserHSC1
Physical AI	Physical AO	Scratchpad
UserAI1	UserAO1	PrsPsia

Tag List Review Screen

Administration Screen

The screenshot shows the 'Supervisor Administration' interface. It features a 'Back' button in the top right corner. The main content is organized into three columns and one bottom section:

- BLM Display Scrolling:** A numeric input field set to '5' with the label 'Seconds'.
- Aggregation Hour:** A dropdown menu currently showing 'Midnight'.
- Save Config to File:** A section with a 'Save Config' checkbox (unchecked), and three numeric input fields for 'Bytes to Xfer', 'State', and 'Bytes Xfered', all set to '0'.
- Restore Config from File:** A section with a red warning message: '!! Warning !! This Action is Destructive. No Undo !!!' and a 'Restore Config' checkbox (unchecked).
- Licensing:** A section at the bottom with the text 'Licensed' in green.

The BeyondHMI logo is visible in the bottom right corner of the interface.

Administration Screen

BLM Display Scrolling

Specify the speed of the scrolling of the “BLM Scrolling” sections on the default splash screen.

Aggregation Hour

Specify the hour of the day when “daily” aggregates (minimum, maximum, average) “broken”.

Save Config to File

Use this section to save the current configuration to a file on the PLC. To save the configuration, check the **Save Config** check box. The **Bytes to Xfer** box will update and the **Bytes Xfered** box will count up to that number. Then, the **Bytes to Xfer** box will update again and the **Bytes Xfered** box will start counting to that number. When the save is completed, the **Save Config** check box will uncheck itself.

Restore Config from File

Use this section to restore the configuration to its state the last time it was saved to file on the PLC.

Warning: this action is not reversible

To restore the configuration, check the **Restore Config** check box. The **Bytes to Xfer** box (in the **Save Config to File** section) will update and the **Bytes Xfered** box will count up to that number. Then, the **Bytes to Xfer** box will update again and the **Bytes Xfered** box will start counting to that number. When the save is completed, the **Restore Config** check box will uncheck itself.

BeyondHMI

Note: After the configuration is restored from file, all serial ports are disabled. After the program restarts, you will need to use the Serial Port Configuration screen to re-enable serial ports – as appropriate.

Licensing

This section will display one of three messages:

Licensed

This means that the product is properly licensed and will perform correctly

Running in trial mode for approximately 4 days. Contact Beyond HMI, Inc for a license.

The product is not license but is running in trial mode. Sepervisor will run in trial mode for up to 4 days from startup before malfunctioning.

No License

The product is not licensed and the trial period has expired. Contact Beyond HMI for a license key,

Configuring the Flow Computer Library

Configuration is performed via Codesys Visualizations included in the library. Your program's Visualizations must provide a link to the Dual Flow Computer Menu screen (refer to the most recent version of Beyond HMI document DFC_DG_yyyy_mm_dd for more details).

This User Manual document describes the features of the library-resident visualizations.

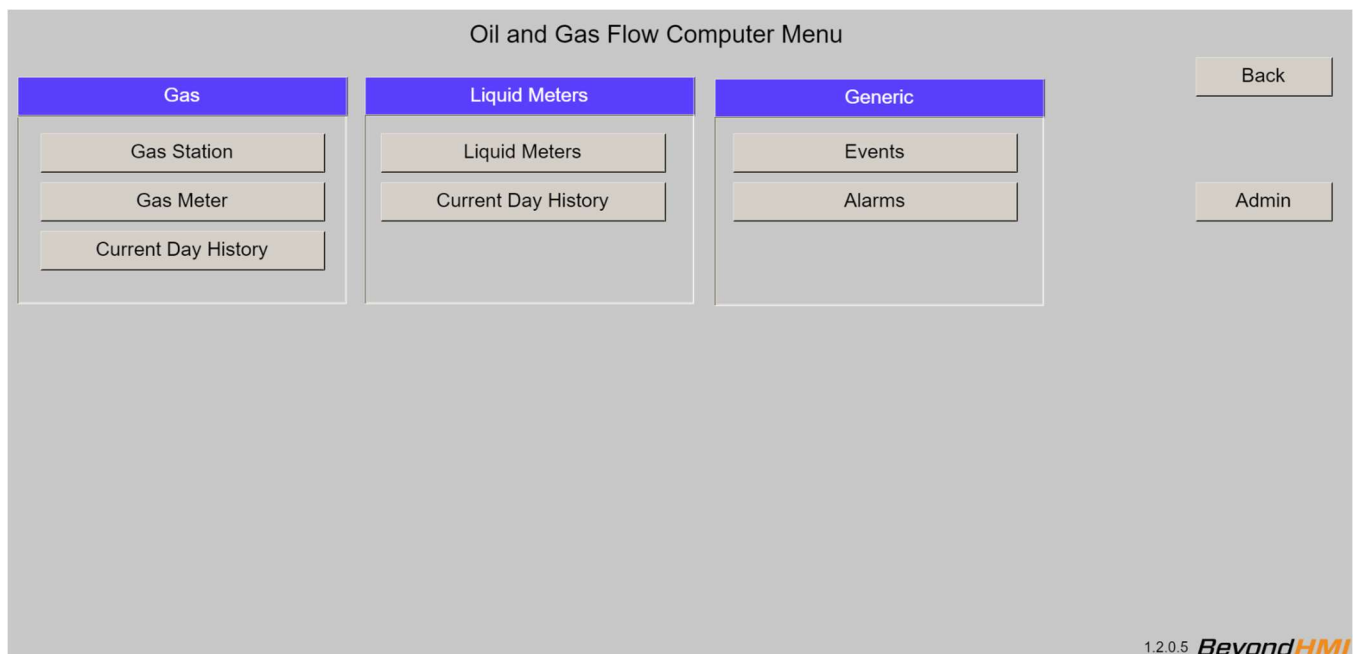
Formatting Note

The library allows input of two classes of parameters: parameters required for calculations and parameters captured for transmission to the hydrocarbon accounting system through .cfx files.

In the documentation sections below, parameters required for calculations are differentiated using an asterisk*. For the purposes of the library and its flow computer functions, entry of these parameters is mandatory. Parameters not marked with an asterisk* are not used by the library, but their values will be included in the .cfx files.

Main Menu

The main menu provides navigation to all of the features of the library.



Dual Flow Computer Main Menu Visualization

Gas Section

Gas Station

Calls the visualization for status and configuration of gas meter stations

Gas Meter

Calls the visualization for status and configuration of gas meters

Current Day History

Calls the visualization for reviewing periodic history for gas meters for the current *day*. A *day* can contain up to 25 hours of data, or less – if a configuration change has been made.

Liquid Meter Section

Liquid Meters

Calls the visualization for status and configuration of liquid (oil/water) meters

Current Day History

Calls the visualization for reviewing periodic history for liquid meters for the current *day*. A *day* can contain up to 25 hours of data, or less – if a configuration change has been made.

Generic Section

Events

Calls the visualization for reviewing meter events

Alarms

Calls the visualization for reviewing meter alarms

Other

Admin

Calls the visualization for viewing license status information

Back

Returns to the visualization in your PLC program from which the gas flow computer memory was called

Gas Station Screen - Values

Each meter must be assigned to a station. Stations house shared gas properties and contract conditions. Since BhiLibDualFc only supports a single gas meter, it is only necessary to configure a single station.

The station screen contains several tabs. The **Values** tab displays live calculated results for the station. Since BhiLibDualFc only supports a single gas meter, these values represent the accumulation of quantities from gas meter.

Gas Meter Station Configuration

Station Description: **Gas Station 1** Enabled Back

	Volume [MSCF/Day]	Energy [MMBTU/D]	Mass [M lb/Day]
Flow Rate	0.000	0.000	0.000
	[MSCF]	[MMBTU]	[M lb]
Current Hour	0.00	0.00	0.00
Last Hour	0.00	0.00	0.00
Today	0.00	0.00	0.00
Yesterday	5.06	5.00	0.25
Current Month	31.4	30.9	1.6
Previous Month	0.0	0.0	0.0
Total	31	31	2

BeyondHMI

Station Screen – Values Tab

Station Description Text Box

This text box is used to modify the common descriptive name of the currently-selected station.

Enabled

Use this check box to enable/disable the station. Disabled stations – if referenced by a meter – will generate a configuration error.

Volume

Values in this column represent volumetric flow rates and accumulations. The screen displays the relevant units of measure.

Energy

Values in this column represent energy flow rates and accumulations. The screen displays the relevant units of measure.

Mass

Values in this column represent mass flow rates and accumulations. The screen displays the relevant units of measure.

Flow Rate

Values in this row represent instantaneous flow rates – as of the last successful calculation. The screen displays the relevant units of measure.

Current Hour

Values in this row represent the accumulated quantity for the current hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Last Hour

Values in this row represent the accumulated quantity for the previous hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Today

Values in this row represent the accumulated quantity for the current contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Yesterday

Values in this row represent the accumulated quantity for the previous contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Current Month

Values in this row represent the accumulated quantity for the current contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Previous Month

Values in this row represent the accumulated quantity for the previous contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Total

*Beyond***HMI**

Values in this row represent the accumulated quantity for the lifetime of the flow computer installation. This value is not resettable by supported features. The screen displays the relevant units of measure.

Station Screen - Main

The station screen contains several tabs. The **Main** tab is used to adjust the main configuration parameters for the station.

The screenshot shows the 'Gas Meter Station Configuration' interface. At the top, the title is 'Gas Meter Station Configuration'. Below the title, there is a 'Station Description' field containing 'Gas Station 1' and an 'Enabled' checkbox which is checked. A 'Back' button is located in the top right corner. Below the title bar, there are four tabs: 'Values', 'Main', 'Quality', and 'Diagnostic'. The 'Main' tab is selected. The main configuration area contains several fields and dropdown menus: 'Flow Computer ID' (GasFCID), 'Contract Hour' (6 AM), 'Supercompressibility Standard' (AGA-8 GERG (2017)), 'Heating Value Basis' (dry), 'Specific Gravity Basis' (dry), 'Atmospheric Pressure' (14.2000 [psia]), 'Gravitational Acceleration' (32.2000 [Ft/sec^2]), 'Contract Base Pressure' (14.7500 [psia]), 'Elevation' (123.0 [Ft]), 'Contract Base Temperature' (60.0000 [F]), 'Latitude' (32.8700 [degrees]), and 'Power Source' (AC). The BeyondHMI logo is in the bottom right corner.

Station Screen – Main Tab

Station Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected station.

Enabled*

Use this check box to enable/disable the station. Disabled stations – if referenced by a meter – will generate a configuration error.

Flow Computer ID

Specify the Flow Computer ID to associate with this station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Supercompressibility Standard

The flow computer library only supports the AGA-8 GERG (2017) method.

Heating Value Basis

Specify the heating value basis – as provided on the gas sample analysis report. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Atmospheric Pressure*

BeyondHMI

Specify the atmospheric pressure to be used. If meters assigned to this station will use **Static Pressure Measurement Type** of *Absolute*, then this value will *not* be used by the flow computer library. If meters assigned to this station use **Static Pressure Measurement Type** of *Gauge*, then this value will be added to the live static pressure values before AGA-3 calculations are performed. In either case, this field is passed to FLOWCAL in the CFX file.

Contract Base Pressure*

Specify the contract base pressure. A common value for this quantity is 14.73.

Contract Base Temperature*

Specify the contract base temperature. A common value for this quantity is 60.0.

Power Source Combo Box

Use this combo box to specify the power source for the station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Contract Hour*

Specify the hour when the contract day changes. The contract day will change at the beginning of the configured hour.

Specific Gravity Basis

Specify the specific gravity (gas relative density) value basis – as provided on the gas sample analysis report. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Gravitational Acceleration

Specify the local acceleration of gravity for the station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Elevation

Specify the elevation of the station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Latitude

Specify the latitude of the station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Station Screen - Quality

The station screen contains several tabs. The **Quality** tab is used to adjust the gas properties for the station.

Gas Meter Station Configuration

Station Description **Gas Station 1** Enabled Back

Values | Main | **Quality** | Diagnostic

Sample Date: 01 - 19 - 22 Sample Type: spot
 Heating Value: 987.000 [BTU/Ft3] Specific Gravity: 0.650000
 Normalization Method: adjust_methane

Composition		Adjustments	
% CO2	0.4000	% Octane (C8)	0.0000
% N2	0.2000	% Nonane (C9)	0.0000
% Methane (C1)	86.2970	% Decane (C10)	0.0000
% Ethane (C2)	8.0000	% Argon (Ar)	0.0000
% Propane (C3)	5.1000	% CO	0.0000
% iButane (iC4)	0.0000	% Hydrogen (H2)	0.0000
% nButane (nC4)	0.0000	% Oxygen (O2)	0.0000
% iPentane (iC5)	0.0000	% Helium (He)	0.0000
% nPentane (nC5)	0.0000	% Water (H2O)	0.0000
% Hexane (C6)	0.0000	% H2S	0.0030
% Heptane (C7)	0.0000	Total	100.0000

Heptanes+ (C6+) 0.0000

Apply 60% / 30% / 10% split

Normalize

Commit Needed
 Commit Changes

BeyondHMI

Station Screen – Quality Tab

Station Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected station.

Enabled*

Use this check box to enable/disable the station. Disabled stations – if referenced by a meter – will generate a configuration error.

Sample Date

Use this control to specify the date on which the sample was captured. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Sample Type

Use this combo box to specify the sample type. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.


Heating Value*

Enter the heating value from the gas analysis report.

Specific Gravity*

Enter the gas specific gravity (relative density) from the gas analysis report.

Normalization Method

The functionality associated with this combo box is typically not used. If the gas compositional percentages add up to 100.0 percent, then normalization is not required. When gas compositions do not total to 100.0 percent, they can be normalized to 100 percent by specifying the normalization method here and selecting the  button.

The different normalization methods are described below.

- **adjust_methane**
The percentages of all other components will remain unchanged and the percentage of methane will be adjusted to cause the total to be 100.0 percent.
- **adjust_all**
The percentages of all of the components will be changed – proportionally – to bring the total to 100.0 percent.

to specify the sample type. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Normalize

The functionality associated with this button is typically not used. If the gas compositional percentages add up to 100.0 percent, then normalization is not required and pressing this button should have no impact. When gas compositions do not total to 100.0 percent, they can be normalized to 100 percent by specifying the **Normalization Method** and selecting this button.

Hexanes+ (C6+)

Typically, the gas analysis report will specify percentage for *Hexanes Plus* or *Hexanes+*. There are many regionally-accepted methods for dividing the *Hexanes Plus* percentage between Hexane, Heptane, and Nonane. The library provides this simple tool for performing a 60/30/10 split:

- Hexane % = 60% x *Hexanes Plus*%
- Heptane % = 30% x *Hexanes Plus*%
- Nonane % = 10% x *Hexanes Plus*%

To use this tool, enter the value from the analysis report into this box and check the **Apply 60% / 30% / 10% split** check box. The library will update the % **Hexane(C6)**, % **Heptane(C7)**, and % **Nonane(C8)** values and then uncheck the **Apply 60% / 30% / 10% split** check box.

Note that this is just a utility feature. Its use is optional.

Apply 60% / 30% 10% split check box

BeyondHMI

See description of **Hexanes+ (C6+)**. Note that this is just a utility feature. Its use is optional.

Commit Needed check box

This read-only checkbox indicates that changes to the gas quality or standard conditions have been made and a Commit is necessary.

Commit Changes check box

When you have completed changes to the gas composition and the station base conditions, check this box to cause the library to begin using the new values. The library will uncheck this box and the **Commit Needed** checkbox when the commit is completed.

Note: committing changes is critical to accurate measurement. With other parameters in the visualizations, the new value of the parameter is used by the program immediately after a change. But with station gas properties and station base conditions, you must make changes and then Commit them as a set of changes.

Station Screen - Diagnostic

The station screen contains several tabs. The **Diagnostic** tab displays live diagnostic and internal calculation values from the library.

Gas Meter Station Configuration

Station Description **Gas Station 1** Enabled Back

Values | Main | Quality | **Diagnostic**

@ 14.73 psia, 60 degrees F

Standard Density	0.0496128	[lbm/CF]
Standard Z Factor	0.9972263	
Gas Relative Density	0.6482882	From Composition

@ Contract base conditions

Base Density	0.0496803	[lbm/CF]
Base Z Factor	0.9972225	

BeyondHMI

Station Screen – Diagnostic Tab

Station Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected station.

Enabled*

Use this check box to enable/disable the station. Disabled stations – if referenced by a meter – will generate a configuration error.

Standard Density

Displays the library-calculated density of the gas at *standard conditions* (14.73 psia, 60 degrees F).

Standard Z Factor

Displays the library-calculated Z factor of the gas at *standard conditions* (14.73 psia, 60 degrees F).

Gas Relative Density

Displays the library-calculated gas gravity (relative density) of the gas at *standard conditions* (14.73 psia, 60 degrees F). This is calculated using gas compositional information. It may be different from the gas gravity you enter on the Station **Quality** tab.

Base Density

Displays the library-calculated density of the gas at the contract base temperature and pressure specified on the Station **Quality** tab.

Base Z Factor

Displays the library-calculated Z factor of the gas at the contract base temperature and pressure specified on the Station **Quality** tab.

Gas Meter Screen - Values

The gas meters screen contains several tabs. The **Values** tab displays live calculated results for the meter.

The screenshot shows the 'Gas Meter Configuration' screen with the 'Values' tab selected. The meter is named 'Gas Meter 1' and is 'Enabled'. The screen displays a table of metrics for Volume, Energy, Mass, and Flow Seconds, along with Sp, Dp, Temperature, and Pulses.

	Volume [MSCF/Day]	Energy [MMBTU/Day]	Mass [M lb/Day]	Flow Seconds			
Flow Rate	0.000	0.000	0.000				
Current Hour	0.00 [MSCF]	0.00 [MMBTU]	0.00 [M lb]	0			
Last Hour	0.00	0.00	0.00	0			
Today	0.0	0.0	0.0	0			
Yesterday	5.1	5.0	0.3	1723			
Current Month	31	31	2	10012			
Previous Month	0	0	0	0			
Total	31	31	2	10012			
Sp	0.00	Dp	0.00	Temperature	0.00	Pulses	0

Gas Meter Screen – Values Tab

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Volume

Values in this column represent volumetric flow rates and accumulations. The screen displays the relevant units of measure.

Energy

Values in this column represent energy flow rates and accumulations. The screen displays the relevant units of measure.

Mass

Values in this column represent mass flow rates and accumulations. The screen displays the relevant units of measure.

Flow Rate

Values in this row represent instantaneous flow rate – as of the last successful calculation. The screen displays the relevant units of measure.

Current Hour

Values in this row represent the accumulated quantity for the current hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Last Hour

Values in this row represent the accumulated quantity for the previous hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Today

Values in this row represent the accumulated quantity for the current contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Yesterday

Values in this row represent the accumulated quantity for the previous contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Current Month

Values in this row represent the accumulated quantity for the current contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Previous Month

Values in this row represent the accumulated quantity for the previous contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Total

Values in this row represent the accumulated quantity for the lifetime of the flow computer installation. This value is not resettable by supported features. The screen displays the relevant units of measure.

Sp

Displays the live static pressure being used by the library for gas flow calculations. If the static pressure is measured in psig, this value will reflect meter measured pressure plus station atmospheric pressure. The screen displays the relevant units of measure.

Dp

Displays the live differential pressure being used by the library for gas flow calculations. The screen displays the relevant units of measure.

Temperature

Displays the live temperature being used by the library for gas flow calculations. The screen displays the relevant units of measure.

Pulses

Displays the live accumulated pulse quantity used by the library for gas flow calculations. This value is only appropriate for linear meters. The current release of the library only supports orifice meters.

Gas Meter Screen - Main

The gas meters screen contains several tabs. The **Main** tab is used to configure most of the important meter parameters.

The screenshot shows the 'Gas Meter Configuration' interface. At the top, the 'Main' tab is selected. The 'Meter Description' field contains 'Gas Meter 1'. To its right is an 'Enabled' checkbox which is checked, and a green circular status indicator. A 'Back' button is located in the top right corner. Below the description are tabs for 'Values', 'Main', 'Advanced', 'Ranges', 'Diagnostic', 'Cal Rpt Params', and 'Calibration'. The 'Main' tab is active, showing fields for 'Meter Serial Nbr' (GasMeterSN) and 'First Delivery Date'. The configuration is organized into three main sections: 'Meter Type' with dropdowns for 'Static Pressure Measurement Type' (absolute), 'Tap Type Flange', 'Fitting Type' (senior), and 'Static Pressure Tap Location' (upstream); 'Meter Size' with input fields for 'Pipe' (2.0670) and 'Orifice' (1.0000) diameters, and dropdowns for 'Material' (carbon_steel, monel) and 'Reference Temperature [Deg F]' (68.0); and 'Meter Misc' with checkboxes for 'Meter Has RTD', 'RTD is In Use', 'Meter Temperature is Live', 'Meter is Pressure Compensated', and 'Meter is Temperature Compensated'. The 'BeyondHMI' logo is in the bottom right corner.

Gas Meter Screen – Main Tab

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Meter Serial Number*

Use this field to specify the meter serial number. Meter serial numbers must be unique at each installation. Each meter on the PLC must have a unique serial number.

Note: CFX files for the different meters are organized on the PLC file system by meter serial number. Therefore, it is important to configure this parameter

BeyondHMI

correctly and – more importantly – to avoid changing it unless absolutely necessary. Meter serial numbers should not contain spaces.

First Delivery Date

Specify the first date of gas delivery through this meter. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Meter Type*

This version of the library only supports orifice meters.

Static Pressure Measurement Type*

Specify whether static pressure values are reported to the library in **absolute** or **gauge** pressure. If the **gauge** option is selected, the library will add the associated station's **atmospheric pressure** to the static pressure values before performing calculations.

*Note: This value defaults to **gauge** for all meters. However, most modern multi-variable sensors report **absolute** pressure. Be sure to configure this parameter correctly.*

Tap Type*

Applies to Orifice meters. The library only supports Flange taps.

Fitting Type

Specify the type of orifice fitting. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Static Pressure Tap Location*

This version of the library only supports static pressure measured at the upstream tap.

Pipe Diameter*

Specify the inside diameter of the meter tube. The screen displays the relevant units of measure.

Pipe Material*

Specify the type of material from which the meter tube was fabricated.

Pipe Reference Temperature*

Specify the reference temperature at which the meter tube measurement was made. The screen displays the relevant units of measure.

Orifice Diameter*

Specify the inside diameter of the orifice plate. The screen displays the relevant units of measure.

Orifice Material*

Specify the type of material from which the orifice plate was fabricated.

Orifice Reference Temperature*

Specify the reference temperature at which the orifice plate measurement was made. The screen displays the relevant units of measure.

Meter Has RTD check box

Indicates whether the meter is equipped with an RTD (usually true). This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

RTD in use

Indicates whether the meter RTD is being used to supply temperature values (usually true). This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature is Live

Indicates whether the temperature values are live (usually true). It is not used by the flow computer library.

Meter is Pressure Compensated

Indicate whether the meter is pressure compensated. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Meter is Temperature Compensated

Indicate whether the meter is temperature compensated. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Gas Meter Screen - Advanced

The gas meters screen contains several tabs. The **Advanced** tab is used to configure additional meter parameters.

The screenshot displays the 'Gas Meter Configuration' interface. At the top, the 'Meter Description' is 'Gas Meter 1', and the meter is 'Enabled' with a green status indicator. The 'Advanced' tab is selected. The configuration is organized into several sections:

- Meter Type:** Meter Factor (1.0000), K-Factor (1.0000), and Pulses_per_actual_Ft3 (dropdown menu).
- Gas:** Viscosity (0.00000689 [lbm/ft-sec]) and Ratio of Specific Heats (1.3).
- Setpoints:** Low Flow Cutoff Setpoint (0.10 [inch H2O]) and Backflow Cutoff Setpoint (0.00 [inch H2O]).
- Gas (Linear Meters Only):** Input Pulse Count Rolls Over at (0), Max Data Retention (35 [Days]), and Force Day Rollover (checkbox).

The BeyondHMI logo is visible in the bottom right corner of the screen.

Gas Meter Screen – Advanced Tab

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Meter Factor

Indicate the meter factor derived from meter proving. Applies to linear meters. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

K-Factor

BeyondHMI

Indicate the factor used to convert linear meter pulses to velocity units. Applies to linear meters. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

K-Factor Units

Indicate the units of measure represented by the K-factor. Applies to linear meters. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Low Flow Cutoff Setpoint*

Indicate the cutoff point to trigger no flow override. For orifice meters, this value pertains to differential pressure. If the differential pressure is below this value, then the meter is considered to be in *no flow* condition and the library will not accumulate volume, energy, or mass while the condition persists.

Backflow Cutoff Setpoint

Indicate the cutoff point to indicate backflow. The screen displays the relevant units of measure. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Viscosity*

Indicate the gas viscosity to use in calculations. If this value is left at 0.0 for an enabled meter, the library will default it to 0.0000069. The screen displays the relevant units of measure.

Ratio of Specific Heats*

Indicate the ratio of specific heats for the gas to use in calculations. If this value is left at 0.0 for an enabled meter, the library will default it to 1.3.

Input Pulse Count Rolls Over At

Applies to linear meters. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Max Data Retention*

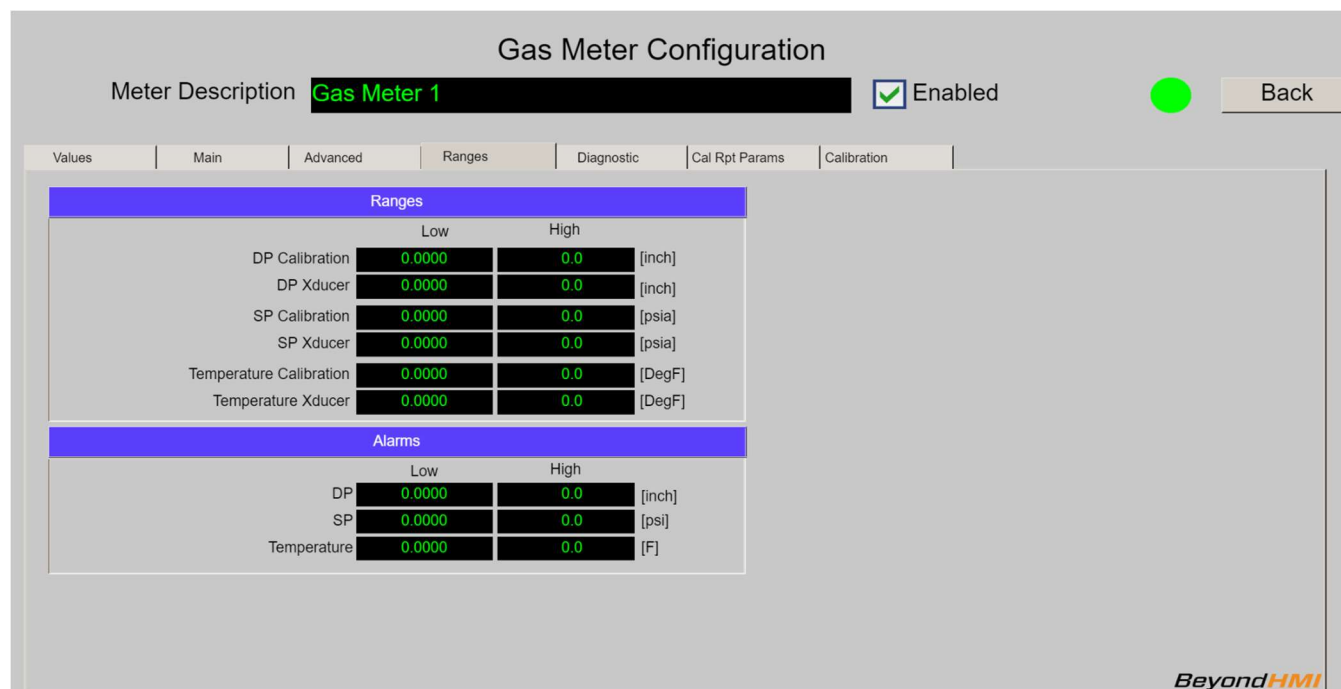
Indicate the number of days of data to save in the PLC file system. If this value is left less than 35 days for an enabled meter, the library will change it to 35. The value can be set larger than 35 days.

Force Day Rollover

Check this box to trigger an immediate "rollover" of data for the current day into a CFX file. Should be used sparingly.

Gas Meter Screen - Ranges

The gas meters screen contains several tabs. The **Ranges** tab is used configure parameters related to sensor ranges and alarm levels.



Gas Meter Screen – Ranges Tab

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

DP Calibrated Range

Enter the low and high ranges for calibration of the meter's differential pressure signal - if applicable. Applies to orifice and cone meters. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

DP Xducer Range

Enter the low and high ranges for absolute ranges of the meter's differential pressure sensor - if applicable. Applies to orifice and cone meters. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

SP Calibrated Range

Enter the low and high ranges for calibration of the meter's static pressure signal – if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

SP Xducer Range

Enter the low and high ranges for absolute ranges of the meter's static pressure sensor - if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature Calibrated Range

Enter the low and high ranges for calibration of the meter's temperature signal – if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature Xducer Range

Enter the low and high ranges for absolute ranges of the meter's temperature sensor - if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

DP Alarm*

Enter the low and high alarm levels for the differential pressure signal. These values are used to trigger alarm events in the flow computer's API 21.1 alarm logs.

SP Alarm*

Enter the low and high alarm levels for the static pressure signal. These values are used to trigger alarm events in the flow computer's API 21.1 alarm logs. The static pressure alarm uses the calculation static pressure [in psia] as the basis for triggering alarms. If the meter's **Static Pressure Measurement Type** is set to **gauge**, then the static pressure alarm logic will reference the static pressure value provided by the PLC program *plus* atmospheric pressure.

Temperature Alarm*

Enter the low and high alarm levels for the temperature signal. These values are used to trigger alarm events in the flow computer's API 21.1 alarm logs.

Gas Meter Screen - Diagnostic

The gas meters screen contains several tabs. The **Diagnostic** tab displays live diagnostic and internal calculation values from the library.

The screenshot displays the 'Gas Meter Configuration' screen for 'Gas Meter 1'. The 'Diagnostic' tab is selected, showing various parameters and their values. A green status indicator is visible in the top right corner.

Parameter	Value	Unit
Static Pressure	0.00	[psia]
Flowing Density	0.0000000	[lbm/CF]
Flowing Z Factor	0.0000000	
Orifice Diameter	0.99946	[inch]
Pipe Diameter	2.06613	[inch]
Beta Ratio	0.483735	
Reynolds Number	0	
Cd	0.600000	
Ev	0.000000	
Y1	0.000000	
Fpv	0.000000	
C Prime	0.000000	

The 'Errors' section shows a table with 6 rows, each containing '0' and 'NO ERROR'. A red message 'No Flow Indicated' is displayed at the bottom of the errors section.

Gas Meter Screen – Diagnostic Tab

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Static Pressure

Displays the static pressure value being used by the library for gas flow calculations.

Flowing Density

Displays the library-calculated density of the gas at flowing temperature and pressure.

Flowing Z Factor

Displays the library-calculated Z factor of the gas at flowing temperature and pressure.

Orifice Diameter

Displays the library-calculated, temperature corrected orifice size.

Pipe Diameter

Displays the library-calculated, temperature corrected meter tube size.

Beta Ratio

Displays the library-calculated beta ratio - using temperature corrected orifice and pipe sizes.

Reynolds Number

Displays the library-calculated Reynolds number for the instantaneous meter flow.

Cd Number

Displays the library-calculated Coefficient of Discharge (C_d) for the instantaneous meter flow.

Ev Number

Displays the library-calculated Velocity of Approach Factor (E_v) for the meter flow.

Y1 Number

Displays the library-calculated Expansion Factor (Y_1) for the meter flow.

Fpv

Displays the library-calculated Supercompressibility Factor (F_{pv}) for the flowing gas. This value is not used by the library's AGA-3 (2013) calculation, but it is a common factor used in other AGA-3 calculations.

C Prime

Displays the library-calculated CPrime from an orifice flow calculation. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library's AGA-3 (2013) calculation.

Error Codes and Messages

The library reports up to five Errors/Warnings for each meter. If more than five Errors/Warnings exist, only five will be displayed. Each Error/Warning is represented by a code number and a short text message. The table below provides further details for each Error/Warning. Note that

Errors must be corrected before calculations can resume for the meter, whereas Warnings are only for informational purposes.

Code	Text	Error or Warning	Description and Suggestions
0	NO ERROR		Meter is functioning without errors or warnings
1	W:BAD COMPN %	Warning	The gas compositional information for the associated station does not sum to 100%. Correct the station gas composition information or normalize the composition percentages, then commit changes to the station's gas composition.
2	W:STAT PRS GAGE	Warning	The meter's Static Pressure Measurement Type is set to gauge . Modify this configuration parameter if it is not correct. Most modern multivariable sensors report static pressure in psia
3	BAD HEAT VALUE	Warning	The gas heating value for the associated station is out of normal range. Correct this value in the station configuration.
1002	BAD ORIFICE SIZ	Error	The orifice size parameter has an unrealistic value. Correct the orifice size parameter for the meter.
1003	BAD PIPE SIZE	Error	The pipe size parameter has an unrealistic value. Correct the orifice size parameter for the meter.
1004	BAD LIVE TMPR	Error	The live temperature value is unrealistic.
1005	LOW CALCd Re	Error	The calculated Reynolds number is too low for AGA-3 calculations. This is caused by a combination of very low flow and the meter's Low Flow Cutoff Setpoint being set too low. When this error is displayed, the meter will not measure flow or accumulate volume (it is basically in "no flow override" mode). When flow goes above the critical level, the meter will start measuring flow again and this error will disappear.
1006	BAD ORF REF T	Error	The meter's Plate Reference Temperature value is unrealistic
1007	BAD PIPE REF T	Error	The meter's Pipe Reference Temperature value is unrealistic
1008	BAD MTR TYP	Error	The meter type parameter is wrong. This error should not be observed with this version of the library. Contact Beyond HMI, Inc. for help if this error is seen.
1009	INVALID STATN	Error	The meter is assigned to an invalid station number. Correct the meter's configuration so that its Station parameter is realistic.
1010	STATN DISABLED	Error	The station to which this meter is assigned is disabled. Enable the station or disable the meter.
1012	BAD BETA RATIO	Error	The calculated Beta ratio is unrealistic. It is unlikely that this error will ever be displayed. More likely, you will see either error 1002 or 1003 – or both.
1013	DENSITY FN ERR	Error	This indicates an internal error in the AGA-8 calculation code. Contact Beyond HMI, Inc. for help if this error is seen.

1014	BAD RE INPUTS	Error	The meter's viscosity parameter might be set to a number very close to zero. If the viscosity is set to exactly 0.0(repeating zeros) then the library will default the viscosity to a realistic value. If this message is displayed, check the meter's viscosity parameter.
1016	QUALITY COMMIT	Error	Changes have been made to critical gas property information on the associated station but those changes have not been committed. Go to the associated station's Quality configuration tab and trigger a Commit. The program should perform an automatic commit after about 5 minutes. This may result in a different error, so it is best to reconcile this error manually
1017	SERNBR 2 SHORT	Error	The meter's serial number is too short (or may not have been configured). The Meter Serial Number parameter for the meter must be at least 4 characters in length. Meter serial numbers are used to organize .cfx files in the PLC file system. It is important to use a correct (and unique) serial number for each meter.
1018	BAD BASE PRS	Error	The base pressure parameter on the associated station is unrealistic. Correct the base pressure parameter in the station configuration.
1019	BAD BASE TMPR	Error	The base temperature parameter on the associated station is unrealistic. Correct the base temperature parameter in the station configuration.
1020	MTR SN DUPLICT	Error	The meter Serial Number for this meter is the same as at least one other meter. Meter serial numbers must be unique – on any specific PLC.

No Flow Indicated

Error Codes and Messages

0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR

No Flow Indicated

When the input value for the meter is below no flow cutoff threshold, this text will appear – as a warning/notification. Volume does not accumulate and input value averaging is suppressed during *no flow*.

Gas Meter Screen – Cal Rpt Params

The gas meters screen contains several tabs. The **Cal Rpt Params** tab displays a set of static parameters which will be saved with a calibration or verification report. These fields are for documentation purposes only. They are not used for library calculations or CFX reporting. They are only used when a calibration or verification report is committed to memory.

Entry of these values is optional. However, if you wish to configure these values for a calibration report, you must Commit the changes using the checkbox described below. If changes are not Committed, they will be lost when the PLC loses power.

The screenshot shows the 'Gas Meter Configuration' interface. At the top, the title is 'Gas Meter Configuration'. Below it, 'Meter Description' is 'Gas Meter 1', and there is a green checkmark next to 'Enabled' and a green status indicator. A 'Back' button is on the right. Below this is a tabbed interface with tabs for 'Values', 'Main', 'Advanced', 'Ranges', 'Diagnostic', 'Cal Rpt Params' (selected), and 'Calibration'. The 'Cal Rpt Params' tab is active, showing a 'Meter Calibration Parameters' section with the following fields:

Producer Name	ABC Resources
Purchaser Name	XYZ Midstream Partners
Lease Name	State 18-12
Well / Facility Name	Central
Well / Facility Number	T8
DP Transducer Make/Model	N1289FGD
SP Transducer Make/Model	M87152KL
Tmptr Transducer Make/Model	XY457

At the bottom of the form are two checkboxes: Commit Changes and Cancel / Refresh. The 'BeyondHMI' logo is in the bottom right corner.

Gas Meter Screen – Cal Rpt Params Tab

Commit Changes

After making changes on this screen, check this box to signal the library to save your changes to persistent memory. ***If changes are not committed, they will be lost when the PLC is power-cycled.*** When the library has finished saving the changes, this box will be un-checked.

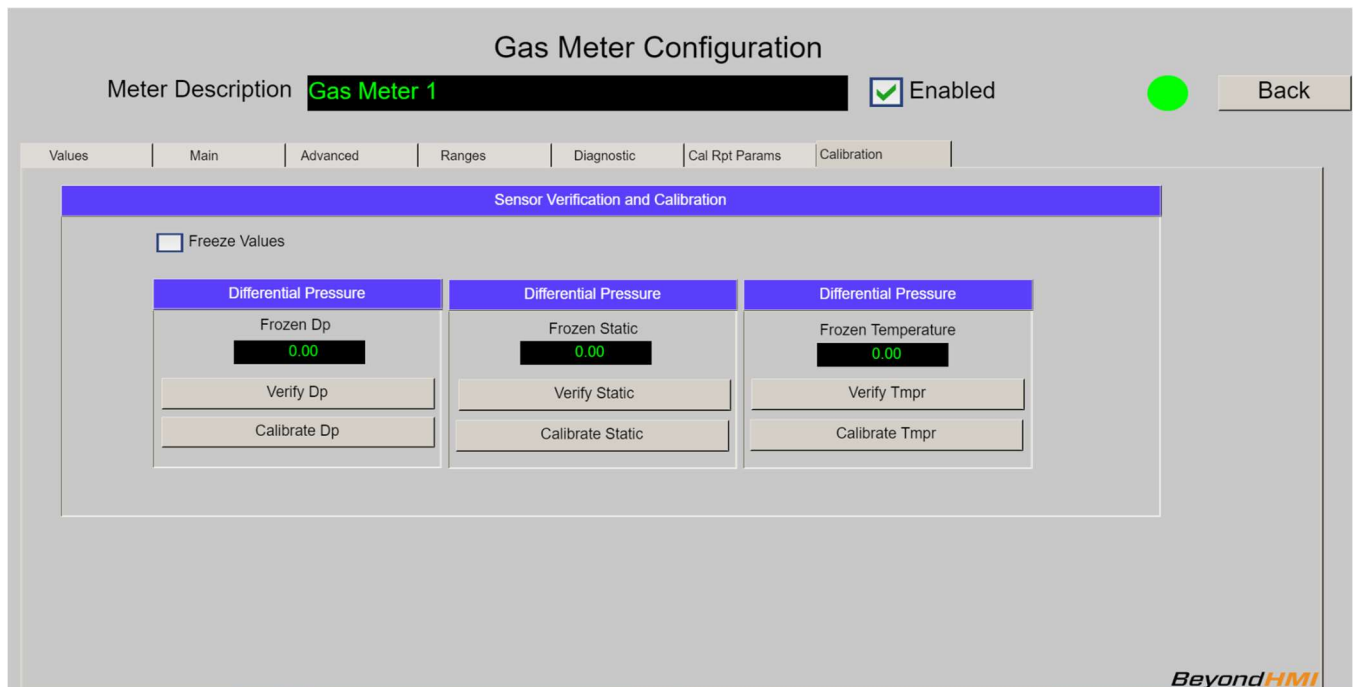
Cancel / Refresh

If you wish to cancel changes that you have made, check this box to signal the library to reload values from persistent memory. When the library has finished reloading the screen, this box will be un-checked.

Gas Meter Screen - Calibration

The gas meters screen contains several tabs. The **Calibration** tab is used to initiate a calibration or a verification of one of the analog input signals.

By default, all input signals are directly translated to process variables. If calibration is performed in the sensor and a digital interface is used to obtain values from the sensor, it is not necessary to calibrate signals in the BHI library. If calibration is performed in the BHI library, a transfer function will be applied to that signal until another calibration is performed on that signal.



Gas Meter Screen – Calibration Tab

Freeze Values Checkbox*

Before calibrating or verifying, check this box to freeze all input signals. After calibration/verification, uncheck this box so the library uses live input values for flow calculations.

Frozen Dp

This text box displays the frozen differential pressure value being used by the flow calculations.

Frozen Static

This text box displays the frozen static pressure value being used by the flow calculations.

Frozen Tmpr

This text box displays the frozen temperature value being used by the flow calculations.

Verify Dp Button

Use this button to initiate a verification of the differential pressure signal.

Verify Static Button

Use this button to initiate a verification of the static pressure signal.

Verify Tmpr Button

Use this button to initiate a verification of the temperature signal.

Calibrate Dp Button

Use this button to initiate a calibration of the differential pressure signal.

Calibrate Static Button

Use this button to initiate a calibration of the static pressure signal.

Calibrate Tmpr Button

Use this button to initiate a calibration of the temperature signal.

Meter Verification Screen

The **Meter Verification** screen is displayed after you select one of the **Verify...** buttons from the **Calibration Tab** of the **Meter** screen. The screen supports up to 6 verification points.

Meter signals should be set to the Frozen state before performing verifications.

Meter Verification

	Action	Actual	Expected	Deviation	Deviation %
1		0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00
3		0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00
5		0.00	0.00	0.00	0.00
6		0.00	0.00	0.00	0.00

Normal Value

Tester Value

Live Reading

Deviation [%]

Meter Values Not Frozen

BeyondHMI

Meter Verification Screen

Normal Value

This is a “memo only” field for BLM calibration/verification reports. It is not used by the library – except to display on the verification report.

Tester Value*

Enter the reference value being applied to the signal.

Log Verify Button*

Use this button to signal that the verification point is ready to be saved for the verification report.

Complete Verification Button*

Use this button to signal that you have logged all verification points and you are ready to commit the verification to the database.

BeyondHMI

You must proceed through the Completion process to get the verification points saved to persistent memory – where they will be available for generating a verification report.

Cancel Verification Button

Use this button to cancel a verification.

If you cancel a verification, all data related to that verification will be lost.

Meter Values Not Frozen message

This message will appear if you have not frozen the meter signals prior to attempting a verification. If you see this message, cancel the verification, freeze meter signals, and restart the verification process.

Meter Serial Number Not Set message

This message will appear if you have not configured the meter serial number on the meter screen – main tab. If you see this message, cancel the verification, properly configure the meter, and restart the verification process.

Meter Calibration Screen

The **Meter Calibration** screen is displayed after you select one of the **Calibrate...** buttons from the **Calibration Tab** of the **Meter** screen. The screen supports up to 6 verification points.

Meter signals should be set to the Frozen state before performing calibrations.

Meter Calibration

	Action	As Found	As Left	Deviation	Deviation %
1		0.00	0.00	0.00	0.00
2		0.00	0.00	0.00	0.00
3		0.00	0.00	0.00	0.00
4		0.00	0.00	0.00	0.00
5		0.00	0.00	0.00	0.00
6		0.00	0.00	0.00	0.00

Normal Value

Tester Value

Live Reading

Deviation [%]

Meter Values Not Frozen

BeyondHMI

Meter Calibration Screen

Normal Value

This is a “memo only” field for BLM calibration/verification reports. It is not used by the library – except to display on the calibration report.

Tester Value*

Enter the reference value being applied to the signal.

Set Zero Button*

Use this button to signal that the current live reading and tester values are to be used as the low range calibration point.

Set Span Button*

Use this button to signal that the current live reading and tester values are to be used as the high range calibration point.

Set Mid Button*

BeyondHMI

Use this button to signal that the current live reading and tester values are to be used as reference mid-points for the calibration.

Complete Calibration Button*

Use this button to signal that you have logged all calibration points and you are ready to commit the calibration to the database.

You must proceed through the Completion process to get the calibration points saved to persistent memory – where they will be used by the BHI library to scale input values and will be available for generating a calibration report.

Cancel Calibration Button

Use this button to cancel a calibration.

If you cancel a calibration, all data related to that calibration will be lost.

Meter Values Not Frozen message

This message will appear if you have not frozen the meter signals prior to attempting a calibration. If you see this message, cancel the calibration, freeze meter signals, and restart the calibration process.

Meter Serial Number Not Set message

This message will appear if you have not configured the meter serial number on the meter screen – main tab. If you see this message, cancel the calibration, properly configure the meter, and restart the calibration process.

Verification and Calibration Report Description Screen

The **Verification and Calibration Report Description** screen is displayed after you select one of the **Complete...** buttons on either the **Meter Verification** or the **Meter Calibration** screens. The screen supports up to 6 verification points.

*The information entered on this screen is optional. However, you **MUST** select the **Commit button** to save your verification or calibration data to the database*

Verification and Calibration Report Description

Tester

Affiliation [Redacted]
Remarks [Redacted]

Witness

Affiliation [Redacted]
Remarks [Redacted]

Validation Equipment

Range [Redacted]
Last Calibration Date [Redacted]

Prior Inspection Date/Time [Redacted]
Prior Inspection Condition [Redacted]
Prior Verification Date/Time [Redacted] Prior Calibration Date/Time [Redacted]

Commit Verification/Calibration Cancel Verification/Calibration

BeyondHMI

Meter Calibration Screen

Commit Verification/Calibration Button*

Use this button to signal that you are ready to commit the data to the database.

You must proceed through the Completion process and Commit changes (even if you do not enter any data on this screen) to get the verification or calibration points saved to persistent memory.

Cancel Verification/Calibration Button

Use this button to cancel a verification or calibration.

If you cancel a verification or calibration, all related data will be discarded.

Gas Meter Current Day Periodic History Screen

The gas meter current day periodic history screen can be used to review API 21.1 periodic history for a gas meter for the current day.

Periodic Index	Start Timestamp	End Timestamp	Duration [sec]	Flow [sec]	DP/pulses	Static Prs	Tmpr	Extensn/Raw vol	CPrime	Volume	Energy	Mass
23	01/19/2022 05:00:00	01/19/2022 06:00:00	3600	0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0
24	N/A	N/A	0	0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0
25	N/A	N/A	0	0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0
0	01/19/2022 06:00:00	01/19/2022 07:00:00	3600	0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0

Gas Current Day Periodic History Screen

The library maintains a buffer 25 periodic history records for each meter. Each periodic history record is meant to contain up to one hour of flow data. However, these history records are broken/changed any time a significant parameter change is made. So, the periodic history log may contain records including less than one hour of data.

The first periodic record for the meter is stored at periodic index zero. Subsequent periods are stored at indices with increasing numbers. The periodic history is not a circular buffer. This data is not overwritten until the previous days' worth of data has been archived to a cfx file.

For long term data retention, periodic history is copied to the .cfx files. A new cfx file is created at least once per day (after contract day change), or when a major configuration change is made to the meter or its station. Once periodic data is archived to a cfx file, the PLC program has no facilities for displaying that data.

The current day periodic history screen can be used to view portions of the current day's periodic history for a meter. Four records are displayed at one time. The user can navigate through the entire 25 record log using this screen – viewing 4 records at one time. The user can change position in the periodic history log by changing the **Index of First Record to Display** parameter on the screen. In the example above, the **Index of First Record to Display** parameter is set to zero. As a result, alarms zero through 3 are displayed. If the **Index of First Record to Display** parameter were changed to 5, for example, the screen would refresh – showing records 5, 6, and 7.

BeyondHMI

The logic behind this screen can handle “rollover”. For example, if the **Index of First Record to Display** parameter were changed to 23, the screen would refresh and records 23, 24, 25, and zero would be displayed.

If you wish to view the 4 most recent periods, check the **Show Most Recent Periodic History** check box and the screen will refresh – displaying the 4 most recent records (the single most recent record will be at the bottom of the list).

The **Index of Record that program is currently populating** parameter reveals the current position of the periodic history logic – within the buffer.

Meter

This combo box displays the description of the gas meter.

Show Most Recent Periodic History check box

Check this box to force the screen to refresh – showing the most recent periodic history records in the log.

Index of First Record to Display

Enter a number in this box (0 through 25) to cause the screen to update – showing periodic history records at a specific location within the buffer. The refreshed list will start with the periodic history record number you enter.

Index of Record that program is currently populating

This read-only field displays the position where the library is currently accumulating flow information.

Periodic Index

Displays the periodic index number (0-25).

Start Timestamp

Displays the local timestamp at which the period began.

End Timestamp

Displays the local timestamp at which the period ended.

Duration

Displays the elapsed time between Start Timestamp and End Timestamp.

Flow Time

Displays the amount of flowing time accumulated during the period.

DP/Pulses

BeyondHMI

For Orifice and cone meters, this field displays the flow time weighted average of the differential pressure during the period. For linear meters, this field displays the number of pulses accumulated during the period.

Static Pressure

This field displays the flow time weighted average of the static pressure during the period.

Temperature

This field displays the flow time weighted average of the temperature during the period.

Extensn/Raw Volume

For Orifice and cone meters, this field displays the flow time weighted average of the calculation extension during the period. For linear meters, this field displays the raw volume accumulated during the period.

CPrime

For Orifice and cone meters, this field displays the flow time weighted average CPrime during the period.

Volume

This field displays the accumulated volume during the period.

Energy

This field displays the accumulated energy during the period.

Mass

This field displays the accumulated mass during the period.

Liquid Meter Screen – Custody Transfer (Custody Xfer)

The liquid meters screen contains several tabs. The **Custody Xfer** tab displays live calculated results for the meter – when the meter is calculating for custody-transfer.

Liquid Meter Configuration

Meter: Enabled

	Indicated Quantity	Indicated Vol [BPD]	Gross Vol [BPD]	Gross Std Vol [BPD]	Net Std Vol [BPD]	S&W Vol [BPD]	Gross Mass [lbm/d]				
Flow Rate	2315.520	2315.520	2315.520	2273.176	2243.625	29.551	677268.188				
		[BBL]	[BBL]	[BBL]	[BBL]	[BBL]	[lbm]				
Current Hour	0.48	0.48	0.48	0.47	0.47	0.01	141.10				
Last Hour	7.24	7.24	7.24	7.10	7.01	0.09	2116.46				
Today	0.5	0.5	0.5	0.5	0.5	0.0	141.1				
Yesterday	7.2	7.2	7.2	7.1	7.0	0.1	2116.5				
Current Month	181684	181684	181684	178361	176042	2319	53140776				
Previous Month	0	0	0	0	0	0	0				
Total	181684	181684	181684	178361	176042	2319	53140776				
Sp	74.70	Density	37.900	Temperature	99.40	S&W	1.30	Pulses	7437	Rate	---

BeyondHMI

Liquid Meter Screen – Values Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Indicated Quantity

BeyondHMI

Values in this column represent the raw meter values. These will be in either barrels or pounds – depending upon whether the meter is providing raw input related to volume or density.

Indicated Vol

Values in this column represent raw meter values – in volume units. If the meter is reporting in volume units, these numbers will be identical to those in the indicated quantity column. The screen displays the relevant units of measure.

Gross Vol

Values in this column represent the indicated volume adjusted for meter factor. The screen displays the relevant units of measure.

Gross Std

Values in this column represent the gross volume – corrected for temperature and pressure. The screen displays the relevant units of measure.

Net Std Vol

Values in this column represent the gross standard volume, minus the amount of S&W. The screen displays the relevant units of measure.

S&W Vol

Values in this column represent the amount of S&W for the meter. The screen displays the relevant units of measure.

Gross Mass

Values in this column represent the gross mass measured through the meter. The screen displays the relevant units of measure.

Flow Rate

Values in this row represent the *ten-second averaged* calculated flow rate – as of the last successful calculation. The screen displays the relevant units of measure.

These values will update at ten-second intervals.

If the meter input is a flow rate (see **Meter Input is a Flow Rate**), these values will be based on the average of the input flow rates over the preceding ten-second period.

If the meter input is an accumulation (see **Meter Input is a Flow Rate**), these values will be based on differentiation of the meter accumulation over the preceding ten-second period.

Current Hour

BeyondHMI

Values in this row represent the accumulated quantity for the current hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Last Hour

Values in this row represent the accumulated quantity for the previous hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Today

Values in this row represent the accumulated quantity for the current contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Yesterday

Values in this row represent the accumulated quantity for the previous contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Current Month

Values in this row represent the accumulated quantity for the current contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Previous Month

Values in this row represent the accumulated quantity for the previous contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Total

Values in this row represent the accumulated quantity for the lifetime of the flow computer installation. This value is not resettable by supported features. The screen displays the relevant units of measure.

Sp

Displays the live static pressure being used by the library for oil correction factor calculations. This is the value used for both density pressure and meter pressure. It should be supplied to the library in psig.

Density

BeyondHMI

Displays the live density for the meter conditions. It should be supplied to the library in API gravity.

Temperature

Displays the live temperature being used by the library for oil correction factor calculations. The screen displays the relevant units of measure. It should be supplied to the library in degrees F.

S&W

Displays the live S&W content of the fluid. It should be supplied to the library in percent.

Pulses

Displays the live raw accumulated pulse quantity used by the library for oil flow calculations – when the meter is providing accumulated pulses. If the input from the meter is in flow rate, this number will be zero.

Rate

Displays the live raw flow rate used by the library for oil flow calculations. When the meter is providing a flow rate, this value is the flow rate from the meter. If the input from the meter is in accumulated pulses, this number is a pseudo-rate calculated by differentiating the change in input units over a ten-second.

Liquid meter Screen - Main

The liquid meters screen contains several tabs. The **Main** tab is used to configure most of the important meter parameters.

Liquid Meter Configuration

Meter: Enabled

Custody Xfer | **Main** | Advanced | Ranges | Diagnostic | Allocation | Cal Rpt Params | Calibration

Meter Identity

Meter Serial Nbr

Flow Computer ID

First Delivery Date

CFX Product Code

Meter Inputs

Meter Type

Meter Input is in Mass

Meter Input is a Flow Rate

S&W from Standard Conditions

Meter Identity

Contract Hour

Measurement Standard

BeyondHMI

Liquid meter Screen – Main Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Meter Serial Number*

BeyondHMI

Use this field to specify the meter serial number. Meter serial numbers must be unique at each installation. Each meter on the PLC must have a unique serial number.

Note: CFX files for the different meters are organized on the PLC file system by meter serial number. Therefore, it is important to configure this parameter correctly and – more importantly – to avoid changing it unless absolutely necessary. Meter serial numbers should not contain spaces.

Flow Computer ID

Specify the Flow Computer ID to associate with this station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

First Delivery Date

Specify the first date of oil delivery through this meter. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

CFX Product Code*

This product name is passed to FLOWCAL through the CFX file. It must match a product code already configured in the end-user's FLOWCAL system. The library defaults to a product code of "Crude Oil".

Meter Type

Specify the type of primary element being used. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Meter Input is in Mass*

The library will accept meter input in mass or volume. If the meter input is in volume, leave this box unchecked. If the meter input is in mass, check this box.

Meter Input is a Flow Rate*

The library will accept meter input as a flow rate or as accumulated (totalizer) value. If the meter input is an accumulated volume or mass, leave this box unchecked. If the meter input is in volume or mass flow rate, check this box.

S&W from Standard Conditions check box*

Indicates whether the value provided for S&W was derived at standard conditions – such as from a grind out (if checked) or the S&W is a "live" value - derived at/near meter temperature and pressure (if unchecked).

Contract Hour*

Specify the hour when the contract day changes. The contract day will change at the beginning of the configured hour.

Measurement Standard Combo Box*

Indicates the type of calculation to perform. Options are:

- Oil - Custody Transfer: API 12 calculations will be used
- Oil – Allocation: API 20.1 calculations will be used
- Water – product will be treated as pure water

Liquid meter Screen - Advanced

The liquid meters screen contains several tabs. The **Advanced** tab is used to configure additional meter parameters.

Liquid Meter Configuration

Meter: Oil Leg **Oil Leg** Enabled ● Back

Custody Xfer | Main | **Advanced** | Ranges | Diagnostic | Allocation | Cal Rpt Params | Calibration

Meter Signal	Other Input Factors
Meter Factor: 1.0000	Density Factor: 1.0000
K-Factor: 10000.0000 [Pulses/BBL]	Shrink Factor: 1.0000
Pulse Source Roll Over: 0	Flash Gas Factor: 0.0000 [mscf / BBL]
<input type="checkbox"/> Meter is Pressure Compensated	
<input type="checkbox"/> Meter is Temperature Compensated	

Setpoints	Misc
Low Flow Cutoff Setpoint: 0.0	Max Data Retention: 35 [Days]
Backflow Cutoff Setpoint: 0.0	<input type="checkbox"/> Force Day Rollover
	<input type="checkbox"/> Meter Has RTD
	<input type="checkbox"/> RTD is In Use
	<input type="checkbox"/> Meter Temperature is Live
	Power Source: AC

BeyondHMI

Liquid meter Screen – Advanced Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator ●

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Meter Factor*

Indicate the meter factor derived from meter proving. This field is used in calculation of gross volume.

K-Factor*

Indicate the factor used to convert linear meter pulses to velocity or accumulation units. The K-factor entered in this field must be in either pulses per barrel or pulses per pound – depending upon how the **Meter Input is in Mass** parameter is set.

Pulse Source Rollover

Enter the value at which the accumulator rolls over to zero. If the meter has an internal accumulator which is being used, enter the value at which the meter accumulator rolls over. If the meter is supplying pulses to a device or module which counts the pulses, enter the value at which this device or module rolls over. If the meter input is a flow rate, this field is not used. If the meter input is an accumulation, this value is used to detect and account for meter accumulator rollover.

Meter is Pressure Compensated

Indicate whether the meter is pressure compensated. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Meter is Temperature Compensated

Indicate whether the meter is temperature compensated. This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Density Factor*

Indicate the factor to apply to the input density – as derived during proving. This value is used in both custody-transfer and allocation calculations.

Shrink Factor*

Indicate the shrinkage factor - as derived per API 20.1 - to apply to an allocation meter. The value in this field is ignored for custody-transfer calculations.

Flash Gas Factor*

Indicate the flash gas factor (estimating the amount of gas that will flash out of a theoretical gross barrel of oil) - as derived per API 20.1 - to apply to an allocation meter. The value in this field is ignored for custody-transfer calculations.

Low Flow Cutoff Setpoint*

Indicate the cutoff point to trigger no flow override. For liquid meters, this threshold is applied to the indicated quantity flow rate (barrels per day or pounds per day).

BeyondHMI

If the meter input is a flow rate (see **Meter Input is a Flow Rate**), this threshold is compared to the meter input flow rate. If the meter input is a rate below this setpoint, no volume will accumulate.

If the meter input is an accumulation (see **Meter Input is a Flow Rate**), this threshold is compared to the pseudo-rate calculated by the library (pulse change of a ten second period converted to a daily flow rate). If the meter pseudo-rate below this setpoint, no volume will accumulate.

Backflow Cutoff Setpoint

Indicate the cutoff point to indicate backflow. For liquid meters, this threshold is applied to the indicated quantity flow rate (barrels per day or pounds per day). This field is passed to FLOWCAL in the CFX file. It is not used by the current version of the flow computer library.

Max Data Retention*

Indicate the number of days of data to save in the PLC file system. If this value is left less than 35 days for an enabled meter, the library will change it to 35. The value can be set larger than 35 days.

Force Day Rollover

Check this box to trigger an immediate “rollover” of data for the current day into a CFX file. Should be used sparingly.

Meter Has RTD check box

Indicates whether the meter is equipped with an RTD (usually true). This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

RTD in use

Indicates whether the meter RTD is being used to supply temperature values (usually true). This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature is Live

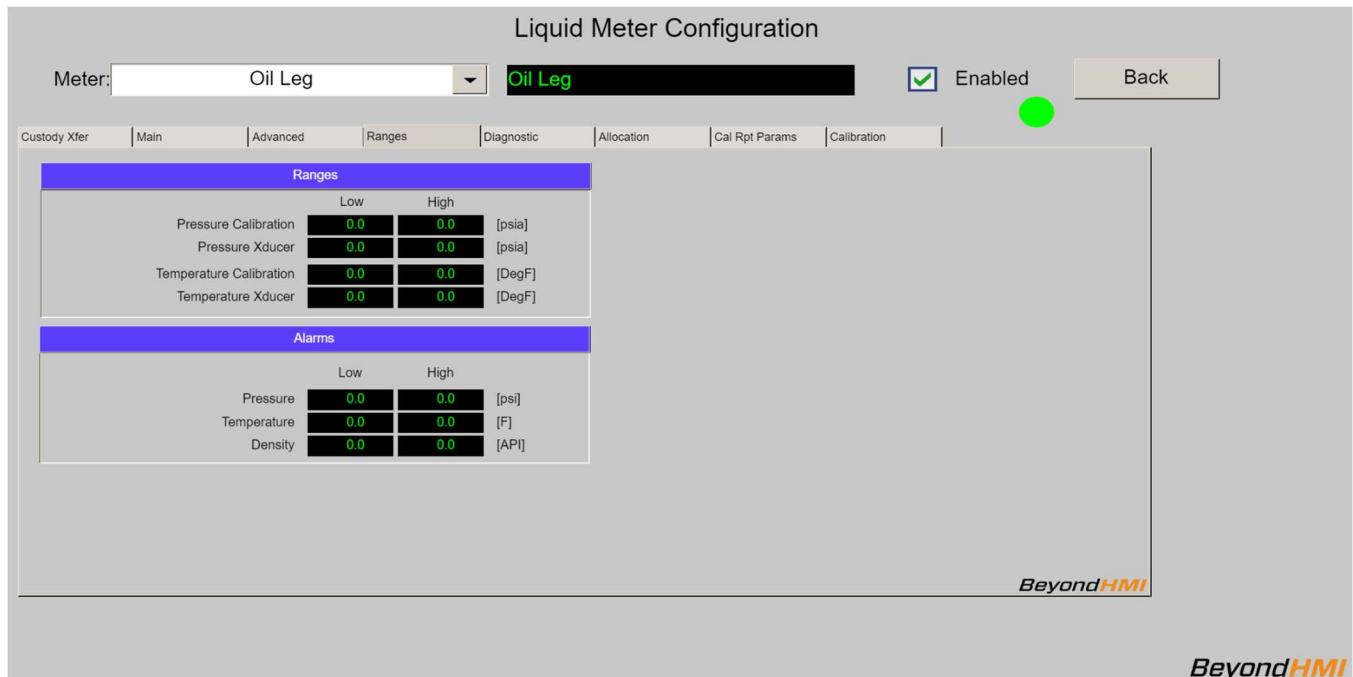
Indicates whether the temperature values are live (usually true). It is not used by the flow computer library.

Power Source Combo Box

Use this combo box to specify the power source for the station. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Liquid meter Screen - Ranges

The liquid meters screen contains several tabs. The **Ranges** tab is used to configure parameters related to sensor ranges and alarm levels.



Liquid meter Screen – Ranges Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator



Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Pressure Calibration Ranges

Enter the low and high ranges for calibration of the meter's static pressure signal – if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Pressure Xducer Ranges

Enter the low and high ranges for absolute ranges of the meter's static pressure sensor - if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature Calibration Ranges

Enter the low and high ranges for calibration of the meter's temperature signal – if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Temperature Xducer Ranges

Enter the low and high ranges for absolute ranges of the meter's temperature sensor - if applicable. Applies to most meter types. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Pressure Alarms*

Enter the low and high alarm levels for the static pressure signal. These values are used to trigger alarm events in the flow computer's API 21.1 alarm logs. The static pressure alarm uses the calculation static pressure [in psia] as the basis for triggering alarms. If the meter's **Static Pressure Measurement Type** is set to **gauge**, then the static pressure alarm logic will reference the static pressure value provided by the PLC program *plus* atmospheric pressure.

Temperature Alarms*

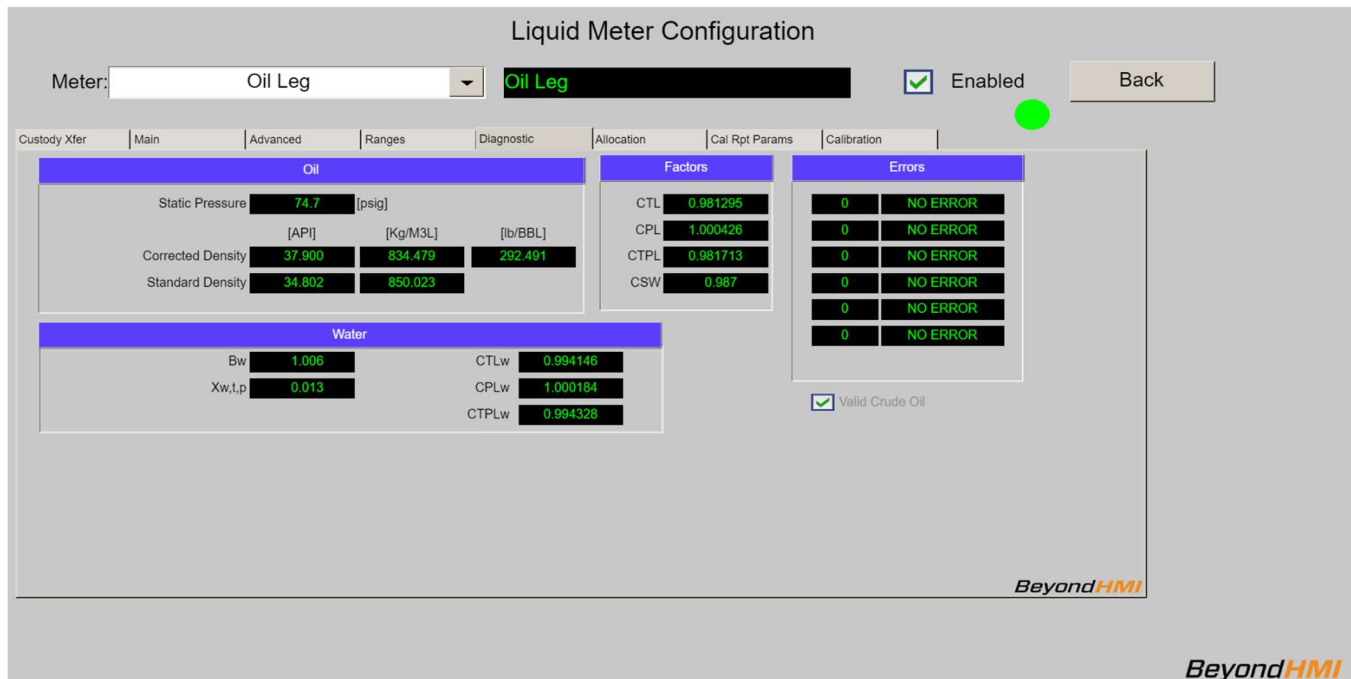
Enter the low and high alarm levels for the temperature signal. These values are used to trigger alarm events in the flow computer's API 21.1 alarm logs.

Density Alarms

Enter the low and high alarm levels for the density signal. This field is passed to FLOWCAL in the CFX file. It is not used by the flow computer library.

Liquid meter Screen - Diagnostic

The liquid meters screen contains several tabs. The **Diagnostic** tab displays live diagnostic and internal calculation values from the library.



Liquid meter Screen – Diagnostic Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Static Pressure

Displays the static pressure value being used by the library for oil flow calculations.

Corrected Density

Displays the input density value – with the density factor applied – in multiple units of measure.

Standard Density

Displays the library-calculated standard density of the oil.

CTL

Displays the library-calculated API 11.1 correction for temperature of the oil.

CPL

Displays the library-calculated API 11.1 correction for pressure of the oil.

CTPL

Displays the combined CTL and CPL

CSW

Displays the library-calculated correction for sediments and water.

Bw

Displays the library-calculated correction factor for allocation meter water.

Xw,t,p

Displays the corrected (for pressure and temperature) water cut as a fraction. If the **S&W from Standard Conditions check box** is NOT checked, this value will be the same as the input S&W percentage – scaled to a fraction. If the **S&W from Standard Conditions check box** IS checked, this value will be the adjusted form of the input S&W percentage – scaled to a fraction. The value will be corrected to account for changes in volume of the water and the mixture from standard conditions to meter pressure and temperature.

CTLw

Displays the library-calculated API 11.1 correction for temperature of the water.

CPLw

Displays the library-calculated API 11.1 correction for pressure of the water.

CTPLw

Displays the combined CTLw and CPLw

Valid Crude Oil

BeyondHMI

Displays a check when the oil API gravity provided to the library is within the valid range for crude oil – as defined by API 11.1. The valid range is -10 to 100 degrees API.

Error Codes and Messages

The library reports up to five Errors/Warnings for each meter. If more than five Errors/Warnings exist, only five will be displayed. Each Error/Warning is represented by a code number and a short text message. The table below provides further details for each Error/Warning. Note that Errors must be corrected before calculations can resume for the meter, whereas Warnings are only for informational purposes.

Code	Text	Error or Warning	Description and Suggestions
0	NO ERROR		Meter is functioning without errors or warnings
1021	CONVERGE FAIL	Error	The API 11.1 density calculation failed to converge. Contact Beyond HMI.
1022	OIL CTPL FAIL	Error	The oil correction factor calculations failed. Check that all oil properties and pressure and temperature are realistic.
1023	WTR CTPL FAIL	Error	The water correction factor calculations failed. Check that all S&W percent and pressure and temperature are realistic.
1024	BAD S&W PCNT	Error	The corrected S&W fraction is less than 0.0 or greater than 1.0. Check that all S&W percent and pressure and temperature are realistic.

No Flow Indicated

Error Codes and Messages

0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR
0	NO ERROR

No Flow Indicated

When the input value for the meter is below no flow cutoff threshold, this text will appear – as a warning/notification. See **Low Flow Cutoff Setpoint** for more information about library behavior in this state.

Liquid meter Screen - Allocation

The liquid meters screen contains several tabs. The **Allocation** tab displays calculation results when the library is calculating for an allocation meter.

Liquid Meter Configuration

Meter: Enabled

	Indicated Quantity	Indicated Vol [BPD]	Gross Vol [BPD]	GTOV Vol [BPD]	NTOV Vol [BPD]	GTWV Vol [BPD]	Flass Gas Vol [mscf]
Flow Rate	2315.520	2315.520	2315.520	0.000	0.000	0.000	0.000
	[BBL]	[BBL]	[BBL]	[BBL]	[BBL]	[BBL]	[mscf]
Current Hour	6.11	6.11	6.11	0.00	0.00	0.00	0.00
Last Hour	7.24	7.24	7.24	0.00	0.00	0.00	0.00
Today	6.1	6.1	6.1	0.0	0.0	0.0	0.0
Yesterday	7.2	7.2	7.2	0.0	0.0	0.0	0.0
Current Month	181689	181689	181689	0	0	0	0
Previous Month	0	0	0	0	0	0	0
Total	181689	181689	181689	0	0	0	0

Sp Density Temperature S&W Pulses Rate

BeyondHMI

Liquid meter Screen – Allocation Tab

Meter Combo Box*

Use this combo box to select the liquid meter that you want to view.

Meter Description Text Box*

This text box is used to modify the common descriptive name of the currently-selected meter.

Enabled*

Use this check box to enable/disable the meter. Disabled meters are ignored by the library.

Status Indicator

Displays the configuration status of the meter. When the meter is enabled, the library internally verifies the configuration. If the configuration is correct, the indicator will be green. If the indicator is orange, see the Diagnostic tab for details about identified configuration issues. Note that some of the indicated issues are only warnings.

Indicated Quantity

BeyondHMI

Values in this column represent the raw meter values. These will be in either barrels or pounds – depending upon whether the meter is providing raw input related to volume or density.

Indicated Vol

Values in this column represent raw meter values – in volume units. If the meter is reporting in volume units, these numbers will be identical to those in the indicated quantity column. The screen displays the relevant units of measure.

Gross Vol

Values in this column represent the indicated volume adjusted for meter factor. The screen displays the relevant units of measure.

GTOV Vol

Values in this column represent the gross theoretical oil volume – the stabilized stock tank liquid equivalent volume. The screen displays the relevant units of measure.

NTOV Vol

Values in this column represent the net theoretical oil volume – the stabilized stock tank oil equivalent volume. The screen displays the relevant units of measure.

GTWV Vol

Values in this column represent the gross theoretical water volume – the stabilized stock tank wall equivalent volume. The screen displays the relevant units of measure.

Flash Gas Vol

Values in this column represent the estimated gas volume that will flash out of the measured oil as the product moves downstream and stabilizes. The screen displays the relevant units of measure.

Flow Rate

Values in this row represent instantaneous flow rate – as of the last successful calculation. The screen displays the relevant units of measure.

Current Hour

Values in this row represent the accumulated quantity for the current hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Last Hour

BeyondHMI

Values in this row represent the accumulated quantity for the previous hour. An hourly period is initiated when the PLC clock indicates a change of hour. The screen displays the relevant units of measure.

Today

Values in this row represent the accumulated quantity for the current contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Yesterday

Values in this row represent the accumulated quantity for the previous contract day. The hour at which the contract day changes is configurable – by station. The contract day changes at the *beginning* of the configured hour. The screen displays the relevant units of measure.

Current Month

Values in this row represent the accumulated quantity for the current contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Previous Month

Values in this row represent the accumulated quantity for the previous contract month. The contract month changes on the first day of each calendar month - at the *beginning* of the configured contract hour. The screen displays the relevant units of measure.

Total

Values in this row represent the accumulated quantity for the lifetime of the flow computer installation. This value is not resettable by supported features. The screen displays the relevant units of measure.

Sp

Displays the live static pressure being used by the library for oil correction factor calculations. This is the value used for both density pressure and meter pressure. It should be supplied to the library in psig.

Density

Displays the live density for the meter conditions. It should be supplied to the library in API gravity.

Temperature

BeyondHMI

Displays the live temperature being used by the library for oil correction factor calculations. The screen displays the relevant units of measure. It should be supplied to the library in degrees F.

S&W

Displays the live S&W content of the fluid. It should be supplied to the library in percent.

Pulses

Displays the live raw accumulated pulse quantity used by the library for oil flow calculations – when the meter is providing accumulated pulses. If the input from the meter is in flow rate, this number will be zero.

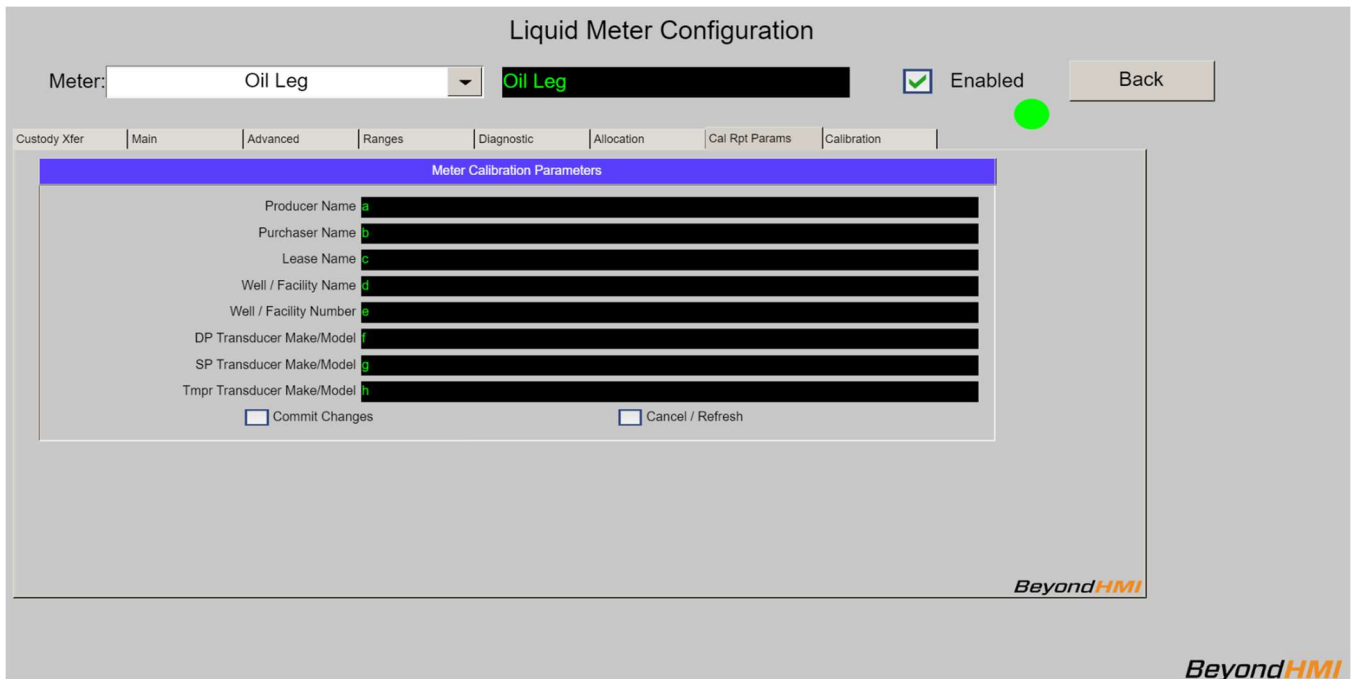
Rate

Displays the live raw flow rate used by the library for oil flow calculations – when the meter is providing a flow rate. If the input from the meter is in accumulated pulses, this number will be zero.

Liquid meter Screen – Cal Rpt Params

The liquid meters screen contains several tabs. The **Cal Rpt Params** tab displays a set of static parameters which will be saved with a calibration or verification report. These fields are for documentation purposes only. They are not used for library calculations or CFX reporting. They are only used when a calibration or verification report is committed to memory.

Entry of these values is optional. However, if you wish to configure these values for a calibration report, you must Commit the changes using the checkbox described below. If changes are not Committed, they will be lost when the PLC loses power.



Liquid meter Screen – Cal Rpt Params Tab

Commit Changes

After making changes on this screen, check this box to signal the library to save your changes to persistent memory. ***If changes are not committed, they will be lost when the PLC is power-cycled.*** When the library has finished saving the changes, this box will be un-checked.

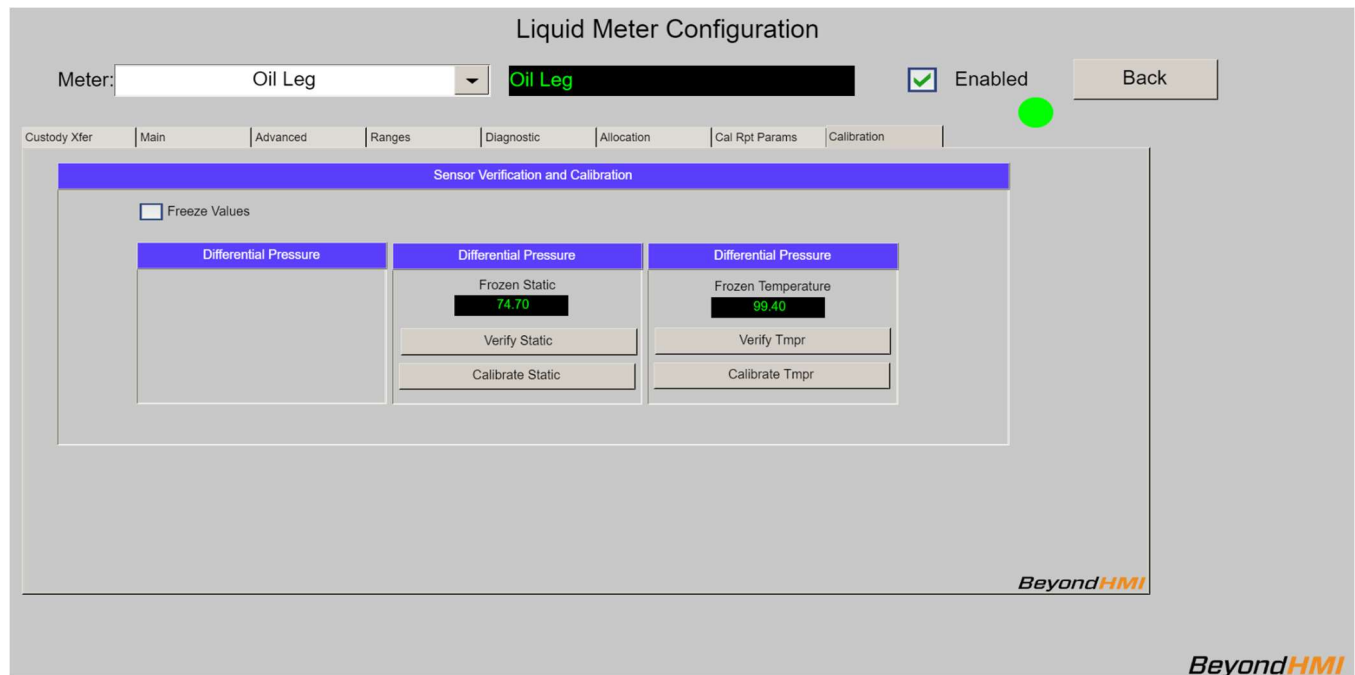
Cancel / Refresh

If you wish to cancel changes that you have made, check this box to signal the library to reload values from persistent memory. When the library has finished reloading the screen, this box will be un-checked.

Liquid meter Screen - Calibration

The liquid meters screen contains several tabs. The **Calibration** tab is used to initiate a calibration or a verification of one of the analog input signals.

By default, all input signals are directly translated to process variables. If calibration is performed in the sensor and a digital interface is used to obtain values from the sensor, it is not necessary to calibrate signals in the BHI library. If calibration is performed in the BHI library, a transfer function will be applied to that signal until another calibration is performed on that signal.



Liquid meter Screen – Calibration Tab

Freeze Values Checkbox*

Before calibrating or verifying, check this box to freeze all input signals. After calibration/verification, uncheck this box so the library uses live input values for flow calculations.

Frozen Dp

This text box displays the frozen differential pressure value being used by the flow calculations.

Frozen Static

This text box displays the frozen static pressure value being used by the flow calculations.

Frozen Tmpr

*Beyond***HMI**

This text box displays the frozen temperature value being used by the flow calculations.

Verify Dp Button

Use this button to initiate a verification of the differential pressure signal.

Verify Static Button

Use this button to initiate a verification of the static pressure signal.

Verify Tmpr Button

Use this button to initiate a verification of the temperature signal.

Calibrate Dp Button

Use this button to initiate a calibration of the differential pressure signal.

Calibrate Static Button

Use this button to initiate a calibration of the static pressure signal.

Calibrate Tmpr Button

Use this button to initiate a calibration of the temperature signal.

Liquid meter Current Day Periodic History Screen

The liquid meter current day periodic history screen can be used to review API 21.1 periodic history for a liquid meter for the current day.

Current Day Periodic Oil History

Meter: Water Leg Show Most Recent Periodic History Back

Index of First Record to Display: 25 Index of Current Active Record: 0

Periodic Index	Start Timestamp	End Timestamp	Flow [sec]	Tmpr	S&W [%]	Pulses	IndVol	GVol	NSV	S&W	GTOV	NTOV	GTWW	FlashG
25	N/A	N/A	0	0	0	0	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000
0	/19/2022 08:16:2	/19/2022 08:19:0	151	0	0	0	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000
1	/19/2022 07:00:0	/19/2022 08:00:0	3600	0	0	0	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000
2	/19/2022 08:00:0	/19/2022 08:16:2	976	0	0	0	0.00	0.00	0.00	0.00	0.00000	0.00000	0.00000	0.00000

BeyondHMI

Oil Current Day Periodic History Screen

The library maintains a buffer 25 periodic history records for each meter. Each periodic history record is meant to contain up to one hour of flow data. However, these history records are broken/changed any time a significant parameter change is made. So, the periodic history log may contain records including less than one hour of data.

The first periodic record for the meter is stored at periodic index zero. Subsequent periods are stored at indices with increasing numbers. The periodic history is not a circular buffer. This data is not overwritten until the previous days' worth of data has been archived to a cfx file.

For long term data retention, periodic history is copied to the .cfx files. A new cfx file is created at least once per day (after contract day change), or when a major configuration change is made to the meter or its station. Once periodic data is archived to a cfx file, the PLC program has no facilities for displaying that data.

The current day periodic history screen can be used to view portions of the current day's periodic history for a meter. Four records are displayed at one time. The user can navigate through the entire 25 record log using this screen – viewing 4 records at one time. The user can change position in the periodic history log by changing the **Index of First Record to Display** parameter on the screen. In the example above, the **Index of First Record to Display** parameter is set to zero. As a result, alarms zero through 3 are displayed. If the **Index of First Record to**

BeyondHMI

Display parameter were changed to 5, for example, the screen would refresh – showing records 5,6, and 7.

The logic behind this screen can handle “rollover”. For example, if the **Index of First Record to Display** parameter were changed to 23, the screen would refresh and records 23, 24, 25, and zero would be displayed.

If you wish to view the 4 most recent periods, check the **Show Most Recent Periodic History** check box and the screen will refresh – displaying the 4 most recent records (the single most recent record will be at the bottom of the list).

The **Index of Record that program is currently populating** parameter reveals the current position of the periodic history logic – within the buffer.

Meter

Use this combo box to display the meter you want to monitor.

Show Most Recent Periodic History check box

Check this box to force the screen to refresh – showing the most recent periodic history records in the log.

Index of First Record to Display

Enter a number in this box (0 through 25) to cause the screen to update – showing periodic history records at a specific location within the buffer. The refreshed list will start with the periodic history record number you enter.

Index of Record that program is currently populating

This read-only field displays the position where the library is currently accumulating flow information.

Periodic Index

Displays the periodic index number (0-25).

Start Timestamp

Displays the local timestamp at which the period began.

End Timestamp

Displays the local timestamp at which the period ended.

Flow Time

Displays the amount of flowing time accumulated during the period.

Tmpr

This field displays the indicated-volume-average of the temperature during the period.

BeyondHMI

S&W %

This field displays the indicated-volume-average of the sediments and water percentage during the period.

Pulses

This field displays the pulses accumulated during the period.

IndVol

This field displays the indicated volume accumulated during the period.

GVol

This field displays the gross volume accumulated during the period.

NSV

This field displays the net standard volume accumulated during the period.

S&W

This field displays the sediments and water volume accumulated during the period.

GTOV

This field displays the gross theoretical oil volume accumulated during the period.

NTOV

This field displays the net theoretical oil volume accumulated during the period.

GTWV

This field displays the gross theoretical water volume accumulated during the period.

FlashG

This field displays the gross flash gas volume accumulated during the period.

Event Screen

The event screen can be used to review API 21.1 events for an oil or gas meter.

Meter Events

Meter

Gas Meter

▼

Back

Show Most Recent Events

Index of First Event to Display 247

Index of Next Event that program will Populate 30

Event Index	Timestamp	Table	Item	Old Value	New Value
247	N/A	0	0	N/A	N/A
248	N/A	0	0	N/A	N/A
249	N/A	0	0	N/A	N/A
250	N/A	0	0	N/A	N/A
251	N/A	0	0	N/A	N/A
252	N/A	0	0	N/A	N/A
253	N/A	0	0	N/A	N/A
254	N/A	0	0	N/A	N/A
255	N/A	0	0	N/A	N/A

Events Screen

The library maintains a circular buffer 256 events for each meter. The first event is stored at event index zero. Subsequent events are stored at indices with increasing numbers. When event 255 has been populated and another event needs to be logged, event index zero is overwritten.

For long term data retention, events are copied to the .cfx files each time a .cfx file is created. This file creation occurs at least once per day (after contract day change), or when a major configuration change is made to the meter or its station.

The event screen can be used to view portions of the event log for a meter. Ten events are displayed at one time. The user can navigate through the entire 256 event log using this screen – viewing 10 events at one time. The user can change position in the event log by changing the **Index of First Event to Display** parameter on the screen. In the example above, the **Index of First Event to Display** parameter is set to zero. As a result, events zero through 9 are displayed. If the **Index of First Event to Display** parameter were changed to 55, for example, the screen would refresh – showing events 55 through 64.

The logic behind this screen can handle “rollover”. For example, if the **Index of First Event to Display** parameter were changed to 250, the screen would refresh and events 250 through 255 followed by events zero through 3 would be displayed.

If you wish to view the 10 most recent events, check the **Show Most Recent Events** check box and the screen will refresh – displaying the 10 most recent events (the single most recent event will be at the bottom of the list).

The **Index of Next Event that program will Populate** parameter reveals the current position of the Event logic – within the circular buffer.

Meter Combo Box

This combo box is used to specify which meter you wish to view.

Show Most Recent Events check box

Check this box to force the screen to refresh – showing the most recent events in the log.

Index of First Event to Display

Enter a number in this box (0 through 255) to cause the screen to update – showing events at a specific location within the circular buffer. The refreshed list will start with the event number you enter.

Index of Next Event that program will Populate

This read-only field displays the position where the next event will be logged.

Event Index

Displays the event index number (0-255).

Timestamp

Displays the local timestamp at which the event was recorded.

Table and Item

The combination of Table and Item represent a specific parameter. This combination indicates which parameter was changed. The Table/Item combinations are defined by Quorum Software and are part of the CFX file specification. This specification is subject to a Nondisclosure Agreement. Therefore, it cannot be reproduced here. For more information, contact Quorum Software.

Old Value and New Value

These represent the *Before* and *After* values of the parameter which was changed.

Alarms Screen

The alarms screen can be used to review API 21.1 alarms for a meter.

Meter Alarms

Meter Back

Show Most Recent Alarms

Index of First Alarm to Display Index of Next Alarm that program will Populate

Alarm Index	Timestamp	AlarmCode	New State	Value
54	N/A	N/A	N/A	0.0
55	N/A	N/A	N/A	0.0
56	N/A	N/A	N/A	0.0
57	N/A	N/A	N/A	0.0
58	N/A	N/A	N/A	0.0
59	N/A	N/A	N/A	0.0
60	N/A	N/A	N/A	0.0
61	N/A	N/A	N/A	0.0
62	N/A	N/A	N/A	0.0
63	N/A	N/A	N/A	0.0

BeyondHMI

Alarms Screen

The library maintains a circular buffer 64 alarms for each meter. The first alarm is stored at alarm index zero. Subsequent alarms are stored at indices with increasing numbers. When event 63 has been populated and another alarm needs to be logged, alarm index zero is overwritten.

For long term data retention, alarms are copied to the .cfx files each time a .cfx file is created. This file creation occurs at least once per day (after contract day change), or when a major configuration change is made to the meter or its station.

The alarm screen can be used to view portions of the alarm log for a meter. Ten alarms are displayed at one time. The user can navigate through the entire 64 alarm log using this screen – viewing 10 alarms at one time. The user can change position in the alarm log by changing the **Index of First Alarm to Display** parameter on the screen. In the example above, the **Index of First Alarm to Display** parameter is set to zero. As a result, alarms zero through 9 are displayed. If the **Index of First Alarm to Display** parameter were changed to 25, for example, the screen would refresh – showing alarms 25 through 34.

The logic behind this screen can handle “rollover”. For example, if the **Index of First Alarm to Display** parameter were changed to 60, the screen would refresh and alarms 60 through 63 followed by alarms zero through 5 would be displayed.

BeyondHMI

If you wish to view the 10 most recent alarms, check the **Show Most Recent Alarms** check box and the screen will refresh – displaying the 10 most recent alarms (the single most recent alarm will be at the bottom of the list).

The **Index of Next Alarm that program will Populate** parameter reveals the current position of the Alarm logic – within the circular buffer.

Meter Combo Box

This combo box is used to specify which meter you wish to view.

Show Most Recent Alarm check box

Check this box to force the screen to refresh – showing the most recent alarms in the log.

Index of First Alarm to Display

Enter a number in this box (0 through 63) to cause the screen to update – showing alarms at a specific location within the circular buffer. The refreshed list will start with the alarm number you enter.

Index of Next Alarm that program will Populate

This read-only field displays the position where the next alarm will be logged.

Alarm Index

Displays the alarm index number (0-63).

Timestamp

Displays the local timestamp at which the alarm was set or cleared.

Alarm Code

Indicates which alarm is involved:

- Diff Prs
- Static Prs
- Tempr
- Low Flow
- Back Flow
- Low Btry

New State

Indicates the state change which triggered the alarm:

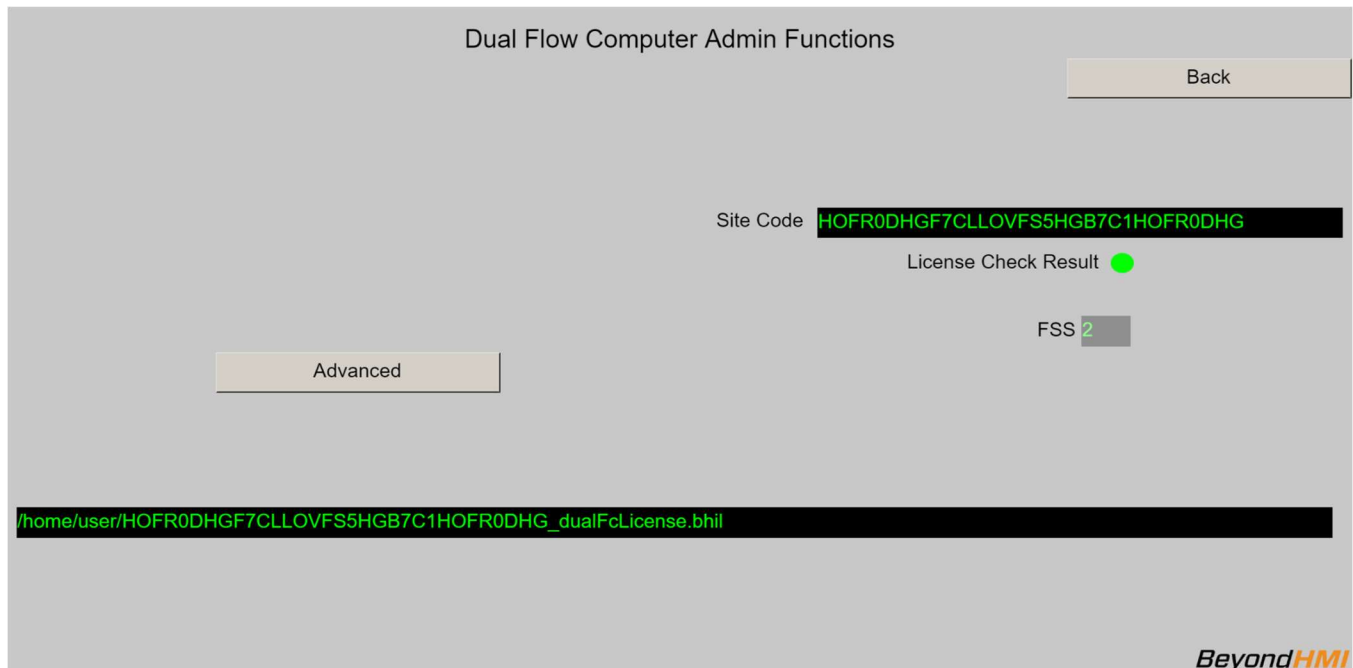
- Off
- On
- High
- Low

Value

Indicates the value of the relevant parameter at the time of the state change.

Admin Screen

The admin screen exposes features related to runtime licensing of the BhiLibDualFc library. It also provides links to the screens where library configurations can be saved to file and/or loaded from file.



Admin Screen

Note: The BhiLibDualFc library utilizes runtime licensing. It must be licensed on every PLC where it runs. Licenses are obtained from beyond HMI, Inc.

The library reads parameters from the PLC which are unique to each PLC specimen. From these parameters, the library generates a Site Code. This represents a unique identifier for the PLC. The license key is unique to the PLC processor. It is not influenced by installed I/O modules or firmware version.

Site Code

A unique identifier for the PLC specimen. Use this to request a runtime license.

License Check Result

If this indicator is green, then a valid license has been detected. If not green, then the program is either running in *trial* mode or is disabled – awaiting a license.

For more information about runtime licensing of the BhiLibDualFc library, see the *Licensing* section of this document.

FSS

Displays a value used for advanced troubleshooting. Under normal circumstances, the value displayed here will be changing rapidly.

License File Name

The text box at the bottom displays the location of the license file required to enable the library.

Advanced Admin Screen

The Advanced Admin screen exposes functions for PLC program maintenance. Please use caution when using the functions on this screen.

Dual Flow Computer Advanced Admin Functions

Back

DO NOT USE THESE FUNCTIONS UNLESS YOU HAVE FAMILIARIZED YOURSELF WITH THE CONSEQUENCES

Save Maintenance File

Save Maintenance File

Restore Maintenance File

Restore Gas Meter Configuration

Restore First Oil Meter Configuration

Restore Second Oil Meter Configuration

Restore Accums, Events, Alarms

Force Maintenance Recovery

BeyondHMI

Advanced Admin Screen

When the Host PLC program needs to be changed, there is potential for loss of accumulator data that the Flow computer library uses. To prevent this loss, a special sequence of events must be followed when changing the host PLC program. The procedure is as follows:

Note: The following steps must be executed in order. Please read and study the entire procedure list before beginning PLC program maintenance.

Stop physical flow

In order to prevent loss of accumulated flow, all processes for all meters must be shut-in to prevent flow while the PLC program is being maintained.

Failure to follow this step may result in lost flow accumulation.

BeyondHMI

Save the library configuration to file

Save a maintenance file

Check the **Save Maintenance File** checkbox on the Advanced Admin screen. Wait for the checkbox to be unchecked. This indicates that a maintenance file has been saved to the PLC file system.

Note: The process of saving the maintenance file will take 3 to 4 minutes. Be patient. Do not proceed until the box is unchecked by the PLC.

Perform PLC program maintenance

At this point, you are free to make changes to the PLC program and load those changes onto the PLC.

Select options for Recovering various features

When reloading the configuration into the PLC, you have options to load partial configuration or all parameters – including historical flow. Use the check boxes to specify which parameters to restore.

Force Maintenance Recovery

Check the **Force Maintenance Recovery** checkbox on the Advanced Admin screen. Wait for the checkbox to be unchecked. This indicates that meter accumulators have been recovered from the maintenance file.

Note: The process of recovering from a maintenance file will take 3 to 4 minutes. Be patient. Do not proceed until the box is unchecked by the PLC.

Resume physical flow

At this point, process flow can be resumed without loss of accumulated volume.

Licensing

The BhiLibDualFc library utilizes runtime licensing. Each PLC upon which it runs must have a license. Licenses are obtained from Beyond HMI, Inc.

Trial Mode

Upon startup, the library will run in trial mode for approximately 4 days. While in trial mode, the library is fully functional. After the 4 day period passes – and if no license is installed - the library will stop calculating flow.

If the PLC program is stopped and restarted, the 4 day trial period begins again. Therefore, PLC program developers should be able to develop and test programs without needing a license for their development PLCs.

Steps to Obtain a Runtime License

To fully license the BhiLibDualFc library on a PLC, the following steps must be executed:

- Include library features in a PLC program (*reference other instructions in the DFC_DG_yyyy_mm_dd document available from Beyond HMI*)
- Install the PLC program on the target PLC specimen
- Open the library's Admin screen and capture the Site Code
- Transmit the site code to Beyond HMI, Inc. and provide payment information
 - Please use info@beyond-hmi.com to initiate contact with us.
- Wait for Beyond HMI, Inc. to return a license file
- Use the free BLT software to log into the PLC as 'root' and install the license file on the PLC
- Open the library's Admin screen and confirm that the license check result is green

Licenses are perpetual. No maintenance fee is required. Licenses are keyed to a site code and are not portable between PLCs. Please contact Beyond HMI if you need to move a license to another PLC.

Collecting CFX Files from the PLC

The CFX files generated by the BhiLibDualFc library are saved into meter-specific directories underneath the PLC's /home/user/ directory. Each meter is given its own directory. The name of the directory is taken from the **Meter Serial Number** parameter for that meter.

For example, if two meters are configured at a certain PLC installation and one meter is given **Meter Serial Number** 'METER_1' and the other is given **Meter Serial Number** 'METER_2', then the following directories will be created:

- /home/user/METER_1
- /home/user/METER_2

And the CFX files for each meter will be stored within their respective directories.

The CFX files in these directories will be named using format YYYYMMDDQQ.CFX

Where:

- YYYYMMDD is the year, month, and day of the *gas/oil day* for which the data applies.
- QQ is a sequence number generated by the program/library – beginning with 00.

Any person or local/remote process with the password for the 'user' profile on the PLC should be able to read/copy CFX files from these sub-directories to another computer.

The free BLT software can be used to transfer files from the PLC to your PC.

For a WINDOWS-like interface to the PLC directory system, products like WinSCP can be easily configured to use Secure FTP to interact with the PLC file system. The PLC must be configured to support whichever file transfer protocol you intend to permit field measurement technicians to use.

Deleting CFX Files From the PLC

There should be no reason to manually delete CFX files from the PLC directories. Files can be copied from the PLC file system to another computer but should not be 'cut' or deleted from the PLC directories. Normally, only a user with access to the 'root' profile would have the ability to delete these files.

The library contains logic to prune the files in the meter subdirectories. By setting the **Max Data Retention** parameter for the meter, you can control this pruning. In order to enforce API 21.1 standards, the **Max Data Retention** parameter cannot be set below 35 days. If you set the parameter to a lower value, it will be overridden later. Data pruning typically occurs once per day – at about 8 minutes after the contract hour.