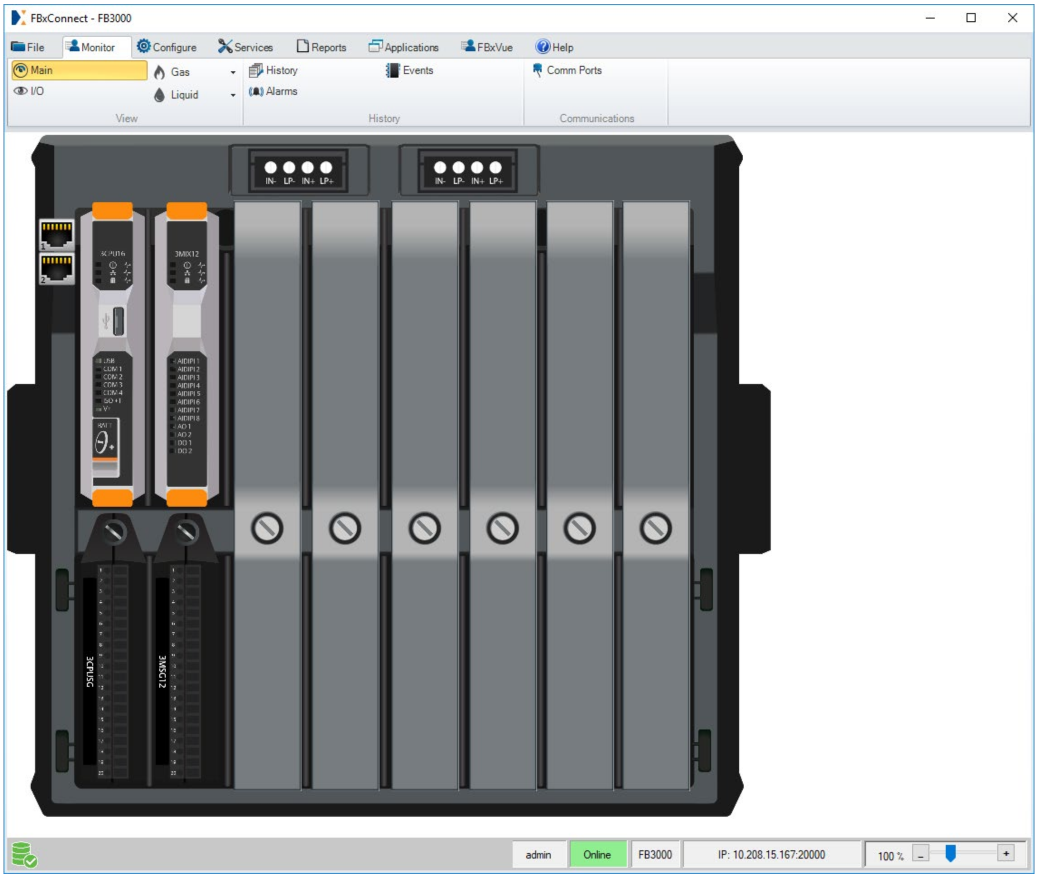
FBxConnect™ Configuration Software User Manual (for the FB3000 RTU)



Energy and Transportation Solutions

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System Training

A well-trained workforce is critical to the success of your operation. Knowing how to correctly install, configure, program, calibrate, and trouble-shoot your Emerson equipment provides your engineers and technicians with the skills and confidence to optimize your investment. Energy and Transportation Solutions offers a variety of ways for your personnel to acquire essential system expertise. Our full-time professional instructors can conduct classroom training at several of our corporate offices, at your site, or even at your regional Emerson office. You can also receive the same quality training via our live, interactive Emerson Virtual Classroom and save on travel costs. For our complete schedule and further information, contact the Energy and Transportation Solutions Training Department at 800-338-8158 or e-mail us at Education@Emerson.com.

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Section 1: Introduction

FBxConnect™ configuration software enables you to monitor, configure, and calibrate Emerson's FB3000 RTU. Designed for ease of use, FBxConnect™ provides at-a-glance monitoring, quick access to commonly performed tasks, and configuration wizards to quickly get your equipment up and running.

1.1 Installing and Starting FBxConnect

FBxConnect™ Configuration Software is installed as a part of Emerson Field Tools. For more information about installation of Field Tools and connecting to a device, refer to *Emerson Field Tools Quick Start Guide* (D301703X412).

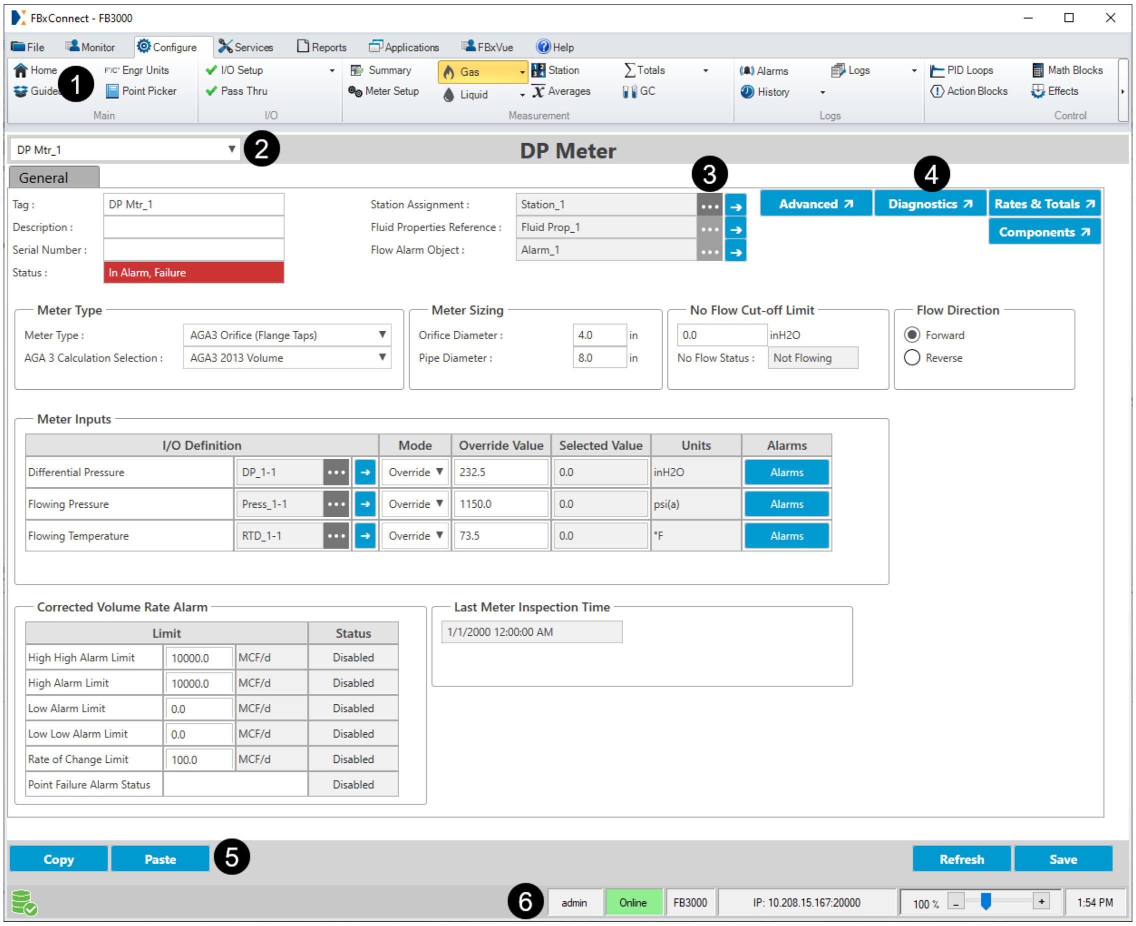
1.2 User Interface

FBxConnect™ is designed for ease of use. At the top of the display, FBxConnect™ utilizes a ribbon-style tabbed menu to navigate the software. Select a menu and submenu option to open the various displays of FBxConnect™.

Note

- Standard Microsoft® Windows® keyboard shortcuts are supported. Refer to Keyboard Shortcuts.
- You can right-click your mouse on any field that is associated with an object or parameter in the FBx product database and select Copy Tag to copy the database tag to your computer's clipboard. You can then paste the information into another application such as FBxDesigner™ or FBxNet.

Figure 1. User Interface



DP Mtr_1

DP Meter

Tag :	DP Mtr_1
Description :	
Serial Number :	
Status :	In Alarm, Failure

Station Assignment :	Station_1
Fluid Properties Reference :	Fluid Prop_1
Flow Alarm Object :	Alarm_1

Meter Type
Meter Type : AGA3 Orifice (Flange Taps)
AGA 3 Calculation Selection : AGA3 2013 Volume

Meter Sizing
Orifice Diameter : 4.0 in
Pipe Diameter : 8.0 in

No Flow Cut-off Limit
0.0 inH2O
No Flow Status : Not Flowing

Flow Direction
● Forward
○ Reverse

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Differential Pressure	DP_1-1	Override	232.5	0.0	inH2O	Alarms
Flowing Pressure	Press_1-1	Override	1150.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-1	Override	73.5	0.0	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

Last Meter Inspection Time
1/1/2000 12:00:00 AM

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 1:54 PM

Click on the links below for more information about each user interface element:

1. Menu – Use the Menu to access the displays and wizards used to configure and monitor your FB Series product.
2. Instance Drop-Down List – The instance drop-down list allows you to choose different instances of a database object and appears at the top-left of many displays in FBxConnect.
3. Point Picker – The Point Picker dialog allows you to reference a specific object or parameter in the database.
4. Forward, Back, and Pop-Up Buttons Forward, back, and pop-up buttons give you the ability to quickly jump back and forth between displays without losing your spot in the configuration process.

5. Copy and Paste Buttons – Use the Copy and Paste buttons to copy information from one instance and paste it into another instance.
6. Status Bar – The Status Bar provides general information about the connection to the FB Series product and contains a slider that controls the zoom level of the display.
7. Pause/Resume Button (not shown) – Use the Pause/Resume button to prevent or restart automatically refreshing the values on the display.

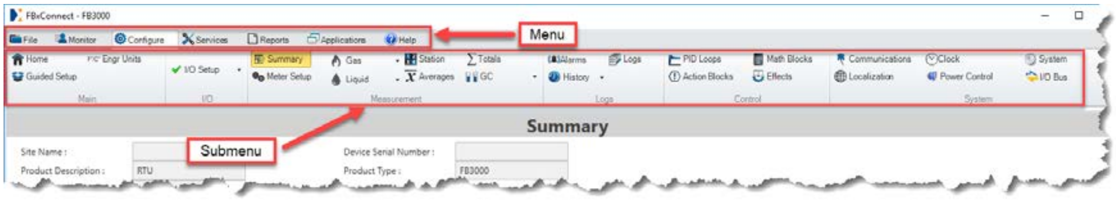
1.2.1 Menu

FBxConnect™ contains a ribbon-style tabbed menu at the top of the window. Select a menu tab to view a list of options in a submenu. Select an option from the submenu to open that display or option.

Note

The submenu options are grouped together based on functionality. For example, the Configure menu has a group named Control where you can configure PID Loops, Action Blocks, Math Blocks, and Effects.

Figure 2. Menu and Submenu



Site Name :
Product Description : RTU
Device Serial Number :
Product Type : FB3000

For more information about each menu, select the name of a menu tab below:

File Menu – Use the options in this menu to save a device configuration file to your PC, save a device configuration to flash memory, load a saved configuration to the device, or close the current connection to the device.

Monitor Menu – Use the options in this menu to view current conditions including flowing conditions, history, alarms, events, and communication port status.

Configure Menu – Use the options in this menu to configure device parameters, including meter runs, I/O, fluid properties, history, customizing the display, and running the Guided Setup.

Services Menu – Use the options in this menu to access utilities and perform maintenance on your device, such as user management, firmware updates, and calibration.

Reports Menu – Use the options in this menu to collect information and view reports, including EFM, CFX, fluid composition, history, alarms, events, and diagnostic reports.

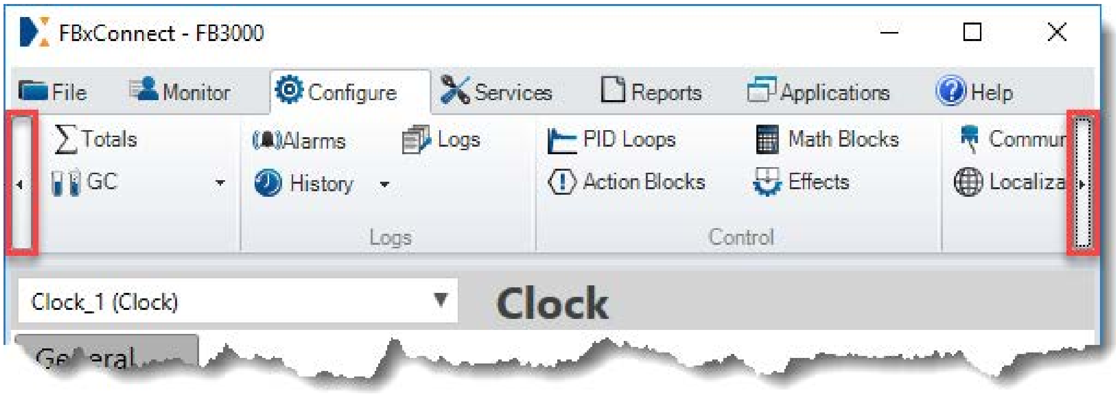
Applications Menu – Use the options in this menu to access applications installed on your flow computer or RTU.

FBxVue Menu – Use the FBxVue menu to create customized displays for the FB Series products.

Help Menu – Use the options in this menu to view information about your installed version of Field Tools, and to access the online help system.

Note

If the submenu extends past the end of your screen, use the arrows located on the sides of the submenu to view the available options.



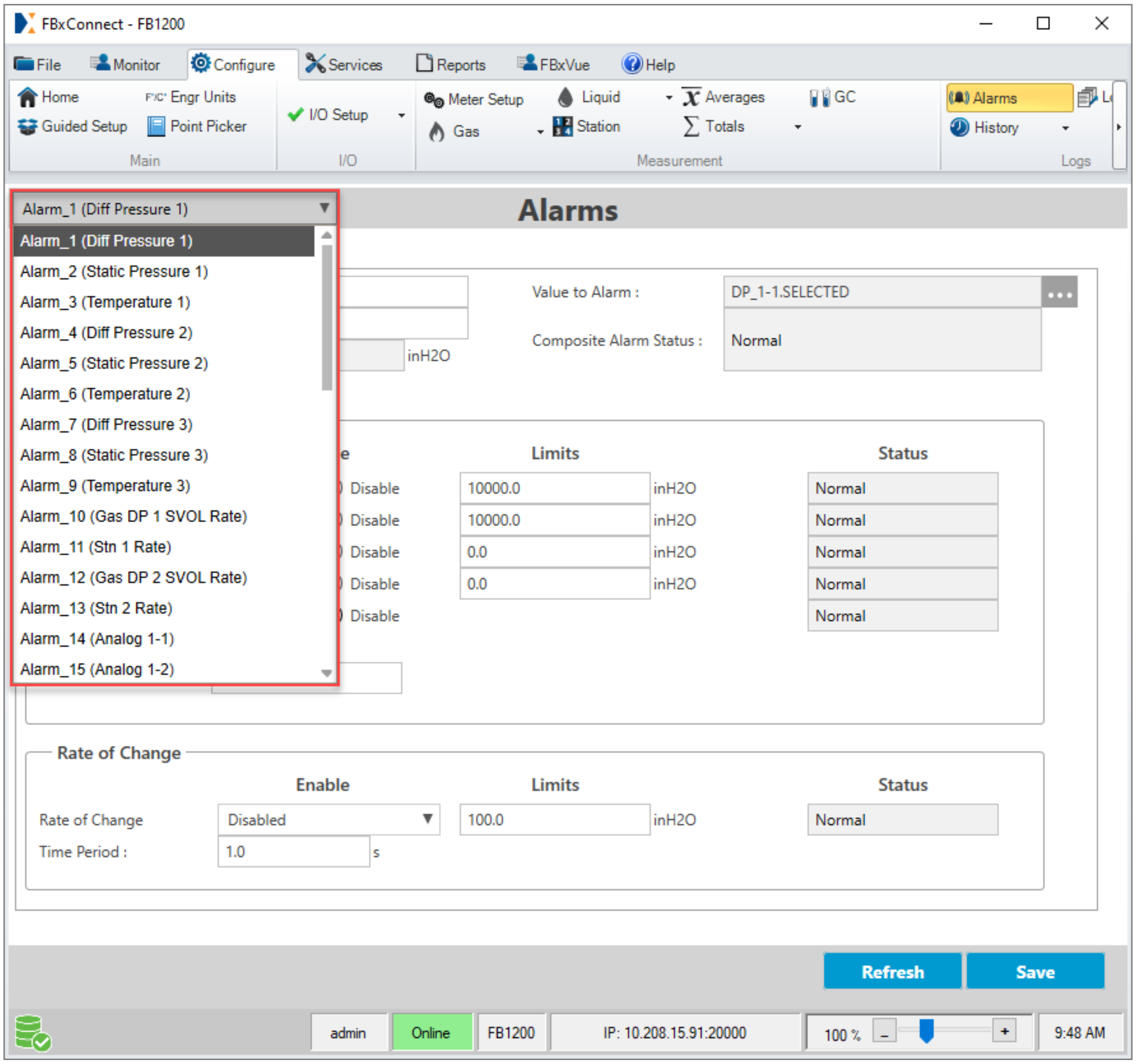
1.2.2 Instance Drop-Down List

The instance drop-down list allows you to choose different instances of a database object and appears at the top-left of many displays in FBxConnect. When viewing a display with an instance drop-down list, select ▼ to show all available instances. For example, the Alarms display (shown below) allows you to choose many different instances of the alarm object. The text shown in the instance drop-down list follows a specific format. This text shows the object name and instance number (Alarm_1 in the picture below) followed by the configured Tag in parentheses (Diff Pressure 1 in the picture below).

Note

The tag shows in the instance drop-down list only if you have configured a unique tag for an instance. If you have not configured a unique tag, only the object and instance number shows in the instance drop-down list.

Instance Drop-Down List



Alarm_1 (Diff Pressure 1)

Value to Alarm : DP_1-1.SELECTED

Composite Alarm Status : Normal

e	Limits		Status
Disable	10000.0	inH2O	Normal
Disable	10000.0	inH2O	Normal
Disable	0.0	inH2O	Normal
Disable	0.0	inH2O	Normal
Disable			Normal

Rate of Change

	Enable	Limits		Status
Rate of Change	Disabled	100.0	inH2O	Normal
Time Period :	1.0 s			

1.2.3 Point Picker

In many locations in FBxConnect, you can click browse (•••) to view the Point Picker dialog. The Point Picker dialog allows you to reference a specific object or parameter in the database. These are used typically when linking two objects together (like a meter to a station) or when dynamically assigning an input or output variable to a source (like an analog input to a meter temperature input).

You can also open the Point Picker dialog to view the database by selecting **Configure > Point Picker** from the FBxConnect™ main menu.

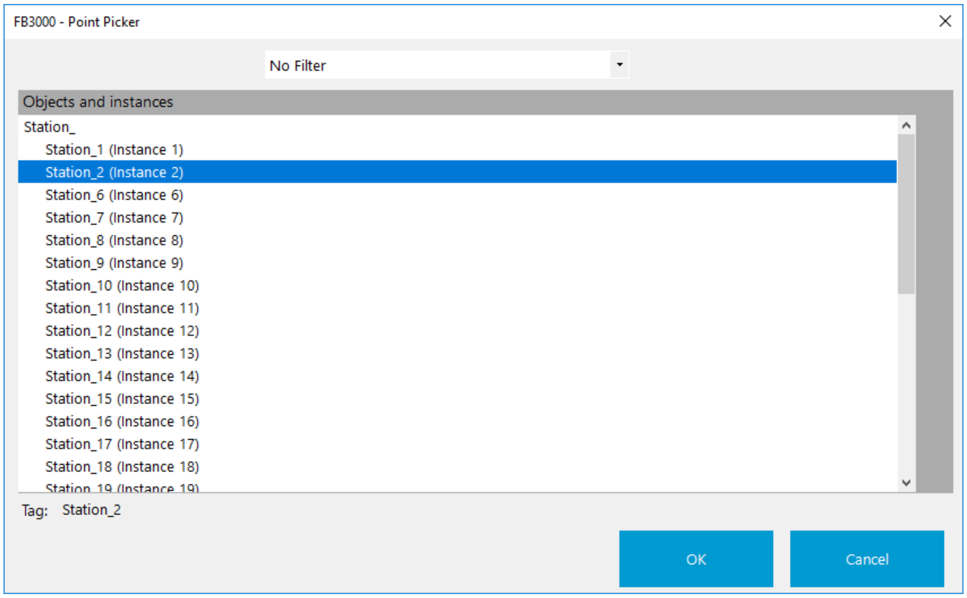
You can select two different types of references in FBxConnect™ depending on the field: object references and parameter references.

Note

If you open the Point Picker from the FBxConnect™ main menu (**Configure > Point Picker**), the dialog shows parameter references.

- **Object References** – Sometimes the point picker is used to pick an object reference. In this case, you are only able to select the object and instance of the object. For example, if you are configuring a meter run and are setting the station assignment, you can only pick which station you wish to assign, not a particular parameter.

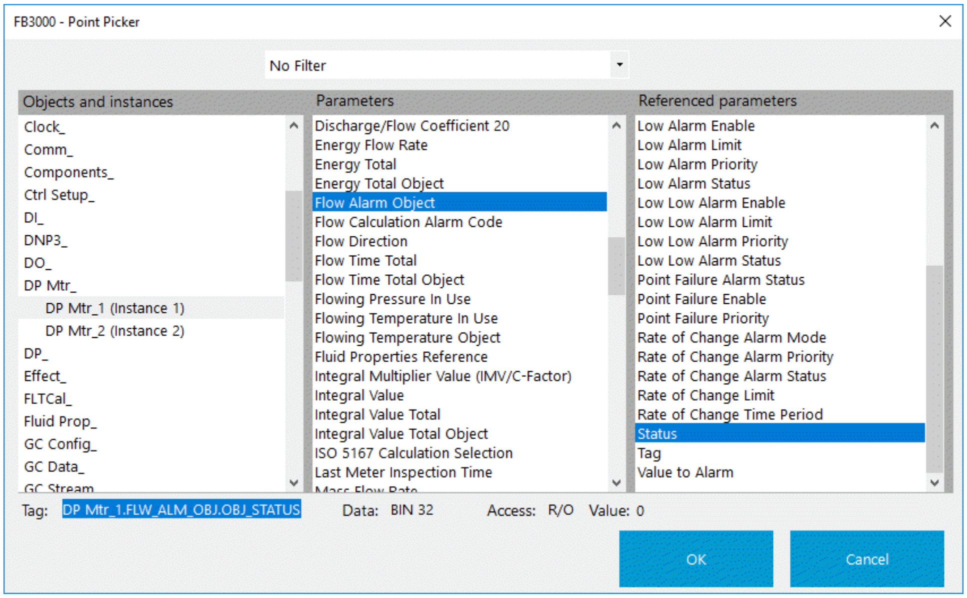
Figure 3. Point Picker – Object Reference



Tag: Station_2

- **Parameter References** – Sometimes the point picker is used to pick a parameter reference. In this case, the Point Picker dialog shows three columns. You select an object and instance of the object in the first column. After clicking on the object type and instance in the first column, the second column displays all appropriate parameters for this particular object reference. Sometimes the parameter you pick in the second column is an object itself, and this object contains additional referenced parameters. You can choose these additional referenced parameters in the third column.

Figure 4. Point Picker – Parameter Reference

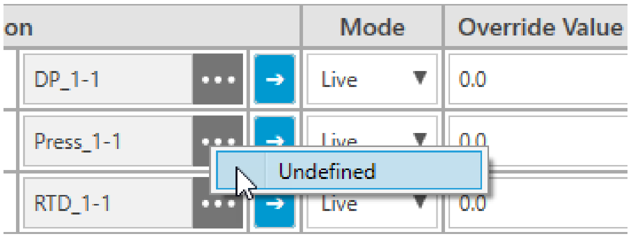


No Filter

Tag: DP Mtr_1.FLW_ALM_OBJ.OBJ_STATUS Data: BIN 32 Access: R/O Value: 0

Note

To quickly remove a previously assigned object or parameter reference, right-click the browse button (•••) and select **Undefined**.



Field	Description
Filter	Click ▼ to change which objects and parameters are displayed. Filters may be based on object type, measurement type, or data type. **Note** Select **No Filter** to view all available Objects.

Field	Description	
Object and Instances	**Object**	A group of configuration settings and calculated or measured values related to a specific function. For example, all values associated with the device clock (second, hour, day, etc.) are part of an Object named Clock. From the first column, click on the object type you wish to reference.
	Instance	There may be one or more occurrences of each type of object with its own set of configuration settings and values. Each occurrence of an object is called an instance. For example, there are multiple instances of the object named Comm, and each instance represents one of the FB Series product's communication ports. After clicking on the object you wish to reference, the available instances are displayed. Click on the instance you wish to reference.
Parameter	One of the configuration settings, calculated values, or measured values that is a part of the object. Each parameter has a value as well as a set of attributes that define it, such as data type, R/W access, measurement type, units, and parameter health. After clicking on the object and instance you wish to reference, the available parameters are displayed. Click on the parameter you wish to reference. **Note** This column appears **only** if you select the Point Picker for a **Parameter Reference**.	
Referenced Parameter	If the point picker is used to pick a parameter reference, you can pick a parameter directly from the object to which it belongs, or you can pick the parameter through an object reference in a related object. For instance, to pick a parameter to assign to an Average object, you can pick the DP Mtr_1 object and the Station Assignment parameter and then the third column displays all of the parameters that are available from the Station object that is assigned to DP Mtr_1. This is useful because even if the station assignment later changes, the Average object is always associated with DP Mtr_1. **Note** This column appears **only** if you select the Point Picker for a **Parameter Reference**.	

Field	Description
Tag	This **read-only** field shows the name of the selected parameter.
Data	This **read-only** field shows the data type of the selected parameter. For more information, refer to Native Data Types.
Access	This **read-only** field shows the read/write access of the selected parameter.
Value	This **read-only** field shows the value of the selected parameter.
Collect Tag Names	Select this button to query the FB Series product and display any unique tag names you have assigned to individual parameters. **Note** You can perform this action at any time to reflect recent configuration changes.
Copy Tag	Select this button to copy the currently selected tag to the computer's clipboard. You can then paste the selected tag into a different application, such as FBxDesigner™.

1.2.4 Forward, Back, and Pop-Up Buttons

Forward, back, and pop-up buttons give you the ability to quickly jump back and forth between displays without losing your spot in the configuration process. Forward buttons allow you to navigate to a new display to perform additional configuration changes, back buttons return you to the previous display, and pop-up buttons open a pop-up display that contains additional configuration options without navigating away from the current display. You can determine the behavior of a button based on the direction of the arrow on the button label.

- Buttons with an arrow pointing to the right (→) navigate to a new display.
- Buttons with an arrow pointing to the left (◀) navigate to the previous display.
- Buttons with an arrow pointing to the upper-right (↗) open a pop-up display.

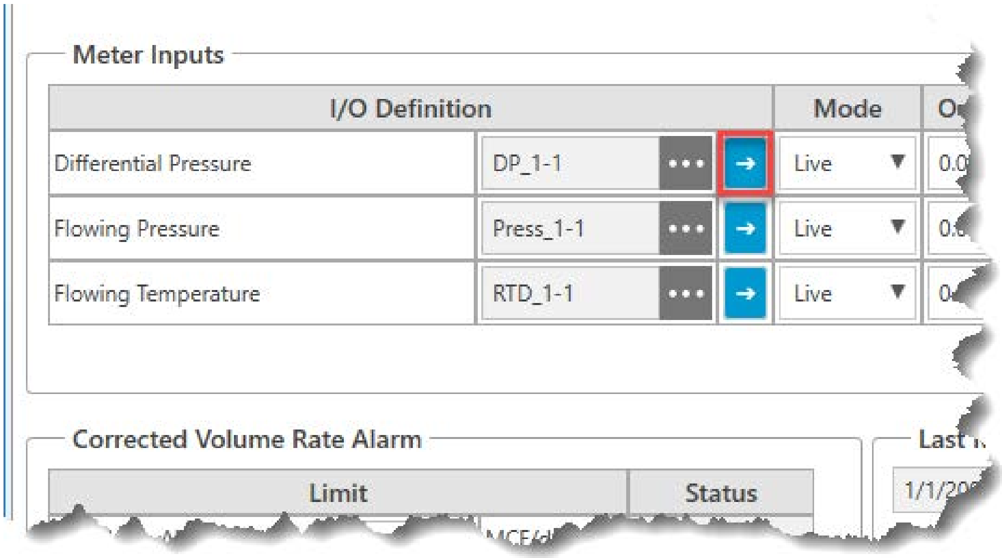
For example:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu. The DP Meter – General display opens.

2. Select the forward button (➔) located to the right of the Differential Pressure field.

   The Differential Pressure I/O display opens and allows you to configure the selected differential pressure input.

Figure 5. Forward Buttons



Meter Inputs

I/O Definition				Mode
Differential Pressure	DP_1-1	•••	➔	Live ▼
Flowing Pressure	Press_1-1	•••	➔	Live ▼
Flowing Temperature	RTD_1-1	•••	➔	Live ▼

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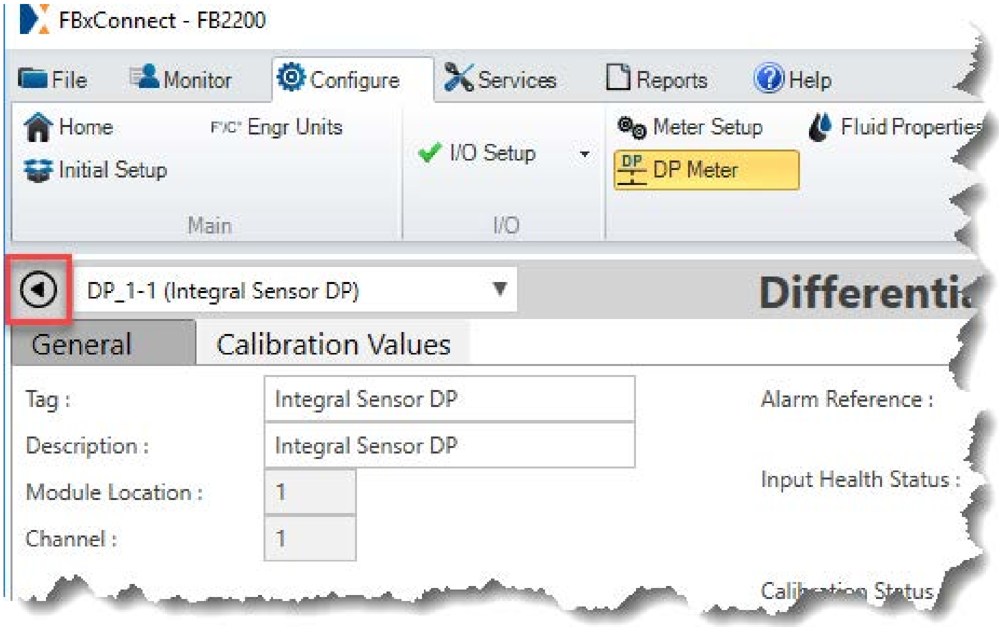
3. After you are done performing changes on the Differential Pressure I/O display, select the back button (◀) to return to the DP Meter display.

Figure 6. Back Button



DP_1-1 (Integral Sensor DP)

Tag : Integral Sensor DP

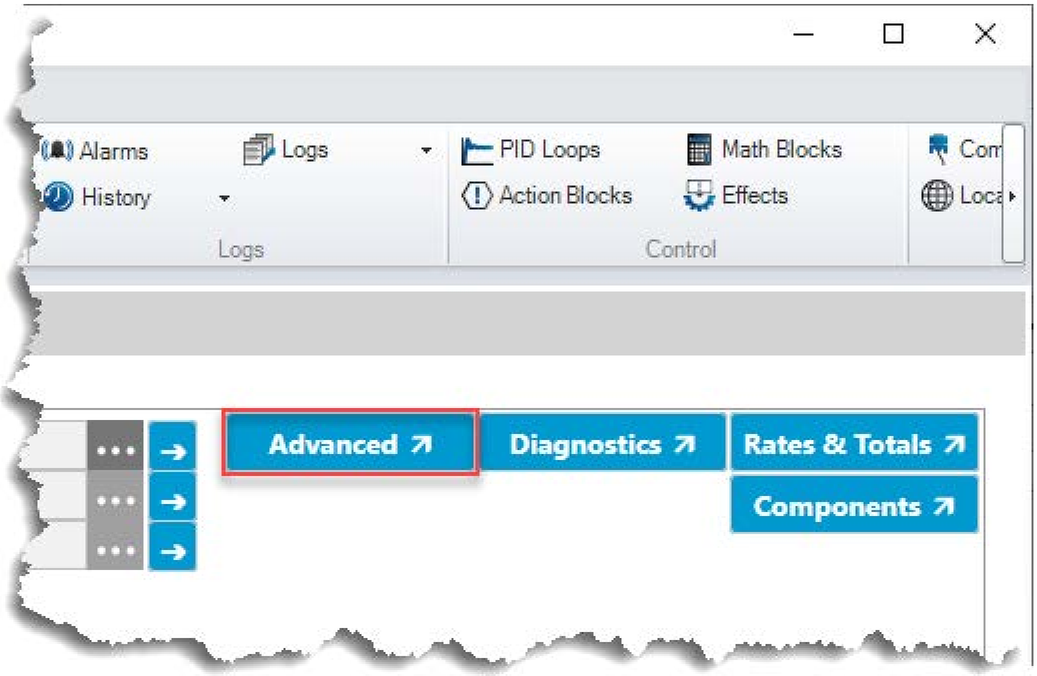
Description : Integral Sensor DP

Module Location : 1

Channel : 1

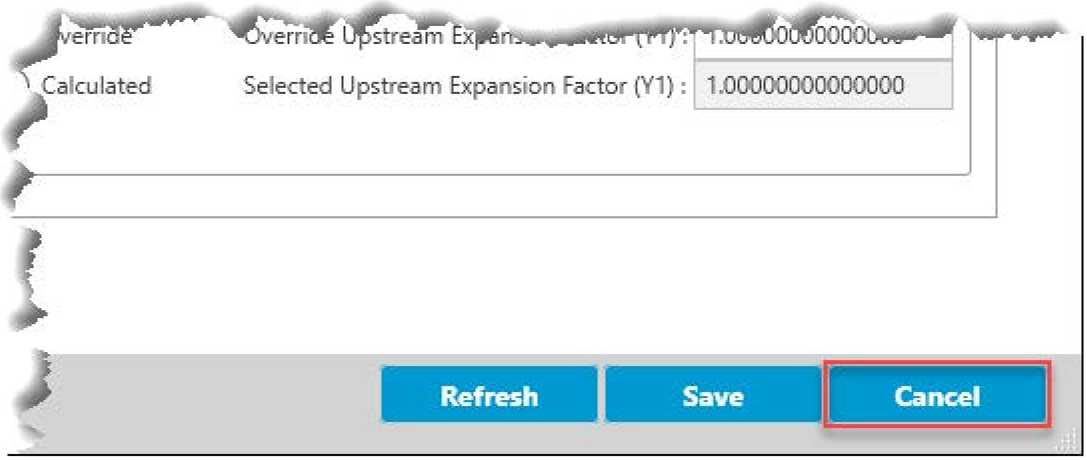
4. Select the **Advanced** button (with the arrow pointing to the upper-right ↗) to open the DP Meter – Advanced display to configure additional options for your meter.

Figure 7. Pop-Up Button



5. When you are done making configuration changes, select **Cancel** to close the DP Meter – Advanced pop-up display.

Figure 8. Cancel Button



Override   Override Upstream Expansion Factor (Y1) : 1.00000000000000

Calculated   Selected Upstream Expansion Factor (Y1) : 1.00000000000000

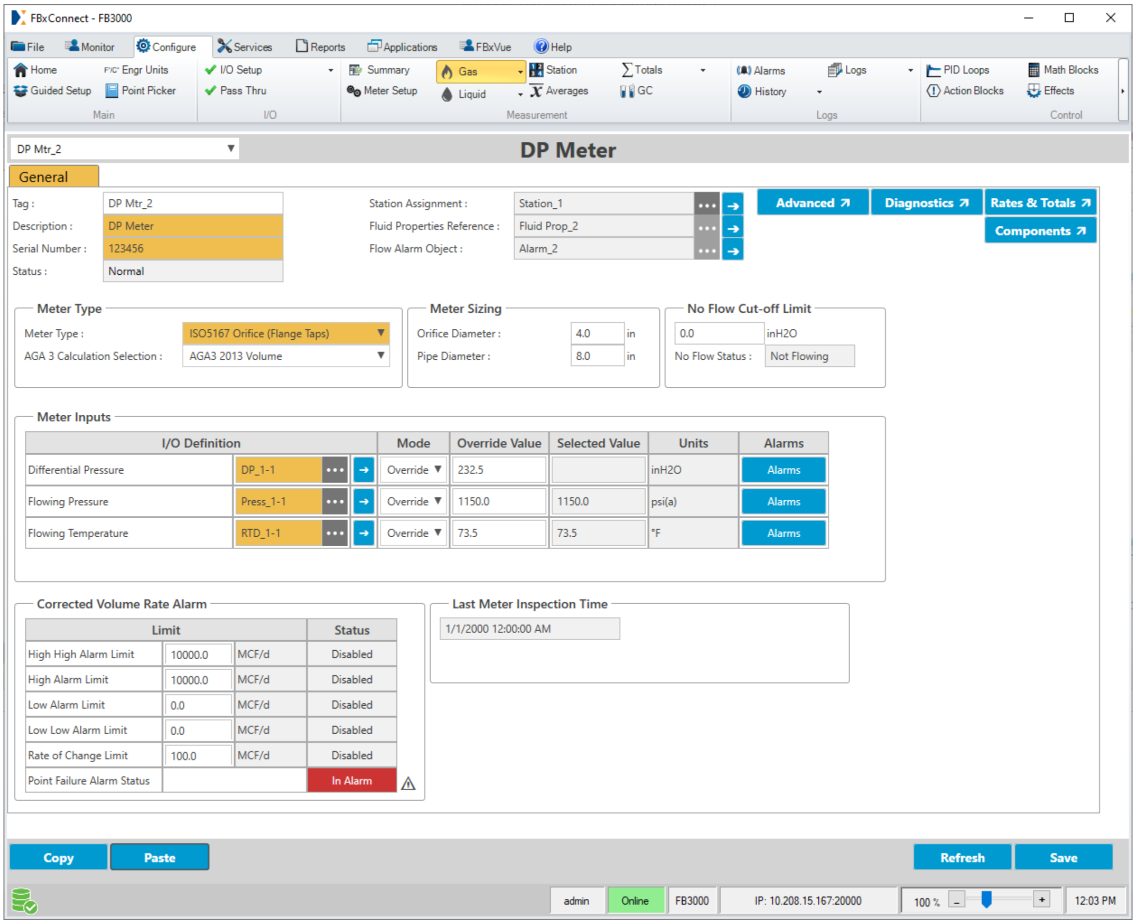
1.2.5 Copy and Paste Buttons

Use the Copy and Paste buttons to copy information from one instance and paste it into another instance. This makes it easy to configure objects that contain similar information, such as meter runs or stations.

For example:

1. Select **Configure > Gas > DP Meter**. The DP Meter opens showing the General tab.
2. Select the **Copy** button located at the bottom of the display.
3. Click ▼ from drop-down list at the top of the display and select DP Meter instance 2.

Figure 9. Display Showing Copied Information



DP Mtr_2

Tag : DP Mtr_2
Description : DP Meter
Serial Number : 123456
Status : Normal

Station Assignment : Station_1
Fluid Properties Reference : Fluid Prop_2
Flow Alarm Object : Alarm_2

Meter Type

Meter Type : ISO5167 Orifice (Flange Taps)
AGA 3 Calculation Selection : AGA3 2013 Volume

Meter Sizing

Orifice Diameter : 4.0 in
Pipe Diameter : 8.0 in

No Flow Cut-off Limit

0.0 inH2O
No Flow Status : Not Flowing

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Differential Pressure	DP_1-1	Override	232.5		inH2O	Alarms
Flowing Pressure	Press_1-1	Override	1150.0	1150.0	psi(a)	Alarms
Flowing Temperature	RTD_1-1	Override	73.5	73.5	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			In Alarm

Last Meter Inspection Time

1/1/2000 12:00:00 AM

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 12:03 PM

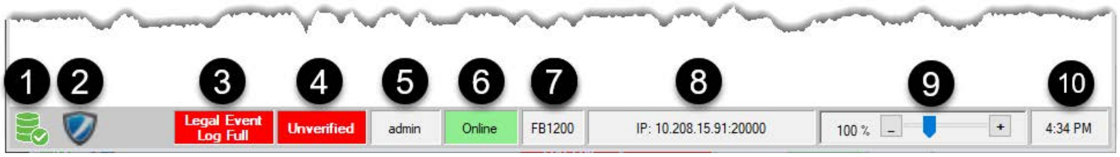
4. Select the **Paste** button. Configuration information is copied from the first instance into the second instance. Any information that was changed is highlighted.

5. Review the information and then select **Save** to save your changes.

1.2.6 Status Bar

The Status Bar is located at the bottom of the display and provides general information about the connection to the FB Series product. Information includes the database build status, your user name, connection status, device type, and type of connection.

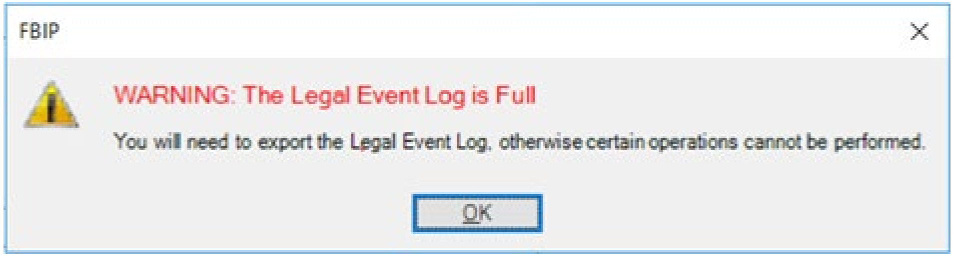
Figure 10. Status Bar



1. **Database Build Status –** Shows the status of the FB Series product database. When the database build is completed, the icon is green. When the database build is not completed, the icon is red.
2. **SAv5 Enabled –** This icon appears when DNP3 Secure Authentication version 5 (SAv5) is enabled on the FB Series product.
3. **Lock Status –** This field appears when the Event Log Configuration Type is set to **Separate Verifiable & Exportable Logs** and the legal event log becomes full.

Note

- When the legal event log is full, a warning message appears and the device no longer accepts changes to legal parameters, firmware updates, calibrations, or configuration downloads. For more information, refer to Event Setup.



WARNING: The Legal Event Log is Full

You will need to export the Legal Event Log, otherwise certain operations cannot be performed.

- If your FB Series product becomes locked due to a full event log, refer to Export Events.

4. **System Verification –** This color-coded field shows the status of the FB Series product as Verified (green) or Unverified (red).

Note

This information appears **only** if you select **Separate Verifiable & Exportable Logs** on the Event Setup display.

5. **User Name –** Shows the user name currently logged into FBxConnect™.

6. **Communications Status** – Shows the communications status between the FB Series product and FBxConnect™. When the connection to the FB Series product is good, the icon says "Online" and the color is green. When communications have been interrupted, the icon says "Comm Error" and the color is red. When viewing a configuration without being connected to an FB Series product, the icon says "Offline" and the color is grey.

7. **Device Type** – Shows the FB Series product type currently connected through FBxConnect™.

8. **CPU Communications Port and Speed** – Shows the communications port being used for communications by FBxConnect™.

9. **Zoom** – Use the slider to adjust the zoom level of the FBxConnect™ display.

Note

You can also hover your mouse pointer over the slider and move the scroll wheel to adjust the zoom level.

10. **Device Time** – Shows the time the current time of the FB Series product's clock.

1.2.7 Pause/Resume Button

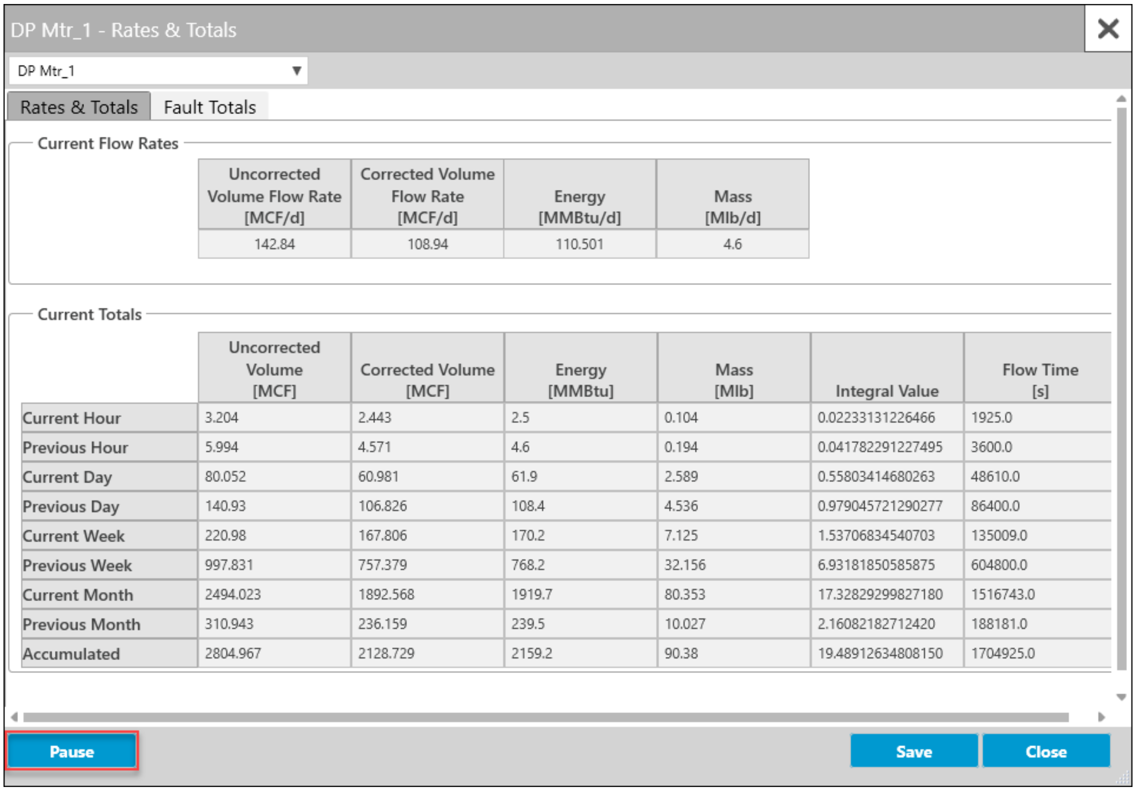
Use the Pause/Resume button to prevent or restart automatically refreshing the values shown on the display. The Pause/Resume button appears on displays with values that are constantly updated.

For example:

1. Select **Configure > Gas > DP Meter**. The DP Meter opens showing the General tab.

2. Select the **Rates & Totals** button. The DP Rates & Totals pop-up display opens showing the Rate & Totals tab.

Figure 11. DP Meter Rates & Totals – Pause Button



Current Flow Rates

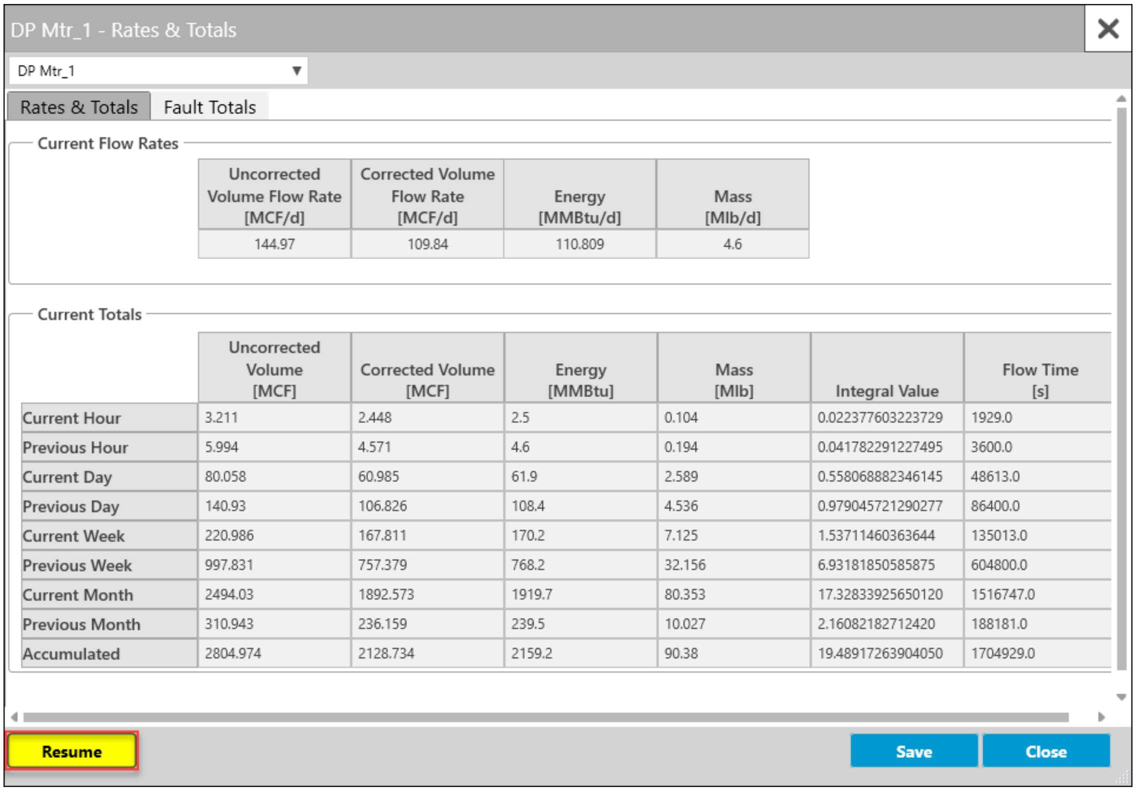
Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy [MMBtu/d]	Mass [Mlb/d]
142.84	108.94	110.501	4.6

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Integral Value	Flow Time [s]
Current Hour	3.204	2.443	2.5	0.104	0.02233131226466	1925.0
Previous Hour	5.994	4.571	4.6	0.194	0.041782291227495	3600.0
Current Day	80.052	60.981	61.9	2.589	0.55803414680263	48610.0
Previous Day	140.93	106.826	108.4	4.536	0.979045721290277	86400.0
Current Week	220.98	167.806	170.2	7.125	1.53706834540703	135009.0
Previous Week	997.831	757.379	768.2	32.156	6.93181850585875	604800.0
Current Month	2494.023	1892.568	1919.7	80.353	17.32829299827180	1516743.0
Previous Month	310.943	236.159	239.5	10.027	2.16082182712420	188181.0
Accumulated	2804.967	2128.729	2159.2	90.38	19.48912634808150	1704925.0

3. Select the **Pause** button to prevent values shown on the display from automatically refreshing.

Figure 12. DP Meter Rates & Totals – Resume Button



Current Flow Rates

Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy [MMBtu/d]	Mass [Mlb/d]
144.97	109.84	110.809	4.6

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Integral Value	Flow Time [s]
Current Hour	3.211	2.448	2.5	0.104	0.022377603223729	1929.0
Previous Hour	5.994	4.571	4.6	0.194	0.041782291227495	3600.0
Current Day	80.058	60.985	61.9	2.589	0.558068882346145	48613.0
Previous Day	140.93	106.826	108.4	4.536	0.979045721290277	86400.0
Current Week	220.986	167.811	170.2	7.125	1.53711460363644	135013.0
Previous Week	997.831	757.379	768.2	32.156	6.93181850585875	604800.0
Current Month	2494.03	1892.573	1919.7	80.353	17.32833925650120	1516747.0
Previous Month	310.943	236.159	239.5	10.027	2.16082182712420	188181.0
Accumulated	2804.974	2128.734	2159.2	90.38	19.48917263904050	1704929.0

4. Select the **Resume** button to restart automatically refreshing the values shown on the display.

5. Review the information and then select **Close** to return to the previous display.

1.2.8 Keyboard Shortcuts

FBxConnect supports keyboard shortcuts that provide an alternate way of performing an action. Below is the list of supported keyboard shortcuts:

Table 1. File Formats

Shortcut	Description
Ctrl+O	Export all parameter values on a display to a CSV file.
Ctrl+U	Open a pop-up version of the User Data display without closing the display you're currently viewing.
Ctrl+C	Copy the selected text to the clipboard.
Ctrl+V	Paste text from the clipboard.

Shortcut	Description
Ctrl	When creating a display in FBxVue, press and hold to select multiple objects on the canvas.

1.3 File Formats

The following table describes the file formats used by FBxConnect™ and FBxDesigner™:

Table 2. File Formats

File Extension	Software	Description
.csv	FBxConnect™	Option for report generation in FBxConnect™ (Alarms, Events, History, etc.).
.mwt	FBxDesigner™	Main FBxDesigner™ project file.
.pak	FBxConnect™	Individual firmware image (CPU, I/O Modules, etc.).
.pdf	FBxConnect™	Option for report generation in FBxConnect™ (Alarms, Events, History, etc.).
.ptc	FBxConnect™	Partial configuration file for FB Series products saved via FBxConnect™.
.v2c	FBxConnect™	License file generated via the Cloud Licensing Portal, and imported to a device via FBxConnect™.
.xml	FBxConnect™	Multiple uses: • Configuration file for FB Series flow computers and is saved via FBxConnect™. • FBxVue display file that is a user interface. The display file can be edited and viewed via FBxConnect™.
.zap	FBxConnect™	Zipped application package that contains an IEC61131 project and components.
.zip	FBxConnect™	System firmware image that contains all firmware images required for the FB3000 (CPU, I/O Modules, etc.).
.zsl	FBxConnect™	Zipped Solution that contains the configuration for an FB3000 device and is saved via FBxConnect™.

File Extension	Software	Description
.zwt	FBxDesigner™	Zipped FBxDesigner™ project file that contains all files needed for a project.

1.4 Native Data Types

Values stored within FB Series devices exist as parameters in an internal database. Each of these parameters has a native data type that best fits the purpose of the data. Many of these data types are industry standard, such as signed integers, unsigned integers, 32-bit floats, and 64-bit doubles. However, more unusual and specialized native data types, such as ENUM16, BIN8, and BYTE4 are also used throughout the device. Data type definitions, their size (in bytes), and typical use or range is defined in the table below.

Understanding the native data types is important for configuration exercises, such as mapping Modbus registers and custom DNP3 maps. External systems do not often have the same native data types as an FB Series device. Choosing appropriate remote data type conversions (Modbus) or Tables (DNP3) will depend on the size, range, and purpose of the native data types.

Note

- **ENUM16 –** The ENUM16 data type is used extensively throughout the internal database. It is an integer which represents an enumeration where each value (0, 1, 2, etc.) has a different meaning. This data type is the same as a UINT16 (unsigned 16-bit integer) and should be treated as such for mapping to external systems.
- **BIN –** The BIN data types (BIN8, BIN16, BIN32) are integers where each bit of the value has a specific meaning. A BIN8 (which is the same as a UINT8) has 8 bits, a BIN16 (same as a UINT16) has up to 16 bits, and a BIN32 (same as a UINT32) has up to 32 bits (note that not all bits may be used). Treat these data types as their associated unsigned integers (UINT8, UINT16, UINT32) when mapping to external systems.
- **BYTE –** The BYTE data types (BYTE4, BYTE6, BYTE32) represent a series of bytes which are all related, but do not typically form an integer. Use of these data types is rare, and they do not typically have an analogous data type in external systems.
- **PRMREF** and **OBJREF –** The PRMREF and OBJREF data types are used throughout the system for linking data and groups of data together. These references can be used to point to other parameters (or objects) sometimes as defined by the user, and other times in a fixed manner. Because of the “tag” based nature of accessing parameters in FB Series devices, a PRMREF is essentially a UC40 (40-character string), and an OBJREF

is essentially a UC20 (20-characters string). Treat these data types as their associated strings (UC40 and UC20) when mapping to external systems.

Table 3. FB Series Device Native Data Types

Data Type (Protocol Name)[1]	**Data Type (FBxConnect™ Name)**[2]	**# of Bytes**	**Database Block Size**	**Definition**
UINT8	INTEGER 8	1	Small	Unsigned 8-bit integer. Range of 0 to 255.
INT8	INTEGER 8	1	Small	Signed 8-bit integer. Range of -128 to 127.
UINT16	INTEGER 16	2	Small	Unsigned 16-bit integer. Range of 0 to 65,353.
INT16	INTEGER 16	2	Small	Signed 16-bit integer. Range of -32,768 to 32,767.
UINT32	INTEGER 32	4	Small	Unsigned 32-bit integer. Range of 0 to 4,294,967,296.
INT32	INTEGER 32	4	Small	Signed 32-bit integer. Range of -2,147,483,648 to 2,147,483,647.
UINT64	INTEGER 64	8	Small	Unsigned 64-bit integer.
INT64	INTEGER 64	8	Small	Signed 64-bit integer.
FLOAT	FLOAT	4	Small	32-bit IEEE floating-point number.
DOUBLE	DOUBLE	8	Small	64-bit IEEE floating-point number.
UC10	STRING 10	11	Medium	10-character string with null termination.
UC20	STRING 20	21	Medium	20-character string with null termination.
UC30	STRING 30	31	Large	30-character string with null termination.
UC40	STRING 40	41	Large	40-character string with null termination.

Data Type (Protocol Name)[1]	Data Type (FBxConnect™ Name)[2]	# of Bytes	Database Block Size	Definition
BYTE4	BYTE 4	4	Small	Byte array with 4 bytes (i.e., an IP address).
BYTE6	BYTE 6	6	Small	Byte array with 6 bytes (i.e., a MAC address).
BYTE32	BYTE 32	32	Large	Byte array with 32 bytes.
TIME	INTEGER 64	8	Small	Bytes 1 thru 4 – Seconds since Jan 1, 2000.
ENUM16	ENUM	2	Small	16-bit unsigned integer, which represents an enumeration.
BIN8	BIN 8	1	Small	8-bit binary value (bitwise indication).
BIN16	BIN 16	2	Small	16-bit binary value (bitwise indication).
BIN32	BIN 32	4	Small	32-bit binary value (bitwise indication).
PRMREF	PRMREF	41	Large	Parameter Reference.
OBJREF	OBJREF	21	Medium	Object Reference.

Note

1. The **Data Type (Protocol Name)** column lists the data type name shown in the *DNP3 Protocol Specifications Manual (for Emerson FB3000 RTUs)* (D310858X012).
2. The **Data Type (FBxConnect™ Name)** column lists the data type name shown in FBxConnect™ Configuration Software.

1.5 Calculation Library Limit Checks

FB Series products support multiple calculation libraries for both gas and liquid measurements. Each calculation library is subject to unique limits. Refer to the following tables based on the fluid you are measuring and the calculation you have selected:

Natural Gas Compressibility & Density Limit Checks

- AGA 8 2017

- AGA 8 1992 + ISO 12213-2 2006
- GERG TM5 1991 (SGERG) + ISO 12213-3 2006
- AGA NX-19 1962 + AGA NX-19 MOD 1966 + AGA NX-19 MOD BR KORR 1982 + VDI/VDE 2040 Part 2 1987

Natural Gas Calorific Value (CV) Limit Checks

- ISO 6976 1995 + Amendment 1997
- GPA 2172 1996/2009 + GPA 2145 1996/2000/2003/2009/2016

Natural Gas Flow Measurement Limit Checks

- AGA 3 1994
- ISO 5167 1991/1998/2003
- Rosemount 1595 Conditioning Orifice Plate, 405 Compact Orifice Plate
- ANNUBAR
- V-CONE (McCrometer and NuFlo)

Liquid Limit Checks

- API Ch. 11.1 2007
- API 11.2.2
- GPA 8117
- GPA 8217

1.5.1 Natural Gas Compressibility & Density Limit Checks

Refer to the following tables for information about specific limit checks for the following calculations:

- AGA 8 2017
- AGA 8 1992 + ISO 12213-2 2006
- GERG TM5 1991 (SGERG) + ISO 12213-3 2006
- AGA NX-19 1962 + AGA NX-19 MOD 1966 + AGA NX-19 MOD BR KORR 1982 + VDI/VDE 2040 Part 2 1987

AGA 8 2017

Table 4. AGA 8 Part 1 Detail method

	Range A	**Range B**	**Range C**
Lower temperature limit	>= 25.0°F >= –4.0°C	25.0°F –4.0°C	17.0°F –8.0°C
Upper pressure limit	<=1500.0 psia <=10.3 MPa	300.0 psia 2.1 MPa	3000.0 psia 21.0 MPa
Gross heating value†	23.5 – 44.7 MJ/m3	25.3 – 56.0 MJ/m3	35.8 – 40.6 MJ/m3
Relative density†	0.554 – 0.91	0.47 – 0.91	0.554 – 0.64
Upper composition limits:			
Methane	<= 100.0%	100.0%	100.0%
Nitrogen	<= 50.0%	50.0%	3.0%
Carbon dioxide	<= 30.0%*	80.0%	3.0%
Ethane	<= 10.0%	25.0%	4.0%
Propane	<= 4.0%	6.0%	2.0%
Isobutane	<= 0.4%	1.5%	0.1%
n-Butane	<= 0.6	6.0%	0.4%
Isopentane	<= 0.3%	2.0%	0.1%
n-Pentane	<= 0.3%	2.0%	0.1%
Total pentanes	<= 0.3%	2.0%	
n-Hexane	<= 0.12%	0.2%	0.03%
n-Heptane	<= 0.04%	0.2%	0.01%
n-Octane	<= 0.03%	0.2%	0.003%
n-Nonane	<= 0.03%	0.2%	0.003%
n-Decane	<= 0.03%	0.2%	0.003%
Total hexanes plus	<= 0.15%		
Total heptanes plus	<= 0.04%		

	Range A	Range B	Range C
Hydrogen	<= 5.0%	100.0%	1.0%
Oxygen	<= 0.2%	1.0%	0.2%
Carbon monoxide	<= 1.0%	10.0%	1.0%
Water	<= 0.05%	1.4%	0.005%
Hydrogen sulfide	<= 0.1%	4.0%	0.1%
Helium	<= 0.4%	5.0%	0.4%
Argon	<= 0.2%		

† Values are based on a methane lower limit composition of 60 mole percent.

*The mole percent of carbon dioxide upper limit is reduced for the following conditions for Range A:

- Carbon Dioxide <= 20.0% when Nitrogen > 7.0%
- Carbon Dioxide <= 10.0% when Nitrogen > 15.0%
- Carbon Dioxide <= 7.0% when Propane > 1.0%
- Carbon Dioxide <= 5.0% when Propane > 2.0%
- Carbon Dioxide <= 10.0% when Isobutane > 0.1%
- Carbon Dioxide <= 10.0% when n-Butane > 0.3%

Table 5. AGA 8 Part 1 Gross Method 1 & 2

	Range 1	Range 2
Lower Temperature	>=25.0°F >=-4.0°C	17.0°F -8.0°C
Min Temperature	<=143.0°F <=62.0°C	143.0°F 62.0°C
Max Pressure	<=1500.0 psia <=10.3 MPa	600.0 psia 4.1 MPa
Gross heating value	34.7 – 38.7 MJ/m3	24.8 – 41 MJ/m3
Relative density	0.554 – 0.63	0.554 – 0.89
Upper composition limits:		
Carbon Dioxide	<= 3.0%	25.0%
Hydrogen	<= 0.2%	2.0%

	Range 1	Range 2
Nitrogen	<= 7.0%	20.0%

Table 6. AGA 8 Part 2 GERG Method

Upper Temperature	<=800.0°F <=700.0 K
Maximum Pressure	<=10150.0 psia <=70.0 MPa

Note

Composition limits are not considered since the “model is also applicable to each of the pure natural gas components and to numerous binary and multi-component mixtures” (AGA 8 Part 2 pg. 1). Mixtures with high compositions of water, hydrogen, or helium may be subject to errors (AGA 8 Part 2 pg. 23).

AGA 8 1992 + ISO 12213-2 2006

Table 7. AGA 8 Detail method (Normal Range)

Pressure	0.0 – 275.79 MPa 0.0 – 40000 psia
Temperature	144.26 – 677.60 K -200.0 – 760.0°F
Methane	45.0 – 100.0%
Nitrogen	<= 50.0%
Carbon Dioxide	<= 30.0%
Ethane	<= 10.0%
Propane	<= 4.0%
iC4 + nC4	<= 1.0%
iC5 + nC5	<= 0.3%
nC6 + nC7 + nC8 + nC9 + nC10	<= 0.2%
Helium	<= 0.2%
Hydrogen	<= 10.0%
Carbon Monoxide	<= 3.0%

Pressure	0.0 – 275.79 MPa 0.0 – 40000 psia
Argon	<= 0.1%
Oxygen	<= 0.1%
Water	<= 0.05%
Hydrogen Sulfide	<= 0.02%

Table 8. AGA 8 Gross 1 method

Pressure	0.0 – 12.07 MPa 0.0 – 1750.0 psia
Temperature	265.0 – 335.0 K 17.0 - 143.0°F
Specific Gravity	0.554 – 0.87
Gross Heating Value	18.7 – 45.1 MJ
Carbon Dioxide	<= 30.0%
Hydrogen	<= 10.0%

Table 9. AGA 8 Gross 2 method

Pressure	0.0 – 12.07 MPa (0.0 – 1750.0 psia)
Temperature	265.0 – 335.0 K (17.0 - 143.0°F)
Specific Gravity	0.554 – 0.87
Nitrogen	<= 53.6%
Carbon Dioxide	<= 30.0%
Hydrogen	<= 10.0%

Table 10. ISO 12213-2 AGA8 Detail method (Wide Range)

Pressure	0.0 – 65.0 MPa
Temperature	225.00 – 335.00 K

Table 11. ISO 12213-2 AGA8 Detail method (Pipeline Quality)

Methane	70.0 – 100.0%
Nitrogen	<= 20.0%
Carbon Dioxide	<= 20.0%
Ethane	<= 10.0%
Propane	<= 3.5%
iC4 + nC4	<= 1.5%
iC5 + nC5	<= 0.5%
nC6	<= 0.1%
nC7	<= 0.05%
nC8 + nC9 + nC10	<= 0.05%
Helium	<= 0.5%
Hydrogen	<= 10.0%
Carbon Monoxide	<= 3.0%
Argon	<= 0.02%
Oxygen	<= 0.02%
Water	<= 0.015%
Hydrogen Sulfide	<= 0.02%

GERG TM5 1991 (SGERG) + ISO 12213-3 2006

Table 12. SGERG Methods 1 - 4

Pressure	0.01 – 12.0 MPa
Temperature	265.0 – 335.0 K (-8.15 – 61.85°C)
Relative Density	0.55 – 0.90
Heating Value	19.0 – 48.0 MJ/m3
Nitrogen	0.0 – 50.0%
Carbon Dioxide	0.0 – 30.0%
Hydrogen	0.0 – 10.0%

Table 13. ISO 12213-3 Data Sets 1 - 4

Pressure	0.01 – 12.0 MPa
Temperature	263.0 – 338.0 K
Relative Density	0.55 – 0.90
Heating Value	20.0 – 48.0 MJ/m3
Nitrogen	0.0 – 50.0%
Carbon Dioxide	0.0 – 30.0%
Hydrogen	0.0 – 10.0%

AGA NX-19 1962 + AGA NX-19 MOD 1966 + AGA NX-19 MOD BR KORR 1982 + VDI/VDE 2040 Part 2 1987

Table 14. NX-19 1962 / NX-19 MOD

Pressure	0.01 – 34.58 MPa (0.0 – 5000.0 psig)
Temperature	233.14 – 388.76 K (-40.0 – 240.0°F)
Relative Density	0.554 – 1.0
Nitrogen	0.0 – 15.0%
Carbon Dioxide	0.0 – 15.0%

Table 15. NX-19 MOD BR KORR

Pressure	0.01 – 34.58 MPa (0.0 – 5000.0 psig)
Temperature	233.14 – 388.76 K (-40.0 – 240.0°F)
Relative Density	0.554 – 1.0
Heating Value	39.8 – 46.2 MJ/m3
Nitrogen	0.0 – 15.0%
Carbon Dioxide	0.0 – 15.0%

Table 16. NX-19 VDI/VDE 2040

Pressure	0.001 – 13.79 MPa
Temperature	233.14 – 388.76 K (-40.15 – 115.6°C)

Pressure	0.001 – 13.79 MPa
Relative Density	0.554 – 0.75
Nitrogen	0.0 – 15.0%
Carbon Dioxide	0.0 – 15.0%

1.5.2 Natural Gas Calorific Value (CV) Limit Checks

Refer to the following tables for information about specific limit checks for the following calculations:

- ISO 6976 1995 + Amendment 1997
- GPA 2172 1996/2009 + GPA 2145 1996/2000/2003/2009/2016

ISO 6976 1995 + Amendment 1997

Table 17. ISO6976 1995

Pressure	0.001 – 13.79 MPa
Base Temperature (t2)	-10.0 – 30.0°C
Each Component	0.0 – 100.0%
Component Sum	99.9 – 100.1%

GPA 2172 1996/2009 + GPA 2145 1996/2000/2003/2009/2016

Table 18. GPA 2172 1996 / GPA 2172 2009

Pressure	0.0 – 30.0 psia
Temperature	-10.0 – 30.0°C
Each Component	0.0 – 100.0%
Component Sum	99.9 – 100.1%

1.5.3 Natural Gas Flow Measurement Limit Checks

Refer to the following tables for information about specific limit checks for the following calculations:

- AGA 3 1994
- ISO 5167 1991/1998/2003
- Rosemount 1595 Conditioning Orifice Plate, 405 Compact Orifice Plate
- ANNUBAR
- V-CONE

AGA 3 1994

Table 19. AGA 3 1994, FLANGE, CORNER, and D-D/2

Pressure	0.0 – 100000.0 psia
Differential Pressure	< Pressure
Pressure Ratio	>= 0.75
Temperature	-400.0 – 1000.0°F
Relative density	0.1 – 2.0
Flowing density	0.001 – 100.0 lbm/ft3
Pipe diameter	2.0 – 100.0 in
Orifice diameter	0.45 – 100.0 in
Orifice diameter	< Pipe diameter
Isentropic exponent	> 0.0
Viscosity	> 0.0
Beta ratio	0.1 – 0.75
Reynolds number	4000.0 – 1.0e10
Gravity	30.0 – 40.0 ft/sec2
Elevation	-10000.0 – 50000.0 ft

ISO 5167 1991/1998/2003

Table 20. ISO5167 1991, ISO5167 1998, and ISO5167 2003

Upstream pressure	>= 1.0e-10
Differential Pressure	< Upstream pressure
Pressure Ratio	>= 0.75
Upstream temperature	-200.0 – 1000.0°C
Upstream density	0.01 – 2000.0 kg/m3
Orifice diameter	< Pipe diameter
Isentropic exponent	> 1.0e-10
Viscosity	> 1.0e-10

Table 21. FLANGE

Orifice diameter	>= 12.5 mm
Pipe diameter (D)	50.0 – 1000.0 mm
Beta Ratio (B)	0.2 – 0.75 (ISO5167 1991) 0.1 – 0.75 (ISO5167 1998, 2003)
Reynolds number	>= 1260.0*B*B*D (ISO5167 1991) >= 4000.0 & >= 170.0*B*B*D (ISO5167 1998) >= 5000.0 & >= 170.0*B*B*D (ISO5167 2003)

Table 22. CORNER

Orifice diameter	>= 12.5 mm
Pipe diameter	50.0 – 1000.0 mm
Beta Ratio (B)	0.2 – 0.75 - ISO5167 1991 0.1 – 0.75 - ISO5167 1998, 2003

Orifice diameter	>= 12.5 mm
Reynolds number	> 5000.0 for B in 0.2 – 0.45 (ISO5167 1991) > 10000.0 for B > 0.45 (ISO5167 1991) > 4000.0 for B in 0.1 – 0.5 (ISO5167 1998) > 16000.0*B*B for B > 0.5 (ISO5167 1998) > 5000.0 for B in 0.1 – 0.56 (ISO5167 2003) > 16000.0*B*B for B > 0.56 (ISO5167 2003)

Table 23. D-D/2

Orifice diameter	>= 12.5 mm
Pipe diameter	50.0 – 1000.0 mm
Beta Ratio (B)	0.2 – 0.75 - ISO5167 1991 0.1 – 0.75 - ISO5167 1998, 2003
Reynolds number	>= 1260.0*B*B*D (ISO5167 1991) > 4000.0 for B in 0.1 – 0.5 (ISO5167 1998) > 16000.0*B*B for B > 0.5 (ISO5167 1998) > 5000.0 for B in 0.1 – 0.56 (ISO5167 2003) > 16000.0*B*B for B > 0.56 (ISO5167 2003)

Table 24. NOZZLE 1932

Pipe diameter	50.0 – 500.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio (B)	0.3 – 0.8

Pipe diameter	50.0 – 500.0 mm
Reynolds number	70000.0 – 10000000.0 for B 0.3 – 0.44 20000.0 – 10000000.0 for B >= 0.44

Table 25. NOZZLE LONG RADIUS

Pipe diameter	50.0 – 630.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio	0.2 – 0.8
Reynolds number	10000.0 – 10000000.0

Table 26. VENTURI NOZZLE

Pipe diameter	65.0 – 500.0 mm
Orifice diameter	>= 50.0 mm
Beta Ratio	0.316 – 0.775
Reynolds number	150000.0 – 2000000.0

Table 27. VENTURI TUBE AS CAST

Pipe diameter	100.0 – 800.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio	0.3 – 0.75
Reynolds number	200000.0 – 2000000.0

Table 28. VENTURI TUBE MACHINED

Pipe diameter	50.0 – 250.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio	0.3 – 0.75
Reynolds number	200000.0 – 1000000.0

Table 29. VENTURI TUBE ROUGH WELD

Pipe diameter	200.0 – 1200.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio	0.4 – 0.70
Reynolds number	200000.0 – 2000000.0

Rosemount 1595 Conditioning Orifice Plate, 405 Compact Orifice Plate

Table 30. RSMT1595 2003, RSMT405C 2003, RSMT405P 2003

Upstream pressure	>= 1.0e-10
Differential Pressure	< Upstream pressure
Pressure Ratio	>= 0.75
Upstream temperature	-200.0 – 1000.0°C
Upstream density	0.01 – 2000.0 kg/m3
Orifice diameter	< Pipe diameter
Isentropic exponent	> 1.0e-10
Viscosity	> 1.0e-10

ANNUBAR

Table 31. Rosemount Diamond II+, 485, 585, Veris Accelabar, MI 2667, Pitot ALL

Upstream pressure	>= 1.0e-10
Differential Pressure	< Upstream pressure
Pressure Ratio	>= 0.75
Upstream temperature	-200.0 – 1000.0°C
Upstream density	0.01 – 2000.0 kg/m3
Orifice diameter	< Pipe diameter
Isentropic exponent	> 1.0e-10
Viscosity	> 1.0e-10
Pipe diameter	10.0 – 4000.0 mm

Upstream pressure	>= 1.0e-10
Orifice diameter	>= 0.0 mm
Blockage Factor	0.001 – 0.95
Min Reynolds number	Dependent on Sensor Size (Typically 6500.0 – 25000.0)
Max Reynolds number	20000000.0

V-CONE (McCrometer, NuFlo)

Table 32. McCROMETER 2.3 1997, McCROMETER 3.0 2001, NUFLO 2007, and NUFLO 2013

Upstream pressure	>= 1.0e-10
Differential Pressure	< Upstream pressure
Pressure Ratio	>= 0.75
Upstream temperature	-200.0 – 1000.0°C
Upstream density	0.01 – 2000.0 kg/m3
Orifice diameter	< Pipe diameter
Isentropic exponent	> 1.0e-10
Viscosity	> 1.0e-10
Pipe diameter	10.0 – 4000.0 mm
Orifice diameter	>= 0.0 mm
Beta Ratio	0.1 – 0.95
Reynolds number	20000.0 – 2000000.0

1.5.4 Liquid Limit Checks

Refer to the following tables for information about specific limit checks for the following calculations:

- API Ch. 11.1 2007
- API 11.2.2
- GPA 8117

- GPA 8217

API Ch. 11.1 2007

Table 33. Crude Oil

Density (observed)	470.5 – 1201.8 kg/m3
Density @ 60°F	610.0 – 1163.5 kg/m3
Temperature	-50.00 – 150.00°C (-58.0 – 302.0°F)
Pressure	0.0 – 1,500.0 psig
α60z	0.000230 – 0.000930 per °F

Table 34. Refined Products

Density (observed)	470.4 – 1209.5 kg/m3
Density @ 60°F	610.0 – 1163.5 kg/m3
Temperature	-50.00 – 150.00°C
Pressure	0.0 – 1,500.0 psig
α60z	0.000230 – 0.000930 per °F

Table 35. Lubricating Oils

Density (observed)	714.3 – 1208.3 kg/m3
Density @ 60°F	800.9 – 1163.5 kg/m3
Temperature	-50.00 – 150.00°C
Pressure	0 – 1,500 psig
α60z	0.000230 – 0.000930 per °F

Table 36. Specific Refined Products (Density @ 60°F)

Fuel Oils	838.3127 – 1163.5 kg/m3
Jet Fuels	787.5195 – 838.3127 kg/m3
Transition Zone	770.3520 – 787.5195 kg/m3
Gasolines	610.6 – 770.3520 kg/m3

API 11.2.2

Table 37. API 11.2.2

Rel. Density @ 60°F	0.350 – 0.637 RD
Temperature	-50.0 – 140.0°F
Tmax	0.96Tcritical ; Tcritical = 621.418 - 822.686 * RD60 + 1737.86 * RD602
Pressure Difference	0.0 – 2,200.0 psig

GPA 8117

Table 38. GPA 8117

Rel. Density @ 60°F	0.350 – 0.676 RD
Temperature	-50.0 – 140.0 °F
Note If RD60 < 0.425 then Tmax = (695.51 * RD60 - 155.51)°F	

GPA 8217

Table 39. GPA 8217

Density (observed)	0.2100 – 0.7400 RD
Density @ 60°F	0.3500 – 0.6880 RD
Temperature	-50.8 – 199.4 °F

1.6 Troubleshooting Pop-Up Displays

You may encounter an issue where pop-up displays (such as DP Meter – Diagnostics or Liquid Linear Meter – Rates and Totals) fail to open. FBxConnect uses the system registry to monitor application memory, and this behavior can occur when performance counters in the system registry become corrupted and FBxConnect is unable to determine the memory consumption. You can fix this issue by rebuilding the performance counters in the system registry.

To rebuild the performance counters:

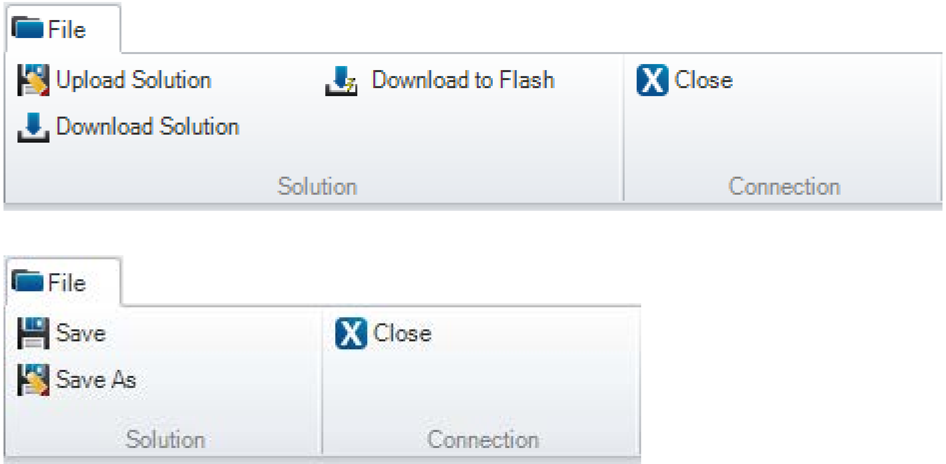
1. Click **Start** and type **CMD** to perform a search for the Command Prompt.
2. Select **Command Prompt** from the search results. The Command Prompt windows opens.
3. Type **cd c:\windows\system32** and press **Enter**.
4. Type **lodctr /R** and press **Enter**.
5. Type **cd c:\windows\sysWOW64** and press **Enter**.
6. Type **lodctr /R** and press **Enter**.

After performing these steps, you have rebuilt the performance counters and can open pop-up displays in FBxConnect.

Section 2: File Menu

Use the options in this menu to save an FB Series product configuration file to your PC, save an FB Series product configuration to flash memory, load a saved configuration to the FB Series product, or close the current connection to the FB Series product.

Figure 13. File Menu (online and offline)



The File menu contains the following options:

Save – Save changes when modifying a solution's configuration file in offline mode (not connected to an FB Series product).

Save As – Save changes when modifying a solution's configuration file in offline mode (not connected to an FB Series product) to a new file on your PC.

Upload Solution – Package application and configuration data from your FB Series product and save it on your PC.

Download Solution – Load a previously saved configuration file or solution to the connected FB Series product.

Download to Flash – Save a previously saved configuration file to the flash memory of the connected FB Series product.

Close – Close the current connection and exit FBxConnect™.

2.1 Save (Offline Mode)

Use the Save option to save changes when modifying a solution's configuration file in offline mode (not connected to an FB Series product). It is good practice to save your configuration whenever you make a change to the file.

When you save a solution's configuration, a file is saved to your PC. This allows you to reload the solution's configuration if something should corrupt your device.

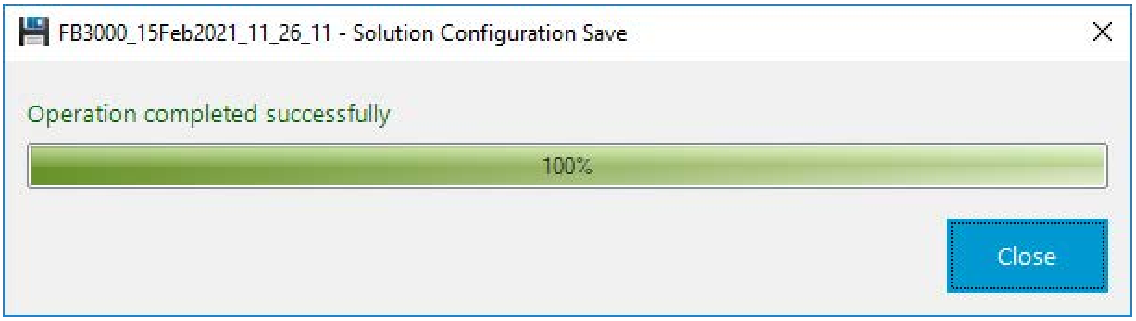
Note

When working in offline mode from a newly created FBxConnect™ configuration file, read-only output parameters are **not** included in the configuration file and are instead displayed as default values.

To save a solution's configuration file in offline mode:

1. Open an FB Series product configuration file in Field Tools, and make the required changes.
2. Select **File > Save** from the FBxConnect™ main menu. The Solution Configuration Save dialog opens and shows the progress of saving your solution's configuration.

Figure 14. Solution Saved Successfully


FB3000_15Feb2021_11_26_11 - Solution Configuration Save

Operation completed successfully

3. Select **Close** to exit the Solution Configuration Save dialog.

2.2 Save As (Offline Mode)

Use the Save As option to save a copy of the current solution's configuration file and specify a new file name or location. This option is **only** available while in offline mode (not connected to an FB Series product).

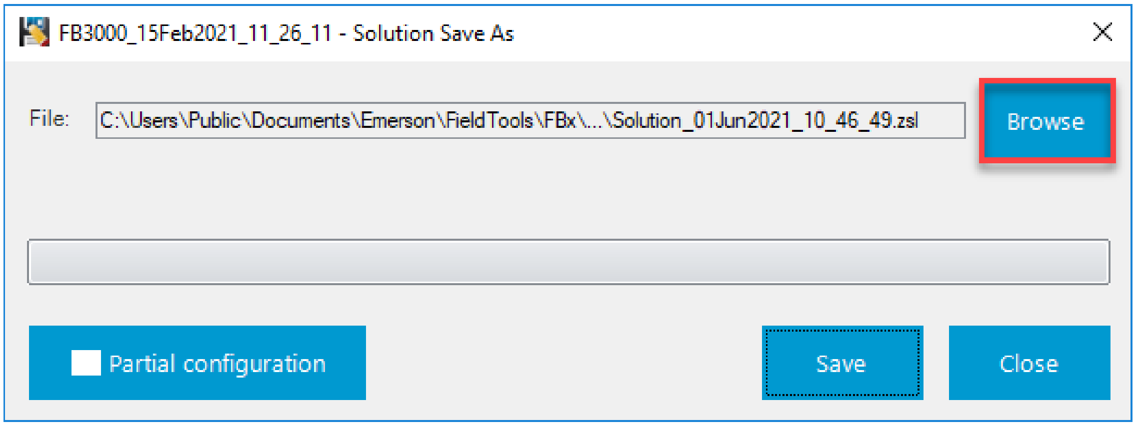
Note

- When working in offline mode from a newly created FBxConnect™ configuration file, read-only output parameters are **not** included in the configuration file and are instead displayed as default values.
- After you create a backup configuration file, you can load it onto a device using Download Solution and save it to the device's flash memory using Download to Flash.

To save a copy of a solution's configuration to a file on your PC:

1. Open an FB Series product configuration file in Field Tools, and then make the required changes.
2. Select **File > Save As** from the FBxConnect™ main menu. The Configuration Save As dialog displays:

Figure 15. Solution Configuration Save As

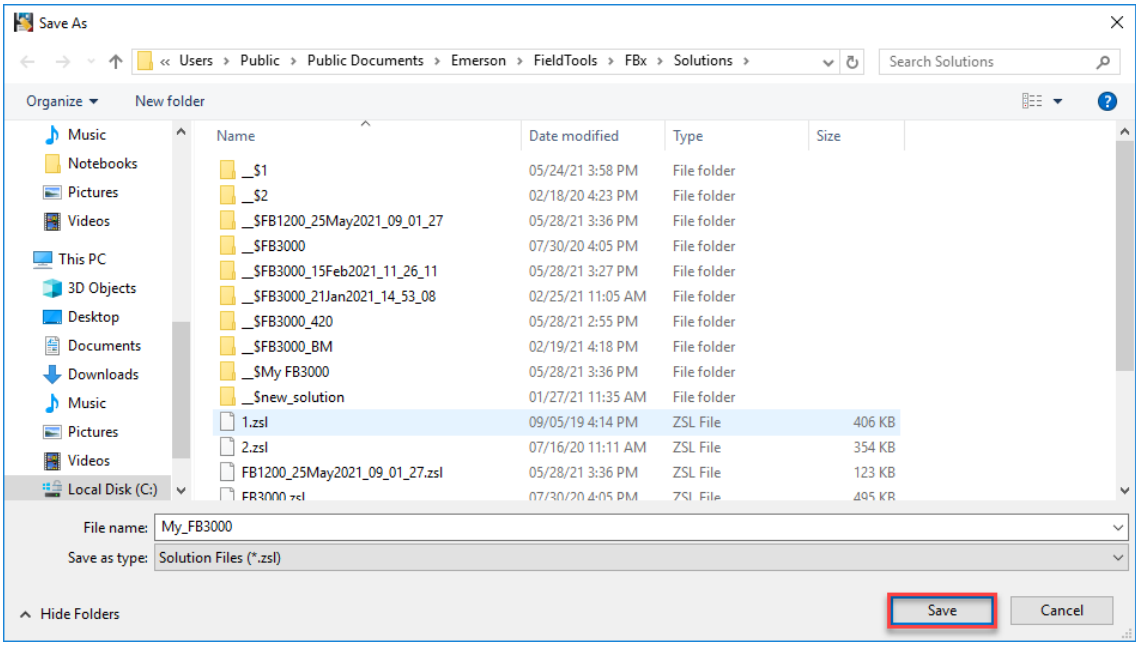


FB3000_15Feb2021_11_26_11 - Solution Save As

File: C:\Users\Public\Documents\Emerson\FieldTools\FBx\...\Solution_01Jun2021_10_46_49.zsl

3. Select **Browse** to open a file explorer window.

Figure 16. Save As



Name	Date modified	Type	Size
__$1	05/24/21 3:58 PM	File folder	
__$2	02/18/20 4:23 PM	File folder	
__$FB1200_25May2021_09_01_27	05/28/21 3:36 PM	File folder	
__$FB3000	07/30/20 4:05 PM	File folder	
__$FB3000_15Feb2021_11_26_11	05/28/21 3:27 PM	File folder	
__$FB3000_21Jan2021_14_53_08	02/25/21 11:05 AM	File folder	
__$FB3000_420	05/28/21 2:55 PM	File folder	
__$FB3000_BM	02/19/21 4:18 PM	File folder	
__$My FB3000	05/28/21 3:36 PM	File folder	
__$new_solution	01/27/21 11:35 AM	File folder	
1.zsl	09/05/19 4:14 PM	ZSL File	406 KB
2.zsl	07/16/20 11:11 AM	ZSL File	354 KB
FB1200_25May2021_09_01_27.zsl	05/28/21 3:36 PM	ZSL File	123 KB
FB3000.zsl	07/30/20 4:05 PM	ZSL File	495 KB

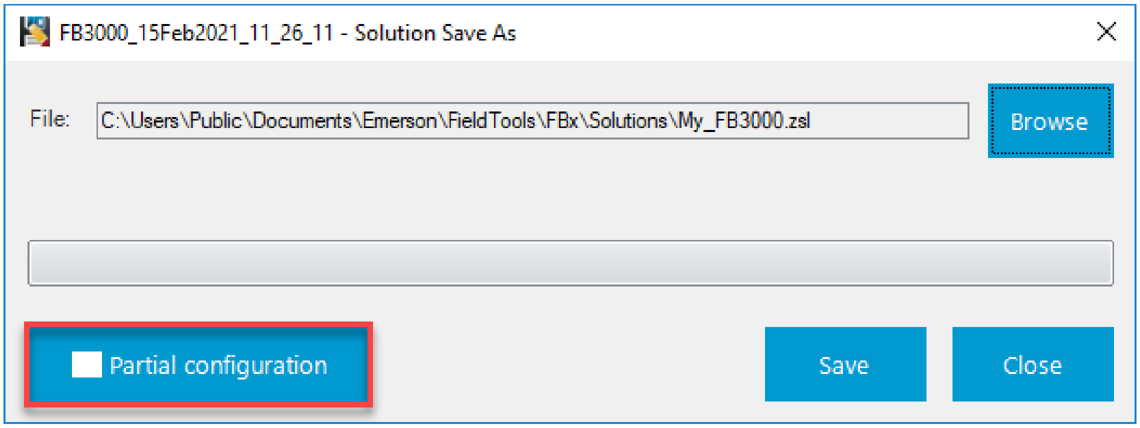
File name: My_FB3000
Save as type: Solution Files (*.zsl)

4. Navigate to a location on your PC you wish to save the configuration file, enter a name for the file, and then select **Save**. The Configuration Save As screen re-displays.

Note

- The default file name includes the connection/device name, report type, and timestamp of report creation (*ConnectionName_ReportType_YYMMDDThhmmss*).
- The default location for saved configuration files is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.

Figure 17. Partial configuration



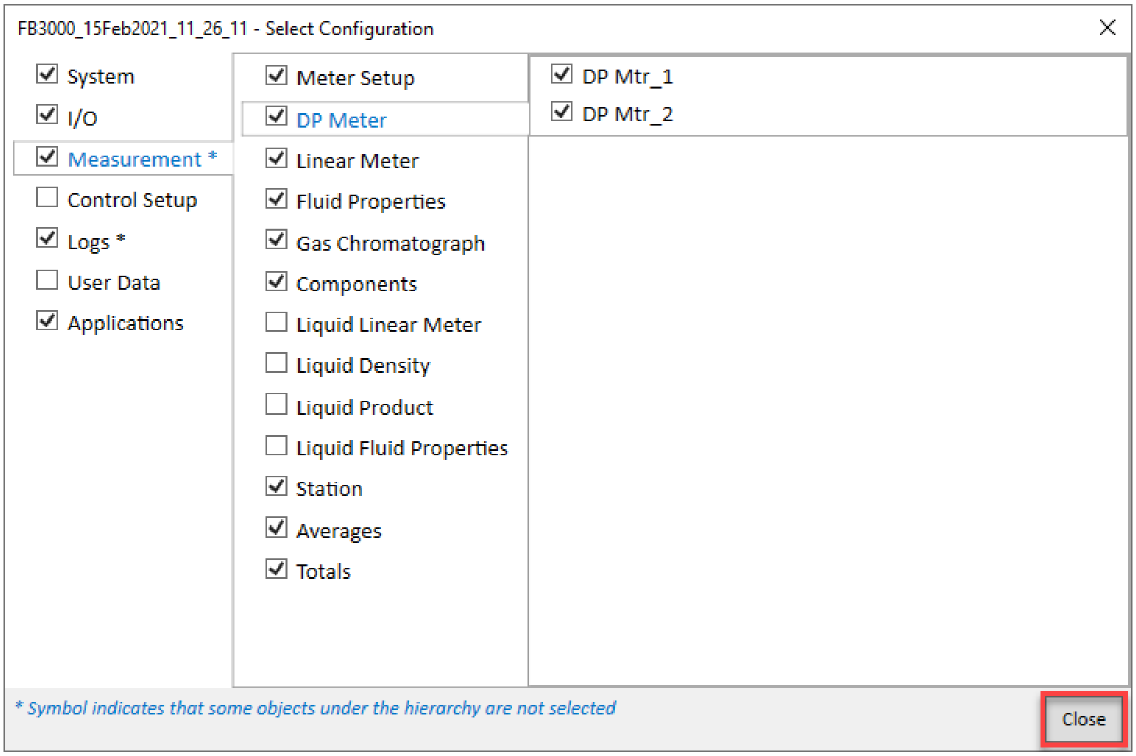
C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\My_FB3000.zsl

5. If you want to manually select which Objects and Instances are saved in the configuration file, select **Partial Upload**. The Select Configuration dialog opens.

Note

The Partial configuration option requires firmware version 2.7 or later.

Figure 18. Select Configuration



FB3000_15Feb2021_11_26_11 - Select Configuration

☑ System
☑ I/O
☑ Measurement *
☐ Control Setup
☑ Logs *
☐ User Data
☑ Applications

☑ Meter Setup
☑ DP Meter
☑ Linear Meter
☑ Fluid Properties
☑ Gas Chromatograph
☑ Components
☐ Liquid Linear Meter
☐ Liquid Density
☐ Liquid Product
☐ Liquid Fluid Properties
☑ Station
☑ Averages
☑ Totals

☑ DP Mtr_1
☑ DP Mtr_2

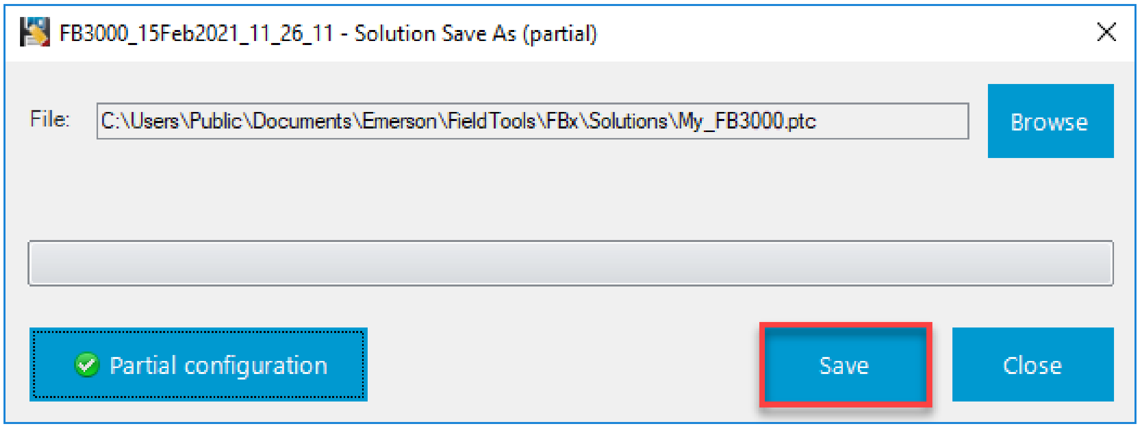
** Symbol indicates that some objects under the hierarchy are not selected*

6. Place a check mark next to the specific Objects and Instances you wish to save in the configuration file and click **Close**. The Configuration Upload dialog re-displays.

Note

- Select an object in the left most column to show the associated objects/instances in the next column. Continue this process for the subsequent columns to select which parameters to include in the configuration. For example, select Measurement in the left-hand column and Fluid Properties in the middle column to display the configured Fluid Properties instances in the right-hand column.
- An asterisk (*) next to an object indicates that only a partial set of parameters is selected for that particular object.
- Partial configuration files are stored with the file extension **.PTC**.

Figure 19. Save



FB3000_15Feb2021_11_26_11 - Solution Save As (partial)

File: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\My_FB3000.ptc

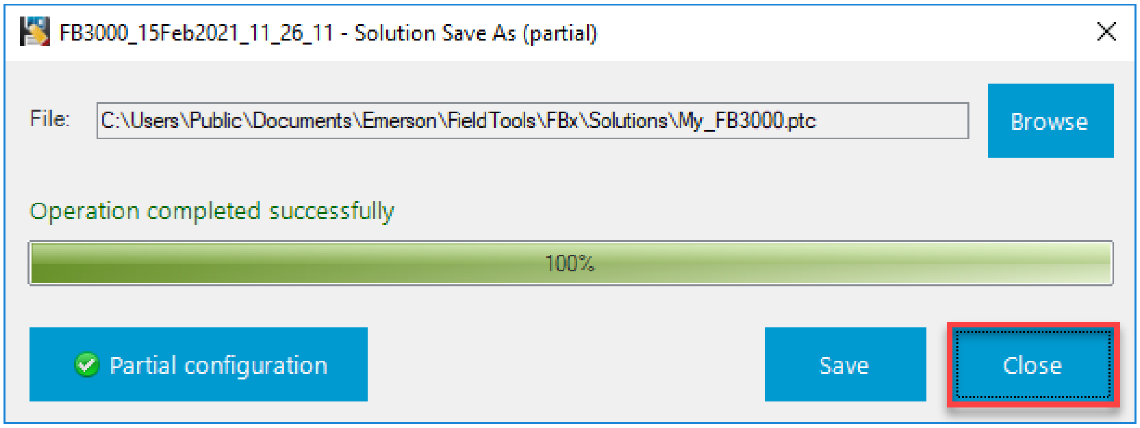
7. Select **Save** to save your device configuration to a file on your PC.

Note

A progress bar displays the status of the configuration save process.

8. When the configuration save process is complete, select **Close** to return to the main FBxConnect™ screen.

Figure 20. Solution Saved Successfully



FB3000_15Feb2021_11_26_11 - Solution Save As (partial)

File: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\My_FB3000.ptc

Operation completed successfully

100%

2.3 Upload Solution

A Solution contains application and configuration data for an FB Series product. When you Upload a Solution, the system packages application and configuration data from your FB Series product and saves it on your PC.

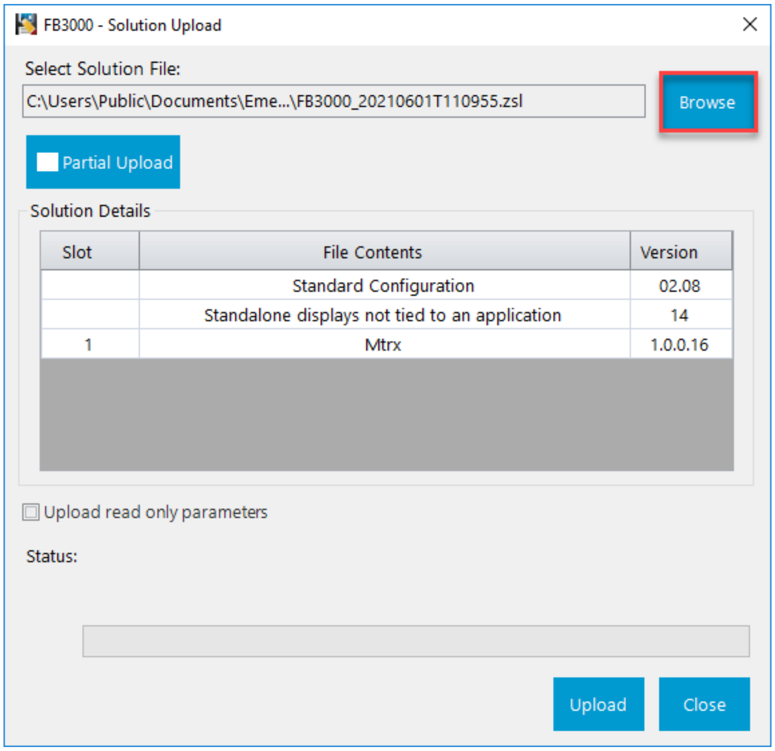
Note

A Solution consists of two parts: a .ZSL file and a file folder. These two parts **must** have the same name and be used together when working offline or downloading a saved solution to another unit.

To upload a Solution to your PC:

1. Select **File > Upload Solution** for the FBxConnect™ main menu. The Solution Upload screen displays.

Figure 21. Solution Upload



Select Solution File: C:\Users\Public\Documents\Eme...\FB3000_20210601T110955.zsl

Solution Details

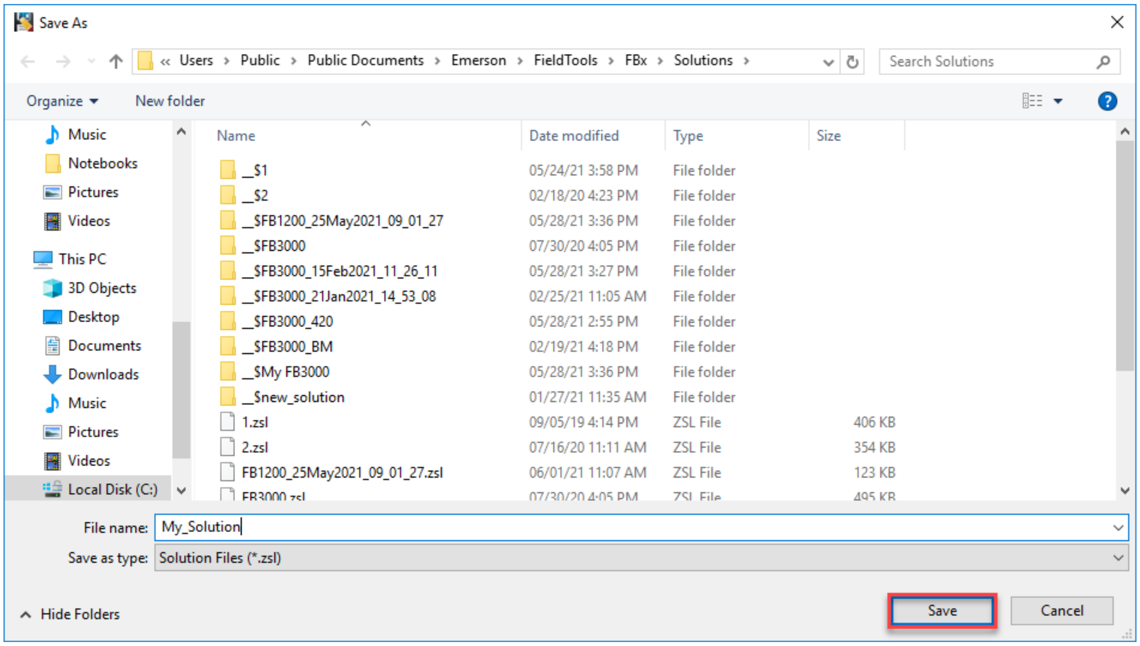
Slot	File Contents	Version
	Standard Configuration	02.08
	Standalone displays not tied to an application	14
1	Mtrx	1.0.0.16

☐ Upload read only parameters

Status:

2. Select **Browse** to open a file explorer window.

Figure 22. Save As



Name	Date modified	Type	Size
__$1	05/24/21 3:58 PM	File folder	
__$2	02/18/20 4:23 PM	File folder	
__$FB1200_25May2021_09_01_27	05/28/21 3:36 PM	File folder	
__$FB3000	07/30/20 4:05 PM	File folder	
__$FB3000_15Feb2021_11_26_11	05/28/21 3:27 PM	File folder	
__$FB3000_21Jan2021_14_53_08	02/25/21 11:05 AM	File folder	
__$FB3000_420	05/28/21 2:55 PM	File folder	
__$FB3000_BM	02/19/21 4:18 PM	File folder	
__$My FB3000	05/28/21 3:36 PM	File folder	
__$new_solution	01/27/21 11:35 AM	File folder	
1.zsl	09/05/19 4:14 PM	ZSL File	406 KB
2.zsl	07/16/20 11:11 AM	ZSL File	354 KB
FB1200_25May2021_09_01_27.zsl	06/01/21 11:07 AM	ZSL File	123 KB
FB3000.zsl	07/30/20 4:05 PM	ZSL File	495 KB

File name: My_Solution

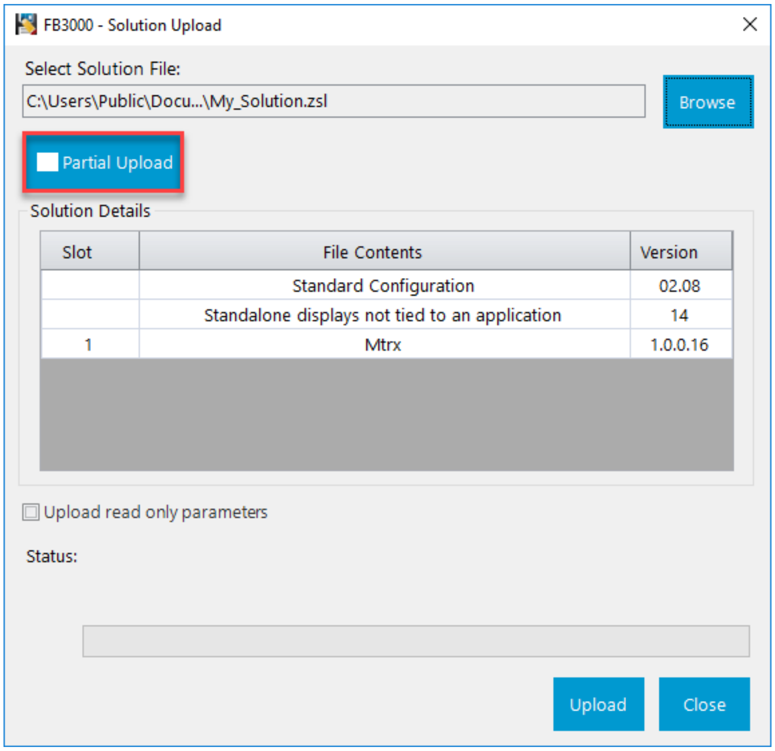
Save as type: Solution Files (*.zsl)

3. Navigate to a location on your PC you wish to save the Solution, enter a name for the Solution, and then select **Save**. The Solution Upload screen re-displays.

Note

- The default file name includes the connection/device name, report type, and timestamp of report creation (*ConnectionName_ReportType_YYMMDDThhmmss*).
- The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.

Figure 23. Partial Upload



FB3000 - Solution Upload

Select Solution File: C:\Users\Public\Docu...\My_Solution.zsl

☐ Partial Upload

Solution Details

Slot	File Contents	Version
	Standard Configuration	02.08
	Standalone displays not tied to an application	14
1	Mtrx	1.0.0.16

☐ Upload read only parameters

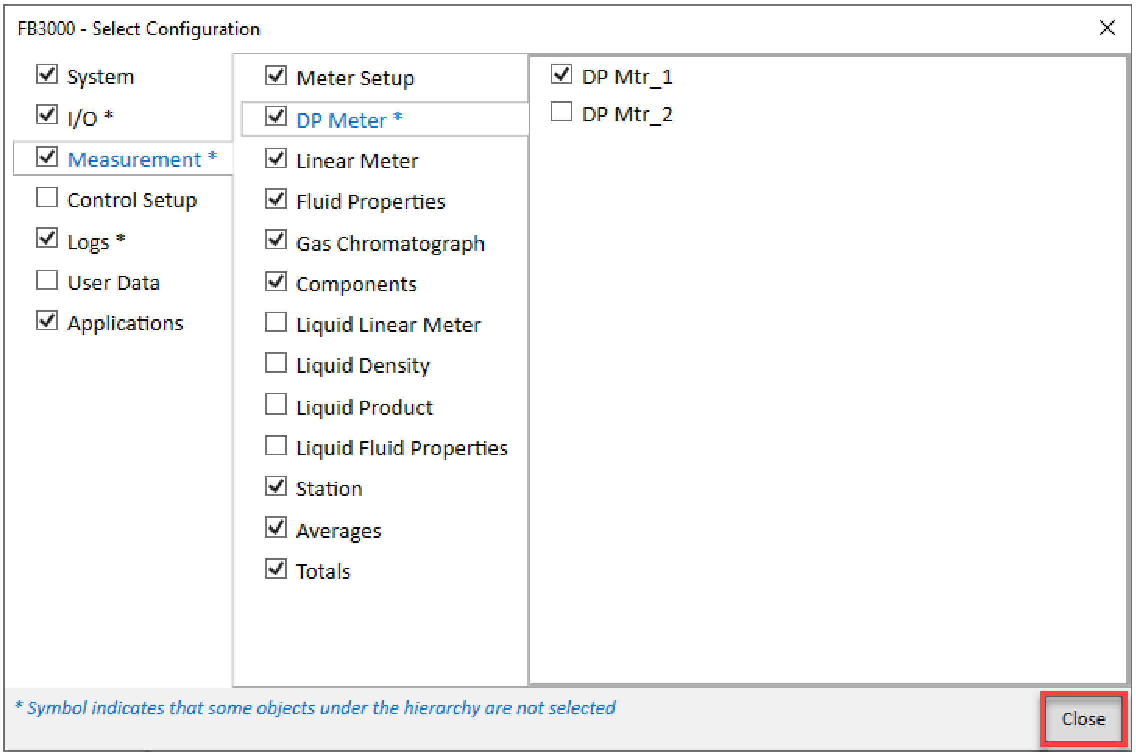
Status:

4. If you want to manually select which Objects and Instances are saved in the configuration file, select **Partial Upload**. The Select Configuration dialog opens.

Note

The Partial Upload option requires firmware version 2.7 or later.

Figure 24. Select Configuration



FB3000 - Select Configuration

☑ System
☑ I/O *
☑ Measurement *
☐ Control Setup
☑ Logs *
☐ User Data
☑ Applications

☑ Meter Setup
☑ DP Meter *
☑ Linear Meter
☑ Fluid Properties
☑ Gas Chromatograph
☑ Components
☐ Liquid Linear Meter
☐ Liquid Density
☐ Liquid Product
☐ Liquid Fluid Properties
☑ Station
☑ Averages
☑ Totals

☑ DP Mtr_1
☐ DP Mtr_2

** Symbol indicates that some objects under the hierarchy are not selected*

5. Place a check mark next to the specific Objects and Instances you wish to save in the configuration file and click **Close**. The Configuration Upload dialog re-displays.

Note

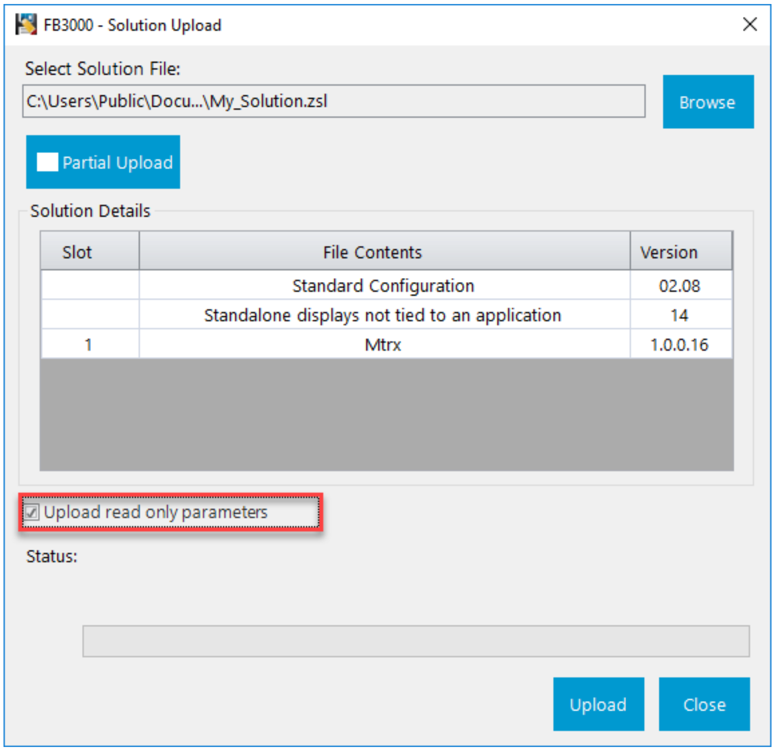
- Select an object in the left most column to show the associated objects/instances in the next column. Continue this process for the subsequent columns to select which parameters to include in the configuration. For example, select Measurement in the left-hand column and Fluid Properties in the middle column to display the configured Fluid Properties instances in the right-hand column.
- An asterisk (*) next to an object indicates that only a partial set of parameters is selected for that particular object.
- Partial configuration files are stored with the file extension **.PTC**.

6. Select **Upload read only parameters** to include all **read-only** parameters in the configuration file. This option provides a snapshot of the FB Series product, and the resulting configuration file includes flow rates, totals, and diagnostic values. This option is useful when troubleshooting a device.

Note

This option is **not** available if you select **Partial Upload**.

Figure 25. Upload read only parameters



FB3000 - Solution Upload

Select Solution File: C:\Users\Public\Docu...\My_Solution.zsl

☐ Partial Upload

Solution Details

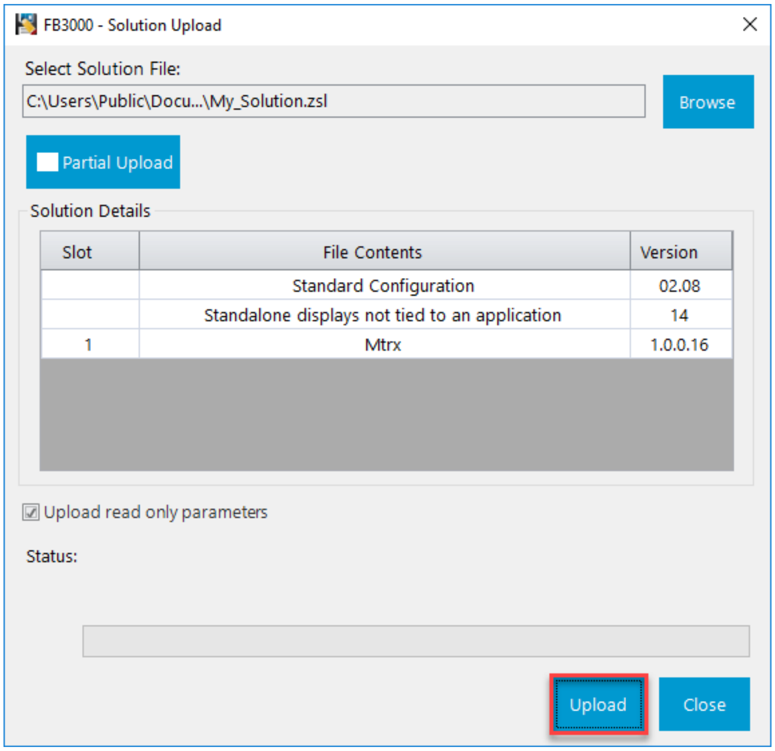
Slot	File Contents	Version
	Standard Configuration	02.08
	Standalone displays not tied to an application	14
1	Mtrx	1.0.0.16

☑ Upload read only parameters

Status:

7. Select **Upload**. FBxConnect™ saves the selected Solution to your PC.

Figure 26. Upload



Select Solution File: C:\Users\Public\Docu...\My_Solution.zsl

Solution Details

Slot	File Contents	Version
	Standard Configuration	02.08
	Standalone displays not tied to an application	14
1	Mtrx	1.0.0.16

☑ Upload read only parameters

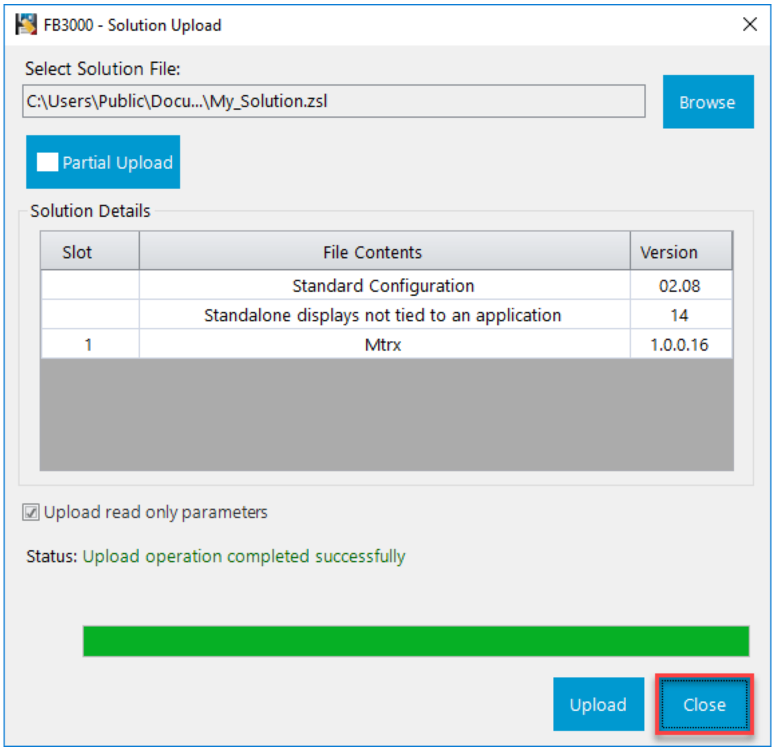
Status:

Note

A progress bar displays the status of the Solution save process.

8. When the Solution upload process is complete, select **Close** to return to the main FBxConnect™ screen.

Figure 27. Solution Saved Successfully



Select Solution File: C:\Users\Public\Docu...\My_Solution.zsl

Slot	File Contents	Version
	Standard Configuration	02.08
	Standalone displays not tied to an application	14
1	Mtrx	1.0.0.16

☑ Upload read only parameters

Status: Upload operation completed successfully

2.4 Download Solution

You can download a solution file to your FB Series product after you have saved the solution file to your PC. A Solution contains application and configuration data for an FB Series product. When you Download a Solution, the system transfers application and configuration data from your PC and loads it into your FB Series product.

Note

A Solution consists of two parts: a .ZSL file and a file folder. These two parts **must** have the same name and be used together when working offline or downloading a saved solution to another unit.

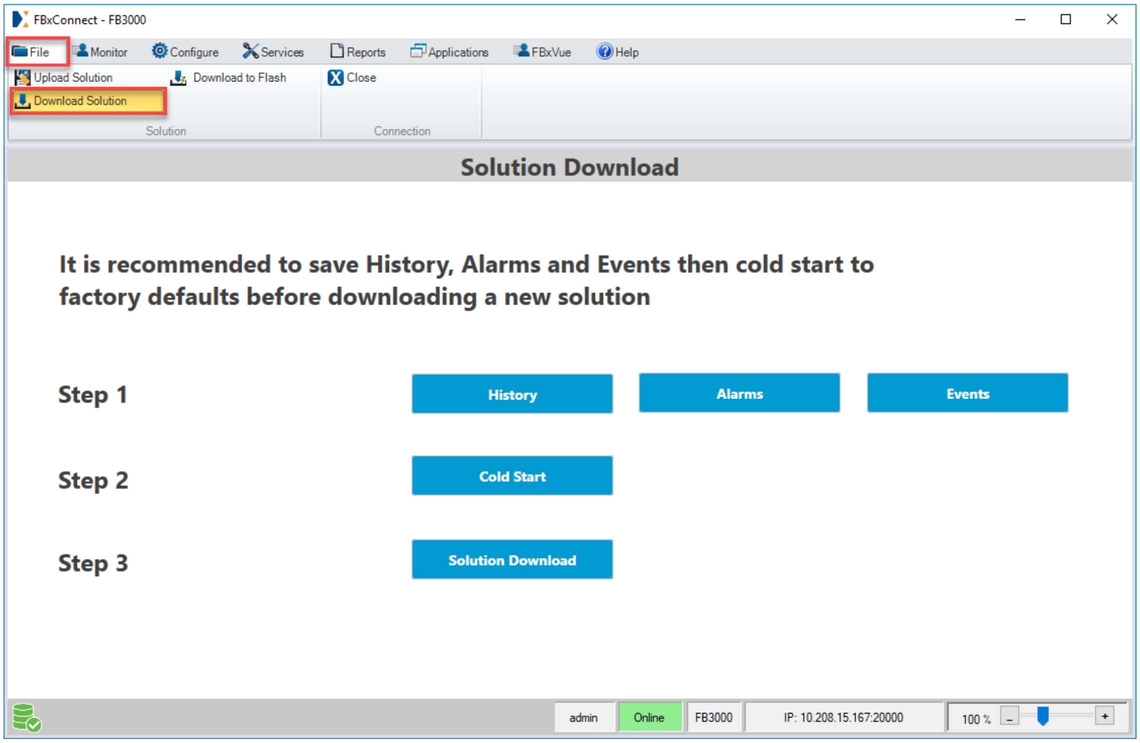
To download a Solution to your FB Series product:

1. Select **File > Download Solution** from the FBxConnect™ menu. The Solution Download display opens.

Note

Emerson recommends performing step 1 and step 2 prior to downloading a solution.

Figure 28. Solution Download



Solution Download

It is recommended to save History, Alarms and Events then cold start to factory defaults before downloading a new solution

Step 1

Step 2

Step 3

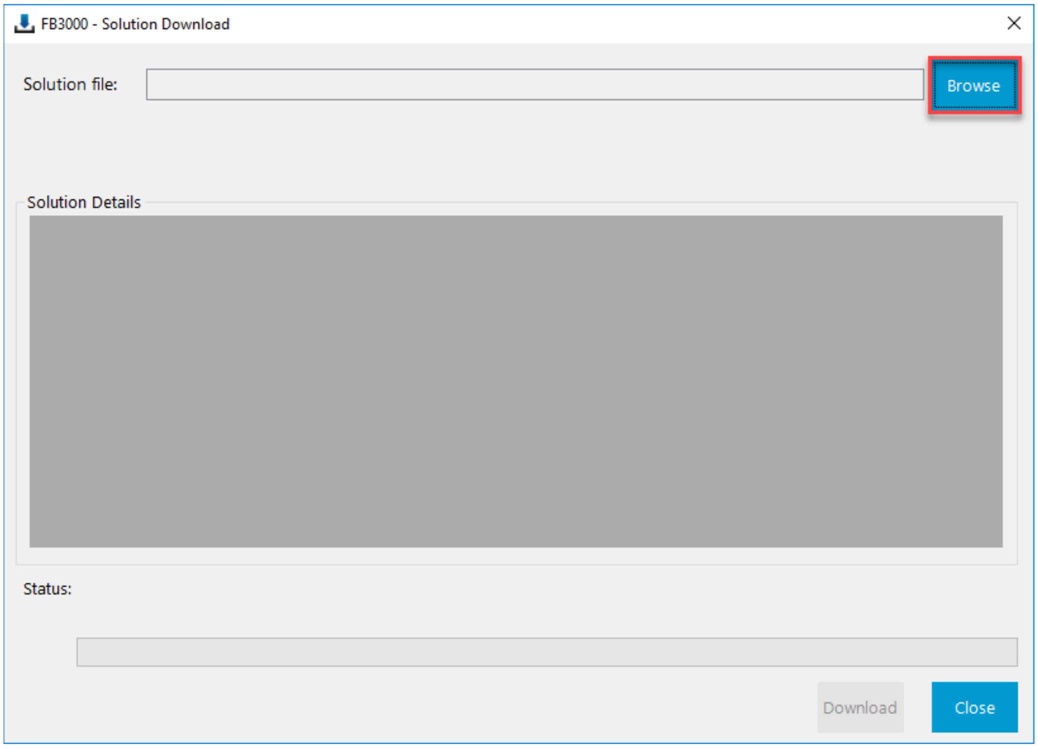
2. Select **History** to save history data. The History Report display opens. For more information, refer to History Report.
3. Select **Alarms** to save alarm data. The Alarm Report display opens. For more information, refer to Alarm Report.
4. Select **Events** to save event data. The Event Report display opens. For more information, refer to Event Report.
5. Select **Cold Start**. The Cold Start display opens. For more information, refer to Cold Start.

Note

Be sure to select **Database is re-initialized with factory defaults**.

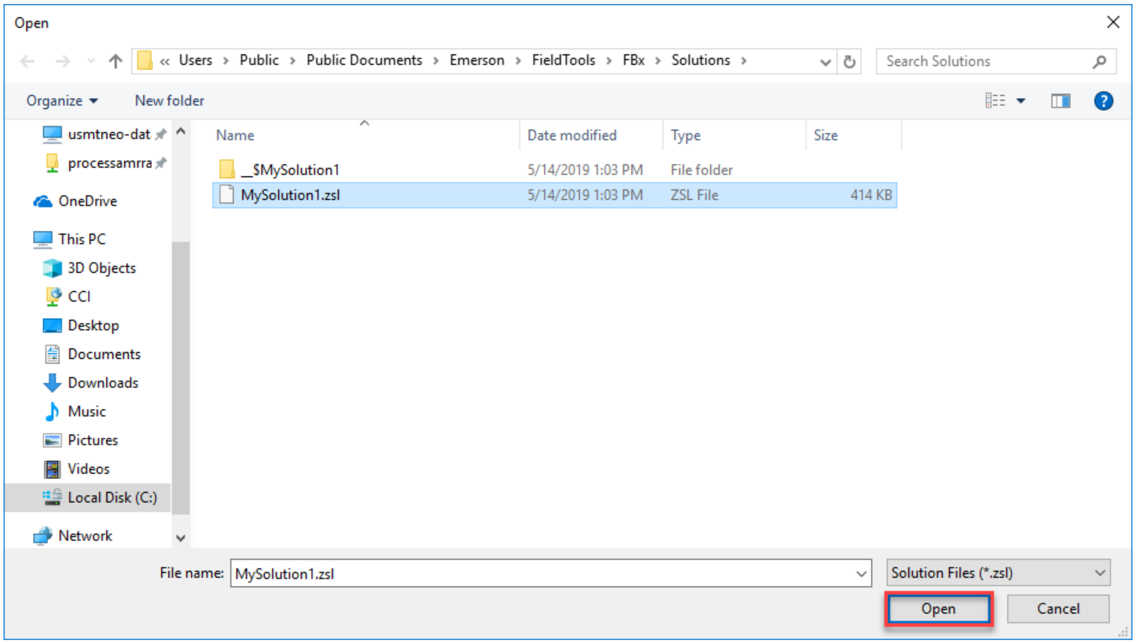
6. Select **Solution Download**. The Solution Download dialog displays:

Figure 29. Solution Download



7. Select **Browse** to open a file explorer window.

Figure 30. Open



Name	Date modified	Type	Size
__$MySolution1	5/14/2019 1:03 PM	File folder	
MySolution1.zsl	5/14/2019 1:03 PM	ZSL File	414 KB

File name: MySolution1.zsl

8. Navigate to a location on your PC of the saved configuration file and select **Open**. The Solution Download screen re-displays.

Note

- The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.
- Partial configuration files are stored with the file extension **.PTC**. To view partial configuration files, you **must** select PTC files in the file type drop-down.

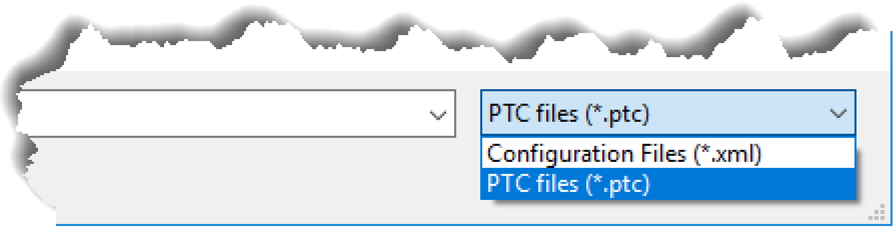
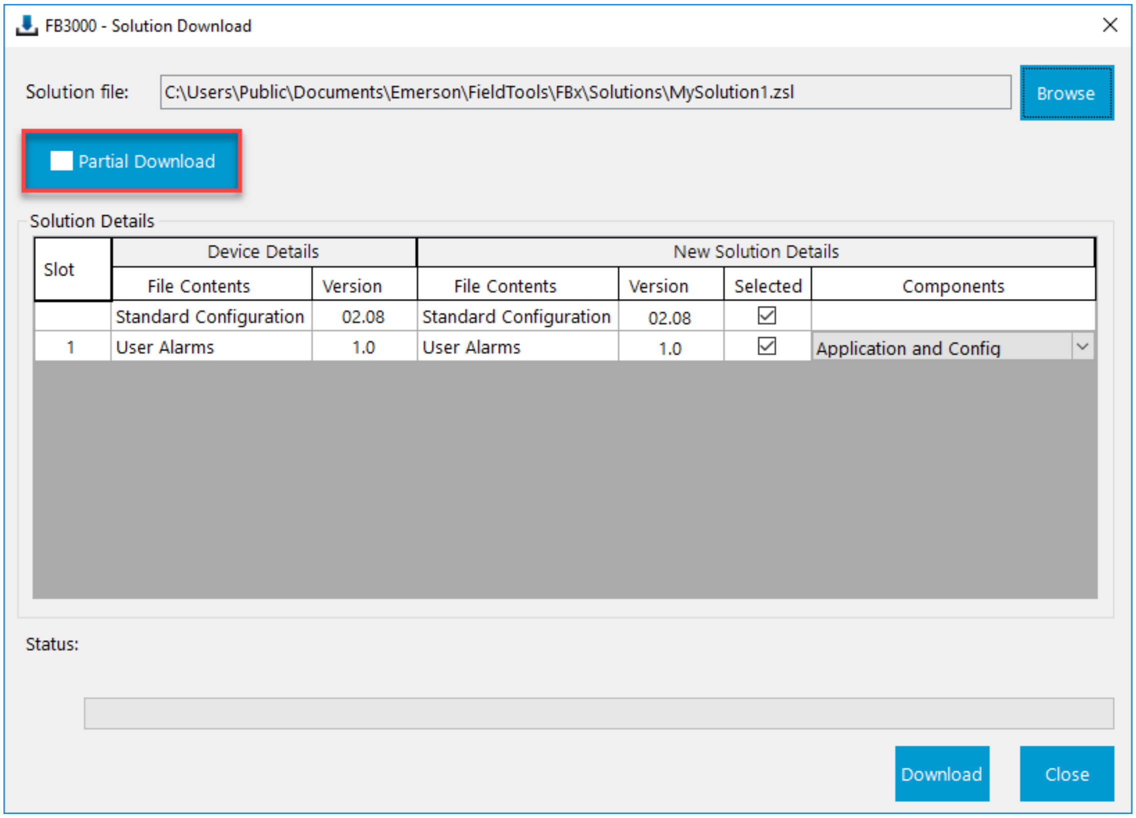


Figure 31. Partial Download



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\MySolution1.zsl

☐ Partial Download

Slot	Device Details		New Solution Details			
	File Contents	Version	File Contents	Version	Selected	Components
	Standard Configuration	02.08	Standard Configuration	02.08	☑	
1	User Alarms	1.0	User Alarms	1.0	☑	Application and Config

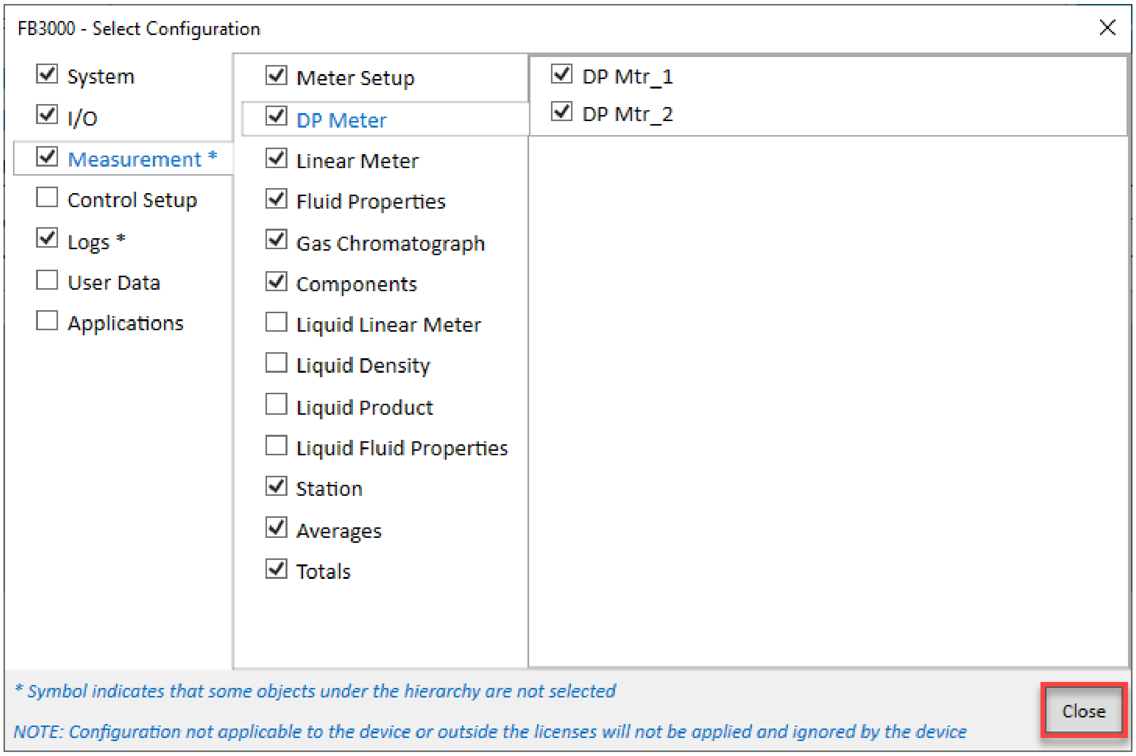
Status:

9. If you want to manually select which Objects and Instances are saved in the configuration file, select **Partial Download**. The Select Configuration dialog opens.

Note

The Partial Download option requires firmware version 2.7 or later.

Figure 32. Select Configuration



FB3000 - Select Configuration

- ☑ System
- ☑ I/O
- ☑ Measurement *
- ☐ Control Setup
- ☑ Logs *
- ☐ User Data
- ☐ Applications

- ☑ Meter Setup
- ☑ DP Meter
- ☑ Linear Meter
- ☑ Fluid Properties
- ☑ Gas Chromatograph
- ☑ Components
- ☐ Liquid Linear Meter
- ☐ Liquid Density
- ☐ Liquid Product
- ☐ Liquid Fluid Properties
- ☑ Station
- ☑ Averages
- ☑ Totals

- ☑ DP Mtr_1
- ☑ DP Mtr_2

** Symbol indicates that some objects under the hierarchy are not selected*

NOTE: Configuration not applicable to the device or outside the licenses will not be applied and ignored by the device

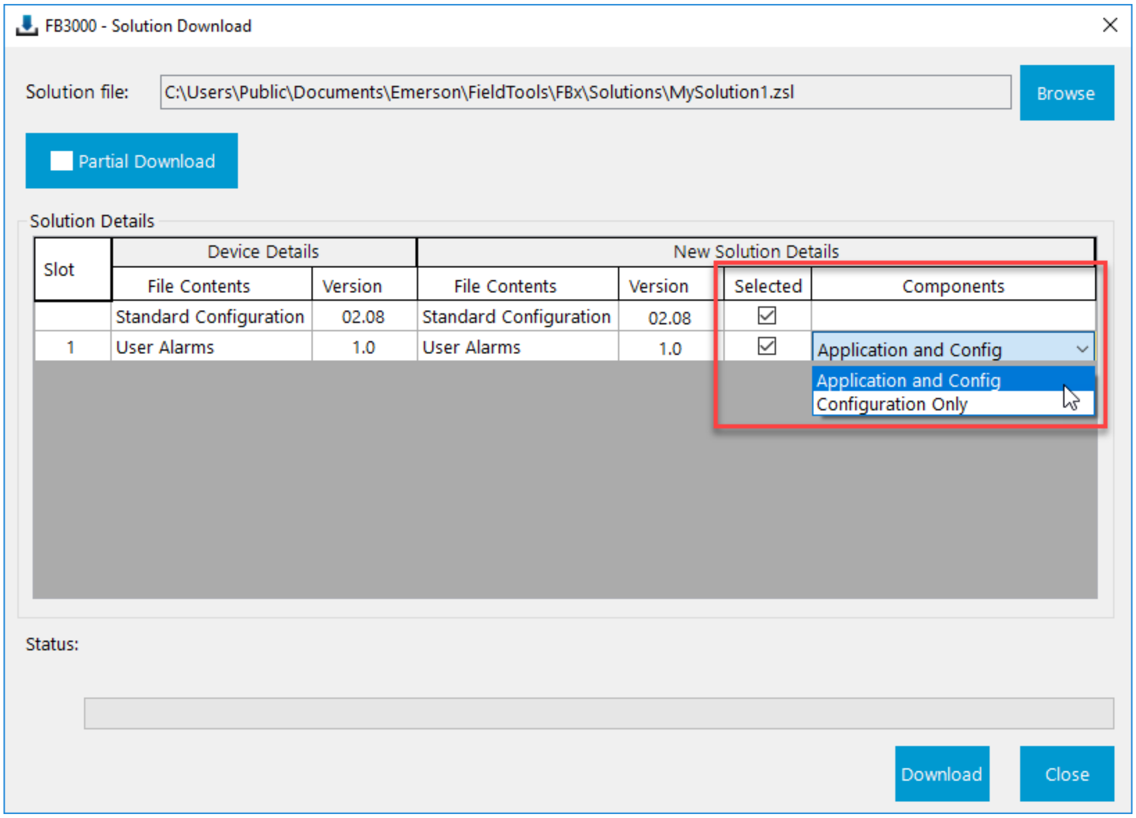
10. Place a check mark next to the specific Objects and Instances you wish to download to your FB Series product and click **Close**. The Solution Download dialog re-displays.

Note

- Select an object in the left most column to show the associated objects/instances in the next column. Continue this process for the subsequent columns to select which parameters to include in the configuration. For example, select Measurement in the left-hand column and Fluid Properties in the middle column to display the configured Fluid Properties instances in the right-hand column.
- An asterisk (*) next to an object indicates that only a partial set of parameters is selected for that particular object.

- The system **does not** download objects and instances that require features or licenses not present in the FB Series product.

Figure 33. Selected Components



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\MySolution1.zsl

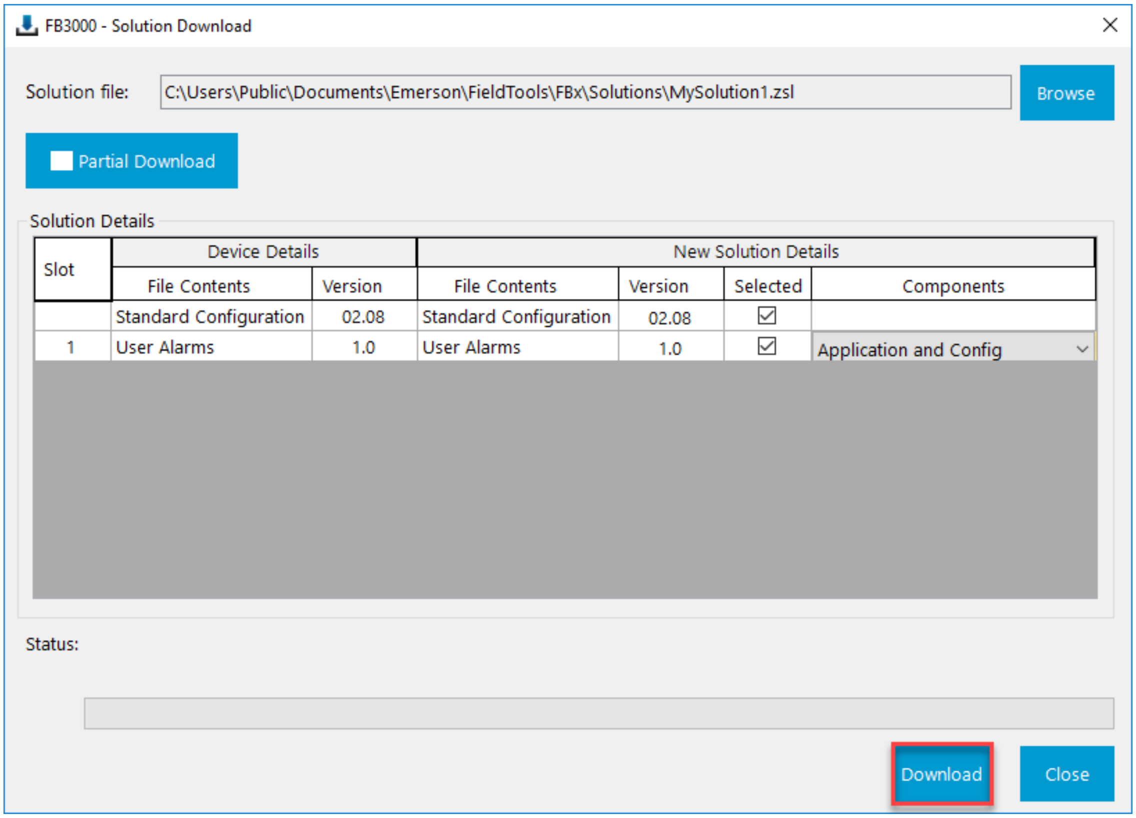
Slot	Device Details		New Solution Details			
	File Contents	Version	File Contents	Version	Selected	Components
	Standard Configuration	02.08	Standard Configuration	02.08	☑	
1	User Alarms	1.0	User Alarms	1.0	☑	Application and Config

11. A solution file may contain multiple items, including the standard FB Series product configuration and various applications. Place a check mark in the Selected column for any item you want to download to the FB Series product.

Note

If you include any applications in the download, use the drop-down menu in the **Components** column to select either the application and configuration or the only the configuration.

Figure 34. Download



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\MySolution1.zsl

Solution Details

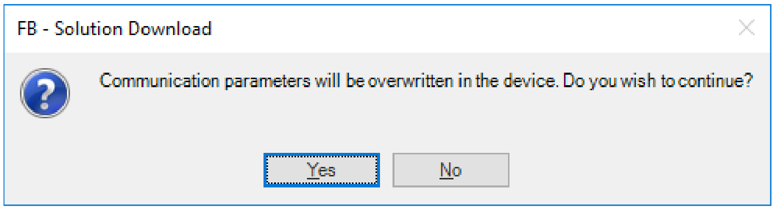
Slot	Device Details		New Solution Details			
	File Contents	Version	File Contents	Version	Selected	Components
	Standard Configuration	02.08	Standard Configuration	02.08	☑	
1	User Alarms	1.0	User Alarms	1.0	☑	Application and Config

Status:

12. Select **Download** to download your Solution to your FB Series product.

Note

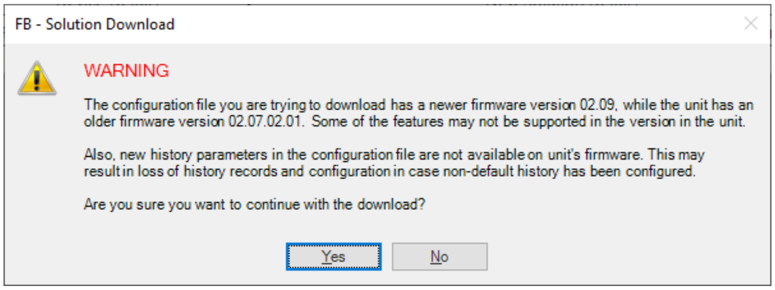
- A progress bar displays the status of the Solution download process.
- A warning dialog opens when you try to download a Solution that includes configured communications parameters. You can potentially lose connection with the FB Series product if you change the parameters on the port to which you are currently connected. Select **Yes** to continue loading the Solution with the new communications configuration. Select **No** to return to the Solution Download screen.



Communication parameters will be overwritten in the device. Do you wish to continue?

- A warning dialog opens if you attempt to download a solution created with a newer firmware version to an FB Series product with an older firmware version. Some features and parameters may not be present in older versions of firmware.

Downloading the configuration may result in the loss of history records and configuration. Select **Yes** to continue or **No** to cancel the download.



WARNING

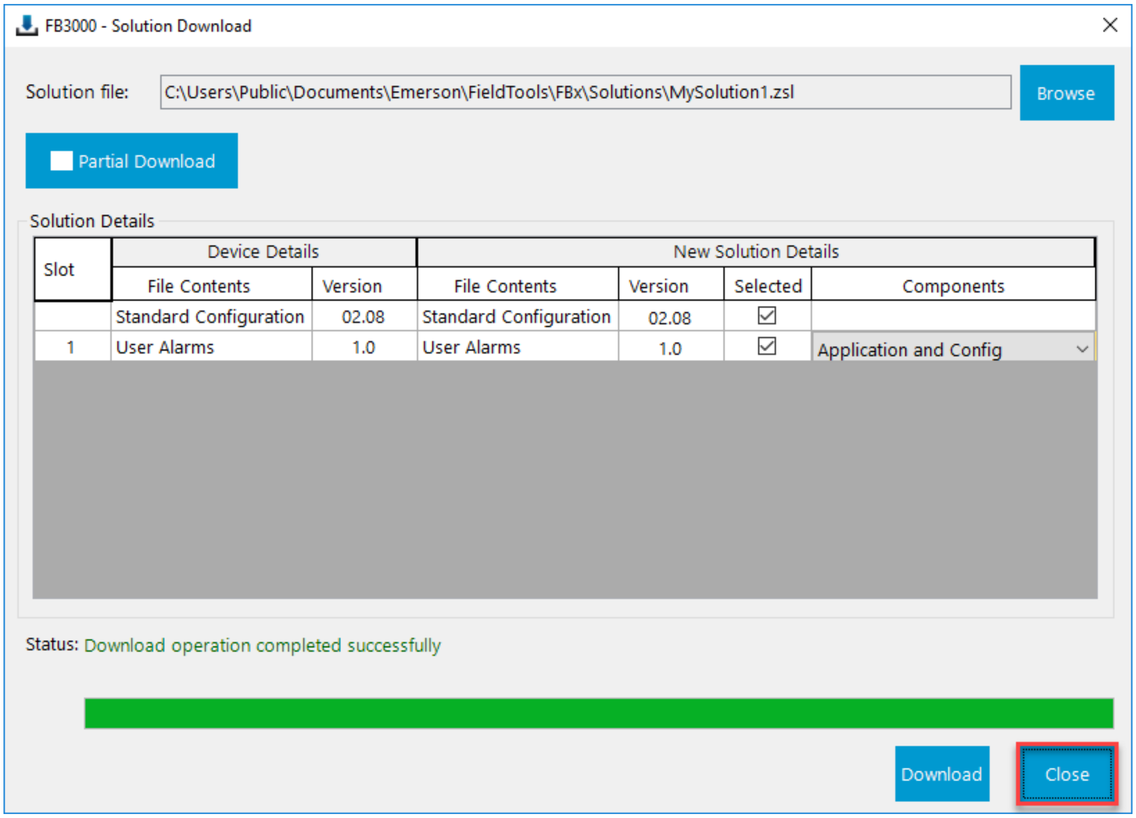
The configuration file you are trying to download has a newer firmware version 02.09, while the unit has an older firmware version 02.07.02.01. Some of the features may not be supported in the version in the unit.

Also, new history parameters in the configuration file are not available on unit's firmware. This may result in loss of history records and configuration in case non-default history has been configured.

Are you sure you want to continue with the download?

13. When the Solution download is complete, select **Close** to return to the main FBxConnect™ screen.

Figure 35. Solution Downloaded Successfully



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Solutions\MySolution1.zsl

Solution Details

Slot	Device Details		New Solution Details			
	File Contents	Version	File Contents	Version	Selected	Components
	Standard Configuration	02.08	Standard Configuration	02.08	☑	
1	User Alarms	1.0	User Alarms	1.0	☑	Application and Config

Status: Download operation completed successfully

2.5 Download to Flash

Use this option to load a previously saved solution's configuration file to the flash memory of the connected FB Series product. The FB Series product can then load the solution's configuration file saved in flash memory when performing a cold start or rebuilding the FB Series product database after corruption.

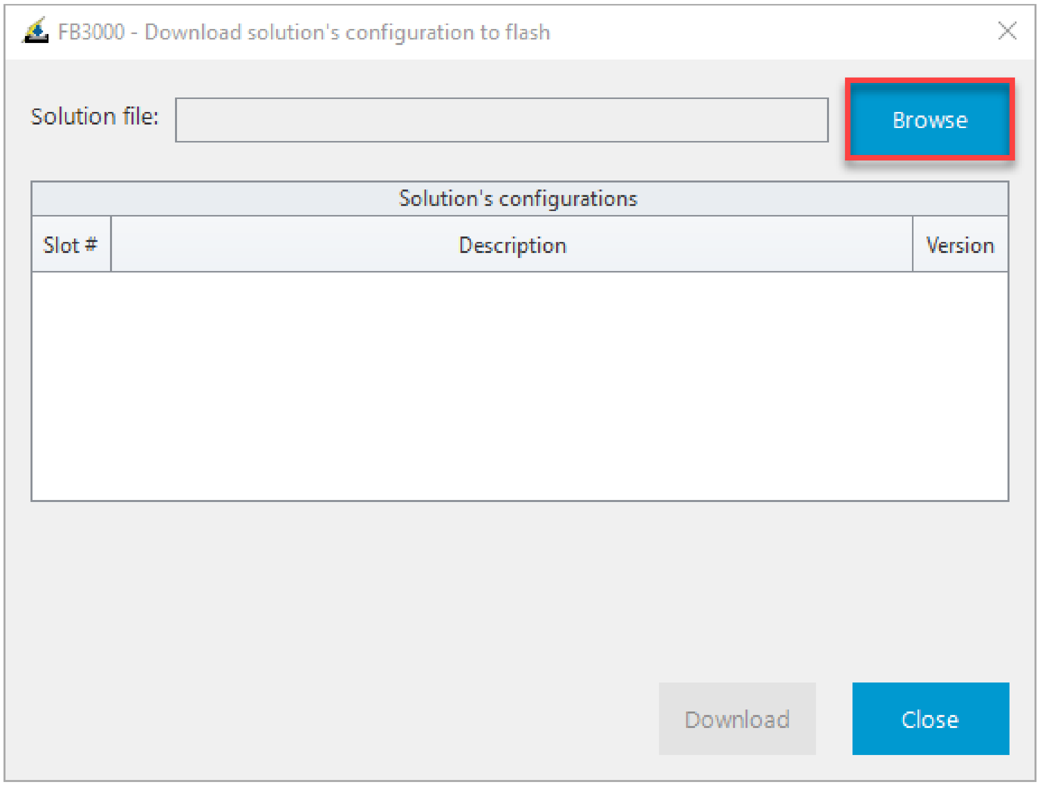
Note

You **must** save a solution's configuration file to your PC **before** you can download a solution's configuration file to flash memory. For information on saving a solution's configuration file to your PC, refer to Upload Solution and Save As.

To download a previously saved solution's configuration file to flash memory:

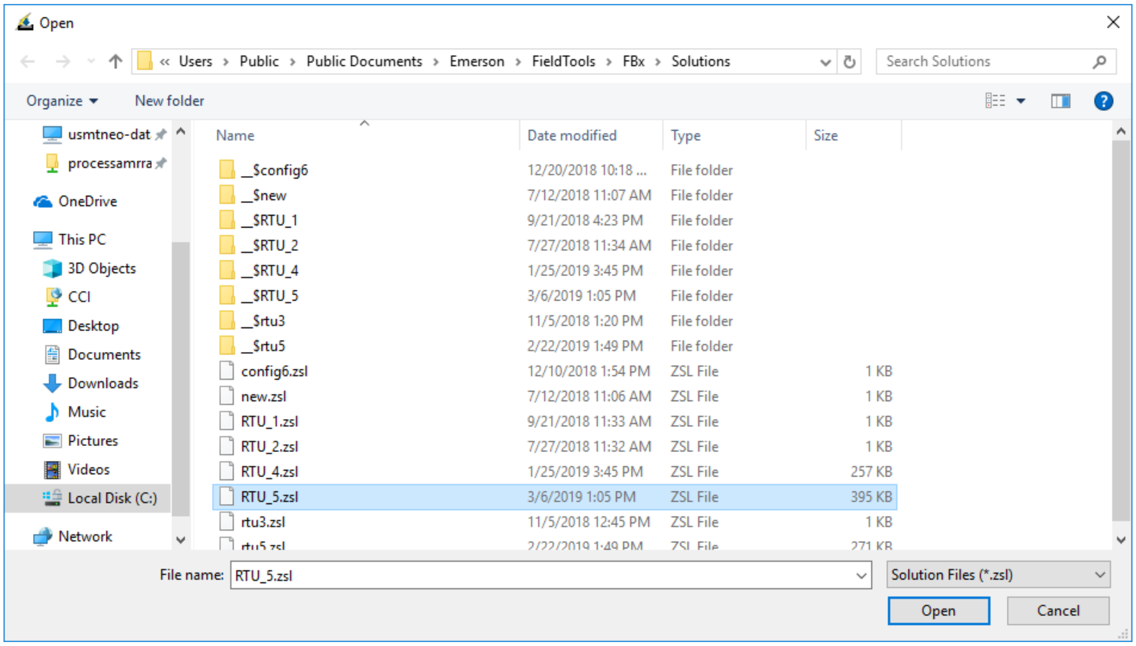
1. Select **File > Download to Flash** from the FBxConnect™ main menu. The Download solution's configuration to flash dialog displays.

Figure 36. Browse



2. Select **Browse** to open a file explorer window.

Figure 37. Open Configuration File

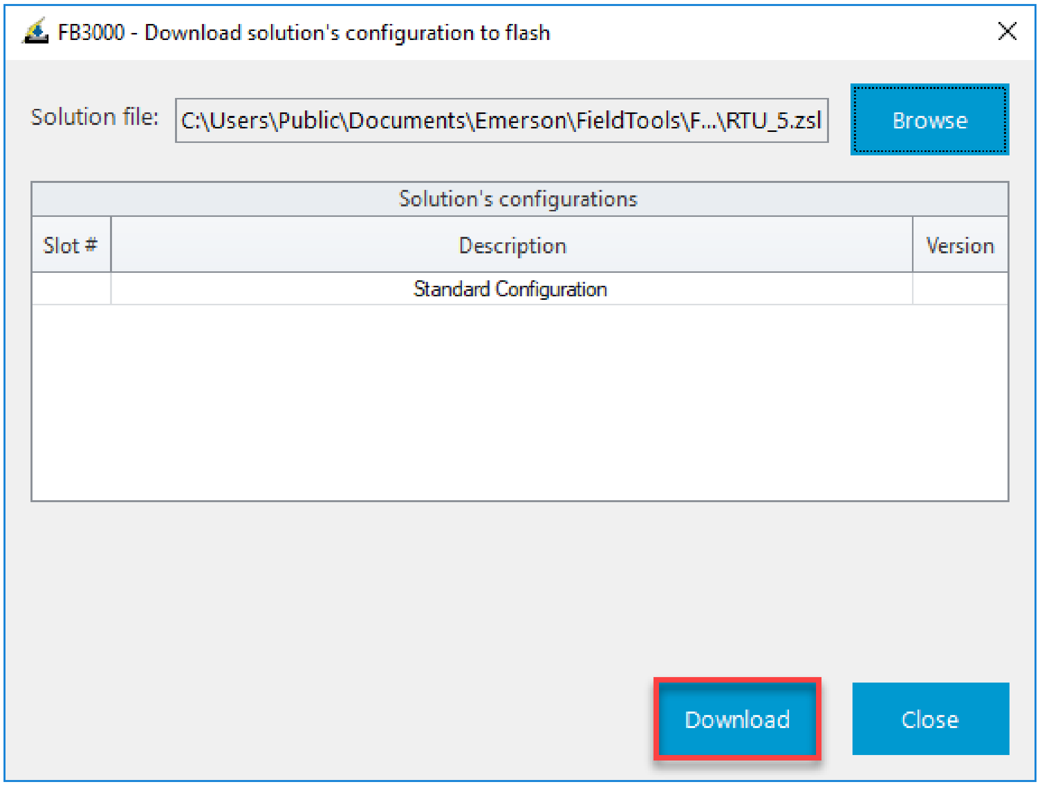


Name	Date modified	Type	Size
__$config6	12/20/2018 10:18 ...	File folder	
__$new	7/12/2018 11:07 AM	File folder	
__$RTU_1	9/21/2018 4:23 PM	File folder	
__$RTU_2	7/27/2018 11:34 AM	File folder	
__$RTU_4	1/25/2019 3:45 PM	File folder	
__$RTU_5	3/6/2019 1:05 PM	File folder	
__$rtu3	11/5/2018 1:20 PM	File folder	
__$rtu5	2/22/2019 1:49 PM	File folder	
config6.zsl	12/10/2018 1:54 PM	ZSL File	1 KB
new.zsl	7/12/2018 11:06 AM	ZSL File	1 KB
RTU_1.zsl	9/21/2018 11:33 AM	ZSL File	1 KB
RTU_2.zsl	7/27/2018 11:32 AM	ZSL File	1 KB
RTU_4.zsl	1/25/2019 3:45 PM	ZSL File	257 KB
RTU_5.zsl	3/6/2019 1:05 PM	ZSL File	395 KB
rtu3.zsl	11/5/2018 12:45 PM	ZSL File	1 KB
rtu5.zsl	2/22/2019 1:49 PM	ZSL File	271 KB

File name: RTU_5.zsl

3. Navigate to the location of your saved configuration file and select **Open**.

Figure 38. Download



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\F...\RTU_5.zsl

Solution's configurations		
Slot #	Description	Version
	Standard Configuration	

4. Select **Download**. FBxConnect™ downloads the selected configuration to the FB Series product and saves the configuration to flash memory.

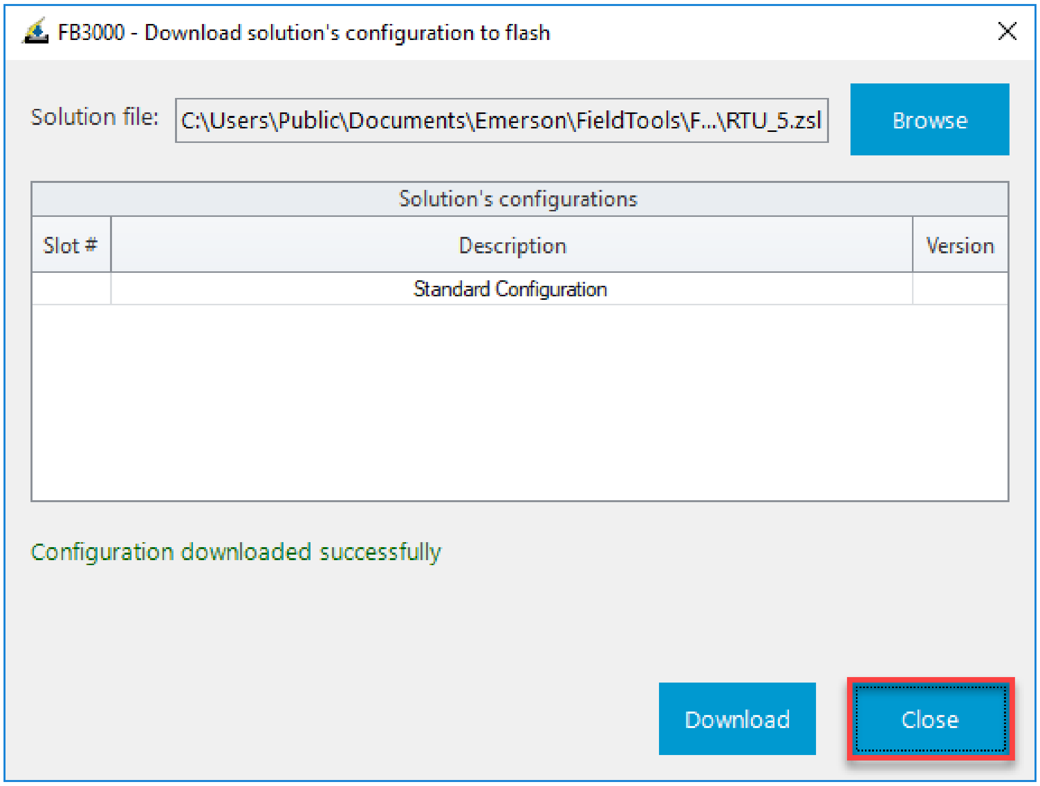
Note

A progress bar displays the status of the configuration save process.

---

5. When the configuration download to flash process is complete, select **Close** to return to the main FBxConnect™ screen.

Figure 39. Configuration Downloaded Successfully



Solution file: C:\Users\Public\Documents\Emerson\FieldTools\F...\RTU_5.zsl

Slot #	Description	Version
	Standard Configuration	

Configuration downloaded successfully

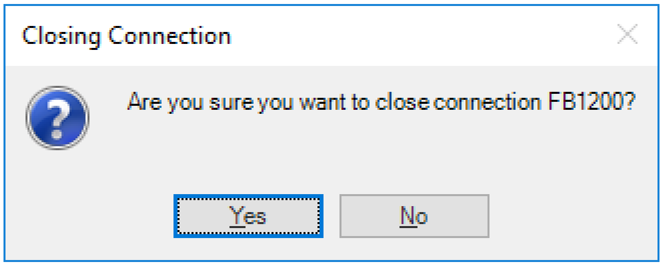
2.6 Close

Use this option to close the current connection or configuration and exit FBxConnect™.

To close FBxConnect:

1. Select **File > Close** from the FBxConnect™ main menu. A confirmation dialog opens.

Figure 40. Closing Connection



Are you sure you want to close connection FB1200?

2. Select **Yes** to close the connection.

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Section 3: Monitor Menu

Use the options in this menu to view the current flowing conditions, communication port status, FB Series product history, alarms, and events.

Figure 41. Monitor Menu

The Monitor menu contains the following options:

Main – Shows an graphical representation of your RTU.

I/O – View data about the currently installed I/O points and currently configured PID loops.

Gas

DP Meter – View the current flow rates and totals for gas differential pressure meters.

Linear Meter – View the current flow rates and totals for gas linear meters.

Liquid

Note

These options appear **only** if the FB Series product has a Liquid Calculation license installed.

Liquid Linear Meter – View the current flow rates and totals for liquid linear meters.

Liquid Batching – Use this display to view the current batch totals for a liquid linear meter with batching enabled.

History

Periodic History – View user periodic, hourly, daily, weekly, and monthly history data stored on the connected FB Series product.

Transaction History – View data from each configured transaction history group.

Alarms – View alarms stored on the connected FB Series product.

Events – View events stored on the connected FB Series product.

Comm Ports – View the status and configuration of the communications ports located on the connected FB Series product.

3.1 Main

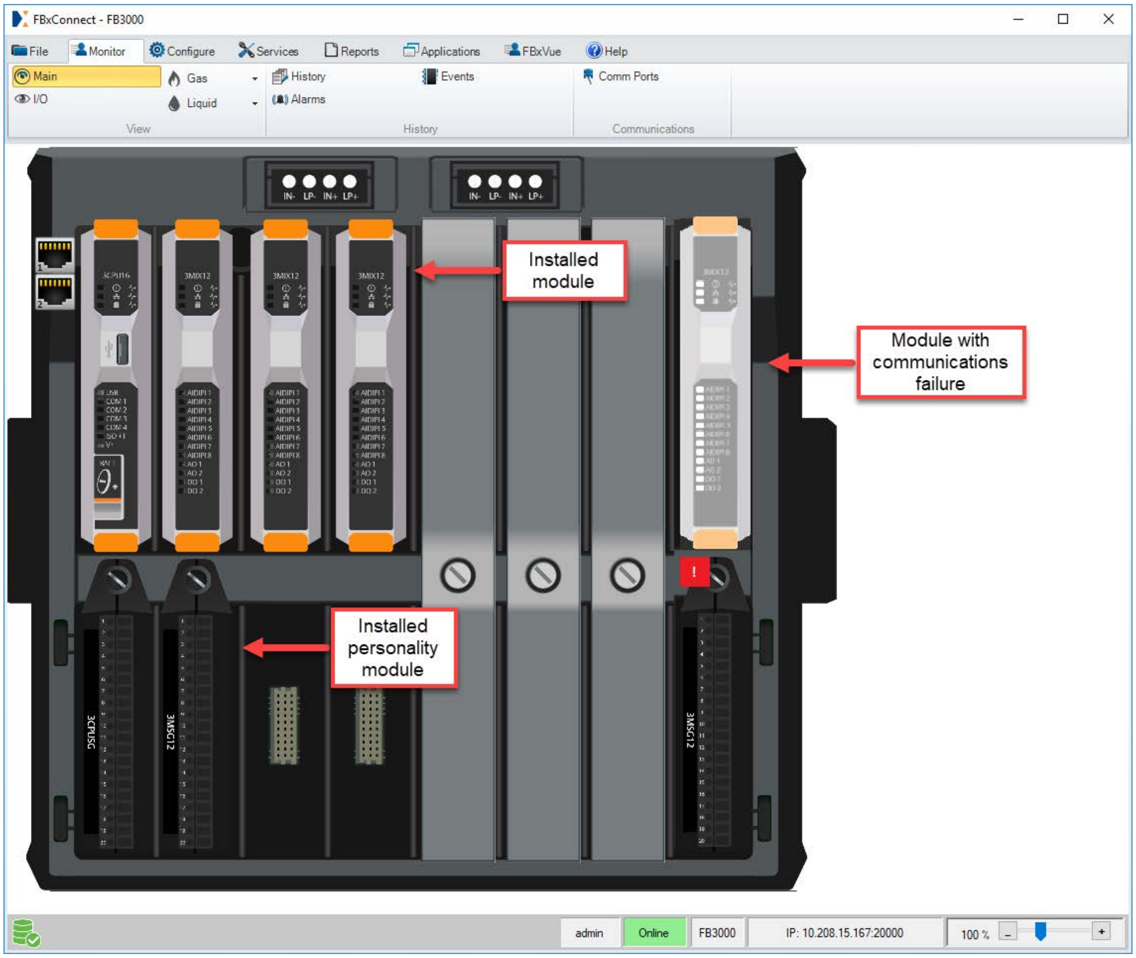
The Main display shows a graphical representation of your RTU. The system displays an yellow line around objects that are links when you hover your cursor over them, and a tool-tip description of each object. Click on an object to open the FBxConnect™ configuration display for the selected object.

Note

- Click on a personality module to open the online help and view communications and I/O wiring diagrams.
- If a module encounters a communications failure (such as when a previously configured module has been removed), the graphical representation of that module is dimmed and a red box with an exclamation mark appears under the module. Click the red box to uninstall the module.

To access this display, select **Monitor > Main** from the FBxConnect™ main menu.

Figure 42. Main



3.2 I/O

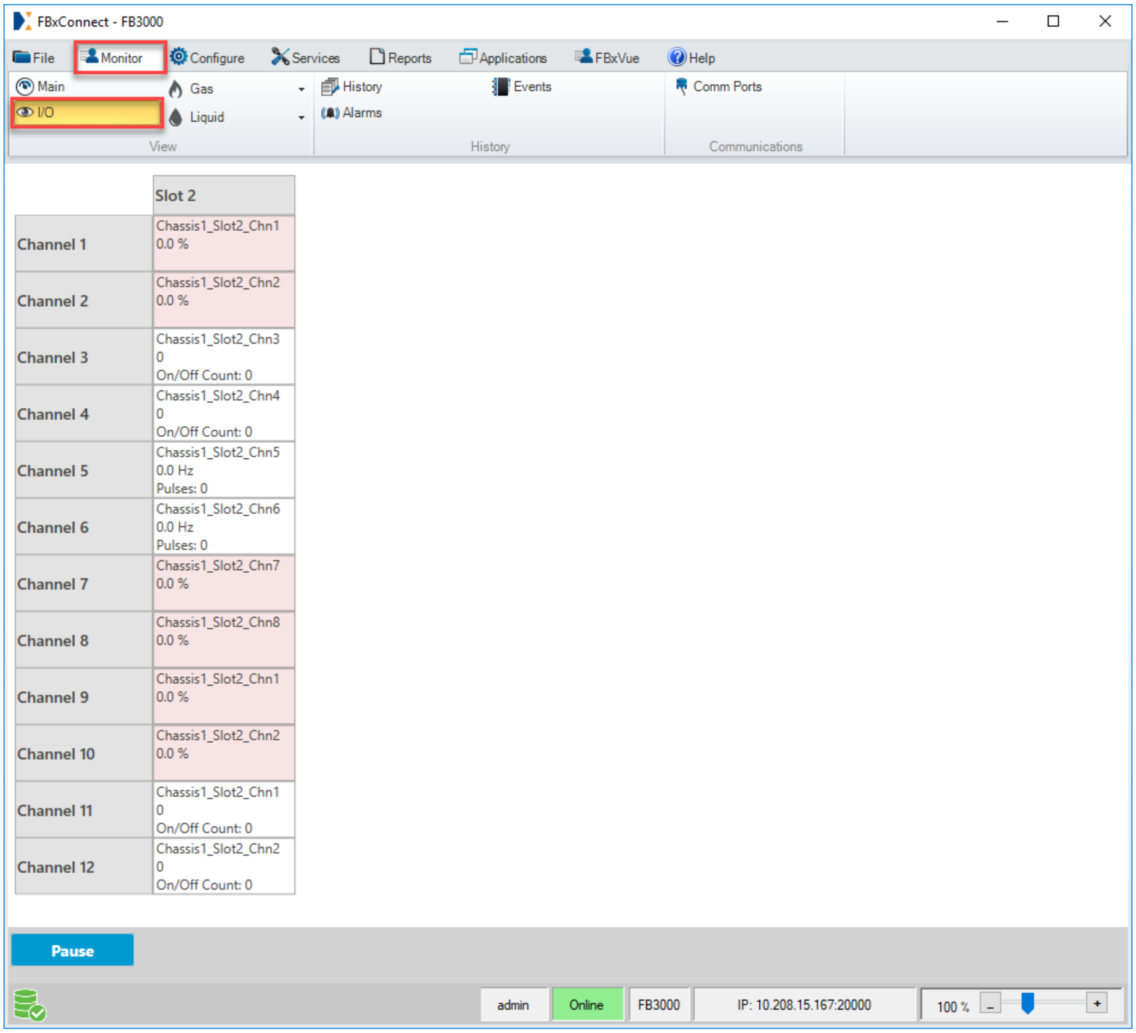
Use The I/O display to view data about the currently installed I/O modules. I/O data includes the type of I/O, engineering units to use with the point, and the current value of the point. Channels with an alarm currently raised are highlighted in red.

To access this display, select **Monitor > I/O** from the FBxConnect™ main menu. The I/O Overview display opens.

Note

- The amount of I/O points shown on this display will vary depending on the type and number of modules installed.
- Fields highlighted in red are an indication of a value in an alarm state.

Figure 43. I/O



	Slot 2
Channel 1	Chassis1_Slot2_Chn1 0.0 %
Channel 2	Chassis1_Slot2_Chn2 0.0 %
Channel 3	Chassis1_Slot2_Chn3 0 On/Off Count: 0
Channel 4	Chassis1_Slot2_Chn4 0 On/Off Count: 0
Channel 5	Chassis1_Slot2_Chn5 0.0 Hz Pulses: 0
Channel 6	Chassis1_Slot2_Chn6 0.0 Hz Pulses: 0
Channel 7	Chassis1_Slot2_Chn7 0.0 %
Channel 8	Chassis1_Slot2_Chn8 0.0 %
Channel 9	Chassis1_Slot2_Chn1 0.0 %
Channel 10	Chassis1_Slot2_Chn2 0.0 %
Channel 11	Chassis1_Slot2_Chn1 0 On/Off Count: 0
Channel 12	Chassis1_Slot2_Chn2 0 On/Off Count: 0

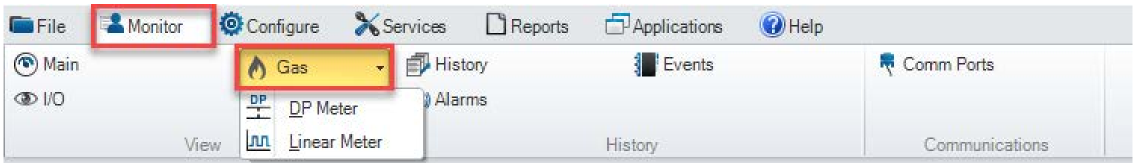
3.3 Gas

Use the Gas drop-down in the Monitor menu to view flow rates and totals for gas differential pressure and gas linear meters.

Note

The Gas drop-down items display **only** if you have previously configured at least one gas differential pressure or linear meter on the Meter Setup display.

Figure 44. Monitor Gas



The Gas drop-down contains the following options:

DP Meter – Use the Monitor Gas DP Meter display to view the current flow rates and totals for gas differential pressure meters.

Linear Meter – Use the Monitor Gas Linear Meter display to view the current flow rates and totals for gas linear meters.

3.3.1 DP Meter

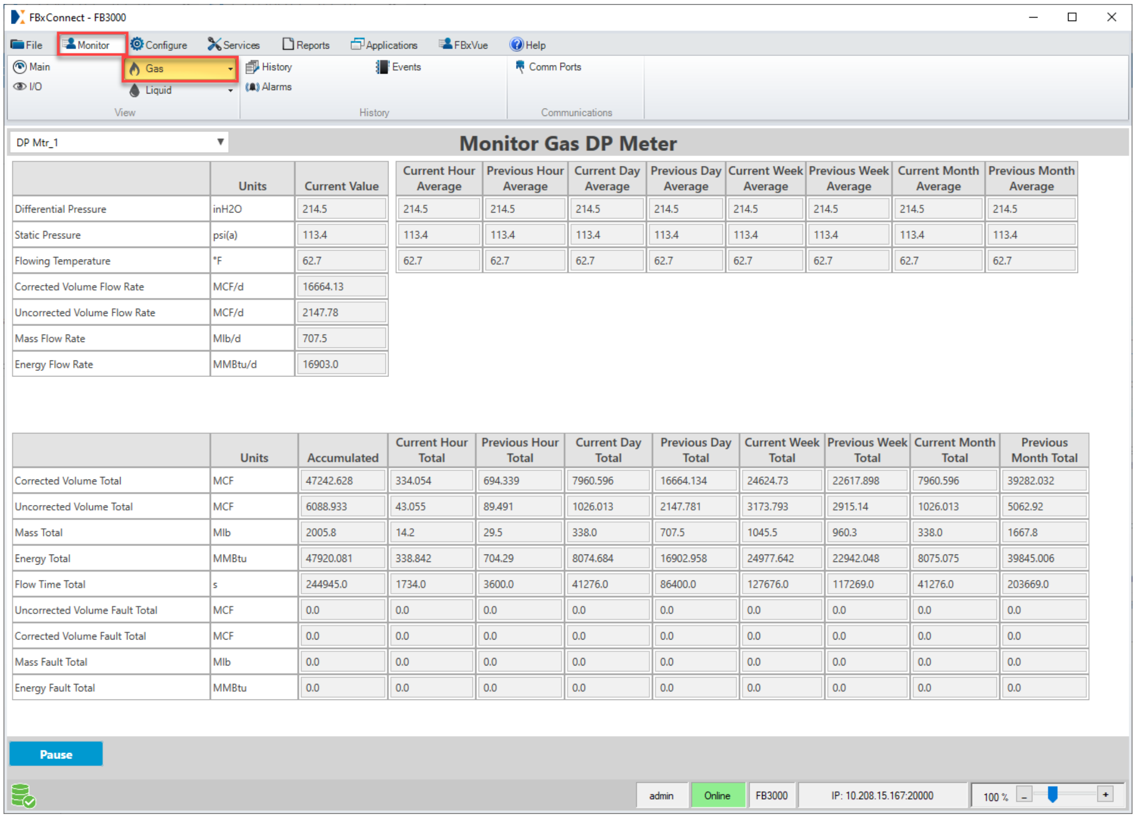
Use the Monitor Gas DP Meter display to view the current flow rates and totals for gas differential pressure meters. FBxConnect™ provides you with real-time values, as well as values for the current hour, previous hour, current day, and previous day.

To access this display:

1. Select **Monitor** > **Gas** > **DP Meter** from the FBxConnect™ main menu. The Monitor Gas DP Meter display opens.

2. Click ▼ to select a meter to view.

Figure 45. Monitor Gas DP Meter



Monitor Gas DP Meter

	Units	Current Value	Current Hour Average	Previous Hour Average	Current Day Average	Previous Day Average	Current Week Average	Previous Week Average	Current Month Average	Previous Month Average
Differential Pressure	inH2O	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5	214.5
Static Pressure	psi(a)	113.4	113.4	113.4	113.4	113.4	113.4	113.4	113.4	113.4
Flowing Temperature	°F	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7
Corrected Volume Flow Rate	MCF/d	16664.13								
Uncorrected Volume Flow Rate	MCF/d	2147.78								
Mass Flow Rate	Mlb/d	707.5								
Energy Flow Rate	MMBtu/d	16903.0								

	Units	Accumulated	Current Hour Total	Previous Hour Total	Current Day Total	Previous Day Total	Current Week Total	Previous Week Total	Current Month Total	Previous Month Total
Corrected Volume Total	MCF	47242.628	334.054	694.339	7960.596	16664.134	24624.73	22617.898	7960.596	39282.032
Uncorrected Volume Total	MCF	6088.933	43.055	89.491	1026.013	2147.781	3173.793	2915.14	1026.013	5062.92
Mass Total	Mlb	2005.8	14.2	29.5	338.0	707.5	1045.5	960.3	338.0	1667.8
Energy Total	MMBtu	47920.081	338.842	704.29	8074.684	16902.958	24977.642	22942.048	8075.075	39845.006
Flow Time Total	s	244945.0	1734.0	3600.0	41276.0	86400.0	127676.0	117269.0	41276.0	203669.0
Uncorrected Volume Fault Total	MCF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corrected Volume Fault Total	MCF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mass Fault Total	Mlb	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy Fault Total	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3.3.2 Linear Meter

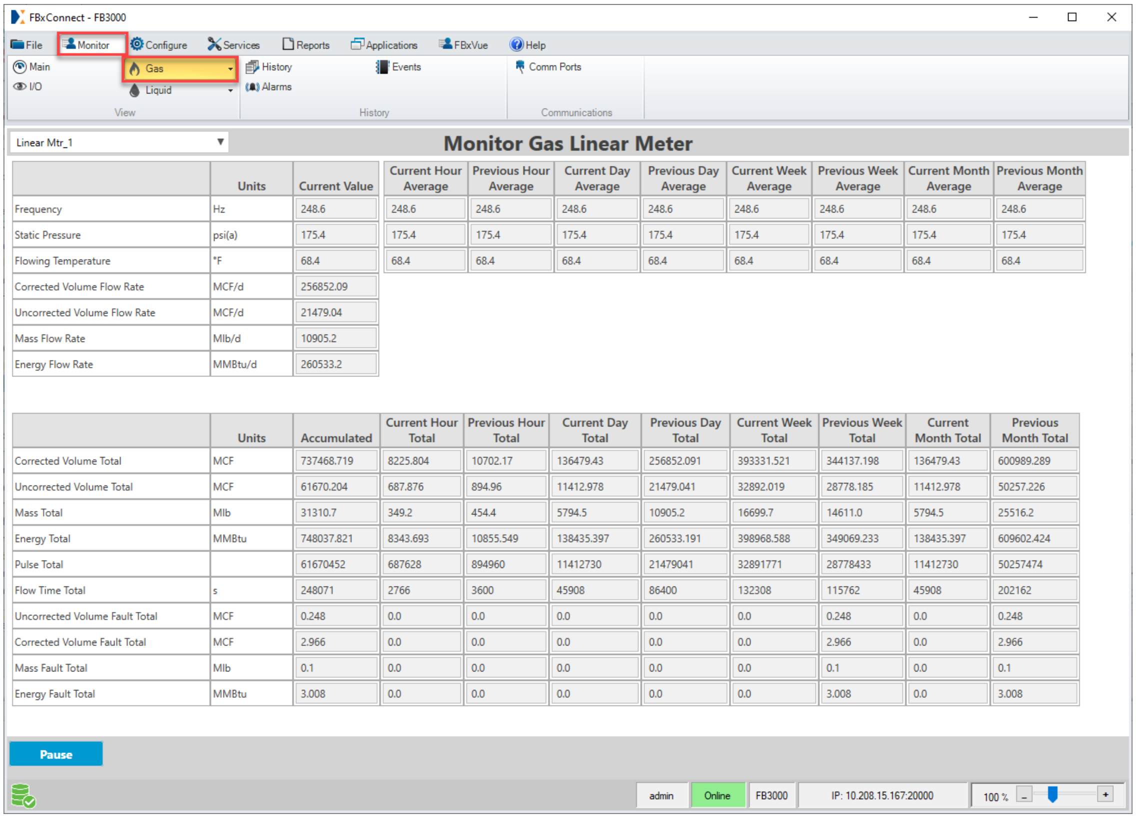
Use the Monitor Gas Linear Meter display to view the current flow rates and totals for gas linear meters. FBxConnect™ provides you with real-time values, as well as values for the current hour, previous hour, current day, and previous day.

To access this display:

1. Select **Monitor >Gas > Linear Meter** from the FBxConnect™ main menu. The Monitor Gas Linear Meter display opens.

2. Click ▼ to select a meter to view.

Figure 46. Monitor Gas Linear Meter



Monitor Gas Linear Meter

	Units	Current Value	Current Hour Average	Previous Hour Average	Current Day Average	Previous Day Average	Current Week Average	Previous Week Average	Current Month Average	Previous Month Average
Frequency	Hz	248.6	248.6	248.6	248.6	248.6	248.6	248.6	248.6	248.6
Static Pressure	psi(a)	175.4	175.4	175.4	175.4	175.4	175.4	175.4	175.4	175.4
Flowing Temperature	°F	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4
Corrected Volume Flow Rate	MCF/d	256852.09								
Uncorrected Volume Flow Rate	MCF/d	21479.04								
Mass Flow Rate	Mlb/d	10905.2								
Energy Flow Rate	MMBtu/d	260533.2								

	Units	Accumulated	Current Hour Total	Previous Hour Total	Current Day Total	Previous Day Total	Current Week Total	Previous Week Total	Current Month Total	Previous Month Total
Corrected Volume Total	MCF	737468.719	8225.804	10702.17	136479.43	256852.091	393331.521	344137.198	136479.43	600989.289
Uncorrected Volume Total	MCF	61670.204	687.876	894.96	11412.978	21479.041	32892.019	28778.185	11412.978	50257.226
Mass Total	Mlb	31310.7	349.2	454.4	5794.5	10905.2	16699.7	14611.0	5794.5	25516.2
Energy Total	MMBtu	748037.821	8343.693	10855.549	138435.397	260533.191	398968.588	349069.233	138435.397	609602.424
Pulse Total		61670452	687628	894960	11412730	21479041	32891771	28778433	11412730	50257474
Flow Time Total	s	248071	2766	3600	45908	86400	132308	115762	45908	202162
Uncorrected Volume Fault Total	MCF	0.248	0.0	0.0	0.0	0.0	0.0	0.248	0.0	0.248
Corrected Volume Fault Total	MCF	2.966	0.0	0.0	0.0	0.0	0.0	2.966	0.0	2.966
Mass Fault Total	Mlb	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Energy Fault Total	MMBtu	3.008	0.0	0.0	0.0	0.0	0.0	3.008	0.0	3.008

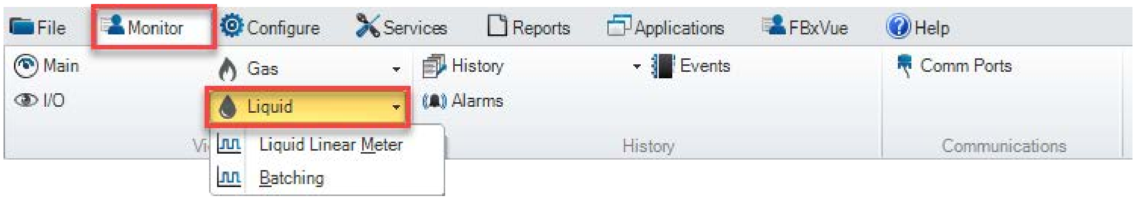
3.4 Liquid

Use the Liquid drop-down in the Monitor menu to view flow rates and totals for liquid linear meters.

Note

- This option appears **only** if the FB Series product has a Liquid Calculation license installed.
- The Liquid drop-down displays **only** if you have previously configured at least one liquid meter on the Meter Setup display.

Figure 47. Monitor Liquid



The Liquid drop-down contains the following options:

Liquid Linear Meter – Use this display to view the current flow rates and totals for liquid linear meters.

Liquid Batching – Use this display to view the current batch totals for a liquid linear meter with batching enabled.

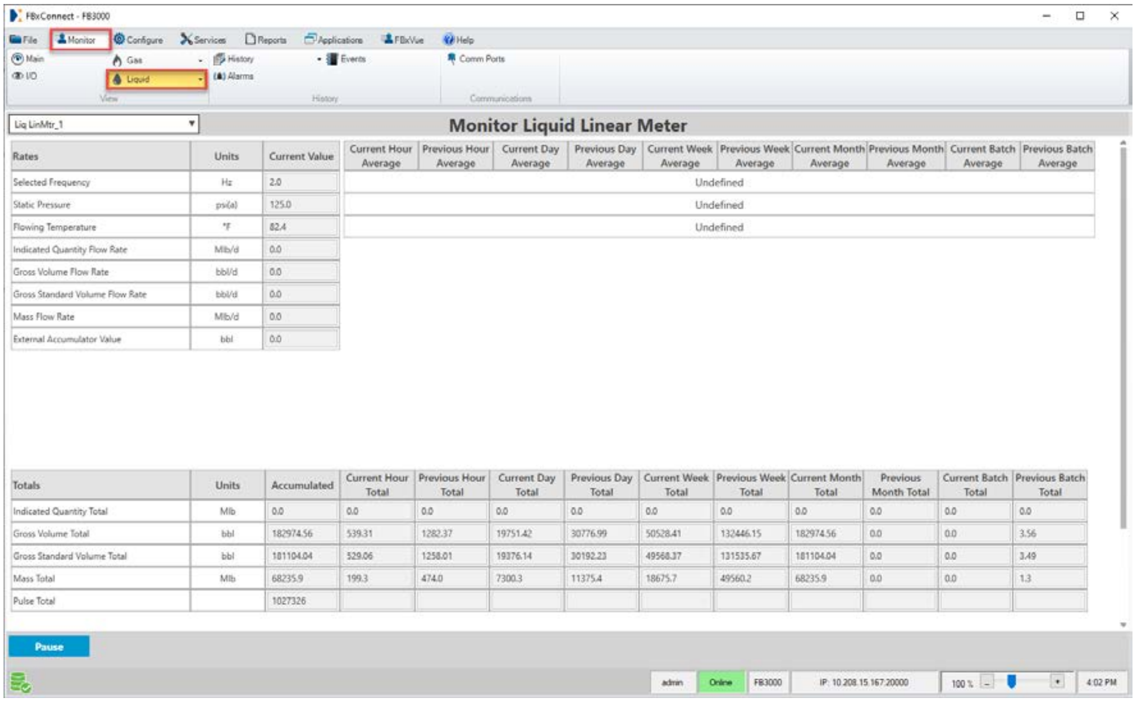
3.4.1 Liquid Linear Meter

Use this display to view the current flow rates and totals for liquid linear meters. FBxConnect™ provides you with the current values, as well as values for the current and previous hour, day, week, month, and batch.

To access this display, select **Monitor > Liquid > Liquid Linear Meter**. The Monitor Liquid Linear Meter display opens.

Click ▼ in the drop-down list at the top of the display to select a liquid linear meter to view.

Figure 48. Monitor Liquid Linear Meter



Liq LinMtr_1

Rates	Units	Current Value	Current Hour Average	Previous Hour Average	Current Day Average	Previous Day Average	Current Week Average	Previous Week Average	Current Month Average	Previous Month Average	Current Batch Average	Previous Batch Average
Selected Frequency	Hz	2.0	Undefined									
Static Pressure	psi(a)	125.0	Undefined									
Flowing Temperature	°F	82.4	Undefined									
Indicated Quantity Flow Rate	Mlb/d	0.0										
Gross Volume Flow Rate	bbl/d	0.0										
Gross Standard Volume Flow Rate	bbl/d	0.0										
Mass Flow Rate	Mlb/d	0.0										
External Accumulator Value	bbl	0.0										

Totals	Units	Accumulated	Current Hour Total	Previous Hour Total	Current Day Total	Previous Day Total	Current Week Total	Previous Week Total	Current Month Total	Previous Month Total	Current Batch Total	Previous Batch Total
Indicated Quantity Total	Mlb	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Volume Total	bbl	182974.56	539.31	1282.37	19751.42	30776.99	50528.41	132446.15	182974.56	0.0	0.0	3.56
Gross Standard Volume Total	bbl	181104.04	529.06	1258.01	19376.14	30192.23	49568.37	131535.67	181104.04	0.0	0.0	3.49
Mass Total	Mlb	68235.9	199.3	474.0	7300.3	11375.4	18675.7	49560.2	68235.9	0.0	0.0	1.3
Pulse Total		1027326										

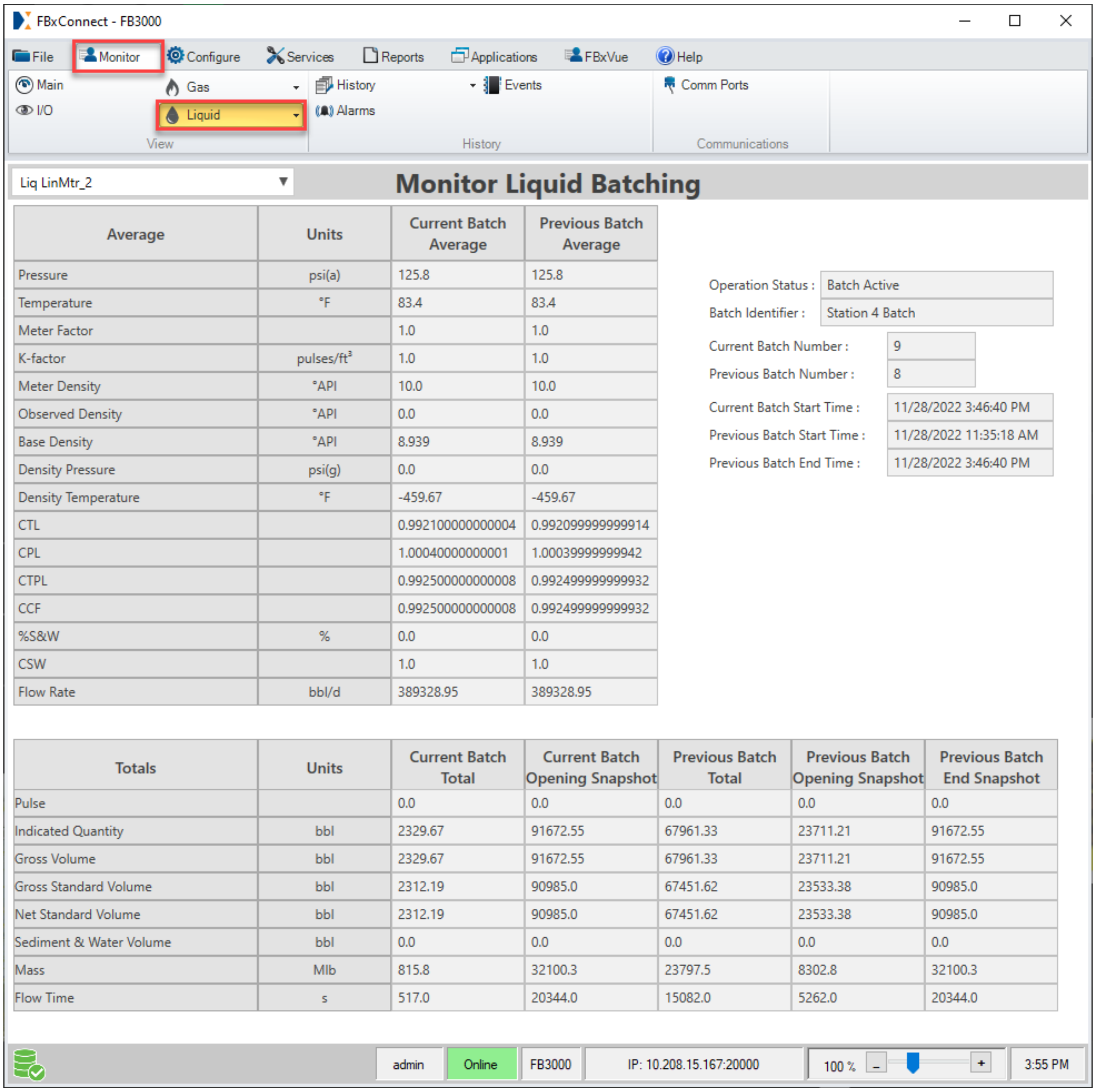
3.4.2 Liquid Batching

Use this display to view the current batch totals for a liquid linear meter with batching enabled. FBxConnect™ provides you with the current and previous batch averages and totals.

To access this display, select **Monitor > Liquid > Batching**. The Monitor Liquid Batching display opens.

Click ▼ in the drop-down list at the top of the display to select a liquid linear meter to view.

Figure 49. Monitor Liquid Linear Meter



Average	Units	Current Batch Average	Previous Batch Average
Pressure	psi(a)	125.8	125.8
Temperature	°F	83.4	83.4
Meter Factor		1.0	1.0
K-factor	pulses/ft³	1.0	1.0
Meter Density	°API	10.0	10.0
Observed Density	°API	0.0	0.0
Base Density	°API	8.939	8.939
Density Pressure	psi(g)	0.0	0.0
Density Temperature	°F	-459.67	-459.67
CTL		0.992100000000004	0.992099999999914
CPL		1.00040000000001	1.00039999999942
CTPL		0.992500000000008	0.992499999999932
CCF		0.992500000000008	0.992499999999932
%S&W	%	0.0	0.0
CSW		1.0	1.0
Flow Rate	bbl/d	389328.95	389328.95

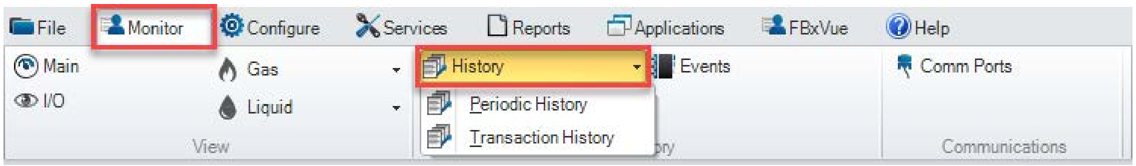
Operation Status : Batch Active
Batch Identifier : Station 4 Batch
Current Batch Number : 9
Previous Batch Number : 8
Current Batch Start Time : 11/28/2022 3:46:40 PM
Previous Batch Start Time : 11/28/2022 11:35:18 AM
Previous Batch End Time : 11/28/2022 3:46:40 PM

Totals	Units	Current Batch Total	Current Batch Opening Snapshot	Previous Batch Total	Previous Batch Opening Snapshot	Previous Batch End Snapshot
Pulse		0.0	0.0	0.0	0.0	0.0
Indicated Quantity	bbl	2329.67	91672.55	67961.33	23711.21	91672.55
Gross Volume	bbl	2329.67	91672.55	67961.33	23711.21	91672.55
Gross Standard Volume	bbl	2312.19	90985.0	67451.62	23533.38	90985.0
Net Standard Volume	bbl	2312.19	90985.0	67451.62	23533.38	90985.0
Sediment & Water Volume	bbl	0.0	0.0	0.0	0.0	0.0
Mass	Mlb	815.8	32100.3	23797.5	8302.8	32100.3
Flow Time	s	517.0	20344.0	15082.0	5262.0	20344.0

3.5 History

Use the History drop-down in the Monitor menu to view history data stored in your FB Series product.

Figure 50. Monitor History



The History drop-down contains the following options:

Periodic History – Use this display to view the current flow rates and totals for liquid linear meters.

Transaction History – Use this display to view the current flow rates and totals for liquid linear meters.

3.5.1 Periodic History

Use the Periodic History option to view user periodic, hourly, daily, weekly, and monthly history data. You can view data from each periodic history group, including User Periodic, General, and Station History.

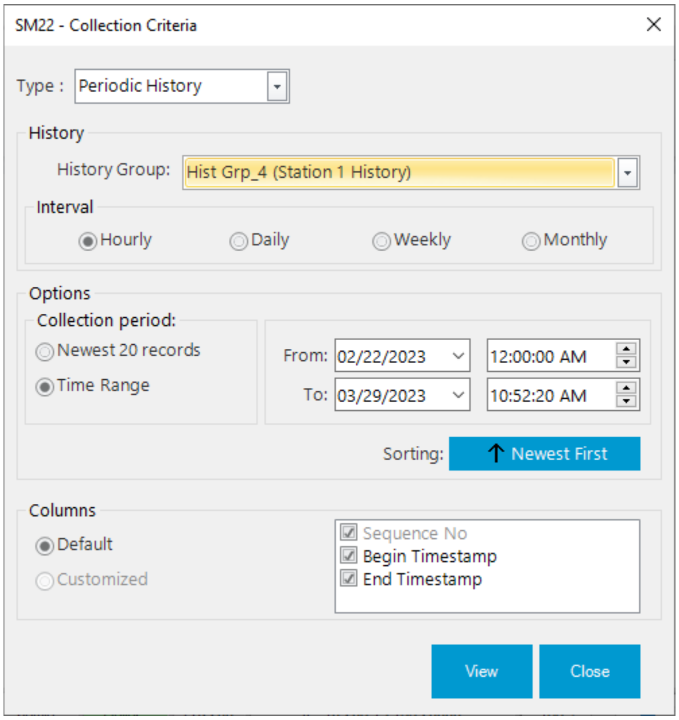
Note

- You **must** first configure history points before viewing history data. For more information, refer to Configure – History.
- The integrity of each history record is checked, and only history records with good integrity are shown.
- Each history record has an associated sequence number. A missing history record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To view periodic history data stored on an FB Series product:

1. Select **Monitor >History> Periodic History** from the FBxConnect™ main menu. The Collection Criteria dialog displays.

Figure 51. Collection Criteria – Periodic History



SM22 - Collection Criteria

Type : Periodic History

History

History Group: Hist Grp_4 (Station 1 History)

Interval

● Hourly ○ Daily ○ Weekly ○ Monthly

Options

Collection period:

○ Newest 20 records

● Time Range

From: 02/22/2023 12:00:00 AM

To: 03/29/2023 10:52:20 AM

Sorting: ↑ Newest First

Columns

● Default

○ Customized

☑ Sequence No

☑ Begin Timestamp

☑ End Timestamp

2. Click ▼ in the **History Group** field to select the history group you want to view. Possible options are User Periodic 1, User Periodic 2, General History, Station History 1, or Station History 2.

3. If you select **General History**, **Station History 1**, or **Station History 2** in the History Group field, select a time frequency for the collected data in the **Interval** field. Possible options are **Hourly**, **Daily**, **Weekly**, or **Monthly**.

4. In the Collection period field, select **Oldest 20 records/Newest 20 Records** to view the twenty oldest/newest history records or select **Time Range** to view history records from a specific time and date range.

Note

Your selection in the **Sorting** field controls the options presented in this field.

5. Click the button in the in the **Sorting** field to control the order of records in the history report. Possible options are:

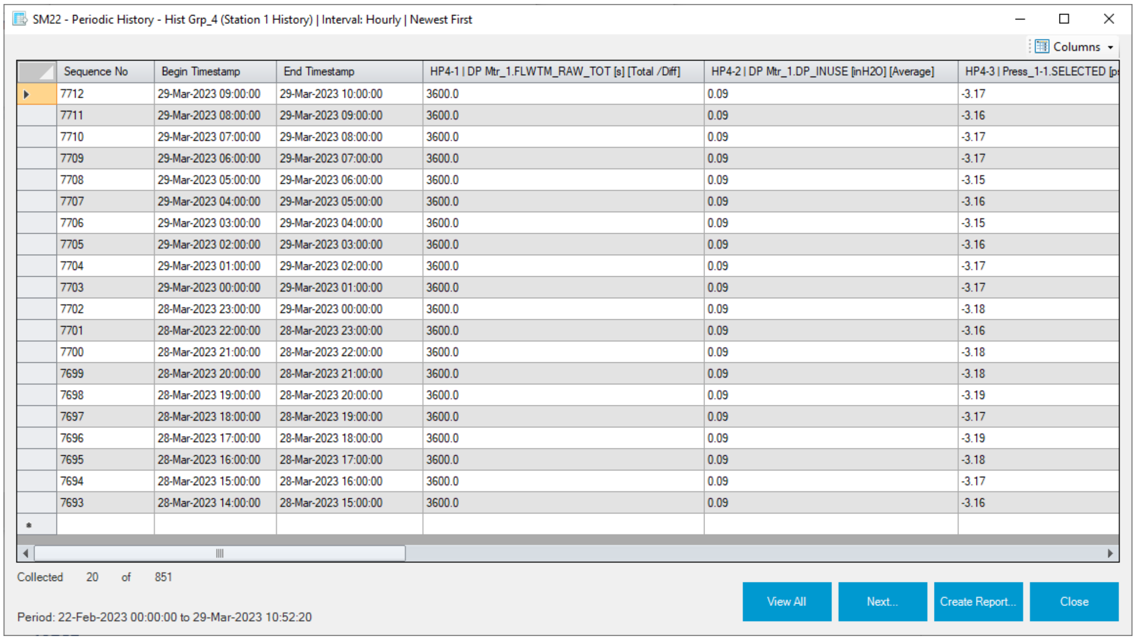
   - **Newest First –** Records are sorted from the newest to the oldest.
   - **Oldest First –** Records are sorted from the oldest to the newest.

6. If you select **Time Range** in the Collection period field, enter a beginning and ending date and time in the **From** and **To** fields.

7. In the Columns field, select or deselect the columns you want to include in the default report view.

8. Click **View** to view the selected history.

Figure 52. Periodic History



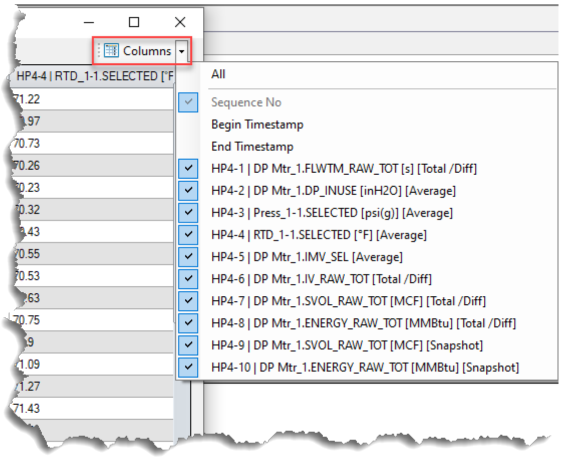
Sequence No	Begin Timestamp	End Timestamp	HP4-1 | DP Mtr_1.FLWTM_RAW_TOT [s] [Total /Diff]	HP4-2 | DP Mtr_1.DP_INUSE [inH2O] [Average]	HP4-3 | Press_1-1.SELECTED [p
7712	29-Mar-2023 09:00:00	29-Mar-2023 10:00:00	3600.0	0.09	-3.17
7711	29-Mar-2023 08:00:00	29-Mar-2023 09:00:00	3600.0	0.09	-3.16
7710	29-Mar-2023 07:00:00	29-Mar-2023 08:00:00	3600.0	0.09	-3.17
7709	29-Mar-2023 06:00:00	29-Mar-2023 07:00:00	3600.0	0.09	-3.17
7708	29-Mar-2023 05:00:00	29-Mar-2023 06:00:00	3600.0	0.09	-3.15
7707	29-Mar-2023 04:00:00	29-Mar-2023 05:00:00	3600.0	0.09	-3.16
7706	29-Mar-2023 03:00:00	29-Mar-2023 04:00:00	3600.0	0.09	-3.15
7705	29-Mar-2023 02:00:00	29-Mar-2023 03:00:00	3600.0	0.09	-3.16
7704	29-Mar-2023 01:00:00	29-Mar-2023 02:00:00	3600.0	0.09	-3.17
7703	29-Mar-2023 00:00:00	29-Mar-2023 01:00:00	3600.0	0.09	-3.17
7702	28-Mar-2023 23:00:00	29-Mar-2023 00:00:00	3600.0	0.09	-3.18
7701	28-Mar-2023 22:00:00	28-Mar-2023 23:00:00	3600.0	0.09	-3.16
7700	28-Mar-2023 21:00:00	28-Mar-2023 22:00:00	3600.0	0.09	-3.18
7699	28-Mar-2023 20:00:00	28-Mar-2023 21:00:00	3600.0	0.09	-3.18
7698	28-Mar-2023 19:00:00	28-Mar-2023 20:00:00	3600.0	0.09	-3.19
7697	28-Mar-2023 18:00:00	28-Mar-2023 19:00:00	3600.0	0.09	-3.17
7696	28-Mar-2023 17:00:00	28-Mar-2023 18:00:00	3600.0	0.09	-3.19
7695	28-Mar-2023 16:00:00	28-Mar-2023 17:00:00	3600.0	0.09	-3.18
7694	28-Mar-2023 15:00:00	28-Mar-2023 16:00:00	3600.0	0.09	-3.17
7693	28-Mar-2023 14:00:00	28-Mar-2023 15:00:00	3600.0	0.09	-3.16

Collected 20 of 851

Period: 22-Feb-2023 00:00:00 to 29-Mar-2023 10:52:20

Note

- Click ▼ in the Columns field to show or hide additional report columns.



All
☑ Sequence No
Begin Timestamp
End Timestamp
☑ HP4-1 | DP Mtr_1.FLWTM_RAW_TOT [s] [Total /Diff]
☑ HP4-2 | DP Mtr_1.DP_INUSE [inH2O] [Average]
☑ HP4-3 | Press_1-1.SELECTED [psi(g)] [Average]
☑ HP4-4 | RTD_1-1.SELECTED [°F] [Average]
☑ HP4-5 | DP Mtr_1.IMV_SEL [Average]
☑ HP4-6 | DP Mtr_1.IV_RAW_TOT [Total /Diff]
☑ HP4-7 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Total /Diff]
☑ HP4-8 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Total /Diff]
☑ HP4-9 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Snapshot]
☑ HP4-10 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Snapshot]

- Every calculated parameter in meter runs has a health attribute. The status of this attribute is determined by a combination of the inputs used to calculate the parameter and the status of the calculation. Values with questionable data integrity are highlighted in pink, and a symbol is placed after the value. Hover your cursor over a highlighted value to view the reason for the highlighting. The symbol definitions are below:
  ? = In Fault
  # = In Override
  X = Unverified Value
  ! = In Alarm
  > = Over Range Limit
  ^ = Stale Value
  ***** = Invalid History
  @ = Undefined History

9. Click the **Next** button to retrieve 40 additional history records.
10. Click **View All** to retrieve all data stored in the flow computer.
11. Click the **Create Report** button to open the History Report dialog and save a history report to your computer. For more information, refer to History Report.
12. Click the **Select New** button to return to step 1 and select new collection criteria.

3.5.2 Transaction History

Use the Transaction History option to view data from each configured transaction history group.

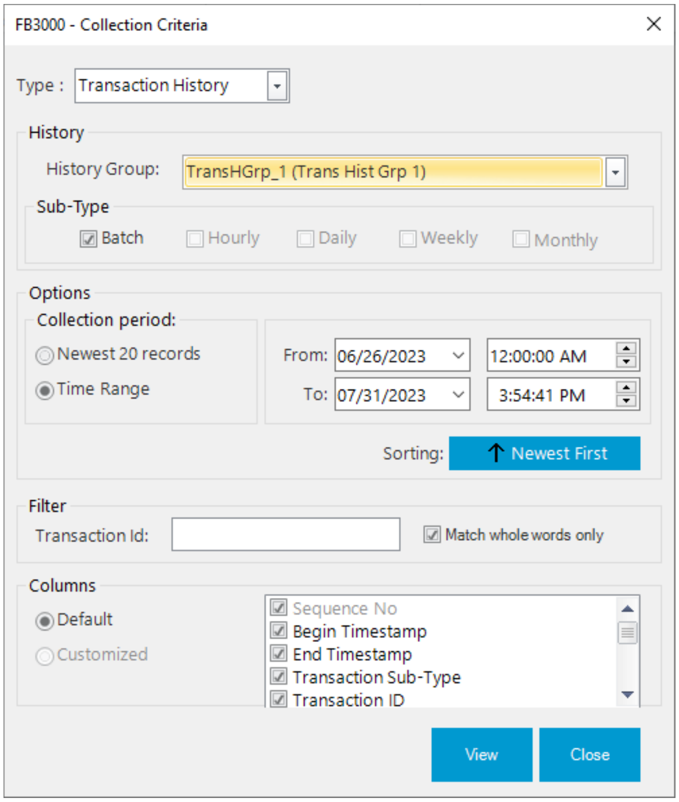
Note

- You **must** first configure history points before viewing history data. For more information, refer to Configure – History.
- The integrity of each history record is checked, and only history records with good integrity are shown.
- Each history record has an associated sequence number. A missing history record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To view transaction history data stored on an FB Series product:

1. Select **Monitor > History > Transaction History** from the FBxConnect™ main menu. The Collection Criteria dialog displays.

Figure 53. Collection Criteria – Transaction History



FB3000 - Collection Criteria

Type : Transaction History

History

History Group: TransHGrp_1 (Trans Hist Grp 1)

Sub-Type

☑ Batch ☐ Hourly ☐ Daily ☐ Weekly ☐ Monthly

Options

Collection period:

○ Newest 20 records

● Time Range

From: 06/26/2023 12:00:00 AM

To: 07/31/2023 3:54:41 PM

Sorting: ↑ Newest First

Filter

Transaction Id:

☑ Match whole words only

Columns

● Default

○ Customized

☑ Sequence No
☑ Begin Timestamp
☑ End Timestamp
☑ Transaction Sub-Type
☑ Transaction ID

2. Click ▼ in the **History Group** field to select the transaction history group you want to view.

3. In the **Sub-Type** field, select the type of history to include in the report. The default selection is **Batch**.

Note

If you select **Hourly**, **Daily**, **Weekly**, or **Monthly** in the **Sub-Type** field, you **must** have previously configured transaction history to include periodic data in the **Periodic Data Logging in Transaction History** field on the Station – Batching Tab **and** configured transaction history to include this data on the Transaction History Group Configuration display.

4. In the **Collection period** field, select **Oldest 20 records/Newest 20 Records** to view the twenty oldest/newest history records or select **Time Range** to view history records from a specific time and date range.

Note

Your selection in the **Sorting** field controls the options presented in this field.

---

5. Click the button in the in the **Sorting** field to control the order of records in the history report. Possible options are:
   - **Newest First** – Records are sorted from the newest to the oldest.
   - **Oldest First** – Records are sorted from the oldest to the newest.
6. In the **Filter** field, enter a Transaction ID to narrow the results to show **only** specific transactions.

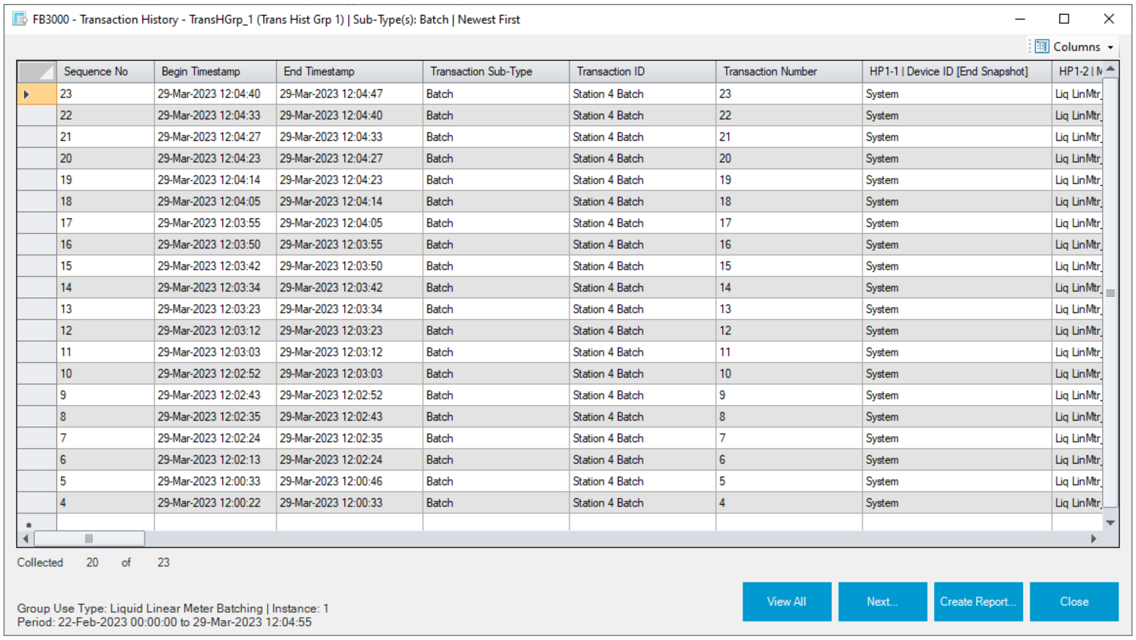
Note

- This field is **not** case sensitive.
- For transactions assigned to a meter, you configure the Transaction ID in the **Batch Identifier** field on the Station – Batching display.
- For transactions **not** assigned to a meter, you configure the Transaction ID in the **Transaction ID** field on the Transaction History Group Configuration display.

---

7. Place a check mark in the **Match whole words only** field to search **only** for Transaction IDs that contain the entire word you entered in the **Filter** field.
8. If you select **Time Range** in the Collection period field, enter a beginning and ending date and time in the **From** and **To** fields.
9. In the Columns field, select or deselect the columns you want to include in the default report view.
10. Click **View** to view the selected history.

Figure 54. Transaction History



FB3000 - Transaction History - TransHGrp_1 (Trans Hist Grp 1) | Sub-Type(s): Batch | Newest First

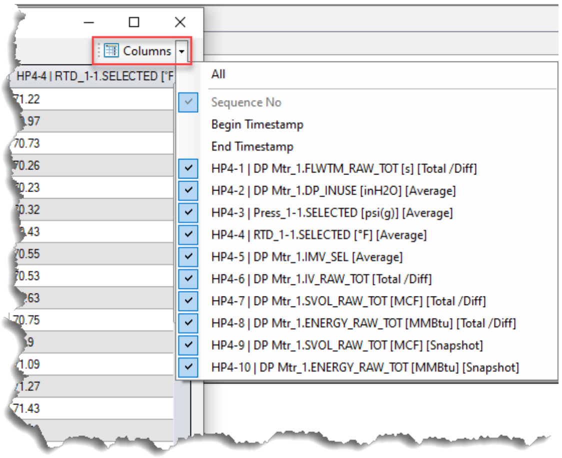
Sequence No	Begin Timestamp	End Timestamp	Transaction Sub-Type	Transaction ID	Transaction Number	HP1-1 | Device ID [End Snapshot]	HP1-2 | M
23	29-Mar-2023 12:04:40	29-Mar-2023 12:04:47	Batch	Station 4 Batch	23	System	Liq LinMtr
22	29-Mar-2023 12:04:33	29-Mar-2023 12:04:40	Batch	Station 4 Batch	22	System	Liq LinMtr
21	29-Mar-2023 12:04:27	29-Mar-2023 12:04:33	Batch	Station 4 Batch	21	System	Liq LinMtr
20	29-Mar-2023 12:04:23	29-Mar-2023 12:04:27	Batch	Station 4 Batch	20	System	Liq LinMtr
19	29-Mar-2023 12:04:14	29-Mar-2023 12:04:23	Batch	Station 4 Batch	19	System	Liq LinMtr
18	29-Mar-2023 12:04:05	29-Mar-2023 12:04:14	Batch	Station 4 Batch	18	System	Liq LinMtr
17	29-Mar-2023 12:03:55	29-Mar-2023 12:04:05	Batch	Station 4 Batch	17	System	Liq LinMtr
16	29-Mar-2023 12:03:50	29-Mar-2023 12:03:55	Batch	Station 4 Batch	16	System	Liq LinMtr
15	29-Mar-2023 12:03:42	29-Mar-2023 12:03:50	Batch	Station 4 Batch	15	System	Liq LinMtr
14	29-Mar-2023 12:03:34	29-Mar-2023 12:03:42	Batch	Station 4 Batch	14	System	Liq LinMtr
13	29-Mar-2023 12:03:23	29-Mar-2023 12:03:34	Batch	Station 4 Batch	13	System	Liq LinMtr
12	29-Mar-2023 12:03:12	29-Mar-2023 12:03:23	Batch	Station 4 Batch	12	System	Liq LinMtr
11	29-Mar-2023 12:03:03	29-Mar-2023 12:03:12	Batch	Station 4 Batch	11	System	Liq LinMtr
10	29-Mar-2023 12:02:52	29-Mar-2023 12:03:03	Batch	Station 4 Batch	10	System	Liq LinMtr
9	29-Mar-2023 12:02:43	29-Mar-2023 12:02:52	Batch	Station 4 Batch	9	System	Liq LinMtr
8	29-Mar-2023 12:02:35	29-Mar-2023 12:02:43	Batch	Station 4 Batch	8	System	Liq LinMtr
7	29-Mar-2023 12:02:24	29-Mar-2023 12:02:35	Batch	Station 4 Batch	7	System	Liq LinMtr
6	29-Mar-2023 12:02:13	29-Mar-2023 12:02:24	Batch	Station 4 Batch	6	System	Liq LinMtr
5	29-Mar-2023 12:00:33	29-Mar-2023 12:00:46	Batch	Station 4 Batch	5	System	Liq LinMtr
4	29-Mar-2023 12:00:22	29-Mar-2023 12:00:33	Batch	Station 4 Batch	4	System	Liq LinMtr

Collected 20 of 23

Group Use Type: Liquid Linear Meter Batching | Instance: 1
Period: 22-Feb-2023 00:00:00 to 29-Mar-2023 12:04:55

Note

- Click ▼ in the Columns field to show or hide additional report columns.



All
☑ Sequence No
Begin Timestamp
End Timestamp
☑ HP4-1 | DP Mtr_1.FLWTM_RAW_TOT [s] [Total /Diff]
☑ HP4-2 | DP Mtr_1.DP_INUSE [inH2O] [Average]
☑ HP4-3 | Press_1-1.SELECTED [psi(g)] [Average]
☑ HP4-4 | RTD_1-1.SELECTED [°F] [Average]
☑ HP4-5 | DP Mtr_1.IMV_SEL [Average]
☑ HP4-6 | DP Mtr_1.IV_RAW_TOT [Total /Diff]
☑ HP4-7 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Total /Diff]
☑ HP4-8 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Total /Diff]
☑ HP4-9 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Snapshot]
☑ HP4-10 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Snapshot]

- Every calculated parameter in meter runs has a health attribute. The status of this attribute is determined by a combination of the inputs used to calculate the parameter and the status of the calculation. Values with questionable data integrity are highlighted in pink, and a symbol is placed after the value. Hover your cursor over a highlighted value to view the reason for the highlighting. The symbol definitions are below:

  ? = In Fault
  # = In Override

X = Unverified Value
! = In Alarm
> = Over Range Limit
^ = Stale Value
***** = Invalid History
@ = Undefined History

---

11. Click the **Next** button to retrieve 40 additional history records.
12. Click **View All** to retrieve all data stored in the flow computer.
13. Click the **Create Report** button to open the History Report dialog and save a history report to your computer. For more information, refer to History Report.
14. Click the **Select New** button to return to step 1 and select new collection criteria.

3.6 Alarms

Use the Alarms screen to view any currently active alarms on your device.

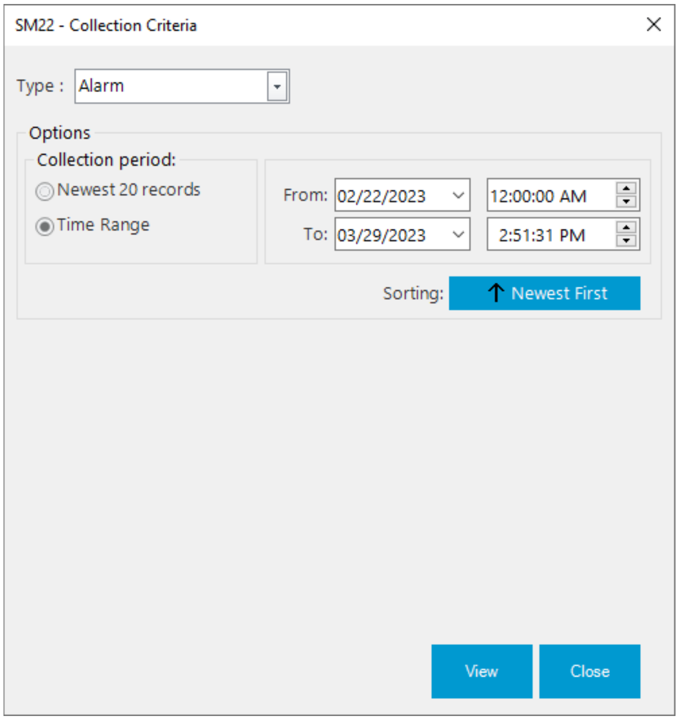
Note

- The integrity of each alarm record is checked, and only alarm records with good integrity are shown.
- Each alarm record has an associated sequence number. A missing alarm record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To view alarms stored on the device:

1. Select **Monitor > Alarms** from the FBxConnect™ main menu. The Collection Criteria dialog displays.

Figure 55. Collection Criteria – Alarm



Type : Alarm

○ Newest 20 records

● Time Range

From: 02/22/2023 12:00:00 AM

To: 03/29/2023 2:51:31 PM

2. In the Collection period field, select **Oldest 20 records/Newest 20 Records** to view the twenty oldest/newest alarm records or select **Time Range** to view alarm records from a specific time and date range.

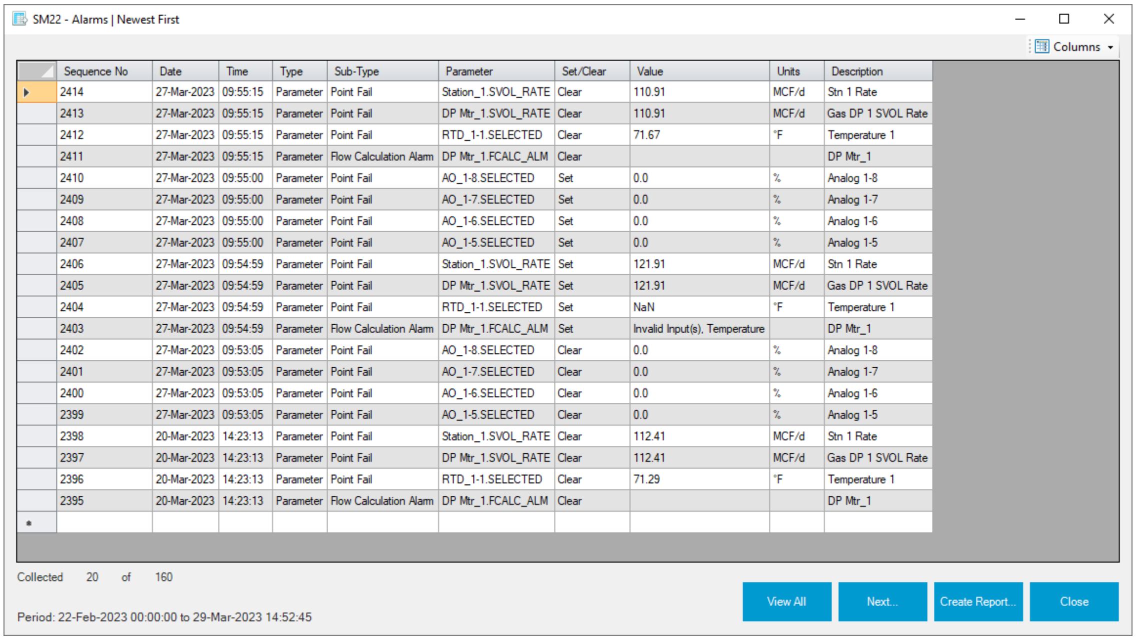
Note

Your selection in the **Sorting** field controls the options presented in this field.

---

3. Click the button in the in the **Sorting** field to control the order of records in the history report. Possible options are:
   - **Newest First** – Records are sorted from the newest to the oldest.
   - **Oldest First** – Records are sorted from the oldest to the newest.
4. If you select **Time Range** in the Collection period field, enter a beginning and ending date and time in the **From** and **To** fields.
5. Click **View** to view the selected alarms.

Figure 56. Alarms



	Sequence No	Date	Time	Type	Sub-Type	Parameter	Set/Clear	Value	Units	Description
▶	2414	27-Mar-2023	09:55:15	Parameter	Point Fail	Station_1.SVOL_RATE	Clear	110.91	MCF/d	Stn 1 Rate
	2413	27-Mar-2023	09:55:15	Parameter	Point Fail	DP Mtr_1.SVOL_RATE	Clear	110.91	MCF/d	Gas DP 1 SVOL Rate
	2412	27-Mar-2023	09:55:15	Parameter	Point Fail	RTD_1-1.SELECTED	Clear	71.67	°F	Temperature 1
	2411	27-Mar-2023	09:55:15	Parameter	Flow Calculation Alarm	DP Mtr_1.FCALC_ALM	Clear			DP Mtr_1
	2410	27-Mar-2023	09:55:00	Parameter	Point Fail	AO_1-8.SELECTED	Set	0.0	%	Analog 1-8
	2409	27-Mar-2023	09:55:00	Parameter	Point Fail	AO_1-7.SELECTED	Set	0.0	%	Analog 1-7
	2408	27-Mar-2023	09:55:00	Parameter	Point Fail	AO_1-6.SELECTED	Set	0.0	%	Analog 1-6
	2407	27-Mar-2023	09:55:00	Parameter	Point Fail	AO_1-5.SELECTED	Set	0.0	%	Analog 1-5
	2406	27-Mar-2023	09:54:59	Parameter	Point Fail	Station_1.SVOL_RATE	Set	121.91	MCF/d	Stn 1 Rate
	2405	27-Mar-2023	09:54:59	Parameter	Point Fail	DP Mtr_1.SVOL_RATE	Set	121.91	MCF/d	Gas DP 1 SVOL Rate
	2404	27-Mar-2023	09:54:59	Parameter	Point Fail	RTD_1-1.SELECTED	Set	NaN	°F	Temperature 1
	2403	27-Mar-2023	09:54:59	Parameter	Flow Calculation Alarm	DP Mtr_1.FCALC_ALM	Set	Invalid Input(s), Temperature		DP Mtr_1
	2402	27-Mar-2023	09:53:05	Parameter	Point Fail	AO_1-8.SELECTED	Clear	0.0	%	Analog 1-8
	2401	27-Mar-2023	09:53:05	Parameter	Point Fail	AO_1-7.SELECTED	Clear	0.0	%	Analog 1-7
	2400	27-Mar-2023	09:53:05	Parameter	Point Fail	AO_1-6.SELECTED	Clear	0.0	%	Analog 1-6
	2399	27-Mar-2023	09:53:05	Parameter	Point Fail	AO_1-5.SELECTED	Clear	0.0	%	Analog 1-5
	2398	20-Mar-2023	14:23:13	Parameter	Point Fail	Station_1.SVOL_RATE	Clear	112.41	MCF/d	Stn 1 Rate
	2397	20-Mar-2023	14:23:13	Parameter	Point Fail	DP Mtr_1.SVOL_RATE	Clear	112.41	MCF/d	Gas DP 1 SVOL Rate
	2396	20-Mar-2023	14:23:13	Parameter	Point Fail	RTD_1-1.SELECTED	Clear	71.29	°F	Temperature 1
	2395	20-Mar-2023	14:23:13	Parameter	Flow Calculation Alarm	DP Mtr_1.FCALC_ALM	Clear			DP Mtr_1
*										

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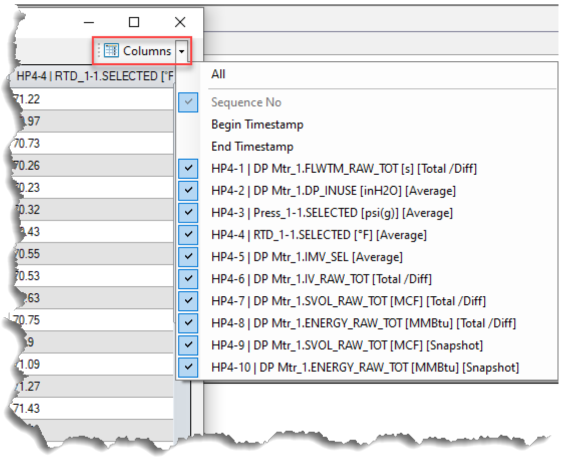
Period: 22-Feb-2023 00:00:00 to 29-Mar-2023 14:52:45

Note

Click ▼ in the Columns field to show or hide additional report columns.



All
☑ Sequence No
Begin Timestamp
End Timestamp
☑ HP4-1 | DP Mtr_1.FLWTM_RAW_TOT [s] [Total /Diff]
☑ HP4-2 | DP Mtr_1.DP_INUSE [inH2O] [Average]
☑ HP4-3 | Press_1-1.SELECTED [psi(g)] [Average]
☑ HP4-4 | RTD_1-1.SELECTED [°F] [Average]
☑ HP4-5 | DP Mtr_1.IMV_SEL [Average]
☑ HP4-6 | DP Mtr_1.IV_RAW_TOT [Total /Diff]
☑ HP4-7 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Total /Diff]
☑ HP4-8 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Total /Diff]
☑ HP4-9 | DP Mtr_1.SVOL_RAW_TOT [MCF] [Snapshot]
☑ HP4-10 | DP Mtr_1.ENERGY_RAW_TOT [MMBtu] [Snapshot]

6. Click the **Next** button to retrieve 50 additional alarm records.

7. Click **View All** to retrieve all data stored in the flow computer.

Note

Double-click on the first column of a row that contains a Flow/Property Calculation Alarm to view information for any raised flow or property calculation alarm codes.

8. Click the **Create Report** button to open the Alarm Report dialog and save an alarm report to your computer. For more information, refer to Alarm Report.

9. Click the **Select New** button to return to step 1 and select new collection criteria.

3.7 Events

Use the Events screen to view events stored in device memory.

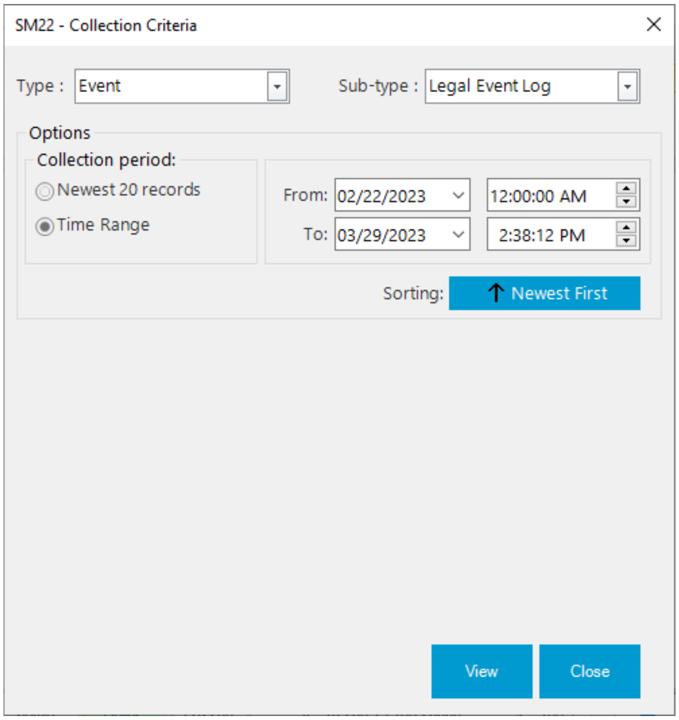
Note

- The integrity of each event record is checked, and only event records with good integrity are shown.
- Each event record has an associated sequence number. A missing event record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To access this screen:

1. Select **Monitor > Events** from the FBxConnect™ main menu. The Collection Criteria dialog displays.

Figure 57. Collection Criteria – Event



2. In the **Sub-type** field, select if you want to view legal or non-legal events.

Note

You **must** configure your FB Series product to keep separate legal and non-legal event logs on the Configure – System screen to view this field.

3. In the **Collection period** field, select **Oldest 20 records/Newest 20 Records** to view the twenty oldest/newest event records or select **Time Range** to view event records from a specific time and date range.

Note

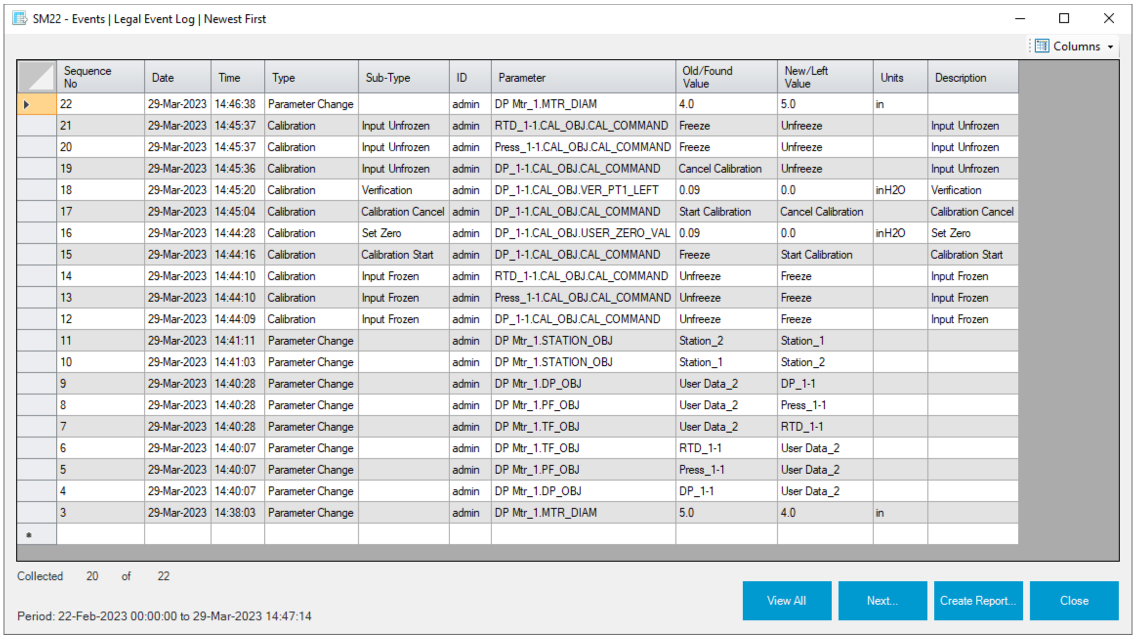
Your selection in the **Sorting** field controls the options presented in this field.

4. Click the button in the in the **Sorting** field to control the order of records in the history report. Possible options are:
   - **Newest First** – Records are sorted from the newest to the oldest.
   - **Oldest First** – Records are sorted from the oldest to the newest.

5. If you select **Time Range** in the Collection period field, enter a beginning and ending date and time in the **From** and **To** fields.

6. Click **View** to view the selected events.

Figure 58. Events



SM22 - Events | Legal Event Log | Newest First

Sequence No	Date	Time	Type	Sub-Type	ID	Parameter	Old/Found Value	New/Left Value	Units	Description
22	29-Mar-2023	14:46:38	Parameter Change		admin	DP Mtr_1.MTR_DIAM	4.0	5.0	in	
21	29-Mar-2023	14:45:37	Calibration	Input Unfrozen	admin	RTD_1-1.CAL_OBJ.CAL_COMMAND	Freeze	Unfreeze		Input Unfrozen
20	29-Mar-2023	14:45:37	Calibration	Input Unfrozen	admin	Press_1-1.CAL_OBJ.CAL_COMMAND	Freeze	Unfreeze		Input Unfrozen
19	29-Mar-2023	14:45:36	Calibration	Input Unfrozen	admin	DP_1-1.CAL_OBJ.CAL_COMMAND	Cancel Calibration	Unfreeze		Input Unfrozen
18	29-Mar-2023	14:45:20	Calibration	Verification	admin	DP_1-1.CAL_OBJ.VER_PT1_LEFT	0.09	0.0	inH2O	Verification
17	29-Mar-2023	14:45:04	Calibration	Calibration Cancel	admin	DP_1-1.CAL_OBJ.CAL_COMMAND	Start Calibration	Cancel Calibration		Calibration Cancel
16	29-Mar-2023	14:44:28	Calibration	Set Zero	admin	DP_1-1.CAL_OBJ.USER_ZERO_VAL	0.09	0.0	inH2O	Set Zero
15	29-Mar-2023	14:44:16	Calibration	Calibration Start	admin	DP_1-1.CAL_OBJ.CAL_COMMAND	Freeze	Start Calibration		Calibration Start
14	29-Mar-2023	14:44:10	Calibration	Input Frozen	admin	RTD_1-1.CAL_OBJ.CAL_COMMAND	Unfreeze	Freeze		Input Frozen
13	29-Mar-2023	14:44:10	Calibration	Input Frozen	admin	Press_1-1.CAL_OBJ.CAL_COMMAND	Unfreeze	Freeze		Input Frozen
12	29-Mar-2023	14:44:09	Calibration	Input Frozen	admin	DP_1-1.CAL_OBJ.CAL_COMMAND	Unfreeze	Freeze		Input Frozen
11	29-Mar-2023	14:41:11	Parameter Change		admin	DP Mtr_1.STATION_OBJ	Station_2	Station_1		
10	29-Mar-2023	14:41:03	Parameter Change		admin	DP Mtr_1.STATION_OBJ	Station_1	Station_2		
9	29-Mar-2023	14:40:28	Parameter Change		admin	DP Mtr_1.DP_OBJ	User Data_2	DP_1-1		
8	29-Mar-2023	14:40:28	Parameter Change		admin	DP Mtr_1.PF_OBJ	User Data_2	Press_1-1		
7	29-Mar-2023	14:40:28	Parameter Change		admin	DP Mtr_1.TF_OBJ	User Data_2	RTD_1-1		
6	29-Mar-2023	14:40:07	Parameter Change		admin	DP Mtr_1.TF_OBJ	RTD_1-1	User Data_2		
5	29-Mar-2023	14:40:07	Parameter Change		admin	DP Mtr_1.PF_OBJ	Press_1-1	User Data_2		
4	29-Mar-2023	14:40:07	Parameter Change		admin	DP Mtr_1.DP_OBJ	DP_1-1	User Data_2		
3	29-Mar-2023	14:38:03	Parameter Change		admin	DP Mtr_1.MTR_DIAM	5.0	4.0	in	

Collected 20 of 22

Period: 22-Feb-2023 00:00:00 to 29-Mar-2023 14:47:14

7. Click **View All** to retrieve all data stored in the flow computer.

8. Click **Next** to retrieve 50 additional event records.

9. Click **Create Report** to open the Event Report dialog and save an event report to your computer. For more information, refer to Event Report.

10. Click **Select New** to return to step 1 and select new collection criteria.

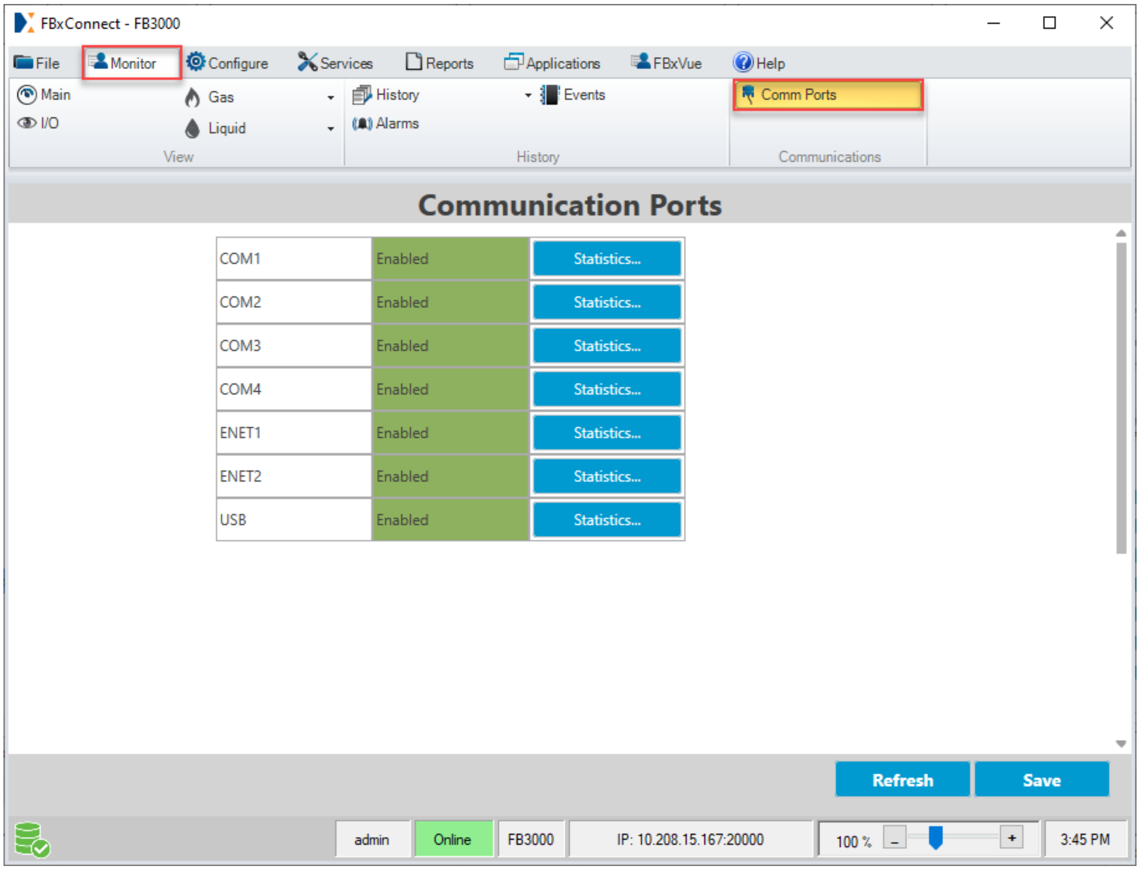
3.8 Comm Ports

Use the Comm Ports display to view the **read-only** status and configuration of each communications port on the FB Series product.

To access this display:

1. Select **Monitor > Comm Ports**. The Communication Ports display opens showing the Overview tab.

Figure 59. Comm Ports



Communication Ports

COM1	Enabled	Statistics...
COM2	Enabled	Statistics...
COM3	Enabled	Statistics...
COM4	Enabled	Statistics...
ENET1	Enabled	Statistics...
ENET2	Enabled	Statistics...
USB	Enabled	Statistics...

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 3:45 PM

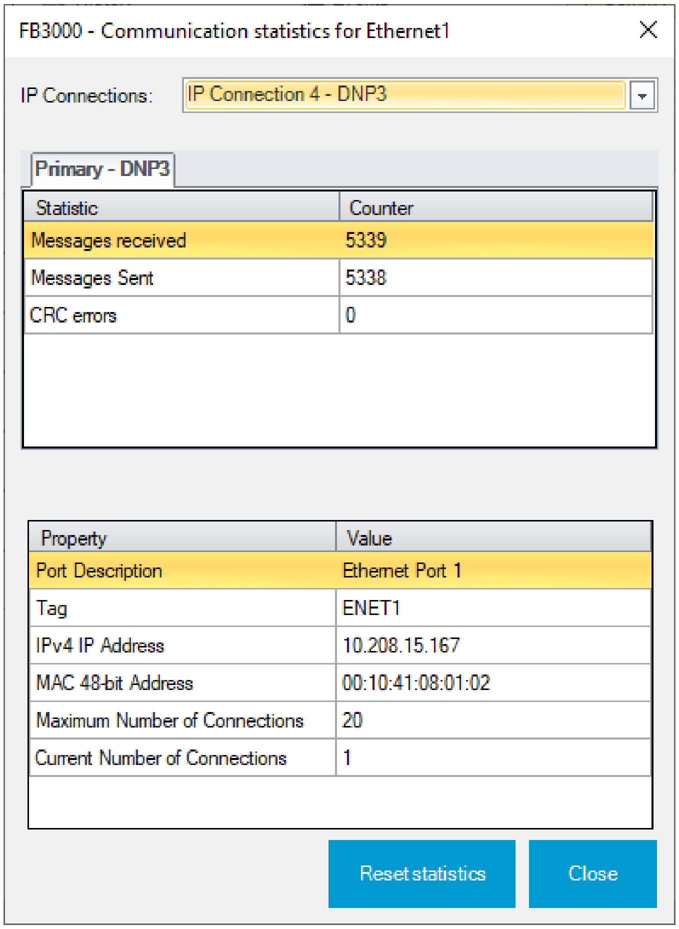
2. Review the status of each port (Enabled or Disabled).

3. Click **Statistics** to open a **Communication statistics** pop-up display and view the number of messages sent and received on the selected communications port.

Note

- For serial ports, a separate tab shows statistics for each configured Port Owner (DNP3, Modbus Slave, and Modbus Master). For more information, refer to Communications – General.
- For Ethernet ports, use the IP Connections drop-down to view statistics for each IP connection. For more information, refer to Communications – General.

Figure 60. Communication statistics



IP Connections: IP Connection 4 - DNP3

Statistic	Counter
Messages received	5339
Messages Sent	5338
CRC errors	0

Property	Value
Port Description	Ethernet Port 1
Tag	ENET1
IPv4 IP Address	10.208.15.167
MAC 48-bit Address	00:10:41:08:01:02
Maximum Number of Connections	20
Current Number of Connections	1

4. Click **Reset statistics** to reset the message counters for the selected communications port.

Note

For Ethernet ports, you **must** reset statistics for each IP Connection individually.

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Section 4: Configure Menu

Use the options in this menu to configure FB Series product parameters, including meter runs, I/O, fluid properties, and history.

Figure 61. Configure Menu

The Configure menu contains the following options:

Home – Set a site name, set your home screen, and view general product information about your device.

Guided Setup – Configure the FB3000 using a guide that directs you through the configuration process.

Engr Units – Configure the engineering units used in calculations.

Point Picker –View internal database parameters in the FB Series product.

I/O Setup – Configure the inputs and outputs of the flow computer.

Pass Thru – Configure parameters used when communicating with other Ethernet enabled FB Series products and remote I/O racks.

Summary – Shows an overview of all configured stations and assigned meters.

Meter Setup – Configure general meter run settings, including the number of DP and linear meter runs.

Gas

DP Meter – Configure differential pressure meters in your device.

Linear Meter – Configure linear meters in your device.

Fluid Properties – Define the physical properties of the fluid flowing through each meter.

Components – Configure how the system calculates fluid composition and the different components of the fluid flowing through the meter.

Liquid

Liquid Linear Meter – Configure liquid linear meters in your FB Series product.

Liquid Product – Define liquid products and their fluid properties.

Liquid Density – Configure liquid density inputs.

Station – Configure parameters for stations.

Averages – Configure which inputs the system uses to calculate averages, and view the results of those calculations.

Totals – Configure which inputs the system totalizes, and to view the results of those calculations.

GC – Configure gas chromatograph options for each meter, and to view the data from each configured gas chromatograph.

Alarms – Configure which parameters need to be monitored, and which alarms need to be raised when limits are reached.

History – Configure history points, to enable and disable history logging for the history groups, to configure user period for user periodic history group types and to configure contract time for standard history group types.

Logs – Configure the options for history, alarm, and event logs.

PID Loops – Configure Proportional, Integral, and Derivative (PID) controls.

Action Blocks – Configure Action Blocks.

Math Blocks – Configure up to 10 instances of Math Blocks.

Effects – Configure custom logic components that drive a selected device parameter to a user defined value.

Control Setup – Configure the number of Action Blocks, Math Blocks, Effects, and PID Loops instances available.

Communications – Configure the communications ports on your device.

Clock – Set the device clock and configure daylight savings time options.

Power Control – Conserve battery power to a radio or any other communicating device.

System – Configure your event log type and database recovery options.

I/O Bus – Configure the polling interval and view statistics for each I/O module installed in an FB3000 RTU.

FBxNet – Configure the FB Series product to communicate over FBxNet.

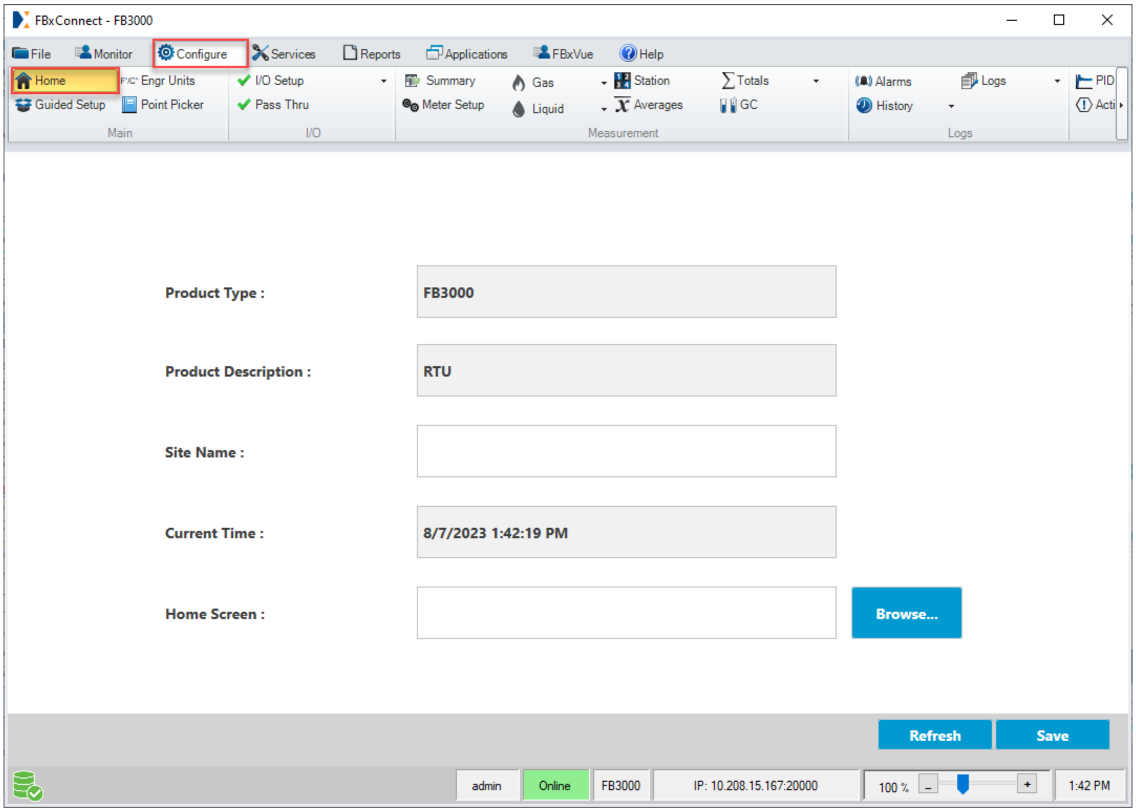
4.1 Home

Use this display to enter a site name, modify which display opens when you first connect to the FB Series product, and view general product information.

To access this display:

1. Select **Configure > Home**. The Configure Home display opens.

Figure 62. Configure – Home



Product Type : FB3000

Product Description : RTU

Site Name :

Current Time : 8/7/2023 1:42:19 PM

Home Screen :

2. Review – and change as necessary – the values in the following fields:

Field	Description
Product Type	This **read-only** field shows the type of FB Series product to which you are connected (online) or the configuration you are viewing (offline).
Product Description	This **read-only** field shows information about the FB Series product type.
Site Name	Enter a unique site name for the FB Series product.

Field	Description
Current Time	This **read-only** field shows the current time and date of the FB Series product's clock. **Note** This field appears **only** for FB Series products with a communication status of **Online**.
Firmware Version	This **read-only** field shows firmware version for the FB Series product configuration you are currently viewing. **Note** This field appears **only** for FB Series products with a communication status of **Offline**.
Home Screen	Select the **Browse** button a choose a specific display to open when you first connect to the FB Series product. For more information, refer to Configuring the Home Screen.

3. Select **Save** to save any changes you make to this tab.

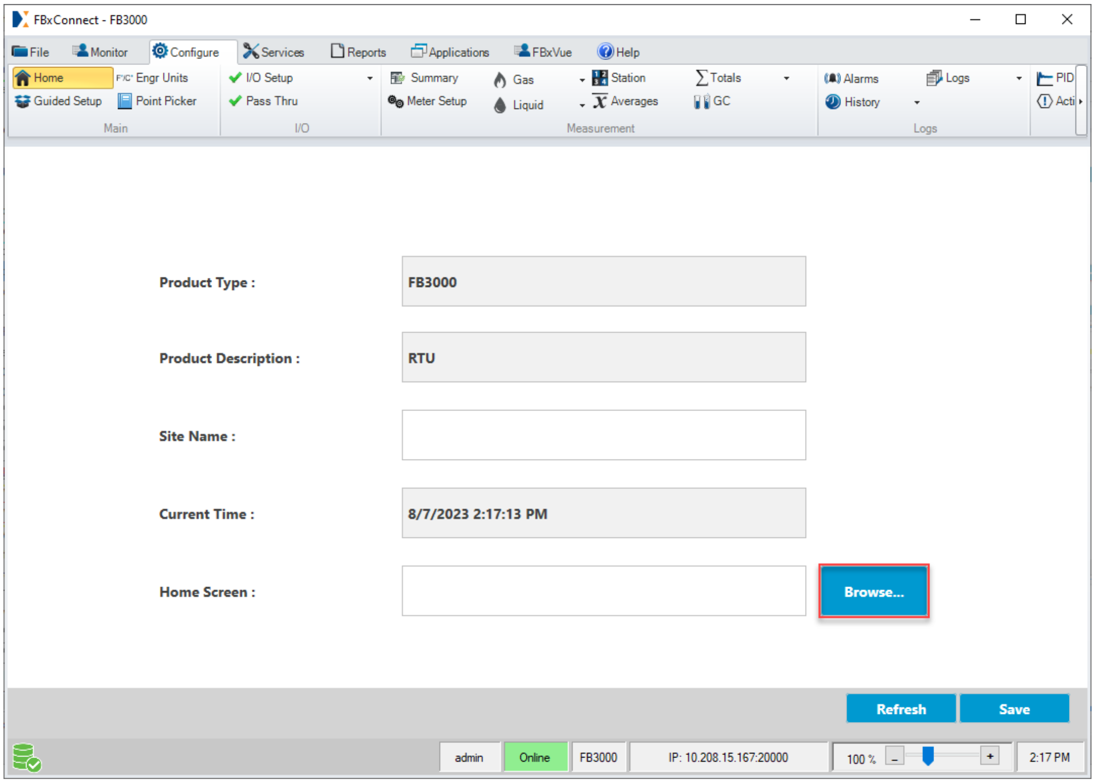
4.1.1 Configuring the Home Screen

You can configure a specific display to open when you first connect to the FB Series product. The default is the Main display in the Monitor Menu, but you can configure any application display, standalone display, or factory display located in the *C:\Users\Public\Documents\Emerson\FieldTools\FBx\CommonDisplays* folder.

To set the home screen display:

1. Select **Configure > Home**. The Home display opens.

Figure 63. Configure – Home



Product Type : FB3000

Product Description : RTU

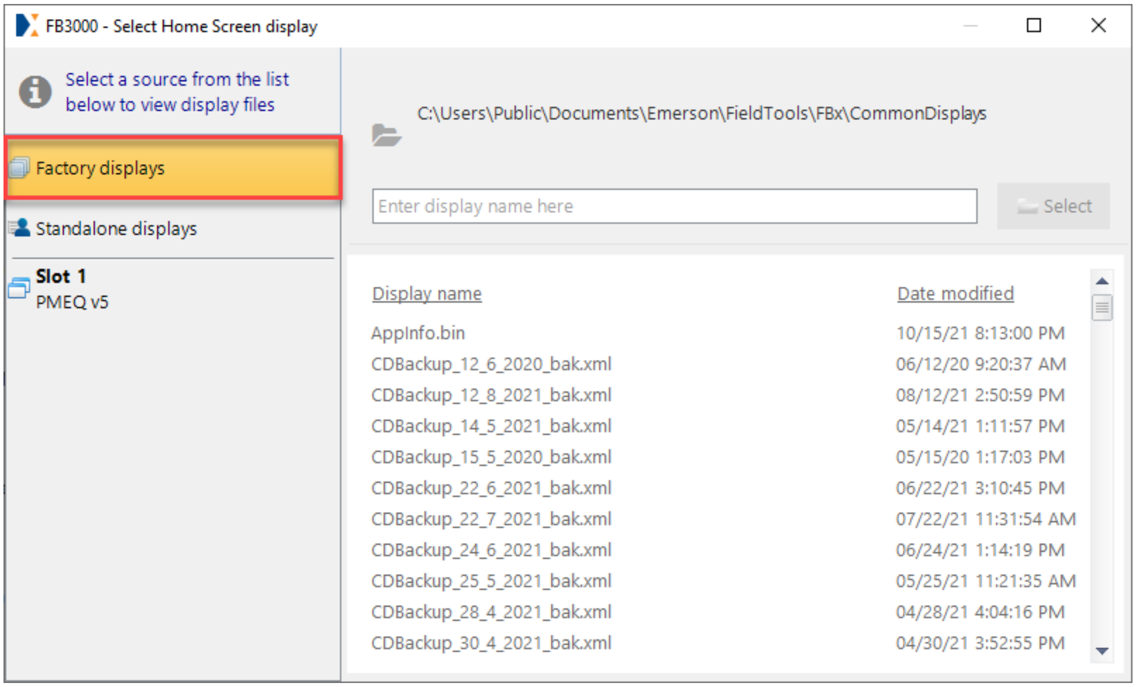
Site Name :

Current Time : 8/7/2023 2:17:13 PM

Home Screen :

2. Select the **Browse** button. The Select Home Screen display opens.

Figure 64. Select Home Screen display



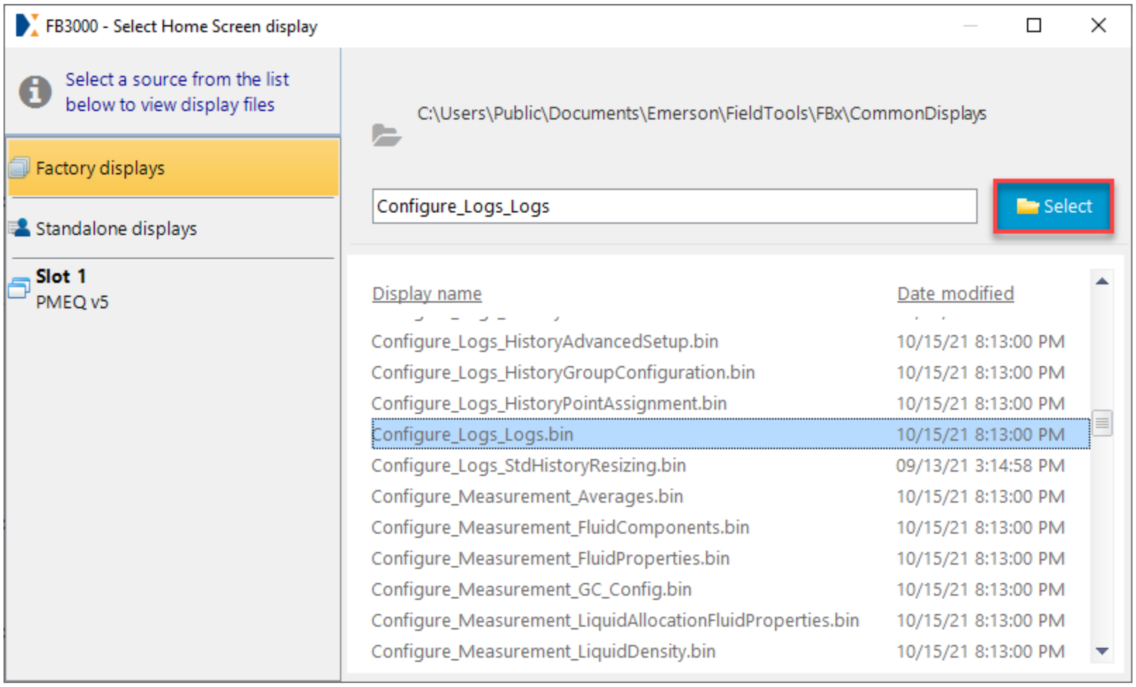
Select a source from the list below to view display files

C:\Users\Public\Documents\Emerson\FieldTools\FBx\CommonDisplays

Display name	Date modified
AppInfo.bin	10/15/21 8:13:00 PM
CDBackup_12_6_2020_bak.xml	06/12/20 9:20:37 AM
CDBackup_12_8_2021_bak.xml	08/12/21 2:50:59 PM
CDBackup_14_5_2021_bak.xml	05/14/21 1:11:57 PM
CDBackup_15_5_2020_bak.xml	05/15/20 1:17:03 PM
CDBackup_22_6_2021_bak.xml	06/22/21 3:10:45 PM
CDBackup_22_7_2021_bak.xml	07/22/21 11:31:54 AM
CDBackup_24_6_2021_bak.xml	06/24/21 1:14:19 PM
CDBackup_25_5_2021_bak.xml	05/25/21 11:21:35 AM
CDBackup_28_4_2021_bak.xml	04/28/21 4:04:16 PM
CDBackup_30_4_2021_bak.xml	04/30/21 3:52:55 PM

3. From the list on the left-side of the display, select what type of display (factory, standalone, or application) you want to open when you first connect to the FB Series product. A list of possible displays shows on the right-side of the display.

Figure 65. Select Home Screen display – Select Button

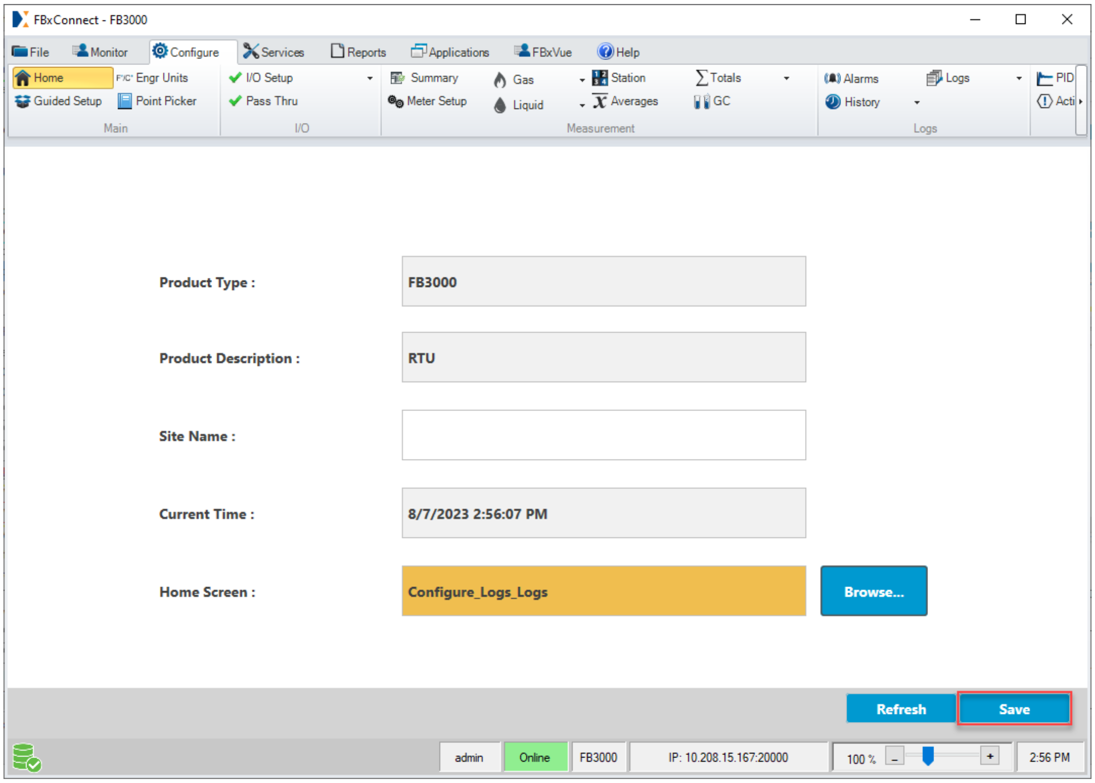


Configure_Logs_Logs

Display name	Date modified
Configure_Logs_HistoryAdvancedSetup.bin	10/15/21 8:13:00 PM
Configure_Logs_HistoryGroupConfiguration.bin	10/15/21 8:13:00 PM
Configure_Logs_HistoryPointAssignment.bin	10/15/21 8:13:00 PM
Configure_Logs_Logs.bin	10/15/21 8:13:00 PM
Configure_Logs_StdHistoryResizing.bin	09/13/21 3:14:58 PM
Configure_Measurement_Averages.bin	10/15/21 8:13:00 PM
Configure_Measurement_FluidComponents.bin	10/15/21 8:13:00 PM
Configure_Measurement_FluidProperties.bin	10/15/21 8:13:00 PM
Configure_Measurement_GC_Config.bin	10/15/21 8:13:00 PM
Configure_Measurement_LiquidAllocationFluidProperties.bin	10/15/21 8:13:00 PM
Configure_Measurement_LiquidDensity.bin	10/15/21 8:13:00 PM

4. Navigate to your desired display, highlight the display, and select the **Select** button. The Select Home Screen display closes showing the Configure Home display.

Figure 66. Configure – Home



Product Type : FB3000

Product Description : RTU

Site Name :

Current Time : 8/7/2023 2:56:07 PM

Home Screen : Configure_Logs_Logs

5. Select **Save** to save your changes. The next time you connect to the FB Series product, the display you selected will be the first display that opens.

Note

You can also configure the display to show a specific instance when it opens. To do this, add a colon (:) after the display name followed by the instance. For example, the third instance of the Logs display opens if you enter **Configure_Logs_Logs:Log_3**.

4.2 Guided Setup

Use **Guided Setup** to configure an FB3000 for the first time. Guided Setup directs you through the process of configuring your FB3000's measurement and I/O functionality, and automatically configures history points needed by API 21.1.

Note

- The steps available in the Guided Setup differ based on your FB Series product type and purchased options. This document shows all possible steps.

- If you need help on a specific display of Guided Setup, press **F1** to open the online help system for that particular display.

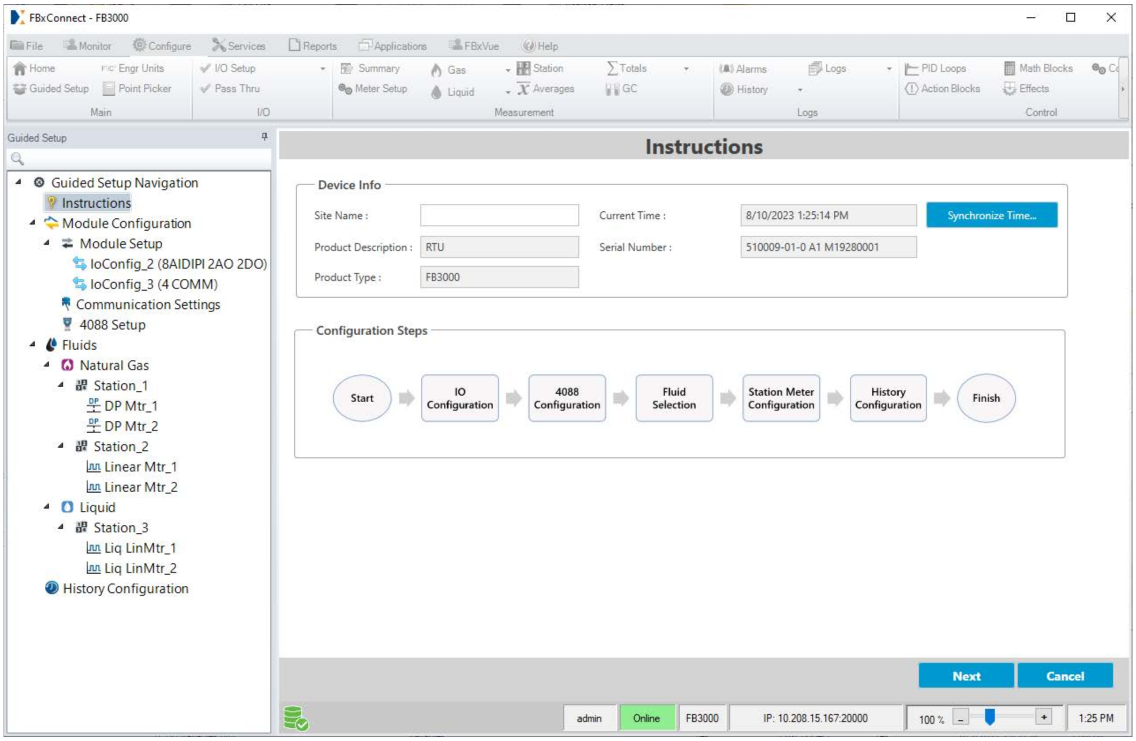
CAUTION

Guided Setup may change your history configuration. If you have previously configured your FB3000, collect history data before proceeding.

To access Guided Setup:

1. Select **Configure > Guided Setup**. The first page of Guided Setup opens.

Figure 67. Guided Setup



Site Name :
Product Description : RTU
Product Type : FB3000
Current Time : 8/10/2023 1:25:14 PM
Serial Number : 510009-01-0 A1 M19280001

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 1:25 PM

2. Review – and change as necessary – the values in the following fields:

Field	Description
Site Name	Sets the name of the active connection in Field Tools.
Product Description	This **read-only** field shows the description of the FB Series product you are currently configuring.

Field	Description
Product Type	This **read-only** field shows the product type of the FB Series product you are currently configuring.
Current Time	This **read-only** field shows current time and date of the FB Series product clock.
Synchronize Time	Select this button to synchronize the FB Series product clock with your PC clock.
Serial Number	This **read-only** field shows the serial number of the FB Series product you are configuring.
Configuration Steps	Shows the steps involved in the Guided Setup process.

3. Select **Next** to advance to the next step in the Guided Setup.

4.2.1 Guided Setup: I\O Configuration

Use this display to configure the input and output types available on your FB3000 RTU. You can configure an input to operate as an analog input (AI), digital input (DI), or pulse input (PI).

Note

- A separate **I/O Configuration** display is available for each installed I/O module.
- There is **not** a separate display for communications modules. You configure communications modules during the **Communications Settings** step of the Guided Setup
- The number of I/O points shown on this display varies depending on the device type and installed options.
- You can **right-click** on the Module Setup node or individual modules in the navigation tree to add or remove a module, and you can also copy and paste the configuration of

one module to another.

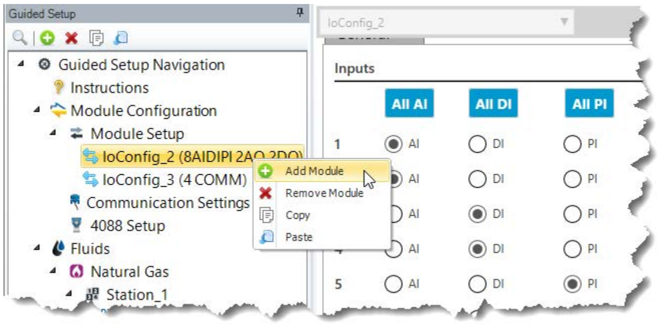
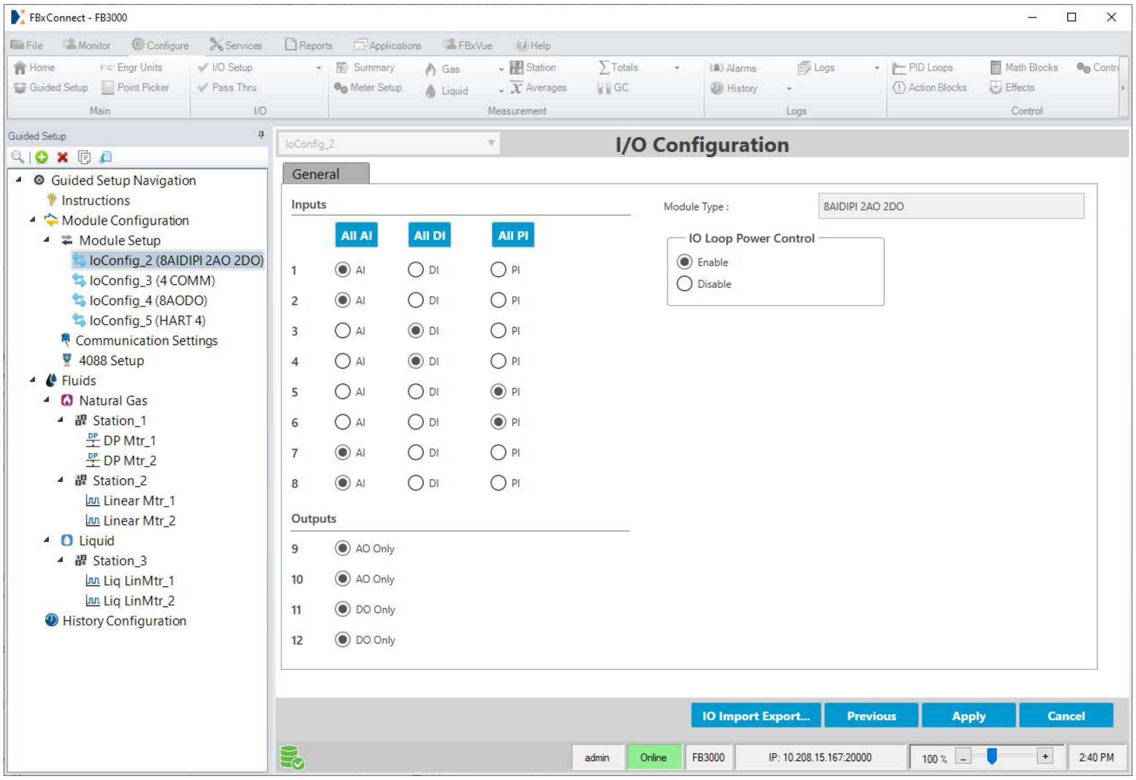


Figure 68. Guided Setup: I/O Configuration



Module Type : 8AIDIPI 2AO 2DO

IO Loop Power Control
● Enable
○ Disable

Inputs

1	● AI	○ DI	○ PI
2	● AI	○ DI	○ PI
3	○ AI	● DI	○ PI
4	○ AI	● DI	○ PI
5	○ AI	○ DI	● PI
6	○ AI	○ DI	● PI
7	● AI	○ DI	○ PI
8	● AI	○ DI	○ PI

Outputs

9	● AO Only
10	● AO Only
11	● DO Only
12	● DO Only

1. Review – and change as necessary – the values in the following fields:

Field	Description
Module Type	This **read-only** field shows the I/O module type installed in the selected slot. The fields available for each module type are described below:

Field	Description	
8AIDIPI 2AO 2DO Module	The 8AIDIPI 2AO 2DO (3MIX12) module provides eight input channels and four output channels. You can configure each input channel as either an analog input (AI), digital input (DI), or pulse input (PI). The output channels are comprised of two analog outputs (AO) and two digital outputs (DO).	
	Inputs	Sets each input channel as either an analog input, digital input, or pulse input. **Note** Select either **All AI**, **All DI**, or **All PI** to configure all input channels as either analog inputs, digital inputs, or pulse inputs, respectively.
	Outputs	Shows the available output channels on the selected I/O module.
	IO Loop Power Control	Enables or disables the 24-Volt loop power feature.
8AODO Module	The 8AODO module provides eight output channels. You can configure each output channel as either an analog output (AO) or digital output (DO).	
	Outputs	Sets each output channel as either an analog output, digital input, or pulse input. **Note** Select either **All AO** or **All DO** to configure all output channels as either analog outputs or digital outputs, respectively.
HART 4 Module	The HART 4 (HRT04) module provides four input/output channels used to communicate with HART devices using the HART protocol. You can configure each channel as either an analog input (AI) or analog output (AO). A channel set as an input can be configured for use in point-to-point or multi-drop mode. A channel set as an output can be configured for use in point-to-point mode only.	
	Analog	Sets each channel as either and analog input (AI) or analog output (AO).

Field	Description
COMM 4	The 4-port serial communications module (COM04) provides additional serial communication channels beyond those available on the CPU module. **Note** To make configuration changes to this module, refer to Communications – General.
I/O Import Export	Select this button to import a CSV file containing a new I/O configuration or export you current I/O configuration to a CSV file. For more information, refer to Importing I/O Configuration CSV Files, Exporting I/O Configuration CSV Files, and Creating I/O Configuration CSV Files.

2. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

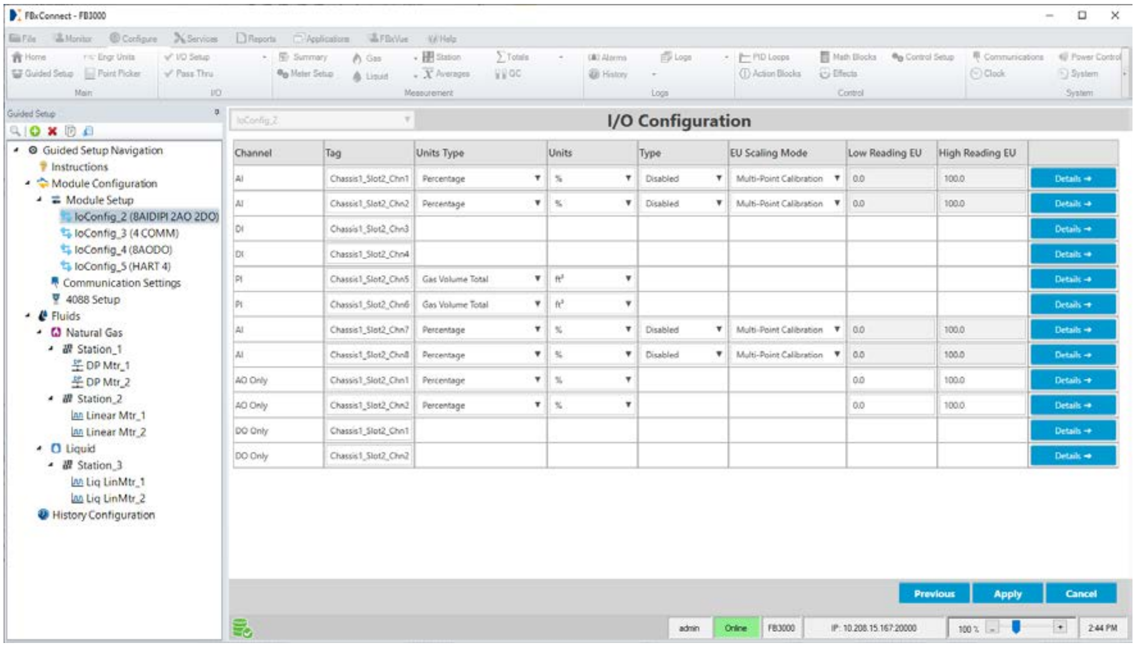
4.2.2 Guided Setup: I\O Configuration Details

Use this display to select what input and output types are available on your device. You can configure inputs to operate as an analog input (AI), digital input (DI), or pulse input (PI).

Note

- A separate **I/O Configuration** display is available for each installed I/O module.
- The number of I/O points shown on this display varies depending on the device type and installed options.

Figure 69. Guided Setup: I/O Config



Channel	Tag	Units Type	Units	Type	EU Scaling Mode	Low Reading EU	High Reading EU	
AI	Chassis1_Slot2_Chn1	Percentage	%	Disabled	Multi-Point Calibration	0.0	100.0	Details →
AI	Chassis1_Slot2_Chn2	Percentage	%	Disabled	Multi-Point Calibration	0.0	100.0	Details →
DI	Chassis1_Slot2_Chn3							Details →
DI	Chassis1_Slot2_Chn4							Details →
PI	Chassis1_Slot2_Chn5	Gas Volume Total	ft³					Details →
PI	Chassis1_Slot2_Chn6	Gas Volume Total	ft³					Details →
AI	Chassis1_Slot2_Chn7	Percentage	%	Disabled	Multi-Point Calibration	0.0	100.0	Details →
AI	Chassis1_Slot2_Chn8	Percentage	%	Disabled	Multi-Point Calibration	0.0	100.0	Details →
AO Only	Chassis1_Slot2_Chn1	Percentage	%			0.0	100.0	Details →
AO Only	Chassis1_Slot2_Chn2	Percentage	%			0.0	100.0	Details →
DO Only	Chassis1_Slot2_Chn1							Details →
DO Only	Chassis1_Slot2_Chn2							Details →

1. Review – and change as necessary – the values in the following fields:

Field	Description
Channel	This **read-only** column shows the type of I/O you selected for each channel on the previous page.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Units Type	Select ▼ to set the measurement type used for the selected channel. **Note** This field appears **only** for channels configured as analog inputs, analog outputs, or pulse inputs.
Units	Select ▼ to set the engineering units used for the selected channel. **Note** This field appears **only** for channels configured as analog inputs, analog outputs, or pulse inputs.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Type</td><td colspan="2">Select ▼ to set if the channel measures either current input or voltage input.
Note
• This field appears only for channels configured as analog inputs.
• The default selection is Disabled. You must select either Current or Voltage before the AI will scan a field device.
• When Current Input is selected, an on-board software switchable 250-ohm resistor is enabled for the selected channel.</td></tr>
<tr><td rowspan="3">EU Scaling Mode</td><td colspan="2">Select ▼ to set how the EU scaling parameters are determined.
Note
This field appears only for channels configured as analog inputs.</td></tr>
<tr><td>Multi-Point Calibration</td><td>EU scaling parameters are determined by the calibration. You cannot modify the EU scaling parameters (Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent) directly. You must use the calibration wizard to adjust the scaling of the AI.
Note
If you download a configuration file that has Multi-Point Calibration selected, the calibration on your device remains unchanged.</td></tr>
<tr><td>EU Scaling</td><td>EU scaling parameters are determined by the values you enter in the Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent fields.
Note
If you download a configuration file that has EU Scaling selected, the existing calibration on your device is overwritten using the EU scaling parameters.</td></tr>
</table>

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td>**Low Reading EU**</td><td colspan="3">Sets the minimum value (in A/D counts) that the analog input can measure.
Note
You **must** select EU Scaling in the EU Scaling Mode field to enable entry in this field.</td></tr>
<tr><td>**High Reading EU**</td><td colspan="3">Sets the maximum value (in A/D counts) that the analog input can measure.
Note
You **must** select EU Scaling in the EU Scaling Mode field to enable entry in this field.</td></tr>
<tr><td>**Details**</td><td colspan="3">Select this button to open the selected I/O channel configuration display. Select ◀ to return to Guided Setup.</td></tr>
<tr><td rowspan="6">**HART Channel Configuration**</td><td colspan="3">Use these fields to configure the HART I/O module.
Note
These fields show **only** if your configuration contains a **HART I/O** module.</td></tr>
<tr><td>**HART Channel**</td><td colspan="2">This **read-only** field displays the name of the channel on the HART module.</td></tr>
<tr><td rowspan="4">**HART Comm Mode**</td><td colspan="2">Sets the communication mode for the selected channel. Possible options are:</td></tr>
<tr><td>**Disabled**</td><td>Stop all HART communication.</td></tr>
<tr><td>**Point to Point**</td><td>Enables the channel to communication with one HART device per channel.</td></tr>
<tr><td>**MultiDrop**</td><td>Enables the channel to communicate with up to five HART devices connected in parallel.
Note
This option is available **only** for channels configured as **analog inputs** (AI).</td></tr>
</table>

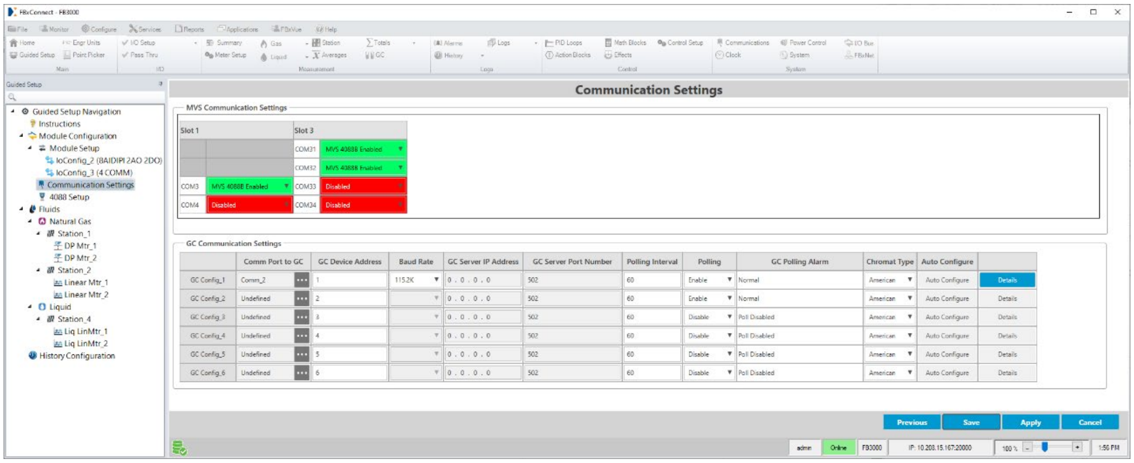
Field	Description	
	Number of Devices	Sets the number of HART devices connected in parallel. **Note** This field appears **only** if you select **MultiDrop** in the HART Comm Mode field.
	Details	Select to open the HART I/O display and configure the selected HART channel.

2. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

4.2.3 Guided Setup: Communication Settings

Use this display to enable communications with 4088B multivariable transmitters and configure gas chromatographs.

Figure 70. Guided Setup: Communication Settings



MVS Communication Settings

Slot 1		Slot 3	
		COM31	MVS 4088B Enabled ▼
		COM32	MVS 4088B Enabled ▼
COM3	MVS 4088B Enabled ▼	COM33	Disabled ▼
COM4	Disabled ▼	COM34	Disabled ▼

GC Communication Settings

	Comm Port to GC	GC Device Address	Baud Rate	GC Server IP Address	GC Server Port Number	Polling Interval	Polling	GC Polling Alarm	Chromat Type	Auto Configure	
GC Config_1	Comm_2	1	115.2K ▼	0 . 0 . 0 . 0	502	60	Enable ▼	Normal	American ▼	Auto Configure	Details
GC Config_2	Undefined	2	▼	0 . 0 . 0 . 0	502	60	Enable ▼	Normal	American ▼	Auto Configure	Details
GC Config_3	Undefined	3	▼	0 . 0 . 0 . 0	502	60	Disable ▼	Poll Disabled	American ▼	Auto Configure	Details
GC Config_4	Undefined	4	▼	0 . 0 . 0 . 0	502	60	Disable ▼	Poll Disabled	American ▼	Auto Configure	Details
GC Config_5	Undefined	5	▼	0 . 0 . 0 . 0	502	60	Disable ▼	Poll Disabled	American ▼	Auto Configure	Details
GC Config_6	Undefined	6	▼	0 . 0 . 0 . 0	502	60	Disable ▼	Poll Disabled	American ▼	Auto Configure	Details

1. Review – and change as necessary – the values in the following fields:

Field	Description
MVS Communication Settings	Select ▼ to enable or disable 4088B communications on the selected communication port.

Field	Description
Comm Port to GC	Select ••• to open a Point Picker dialog and define which communications port on the FB Series product is connected to the gas chromatograph.
GC Device Address	Sets the Modbus address the FB Series product uses to communicate with the gas chromatograph. You must set this value before the program can poll data and write it to the meter run.
Baud Rate	Sets the baud rate of communications over the selected port. **Note** This field applies **only** to GC connections using a serial port.
GC Server IP Address	Specifies the IP address of the GC. **Note** This field applies **only** to GC connections using an Ethernet port.
GC Server Port Number	Specifies port number used by the GC. **Note** This field applies **only** to GC connections using an Ethernet port.
Polling Interval	Sets the delay (in seconds) the system waits before asking the gas chromatograph for the next set of results.
Polling	Select ▼ to enable or disable polling of the gas chromatograph.
GC Polling Alarm	This **read-only** field shows the status of the poll result. Possible statuses are: • Normal • Poll Failed • Comp Code Match Error • Poll Disabled • Auto config Failed
Chromat Type	Specifies either the American or European version of the SIM-2251 Modbus map and polling sequences.

Field	Description
Auto Configure	Select this button to automatically configure the selected communications port and Modbus parameters necessary to poll the gas chromatograph. The port owner is automatically changed to Modbus Master for selected communications port. **Note** • This field is **only** available if you are connected to an FB Series product. • **Before** selecting the Auto Configure button, you must first specify a communications port in the **Comm Port to GC** field and an address in the **GC Modbus Address** field, select **Disabled** in the **Polling** field, and then click **Save** to write these settings to the FB Series product. • To view which parameters are automatically configured when you select Auto Configure, refer to Automatically Configured Parameters.
Details	Select this button to open the Communications configuration display for the communications port configured in the Comm Port to GC field. Select ◀ to return to Guided Setup. **Note** You **must** configure the **Comm Port to GC** field before this button is active.

2. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

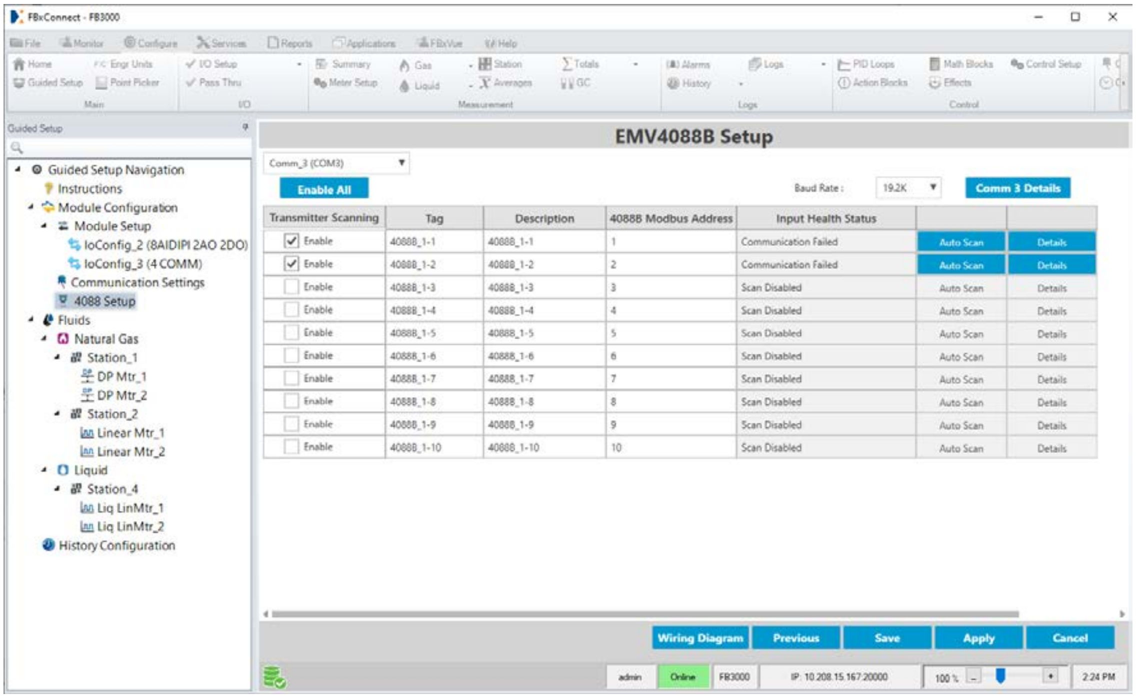
4.2.4 Guided Setup: 4088 Setup

Use this display to enable communications with a 4088B multivariable transmitter on selected communications ports.

Note

When communicating with more than six 4088Bs at 9600 baud, update times exceed once per second.

Figure 71. Guided Setup: 4088 Setup



EMV4088B Setup

Comm_3 (COM3)

Enable All

Baud Rate : 19.2K

Comm 3 Details

Transmitter Scanning	Tag	Description	4088B Modbus Address	Input Health Status		
☑ Enable	4088B_1-1	4088B_1-1	1	Communication Failed	Auto Scan	Details
☑ Enable	4088B_1-2	4088B_1-2	2	Communication Failed	Auto Scan	Details
☐ Enable	4088B_1-3	4088B_1-3	3	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-4	4088B_1-4	4	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-5	4088B_1-5	5	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-6	4088B_1-6	6	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-7	4088B_1-7	7	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-8	4088B_1-8	8	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-9	4088B_1-9	9	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-10	4088B_1-10	10	Scan Disabled	Auto Scan	Details

1. Review – and change as necessary – the values in the following fields:

Field	Description
Communications Port Instance	Click ▼ to select a communications port on which to enable multivariable transmitters. **Note** Only communications ports with the Port Owner field configured as MVS4088B are shown.
Enable All	Select to enable communications for all transmitters.
Baud Rate	Sets the baud rate for 4088B communications using the selected port.
Comm Details	Select this button to open the Communications configuration display for the communications port configured in the Comm Port to GC field. Select ◀ to return to Guided Setup.
Transmitter Scanning	Place a check mark to enable the system to scan the selected 4088B for data.
Tag	Sets a name (up to 8-alphanumeric characters) for the selected 4088B.

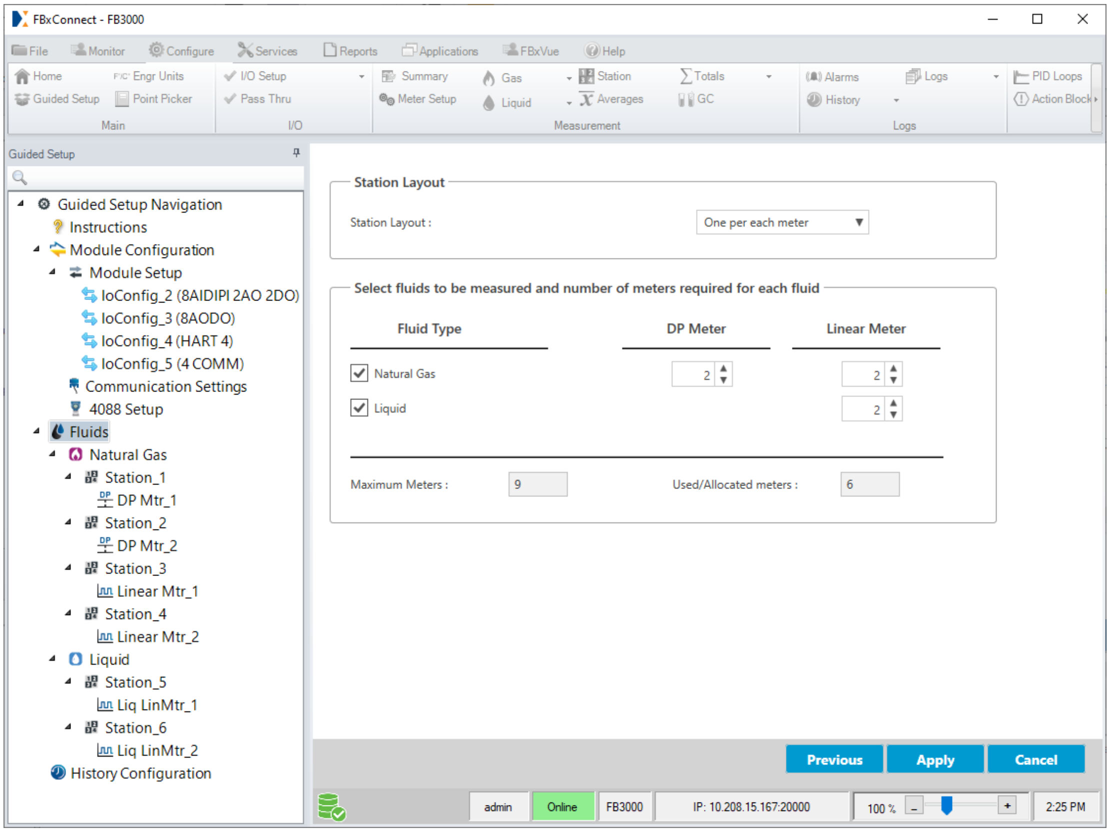
Field	Description
Description	Sets a description (up to 16-alphanumeric characters) for the selected 4088B.
4088B Modbus Address	Sets the unique Modbus address for the selected 4088B multivariable transmitter. The default address is **1**. If the 4088B is used in the multi-drop mode, each 4088B must have a unique address. Use Address **240** to poll the sensor to determine the address of the connected sensor. This is similar to polling a device using Address and Group 240. When Address 240 is used, the sensor responds with its address by updating the Address field.
Input Health Status	This **read-only** field shows the current operating status of the selected 4088B.
Auto Scan	Select to have the system automatically scan the baud rates for the 4088B with the indicated Modbus address. **Note** • The baud rate of the transmitter is changed to the baud rate configured in the **Baud Rate** field. • You **must** select the **Enable** checkbox in the **Transmitter Scanning** field to activate this button.
Details	Select this button to open the 4088B configuration display for the selected transmitter. Select ◀ to return to Guided Setup. **Note** You **must** select the **Enable** checkbox in the **Transmitter Scanning** field to activate this button.
Wiring Diagram	Click to open a 4088B wiring diagram for the selected communications port.

2. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

4.2.5 Guided Setup: Fluid Selection

Use this display to select the station layout, and to assign number and types of meters for each fluid type.

Figure 72. Guided Setup: Fluid Selection



Station Layout

Station Layout : One per each meter

Select fluids to be measured and number of meters required for each fluid

Fluid Type	DP Meter	Linear Meter
☑ Natural Gas	2	2
☑ Liquid		2

Maximum Meters : 9

Used/Allocated meters : 6

1. Review – and change as necessary – the values in the following fields:

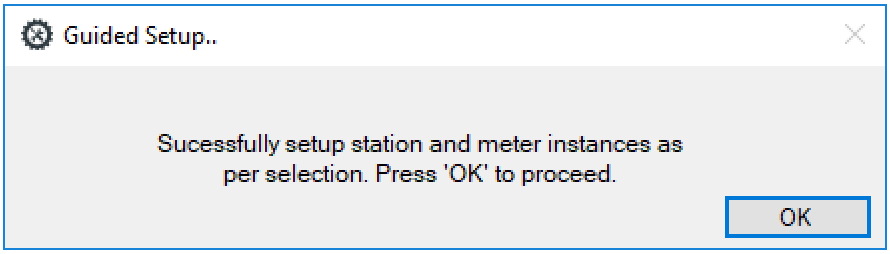
Field	Description	
Station Layout	Select how meters are assigned to stations.	
	One per each meter	Each meter is assigned to a separate station.
	One per fluid type	Each fluid type is assigned to a separate station.
	Custom	Select **Custom** and select **Apply** to open the Custom Station Layout Configuration display. This display allows you to specify the number of stations, assign the fluid type for each station, and configure the number and types of meters assigned to each station.

Field	Description
	Note This field is **read-only** and set to **Custom** if you have previously configured **any** meter in your FB Series product.
Fluid Type	Select the type of fluids being measured.
DP Meters	Set the number of differential pressure meters for each fluid type.
Linear Meters	Set the number of linear meters for each fluid type.
Maximum Meters	This **read-only** field shows the number of meters available in your FB3000.
Used/Allocated Meters	This **read-only** field shows the number of meters currently assigned in your FB3000.

2. Complete the following step based on your selections:

- If you select either **One per each meter** or **One per each fluid type** in the **Station Layout** field, select **Apply** to save your selections to the FB Series product. A confirmation dialog opens. Select **OK** to advance to Engineering Units.

Figure 73. Confirmation



Sucessfully setup station and meter instances as per selection. Press 'OK' to proceed.

- If you select **Custom** in the **Station Layout** field and you **do not** have any meters currently assigned to a station, select **Next** to open the Custom Station Layout Configuration pop-up display.
- If you select **Custom** in the **Station Layout** field and you **do** have any meters currently assigned to a station, select **Next** to open the Station Assignment display.

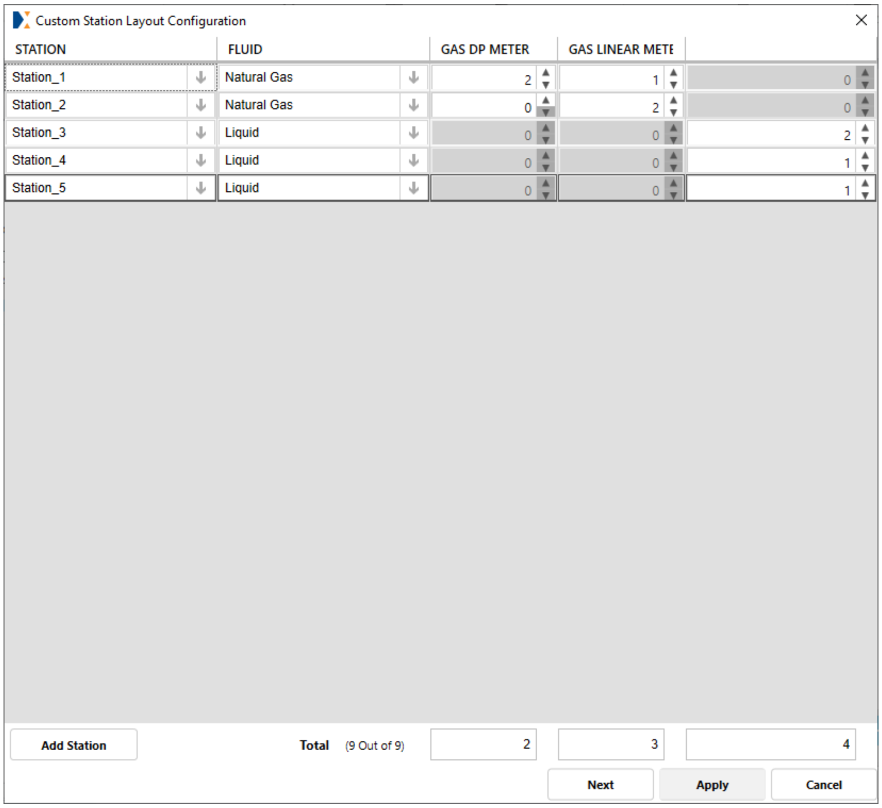
4.2.6 Guided Setup: Custom Station Layout Configuration

Use this display to manually customize your station layout. You can select the type of fluid being measured by the station, and the number and type of meters belonging to each station.

Note

This display opens **only** if you select **Custom** in the **Station Layout** field on the Fluid Selection display and you **do not** have any meters currently assigned to a station.

Figure 74. Guided Setup: Custom Station Layout Configuration



Custom Station Layout Configuration

STATION	FLUID	GAS DP METER	GAS LINEAR METE	
Station_1	Natural Gas	2	1	0
Station_2	Natural Gas	0	2	0
Station_3	Liquid	0	0	2
Station_4	Liquid	0	0	1
Station_5	Liquid	0	0	1
Total (9 Out of 9)		2	3	4

1. Select **Add Station** to add a station and configure its properties.
2. Review – and change as necessary – the values in the following fields:

Field	Description
Station	Select ↓ to select a station iteration to configure.

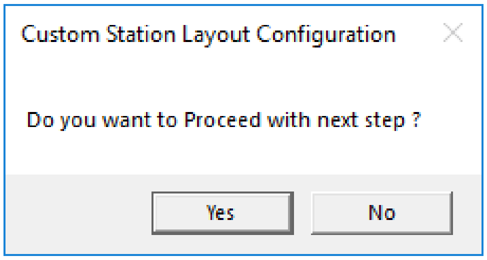
Field	Description
Fluid	Select ⬇ to set the type of fluids being measured by the selected station.
Gas DP Meter	Select ⬍ to set the number of gas differential pressure meters being measured by the selected station. **Note** You **must** select **Natural Gas** in the Fluid field to enable this field.
Gas Linear Meter	Select ⬍ to set the number of gas linear meters being measured by the selected station. **Note** You **must** select **Natural Gas** in the Fluid field to enable this field.
Liquid Linear Meter	Select ⬍ to set the number of liquid linear meters being measured by the selected station. **Note** You **must** select Liquid in the Fluid field to enable this field.
Totals	These **read-only** fields show the total number of each meter type currently assigned to station.

3. Select **Apply** to save any changes you make to this display. A confirmation dialog opens.

Note

Stations without at least one meter type assigned are automatically removed from the list.

Figure 75. Confirmation



Custom Station Layout Configuration

Do you want to Proceed with next step ?

4. Select **Yes** to advance to the next step in the Guided Setup.

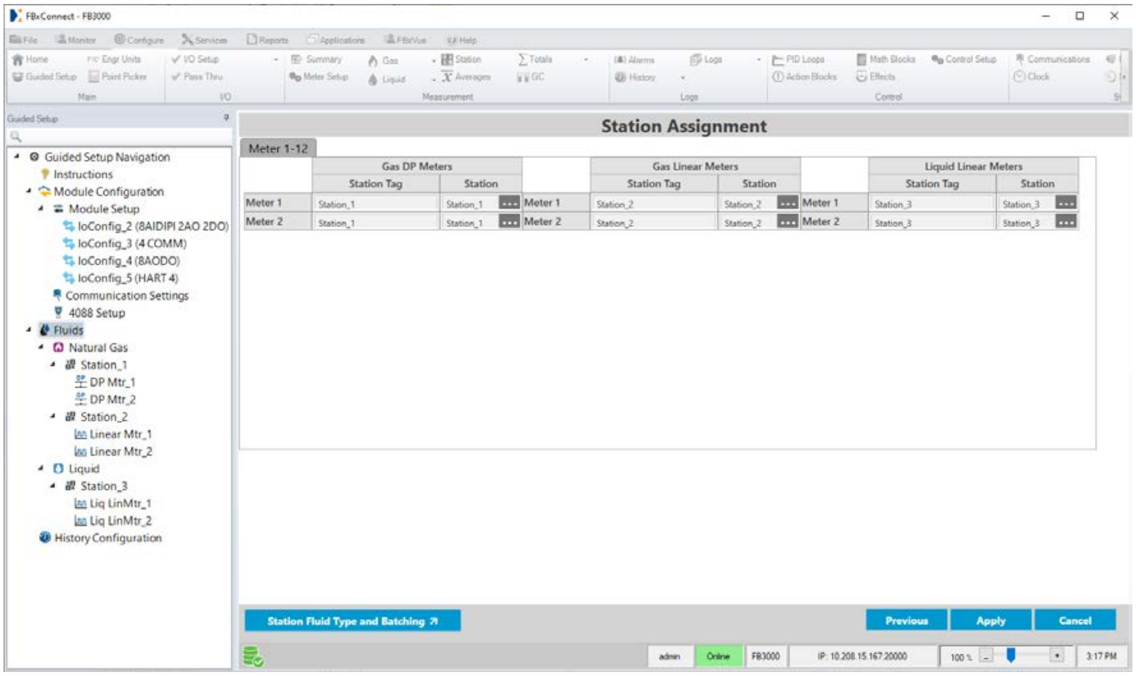
4.2.7 Guided Setup: Station Assignment

Use this display to manually customize your station layout. You can select the type of fluid being measured by the station, and the number and type of meters belonging to each station.

Note

This display opens **only** if you select **Custom** in the **Station Layout** field on the Fluid Selection display and you **do** have any meters currently assigned to a station.

Figure 76. Guided Setup: Station Assignment



	Gas DP Meters			Gas Linear Meters			Liquid Linear Meters	
	Station Tag	Station		Station Tag	Station		Station Tag	Station
Meter 1	Station_1	Station_1	Meter 1	Station_2	Station_2	Meter 1	Station_3	Station_3
Meter 2	Station_1	Station_1	Meter 2	Station_2	Station_2	Meter 2	Station_3	Station_3

---

1. Tabs appear at the top of the display. Each tab consists of up to 12 meters. Select the tab that contains the meters you want to assign to a specific station.

2. Select ••• to open a Point Picker dialog and assign each meter to a specific station.

Note

Gas meters and liquid meters **cannot** belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.

---

3. Select **Station Fluid Type and Batching** to configure the fluid type measured by each station and to enable batching on liquid stations.

Note

You **cannot** change the fluid type of a station if a meter is already assigned to that station. In this case, you **must** first remove any meters assigned to the selected station before you are able to change the Fluid Type field.

4. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

4.2.8 Guided Setup: Engineering Units

Use this display to configure the engineering units used by the station for measurements. You can select Set all to US/Imperial, Set all to Metric, Set all to Canadian, or configure each measurement type individually. You can also configure how many decimal places are used for each measurement value.

Conversion factors for the different engineering units are taken from the following standards:

- IEEE/ASTM SI 10-2002 - IEEE/ASTM Standard for Use of the International System of Units (SI): The Modern Metric System
- Manual of Petroleum Measurement Standards Chapter 15—Guidelines for the Use of the International System of Units (SI) in the Petroleum and Allied Industries
- ANSI/API MPMS Ch. 14.3.3/AGA Report No. 3

Note

- **FB Series products use full-resolution data for all calculations.** The **Decimal Places** fields on this display are used **only** for viewing data in FBxConnect Configuration Software.
- Fields on this display differ based on what fluid type the selected station is measuring (Natural Gas or Liquid).
- Changes to engineering units are applied to the station and all meters assigned to the selected station, even if a meter has previously been configured. Additionally, any I/O associated with the station or its meters is also updated. Refer to Configure – Summary to view which meters are assigned to each station.

Molar mass units are dependent upon the density units:

Density Unit	Molar Mass Unit
lb/ft^3	lb/lb-mol
lb/MMCF	lb/lb-mol
lb/US gal	lb/lb-mol
lb/bbl	lb/lb-mol
RD	lb/lb-mol
°API	lb/lb-mol
kg/m^3	kg/kmol
kg/L	kg/kmol
g/cc	g/mol

Joule Thomson units are dependent upon the pressure units:

Pressure Unit	Joule Thompson Unit
psi	°F/psi
kPa	K/kPa
bar	°C/bar
MPa	K/MPa
kg/cm^2	K/MPa

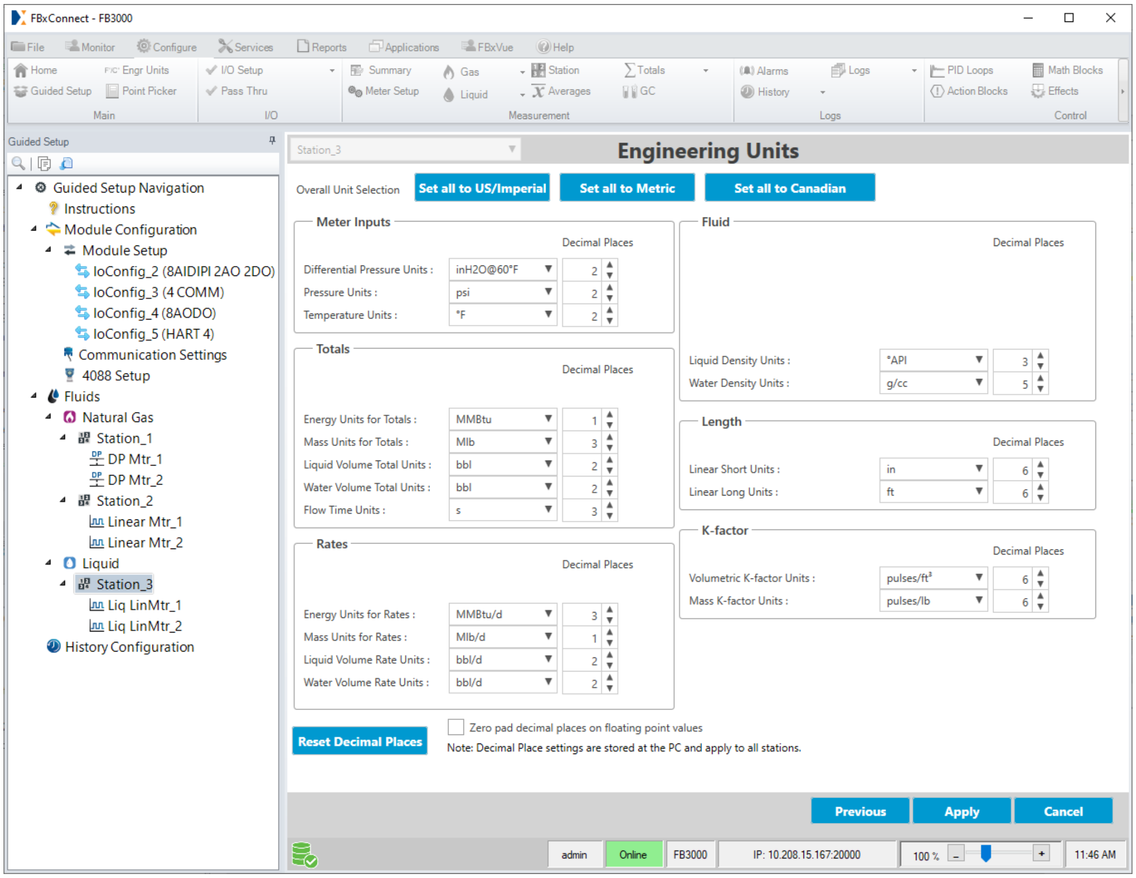
Acceleration units are dependent upon the linear long units:

Linear Long Unit	Acceleration Unit
ft	ft/s^2
m	m/s^2

Note

The 4088 **does not** support temperature units of Kelvin.

Figure 77. Guided Setup: Engineering Units (Liquid Station shown)



Differential Pressure Units : inH2O@60°F 2
Pressure Units : psi 2
Temperature Units : °F 2

Energy Units for Totals : MMBtu 1
Mass Units for Totals : Mlb 3
Liquid Volume Total Units : bbl 2
Water Volume Total Units : bbl 2
Flow Time Units : s 3

Energy Units for Rates : MMBtu/d 3
Mass Units for Rates : Mlb/d 1
Liquid Volume Rate Units : bbl/d 2
Water Volume Rate Units : bbl/d 2

Liquid Density Units : °API 3
Water Density Units : g/cc 5

Linear Short Units : in 6
Linear Long Units : ft 6

Volumetric K-factor Units : pulses/ft³ 6
Mass K-factor Units : pulses/lb 6

☐ Zero pad decimal places on floating point values

Note: Decimal Place settings are stored at the PC and apply to all stations.

1. Review – and change as necessary – the values in the following fields:

Field	Description
Set all to US/Imperial	Select to automatically configure the selected station to use US/Imperial units for all measurements and calculations.
Set all to Metric	Select to automatically configure the selected station to use metric units for all measurements and calculations.
Set all to Canadian	Select to automatically configure the selected station to use Canadian units for all measurements and calculations.
Meter Inputs	Select ▼ to choose the measurement units used with each meter input and the number of decimal places shown in FBxConnect. Meter Inputs include differential pressure units, static pressure units, and temperature units.

Field	Description
Totals	Select ▼ to choose the measurement units used when calculating totals and the number of decimal places shown in FBxConnect. Totals include gas volume units, energy units, mass units, liquid volume units, water volume units, and flow time units.
Rates	Select ▼ to choose the measurement units used when displaying rate and the number of decimal places shown in FBxConnect. Rates include gas volume units, energy units, mass units, liquid volume units, and water volume units.
Fluid	Select ▼ to choose the measurement units used when performing fluid calculations and the number of decimal places shown in FBxConnect. Fluid properties include dynamic viscosity, density, volume-based heating value, mass-based heating value, water density, and oil density.
Length	Select ▼ to choose the measurement units used for distance and the number of decimal places shown in FBxConnect. Length includes linear short and linear long.
K-Factor	Select ▼ to choose the measurement units used when calculating the K-factor and the number of decimal places shown in FBxConnect. K-factor includes volumetric and mass.
Other	Select ▼ to choose the measurement units used for other calculations, including water content, and the number of decimal places shown in FBxConnect.
Reset Decimal Places	Select to revert all measurement units to show the default number of decimal places in FBxConnect.

2. Select **Apply** to save your selections to the FB Series product and advance to the next step in the Guided Setup.

4.2.9 Guided Setup: Station

Use this display to configure parameters for the selected station.

Note

- Available station parameters are slightly different based on the measured fluid type. All possible fields are described below.

- You can **right-click** on the Station node in the navigation tree to copy or paste the configuration of one station to another.

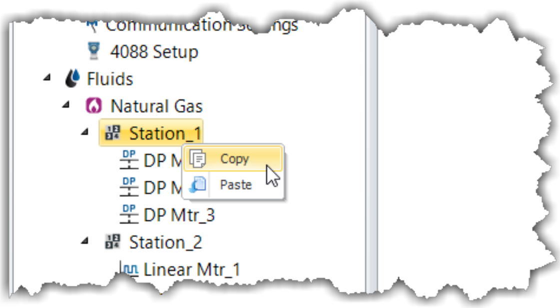
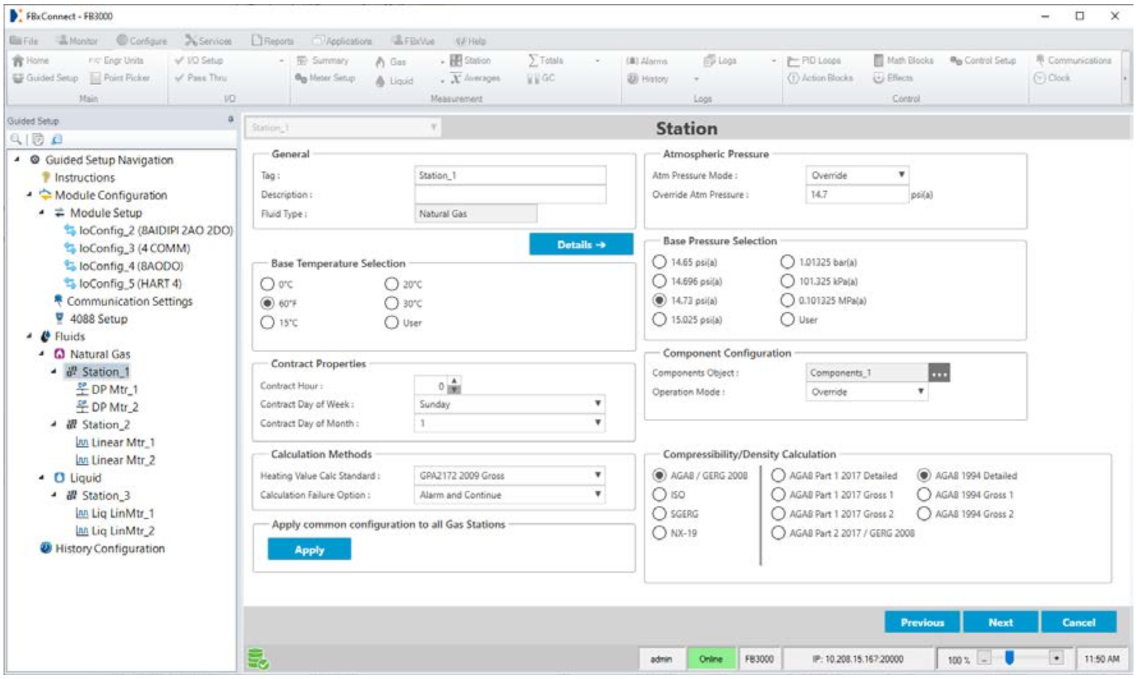


Figure 78. Guided Setup: Station (Natural Gas shown)



General
Tag : Station_1
Description :
Fluid Type : Natural Gas

Base Temperature Selection
○ 0°C ○ 20°C
● 60°F ○ 30°C
○ 15°C ○ User

Contract Properties
Contract Hour : 0
Contract Day of Week : Sunday
Contract Day of Month : 1

Calculation Methods
Heating Value Calc Standard : GPA2172 2009 Gross
Calculation Failure Option : Alarm and Continue

Apply common configuration to all Gas Stations

Atmospheric Pressure
Atm Pressure Mode : Override
Override Atm Pressure : 14.7 psi(a)

Base Pressure Selection
○ 14.65 psi(a) ○ 1.01325 bar(a)
○ 14.696 psi(a) ○ 101.325 kPa(a)
● 14.73 psi(a) ○ 0.101325 MPa(a)
○ 15.025 psi(a) ○ User

Component Configuration
Components Object : Components_1
Operation Mode : Override

Compressibility/Density Calculation
● AGA8 / GERG 2008 ○ AGA8 Part 1 2017 Detailed ● AGA8 1994 Detailed
○ ISO ○ AGA8 Part 1 2017 Gross 1 ○ AGA8 1994 Gross 1
○ SGERG ○ AGA8 Part 1 2017 Gross 2 ○ AGA8 1994 Gross 2
○ NX-19 ○ AGA8 Part 2 2017 / GERG 2008

1. Review – and change as necessary – the values in the following fields:

Field	Description	
General	**Tag**	Sets an identifier (up to 20-alphanumeric characters) for the selected station.
	Description	Sets a description (up to 20-alphanumeric characters) for the selected station.

Field	Description		
	Fluid Type	This **read-only** field shows the type of fluid measured by the selected station.	
Details	Select this button to open the standard Station configuration display. Select ◀ to return to Guided Setup.		
Atmospheric Pressure	**Atm Pressure Mode**	Click ▼ to set how the system acquires the atmospheric pressure value used in calculations. Possible options are:	
		Override	The system uses a value you define in the Override Atm Pressure field.
		Calculated	The system calculates the atmospheric pressure value.
	Override Atm Pressure	Sets a value to use for the atmospheric pressure in calculations when Override is selected in the Atm Pressure Mode field.	
Base Temperature Selection	Sets the flow measurement Base Temperature specified in the gas contract. The temperature units are in degrees Fahrenheit or degrees Celsius. **Note** Select **User** to enter a custom temperature value.		
Base Pressure Selection	Sets the flow measurement Base Pressure specified in the gas contract. The pressure units are in psi(a) or kPa. **Note** • Select **User** to enter a custom pressure value. • This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.		
Contract Properties	**Contract Hour**	Sets the hour at which daily, weekly, and totals rollover and history records are logged (for daily-based, weekly-based, or monthly-based reports).	
	Contract Day of Week	Sets the day of the week at which totals rollover and history records are logged (for weekly-based reports).	

Field	Description		
	Contract Day of Month	Sets the day of the month at which totals rollover and history records are logged (for monthly-based reports).	
Component Configuration	**Note** These fields appears **only** for stations with a **Fluid Type** of **Natural Gas**.		
	Components Object	Click ... to open a Point Picker dialog and select a Components object from the database that the station uses to calculate fluid composition.	
	Operation Mode	Sets how the system acquires the component information. Possible options are:	
		Measured	Selected composition is obtained from the LIVE parameters updated from a gas chromatograph.
		Override	Selected composition is obtained from the OVRD parameters entered by a user. Changes to OVRD parameters are logged to the event log.
		Remote Download	Selected composition is obtained from the OVRD parameters downloaded from a SCADA host or other remote master. Changes to OVRD parameters are not logged to the event log.
	GC Data Object	Select ... to open a Point Picker dialog and define which GC Data instance is associated with each Components instance. **Note** This field appears **only** if you select **Measured** in the **Operation Mode** field.	

Field	Description	
	Stream Number	Sets the Stream number associated with each GC Data instance configured in the GC Data Object field. **Note** This field appears **only** if you select **Measured** in the **Operation Mode** field.
Calculation Methods	**Heating Value Calc Standard**	Sets the calculation standard used in heating value, relative density of the gas to air, and Wobbe Index calculations. Options are GPA 2172 2009 Gross, ISO 6976 1995 Superior, ISO 6976 1995 Inferior, AGA5 2009 Gross, and AGA5 2009 Net. **Note** • This field appears **only** for stations with a **Fluid Type** of **Natural Gas.** • GPA 2172 2009 uses GPA 2145 2016. • ISO 6976 1995 Superior and ISO 6976 1995 Inferior use the base compressibility (Zb) value calculated per ISO 6976 in the heating value calculation when base temperature selection is 0°C, 15°C, or 20°C; in these cases a base pressure of 1.01325 bar is used for the real Heating Value and Real Relative density. For other base temperature selections, the selected Zb from the compressibility calculation is used. The base pressure for combustion is always 1.01325 bar. • If the base compressibility method is dependent upon the Heating value or relative density, GPA 2172 uses the Base Compressibility using the GPA 2172 2009 method. Otherwise, GPA 2172 2009 uses the Selected Base Compressibility value found on the Fluid Properties – Advanced tab in the heating value calculation.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>

- If the base compressibility method is dependent upon the heating value or relative density, then GPA 2172 2009 Gross, AGA5 2009 Gross, and AGA5 2009 Net use the base compressibility from their respective internal compressibility method. Otherwise, GPA 2172 2009 Gross, AGA5 2009 Gross, and AGA5 2009 Net use the Selected Base Compressibility value found on the Fluid Properties – Advanced tab in the heating value calculation.
- Although AGA5 says the base temperature and the combustion temperature shall be the same, the calculation will handle any base temperature and combustion temperature combination.
- Since the components Benzene and Toluene are not included in AGA5, their properties are calculated separately. This calculation closely follows *Example Process for Supporting Additional Compounds* in Appendix A of AGA5 2009.
- The AGA5 2009 Net (Inferior / Lower) heating value option assumes that the water formed in the combustion reaction remains in the ideal (gaseous) state. The AGA5 2009 Gross (Superior / Higher) heating value option assumes that water formed in the combustion reaction condenses totally to the liquid state. For fiscal measurement applications, the gross heating value is more commonly used.

</td></tr>
<tr><td>Calculation Failure Option</td><td>
Sets how the FB Series product responds if a calculation failure occurs. Possible options are:
<table>
<tr><td>Alarm Disabled</td><td>No alarm is logged if a calculation failure occurs.</td></tr>
</table>
</td></tr>
</table>
</td></tr>
</table>

Field	Description	
	Alarm and Continue	An alarm is logged and the calculation continues if a calculation failure occurs.
	Alarm and Halt Calculation	An alarm is logged and the calculation stops if a calculation failure occurs.
Compressibility / Density Calculation	Sets the desired compressibility/density calculation for the selected station. Select a standard from the list on the left, and then select a version/method to use from the list on the right. **Note** - This field appears **only** for stations with a **Fluid Type** of **Natural Gas**. - **AGA8 2017 Part 2 / GERG 2008** can be used for both natural gas and pure gas measurement. For more information about pure gas measurement, refer to Measuring Pure Gas. - If you select **AGA8 2017 Gross 1** or **Gross 2**, **AGA8 1994 Gross 1** or **Gross 2**, any **SGERG**, any **ISO 12213-3**, or any **NX-19** option, the real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field. - Some compressibility/density standards are based on a specific set of reference conditions. For the most accurate results, ensure the following reference conditions are configured based on the Compressibility/Density Calculation you select: **AGA8** ▪ Any reference conditions. **ISO 12213-2 2009** ▪ Any reference conditions. **SGERG 1991 Std, CV/RD/N2/H2 or CV/N2/CO2/H2** ▪ The Base Temperature Selection field is set to 0°C. ▪ The Base Pressure Selection field is set to 1.01325 bar. ▪ The Heating Value Combustion Temperature field is set to 25°C. **ISO 12213-3 2006 Pref, Set B or Set D**	

Field	Description
	- The Base Temperature Selection field is set to 0°C. - The Base Pressure Selection field is set to 1.01325 bar. - The Heating Value Combustion Temperature field is set to 25°C. **SGERG 1991 RD/N2/CO2/H2 or ISO 12213-3 2006 Set C** - The Base Temperature Selection field is set to 0°C. - The Base Pressure Selection field is set to 1.01325 bar. **NX-19 1962** - The Base Temperature Selection field is set to 60°F. - The Base Pressure Selection field is set to 14.73 psi(a). **NX-19 Mod or NX-19 VDE/VDI** - The Base Temperature Selection field is set to 0°C. - The Base Pressure Selection field is set to 1.01325 bar.
Apply	Select to apply the currently selected station configuration to all other stations with the same fluid type. **Note** This field appears **only** if you have multiple stations with the same fluid type.

2. Select **Next** to advance to the next step in the Guided Setup.

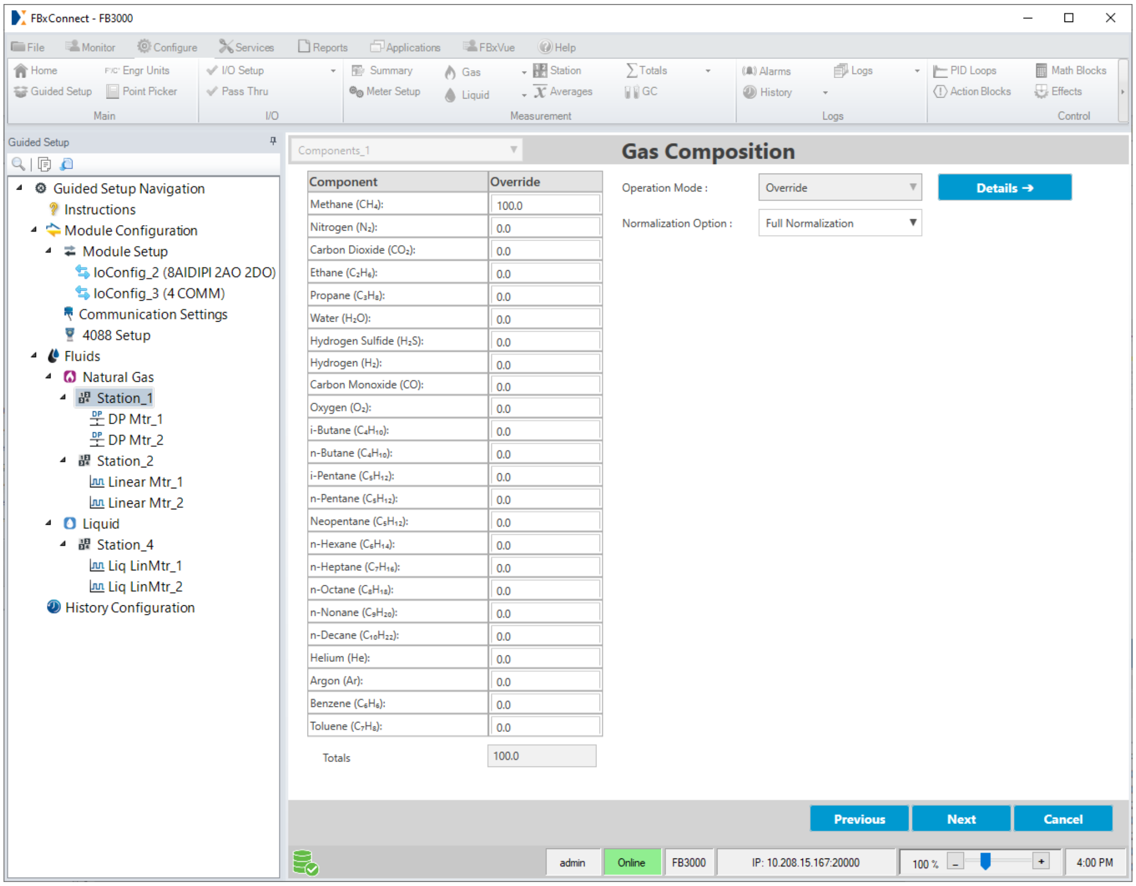
4.2.10 Guided Setup: Gas Composition

Use this display to configure gas composition parameters for the selected station.

Note

This display is applicable **only** for stations with a fluid type set to **Natural Gas**.

Figure 79. Guided Setup: Gas Composition



Gas Composition

Component	Override
Methane (CH_4):	100.0
Nitrogen (N_2):	0.0
Carbon Dioxide (CO_2):	0.0
Ethane (C_2H_6):	0.0
Propane (C_3H_8):	0.0
Water (H_2O):	0.0
Hydrogen Sulfide (H_2S):	0.0
Hydrogen (H_2):	0.0
Carbon Monoxide (CO):	0.0
Oxygen (O_2):	0.0
i-Butane (C_4H_{10}):	0.0
n-Butane (C_4H_{10}):	0.0
i-Pentane (C_5H_{12}):	0.0
n-Pentane (C_5H_{12}):	0.0
Neopentane (C_5H_{12}):	0.0
n-Hexane (C_6H_{14}):	0.0
n-Heptane (C_7H_{16}):	0.0
n-Octane (C_8H_{18}):	0.0
n-Nonane (C_9H_{20}):	0.0
n-Decane ($C_{10}H_{22}$):	0.0
Helium (He):	0.0
Argon (Ar):	0.0
Benzene (C_6H_6):	0.0
Toluene (C_7H_8):	0.0
Totals	100.0

Operation Mode : Override

Normalization Option : Full Normalization

1. Review – and change as necessary – the values in the following fields:

Field	Description	
Operation Mode	This **read-only** field shows how the system acquires the component information. Possible options are:	
	Measured	Selected composition is obtained from the LIVE parameters updated from a gas chromatograph.
	Override	Selected composition is obtained from the OVRD parameters entered by a user. Changes to OVRD parameters are logged to the event log.
	Remote Download	Selected composition is obtained from the OVRD parameters downloaded from a SCADA host or other remote master. Changes to OVRD parameters are not logged to the event log.

Field	Description	
Details	Select this button to open the Component configuration display. Select ◀ to return to Guided Setup.	
Normalization Option	Sets what action is taken if the total of the gas mole percentages does not add up to 100%.	
	None	No action is taken if the total does not equal 100%.
	Full Normalization	The system automatically adjusts each component proportionally so that the total adds up to 100%.
	Methane Adjust	The system automatically adjusts the methane mole percent up or down so that the total adds up to 100%.
Override	Sets the mole percent of each fluid component (as a percentage) to use in calculations when **Override** is selected in the **Operation Mode** field.	
Totals	This **read-only** field shows the total mole percent of all fluid components.	

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.11 Guided Setup: DP Meter

Use this display to configure parameters for the selected differential pressure meter.

Note

You can **right-click** on a DP Meter node in the navigation tree to copy or paste the configuration of one meter to another.

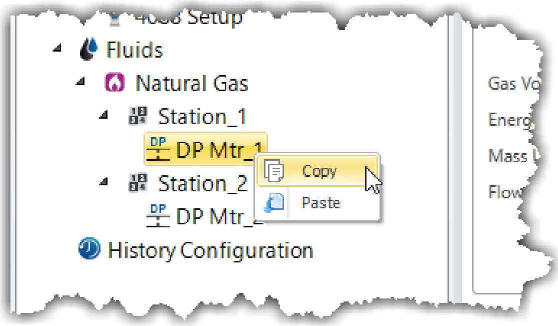
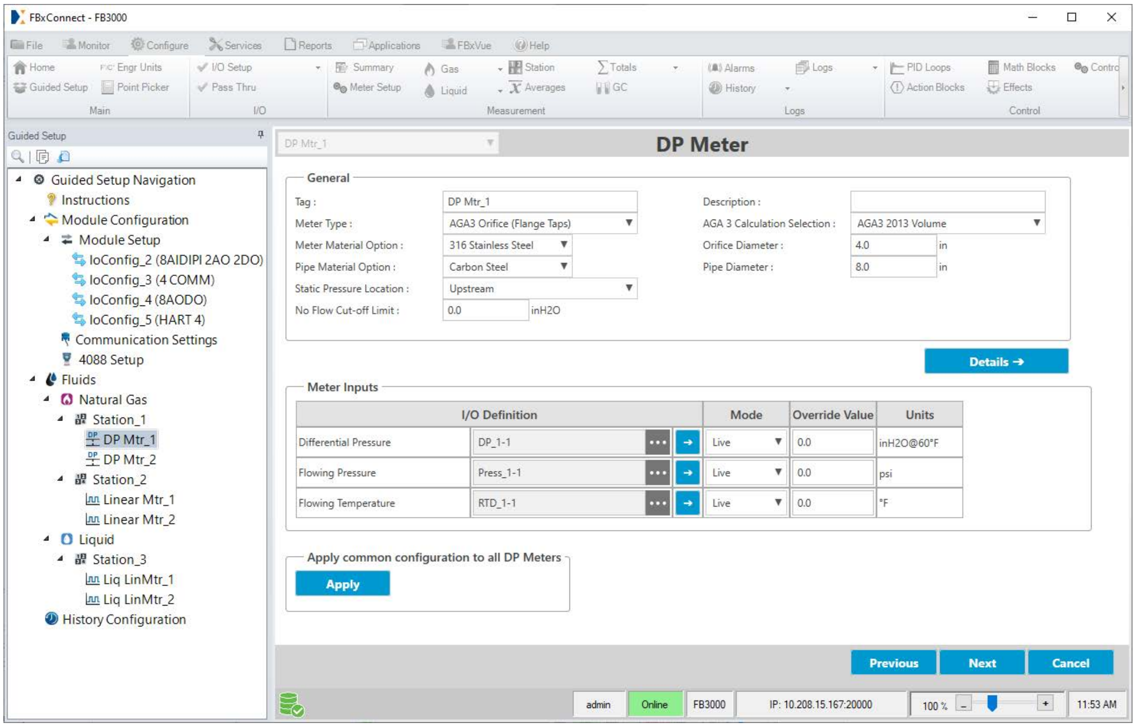


Figure 80. Guided Setup: DP Meter



General

Tag : DP Mtr_1
Meter Type : AGA3 Orifice (Flange Taps)
Meter Material Option : 316 Stainless Steel
Pipe Material Option : Carbon Steel
Static Pressure Location : Upstream
No Flow Cut-off Limit : 0.0 inH2O
Description :
AGA 3 Calculation Selection : AGA3 2013 Volume
Orifice Diameter : 4.0 in
Pipe Diameter : 8.0 in

Meter Inputs

I/O Definition		Mode	Override Value	Units
Differential Pressure	DP_1-1	Live	0.0	inH2O@60°F
Flowing Pressure	Press_1-1	Live	0.0	psi
Flowing Temperature	RTD_1-1	Live	0.0	°F

Apply common configuration to all DP Meters

1. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected meter.
Description	Sets a description (up to 20-alphanumeric characters) for the selected meter.
Meter Type	Click ▼ to specify the type of differential pressure meter you are configuring, and the calculation to use for the selected meter.
AGA 3 Calculation Selection	Click ▼ to specify the calculation to use for the selected meter. **Note** This field shows **only** if you select an **AGA3 Orifice** meter in the **Meter Type** field.
ISO 5167 Calculation Selection	Click ▼ to specify the calculation to use for the selected meter. **Note** This field shows **only** if you select an **ISO5167** meter in the **Meter Type** field.

Field	Description
Rosemont Orifice Calculation	Click ▼ to specify the calculation to use for the selected meter. **Note** This field shows **only** if you select a **1595 Conditioning Orifice** or **405C Compact Orifice** meter in the **Meter Type** field.
Meter Material Option	Indicates the material from which the orifice (or other meter element) is made. Nearly all natural gas applications use stainless steel orifice plates.
Orifice Diameter	Specifies the orifice plate bore diameter. **Note** This field appears **only** if you select an **orifice meter** in the **Meter Type** field.
Throat Diameter	Specifies the Venturi tube throat diameter. **Note** This field appears **only** if you select a **Venturi meter** in the **Meter Type** field.
Nozzle Diameter	Specifies the nozzle throat diameter. **Note** This field appears **only** if you select a **nozzle meter** in the **Meter Type** field.
Orifice Diameter (single hole)	Specifies the typical orifice hole size (single hole). **Note** This field appears **only** if you select a **conditioning orifice meter** in the **Meter Type** field.
Cone Diameter	Specifies the cone diameter. **Note** This field appears **only** if you select a **cone meter** in the **Meter Type** field.
Pipe Material Option	Indicates the material from which the meter tube is constructed. Nearly all natural gas applications use a carbon steel meter tube.
Pipe Diameter	Specifies the inside diameter of the pipe in which the meter is installed.

Field	Description	
Static Pressure Location	Sets the location of the static pressure tap in relation to the meter and normal flow.	
	Upstream	The static pressure tap is located upstream in relation to the meter and normal flow.
	Downstream	The static pressure tap is located downstream in relation to the meter and normal flow.
Pressure Transmitter Type	Indicates the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select a **User Data** instance in the **Flowing Pressure** I/O Definition field.	
No Flow Cut-off Limit	Sets the low flow cutoff point. When the live differential pressure of the metering device is less than this value, the meter flow rates will be set to zero.	
Details	Select this button to open the DP Meter configuration display. Select ◀ to return to Guided Setup.	
Differential Pressure	**I/O Definition**	Click ••• to open a Point Picker dialog and select the differential pressure input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • DP object (Forward) – SELECTED VALUE • DP object (Reverse) – REVERSE DIFFERENTIAL PRESSURE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data object – DOUBLE FLOATING POINT 1. For more information, refer to User Data.

Field	Description	
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not** available if you select a **User Data** object.
	Override Value	Sets the differential pressure value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not** available if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Flowing Pressure	**I/O Definition**	Click ... to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. The value is assumed to be in the pressure units selected for the associated station. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the

Field	Description	
		correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not** available if you select a **User Data** object.
	Override Value	Sets the static pressure value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not** available if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Flowing Temperature	**I/O Definition**	Click … to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • RTD object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data.

Field	Description	
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not** available if you select a **User Data** object.
	Override Value	Sets the flowing temperature value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not** available if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Apply	Select to apply the currently selected meter configuration to all other meters with the same meter type. **Note** This field appears **only** for the first instance of multiple meters with the same meter type.	

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.12 Guided Setup: Linear Meter

Use this display to configure parameters for the selected linear meter.

Note

You can **right-click** on a Linear Meter node in the navigation tree to copy or paste the configuration of one meter to another.

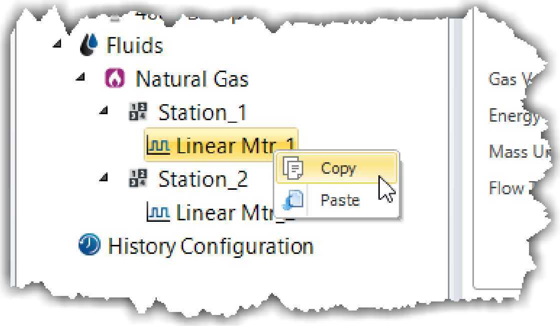
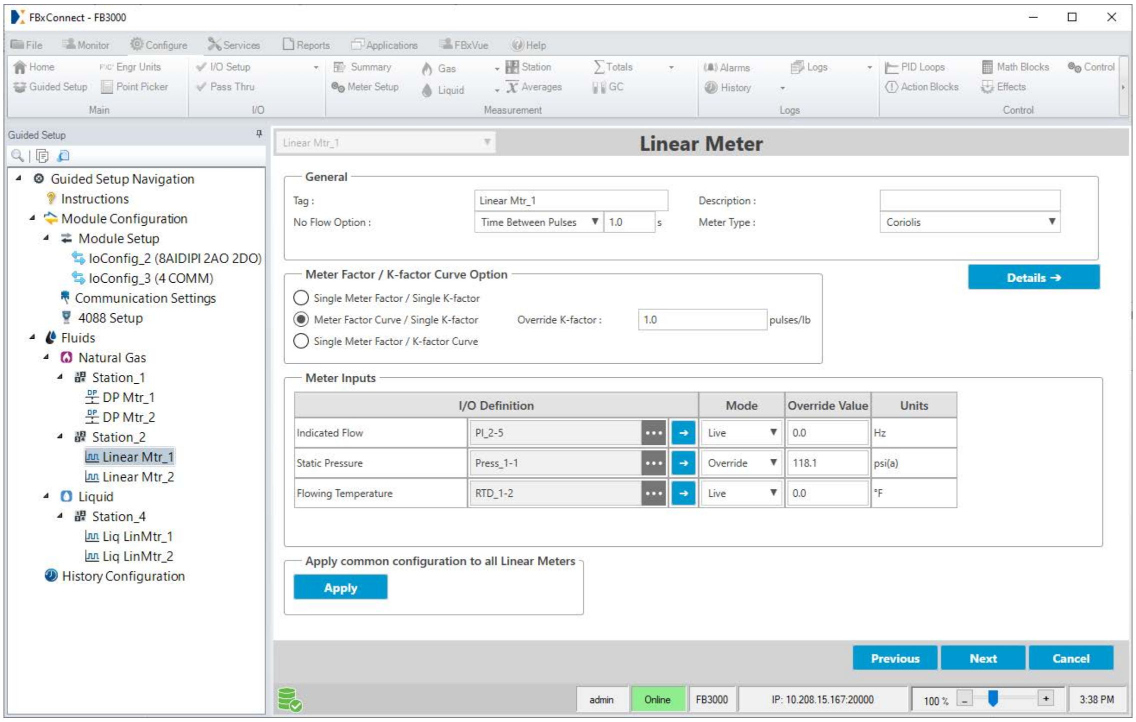


Figure 81. Guided Setup: Linear Meter



Linear Meter

General

Tag : Linear Mtr_1
Description :
No Flow Option : Time Between Pulses 1.0 s
Meter Type : Coriolis

Meter Factor / K-factor Curve Option

○ Single Meter Factor / Single K-factor
● Meter Factor Curve / Single K-factor
○ Single Meter Factor / K-factor Curve

Override K-factor : 1.0 pulses/lb

Meter Inputs

I/O Definition		Mode	Override Value	Units
Indicated Flow	PI_2-5	Live	0.0	Hz
Static Pressure	Press_1-1	Override	118.1	psi(a)
Flowing Temperature	RTD_1-2	Live	0.0	°F

Apply common configuration to all Linear Meters

1. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected meter.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected meter.	
No Flow Option	Sets how the system calculates a "no flow" condition for the meter. Possible options are:	
	Time Between Pulses	The system determines a "no flow" condition for the meter based on the amount of time between successive pulses. The calculated flow is set equal to zero. **Note** • This field applies **only** if you select a **pulse input** object in the **Indicated Flow** field. • You **must** enter a time (in seconds) for the system to use in the text field.
	Flow Cut-off	When the value of the uncorrected volume input is less than or equal to the Low Flow Cutoff value, the calculated flow is set equal to zero. **Note** You **must** enter a value (in Hz) for the system to use in the text field.
Meter Type	Specifies the type of linear meter you are configuring. Possible options are:	
	Turbine	Select if measuring flow through a turbine meter or other linear meter with a frequency or analog signal representing actual volumetric flow rate.
	Coriolis	Select if measuring flow through a Coriolis meter or other linear meter with a frequency or analog signal representing a mass flow rate.
	Auto-Adjust	Select if measuring flow through an Auto-Adjust meter. This meter type requires 2 pulse inputs, one representing the main rotor and one representing the sensing rotor.

Field	Description	
	Ultrasonic	Select if measuring flow through an ultrasonic meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
	Positive Displacement	Select if measuring flow through a positive displacement meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
Pressure Transmitter Type	Indicates the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select a **User Data** instance in the **Static Pressure I/O Definition** field.	
Details	Select this button to open the Linear Meter configuration display. Select ◀ to return to Guided Setup.	
Meter Factor / K-factor Curve Option	Sets how system uses calculates K-factors or Meter Factors in the flow calculation. Possible options are:	
	Single Meter Factor / Single K-factor	Uses a single Meter Factor and a single K-factor for the meter. This is the simplest choice and means that a value for the meter factor and a value for the K-factor are fixed for all flow rates and the values are taken from the last prove or an entered value. Select this option when using either the K-factor or meter factor proving, as long as neither the K-factor or meter factor will vary with flow rate or product. **Note** This option appears **only** if you select **Turbine** or **Coriolis** in the **Meter Type** field.

Field	Description	
	Meter Factor Curve / Single K-factor	A meter factor calculates for the current flow rate based on a linear interpolation of the meter factor versus flow rate values entered under the Factor Curve heading, but the K-factor will be fixed. Select this option when using meter factor proving if proving is done at multiple flow rates. **Note** This option appears **only** if you select **Turbine** or **Coriolis** in the **Meter Type** field.
	Single Meter Factor / K-factor Curve	A K-factor calculates for the current flow input frequency based on a linear interpolation of the meter factor versus frequency values entered under the Factor Curve, but the meter factor will be a single value from the last prove or entered value. The K-factor curve can come from multiple proves at different flow rates with a meter factor of 1.0 (K-factor proving) or the K-factor curve can come from factory calibration and a single meter factor from a prove (meter factor proving). **Note** This option appears **only** if you select **Turbine** or **Coriolis** in the **Meter Type** field.
Override Meter Factor	Sets a fixed meter factor value to use in calculations. **Note** This field appears **only** if you select either **Single Meter Factor / Single K-factor** or **Single Meter Factor / K-factor Curve** in the **Meter Factor / K-factor Curve Option** field.	
Override K-factor	Sets the discharge coefficient value to use in calculations. **Note** This field appears **only** if you select either **Single Meter Factor / Single K-factor** or **Meter Factor Curve / Single K-factor** in the **Meter Factor / K-factor Curve Option** field.	

Field	**Description**	
Calibration Curve Option	Sets how the system uses the Adjusted Uncorrected Volume Factor (AUVF) in calculations. Possible options are: **Note** These options appear **only** if you select **Auto-Adjust** in the **Meter Type** field.	
	Disable	The system does not use the AUVF in calculations (which is equal to an AUVF of 1.00). **Note** If you disable the calibration curve, the adjusted volume rate reflects the result of the auto-adjust algorithm with no correction for the calibration curve.
	Enable	The system includes the Adjusted Uncorrected Volume Factor (AUVF) in calculations. **Note** You **must** enter information from the calibration report in the % Error and AAT Volume fields. The program applies the AUVF to the result of the auto-adjust algorithm to calculate the adjusted volume rate at flowing conditions.
Indicated Flow	**I/O Definition**	Click … to open a Point Picker dialog and select an indicated flow input to use for the selected meter. This field represents the Pulse Frequency for a Turbine or Coriolis meter type, and the Main Rotor Frequency for an Auto-Adjust meter type. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • PI object – SELECTED FREQUENCY and ACCUMULATED PULSES • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible

Field	Description	
		in the Point Picker. For more information, refer to AI. - User Data – DOUBLE FLOATING POINT 1. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Secondary Flow Input Object	**I/O Definition**	Click … to open a Point Picker dialog and select the secondary flow object to use for the selected meter. The secondary flow object represents the Sensing Rotor Frequency and must be a PI object. This field is currently **only** used for an **Auto-Adjust** meter type. **Note** Only an object is chosen, and the Auto-Adjust algorithm reads the SELECTED FREQUENCY and ACCUMULATED PULSES parameters from the selected PI object.

Field	Description	
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Note These fields appear **only** if you select **Auto-Adjust** in the **Meter Type** field.	
Static Pressure	**I/O Definition**	Click ••• to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. The value is assumed to be in the pressure units selected for the associated station. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object.

Field	Description	
		• Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Flowing Temperature	**I/O Definition**	Click … to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • RTD object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use

Field	**Description**	
		the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Apply	Select to apply the currently selected meter configuration to all other meters with the same meter type. **Note** This field appears **only** for the first instance of multiple meters with the same meter type.	

2. Select **Next** to advance to the next step in the Guided Setup.

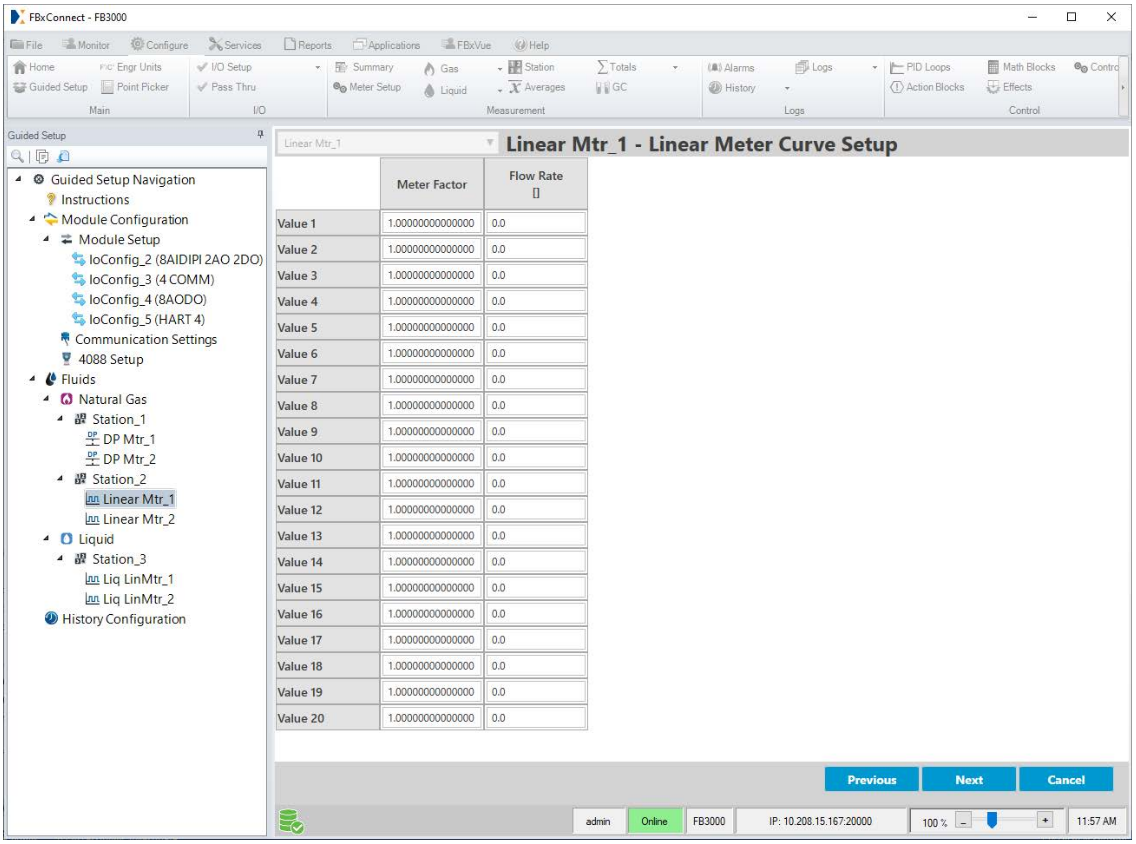
4.2.13 Guided Setup: Linear Meter Curve Setup

Use this display to enter a meter factor curve or K-factor curve.

Note

This display appears **only** if you select Meter Factor Curve/Single K-factor or Single Meter Factor/K-factor Curve in the Meter Factor/K-factor Curve Option field on the previous display.

Figure 82. Guided Setup: Linear Meter Curve Setup



Linear Mtr_1 - Linear Meter Curve Setup

	Meter Factor	Flow Rate []
Value 1	1.00000000000000	0.0
Value 2	1.00000000000000	0.0
Value 3	1.00000000000000	0.0
Value 4	1.00000000000000	0.0
Value 5	1.00000000000000	0.0
Value 6	1.00000000000000	0.0
Value 7	1.00000000000000	0.0
Value 8	1.00000000000000	0.0
Value 9	1.00000000000000	0.0
Value 10	1.00000000000000	0.0
Value 11	1.00000000000000	0.0
Value 12	1.00000000000000	0.0
Value 13	1.00000000000000	0.0
Value 14	1.00000000000000	0.0
Value 15	1.00000000000000	0.0
Value 16	1.00000000000000	0.0
Value 17	1.00000000000000	0.0
Value 18	1.00000000000000	0.0
Value 19	1.00000000000000	0.0
Value 20	1.00000000000000	0.0

1. Review – and change as necessary – the values in the following fields:

Field	Description
K-factor / Frequency	If you selected **Meter Factor Curve / Single K-factor** in the Meter Factor / K-factor Curve Option field on the previous display, enter up to 20 points on the curve (pairs of meter factor and flow rate) and a meter factor is calculated for use in the flow equation by linear interpolation of the current indicated quantity flow rate.
Meter Factor / Flow Rate	If you selected **Single Meter Factor / K-factor Curve** in the Meter Factor / K-factor Curve Option field on the previous display, enter up to 20 points on the curve (pairs of K-factor and frequency) and a K-factor is calculated for use in the flow equation by linear interpolation of the current flow meter input frequency.

Field	Description
% Error / AAT Volume	If you selected **Auto-Adjust** in the Meter Type field on the previous display, enter up to 20 points on the curve (pairs of % Error and AAT Volume {the volumetric flow rate calculated by the Auto-Adjust Turbine algorithm}). The adjusted Uncorrected Volume Factor is calculated for use in the flow equation by using linear interpolation of the AAT Volume to determine % Error and then the AUVF is calculated as follows: $AUVF = \frac{1}{\left(\frac{\%\,Error}{100}\right)+1}$

Note

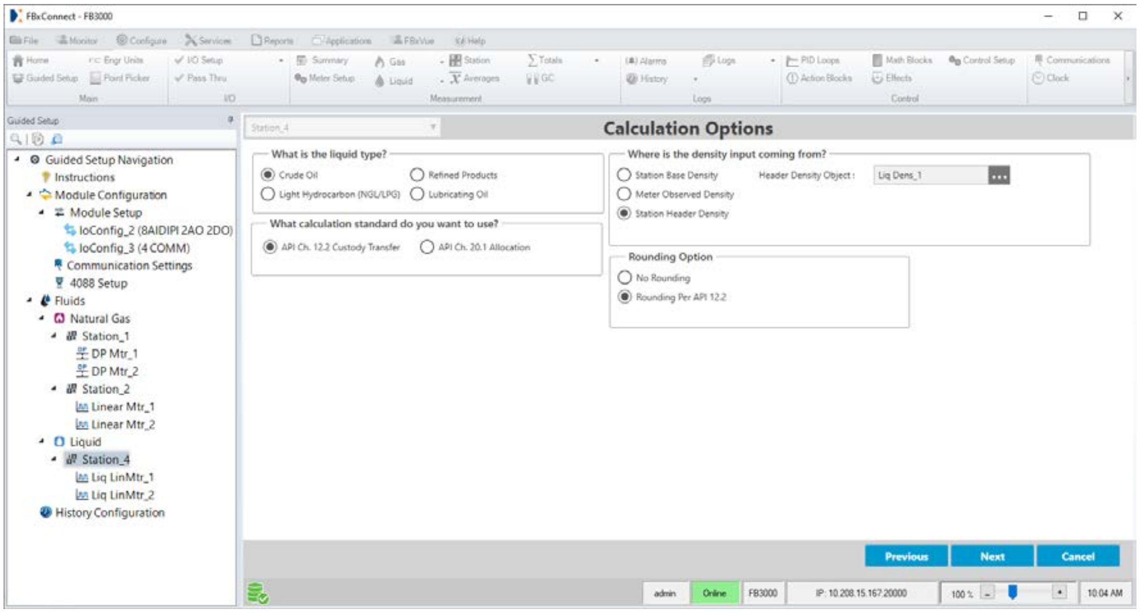
A valid point **must** have a non-zero flow rate/frequency and a non-zero factor. The points may be entered in any order and will be internally sorted by flow rate (MF curve) or frequency (K-Factor Curve), discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the flow rate/frequency is less than the lowest point on the curve, the calculated factor will be the factor for the lowest point on the curve. If the flow rate/frequency is greater than the highest point on the curve, the calculated factor will be the factor for the highest point on the curve.

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.14 Guided Setup: Calculation Options

Use this display to set the flow calculation methodology used to calculate crude oil, crude oil byproducts, water quantities, and density input for the selected liquid linear meter.

Figure 83. Guided Setup: Calculation Options



Station_4

Calculation Options

What is the liquid type?

● Crude Oil ○ Refined Products
○ Light Hydrocarbon (NGL/LPG) ○ Lubricating Oil

What calculation standard do you want to use?

● API Ch. 12.2 Custody Transfer ○ API Ch. 20.1 Allocation

Where is the density input coming from?

○ Station Base Density
○ Meter Observed Density
● Station Header Density

Header Density Object : Liq Dens_1

Rounding Option

○ No Rounding
● Rounding Per API 12.2

1. Review – and change as necessary – the values in the following fields:

Field	Description	
What is the liquid type?	Sets the specific type of hydrocarbon fluid for the selected product instance. Possible options are:	
	Crude Oil	A liquid hydrocarbon is generally considered to be a crude oil if its density falls between approximately 0.61120 to 1.16464 relative density (100 to −10 °API). Crude oils that have been stabilized for transportation or storage purposes with API gravities within this range are considered to be part of this group.
	Light Hydrocarbon	A liquid hydrocarbon is generally considered to be a light hydrocarbon if its density falls between approximately 0.3500 to 0.6880 relative density (272.8 to 72.2 °API). Light hydrocarbons are often referred to as LPGs (Liquified Petroleum Gases) or NGLs (Natural Gas Liquids) and are predominantly composed of lighter hydrocarbons, such as methane, ethane, butane, and propane.

Field	Description	
	Refined Products	A liquid hydrocarbon is generally considered to be a refined product if it falls into one of the following product groups: • **Gasoline –** Motor gasoline and unfinished gasoline blending stock with a base density range between approximately 50° API and 85° API. • **Jet Fuels –** Jet fuels, kerosene, and Stoddard solvents with a base density range between approximately 37° API and 50° API. • **Fuel Oils –** Diesel oils, heating oils and fuel oils with a base density range between approximately -10° API and 37° API.
	Lubricating Oil	A liquid hydrocarbon is generally considered to be a lubricating oil if it is a base stock derived from crude oil fractions by distillation or asphalt precipitation. Lubricating oils have densities in the range between approximately -10 to 45° API.
What calculation standard do you want to use?	Sets the flow calculation methodology used to calculate crude oil, crude oil byproducts, and water quantities. Possible options are:	
	API Ch. 12.2 Custody Transfer	Meters assigned to the selected station use API Ch. 12.2 for oil measurement. This standard is typically used for custody transfer but can also be utilized for allocation applications. The standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. The meter calculates flow rates and accumulations representing indicated quantity, gross volume, gross standard volume, net standard volume, water volume, and mass. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch 12.2 Table 6.

Field	Description	
		Note CTL, CPL, CCF, and Meter Factor (MF) are rounded as per API Ch. 12.2 Table 6. The associated Station provides flow rates and accumulations representing gross volume, net standard volume, water volume, and mass.
	API Ch. 20.1 Allocation	Meters assigned to the selected station use API Ch. 20.1 standard for allocation measurement. The standard handles unstable crude oil and/or higher water cases. The standard is partitioned by its water volume correction methodology. **Note** This field **appears** only if you select **Crude Oil** in the previous field.
Water Factor	Sets how the system calculates the water volume correction. **Note** This field appears only if you select **API Ch. 20.1** in the previous field.	
	Apply S&W% at end (to base conditions)	Meters assigned to the selected station use API Ch. 20.1 Procedure A for oil measurement. The standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. API Ch. 20.1 (2016) suggests using this method when the sediment and water is generally **less** than 5.0 percent. The meter calculates the same quantities as the API Ch. 12.2 Custody Transfer Meter, but a shrinkage factor is applied to the gross standard volume. If the shrinkage factor includes a correction for temperature, the CTL should be set to override mode with a value of 1.0, otherwise it should be set to calculated mode. If pressure correction is included in the SF or pressure correction is not required, CPL should be set to override mode at 1.0, otherwise CPL should be set to calculated mode. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch

Field	Description	
		12.2 Table 6. The water fraction is calculated using the in-use CSW. **Note** CTL, CPL, CCF, and Meter Factor (MF) are rounded as per API Ch. 12.2 Table 6. Station quantity calculations are not supported for allocation meters.
	Apply % Water to Gross Volume (oil and water volumes corrected separately)	Meters assigned to the selected station use API Ch. 20.1 Procedure C for oil measurement. The oil and water have separate volume correction factors and are split before volume correction is applied. API Ch. 20.1 (2016) suggests using this method when the sediment and water is generally **greater** than 5.0 percent. The meter calculates flow rates and accumulations representing indicated quantity, gross volume, oil unshrunk volume, net standard volume, water metered volume and water net volume. Additionally, a flash gas net volume and an NGL net volume may be calculated by entering an override flash gas factor and NGL factor. The correction factor for the oil is entered via an override or external shrinkage factor (SF). The Shrinkage Factor is assumed to include any correction for shrinkage, temperature, and pressure. CTL, CPL, CTPL, CCF and CSW are assumed to be 1.0 The correction factor for water is calculated according to API Ch. 20.1 A.1 (2016). **Note** The flow calculation uses unrounded correction factors. Station quantity calculations are not supported for allocation meters.

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td rowspan="4">Where is the density input coming from?</td><td colspan="3">Sets where the density measurement is occurring. Possible options are:
Note
This field appear only if you select either API Ch. 12.2 Custody Transfer or API Ch. 20.1 Allocation and Apply S&W% at end (to base conditions).</td></tr>
<tr><td rowspan="2">Station Base Density</td><td colspan="2">Use the static density value you define in the Base Density field. No densitometer is at the meter. A base to alternate calculation occurs using the meter temperature and pressure as the alternate conditions.
Note
If the base density and temperature units are different than the station's base conditions, the system converts the value to the station's base conditions.</td></tr>
<tr><td>Base Density</td><td>Enter a base density value to use in calculations.
Note
This field appears only if you select Station Base Density as the density input source.</td></tr>
<tr><td>Meter Observed Density</td><td colspan="2">Use the dynamic density value measured at the meter by a densitometer you configure in the Flowing Density Parameter field. The observed to base density calculation uses the meter temperature and pressure as the observed density conditions. In most cases where the meters have individual live density measurement, there is only one temperature measurement and one pressure measurement to cover both the density and the meter. This means that the meter density is set equal to the observed density and only an observed to base calculation is performed.</td></tr>
</table>

Field	Description		
	Station Header Density	Use the dynamic density value measured at the station/header (with header temperature and pressure). You configure the measurement source in the **Header Density Object** field.	
		Header Density Object	Sets the Liquid Density instance associated with the selected station. Select ⋯ to open a Point Picker dialog and choose the liquid density instance used by the selected station. **Note** This field appears **only** if you select **Station Header Density** as the density input source.
Rounding Option	Sets the rounding used by the system for volume correction factors.		
	Rounding According to API 12.2.2	Calculation outputs are rounded according to API 12.2.2.	
	No Rounding	No rounding is performed on intermediate or final calculated variables, and values display in full double precision.	
Apply	Select to apply the currently selected station configuration to all other stations with the same fluid type. **Note** This field appears **only** for the first instance of multiple stations with the same fluid type.		

2. Select **Next** to advance to the next step in the Guided Setup.

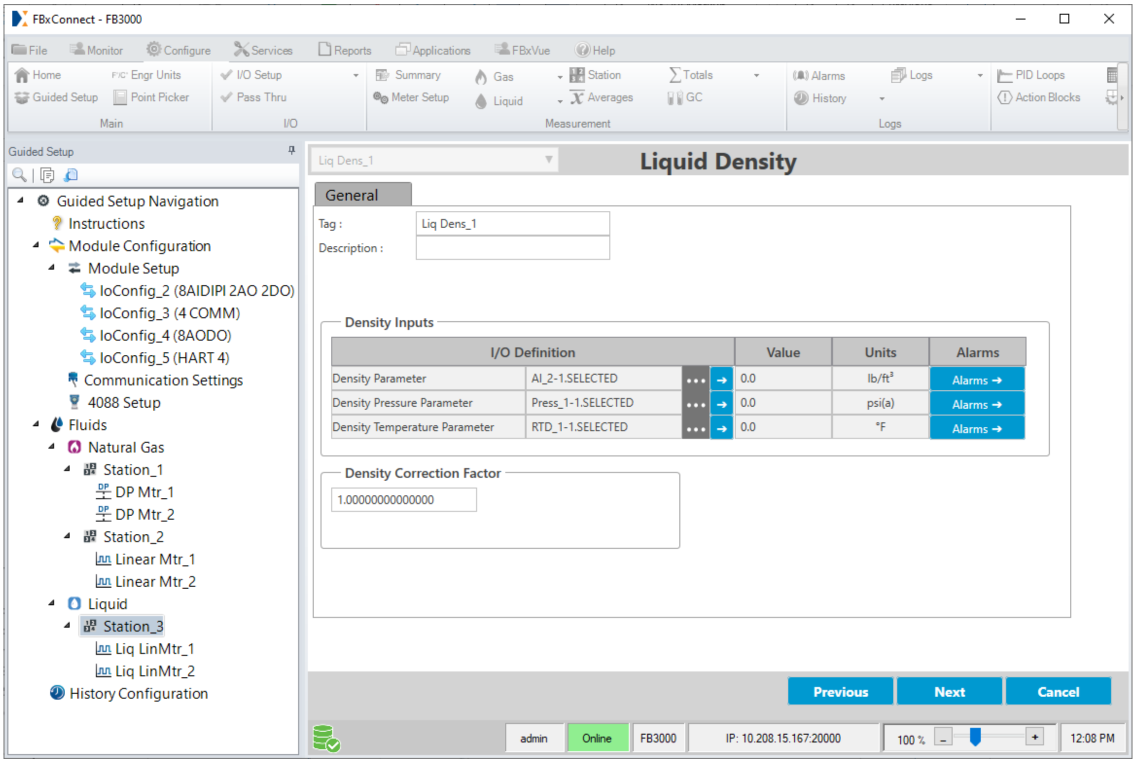
4.2.15 Guided Setup: Liquid Density

If you select **Station Header Density** in the Calculation Options step of the Guided Setup, use this display to configure the station header density input.

Note

- You **must** configure the **Density Parameter** field.
- The **Density Pressure Parameter** and **Density Temperature Parameter** fields are optional, but a property calculation alarm is raised at any associated liquid linear meter if the **Density Temperature Parameter** is Undefined.

Figure 84. Guided Setup: Liquid Density



Liquid Density

General

Tag : Liq Dens_1
Description :

Density Inputs

I/O Definition		Value	Units	Alarms
Density Parameter	AI_2-1.SELECTED	0.0	lb/ft³	Alarms →
Density Pressure Parameter	Press_1-1.SELECTED	0.0	psi(a)	Alarms →
Density Temperature Parameter	RTD_1-1.SELECTED	0.0	°F	Alarms →

Density Correction Factor

1.00000000000000

1. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected product instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected product instance.

Field		**Description**
Density Parameter	**I/O Definition**	Click … to open a Point Picker dialog and select the density input to use for the selected Liquid Density instance. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. - AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. - User Data – You can manually select any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure > Alarms display for the User Data value.

Field	Description	
Density Pressure Parameter	**I/O Definition**	Click ... to open a Point Picker dialog and select the density pressure input to use for the Liquid Density instance. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • Press object – SELECTED VALUE • User Data – You can manually select any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure > Alarms display for the User Data value.

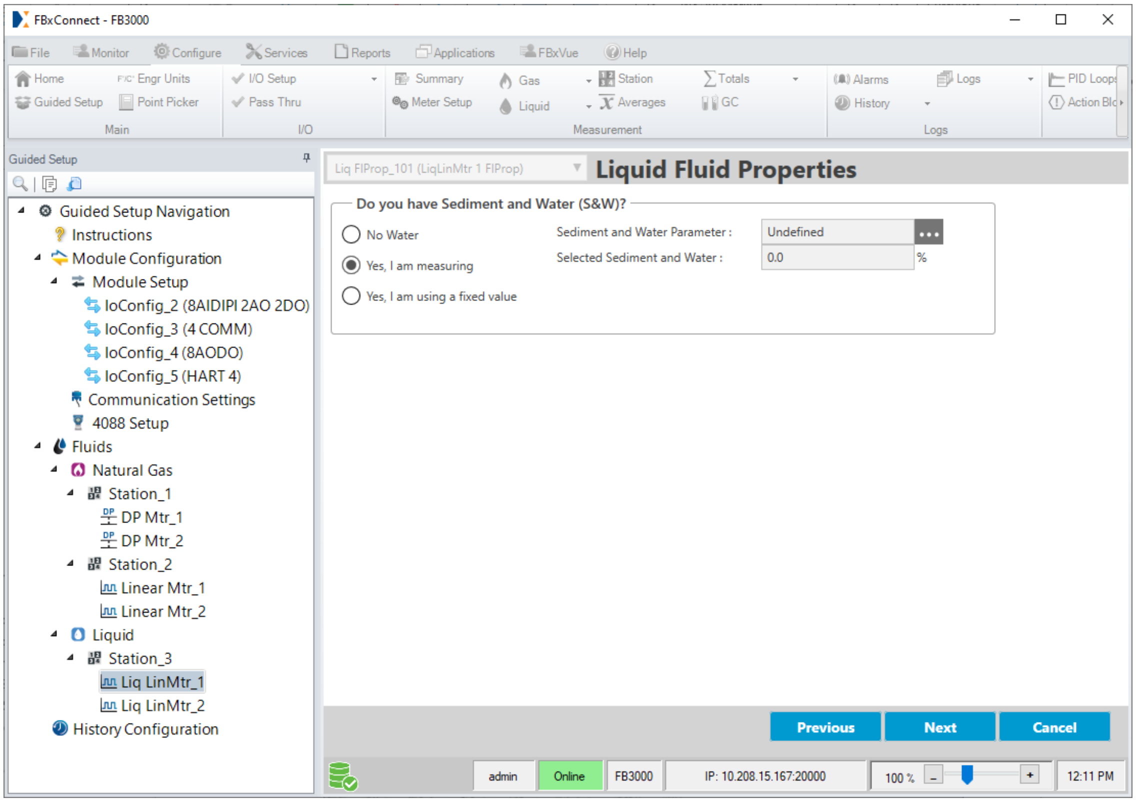
Field	**Description**	
Density Temperature Parameter	**I/O Definition**	Click ... to open a Point Picker dialog and select the density temperature input to use for the Liquid Density instance. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • RTD object – SELECTED VALUE • User Data – You can manually select any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure > Alarms display for the User Data value.
Density Correction Factor	Sets the multiplier value to correct the observed density provided by a pycnometer or similar device. The Density Correction Factor (sometimes referred to as DCF) is a unitless scaler used to adjust the density referenced by the density parameter.	

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.16 Guided Setup: Liquid Fluid Properties (Sediment and Water)

If you select **Crude Oil** as the liquid type and you select either **API Ch. 12.2 Custody Transfer** or **API Ch. 20.1 Allocation** and **Apply S&W% at end (to base conditions)** in the Calculation Options step, use this display to configure the sediment and water value parameters for the selected liquid linear meter.

Figure 85. Guided Setup: Liquid Fluid Properties (Sediment and Water)



Liquid Fluid Properties

Do you have Sediment and Water (S&W)?

○ No Water

● Yes, I am measuring

○ Yes, I am using a fixed value

Sediment and Water Parameter : Undefined

Selected Sediment and Water : 0.0 %

1. Review – and change as necessary – the values in the following fields:

Field	Description	
Do you have Sediment and Water?	Determines if calculations include corrections for sediment and water volumes.	
	No Water	Select this option if you do not have any sediment or water flowing through the meter.
	Yes, I’m measuring	Select this option if you have sediment water flowing through the meter, and the amount is being measured.
	Yes, I’m using a fixed value	Select this option to use an override value for the percent of sediment and water flowing through the meter.
Sediment and Water Parameter	Click ... to open a Point Picker dialog and select a parameter to acquire the sediment and water value for the selected meter. **Note** This field appears **only** if you select **Yes, I’m measuring**.	
Override Sediment and Water	Sets, in percent, a fixed sediment and water value to use in calculations for the selected meter. **Note** This field appears **only** if you select **Yes, I’m using a fixed value**.	
Selected Sediment and Water	This **read-only** field shows the current sediment and water value, based on the selected options, used in calculations. **Note** This field appears **only** if you select **Yes, I'm measuring** or select **Yes, I'm using a fixed value**.	

2. Select **Next** to advance to the next step in the Guided Setup.

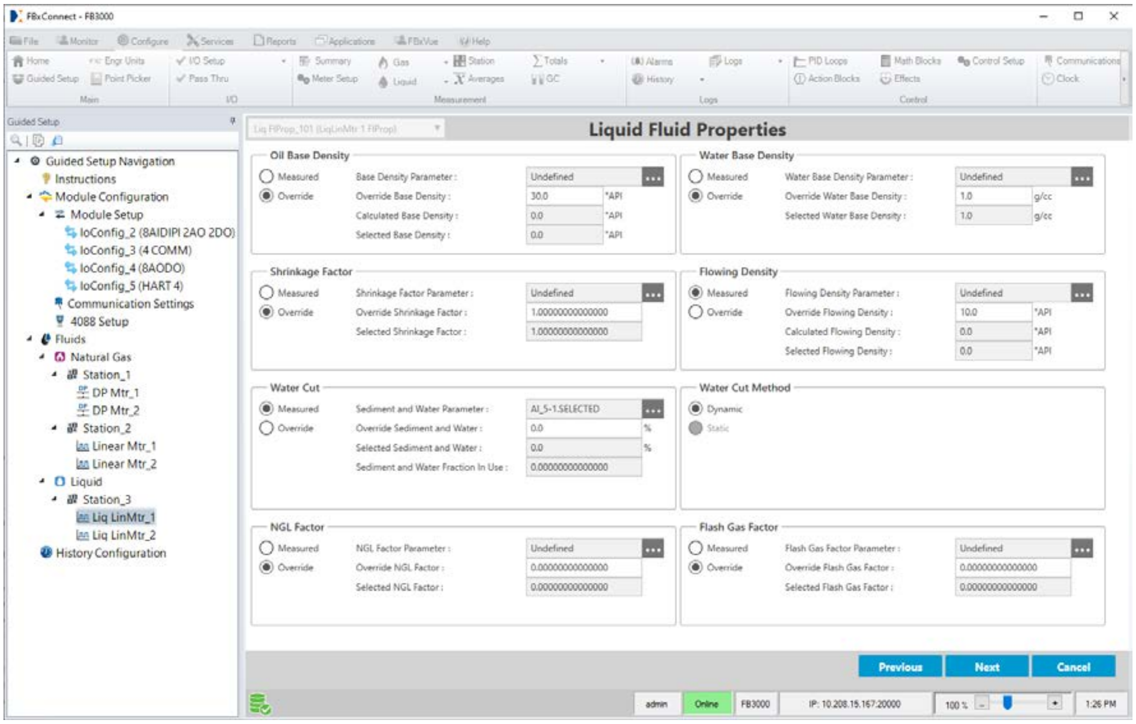
4.2.17 Guided Setup: Liquid Fluid Properties (Additional Factors)

If you select **Crude Oil** as the liquid type and you select **API Ch. 20.1 Allocation** in the Calculation Options step of the Guided Setup, use this display to configure general fluid properties and additional factors for the fluid being measured.

Note

- The fields shown on this display are determined by your answer to the question **What calculation standard do you want to use?** in the Calculation Options step of the Guided Setup.
- Physically impossible inputs may be clamped at a high or low limit value in order to ensure reasonable results. If a value is clamped at a high or low limit, a corresponding flow or property alarm is raised.

Figure 86. Guided Setup: Liquid Fluid Properties (Additional Factors)



Liquid Fluid Properties

Oil Base Density
○ Measured
● Override
Base Density Parameter : Undefined
Override Base Density : 30.0 °API
Calculated Base Density : 0.0 °API
Selected Base Density : 0.0 °API

Water Base Density
○ Measured
● Override
Water Base Density Parameter : Undefined
Override Water Base Density : 1.0 g/cc
Selected Water Base Density : 1.0 g/cc

Shrinkage Factor
○ Measured
● Override
Shrinkage Factor Parameter : Undefined
Override Shrinkage Factor : 1.00000000000000
Selected Shrinkage Factor : 1.00000000000000

Flowing Density
● Measured
○ Override
Flowing Density Parameter : Undefined
Override Flowing Density : 10.0 °API
Calculated Flowing Density : 0.0 °API
Selected Flowing Density : 0.0 °API

Water Cut
● Measured
○ Override
Sediment and Water Parameter : AI_5-1.SELECTED
Override Sediment and Water : 0.0 %
Selected Sediment and Water : 0.0 %
Sediment and Water Fraction In Use : 0.00000000000000

Water Cut Method
● Dynamic
● Static

NGL Factor
○ Measured
● Override
NGL Factor Parameter : Undefined
Override NGL Factor : 0.00000000000000
Selected NGL Factor : 0.00000000000000

Flash Gas Factor
○ Measured
● Override
Flash Gas Factor Parameter : Undefined
Override Flash Gas Factor : 0.00000000000000
Selected Flash Gas Factor : 0.00000000000000

1. Review – and change as necessary – the values in the following fields:

Field	Description	
Oil Base Density	Sets how the system acquires the oil base density value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Oil Base Density Parameter** field to acquire the value.

Field	Description	
	Override	The system uses the value you define in the **Override Oil Base Density** field.
Base Density Parameter	Click ⋯ to open a Point Picker dialog and select a parameter to acquire the oil base density value.	
Override Base Density	Sets the oil base density value to use in calculations when **Override** is selected in the **Oil Base Density Mode** field.	
Calculated Base Density	This **read-only** field shows the oil base density value as calculated by the system.	
Selected Base Density	This **read-only** field shows the current oil base density value, based on the selected options, used in calculations.	
Water Base Density	Sets how the system acquires the water base density value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Water Base Density Parameter** field to acquire the value. **Note** The system ignores invalid measured water base density values and uses a value of 0 instead.
	Override	The system uses the value you define in the **Override Water Base Density** field.
Water Base Density Parameter	Click ⋯ to open a Point Picker dialog and select a parameter to acquire the water base density value.	
Override Water Base Density	Sets the water base density value to use in calculations when **Override** is selected in the **Water Base Density Mode** field.	
Selected Water Base Density	This **read-only** field shows the current water base density value, based on the selected options, used in calculations.	
Shrinkage Factor	Sets how the system acquires the shrinkage factor value. The shrinkage factor is the ratio of hydrocarbon liquid at base conditions to the hydrocarbon liquid at metering conditions. Possible options are:	

Field	Description	
	Measured	The system uses a parameter you configure in the **Shrinkage Factor Parameter** field to acquire the value. **Note** Valid values are between 0 and 1. The system ignores an invalid measured shrinkage factor values and uses a value of 0 instead.
	Override	The system uses the value you define in the **Override Shrinkage Factor** field.
Shrinkage Factor Parameter	Click ••• to open a Point Picker dialog and select a parameter to acquire the shrinkage factor value.	
Override Shrinkage Factor	Sets the shrinkage factor value to use in calculations when **Override** is selected in the **Shrinkage Factor Mode** field.	
Selected Shrinkage Factor	This **read-only** field shows the current shrinkage factor value, based on the selected options, used in calculations.	
Flowing Density	Sets how the system acquires the flowing density value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Flowing Density Parameter** field to acquire the value. **Note** The system ignores invalid measured emulsion density values and uses a value of 0 instead.
	Override	The system uses the value you define in the **Override Flowing Density** field.
Flowing Density Parameter	Click ••• to open a Point Picker dialog and select a parameter to acquire the flowing density value.	
Override Flowing Density	Sets the flowing density value to use in calculations when **Override** is selected in the **Flowing Density Mode** field.	
Calculated Flowing Density	This **read-only** field shows the flowing density value as calculated by the system.	

Field	Description	
Selected Flowing Density	This **read-only** field shows the current flowing density value, based on the selected options, used in calculations.	
Water Cut	Sets how the system acquires the water cut value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Water Cut Parameter** field to acquire the value. **Note** The system ignores negative or invalid measured water cut values and uses a value of 0% instead. Water cut values greater than 100% are treated as 100%
	Override	The system uses the value you define in the **Water Cut Override** field.
Sediment and Water Parameter	Click ⋯ to open a Point Picker dialog and select a parameter to acquire the sediment and water value.	
Override Sediment and Water	Sets the sediment and water value to use in calculations when **Override** is selected in the **Water Cut Mode** field.	
Selected Water Cut	This **read-only** field shows the current sediment and water value, based on the selected options, used in calculations.	
Sediment and Water Fraction In Use	This **readd-**only field shows the volume fraction of water applied to the gross volume of fluid measured to determine uncorrected (actual) water volume at metering conditions.	
Water Cut Method	Sets how the water cut value is obtained.	
	Dynamic	Live reading of water cut at metering conditions.
	Static	Off-line reading of water cut at laboratory conditions (needs to be corrected to metering conditions before using in the calculation).
NGL Factor	Sets how the system acquires the NGL factor value. The NGL factor is the ratio of the natural gas liquids at metering conditions to the hydrocarbon liquids at base conditions. Possible options are:	

Field	Description	
	Measured	The system uses a parameter you configure in the **NGL Factor Parameter** field to acquire the value. **Note** The system ignores negative or invalid NGL factor values and uses a value of 0 instead.
	Override	The system uses the value you define in the **Override NGL Factor** field.
NGL Factor Parameter	Click ... to open a Point Picker dialog and select a parameter to acquire the NGL factor value.	
Override NGL Factor	Sets the NGL factor value to use in calculations when **Override** is selected in the **NGL Factor Mode** field.	
Selected NGL Factor	This **read-only** field shows the current NGL factor value, based on the selected options, used in calculations.	
Flash Gas Factor	Sets how the system acquires the flash gas factor value. The flash gas factor is the ratio of the flash gas at metering conditions to the hydrocarbon liquids at base conditions. Possible options are:	
	Measured	The system uses a parameter you configure in the **Flash Gas Factor Parameter** field to acquire the value. **Note** The system ignores negative or invalid flash gas factor values and uses a value of 0 instead.
	Override	The system uses the value you define in the **Override NGL Factor** field.
Flash Gas Factor Parameter	Click ... to open a Point Picker dialog and select a parameter to acquire the flash gas factor value.	
Override Flash Gas Factor	Sets the flash gas factor value to use in calculations when **Override** is selected in the **Flash Gas Factor Mode** field.	
Selected Flash Gas Factor	This **read-only** field shows the current flash gas factor value, based on the selected options, used in calculations.	

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.18 Guided Setup: Liquid Linear Meter

Use this display to configure parameters for the selected liquid linear meter.

Note

You can **right-click** on a Liquid Linear Meter node in the navigation tree to copy or paste the configuration of one meter to another.

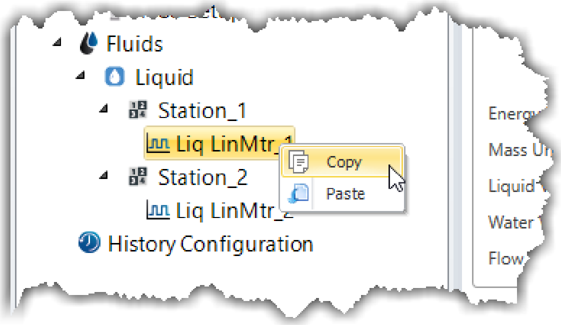
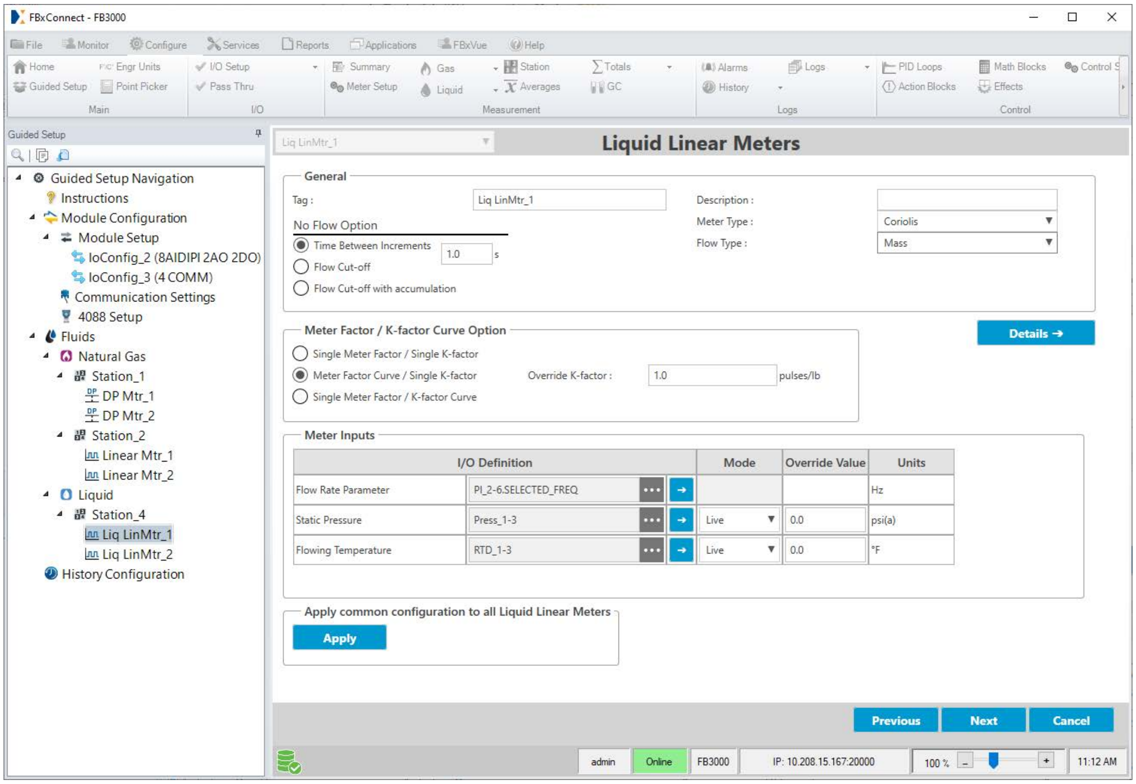


Figure 87. Guided Setup: Liquid Linear Meter



Liquid Linear Meters

General

Tag : Liq LinMtr_1

Description :

Meter Type : Coriolis

Flow Type : Mass

No Flow Option

● Time Between Increments 1.0 s
○ Flow Cut-off
○ Flow Cut-off with accumulation

Meter Factor / K-factor Curve Option

○ Single Meter Factor / Single K-factor
● Meter Factor Curve / Single K-factor   Override K-factor : 1.0 pulses/lb
○ Single Meter Factor / K-factor Curve

Meter Inputs

I/O Definition		Mode	Override Value	Units
Flow Rate Parameter	PI_2-6.SELECTED_FREQ			Hz
Static Pressure	Press_1-3	Live	0.0	psi(a)
Flowing Temperature	RTD_1-3	Live	0.0	°F

Apply common configuration to all Liquid Linear Meters

1. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected meter.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected meter.	
No Flow Option	Sets how the system calculates a "no flow" condition for the meter. Possible options are:	
	Time Between Pulses / Increments	If the amount of time between pulses/increments is greater than or equal to the time you enter in the text field, then system sets the calculated flow equal to zero. **Note** • This option applies **only** if you select a **PI** object in the **Flow Rate Parameter** field. • You **must** enter a time (in seconds) for the system to use in the text field. • The label of this option changes based on your selection in the **Flow Input Option** field of the **Liquid Linear Meter** display accessed through the **Details** button. If you select **Flow Input Only**, then the label shows **Time Between Pulses**. If you select **External Accumulator** or **External Accumulator with Flow Rate**, then the label shows **Time Between Increments**.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Flow Cut-off</td><td>If the value of the uncorrected volume or mass input is less than or equal to the value you enter in the text field, then the system sets the calculated flow rates equal to zero. Enter a value (in units based on the table below) for the system to use in the text field.
<table>
<tr><th>Indicated Flow Input Type</th><th>Meter Type</th><th>Unit Type</th></tr>
<tr><td rowspan="2">Pulse Input</td><td>Turbine</td><td>Hz</td></tr>
<tr><td>Coriolis</td><td>Hz</td></tr>
<tr><td rowspan="2">AI or User Data</td><td>Turbine</td><td>Volume Rate</td></tr>
<tr><td>Coriolis</td><td>Mass Rate</td></tr>
</table>
Note

You must enter a value (in the indicated units) in the text field for the system to use.
The lowest frequency the system can accurately measure is 1 divided by the PI Scan Period (configured on the Pulse Input display). Flow control may be erratic below this threshold.
</td></tr>
<tr><td></td><td>Flow Cut-off with accumulation</td><td>If the value of the uncorrected volume or mass input is less than or equal to the value you enter in the text field, then the system sets the calculated flow rates equal to zero, but any accumulations are still counted.
Note

You must enter a value (in the indicated units) in the text field for the system to use.
For details on the unit types used by different indicated flow input and meter types, refer to the table in the Flow Cut-off field description.
</td></tr>
<tr><td>Meter Type</td><td colspan="2">Specifies the type of liquid linear meter you are configuring. Possible options are:</td></tr>
</table>

Field	Description	
	Turbine	Select if measuring flow through a turbine meter or other linear meter with a frequency or analog signal representing actual volumetric flow rate.
	Coriolis	Select if measuring flow through a Coriolis meter or other linear meter with a frequency or analog signal representing a mass flow rate.
	Ultrasonic	Select if measuring flow through an ultrasonic meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
	Positive Displacement	Select if measuring flow through a positive displacement meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
Flow Type	Click ▼ to specify the type of flow rate you are measuring through the meter. Possible options are: **Note** This field appears **only** if you select **Coriolis** in the **Meter Type** field.	
	Volume	Select if you are measuring volume flow rate.
	Mass	Select if you are measuring mass flow rate.
Pressure Transmitter Type	Indicates the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select a **User Data** instance in the **Static Pressure I/O Definition** field.	
Details	Select this button to open the Liquid Linear Meter display. Select ◀ to return to Guided Setup.	

Field	**Description**	
Meter Factor / K-factor Curve Option	Sets how system uses calculates K-factors or Meter Factors in the flow calculation. Possible options are:	
	Single Meter Factor / Single K-factor	Uses a single Meter Factor and a single K-factor for the meter. This is the simplest choice and means that a value for the meter factor and a value for the K-factor are fixed for all flow rates and the values are taken from the last prove or an entered value. Select this option when using either the K-factor or meter factor proving, as long as neither the K-factor or meter factor will vary with flow rate or product.
	Meter Factor Curve / Single K-factor	A meter factor calculates for the current flow rate based on a linear interpolation of the meter factor versus flow rate values entered under the Factor Curve heading, but the K-factor will be fixed. Select this option when using meter factor proving if proving is done at multiple flow rates.
	Single Meter Factor / K-factor Curve	A K-factor calculates for the current flow input frequency based on a linear interpolation of the meter factor versus frequency values entered under the Factor Curve, but the meter factor will be a single value from the last prove or entered value. The K-factor curve can come from multiple proves at different flow rates with a meter factor of 1.0 (K-factor proving) or the K-factor curve can come from factory calibration and a single meter factor from a prove (meter factor proving).
Override Meter Factor	Sets a fixed meter factor value to use in calculations. **Note** This field appears **only** if you select either **Single Meter Factor / Single K-factor** or **Single Meter Factor / K-factor Curve** in the **Meter Factor / K-factor Curve Option** field.	

Field	Description	
Override K-factor	Sets a fixed discharge coefficient value to use in calculations. **Note** This field appears **only** if you select either **Single Meter Factor / Single K-factor** or **Meter Factor Curve / Single K-factor** in the **Meter Factor / K-factor Curve Option** field.	
Flow Rate Parameter	**I/O Definition**	Click … to open a Point Picker dialog and select a flow rate input to use for the selected meter. This field represents the Pulse Frequency for a Turbine or Coriolis meter type. • PI object – RATE or SELECTED FREQUENCY • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – Any parameter. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	Description	
Static Pressure Object	**I/O Definition**	Click ... to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. The value is assumed to be in the pressure units selected for the associated station. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.

Field	Description	
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Flowing Temperature Object	**I/O Definition**	Click ... to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • RTD object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.

Field	Description	
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
Meter Density Parameter	**I/O Definition**	Click ••• to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – Any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.

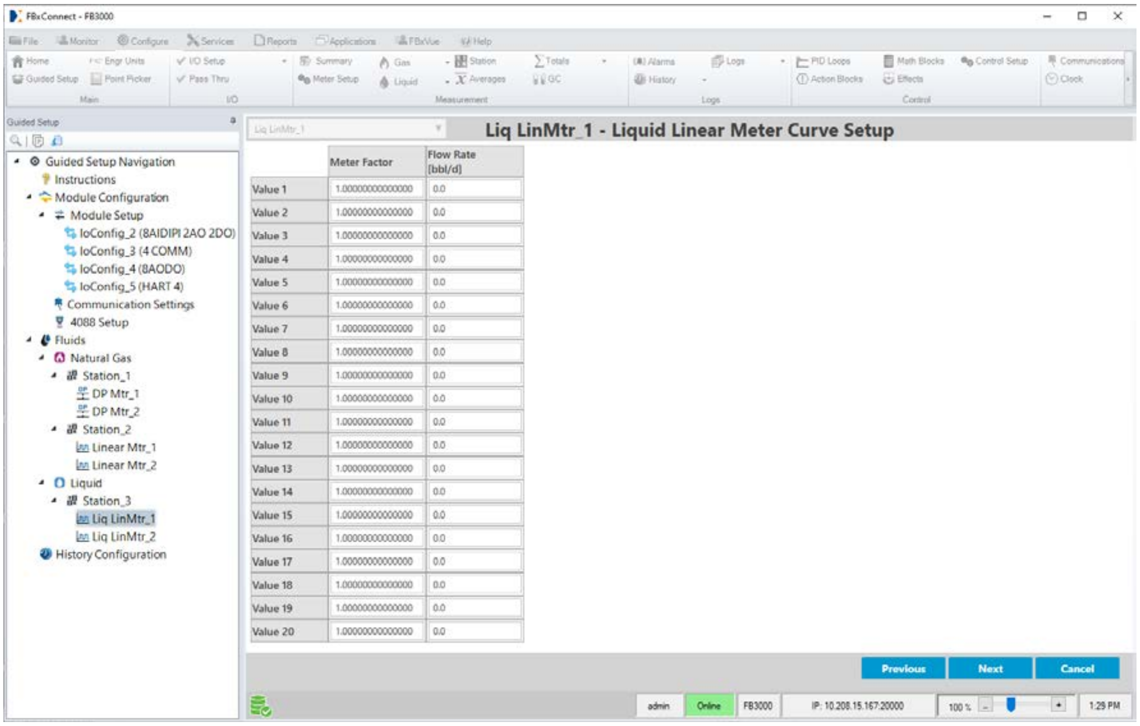
Field	Description	
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Note This field appears **only** in certain configuration scenarios: • If the meter is assigned to a Station where the Density Option is set to **Meter Observed Density**, and the Crude Oil Option is set to **API Ch. 12.2** or **API Ch. 20.1** with **Use Oil Correction Factor for Water**. • If the meter is assigned to a Station with Crude Oil Options set to **API Ch. 20.1** and **Use Separate Correction Factor for Water**, and the meter type of **Coriolis** is selected.	
Apply	Select to apply the currently selected meter configuration to all other meters with the same meter type. **Note** This field appears **only** for the first instance of multiple meters with the same meter type.	

2. Select **Next** to advance to the next step in the Guided Setup.

4.2.19 Guided Setup: Liquid Meter Curve Setup

Use this display to enter a meter factor curve or K-factor curve.

Figure 88. Guided Setup: Liquid Meter Curve Setup



Liq LinMtr_1 - Liquid Linear Meter Curve Setup

	Meter Factor	Flow Rate [bbl/d]
Value 1	1.0000000000000	0.0
Value 2	1.0000000000000	0.0
Value 3	1.0000000000000	0.0
Value 4	1.0000000000000	0.0
Value 5	1.0000000000000	0.0
Value 6	1.0000000000000	0.0
Value 7	1.0000000000000	0.0
Value 8	1.0000000000000	0.0
Value 9	1.0000000000000	0.0
Value 10	1.0000000000000	0.0
Value 11	1.0000000000000	0.0
Value 12	1.0000000000000	0.0
Value 13	1.0000000000000	0.0
Value 14	1.0000000000000	0.0
Value 15	1.0000000000000	0.0
Value 16	1.0000000000000	0.0
Value 17	1.0000000000000	0.0
Value 18	1.0000000000000	0.0
Value 19	1.0000000000000	0.0
Value 20	1.0000000000000	0.0

1. Review – and change as necessary – the values in the following fields:

Field	Description
K-factor / Frequency	If you selected **Meter Factor Curve / Single K-factor** on the previous display, enter up to 20 points on the curve (pairs of meter factor and flow rate) and a meter factor is calculated for use in the flow equation by linear interpolation of the current indicated quantity flow rate.
Meter Factor / Flow Rate	If you selected **Single Meter Factor / K-factor Curve** on the previous display, enter up to 20 points on the curve (pairs of K-factor and frequency) and a K-factor is calculated for use in the flow equation by linear interpolation of the current flow meter input frequency.

Note

A valid point **must** have a non-zero flow rate/frequency and a non-zero factor. The points may be entered in any order and will be internally sorted by flow rate (MF curve) or frequency (K-Factor Curve), discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the flow rate/frequency is less than the lowest point on the curve, the calculated factor will be the factor for the lowest point on the curve. If the flow rate/frequency is greater than the highest point on the curve, the calculated factor will be the factor for the highest point on the curve.

2. Select **Next** to advance to the next step in the Guided Setup.

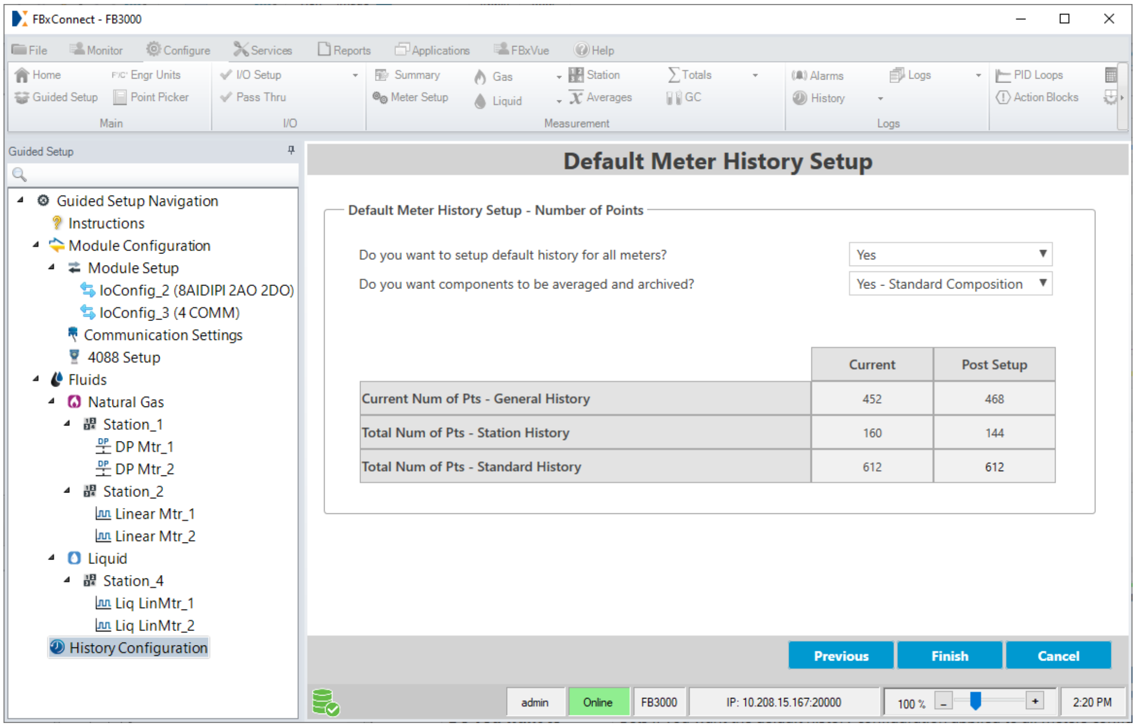
4.2.20 Guided Setup: Default Meter History Setup

Use this display to configure history points in your FB3000 RTU using the default history values.

Note

- For more information about the structure of history stored in the FB Series products, refer to History Overview.
- If liquid batching is enabled on any meters, then you **cannot** configure history using the Guided Setup Wizard. In this case, you **must** use the standard Default History Setup display to configure history.

Figure 89. Guided Setup: Default Meter History Setup



Default Meter History Setup

Default Meter History Setup - Number of Points

Do you want to setup default history for all meters? Yes

Do you want components to be averaged and archived? Yes - Standard Composition

	Current	Post Setup
Current Num of Pts - General History	452	468
Total Num of Pts - Station History	160	144
Total Num of Pts - Standard History	612	612

1. Review – and change as necessary – the values in the following fields:

Field	**Description**	
Do you want to setup default history for all meters?	Sets if you want the default history configuration applied to all meters configured in the FB3000.	
	No	FBxConnect does **not** configure history for any meters in the FB3000.
	Yes	FBxConnect configures the default history for all meters in the FB3000.
Do you want components averaged and archived?	Sets if you want the FB3000 to average and archive components in history.	
	No	Components are **not** averaged and archived in history.
	Yes – Standard Composition	The FB Series product archives standard composition component averages for gas meters.

Field	Description
	Yes – Extended Composition The FB Series product archives extended composition (includes C7, C8, C9, and C10) component averages for gas meters.
Total Num of Available Standard Points	This **read-only** field shows the total number of history points allocated to the standard group both before (Current) and after (Post Setup) applying the default history setup.
Number of Points used for Meter History Groups	This **read-only** field shows the total number of history points allocated to the station history groups both before (Current) and after (Post Setup) applying the default history setup.
Standard General Current Num of Pts	This **read-only** field shows the total number of history points allocated to the standard group both before (Current) and after (Post Setup) applying the default history setup.

2. Select **Finish** to complete the Guided Setup. A confirmation message opens.

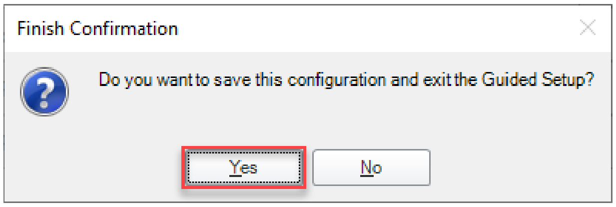
Note

A message appears if have previously sized history and the FB Series product does not have the number of history points required to perform the default history setup. If this occurs, you must first increase the number of points on the History Setup – Advanced – Standard History Sizing Tab before you perform the default history setup.

---

3. Select **Yes** to save the configuration and exit the Guided Setup.

Figure 90. Finish Confirmation



Finish Confirmation

Do you want to save this configuration and exit the Guided Setup?

4.3 Engineering Units

Use this display to configure the engineering units used by the station for measurements. You can select Set all to US/Imperial, Set all to Metric, Set all to Canadian, or configure each measurement type individually. You can also configure how many decimal places are used for each measurement value.

Conversion factors for the different engineering units are taken from the following standards:

- IEEE/ASTM SI 10-2002 - IEEE/ASTM Standard for Use of the International System of Units (SI): The Modern Metric System
- Manual of Petroleum Measurement Standards Chapter 15—Guidelines for the Use of the International System of Units (SI) in the Petroleum and Allied Industries
- ANSI/API MPMS Ch. 14.3.3/AGA Report No. 3

Note

- **FB Series products use full-resolution data for all calculations.** The **Decimal Places** fields on this display are used **only** for viewing data in FBxConnect Configuration Software.
- Fields on this display differ based on what fluid type the selected station is measuring (Natural Gas or Liquid).
- Changes to engineering units are applied to the station and all meters assigned to the selected station, even if a meter has previously been configured. Additionally, any I/O associated with the station or its meters is also updated. Refer to Configure – Summary to view which meters are assigned to each station.

Molar mass units are dependent upon the density units:

Density Unit	Molar Mass Unit
lb/ft^3	lb/lb-mol
lb/MMCF	lb/lb-mol
lb/US gal	lb/lb-mol
lb/bbl	lb/lb-mol
RD	lb/lb-mol
°API	lb/lb-mol

Density Unit	Molar Mass Unit
kg/m^3	kg/kmol
kg/L	kg/kmol
g/cc	g/mol

Joule Thomson units are dependent upon the pressure units:

Pressure Unit	Joule Thompson Unit
psi	°F/psi
kPa	K/kPa
bar	°C/bar
MPa	K/MPa
kg/cm^2	K/MPa

Acceleration units are dependent upon the linear long units:

Linear Long Unit	Acceleration Unit
ft	ft/s^2
m	m/s^2

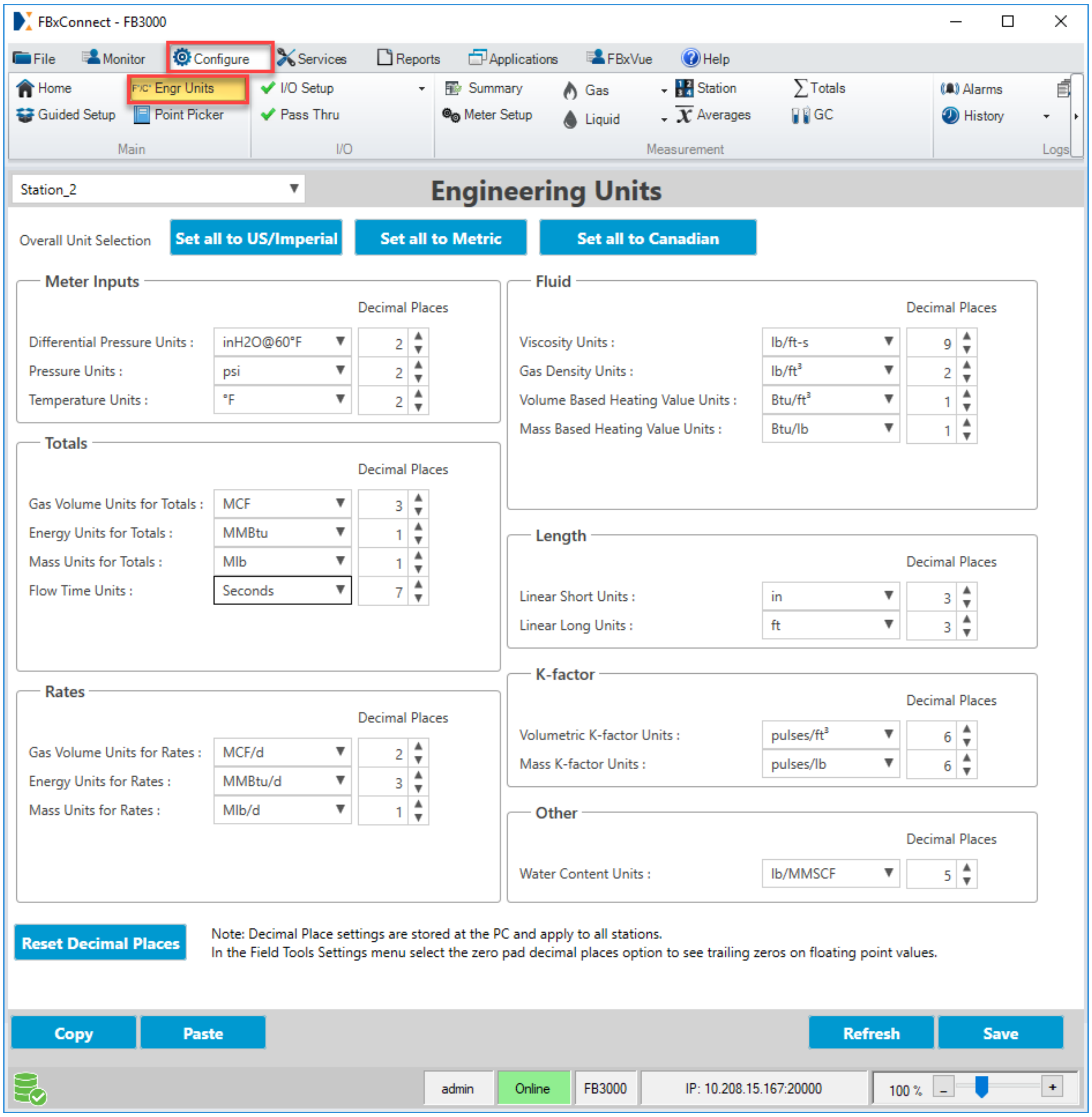
Note

The 4088B **does not** support temperature units of Kelvin.

To access this display:

1. Select **Configure > Engr Units**. from the FBxConnect™ main menu. The Engineering Units display opens:

Figure 91. Engineering Units (Gas Station shown)



Station_2

Engineering Units

Overall Unit Selection

Meter Inputs

		Decimal Places
Differential Pressure Units :	inH2O@60°F	2
Pressure Units :	psi	2
Temperature Units :	°F	2

Totals

		Decimal Places
Gas Volume Units for Totals :	MCF	3
Energy Units for Totals :	MMBtu	1
Mass Units for Totals :	Mlb	1
Flow Time Units :	Seconds	7

Rates

		Decimal Places
Gas Volume Units for Rates :	MCF/d	2
Energy Units for Rates :	MMBtu/d	3
Mass Units for Rates :	Mlb/d	1

Fluid

		Decimal Places
Viscosity Units :	lb/ft-s	9
Gas Density Units :	lb/ft³	2
Volume Based Heating Value Units :	Btu/ft³	1
Mass Based Heating Value Units :	Btu/lb	1

Length

		Decimal Places
Linear Short Units :	in	3
Linear Long Units :	ft	3

K-factor

		Decimal Places
Volumetric K-factor Units :	pulses/ft³	6
Mass K-factor Units :	pulses/lb	6

Other

		Decimal Places
Water Content Units :	lb/MMSCF	5

Note: Decimal Place settings are stored at the PC and apply to all stations.
In the Field Tools Settings menu select the zero pad decimal places option to see trailing zeros on floating point values.

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2. Click ▼ in the **Station** drop-down list to select the station to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Set all to US/Imperial	Select to automatically configure the selected station to use US/Imperial units for all measurements and calculations.
Set all to Metric	Select to automatically configure the selected station to use metric units for all measurements and calculations.

Field	Description
Set all to Canadian	Select to automatically configure the selected station to use Canadian units for all measurements and calculations.
Meter Inputs	Select ▼ to choose the measurement units used with each meter input and the number of decimal places shown in FBxConnect. Meter Inputs include differential pressure units, static pressure units, and temperature units.
Totals	Select ▼ to choose the measurement units used when calculating totals and the number of decimal places shown in FBxConnect. Totals include gas volume units, energy units, mass units, liquid volume units, water volume units, and flow time units.
Rates	Select ▼ to choose the measurement units used when displaying rates and the number of decimal places shown in FBxConnect. Rates include volume units, energy units, mass units, liquid volume units, and water volume units,
Fluid	Select ▼ to choose the measurement units used when performing fluid calculations and the number of decimal places shown in FBxConnect. Fluid properties include dynamic viscosity, density, volume-based heating value, mass-based heating value, liquid density, and water density.
Length	Select ▼ to choose the measurement units used for distance and the number of decimal places shown in FBxConnect. Length includes linear short and linear long.
K-Factor	Select ▼ to choose the measurement units used when calculating the K-factor and the number of decimal places shown in FBxConnect. K-factor includes volumetric and mass.
Other	Select ▼ to choose the measurement units used for other calculations, including water content, and the number of decimal places shown in FBxConnect.
Reset Decimal Places	Select to revert all measurement units to show the default number of decimal places in FBxConnect.

4. Select **Save** to save any changes you make to this display.

4.4 Point Picker

Use this display to view internal database parameters in the FB Series product.

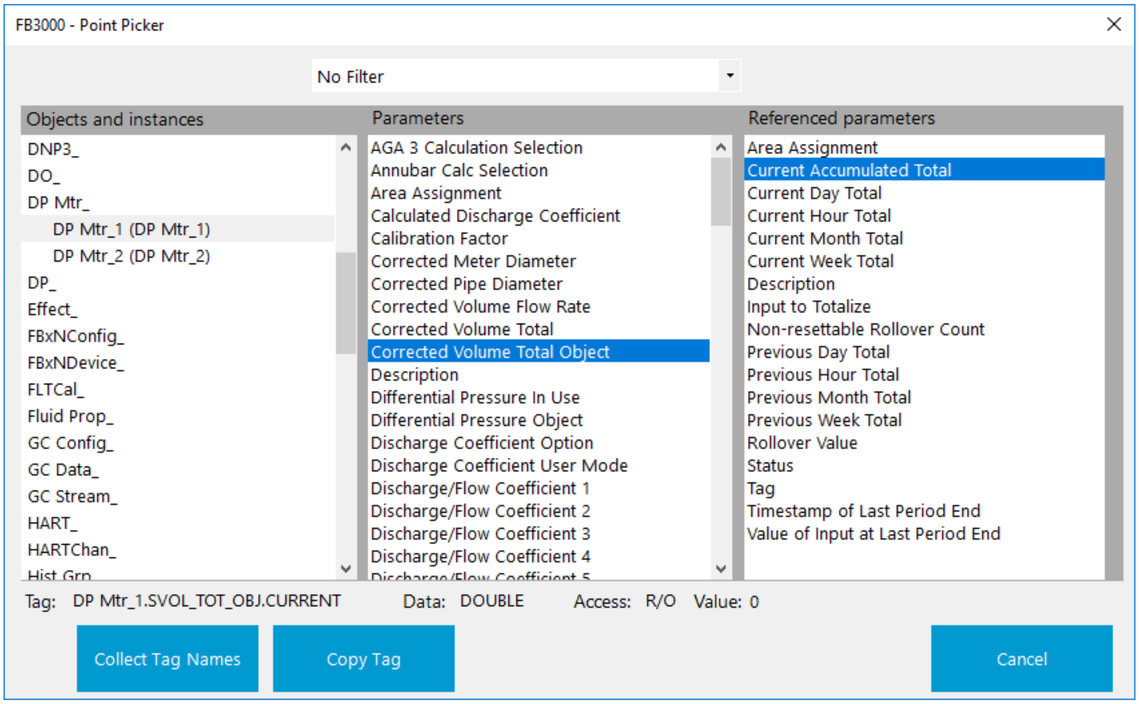
Note

Refer to User Interface – Point Picker for more information.

To access this display:

1. Select **Configure > Point Picker** from the FBxConnect™ main menu. The Point Picker dialog opens.

Figure 92. Point Picker (Parameter Reference)



No Filter

Tag: DP Mtr_1.SVOL_TOT_OBJ.CURRENT Data: DOUBLE Access: R/O Value: 0

2. Review the values in the following fields:

Field	Description
Filter	Select ▼ to change which objects and parameters are displayed. Filters may be based on object type, measurement type, or data type. **Note** Select **No Filter** to view all available Objects.

Field	Description	
Object and Instances	**Object**	A group of configuration settings and calculated or measured values related to a specific function. For example, all values associated with the device clock (second, hour, day, etc.) are part of an Object named Clock. From the first column, select the object type you wish to reference.
	Instance	There may be one or more occurrences of each type of object with its own set of configuration settings and values. Each occurrence of an object is called an instance. For example, there are multiple instances of the object named Comm, and each instance represents one of the FB Series product's communication ports. After clicking on the object you wish to reference, the available instances are displayed. Select the instance you wish to reference.
Parameter	One of the configuration settings, calculated values, or measured values that is a part of the object. Each parameter has a value as well as a set of attributes that define it, such as data type, R/W access, measurement type, units, and parameter health. After clicking on the object and instance you wish to reference, the available parameters are displayed. Select the parameter you wish to reference. **Note** This column appears **only** if you select the Point Picker for a **Parameter Reference**.	

Field	Description
Referenced Parameter	If the point picker is used to pick a parameter reference, you can pick a parameter directly from the object to which it belongs, or you can pick the parameter through an object reference in a related object. For instance, to pick a parameter to assign to an Average object, you can pick the DP Mtr_1 object and the Station Assignment parameter and then the third column displays all of the parameters that are available from the Station object that is assigned to DP Mtr_1. This is useful because even if the station assignment later changes, the Average object is always associated with DP Mtr_1. **Note** This column appears **only** if you select the Point Picker for a **Parameter Reference**.
Tag	This **read-only** field shows the name of the selected parameter.
Data	This **read-only** field shows the data type of the selected parameter. For more information, refer to Native Data Types.
Access	This **read-only** field shows the read/write access of the selected parameter.
Value	This **read-only** field shows the value of the selected parameter.
Collect Tag Names	Select this button to query the FB Series product and display any unique tag names you have assigned to individual parameters. **Note** You can perform this action at any time to reflect recent configuration changes.
Copy Tag	Select this button to copy the currently selected tag to the computer's clipboard. You can then paste the selected tag into a different application, such as FBxDesigner™.

3. Select **Close** to exit the Point Picker dialog.

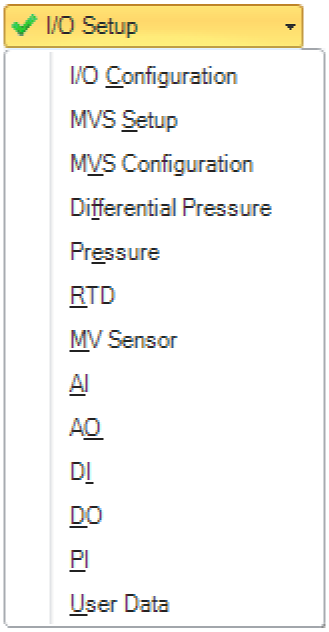
4.5 I/O Setup

The I/O Setup drop-down menu provides an interface to configure each I/O point. Each I/O type is configured using a separate display.

To access these configuration displays:

1. Select the **Configure** menu
2. Select the down arrow (▼) next to **I/O Setup**.
3. Select the I/O type you want to configure.

Figure 93. I/O Setup Drop-Down Menu



The I/O Setup drop-down menu contains the following options (depending on your hardware specifications and current configuration):

I/O Configuration – Use this display to configure the I/O type (AI/AO/DI/DO/PI) and to view module properties.

MVS Setup – Use this display to enable communications with 4088B multivariable transmitters on either COM3 or COM4 of your FB3000 RTU.

MVS Configuration – Use this display to view and configure various parameters of a multivariable sensor.

HART I/O –Use this display configure a HART® module to process input from field-based HART devices.

Differential Pressure – Use this display to view and configure general parameters associated with the differential pressure input.

Pressure – Use this display to view and configure general parameters associated with the static pressure input.

RTD – Use this display to view and configure general RTD parameters.

MV Sensor – Use this display to view multivariable sensor values and properties for both the integral sensor and 4088B.

AI – Use this display to configure the analog inputs (AI).

AO – Use this display to configure analog outputs (AO).

DI – Use this display to configure digital inputs (DI).

DO – Use this display to configure digital outputs (DO).

PI – Use this display to configure pulse inputs (PI).

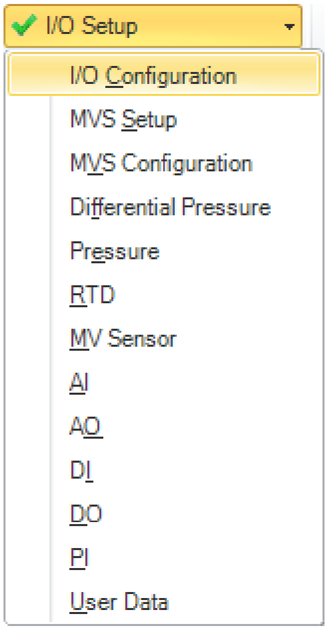
User Data – Use this display as a generic data storage area that any application can use.

4.5.1 I/O Configuration

Use the I/O Configuration display to configure the type of inputs and outputs available on your FB Series product and to view module properties.

To access this display, select **Configure > I/O Setup > I/O Configuration** from the FBxConnect™ main menu.

Figure 94. I/O Setup – I/O Configuration



The I/O Configuration display has the following tabs:

General – Use this tab to configure the type of inputs and outputs available on your FB Series product.

Properties – Use this tab to view details of the modules installed in your FB Series product, including the module type and the number of channels available on the module.

4.5.1.1 I/O Configuration – General Tab

Use the General tab on the I/O Configuration display to select what input and output types are available on your FB Series product.

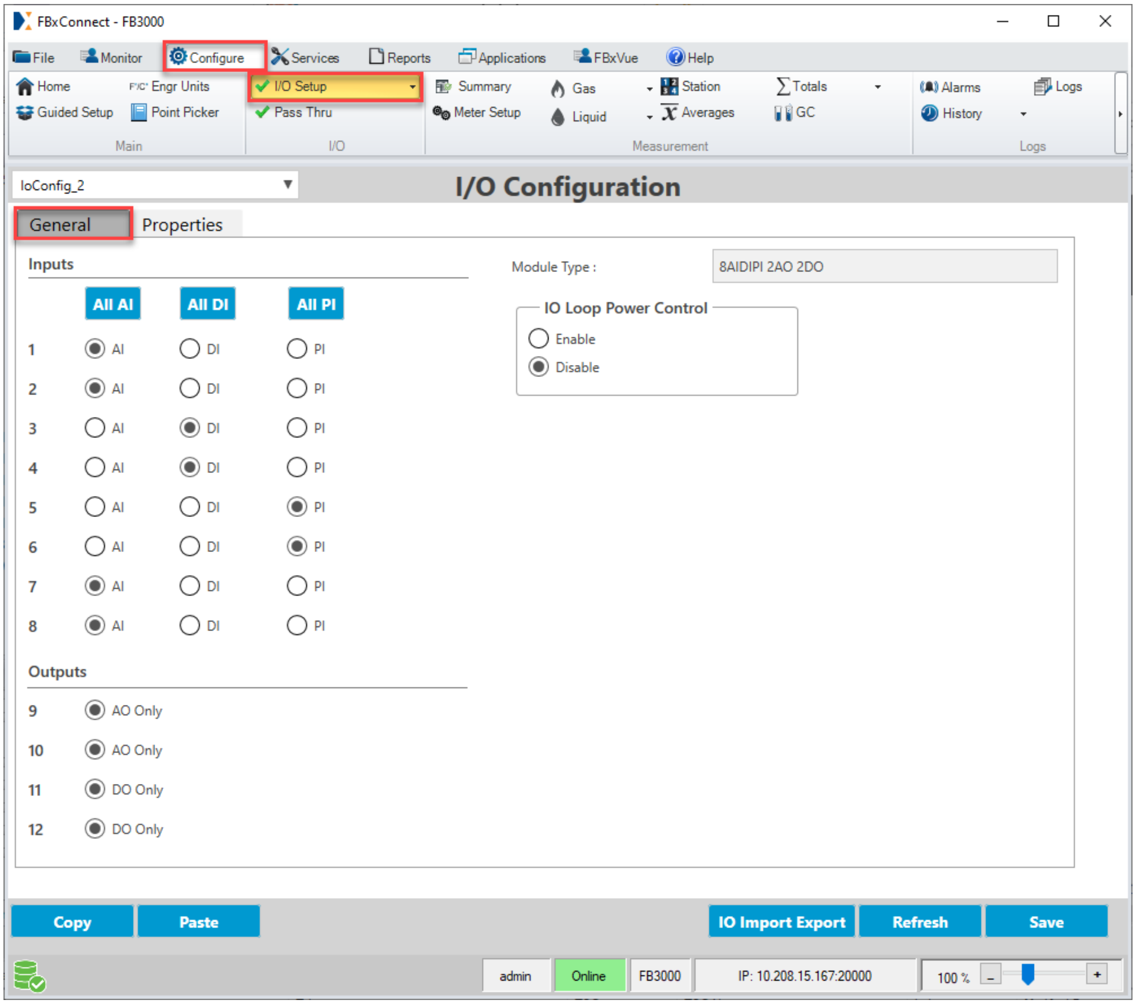
Note

A separate I/O Configuration display is available for each installed module. The amount of I/O points and available fields shown on this display varies depending on the device type and installed options.

To access this display:

1. Select **Configure > I/O Setup > I/O Configuration**. The I/O Configuration display opens showing the **General** tab.

Figure 95. I/O Configuration – General Tab



IoConfig_2

Module Type : 8AIDIPI 2AO 2DO

IO Loop Power Control
○ Enable
● Disable

Inputs

	AI	DI	PI
1	● AI	○ DI	○ PI
2	● AI	○ DI	○ PI
3	○ AI	● DI	○ PI
4	○ AI	● DI	○ PI
5	○ AI	○ DI	● PI
6	○ AI	○ DI	● PI
7	● AI	○ DI	○ PI
8	● AI	○ DI	○ PI

Outputs

9 ● AO Only
10 ● AO Only
11 ● DO Only
12 ● DO Only

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2. Click ▼ in the drop-down list at the top of the display to select a I/O module slot to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Module Type	This **read-only** field shows the I/O module type installed in the selected slot.
8AIDIPI 2AO 2DO	The 8AIDIPI 2AO 2DO module (3MIX12) provides eight input channels and four output channels. You can configure each input channel as either an analog input (AI), digital input (DI), or pulse input (PI). The output channels are comprised of two analog outputs (AO) and two digital outputs (DO).

Field	Description	
	Inputs	Sets each input channel as either an analog input, digital input, or pulse input. **Note** Select either **All AI**, **All DI**, or **All PI** to configure all input channels as either AI, DI, or PI respectively.
	Outputs	Shows the available output channels on the selected I/O module.
	IO Loop Power Control	Enables or disables the 24-Volt loop power feature.
8AODO	The 8AODO module provides eight output channels. You can configure each output channel as either an analog output (AO) or digital output (DO).	
	Outputs	Sets each output channel as either an analog output or digital output. **Note** Select **All AO** or **All DO** to set all channels as either analog outputs or digital outputs, respectively.
HART 4	The HART 4 module (HRT04) provides four input/output channels used to communicate with HART devices using the HART protocol. You can configure each channel as either an analog input (AI) or analog output (AO). A channel set as an input can be configured for use in point-to-point or multi-drop mode. A channel set as an output can be configured for use in point-to-point mode only.	
	Analog	Sets each channel as either and analog input (AI) or analog output (AO).
4 COMM Module	The 4-port serial communications module (COM04) provides additional serial communication channels beyond those available on the CPU module. **Note** To make configuration changes to this module, refer to Communications – General.	

Field	Description
I/O Import Export	Select this button to import a CSV file containing a new I/O configuration or export you current I/O configuration to a CSV file. For more information, refer to Importing I/O Configuration CSV Files, Exporting I/O Configuration CSV Files, and Creating I/O Configuration CSV Files.

4. Select **Save** to save any changes you make to this display.

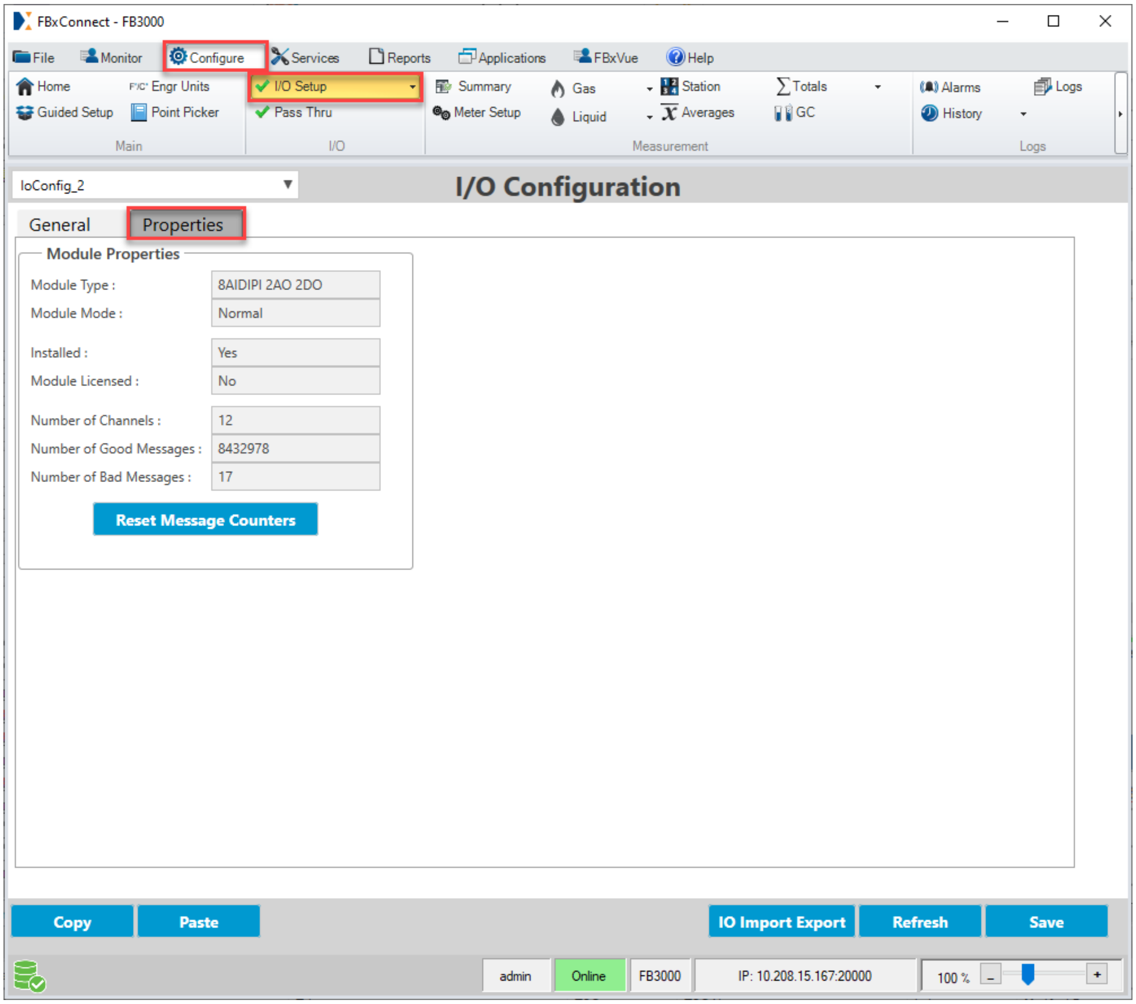
4.5.1.2 I/O Configuration – Properties Tab

Use this tab to view details of the modules installed in your FB Series product, including the module type and the number of channels available on the module. You can also reset the message counters of each module.

To access this tab:

1. Select **Configure > I/O Setup > I/O Configuration**. The I/O Configuration display opens.
2. Click ▼ in the drop-down list at the top of the display to select a I/O module slot to configure.
3. Select the **Properties** tab.

Figure 96. I/O Configuration – Properties Tab



IoConfig_2

I/O Configuration

Module Properties

Module Type : 8AIDIPI 2AO 2DO
Module Mode : Normal
Installed : Yes
Module Licensed : No
Number of Channels : 12
Number of Good Messages : 8432978
Number of Bad Messages : 17

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4. Review – and change as necessary – the values in the following fields:

Field	Description	
Module Type	This **read-only** field shows the kind of module installed in the FB Series product.	
Module Mode	This **read-only** field shows the operational status of the module. Possible statuses are:	
	Not Installed	No module is installed in the selected module slot.
	Boot	The selected module is operating in startup mode (boot), and will not function properly until the module firmware is loaded.
	Normal	The selected module is operating as expected.

Field	Description
	Not Licensed No license for the selected module exists on the FB Series product. The module will not run.
	Communication Failure The selected module slot is known to contain a module, but the module is no longer communicating with the main CPU module.
	Module Failure The selected module has failed and requires service.
	Termination Missing The selected module slot does not contain the required termination module.
	Firmware Mismatch The CPU firmware version and the module firmware version are not compatible. Firmware for one (or both) module must be upgraded.
	Note For CPU firmware version 2.1 or lower, the Module Mode field toggles between **Normal**, **Communication Failure**, and **Boot** if the CPU firmware version **does not** match with the I/O module firmware version.
Installed	This **read-only** field shows the installation status of the module.
Module Licensed	This **read-only** field shows if a license is present in the FB Series product for the module.
Number of Channels	This **read-only** field shows the number of channels present on the module.
Number of Good Messages	This **read-only** field shows the number of messages successfully received by the module.
Number of Bad Messages	This **read-only** field shows the number of messages that failed to be received by the module.
Reset Message Counters	Click to reset to zero the number of good and the number of bad messages. **Note** Each Reset Message Counters button affects **only** the selected module.

Field	Description
I/O Import Export	Select this button to import a CSV file containing a new I/O configuration or export you current I/O configuration to a CSV file. For more information, refer to Importing I/O Configuration CSV Files, Exporting I/O Configuration CSV Files, and Creating I/O Configuration CSV Files.

5. Select **Save** to save any changes you make to this tab.

4.5.1.3 IO Import Export

Use this pop-up display to import or export CSV files that contain the I/O configuration for your FB Series product. The FB Series product uses one CSV file that contains information about all modules in the configuration (module type, rack location, and channel information) and separate CSV files that contain the configuration information for each I/O type (analog inputs, analog outputs, digital inputs, digital outputs, and pulse inputs).

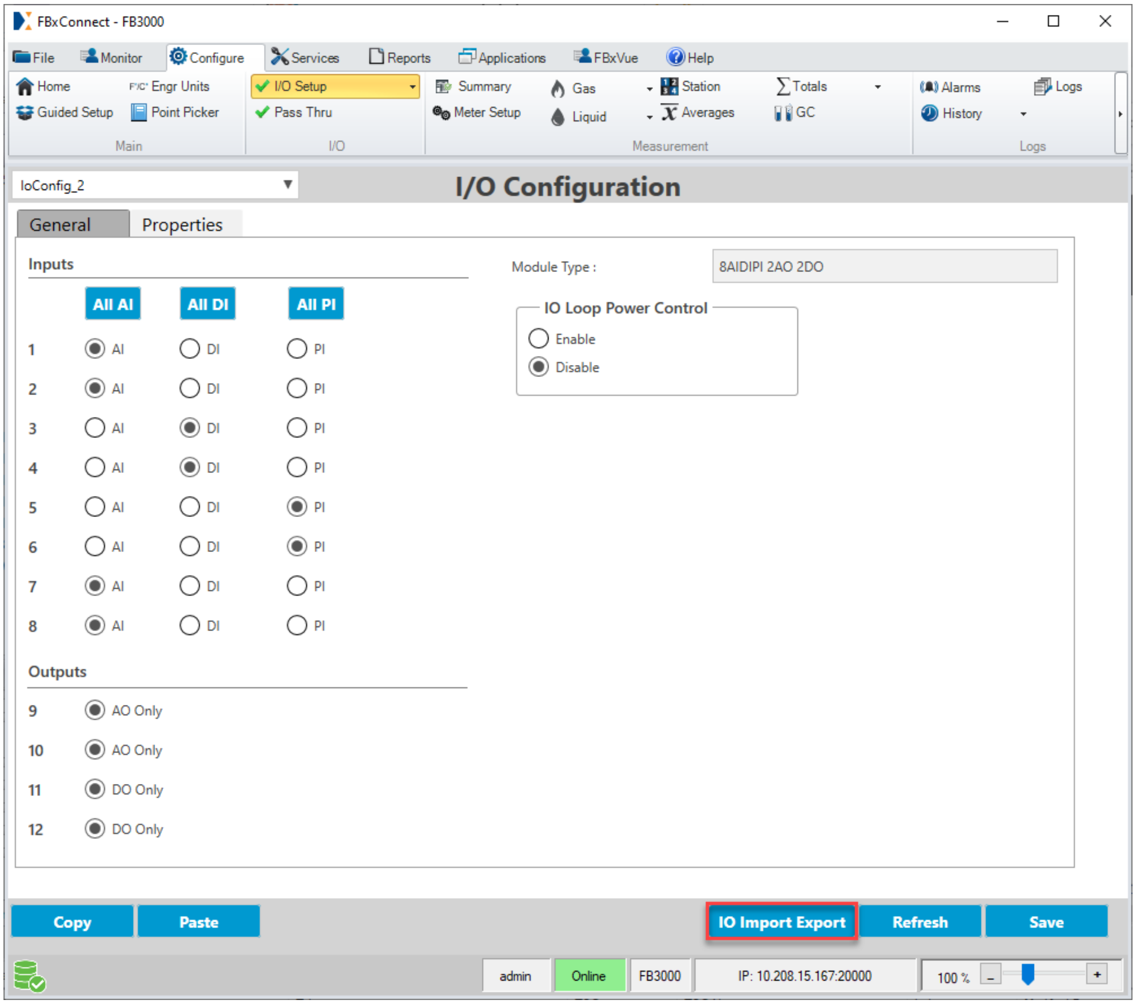
Note

For more information about creating your own I/O configuration CSV file, refer to Creating I/O Configuration CSV Files.

To access this pop-up display:

1. Select **Configure > I/O Setup > I/O Configuration**. The I/O Configuration display opens.

Figure 97. IO Import Export



ioConfig_2

Inputs

1 ● AI ○ DI ○ PI
2 ● AI ○ DI ○ PI
3 ○ AI ● DI ○ PI
4 ○ AI ● DI ○ PI
5 ○ AI ○ DI ● PI
6 ○ AI ○ DI ● PI
7 ● AI ○ DI ○ PI
8 ● AI ○ DI ○ PI

Outputs

9 ● AO Only
10 ● AO Only
11 ● DO Only
12 ● DO Only

Module Type : 8AIDIPI 2AO 2DO

IO Loop Power Control
○ Enable
● Disable

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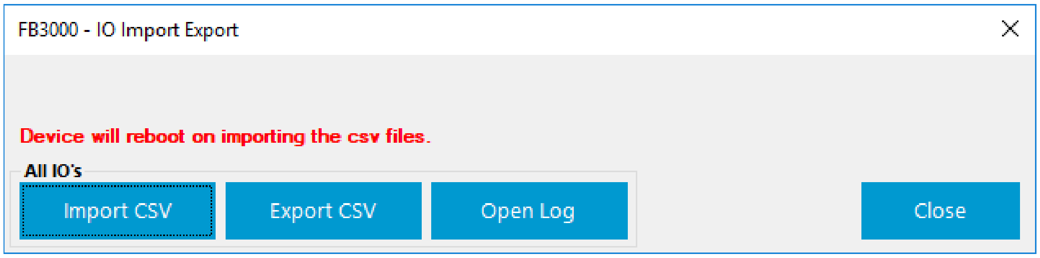
2. Select the **IO Import Export** button. The IO Import Export pop-up display opens.

Figure 98. IO Import Export



Device will reboot on importing the csv files.

3. Use the buttons on this display to perform the following actions:

Field	Description
Import CSV	Click to import a CSV file into your FB Series product that contains your desired I/O configuration. Navigate to the folder location that contains the CSV files and select **OK** to start the import process. For more information, refer to Importing I/O Configuration CSV Files. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found.
Export CSV	Click to save CSV files to your computer that contains the current I/O configuration of your FB Series product. A Select Table dialog opens where you can select which I/O modules and which I/O types to include in the export. Click **Start**, navigate to a folder on your computer where the CSV files will be saved, and click **OK** to begin the export process. For more information, refer to Exporting I/O Configuration CSV Files.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.

4. Select **Close** to exit the pop-up display.

4.5.1.3.1 Importing I/O Configuration CSV Files

You can import CSV files that contain the I/O configuration for your FB Series product. The FB Series product uses one CSV file that contains information about all modules in the configuration (module type, rack location, and channel information) and separate CSV files that contain the configuration information for each I/O type (analog inputs, analog outputs, digital inputs, digital outputs, and pulse inputs).

Note

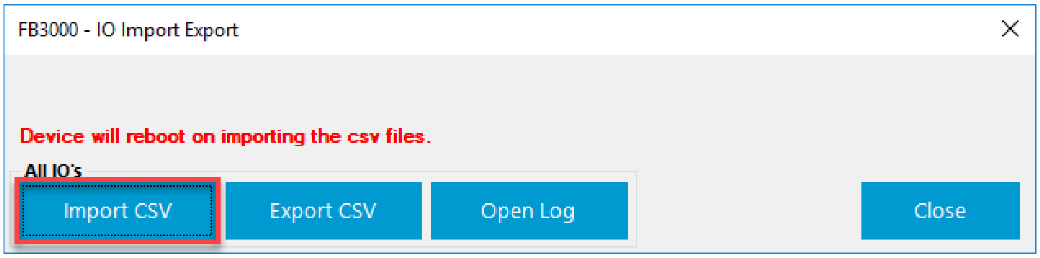
- For more information about creating your own I/O configuration CSV file, refer to Creating I/O Configuration CSV Files.
- For more information about exporting a CSV file that contains the FB Series product's current I/O configuration, refer to Exporting I/O Configuration CSV Files.

- If you want to remove a previously imported I/O configuration, perform a Cold Start and select **Database is re-initialized with factory defaults**.

To import I/O Configuration CSV files:

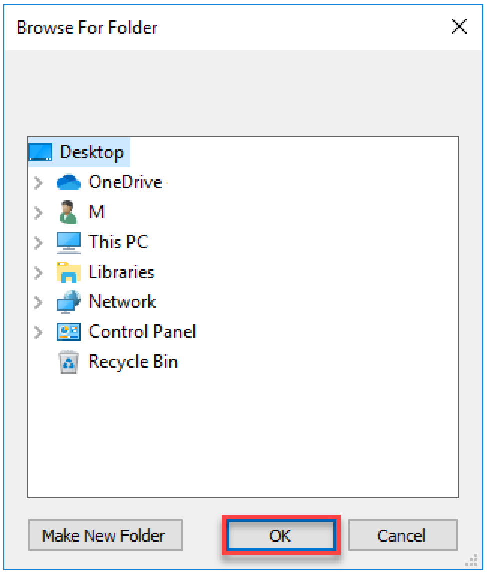
1. Select **Configure > I/O Setup > I/O Configuration**. The I/O Configuration display opens.
2. Select the **IO Import Export** button. The IO Import Export pop-up display opens.

Figure 99. IO Import Export



3. Select the **Import CSV** button.

Figure 100. Browse For Folder

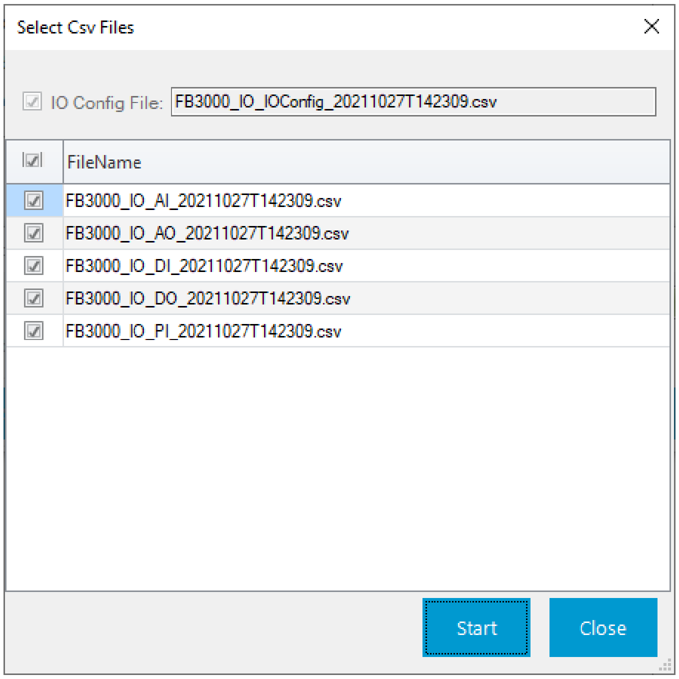


4. Navigate to the folder with your I/O configuration CSV files and select **OK**. The Select CSV File display opens showing the available I/O configuration CSV files in the selected folder.

Note

In order to successfully import any I/O Configuration CSV files, the folder you select **must** include one I/O Config CSV file and no more than one CSV file for each I/O type (analog inputs, analog outputs, digital inputs, digital outputs, and pulse inputs).

Figure 101. Select CSV Files


Select Csv Files

☑ IO Config File: FB3000_IO_IOConfig_20211027T142309.csv

☑	FileName
☑	FB3000_IO_AI_20211027T142309.csv
☑	FB3000_IO_AO_20211027T142309.csv
☑	FB3000_IO_DI_20211027T142309.csv
☑	FB3000_IO_DO_20211027T142309.csv
☑	FB3000_IO_PI_20211027T142309.csv

5. Place a check mark next to the CSV files you want to import.

Note

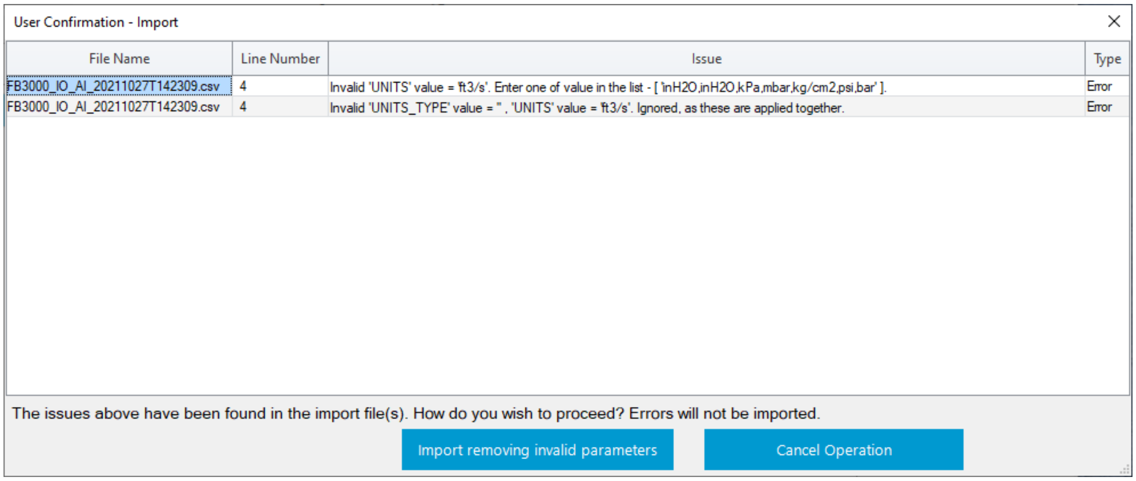
The IO Config File is **always** selected.

6. Select **Start** to import the selected files. The files are downloaded, the FB Series product performs a warm start, and a confirmation message opens.

Note

- The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

Figure 102. Example Import I/O Errors



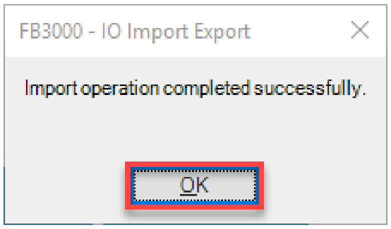
File Name	Line Number	Issue	Type
FB3000_IO_AI_20211027T142309.csv	4	Invalid 'UNITS' value = 'ft3/s'. Enter one of value in the list - ['inH2O,inH2O,kPa,mbar,kg/cm2,psi,bar'].	Error
FB3000_IO_AI_20211027T142309.csv	4	Invalid 'UNITS_TYPE' value = '' , 'UNITS' value = 'ft3/s'. Ignored, as these are applied together.	Error

The issues above have been found in the import file(s). How do you wish to proceed? Errors will not be imported.

- **Low Reading EU** and **High Reading EU** values are **not** imported for online devices with **AI** channels where the **EU Scaling Mode** is set to **Multi-Point Calibration**.

7. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Figure 103. Import Successful



Import operation completed successfully.

4.5.1.3.2 Exporting I/O Configuration CSV Files

You can export the current I/O configuration of your FB Series product as CSV file saved to your computer. You can then modify the files on your computer or import them into another device. The FB Series product uses one CSV file that contains information about all modules in the configuration (module type, rack location, and channel information) and separate CSV files that contain the configuration information for each I/O type (analog inputs, analog outputs, digital inputs, digital outputs, and pulse inputs).

Note

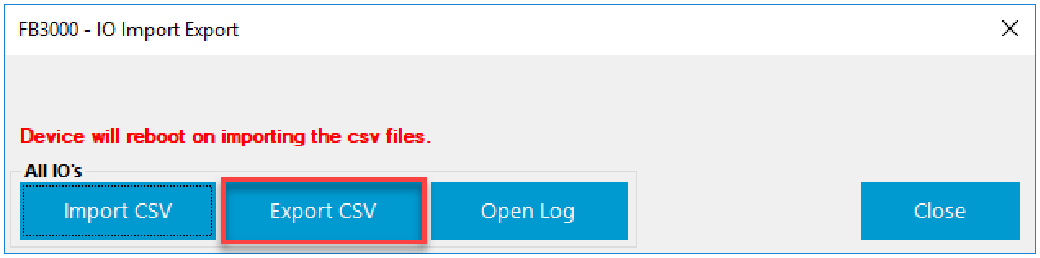
- For more information about creating your own I/O configuration CSV file, refer to Creating I/O Configuration CSV Files.

- For more information about importing a CSV file that contains the FB Series product's current I/O configuration, refer to Importing I/O Configuration CSV Files.

To export I/O Configuration CSV files:

1. Select **Configure > I/O Setup > I/O Configuration**. The I/O Configuration display opens.
2. Select the **IO Import Export** button. The IO Import Export pop-up display opens.

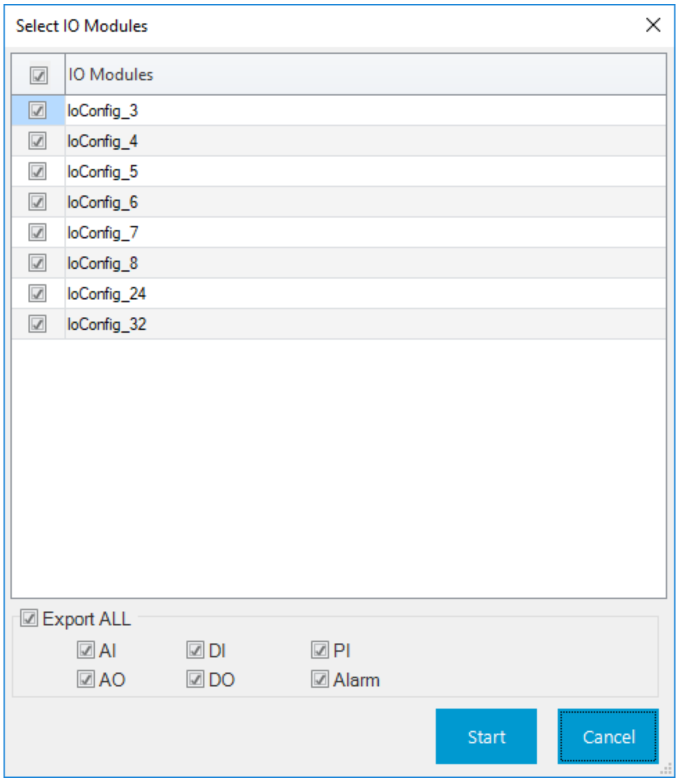
Figure 104. IO Import Export



Device will reboot on importing the csv files.

3. Select the **Export CSV** button. The Select Table pop-up display opens.

Figure 105. Select Table



☑	IO Modules
☑	IoConfig_3
☑	IoConfig_4
☑	IoConfig_5
☑	IoConfig_6
☑	IoConfig_7
☑	IoConfig_8
☑	IoConfig_24
☑	IoConfig_32

☑ Export ALL
☑ AI ☑ DI ☑ PI
☑ AO ☑ DO ☑ Alarm

4. Place a check mark next to each module slot whose configuration you want to export.

Note

A single CSV file is created for all selected modules.

---

5. Place a check mark next to each I/O type (**Export ALL**, **AI**, **AO**, **DI**, and/or **DO**) whose configuration you want to export.

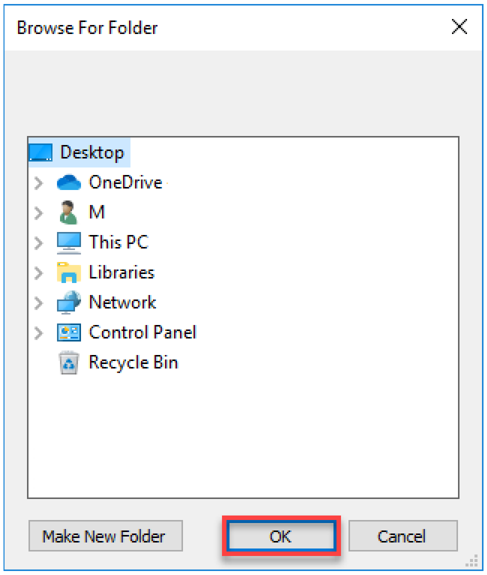
Note

Separate CSV files are created for each selected I/O type.

---

6. Place a check mark next to **Alarm** if you want to include alarm configuration data in the CSV files for each selected I/O type.
7. Select **Start**. A Browse For Folder windows opens.

Figure 106. Browse For Folder



---

8. Navigate to the folder where the I/O configuration CSV files will be saved and Select **OK** to begin the export process.

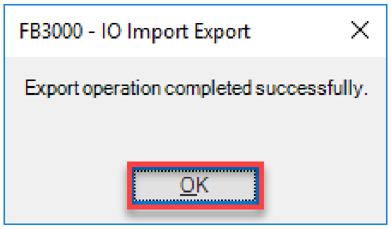
Note

Each time you export I/O configuration CSV files, save the files to a unique folder that **does not** contain any other I/O configuration CSV files.

---

9. When the process completes, a confirmation dialog opens. Select **OK**.

Figure 107. Confirmation



FB3000 - IO Import Export

Export operation completed successfully.

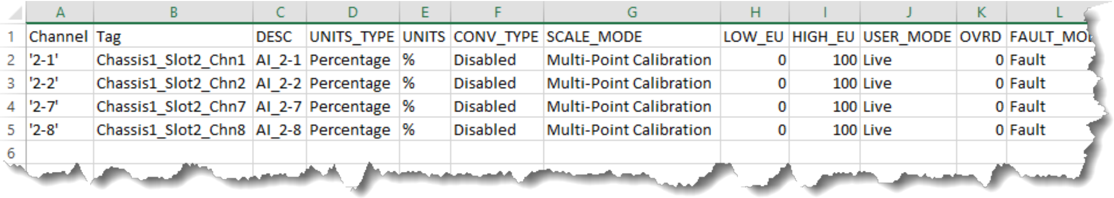
4.5.1.3.3 Creating I/O Configuration CSV Files

You can create a CSV file that contains your I/O configuration on your computer and then import the CSV file for use in the FB Series product. If your I/O configuration contains a large number of channels, it may be easier to create a CSV file on your computer than it is to configure each I/O channel individually in FBxConnect. The FB Series product uses one CSV file that contains information about all modules in the configuration (module type, rack location, and channel information) and separate CSV files that contain the configuration information for each I/O type (analog inputs, analog outputs, digital inputs, digital outputs, and pulse inputs).

Note

- The system automatically corrects for incorrect capitalization and missing special characters, such as the degree symbol (°) and superscripts (³), in the created I/O configuration CSV files. This means you can enter **F** or **C** without the degrees symbol in the I/O configuration CSV file and the system automatically corrects the entry to **°F** or **°C**, and you can enter **KG/M3** or **mpa(a)** and the system automatically corrects the entry to **kg/m³** or **MPa(a)**.
- The easiest way to begin creating a custom map is to export I/O configuration CSV files that contain the current configuration and then edit that file. For more information about exporting a I/O Configuration CSV files, refer to Exporting I/O Configuration CSV Files.

Figure 108. Example Analog Input Configuration CSV Format



	A	B	C	D	E	F	G	H	I	J	K	L
1	Channel	Tag	DESC	UNITS_TYPE	UNITS	CONV_TYPE	SCALE_MODE	LOW_EU	HIGH_EU	USER_MODE	OVRD	FAULT_MO
2	'2-1'	Chassis1_Slot2_Chn1	AI_2-1	Percentage	%	Disabled	Multi-Point Calibration	0	100	Live	0	Fault
3	'2-2'	Chassis1_Slot2_Chn2	AI_2-2	Percentage	%	Disabled	Multi-Point Calibration	0	100	Live	0	Fault
4	'2-7'	Chassis1_Slot2_Chn7	AI_2-7	Percentage	%	Disabled	Multi-Point Calibration	0	100	Live	0	Fault
5	'2-8'	Chassis1_Slot2_Chn8	AI_2-8	Percentage	%	Disabled	Multi-Point Calibration	0	100	Live	0	Fault
6												

To create CSV files that contain your I/O configuration:

1. Open a blank spreadsheet (or open a previously exported I/O configuration CSV file).
2. Review – and change as necessary – the values for each CSV file according to the tables below (I/O Configuration CSV File Format, Analog Input CSV File Format, Analog Output CSV File Format, Digital Input CSV File Format, Digital Output CSV File Format, and Pulse Input CSV File Format):

I/O Configuration CSV File Format

The I/O configuration CSV file contains information for all I/O modules in the configuration, including the module type, installation location, and IO type configuration for each channel. Each row corresponds to a different channel on the module.

Note

- All columns **must** be present in the I/O Configuration CSV file.
- The I/O configuration CSV file **must** include **_IOConfig_** in the file name in order to be successfully imported.
- The system ignores any invalid lines in the CSV file and data currently in the FB Series device is maintained.

Column Heading	Description
Channel	Rack position of the module and channel number.
Card Type	Identifies the type of I/O module installed. Possible options are: • 8AIDIPI 2AI 2DO • HART 4
Selected IO Type	Sets the input or output type for the selected channel. Possible options are: **8AIDIPI 2A0 2DO Module** Channels 1 through 8 • AI • DI • PI Channels 9 and 10 • AO

Column Heading	Description
	Channels 11 and 12 • DO **8AODO Module** Channels 1 through 8 • AO • DO **HART 4 Module** Channels 1 through 4 • AI • AO

Analog Input CSV File Format

The analog input CSV file contains

Note

- The **Channel** column **must** be present in the Analog Input CSV file. All other columns are optional.
- The I/O configuration CSV file **must** include **_AI_** in the file name in order to be successfully imported.

Column Heading	Description
Channel	Rack position of the module and channel number.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
DESC	Sets a description (up to 20-alphanumeric characters) for the selected channel.

Column Heading	Description
UNITS_TYPE	Sets the measurement type used for the selected channel. Possible options are: • Unitless • Absolute Pressure • Temperature • Gas Density • Volume Heating Value • Dynamic Viscosity • Linear (Short) • Linear (Long) • Gas Volume Rate • Mass Rate • Energy Rate • Current • Voltage • Percentage • Acceleration • Water Content • Resistance • Differential Pressure • Gauge Pressure • Mass Heating Value • Liquid Density • Water Density • Liquid Volume • Water Volume • Liquid Rate • Water Rate • Relative Density **Note** If you populate this column, you must also populate the **UNITS** column.

UNITS	Sets the engineering units used for the selected channel. Options change based the selected UNITS_TYPE option. Possible options are: **Unitless** • N/A **Absolute Pressure** • psi(a) • kPa(a) • MPa(a) • bar(a) • kg/cm^2(a) **Temperature** • °F • °C • K **Gas Density** • lb/ft^3 • kg/m^3 • g/cc • lb/MMCF • lb/US gal • kg/L • lb/bbl • RD(liq) • °API **Volume Heating Value** • Btu/ft^3 • MJ/m^3 **Dynamic Viscosity** • cP • lb/ft-s **Linear (Short)** • in • mm

Linear (Long)

- ft
- m

Gas Volume Rate

- ft^3/s
- ft^3/min
- ft^3/h
- ft^3/d
- MCF/s
- MCF/min
- MCF/f
- MCF/d
- m^3/s
- m^3/min
- m^3/h
- m^3/d
- $(k)m^3/s$
- $(k)m^3/min$
- $(k)m^3/h$
- $(k)m^3/d$
- MMCF/s
- MMCF/min
- MMCF/h
- MMCF/d
- BCF/s
- BCF/min
- BCF/h
- BCF/d
- L/s
- L/min
- L/h
- L/d
- US gal/s
- US gal/min

- US gal/h
- US gal/d
- bbl/s
- bbl/min
- bbl/h
- bbl/d

Mass Rate

- lb/s
- lb/min
- lb/h
- lb/d
- Mlb
- kg/s
- kg/min
- kg/h
- kg/d
- tonne/s
- tonne/min
- tonne/h
- tonne/d
- ton/s
- ton/min
- ton/h
- ton/d

Energy Rate

- Btu/s
- Btu/min
- Btu/h
- Btu/d
- MMBtu/s
- MMBtu/min
- MMBtu/h
- MMBtu/d
- J/s

- J/min
- J/h
- J/d
- MJ/s
- MJ/min
- MJ/h
- MJ/d
- GJ/s
- GJ/min
- GJ/h
- GJ/d
- Dth/s
- Dth/min
- Dth/h
- Dth/d
- TJ/s
- TJ/min
- TJ/h
- TJ/d
- PJ/s
- PJ/min
- PJ/h
- PJ/d

Current

- mA
- A

Voltage

- V
- kV

Percentage

- %
- ppm

Acceleration

- ft/s^2

- m/s^2

Water Content

- lb/MMSCF
- kg/(k)m^3

Resistance

- ohms

Differential Pressure

- inH2O@60°F
- inH2O@68°F
- kPa
- mbar
- kg/cm^2
- psi
- bar

Gauge Pressure

- psi(g)
- kPa(g)
- MPa(g)
- bar(g)
- kg/cm^2(g)

Mass Heating Value

- Btu/lb
- MJ/kg

Liquid Density

- lb/ft^3
- kg/m^3
- g/cc
- lb/MMCF
- lb/US gal
- kg/L
- lb/bbl
- RD
- °API

Water Density

- lb/ft^3
- kg/m^3
- g/cc
- lb/MMCF
- lb/US gal
- kg/L
- lb/bbl
- RD
- °API

Liquid Volume

- ft^3
- m^3
- MCF
- (k)m^3
- MMCF
- BCF
- L
- US gal
- bbl

Water Volume

- ft^3
- m^3
- MCF
- (k)m^3
- MMCF
- BCF
- L
- US gal
- bbl

Liquid Rate

- ft^3/s
- ft^3/min
- ft^3/h

- ft^3/d
- MCF/s
- MCF/min
- MCF/h
- MCF/d
- m^3/s
- m^3/min
- m^3/h
- m^3/d
- (k)m^3/s
- (k)m^3/min
- (k)m^3/h
- (k)m^3/d
- MMCF/s
- MMCF/min
- MMCF/h
- MMCF/d
- BCF/s
- BCF/min
- BCF/h
- BCF/d
- L/s
- L/min
- L/h
- L/d
- US gal/s
- US gal/min
- US gal/h
- US gal/d
- bbl/s
- bbl/min
- bbl/h
- bbl/d

Water Rate

- ft^3/s
- ft^3/min
- ft^3/h
- ft^3/d
- MCF/s
- MCF/min
- MCF/h
- MCF/d
- m^3/s
- m^3/min
- m^3/h
- m^3/d
- (k)m^3/s
- (k)m^3/min
- (k)m^3/h
- (k)m^3/d
- MMCF/s
- MMCF/min
- MMCF/h
- MMCF/d
- BCF/s
- BCF/min
- BCF/h
- BCF/d
- L/s
- L/min
- L/h
- L/d
- US gal/s
- US gal/min
- US gal/h
- US gal/d
- bbl/s
- bbl/min

Column Heading	Description
	• bbl/h • bbl/d **Relative Density** • RD **Note** If you populate this column, you must also populate the **UNITS_TYPE** column.
CONV_TYPE	Sets if the channel measures either current input, voltage input or is disabled. Possible options are: • **Current –** The channel measure current. • **Voltage** – The channel measures voltage. • **Disabled –** The channel is disabled. For channels on a **HART module**, the **only** available options are **Disabled** and **Current**.
SCALE_MODE	Specifies how the EU scaling parameters are determined. Possible options are: • **Multi-Point Calibration –** EU scaling parameters are determined by the calibration. You cannot modify the EU scaling parameters (Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent) directly. You must use the calibration wizard to adjust the scaling of the AI. **Note** If you download a configuration file that has Multi-Point Calibration selected, the calibration on your device remains unchanged. • **EU Scaling –** EU scaling parameters are determined by the values you enter in the Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent fields. **Note** If you download a configuration file that has EU Scaling selected, the existing calibration on your device is overwritten using the EU scaling parameters.

Column Heading	Description
LOW_EU	Sets the low reading (in engineering units) that is equal to zero percent input. For example, if a temperature transmitter is connected to the analog input with a range of –40 to 160 degrees F, the Low field would be set to –40. **Note** If you enter a value in this column, you **must** also populate the **CONV_TYPE** column with either **Voltage** or **Current** and the **SCALE_MODE** column with **EU Scaling**.
HIGH_EU	Sets the high reading (in engineering units) that is equal to 100 percent input. For example, if a temperature transmitter is connected to the analog input with a range of – 40 to 160 degrees F, the High field would be set to 160. **Note** If you enter a value in this column, you **must** also populate the **CONV_TYPE** column with either **Voltage** or **Current** and the **SCALE_MODE** column with **EU Scaling**.
USER_MODE	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are: • **Live –** The system copies the Live Value to the Selected Value parameter. • **Override –** The system copies the value set in the Override Value (OVRD) field to the Selected Value parameter. **Note** If a fault occurs and the **operation mode** (USER_MODE) is set to **Override**, the Selected Value parameter is set to the **Override Value** (OVRD) and is not set based on the Fault Mode.
OVRD	Sets the value (in engineering units) written to the Selected Value field when the Operation Mode is set to Override.
FAULT_MODE	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs. Possible options are: • **Fault –** The system copies the value set in the Fault Value field to the Selected Value parameter. • **Last Good –** The system copies the value of the Last Good Value field to the Selected Value parameter.

Column Heading	Description
FAULT	Sets the value (in engineering units) that is written to the Selected Value parameter when a fault occurs on the selected sensor and the Fault Mode is set to Fault.
CLIP_MODE	Sets if clipping occurs on the selected input. Clipping forces the Selected Value to stay within a range defined by the Low Clipping Limit and High Clipping Limit. Clipping is only applied when there is not a fault. Possible options are: • **Enable** – Clipping does occur. **Note** You must enter a value in the **CLIP_LOW_LIMIT** and **CLIP_HIGH_LIMIT** fields. • **Disable** – Clipping does not occur.
CLIP_LOW_LIMIT	When clipping (CLIP_MODE) is enabled, sets the lower limit of the Selected Value parameter.
CLIP_HIGH_LIMIT	When clipping (CLIP_MODE) is enabled, sets the upper limit of the Selected Value parameter.
DAMPING_FACTOR	Sets a time (in seconds) used to dampen the reading of the AI. Small fluctuations can occur with every reading. The damping time is used to give a value that is less prone to those fluctuations, based on the value previous read. A value of 0.0 will disable damping.
AVG_PERIOD	When the **Operation Mode** (USER_MODE) is set to **Live**, this field defines the period of time (in seconds) over which the Live Value will be averaged before it is written to the Selected Value.
Alarm Tag	Set an identifier (up to 20-alphanumeric characters) for the selected instance.
ALM_DESC	Set a description (up to 20-alphanumeric characters) for the selected instance.
HIHI_ENB	Sets if the system monitors the point for the specified the High High alarm limit (HIHI_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit. • **Disable** – the system ignores the specified alarm limit.

Column Heading	Description
HIHI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High High alarm.
HI_ENB	Sets if the system monitors the point for the specified the High alarm limit (HI_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit. • **Disable** – The system ignores the specified alarm limit.
HI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High alarm.
LO_ENB	Sets if the system monitors the point for the specified the Lo alarm limit (LO_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit. • **Disable** – The system ignores the specified alarm limit.
LO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low alarm.
LOLO_ENB	Sets if the system monitors the point for the specified the High alarm limit (LOLO_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit. • **Disable** – The system ignores the specified alarm limit.
LOLO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low Low alarm.
PF_ENB	Sets if an alarm is raised on a point failure. Possible options are: • **Enable** – An alarm is raised if the selected channel reports a point failure. • **Disable** – No alarm is raised if the selected channel reports a point failure.
DEADBAND	Sets the value (in engineering units) that is an inactive zone above the low alarm and below the high alarm.

Column Heading	Description
ROC_MODE	Use this section to configure alarming based on the speed of variability in the value of the alarm input. Possible options are: • **Disabled –** The system does not monitor the input for rate of change alarming. • **Alarm on Positive Changes –** An alarm is raised if the value increases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). • **Alarm on Negative Changes –** An alarm is raised if the value decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). • **Alarm on Both –** An alarm is raised if the value increases or decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM).
ROC_LIM	Sets a limit value (in engineering units) to which the input must rise or fall during the configured time period to generate an alarm.
ROC_TM	Sets the time duration (in seconds) that the system uses to determine the Rate of Change for an input.

Analog Output CSV File Format

The analog output CSV file contains information for all I/O modules in the configuration, including the module type, installation location, and IO type configuration for each channel.

Note

- The **Channel** column **must** be present in the Analog Output CSV file. All other columns are optional.
- The I/O configuration CSV file **must** include **_AO_** in the file name in order to be successfully imported.

Column Heading	Description
Channel	Rack position of the module and channel number.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
DESC	Sets a description (up to 20-alphanumeric characters) for the selected channel.
UNITS_TYPE	Sets the measurement type used for the selected channel. Possible options are: • Unitless • Absolute Pressure • Temperature • Gas Density • Volume Heating Value • Dynamic Viscosity • Linear (Short) • Linear (Long) • Gas Volume Rate • Mass Rate • Energy Rate • Current • Voltage • Percentage • Acceleration • Resistance • Differential Pressure • Gauge Pressure • Mass Heating Value • Liquid Density • Water Density • Liquid Volume • Water Volume • Liquid Rate • Water Rate • Relative Density

Column Heading	Description
	Note If you populate this column, you **must** also populate the **UNITS** column.
UNITS	Sets the engineering units used for the selected channel. Possible options are: **Unitless** • N/A **Absolute Pressure** • psi(a) • kPa(a) • MPa(a) • bar(a) • kg/cm^2(a) **Temperature** • °F • °C • K **Gas Density** • lb/ft^3 • kg/m^3 • g/cc • lb/MMCF • lb/US gal • kg/L • lb/bbl • RD(liq) • °API **Volume Heating Value** • Btu/ft^3 • MJ/m^3 **Dynamic Viscosity** • cP • lb/ft-s

Column Heading	Description
	Linear (Short) • in • mm **Linear (Long)** • ft • m **Gas Volume Rate** • ft^3/s • ft^3/min • ft^3/h • ft^3/d • MCF/s • MCF/min • MCF/f • MCF/d • m^3/s • m^3/min • m^3/h • m^3/d • (k)m^3/s • (k)m^3/min • (k)m^3/h • (k)m^3/d • MMCF/s • MMCF/min • MMCF/h • MMCF/d • BCF/s • BCF/min • BCF/h • BCF/d • L/s • L/min

Column Heading	Description
	• L/h • L/d • US gal/s • US gal/min • US gal/h • US gal/d • bbl/s • bbl/min • bbl/h • bbl/d **Mass Rate** • lb/s • lb/min • lb/h • lb/d • Mlb • kg/s • kg/min • kg/h • kg/d • tonne/s • tonne/min • tonne/h • tonne/d • ton/s • ton/min • ton/h • ton/d **Energy Rate** • Btu/s • Btu/min • Btu/h • Btu/d

Column Heading	Description
	• MMBtu/s • MMBtu/min • MMBtu/h • MMBtu/d • J/s • J/min • J/h • J/d • MJ/s • MJ/min • MJ/h • MJ/d • GJ/s • GJ/min • GJ/h • GJ/d • Dth/s • Dth/min • Dth/h • Dth/d • TJ/s • TJ/min • TJ/h • TJ/d • PJ/s • PJ/min • PJ/h • PJ/d **Current** • mA • A **Voltage** • V

Column Heading	Description
	• kV **Percentage** • % • ppm **Acceleration** • ft/s^2 • m/s^2 **Resistance** • ohms **Differential Pressure** • inH2O@60°F • inH2O@68°F • kPa • mbar • kg/cm^2 • psi • bar **Gauge Pressure** • psi(g) • kPa(g) • MPa(g) • bar(g) • kg/cm^2(g) **Mass Heating Value** • Btu/lb • MJ/kg **Liquid Density** • lb/ft^3 • kg/m^3 • g/cc • lb/MMCF • lb/US gal

Column Heading	Description
	• kg/L • lb/bbl • RD • °API **Water Density** • lb/ft^3 • kg/m^3 • g/cc • lb/MMCF • lb/US gal • kg/L • lb/bbl • RD • °API **Liquid Volume** • ft^3 • m^3 • MCF • (k)m^3 • MMCF • BCF • L • US gal • bbl **Water Volume** • ft^3 • m^3 • MCF • (k)m^3 • MMCF • BCF • L • US gal

Column Heading	Description
	- bbl **Liquid Rate** - ft^3/s - ft^3/min - ft^3/h - ft^3/d - MCF/s - MCF/min - MCF/h - MCF/d - m^3/s - m^3/min - m^3/h - m^3/d - (k)m^3/s - (k)m^3/min - (k)m^3/h - (k)m^3/d - MMCF/s - MMCF/min - MMCF/h - MMCF/d - BCF/s - BCF/min - BCF/h - BCF/d - L/s - L/min - L/h - L/d - US gal/s - US gal/min - US gal/h

Column Heading	Description
	- US gal/d - bbl/s - bbl/min - bbl/h - bbl/d **Water Rate** - ft^3/s - ft^3/min - ft^3/h - ft^3/d - MCF/s - MCF/min - MCF/h - MCF/d - m^3/s - m^3/min - m^3/h - m^3/d - (k)m^3/s - (k)m^3/min - (k)m^3/h - (k)m^3/d - MMCF/s - MMCF/min - MMCF/h - MMCF/d - BCF/s - BCF/min - BCF/h - BCF/d - L/s - L/min - L/h

Column Heading	Description
	• L/d • US gal/s • US gal/min • US gal/h • US gal/d • bbl/s • bbl/min • bbl/h • bbl/d **Relative Density** • RD **Note** If you populate this column, you **must** also populate the **UNITS_TYPE** column.
CONV_TYPE	Sets if the channel measures either current input, voltage input or is disabled. Possible options are: • **Current –** The channel measure current. • **Voltage –** The channel measures voltage. • **Disabled –** The channel is disabled. For channels on a **HART module**, the **only** available options are **Disabled** and **Current**.
LOW_EU	Sets the value (in engineering units) that is equal to zero percent output (low end of the EU range).
HIGH_EU	Sets the value (in engineering units) that is equal to 100 percent output (high end of the EU range).
USER_MODE	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are: • **Auto –** The system copies the value in the Auto Value (AUTO) field to the Selected Value parameter. • **Override –** The system copies the value set in the Override Value (OVRD) field to the Selected Value parameter. **Note** If a fault occurs and the **operation mode** (USER_MODE) is set to **Override**, the Selected Value parameter is set to the

Column Heading	Description
	Override Value (OVRD) and is not set based on the Fault Mode. • **Auto Read –** The system copies the value of the parameter you configure in the Auto Read Parameter Reference (AUTO_READ_PARAM) field to the Selected Value parameter. This value is updated once per second. **Note** When setting the Operation Mode (USER_MODE) to Auto Read, make sure that the units and scaling are correct for the referenced parameter.
AUTO	Sets the value (in engineering units) to use for the selected channel when the Operation Mode (USER_MODE) is set to Auto.
AUTO_READ_PARAM	Enter a parameter from the FB Series internal database to use as the analog output value when the Operation Mode (USER_MODE) is set to Auto Read.
OVD	Sets the value (in engineering units) that is written to the Selected Value field when the Operation Mode (USER_MODE) is set to Override.
FAULT_MODE	Sets the value to use when the output experiences a fault condition. Possible options are: • **Fault –** The system uses the value set in the Fault Value (FAULT) field. • **Last Good Value –** The system uses the last good value received before the fault occurred. • **Last Hour Average –** The system uses the last hourly average before the fault occurred. • **Ramp To Fault Value –** The system ramps the output to the value you configure in the Fault Value (FAULT) field over the time configured in the Ramp Duration (RAMP_DURATION) field. • **Ramp To Last Hour Avg –** The system ramps the output to the value shown in the Last Hour Average Value field over the time configured in the Ramp Duration (RAMP_DURATION) field.

Column Heading	Description
FAULT	Sets the value (in engineering units) to use when a fault occurs on the selected channel and the Fault Mode (FAULT_MODE) is set to Fault.
RAMP_DURATION	Sets, in seconds, the amount of time the system takes after a fault has occurred to ramp the output to the new value.
RESET_MODE	Sets the value to use for the channel after a power cycle occurs. Possible options are: • **Fault –** Use the value you set in the Fault Value (FAULT) field. • **Last Good –** Use the last known good value. **Note** • During a power cycle, an analog output generates 0mA while the FB Series product is restarting. Once the FB Series product has completed the restart, then the Action on CPU Restart is applied. • If only the 12MIO restarts, then the Action on CPU Restart is applied until communication is established with main CPU.
CLIP_MODE	Sets if clipping occurs on the selected input. Clipping forces the Selected Value to stay within a range defined by the Low Clipping Limit and High Clipping Limit. Clipping is only applied when there is not a fault. Possible Values are: • **Disable –** Clipping does not occur. • **Enable –** Clipping does occur. **Note** You must enter a value in the **Low Clipping Limit** (CLIP_LOW_LIMIT) and **High Clipping Limit** (CLIP_HIGH_LIMIT) fields.
CLIP_LOW_LIMIT	When clipping is enabled, this field sets the lower limit of the Selected Value parameter.
CLIP_HIGH_LIMIT	When clipping is enabled, this field sets the upper limit of the Selected Value parameter.
Alarm Tag	Set an identifier (up to 20-alphanumeric characters) for the selected instance.

Column Heading	Description
ALM_DESC	Set a description (up to 20-alphanumeric characters) for the selected instance.
HIHI_ENB	Sets if the system monitors the point for the specified the High High alarm limit (HIHI_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit. • **Disable** – The system ignores the specified alarm limit.
HIHI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High High alarm.
HI_ENB	Sets if the system monitors the point for the specified the High alarm limit (HI_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit • **Disable** – The system ignores the specified alarm limit.
HI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High alarm.
LO_ENB	Sets if the system monitors the point for the specified the Lo alarm limit (LO_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit • **Disable** – The system ignores the specified alarm limit.
LO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low alarm.
LOLO_ENB	Sets if the system monitors the point for the specified the High alarm limit (LOLO_LIM). Possible options are: • **Enable** – The system monitors the point for the specified alarm limit • **Disable** – The system ignores the specified alarm limit.
LOLO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low Low alarm.

Column Heading	Description
PF_ENB	Sets if an alarm is raised on a point failure. Possible options are: • **Enable –** An alarm is raised if the selected channel reports a point failure. • **Disable –** No alarm is raised if the selected channel reports a point failure.
DEADBAND	Sets the value (in engineering units) that is an inactive zone above the low alarm and below the high alarm.
ROC_MODE	Use this section to configure alarming based on the speed of variability in the value of the alarm input. Possible options are: • **Disabled –** The system does not monitor the input for rate of change alarming. • **Alarm on Positive Changes –** An alarm is raised if the value increases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). • **Alarm on Negative Changes –** An alarm is raised if the value decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). • **Alarm on Both –** An alarm is raised if the value increases or decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM).
ROC_LIM	Sets a limit value (in engineering units) to which the input must rise or fall during the configured time period to generate an alarm.
ROC_TM	Sets the time duration (in seconds) that the system uses to determine the Rate of Change for an input.

Digital Input CSV File Format

The digital input CSV file contains information for all I/O modules in the configuration, including the module type, installation location, and IO type configuration for each channel.

Note

- The **Channel** column **must** be present in the Digital Input CSV file. All other columns are optional.
- The I/O configuration CSV file **must** include **_DI_** in the file name in order to be successfully imported.

Column Heading	Description
Channel	Rack position of the module and channel number.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
DESC	Sets a description (up to 20-alphanumeric characters) for the selected channel.
DI_TYPE	Set how the digital inputs function when the **Operation Mode** is set to **Live**. Possible options are: • **Normal** – The Selected Value is updated based on the Live Value. • **Latched** – When the Live parameter transitions from off to on, the selected parameter remains on, until the latch is cleared using the Reset Latch parameter.
USER_MODE	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are: • **Live –** The system copies the Live Value to the Selected Value parameter. • **Override –** The system copies the value you select in the Override Value field to the Selected Value parameter. **Note** If a fault occurs and the **Operation Mode** (USER_MODE) is set to **Override**, the Selected Value parameter is set to the **Override Value** (OVRD) and is not set based on the Fault Mode.

Column Heading	Description
OVRD	Sets the value that is written to the Selected Value field when the **Operation Mode** (USER_MODE) is set to **Override**. Possible options are: • **Off –** The selected channel is set to Off when the Operation Mode is set to Override. • **On –** The selected channel is set to On when the Operation Mode is set to Override.
FAULT_MODE	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs. • **Fault –** The system copies the value set in the Fault Value field to the Selected Value parameter. • **Last Good –** The system copies the value of the Last Good Value field to the Selected Value parameter.
FAULT	Sets the value to use when a fault occurs on the selected channel and the **Fault Mode** (FAULT_MODE) is set to **Fault**. Possible options are: • **Off –** The channel is set to Off when a fault occurs on the selected channel and the Fault Mode is set to Fault. • **On –** The channel is set to On when a fault occurs on the selected channel and the Fault Mode is set to Fault.
ZERO_DESC	Enter a short description (up to 10-alphanumeric characters) for the digital input off state.
ONE_DESC	Enter a short description (up to 10-alphanumeric characters) for the digital input on state.
LOGIC_LEVEL	Sets the amount of current that the channel sources. Pick the appropriate setting based on the digital input device used with this channel. Possible options are: • **66 microamps –** The input will source 66 microamps. • **2 milliamps –** The input will source 2 milliamps.

Column Heading	Description
INVERT	Sets whether the system will invert the Live value before writing it to the Selected value. Possible options are: • **Disable –** The Selected Value will be set to the Live value. • **Enable –** The Selected Value will be set to the inverse of the Live value. For example, if the Live value is "Off" then the Selected value will be "On." **Note** This mode only works when the **Operation Mode** (USER_MODE) is set to **Live** and there is not a fault.
FILTER_TIME	Sets the amount of time (in seconds) the discrete input must remain in the On (high) state before it is recognized as such. The discrete input returns to the Off state immediately upon detection of the On to Off transition; there is no filtering for this transition.
ALARM_MODE	Sets alarming for the digital input. Possible options are: • **Off –** No alarms are logged. • **On –** A Set Alarm is logged when the Selected value transitions from “off” to “on.” A Clear Alarm is logged when the digital input transitions from “on” to “off.”
RESISTOR_TYPE	Activates a pull-up or pull-down resistor to maintain input in a deterministic state when no input is applied.

Digital Output CSV File Format

The digital output CSV file contains information for all I/O modules in the configuration, including the module type, installation location, and IO type configuration for each channel.

Note

- The **Channel** column **must** be present in the Digital Output CSV file. All other columns are optional.
- The I/O configuration CSV file **must** include **_DO_** in the file name in order to be successfully imported.

Column Heading	Description
Channel	Rack position of the module and channel number of the I/O point.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
DESC	Sets a description (up to 20-alphanumeric characters) for the selected channel.
DO_TYPE	Select the function of the digital output when the Operation Mode is Auto or Auto Read and there is no fault. Digital outputs are high/low outputs used to turn equipment on and off. Possible options are: • **Latching –** The discrete output turns on when the Auto or Auto Read Value, depending on Operation mode, is on. The output remains on until the Auto or Auto Read value turns off. • **Momentary –** When the Auto or Auto Read Value transitions from off to on, the discrete output will turn the discrete output on for the amount of time defined in the Time On field. The Auto parameter will be automatically set to 0 (off) when the discrete output generates the momentary output. **Note** The discrete output will not set the Auto Read Value back to 0. • **Toggle –** Enables a square-wave output for which both the time on and time off are defined by the value in the Time On and Time Off parameters, respectively. • **Timed Duration Output Momentary –** Enables the discrete output to complete one cycle based on the time related parameters in the Time Duration Output frame, and the Auto EU value. Once a cycle is completed, the DO will remain off until the Auto EU value is modified, starting a new cycle. • **Timed Duration Output Toggle –** Enables the discrete output to continuously repeat in a cycle defined by the value in the Cycle Time field on the TDO Parameters Tab where the EU Value controls the on-time duration. The

Column Heading	Description
	current cycle will be completed before a new Auto EU value takes effect. • **Scaled Pulse Output –** Enables the discrete output to be turned on for the amount of time defined in the Time On field each time an accumulation limit is reached. This could be used to send a pulse output to another device, such as an odorizer, or to turn a sampler on each time a certain amount of flow is accumulated.
USER_MODE	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are: • **Auto –** The system copies the value in the Auto Value field to the Selected Value parameter. • **Override –** The system copies the value set in the Override Value field to the Selected Value parameter. • **Auto Read –** The system copies the value of the parameter you configure in the Auto Read Parameter Reference field to the Selected Value parameter. **Note** This field applies only if you select **Latching** or **Momentary** in the **Digital Output Type** (DO_TYPE) field.
AUTO	Sets the value to use for the selected channel when the Operation Mode (USER_MODE) is set to Auto. Possible options are: • **Off –** The system copies a value of Off to the Selected Value parameter. • **On –** The system copies a value of On to the Selected Value parameter. **Note** This field applies only if you select **Latching** or **Momentary** in the **Digital Output Type** (DO_TYPE) field.

Column Heading	Description
AUTO_READ_PARAM	Enter a parameter from the FB Series product's internal database to use as the digital output value when the Operation Mode (USER_MODE) is set to Auto Read. **Note** This field applies only if you select **Latching** or **Momentary** in the **Digital Output Type** (DO_TYPE) field.
OVRD	Sets the value that is written to the Selected Value field when the Operation Mode (USER_MODE) is set to Override. Possible options are: • **Off –** The system copies a value of Off to the Selected Value parameter. • **On –** The system copies a value of On to the Selected Value parameter.
FAULT_MODE	Sets the value to use when the output experiences a fault condition. Possible options are: • **Fault –** The system uses the value set in the Fault Value field. • **Last Good –** The system uses the last good value output before the fault occurred. **Note** If the **Digital Output Type** (DO_TYPE) is **TDO momentary**, **TDO toggle**, or **SPO**, the DO will be set to off instead of set based on the fault mode.
FAULT	Sets the value to use when a fault occurs on the selected channel and the Fault Mode (FAULT_MODE) is set to Fault. Possible options are: • **Off –** The channel is set to off when a fault occurs on the selected channel and the Fault Mode is set to Fault. • **On –** The channel is set to on when a fault occurs on the selected channel and the Fault Mode is set to Fault.

Column Heading	Description
ZERO_DESC	Enter a short description (up to 10-alphanumeric characters) for the Off state of the digital output. **Note** This field applies **only** if you select **Latching**, **Momentary**, **Toggle**, **Time Duration Output Momentary**, or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
ONE_DESC	Enter a short description (up to 10-alphanumeric characters) for the On state of the digital output. **Note** This field applies **only** if you select **Latching**, **Momentary**, **Toggle**, **Time Duration Output Momentary**, or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
ALARM_MODE	Sets Alarming for the digital output. • **Off –** No alarms are logged. • **On –** A Set Alarm is logged when the Selected value transitions from “off” to “on.” A Clear Alarm is logged when the digital output transitions from “on” to “off.”
RESET_MODE	For **Latched DO's**, sets the value to use for the channel after a power cycle occurs. For **Momentary DO's**, the output is set to Off and no momentary pulse is generated. For **all other DO's**, the output is set based on the behavior described in the Digital Output Type parameter section. Possible options are: • **Fault –** The system uses the value set in the Fault Value field. • **Last Good –** The system uses the last good value output before the fault occurred. **Note** • During a power cycle, a discrete output is set to Off while the FB Series product is restarting. Once the FB Series product has completed the restart, then the action on power cycle is applied.

Column Heading	Description
	- This field applies **only** if you select **Latching** in the **Digital Output Type** (DO_TYPE) field and **Auto** in the **Operation Mode** (USER_MODE) field. - If only the 12MIO restarts, then the Action on CPU Restart is applied until communication is established with main CPU.
TIME_ON	Sets the amount of time, in seconds, an output is set to On. The minimum On and Off time is 0.01 seconds, resulting in a maximum frequency of 50 Hz. The default value is 1.0 seconds. - In **Momentary** mode, this is the amount of time (in seconds) that the output is energized. - In **Toggle** mode, this is the amount of time (in seconds) between switching On or Off. - In **Scaled Pulse Output** mode, this is the amount of time (in seconds) that the output is energized each time the change in the Scaled Pulse Output Value is greater than the Pulse Output Significance. For example, if the Scaled Pulse Output Value is 950 MCF when the scaled pulse output functionality is enabled and the Pulse Output Significance is 1000 MCF, the DO will be energized when the Scaled Pulse Output Value reaches 1950 MCF. **Note** This field applies **only** if you select **Momentary**, **Toggle**, or **Scaled Pulse Output** in the **Digital Output Type** (DO_TYPE) field.
TIME_OFF	Sets the amount of time, in seconds, the output is set to Off. The minimum On and Off time is 0.01 seconds, resulting in a maximum frequency of 50 Hz. The default value is 1.0 seconds. **Note** This field applies **only** if you select **Toggle** in the **Digital Output Type** (DO_TYPE) field.

Column Heading	Description
TDO_CYCLE_TIME	Sets the total amount of time (in seconds) the cycle spends in the On and Off positions. The Cycle Time entry is used to define the Off Time in the Time Duration Output Toggle mode. The Off Time is calculated by the formula: Off Time = Cycle Time - On Time Example: A Time Duration Output is used to emulate a field instrument measuring flow. The Time Duration Output outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow. The output is repeated every 15 seconds. If the Cycle Time is less than, or equal to the On Time, the Off Time is set to one. Care must be taken in configuration to ensure that the Cycle Time remains greater than the calculated On Time for proper operation. **Note** This field applies **only** if you select **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
TDO_LOW_EU	Sets the value for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal. **Note** This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
TDO_HIGH_EU	Sets the value for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal. **Note** This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.

Column Heading	Description
TDO_0%_TIME	Sets the amount of time (in seconds) the cycle is in the On position when the EU is at zero percent. Note • 0% and 100% should be less than or equal to the Cycle Time. • This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
TDO_100%_TIME	Sets the amount of time (in seconds) the cycle is in the on position when the EU is at 100 percent. **Note** • 0% and 100% should be less than or equal to the Cycle Time. • This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** (DO_TYPE) field.
SPO_INPUT_PRM	This parameter chooses the parameter the digital output will monitor for changes so that it can turn the digital output on for the amount of time specified by the Time On parameter each time it changes by the amount specified in the Pulse Output Significance parameter. **Note** • Choose a parameter with an incremental value. • This field applies **only** if you select **Scaled Pulse Output** in the **Digital Output Type** (DO_TYPE) field.
SPO_ACCUM_LIMIT	This field defines the amount of change that must occur in the Scaled Pulse Output parameter before a pulse will be generated. **Note** • This parameter is in the same units as the Scaled Pulse Output Value. • This field applies **only** if you select **Scaled Pulse Output** in the **Digital Output Type** (DO_TYPE) field.

Column Heading	Description
LOW_SIDE_SWITCH	Sets if the digital output is internally connected to or isolated from ground. Possible options are: • **Enabled** – The DO_LO pin is internally connected to ground and provides a grounded output (50 mA current limit). • **Disabled** – The DO_LO pin is internally isolated from ground and acts as a contact closure.

Pulse Input CSV File Format

The pulse input CSV file contains information for all I/O modules in the configuration, including the module type, installation location, and IO type configuration for each channel.

Note

- The **Channel** column **must** be present in the Pulse Input CSV file. All other columns are optional.
- The I/O configuration CSV file **must** include **_PI_** in the file name in order to be successfully imported.

Column Heading	Description
Channel	Rack position of the module and channel number.
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
DESC	Sets a description (up to 20-alphanumeric characters) for the selected channel.
UNITS_TYPE	Sets the measurement type used for the selected channel. **Note** If you populate this column, you **must** also populate the **UNITS** column.
UNITS	Sets the engineering units used for the selected channel. **Note** If you populate this column, you **must** also populate the **UNITS_TYPE** column.

Column Heading	Description
CONV_FACTOR	Sets the ratio of the number of pulses per engineering unit. **Note** This field applies **only** if the selected pulse input channel is **not** assigned to a **Gas** or **Liquid Linear Meter Input**.
CONTRACT_HR	Click ▼ to set the hour of the day to begin the daily counted parameters.
RATE_PERIOD	Click ▼ to set the time units used for the PI scan rate.
USER_MODE	Sets the source of the selected value. Possible options are: **Live** – The system uses the current value of the input. **Override** – The system uses the value set in the **Override Frequency** (OVRD_FREQ) field.
OVRD_FREQ	Sets the value to use for the selected channel when the **Operation Mode** (USER_MODE) is set to **Override**.
FILTER	Sets the amount of filtering that will be applied to the pulse input. Choose a filtering mode that is appropriate for the input frequency, and the amount of noise that may be present. Possible options are: • **Low Speed Filter** – Choose low speed filtering if the pulse input will be measuring frequencies less than 10Hz. • **Medium Speed Filter** – Choose medium speed filtering if the pulse input will be measuring frequencies between 0 to 300Hz. • **High Speed Filter** – Choose high speed filtering if the pulse input will be measuring frequencies above 300Hz.
LOGIC_LEVEL	This setting determines the amount of current that the channel sources. Pick the appropriate setting based on the pulse input device used with this channel. Possible options are: • **66 microamps** – The input will source 66 microamps. • **2 milliamps** – The input will source 2 milliamps. **Note** • For the PI configuration driven from an open collector stage, high speed (10KHz) is only supported with the 2 milliamps setting.

Column Heading	Description
	• For the PI configuration driven from a voltage source, 66 microamps is acceptable for low and high speed.
RESISTOR_TYPE	Activates a pull-up or pull-down resistor to maintain input in a deterministic state when no input is applied. • **Pull Up** – Maintain signal High when no input is applied. • **Pull Down** – Maintain signal Low when no input is applied. **Note** Open collector circuit configuration is not supported with a pull-down resistor.
SCAN_PERIOD	Sets how frequently the system scans the input (in seconds) to acquire the value. Each input updates based on their individual scan period.
MONITOR_MAX	Sets the maximum value of the pulse input gauge shown on the Monitor > Main display. **Note** This field applies **only** to the **FB1000** and **FB2000 Series Flow Computers**.
MONITOR_MIN	Sets the minimum value of the pulse input gauge shown on the Monitor > Main display. **Note** This field applies **only** to the **FB1000** and **FB2000 Series Flow Computers**.
Alarm Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
ALM_DESC	Sets a description (up to 20-alphanumeric characters) for the selected instance.
HIHI_ENB	Sets if the system monitors the point for the specified the High High alarm limit (HIHI_LIM). Possible options are: • **Enable** – the system monitors the point for the specified alarm limit. • **Disable** – The system ignores the specified alarm limit.
HIHI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High High alarm.

Column Heading	Description
HI_ENB	Sets if the system monitors the point for the specified the High alarm limit (HI_LIM). Possible options are: • **Enable –** the system monitors the point for the specified alarm limit. • **Disable –** The system ignores the specified alarm limit.
HI_LIM	Sets a limit value (in engineering units) to which the input must rise to generate a High alarm.
LO_ENB	Sets if the system monitors the point for the specified the Lo alarm limit (LO_LIM). Possible options are: • **Enable –** the system monitors the point for the specified alarm limit. • **Disable –** The system ignores the specified alarm limit.
LO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low alarm.
LOLO_ENB	Sets if the system monitors the point for the specified the High alarm limit (LOLO_LIM). Possible options are: • **Enable –** the system monitors the point for the specified alarm limit. • **Disable –** The system ignores the specified alarm limit.
LOLO_LIM	Sets a limit value (in engineering units) to which the input must fall to generate a Low Low alarm.
PF_ENB	Sets if an alarm is raised on a point failure. Possible options are: • **Enable –** An alarm is raised if the selected channel reports a point failure. • **Disable –** No alarm is raised if the selected channel reports a point failure.
DEADBAND	Sets the value (in engineering units) that is an inactive zone above the low alarm and below the high alarm.
ROC_MODE	Use this section to configure alarming based on the speed of variability in the value of the alarm input. Possible options are: • **Disabled –** The system does not monitor the input for rate of change alarming.

Column Heading	Description
	- **Alarm on Positive Changes –** An alarm is raised if the value increases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). - **Alarm on Negative Changes** – An alarm is raised if the value decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM). - **Alarm on Both** – An alarm is raised if the value increases or decreases more than the limit set (ROC_LIM) over the specified period of time (ROC_TM).
ROC_LIM	Sets a limit value (in engineering units) to which the input must rise or fall during the configured time period to generate an alarm.
ROC_TM	Sets the time duration (in seconds) that the system uses to determine the Rate of Change for an input.

3. Save your changes. You can now import your I/O configuration CSV files for use in your FB Series product. For more information, refer to Importing I/O Configuration CSV Files.

Note

Make sure to save the file with a **.csv** file extension.

4.5.2 MVS Setup

Use this display to enable communications with 4088B multivariable transmitters on either COM3 or COM4.

Note

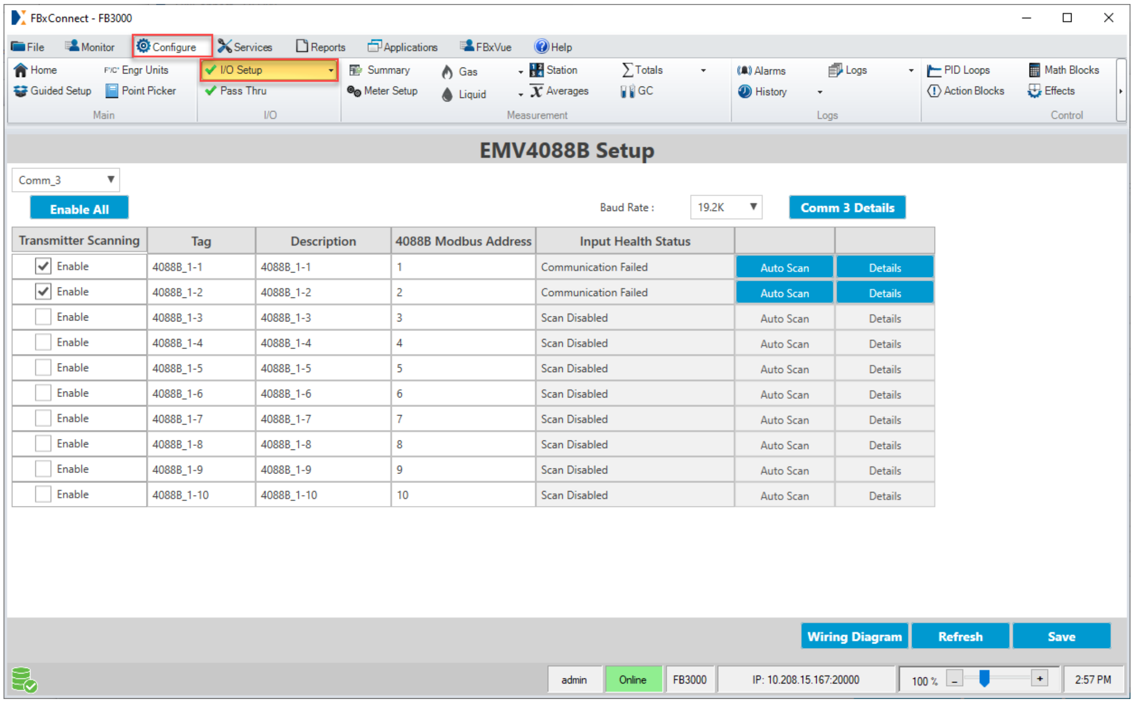
- To view this display, you **must** first set the Port Owner of COM3 or COM4 to MVS4088B. For more information, refer to **Port Owner** field on the Communications – General tab.
- If you enabled MVS4088B communications on multiple communications ports, select the different communications ports using the communications port drop-down list at the top-left of the display.

- When communicating with more than six transmitters at 9600 baud, update times exceed once per second.

To access this display:

1. Select **Configure > I/O Setup > MVS Setup** from the FBxConnect™ main menu. The MVS Setup display opens.

Figure 109. MVS Setup



EMV4088B Setup

Comm_3

Baud Rate : 19.2K

Transmitter Scanning	Tag	Description	4088B Modbus Address	Input Health Status		
☑ Enable	4088B_1-1	4088B_1-1	1	Communication Failed	Auto Scan	Details
☑ Enable	4088B_1-2	4088B_1-2	2	Communication Failed	Auto Scan	Details
☐ Enable	4088B_1-3	4088B_1-3	3	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-4	4088B_1-4	4	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-5	4088B_1-5	5	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-6	4088B_1-6	6	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-7	4088B_1-7	7	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-8	4088B_1-8	8	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-9	4088B_1-9	9	Scan Disabled	Auto Scan	Details
☐ Enable	4088B_1-10	4088B_1-10	10	Scan Disabled	Auto Scan	Details

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2. Review – and change as necessary – the values in the following fields:

Field	Description
Communications Port Instance	Click ▼ to select a communications port on which to enable multivariable transmitters. **Note** Only communications ports with the Port Owner field configured as MVS4088B are shown. For more information, refer the Communications – General tab.
Enable All	Select to enable communications for all multivariable transmitters.
Baud Rate	Sets the baud rate for multivariable transmitter communications using the selected port.

Field	Description
Comm Details	Select this button to open the Communications configuration display for the communications port configured in the Comm Port to GC field.
Transmitter Scanning	Place a check mark to enable the system to scan the selected multivariable transmitter for data.
Tag	Sets a name (up to 8-alphanumeric characters) for the selected multivariable transmitter.
Description	Sets a description (up to 16-alphanumeric characters) for the selected multivariable transmitter.
4088B Modbus Address	Sets the unique Modbus address for the selected multivariable transmitter. The default address is **1**. If the multivariable transmitter is used in the multi-drop mode, each multivariable transmitter must have a unique address. Use Address **240** to poll the sensor to determine the address of the connected sensor. This is similar to polling a device using Address and Group 240. When Address 240 is used, the sensor responds with its address by updating the Address field. **Note** This field shows only if the Port Owner field for the selected communications port is configured as MVS4088B. For more information, refer the Communications – General tab.
Input Health Status	This **read-only** field shows the current operating status of the selected multivariable transmitter.
Auto Scan	Select to have the system automatically scan the baud rates for the multivariable transmitter with the indicated Modbus address. **Note** • The baud rate of the transmitter is changed to the baud rate configured in the **Baud Rate** field. • You **must** select the **Enable** checkbox in the **Transmitter Scanning** field to activate this button.
Details	Select this button to open the configuration display for the selected transmitter. **Note** You **must** select the **Enable** checkbox in the **Transmitter Scanning** field to activate this button.

Field	Description
Wiring Diagram	Click to open a 4088B wiring diagram for the selected communications port.

3. Select **Save** to save any changes you make to this display.

4.5.3 MVS Configuration

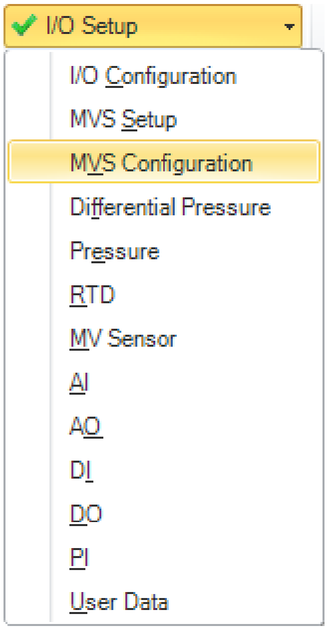
Use this display to view and configure various parameters of a 4088B multivariable transmitter.

Note

To view this display, you **must** first set the Port Owner of COM3 or COM4 to either MVS4088B. For more information, refer to Communication – General Tab.

To access this display, select **Configure > I/O Setup > MVS Configuration** from the FBxConnect™ main menu. The MVS Configuration display opens.

Figure 110. I/O Setup – MVS Configuration



The MVS Configuration display has the following tabs:

General – Use this tab to view and configure communication settings, and issue commands related to the 4088B.

User Defines – Use this tab to setup the user defined points in the 4088B multivariable transmitter, and what is displayed on the 4088B's LCD.

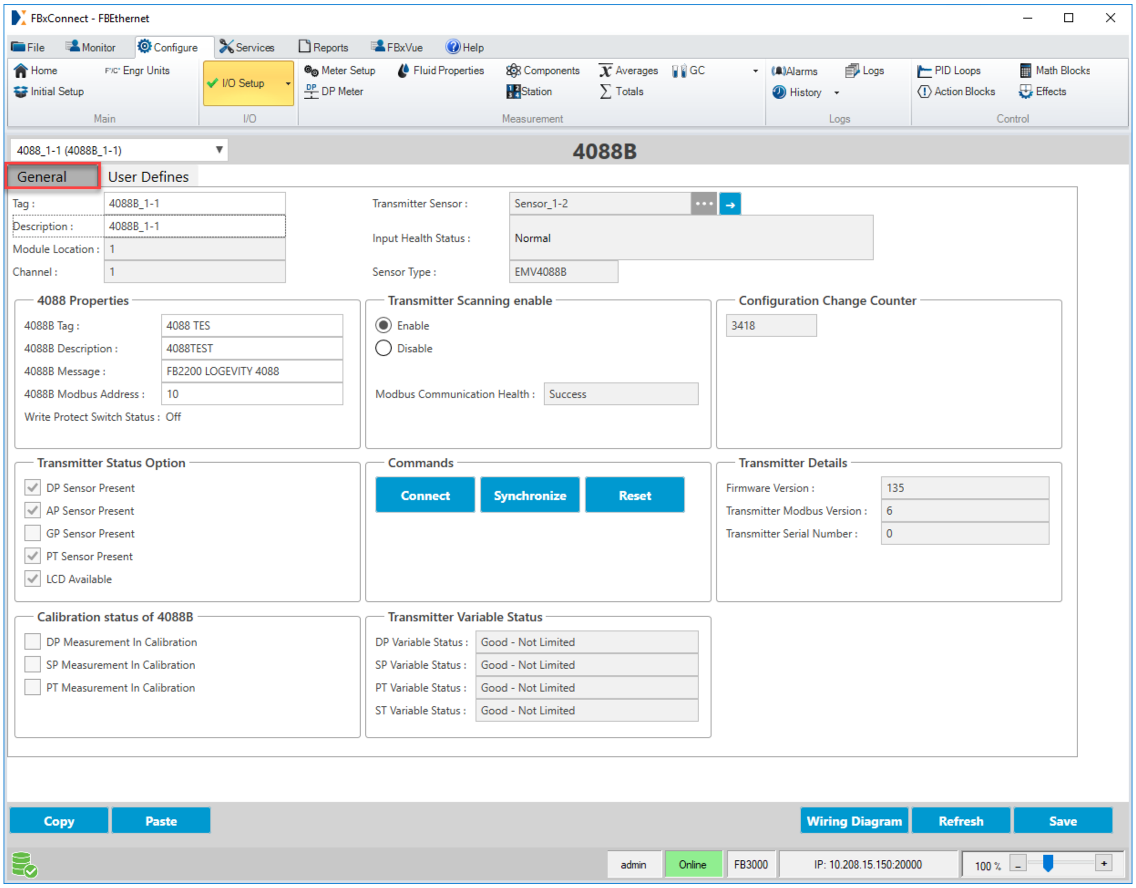
4.5.3.1 MVS Configuration – General Tab

Use this tab to view and configure communication settings, and issue commands related to the 4088B multivariable transmitter.

To access this tab:

1. Select **Configure > I/O Setup > MVS Configuration**. The MVS Configuration display opens showing the **General** tab.

Figure 111. MVS Configuration – General Tab



4088_1-1 (4088B_1-1) ▼

4088B

Tag : 4088B_1-1
Description : 4088B_1-1
Module Location : 1
Channel : 1
Transmitter Sensor : Sensor_1-2
Input Health Status : Normal
Sensor Type : EMV4088B

4088 Properties
4088B Tag : 4088 TES
4088B Description : 4088TEST
4088B Message : FB2200 LOGEVITY 4088
4088B Modbus Address : 10
Write Protect Switch Status : Off

Transmitter Scanning enable
● Enable
○ Disable
Modbus Communication Health : Success

Configuration Change Counter
3418

Transmitter Status Option
☑ DP Sensor Present
☑ AP Sensor Present
☐ GP Sensor Present
☑ PT Sensor Present
☑ LCD Available

Commands

Transmitter Details
Firmware Version : 135
Transmitter Modbus Version : 6
Transmitter Serial Number : 0

Calibration status of 4088B
☐ DP Measurement In Calibration
☐ SP Measurement In Calibration
☐ PT Measurement In Calibration

Transmitter Variable Status
DP Variable Status : Good - Not Limited
SP Variable Status : Good - Not Limited
PT Variable Status : Good - Not Limited
ST Variable Status : Good - Not Limited

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2. Click ▼ in the drop-down list at the top of the display to select a 4088B instance to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected 4088B instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected 4088B instance.
Module Location	This **read-only** field shows the location of the module in the FB Series product.
Channel	This **read-only** field shows the channel in the FB Series product used by the module.
Transmitter Sensor	This **read-only** field shows the sensor object associated with the selected 4088B instance. Click → to open the MV Sensor display and view sensor properties.
Input Health Status	This **read-only** field shows the current operating status of the selected 4088B. Possible values are: • Normal • Not Licensed • Instance Inactive • Communication Failed • Config. Issue Due To Write Protect • DP Failed • Pressure Failed • RTD Failed • Synchronization In Progress • Scan Disabled • Writing Failed • Reserved • 4088 in Mode A **Note** 4088A models and 4088 model in Mode A are **not** supported. • Reading Device • Writing Device • Baud Too Low • Writing Baud Failed

Field	Description
	• Sensor Disconnected • Scanning Baud Rate 1200 • Scanning Baud Rate 2400 • Scanning Baud Rate 4800 • Scanning Baud Rate 9600 • Scanning Baud Rate 19200
Sensor Type	This **read-only** field shows the type of multivariable transmitter connected to the FB Series product.
4088B Tag	Sets a name (up to 8-alphanumeric characters) for the selected 4088B.
4088B Description	Sets a description (up to 16-alphanumeric characters) for the selected 4088B.
4088B Message	Sets a message (up to 32-alphanumeric characters) for the selected 4088B.
4088B Modbus Address	Sets the unique Modbus address for the selected 4088B multivariable transmitter. The default address is **1**. If the 4088B is used in the multi-drop mode, each 4088B must have a unique address. Use address **240** to poll the sensor to determine the address of the connected sensor. When address 240 is used, the sensor responds with its address by updating the Address field. **Note** Only one 4088B should be connected to the FB Series product when polling address 240.
Write Protect Switch Status	This **read-only** field show the status of the write protect switch on the 4088B.
Transmitter Scanning enable	Sets if the system scans the 4088B for data. **Disable** The system does not scan the 4088B for data. **Enable** The system does scan the 4088B for data.
Communication Health	This **read-only** field shows the status of Modbus communications between the FB Series product and the 4088B.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Configuration Change Counter</td><td colspan="2">This read-only field shows the number of configuration changes that have been made to the 4088B. The FB Series product automatically reads the configuration of the 4088B if it detects a change in this value.</td></tr>
<tr><td rowspan="6">Transmitter Status Option</td><td colspan="2">This read-only field shows information about the capabilities of the 4088B.</td></tr>
<tr><td>DP Sensor Present</td><td>The box next to this field is checked if a differential pressure sensor is installed in the 4088B.</td></tr>
<tr><td>AP Sensor Present</td><td>The box next to this field is checked if an absolute pressure sensor is installed in the 4088B.</td></tr>
<tr><td>GP Sensor Present</td><td>The box next to this field is checked if a gauge pressure sensor is installed in the 4088B.</td></tr>
<tr><td>PT Sensor Present</td><td>The box next to this field is checked if a process temperature RTD interface is installed in the 4088B.</td></tr>
<tr><td>LCD Available</td><td>The box next to this field is checked if an LCD is installed in the 4088B.</td></tr>
<tr><td>Connect</td><td colspan="2">Click to establish communications with the selected 4088B. The FB Series device automatically changes the baud rate of the communications port to attempt to locate a 4088B. Once communications are established, the system updates the transmitter's baud rate to match the baud rate selected in FBxConnect™.
Note
Only one 4088B should be connected to the FB Series product when using this command.</td></tr>
<tr><td>Synchronize</td><td colspan="2">Click to synchronize parameters between the FB Series product and the 4088B. This command automatically executes when you enable communications.</td></tr>
<tr><td>Reset</td><td colspan="2">Click to power cycle to 4088B.</td></tr>
<tr><td>Firmware Version</td><td colspan="2">This read-only field shows the revision level of the firmware in the selected 4088B.</td></tr>
<tr><td>Transmitter Modbus Version</td><td colspan="2">This read-only field shows the revision level of the Modbus protocol used in the selected 4088B.</td></tr>
</table>

Field	Description
Transmitter Serial Number	This **read-only** field shows the serial number of the 4088B.
Calibration Status of 4088	Shows, if checked, a calibration is currently being performed on the selected I/O point.
Transmitter Variable Status	Shows the status of each process variable.

4. Select **Save** to save any changes you make to this tab.

4.5.3.2 MVS Configuration – User Defines Tab

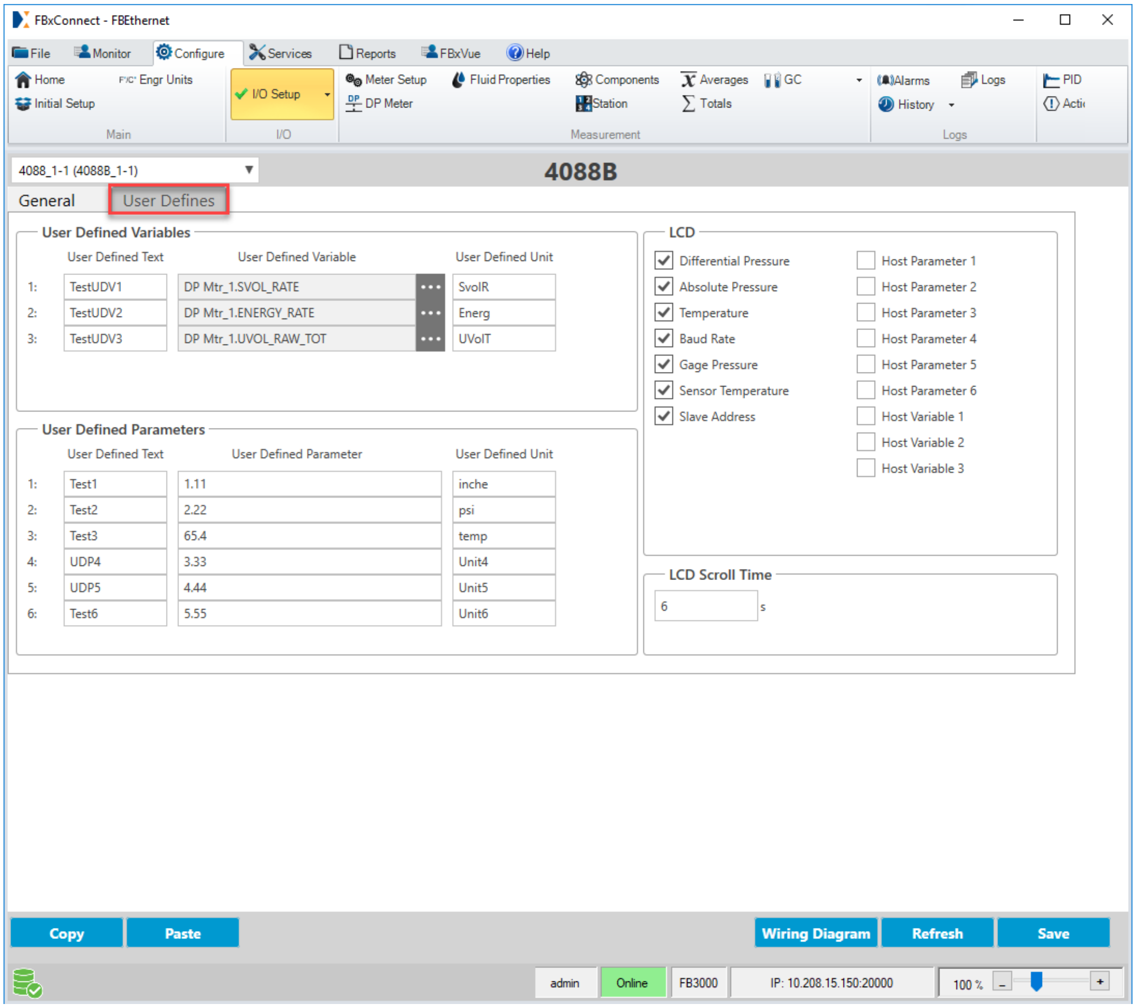
Use this display to setup the user defined points in the 4088B multivariable transmitter, and what is displayed on the 4088B's LCD.

To access this tab:

1. Select **Configure > I/O Setup > MVS Configuration**. The MVS Configuration display opens.

2. Select the **User Defines** tab.

Figure 112. MVS Configuration – User Defines Tab



4088_1-1 (4088B_1-1) ▼

4088B

User Defined Variables

	User Defined Text	User Defined Variable	User Defined Unit
1:	TestUDV1	DP Mtr_1.SVOL_RATE	SvolR
2:	TestUDV2	DP Mtr_1.ENERGY_RATE	Energ
3:	TestUDV3	DP Mtr_1.UVOL_RAW_TOT	UVolT

User Defined Parameters

	User Defined Text	User Defined Parameter	User Defined Unit
1:	Test1	1.11	inche
2:	Test2	2.22	psi
3:	Test3	65.4	temp
4:	UDP4	3.33	Unit4
5:	UDP5	4.44	Unit5
6:	Test6	5.55	Unit6

LCD

☑ Differential Pressure
☑ Absolute Pressure
☑ Temperature
☑ Baud Rate
☑ Gage Pressure
☑ Sensor Temperature
☑ Slave Address
☐ Host Parameter 1
☐ Host Parameter 2
☐ Host Parameter 3
☐ Host Parameter 4
☐ Host Parameter 5
☐ Host Parameter 6
☐ Host Variable 1
☐ Host Variable 2
☐ Host Variable 3

LCD Scroll Time

6 s

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3. Click ▼ in the drop-down list at the top of the display to select a 4088B instance to configure.

4. Review – and change as necessary – the values in the following fields:

Field	Description
User Defined Variables	Use these fields to configure the three host variable screens supported by the 4088B's LCD. User Defined Variables are sent to the 4088B periodically, making it possible to display parameters in the FB Series product that change frequently on the 4088B's LCD. For example, you can configure User Defined Variables to display the flow rate calculated by one of the meter runs in the FB Series product.

Field	Description	
	User Defined Text	Sets the text (up to 10-alphanumeric characters) displayed on the top line of the 4088B's LCD screen.
	User Defined Variable	Click … to set a parameter in the FB Series product whose value is written to the 4088B. This value is displayed on the middle line of the 4088B's LCD.
	User Defined Unit	Sets the text (up to 5-alphanumeric characters) that is displayed on the bottom line of the 4088B's LCD screen.
User Defined Parameters	Use these fields to configure the six host parameter screens supported by the 4088B's LCD. User Defined Parameters are only sent to the 4088B when they are changed, and are meant to display values that **do not** change frequently. For example, you can configure User Defined Parameters to display the orifice plate diameter for a meter run.	
	User Defined Text	Sets the text (up to 10-alphanumeric characters) that is displayed on the top line of the 4088B's LCD screen.
	User Defined Parameter	Sets the floating-point value that is displayed on the middle line of the 4088B's LCD screen.
	User Defined Unit	Sets the text (up to 5-alphanumeric characters) that is displayed on the bottom line of the 4088B's LCD screen.
LCD	The checkboxes inside this frame provide control over which of the available 4088B LCD screens will be displayed.	
LCD Scroll Time	Sets the amount of time the 4088B LCD remains on a screen before switching to the next.	

5. Select **Save** to save any changes you make to this display.

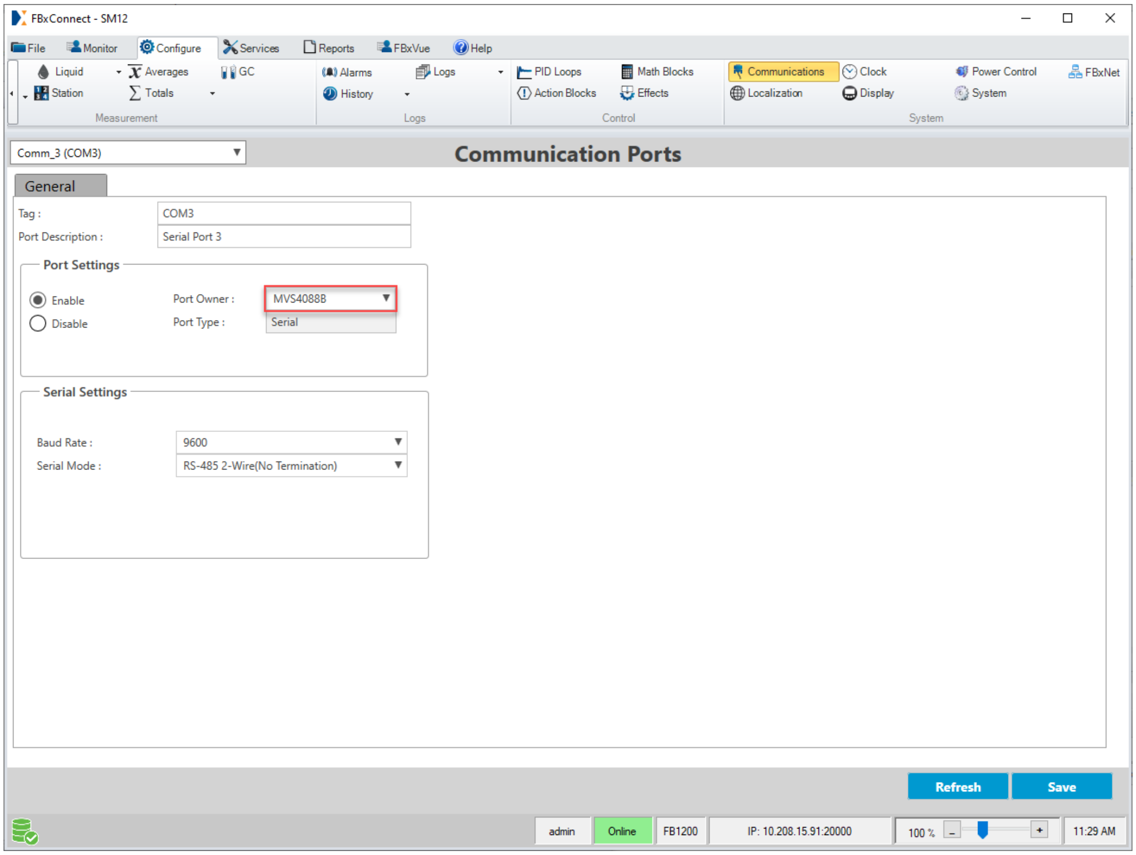
4.5.3.3 Configuring Communications with a 4088B

Use these steps to configure a 4088B multivariable transmitter to communicate with your FB Series product.

To configure communications with a 4088B:

1. Select **Configure > Communications** from the FBxConnect™ main menu. The Communications display opens showing the **General** tab.
2. Click ▼ in the drop-down list at the top of the display and select **COM3** or **COM3** or **COM4**.
3. Click ▼ in the **Port Owner** field and select **MVS4088B**.

Figure 113. Communications – General



Comm_3 (COM3) ▼

Communication Ports

General

Tag : COM3

Port Description : Serial Port 3

Port Settings

● Enable

○ Disable

Port Owner : MVS4088B ▼

Port Type : Serial

Serial Settings

Baud Rate : 9600 ▼

Serial Mode : RS-485 2-Wire(No Termination) ▼

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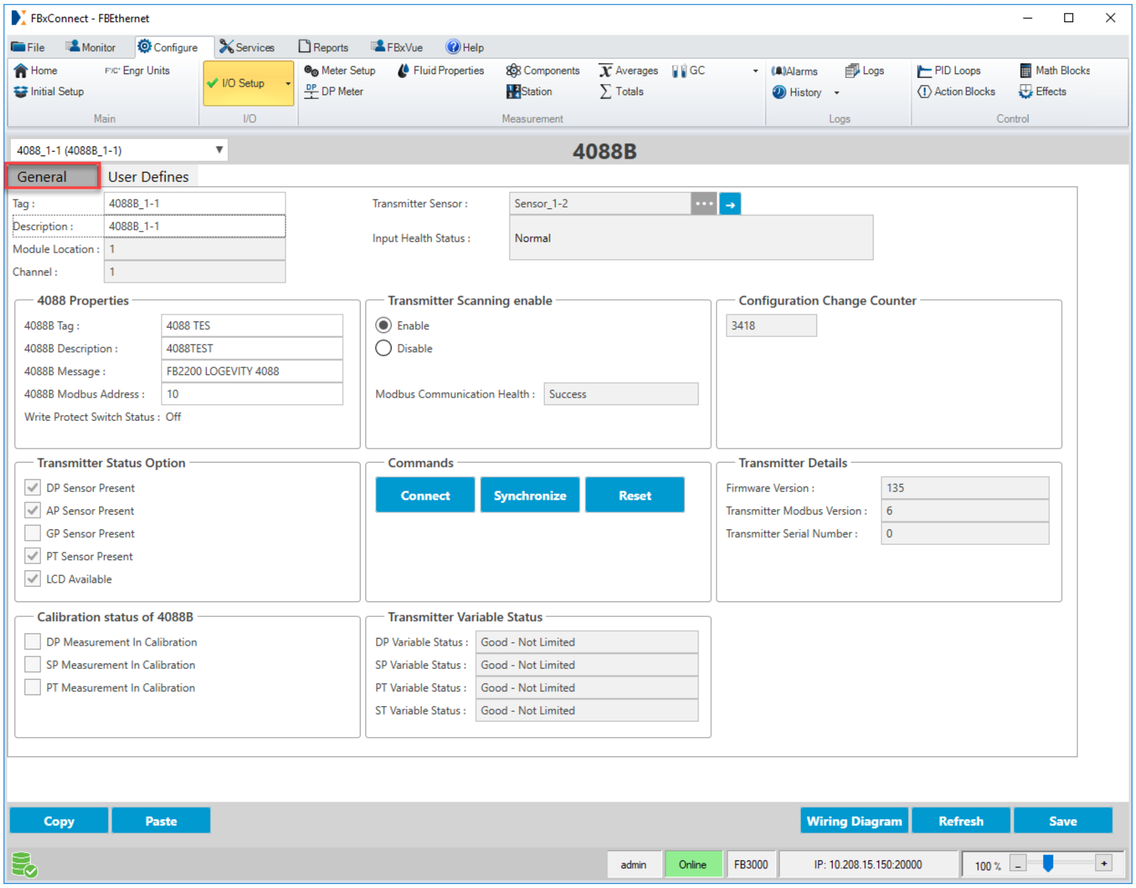
4. Select **Save** to save your changes.
5. Select **Configure > I/O Setup > MVS Configuration**. The **MVS Configuration** display opens showing the **General** tab.

Figure 114. MVS Configuration – General Tab



4088_1-1 (4088B_1-1) ▼

4088B

Tag : 4088B_1-1
Description : 4088B_1-1
Module Location : 1
Channel : 1

Transmitter Sensor : Sensor_1-2
Input Health Status : Normal

4088 Properties
4088B Tag : 4088 TES
4088B Description : 4088TEST
4088B Message : FB2200 LOGEVITY 4088
4088B Modbus Address : 10
Write Protect Switch Status : Off

Transmitter Scanning enable
● Enable
○ Disable
Modbus Communication Health : Success

Configuration Change Counter
3418

Transmitter Status Option
☑ DP Sensor Present
☑ AP Sensor Present
☐ GP Sensor Present
☑ PT Sensor Present
☑ LCD Available

Commands

Transmitter Details
Firmware Version : 135
Transmitter Modbus Version : 6
Transmitter Serial Number : 0

Calibration status of 4088B
☐ DP Measurement In Calibration
☐ SP Measurement In Calibration
☐ PT Measurement In Calibration

Transmitter Variable Status
DP Variable Status : Good - Not Limited
SP Variable Status : Good - Not Limited
PT Variable Status : Good - Not Limited
ST Variable Status : Good - Not Limited

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6. Click ▼ in the drop-down list at the top of the display to select a 4088B instance to configure.

7. In the **Tag** field, enter a name for the 4088B.

8. In the **Description** field, enter a description for the 4088B.

9. In the **4088B Modbus Address** field, enter the Modbus Address of the 4088B.

10. In the **Transmitter Scanning** field, select **Enable** to set the system to scan the 4088B for data.

11. Select **Save** to save your changes to device memory, and to retrieve data from the 4088B.

Note

The remaining fields are automatically populated with data retrieved from the 4088B after a successful scan. To avoid having your changes overwritten, ensure that Transmitter Scanning is successful before you configure additional fields.

---

12. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to MVS Configuration.

13. Select **Save** to save your changes to device memory, and to write the changes to the 4088B.

14. You can now select a 4088B instance on the Differential Pressure, Static Pressure, and RTD displays.

4.5.4 HART® I/O

The HART® (Highway Addressable Remote Transducer) I/O module allows an FB3000 RTU to process input from field-based HART devices. The module has four channels that are independently selectable as either an input or output channel. You use each channel's analog input capabilities for diagnostic and primary process variable measurement. You can configure an input channel for use in point-to-point or multi-drop mode. You can configure an output channel for use in point-to-point mode only.

HART superimposes Frequency Shift Keying (FSK) signals on an analog signal. This technique allows digital information to pass to and from the HART device on a 4 to 20 mA analog signal.

In point-to-point mode, the analog signal is representative of the measured variable. This mode allows communications with one HART device per channel with up to one second updates. The scan time for one channel does not affect the scan time of any other channel. Point-to-point mode with one second updates meets API 21 requirements.

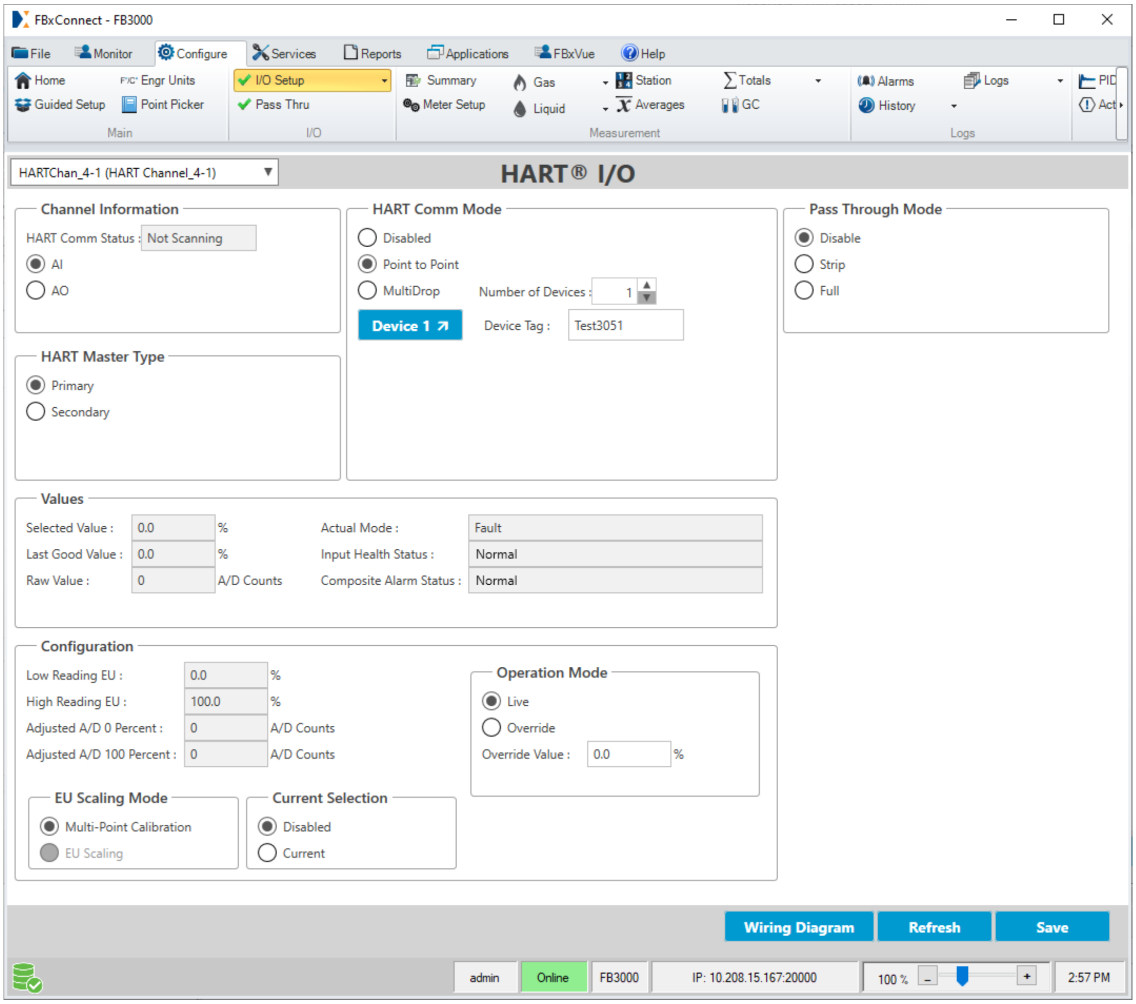
In multi-drop mode, as many as five HART devices can be connected (in parallel) to each channel. Like the point-to-point mode, digital communications are superimposed on the analog signal that is used for powering the HART devices. Each HART device in multi-drop mode requires 4mA, and the analog signal does not represent any measured variable value. With all four channels in the multi-drop mode, the FB3000 can support a maximum of twenty HART devices.

You can configure the FB3000 as a primary master with a Class 1 Conformance classification or as a secondary master for use in redundant applications.

To access this display:

1. Select **Configure > I/O Setup > HART I/O** from the FBxConnect™ main menu. The HART display opens.

Figure 115. HART I/O



HARTChan_4-1 (HART Channel_4-1)

HART® I/O

Channel Information
HART Comm Status : Not Scanning
● AI
○ AO

HART Comm Mode
○ Disabled
● Point to Point
○ MultiDrop
Number of Devices : 1
Device Tag : Test3051

Pass Through Mode
● Disable
○ Strip
○ Full

HART Master Type
● Primary
○ Secondary

Values
Selected Value : 0.0 %
Last Good Value : 0.0 %
Raw Value : 0 A/D Counts
Actual Mode : Fault
Input Health Status : Normal
Composite Alarm Status : Normal

Configuration
Low Reading EU : 0.0 %
High Reading EU : 100.0 %
Adjusted A/D 0 Percent : 0 A/D Counts
Adjusted A/D 100 Percent : 0 A/D Counts

Operation Mode
● Live
○ Override
Override Value : 0.0 %

EU Scaling Mode
● Multi-Point Calibration
● EU Scaling

Current Selection
● Disabled
○ Current

2. Click ▼ in the drop-down list at the top of the display to select a HART channel to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Channel Information	Sets the configuration of the selected channel. Possible options are:

Field	Description		
	HART Comm Status	This **read-only** field shows the current operational state of the selected channel. Possible states are:	
		Scanning	Indicates the channel is currently scanning the HART device(s).
		Not Scanning	Indicates the channel is **not** currently scanning the HART device(s) because the FB Series product is currently offline or not communicating.
		Dual Master	Indicates that the channel has another master connected. Examples of other masters include a Hand-Held Communicator. When in Dual Master, the FB3000 is not scanning the HART device, which allows communications between the other master and the devices. When the other master finishes communicating with the HART device, normal HART module scanning will automatically resume.
		Burst Mode	Indicates that the channel has a device that is configured to be in burst mode. **Note** Burst mode is **not** supported by the HART module. The device should not be configured in Burst mode when connected to FB3000. If a device is in Burst mode, use a Hand-Held Communicator to turn off Burst mode.

Field	**Description**	
	AI	The channel is an analog input. **Note** If you want to use the selected HART channel as an analog input, you should also configure the input using the Analog Input configuration display and selecting the instance (chassis, slot, and channel number) of the input.
	AO	The channel is an analog output. **Note** If you want to use the selected HART channel as an analog output, you should also configure the output using the Analog Output configuration display and selecting the instance (chassis, slot, and channel number) of the output.
HART Master Type	Sets sequencing to ensure that two masters can communicate with one slave device.	
	Primary	The FB3000 has priority in communications.
	Secondary	The FB3000 must wait until the Primary communications have completed.
HART Comm Mode	Sets the communication mode for the selected channel. Possible options are:	
	Disabled	Stop all HART communication.
	Point to Point	Enables the channel to communication with one HART device per channel.
	MultiDrop	Enables the channel to communicate with up to five HART devices connected in parallel. **Note** • This option is available **only** if you select **AI** in the **Channel Information** field. • AI calibration cannot be performed in this communication mode. Calibration can **only** be performed in **Point to Point** mode.

Field	Description	
Number of Devices	Sets the number of HART devices connected in parallel. Note This field applies **only** if you select **MultiDrop** in the HART Comm Mode field.	
Device 1-5	Each button represents one HART device connected to the selected channel. Select a button to open the HART Device display and configure the selected HART device. **Note** • The name of the HART device shows in the **Device Tag** field. • A ⚠ icon next to a **Device Tag** indicates a device that is in an alarm state.	
Pass Through Mode	Sets how communications pass from a host device through the FB Series product on to the HART devices. Possible options are:	
	Disable	No pass-through communications occur.
	Strip	Removes all preamble bytes in HART protocol.
	Full	Leaves the entire message intact.
	Note If you select Strip or Full, you also **must** enable HART protocol on the Ethernet port for this feature to work. For more information, refer to Communications – General Tab.	
Values	These fields display values from the selected HART AI or AO channel.	
	Selected Value	This **read-only** field shows the value (in engineering units) based on the Operation and Fault Mode fields, as well as the health status of the selected input. It is intended to be used as an input to calculations and control logic.
	Last Good Value	This **read-only** field shows the last good value (in engineering units) received by the selected sensor. This value is written to the Selected Value parameter if a fault occurs and the Fault Mode is set to Last Good.
	Raw Value	This **read-only** field shows the current digital count directly from the Analog-to-Digital converter.

Field	Description	
	Auto Read Value	This **read-only** field shows the current value of the parameter configured in the Auto Read Parameter Reference field. **Note** This field appears **only** if you select **AO** in the **Channel Information** field.
	Actual Mode	This **read-only** field shows the source of the selected value. Possible values are: • Live • Auto • Auto Read • Override • Calibration • Fault • Last Good • Last Hour Average • Ramp To Fault Value • Ramp To Last Hour Avg • Polling Disabled
	Input/Output Health Status	This **read-only** field shows the status of the selected channel. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above Calibration Limit • Below Calibration Limit • Input Frozen • Input Clipped • Factory Calibration Invalid • User Calibration Invalid • Disabled • Termination Missing • Hardware Fail

Field	Description	
		- HART Device Fail **Note** This field may temporarily show Point Fail if the **Interval to Poll I/O** field on the I/O Bus display is set to 10 ms and the AO value is changed more than 10%.
	Composite Alarm Status	This **read-only** field shows the current active alarms for the selected channel. The Composite Alarm Status is Normal if there are no active alarms.
Configuration	Use these fields to configure the selected AI or AO channel.	
	Low Reading EU	Sets the value (in engineering units) that is equal to zero percent output (low end of the EU range). Sets the low reading (in engineering units) that is equal to zero percent input. For example, if a temperature transmitter is connected to the analog input with a range of –40 to 160 degrees F, the Low field would be set to –40. **Note** You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.
	High Reading EU	Sets the value (in engineering units) that is equal to 100 percent output (high end of the EU range). Sets the high reading (in engineering units) that is equal to 100 percent input. For example, if a temperature transmitter is connected to the analog input with a range of – 40 to 160 degrees F, the High field would be set to 160. **Note** You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.

Field	Description	
	Adjusted A/D 0 percent	Sets the calibrated Analog-to-Digital count corresponding to zero percent input. In the Calibrate function, this value is altered to set the zero percent input exactly at the Low Reading EU value. **Note** - This field appears **only** if you select **AI** in the **Channel Information** field. - You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.
	Adjusted A/D 100 percent	Sets the calibrated Analog-to-Digital count corresponding to 100 percent input. In the Calibrate function, this value is altered to set the zero percent input exactly at the Low Reading EU value. **Note** - This field appears **only** if you select **AI** in the **Channel Information** field. - You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.
	Adjusted D/A 0 percent	Sets the count that the digital-to-analog converter uses for zero percent output. This value scales the output to engineering units. **Note** - This field appears **only** if you select **AO** in the **Channel Information** field. - You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.

Field	Description		
	Adjusted D/A 100 percent	Sets the count that the digital-to-analog converter uses for zero percent output. This value scales the output to engineering units. **Note** • This field appears **only** if you select **AO** in the **Channel Information** field. • You must select **EU Scaling** in the **EU Scaling Mode** frame to modify this field.	
	EU Scaling Mode	Specifies how the EU scaling parameters are determined. **Note** • These fields appear **only** if you select **AI** in the **Channel Information** field. • You must select **Current** in the **Current/Voltage Selection** frame to modify this field.	
		Multi-Point Calibration	EU scaling parameters are determined by the calibration. You cannot modify the EU scaling parameters (Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent) directly. You must use the calibration wizard to adjust the scaling of the AI. **Note** If you download a configuration file that has Multi-Point Calibration selected, the calibration on your device remains unchanged.

Field	Description		
		EU Scaling	EU scaling parameters are determined by the values you enter in the Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent fields. **Note** If you download a configuration file that has EU Scaling selected, the existing calibration on your device is overwritten using the EU scaling parameters.
	Current/Voltage Selection	Sets the signal type of the selected I/O point.	
		Disabled	No signal is present on the selected channel.
		Current	A 4 to 20 mA signal is present on the selected channel.
	Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are:	
		Live	The system copies the Live Value to the Selected Value parameter. **Note** This field appears **only** if you select **AI** in the **Channel Information** field.
		Auto	The system copies the value in the Auto Value field to the Selected Value parameter. **Note** This field appears **only** if you select **AO** in the **Channel Information** field.

Field	Description		
	Override	The system copies the value set in the Override Value field to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.	
		Override Value	Sets the value (in engineering units) written to the Selected Value field when the Operation Mode is set to Override.
	Auto Read	The system copies the value of the parameter you configure in the Auto Read Parameter Reference field to the Selected Value parameter. This value is updated once per second. **Note** • This field appears **only** if you select **AO** in the **Channel Information** field. • When setting the Operation Mode to Auto Read, make sure that the units and scaling are correct for the referenced parameter.	
	Override Value	Sets the value (in engineering units) to use when the Operation Mode is set to Override.	

Field	Description	
	Auto Value	Sets the value (in engineering units) to use when the Operation Mode is set to Auto Read. **Note** This field appears **only** if you select **AO** in the **Channel Information** field.

4. Select **Save** to save any changes you make to this tab.

4.5.4.1 HART Device

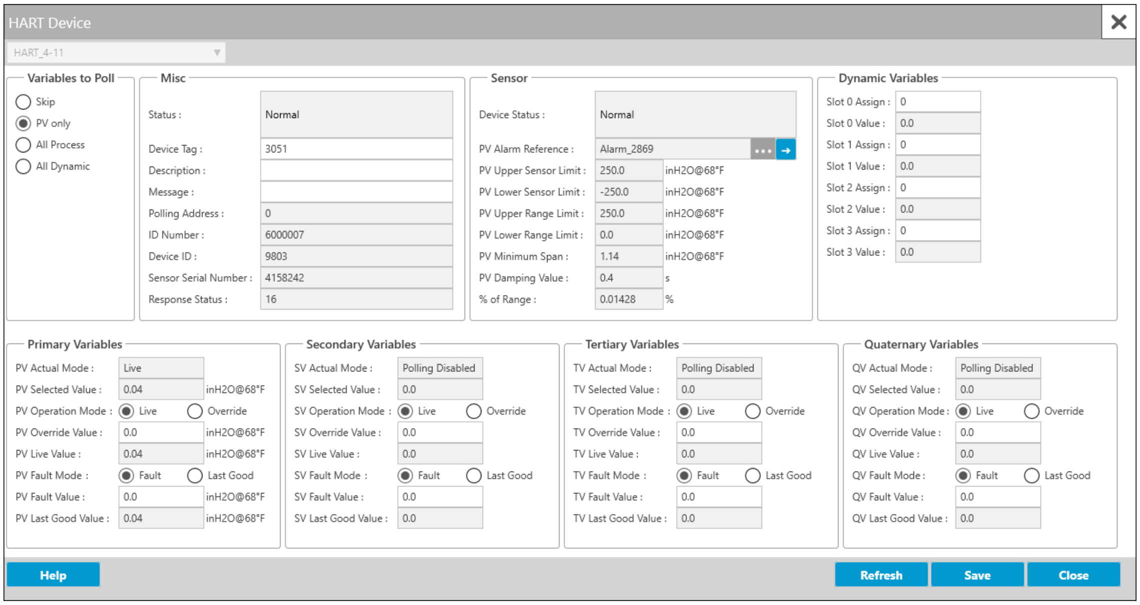
Use this pop-up display to configure parameters specific to the selected HART® device. When in MultiDrop mode, a separate Device button exists for each connected HART device.

To access this tab:

1. Select **Configure > I/O Setup > HART I/O** from the FBxConnect™ main menu. The HART display opens.

2. Select the **Device** button for the device you want to configure. The HART Device pop-up display opens.

Figure 116. HART Device



HART_4-11

Variables to Poll
○ Skip
● PV only
○ All Process
○ All Dynamic

Misc
Status : Normal
Device Tag : 3051
Description :
Message :
Polling Address : 0
ID Number : 6000007
Device ID : 9803
Sensor Serial Number : 4158242
Response Status : 16

Sensor
Device Status : Normal
PV Alarm Reference : Alarm_2869
PV Upper Sensor Limit : 250.0 inH2O@68°F
PV Lower Sensor Limit : -250.0 inH2O@68°F
PV Upper Range Limit : 250.0 inH2O@68°F
PV Lower Range Limit : 0.0 inH2O@68°F
PV Minimum Span : 1.14 inH2O@68°F
PV Damping Value : 0.4 s
% of Range : 0.01428 %

Dynamic Variables
Slot 0 Assign : 0
Slot 0 Value : 0.0
Slot 1 Assign : 0
Slot 1 Value : 0.0
Slot 2 Assign : 0
Slot 2 Value : 0.0
Slot 3 Assign : 0
Slot 3 Value : 0.0

Primary Variables
PV Actual Mode : Live
PV Selected Value : 0.04 inH2O@68°F
PV Operation Mode : ● Live ○ Override
PV Override Value : 0.0 inH2O@68°F
PV Live Value : 0.04 inH2O@68°F
PV Fault Mode : ● Fault ○ Last Good
PV Fault Value : 0.0 inH2O@68°F
PV Last Good Value : 0.04 inH2O@68°F

Secondary Variables
SV Actual Mode : Polling Disabled
SV Selected Value : 0.0
SV Operation Mode : ● Live ○ Override
SV Override Value : 0.0
SV Live Value : 0.0
SV Fault Mode : ● Fault ○ Last Good
SV Fault Value : 0.0
SV Last Good Value : 0.0

Tertiary Variables
TV Actual Mode : Polling Disabled
TV Selected Value : 0.0
TV Operation Mode : ● Live ○ Override
TV Override Value : 0.0
TV Live Value : 0.0
TV Fault Mode : ● Fault ○ Last Good
TV Fault Value : 0.0
TV Last Good Value : 0.0

Quaternary Variables
QV Actual Mode : Polling Disabled
QV Selected Value : 0.0
QV Operation Mode : ● Live ○ Override
QV Override Value : 0.0
QV Live Value : 0.0
QV Fault Mode : ● Fault ○ Last Good
QV Fault Value : 0.0
QV Last Good Value : 0.0

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Variables to Poll	Sets the polling behavior for this device. Possible options are:	
	Skip	Removes this device from the polling sequence
	PV Only	Poll **only** the Primary Variable value.
	All Process	Poll all process variable values (Primary, Secondary, Tertiary, Quaternary).
	All Dynamic	Poll values for all Dynamic Variables (Slot 0, Slot 1, Slot 2, and Slot 3).
Misc	These fields allow you to set and view general information about the selected HART device.	
	Status	This **read-only** field shows the state of the device.
	Device Tag	Sets the name for the HART device to identify it throughout the configuration. The tag should be 8 characters or less. When in Multidrop mode, the tag must be unique for every device.
	Description	Provides up to 16 alphanumeric characters of information (in addition to the device Tag) to more specifically describe the device.
	Message	Defines a message (up to 32 alphanumeric characters in length) sent to and stored in the device.
	Polling Address	This **read-only** field shows the address used for this HART device. In Point to Point mode, the Poll Address is 0. In Multidrop mode, the system uses addresses between 1 and 5.
	ID Number	This **read-only** field shows a 3-byte globally unique address of the device.
	Device ID	This **read-only** field shows the coded ID that reflects the manufacturer of the device, the device type, and the device ID.
	Serial Number	This **read-only** field shows the serial number of the sensor.

Field	**Description**	
	Response Status	This **read-only** field shows the response status of the device. Refer to the documentation from the transmitter manufacturer and HART specification for more information.
Sensor	These read-only fields show you general information about the sensor range and health of the HART device.	
	Device Status	This **read-only** field shows the state of the device.
	PV Alarm Reference	This **read-only** field shows you which alarm is currently configured for the selected HART device.
	PV Upper Sensor Limit	This **read-only** field shows the upper limit on the sensor.
	PV Lower Sensor Limit	This **read-only** field shows the lower limit on the sensor.
	PV Upper Range Limit	This **read-only** field shows the maximum value in the sensor range. **Note** The PV Upper Range Limit is typically a user-configurable value and should be a value less than or equal to the Upper Sensor Limit.
	PV Lower Range Limit	This **read-only** field shows the minimum value in the sensor range. **Note** The PV Lower Range Limit is typically a user-configurable value and should be a value greater than or equal to the Lower Sensor Limit.
	PV Minimum Span	This **read-only** field shows the minimum sensor span.
	PV Damping Value	This **read-only** field shows the damping value reported by the device for the Primary Variable.
	% of Range	This **read-only** field shows the percentage of the range currently being reported by the device.
Dynamic Variables	Use these fields to configure the dynamic variable values used by the system.	

Field	Description	
	Slot 0 Assign	Sets a valid value according to the manufacturer specification between 0-255 to determine which variable in that slot to request.
	Slot 0 Value	This **read-only** field shows the value of the variable requested from that slot. The read-only units defined in the device are shown to the right of this field.
	Slot 1 Assign	Sets a valid value according to the manufacturer specification between 0-255 to determine which variable in that slot to request.
	Slot 1 Value	This **read-only** field shows the value of the variable requested from that slot. The read-only units defined in the device are shown to the right of this field.
	Slot 2 Assign	Sets a valid value according to the manufacturer specification between 0-255 to determine which variable in that slot to request.
	Slot 2 Value	This **read-only** field shows the value of the variable requested from that slot. The read-only units defined in the device are shown to the right of this field.
	Slot 3 Assign	Sets a valid value according to the manufacturer specification between 0-255 to determine which variable in that slot to request.
	Slot 3 Value	This **read-only** field shows the value of the variable requested from that slot. The read-only units defined in the device are shown to the right of this field.
Primary Variables	Use these fields to configure the primary variable values used by the system.	
	PV Actual Mode	This **read-only** field shows the source for the primary variable value used by the system. Possible values are:

Field	Description		
		Polling Disabled	The system is **not** currently polling for this variable.
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the PV Override Value field.
		Fault	The system uses the value set in the PV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	PV Selected Value	This **read-only** field shows the current in-use primary variable value.	
	PV Operation Mode	Sets the operation mode of the primary variable. Possible options are:	
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the PV Override Value field.
	PV Override Value	Sets the primary variable value to use when the PV Operation Mode is set to Override.	
	PV Live Value	This read-only field shows the live primary variable value received from the HART device.	
	PV Fault Mode	Sets the source of the primary variable value when a fault is encountered. Possible options are:	
		Fault	The system uses the value set in the PV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	PV Fault Value	Sets a value to use for the primary variable when a fault occurs and the PV Fault Mode field is set to Fault.	
	PV Last Good Value	This read-only field shows the last known good value received from the HART device.	

Field	Description		
Secondary Variables	Use these fields to configure the secondary variable value used by the system.		
	SV Actual Mode	This read-only field shows the source for the secondary variable value used by the system. Possible values are:	
		Polling Disabled	The system is not currently polling for this variable.
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the SV Override Value field.
		Fault	The system uses the value set in the SV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	SV Selected Value	This **read-only** field shows the current in-use secondary variable value.	
	SV Operation Mode	Sets the operation mode of the secondary variable.	
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the SV Override Value field.
	SV Override Value	Sets the secondary variable value to use when the SV Operation Mode is set to Override.	
	SV Live Value	This **read-only** field shows the live secondary variable value received from the HART device.	
	SV Fault Mode	Sets the source of the secondary variable value when a fault is encountered.	
		Fault	The system uses the value set in the SV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.

Field	Description			
	SV Fault Value	Sets a value to use for the secondary variable when a fault occurs and the SV Fault Mode field is set to Fault.		
	SV Last Good Value	This **read-only** field shows the last known good value received from the HART device.		
Tertiary Variables	Use these fields to configure the tertiary variable value used by the system.			
	TV Actual Mode	This read-only field shows the source for the tertiary variable value used by the system.		
			Polling Disabled	The system is **not** currently polling for this variable.
			Live	The system uses the live value received from HART device.
			Override	The system uses the value set in the TV Override Value field.
			Fault	The system uses the value set in the TV Fault Value field.
			Last Good	The system uses the value shown in the Last Good Value field.
	TV Selected Value	This **read-only** field shows the current in-use tertiary variable value.		
	TV Operation Mode	Sets the operation mode of the tertiary variable.		
			Live	The system uses the live value received from the HART device.
			Override	The system uses the value set in the TV Override Value field.
	TV Override Value	Sets the tertiary variable value to use when the TV Operation Mode is set to Override.		
	TV Live Value	This **read-only** field shows the live tertiary variable value received from the HART device.		
	TV Fault Mode	Sets the source of the tertiary variable value when a fault is encountered.		

Field	Description		
		Fault	The system uses the value set in the TV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	TV Fault Value	Sets a value to use for the tertiary variable when a fault occurs and the TV Fault Mode field is set to Fault.	
	TV Last Good Value	This **read-only** field shows the last known good value received from the HART device.	
Quaternary Variables	Use these fields to configure the quaternary variable value used by the system.		
	QV Actual Mode	This **read-only** field shows the source for the quaternary variable value used by the system.	
		Polling Disabled	The system is **not** currently polling for this variable.
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the QV Override Value field.
		Fault	The system uses the value set in the QV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	QV Selected Value	This **read-only** field shows the current in-use quaternary variable value.	
	QV Operation Mode	Sets the operation mode of the quaternary variable.	
		Live	The system uses the live value received from the HART device.
		Override	The system uses the value set in the QV Override Value field.
	QV Override Value	Sets the quaternary variable value to use when the QV Operation Mode is set to Override.	

Field	Description		
	QV Live Value	This **read-only** field shows the live quaternary variable received from the HART device.	
	QV Fault Mode	Sets the source of the quaternary value when a fault is encountered.	
		Fault	The system uses the value set in the QV Fault Value field.
		Last Good	The system uses the value shown in the Last Good Value field.
	QV Fault Value	Sets a value to use for the quaternary variable when a fault occurs and the QV Fault Mode field is set to Fault.	
	QV Last Good Value	This **read-only** field shows the last known good value received from the HART device.	

4. Select **Save** to save any changes you make to this tab.

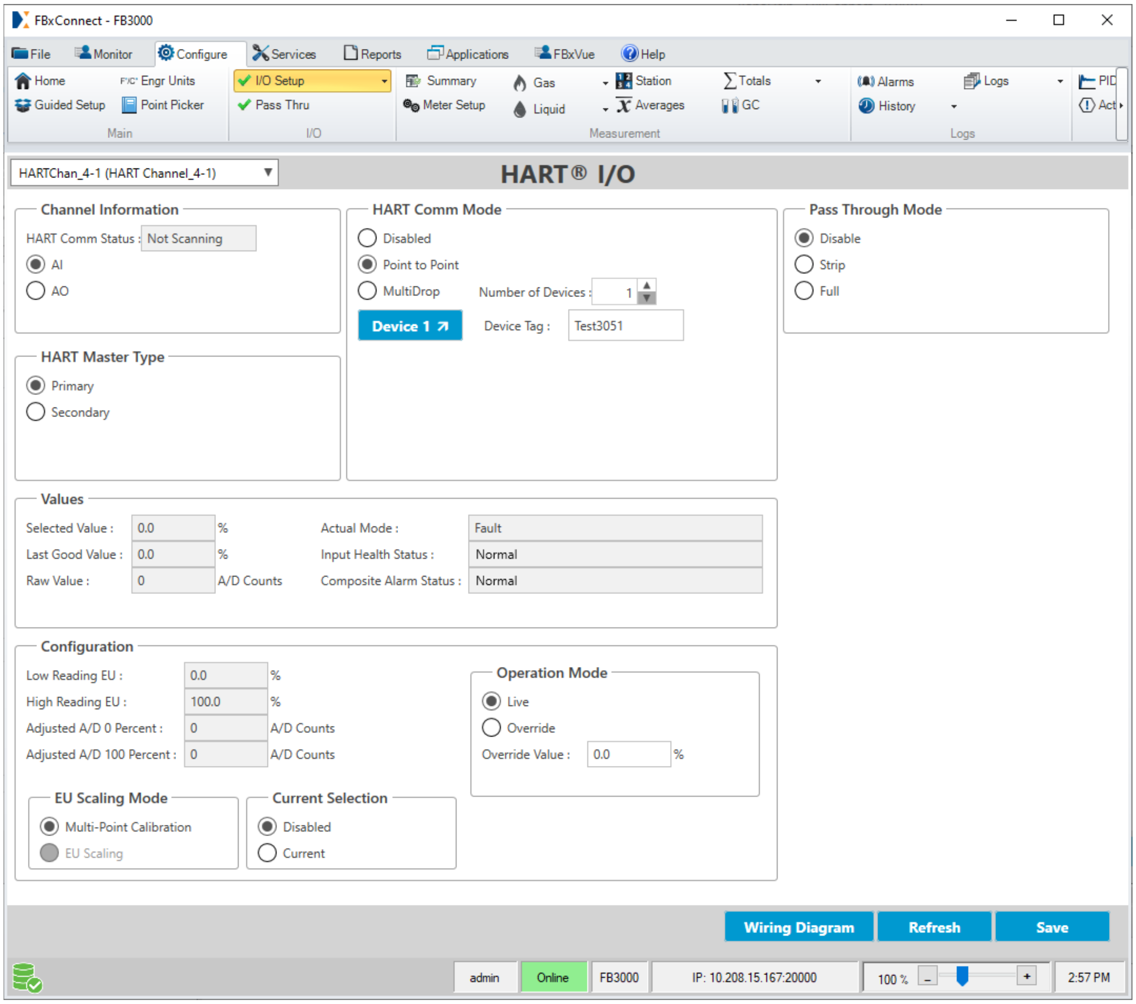
4.5.4.2 Configuring HART® I/O

Use these steps to configure HART® I/O on your FB3000 RTU.

To configure HART I/O:

1. Select **Configure > I/O Setup > HART I/O** from the FBxConnect™ main menu. The HART display opens.

Figure 117. HART



HARTChan_4-1 (HART Channel_4-1) ▼

HART® I/O

Channel Information

HART Comm Status : Not Scanning

● AI
○ AO

HART Master Type

● Primary
○ Secondary

HART Comm Mode

○ Disabled
● Point to Point
○ MultiDrop

Number of Devices : 1

Device Tag : Test3051

Pass Through Mode

● Disable
○ Strip
○ Full

Values

Selected Value : 0.0 %
Last Good Value : 0.0 %
Raw Value : 0 A/D Counts
Actual Mode : Fault
Input Health Status : Normal
Composite Alarm Status : Normal

Configuration

Low Reading EU : 0.0 %
High Reading EU : 100.0 %
Adjusted A/D 0 Percent : 0 A/D Counts
Adjusted A/D 100 Percent : 0 A/D Counts

Operation Mode

● Live
○ Override

Override Value : 0.0 %

EU Scaling Mode

● Multi-Point Calibration
○ EU Scaling

Current Selection

● Disabled
○ Current

2. Click ▼ in the drop-down list at the top of the display to select a HART channel to configure; there are four HART channels per module.

3. Specify whether this is a **Primary** or **Secondary** HART Master in the **HART Master Type** field.

4. Choose the **HART Comm Mode:**

   - If you have a single HART device on the channel, select **Point to Point**.
   - If multiple devices are multi-dropped on the channel, select **Multidrop** and specify the **Number of Devices**.

5. Select if HART pass through communications are allowed and if the FB Series devices removes the preamble bytes in HART protocol (Strip) or if the entire message is forwarded (Full) in the **Pass Through Mode** field.

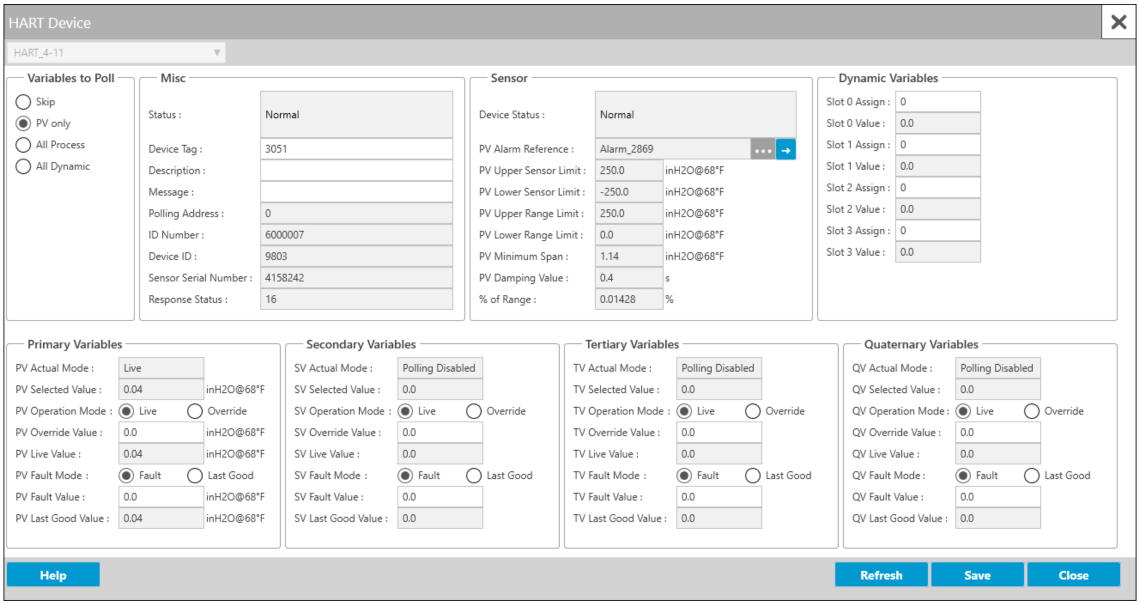
6. Click **Save**. If you chose Multidrop, the HART menu creates a button for each of the devices.

7. Click on the **Device** button to configure the HART device on this channel. The HART Device display opens.

Note

For more information, refer to **HART Device**.

Figure 118. HART Device



Variables to Poll:
○ Skip
● PV only
○ All Process
○ All Dynamic

Status : Normal
Device Tag : 3051
Description :
Message :
Polling Address : 0
ID Number : 6000007
Device ID : 9803
Sensor Serial Number : 4158242
Response Status : 16

Device Status : Normal
PV Alarm Reference : Alarm_2869
PV Upper Sensor Limit : 250.0 inH2O@68°F
PV Lower Sensor Limit : -250.0 inH2O@68°F
PV Upper Range Limit : 250.0 inH2O@68°F
PV Lower Range Limit : 0.0 inH2O@68°F
PV Minimum Span : 1.14 inH2O@68°F
PV Damping Value : 0.4 s
% of Range : 0.01428 %

Slot 0 Assign : 0
Slot 0 Value : 0.0
Slot 1 Assign : 0
Slot 1 Value : 0.0
Slot 2 Assign : 0
Slot 2 Value : 0.0
Slot 3 Assign : 0
Slot 3 Value : 0.0

PV Actual Mode : Live
PV Selected Value : 0.04 inH2O@68°F
PV Operation Mode : ● Live ○ Override
PV Override Value : 0.0 inH2O@68°F
PV Live Value : 0.04 inH2O@68°F
PV Fault Mode : ● Fault ○ Last Good
PV Fault Value : 0.0 inH2O@68°F
PV Last Good Value : 0.04 inH2O@68°F

SV Actual Mode : Polling Disabled
SV Selected Value : 0.0
SV Operation Mode : ● Live ○ Override
SV Override Value : 0.0
SV Live Value : 0.0
SV Fault Mode : ● Fault ○ Last Good
SV Fault Value : 0.0
SV Last Good Value : 0.0

TV Actual Mode : Polling Disabled
TV Selected Value : 0.0
TV Operation Mode : ● Live ○ Override
TV Override Value : 0.0
TV Live Value : 0.0
TV Fault Mode : ● Fault ○ Last Good
TV Fault Value : 0.0
TV Last Good Value : 0.0

QV Actual Mode : Polling Disabled
QV Selected Value : 0.0
QV Operation Mode : ● Live ○ Override
QV Override Value : 0.0
QV Live Value : 0.0
QV Fault Mode : ● Fault ○ Last Good
QV Fault Value : 0.0
QV Last Good Value : 0.0

8. Select the variables you want to poll from the device, then click **Save** and **Close** the screen.

9. If this channel uses multi-drop, repeat steps 8 and 9 for any other connected HART devices.

4.5.5 Differential Pressure

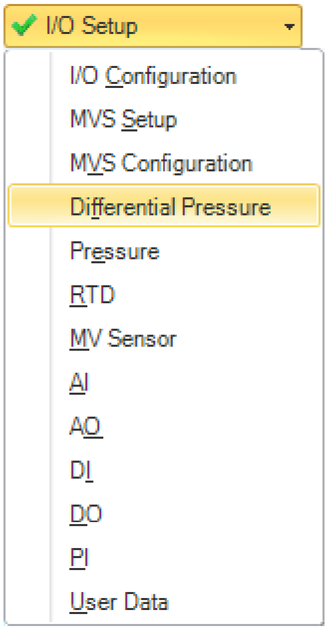
Use this display to view and configure general parameters associated with the differential pressure input, set the calibration timeout period, and view calibration/verification values.

Note

To view this display, you **must** first enable 4088B communications on either COM3 or COM4. For more information, refer to **Port Owner** field on the Communications – General tab.

To access this display, select **Configure > I/O Setup > Differential Pressure** from the FBxConnect™ main menu.

Figure 119. I/O Setup – Differential Pressure



The Differential Pressure contains the following items:

General – Use this display to view and configure general parameters associated with the differential pressure input.

Calibration Values – Use this pop-up display to set the calibration timeout period and view previous calibration/verification values.

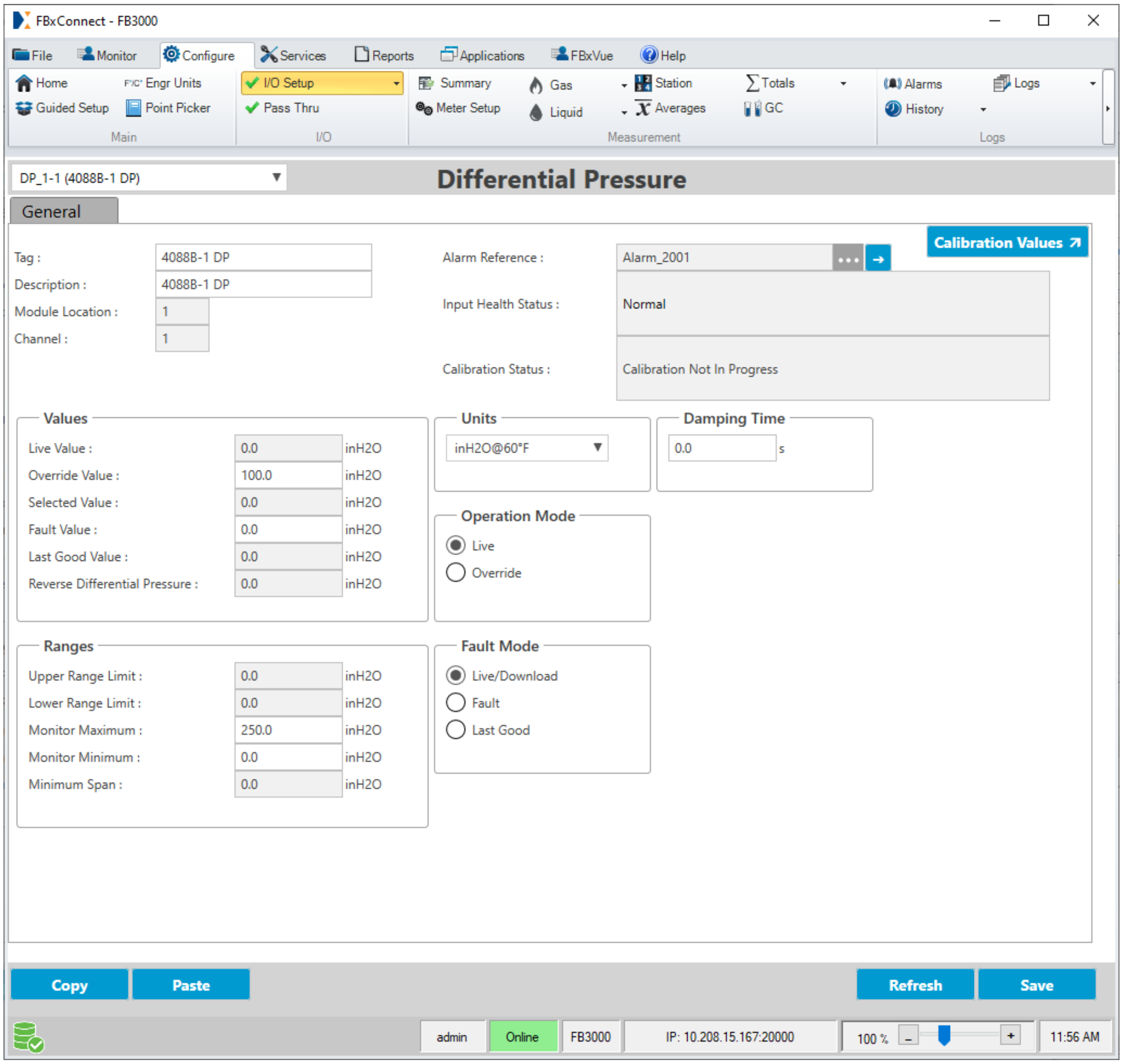
4.5.5.1 Differential Pressure – General

Use this display to view and configure general parameters associated with the differential pressure input.

To access this display:

1. Select **Configure > I/O Setup > Differential Pressure** from the FBxConnect™ main menu. The Differential Pressure display opens.

Figure 120. Differential Pressure – General



DP_1-1 (4088B-1 DP)

Tag : 4088B-1 DP
Description : 4088B-1 DP
Module Location : 1
Channel : 1
Alarm Reference : Alarm_2001
Input Health Status : Normal
Calibration Status : Calibration Not In Progress

Values
Live Value : 0.0 inH2O
Override Value : 100.0 inH2O
Selected Value : 0.0 inH2O
Fault Value : 0.0 inH2O
Last Good Value : 0.0 inH2O
Reverse Differential Pressure : 0.0 inH2O

Units
inH2O@60°F

Damping Time
0.0 s

Operation Mode
● Live
○ Override

Ranges
Upper Range Limit : 0.0 inH2O
Lower Range Limit : 0.0 inH2O
Monitor Maximum : 250.0 inH2O
Monitor Minimum : 0.0 inH2O
Minimum Span : 0.0 inH2O

Fault Mode
● Live/Download
○ Fault
○ Last Good

2. Click ▼ in the sensor drop-down list and select the sensor you want to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected sensor.
Description	Sets a description (up to 20-alphanumeric characters) for the selected sensor.
Module Location	This **read-only** field shows the location of the module in your FB Series product.

Field	Description
Channel	This **read-only** field shows the unique channel number for this differential pressure instance.
Alarm Reference	This **read-only** field shows you which alarm is currently configured for the point. **Note** Click → to open the Alarms display and configure the alarm parameters.
Input Health Status	This **read-only** field shows the status of the input. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above URL • Below LRL • Input Frozen
Calibration Status	This **read-only** field shows the current calibration status of the selected channel.
Calibration Values	Select this button to open a pop-up display where you can set the calibration timeout period and view previous calibration/verification values.
Live Value	This **read-only** field shows the current value (in engineering units) of the selected sensor.
Override Value	Sets the value (in engineering units) written to the Selected Value field when the **Operation Mode** is set to **Override**.
Selected Value	This **read-only** field shows the value (in engineering units) based on the Operation Mode and Fault Mode fields, as well as the health status of the selected sensor. It is intended to be used as an input to calculations and control logic.

Field	Description
Fault Value	Sets the value (in engineering units) written to the Selected Value parameter when a fault occurs on the selected sensor and the Fault Mode is set to Fault.
Last Good Value	This **read-only** field shows the last good value (in engineering units) received by the selected sensor. This value is written to the Selected Value parameter if a fault occurs and the Fault Mode is set to Last Good.
Reverse Differential Pressure	This **read-only** field shows the Selected Value multiplied by −1.
Upper Range Limit	This **read-only** field shows the maximum amount of differential pressure the sensor can detect.
Lower Range Limit	This **read-only** field shows the minimum amount of differential pressure the sensor can detect.
Monitor Maximum	Sets the maximum value of the differential pressure gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Monitor Minimum	Sets the minimum value of the differential pressure gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Minimum Span	This **read-only** field shows the minimum span of the sensor.
Units	Sets the measurement units to use with the differential pressure input value.
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are:

Field	Description	
	Live	The system copies the Live Value to the Selected Value parameter.
	Override	The system copies the Override Value to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.
Fault Mode	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs.	
	Live	The system copies the value of the **Live Value** field to the Selected Value Parameter.
	Fault	The system copies the value set in the **Fault Value** field to the Selected Value parameter.
	Last Good	The system copies the value of the **Last Good Value** field to the Selected Value parameter.
Damping Time	Sets a time (in seconds) used to dampen the reading of the signal from the sensor. Small fluctuations can occur with every reading. The damping time is used to give a value that is less prone to those fluctuations, based on the previous read value. A value of 0.0 disables damping.	

4. Select **Save** to save any changes you make to this display.

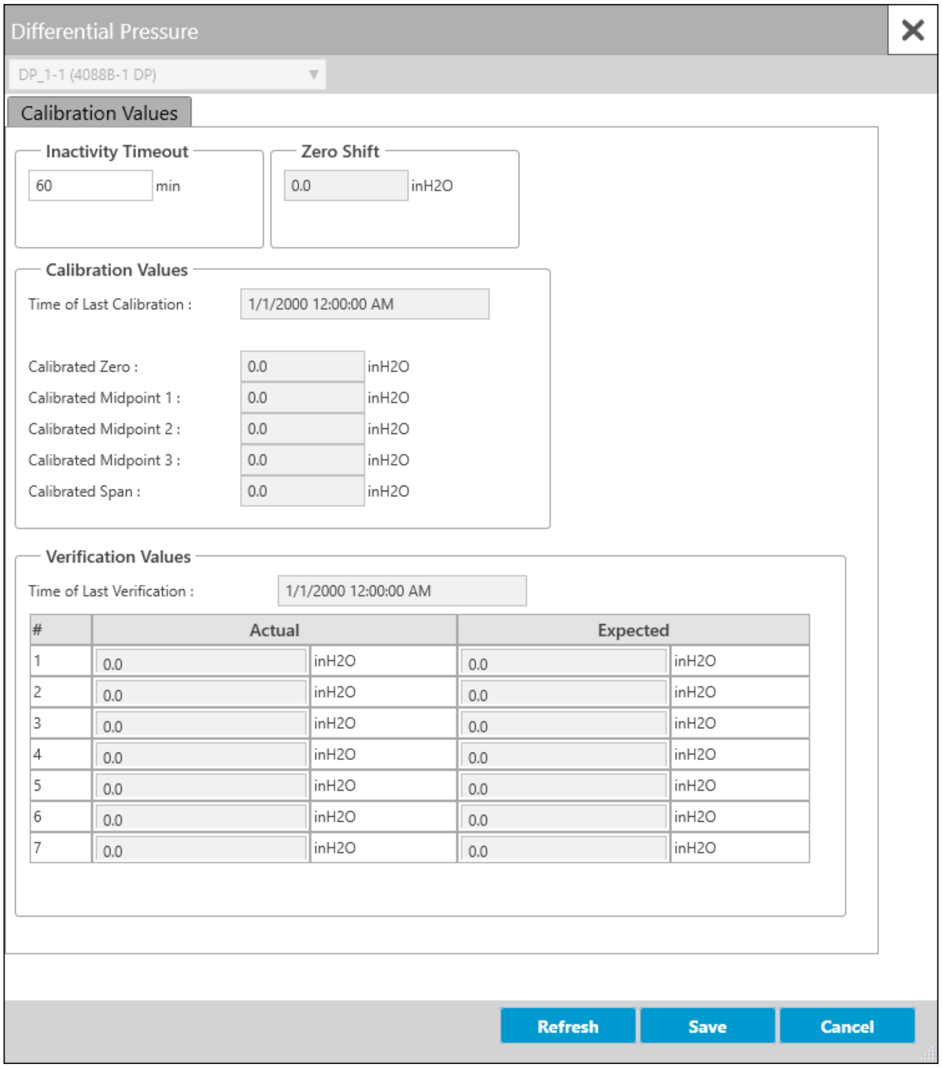
4.5.5.2 Differential Pressure – Calibration Values

Use this pop-up display to set the calibration timeout period and view previous calibration/verification values.

To access this pop-up display:

1. Select **Configure > I/O Setup > Differential Pressure** from the FBxConnect™ main menu.
2. Click ▼ in the sensor drop-down list and select the sensor you want to configure.
3. Select the **Calibration Values** button. The Calibration Values pop-up display opens.

Figure 121. Differential Pressure – Calibration Values



Inactivity Timeout
60 min

Zero Shift
0.0 inH2O

Calibration Values

Time of Last Calibration : 1/1/2000 12:00:00 AM

Calibrated Zero : 0.0 inH2O
Calibrated Midpoint 1 : 0.0 inH2O
Calibrated Midpoint 2 : 0.0 inH2O
Calibrated Midpoint 3 : 0.0 inH2O
Calibrated Span : 0.0 inH2O

Verification Values

Time of Last Verification : 1/1/2000 12:00:00 AM

#	Actual		Expected	
1	0.0	inH2O	0.0	inH2O
2	0.0	inH2O	0.0	inH2O
3	0.0	inH2O	0.0	inH2O
4	0.0	inH2O	0.0	inH2O
5	0.0	inH2O	0.0	inH2O
6	0.0	inH2O	0.0	inH2O
7	0.0	inH2O	0.0	inH2O

4. Review – and change as necessary – the values in the following fields:

Field	Description
Inactivity Timeout	Sets the period of time (in minutes) the system waits for activity during the calibration process. If no activity occurs during the specified time period, the calibration automatically ends. The default is 60 minutes.
Zero Shift	This **read-only** field shows the offset applied to the input to compensate for environmental factors to set the reading as close to zero as possible.
Calibration Values	These **read-only** fields show the date and time of the last calibration, and the Calibrated Zero, Midpoints, and Span.
Verification Values	These **read-only** fields show the date and time of the last verification, and the Actual and Expected values of that verification.

5. Select **Save** to save any changes you make to this tab.

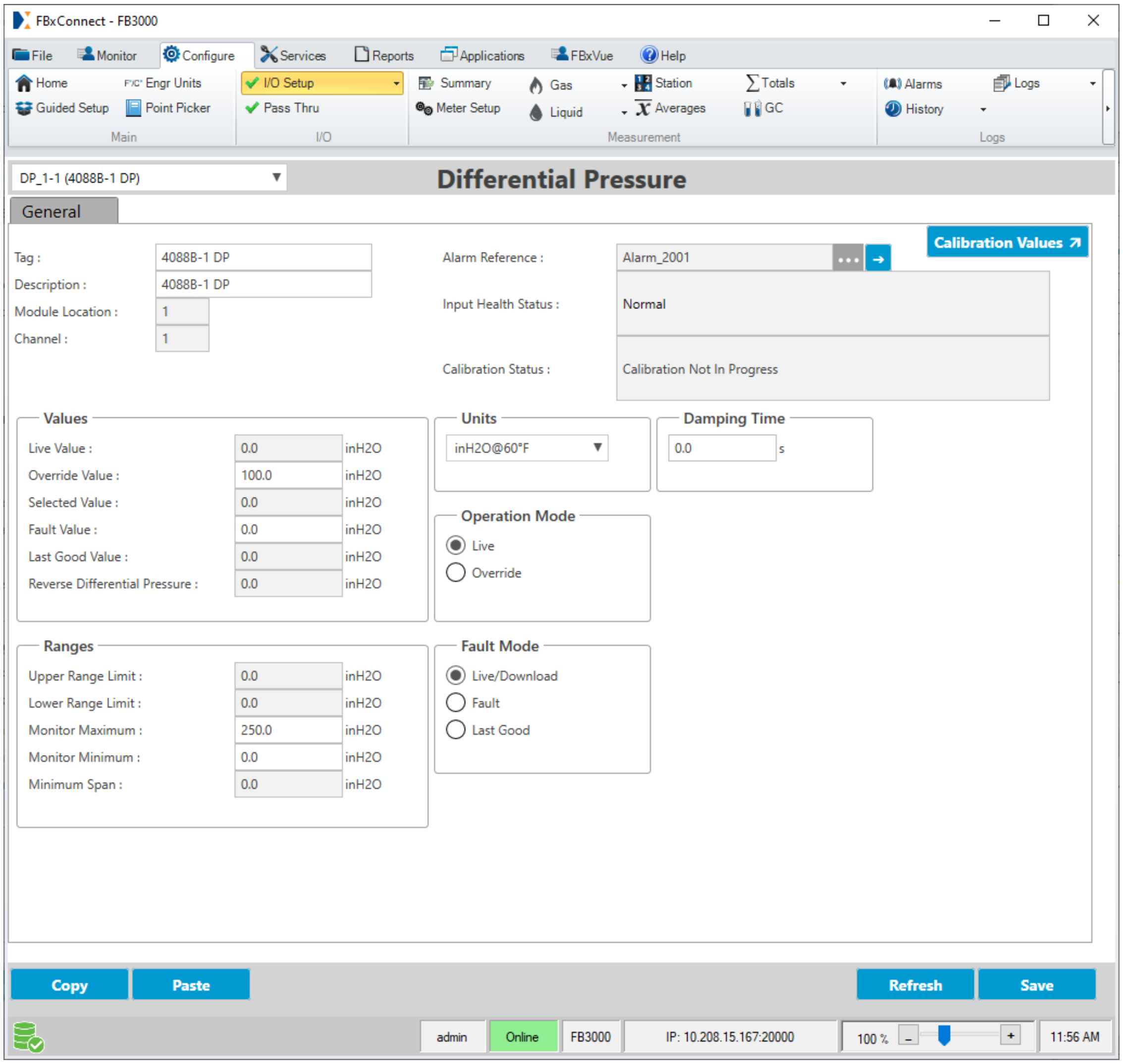
4.5.5.3 Configuring Differential Pressure Inputs

Use these steps to configure a differential pressure input on your FB Series product.

To configure a differential pressure input:

1. Select **Configure > I/O Setup > Differential Pressure** from the FBxConnect™ main menu.

Figure 122. Differential Pressure – General



DP_1-1 (4088B-1 DP)

Tag : 4088B-1 DP

Description : 4088B-1 DP

Module Location : 1

Channel : 1

Alarm Reference : Alarm_2001

Input Health Status : Normal

Calibration Status : Calibration Not In Progress

Values

Live Value :	0.0	inH2O
Override Value :	100.0	inH2O
Selected Value :	0.0	inH2O
Fault Value :	0.0	inH2O
Last Good Value :	0.0	inH2O
Reverse Differential Pressure :	0.0	inH2O

Units

inH2O@60°F

Damping Time

0.0 s

Operation Mode

● Live
○ Override

Ranges

Upper Range Limit :	0.0	inH2O
Lower Range Limit :	0.0	inH2O
Monitor Maximum :	250.0	inH2O
Monitor Minimum :	0.0	inH2O
Minimum Span :	0.0	inH2O

Fault Mode

● Live/Download
○ Fault
○ Last Good

2. Click ▼ in the drop-down list at the top of the display to select a differential pressure input to configure.

3. In the **Tag** field, enter a name for the selected input.

4. In the **Description** field, enter a description for the selected input.

5. In the **Units** frame, set the engineering units used for the selected channel.

6. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

If you select **Override**, you **must** enter a value in the **Override Value** field.

7. In the **Fault Mode** frame, set how the system acquires the value written to the Selected Value parameter when a fault occurs (Live, Fault, or Last Good).

Note

If you select **Fault**, you must enter a value in the **Fault Value** field.

8. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Differential Pressure.
9. Select **Save** to save your changes to device memory.

4.5.6 Pressure

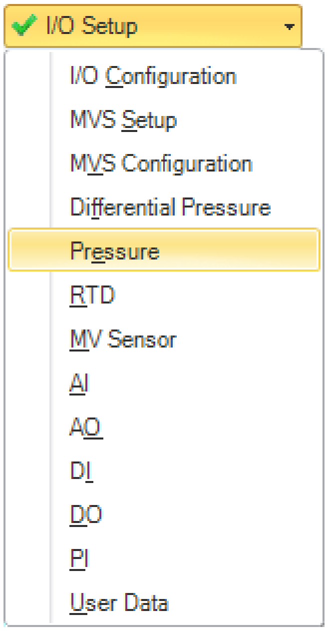
Use this display to view and configure general parameters associated with the static pressure input, set the calibration timeout period, and view calibration/verification values.

Note

To view this display, you **must** first enable 4088B communications on either COM3 or COM4. For more information, refer to **Port Owner** field on Communications – General.

To access this display, select **Configure > I/O Setup > Pressure** from the FBxConnect™ main menu.

Figure 123. I/O Setup – Pressure



The Pressure display has the following sections:

General – Use this display to view and configure general parameters associated with the static pressure input.

Calibration Values – Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

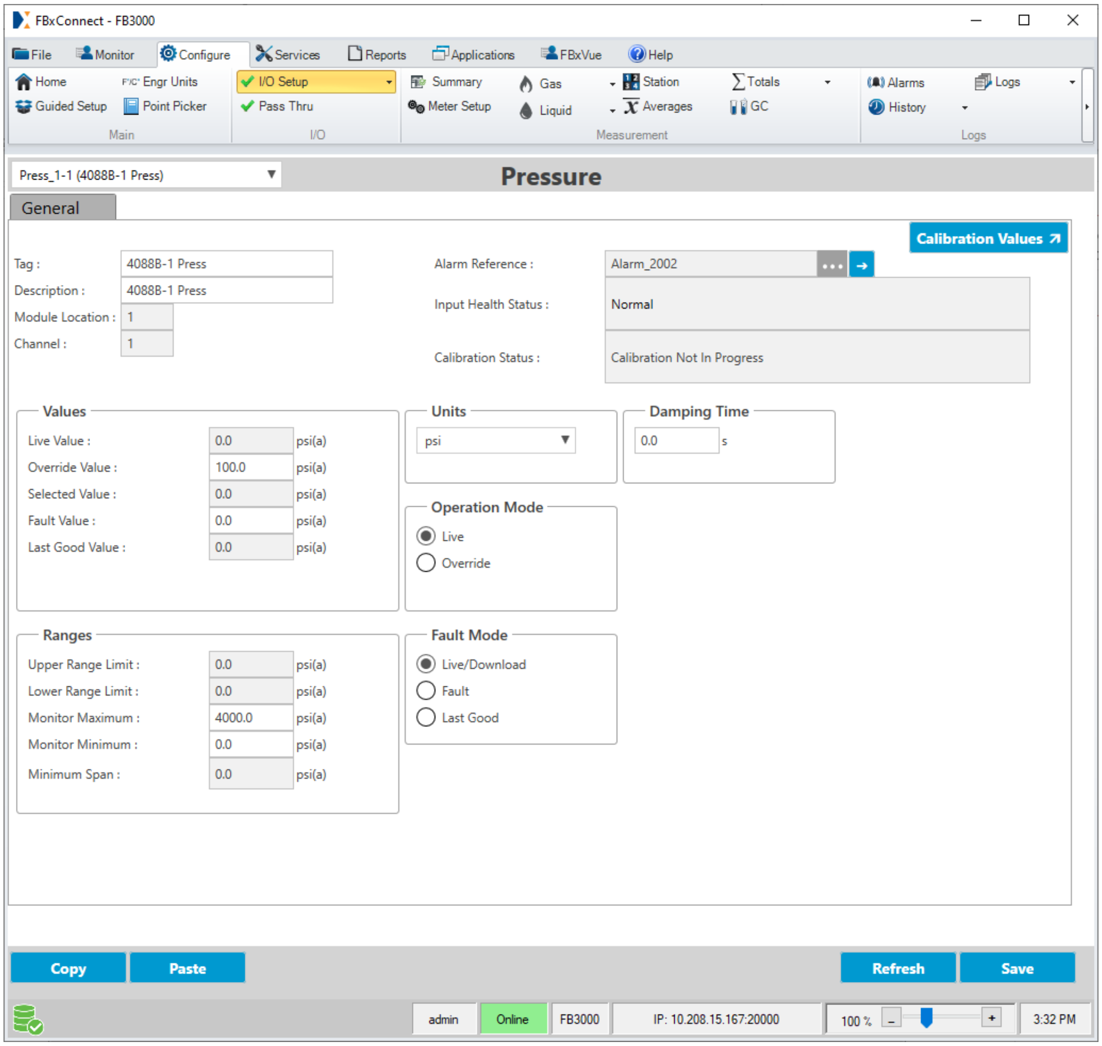
4.5.6.1 Pressure – General

Use this display to view and configure general parameters associated with the static pressure input.

To access this display:

1. Select **Configure > I/O Setup > Pressure** from the FBxConnect™ main menu. The Pressure display opens.

Figure 124. Pressure – General



Tag : 4088B-1 Press
Description : 4088B-1 Press
Module Location : 1
Channel : 1
Alarm Reference : Alarm_2002
Input Health Status : Normal
Calibration Status : Calibration Not In Progress

Values
Live Value : 0.0 psi(a)
Override Value : 100.0 psi(a)
Selected Value : 0.0 psi(a)
Fault Value : 0.0 psi(a)
Last Good Value : 0.0 psi(a)

Units
psi

Damping Time
0.0 s

Operation Mode
● Live
○ Override

Ranges
Upper Range Limit : 0.0 psi(a)
Lower Range Limit : 0.0 psi(a)
Monitor Maximum : 4000.0 psi(a)
Monitor Minimum : 0.0 psi(a)
Minimum Span : 0.0 psi(a)

Fault Mode
● Live/Download
○ Fault
○ Last Good

2. Click ▼ in the sensor drop-down list and select the sensor you want to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected sensor.
Description	Sets a description (up to 20-alphanumeric characters) for the selected sensor.
Module Location	This **read-only** field shows the location of the module in your FB Series product.

Field	Description
Channel	This **read-only** field shows the unique channel number for this static pressure instance.
Alarm Reference	This **read-only** field shows you which alarm is currently configured for the point. **Note** Click ➔ to open the Alarms display and configure the alarm parameters.
Input Health Status	This **read-only** field shows the status of the input. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above URL • Below LRL • Input Frozen
Calibration Status	This **read-only** field shows the current calibration status of the selected channel.
Calibration Values	Select this button to open a pop-up display where you can set the calibration timeout period and view previous calibration/verification values.
Live Value	This **read-only** field shows the current value (in engineering units) of the selected sensor.
Override Value	Sets the value (in engineering units) written to the Selected Value field when the Operation Mode is set to Override.
Selected Value	This **read-only** field represents the value (in engineering units) based on the Operation Mode and Fault Mode fields, as well as the health status of the selected sensor. It is intended to be used as an input to calculations and control logic.

Field	Description
Fault Value	Sets the value (in engineering units) written to the Selected Value parameter when a fault occurs on the selected sensor and the Fault Mode is set to Fault.
Last Good Value	This **read-only** field shows the last good value (in engineering units) received by the selected sensor. This value is written to the Selected Value parameter if a fault occurs and the Fault Mode is set to Last Good.
Upper Range Limit	This **read-only** field shows the maximum amount of static pressure the sensor can detect.
Lower Range Limit	This **read-only** field shows the minimum amount of static pressure the sensor can detect.
Monitor Maximum	Sets the maximum value of the static pressure gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Monitor Minimum	Sets the minimum value of the static pressure gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Minimum Span	This **read-only** field shows the minimum span of the sensor.
Units	Sets the measurement units to use with the pressure input value.
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. **Live** The system copies the Live Value to the Selected Value parameter.

Field	Description	
	Override	The system copies the Override Value to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.
Fault Mode	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs.	
	Live	The system copies the Live Value to the Selected Value parameter.
	Fault	The system copies the Fault Value to the Selected Value parameter.
	Last Good	The system copies the Last Good Value to the Selected Value parameter.
Damping Time	Sets a time (in seconds) used to dampen the reading of the signal from the sensor. Small fluctuations can occur with every reading. The damping time is used to give a value that is less prone to those fluctuations, based on the previous read value. A value of 0.0 disables damping.	

4. Select **Save** to save any changes you make to this display.

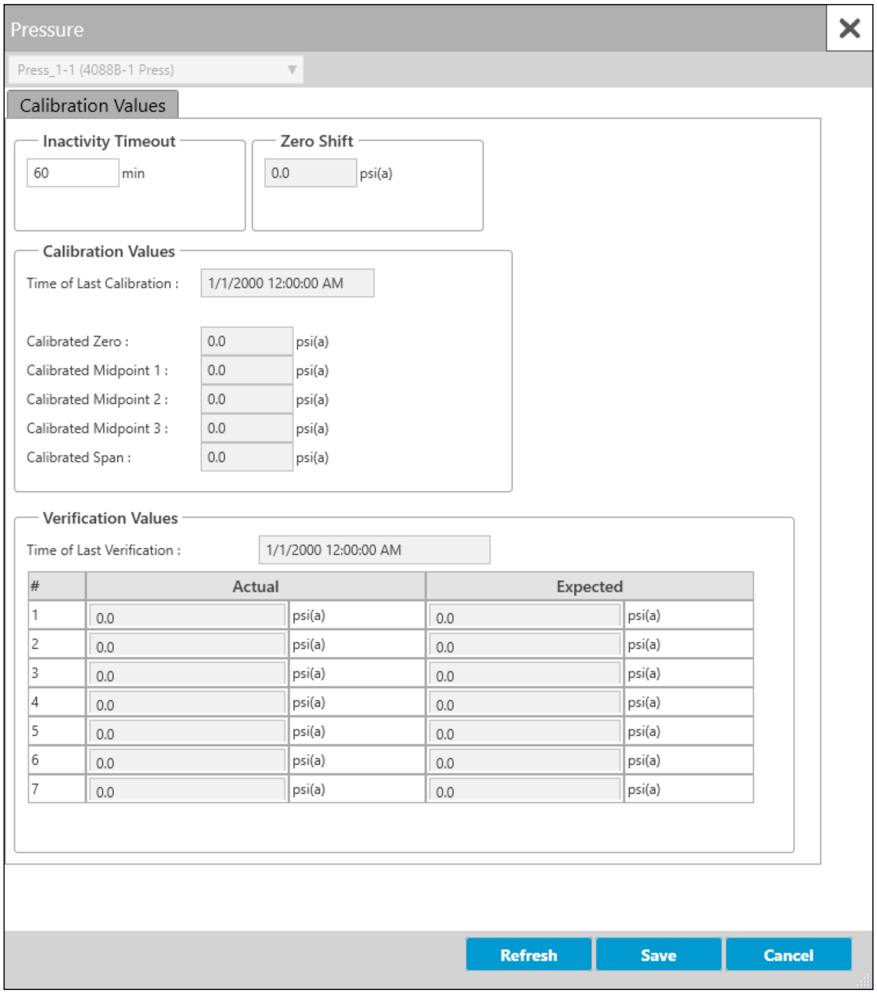
4.5.6.2 Pressure – Calibration Values

Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

To access this pop-up display:

1. Select **Configure > I/O Setup > Pressure** from the FBxConnect™ main menu.
2. Click ▼ in the sensor drop-down list and select the sensor you want to configure.
3. Select the **Calibration Values** button. The Calibration Values pop-up display opens.

Figure 125. Pressure – Calibration Values



Inactivity Timeout: 60 min

Zero Shift: 0.0 psi(a)

Calibration Values

Time of Last Calibration : 1/1/2000 12:00:00 AM

Calibrated Zero : 0.0 psi(a)
Calibrated Midpoint 1 : 0.0 psi(a)
Calibrated Midpoint 2 : 0.0 psi(a)
Calibrated Midpoint 3 : 0.0 psi(a)
Calibrated Span : 0.0 psi(a)

Verification Values

Time of Last Verification : 1/1/2000 12:00:00 AM

#	Actual		Expected	
1	0.0	psi(a)	0.0	psi(a)
2	0.0	psi(a)	0.0	psi(a)
3	0.0	psi(a)	0.0	psi(a)
4	0.0	psi(a)	0.0	psi(a)
5	0.0	psi(a)	0.0	psi(a)
6	0.0	psi(a)	0.0	psi(a)
7	0.0	psi(a)	0.0	psi(a)

4. Review – and change as necessary – the values in the following fields:

Field	Description
Inactivity Timeout	Sets the period of time (in minutes) the system waits for activity during the calibration process. If no activity occurs during the specified time period, the calibration automatically ends. The default is 60 minutes.
Zero Shift	This **read-only** field shows the offset applied to the input to compensate for environmental factors to set the reading as close to zero as possible.
Calibration Values	These **read-only** fields show the date and time of the last calibration, and the Calibrated Zero, Midpoints, and Span.

Field	Description
Verification Values	These **read-only** fields show the date and time of the last verification, and the Actual and Expected values of that verification.

5. Select **Save** to save any changes you make to this pop-up display.

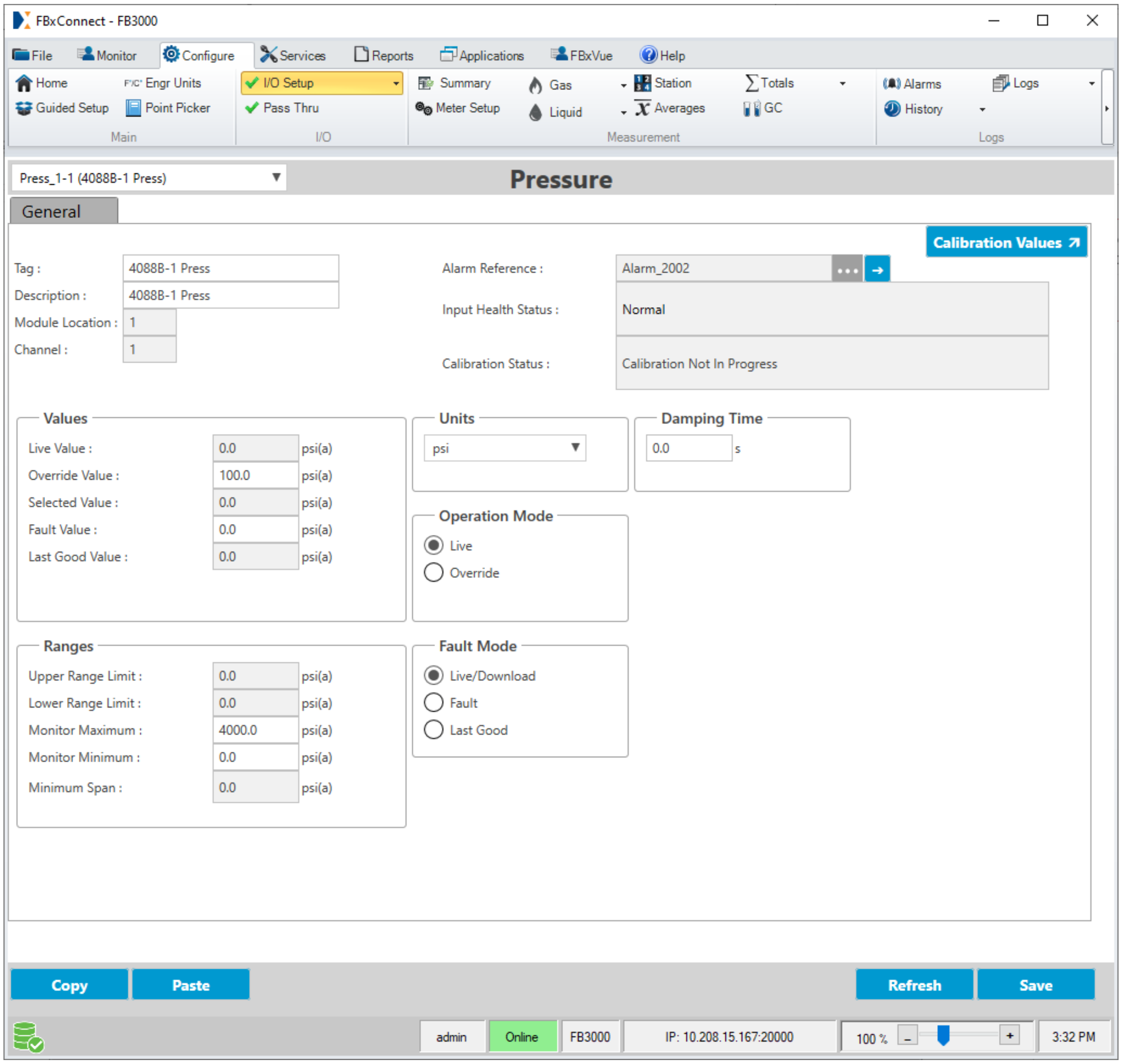
4.5.6.3 Configuring Static Pressure Inputs

Use these steps to configure a static pressure input on your FB Series product.

To configure a static pressure input:

1. Select **Configure > I/O Setup > Pressure** from the FBxConnect™ main menu.

Figure 126. Pressure – General



Tag : 4088B-1 Press
Description : 4088B-1 Press
Module Location : 1
Channel : 1
Alarm Reference : Alarm_2002
Input Health Status : Normal
Calibration Status : Calibration Not In Progress

Values
Live Value : 0.0 psi(a)
Override Value : 100.0 psi(a)
Selected Value : 0.0 psi(a)
Fault Value : 0.0 psi(a)
Last Good Value : 0.0 psi(a)

Units
psi

Damping Time
0.0 s

Operation Mode
● Live
○ Override

Ranges
Upper Range Limit : 0.0 psi(a)
Lower Range Limit : 0.0 psi(a)
Monitor Maximum : 4000.0 psi(a)
Monitor Minimum : 0.0 psi(a)
Minimum Span : 0.0 psi(a)

Fault Mode
● Live/Download
○ Fault
○ Last Good

2. Click ▼ in the drop-down list at the top of the display to select a static pressure input to configure.

3. In the **Tag** field, enter a name for the selected input.

4. In the **Description** field, enter a description for the selected input.

5. In the **Units** frame, set the engineering units used for the selected channel.

6. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

If you select **Override**, you **must** enter a value in the **Override Value** field.

---

7. In the **Fault Mode** frame, set how the system acquires the value written to the Selected Value parameter when a fault occurs (Live, Fault, or Last Good).

Note

If you select **Fault**, you must enter a value in the **Fault Value** field.

---

8. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Pressure.

9. Select **Save** to save your changes to device memory.

4.5.7 RTD

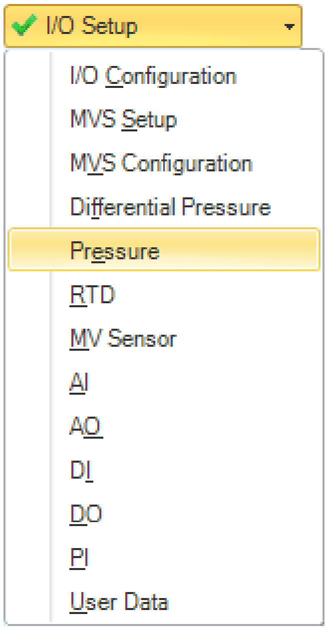
Use this display to view and configure general RTD parameters, set the calibration timeout period, and view calibration/verification values.

Note

To view this display, you **must** first enable 4088B communications on either COM3 or COM4. For more information, refer to **Port Owner** field on the Communications – General tab.

To access this display, select **Configure > I/O Setup > RTD** from the FBxConnect™ main menu.

Figure 127. I/O Setup – RTD



The RTD display contains the following items:

General – Use this display to view and configure general RTD parameters.

Calibration Values – Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

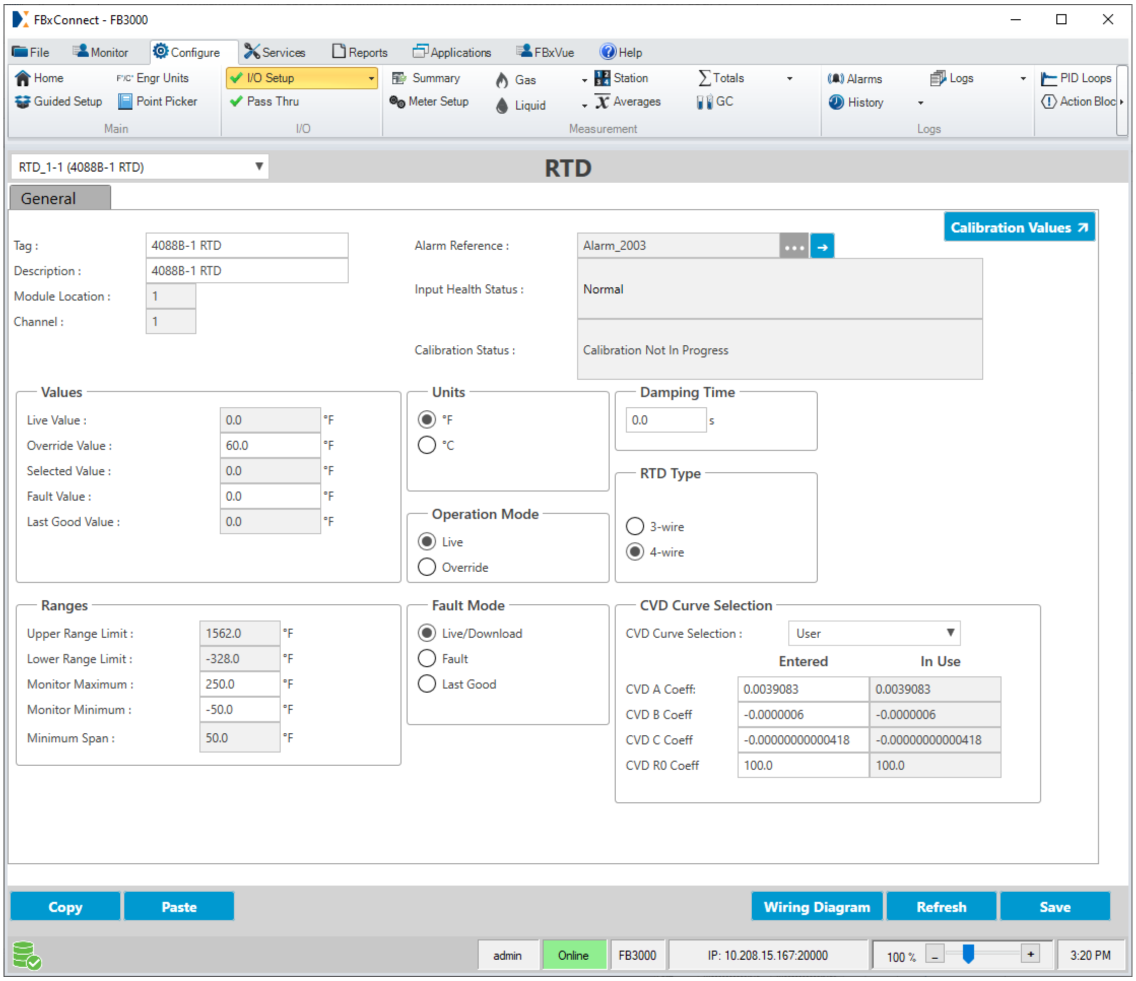
4.5.7.1 RTD – General

Use this display to view and configure general RTD parameters.

To access this display:

1. Select **Configure > I/O Setup > RTD** from the FBxConnect™ main menu. The RTD display opens.

Figure 128. RTD – General



RTD_1-1 (4088B-1 RTD) ▼

RTD

Tag : 4088B-1 RTD
Description : 4088B-1 RTD
Module Location : 1
Channel : 1
Alarm Reference : Alarm_2003
Input Health Status : Normal
Calibration Status : Calibration Not In Progress

Values
Live Value : 0.0 °F
Override Value : 60.0 °F
Selected Value : 0.0 °F
Fault Value : 0.0 °F
Last Good Value : 0.0 °F

Units
● °F
○ °C

Damping Time
0.0 s

RTD Type
○ 3-wire
● 4-wire

Operation Mode
● Live
○ Override

Ranges
Upper Range Limit : 1562.0 °F
Lower Range Limit : -328.0 °F
Monitor Maximum : 250.0 °F
Monitor Minimum : -50.0 °F
Minimum Span : 50.0 °F

Fault Mode
● Live/Download
○ Fault
○ Last Good

CVD Curve Selection
CVD Curve Selection : User ▼

	Entered	In Use
CVD A Coeff:	0.0039083	0.0039083
CVD B Coeff	-0.0000006	-0.0000006
CVD C Coeff	-0.00000000000418	-0.00000000000418
CVD R0 Coeff	100.0	100.0

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 3:20 PM

2. Click ▼ in the drop-down list at the top of the display to select an RTD to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected RTD.
Description	Sets a description (up to 20-alphanumeric characters) for the selected RTD.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the unique channel number for this RTD instance.

Field	Description
Alarm Reference	This **read-only** field shows you which alarm is currently configured for the point. **Note** Click → to open the Alarms display and configure the alarm parameters.
Input Health Status	This **read-only** field shows the status of the selected channel. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above URL • Below LRL • Input Frozen • Type Mismatch
Calibration Status	This **read-only** field shows the current calibration status of the selected channel. Possible values are: • Calibration Not In Progress • Input Frozen • Calibration In Progress • Set Command Failed • Timeout Occurred • Span Too Small • Excess Correction • Passed Parameter Too Small • Passed Parameter Too Large • Ideal Value Too Small • Ideal Value Too Large

Field	Description
	- Wrong Command - Verification In Progress
Calibration Values	Select this button to open a pop-up display where you can set the calibration timeout period and view previous calibration/verification values.
Live Value	This **read-only** field shows the current value (in engineering units) of the RTD.
Override Value	Sets the value (in engineering units) written to the Selected Value field when the Operation Mode is set to Override.
Selected Value	This **read-only** field represents the value (in engineering units) based on the Operation Mode and Fault Mode fields, as well as the health status of the selected sensor. It is intended to be used as an input to calculations and control logic.
Fault Value	Sets the value (in engineering units) written to the Selected Value parameter when a fault occurs on the selected sensor and the Fault Mode is set to Fault.
Last Good Value	This **read-only** field shows the last good value (in engineering units) received by the selected sensor. This value is written to the Selected Value parameter if a fault occurs and the Fault Mode is set to Last Good.
Minimum Span	This **read-only** field shows the minimum difference between the zero and the span (in engineering units). When performing a calibration, the span must at least be greater than the zero by the value of this parameter.
Upper Range Limit	This **read-only** field shows the maximum temperature the RTD can detect.
Lower Range Limit	This **read-only** field shows the minimum temperature the RTD can detect.
Monitor Maximum	Sets the maximum value of the temperature gauge shown on the Monitor > Main display. **Note** - To avoid prolonged display rendering times, limit the scale range to no more than 10,000.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">• This field applies only to the FB1000 and FB2000 Series Flow Computers.</td></tr>
<tr><td>Monitor Minimum</td><td colspan="2">Sets the minimum value of the temperature gauge shown on the Monitor > Main display.
Note
• To avoid prolonged display rendering times, limit the scale range to no more than 10,000.
• This field applies only to the FB1000 and FB2000 Series Flow Computers.</td></tr>
<tr><td>Minimum Span</td><td colspan="2">This read-only field shows the minimum span of the sensor.</td></tr>
<tr><td>Units</td><td colspan="2">Sets the measurement units to use with the RTD input value.</td></tr>
<tr><td rowspan="3">Operation Mode</td><td colspan="2">Sets how the system acquires the value written to the Selected Value parameter under normal operation.</td></tr>
<tr><td>Live</td><td>The system copies the Live Value to the Selected Value parameter.</td></tr>
<tr><td>Override</td><td>The system copies the Override Value to the Selected Value parameter.
Note
If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.</td></tr>
<tr><td rowspan="4">Fault Mode</td><td colspan="2">Sets how the system acquires the value written to the Selected Value parameter when a fault occurs.</td></tr>
<tr><td>Live</td><td>The system copies the Live Value to the Selected Value parameter.</td></tr>
<tr><td>Fault</td><td>The system copies the Fault Value to the Selected Value parameter.</td></tr>
<tr><td>Last Good</td><td>The system copies the Last Good Value to the Selected Value parameter.</td></tr>
</table>

Field	Description
Damping Time	Sets a time (in seconds) used to dampen the reading of the signal from the sensor. Small fluctuations can occur with every reading. The damping time is used to give a value that is less prone to those fluctuations, based on the previous read value. A value of 0.0 disables damping.
RTD Type	Specifies the wiring and signal type of the RTD used by the FB Series product. Possible options are 3-wire or 4-wire.
CVD Curve Selection	Click ▼ to select the Callendar-Van Dusen equation to use for the RTD. The Callendar-Van Dusen equation describes the relationship between resistance (R) and temperature (T) of a resistance temperature detector (RTD). The form of the equation is as follows: $R(T) = R(0)[1 + A * T + B * T^2 + (T - 100)C *$ You can pick from two pre-defined sets of coefficients for the equation based on a specific material temperature coefficient of resistance (Alpha) or you can select a user set of coefficients. The Alpha value will be specified by the RTD manufacturer.

4. Select **Save** to save any changes you make to this display.

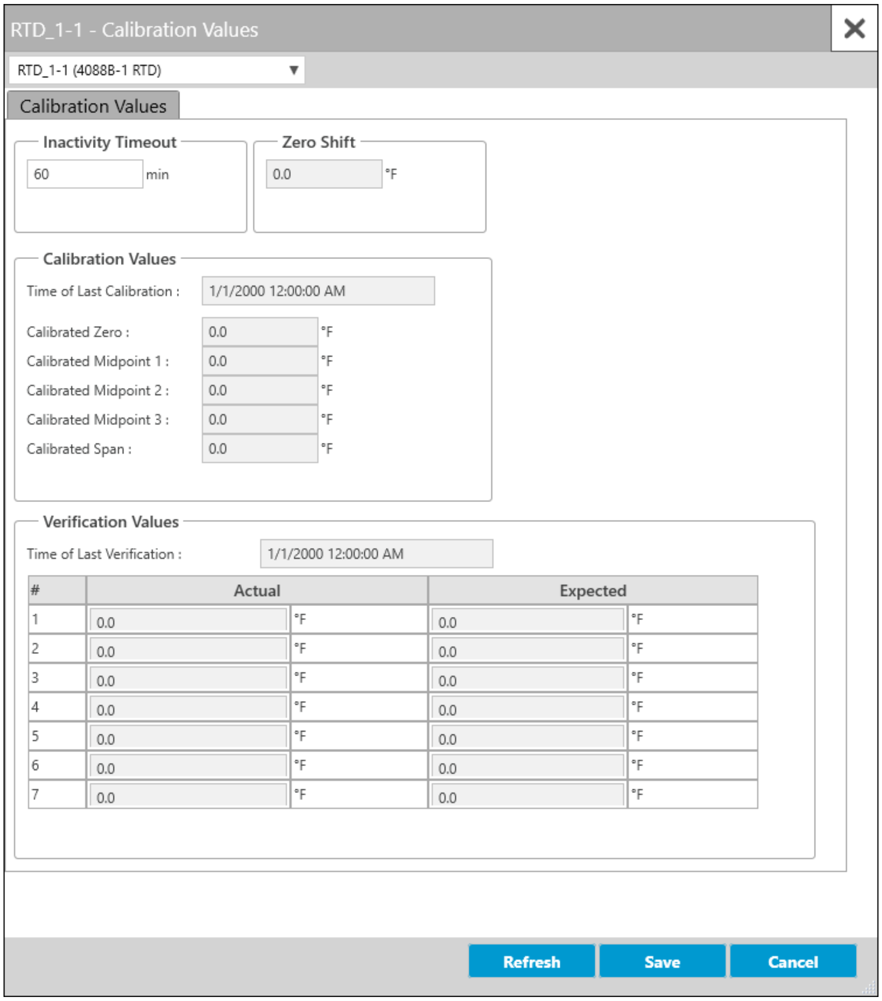
4.5.7.2 RTD – Calibration Values

Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

To access this pop-up display:

1. Select **Configure > I/O Setup > RTD** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select an RTD to configure.
3. Select the **Calibration Values** button. The Calibration Values pop-up display opens.

Figure 129. RTD – Calibration Values



Inactivity Timeout: 60 min

Zero Shift: 0.0 °F

Calibration Values

Time of Last Calibration : 1/1/2000 12:00:00 AM

Calibrated Zero : 0.0 °F

Calibrated Midpoint 1 : 0.0 °F

Calibrated Midpoint 2 : 0.0 °F

Calibrated Midpoint 3 : 0.0 °F

Calibrated Span : 0.0 °F

Verification Values

Time of Last Verification : 1/1/2000 12:00:00 AM

#	Actual		Expected	
1	0.0	°F	0.0	°F
2	0.0	°F	0.0	°F
3	0.0	°F	0.0	°F
4	0.0	°F	0.0	°F
5	0.0	°F	0.0	°F
6	0.0	°F	0.0	°F
7	0.0	°F	0.0	°F

4. Review – and change as necessary – the values in the following fields:

Field	Description
Inactivity Timeout	Sets the period of time (in minutes) the system waits for activity during the calibration process. If no activity occurs during the specified time period, the calibration automatically ends. The default is 60 minutes.
Zero Shift	This **read-only** field shows the offset applied to the input to compensate for environmental factors to set the reading as close to zero as possible.
Calibration Values	These **read-only** fields show the date and time of the last calibration, and the Calibrated Zero, Midpoints, and Span.

Field	Description
Verification Values	These **read-only** fields show the date and time of the last verification, and the Actual and Expected values of that verification.

5. Select **Save** to save any changes you make to this pop-up display.

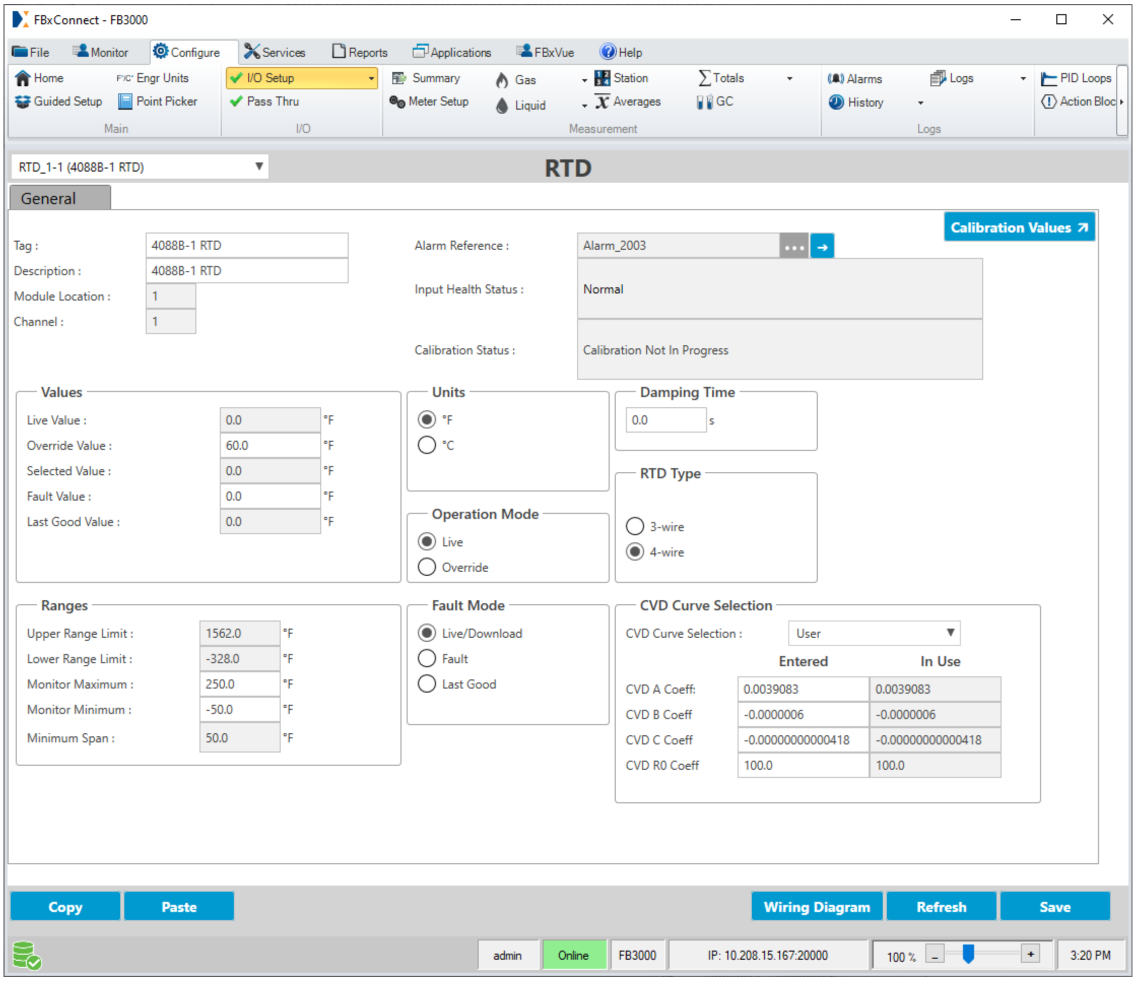
4.5.7.3 Configuring an RTD

Use these steps to configure an RTD on your FB Series product.

To configure an RTD:

1. Select **Configure > I/O Setup > RTD** from the FBxConnect™ main menu.

Figure 130. RTD – General



RTD_1-1 (4088B-1 RTD)

Tag : 4088B-1 RTD
Description : 4088B-1 RTD
Module Location : 1
Channel : 1
Alarm Reference : Alarm_2003
Input Health Status : Normal
Calibration Status : Calibration Not In Progress

Values
Live Value : 0.0 °F
Override Value : 60.0 °F
Selected Value : 0.0 °F
Fault Value : 0.0 °F
Last Good Value : 0.0 °F

Units
● °F
○ °C

Damping Time
0.0 s

RTD Type
○ 3-wire
● 4-wire

Operation Mode
● Live
○ Override

Ranges
Upper Range Limit : 1562.0 °F
Lower Range Limit : -328.0 °F
Monitor Maximum : 250.0 °F
Monitor Minimum : -50.0 °F
Minimum Span : 50.0 °F

Fault Mode
● Live/Download
○ Fault
○ Last Good

CVD Curve Selection
CVD Curve Selection : User

	Entered	In Use
CVD A Coeff:	0.0039083	0.0039083
CVD B Coeff	-0.0000006	-0.0000006
CVD C Coeff	-0.00000000000418	-0.00000000000418
CVD R0 Coeff	100.0	100.0

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2. Click ▼ in the drop-down list at the top of the display to select an RTD to configure.

3. In the **Tag** field, enter a name for the selected channel.
4. In the **Description** field, enter a description for the selected channel.
5. In the **RTD Type** field, select type of RTD used by the FB Series product. Possible options are
6. In the **CVD Curve** frame, set the Callendar-Van Dusen constants to use for the RTD.
7. In the **Units** frame, set the engineering units used for the selected input.
8. In the **Operation Mode** frame, set how the system acquires the value of the selected input under normal operating conditions.

Note

If you select **Override**, you **must** enter a value in the **Override Value** field.

---

9. In the **Fault Mode** frame, set how the system acquires the value written to the Selected Value parameter when a fault occurs (Live, Fault, or Last Good).

Note

If you select **Fault**, you must enter a value in the **Fault Value** field.

---

10. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to RTD.
11. Select **Save** to save your changes to device memory.

4.5.8 MV Sensor

Use this display to view multivariable sensor values and properties for both the integral sensor and 4088B MultiVariable Transmitter.

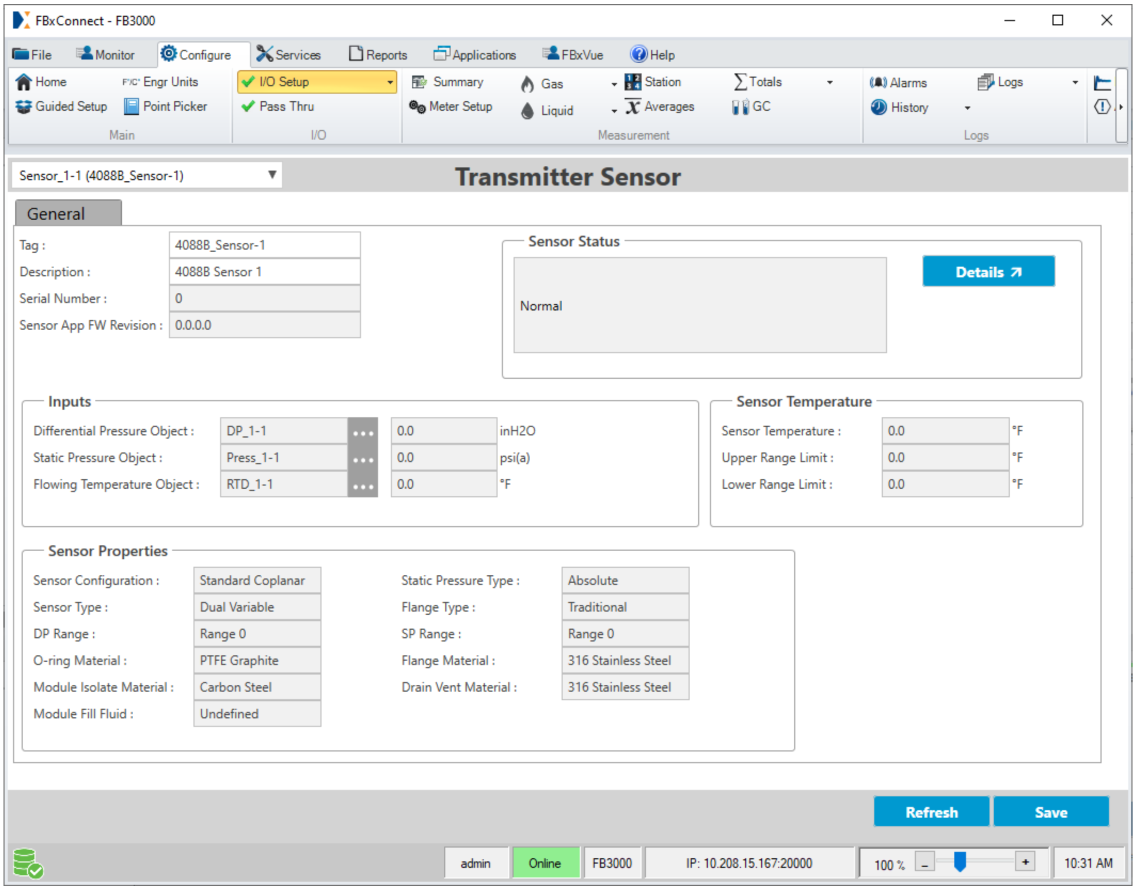
Note

To view this display, you **must** first enable 4088B communications on either COM3 or COM4. For more information, refer to **Port Owner** field on the Communications – General display.

To access this display:

1. Select **Configure > I/O Setup > MV Sensor** from the FBxConnect™ main menu.

Figure 131. MV Sensor



Sensor_1-1 (4088B_Sensor-1)

Transmitter Sensor

Tag : 4088B_Sensor-1
Description : 4088B Sensor 1
Serial Number : 0
Sensor App FW Revision : 0.0.0.0

Sensor Status
Normal

Inputs

Differential Pressure Object :	DP_1-1	0.0	inH2O
Static Pressure Object :	Press_1-1	0.0	psi(a)
Flowing Temperature Object :	RTD_1-1	0.0	°F

Sensor Temperature

Sensor Temperature :	0.0	°F
Upper Range Limit :	0.0	°F
Lower Range Limit :	0.0	°F

Sensor Properties

Sensor Configuration :	Standard Coplanar	Static Pressure Type :	Absolute
Sensor Type :	Dual Variable	Flange Type :	Traditional
DP Range :	Range 0	SP Range :	Range 0
O-ring Material :	PTFE Graphite	Flange Material :	316 Stainless Steel
Module Isolate Material :	Carbon Steel	Drain Vent Material :	316 Stainless Steel
Module Fill Fluid :	Undefined		

2. Click ▼ in the drop-down list at the top of the display to select a sensor to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected sensor.
Description	Sets a description (up to 20-alphanumeric characters) for the selected sensor.
Serial Number	This **read-only** field shows the serial number of the sensor.
Sensor App FW Revision	This **read-only** field shows the firmware revision level of the sensor.
Sensor Status	This **read-only** field shows the status of the sensor.

Field	Description
	Details Click to see possible MV sensor status conditions. **Note** Current active statuses are selected with a check mark.
Differential Pressure Object	This **read-only** field shows the differential pressure parameter in the FB Series product currently configured for the selected sensor, and the current value of that parameter.
Static Pressure Object	This **read-only** field shows the static pressure parameter in the FB Series product currently configured for the selected sensor, and the current value of that parameter.
Flowing Temperature Object	This **read-only** field shows the temperature of the fluid in the meter.
Sensor Temperature	This **read-only** field shows the current temperature of the selected sensor. **Note** This field appears **only** if you select a 4088B in the MV Sensor drop-down list.
Upper Range Limit	This **read-only** field shows the upper temperature range limit of the selected sensor. **Note** This field appears **only** if you select a 4088B in the MV Sensor drop-down list.
Lower Range Limit	This **read-only** field shows the lower temperature range limit of the selected sensor. **Note** This field appears **only** if you select a 4088B in the MV Sensor drop-down list.
Sensor Configuration	This **read-only** field shows the connection type of the sensor in the current configuration.
Static Pressure Type	This **read-only** field shows the type of static pressure returned from the currently configured sensor.
Sensor Type	This **read-only** field shows the type of sensor connected in the current configuration.

Field	Description
Flange Type	This **read-only** field shows the type of flange in the currently configured sensor.
DP Range	This **read-only** field shows the differential pressure range of the currently configured sensor.
SP Range	This **read-only** field shows the static pressure range of the currently configured sensor.
O-ring Material	This **read-only** field shows the O-ring construction material in the currently configured sensor.
Flange Material	This **read-only** field shows the flange construction material in the currently configured sensor.
Module Isolate Material	This **read-only** field shows the module isolate construction material in the currently configured sensor.
Drain Vent Material	This **read-only** field shows the drain vent construction material in the currently configured sensor.
Module Fill Fluid	This **read-only** field shows the type of module fill fluid in the currently configured sensor.

4. Select **Save** to save any changes you make to this display.

4.5.8.1 Sensor Status

Use this display to view status conditions associated with your multivariable sensor.

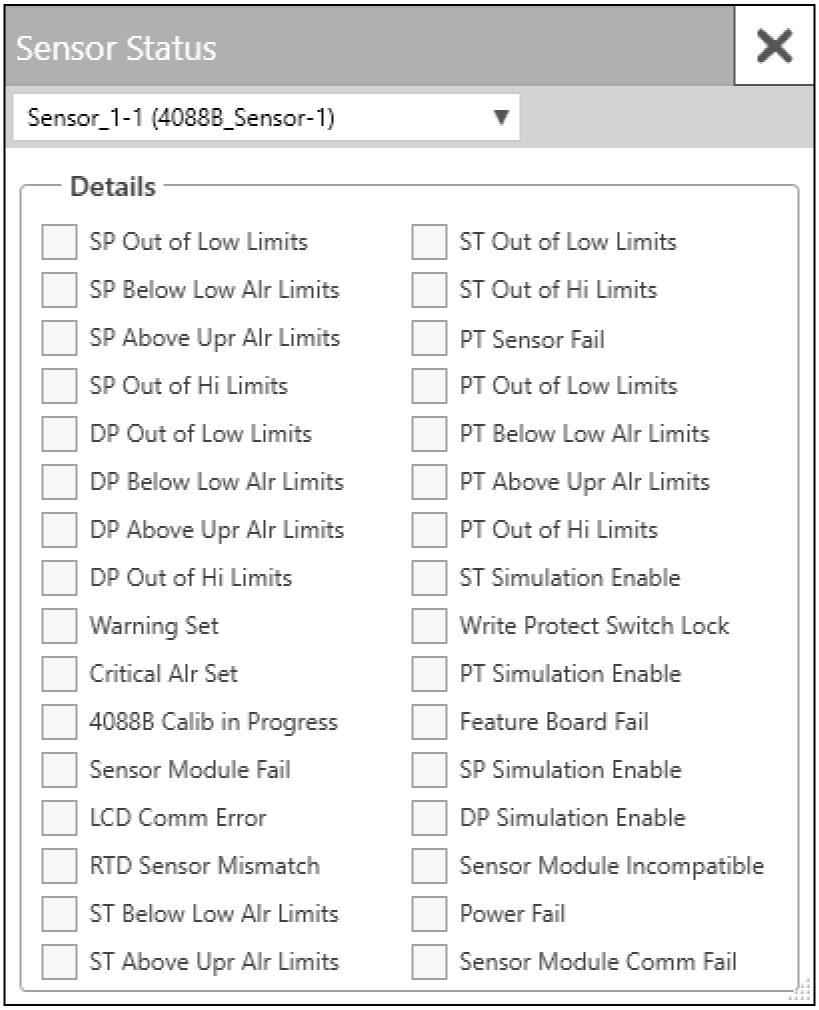
Note

Current active statuses are selected with a check mark.

To access this display:

1. Select **Configure > I/O Setup > MV Sensor** from the FBxConnect main menu. The Transmitter Sensor display opens.
2. Click ▼ in the drop-down list at the top of the display to select a sensor to configure.
3. Select the **Details** button.

Figure 132. Sensor Status



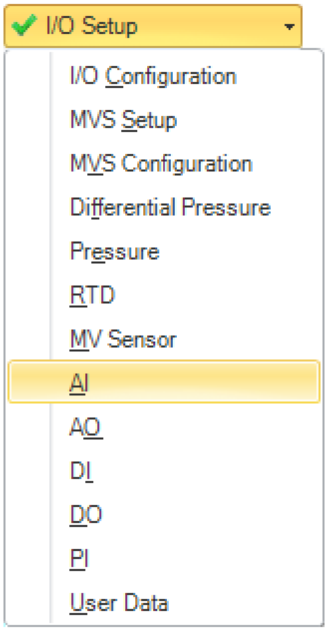
☐ SP Out of Low Limits
☐ SP Below Low Alr Limits
☐ SP Above Upr Alr Limits
☐ SP Out of Hi Limits
☐ DP Out of Low Limits
☐ DP Below Low Alr Limits
☐ DP Above Upr Alr Limits
☐ DP Out of Hi Limits
☐ Warning Set
☐ Critical Alr Set
☐ 4088B Calib in Progress
☐ Sensor Module Fail
☐ LCD Comm Error
☐ RTD Sensor Mismatch
☐ ST Below Low Alr Limits
☐ ST Above Upr Alr Limits
☐ ST Out of Low Limits
☐ ST Out of Hi Limits
☐ PT Sensor Fail
☐ PT Out of Low Limits
☐ PT Below Low Alr Limits
☐ PT Above Upr Alr Limits
☐ PT Out of Hi Limits
☐ ST Simulation Enable
☐ Write Protect Switch Lock
☐ PT Simulation Enable
☐ Feature Board Fail
☐ SP Simulation Enable
☐ DP Simulation Enable
☐ Sensor Module Incompatible
☐ Power Fail
☐ Sensor Module Comm Fail

4.5.9 Analog Input

Use this display to view and configure general parameters associated with analog inputs.

To access this display, select **Configure > I/O Setup > AI** from the FBxConnect™ main menu.

Figure 133. I/O Setup – AI



The Analog Input display contains the following items:

General – Use this display to configure the analog inputs.

Calibration Values – Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

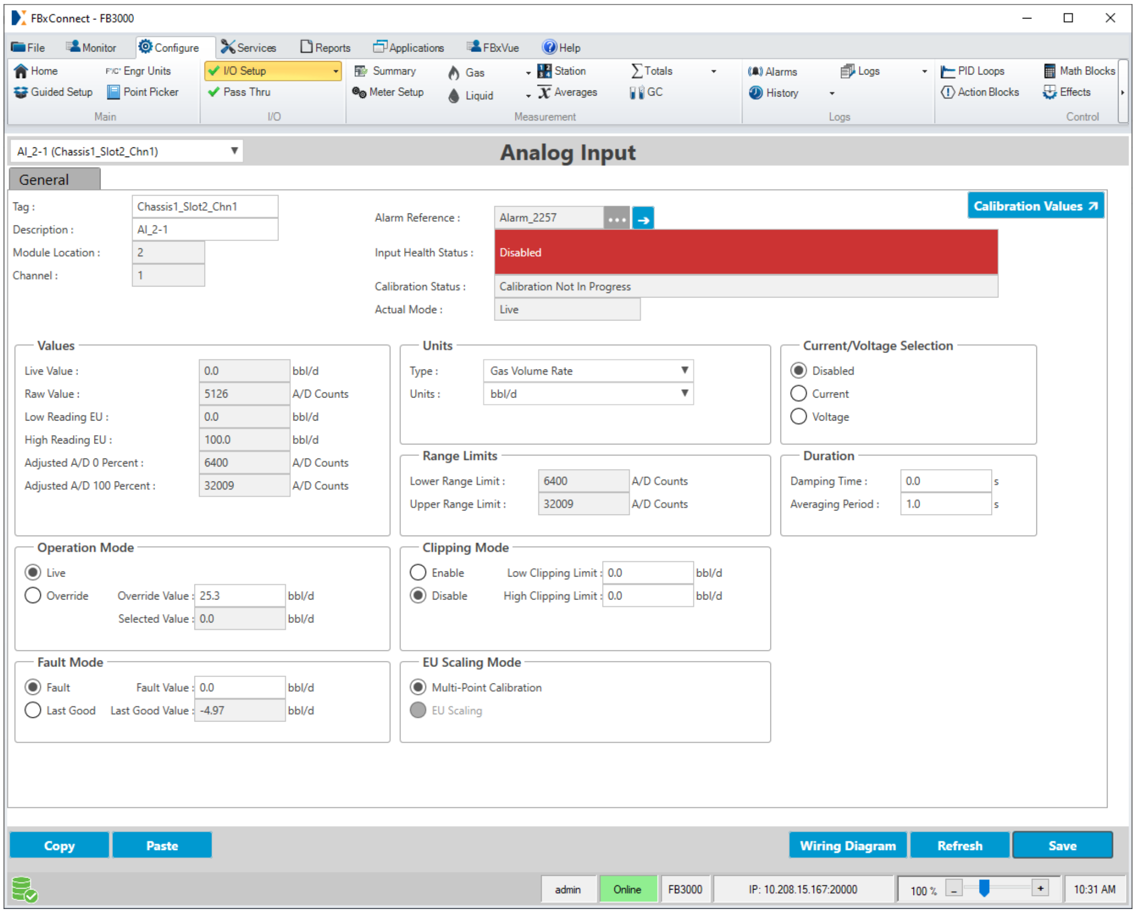
4.5.9.1 Analog Input – General

Use this display to configure the analog inputs. Analog inputs are analog signals that measurement devices (such as pressure and temperature transmitters, including RTD probes and pressure sensors) generate.

To access this display:

1. Select **Configure > I/O Setup > AI** from the FBxConnect™ main menu. The Analog Input display opens.

Figure 134. Analog Input – General



AI_2-1 (Chassis1_Slot2_Chn1)

Tag : Chassis1_Slot2_Chn1
Description : AI_2-1
Module Location : 2
Channel : 1
Alarm Reference : Alarm_2257
Input Health Status : Disabled
Calibration Status : Calibration Not In Progress
Actual Mode : Live

Values
Live Value : 0.0 bbl/d
Raw Value : 5126 A/D Counts
Low Reading EU : 0.0 bbl/d
High Reading EU : 100.0 bbl/d
Adjusted A/D 0 Percent : 6400 A/D Counts
Adjusted A/D 100 Percent : 32009 A/D Counts

Units
Type : Gas Volume Rate
Units : bbl/d

Current/Voltage Selection
● Disabled
○ Current
○ Voltage

Range Limits
Lower Range Limit : 6400 A/D Counts
Upper Range Limit : 32009 A/D Counts

Duration
Damping Time : 0.0 s
Averaging Period : 1.0 s

Operation Mode
● Live
○ Override
Override Value : 25.3 bbl/d
Selected Value : 0.0 bbl/d

Clipping Mode
○ Enable
● Disable
Low Clipping Limit : 0.0 bbl/d
High Clipping Limit : 0.0 bbl/d

Fault Mode
● Fault
○ Last Good
Fault Value : 0.0 bbl/d
Last Good Value : -4.97 bbl/d

EU Scaling Mode
● Multi-Point Calibration
● EU Scaling

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2. Click ▼ in the drop-down list at the top of the display to select an analog input channel to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Description	Sets a description (up to 20-alphanumeric characters) for the selected channel.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the currently selected channel.

Field	Description
Alarm Reference	This **read-only** field shows you which alarm is currently configured for the selected channel. **Note** Click ➔ to open the Alarms display and configure the alarm parameters for the selected channel.
Input Health Status	This **read-only** field shows the status of the selected channel. Possible values are: • Normal • Disabled • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above CAL Limit • Below CAL Limit • Input Frozen • Input Clipped • Factory Calibration Invalid • User Calibration Invalid • Termination Missing • Hardware Fail
Calibration Status	This **read-only** field shows the current calibration status of the selected channel. Possible values are: • Calibration Not In Progress • Input Frozen • Calibration In Progress • Set Command Failed • Timeout Occurred • Span Too Small

Field	Description
	• Excess Correction • Wrong Command • Verification In Progress
Actual Mode	This **read-only** field shows the source of the selected value. Possible values are: • Live • Override • Calibration • Fault • Last Good
Calibration Values	Select this button to open a pop-up display where you can set the calibration timeout period and view previous calibration/verification values.
Live Value	This **read-only** field shows the current value (in engineering units) from the field device.
Raw Value	This **read-only** field shows the current digital count directly from the Analog-to-Digital converter.
Low Reading EU	Sets the low reading (in engineering units) that is equal to zero percent input. For example, if a temperature transmitter is connected to the analog input with a range of –40 to 160 degrees F, the Low field would be set to –40. **Note** You must select **EU Scaling** in the EU Scaling Mode frame to modify this field.
High Reading EU	Sets the high reading (in engineering units) that is equal to 100 percent input. For example, if a temperature transmitter is connected to the analog input with a range of – 40 to 160 degrees F, the High field would be set to 160. **Note** You must select **EU Scaling** in the EU Scaling Mode frame to modify this field.

Field	Description
Adjusted A/D 0 Percent	Sets the calibrated Analog-to-Digital count corresponding to zero percent input. In the Calibrate function, this value is altered to set the zero percent input exactly at the Low Reading EU value. **Note** You must select **EU Scaling** in the EU Scaling Mode frame to modify this field.
Adjusted A/D 100 Percent	Sets the calibrated Analog-to-Digital count corresponding to 100 percent input. Use this value to convert the input to engineering units. In the Calibrate function, this value is altered to set the 100 percent input exactly at the High Reading EU value. **Note** You must select **EU Scaling** in the EU Scaling Mode frame to modify this field.
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are: **Live** The system copies the Live Value to the Selected Value parameter. **Override** The system copies the value set in the Override Value field to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.
Override Value	Sets the value (in engineering units) written to the Selected Value field when the Operation Mode is set to Override.
Selected Value	This **read-only** field shows the value (in engineering units) based on the Operation and Fault Mode fields, as well as the health status of the selected input. It is intended to be used as an input to calculations and control logic.
Fault Mode	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs. **Fault** The system copies the value set in the **Fault Value** field to the Selected Value parameter.

Field	Description	
	Last Good	The system copies the value of the **Last Good Value** field to the Selected Value parameter.
Fault Value	Sets the value (in engineering units) that is written to the Selected Value parameter when a fault occurs on the selected sensor and the Fault Mode is set to Fault.	
Last Good Value	This **read-only** field shows the last good value (in engineering units) received by the selected sensor. This value is written to the Selected Value parameter if a fault occurs and the Fault Mode is set to Last Good.	
Units	Sets the measurement type and engineering units used for the selected channel.	
	Type	Sets the measurement type used for the selected channel.
	Units	Sets the engineering units used for the selected channel. **Note** Changing the Units does not alter the value of parameters.
Range Limits	Shows the minimum and maximum value that the analog input can measure.	
	Lower Range Limit	This **read-only** field shows the minimum value (in A/D counts) that the analog input can measure.
	Upper Range Limit	This **read-only** field shows the maximum value (in A/D counts) that the analog input can measure.
Clipping Mode	Sets if clipping occurs on the selected input. Clipping forces the Selected Value to stay within a range defined by the Low Clipping Limit and High Clipping Limit. Clipping is only applied when there is not a fault.	
	Enable	Clipping does occur. **Note** You **must** enter a value in the Low Clipping Limit and High Clipping Limit fields.

Field	Description	
	Disable	Clipping does not occur.
	Low Clipping Limit	When clipping is enabled, this field sets the lower limit of the Selected Value parameter.
	High Clipping Limit	When clipping is enabled, this field sets the upper limit of the Selected Value parameter.
EU Scaling Mode	Specifies how the EU scaling parameters are determined.	
	Multi-Point Calibration	EU scaling parameters are determined by the calibration. You cannot modify the EU scaling parameters (Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent) directly. You must use the calibration wizard to adjust the scaling of the AI. **Note** If you download a configuration file that has Multi-Point Calibration selected, the calibration on your device remains unchanged.
	EU Scaling	EU scaling parameters are determined by the values you enter in the Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent fields. **Note** If you download a configuration file that has EU Scaling selected, the existing calibration on your device is overwritten using the EU scaling parameters.
Current/Voltage Selection	Sets if the channel measures either current input, voltage input or is disabled. **Note** • The default Current/Voltage Selection is disabled. You **must** select either Current or Voltage before the AI will scan a field device. • When Current Input is selected, an on-board software switchable 250-ohm resistor is enabled for the selected channel.	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">• For channels on a HART module, the only available options are Disabled and Current.</td></tr>
<tr><td rowspan="3">Durations</td><td colspan="2">Sets the damping time and averaging period for the input.</td></tr>
<tr><td>Damping Time</td><td>Sets a time (in seconds) used to dampen the reading of the AI. Small fluctuations can occur with every reading. The damping time is used to give a value that is less prone to those fluctuations, based on the value previous read. A value of 0.0 will disable damping.</td></tr>
<tr><td>Averaging Period</td><td>When the Operation Mode is set to Live, this field defines the period over which the Live Value will be averaged before it is written to the Selected Value.</td></tr>
</table>

4. Select **Save** to save any changes you make to this display.

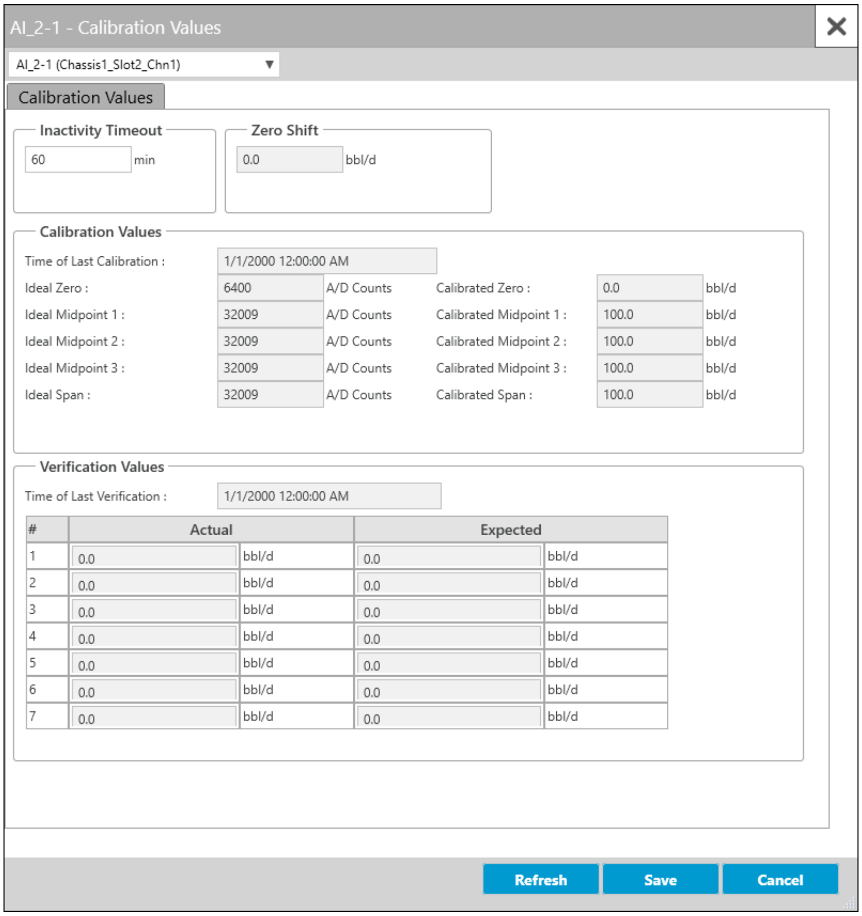
4.5.9.2 Analog Input – Calibration Values

Use this pop-up display to set the calibration timeout period, and to view previous calibration/verification values.

To access this pop-up display:

1. Select **Configure > I/O Setup > AI** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select an analog input channel to configure.
3. Select the **Calibration Values** button. The Calibration Values pop-up display opens.

Figure 135. AI – Calibration Values



Inactivity Timeout: 60 min

Zero Shift: 0.0 bbl/d

Calibration Values

Time of Last Calibration : 1/1/2000 12:00:00 AM

Ideal Zero :	6400 A/D Counts		Calibrated Zero :	0.0 bbl/d
Ideal Midpoint 1 :	32009 A/D Counts		Calibrated Midpoint 1 :	100.0 bbl/d
Ideal Midpoint 2 :	32009 A/D Counts		Calibrated Midpoint 2 :	100.0 bbl/d
Ideal Midpoint 3 :	32009 A/D Counts		Calibrated Midpoint 3 :	100.0 bbl/d
Ideal Span :	32009 A/D Counts		Calibrated Span :	100.0 bbl/d

Verification Values

Time of Last Verification : 1/1/2000 12:00:00 AM

#	Actual	Expected
1	0.0 bbl/d	0.0 bbl/d
2	0.0 bbl/d	0.0 bbl/d
3	0.0 bbl/d	0.0 bbl/d
4	0.0 bbl/d	0.0 bbl/d
5	0.0 bbl/d	0.0 bbl/d
6	0.0 bbl/d	0.0 bbl/d
7	0.0 bbl/d	0.0 bbl/d

4. Review – and change as necessary – the values in the following fields:

Field	Description
Inactivity Timeout	Sets the period of time (in minutes) the system waits for activity during the calibration process. If no activity occurs during the specified time period, the calibration automatically ends. The default is 60 minutes.
Zero Shift	This **read-only** field shows the offset applied to the input to compensate for environmental factors to set the reading as close to zero as possible.
Calibration Values	These **read-only** fields show the date and time of the last calibration, and the Calibrated Zero, Midpoints, and Span.
Verification Values	These **read-only** fields show the date and time of the last verification, and the Actual and Expected values of that verification.

5. Select **Save** to save any changes you make to this pop-up display.

4.5.9.3 Configuring Analog Inputs

Use these steps to configure an analog input on your FB Series product.

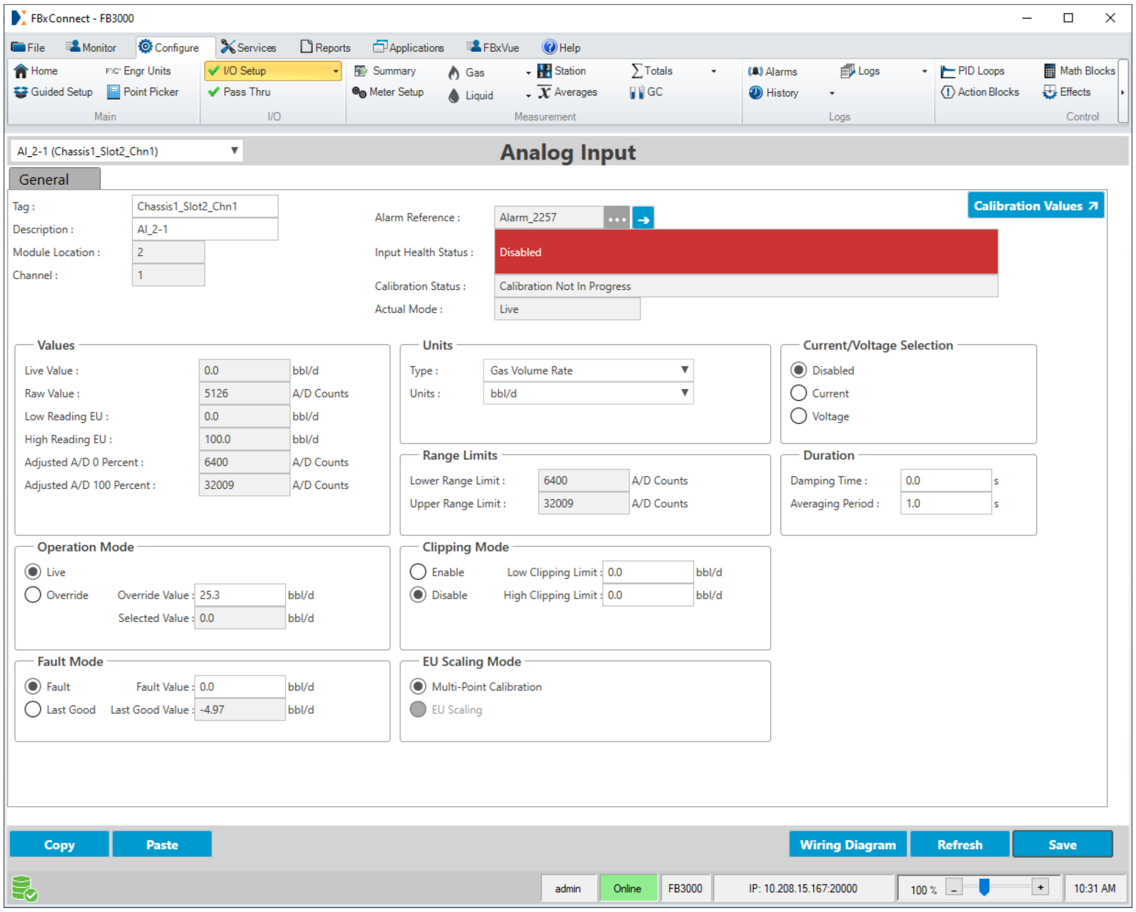
Note

You **must** configure I/O types before you configure I/O. For more information, refer to I/O Configuration.

To configure an analog input:

1. Select **Configure > I/O Setup > AI** from the FBxConnect™ main menu.

Figure 136. Analog Input – General



AI_2-1 (Chassis1_Slot2_Chn1)

Analog Input

General

Tag : Chassis1_Slot2_Chn1
Description : AI_2-1
Module Location : 2
Channel : 1

Alarm Reference : Alarm_2257
Input Health Status : Disabled
Calibration Status : Calibration Not In Progress
Actual Mode : Live

Values
Live Value : 0.0 bbl/d
Raw Value : 5126 A/D Counts
Low Reading EU : 0.0 bbl/d
High Reading EU : 100.0 bbl/d
Adjusted A/D 0 Percent : 6400 A/D Counts
Adjusted A/D 100 Percent : 32009 A/D Counts

Units
Type : Gas Volume Rate
Units : bbl/d

Current/Voltage Selection
● Disabled
○ Current
○ Voltage

Range Limits
Lower Range Limit : 6400 A/D Counts
Upper Range Limit : 32009 A/D Counts

Duration
Damping Time : 0.0 s
Averaging Period : 1.0 s

Operation Mode
● Live
○ Override
Override Value : 25.3 bbl/d
Selected Value : 0.0 bbl/d

Clipping Mode
○ Enable
● Disable
Low Clipping Limit : 0.0 bbl/d
High Clipping Limit : 0.0 bbl/d

Fault Mode
● Fault
○ Last Good
Fault Value : 0.0 bbl/d
Last Good Value : -4.97 bbl/d

EU Scaling Mode
● Multi-Point Calibration
○ EU Scaling

2. Click ▼ in the drop-down list at the top of the display to select an analog input channel to configure.

3. In the **Tag** field, enter a name for the selected channel.
4. In the **Description** field, enter a description for the selected channel.
5. In the **Current/Voltage Selection** frame, select either Current or Voltage to set if the channel measures current or voltage.

Note

- The default Current/Voltage Selection is disabled. You **must** select either Current or Voltage before the AI will scan a field device.
- When Current Input is selected, an on-board software switchable 250-ohm resistor is enabled for the selected channel.
- For channels on a HART module, the **only** available options are **Disabled** and **Current**.

---

6. Select **Save** to save your changes to device memory.
7. In the **Units** frame, set the measurement type and engineering units used for the selected channel.
8. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

If you select **Override**, you **must** enter a value in the **Override Frequency** field.

---

9. In the **EU Scaling Mode** frame, set how the EU scaling parameters are determined.

Note

If you select **EU Scaling**, you must select **Save** and manually enter values in the Low Reading EU, High Reading EU, Adjusted A/D 0 Percent, Adjusted A/D 100 Percent fields.

---

10. In the **Low Reading EU** field, set the low reading that is equal to zero percent input.
11. In the **High Reading EU** field, set the high reading that is equal to 100 percent input.
12. In the **Fault Mode** frame, set how the system acquires the value written to the Selected Value parameter when a fault occurs (Fault or Last Good).

Note

If you select **Fault**, you must enter a value in the **Fault Value** field.

13. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Analog Input.
14. Select **Save** to save your changes to device memory.

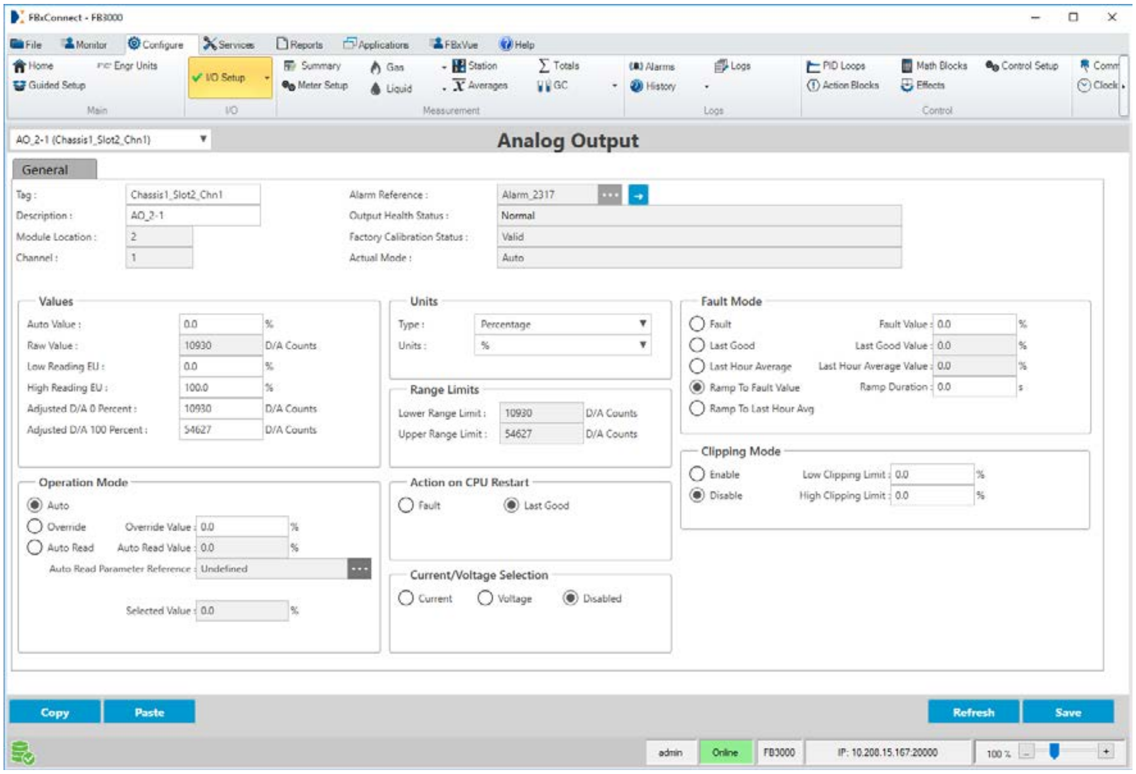
4.5.10 Analog Output

Use this display to configure analog outputs. Analog outputs are analog signals the FB Series product uses to generate signals sent to regulate equipment, such as any analog device requiring proportional control.

To access this display:

1. Select **Configure > I/O Setup > AO** from the FBxConnect™ main menu.

Figure 137. Analog Output



AO_2-1 (Chassis1_Slot2_Chn1)

Tag : Chassis1_Slot2_Chn1
Description : AO_2-1
Module Location : 2
Channel : 1
Alarm Reference : Alarm_2317
Output Health Status : Normal
Factory Calibration Status : Valid
Actual Mode : Auto

Values
Auto Value : 0.0 %
Raw Value : 10930 D/A Counts
Low Reading EU : 0.0 %
High Reading EU : 100.0 %
Adjusted D/A 0 Percent : 10930 D/A Counts
Adjusted D/A 100 Percent : 54627 D/A Counts

Units
Type : Percentage
Units : %

Range Limits
Lower Range Limit : 10930 D/A Counts
Upper Range Limit : 54627 D/A Counts

Fault Mode
○ Fault Fault Value : 0.0 %
○ Last Good Last Good Value : 0.0 %
○ Last Hour Average Last Hour Average Value : 0.0 %
● Ramp To Fault Value Ramp Duration : 0.0 s
○ Ramp To Last Hour Avg

Clipping Mode
○ Enable Low Clipping Limit : 0.0 %
● Disable High Clipping Limit : 0.0 %

Operation Mode
● Auto
○ Override Override Value : 0.0 %
○ Auto Read Auto Read Value : 0.0 %
Auto Read Parameter Reference : Undefined
Selected Value : 0.0 %

Action on CPU Restart
○ Fault ● Last Good

Current/Voltage Selection
○ Current ○ Voltage ● Disabled

admin Online FB3000 IP: 10.208.15.167:20000 100 %

2. Click ▼ in the drop-down list at the top of the display to select an analog output channel to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Description	Sets a description (up to 20-alphanumeric characters) for the selected channel.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the currently selected module channel.
Alarm Reference	This **read-only** field shows you which alarm is currently configured for the selected channel. **Note** Click ➔ to open the Alarms display and configure the alarm parameters for the selected channel.
Output Health Status	This **read-only** field shows the current operating status of the selected channel. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above URL • Below LRL • Output Frozen • Output Clipped • Factory Calibration Invalid • Auto Read Parameter Invalid • AO Readback Failure

Field	Description
	• Termination Missing • Disabled • Hardware Fail **Note** This field may temporarily show Point Fail if the **Interval to Poll I/O** field on the I/O Bus display is set to 10 ms and the AO value is changed more than 10%.
Factory Calibration Status	This **read-only** field shows the current factory calibration status of the selected channel. To ensure accuracy of the Analog Output, a factory calibration is applied when an I/O module is manufactured.
Actual Mode	This **read-only** field shows the source of the selected value. Possible values are: • Auto • Auto Read • Override • Fault • Last Good • Last Hour Average • Ramp To Fault Value • Ramp To Last Hour Avg
Auto Value	Sets the value (in engineering units) to use for the selected channel when the **Operation Mode** is set to **Auto**.
Raw Value	This **read-only** field shows the current counts written directly to the Digital-to-Analog converter.
Low Reading EU	Sets the value (in engineering units) that is equal to zero percent output (low end of the EU range).
High Reading EU	Sets the value (in engineering units) that is equal to 100 percent output (high end of the EU range).
Adjusted D/A 0 Percent	Sets the count that the digital-to-analog converter uses for zero percent output. This value scales the output to engineering units.
Adjusted D/A 100 Percent	Sets the count that the digital-to-analog converter uses for 100 percent output. This value scales the output to engineering units.

Field	Description	
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are:	
	Auto	The system copies the value in the Auto Value field to the Selected Value parameter.
	Override	The system copies the value set in the Override Value field to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.
	Auto Read	The system copies the value of the parameter you configure in the **Auto Read Parameter Reference** field to the Selected Value parameter. This value is updated once per second. **Note** When setting the Operation Mode to Auto Read, make sure that the units and scaling are correct for the referenced parameter.
Override Value	Sets the value (in engineering units) that is written to the Selected Value field when the **Operation Mode** is set to **Override**.	
Auto Read Value	This **read-only** field shows the current value of the parameter configured in the Auto Read Parameter Reference field.	
Auto Read Parameter Reference	Click ••• to open a Point Picker dialog and select a parameter to use as the analog output value when the **Operation Mode** is set to **Auto Read**.	
Selected Value	This **read-only** field shows the value (in engineering units) based on the Operation Mode and Fault Mode fields, as well as the health status of the selected output. It is intended to be used as an input to calculations and control logic.	
Units	Sets the measurement type and engineering units used for the selected channel.	

Field	Description	
	Type	Sets the measurement type used for the selected channel. **Note** Click **Save** after you select the type of units to update the units available in the **Units** field.
	Units	Sets the engineering units used for the selected channel. **Note** Changing the Units does not alter the value of parameters.
Range Limits	Shows the minimum and maximum value that the analog output can generate.	
	Lower Range Limit	This **read-only** field shows the minimum value (in D/A counts) that the analog output can generate.
	Upper Range Limit	This **read-only** field shows the maximum value (in D/A counts) that the analog output can generate.
Action on CPU Restart	Sets the value to use for the channel after a power cycle occurs. Possible options are **Fault** (use the value you set in the **Fault Value** field) or **Last Good** (use the last known good value). **Note** • During a power cycle, an analog output generates 0mA while the FB Series product is restarting. Once the FB Series product has completed the restart, then the Action on CPU Restart is applied. • If only the 12MIO restarts, then the Action on CPU Restart is applied until communication is established with main CPU.	
Current/Voltage Selection	Sets the signal type output by the selected channel. Possible options are:	
	Current	A 4 to 20 mA signal is output on the selected channel.
	Voltage	A 1 to 5 Vdc signal is output on the selected channel.
	Disabled	No signal is output on the selected channel.

Field	Description	
	Note For channels on a HART module, the **only** available options are **Disabled** and **Current**.	
Fault Mode	Sets the value to use when the output experiences a fault condition. Possible options are **Fault** (the system uses the value set in the **Fault Value** field), **Last Good** (the system uses the last good value received before the fault occurred), **Last Hour Average** (the system uses the last hourly average before the fault occurred).	
	Fault Value	Sets the value (in engineering units) to use when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**.
	Last Good Value	This **read-only** field shows the last good value (in engineering units) output by the channel. This value is used if a fault occurred and the **Fault Mode** was set to **Last Good**.
	Last Hour Average	This **read-only** field shows the last hourly average value before the fault occurred. This value is used if a fault occurred and the **Fault Mode** was set to **Last Hour Average**.
	Ramp To Fault Value	The system ramps the output to the value you configure in the **Fault Value** field over the time configured in the **Ramp Duration** field.
	Ramp To Last Hour Avg	The system ramps the output to the value shown in the **Last Hour Average Value** field over the time configured in the **Ramp Duration** field.
	Ramp Duration	Sets, in seconds, the amount of time the system takes after a fault has occurred to ramp the output to the new value.
Clipping Mode	Sets if clipping occurs on the selected input. Clipping forces the Selected Value to stay within a range defined by the Low Clipping Limit and High Clipping Limit. Clipping is only applied when there is not a fault.	
	Disable	Clipping does not occur.

Field	Description	
	Enable	Clipping does occur. **Note** You **must** enter a value in the Low Clipping Limit and High Clipping Limit fields.
	Low Clipping Limit	When clipping is enabled, this field sets the lower limit of the Selected Value parameter.
	High Clipping Limit	When clipping is enabled, this field sets the upper limit of the Selected Value parameter.

4. Select **Save** to save any changes you make to this display.

4.5.10.1 Configuring Analog Outputs

Use these steps to configure an analog output on your FB Series product.

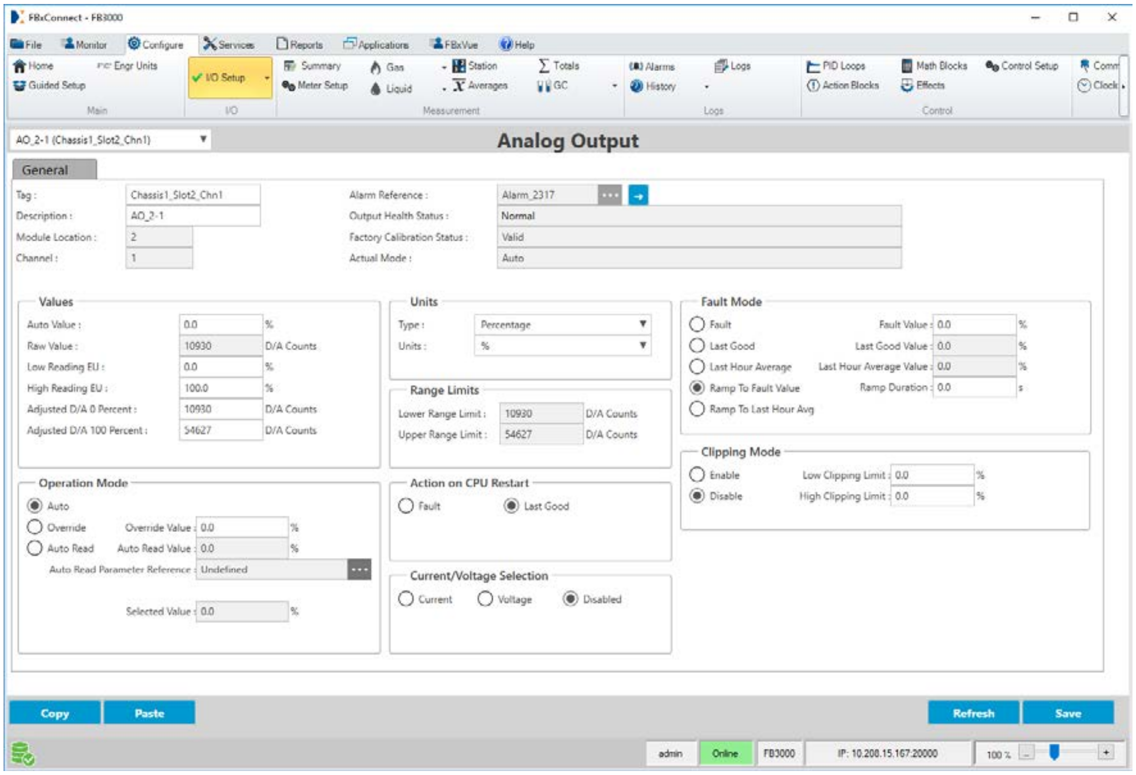
Note

You **must** configure I/O types before you configure I/O. For more information, refer to I/O Configuration.

To configure an analog output:

1. Select **Configure** > **I/O Setup** > **AO** from the FBxConnect™ main menu.

Figure 138. Analog Output



AO_2-1 (Chassis1_Slot2_Chn1)

Analog Output

General

Tag : Chassis1_Slot2_Chn1
Description : AO_2-1
Module Location : 2
Channel : 1
Alarm Reference : Alarm_2317
Output Health Status : Normal
Factory Calibration Status : Valid
Actual Mode : Auto

Values
Auto Value : 0.0 %
Raw Value : 10930 D/A Counts
Low Reading EU : 0.0 %
High Reading EU : 100.0 %
Adjusted D/A 0 Percent : 10930 D/A Counts
Adjusted D/A 100 Percent : 54627 D/A Counts

Units
Type : Percentage
Units : %

Range Limits
Lower Range Limit : 10930 D/A Counts
Upper Range Limit : 54627 D/A Counts

Fault Mode
○ Fault
○ Last Good
○ Last Hour Average
● Ramp To Fault Value
○ Ramp To Last Hour Avg
Fault Value : 0.0 %
Last Good Value : 0.0 %
Last Hour Average Value : 0.0 %
Ramp Duration : 0.0 s

Clipping Mode
○ Enable
● Disable
Low Clipping Limit : 0.0 %
High Clipping Limit : 0.0 %

Operation Mode
● Auto
○ Override
○ Auto Read
Override Value : 0.0 %
Auto Read Value : 0.0 %
Auto Read Parameter Reference : Undefined
Selected Value : 0.0 %

Action on CPU Restart
○ Fault
● Last Good

Current/Voltage Selection
○ Current
○ Voltage
● Disabled

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2. Click ▼ in the drop-down list at the top of the display to select an analog output channel to configure.

3. In the **Tag** field, enter a name for the selected channel.

4. In the **Description** field, enter a description for the selected channel.

5. In the **Units** frame, set the measurement type and engineering units used for the selected channel.

6. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

- If you select **Auto**, the system copies the value in the **Auto Value** field to the Selected Value parameter.
- If you select **Override**, the system copies the value set in the **Override Value** field to the Selected Value parameter.

- If you select **Auto Read**, the system copies the value of the parameter you configure in the **Auto Read Parameter Reference** field to the Selected Value parameter.

---

7. In the **Fault Mode** frame, set how the system acquires the value of the selected channel when a fault occurs.

Note

If you select **Fault**, you must enter a value in the **Fault Value** field.

---

8. In the **Low Reading EU** field, set the low reading that is equal to zero percent output.
9. In the **High Reading EU** field, set the high reading that is equal to 100 percent output.
10. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Analog Output.
11. Select **Save** to save your changes to device memory.

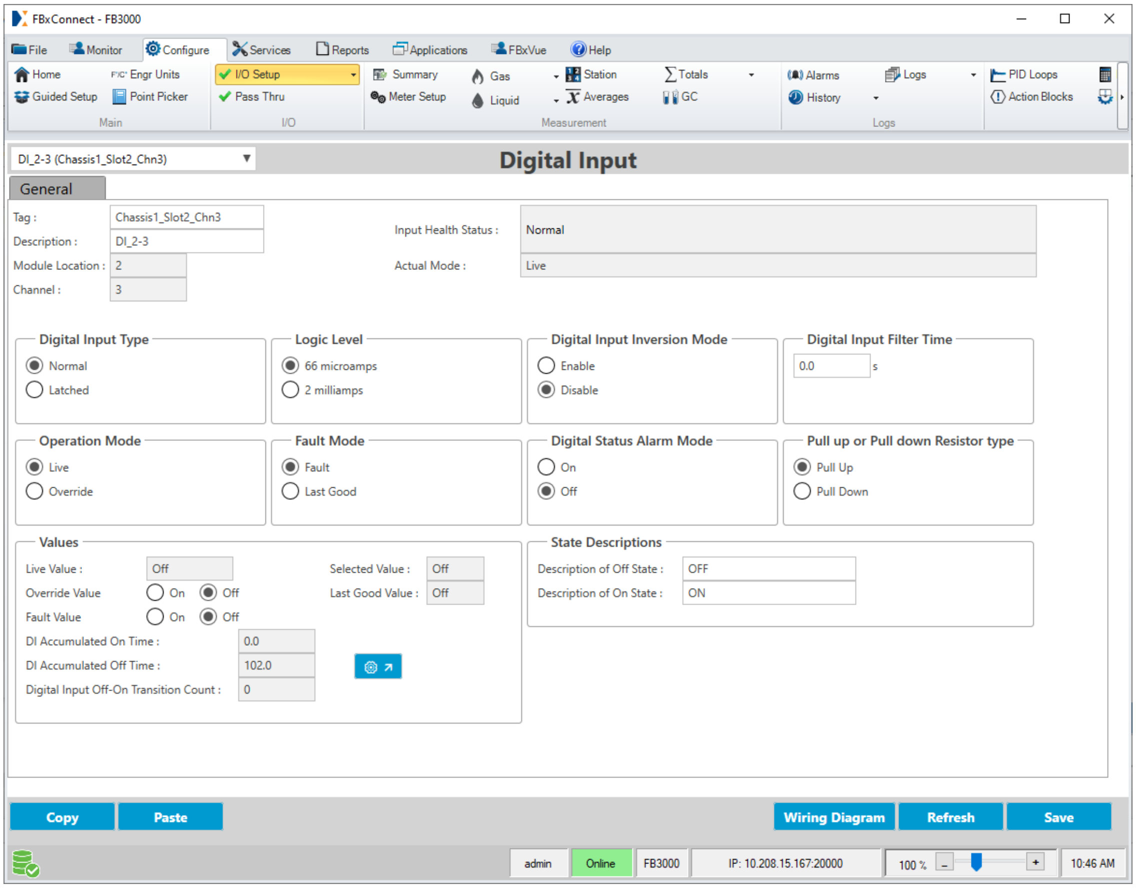
4.5.11 Digital Input

Use this display to configure digital inputs (DI). Digital inputs monitor the status of relays, open collector/open drain type solid-state switches, and other two-state devices. Each DI channel can also be software configured to function as a "latched" DI, which remains in the active state until reset. Other parameters can invert the field signal and gather statistical information on the number of transitions and the time accumulated in the on or off state.

To access this display:

1. Select **Configure > I/O Setup > DI** from the FBxConnect™ main menu.

Figure 139. Digital Input



DI_2-3 (Chassis1_Slot2_Chn3) ▼

Digital Input

General

Tag : Chassis1_Slot2_Chn3
Description : DI_2-3
Module Location : 2
Channel : 3
Input Health Status : Normal
Actual Mode : Live

Digital Input Type: ● Normal ○ Latched
Logic Level: ● 66 microamps ○ 2 milliamps
Digital Input Inversion Mode: ○ Enable ● Disable
Digital Input Filter Time: 0.0 s
Operation Mode: ● Live ○ Override
Fault Mode: ● Fault ○ Last Good
Digital Status Alarm Mode: ○ On ● Off
Pull up or Pull down Resistor type: ● Pull Up ○ Pull Down

Values
Live Value : Off
Override Value ○ On ● Off
Fault Value ○ On ● Off
DI Accumulated On Time : 0.0
DI Accumulated Off Time : 102.0
Digital Input Off-On Transition Count : 0
Selected Value : Off
Last Good Value : Off

State Descriptions
Description of Off State : OFF
Description of On State : ON

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2. Click ▼ in the drop-down list at the top of the display to select a digital input channel to configure.

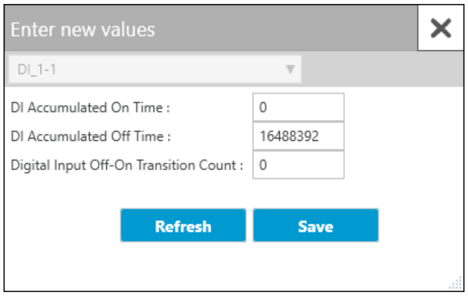
3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Description	Sets a description (up to 20-alphanumeric characters) for the selected channel.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the currently selected module channel.

Field	Description	
Input Health Status	This **read-only** field shows the current operating status of the selected channel. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Termination Missing • Status Alarm • Hardware Fail	
Actual Mode	This **read-only** field shows the source of the selected value. Possible values are: • Live • Override • Fault • Last Good	
Digital Input Type	Set how the digital inputs function when the Operation Mode is set to Live. Possible options are:	
	Normal	The Selected Value is updated based on the Live Value.
	Latched	When the Live parameter transitions from off to on, the selected parameter remains on, until the latch is cleared using the Reset Latch parameter.
Reset Latch	Select to clear the latched state of the digital input.	
	Disable	No action is taken.
	Enable	Clears the latched state of the digital input. The Reset Latch parameter will be reset back to Disable once the latch is cleared.

Field	Description	
	Note This field display **only** if you select **Latched** in the **Digital Input Type** frame.	
Logic Level	Sets the amount of current that the channel sources. Pick the appropriate setting based on the digital input device used with this channel.	
	66 microamps	The input will source 66 microamps.
	2 milliamps	The input will source 2 milliamps.
Digital Input Inversion Mode	Sets whether the system will invert the Live value before writing it to the Selected value. **Note** This mode only works when the Operation Mode is set to Live and there is not a fault.	
	Disable	The Selected Value will be set to the Live value.
	Enable	The Selected Value will be set to the inverse of the Live value. For example, if the Live value is "Off" then the Selected value will be "On."
Digital Input Filter Time	Sets the amount of time (in seconds) the discrete input must remain in the On (high) state before it is recognized as such. The discrete input returns to the Off state immediately upon detection of the On to Off transition; there is no filtering for this transition.	
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are:	
	Live	The system copies the Live Value to the Selected Value parameter.
	Override	The system copies the value you select in the Override Value field to the Selected Value parameter. **Note** If a fault occurs and the operation mode is set to Override, the Selected Value parameter is set to the Override Value and is not set based on the Fault Mode.

Field	Description	
Fault Mode	Sets how the system acquires the value written to the Selected Value parameter when a fault occurs.	
	Fault	The system copies the value set in the **Fault Value** field to the Selected Value parameter.
	Last Good	The system copies the value of the **Last Good Value** field to the Selected Value parameter.
Digital Status Alarm Mode	Sets alarming for the digital input.	
	Off	No alarms are logged.
	On	A Set Alarm is logged when the Selected value transitions from "off" to "on." A Clear Alarm is logged when the digital input transitions from "on" to "off."
Pull up or Pull down Resistor Type	Activates a pull up or pull down resistor to maintain input in a deterministic state when no input is applied.	
	Pull Up	Maintain signal High when no input is applied.
	Pull Down	Maintain signal Low when no input is applied.
Live Value	This **read-only** field shows the state of the selected input.	
Selected Value	This **read-only** field shows the value based on the Operation Mode and Fault Mode fields, as well as the health status of the selected input. It is intended to be used as an input to calculations and control logic.	
Override Value	Sets the value that is written to the Selected Value field when the **Operation Mode** is set to **Override**. Possible options are:	
	Off	The selected channel is set to Off when the **Operation Mode** is set to **Override**.
	On	The selected channel is set to On when the **Operation Mode** is set to **Override**.
Last Good Value	This **read-only** field shows the last good value (Off or On) received by the channel. This value would be used if a fault occurred and the **Fault Mode** was set to **Last Good**.	
Fault Value	Sets the value to use when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**. Possible options are:	

Field	Description	
	Off	The channel is set to Off when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**.
	On	The channel is set to On when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**.
DI Accumulated On Time	Counts the number of 1-second periods when the Live Value parameter is in the On state. The On Counter is a 32-bit number that automatically "rolls over" when it reaches its maximum value. You can preset the On Counter by entering the desired value or clear the counter by entering **0**.	
DI Accumulated Off Time	Counts the number of 1-second periods when the Live Value parameter is in the Off state. The Off Counter is a 32-bit number that automatically "rolls over" when it reaches its maximum value. You can preset the Off Counter by entering the desired value or clear the counter by entering **0**.	
Digital Input Off-On Transition Count	Sets a value for the accumulated number of off-to-on transitions for the selected channel. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator to a desired value or clear it by entering **0**.	
⚙ ↗	Click to open a pop-up display that lets you preset or reset the values for the selected digital input.  Enter new values DI_1-1 DI Accumulated On Time : 0 DI Accumulated Off Time : 16488392 Digital Input Off-On Transition Count : 0 	
	DI Accumulated On Time	You can preset the On Counter by entering the desired value or clear the counter by entering **0**.
	DI Accumulated Off Time	You can preset the Off Counter by entering the desired value or clear the counter by entering **0**.

Field	Description	
	Digital Input Off-On Transition Count	You can preset the accumulator to a desired value or clear it by entering **0**.
	Refresh	The values shown are frozen at the time you open this pop-up display. Select this button to update these values.
	Save	Select this button to save any changes you make to the DI values and close the pop-up display.
Description of Off State	Enter a short description (up to 10-alphanumeric characters) for the digital input off state.	
Description of On State	Enter a short description (up to 10-alphanumeric characters) for the digital input on state.	

4. Select **Save** to save any changes you make to this display.

4.5.11.1 Configuring Digital Inputs

Use these steps to configure a digital input on your FB Series product.

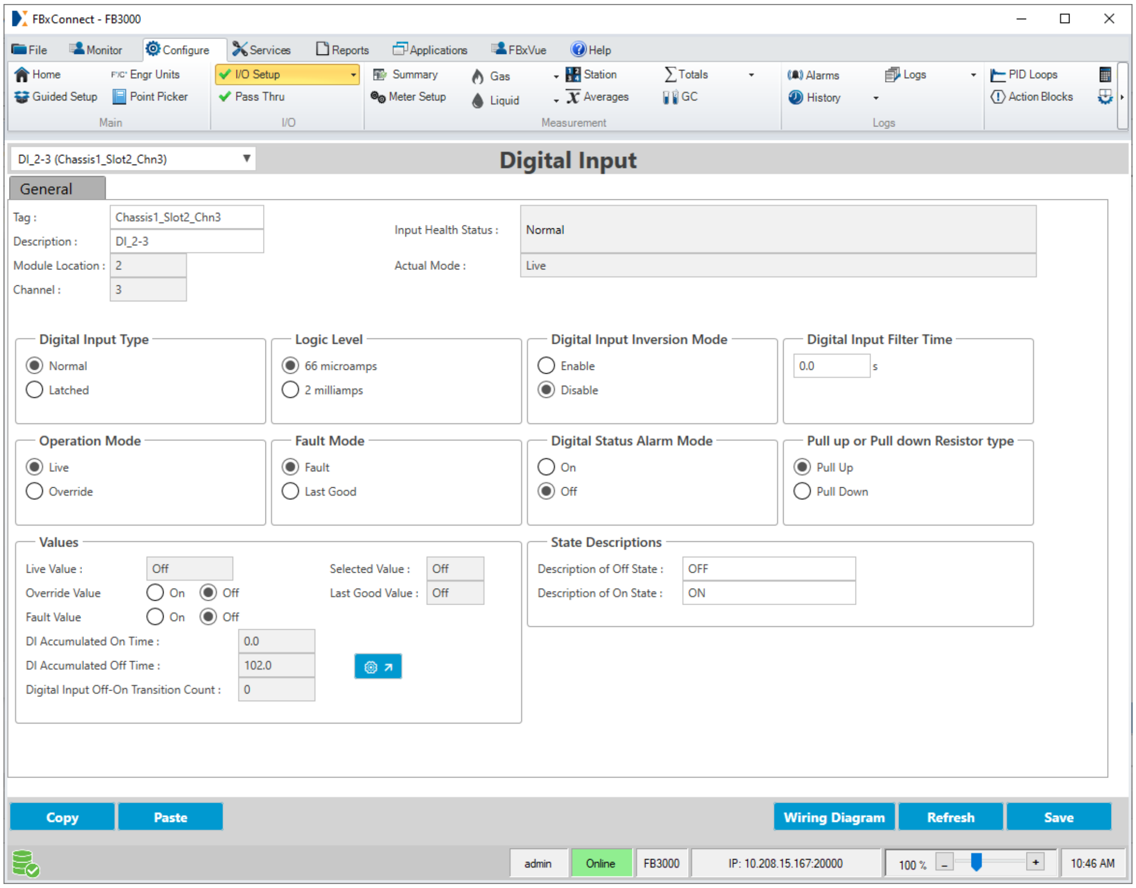
Note

You **must** configure I/O types before you configure I/O. For more information, refer to I/O Configuration.

To configure a digital input:

1. Select **Configure > I/O Setup > DI** from the FBxConnect™ main menu.

Figure 140. Digital Input



DI_2-3 (Chassis1_Slot2_Chn3)

Digital Input

General

Tag : Chassis1_Slot2_Chn3
Description : DI_2-3
Module Location : 2
Channel : 3
Input Health Status : Normal
Actual Mode : Live

Digital Input Type: ● Normal ○ Latched
Logic Level: ● 66 microamps ○ 2 milliamps
Digital Input Inversion Mode: ○ Enable ● Disable
Digital Input Filter Time: 0.0 s
Operation Mode: ● Live ○ Override
Fault Mode: ● Fault ○ Last Good
Digital Status Alarm Mode: ○ On ● Off
Pull up or Pull down Resistor type: ● Pull Up ○ Pull Down

Values
Live Value : Off
Override Value ○ On ● Off
Fault Value ○ On ● Off
DI Accumulated On Time : 0.0
DI Accumulated Off Time : 102.0
Digital Input Off-On Transition Count : 0
Selected Value : Off
Last Good Value : Off

State Descriptions
Description of Off State : OFF
Description of On State : ON

2. Click ▼ in the drop-down list at the top of the display to select a digital input channel to configure.

3. In the **Tag** field, enter a name for the selected channel.

4. In the **Description** field, enter a description for the selected channel.

5. In the **Digital Input Type** frame, select how the digital inputs function when the Operation Mode is set to Live (Normal or Latched).

6. In the **Logic Level** frame, select the amount of current sourced by the channel.

Note

Pick the appropriate setting based on the digital input device used with this channel.

7. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

If you select **Override**, you **must** set a value in the **Override Value** field.

---

8. In the **Fault Mode** frame, set how the system acquires the value of the selected channel when a fault occurs.

Note

If you select **Fault**, you **must** enter a value in the **Fault Value** field.

---

9. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Digital Input.
10. Select **Save** to save your changes to device memory.

4.5.12 Digital Output

Use this display to configure digital output channels. Digital outputs are high/low outputs used to turn equipment on and off. You can set a digital output to send a pulse to a specified device. You can also configure a digital output as latching, momentary, toggle, timed duration output momentary, timed duration output toggle, or scaled pulse output with a fixed pulse width.

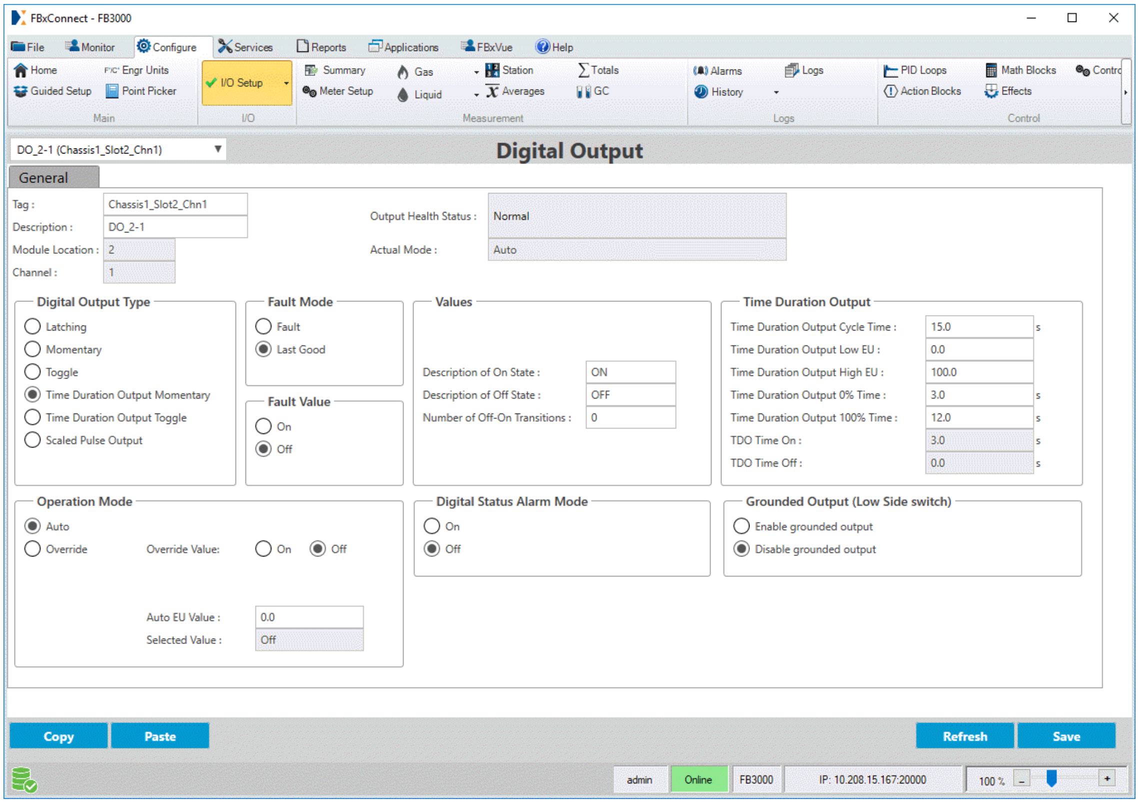
Note

Set the **Digital Output Type** field to **Scaled Pulse Output** to send a pulse output to another device, such as an odorizer, and to control a gas sampler for a meter run.

To access this display,

1. Select **Configure > I/O Setup > DO** from the FBxConnect™ main menu.

Figure 141. Digital Output



DO_2-1 (Chassis1_Slot2_Chn1) ▼

Digital Output

General

Tag : Chassis1_Slot2_Chn1
Description : DO_2-1
Module Location : 2
Channel : 1
Output Health Status : Normal
Actual Mode : Auto

Digital Output Type
○ Latching
○ Momentary
○ Toggle
● Time Duration Output Momentary
○ Time Duration Output Toggle
○ Scaled Pulse Output

Fault Mode
○ Fault
● Last Good

Fault Value
○ On
● Off

Values
Description of On State : ON
Description of Off State : OFF
Number of Off-On Transitions : 0

Time Duration Output
Time Duration Output Cycle Time : 15.0 s
Time Duration Output Low EU : 0.0
Time Duration Output High EU : 100.0
Time Duration Output 0% Time : 3.0 s
Time Duration Output 100% Time : 12.0 s
TDO Time On : 3.0 s
TDO Time Off : 0.0 s

Operation Mode
● Auto
○ Override
Override Value: ○ On ● Off
Auto EU Value : 0.0
Selected Value : Off

Digital Status Alarm Mode
○ On
● Off

Grounded Output (Low Side switch)
○ Enable grounded output
● Disable grounded output

2. Click ▼ in the drop-down list at the top of the display to select a digital output channel to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Description	Sets a description (up to 20-alphanumeric characters) for the selected channel.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the currently selected module channel.

Field	Description
Output Health Status	This **read-only** field shows the current operating status of the selected channel. Possible values are: • Normal • Not Licensed • Instance Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Auto Read Parameter Invalid • SPO Parameter Invalid • Termination Missing • Status Alarm • Hardware Fail
Actual Mode	This **read-only** field shows the source of the selected value. Possible values are: • Auto • Auto Read • Override • Fault • Last Good
Digital Output Type	Select the function of the digital output when the Operation mode is Auto or Auto Read and there is no fault. Digital outputs are high/low outputs used to turn equipment on and off. Possible options are: **Latching** — The discrete output turns on when the Auto or Auto Read Value, depending on Operation mode, is on. The output remains on until the Auto or Auto Read value turns off.

Field	Description	
	Momentary	When the Auto or Auto Read Value transitions from off to on, the discrete output will turn the discrete output on for the amount of time defined in the Time On field. The Auto parameter will be automatically set to 0 (off) when the discrete output generates the momentary output. **Note** The discrete output will not set the Auto Read Value back to 0.
	Toggle	Enables a square-wave output for which both the time on and time off are defined by the value in the Time On and Time Off parameters, respectively.
	Timed Duration Output Momentary	Enables the discrete output to complete one cycle based on the time related parameters in the Time Duration Output frame, and the Auto EU value. Once a cycle is completed, the DO will remain off until the Auto EU value is modified, starting a new cycle.
	Timed Duration Output Toggle	Enables the discrete output to continuously repeat in a cycle defined by the value in the Cycle Time field on the TDO Parameters Tab where the EU Value controls the on-time duration. The current cycle will be completed before a new Auto EU value takes effect.
	Scaled Pulse Output	Enables the discrete output to be turned on for the amount of time defined in the Time On field each time an accumulation limit is reached. This could be used to send a pulse output to another device, such as an odorizer, or to turn a sampler on each time a certain amount of flow is accumulated.
Fault Mode	Sets the value to use when the output experiences a fault condition. Possible options are: **Note** If the DO type is TDO momentary, TDO toggle, or SPO, the DO will be set to off instead of set based on the fault mode.	
	Fault	The system uses the value set in the **Fault Value** field.

Field	Description	
	Last Good	The system uses the last good value output before the fault occurred.
Fault Value	Sets the value to use when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**. Possible options are:	
	Off	The channel is set to off when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**.
	On	The channel is set to on when a fault occurs on the selected channel and the **Fault Mode** is set to **Fault**.
Operation Mode	Sets how the system acquires the value written to the Selected Value parameter under normal operation. Possible options are:	
	Auto	The system copies the value in the **Auto Value** field to the Selected Value parameter.
	Override	The system copies the value set in the **Override Value** field to the Selected Value parameter.
	Auto Read	The system copies the value of the parameter you configure in the **Auto Read Parameter Reference** field to the Selected Value parameter. **Note** This field applies **only** if you select **Latching** or **Momentary** in the **Digital Output Type** frame.
Auto Value	Sets the value to use for the selected channel when the **Operation Mode** is set to **Auto**. Possible options are:	
	Off	The system copies a value of Off to the Selected Value parameter.
	On	The system copies a value of On to the Selected Value parameter.
	Note This field applies **only** if you select **Latching** or **Momentary** in the **Digital Output Type** frame.	
Override Value	Sets the value that is written to the Selected Value field when the **Operation Mode** is set to **Override**. Possible options are:	
	Off	The system copies a value of Off to the Selected Value parameter.

Field	Description
	On The system copies a value of On to the Selected Value parameter.
Auto Read Value	This **read-only** field shows the current value (Off or On) of the parameter configured in the **Auto Read Parameter Reference** field. **Note** This field applies **only** if you select **Latching** or **Momentary** in the **Digital Output Type** frame.
Auto Read Parameter Reference	Click … to open a Point Picker dialog and select a parameter to use as the digital output value when the **Operation Mode** is set to **Auto Read**. **Note** This field applies **only** if you select **Latching** or **Momentary** in the **Digital Output Type** frame.
Auto EU Value	Sets the EU Value which controls the Time On. The output is set based on the magnitude of the value, as calculated by the following equation: Time On = ((EU Value - Low Reading EU) / (High Reading EU - Low Reading EU) * (High Time - Low Time)) + Low Time **Note** This field applies only if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.
Selected Value	This **read-only** field shows the value based on the Operation Mode and Fault Mode fields, as well as the health status of the selected input. It is intended to be used as an input to calculations and control logic. **Note** The Selected Value will mirror the DO's physical output. For example, the Selected Value will toggle on and off if the DO Type is set to toggle.

Field	Description
Time On	Sets the amount of time, in seconds, an output is set to On. The minimum On and Off time is 0.01 seconds, resulting in a maximum frequency of 50 Hz. The default value is 1.0 seconds. • In **Momentary** mode, this is the amount of time (in seconds) that the output is energized. • In **Toggle** mode, this is the amount of time (in seconds) between switching On or Off. • In **Scaled Pulse Output** mode, this is the amount of time (in seconds) that the output is energized each time the change in the Scaled Pulse Output Value is greater than the Pulse Output Significance. For example, if the Scaled Pulse Output Value is 950 MCF when the scaled pulse output functionality is enabled and the Pulse Output Significance is 1000 MCF, the DO will be energized when the Scaled Pulse Output Value reaches 1950 MCF. **Note** This field applies only if you select **Momentary**, **Toggle**, or **Scaled Pulse Output** in the **Digital Output Type** frame.
Time Off	Sets the amount of time, in seconds, the output is set to Off. The minimum On and Off time is 0.01 seconds, resulting in a maximum frequency of 50 Hz. The default value is 1.0 seconds. **Note** This field applies **only** if you select **Toggle** in the **Digital Output Type** frame.
Description of On State	Enter a short description (up to 10-alphanumeric characters) for the On state of the digital output. **Note** This field applies **only** if you select **Latching**, **Momentary**, **Toggle**, **Time Duration Output Momentary**, or **Time Duration Output Toggle** in the **Digital Output Type** frame.

Field	Description
Description of Off State	Enter a short description (up to 10-alphanumeric characters) for the Off state of the digital output. **Note** This field applies **only** if you select **Latching**, **Momentary**, **Toggle**, **Time Duration Output Momentary**, or **Time Duration Output Toggle** in the **Digital Output Type** frame.
Number of Off-On Transitions	Sets a value for the accumulated number of Off-to-On transitions for the selected channel. The accumulator is a 32-bit number with a maximum count of 4,294,967,295. You can preset the accumulator to a desired value or clear it by entering **0**.
Digital Status Alarm Mode	Sets Alarming for the digital output. **Off** No alarms are logged. **On** A Set Alarm is logged when the Selected value transitions from “off” to “on.” A Clear Alarm is logged when the digital output transitions from “on” to “off.”
Action on CPU Restart	For **Latched DO's**, sets the value to use for the channel after a power cycle occurs. For **Momentary DO's**, the output is set to Off and no momentary pulse is generated. For **all other DO's**, the output is set based on the behavior described in the Digital Output Type parameter section. Possible options are: **Fault** The system uses the value set in the **Fault Value** field. **Last Good** The system uses the last good value output before the fault occurred. **Note** • During a power cycle, a discrete output is set to Off while the FB Series product is restarting. Once the FB Series product has completed the restart, then the action on power cycle is applied. • This field applies **only** if you select **Latching** in the **Digital Output Type** frame and **Auto** in the **Operation Mode** frame. • If only the 12MIO restarts, then the Action on CPU Restart is applied until communication is established with main CPU.

Field	Description
Time Duration Output Cycle Time	Sets the total amount of time (in seconds) the cycle spends in the On and Off positions. The Cycle Time entry is used to define the Off Time in the Time Duration Output Toggle mode. The Off Time is calculated by the formula: Off Time = Cycle Time - On Time Example: A Time Duration Output is used to emulate a field instrument measuring flow. The Time Duration Output outputs a pulse width of 3 seconds for no flow and a pulse width of 12 seconds for 1000 MCF per day flow. The output is repeated every 15 seconds. If the Cycle Time is less than, or equal to the On Time, the Off Time is set to one. Care must be taken in configuration to ensure that the Cycle Time remains greater than the calculated On Time for proper operation. **Note** This field applies only if you select **Time Duration Output Toggle** in the **Digital Output Type** frame.
Time Duration Output Low EU	Sets the value for the low reading to zero percent output (low end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal. **Note** This field applies only if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.
Time Duration Output High EU	Sets the value for the high reading to 100 percent output (or high end of the EU range). Based on the EU range determined in part by this parameter, the EU value is converted to a corresponding signal. **Note** This field applies only if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.

Field	Description
Time Duration Output 0% Time	Sets the amount of time (in seconds) the cycle is in the On position when the EU is at zero percent. **Note** • 0% and 100% should be less than or equal to the Cycle Time. • This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.
Time Duration Output 100% Time	Sets the amount of time (in seconds) the cycle is in the on position when the EU is at 100 percent. **Note** • 0% and 100% should be less than or equal to the Cycle Time. • This field applies **only** if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.
TDO Time On	This **read-only** field shows the value calculated from the entered Auto EU Value and the previous definitions of Low Reading Time, High Reading Time, Low Reading EU, and High Reading EU. The calculation formula is: TDO Time On = ((EU Value - Low Reading EU) / (High Reading EU - Low Reading EU) * (High Time - Low Time)) + Low Time **Note** This field applies only if you select **Time Duration Output Momentary** or **Time Duration Output Toggle** in the **Digital Output Type** frame.
TDO Time Off	This **read-only** field shows the value calculated from the Cycle Time and the TDO Time On. The calculation formula is: TDO Time Off = Cycle Time - TDO Time On **Note** This field applies only if you select **Time Duration Output Toggle** in the **Digital Output Type** frame.

Field	Description
Scaled Pulse Output Parameter Reference	This parameter chooses the parameter the digital output will monitor for changes so that it can turn the digital output on for the amount of time specified by the Time On parameter each time it changes by the amount specified in the Pulse Output Significance parameter. **Note** • Choose a parameter with an incremental value. • This field applies **only** if you select **Scaled Pulse Output** in the **Digital Output Type** frame.
Scaled Pulse Output Value	This **read-only** field shows the value of the parameter configured in the Scaled Pulse Output Parameter Reference field. **Note** This field applies only if you select **Scaled Pulse Output** in the **Digital Output Type** frame.
Pulse Output Significance	This field defines the amount of change that must occur in the Scaled Pulse Output parameter before a pulse will be generated. **Note** • This parameter is in the same units as the Scaled Pulse Output Value. • This field applies **only** if you select **Scaled Pulse Output** in the **Digital Output Type** frame.
Override Value	Sets the value that is written to the Selected Value field when the **Operation Mode** is set to **Override**. Possible options are: **Off** – The system copies a value of Off to the Selected Value parameter. **On** – The system copies a value of On to the Selected Value parameter.
Grounded Output (Low Side Switch)	Sets if the digital output is internally connected to or isolated from ground. **Enabled** – The DO_LO pin is internally connected to ground and provides a grounded output (50 mA current limit). **Disabled** – The DO_LO pin is internally isolated from ground and acts as a contact closure.

Field	Description
	Note This field applies to the Mixed I/O module **only**.

4. Select **Save** to save any changes you make to this display.

4.5.12.1 Configuring Digital Outputs

Use these steps to configure a digital output on your FB Series product.

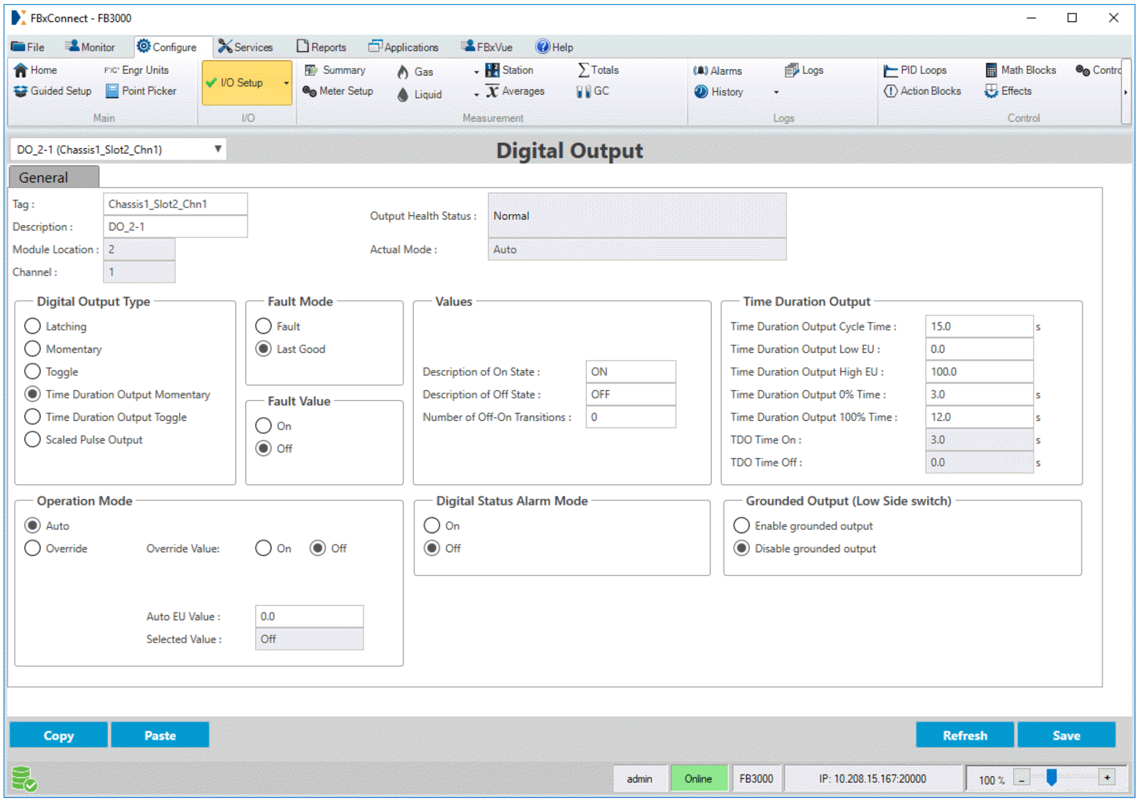
Note

You **must** configure I/O types before you configure I/O. For more information, refer to I/O Configuration.

To configure a digital output:

1. Select **Configure > I/O Setup > DO** from the FBxConnect™ main menu.

Figure 142. Digital Output



DO_2-1 (Chassis1_Slot2_Chn1)

Digital Output

Tag : Chassis1_Slot2_Chn1
Description : DO_2-1
Module Location : 2
Channel : 1
Output Health Status : Normal
Actual Mode : Auto

Digital Output Type
○ Latching
○ Momentary
○ Toggle
● Time Duration Output Momentary
○ Time Duration Output Toggle
○ Scaled Pulse Output

Fault Mode
○ Fault
● Last Good

Fault Value
○ On
● Off

Values
Description of On State : ON
Description of Off State : OFF
Number of Off-On Transitions : 0

Time Duration Output
Time Duration Output Cycle Time : 15.0 s
Time Duration Output Low EU : 0.0
Time Duration Output High EU : 100.0
Time Duration Output 0% Time : 3.0 s
Time Duration Output 100% Time : 12.0 s
TDO Time On : 3.0 s
TDO Time Off : 0.0 s

Operation Mode
● Auto
○ Override
Override Value: ○ On ● Off
Auto EU Value : 0.0
Selected Value : Off

Digital Status Alarm Mode
○ On
● Off

Grounded Output (Low Side switch)
○ Enable grounded output
● Disable grounded output

2. Click ▼ in the drop-down list at the top of the display to select a digital output channel to configure.

3. In the **Tag** field, enter a name for the selected channel.

4. In the **Description** field, enter a description for the selected channel.

5. In the **Digital Output Type** frame, select the function of the digital output when the Operation mode is Auto or Auto Read and there is no fault.

6. Select **Save** to save your changes to device memory, and update the available fields based on the selected Digital Output Type.

7. In the **Operation Mode** frame, set how the system acquires the value of the selected channel under normal operating conditions.

Note

If you select **Auto**, the system copies the value in the Auto Value field to the Selected Value parameter.
If you select **Override**, the system copies the value set in the **Override Value** field to the Selected Value parameter.
If you select **Auto Read**, the system copies the value of the parameter you configure in the **Auto Read Parameter Reference** field to the Selected Value parameter.

---

8. In the **Fault Mode** frame, set how the system acquires the value of the selected channel when a fault occurs.

Note

If you select **Fault**, you must select a value to use in the **Fault Value** frame.

---

9. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Digital Output.

10. Select **Save** to save your changes to device memory.

4.5.13 Pulse Input

Use this display to configure pulse inputs. Pulse inputs accept pulse trains (square wave signals) that measurement devices (such as turbine meters) generate. The pulse input accepts digital level on/off signals from an external device and accumulates the changes over a configured period of time. Pulse inputs can also determine a rate from the accumulated pulses over a configured period of time.

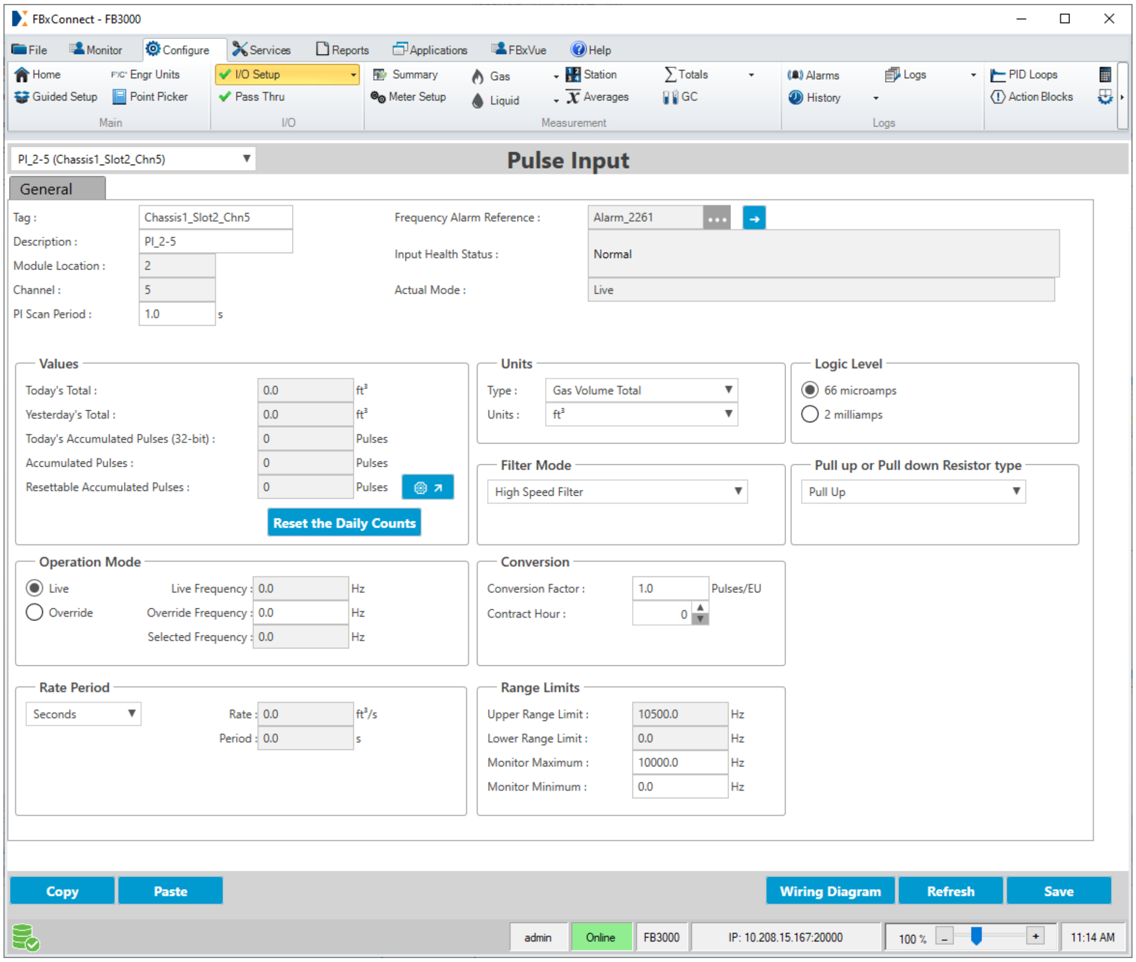
Note

The **lowest frequency the system can accurately measure** is 1 divided by the PI Scan Period. Flow control may be erratic below this threshold.

To access this display:

1. Select **Configure > I/O Setup > PI** from the FBxConnect™ main menu.

Figure 143. Pulse Input



PI_2-5 (Chassis1_Slot2_Chn5)

Pulse Input

General

Tag : Chassis1_Slot2_Chn5
Description : PI_2-5
Module Location : 2
Channel : 5
PI Scan Period : 1.0 s
Frequency Alarm Reference : Alarm_2261
Input Health Status : Normal
Actual Mode : Live

Values
Today's Total : 0.0 ft^3
Yesterday's Total : 0.0 ft^3
Today's Accumulated Pulses (32-bit) : 0 Pulses
Accumulated Pulses : 0 Pulses
Resettable Accumulated Pulses : 0 Pulses

Units
Type : Gas Volume Total
Units : ft^3

Logic Level
● 66 microamps
○ 2 milliamps

Filter Mode
High Speed Filter

Pull up or Pull down Resistor type
Pull Up

Operation Mode
● Live
○ Override
Live Frequency : 0.0 Hz
Override Frequency : 0.0 Hz
Selected Frequency : 0.0 Hz

Conversion
Conversion Factor : 1.0 Pulses/EU
Contract Hour : 0

Rate Period
Seconds
Rate : 0.0 ft^3/s
Period : 0.0 s

Range Limits
Upper Range Limit : 10500.0 Hz
Lower Range Limit : 0.0 Hz
Monitor Maximum : 10000.0 Hz
Monitor Minimum : 0.0 Hz

---

2. Click ▼ in the drop-down list at the top of the display to select a pulse input channel to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected channel.
Description	Sets a description (up to 20-alphanumeric characters) for the selected channel.
Module Location	This **read-only** field shows the location of the module in your FB Series product.
Channel	This **read-only** field shows the currently selected module channel.
PI Scan Period	Sets how frequently the system scans the input (in seconds) to acquire the value. Each input updates based on their individual scan period.
Frequency Alarm Reference	This **read-only** field shows you which alarm is currently configured for the point. **Note** Click → to open the Alarms display and configure the alarm parameters.
Input Health Status	This **read-only** field shows the current operating status of the selected channel. Possible values are: • Normal • Not Licensed • Inactive • Comm Fail • Override Active • In Alarm • Point Fail • Above URL • Below LRL • Termination Missing • Hardware Fail
Actual Mode	This **read-only** field shows the source of the selected value.
Today's Total	This **read-only** field shows the total flow for the current day.
Yesterday's Total	This **read-only** field shows the total flow for the previous day.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Today's Accumulated Pulses (32-bit)</td><td colspan="2">This read-only field shows the number of pulses stored in the accumulated value counter in firmware. For each I/O scan period (poll interval), the device determines the number of pulses that have occurred since the last I/O scan period and adds them to the accumulated value counter.</td></tr>
<tr><td>Accumulated Pulses</td><td colspan="2">This read-only field shows the number of raw counts stored in the accumulated value counter in firmware. For each scan period, the device determines the number of raw counts that have occurred since the last scan period and adds them to the accumulated value counter.
Note
The accumulated value rolls over to zero after reaching 4,294,967,296.</td></tr>
<tr><td>Resettable Accumulated Pulses</td><td colspan="2">This read-only field shows the number of raw counts stored in the accumulated value counter in firmware since the last time this field was manually reset to a custom value.
Note
To reset this field to a custom value, click ⚙↗ to open a pop-up display, enter the desired number of pulses in the Resettable Accumulated Pulses field, and select Save. New pulses are added to the entered value.</td></tr>
<tr><td>Reset the Daily Counts</td><td colspan="2">Click to reset all daily pulse input totals [Today's Total, Yesterday's Total, and Today's Accumulated Pulses (32-bit)].</td></tr>
<tr><td rowspan="2">Units</td><td colspan="2">Sets the measurement type and engineering units used for the selected channel.</td></tr>
<tr><td>Type</td><td>Sets the measurement type used for the selected channel.
Note
Click Save after you select the type of units to update the units available in the Units field.</td></tr>
</table>

Field	Description	
	Units	Sets the engineering units used for the selected channel. **Note** Changing the Units does not alter the value of parameters.
	Note These fields are hidden when the selected pulse input channel is assigned to a Linear Meter Input.	
Filter Mode	Sets the amount of filtering that will be applied to the pulse input. Choose a filtering mode that is appropriate for the input frequency, and the amount of noise that may be present.	
	Low Speed Filter	Choose low speed filtering if the pulse input will be measuring frequencies less than 10Hz.
	Medium Speed Filter	Choose medium speed filtering if the pulse input will be measuring frequencies between 0 to 300Hz.
	High Speed Filter	Choose high speed filtering if the pulse input will be measuring frequencies above 300Hz.
Logic Level	This setting determines the amount of current that the channel sources. Pick the appropriate setting based on the pulse input device used with this channel. **Note** • For the PI configuration driven from an open collector stage, high speed (10KHz) is **only** supported with the 2 milliamps setting. • For the PI configuration driven from a voltage source, 66 microamps is acceptable for low and high speed.	
	66 microamps	The input will source 66 microamps.
	2 milliamps	The input will source 2 milliamps.
Operation Mode	Sets the source of the selected value. Possible options are:	
	Live	The system uses the current value of the input.
	Override	The system uses the value set in the **Override Frequency** field.

Field	Description
Live Frequency	This **read-only** field shows the current value from the field device.
Override Frequency	Sets the value to use for the selected channel when the **Operation Mode** is set to **Override**.
Selected Frequency	This **read-only** field shows the current value used in calculations.
Conversion Factor	Sets the ratio of the number of pulses per engineering unit. **Note** This field is hidden when the selected pulse input channel is assigned to a Gas or Liquid Linear Meter Input.
Contract Hour	Click ▼ to set the hour of the day to begin the daily counted parameters. **Note** This field is hidden when the selected pulse input channel is assigned to a Gas or Liquid Linear Meter Input.
Rate Period	Click ▼ to set the time units used for the PI scan rate. **Note** This field is hidden when the selected pulse input channel is assigned to a Linear Meter Input.
Rate	This **read-only** field shows the calculated rate as of the most recent scan expressed in engineering units per unit of time. The system calculates the rate at the end of each scan period by dividing the number of pulses received by the conversion value and then multiplying by the rate period. **Note** This field is hidden when the selected pulse input channel is assigned to a Linear Meter Input.
Period	This **read-only** field shows the amount of time between each pulse. For example, if the input frequency was 100 Hz, the period will be 0.01 seconds. **Note** This field is hidden when the selected pulse input channel is assigned to a Linear Meter Input.

Field	Description
Accumulated Pulses	This **read-only** field shows the number of raw counts stored in the accumulated value counter in firmware. For each scan period, the FB Series product determines the number of raw counts that have occurred since the last scan period and adds them to the accumulated value counter. The accumulated value rolls over to zero after reaching 4,294,967,295. **Note** This field is hidden when the selected pulse input channel is assigned to a Linear Meter Input.
Upper Range Limit	This **read-only** field shows the maximum frequency the pulse input can measure.
Lower Range Limit	This **read-only** field shows the minimum frequency the pulse input can measure.
Monitor Maximum	Sets the maximum value of the pulse input gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Monitor Minimum	Sets the minimum value of the pulse input gauge shown on the Monitor > Main display. **Note** • To avoid prolonged display rendering times, limit the scale range to no more than 10,000. • This field applies **only** to the FB1000 and FB2000 Series Flow Computers.
Pull up or Pull down Resistor Type	Activates a pull up or pull down resistor to maintain input in a deterministic state when no input is applied. **Pull Up** Maintain signal High when no input is applied.

Field	Description	
	Pull Down	Maintain signal Low when no input is applied. **Note** Open collector circuit configuration is **not** supported with a pull down resistor.

4. Select **Save** to save any changes you make to this display.

4.5.13.1 Configuring Pulse Inputs

Use these steps to configure a pulse input on your FB Series product.

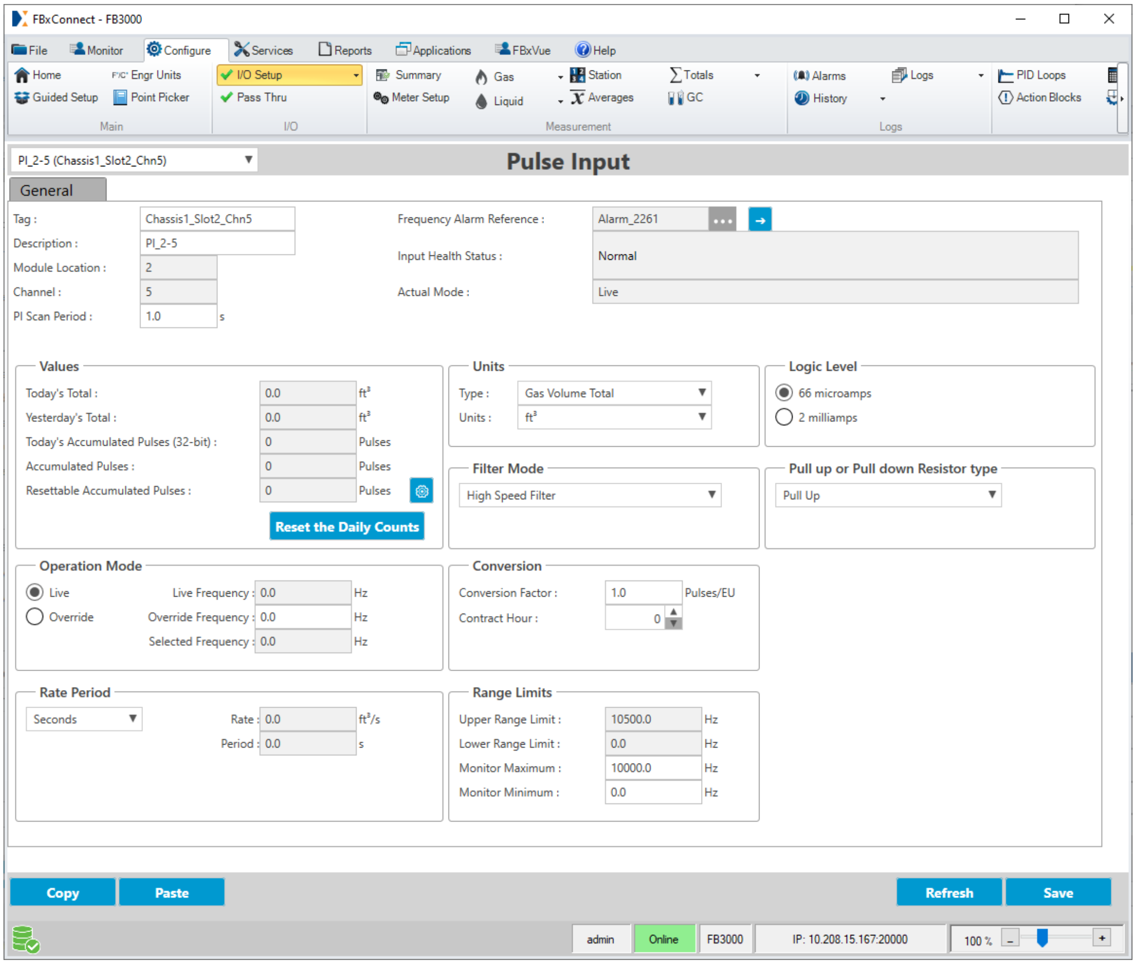
Note

You **must** configure I/O types before you configure I/O. For more information, refer to I/O Configuration.

To configure a pulse input:

1. Select **Configure > I/O Setup > PI** from the FBxConnect™ main menu.

Figure 144. Pulse Input



PI_2-5 (Chassis1_Slot2_Chn5)

Pulse Input

Tag : Chassis1_Slot2_Chn5
Description : PI_2-5
Module Location : 2
Channel : 5
PI Scan Period : 1.0 s
Frequency Alarm Reference : Alarm_2261
Input Health Status : Normal
Actual Mode : Live

Values
Today's Total : 0.0 ft^3
Yesterday's Total : 0.0 ft^3
Today's Accumulated Pulses (32-bit) : 0 Pulses
Accumulated Pulses : 0 Pulses
Resettable Accumulated Pulses : 0 Pulses

Units
Type : Gas Volume Total
Units : ft^3

Logic Level
● 66 microamps
○ 2 milliamps

Filter Mode
High Speed Filter

Pull up or Pull down Resistor type
Pull Up

Operation Mode
● Live
○ Override
Live Frequency : 0.0 Hz
Override Frequency : 0.0 Hz
Selected Frequency : 0.0 Hz

Conversion
Conversion Factor : 1.0 Pulses/EU
Contract Hour : 0

Rate Period
Seconds
Rate : 0.0 ft^3/s
Period : 0.0 s

Range Limits
Upper Range Limit : 10500.0 Hz
Lower Range Limit : 0.0 Hz
Monitor Maximum : 10000.0 Hz
Monitor Minimum : 0.0 Hz

2. Click ▼ in the drop-down list at the top of the display to select a pulse input channel to configure.
3. In the **Tag** field, enter a name for the selected channel.
4. In the **Description** field, enter a description for the selected channel.
5. In the **Units** frame, set the measurement type and engineering units used for the selected channel.
6. In the **Logic Level** frame, select the amount of current sourced by the channel.

Note

Pick the appropriate setting based on the pulse input device used with this channel.

7. In the **Operation Mode** frame, set the source of the selected value.

Note

If you select **Override**, you **must** enter a value in the **Override Frequency** field.

---

8. In the **Rate Period** frame, click ▼ to set the time units used for the PI scan rate.
9. In the **PI Scan Period** field, set how frequently the system scans the input to acquire the value.
10. In the **Filter Mode** frame, set the amount of filtering that will be applied to the pulse input.
11. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Pulse Input.
12. Select **Save** to save your changes to device memory.

4.5.14 User Data

Use this display as a global data storage area that any device or application can use. A user data entry may store the results of a specified calculation from a Math Block or an intermediate result of a specified value a Math Block acquires. 50 instances of the User Data display exist.

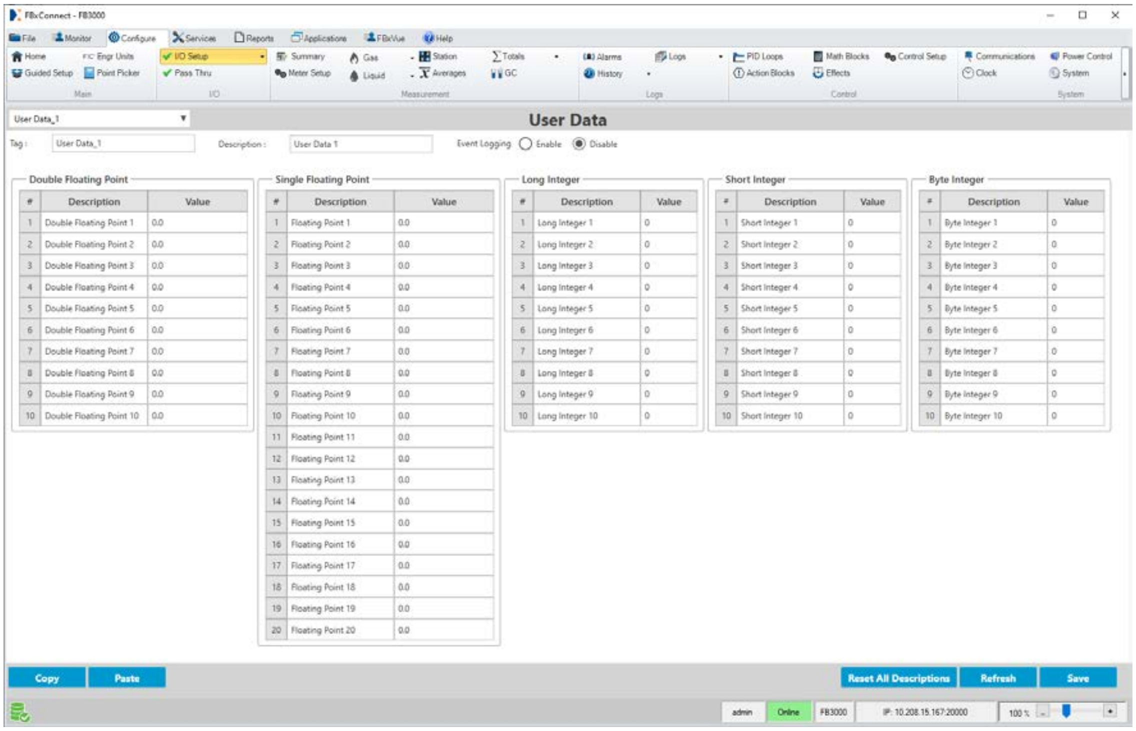
Each user data instance consists of the following:

- 1 Tag (20-alphanumeric string)
- 1 Description (40-alphanumeric string)
- 10 Double Floating Points (floating point values)
- 20 Single Floating Points (floating point values)
- 10 Long Integers (32-bit)
- 10 Short Integers (16-bit)
- 10 Byte Integers (8-bit)

To access this display:

1. Select **Configure > I/O Setup > User Data** from the FBxConnect™ main menu.

Figure 145. User Data



User Data

User Data_1

Tag : User Data_1

Description : User Data 1

Event Logging ○ Enable ● Disable

Double Floating Point

#	Description	Value
1	Double Floating Point 1	0.0
2	Double Floating Point 2	0.0
3	Double Floating Point 3	0.0
4	Double Floating Point 4	0.0
5	Double Floating Point 5	0.0
6	Double Floating Point 6	0.0
7	Double Floating Point 7	0.0
8	Double Floating Point 8	0.0
9	Double Floating Point 9	0.0
10	Double Floating Point 10	0.0

Single Floating Point

#	Description	Value
1	Floating Point 1	0.0
2	Floating Point 2	0.0
3	Floating Point 3	0.0
4	Floating Point 4	0.0
5	Floating Point 5	0.0
6	Floating Point 6	0.0
7	Floating Point 7	0.0
8	Floating Point 8	0.0
9	Floating Point 9	0.0
10	Floating Point 10	0.0
11	Floating Point 11	0.0
12	Floating Point 12	0.0
13	Floating Point 13	0.0
14	Floating Point 14	0.0
15	Floating Point 15	0.0
16	Floating Point 16	0.0
17	Floating Point 17	0.0
18	Floating Point 18	0.0
19	Floating Point 19	0.0
20	Floating Point 20	0.0

Long Integer

#	Description	Value
1	Long Integer 1	0
2	Long Integer 2	0
3	Long Integer 3	0
4	Long Integer 4	0
5	Long Integer 5	0
6	Long Integer 6	0
7	Long Integer 7	0
8	Long Integer 8	0
9	Long Integer 9	0
10	Long Integer 10	0

Short Integer

#	Description	Value
1	Short Integer 1	0
2	Short Integer 2	0
3	Short Integer 3	0
4	Short Integer 4	0
5	Short Integer 5	0
6	Short Integer 6	0
7	Short Integer 7	0
8	Short Integer 8	0
9	Short Integer 9	0
10	Short Integer 10	0

Byte Integer

#	Description	Value
1	Byte Integer 1	0
2	Byte Integer 2	0
3	Byte Integer 3	0
4	Byte Integer 4	0
5	Byte Integer 5	0
6	Byte Integer 6	0
7	Byte Integer 7	0
8	Byte Integer 8	0
9	Byte Integer 9	0
10	Byte Integer 10	0

2. Click ▼ in the drop-down list to select a user data instance to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected user data instance.
Description	Sets a description (up to 40-alphanumeric characters) for the selected user data instance.
Event Logging	Select to enable the system to log user data parameters changes to the event log. **Note** A change to this option may require up to 10 seconds to take effect.
Double Floating Point	Sets up to 10 parameters to provide storage for double precision floating point values. In the row for each parameter, use the **Description** field to describe (up to 200-alphanumeric characters) the data stored in that row.

Field	Description
Single Floating Point	Sets up to 20 parameters to provide storage for single precision floating point values. In the row for each parameter, use the **Description** field to describe (up to 200-alphanumeric characters) the data stored in that row.
Long Integer	Sets up to 10 parameters to provide storage for 32-bit unsigned integer values. In the row for each parameter, use the **Description** field to describe (up to 200-alphanumeric characters) the data stored in that row.
Short Integer	Sets up to 10 parameters to provide storage for 16-bit unsigned integer values. In the row for each parameter, use the **Description** field to describe (up to 200-alphanumeric characters) the data stored in that row.
Byte Integer	Sets up to 10 parameters to provide storage for 8-bit unsigned values. In the row for each parameter, use the Description field to describe (up to 200-alphanumeric characters) the data stored in that row.
Reset All Descriptions	Select this button to restore the default parameter description for **all** user data types.

4. Select **Save** to save any changes you make to this display.

4.6 Pass Thru

Use this display to configure parameters used when communicating with other Ethernet enabled FB Series products and FBxRemote™ I/O racks.

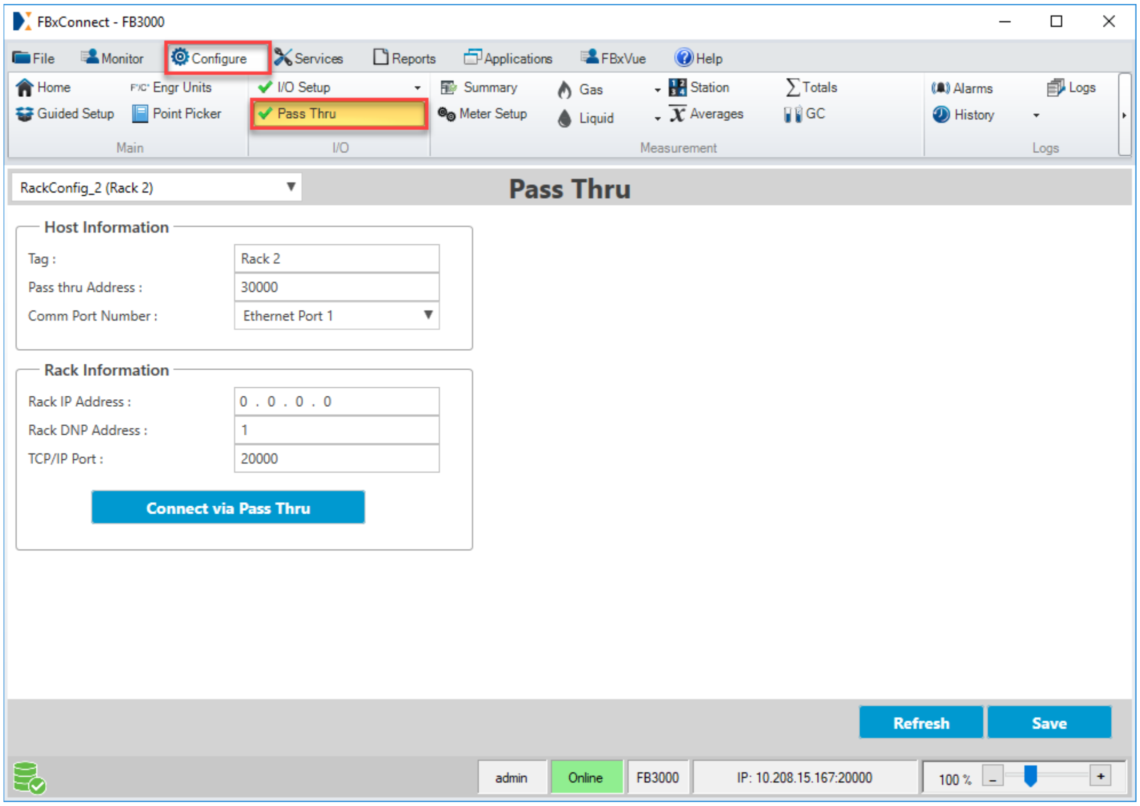
Note:

You can connect an FBxRemote I/O rack to an Ethernet communications port on the FB3000 using FBxNet™, and the FB3000 supports pass-thru communications. This allows you to connect to and configure the FBxRemote™ I/O rack through the FB3000 (without a direct connection). After configuring communication parameters on the FBxRemote™ I/O rack and the Pass Thru display, select the Connect via Pass Thru button to connect to the FBxRemote™ I/O rack.

To access this display:

1. Select **Configure > Pass Thru**. The Pass Thru display opens.

Figure 146. Pass Thru



RackConfig_2 (Rack 2)

Pass Thru

Host Information

Tag : Rack 2
Pass thru Address : 30000
Comm Port Number : Ethernet Port 1

Rack Information

Rack IP Address : 0 . 0 . 0 . 0
Rack DNP Address : 1
TCP/IP Port : 20000

2. Click ▼ in the FBxRemote™ I/O rack drop-down list and select the rack you want to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Host Information	Use these fields to specify communication parameters used by the host FB Series product when communicating with the selected FBxRemote™ I/O rack.	
	Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected FBxRemote™ I/O rack.
	Pass thru Address	Sets the TCP/IP port number that will be opened between the host and the PC running FBxConnect™.
	Comm Port Number	Click ▼ to specify which communications port to use when communication with the selected FBxRemote™ I/O rack.

Field	Description	
Rack Information	Use these fields to specify communications parameters of the selected FBxRemote™ I/O rack.	
	Rack IP Address	Enter the IP address of the selected FBxRemote™ I/O rack.
	Rack DNP Address	Enter the DNP address of the selected FBxRemote™ I/O rack.
	TCP/IP Port	Enter the DNP3 TCP/IP port of the selected FBxRemote™ I/O rack.
	Connect via Pass Thru	Select this button to connect to the selected FBxRemote™ I/O rack. When connected, a new FBxConnect™ instance opens and allows you to configure the FBxRemote™ I/O rack. **Note** Since FBxRemote™ I/O racks do not support the full functionality available in FBxConnect, only a subset of menu items are available.

4. Select **Save** to save any changes you make to this display.

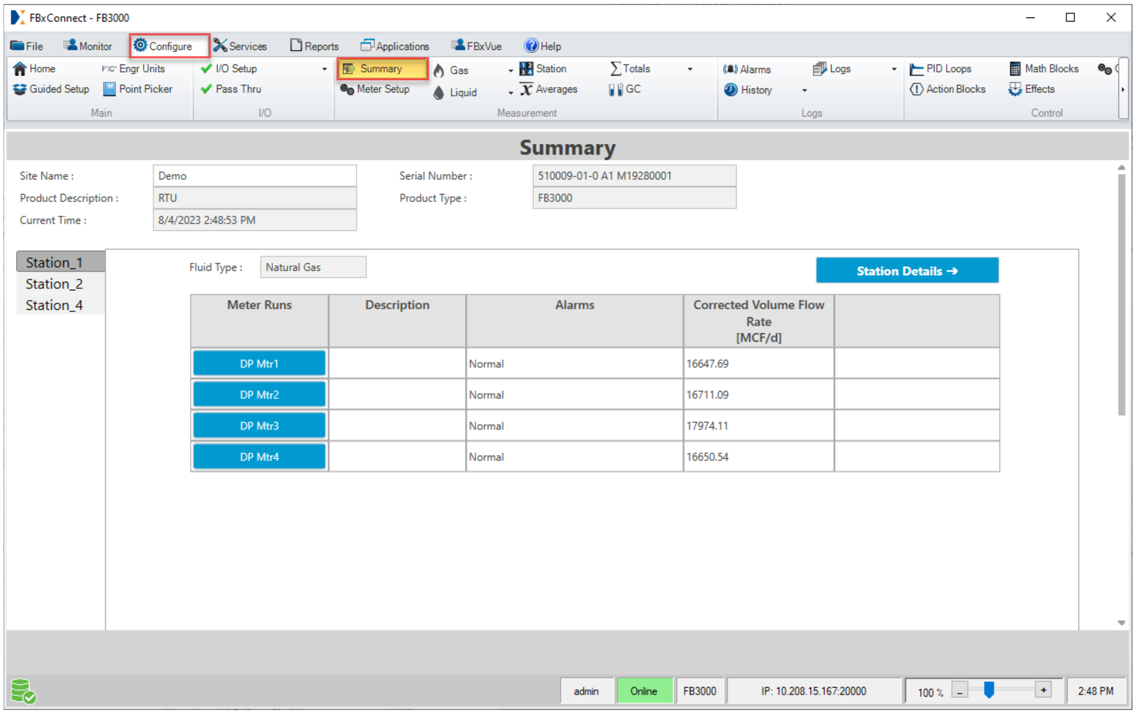
4.7 Summary

The Summary display shows an overview of all configured stations and assigned meters.

To access this display:

1. Select **Configure > Summary**.

Figure 147. Summary



Site Name : Demo

Product Description : RTU

Current Time : 8/4/2023 2:48:53 PM

Serial Number : 510009-01-0 A1 M19280001

Product Type : FB3000

Fluid Type : Natural Gas

Meter Runs	Description	Alarms	Corrected Volume Flow Rate [MCF/d]	
DP Mtr1		Normal	16647.69	
DP Mtr2		Normal	16711.09	
DP Mtr3		Normal	17974.11	
DP Mtr4		Normal	16650.54	

IP: 10.208.15.167:20000

2. Review – and change as necessary – the values in the following fields:

Field	Description	
Site Name	This **read-only** field shows the configured location name of your FB3000.	
Device Serial Number	This **read-only** field shows the serial number of your FB3000.	
Product Description	This **read-only** field shows the configured description of your FB3000.	
Product Type	This **read-only** field shows FB Series product type you are configuring.	
Current Time	This **read-only** field shows the current time of the clock on the FB3000.	
Station Tabs	A separate tab appears for each station you have configured. Select each station tab to view the following information.	
	Fluid Type	This **read-only** field shows the fluid type measured by each station.

Field	Description	
	Station Details	Select this button to open the station configuration display for the selected station. Select ◀ to return to Summary display.
	Description	This **read-only** field shows the description of each meter assigned to the selected station.
	Meter Runs	This column shows each meter assigned to the selected station. Select a meter name to open the meter configuration display for that meter. Select ◀ to return to Summary display.
	Alarms	This **read-only** field shows any currently active alarms on the meter.
	Corrected Volume Flow Rate	This **read-only** field shows corrected Volume Flow Rate for the meter. **Note** This field appears **only** for gas meters.
	Water Net Volume Flow Rate	This **read-only** field shows Water Net Volume Flow Rate for the meter. **Note** This field appears **only** for liquid linear meters.
	Oil Net Volume Flow Rate	This **read-only** field shows Oil Net Volume Flow Rate for the meter. **Note** This field appears **only** for liquid linear meters.

3. Select **Save** to save any changes you make to this display.

4.8 Meter Setup

Use this display to configure general meter run parameters, including the number of differential pressure (DP), gas linear, and liquid linear meter runs.

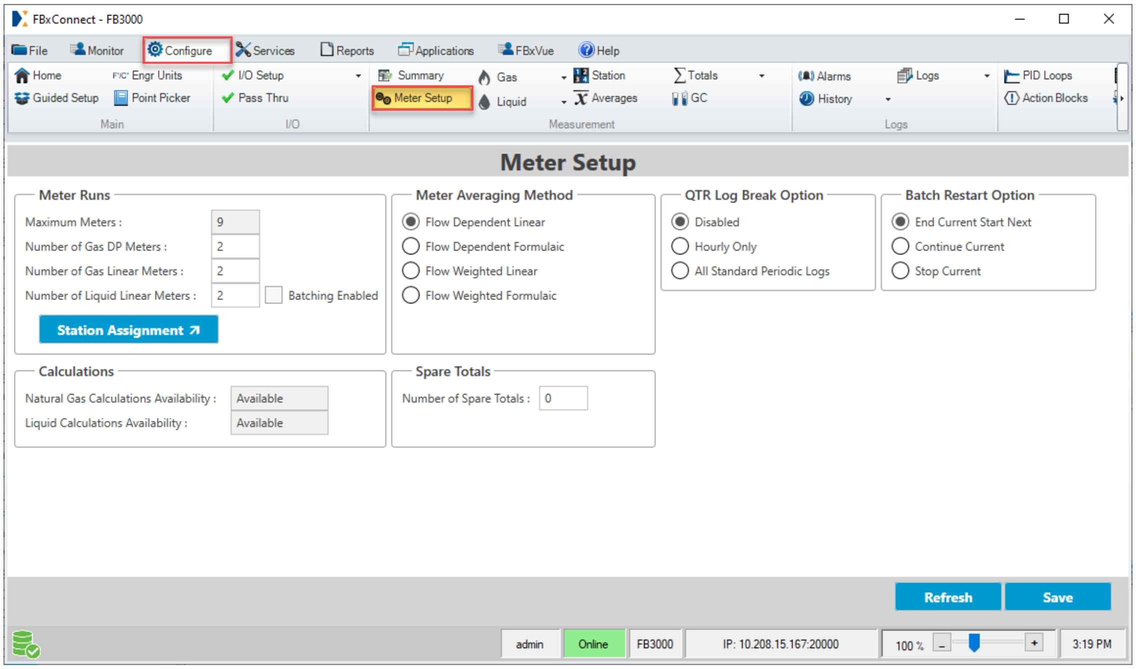
Note

If the system is unable to create meter runs or experiences a fatal metering error, the system logs a **Meter Task Detected Fatal Error** event to the Event log.

To access this display:

1. Select **Configure > Meter Setup**.

Figure 148. Meter Setup



Meter Setup

Meter Runs
Maximum Meters : 9
Number of Gas DP Meters : 2
Number of Gas Linear Meters : 2
Number of Liquid Linear Meters : 2
☐ Batching Enabled

Meter Averaging Method
● Flow Dependent Linear
○ Flow Dependent Formulaic
○ Flow Weighted Linear
○ Flow Weighted Formulaic

QTR Log Break Option
● Disabled
○ Hourly Only
○ All Standard Periodic Logs

Batch Restart Option
● End Current Start Next
○ Continue Current
○ Stop Current

Calculations
Natural Gas Calculations Availability : Available
Liquid Calculations Availability : Available

Spare Totals
Number of Spare Totals : 0

2. Review – and change as necessary – the values in the following fields:

Field	Description
Maximum Meters	This **read-only** field shows the maximum number of meter runs allowed in the FB Series product.
Number of Gas DP Meters	Sets the number of differential pressure meter runs on the currently attached FB Series product. **Note** This value (combined with the values in the Number of Gas Linear Meters and Number of Liquid Linear Meters fields) cannot exceed the value shown in the Maximum Meters field.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Number of Gas Linear Meters</td><td colspan="2">Sets the number of liner meter runs on the currently attached FB Series product.
Note
This value (combined with the values in the Number of Gas DP Meters and Number of Liquid Linear Meters fields) cannot exceed the value shown in the Maximum Meters field.</td></tr>
<tr><td rowspan="2">Number of Liquid Linear Meters</td><td colspan="2">Sets the number of liquid linear meter runs on the currently attached FB Series product.
Note
This value (combined with the values in the Number of Gas Linear Meters and Number of Active DP Meters fields) cannot exceed the value shown in the Maximum Meters field.</td></tr>
<tr><td>Batching Enabled</td><td>This read-only field shows if the batching feature is enabled on any liquid stations.
Note
This checkbox has three possible states:
• Empty – No liquid stations have the batching feature enabled.
• Checked – All liquid stations have the batching feature enabled.
• Grayed out – At least one liquid station has the batching feature enabled and at least one liquid station does not have the batching feature enabled.</td></tr>
<tr><td>Station Assignment</td><td colspan="2">Select Station Assignment to configure which meters are assigned to which stations.</td></tr>
<tr><td>Calculations</td><td colspan="2">These read-only fields show the status of calculation types on the FB3000 RTU. Possible statuses are:
• Available – A valid licensed is installed for the calculation type.
• Not available – A valid licensed is not installed for the calculation type.</td></tr>
</table>

Field	Description	
Meter Averaging Method	Sets the averaging method used by the currently attached FB Series product. The selected method is used for all averages associated with all gas meters in the FB Series product. Current and previous period averages are stored in the database by the Average object, and historical data is recorded under Station History if a history point is assigned to that Average object. For further details on the averaging techniques, see API measurement standard Chapter 21, Section 1, Appendix B (1993). **Gas Averaging (API 21.1)** • The current version of API Chapter 21, Section 1, Annex B (2013) states that Flow Dependent Linear averaging shall be used. • If there was an intermittent flow during the averaging period (hourly, daily, etc.), then only samples during flow are included. If there is no flow for the entire averaging period, then all of the samples are included. **Liquid Averaging (API 12.2.2)** • Averages associated with liquid linear meters are **always** flow-weighted based on API 12.2.2, and periods of no flow produce averages of 0.	
	Flow Dependent Linear	This is the simplest and most commonly used method. This method sums the included samples and divides by the number of included samples to compute the average values for the period.
	Flow Dependent Formulaic	This method raises each included sample to the lowest order power to which that particular value is used in the flow equation before averaging as above and then the result is raised to the inverse power. For averaging flowing pressure for a DP meter, for instance, where pressure is used to the 0.5 power, this means taking the square root of each sample and squaring the average of those samples. For averaging flowing pressure for a linear meter, however, where the pressure is used directly in the flow equation, the samples are taken to the "1" power, producing identical results to the flow dependent linear method.

Field	Description	
	Flow Weighted Linear	This method determines a relative "weight" for each sample by first multiplying the sample by a flow value (the square root of the differential pressure for a DP meter and the indicated quantity flow rate for a linear meter) and then calculates a linear average by dividing the sum of the flow-weighted sample by the sum of the flow values.
	Flow Weighted Formulaic	This method raises each included sample to the lowest order power as described above for flow dependent formulaic and also multiplies each sample by a weight as described above for flow weighted linear. The resulting sum is divided by the sum of the flows and raised to the inverse power to obtain the average value.
Number of Spare Totals	Sets the number of additional instances of the Totals object in the FB Series product database. Change this value to dynamically increase the number of Total_x object instances in the system database, as viewed by the Point Picker. New instances of the Totals object start with Total_50001. Up to four instances per meter are supported for a maximum of 144 additional Total_x object instances. **Note** • Spare totals are **only** used when calculating **fault totals**. For more information about fault totals, refer the **Fault Total Enable** field on the Station – Advanced Tab. • For more information about automatically configuring fault totals, refer to Totals Setup. • For more information about viewing totals, refer to Totals.	
QTR Log Break Option	Sets the Quantity Transaction Record (QTR) log action to be taken when a configuration parameter is changed that affects the flow calculations. **Note** The action will be taken at the top of the minute following the parameter change.	
	Disabled	No action is taken.
	Hourly Only	Logs an hourly record in affected station history group.

Field	Description	
	All Standard Period Logs	Logs hourly, daily, weekly, and monthly records in affected station history group.
Batch Restart Option	If batching is enabled, sets how the system responds when a batch is in progress and the FB product restarts.	
	End Current Start Next	The current batch stops and a new batch automatically starts.
	Continue Current	The current batch continues.
	Stop Current	The current batch stops and a new batch **does not** automatically start.

3. Select **Save** to save any changes you make to this display.

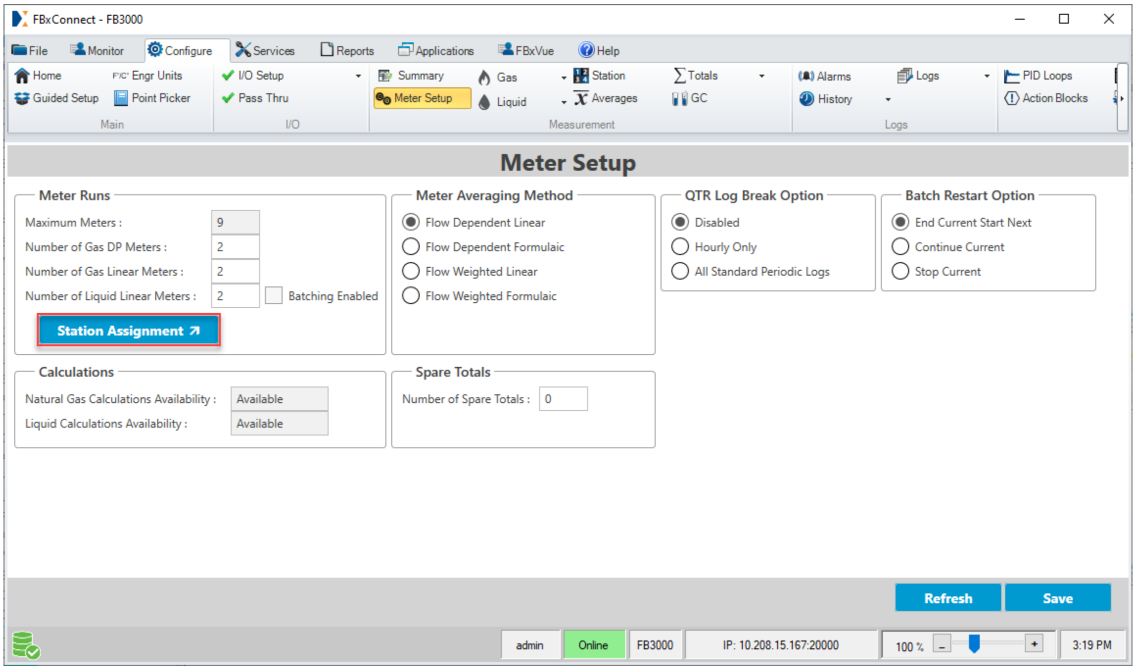
4.8.1 Station Assignment

Use this pop-up display to configure which meters are assigned to which station.

To access this display:

1. Select **Configure > Meter Setup**. The Meter Setup display opens.

Figure 149. Station Assignment



Meter Setup

Meter Runs
Maximum Meters : 9
Number of Gas DP Meters : 2
Number of Gas Linear Meters : 2
Number of Liquid Linear Meters : 2
☐ Batching Enabled

Meter Averaging Method
● Flow Dependent Linear
○ Flow Dependent Formulaic
○ Flow Weighted Linear
○ Flow Weighted Formulaic

QTR Log Break Option
● Disabled
○ Hourly Only
○ All Standard Periodic Logs

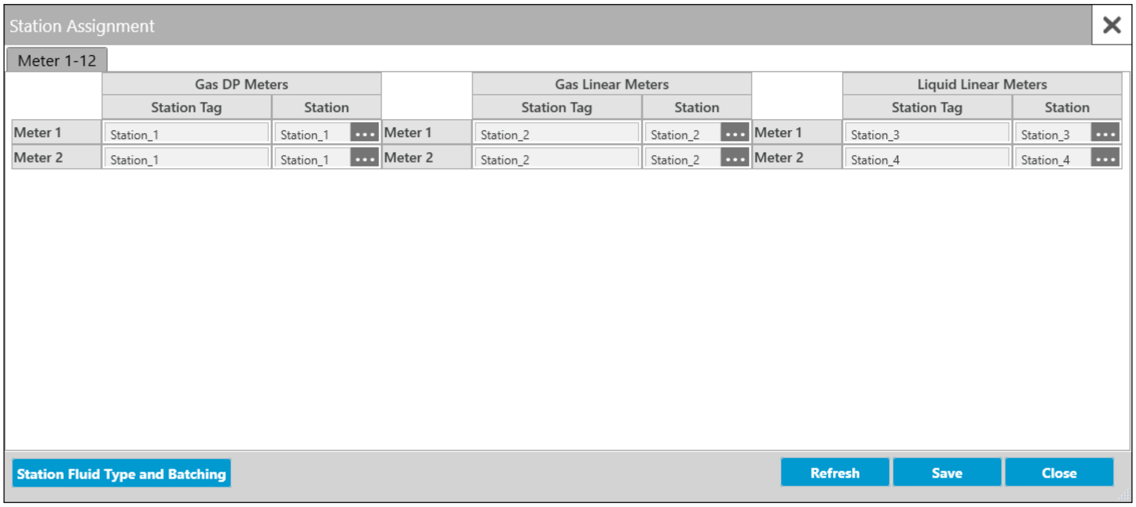
Batch Restart Option
● End Current Start Next
○ Continue Current
○ Stop Current

Calculations
Natural Gas Calculations Availability : Available
Liquid Calculations Availability : Available

Spare Totals
Number of Spare Totals : 0

2. Select **Station Assignment**. The Station Assignment pop-up display opens.

Figure 150. Station Assignment



	Gas DP Meters			Gas Linear Meters			Liquid Linear Meters	
	Station Tag	Station		Station Tag	Station		Station Tag	Station
Meter 1	Station_1	Station_1	Meter 1	Station_2	Station_2	Meter 1	Station_3	Station_3
Meter 2	Station_1	Station_1	Meter 2	Station_2	Station_2	Meter 2	Station_4	Station_4

3. Tabs appear at the top of the display. Each tab consists of up to 12 meters. Select the tab that contains the meters you want to assign to a specific station.

4. In the row for each meter, select ••• to open a Point Picker dialog and assign each meter to a specific station.

Note

Gas meters and liquid meters **cannot** belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.

5. Select **Station Fluid Type and Batching** to configure the fluid type measured by each station.

Note

You **cannot** change the fluid type of a station if a meter is already assigned to that station. In this case, you **must** first remove any meters assigned to the selected station before you are able to change the Fluid Type field.

6. Select **Save** to save any changes you make to this pop-up display.

7. Select **Close** to exit the display.

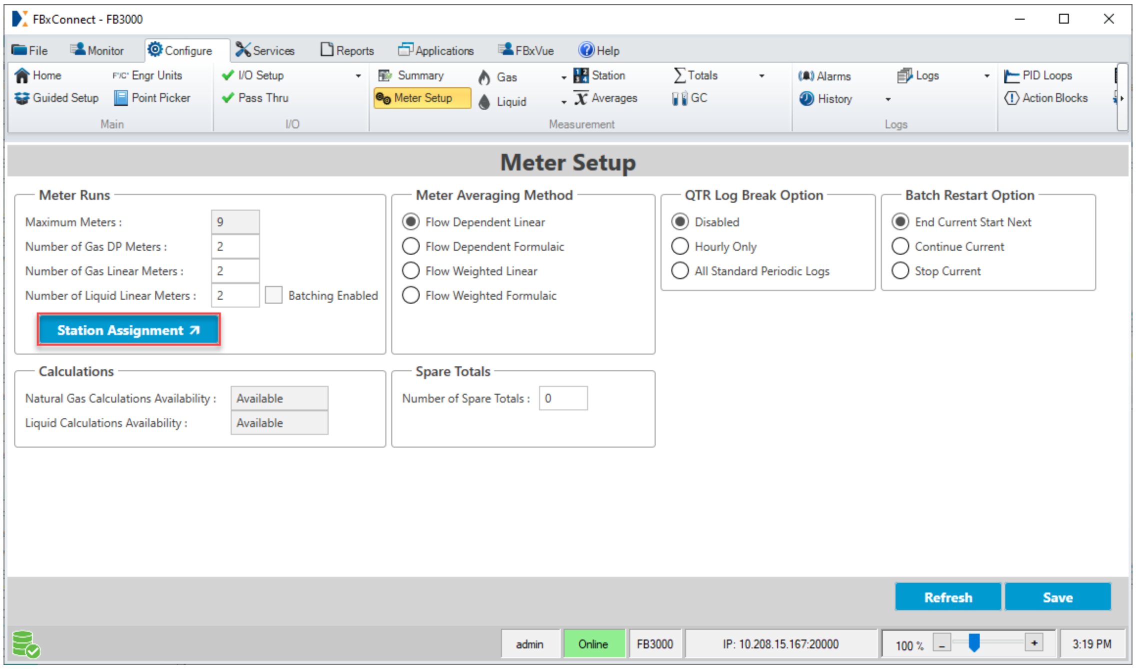
4.8.2 Station Fluid Type

Use this pop-up display to configure the fluid type measured by each station.

To access this display:

1. Select **Configure > Meter Setup**. The Meter Setup display opens.

Figure 151. Station Assignment



Meter Setup

Meter Runs
Maximum Meters : 9
Number of Gas DP Meters : 2
Number of Gas Linear Meters : 2
Number of Liquid Linear Meters : 2 ☐ Batching Enabled

Meter Averaging Method
● Flow Dependent Linear
○ Flow Dependent Formulaic
○ Flow Weighted Linear
○ Flow Weighted Formulaic

QTR Log Break Option
● Disabled
○ Hourly Only
○ All Standard Periodic Logs

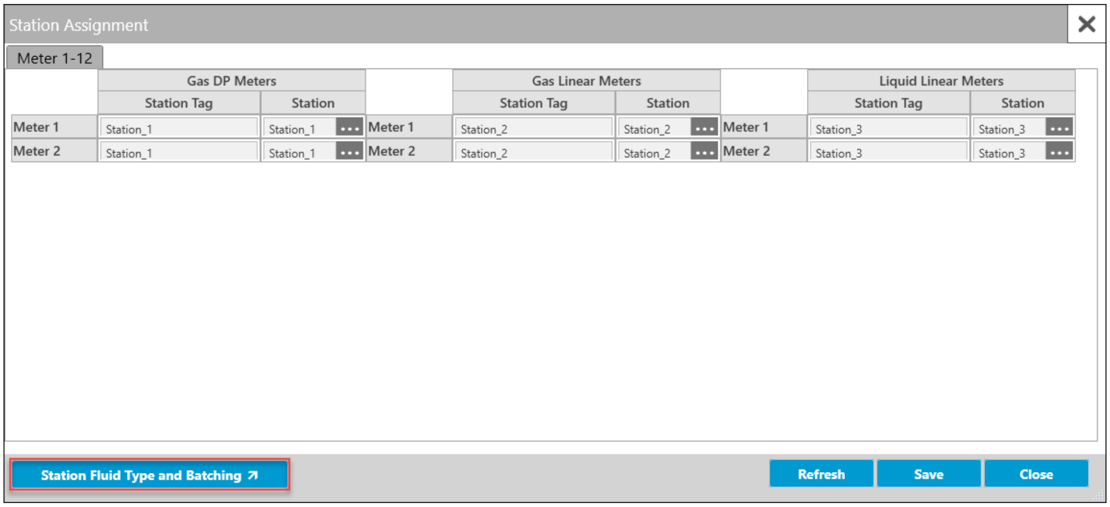
Batch Restart Option
● End Current Start Next
○ Continue Current
○ Stop Current

Calculations
Natural Gas Calculations Availability : Available
Liquid Calculations Availability : Available

Spare Totals
Number of Spare Totals : 0

2. Select **Station Assignment**. The Station Assignment pop-up display opens.

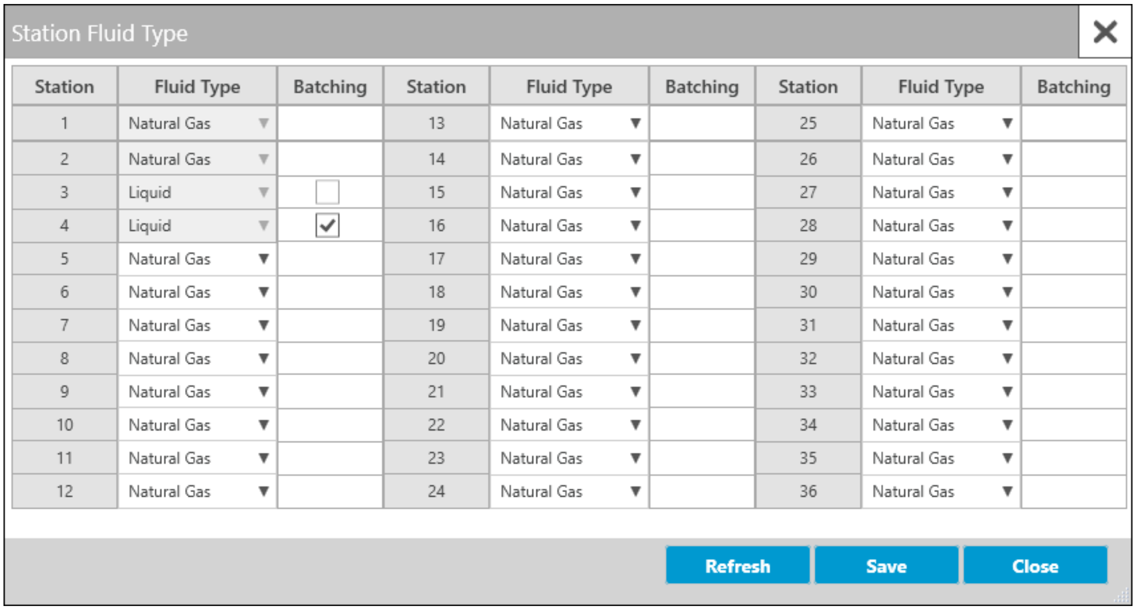
Figure 152. Station Assignment



	Gas DP Meters			Gas Linear Meters			Liquid Linear Meters	
	Station Tag	Station		Station Tag	Station		Station Tag	Station
Meter 1	Station_1	Station_1 ...	Meter 1	Station_2	Station_2 ...	Meter 1	Station_3	Station_3 ...
Meter 2	Station_1	Station_1 ...	Meter 2	Station_2	Station_2 ...	Meter 2	Station_3	Station_3 ...

3. Select **Station Fluid Type and Batching**. The Station Fluid Type pop-up display opens showing a list of all stations.

Figure 153. Station Fluid Type



Station	Fluid Type	Batching	Station	Fluid Type	Batching	Station	Fluid Type	Batching
1	Natural Gas ▼		13	Natural Gas ▼		25	Natural Gas ▼	
2	Natural Gas ▼		14	Natural Gas ▼		26	Natural Gas ▼	
3	Liquid ▼	☐	15	Natural Gas ▼		27	Natural Gas ▼	
4	Liquid ▼	☑	16	Natural Gas ▼		28	Natural Gas ▼	
5	Natural Gas ▼		17	Natural Gas ▼		29	Natural Gas ▼	
6	Natural Gas ▼		18	Natural Gas ▼		30	Natural Gas ▼	
7	Natural Gas ▼		19	Natural Gas ▼		31	Natural Gas ▼	
8	Natural Gas ▼		20	Natural Gas ▼		32	Natural Gas ▼	
9	Natural Gas ▼		21	Natural Gas ▼		33	Natural Gas ▼	
10	Natural Gas ▼		22	Natural Gas ▼		34	Natural Gas ▼	
11	Natural Gas ▼		23	Natural Gas ▼		35	Natural Gas ▼	
12	Natural Gas ▼		24	Natural Gas ▼		36	Natural Gas ▼	

4. Select ▼ to assign a fluid type for each station.

Note

Gas meters and liquid meters **cannot** belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.

You **cannot** change the fluid type of a station if a meter is already assigned to that station. In this case, you **must** first remove any meters assigned to the selected station before you are able to change the Fluid Type field.

---

5. For FB3000 RTU liquid meters, place a check mark in the Batching column to enable the batching feature for the station configured in the selected row.

Note

Batching is enabled at the station level. If you enable batching for a meter assigned to a particular station, all other meters assigned to that station will also have the batching feature enabled.

---

6. Select **Save** to save any changes you make to this pop-up display.
7. Select **Close** to exit the display.

4.9 DP Meter

Use this display to configure differential pressure meters in your FB Series product.

To access this display, select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.

Figure 154. Configure – DP Meter

The DP Meter display contains the following items:

General – Use this display to configure the type, sizing, and inputs for the selected meter.

Advanced – Use this pop-up display to configure advanced properties for the selected meter, including meter construction material, temperature correction, and discharge coefficient options.

Diagnostics – Use this pop-up display to view **read-only** diagnostic information for the selected meter, including calculated values and alarm codes.

Rates & Totals – Use this pop-up display to view **read-only** flow rates and accumulations for the selected meter.

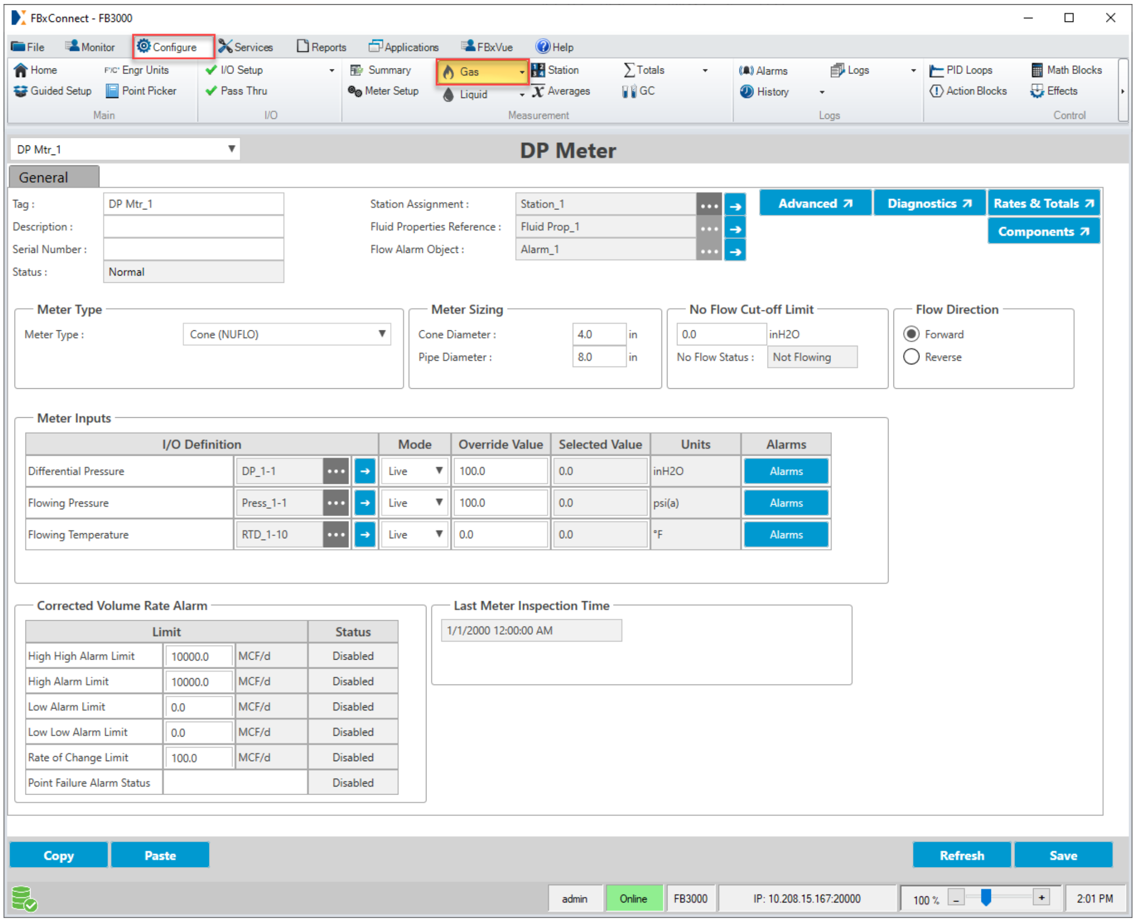
4.9.1 DP Meter – General

Use this display to configure the type, sizing, and inputs for the selected differential pressure meter.

To access this display:

1. Select **Configure > Gas > DP Meter**. The DP Meter opens.

Figure 155. DP Meter – General



DP Mtr_1

Tag : DP Mtr_1
Description :
Serial Number :
Status : Normal

Station Assignment : Station_1
Fluid Properties Reference : Fluid Prop_1
Flow Alarm Object : Alarm_1

Meter Type

Meter Type : Cone (NUFLO)

Meter Sizing

Cone Diameter : 4.0 in
Pipe Diameter : 8.0 in

No Flow Cut-off Limit

0.0 inH2O
No Flow Status : Not Flowing

Flow Direction

● Forward
○ Reverse

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Differential Pressure	DP_1-1	Live	100.0	0.0	inH2O	Alarms
Flowing Pressure	Press_1-1	Live	100.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-10	Live	0.0	0.0	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

Last Meter Inspection Time

1/1/2000 12:00:00 AM

admin Online FB3000 IP: 10.208.15.167:20000 100 %

2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.

3. Review – and change as necessary – the values in the following fields:

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Tag</td><td colspan="2">Sets an identifier (up to 20-alphanumeric characters) for the selected meter.</td></tr>
<tr><td>Description</td><td colspan="2">Sets a description (up to 20-alphanumeric characters) for the selected meter.</td></tr>
<tr><td>Serial number</td><td colspan="2">Sets a description (up to 20-alphanumeric characters) for the serial number or other identifier of the selected meter.</td></tr>
<tr><td rowspan="5">Status</td><td colspan="2">This read-only field indicates the overall health of the selected meter. Possible values are:</td></tr>
<tr><td>Normal</td><td>Indicates the meter is not in an alarm, failure, or override condition.</td></tr>
<tr><td>In alarm</td><td>Indicates an active flow rate, I/O, property calculation, or flow calculation alarm.</td></tr>
<tr><td>Failure</td><td>Indicates a point fail on a meter input that is used in flow calculations or a severe calculation error that prevented calculations from continuing.</td></tr>
<tr><td>Override</td><td>Indicates a meter input that is used in flow calculations in override mode that is not typically in override.</td></tr>
</table>

Field	Description
	Note The status is based on the health of the uncorrected volume, corrected volume, and mass of the meter. You can configure which parameters are considered in determining the health of the meter in the **Fault Health Configuration** field on the Station – Advanced Tab. The associated parameter (OBJ_STATUS) is a 32-bit binary value, where individual bits have different meaning. We currently use 3 bits. Starting from LSB (Least Significant Bit), Bit 1 represents “In Alarm,” Bit 2 represents “Failure,” and Bit 3 represents “Override.” When viewing this parameter via a host system, the value is represented as a decimal number. For example, a value of 0 means no bits are set and the meter status is Normal. A value of 1 means the meter status is In Alarm. A value of 2 means the meter status is Failure. A value of 4 means the meter status is Override. A value of 7 means Bits 1, 2, and 3 are all set, and the meter status is In Alarm, Failure, and Override.
Station Assignment	Click ••• to open a Point Picker dialog and select the station to which this meter belongs. **Note** - After selecting a Station, click ➔ to open the Station configuration display. - Stations measuring different fluid types are hidden in the Point Picker. - Gas meters and liquid meters **cannot** belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.
Fluid Properties Reference	This **read-only** field shows the fluid properties instance currently assigned to the selected meter. **Note** Click ➔ to open the Fluid Properties configuration display.

Field	Description
Flow Alarm Object	This **read-only** field shows the alarm instance currently assigned to the selected meter. **Note** Click ➔ to open the Alarms configuration display.
Advanced	Click this button to open the DP Meter – Advanced pop-up display and configure advanced properties for the selected differential pressure meter.
Diagnostics	Click this button to open the DP Meter – Diagnostics pop-up display and view **read-only** diagnostic information for the selected differential pressure meter.
Rates & Totals	Click this button to open the DP Meter – Rates & Totals pop-up display and view **read-only** flow rates and accumulations and to manually configure fault totals for the selected differential pressure meter.
Components	Click this button to open the Components pop-up display and set the mole percent of each fluid component present in the meter.
Meter Type	Click ▼ to specify the type of differential pressure meter you are configuring, and the calculation to use for the selected meter.
Orifice Diameter	Specifies the orifice plate bore diameter. **Note** This field appears **only** if you select an **orifice meter** in the **Meter Type** field.
Throat Diameter	Specifies the Venturi tube throat diameter. **Note** This field appears **only** if you select a **Venturi meter** in the **Meter Type** field.
Nozzle Diameter	Specifies the nozzle throat diameter. **Note** This field appears **only** if you select a **nozzle meter** in the **Meter Type** field.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Orifice Diameter (single hole)</td><td colspan="2">Specifies the typical orifice hole size (single hole).
Note
This field appears only if you select a conditioning orifice meter in the Meter Type field.</td></tr>
<tr><td>Cone Diameter</td><td colspan="2">Specifies the cone diameter.
Note
This field appears only if you select a cone meter in the Meter Type field.</td></tr>
<tr><td>Pipe Diameter</td><td colspan="2">Specifies the inside diameter of the pipe in which the meter is installed.</td></tr>
<tr><td>No Flow Cut-off Limit</td><td colspan="2">Sets the low flow cutoff point. When the live differential pressure of the metering device is less than this value, the meter flow rates will be set to zero.</td></tr>
<tr><td>No Flow Status</td><td colspan="2">This read-only field shows the current flowing status of the selected meter. A differential pressure greater than or equal to the no flow cutoff is considered “flowing” and increments flow and flow time. A differential pressure below the no flow cutoff is considered “not flowing,” does not increment flow or flow time, and the Differential Pressure In Use field on the DP Meter – Diagnostics tab shows 0.</td></tr>
<tr><td rowspan="4">Flow Direction</td><td colspan="2">Selects the value to be read from an integral or remote sensor DP object.</td></tr>
<tr><td>Forward</td><td>DP Value will be read from DP object’s SELECTED parameter.</td></tr>
<tr><td>Reverse</td><td>DP Value will be read from DP object’s REV_DP parameter.</td></tr>
<tr><td colspan="2">Note
This selection only applies when a DP object is assigned as the differential pressure input.</td></tr>
</table>

Field	Description	
Differential Pressure	**I/O Definition**	Click … to open a Point Picker dialog and select the differential pressure input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • DP object (Forward) – SELECTED VALUE • DP object (Reverse) – REVERSE DIFFERENTIAL PRESSURE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data object – DOUBLE FLOATING POINT 1. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the differential pressure value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.

Field	**Description**	
	Selected Value	This **read-only** field shows the current value of the selected differential pressure input.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Static Pressure	**I/O Definition**	Click … to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet.

Field	Description	
		• HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the static pressure value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This **read-only** field shows the current value of the selected static pressure input.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.

Field	**Description**	
Flowing Temperature	**I/O Definition**	Click … to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • RTD object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the flowing temperature value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This **read-only** field shows the current value of the flowing temperature input used in calculations.

Field	Description	
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Pressure Transmitter Type	Specifies the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select an **FBxNData**, **HART**, or **User Data** instance in the **Flowing Pressure I/O Definition** field.	
Corrected Volume Rate Alarm	Sets the rate alarm limits for the corrected flow rate, and shows the status of each alarm. Possible statuses are: • **Normal –** The alarm is enabled and is not in an alarm condition. • **Disabled –** The alarm has been disabled. • **In Alarm –** The alarm is enabled and is in an alarm condition.	
Last Meter Inspection Time	This **read-only** field shows the date and time the last meter element change event occurred in FBxConnect™ for the selected meter. For more information, refer to Plate Change. **Note** The default is 1/1/2000 12:00:00 AM.	

4. Select **Save** to save any changes you make to this display.

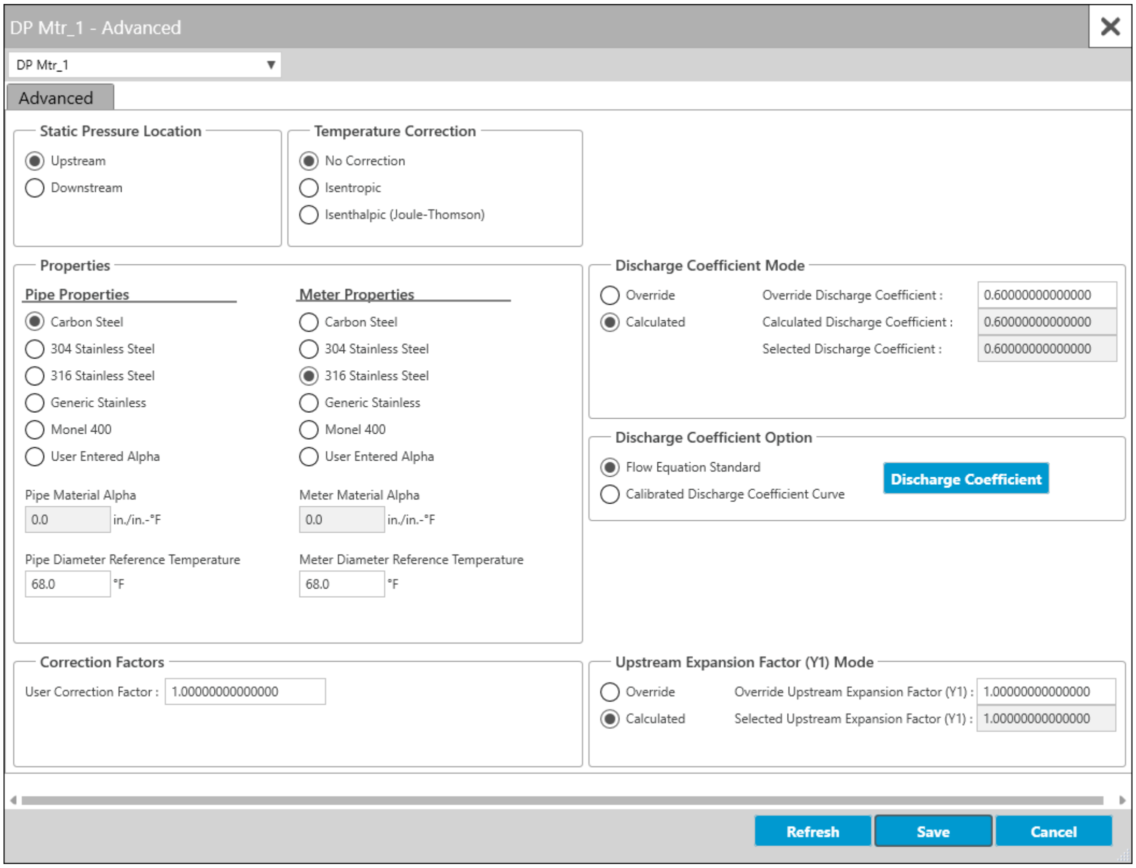
4.9.2 DP Meter – Advanced

Use this pop-up display to configure advanced properties for the selected differential pressure meter, including meter construction material, temperature correction, and discharge coefficient options.

To access this pop-up display:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu. The DP Meter display opens.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The DP Meter – Advanced pop-up display opens.

Figure 156. DP Meter – Advanced



DP Mtr_1 - Advanced

DP Mtr_1

Advanced

Static Pressure Location
● Upstream
○ Downstream

Temperature Correction
● No Correction
○ Isentropic
○ Isenthalpic (Joule-Thomson)

Properties

Pipe Properties
● Carbon Steel
○ 304 Stainless Steel
○ 316 Stainless Steel
○ Generic Stainless
○ Monel 400
○ User Entered Alpha

Pipe Material Alpha: 0.0 in./in.-°F

Pipe Diameter Reference Temperature: 68.0 °F

Meter Properties
○ Carbon Steel
○ 304 Stainless Steel
● 316 Stainless Steel
○ Generic Stainless
○ Monel 400
○ User Entered Alpha

Meter Material Alpha: 0.0 in./in.-°F

Meter Diameter Reference Temperature: 68.0 °F

Discharge Coefficient Mode
○ Override
● Calculated

Override Discharge Coefficient : 0.60000000000000
Calculated Discharge Coefficient : 0.60000000000000
Selected Discharge Coefficient : 0.60000000000000

Discharge Coefficient Option
● Flow Equation Standard
○ Calibrated Discharge Coefficient Curve

Correction Factors

User Correction Factor : 1.00000000000000

Upstream Expansion Factor (Y1) Mode
○ Override
● Calculated

Override Upstream Expansion Factor (Y1) : 1.00000000000000
Selected Upstream Expansion Factor (Y1) : 1.00000000000000

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Static Pressure Location	Sets the location of the static pressure tap in relation to the meter and normal flow.	
	Upstream	The static pressure tap is located upstream in relation to the meter and normal flow.
	Downstream	The static pressure tap is located downstream in relation to the meter and normal flow.

Field	Description	
Temperature Correction	Sets the option to correct the measured temperature to an upstream value.	
	No Correction	Temperature is either measured upstream or temperature correction is not significant and considered to be within the uncertainty of the measurement. AGA3 does not require temperature correction to upstream.
	Isentropic	Temperature correction is made based on isentropic expansion across the meter using the isentropic exponent.
	Isenthalpic (Joule-Thompson)	Temperature correction is made based on isenthalpic expansion across the meter using Joule-Thomson coefficient. **Note** If you select **AGA8 2017 Part 1 Detailed** or **AGA 8 2017 – Part 2 / GERG 2008** in the Compressibility/Density Calculation field for the associated station (Station – General Tab), then the Joule-Thompson coefficient is calculated per the selected standard. For all other Compressibility/Density Calculation options, the Joule-Thompson coefficient is calculated per ISO/TR 9464.
Pipe Properties	Indicates the material from which the meter tube is constructed. Nearly all natural gas applications use a carbon steel meter tube. This selection controls the value in the Pipe Material Alpha field. **Note** You must also configure the **Pipe Diameter Reference Temperature** field.	
	Carbon Steel	Indicates the meter tube material as carbon steel.
	304 Stainless Steel	Indicates the meter tube material as 304 stainless steel.
	316 Stainless Steel	Indicates the meter tube material as 316 stainless steel.

Field	Description	
	Generic Stainless Steel	Indicates the meter tube material as generic stainless steel. This selection uses an average alpha based on 304 and 316 stainless steel, and should be used if the exact grade is unknown.
	Monel 400	Indicates the meter tube material as Monel 400.
	User Entered Alpha	Select User Entered Alpha to configure your own value in the Pipe Material User Alpha field.
Pipe Material Alpha	This field shows the coefficient of thermal expansion used to calculate the effect of temperature on the pipe. This number is shown with an implied multiplier of 1000. **Note** • This field is **read-only** unless you select **User Entered Alpha** in the **Pipe Properties** field. • This field shows a value **only** under flowing conditions, and shows 0.0 under no flow conditions.	
Pipe Diameter Reference Temperature	Indicates the reference temperature at which the internal diameter of the pipe was measured, expressed in degrees Fahrenheit or degrees Celsius.	
Meter Properties	Indicates the material from which the orifice (or other meter element) is made. Nearly all natural gas applications use stainless steel orifice plates. **Note** You must also configure the **Meter Diameter Reference Temperature** field.	
	Carbon Steel	Indicates the meter element material as carbon steel.
	304 Stainless Steel	Indicates the meter element material as 304 stainless steel.
	316 Stainless Steel	Indicates the meter element material as 316 stainless steel.
	Generic Stainless Steel	Indicates the meter element material as generic stainless steel. This selection uses an average alpha based on 304 and 316 stainless steel, and should be used if the exact grade is unknown.

Field	Description	
	Monel 400	Indicates the meter element material as Monel 400.
	User Entered Alpha	Select User Entered Alpha to configure your own value in the Meter Material Alpha field.
Meter Material Alpha	This field shows the coefficient of thermal expansion used to calculate the effect of temperature on the meter. This number is shown with an implied multiplier of 1000. **Note** • This field is **read-only** unless you select **User Entered Alpha** in the **Meter Properties** field. • This field shows a value **only** under flowing conditions and shows 0.0 under no flow conditions.	
Meter Diameter Reference Temperature	Indicates the reference temperature at which the bore diameter of the orifice plate was measured (in selected temperature units).	
User Correction Factor	Sets a factor the system multiplies by the base flow equation to make a desired adjustment to the flow. The user correction factor is applied to the volume, mass, and energy flow rates and totals. **Note** If you use the default value of 1, the system does not apply any correction.	
Relative Pressure Loss	Enter the ratio of permanent pressure loss to differential pressure for the Venturi meter. This value is used to determine the pressure loss shown on the diagnostic pop-up display. **Note** This field appears **only** if you select **ISO5167 Venturi (As Cast)**, **ISO5167 Venturi (Machined)**, or **ISO5167 Venturi (Rough Weld)** in the **Meter Type** field on the DP Meter – General display.	
Discharge Coefficient Mode	Sets how the system obtains the discharge coefficient value used in calculations.	
	Override	The system uses the value set in the Discharge Coefficient Override field for the discharge coefficient value.

Field	Description	
	Calculated	The system calculates a value for the discharge coefficient.
	Calculated from Curve	The system calculates a value for the discharge coefficient based on the values you enter. Select the Discharge Coefficient Calibration Curve Setup button to configure a 20-point discharge coefficient vs. Reynolds number curve. **Note** This field shows **only** if you select **Cone** in the **Meter Type** field on the DP Meter display.
Override Discharge Coefficient	Sets the discharge coefficient to use in calculations when **Override** is selected in the **Discharge Coefficient Mode** field.	
Calculated Discharge Coefficient	This **read-only** field shows the discharge coefficient calculated by the system. This value is used by the system when you select **Calculated** in the **Discharge Coefficient Mode** field.	
Selected Discharge Coefficient	This **read-only** field shows the discharge coefficient currently used in calculations based on the selected options.	
Discharge Coefficient Option	Sets the option to calculate the discharge coefficient from the selected flow calculation method or from a calibrated curve of discharge coefficient vs. Reynolds number.	
	Flow Equation Standard	The system calculates the coefficient of discharge based on the selected calculation method.
	Calibrated Discharge Coefficient Curve	The system calculates the coefficient of discharge from the user entered calibration curve.
	Note This option is **not** available for cone meters.	
Discharge Coefficient / Discharge Coefficient Calibration Curve Setup	This option brings up a 20-point discharge coefficient vs. Reynolds number curve to allow you to enter values from a meter calibration report. Refer to Discharge Coeffcient.	

Field	Description
Pipe Schedule	Identifies the wall thickness of the pipe. **Note** This field appears **only** if you select **1595 Conditioning Orifice (Flange)**, **1595 Conditioning Orifice (D and D/2)**, or **405C Compact Orifice** in the **Meter Type** field on the General tab.
Pipe Schedule Adjustment Factor	This **read-only** field shows an adjustment factor based on the selected pipe schedule. **Note** This field appears **only** if you select **1595 Conditioning Orifice (Flange)**, **1595 Conditioning Orifice (D and D/2)**, or **405C Compact Orifice** in the **Meter Type** field on the General tab.
Calibration Factor	Enter the manufacturer supplied meter calibration factor. **Note** This field appears **only** if you select **1595 Conditioning Orifice (Flange)**, **1595 Conditioning Orifice (D and D/2)**, or **405C Compact Orifice** in the **Meter Type** field on the General tab.
Upstream Expansion Factor (Y1) Mode	Sets how the system obtains the Upstream Expansion Factor (Y1) value used in calculations. Possible options are: **Override** The system uses the value you enter in the Override Upstream Expansion Factor (Y1) field. **Calculated** The system calculates the value per the selected DP meter standard.
Override Upstream Expansion Factor (Y1)	Sets the value to be used for the upstream expansion factor (Y1) in the calculations. Enter a value of 1.0 if the fluid measured is a liquid or a dense phase fluid.
Selected Upstream Expansion Factor (Y1)	This **read-only** field shows the value calculated per the selected DP meter standard. Notably, ISO 5167 calculations use the Reader-Harris equation, AGA 3 1992 calculations use the Buckingham-Beane equation, and AGA 3 2013 calculations use a revised equation developed at CEESI.

5. Select **Save** to save any changes you make to this pop-up display .

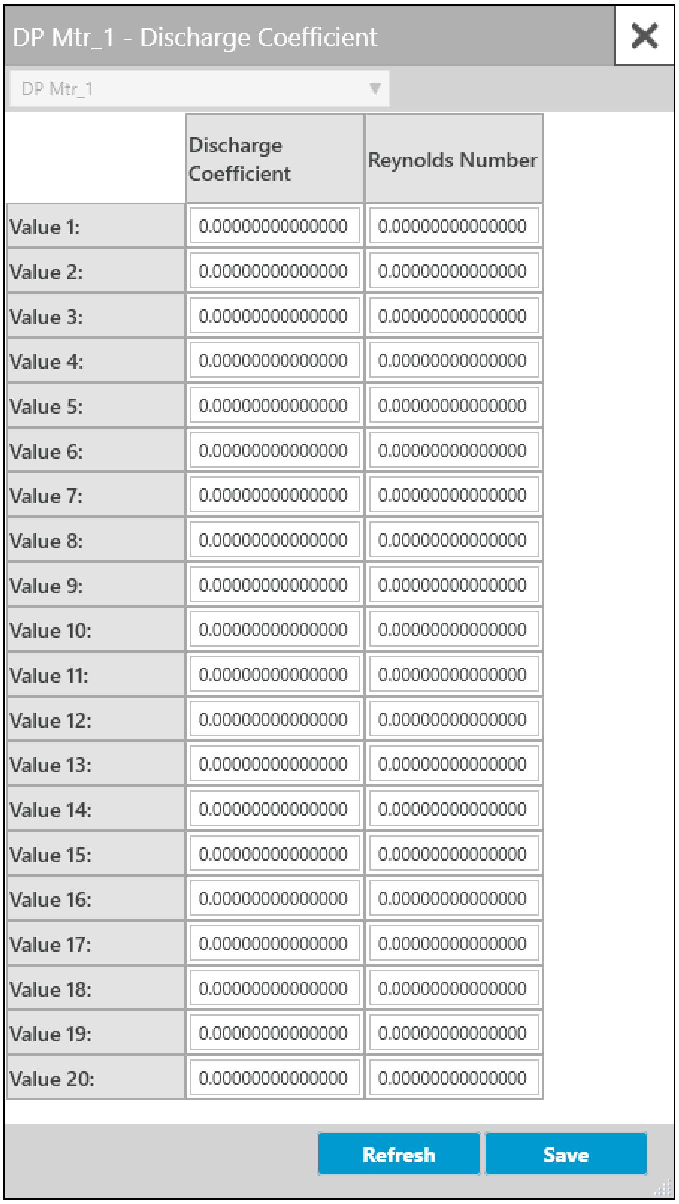
4.9.2.1 Discharge Coefficient

Use this option to enter values from the meter calibration report.

To access this pop-up display:

1. Select **Configure > Gas > DP Meter** . The DP Meter display opens.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The DP Meter – Advanced pop-up display opens.
4. If present for your configured meter type, select either **Calibrated from Curve** in the Discharge Coefficient Mode frame or **Calibrated Discharge Coefficient Curve** in the Discharge Coefficient Option frame and **Save** your changes.
5. Select the **Discharge Coefficient /Discharge Coefficient Calibration Curve Setup** button. The Discharge Coefficient pop-up display opens.

Figure 157. Discharge Coefficient



	Discharge Coefficient	Reynolds Number
Value 1:	0.00000000000000	0.00000000000000
Value 2:	0.00000000000000	0.00000000000000
Value 3:	0.00000000000000	0.00000000000000
Value 4:	0.00000000000000	0.00000000000000
Value 5:	0.00000000000000	0.00000000000000
Value 6:	0.00000000000000	0.00000000000000
Value 7:	0.00000000000000	0.00000000000000
Value 8:	0.00000000000000	0.00000000000000
Value 9:	0.00000000000000	0.00000000000000
Value 10:	0.00000000000000	0.00000000000000
Value 11:	0.00000000000000	0.00000000000000
Value 12:	0.00000000000000	0.00000000000000
Value 13:	0.00000000000000	0.00000000000000
Value 14:	0.00000000000000	0.00000000000000
Value 15:	0.00000000000000	0.00000000000000
Value 16:	0.00000000000000	0.00000000000000
Value 17:	0.00000000000000	0.00000000000000
Value 18:	0.00000000000000	0.00000000000000
Value 19:	0.00000000000000	0.00000000000000
Value 20:	0.00000000000000	0.00000000000000

6. Enter the Discharge Coefficient and Reynolds Number values from the meter calibration report.

Note

A valid point **must** have a non-zero Reynolds Number and a non-zero Discharge Coefficient. The points may be entered in any order and will be internally sorted by Reynolds Number, discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the Reynolds Number is less than the lowest point on the curve, the calculated factor will be the factor for the lowest point on the curve. If the Reynolds Number is greater than the highest point on the curve, the calculated Discharge Coefficient will be the Discharge Coefficient for the highest point on the curve.

7. Select **Save** to save any changes you make to this pop-up display.

4.9.3 DP Meter Diagnostics

Use this pop-up display to view **read-only** diagnostic information for the selected differential pressure meter, including calculated factors, calculated values, and alarm codes.

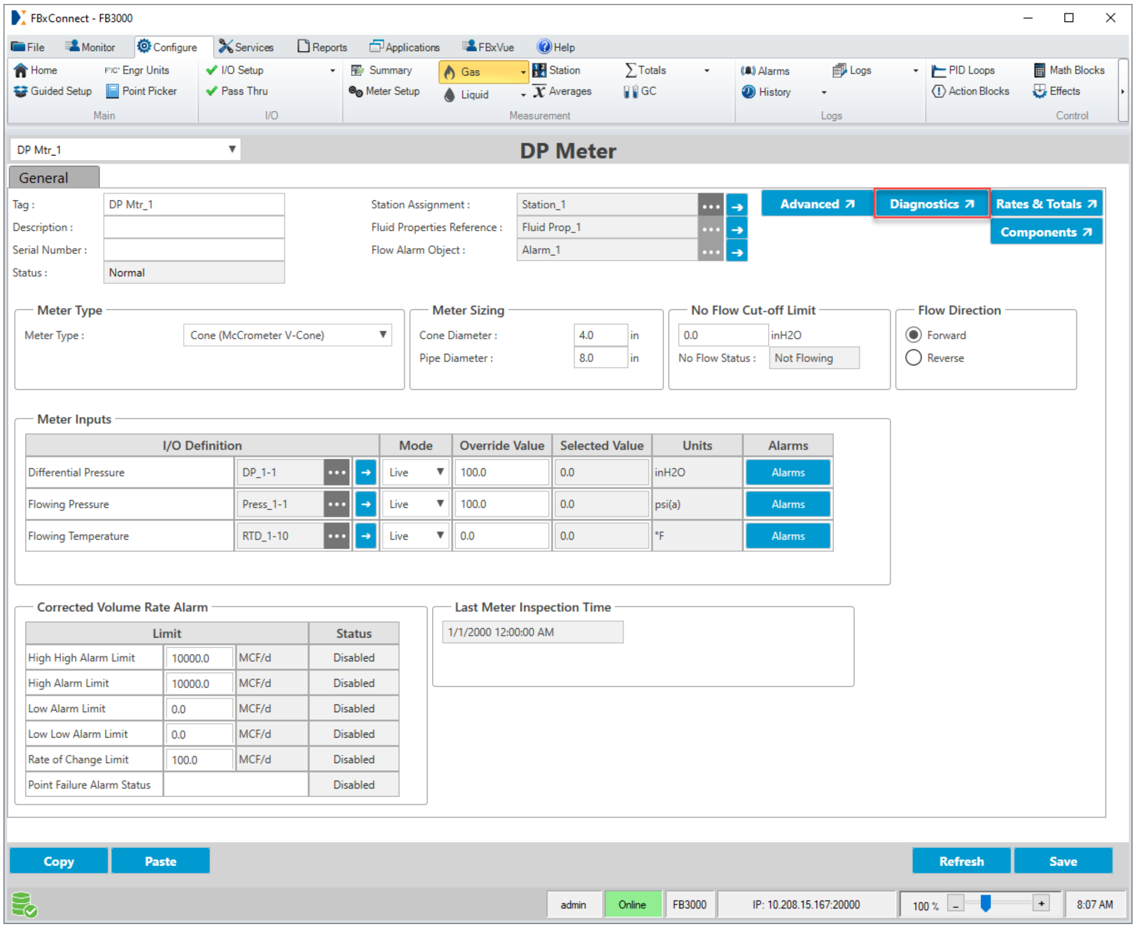
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- Physically impossible inputs may be clamped at a high or low limit value in order to ensure reasonable results. If a value is clamped at a high or low limit, a corresponding flow or property alarm is raised.

To access this pop-up display:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 158. DP Meter – Diagnostics Button



Tag : DP Mtr_1
Description :
Serial Number :
Status : Normal
Station Assignment : Station_1
Fluid Properties Reference : Fluid Prop_1
Flow Alarm Object : Alarm_1

Meter Type
Meter Type : Cone (McCrometer V-Cone)

Meter Sizing
Cone Diameter : 4.0 in
Pipe Diameter : 8.0 in

No Flow Cut-off Limit
0.0 inH2O
No Flow Status : Not Flowing

Flow Direction
● Forward
○ Reverse

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Differential Pressure	DP_1-1	Live	100.0	0.0	inH2O	Alarms
Flowing Pressure	Press_1-1	Live	100.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-10	Live	0.0	0.0	°F	Alarms

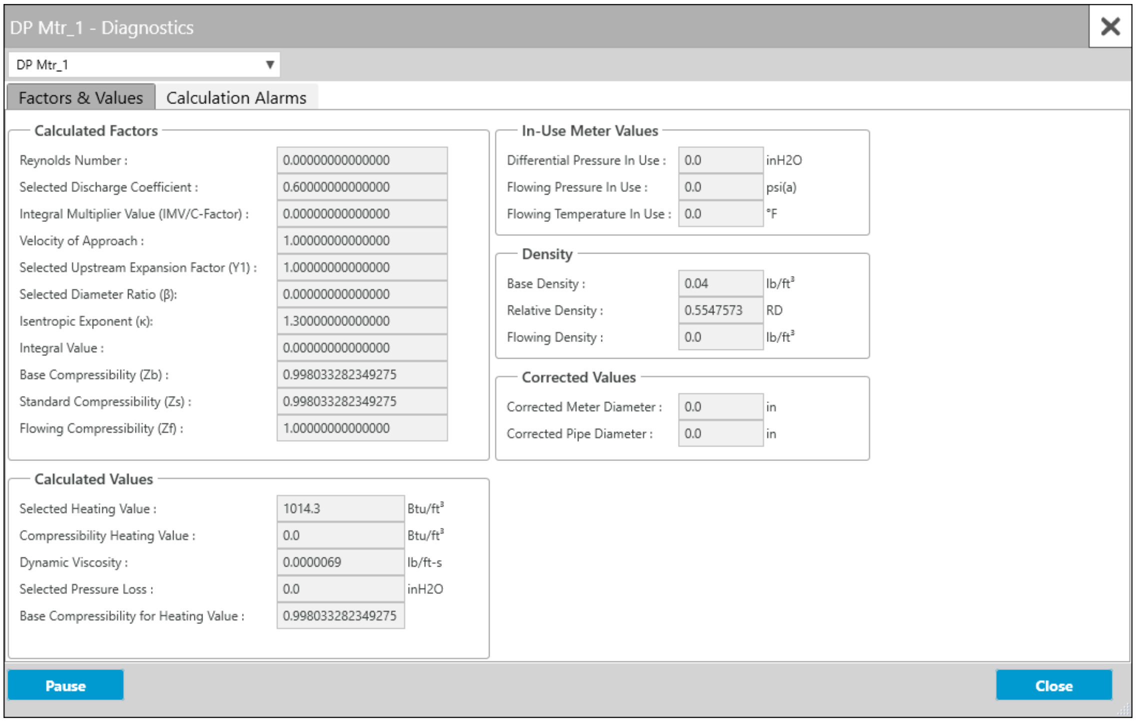
Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

Last Meter Inspection Time
1/1/2000 12:00:00 AM

3. Select the **Diagnostics** button. The DP Meter Diagnostics pop-up display opens showing the Factors & Values tab.

Figure 159. DP Meter Diagnostics



Calculated Factors

Reynolds Number :	0.00000000000000
Selected Discharge Coefficient :	0.60000000000000
Integral Multiplier Value (IMV/C-Factor) :	0.00000000000000
Velocity of Approach :	1.00000000000000
Selected Upstream Expansion Factor (Y1) :	1.00000000000000
Selected Diameter Ratio (β):	0.00000000000000
Isentropic Exponent (κ):	1.30000000000000
Integral Value :	0.00000000000000
Base Compressibility (Zb) :	0.998033282349275
Standard Compressibility (Zs) :	0.998033282349275
Flowing Compressibility (Zf) :	1.00000000000000

Calculated Values

Selected Heating Value :	1014.3	Btu/ft³
Compressibility Heating Value :	0.0	Btu/ft³
Dynamic Viscosity :	0.0000069	lb/ft-s
Selected Pressure Loss :	0.0	inH2O
Base Compressibility for Heating Value :	0.998033282349275	

In-Use Meter Values

Differential Pressure In Use :	0.0	inH2O
Flowing Pressure In Use :	0.0	psi(a)
Flowing Temperature In Use :	0.0	°F

Density

Base Density :	0.04	lb/ft³
Relative Density :	0.5547573	RD
Flowing Density :	0.0	lb/ft³

Corrected Values

Corrected Meter Diameter :	0.0	in
Corrected Pipe Diameter :	0.0	in

The DP Meter Diagnostics pop-up display contains the following tabs:

Factors and Values – This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

Calculation Alarms – This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with the meter.

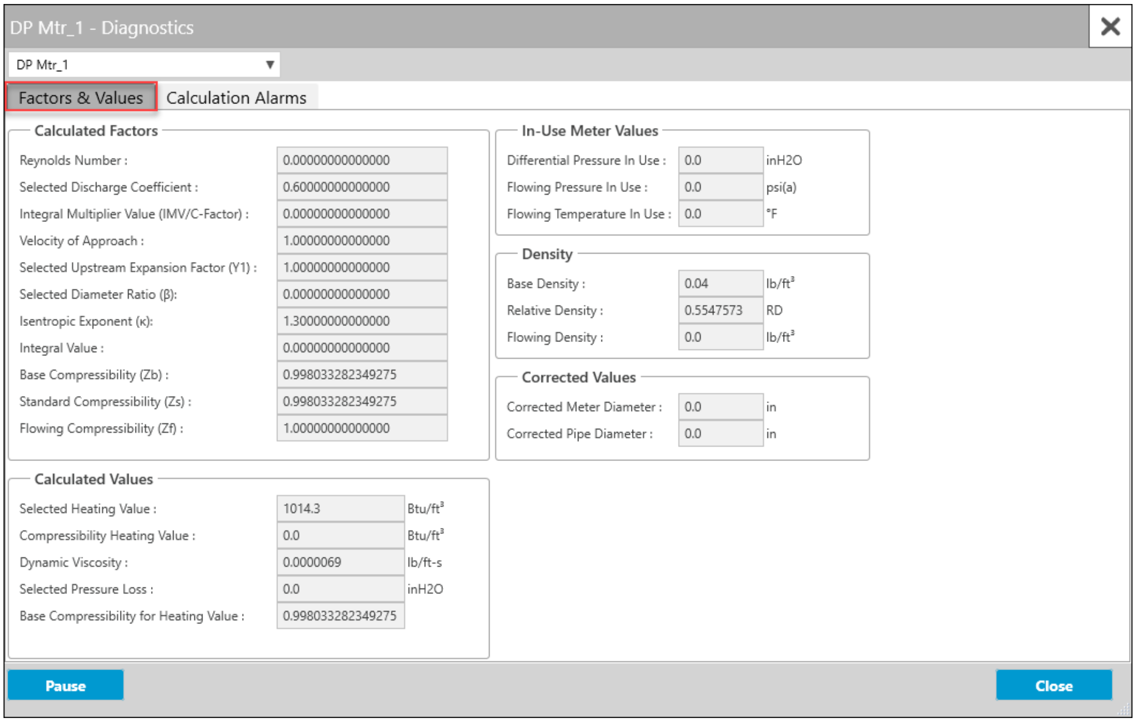
4.9.3.1 DP Meter Diagnostics – Factors & Values Tab

This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

To access this display:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The DP Meter Diagnostics pop-up display opens showing the Factors & Values tab.

Figure 160. DP Meter Diagnostics – Factors & Values Tab



Calculated Factors

Reynolds Number : 0.00000000000000
Selected Discharge Coefficient : 0.60000000000000
Integral Multiplier Value (IMV/C-Factor) : 0.00000000000000
Velocity of Approach : 1.00000000000000
Selected Upstream Expansion Factor (Y1) : 1.00000000000000
Selected Diameter Ratio (β): 0.00000000000000
Isentropic Exponent (κ): 1.30000000000000
Integral Value : 0.00000000000000
Base Compressibility (Zb) : 0.998033282349275
Standard Compressibility (Zs) : 0.998033282349275
Flowing Compressibility (Zf) : 1.00000000000000

In-Use Meter Values

Differential Pressure In Use : 0.0 inH2O
Flowing Pressure In Use : 0.0 psi(a)
Flowing Temperature In Use : 0.0 °F

Density

Base Density : 0.04 lb/ft³
Relative Density : 0.5547573 RD
Flowing Density : 0.0 lb/ft³

Corrected Values

Corrected Meter Diameter : 0.0 in
Corrected Pipe Diameter : 0.0 in

Calculated Values

Selected Heating Value : 1014.3 Btu/ft³
Compressibility Heating Value : 0.0 Btu/ft³
Dynamic Viscosity : 0.0000069 lb/ft-s
Selected Pressure Loss : 0.0 inH2O
Base Compressibility for Heating Value : 0.998033282349275

4. Review the values in the following fields:

Field	Description	
Calculated Factors	**Reynolds Number (Re)**	This **read-only** field shows the pipe Reynolds number, a dimensionless ratio of forces used to correlate the variations in the meter coefficient of discharge (Cd) with changes in the fluid's properties, flow rate, and meter geometry.
	Selected Discharge Coefficient (Cd)	This **read-only** field shows the meter coefficient of discharge, the ratio of the actual flow to the theoretical flow and is applied to the theoretical flow equation to obtain the actual flow.
	Integral Multiplier Value (IMV/C-Factor)	This **read-only** field shows the integral multiplier value (also known as C-prime or C-Factor). It represents the static variables in the flow equation.

Field	Description	
	Velocity of Approach (Ev)	This **read-only** field shows the velocity of approach factor (Ev), a mathematical expression that relates the velocity of the flowing fluid in the meter approach section (upstream meter tube) to the fluid velocity in the meter.
	Upstream Expansion Factor (Y_1)	This **read-only** field shows the upstream expansion factor (Y1), an empirical expression used to correct the flow rate for the reduction in fluid density that a compressible fluid experiences when it passes through the meter.
	Selected Diameter Ratio (β)	This **read-only** field shows the ratio of the temperature corrected meter diameter to the temperature corrected pipe diameter.
	Isentropic Exponent (K)	This **read-only** field shows the isentropic exponent (κ), a thermodynamic state property that establishes the relationship between an expanding fluid’s pressure and density as the fluid flows through the meter.
	Integral Value (IV)	This **read-only** field shows the integral value (also known as hwPf or flow extension). It represents the dynamic variables in the flow equation and is calculated as the square root of the product of differential pressure and flowing pressure.
	Base Compressibility (Zb)	This **read-only** field shows the base compressibility (Zb), an adjustment factor used to account for the deviation from the ideal gas law at user entered base temperature and pressure.
	Standard Compressibility (Zs)	This **read-only** field shows the standard compressibility (Zs), an adjustment factor used to account for the deviation from the ideal gas law at standard temperature and pressure (60°F and 14.73 psia). This value is used in the AGA3 Volume equations only.

Field	Description	
	Flowing Compressibility (Zf)	This **read-only** field shows the flowing compressibility (Zf), an adjustment factor used to account for the deviation from the ideal gas law at flowing temperature and pressure.
Calculated Values	**Selected Heating Value**	This **read-only** field shows the heating value of the fluid at base conditions. The heating value represents the amount of energy transferred as heat per unit mass or unit volume from the complete, ideal combustion of the gas with oxygen at a base temperature.
	Compressibility Heating Value	If the compressibility calculation **is** dependent on the heating value, the value shown is the superior/gross volumetric heating value at the reference conditions you select on the Station – General. **Note** If the compressibility calculation **is not** dependent on the heating value, this field shows a value of 0.
	Dynamic Viscosity	This **read-only** field shows the dynamic (absolute) viscosity of the fluid at flowing temperature and pressure. The dynamic viscosity represents the measure of a fluid's intermolecular cohesive force's resistance to shear per unit of time.
	Selected Pressure Loss	This **read-only** field shows the permanent pressure loss due to the presence of the meter (upstream pressure less downstream pressure after recovery is complete).
	Base Compressibility for Heating Value	This **read-only** field shows the calculated base compressibility used in heating value calculations. **Note** For more information about the heating value calculation, refer to the Station – Advanced.

Field	Description	
In-Use Meter Value	**Differential Pressure In Use**	This **read-only** field shows the differential pressure being used by the flow calculation. It will reflect the value after the no-flow cutoff is applied in the selected differential pressure units of the station.
	Flowing Pressure In Use	This **read-only** field shows the flowing pressure being used by the flow calculation. It will reflect the upstream, absolute pressure in the selected pressure units of the station.
	Flowing Temperature In Use	This **read-only** field shows the flowing temperature being used by the flow calculation. It will reflect the value converted to upstream if upstream correction has been enabled in the selected temperature units of the station.
Density	**Base Density**	This **read-only** field shows the base density value currently used in calculations. The base density is the mass per unit volume of the fluid being measured at user entered base temperature and pressure in the selected density units of the station.
	Relative Density	This **read-only** field shows the relative density, the ratio of the density of the fluid to the density of air at base temperature and pressure. Relative density is a unit-less value.
	Flowing Density	This **read-only** field shows the flowing density value currently used in calculations. The flowing density is the mass per unit volume of the fluid being measured at flowing temperature and pressure in the selected density units of the station.
Corrected Values	**Corrected Meter Diameter**	This **read-only** field shows the meter diameter corrected for the difference between flowing temperature and the meter diameter reference temperature.

Field	Description	
	Corrected Pipe Diameter	This **read-only** field shows the pipe diameter corrected for the difference between flowing temperature and the pipe diameter reference temperature.
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.	

4.9.3.2 DP Meter Diagnostics – Calculation Alarms Tab

This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with the meter. Alarm codes are comprised of two parts: Alarm Category (the reason for the alarm) and Alarm Value (the part of the calculation that raised the alarm). For example, if you assign a voltage signal to a pressure input, **Invalid Input** would be selected in the **Alarm Category** frame and **Pressure** would be selected in the **Alarm Value** frame.

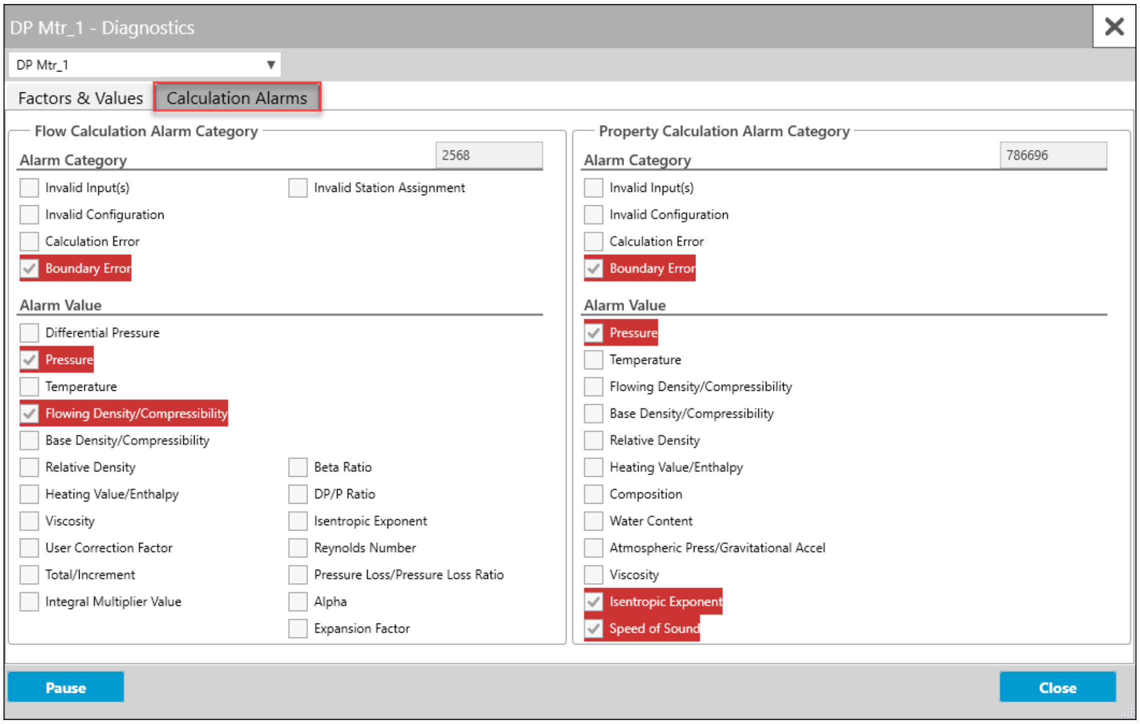
Note

- The alarm code is a decimal representation of which alarm bits are set. Each bit is identified in the table below.
- The error code can be a composite of one or more errors.
- Error codes are generated according to your selection in the Calculation Failure Option field on the Station – Advanced.
- Alarms are raised if calculation inputs and interim values do not fall within certain ranges based on the calculation you have selected. To view the boundary limits for calculations, refer to Calculation Library Limit Checks.

To access this display:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The DP Meter Diagnostics pop-up display opens.
4. Select the **Calculation Alarms** tab.

Figure 161. DP Meter Diagnostics – Calculation Alarms Tab



Flow Calculation Alarm Category

Alarm Category 2568

☐ Invalid Input(s)
☐ Invalid Configuration
☐ Calculation Error
☑ Boundary Error
☐ Invalid Station Assignment

Alarm Value

☐ Differential Pressure
☑ Pressure
☐ Temperature
☑ Flowing Density/Compressibility
☐ Base Density/Compressibility
☐ Relative Density
☐ Heating Value/Enthalpy
☐ Viscosity
☐ User Correction Factor
☐ Total/Increment
☐ Integral Multiplier Value
☐ Beta Ratio
☐ DP/P Ratio
☐ Isentropic Exponent
☐ Reynolds Number
☐ Pressure Loss/Pressure Loss Ratio
☐ Alpha
☐ Expansion Factor

Property Calculation Alarm Category

Alarm Category 786696

☐ Invalid Input(s)
☐ Invalid Configuration
☐ Calculation Error
☑ Boundary Error

Alarm Value

☑ Pressure
☐ Temperature
☐ Flowing Density/Compressibility
☐ Base Density/Compressibility
☐ Relative Density
☐ Heating Value/Enthalpy
☐ Composition
☐ Water Content
☐ Atmospheric Press/Gravitational Accel
☐ Viscosity
☑ Isentropic Exponent
☑ Speed of Sound

5. Review the values in the following fields:

Field	Description	
Flow Calculation Alarm Category	These **read-only** fields show flow calculation alarm information.	
	Alarm Code	This **read-only** field shows a code that indicates whether the flow calculation is within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set. **Note** • This is the same alarm code shown in the Alarm report. • The Alarm Code may show **0** if Calculation Failure Option has been set to Alarm Disabled on the Station – Advanced.
	Alarm Category	These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:

Field	Description	
	Invalid Input(s) (Bit 0)	A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.
	Invalid Configuration (Bit 1)	Database or program corruption. **Note** If detected, this alarm is asserted even when calculation alarms are disabled.
	Calculation Error (Bit 2)	An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.
	Boundary Error (Bit 3)	Something exceeded stated boundary of the calculation standard.
	Invalid Station Assignment (Bit 4)	The meter type not is valid for the station type or station fluid type.

Field	Description	
	Alarm Value	These **read-only** fields show, if checked, shows which part of the flow calculation is associated with the Alarm Category. - Differential Pressure (Bit 8) - Pressure (Bit 9) - Temperature (Bit 10) - Flowing Density / Compressibility (Bit 11) - Base Density / Compressibility (Bit 12) - Relative Density (Bit 13) - Heating Factor / Enthalpy (Bit 14) - Viscosity (Bit 15) - User Correction Factor (Bit 16) - Total / Increment (Bit 17) - Integral Multiplier Value (Bit 18) - Beta Ratio (Bit 25) - DP/P Ratio (Bit 26) - Isentropic Exponent (Bit 27) - Reynolds Number (Bit 28) - Pressure Loss / Pressure Loss Ratio (Bit 29) - Alpha (Bit 30) - Expansion Factor (Bit 31) **Note** A Total alarm can occur in the following situations: - A Fault Total object reference is incorrectly configured. For more information, refer to DP Meter Rates & Totals – Fault Totals Tab. - An internal error has occurred while totalizing.

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td rowspan="7">**Property Calculation Alarm Category**</td><td colspan="3">These **read-only** fields show property calculation alarm information.</td></tr>
<tr><td>**Alarm Code**</td><td colspan="2">This **read-only** field shows a code that indicates whether the property calculations (density, compressibility, and heating value) are within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set.
Note
- This is the same alarm code shown in the Alarm report.
- The Alarm Code may show **0** if Calculation Failure Option has been set to Alarm Disabled on the Station – Advanced.</td></tr>
<tr><td rowspan="5">**Alarm Category**</td><td colspan="2">These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:</td></tr>
<tr><td>**Invalid Input(s) Bit (0)**</td><td>A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.</td></tr>
<tr><td>**Invalid Configuration Bit (1)**</td><td>Database or program corruption.
Note
If detected, this alarm is asserted even when calculation alarms are disabled.</td></tr>
<tr><td>**Calculation Error Bit (2)**</td><td>An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.</td></tr>
<tr><td>**Boundary Error Bit (3)**</td><td>Something exceeded stated boundary of the calculation standard.</td></tr>
</table>

Field	Description	
	Alarm Value	These **read-only** fields show, if checked, shows which part of the flow calculation is associated with the Alarm Category. • Pressure (Bit 8) • Temperature (Bit 9) • Flowing Density/Compressibility (Bit 10) • Base Density/Compressibility (Bit 11) • Relative Density (Bit 12) • Heating Value/Enthalpy (Bit 13) • Composition (Bit 14) • Water Content (Bit 15) • Atmospheric Press/Gravitational Accel (Bit 16) • Viscosity (Bit 17) • Isentropic Exponent (Bit 18) • Speed of Sound (Bit 19)
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.	

4.9.4 DP Meter – Rates & Totals

Use this tab to view **read-only** flow rates and accumulations and to manually configure fault totals for the selected differential pressure meter.

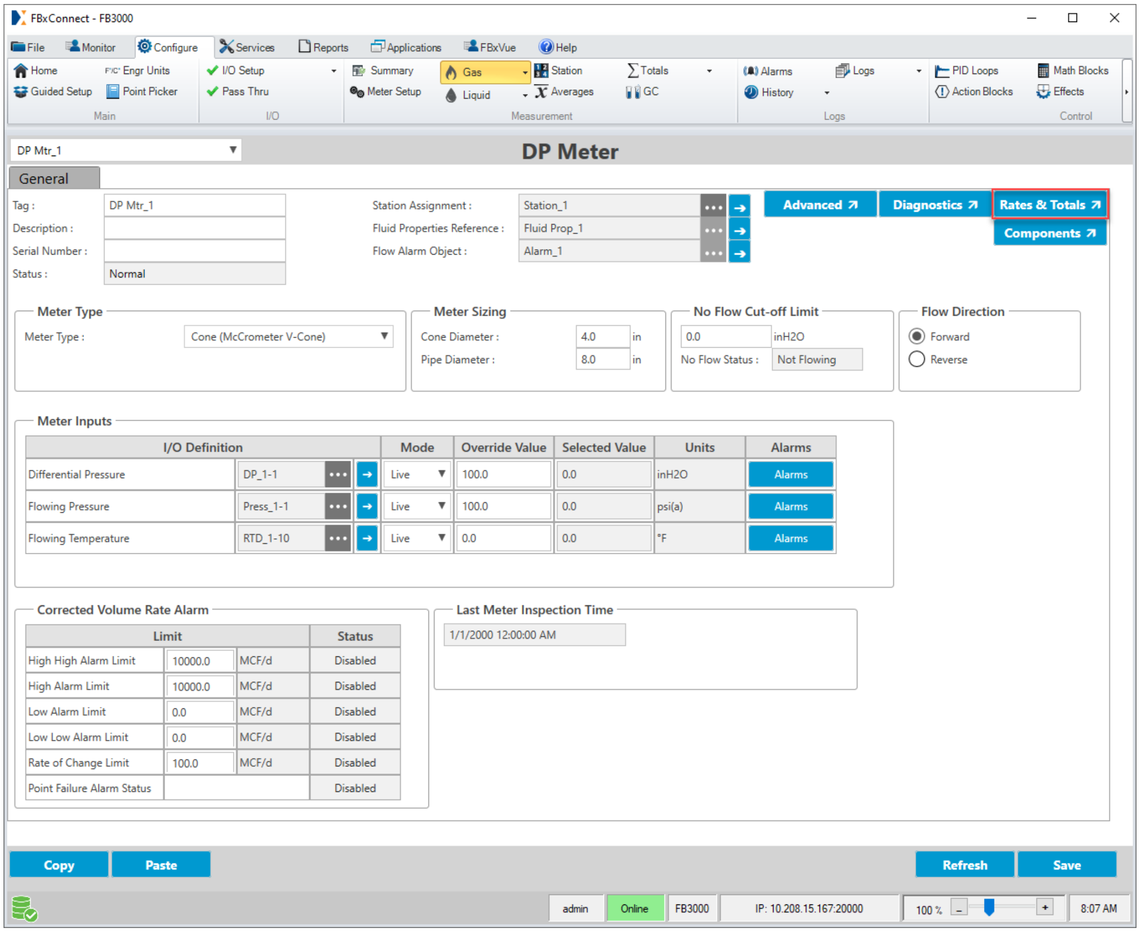
Note

This pop-up can remain open while you change values on the other tabs of this display.

To access this tab:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 162. DP Meter – Rates & Totals Button



DP Mtr_1

Tag : DP Mtr_1
Description :
Serial Number :
Status : Normal

Station Assignment : Station_1
Fluid Properties Reference : Fluid Prop_1
Flow Alarm Object : Alarm_1

Meter Type

Meter Type : Cone (McCrometer V-Cone)

Meter Sizing

Cone Diameter : 4.0 in
Pipe Diameter : 8.0 in

No Flow Cut-off Limit

0.0 inH2O
No Flow Status : Not Flowing

Flow Direction

● Forward
○ Reverse

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Differential Pressure	DP_1-1	Live	100.0	0.0	inH2O	Alarms
Flowing Pressure	Press_1-1	Live	100.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-10	Live	0.0	0.0	°F	Alarms

Corrected Volume Rate Alarm

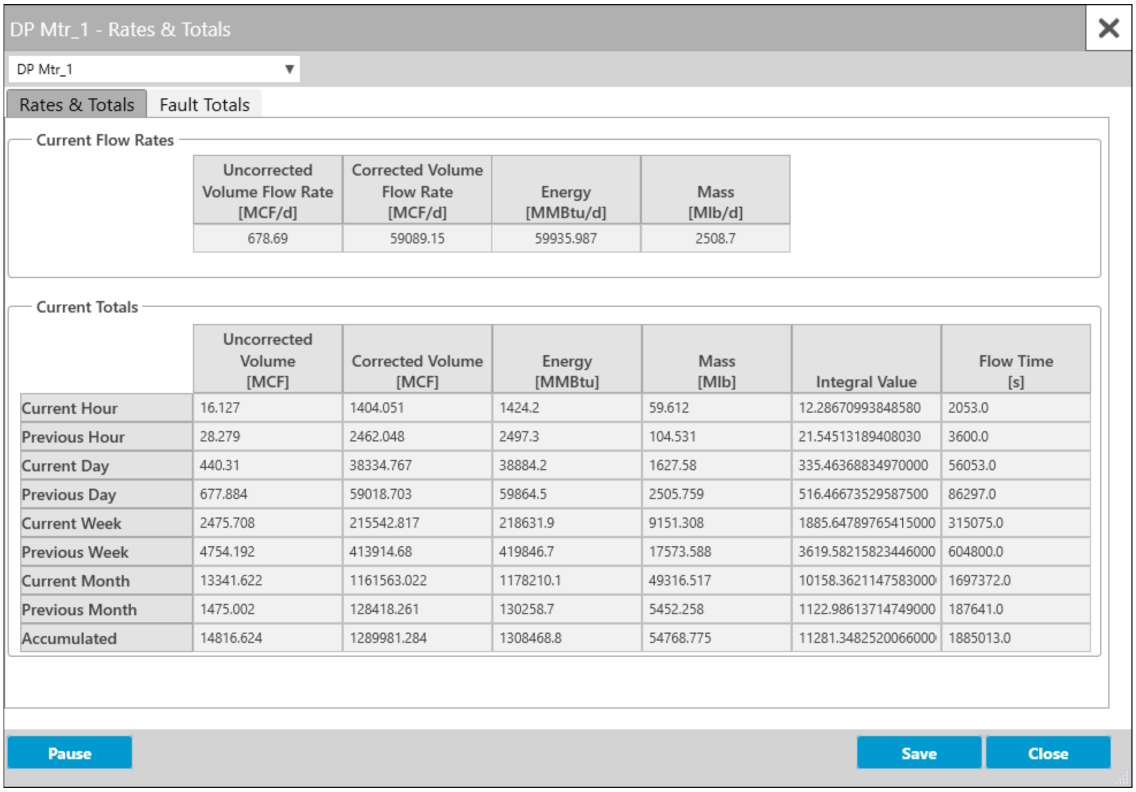
Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

Last Meter Inspection Time

1/1/2000 12:00:00 AM

3. Select the **Rates & Totals** button. The DP Rates & Totals pop-up display opens.

Figure 163. DP Meter Rates & Totals



Current Flow Rates

Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy [MMBtu/d]	Mass [Mlb/d]
678.69	59089.15	59935.987	2508.7

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Integral Value	Flow Time [s]
Current Hour	16.127	1404.051	1424.2	59.612	12.28670993848580	2053.0
Previous Hour	28.279	2462.048	2497.3	104.531	21.54513189408030	3600.0
Current Day	440.31	38334.767	38884.2	1627.58	335.46368834970000	56053.0
Previous Day	677.884	59018.703	59864.5	2505.759	516.46673529587500	86297.0
Current Week	2475.708	215542.817	218631.9	9151.308	1885.64789765415000	315075.0
Previous Week	4754.192	413914.68	419846.7	17573.588	3619.58215823446000	604800.0
Current Month	13341.622	1161563.022	1178210.1	49316.517	10158.3621147583000	1697372.0
Previous Month	1475.002	128418.261	130258.7	5452.258	1122.98613714749000	187641.0
Accumulated	14816.624	1289981.284	1308468.8	54768.775	11281.3482520066000	1885013.0

The DP Rates & Totals pop-up display contains the following tabs:

Rates & Totals – Use this tab to view **read-only** flow rates and accumulations for the selected differential pressure meter.

Fault Totals – Use this tab to manually configure which Totals objects in the FB Series product database are used to store fault totals and view **read-only** fault total accumulations for the selected differential pressure meter.

4.9.4.1 DP Meter Rates & Totals – Rates & Totals Tab

Use this tab to view **read-only** flow rates and accumulations for the selected differential pressure meter.

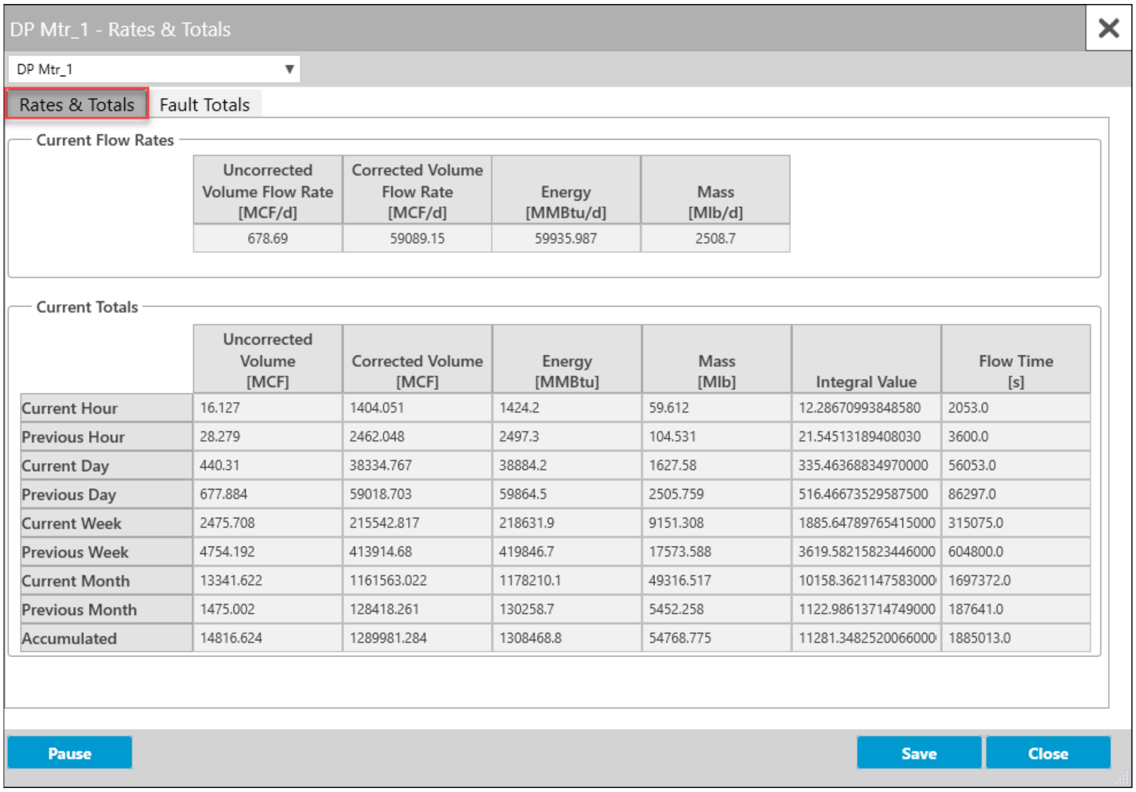
Note

This pop-up can remain open while you change values on the other tabs of this display.

To access this tab:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Rates & Totals** button. The DP Rates & Totals pop-up display opens.

Figure 164. DP Meter Rates & Totals – Rates & Totals Tab



Current Flow Rates

Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy [MMBtu/d]	Mass [Mlb/d]
678.69	59089.15	59935.987	2508.7

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Integral Value	Flow Time [s]
Current Hour	16.127	1404.051	1424.2	59.612	12.28670993848580	2053.0
Previous Hour	28.279	2462.048	2497.3	104.531	21.54513189408030	3600.0
Current Day	440.31	38334.767	38884.2	1627.58	335.46368834970000	56053.0
Previous Day	677.884	59018.703	59864.5	2505.759	516.46673529587500	86297.0
Current Week	2475.708	215542.817	218631.9	9151.308	1885.64789765415000	315075.0
Previous Week	4754.192	413914.68	419846.7	17573.588	3619.58215823446000	604800.0
Current Month	13341.622	1161563.022	1178210.1	49316.517	10158.3621147583000	1697372.0
Previous Month	1475.002	128418.261	130258.7	5452.258	1122.98613714749000	187641.0
Accumulated	14816.624	1289981.284	1308468.8	54768.775	11281.3482520066000	1885013.0

4. Review the values in the following fields:

Field	Description
Current Flow Rates	These **read-only** fields show the current uncorrected volume, corrected volume, energy, and mass flow rates for the selected meter.
Current Totals	These **read-only** fields show the total accumulation, as well as the current and previous hourly, daily, weekly, and monthly accumulation for the selected meter.

Field	Description
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.

4.9.4.2 DP Meter Rates & Totals – Fault Totals Tab

Use this tab to manually configure which Totals objects in the FB Series product database are used to store fault totals and view **read-only** fault total accumulations for the selected differential pressure meter.

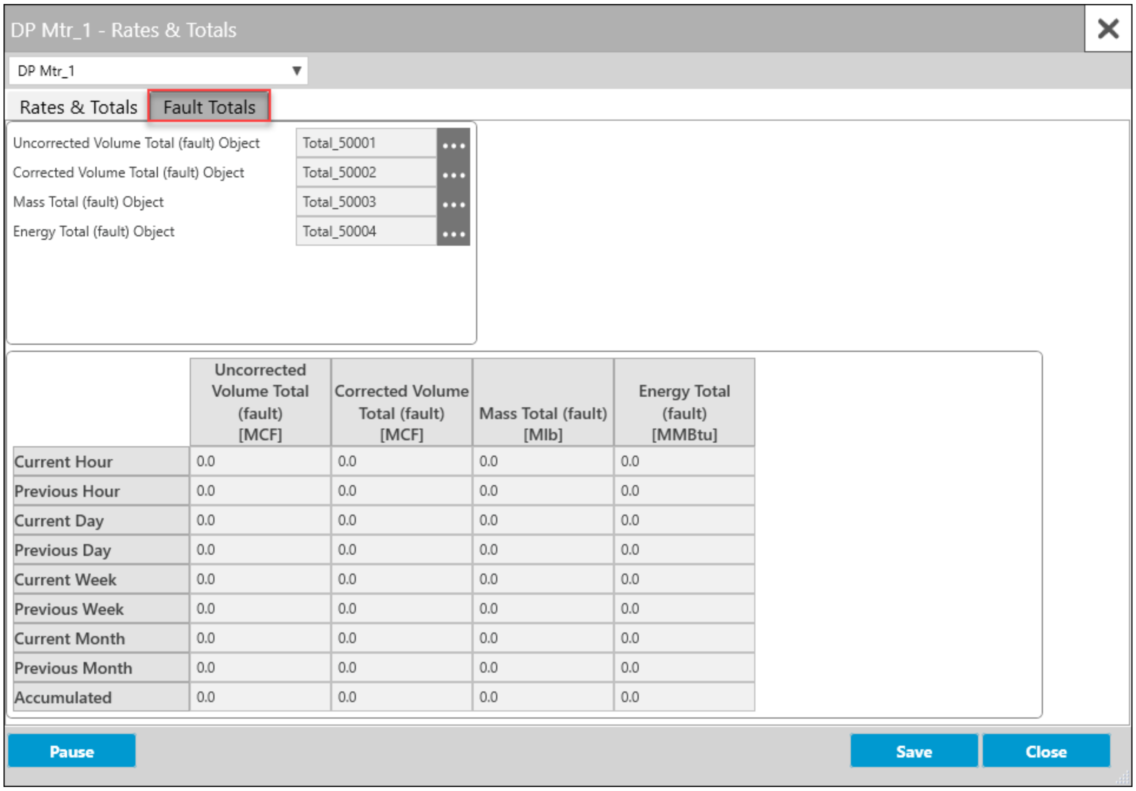
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- Fault totals are calculated when the system becomes unhealthy and can be used to determine how measurement quantities are affected by faults and alarms. To configure which faults and alarms cause the system to become unhealthy, refer to the **Fault Health Configuration** field on the Station – Advanced.
- You can automatically configure which Totals objects are associated with fault totals by using the Totals Setup wizard.
- You **must** configure additional spare Totals objects in the FB Series product database before manually configuring fault totals. For more information, refer to the **Number of Spare Totals** field on the Meter Setup display.

To access this tab:

1. Select **Configure > Gas > DP Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Rates & Totals** button. The DP Rates & Totals pop-up display opens.
4. Select the **Fault Totals** tab.

Figure 165. DP Meter Rates & Totals – Fault Totals Tab



Uncorrected Volume Total (fault) Object: Total_50001
Corrected Volume Total (fault) Object: Total_50002
Mass Total (fault) Object: Total_50003
Energy Total (fault) Object: Total_50004

	Uncorrected Volume Total (fault) [MCF]	Corrected Volume Total (fault) [MCF]	Mass Total (fault) [Mlb]	Energy Total (fault) [MMBtu]
Current Hour	0.0	0.0	0.0	0.0
Previous Hour	0.0	0.0	0.0	0.0
Current Day	0.0	0.0	0.0	0.0
Previous Day	0.0	0.0	0.0	0.0
Current Week	0.0	0.0	0.0	0.0
Previous Week	0.0	0.0	0.0	0.0
Current Month	0.0	0.0	0.0	0.0
Previous Month	0.0	0.0	0.0	0.0
Accumulated	0.0	0.0	0.0	0.0

5. Review the values in the following fields:

Field	Description
Uncorrected Volume Total (fault) Object	Click ••• to open a Point Picker dialog and select a Totals object from the FB Series product database to use for uncorrected volume fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.

Field	Description
Corrected Volume Total (fault) Object	Click … to open a Point Picker dialog and select a Totals object from the FB Series product database to use for corrected volume fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.
Mass Total (fault) Object	Click … to open a Point Picker dialog and select a Totals object from the FB Series product database to use for mass fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.
Energy Total (fault) Object	Click … to open a Point Picker dialog and select a Totals object from the FB Series product database to use for energy fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.

Field	Description
Current Fault Totals	These **read-only** fields show the total fault total accumulation, as well as the current and previous hourly, daily, weekly, and monthly fault total accumulations for the selected meter.
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.

4.10 Linear Meter

Use this display to configure linear meters in your FB Series product.

To access this display, select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.

Figure 166. Configure – Linear Meter

The Linear Meter display contains the following items:

General – Use this display to define basic parameters for the linear meter. The General tab displays when you first access the Linear Meter display.

Auto-Adjust – Use this pop-up display to configure and view parameters specific to an Auto-Adjust meter.

Note

This tab is **only** available when a **meter type** of **Auto-Adjust** is configured.

Advanced – Use this pop-up display to configure advanced properties for the selected linear meter, including meter construction material, temperature correction, and discharge coefficient options.

Diagnostics – Use this pop-up display to view **read-only** diagnostic information for the selected linear meter, including calculated values and alarm codes.

Rates & Totals – Use this pop-up display to view **read-only** flow rates and accumulations for the selected linear meter.

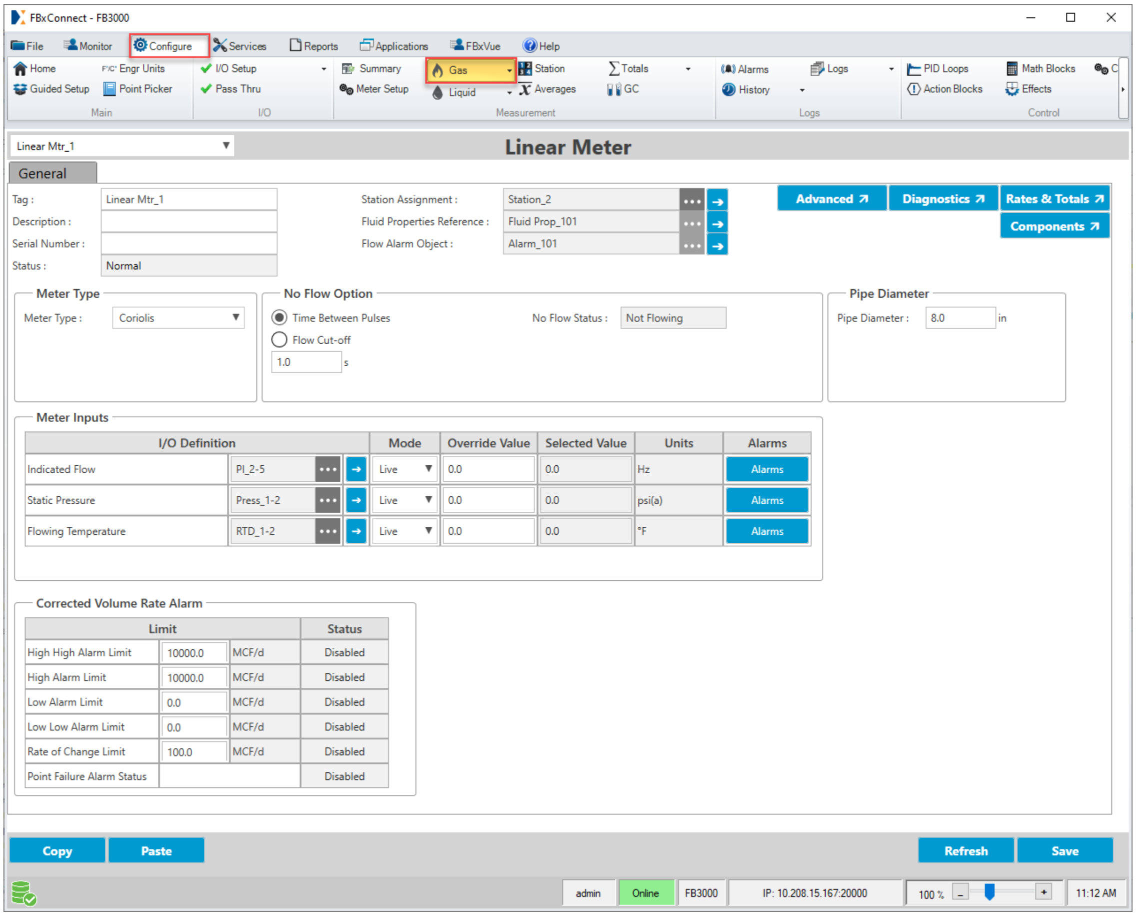
4.10.1 Linear Meter – General

Use this display to define basic parameters for the linear meter.

To access this display:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu. The Linear Meter display opens.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.

Figure 167. Linear Meter – General



Linear Mtr_1 ▼

Tag : Linear Mtr_1
Description :
Serial Number :
Status : Normal

Station Assignment : Station_2
Fluid Properties Reference : Fluid Prop_101
Flow Alarm Object : Alarm_101

Meter Type

Meter Type : Coriolis ▼

No Flow Option

● Time Between Pulses
○ Flow Cut-off
1.0 s

No Flow Status : Not Flowing

Pipe Diameter

Pipe Diameter : 8.0 in

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Indicated Flow	PI_2-5	Live	0.0	0.0	Hz	Alarms
Static Pressure	Press_1-2	Live	0.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-2	Live	0.0	0.0	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

3. Review – and change as necessary – the values in the following fields:

Field	**Description**
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected meter.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Description</td><td colspan="2">Sets a description (up to 20-alphanumeric characters) for the selected meter.</td></tr>
<tr><td>Serial Number</td><td colspan="2">Sets a description (up to 20-alphanumeric characters) for the serial number or other identifier of the selected meter.</td></tr>
<tr><td rowspan="6">Status</td><td colspan="2">This read-only field indicates the overall health of the selected meter. Possible values are:</td></tr>
<tr><td>Normal</td><td>Indicates the meter is not in an alarm, failure, or override condition.</td></tr>
<tr><td>In alarm</td><td>Indicates an active flow rate, I/O, property calculation, or flow calculation alarm.</td></tr>
<tr><td>Failure</td><td>Indicates a point fail on a meter input that is used in flow calculations or a severe calculation error that prevented calculations from continuing.</td></tr>
<tr><td>Override</td><td>Indicates a meter input that is used in flow calculations in override mode that is not typically in override.</td></tr>
<tr><td colspan="2">Note
The status is based on the health of the uncorrected volume, corrected volume, and mass of the meter. You can configure which parameters determine the health of the meter in the Fault Health Configuration field on the Station – Advanced.
The associated parameter (OBJ_STATUS) is a 32-bit binary value, where individual bits have different meaning. We currently use 3 bits. Starting from LSB (Least Significant Bit), Bit 1 represents “In Alarm,” Bit 2 represents “Failure,” and Bit 3 represents “Override.” When viewing this parameter via a host system, the value is represented as a decimal number. For example, a value of 0 means no bits are set and the meter status is Normal. A value of 1 means the meter status is In Alarm. A value of 2 means the meter status is Failure. A value of 4 means the meter status is Override. A value of 7 means Bits 1, 2, and 3 are all set, and the meter status is In Alarm, Failure, and Override.</td></tr>
<tr><td>Station Assignment</td><td colspan="2">Click … to open a Point Picker dialog and select the station to which this meter belongs.
Note</td></tr>
</table>

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">• After selecting a Station, click ➔ to open the Station configuration display.
• Stations measuring different fluid types are hidden in the Point Picker.
• Gas meters and liquid meters cannot belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.</td></tr>
<tr><td>Fluid Properties Reference</td><td colspan="2">This read-only field shows the fluid properties instance currently assigned to the selected meter.
Note
Click ➔ to open the Fluid Properties configuration display.</td></tr>
<tr><td>Flow Alarm Object</td><td colspan="2">This read-only field shows the alarm instance currently assigned to the selected meter.
Note
Click ➔ to open the Alarms configuration display.</td></tr>
<tr><td>Advanced</td><td colspan="2">Click this button to open the Linear Meter – Advanced pop-up display and configure advanced properties for the selected differential pressure meter.</td></tr>
<tr><td>Diagnostics</td><td colspan="2">Click this button to open the Linear Meter – Diagnostics pop-up display and view read-only diagnostic information for the selected differential pressure meter.</td></tr>
<tr><td>Rates & Totals</td><td colspan="2">Click this button to open the Linear Meter – Rates & Totals pop-up display and view read-only flow rates and accumulations and to manually configure fault totals for the selected differential pressure meter.</td></tr>
<tr><td>Components</td><td colspan="2">Click this button to open the Components pop-up display and set the mole percent of each fluid component present in the meter.</td></tr>
<tr><td rowspan="2">Meter Type</td><td colspan="2">Click ▼ to specify the type of linear meter you are configuring. Possible options are:</td></tr>
<tr><td>Turbine</td><td>Select if measuring flow through a turbine meter or other linear meter with a frequency or analog signal representing actual volumetric flow rate. Flow is calculated according to AGA 7.</td></tr>
</table>

Field	**Description**	
	Coriolis	Select if measuring flow through a Coriolis meter or other linear meter with a frequency or analog signal representing a mass flow rate. Flow is calculated according to AGA 11.
	Auto-Adjust	Select if measuring flow through an Auto-Adjust meter. This meter type requires 2 pulse inputs, one representing the main rotor and one representing the sensing rotor.
	Ultrasonic	Select if measuring flow through an ultrasonic meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
	Positive Displacement	Select if measuring flow through a positive displacement meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
No Flow Option	Sets how the system calculates a "no flow" condition for the meter and sets the calculated flow equal to zero. Possible options are:	
	Time Between Pulses	If the amount of time between pulses is greater than or equal to the time you enter in the text field, then system sets the calculated flow equal to zero. **Note** • This option is available **only** if you select a **pulse input** object in the **Indicated Flow** field. • You **must** enter a time (in seconds) for the system to use in the text field. • This method should be used for low frequency pulse inputs. • Use the method if you wish to perform a fixed count pulse input test.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td></td><td>Flow Cut-off
If the value of the uncorrected volume input is less than or equal to the value you enter in the text field, then the system sets the calculated flow equal to zero. Enter a value (in units based on the table below) for the system to use in the text field.
<table>
<tr><th>Indicated Flow Input Type</th><th>Meter Type</th><th>Unit Type</th></tr>
<tr><td>Pulse Input</td><td>Turbine</td><td>Hz</td></tr>
<tr><td></td><td>Auto-Adjust</td><td>Hz</td></tr>
<tr><td></td><td>Coriolis</td><td>Hz</td></tr>
<tr><td>AI or User Data</td><td>Turbine</td><td>Volume Rate</td></tr>
<tr><td></td><td>Auto-Adjust</td><td>Volume Rate</td></tr>
<tr><td></td><td>Coriolis</td><td>Mass Rate</td></tr>
</table>
Note
The lowest frequency the system can accurately measure is 1 divided by the PI Scan Period (configured on the Pulse Input display). Flow control may be erratic below this threshold.</td></tr>
<tr><td>No Flow Status</td><td>This read-only field shows the current flowing status of the selected meter. An indicated flow greater than or equal to the no flow cutoff is considered “flowing” and increments flow and flow time. An indicated flow below the no flow cutoff is considered “not flowing” and does not increment flow or flow time.</td></tr>
<tr><td>Pipe Diameter</td><td>Indicates the pipe’s approximate internal diameter in selected Linear Short units.
Note
• For Auto-Adjust meter types, the program uses this value to complete the Blade Tip Sensor Factor field on the Auto-Adjust Alarms display.
• For Turbine and Coriolis meter types, this field is for informational purposes.</td></tr>
</table>

Field	Description	
Indicated Flow	**I/O Definition**	Click … to open a Point Picker dialog and select an indicated flow input to use for the selected meter. This field represents the Pulse Frequency for a Turbine or Coriolis meter type, and the Main Rotor Frequency for an Auto-Adjust meter type. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • PI object – SELECTED FREQUENCY and ACCUMULATED PULSES • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 1. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.

Field	Description	
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Secondary Flow Input	**I/O Definition**	Click … to open a Point Picker dialog and select the secondary flow input to use for the selected meter. The secondary flow input represents the Sensing Rotor Frequency and must be a PI object. This field is currently **only** used for an **Auto-Adjust** meter type. **Note** Only an object is chosen, and the Auto-Adjust algorithm reads the SELECTED FREQUENCY and ACCUMULATED PULSES parameters from the selected PI object.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field).
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**.
	Selected Value	This field shows the value currently used in calculations based on the selected options.

Field	Description	
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input.
Static Pressure	**I/O Definition**	Click ••• to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data. **Note**

Field	**Description**	
		The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Flowing Temperature	**I/O Definition**	Click … to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • RTD object – SELECTED VALUE

Field	Description	
		• AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	Description	
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Pressure Transmitter Type	Indicates the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select an **FBxNData**, **HART**, or **User Data** instance in the **Static Pressure I/O Definition** field.	
Corrected Volume Rate Alarms	Sets the rate alarm limits for the corrected flow rate, and shows the status of each alarm. Possible statuses are: • **Normal** – The alarm is enabled and is not in an alarm condition. • **Disabled** – The alarm has been disabled. • **In Alarm** – The alarm is enabled and is in an alarm condition.	
Auto Adjust Main Rotor K-factor	Sets a scaling K-factor the program uses to convert the main rotor pulses to volume in the selected Volumetric K-factor units. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.	
Auto Adjust Sensing Rotor K-factor	Sets a scaling K-factor the program uses to convert the sensing rotor pulses to volume in the selected Volumetric K-factor units. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.	
Auto Adjust Mechanical K-factor	Sets a scaling K-factor in the selected Volumetric K-factor units as provided from the Equimeter calibration sheet. The program uses this value to calculate a Mechanical Volume rate or unadjusted volume, which matches the Turbo-Meter mechanical totalizer volume. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.	

Field	Description
Auto Adjust Relative Adjustment	Indicates the average relative adjustment (as a percentage) for the auto-adjust algorithm determined at factory calibration. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.
Auto Adjust Maximum Frequency	Indicates the maximum frequency value (in Hz) the program uses when calculating the meter load, expressed as Current Frequency or Maximum Frequency. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.
Calibration Mode	Sets the rotor calibration mode. Possible options are: **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field. **Disable** Uses a self-checking cycle of 2,500 rotations **Enable** Uses the standard cycle of 25,000 rotations
Details	Select this button to open the Linear Meter – Auto Adjust pop-up display and configure options for the selected Auto-Adjust meter.
Reset Algorithm	Select this button to clear alarms and self-checking test data for the Auto-Adjust meter, and to re-start collection and analysis of the data. It is recommended to reset the algorithm after installation or after any maintenance on the meter. **Note** This field appears **only** if you select **Auto-Adjust** in the **Meter Type** field.

4. **4** Select **Save** to save your changes if you modify any of the fields on this display.

4.10.2 Linear Meter – Auto-Adjust

Use this pop-up display to configure options for the selected Auto-Adjust meter.

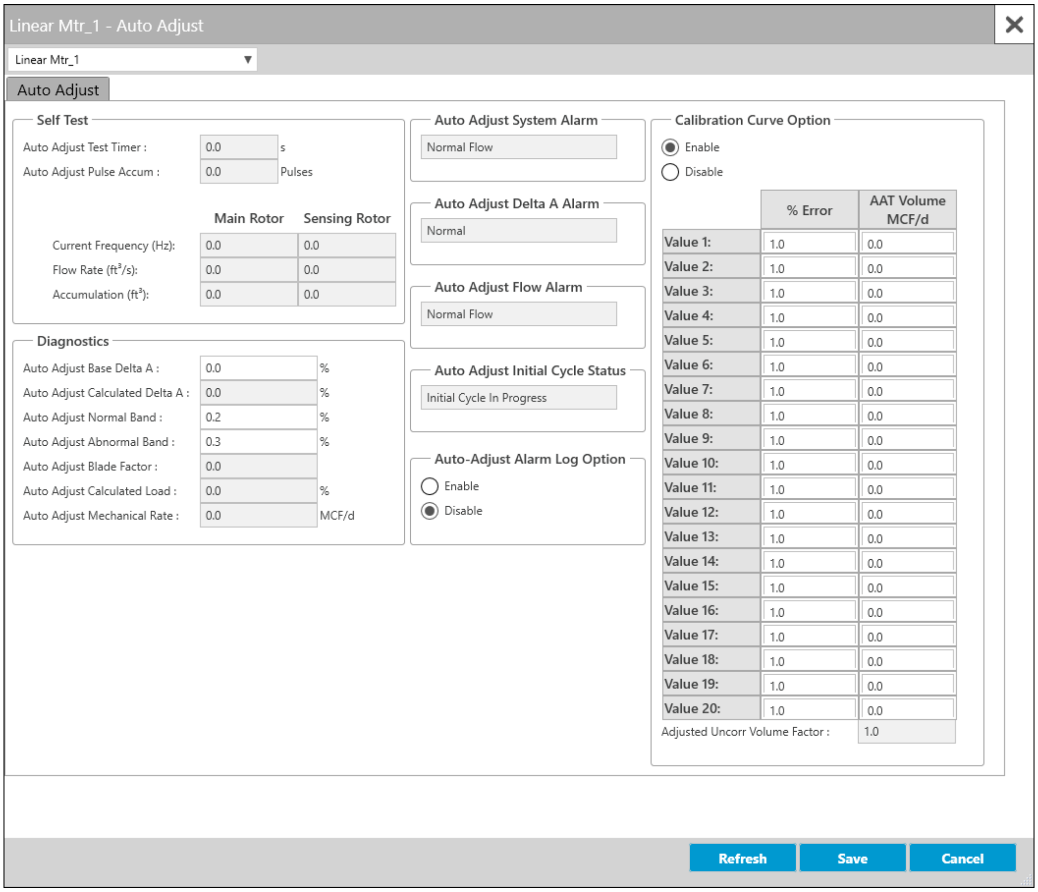
Note

This pop-up display is available **only** if you select **Auto-Adjust** in the **Meter Type** field.

To access this pop-up display:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Details** button in the Auto Adjust frame. The Linear Meter – Auto Adjust pop-up display opens.

Figure 168. Linear Meter – Auto-Adjust



Self Test

Auto Adjust Test Timer : 0.0 s

Auto Adjust Pulse Accum : 0.0 Pulses

	Main Rotor	Sensing Rotor
Current Frequency (Hz):	0.0	0.0
Flow Rate (ft^3/s):	0.0	0.0
Accumulation (ft^3):	0.0	0.0

Diagnostics

Auto Adjust Base Delta A : 0.0 %

Auto Adjust Calculated Delta A : 0.0 %

Auto Adjust Normal Band : 0.2 %

Auto Adjust Abnormal Band : 0.3 %

Auto Adjust Blade Factor : 0.0

Auto Adjust Calculated Load : 0.0 %

Auto Adjust Mechanical Rate : 0.0 MCF/d

Auto Adjust System Alarm: Normal Flow

Auto Adjust Delta A Alarm: Normal

Auto Adjust Flow Alarm: Normal Flow

Auto Adjust Initial Cycle Status: Initial Cycle In Progress

Auto-Adjust Alarm Log Option: ○ Enable ● Disable

Calibration Curve Option: ● Enable ○ Disable

	% Error	AAT Volume MCF/d
Value 1:	1.0	0.0
Value 2:	1.0	0.0
Value 3:	1.0	0.0
Value 4:	1.0	0.0
Value 5:	1.0	0.0
Value 6:	1.0	0.0
Value 7:	1.0	0.0
Value 8:	1.0	0.0
Value 9:	1.0	0.0
Value 10:	1.0	0.0
Value 11:	1.0	0.0
Value 12:	1.0	0.0
Value 13:	1.0	0.0
Value 14:	1.0	0.0
Value 15:	1.0	0.0
Value 16:	1.0	0.0
Value 17:	1.0	0.0
Value 18:	1.0	0.0
Value 19:	1.0	0.0
Value 20:	1.0	0.0

Adjusted Uncorr Volume Factor : 1.0

---

4. Review – and change as necessary – the values in the following fields:

Field	Description
Auto Adjust Test Timer	This **read-only** field shows the number of seconds elapsed since the program last started the Auto-Adjust self-checking calculation. The program resets this value either after 512 seconds or when the main rotor reaches 25,000 pulses, whichever occurs first.
Auto Adjust Pulse Accum	This **read-only** field shows the rotor pulses accumulated during the current self-checking calculation cycle. A self-checking calculation cycle takes either 25,000 rotor rotations or 512 seconds, whichever occurs first.
Current Frequency	This **read-only** field shows the current frequency (in Hz) for both the main and sensing rotors. The program updates this value once each second.
Flow Rate	This **read-only** field shows the raw volumetric rate (in ft3/second or m3/second) for both the main and sensing rotors. The program calculates this value as pulse/second divided by K-factor for the rotor.
Accumulation	This **read-only** field shows the raw volume values (in ft3 or m3) for both the main and sensing rotors during the current self-adjusting calculation cycle.
Auto Adjust Base Delta A	Sets the baseline delta adjustment (Delta A) value (as a percentage) derived either from the factory calibration curve or the initial field testing. **Note** The program's run-time warning and alarm limits depend on this value. For example, the program calculates the low warning limit as the Baseline Delta Adjustment value minus the Normal Band value and the high alarm limit as the Baseline Delta Adjustment value plus the Abnormal Band value.
Auto Adjust Calculated Delta A	This **read-only** field shows the system-calculated delta adjustment (Delta A) value (as a percentage). This value is the amount of change that has occurred in the meter or flow condition compared to its original calibration value. The program refreshes this value at least every 512 seconds or 25,000 rotations of the main rotor.
Auto Adjust Normal Band	Sets the normal limits (as a percentage) above and below the Baseline Delta A value. The default value is 0.2. If the percentage exceeds this value, the program triggers a warning.

Field	Description
Auto Adjust Abnormal Band	Sets the abnormal limits (as a percentage) above and below the Baseline Delta A value. The default value is 0.3. If the percentage exceeds this value, the program triggers an alarm.
Auto Adjust Blade Factor	This **read-only** field shows a predefined factor based on the value entered in the Pipe Diameter field on the Linear Meter – General display. **Note** The program considers any pipe diameter between 7 and 10 inches as 8 inches, to correspond to the Equimeter meter choices of 4, 6, 8, and 12 inches.
Auto Adjust Calculated Load	This **read-only** field shows the instantaneous turbine load (as a percentage), calculated as the current main rotor frequency divided by the maximum frequency. The program updates this value once every second.
Auto Adjust Mechanical Rate	Indicates the unadjusted flow rate (in MCF/day or KM3/day) based on the main rotor pulses and the mechanical K-factor. The system updates this value once per second. This parameter does not have compensation from the auto-adjust algorithm. **Note** The AGA 7 firmware expects a flow rate (in either MCF/day or KM3/day) when reading an uncorrected value other than from a pulse input point.
Auto Adjust System Alarm	This read-only field indicates the current system status. Possible system alarms include Normal Flow, No Flow or Loss of Both Rotor, Leakage or Resonant No-Net Flow, No Main Rotor Pulses Or Leakage Or Resonant No-Net Flow, and No Sensing Rotor Pulses. **Note** Alarms are audited in the alarm log.
Auto Adjust Delta A Alarm	This **read-only** field shows whether the program-calculated deviation from the average relative adjustment is within normal limits. Possible Delta A alarms include Normal, Low Warning, High Warning, Low Alarm, and High Alarm. **Note** Alarms are audited in the alarm log.

Field	**Description**	
Auto Adjust Flow Alarm	This **read-only** field shows the status of the ratio between the sensing rotor’s volume and the main rotor’s volume. Possible values are **Normal Flow** (the ratio is steady) or **Non-Steady Flow** (the ratios are below acceptable limits). **Note** Alarms are audited in the alarm log.	
Auto Adjust Initial Cycle Status	This **read-only** field indicates whether the initial cycle has started or is complete.	
Auto Adjust Alarm Log Option	Sets whether the Auto-Adjust alarms are written to the alarm log or not.	
	Disable	Alarm states are accessible through the alarm parameters, but alarm state changes are not logged to the alarm log.
	Enable	Alarm states are accessible through the alarm parameters and alarm state changes are logged to the alarm log.
Calibration Curve Option	Activates the Auto-Adjust Calibration Curve calculation. Valid values are:	
	Enable	The system includes the Adjusted Uncorrected Volume Factor (AUVF) in calculations. **Note** You **must** enter information from the calibration report in the % Error and AAT Volume fields. The program applies the AUVF to the result of the auto-adjust algorithm to calculate the adjusted volume rate at flowing conditions.
	Disable	The system does not use the AUVF in calculations (which is equal to an AUVF of 1.00). **Note** If you disable the calibration curve, the adjusted volume rate reflects the result of the auto-adjust algorithm with no correction for the calibration curve.

5. Select **Save** to save your changes if you modify any of the fields on this pop-up display.

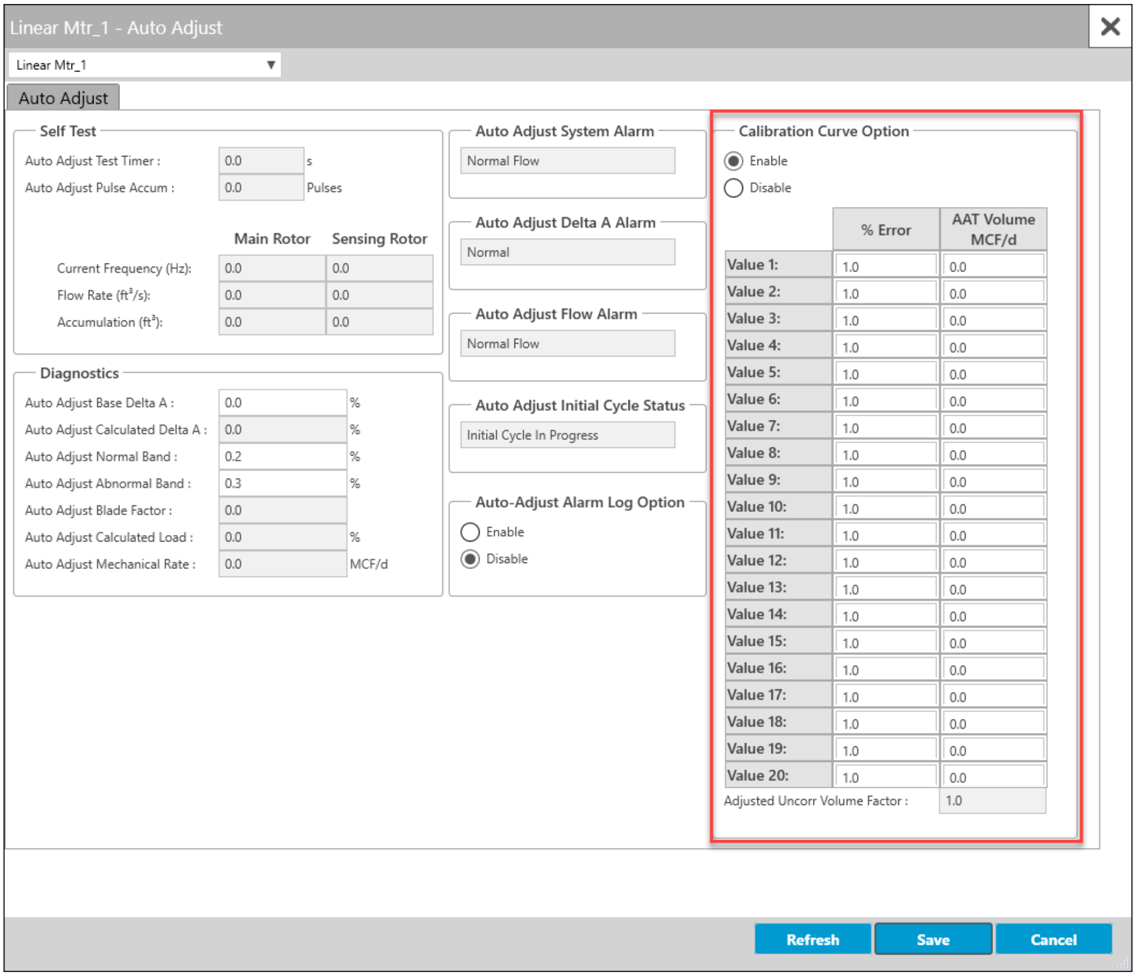
4.10.2.1 Calibration Curve Option (Auto-Adjust)

Use the Calibration Curve Option to enter a meter factor curve or K-factor curve for an Auto-Adjust meter.

To access this option:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Details** button in the Auto Adjust frame. The Auto Adjust pop-up display opens.
4. Select **Enable** in the Calibration Curve Option frame.

Figure 169. Linear Meter – Auto Adjust



Linear Mtr_1 - Auto Adjust

Linear Mtr_1

Auto Adjust

Self Test

Auto Adjust Test Timer : 0.0 s
Auto Adjust Pulse Accum : 0.0 Pulses

	Main Rotor	Sensing Rotor
Current Frequency (Hz):	0.0	0.0
Flow Rate (ft³/s):	0.0	0.0
Accumulation (ft³):	0.0	0.0

Diagnostics

Auto Adjust Base Delta A : 0.0 %
Auto Adjust Calculated Delta A : 0.0 %
Auto Adjust Normal Band : 0.2 %
Auto Adjust Abnormal Band : 0.3 %
Auto Adjust Blade Factor : 0.0
Auto Adjust Calculated Load : 0.0 %
Auto Adjust Mechanical Rate : 0.0 MCF/d

Auto Adjust System Alarm
Normal Flow

Auto Adjust Delta A Alarm
Normal

Auto Adjust Flow Alarm
Normal Flow

Auto Adjust Initial Cycle Status
Initial Cycle In Progress

Auto-Adjust Alarm Log Option
○ Enable
● Disable

Calibration Curve Option
● Enable
○ Disable

	% Error	AAT Volume MCF/d
Value 1:	1.0	0.0
Value 2:	1.0	0.0
Value 3:	1.0	0.0
Value 4:	1.0	0.0
Value 5:	1.0	0.0
Value 6:	1.0	0.0
Value 7:	1.0	0.0
Value 8:	1.0	0.0
Value 9:	1.0	0.0
Value 10:	1.0	0.0
Value 11:	1.0	0.0
Value 12:	1.0	0.0
Value 13:	1.0	0.0
Value 14:	1.0	0.0
Value 15:	1.0	0.0
Value 16:	1.0	0.0
Value 17:	1.0	0.0
Value 18:	1.0	0.0
Value 19:	1.0	0.0
Value 20:	1.0	0.0

Adjusted Uncorr Volume Factor : 1.0

5. Enter up to 20 points on the curve (pairs of % Error and AAT Volume {the volumetric flow rate calculated by the Auto-Adjust Turbine algorithm}).

6. Enable the calibration curve option. The adjusted Uncorrected Volume Factor is calculated for use in the flow equation by using linear interpolation of the AAT Volume to determine % Error and then the AUVF is calculated as follows:

$$AUVF = \frac{1}{\left(\frac{\%\,Error}{100}\right)+1}$$

Note

A valid point **must** have an AAT Volume greater than zero. The points may be entered in any order and will be internally sorted by AAT Volume, discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the actual AAT Volume is less than the lowest point on the curve, the % Error will be the % Error for the lowest point on the curve. If the actual AAT Volume is greater than the highest point on the curve, the % Error will be the % Error for the highest point on the curve. If there are no valid points, then a default of 1.0% is used.

7. Select **Save** to save any changes you make to this pop-up display.

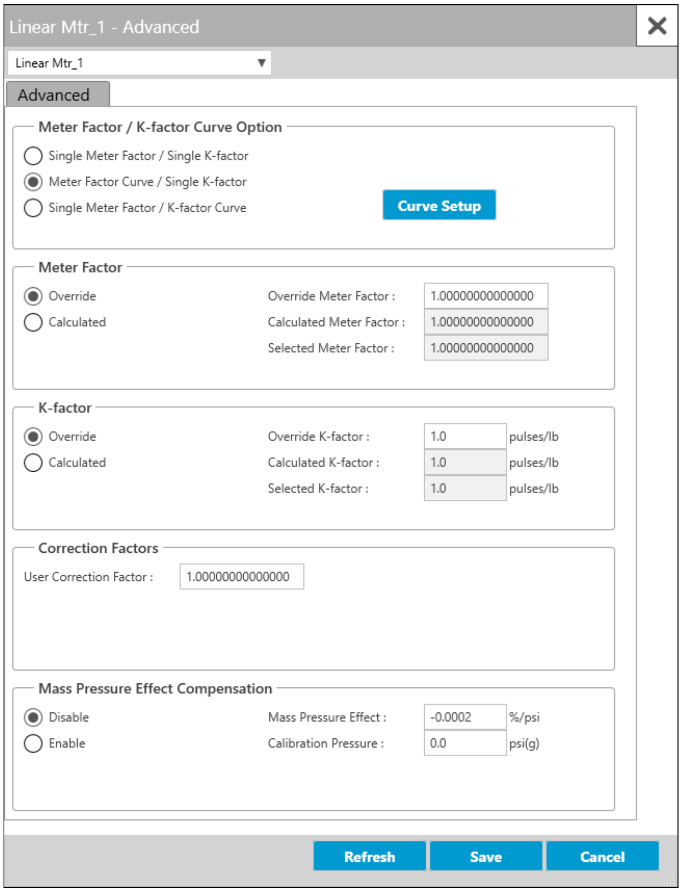
4.10.3 Linear Meter – Advanced

Use this pop-up display to configure advanced properties for the selected linear meter, including meter construction material, temperature correction, and discharge coefficient options.

To access this pop-up display:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The Linear Meter – Advanced pop-up display opens.

Figure 170. Linear Meter – Advanced (Coriolis Meter Type)



Linear Mtr_1 ▼

Meter Factor / K-factor Curve Option
○ Single Meter Factor / Single K-factor
● Meter Factor Curve / Single K-factor
○ Single Meter Factor / K-factor Curve

Meter Factor
● Override
○ Calculated
Override Meter Factor : 1.00000000000000
Calculated Meter Factor : 1.00000000000000
Selected Meter Factor : 1.00000000000000

K-factor
● Override
○ Calculated
Override K-factor : 1.0 pulses/lb
Calculated K-factor : 1.0 pulses/lb
Selected K-factor : 1.0 pulses/lb

Correction Factors
User Correction Factor : 1.00000000000000

Mass Pressure Effect Compensation
● Disable
○ Enable
Mass Pressure Effect : -0.0002 %/psi
Calibration Pressure : 0.0 psi(g)

4. Review – and change as necessary – the values in the following fields:

Field	Description
Meter Factor / K-factor Curve Option	Sets how system uses calculates K-factors or Meter Factors in the flow calculation. Possible options are: **Note** This field appears **only** if you select either **Turbine**, **Coriolis**, **Ultrasonic**, or **Positive Displacement** in the **Meter Type** field on the General tab.

Field	Description	
	Single Meter Factor / Single K-factor	Uses a single Meter Factor and a single K-factor for the meter. This is the simplest choice and means that a value for the meter factor and a value for the K-factor are fixed for all flow rates and the values are taken from the last prove or an entered value. Select this option when using either the K-factor or meter factor proving, as long as neither the K-factor or meter factor will vary with flow rate or product.
	Meter Factor Curve / Single K-factor	A meter factor calculates for the current flow rate based on a linear interpolation of the meter factor versus flow rate values entered under the Factor Curve heading, but the K-factor will be fixed. Select this option when using meter factor proving if proving is done at multiple flow rates. **Note** You **must** select the **Curve Setup** button and configure the meter factor curve.
	Single Meter Factor / K-factor Curve	A K-factor calculates for the current flow input frequency based on a linear interpolation of the meter factor versus frequency values entered under the Factor Curve, but the meter factor will be a single value from the last prove or entered value. The K-factor curve can come from multiple proves at different flow rates with a meter factor of 1.0 (K-factor proving) or the K-factor curve can come from factory calibration and a single meter factor from a prove (meter factor proving). **Note** You **must** select the **Curve Setup** button and configure the K-factor curve.

Field	Description
Curve Setup	Click to open the Curve Setup dialog and configure the meter factor/K-factor curve. For more information, refer to Curve Setup (Linear Meter). **Note** This field appears **only** if you select either **Meter Factor Curve / Single K-factor** or **Single Meter Factor / K-factor Curve** in the Meter Factor / K-factor Curve Option field.
Meter Factor	Sets how the system obtains the meter factor value used in calculations. Possible options are: **Override** The system uses the value set in the **Override Meter Factor** field for the meter factor value. **Calculate** The system calculates a value for the meter factor.
Override Meter Factor	Sets the meter factor value to use in calculations when you select **Override** in the **Meter Factor** field.
Calculated Meter Factor	This **read-only** field shows the meter factor value as calculated by the system. **Note** This value is used by the system when you select **Calculate** in the **Meter Factor** field.
Selected Meter Factor	This **read-only** field shows the meter factor currently used in calculations based on the selected options.
K-factor	Sets how the system obtains the K-factor value used in calculations. Possible options are: **Note** This field appears **only** if you select either **Turbine**, **Coriolis**, **Ultrasonic**, or **Positive Displacement** in the **Meter Type** field on the General tab. **Override** The system uses the value set in the **Override K-factor** field for the K-factor value. **Calculated** The system calculates a value for the K-factor.
Override K-factor	Sets the discharge coefficient value to use in calculations when you select **Override** in the **K-factor** field.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Calculated K-factor</td><td>This read-only field shows the discharge coefficient value as calculated by the system.
Note
• This field appears only if you select either Turbine, Coriolis, Ultrasonic, or Positive Displacement in the Meter Type field on the General tab.
• This value is used by the system when you select Calculate in the K-factor field.</td></tr>
<tr><td>Selected K-factor</td><td>This read-only field shows the K-factor currently used in calculations based on the selected options.
Note
This field appears only if you select either Turbine, Coriolis, Ultrasonic, or Positive Displacement in the Meter Type field on the General tab.</td></tr>
<tr><td>User Correction Factor</td><td>Sets a factor the system multiplies by the base flow equation to make a desired adjustment to the flow. The user correction factor is applied to the volume, mass, and energy flow rates and totals.
Note
If you use the default value of 1, the system does not apply any correction.</td></tr>
<tr><td>Mass Pressure Effect Compensation</td><td>This option allows for the compensation for the effects of high pressure on the accuracy of the meter mass flow rate and accumulation. This may be necessary in applications where the operating pressure is significantly different from the meter’s calibration pressure.
Note
This field appears only if you select Coriolis in the Meter Type field on the General tab.
<table>
<tr><td>Enable</td><td>The system compensates for the effects of pressure on accuracy.
Note
You must enter a value in the Mass Pressure Effect and Calibration Pressure fields.</td></tr>
</table></td></tr>
</table>

Field	Description
	Disable — The system **does not** compensate for the effects of pressure on accuracy.
Mass Pressure Effect	Enter a value (in units of per psi or per bar) to be used when performing mass pressure effect compensation. **Note** • This value is supplied by the manufacture of the mass meter and is typically a small negative number. • This field appears **only** if you select **Coriolis** in the **Meter Type** field on the General tab.
Calibration Pressure	Sets the pressure (in units of gauge psi or bar) of the mass meter as calibrated. **Note** • This value is supplied by the manufacture of the mass meter and is typically a small negative number. • This field appears **only** if you select **Coriolis** in the **Meter Type** field on the General tab.

5. Select **Save** to save your changes if you modify any of the fields on this pop-up display.

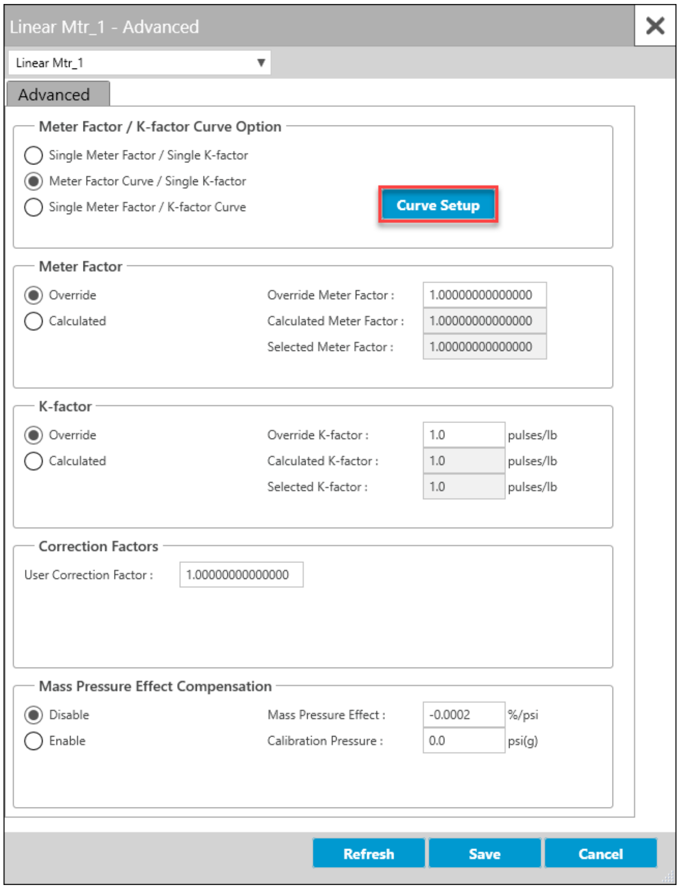
4.10.3.1 Curve Setup (Linear Meter)

Use this option to enter a meter factor curve or K-factor curve.

To access this pop-up display:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The Linear Meter – Advanced pop-up display opens.

Figure 171. Linear Meter – Advanced



Meter Factor / K-factor Curve Option
○ Single Meter Factor / Single K-factor
● Meter Factor Curve / Single K-factor
○ Single Meter Factor / K-factor Curve

Meter Factor
● Override
○ Calculated
Override Meter Factor : 1.00000000000000
Calculated Meter Factor : 1.00000000000000
Selected Meter Factor : 1.00000000000000

K-factor
● Override
○ Calculated
Override K-factor : 1.0 pulses/lb
Calculated K-factor : 1.0 pulses/lb
Selected K-factor : 1.0 pulses/lb

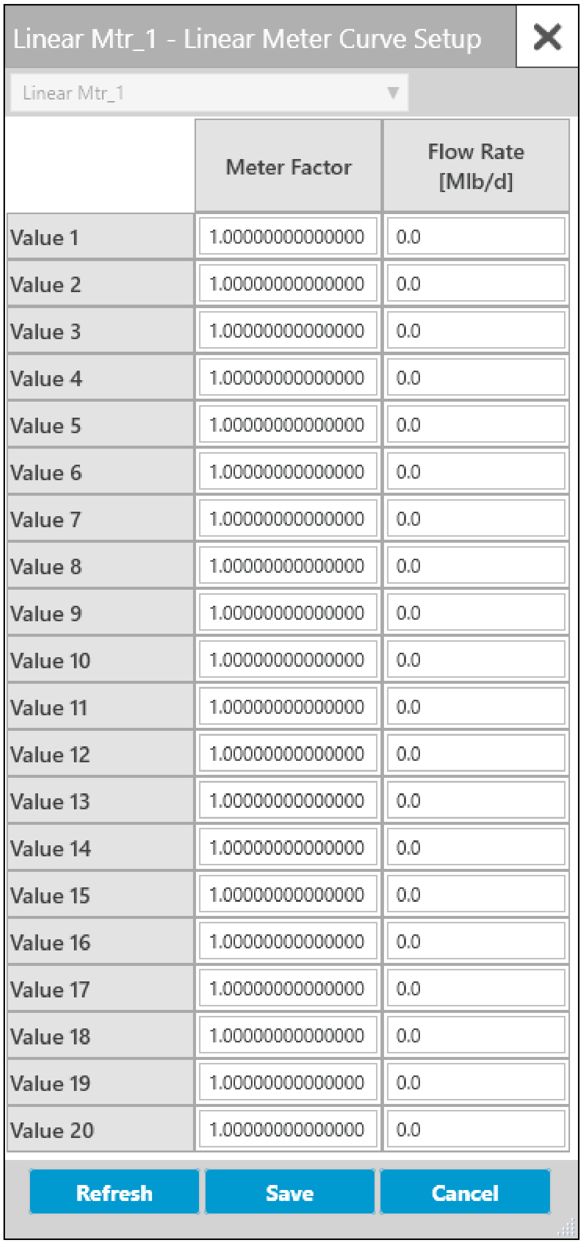
Correction Factors
User Correction Factor : 1.00000000000000

Mass Pressure Effect Compensation
● Disable
○ Enable
Mass Pressure Effect : -0.0002 %/psi
Calibration Pressure : 0.0 psi(g)

4. Select either **Meter Factor Curve / Single K-factor** or **Single Meter Factor / K-factor Curve** in the Meter Factor / K-factor Curve Option frame and **Save** your changes.

5. Select the **Curve Setup** button. The Curve Setup pop-up display opens.

Figure 172. Curve Setup



	Meter Factor	Flow Rate [Mlb/d]
Value 1	1.00000000000000	0.0
Value 2	1.00000000000000	0.0
Value 3	1.00000000000000	0.0
Value 4	1.00000000000000	0.0
Value 5	1.00000000000000	0.0
Value 6	1.00000000000000	0.0
Value 7	1.00000000000000	0.0
Value 8	1.00000000000000	0.0
Value 9	1.00000000000000	0.0
Value 10	1.00000000000000	0.0
Value 11	1.00000000000000	0.0
Value 12	1.00000000000000	0.0
Value 13	1.00000000000000	0.0
Value 14	1.00000000000000	0.0
Value 15	1.00000000000000	0.0
Value 16	1.00000000000000	0.0
Value 17	1.00000000000000	0.0
Value 18	1.00000000000000	0.0
Value 19	1.00000000000000	0.0
Value 20	1.00000000000000	0.0

6. If you selected **Meter Factor Curve / Single K-factor** on the previous display, enter up to 20 points on the curve (pairs of meter factor and flow rate) and a meter factor is calculated for use in the flow equation by linear interpolation of the current indicated quantity flow rate. If you selected **Single Meter Factor / K-factor Curve** on the previous display, enter up to 20 points on the curve (pairs of K-factor and frequency) and a K-factor is calculated for use in the flow equation by linear interpolation of the current flow meter input frequency.

Note

A valid point **must** have a flow rate/frequency greater than zero and a factor greater than zero. The points may be entered in any order and will be internally sorted by flow rate (MF curve) or frequency (K-Factor Curve), discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the flow rate/frequency is less than the lowest point on the curve, the calculated factor will be the factor for the lowest point on the curve. If the flow rate/frequency is greater than the highest point on the curve, the calculated factor will be the factor for the highest point on the curve. If there are no valid points, then a default factor of 1.0 is used.

---

7. Select **Save** to save any changes you make to this pop-up display.

4.10.4 Linear Meter Diagnostics

Use this pop-up display to view **read-only** diagnostic information for the selected linear meter, including calculated factors, calculated values, and alarm codes.

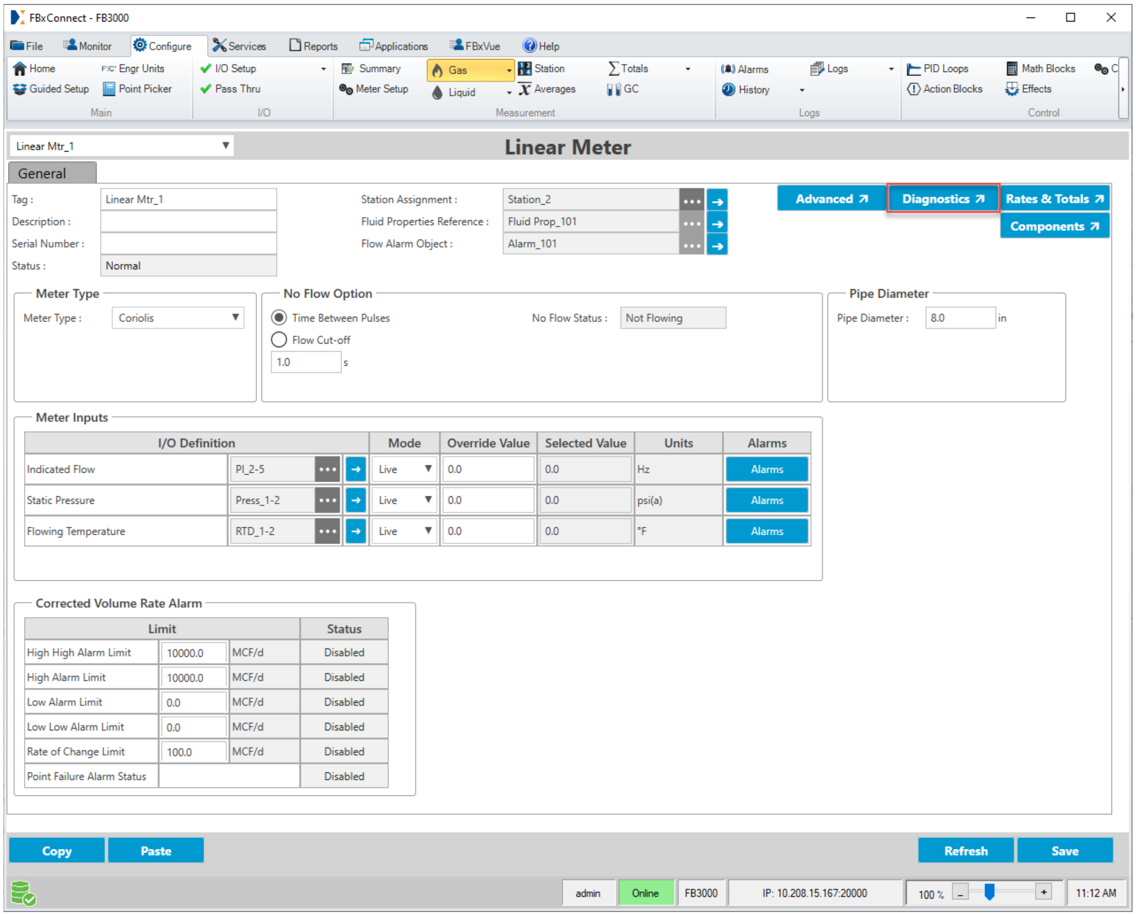
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- Physically impossible inputs may be clamped at a high or low limit value in order to ensure reasonable results. If a value is clamped at a high or low limit, a corresponding flow or property alarm is raised.

To access this pop-up display:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 173. Linear Meter – Diagnostics Button



Linear Mtr_1

Tag : Linear Mtr_1
Description :
Serial Number :
Status : Normal

Station Assignment : Station_2
Fluid Properties Reference : Fluid Prop_101
Flow Alarm Object : Alarm_101

Meter Type
Meter Type : Coriolis

No Flow Option
● Time Between Pulses
○ Flow Cut-off
1.0 s
No Flow Status : Not Flowing

Pipe Diameter
Pipe Diameter : 8.0 in

Meter Inputs

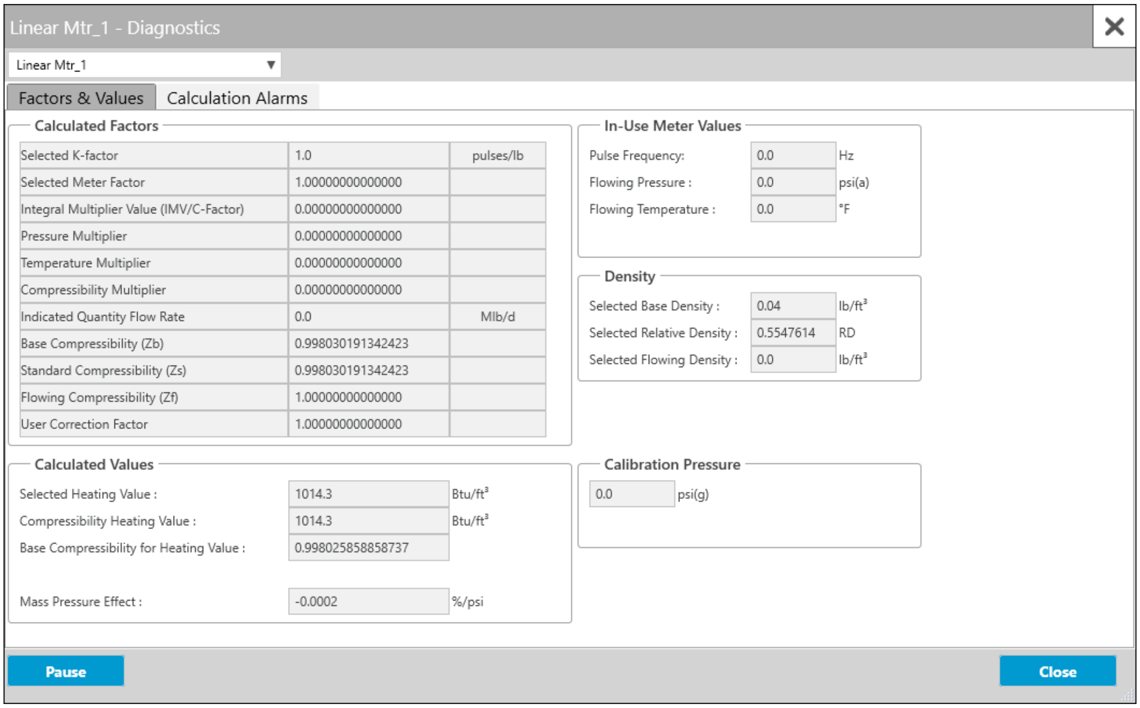
I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Indicated Flow	PI_2-5	Live	0.0	0.0	Hz	Alarms
Static Pressure	Press_1-2	Live	0.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-2	Live	0.0	0.0	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

3. Select the **Diagnostics** button. The Linear Meter Diagnostics pop-up display opens showing the Factors & Values tab.

Figure 174. Linear Meter Diagnostics



Calculated Factors

Selected K-factor	1.0	pulses/lb
Selected Meter Factor	1.00000000000000	
Integral Multiplier Value (IMV/C-Factor)	0.00000000000000	
Pressure Multiplier	0.00000000000000	
Temperature Multiplier	0.00000000000000	
Compressibility Multiplier	0.00000000000000	
Indicated Quantity Flow Rate	0.0	Mlb/d
Base Compressibility (Zb)	0.998030191342423	
Standard Compressibility (Zs)	0.998030191342423	
Flowing Compressibility (Zf)	1.00000000000000	
User Correction Factor	1.00000000000000	

In-Use Meter Values

Pulse Frequency: 0.0 Hz
Flowing Pressure : 0.0 psi(a)
Flowing Temperature : 0.0 °F

Density

Selected Base Density : 0.04 lb/ft³
Selected Relative Density : 0.5547614 RD
Selected Flowing Density : 0.0 lb/ft³

Calculated Values

Selected Heating Value : 1014.3 Btu/ft³
Compressibility Heating Value : 1014.3 Btu/ft³
Base Compressibility for Heating Value : 0.998025858858737

Mass Pressure Effect : -0.0002 %/psi

Calibration Pressure

0.0 psi(g)

The Linear Meter Diagnostics pop-up display contains the following tabs:

Factors and Values – This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

Calculation Alarms – This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with the meter.

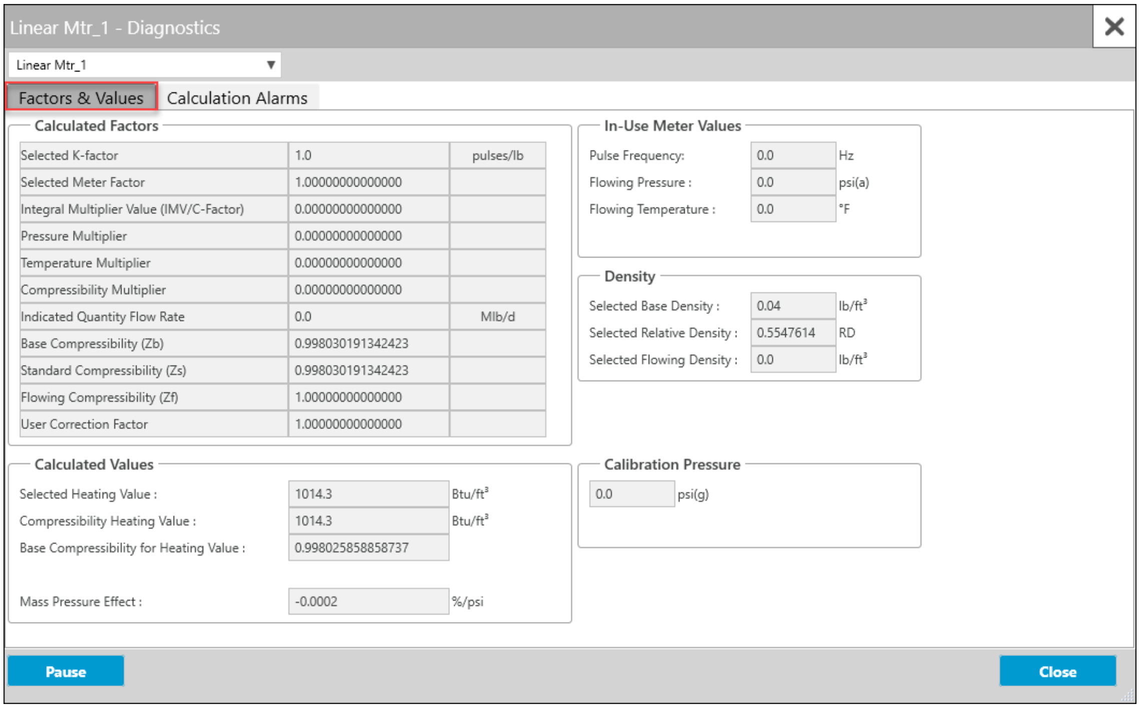
4.10.4.1 Linear Meter Diagnostics – Factors & Values Tab

This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

To access this tab:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The Linear Meter Diagnostics pop-up display opens showing the Factors & Values tab

Figure 175. Linear Meter Diagnostics – Factors & Values Tab



Calculated Factors

Selected K-factor	1.0	pulses/lb
Selected Meter Factor	1.00000000000000	
Integral Multiplier Value (IMV/C-Factor)	0.00000000000000	
Pressure Multiplier	0.00000000000000	
Temperature Multiplier	0.00000000000000	
Compressibility Multiplier	0.00000000000000	
Indicated Quantity Flow Rate	0.0	Mlb/d
Base Compressibility (Zb)	0.998030191342423	
Standard Compressibility (Zs)	0.998030191342423	
Flowing Compressibility (Zf)	1.00000000000000	
User Correction Factor	1.00000000000000	

In-Use Meter Values

Pulse Frequency: 0.0 Hz
Flowing Pressure : 0.0 psi(a)
Flowing Temperature : 0.0 °F

Density

Selected Base Density : 0.04 lb/ft³
Selected Relative Density : 0.5547614 RD
Selected Flowing Density : 0.0 lb/ft³

Calculated Values

Selected Heating Value : 1014.3 Btu/ft³
Compressibility Heating Value : 1014.3 Btu/ft³
Base Compressibility for Heating Value : 0.998025858858737
Mass Pressure Effect : -0.0002 %/psi

Calibration Pressure

0.0 psi(g)

4. Review the values in the following fields:

Field	Description	
Calculated Factors	**Selected K-factor**	This **read-only** field shows the pulses per unit quantity generated by a pulse output type flow meter (also system factor). The nominal value is determined by flow meter design and factory water flow calibration. The "average" K-factors for the flow meters are usually displayed on the flow meter nameplates.
	Selected Meter Factor	This **read-only** field shows the number obtained by dividing the actual volume of fluid passed through a flow meter during a meter proving operation by the volume registered by the flow meter. The meter factor is used in flow calculations to correct the indicated volume (end flow meter registration minus start flow meter registration) to the observed gross volume (actual flow meter throughput at operating conditions).

Field	Description	
		Meter factor = (Meter prover volume corrected to standard conditions) / (Flow meter indicated volume corrected to standard conditions)
	Integral Multiplier Value (IMV/C-Factor)	This **read-only** field shows the combined volume correction factor which is the product of the pressure, temperature, and compressibility factors described below.
	Pressure Multiplier	This **read-only** field shows the pressure multiplier, a ratio of flowing pressure to base pressure that reflects the volume correction for pressure.
	Temperature Multiplier	This **read-only** field shows the temperature multiplier, a ratio of base temperature to flowing temperature that reflects the volume correction for temperature.
	Compressibility Multiplier	This **read-only** field shows the compressibility multiplier, a ratio of base compressibility to flowing compressibility that reflects the volume correction for non-ideal gas.
	Indicated Quantity Flow Rate	This **read-only** field shows the raw flow rate from the meter in Volumetric or Mass Flow Rate units, depending on the meter type. This value is prior to any meter factor correction.
	Base Compressibility (Zb)	This **read-only** field shows the compressibility at base conditions.
	Standard Compressibility (Zs)	This **read-only** field shows the compressibility at standard conditions.
	Flowing Compressibility (Zf)	This **read-only** field shows the compressibility at flowing conditions.

Field	Description	
	User Correction Factor	This **read-only** field shows a factor the system multiplies by the base volume flow equation to make a desired adjustment to the flow. The user correction factor is applied to the volume, mass, and energy flow rates and totals. **Note** A value of 1 does not apply any correction.
Calculated Values	**Selected Heating Value**	This **read-only** field shows the heating value of the fluid at base conditions. The heating value represents the amount of energy transferred as heat per unit mass or unit volume from the complete, ideal combustion of the gas with oxygen at a base temperature.
	Compressibility Heating Value	If the compressibility calculation **is** dependent on the heating value, this **read-only** field shows the superior/gross volumetric heating value at the reference conditions you select on the Station – General. **Note** If the compressibility calculation **is not** dependent on the heating value, this field shows a value of 0.
	Base Compressibility for Heating Value	This **read-only** field shows the calculated base compressibility used in heating value calculations. **Note** For more information about the heating value calculation, refer to the Station – Advanced.
	Calculated Speed of Sound	This **read-only** field shows the speed of sound through the fluid calculated from the gas composition, temperature, and pressure. It is commonly compared to the measured speed of sound from an ultrasonic meter for diagnostic purposes.

Field	Description	
	Mass Pressure Effect	This **read-only** field shows the mass pressure effect currently used in calculations. The mass pressure effect accounts for the effect of pressure on the vibrating tube of the Coriolis meter. **Note** This field shows **only** for Coriolis meter types.
In-Use Meter Value	**Pulse Frequency / Main Rotor Frequency**	This **read-only** field shows the value of the indicated flow input configured on the Linear Meter – General.
	Sensing Rotor Frequency	This **read-only** field shows the value of the secondary flow input configured on the Linear Meter – General.
	Flowing Pressure	This **read-only** field shows the flowing pressure being used by the flow calculation. It will reflect the absolute pressure in the selected pressure units of the station.
	Flowing Temperature	This **read-only** field shows the flowing temperature being used by the flow calculation. It will reflect the temperature in the selected temperature units of the station.
Density	**Selected Base Density**	This **read-only** field shows the base density value currently used in calculations. The base density is the mass per unit volume of the fluid being measured at user entered base temperature and pressure in the selected density units of the station.
	Selected Relative Density	This **read-only** field shows the relative density, the ratio of the density of the fluid to the density of air at base temperature and pressure. Relative density is a unit-less value.

Field	Description	
	Selected Flowing Density	This **read-only** field shows the flowing density value currently used in calculations. The flowing density is the mass per unit volume of the fluid being measured at flowing temperature and pressure in the selected density units of the station.
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.	

4.10.4.2 Linear Meter Diagnostics – Calculation Alarms Tab

This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with the meter. Alarm codes are comprised of two parts: Alarm Category (the reason for the alarm) and Alarm Value (the part of the calculation that raised the alarm). For example, if you assign a voltage signal to a pressure input, **Invalid Input** would be selected in the **Alarm Category** frame and **Pressure** would be selected in the **Alarm Value** frame.

Note

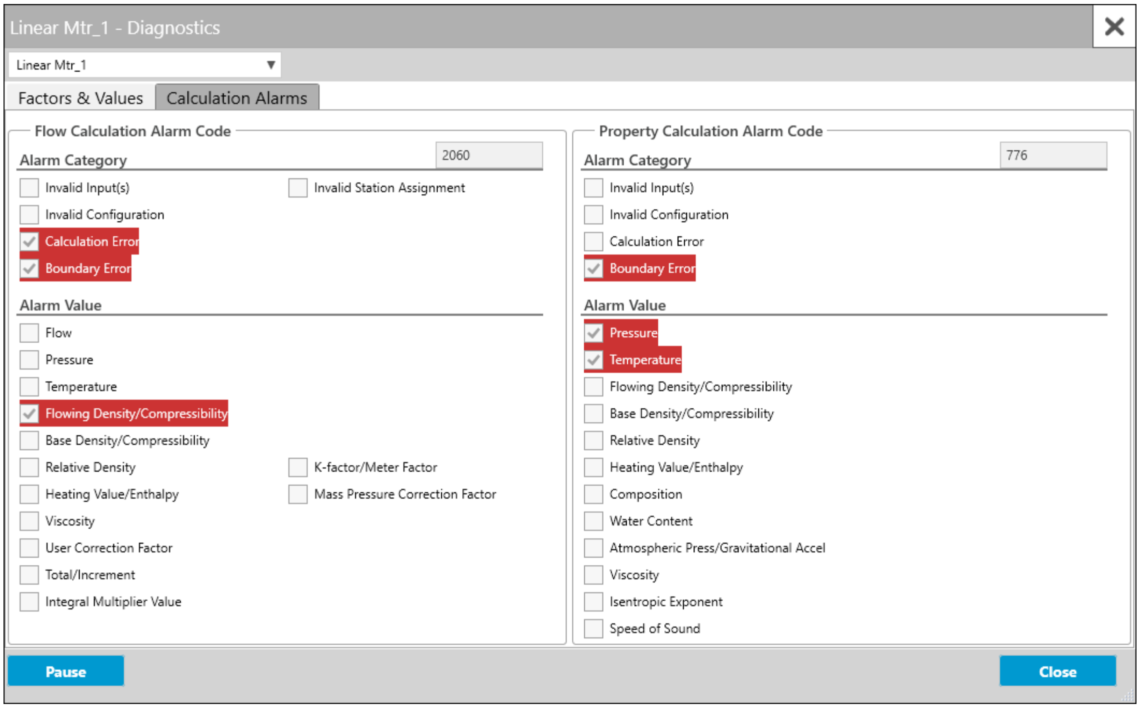
- The alarm code is a decimal representation of which alarm bits are set. Each bit is identified in the table below.
- The error code can be a composite of one or more errors.
- Error codes are generated according to your selection in the Calculation Failure Option field on the Station – Advanced.
- Alarms are raised if calculation inputs and interim values do not fall within certain ranges based on the calculation you have selected. To view the boundary limits for calculations, refer to Calculation Library Limit Checks.

To access this tab:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The Linear Meter Diagnostics pop-up display opens

4. Select the **Calculation Alarms** tab.

Figure 176. Linear Meter Diagnostics – Calculation Alarms Tab



Linear Mtr_1 - Diagnostics

Linear Mtr_1 ▼

Flow Calculation Alarm Code

Alarm Category 2060

☐ Invalid Input(s)
☐ Invalid Station Assignment
☐ Invalid Configuration
☑ Calculation Error
☑ Boundary Error

Alarm Value

☐ Flow
☐ Pressure
☐ Temperature
☑ Flowing Density/Compressibility
☐ Base Density/Compressibility
☐ Relative Density
☐ K-factor/Meter Factor
☐ Heating Value/Enthalpy
☐ Mass Pressure Correction Factor
☐ Viscosity
☐ User Correction Factor
☐ Total/Increment
☐ Integral Multiplier Value

Property Calculation Alarm Code

Alarm Category 776

☐ Invalid Input(s)
☐ Invalid Configuration
☐ Calculation Error
☑ Boundary Error

Alarm Value

☑ Pressure
☑ Temperature
☐ Flowing Density/Compressibility
☐ Base Density/Compressibility
☐ Relative Density
☐ Heating Value/Enthalpy
☐ Composition
☐ Water Content
☐ Atmospheric Press/Gravitational Accel
☐ Viscosity
☐ Isentropic Exponent
☐ Speed of Sound

5. Review the values in the following fields:

Field	Description	
Flow Calculation	These **read-only** fields show flow calculation alarm information.	
	Alarm Code	This **read-only** field shows a code that indicates whether the flow calculation is within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set. **Note** • This is the same alarm code shown in the Alarm report. • The Alarm Code may show **0** if Calculation Failure Option has been set to Alarm Disabled on the Station – Advanced.
	Alarm Category	These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:

Field	Description		
		Invalid Input(s) (Bit 0)	A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.
		Invalid Configuration (Bit 1)	Database or program corruption. **Note** If detected, this alarm is asserted even when calculation alarms are disabled.
		Calculation Error (Bit 2)	An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.
		Boundary Error (Bit 3)	Something exceeded stated boundary of the calculation standard.
		Invalid Station Assignment (Bit 4)	The meter type is not valid for the station type or station fluid type.
	Alarm Value	These read-only fields show, if checked, shows which part of the flow calculation is associated with the Alarm Category. • Flow (Bit 8) • Pressure (Bit 9) • Temperature (Bit 10) • Flowing Density/Compressibility (Bit 11) • Base Density/Compressibility (Bit 12) • Relative Density (Bit 13) • Heating Value/Enthalpy (Bit 14) • Viscosity (Bit 15) • User Correction Factor (Bit 16) • Total/Increment (Bit 17) • Integral Multiplier Value (Bit 18)	

Field	Description		
		• K-factor/Meter Factor (Bit 25) • Mass Pressure Correction Factor (Bit 26) **Note** A Total alarm can occur in the following situations: • A Fault Total object reference is incorrectly configured. For more information, refer to Linear Meter Rates & Totals – Fault Totals Tab. • An internal error has occurred while totalizing.	
Property Calculation	These **read-only** fields show property calculation alarm information.		
	Alarm Code	This **read-only** field shows a code that indicates whether the property calculations (density, compressibility, and heating value) are within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set. **Note** • This is the same alarm code shown in the Alarm report. • The Alarm Code may show **0** if Calculation Failure Option has been set to Alarm Disabled on the Station - Advanced tab.	
	Alarm Category	These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:	
		Invalid Input(s) (Bit 0)	A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.
		Invalid Configuration (Bit 1)	Database or program corruption. **Note** If detected, this alarm is asserted even when calculation alarms are disabled.

Field	Description		
		Calculation Error (Bit 2)	An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.
		Boundary Error (Bit3)	Something exceeded stated boundary of the calculation standard.
	Alarm Value	These **read-only** fields show, if checked, shows which part of the flow calculation is associated with the Alarm Category. • Pressure (Bit 8) • Temperature (Bit 9) • Flowing Density/Compressibility (Bit 10) • Base Density/Compressibility (Bit 11) • Relative Density (Bit 12) • Heating Value/Enthalpy (Bit 13) • Composition (Bit 14) • Water Content (Bit 15) • Atmospheric Press/Gravitational Accel (Bit 16) • Viscosity (Bit 17) • Isentropic Exponent (Bit 18) • Speed of Sound (Bit 19)	
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.		

4.10.5 Linear Meter Rates & Totals

Use this pop-up display to view **read-only** flow rates and accumulations and to manually configure fault totals for the selected linear meter.

Note

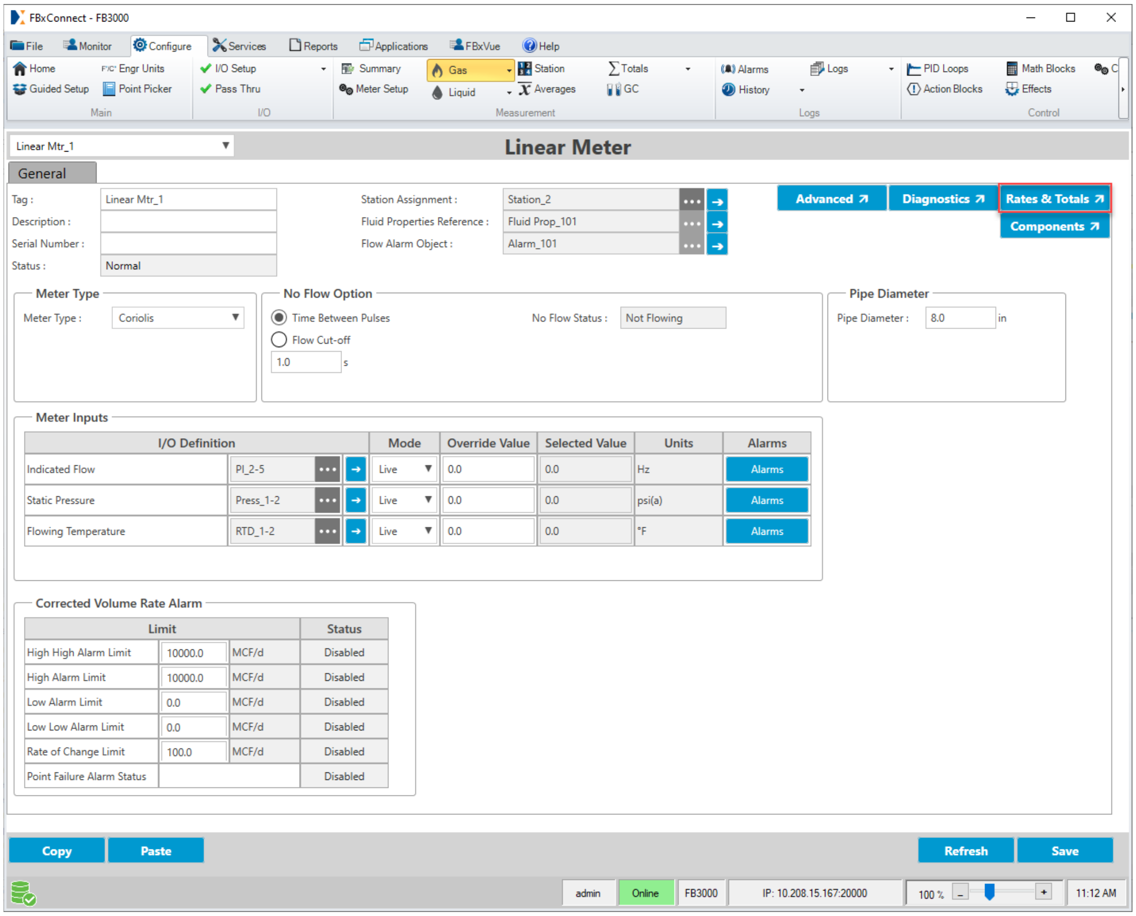
This pop-up can remain open while you change values on the other tabs of this display.

To access this pop-up display:

1. Select **Configure** > **Gas** > **Linear Meter** from the FBxConnect™ main menu.

2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 177. Linear Meter – Rates & Totals Button



Linear Mtr_1 ▼

Linear Meter

General

Tag : Linear Mtr_1
Description :
Serial Number :
Status : Normal

Station Assignment : Station_2
Fluid Properties Reference : Fluid Prop_101
Flow Alarm Object : Alarm_101

Meter Type
Meter Type : Coriolis ▼

No Flow Option
● Time Between Pulses
○ Flow Cut-off
1.0 s
No Flow Status : Not Flowing

Pipe Diameter
Pipe Diameter : 8.0 in

Meter Inputs

I/O Definition		Mode	Override Value	Selected Value	Units	Alarms
Indicated Flow	PI_2-5	Live ▼	0.0	0.0	Hz	Alarms
Static Pressure	Press_1-2	Live ▼	0.0	0.0	psi(a)	Alarms
Flowing Temperature	RTD_1-2	Live ▼	0.0	0.0	°F	Alarms

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	MCF/d	Disabled
High Alarm Limit	10000.0	MCF/d	Disabled
Low Alarm Limit	0.0	MCF/d	Disabled
Low Low Alarm Limit	0.0	MCF/d	Disabled
Rate of Change Limit	100.0	MCF/d	Disabled
Point Failure Alarm Status			Disabled

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 11:12 AM

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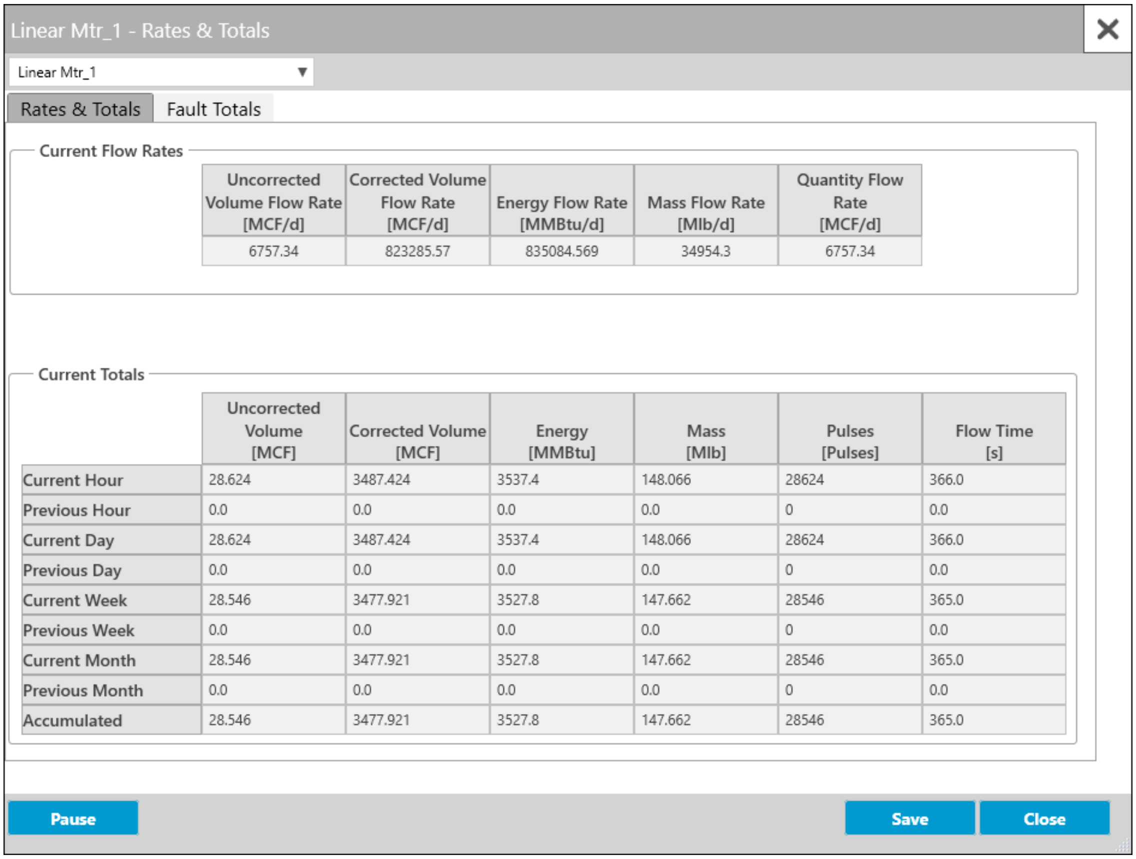
3. Select the **Rates & Totals** button. Linear Meter Rates & Totals pop-up display opens.



Current Flow Rates

Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy Flow Rate [MMBtu/d]	Mass Flow Rate [Mlb/d]	Quantity Flow Rate [MCF/d]
6757.34	823285.57	835084.569	34954.3	6757.34

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Pulses [Pulses]	Flow Time [s]
Current Hour	28.624	3487.424	3537.4	148.066	28624	366.0
Previous Hour	0.0	0.0	0.0	0.0	0	0.0
Current Day	28.624	3487.424	3537.4	148.066	28624	366.0
Previous Day	0.0	0.0	0.0	0.0	0	0.0
Current Week	28.546	3477.921	3527.8	147.662	28546	365.0
Previous Week	0.0	0.0	0.0	0.0	0	0.0
Current Month	28.546	3477.921	3527.8	147.662	28546	365.0
Previous Month	0.0	0.0	0.0	0.0	0	0.0
Accumulated	28.546	3477.921	3527.8	147.662	28546	365.0

Figure 178. Linear Meter Rates & Totals

The Linear Rates & Totals pop-up display contains the following tabs:

Rates & Totals – Use this tab to view **read-only** flow rates and accumulations for the selected linear meter.

Fault Totals – Use this tab to manually configure which Totals objects in the FB Series product database are used to store fault totals and view read-only fault total accumulations for the selected linear meter.

4.10.5.1 Linear Meter Rates & Totals – Rates & Totals Tab

Use this tab to view **read-only** flow rates and accumulations for the selected linear meter.

Note

This pop-up can remain open while you change values on the other tabs of this display.

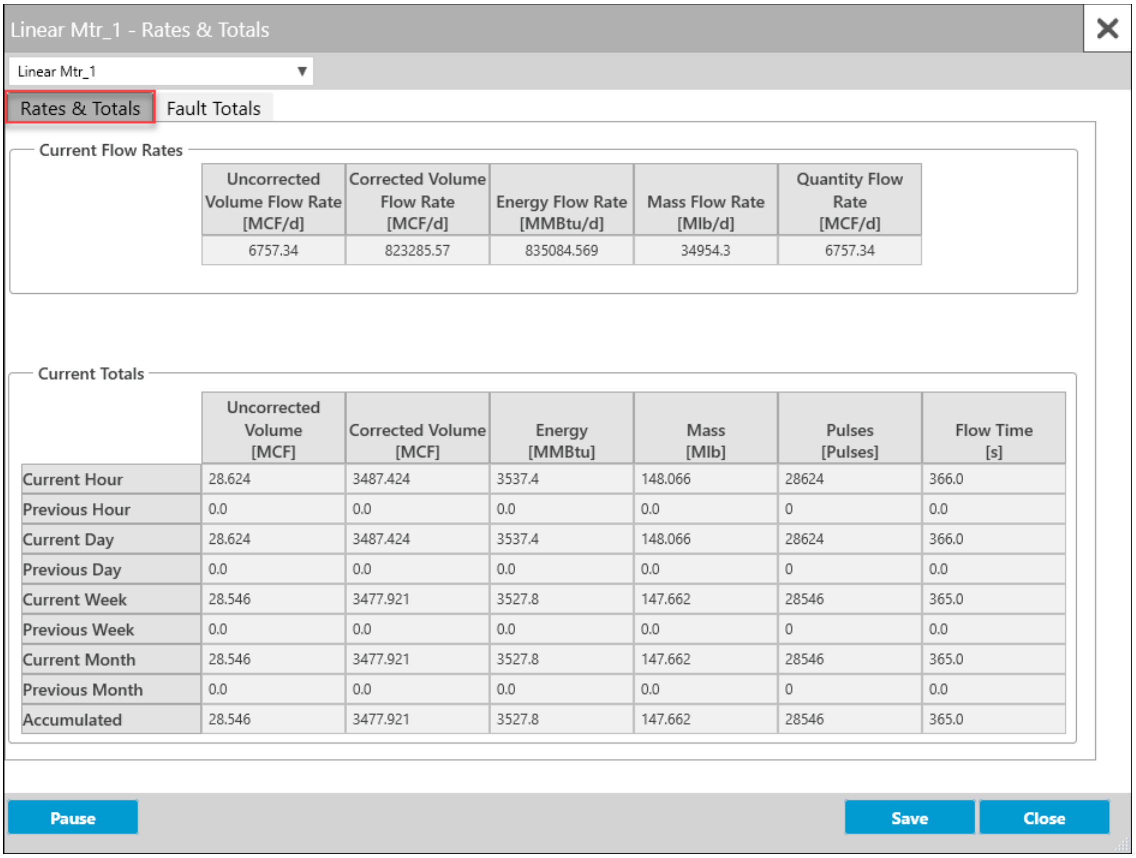
To access this tab:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.

2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

3. Select the **Rates & Totals** button. The Linear Meter Rates & Totals pop-up display opens showing the Rates & Totals tab.

Figure 179. Linear Meter Rates & Totals – Rates & Totals Tab



Current Flow Rates

Uncorrected Volume Flow Rate [MCF/d]	Corrected Volume Flow Rate [MCF/d]	Energy Flow Rate [MMBtu/d]	Mass Flow Rate [Mlb/d]	Quantity Flow Rate [MCF/d]
6757.34	823285.57	835084.569	34954.3	6757.34

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]	Pulses [Pulses]	Flow Time [s]
Current Hour	28.624	3487.424	3537.4	148.066	28624	366.0
Previous Hour	0.0	0.0	0.0	0.0	0	0.0
Current Day	28.624	3487.424	3537.4	148.066	28624	366.0
Previous Day	0.0	0.0	0.0	0.0	0	0.0
Current Week	28.546	3477.921	3527.8	147.662	28546	365.0
Previous Week	0.0	0.0	0.0	0.0	0	0.0
Current Month	28.546	3477.921	3527.8	147.662	28546	365.0
Previous Month	0.0	0.0	0.0	0.0	0	0.0
Accumulated	28.546	3477.921	3527.8	147.662	28546	365.0

4. Review the values in the following fields:

Field	Description
Current Flow Rates	These **read-only** fields show the current flow rates for the selected meter.
Current Totals	These **read-only** fields show the total accumulation, as well as the current and previous hourly, daily, weekly, and monthly accumulations for the selected meter.
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.

4.10.5.2 Linear Meter Rates & Totals – Fault Totals Tab

Use this tab to manually configure which Totals objects in the FB Series product database are used to store fault totals and view **read-only** fault total accumulations for the selected linear meter.

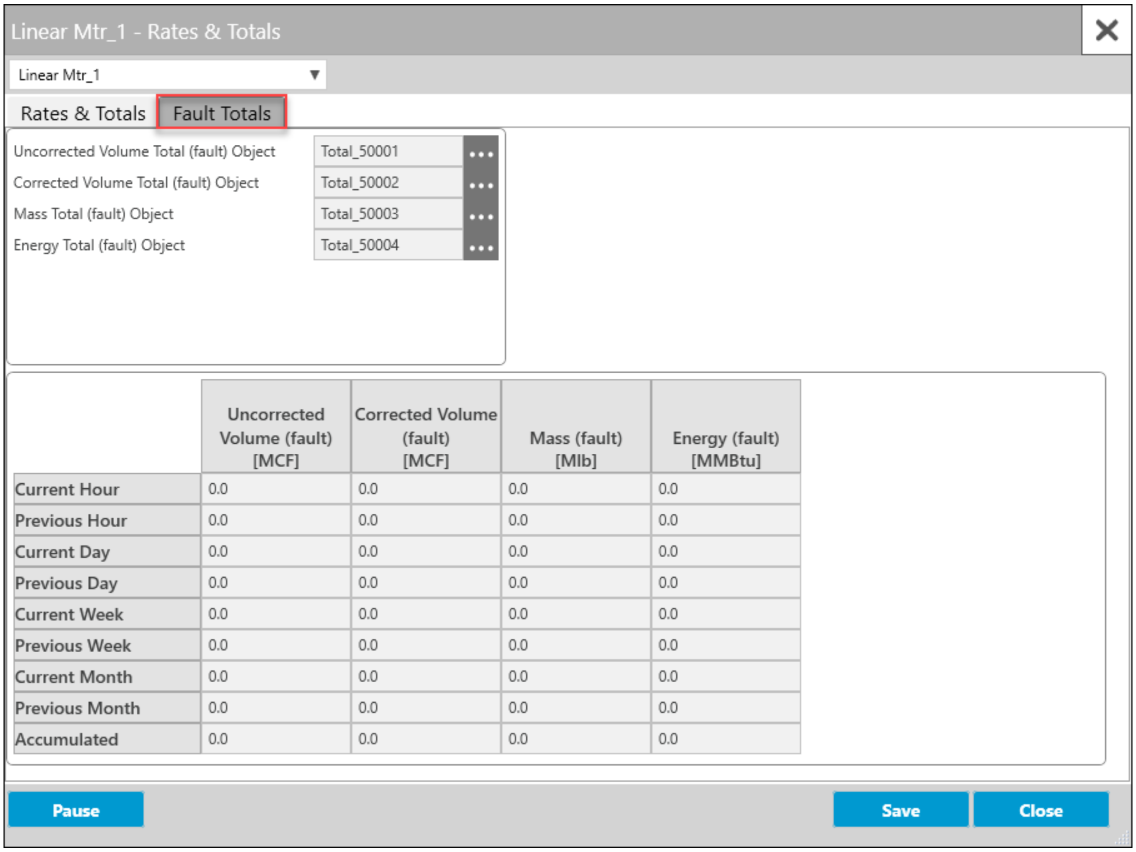
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- Fault totals are calculated when the system becomes unhealthy and can be used to determine how measurement quantities are affected by faults and alarms. To configure which faults and alarms cause the system to become unhealthy, refer to the **Fault Health Configuration** field on the Station – Advanced.
- You can automatically configure which Totals objects for fault totals by using the Totals Setup wizard.
- You **must** configure additional spare Totals objects in the FB Series product database before manually configuring fault totals. For more information, refer to the **Number of Spare Totals** field on the Meter Setup display.

To access this tab:

1. Select **Configure > Gas > Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Rates & Totals** button. The Linear Meter Rates & Totals pop-up display opens.
4. Select the **Fault Totals** tab.

Figure 180. Linear Meter Rates & Totals – Fault Totals Tab



Uncorrected Volume Total (fault) Object: Total_50001
Corrected Volume Total (fault) Object: Total_50002
Mass Total (fault) Object: Total_50003
Energy Total (fault) Object: Total_50004

	Uncorrected Volume (fault) [MCF]	Corrected Volume (fault) [MCF]	Mass (fault) [Mlb]	Energy (fault) [MMBtu]
Current Hour	0.0	0.0	0.0	0.0
Previous Hour	0.0	0.0	0.0	0.0
Current Day	0.0	0.0	0.0	0.0
Previous Day	0.0	0.0	0.0	0.0
Current Week	0.0	0.0	0.0	0.0
Previous Week	0.0	0.0	0.0	0.0
Current Month	0.0	0.0	0.0	0.0
Previous Month	0.0	0.0	0.0	0.0
Accumulated	0.0	0.0	0.0	0.0

5. Review the values in the following fields:

Field	Description
Uncorrected Volume Total (fault) Object	Click ••• to open a Point Picker dialog and select a Totals object from the FB Series product database to use for uncorrected volume fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.

Field	Description
Corrected Volume Total (fault) Object	Click ••• to open a Point Picker dialog and select a Totals object from the FB Series product database to use for corrected volume fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.
Mass Total (fault) Object	Click ••• to open a Point Picker dialog and select a Totals object from the FB Series product database to use for mass fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.
Energy Total (fault) Object	Click ••• to open a Point Picker dialog and select a Totals object from the FB Series product database to use for energy fault totals. **Note** • Advanced users may select their own totals objects, but you **must** ensure you select a spare total (Total_5000x). • If you select a normal total that is already used elsewhere, a total increment alarm is raised at the meter and the normal total increments when a fault condition occurs. • If a fault total is Undefined, the normal total increments when a fault condition occurs.
Current Flow Rates	These **read-only** fields show the current flow rates for the selected meter.

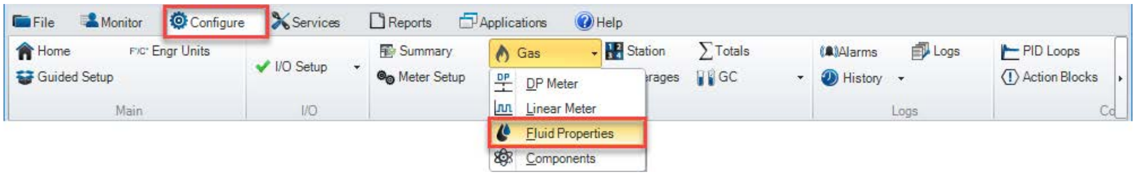
Field	Description
Current Totals	These **read-only** fields show the total accumulation, as well as the current and previous hourly, daily, weekly, and monthly accumulations for the selected meter.
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.

4.11 Fluid Properties

Use this display to define the physical properties of the fluid flowing through each meter.

To access this display, select **Configure > Gas > Fluid Properties**.

Figure 181. Configure – Fluid Properties



The Fluid Properties display contains the following items:

General – Use this display to configure general fluid properties, including relative density, base density, and heating value of the fluid being measured.

Advanced – Use this pop-up display to configure advanced fluid properties, including water content, compressibility, and viscosity of the fluid being measured.

Components – Use this pop-up display to view the currently configured components for each meter.

4.11.1 Fluid Properties – General

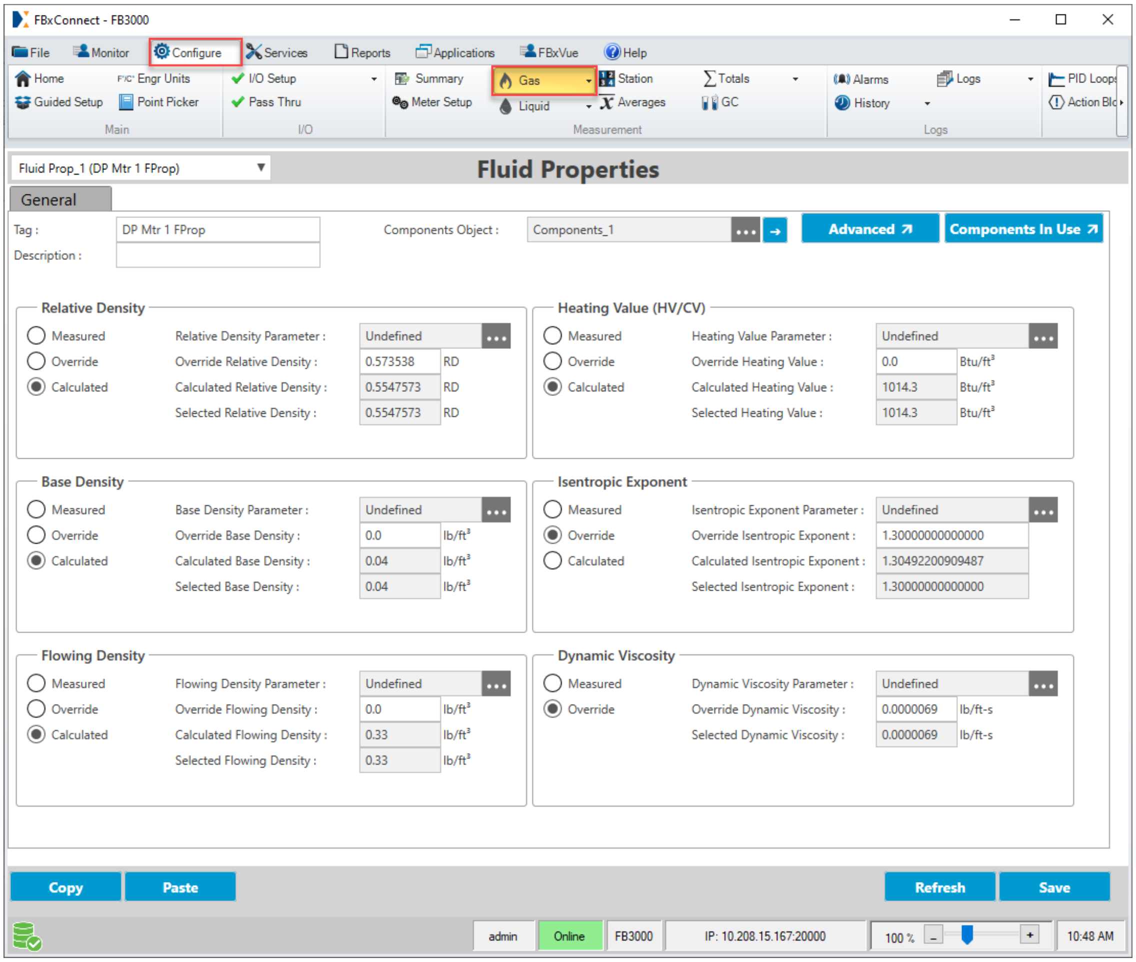
Use this display to configure general fluid properties, including relative density, base density, and heating value of the fluid being measured.

To access this display:

1. Select **Configure > Gas > Fluid Properties** from the FBxConnect™ main menu. The Fluid Properties display opens.

2. Click ▼ in the drop-down list and select a Fluid Properties instance to configure.

Figure 182. Fluid Properties – General



Fluid Prop_1 (DP Mtr 1 FProp) ▼

Fluid Properties

General

Tag : DP Mtr 1 FProp

Description :

Components Object : Components_1

Relative Density

○ Measured
○ Override
● Calculated

Relative Density Parameter : Undefined
Override Relative Density : 0.573538 RD
Calculated Relative Density : 0.5547573 RD
Selected Relative Density : 0.5547573 RD

Heating Value (HV/CV)

○ Measured
○ Override
● Calculated

Heating Value Parameter : Undefined
Override Heating Value : 0.0 Btu/ft^3
Calculated Heating Value : 1014.3 Btu/ft^3
Selected Heating Value : 1014.3 Btu/ft^3

Base Density

○ Measured
○ Override
● Calculated

Base Density Parameter : Undefined
Override Base Density : 0.0 lb/ft^3
Calculated Base Density : 0.04 lb/ft^3
Selected Base Density : 0.04 lb/ft^3

Isentropic Exponent

○ Measured
● Override
○ Calculated

Isentropic Exponent Parameter : Undefined
Override Isentropic Exponent : 1.30000000000000
Calculated Isentropic Exponent : 1.30492200909487
Selected Isentropic Exponent : 1.30000000000000

Flowing Density

○ Measured
○ Override
● Calculated

Flowing Density Parameter : Undefined
Override Flowing Density : 0.0 lb/ft^3
Calculated Flowing Density : 0.33 lb/ft^3
Selected Flowing Density : 0.33 lb/ft^3

Dynamic Viscosity

○ Measured
● Override

Dynamic Viscosity Parameter : Undefined
Override Dynamic Viscosity : 0.0000069 lb/ft-s
Selected Dynamic Viscosity : 0.0000069 lb/ft-s

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.
Components Object	Click ••• to open a [Point Picker]() dialog and select the components instance parameter associated with the selected fluid properties instance.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">Select → to open the Components display and configure the operation mode, normalization option, and mole percentage of each fluid component flowing through the meter.</td></tr>
<tr><td>Advanced</td><td colspan="2">Click this button to open the Fluid Properties – Advanced pop-up display and configure advanced fluid properties, including water content, compressibility, and viscosity of the fluid being measured.</td></tr>
<tr><td>Components In Use</td><td colspan="2">Click this button to open the Fluid Properties – Components In Use pop-up display and view read-only in-use values for the currently configured components.</td></tr>
<tr><td>Relative Density</td><td colspan="2">Sets how the system acquires the real relative density (specific gravity) value, which is the ratio of the density of the flowing gas to the density of the reference gas. Possible options are:</td></tr>
<tr><td></td><td>Measured</td><td>The system acquires the real relative density value from a gas chromatograph input you configure in the Relative Density Parameter field.
Note
• For the most accurate measurement of flow and fluid properties the measured relative density parameter must match the Base Temperature Selection and Base Pressure Selection fields on the Station – General display.
• You must also define a gas chromatograph input in the Relative Density Parameter field.
• If the compressibility calculation is dependent on the relative density, the calculation updates every time the input changes. If the input is an analog input, the threshold before the calculation updates is 0.05%.</td></tr>
<tr><td></td><td>Override</td><td>The system uses a value you define in the Override Relative Density field.</td></tr>
<tr><td></td><td>Calculated</td><td>The system calculates the relative density value.</td></tr>
<tr><td>Relative Density Parameter</td><td colspan="2">Click … to open a Point Picker dialog and select a parameter to acquire the real relative density value.</td></tr>
</table>

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>**Override Relative Density**</td><td colspan="2">Sets a value to use for the relative density in calculations when **Override** is selected in the **Relative Density** field.
Note
If the compressibility calculation is dependent on the relative density, the value you enter must **match** the reference conditions expected by the **Compressibility / Density Calculation** option you select. For more information, refer to the Station – General display.</td></tr>
<tr><td>**Calculated Relative Density**</td><td colspan="2">This **read-only** field shows the relative density value as calculated by the system.</td></tr>
<tr><td>**Selected Relative Density**</td><td colspan="2">This **read-only** field shows the current relative density value, based on the selected options, used in calculations.</td></tr>
<tr><td rowspan="4">**Base Density**</td><td colspan="2">Sets how the system acquires the real base density value. Possible options are:</td></tr>
<tr><td>**Measured**</td><td>The system uses a parameter you configure in the **Base Density Parameter** field to acquire the real base density value.
Note
For the most accurate measurement of flow and fluid properties the measured base density parameter **must** match the **Base Temperature Selection** and **Base Pressure Selection** fields on the Station – General display.</td></tr>
<tr><td>**Override**</td><td>The system uses a value you define in the **Override Base Density** field.</td></tr>
<tr><td>**Calculated**</td><td>The system calculates the base density value.</td></tr>
<tr><td>**Base Density Parameter**</td><td colspan="2">Click ••• to open a Point Picker dialog and select a parameter to acquire the real base density value.</td></tr>
<tr><td>**Override Base Density**</td><td colspan="2">Sets a value to use for the base density in calculations when **Override** is selected in the **Base Density** field.</td></tr>
<tr><td>**Calculated Base Density**</td><td colspan="2">This **read-only** field shows the base density value as calculated by the system.</td></tr>
</table>

Field	**Description**	
Selected Base Density	This **read-only** field shows the current base density value, based on the selected options, used in calculations.	
Flowing Density	Sets how the system acquires the flowing density value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Flowing Density Parameter** field to acquire the flowing density value.
	Override	The system uses a value you define in the **Override Flowing Density** field.
	Calculated	The system calculates the flowing density value.
Flowing Density Parameter	Click ··· to open a Point Picker dialog and select a parameter to acquire the flowing density value.	
Override Flowing Density	Sets a value to use for the flowing density in calculations when Override is selected in the Flowing Density field.	
Calculated Flowing Density	This **read-only** field shows the flowing density value as calculated by the system.	
Selected Flowing Density	This **read-only** field shows the current flowing density value, based on the selected options, used in calculations.	
Heating Value (HV/CV)	Sets how the system acquires the heating value of the measured fluid at base conditions. When the Heating value basis is volume, this value represents the real heating value, rather than the ideal heating value. When the heating value basis is mass, this value represents the mass heating value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Heating Value Parameter** field to acquire the heating value. **Note** • The measured heating value parameter **must** match the **Heating Value Measurement Basis**. For the most accurate measurement of flow & fluid properties the measured heating value parameter should match the **Base Temperature Selection**,

Field	Description	
		Base Pressure Selection , and **Heating Value Combustion Temperature** fields on the [Station – General]() display. - If the compressibility calculation is dependent on the heating value, the measured heating value **must** be gross / superior volumetric heating value. The compressibility calculation updates every time the input changes. If the input is an analog input, the threshold before the calculation updates is 0.05%. - Negative or invalid heating values are rejected, and the calculation uses a heating value of 0.
	Override	The system uses the value you define in the **Override Heating Value** field to calculate the energy flow rates, regardless of the selected station heating value calculation standard. **Note** - You **must** enter a value in the **Override Heating Value** field. - If the compressibility calculation is dependent upon the heating value, the override **must** be the override gross / superior heating value. - The value entered **must** match the reference conditions expected by the compressibility calculation you select in the **Compressibility/Density Calculation** field on the Station – General display.
	Calculated	The system calculates the heating value based on your selection in the **Heating Value Calc Standard** field on the Station – General display.
Heating Value Parameter	Click ••• to open a Point Picker dialog and select a parameter used to acquire the heating value.	
Override Heating Value	Sets the heating value used in calculations when **Override** is selected in the **Heating Value (HV/CV)** field.	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Calculated Heating Value</td><td colspan="2">This read-only field shows the heating value as calculated by the system.</td></tr>
<tr><td>Selected Heating Value</td><td colspan="2">This read-only field shows the current heating value, based on the selected options, used in energy calculations. If the compressibility calculation is dependent on the heating value, the value used by the calculation is shown in Compressibility Heating Value field on the DP Meter – Diagnostics display or the Linear Meter – Diagnostics display.</td></tr>
<tr><td rowspan="5">Isentropic Exponent</td><td colspan="2">Sets how the system acquires the isentropic exponent. Possible options are:</td></tr>
<tr><td>Measured</td><td>The system uses a parameter you configure in the Isentropic Exponent Parameter field to acquire the isentropic exponent.</td></tr>
<tr><td>Override</td><td>The system uses a value you define in the Override Isentropic Exponent field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the isentropic exponent at flowing conditions.
Note
You must select AGA8 1994 Detailed or ISO 12213-2 2009 in the Compressibility/Density Calculation field on the Station – General display in order for the system to calculate the Isentropic Exponent.</td></tr>
<tr><td colspan="2">Note
It is often accepted practice to use the specific heat ratio (Cp/Cv = ratio of specific heat at constant pressure to the specific heat at constant volume) in place of the isentropic exponent, as in many applications they are nearly identical. To enter a specific heat ratio, set the isentropic exponent mode to Override and enter the specific heat ratio value in the Override Isentropic Exponent field.</td></tr>
<tr><td>Isentropic Exponent Parameter</td><td colspan="2">Click ... to open a Point Picker dialog and select a parameter used to acquire the isentropic exponent.</td></tr>
</table>

Field	Description
Override Isentropic Exponent	Sets the isentropic exponent used in calculations when **Override** is selected in the **Isentropic Exponent** field. **Note** This field appears **only** for differential pressure meters.
Calculated Isentropic Exponent	This **read-only** field shows the isentropic exponent as calculated by the system. **Note** This field appears **only** for differential pressure meters.
Selected Isentropic Exponent	This **read-only** field shows the current isentropic exponent value, based on the selected options, used in calculations. **Note** This field appears **only** for differential pressure meters.
Dynamic Vicosity	Sets how the system acquires the dynamic viscosity. Possible options are: **Measured** The system uses a parameter you configure in the **Dynamic Viscosity Parameter** field to acquire the dynamic viscosity. **Override** The system uses a value you define in the **Override Dyanamic Viscosity** field.
Dynamic Viscosity Parameter	Click ••• to open a Point Picker dialog and select a parameter used to acquire the dynamic viscosity.
Override Dynamic Viscosity	Sets the dynamic viscosity used in calculations when **Override** is selected in the **Dynamic Viscosity** field.
Selected Dynamic Viscosity	This **read-only** field shows the current dynamic viscosity value, based on the selected options, used in calculations.

4. Select **Save** to save any changes you make to this display.

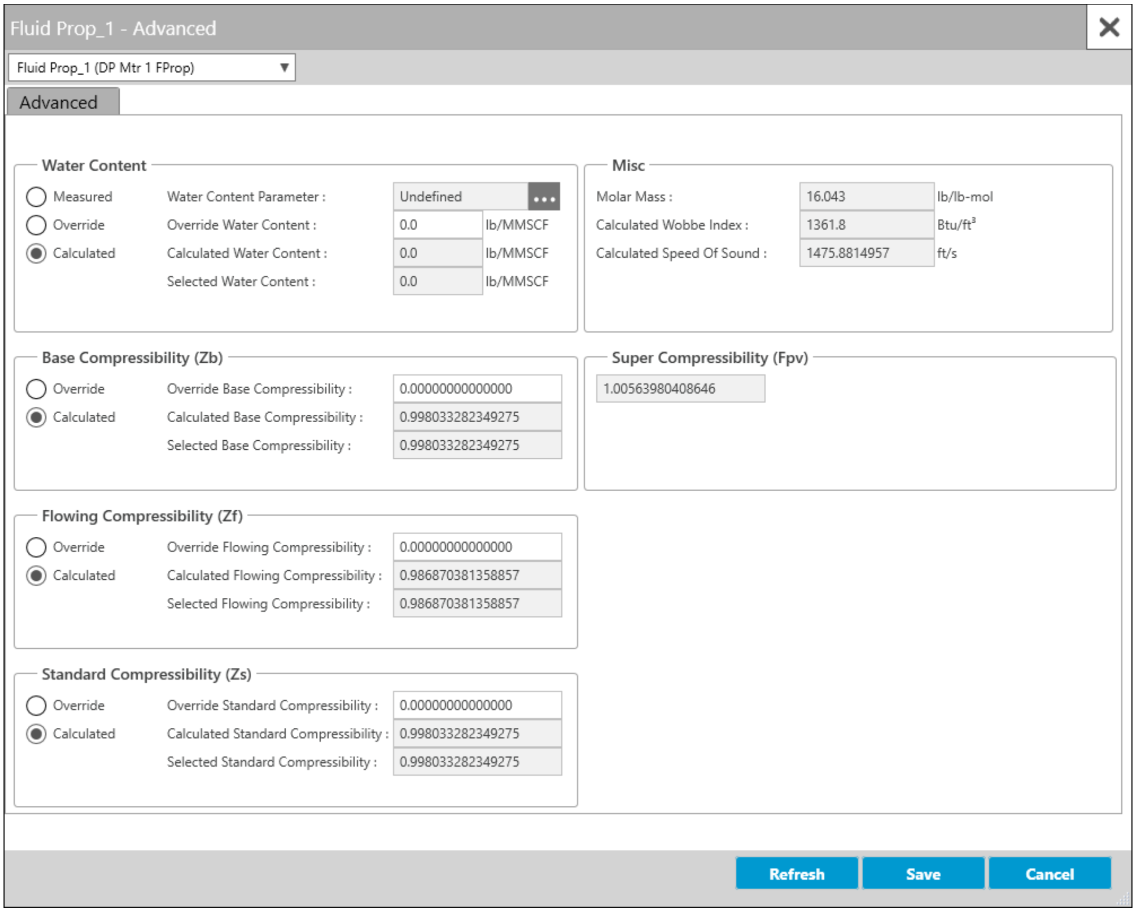
4.11.2 Fluid Properties – Advanced

Use this display to configure advanced fluid properties, including water content, compressibility, and viscosity of the fluid being measured.

To access this display:

1. Select **Configure > Gas > Fluid Properties** from the FBxConnect™ main menu. The Fluid Properties display opens showing the General tab.
2. Click ▼ in the drop-down list and select a fluid properties instance to configure.
3. Select the **Advanced** button. The Fluid Properties – Advanced pop-up display opens.

Figure 183. Fluid Properties – Advanced



Fluid Prop_1 - Advanced

Fluid Prop_1 (DP Mtr 1 FProp)

Advanced

Water Content
○ Measured
○ Override
● Calculated
Water Content Parameter : Undefined
Override Water Content : 0.0 lb/MMSCF
Calculated Water Content : 0.0 lb/MMSCF
Selected Water Content : 0.0 lb/MMSCF

Misc
Molar Mass : 16.043 lb/lb-mol
Calculated Wobbe Index : 1361.8 Btu/ft^3
Calculated Speed Of Sound : 1475.8814957 ft/s

Base Compressibility (Zb)
○ Override
● Calculated
Override Base Compressibility : 0.00000000000000
Calculated Base Compressibility : 0.998033282349275
Selected Base Compressibility : 0.998033282349275

Super Compressibility (Fpv)
1.00563980408646

Flowing Compressibility (Zf)
○ Override
● Calculated
Override Flowing Compressibility : 0.00000000000000
Calculated Flowing Compressibility : 0.986870381358857
Selected Flowing Compressibility : 0.986870381358857

Standard Compressibility (Zs)
○ Override
● Calculated
Override Standard Compressibility : 0.00000000000000
Calculated Standard Compressibility : 0.998033282349275
Selected Standard Compressibility : 0.998033282349275

4. Review – and change as necessary – the values in the following fields:

Field	Description
Water Content	Sets how the system acquires the water content value used in calculations. Possible options are:

Field	Description	
	Measured	The system acquires the water content value from the parameter you configure in the **Water Content Parameter** field. **Note** Measured Water Content is read every calculation cycle, but is only used to adjust gas composition if all of the following conditions are met. • The **Water Content Basis** field is set to **Saturated at Base Conditions**. • The **Water Adjustment Option** field is set to **Adjust Composition**. • The gas composition is updated. The gas composition is updated in the following circumstances: • The **Operation Mode** field on the Components – General display is set to **Override**, and you select the **Apply Override Values** on the Components – Component display. • The **Operation Mode** field on the Components – General display is set to **Measured**, and a new valid gas composition is received from a GC. • The **Operation Mode** field on the Components – General display is set to **Remote Download**, and the **Apply Override Values** parameter is set to **Accept Composition** (see protocol manual).
	Override	The system uses a value you define in the **Override Water Content** field.
	Calculated	Selected water content is calculated from the configured method.
Water Content Parameter	Click … to open a Point Picker dialog and select a parameter used to acquire the water content value.	
Override Water Content	Sets a value to use for the water content in calculations when Override is selected in the Water Content field.	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Calculated Water Content</td><td colspan="2">This read-only field shows the current water content value as calculated by the system.</td></tr>
<tr><td>Selected Water Content</td><td colspan="2">This read-only field shows the current water content value used in calculations based on the selected options.</td></tr>
<tr><td rowspan="3">Base Compressibility (Zb)</td><td colspan="2">Sets how the system acquires the base compressibility value used in calculations. Possible options are:</td></tr>
<tr><td>Override</td><td>The system uses a value you define in the Override Base Compressibility field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the base compressibility value.</td></tr>
<tr><td>Override Base Compressibility</td><td colspan="2">Sets a value to use for the base compressibility in calculations when Override is selected in the Base Compressibility field.</td></tr>
<tr><td>Calculated Base Compressibility</td><td colspan="2">This read-only field shows the current base compressibility value as calculated by the system.</td></tr>
<tr><td>Selected Base Compressibility</td><td colspan="2">This read-only field shows the current base density value used in calculations based on the selected options.</td></tr>
<tr><td rowspan="3">Flowing Compressibility (Zf)</td><td colspan="2">Sets how the system acquires the flowing compressibility value used in calculations. Possible options are:</td></tr>
<tr><td>Override</td><td>The system uses a value you define in the Override Flowing Compressibility field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the flowing compressibility value.</td></tr>
<tr><td>Override Flowing Compressibility</td><td colspan="2">Sets a value to use for the flowing compressibility in calculations when Override is selected in the Flowing Compressibility field.</td></tr>
<tr><td>Calculated Flowing Compressibility</td><td colspan="2">This read-only field shows the current flowing compressibility value as calculated by the system.</td></tr>
<tr><td>Selected Flowing Compressibility</td><td colspan="2">This read-only field shows the current flowing compressibility value used in calculations based on the selected options.</td></tr>
<tr><td rowspan="2">Standard Compressibility (Zs)</td><td colspan="2">Sets how the system acquires the standard compressibility value used in calculations. Possible options are:</td></tr>
<tr><td>Override</td><td>The system uses a value you define in the Override Standard Compressibility field.</td></tr>
</table>

Field	Description
	Calculated The system calculates the standard compressibility value.
Override Standard Compressibility	Sets a value to use for the standard compressibility in calculations when **Override** is selected in the **Standard Compressibility** field.
Calculated Standard Compressibility	This **read-only** field shows the standard compressibility as calculated by the system.
Selected Standard Compressibility	This **read-only** field shows the current standard compressibility value used in calculations based on the selected options.
Molar Mass	This **read-only** field shows the average molar mass of the fluid. Units are based on selected density units for the station (e.g. density units selection of lb/ft3 would display molar mass in units of lb/lb-mol).
Calculated Wobbe Index	This **read-only** field shows the Wobbe Index of the fluid as calculated by the system. The Wobbe Index is the BTU per cubic foot divided by the square root of the specific gravity.
Calculated Speed Of Sound	This **read-only** field shows the result of the speed of sound calculation. The system calculates speed of sound in the fluid in feet per second or meter per second based on the Pressure, Temperature, and Gas Composition. **Note** • You **must** select **AGA8 1994 Detailed**, **AGA8 2017 Part 1 Detailed**, **AGA8 Part 2 2017 / GERG 2008**, or **ISO 12213-2 2009** in the **Compressibility/Density Calculation** field on the Station – General display in order for the system to calculate the speed of sound. • If you select **AGA8 1994 Detailed** or **ISO 12213-2 2009**, then the system uses the **AGA10** standard to calculate the speed of sound. • If you select **AGA8 2017 Part 1 Detailed** or **AGA8 2017 Part 2 / GERG 2008**, then the system uses the selected standard to calculate the speed of sound.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Super Compressibility (Fpv)</td><td>This read-only field shows a correction factor used in certain compressibility calculations, such as NX-19 1962. For calculations without it, the factor is calculated as the square root of the ratio of base compressibility to flowing compressibility (per AGA3 1985).</td></tr>
<tr><td>Joule-Thomson</td><td>Sets how the system acquires the Joule-Thomson coefficient. Possible options are:
<table>
<tr><td>Override</td><td>The system uses a value you define in the Override Joule-Thomson field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the Joule-Thomson coefficient at flowing conditions.</td></tr>
</table>
Note
• This field appears only for differential pressure meters if you select Isenthalpic (Joule-Thomson) in the Temperature Correction field on the DP Meter – Advanced display.
• If you select AGA 8 Part 1 2017 Detailed or AGA 8 Part 2 2017 / GERG 2008 in the Compressibility/Density Calculation field on the Station – General display, then the Joule-Thomson coefficient is calculated by the selected standard.
• For all other Compressibility/Density Calculation selections, it is calculated by ISO 9464.</td></tr>
<tr><td>Override Joule-Thomson</td><td>Sets the Joule-Thomson coefficient used in calculations when Override is selected in the Joule-Thomson field.
Note
This field appears only for differential pressure meters if you select Isenthalpic (Joule-Thomson) in the Temperature Correction field on the DP Meter – Advanced display.</td></tr>
<tr><td>Calculated Joule-Thomson</td><td>This read-only field shows the Joule-Thomson coefficient as calculated by the system.
Note
This field appears only for differential pressure meters if you select Isenthalpic (Joule-Thomson) in the Temperature Correction field on the DP Meter – Advanced display.</td></tr>
</table>

Field	Description
Selected Joule-Thomson	This **read-only** field shows the current Joule-Thomson coefficient value, based on the selected options, used in calculations. **Note** This field appears **only** for differential pressure meters if you select **Isenthalpic (Joule-Thomson)** in the **Temperature Correction** field on the DP Meter – Advanced display.

5. Select **Save** to save any changes you make to this tab.

4.11.3 Fluid Properties – Components

Use this display to view **read-only** in-use values for the currently configured components for each meter.

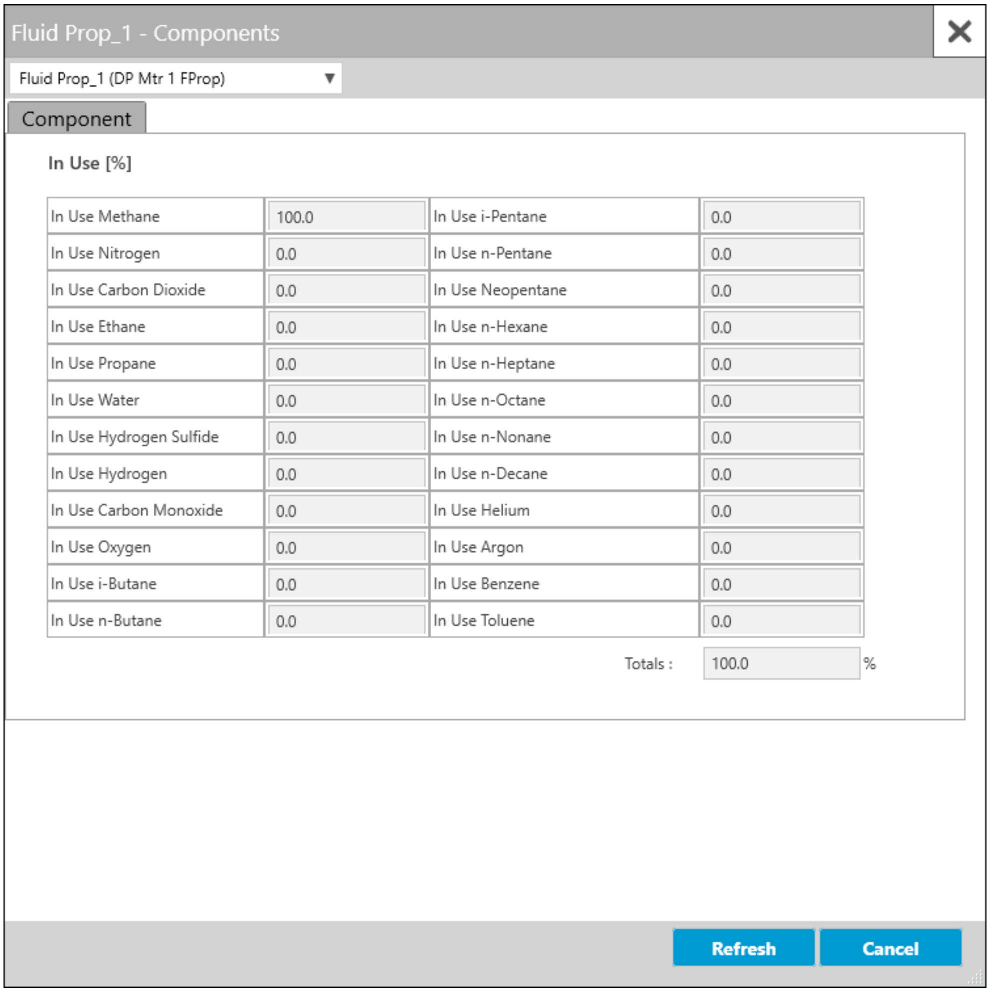
Note

- The in-use values are adjusted according to your selections in the **Water Content Basis** and **Water Adjustment Option** fields on the Station – Advanced display.
- You configure the components of the fluid being measure on the Components display.

To access this display:

1. Select **Configure > Gas > Fluid Properties** from the FBxConnect™ main menu. The Fluid Properties display opens showing the General tab.
2. Click ▼ in the drop-down list and select an instance to view the configured components.
3. Select the **Components In Use** button. The Fluid Properties – Components pop-up display opens.

Figure 184. Fluid Properties – Components



In Use [%]

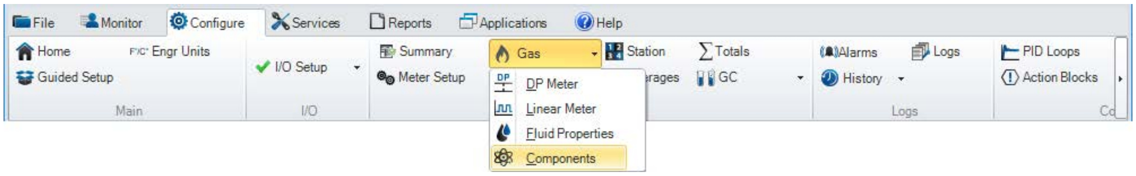
In Use Methane	100.0	In Use i-Pentane	0.0
In Use Nitrogen	0.0	In Use n-Pentane	0.0
In Use Carbon Dioxide	0.0	In Use Neopentane	0.0
In Use Ethane	0.0	In Use n-Hexane	0.0
In Use Propane	0.0	In Use n-Heptane	0.0
In Use Water	0.0	In Use n-Octane	0.0
In Use Hydrogen Sulfide	0.0	In Use n-Nonane	0.0
In Use Hydrogen	0.0	In Use n-Decane	0.0
In Use Carbon Monoxide	0.0	In Use Helium	0.0
In Use Oxygen	0.0	In Use Argon	0.0
In Use i-Butane	0.0	In Use Benzene	0.0
In Use n-Butane	0.0	In Use Toluene	0.0

Totals : 100.0 %

4.12 Component

Use this display to configure how the system calculates fluid composition and the different components of the fluid flowing through the meter.

Figure 185. Configure – Components



The Component display contains the following items:

General – Use this display to configure how the system calculates fluid composition.

Components – Use this pop-up display to set the mole percent of each fluid component present in the meter.

Component Import Export – Use this button to import a new gas composition from a CSV file or export the current gas composition to a CSV file.

Apply Override Values – Use this button to manually override the in-use gas composition.

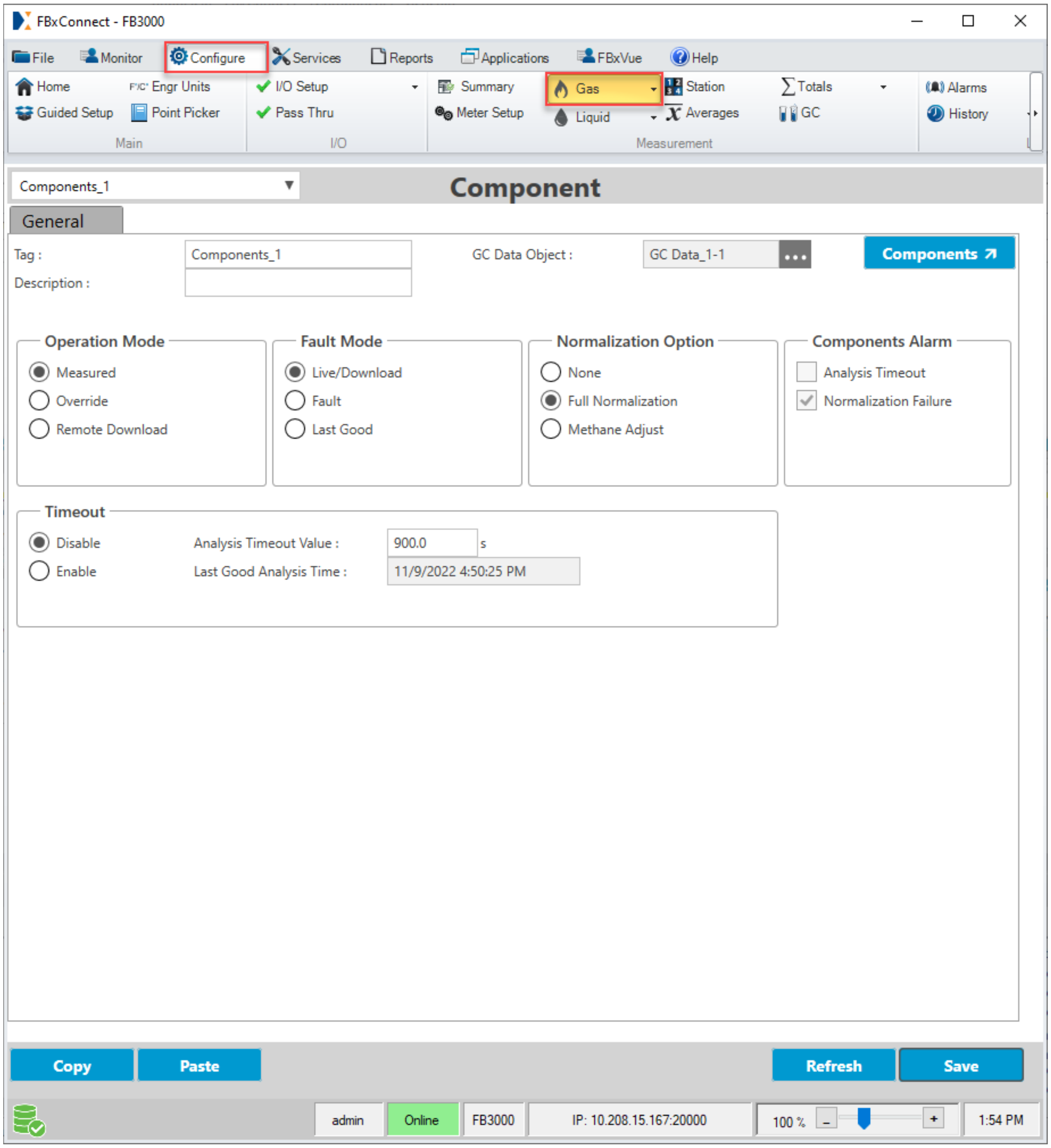
4.12.1 Component – General

Use this display to configure how the system calculates fluid composition.

To access this display:

1. Select **Configure > Gas > Components** from the FBxConnect™ main menu. The Components display opens.
2. Click ▼ in the drop-down list at the top of the display and select a Components instance to configure.

Figure 186. Component – General



Components_1

Tag : Components_1

Description :

GC Data Object : GC Data_1-1

Operation Mode
● Measured
○ Override
○ Remote Download

Fault Mode
● Live/Download
○ Fault
○ Last Good

Normalization Option
○ None
● Full Normalization
○ Methane Adjust

Components Alarm
☐ Analysis Timeout
☑ Normalization Failure

Timeout
● Disable
○ Enable

Analysis Timeout Value : 900.0 s

Last Good Analysis Time : 11/9/2022 4:50:25 PM

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>GC Data Object</td><td colspan="2">Click … to open a Point Picker dialog and select a parameter used to acquire the gas chromatograph data.</td></tr>
<tr><td>Components</td><td colspan="2">Click this button to open the Component – Components pop-up display and set the mole percent of each fluid component present in the meter.</td></tr>
<tr><td>Operation Mode</td><td colspan="2">Sets how the system acquires the component information. Possible options are:</td></tr>
<tr><td></td><td>Measured</td><td>Selected composition is obtained from a gas chromatograph and shown in the Live Value fields on the Component – Components display. If an analysis timeout alarm occurs, the selected composition updates according to the fault mode. The analysis timeout alarm resets on a system restart or on the receipt of a new measured gas composition that satisfies the gas chromatograph alarm/range checks (see Gas Chromatograph – Configuration Tab).</td></tr>
<tr><td></td><td>Override</td><td>Selected composition is obtained from the Override values you enter on the Component – Components display, even when a timeout alarm is active. Use of the Apply Override Values button, changes to the Override values, and changes resulting from normalization are logged to the event log. The analysis timeout alarm resets on a system restart or whenever you select the Apply Override Values button.</td></tr>
</table>

Field	Description	
	Remote Download	Selected composition is obtained from the Override values downloaded from a SCADA host or other remote master. Changes to Override values are not logged to the event log. If an analysis timeout alarm occurs, the selected composition updates according to the fault mode. The analysis timeout alarm resets on a system restart or whenever you select the **Apply Override Values** button. **Note** Whenever the operation mode changes, the analysis timeout timer restarts and the current selected values are copied to the last good composition.
Fault Mode	Sets how the system responds if the Operation Mode field is set to **Measured** or **Remote Download** and an analysis timeout occurs. A measured analysis timeout may be due to a communications failure with the gas chromatograph or a failure of the returned data to pass the validity test. A remote download timeout occurs if the time since the last composition accepted exceeds the timeout limit. **Note** This field is **read-only** if you select **Override** in the Operation Mode field.	
	Live / Download	If you select **Measured** in the Operation Mode field, the selected composition continues to obtain values from a gas chromatograph. If you select **Remote Download** in the Operation Mode field, the selected composition continues to obtain values from a SCADA host or other remote master.
	Fault	Selected composition is obtained from the user entered FAULT values.

Field	Description	
	Last Good	Selected composition retains the last value prior to the analysis timeout. If the Operation Mode field is set to **Measured**, the last good composition is **only** updated on the receipt of a new measured gas composition that satisfies the gas chromatograph alarm/range checks (see Gas Chromatograph – Configuration Tab). If the Operation Mode field is set to **Remote Download**, the last good composition is **only** updated if the override composition can be normalized according to the current normalization option.
Normalization Option	Sets what action is taken if the total of the gas mole percentages does not add up to 100%.	
	None	No action is taken if the total does not equal 100%.
	Full Normalization	The system automatically adjusts each component proportionally so that the total adds up to 100%.
	Methane Adjust	The system automatically adjusts the methane mole percent up or down so that the total adds up to 100%.
Components Alarm	**Analysis Timeout**	If enabled, this alarm indicates the selected composition has not been updated with a valid set of data in the amount of time specified by the user in Analysis Timeout Value.
	Normalization Failure	This alarm indicates the composition did not add up to 100% and could not be normalized. This will only occur if a normalization option of Methane Adjust is selected and adjustment of methane does not make up the difference required to have the total composition add up to 100%.
Timeout	Sets the option to alarm on an analysis timeout.	
	Analysis Timeout Value	Sets an amount of time (in seconds) to wait for a valid update to the selected composition before setting the analysis timeout alarm.

Field	Description	
	Last Good Analysis Time	This **read-only** field shows the date and time of the last good analysis.
Component Import Export	Select this button to import a new gas composition from a CSV file or export the current gas composition to a CSV file. For more information, refer to Component Import Export.	
Apply Override Values	Select this button to manually override the in-use gas composition. For more information, refer to Apply Override Values.	

4. Select **Save** to save any changes you make to this display.

4.12.2 Component – Components

Use this pop-up display to set the mole percent of each fluid component present in the meter. This value is required to calculate the compressibility of gas using the AGA 8 detailed method.

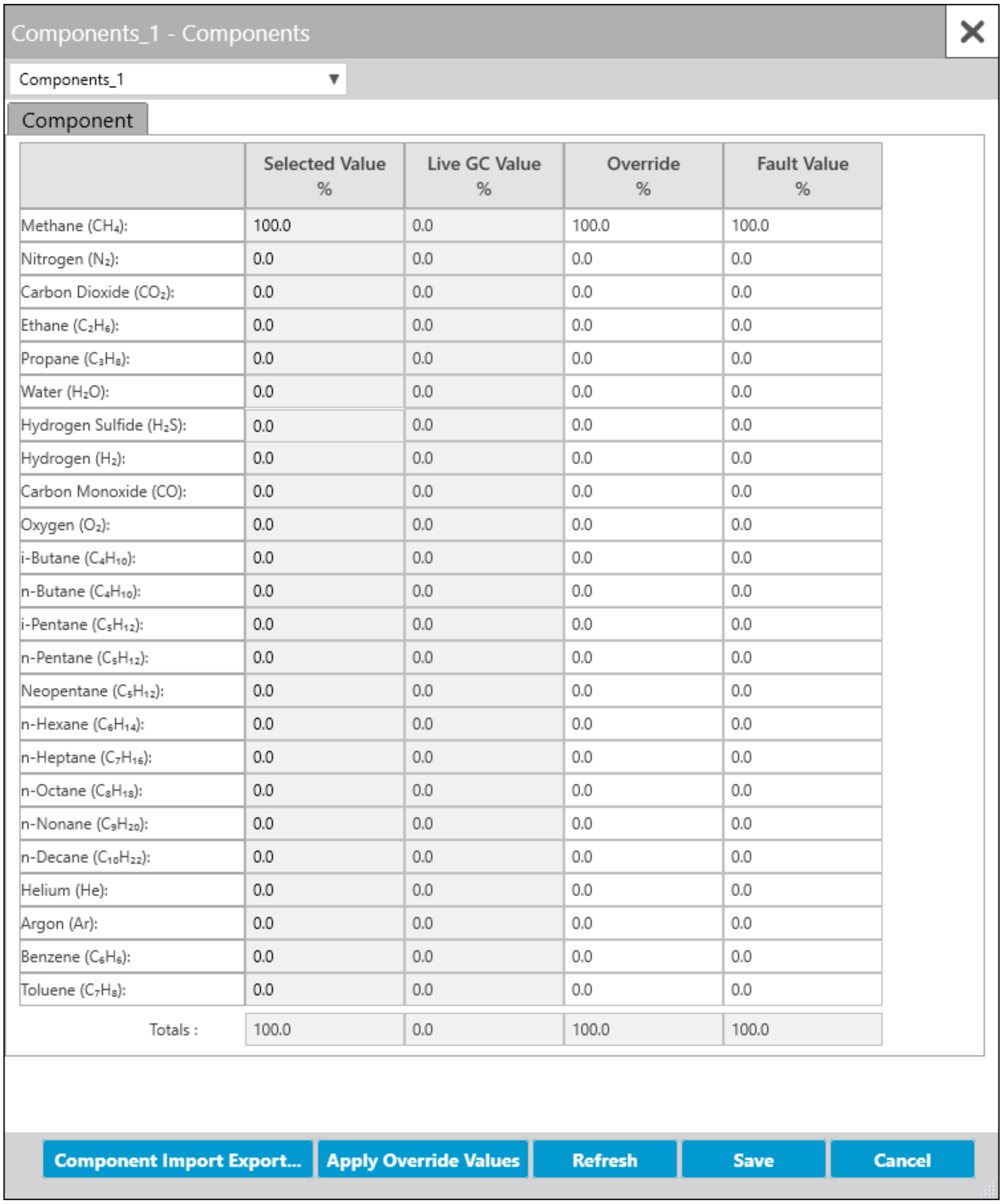
Note

You can save values on this display at any time, but the new values are not used in until you select the **Apply Override Values** button. This prevents a partial set of data from being processed by the meter.

To access this pop-up display:

1. Select **Configure** > **Gas** > **Components** from the FBxConnect™ main menu. The Component display opens.
2. Click ▼ in the drop-down list at the top of the display and select a Components instance to configure.
3. Select the **Components** button. The Component – Components pop-up display opens.

Figure 187. Component – Components



	Selected Value %	Live GC Value %	Override %	Fault Value %
Methane (CH_4):	100.0	0.0	100.0	100.0
Nitrogen (N_2):	0.0	0.0	0.0	0.0
Carbon Dioxide (CO_2):	0.0	0.0	0.0	0.0
Ethane (C_2H_6):	0.0	0.0	0.0	0.0
Propane (C_3H_8):	0.0	0.0	0.0	0.0
Water (H_2O):	0.0	0.0	0.0	0.0
Hydrogen Sulfide (H_2S):	0.0	0.0	0.0	0.0
Hydrogen (H_2):	0.0	0.0	0.0	0.0
Carbon Monoxide (CO):	0.0	0.0	0.0	0.0
Oxygen (O_2):	0.0	0.0	0.0	0.0
i-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
n-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
i-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
Neopentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Hexane (C_6H_{14}):	0.0	0.0	0.0	0.0
n-Heptane (C_7H_{16}):	0.0	0.0	0.0	0.0
n-Octane (C_8H_{18}):	0.0	0.0	0.0	0.0
n-Nonane (C_9H_{20}):	0.0	0.0	0.0	0.0
n-Decane ($C_{10}H_{22}$):	0.0	0.0	0.0	0.0
Helium (He):	0.0	0.0	0.0	0.0
Argon (Ar):	0.0	0.0	0.0	0.0
Benzene (C_6H_6):	0.0	0.0	0.0	0.0
Toluene (C_7H_8):	0.0	0.0	0.0	0.0
Totals :	100.0	0.0	100.0	100.0

4. Review – and change as necessary – the values in the following fields:

Field	Description
Selected Value %	This **read-only** field shows the current gas quality readings before any water content or water adjustment option has been applied. **Note** Fields in this column turn red if there is a validation alarm associated with the selected component.
Live GC Value %	This **read-only** field shows gas quality readings from the configured gas chromatograph.
Override %	Sets the mole percent of each fluid component (as a percentage) to use in calculations when **Override** is selected in the **Operation** field on the Component – General display. **Note** You can save values on this display at any time, but the new values are not used in until you select the **Apply Override Values** button. This prevents a partial set of data from being processed by the meter.
Fault Value %	Sets the mole percent of each fluid component (as a percentage) to use in calculations when **Fault** is selected in the **Fault Mode** field on the Component – General display and a fault occurs. **Note** You can save values on this display at any time, but the new values are not used in until you select the **Apply Override Values** button. This prevents a partial set of data from being processed by the meter.
Totals	This **read-only** field shows the total mole percent of all fluid components.
Component Import Export	Select this button to import a new gas composition from a CSV file or export the current gas composition to a CSV file. For more information, refer to Component Import Export.
Apply Override Values	Select this button to manually override the in-use gas composition. For more information, refer to Apply Override Values.

5. Select **Save** to save any changes you make to this display.

Note

A warning icon shows if the **Selected Value** field and **Override Value** field **do not** match.

4.12.3 Component Import Export

Use this pop-up display to import gas component values from a CSV file or export the current gas component values to a CSV file.

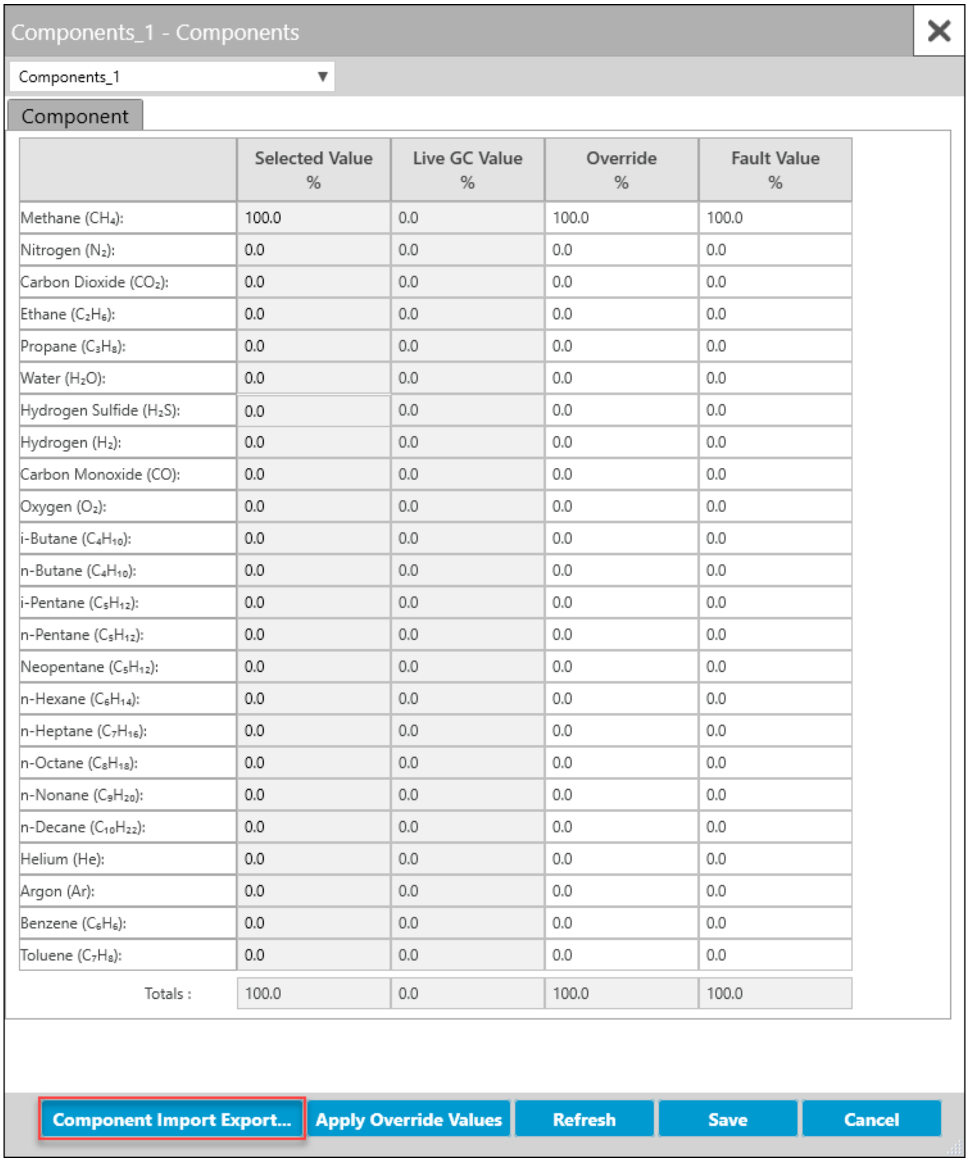
Note

For more information about creating your own gas component CSV files, refer to Creating Gas Component CSV Files.

To access this pop-up display:

1. Select **Configure > Gas > Components** from the FBxConnect™ main menu. The Component display opens.
2. Select the **Components** button. The Component – Components pop-up display opens.

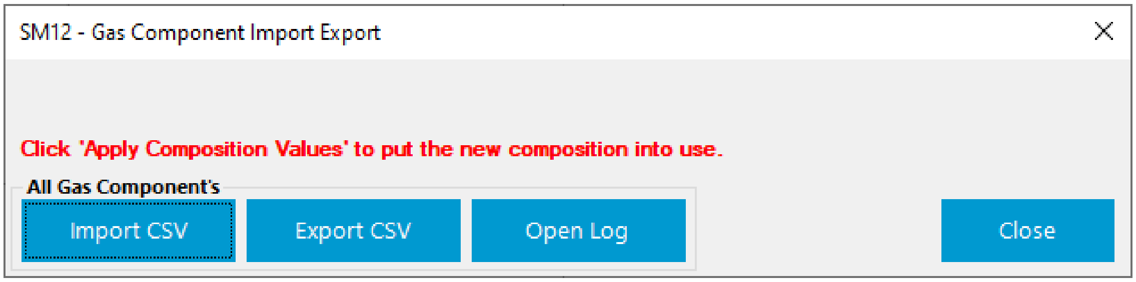
Figure 188. Component Import Export



	Selected Value %	Live GC Value %	Override %	Fault Value %
Methane (CH_4):	100.0	0.0	100.0	100.0
Nitrogen (N_2):	0.0	0.0	0.0	0.0
Carbon Dioxide (CO_2):	0.0	0.0	0.0	0.0
Ethane (C_2H_6):	0.0	0.0	0.0	0.0
Propane (C_3H_8):	0.0	0.0	0.0	0.0
Water (H_2O):	0.0	0.0	0.0	0.0
Hydrogen Sulfide (H_2S):	0.0	0.0	0.0	0.0
Hydrogen (H_2):	0.0	0.0	0.0	0.0
Carbon Monoxide (CO):	0.0	0.0	0.0	0.0
Oxygen (O_2):	0.0	0.0	0.0	0.0
i-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
n-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
i-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
Neopentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Hexane (C_6H_{14}):	0.0	0.0	0.0	0.0
n-Heptane (C_7H_{16}):	0.0	0.0	0.0	0.0
n-Octane (C_8H_{18}):	0.0	0.0	0.0	0.0
n-Nonane (C_9H_{20}):	0.0	0.0	0.0	0.0
n-Decane ($C_{10}H_{22}$):	0.0	0.0	0.0	0.0
Helium (He):	0.0	0.0	0.0	0.0
Argon (Ar):	0.0	0.0	0.0	0.0
Benzene (C_6H_6):	0.0	0.0	0.0	0.0
Toluene (C_7H_8):	0.0	0.0	0.0	0.0
Totals :	100.0	0.0	100.0	100.0

3. Select the **Component Import Export** button. The Gas Component Import Export pop-up display opens.

Figure 189. Gas Component Import Export



Click 'Apply Composition Values' to put the new composition into use.

4. Use the buttons on this display to perform the following actions:

Field	Description
Import CSV	Click to import a CSV file into your FB Series product that contains your gas component values. Navigate to the location on your computer that contains the CSV files and select **OK** to start the import process. For more information, refer to Importing Gas Component CSV Files. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found.
Export CSV	Click to save CSV files to your computer that contain the current gas component values used by your FB Series product. A Select Table dialog opens that allows you to select which Components instances to include in the export. Click **Start**, navigate to a folder on your computer where the CSV files will be saved, and click **Save** to begin the export process. For more information, refer to Exporting Gas Component CSV Files.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.

5. Select **Close** to exit the pop-up display.

4.12.3.1 Importing a Gas Composition CSV File

You can import CSV files that contain your gas component values. You can include gas component values for all Components instances in a single CSV file or separate CSV files for each instance.

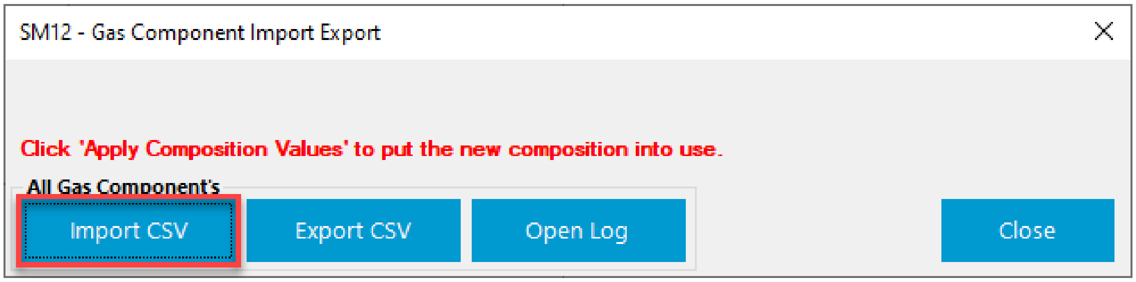
Note

- For more information about creating your own gas component CSV files, refer to Creating Gas Component CSV Files.
- For more information about exporting CSV files that contains the FB Series product's current gas component values, refer to Exporting Gas Component CSV Files.
- If you want to remove previously imported gas component values, perform a Cold Start and select **Database is re-initialized with factory defaults**.

To import gas component CSV files:

1. Select **Configure > Gas > Components** from the FBxConnect™ main menu. The Components display opens.
2. Select the **Components** button. The Component – Components pop-up display opens.
3. Select the **Component Import Export** button. The Gas Component Import Export pop-up display opens.

Figure 190. Gas Component Import Export

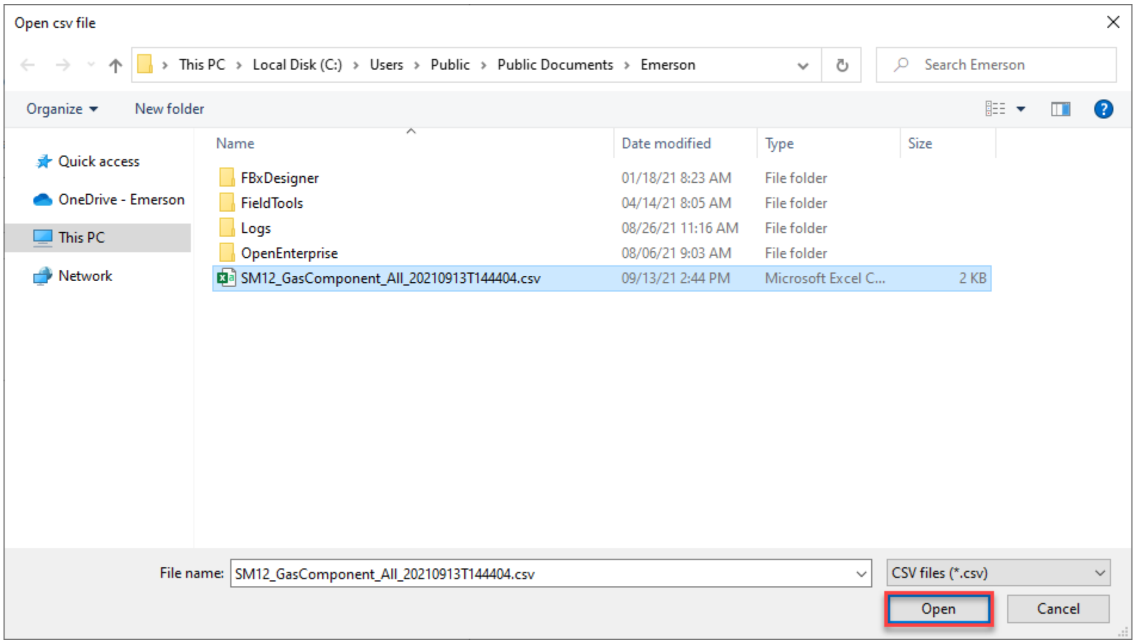


SM12 - Gas Component Import Export

Click 'Apply Composition Values' to put the new composition into use.

4. Select the **Import CSV** button. The Open csv File window opens.

Figure 191. Open csv File



Open csv file

This PC › Local Disk (C:) › Users › Public › Public Documents › Emerson

Name	Date modified	Type	Size
FBxDesigner	01/18/21 8:23 AM	File folder	
FieldTools	04/14/21 8:05 AM	File folder	
Logs	08/26/21 11:16 AM	File folder	
OpenEnterprise	08/06/21 9:03 AM	File folder	
SM12_GasComponent_All_20210913T144404.csv	09/13/21 2:44 PM	Microsoft Excel C...	2 KB

File name: SM12_GasComponent_All_20210913T144404.csv

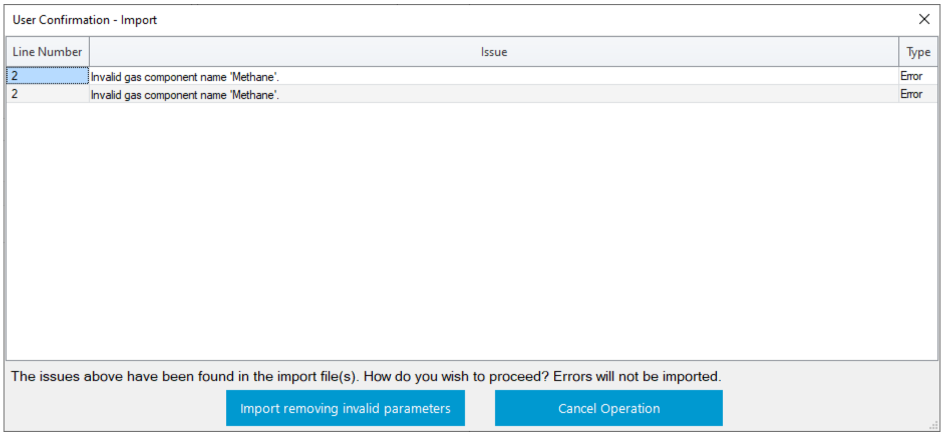
CSV files (*.csv)

5. Navigate to location of your gas composition CSV file, highlight the file, and select **Open**.

Note

The system verifies the integrity of the CSV file and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

Figure 192. Example Import Gas Composition Errors



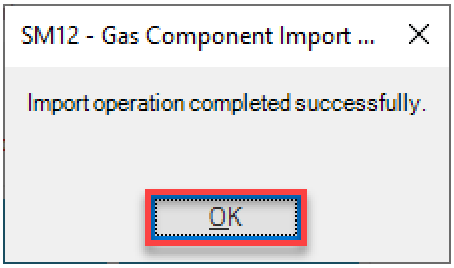
User Confirmation - Import

Line Number	Issue	Type
2	Invalid gas component name 'Methane'.	Error
2	Invalid gas component name 'Methane'.	Error

The issues above have been found in the import file(s). How do you wish to proceed? Errors will not be imported.

6. A confirmation message displays after importing the CSV file. Select **OK** to complete the process.

Figure 193. Import Successful



Import operation completed successfully.

Note

You **must** click the **Apply Override Values** button after importing a gas component CSV file before any changes take effect.

4.12.3.2 Exporting a Gas Composition CSV File

You can export CSV files to your computer that contain the current gas component values used by your FB Series product. You can then modify the files on your computer or import them into another device. You can export gas component values to one CSV file that contains information for all Components instances or export separate CSV files for each instance.

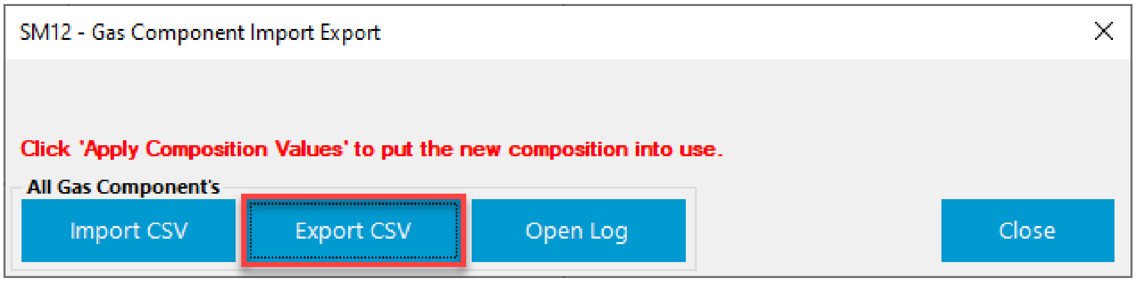
Note

- For more information about creating your own gas component CSV files, refer to Creating Gas Component CSV Files.
- For more information about importing CSV files that contains gas component values, refer to Importing Gas Component CSV Files.

To export gas component CSV files:

1. Select **Configure > Gas > Components** (FB3000 RTU) from the FBxConnect™ main menu. The Components display opens.
2. Select the **Components** button. The Component – Components pop-up display opens.
3. Select the **Composition Import Export** button. The Gas Component Import Export pop-up display opens.

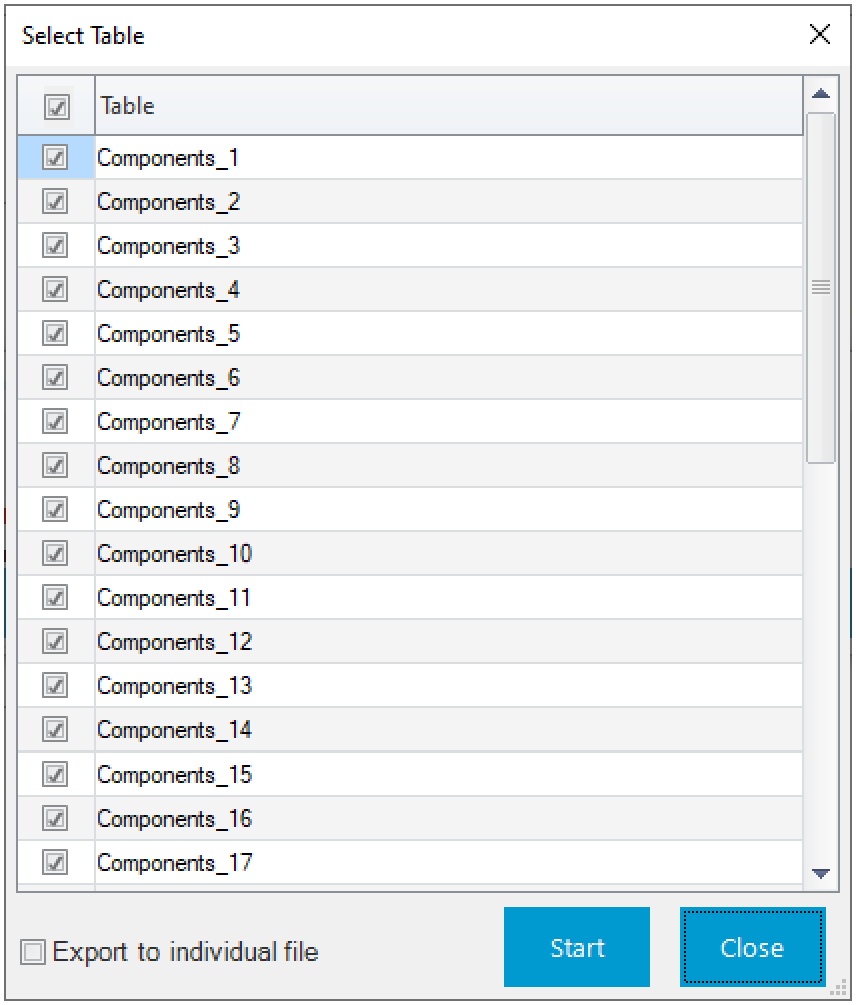
Figure 194. Gas Component Import Export



Click 'Apply Composition Values' to put the new composition into use.

4. Select the **Export CSV** button. The Select Table pop-up display opens.

Figure 195. Select Table



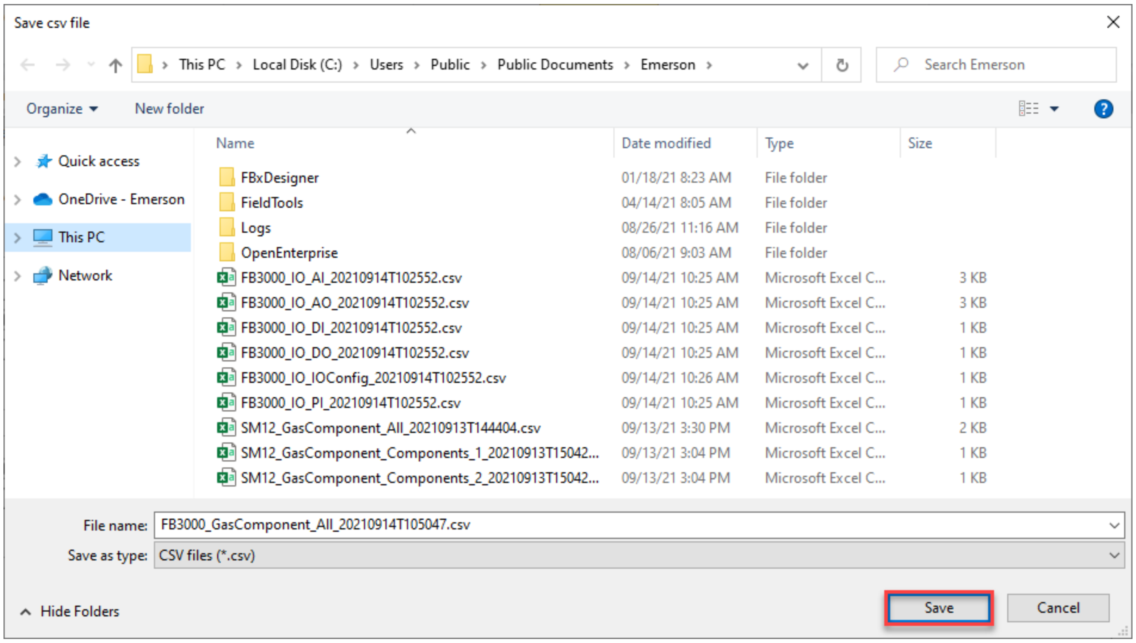
5. Place a check mark next to each Components instance you want to export.

Note

By default, the FB Series device exports all Components instances to a single CSV file. Place a check mark next to **Export to individual file** to export separate CSV files for each selected Components instance.

6. Select **Start**. A Save csv file windows opens.

Figure 196. Save csv file



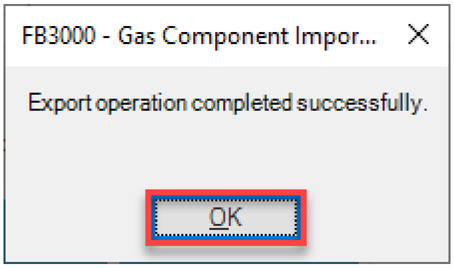
Name	Date modified	Type	Size
FBxDesigner	01/18/21 8:23 AM	File folder	
FieldTools	04/14/21 8:05 AM	File folder	
Logs	08/26/21 11:16 AM	File folder	
OpenEnterprise	08/06/21 9:03 AM	File folder	
FB3000_IO_AI_20210914T102552.csv	09/14/21 10:25 AM	Microsoft Excel C...	3 KB
FB3000_IO_AO_20210914T102552.csv	09/14/21 10:25 AM	Microsoft Excel C...	3 KB
FB3000_IO_DI_20210914T102552.csv	09/14/21 10:25 AM	Microsoft Excel C...	1 KB
FB3000_IO_DO_20210914T102552.csv	09/14/21 10:25 AM	Microsoft Excel C...	1 KB
FB3000_IO_IOConfig_20210914T102552.csv	09/14/21 10:26 AM	Microsoft Excel C...	1 KB
FB3000_IO_PI_20210914T102552.csv	09/14/21 10:25 AM	Microsoft Excel C...	1 KB
SM12_GasComponent_All_20210913T144404.csv	09/13/21 3:30 PM	Microsoft Excel C...	2 KB
SM12_GasComponent_Components_1_20210913T15042...	09/13/21 3:04 PM	Microsoft Excel C...	1 KB
SM12_GasComponent_Components_2_20210913T15042...	09/13/21 3:04 PM	Microsoft Excel C...	1 KB

File name: FB3000_GasComponent_All_20210914T105047.csv
Save as type: CSV files (*.csv)

7. Navigate to the folder where the Gas Component CSV files will be saved and select **Save** to begin the export process.

8. When the process completes, a confirmation dialog opens. Select **OK**.

Figure 197. Confirmation



FB3000 - Gas Component Impor...

Export operation completed successfully.

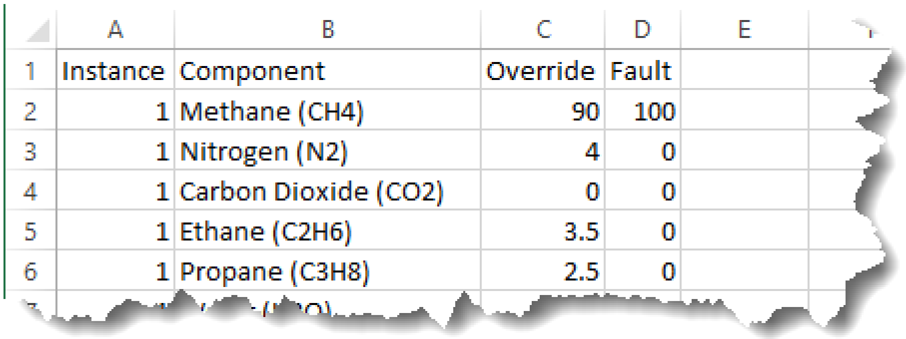
4.12.3.3 Creating a Gas Composition CSV File

You can create CSV files that contain your gas component values on your computer and then import the CSV files for use in the FB Series product. If your gas components configuration contains a large number of instances, it may be easier to create CSV files on your computer than it is to configure each Components instance individually in FBxConnect. You can create either one CSV file that contains information about all Components instances or separate CSV files for each instance.

Note

- The system automatically corrects for incorrect capitalization in the created gas components CSV files. This means you can enter **methane (ch4)** and the system automatically corrects the entry to **Methane (CH4)**.
- The easiest way to begin creating a custom map is to export gas component CSV files that contain the current values and then edit that file. For more information about exporting a Gas Component CSV files, refer to Exporting Gas Component CSV Files.

Figure 198. Example Gas Component CSV Format



	A	B	C	D	E
1	Instance	Component	Override	Fault	
2	1	Methane (CH4)	90	100	
3	1	Nitrogen (N2)	4	0	
4	1	Carbon Dioxide (CO2)	0	0	
5	1	Ethane (C2H6)	3.5	0	
6	1	Propane (C3H8)	2.5	0	

To create CSV files that contain gas component values:

1. Open a blank spreadsheet (or open a previously exported gas component CSV file).
2. Review – and change as necessary – the values for each CSV file according to the tables below:

Field	Description
Instance	Enter the Components instance number in the rows below this column. Possible Values are 1 through 36. **Note** You can include multiple instances in a single CSV file or create separate CSV files for each instance.
Component	Enter the name for each component to include in your gas composition. You are not required to enter every possible component, but the names **must** match the list below. Possible options are: • Methane (CH4) • Nitrogen (N2) • Carbon Dioxide (CO2) • Ethane (C2H6) • Propane (C3H8) • Hydrogen Sulfide (H2S) • Hydrogen (H2) • Carbon Monoxide (CO) • Oxygen (O2) • i-Butane (C4H10) • n-Butane (C4H10) • i-Pentane (C5H12) • n-Pentane (C5H12) • n-Hexane (C6H14) • n-Heptane (C7H16) • n-Octane (C8H18) • n-Nonane (C9H20) • n-Decane (C10H22) • Helium (He) • Argon (Ar) • Neopentane (C5H12) • Benzene (C6H6) • Toluene (C7H8)

Field	Description
Override	Enter the mole percent of each fluid component (as a percentage) to use in calculations when **Override** is selected in the **Operation** field on the Components – General tab.
Fault	Enter the mole percent of each fluid component (as a percentage) to use in calculations when **Fault** is selected in the **Fault Mode** field on the Components – General tab and a fault occurs.

3. Save your changes. You can now import your gas component CSV files for use in your FB Series product. For more information, refer to Importing Gas Component CSV Files.

Note

Make sure to save the file with a **.csv** file extension.

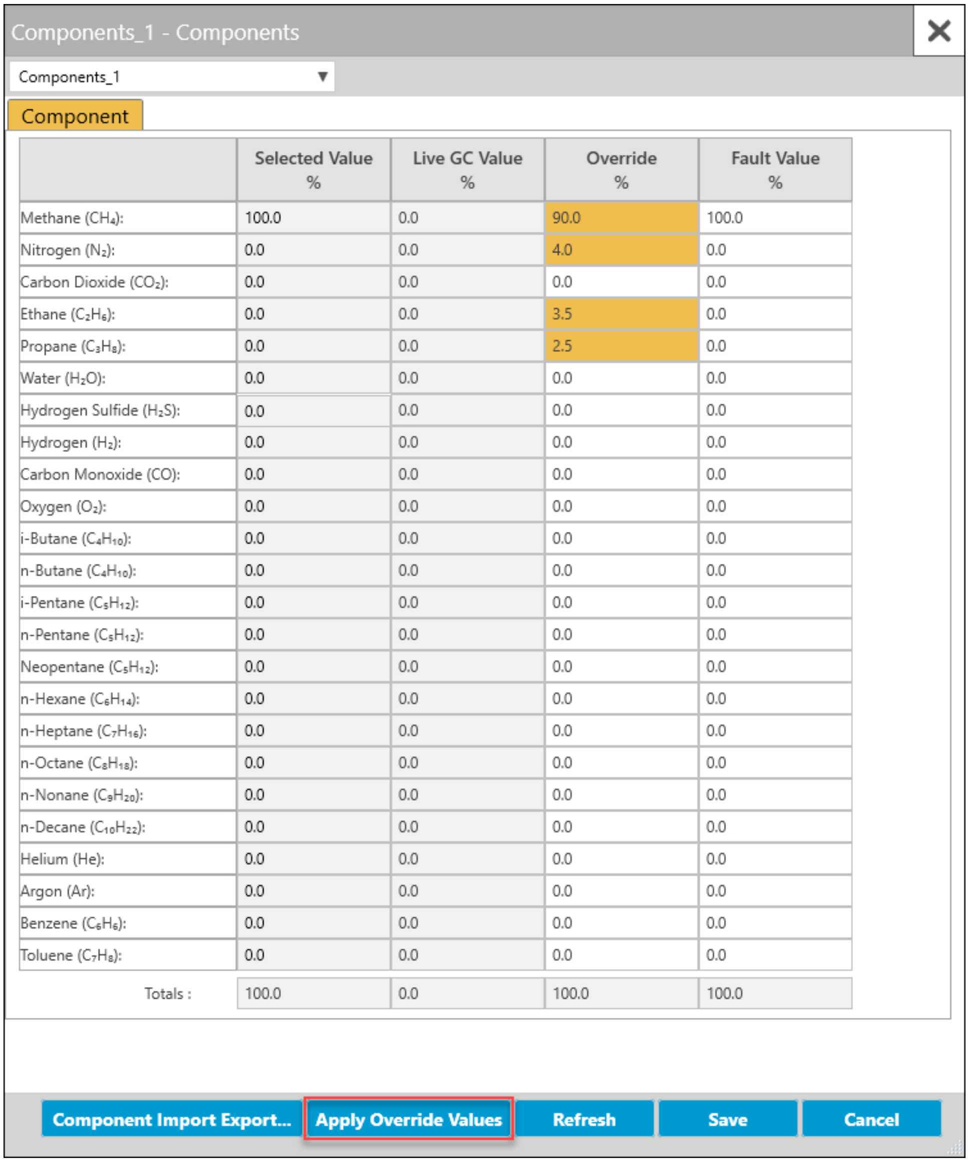
4.12.4 Apply Override Values

Use this display to manually set mole percentages of each fluid component.

To manually apply composition values:

1. Select **Configure > Gas > Components** from the FBxConnect™ main menu. The Components display opens showing the General tab.
2. Click ▼ in the drop-down list at the top of the display and select the Components instance you wish to configure.
3. Select the **Components** button. The Component – Components pop-up display opens.

Figure 199. Apply Override Values



	Selected Value %	Live GC Value %	Override %	Fault Value %
Methane (CH_4):	100.0	0.0	90.0	100.0
Nitrogen (N_2):	0.0	0.0	4.0	0.0
Carbon Dioxide (CO_2):	0.0	0.0	0.0	0.0
Ethane (C_2H_6):	0.0	0.0	3.5	0.0
Propane (C_3H_8):	0.0	0.0	2.5	0.0
Water (H_2O):	0.0	0.0	0.0	0.0
Hydrogen Sulfide (H_2S):	0.0	0.0	0.0	0.0
Hydrogen (H_2):	0.0	0.0	0.0	0.0
Carbon Monoxide (CO):	0.0	0.0	0.0	0.0
Oxygen (O_2):	0.0	0.0	0.0	0.0
i-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
n-Butane (C_4H_{10}):	0.0	0.0	0.0	0.0
i-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Pentane (C_5H_{12}):	0.0	0.0	0.0	0.0
Neopentane (C_5H_{12}):	0.0	0.0	0.0	0.0
n-Hexane (C_6H_{14}):	0.0	0.0	0.0	0.0
n-Heptane (C_7H_{16}):	0.0	0.0	0.0	0.0
n-Octane (C_8H_{18}):	0.0	0.0	0.0	0.0
n-Nonane (C_9H_{20}):	0.0	0.0	0.0	0.0
n-Decane ($C_{10}H_{22}$):	0.0	0.0	0.0	0.0
Helium (He):	0.0	0.0	0.0	0.0
Argon (Ar):	0.0	0.0	0.0	0.0
Benzene (C_6H_6):	0.0	0.0	0.0	0.0
Toluene (C_7H_8):	0.0	0.0	0.0	0.0
Totals :	100.0	0.0	100.0	100.0

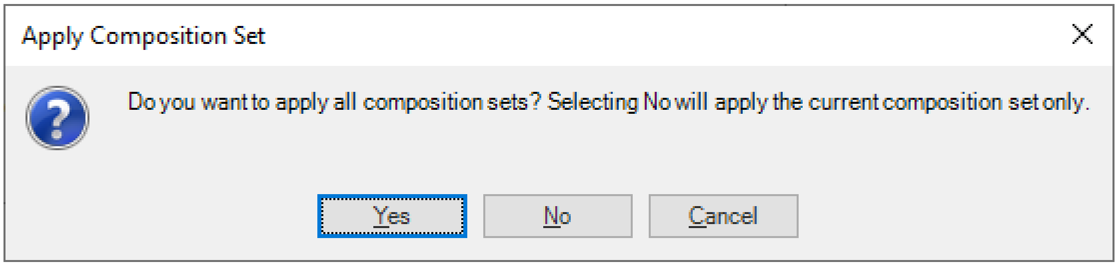
4. Enter the mole percent of each fluid component.

5. Once you have reviewed the override composition set and verified that the composition adds up to 100%, select **Apply Override Values** to put the new Override composition into use. A confirmation dialog opens:

Note

When remotely updating components via Modbus, you need to map the **Apply Override Values** button to a map table register and write a value of 1 to that register before the changes take effect.

Figure 200. Apply Composition Set



Apply Composition Set

Do you want to apply all composition sets? Selecting No will apply the current composition set only.

6. Select one of the following three options on the confirmation dialog:

   - Select **Yes** to apply the composition changes to **all** Components instances.
   - Select **No** to apply the composition changes to the currently selected Components instance **only**.
   - Select **Cancel** to close the dialog without applying composition changes to any Components instance.

4.13 Liquid Linear Meter

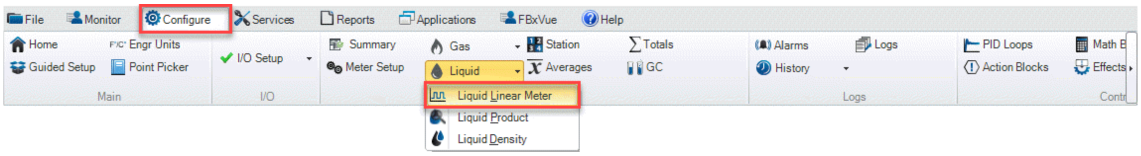
Use this display to configure liquid linear meters in the FB3000.

Note

- You **must** configure at least one Liquid Linear Meter on the Meter Setup display before you can access this display.
- The system uses different calculations based on three possible configurations. Refer to Liquid Linear Meter Calculations for a list of flow calculations used with different configurations.

To access this display, select **Configure > Liquid > Liquid Linear Meter**.

Figure 201. Configure – Liquid Linear Meter



The Liquid Linear Meter display contains the following items:

Note

The available pop-up displays vary based on your selection in the **Crude Oil Options** field on the Station – General display.

General – Use this display to define basic parameters for liquid linear meters. The General tab opens when you first access the Liquid Linear Configuration display.

Advanced – Use this pop-up display to configure advanced properties for liquid linear meters, including meter factor and K-factor.

Volume Correction – Use this pop-up display to configure temperature and pressure volume correction options for the selected liquid linear meter.

Water – Use this pop-up display to configure correction options for sediment in water present in the selected liquid linear meter.

Additional Factors – Use this pop-up display to configure additional properties for the fluid flowing through the meter, including NGL, shrinkage, and flash gas factors.

Diagnostics – Use this pop-up display to view **read-only** diagnostic information for liquid linear meters, including calculated values and alarm codes.

Rates and Totals – Use this pop-up display to view **read-only** flow rates and accumulations for liquid linear meters.

4.13.1 Liquid Linear Meter Flow Calculations

You can configure liquid linear meters a number of different ways based on your specific application. The system uses different flow calculations based on three possible configurations:

Use-Case	Description
Crude Oil Custody Transfer	For custody transfer applications: Select **Crude Oil** in the **Liquid Product Type** field on the Liquid Product display and select **API Ch. 12.2** in the **Crude Oil Options** field on the Station – General display. **Calculations** • IQ = Pulses / K-Factor • GV (Turbine Meter) = IQ * MF • GV (Coriolis Meter) = IQ * MF / Meter Density • GSV = GV * CTL * CPL • NSV = GSV * (1 – SW / 100) • S&W = GSV * SW / 100 • Mass (Turbine Meter) = GV * Meter Density • Mass (Coriolis Meter) = IQ * MF

Crude Oil Allocation – Low Water	For Crude Oil Allocation – Low Water applications:
	Select **Crude Oil** in the **Liquid Product Type** field on the Liquid Product display, and select both **API Ch. 20.1** and **Use Oil Correction for Water** in the **Crude Oil Options** fields on the Station – General display.
	Calculations
	• IQ = Pulses / K-Factor
	• GV (Turbine Meter) = IQ * MF
	• GV (Coriolis Meter) = IQ * MF / Meter Density
	When SF applied to gross standard volume:
	  • GSV = GV * SF * CTL * CPL
	  • NSV = GSV * (1 – SW / 100)
	When SF applied to net standard volume:
	  • GSV = GV * CTL * CPL
	  • NSV = GSV * (1 – SW/100) * SF
	• S&W = GSV * SW / 100

Use-Case	Description
	• Mass (Turbine Meter) = GV * Meter Density • Mass (Coriolis Meter) = IQ * MF
Crude Oil Allocation – High Water	For Crude Oil Allocation – High Water applications: Select **Crude Oil** in the **Liquid Product Type** field on the Liquid Product display, and select both **API Ch. 20.1** and **Use Separate Correction Factor for Water** in the **Crude Oil Options** field on the Station – General display. **Calculations** • IQ = Pulses / K-Factor • GV (Turbine Meter) = IQ * MF • GV (Coriolis Meter) = IQ * MF / Meter Density • GV_{Oil} = GV * (1 – Xw) • $GSV_{Oil} = GV_{Oil}$ * SF • GV_{Water} = GV * Xw • $GSV_{Water} = GV_{Water}$ * CTL • FGN = GSV_{Oil} * FGF • NGL = GSV_{Oil} * NGLF
Refined Products / Lubricating Oil	For Refined Products/Lubricating Oil applications: Select **Refined Products / Lubricating Oil** in the **Liquid Product Type** field on the Liquid Product display. **Calculations** • IQ = Pulses / K-Factor • GV (Turbine Meter) = IQ * MF • GV (Coriolis Meter) = IQ * MF / Meter Density • GSV = GV * CTL * CPL • Mass (Turbine Meter) = GV * Meter Density • Mass (Coriolis Meter) = IQ * MF

Use-Case	Description
Light Hydrocarbon	For Light Hydrocarbon applications: Select **Light Hydrocarbon** in the **Liquid Product Type** field on the Liquid Product display. **Calculations** • IQ = Pulses / K-Factor • GV (Turbine Meter) = IQ * MF • GV (Coriolis Meter) = IQ * MF / Meter Density • GSV = GV * CTL * CPL • Mass (Turbine Meter) = GV * Meter Density • Mass (Coriolis Meter) = IQ * MF

Where:

CTL = Correction for the effect of temperature on the liquid

CPL = Correction for the effect of pressure on the liquid

FGF = Flash Gas Factor

FGN = Flash Gas Volume

GV = Gross Volume

GSV = Gross Std Volume

IQ = Indicated Quantity

MF = Meter Factor

NGL = Natural Gas Liquids Volume

NGLF = Natural Gas Liquids Factor

NSV = Net Standard Volume

SF = Shrinkage Factor

SW = Sediment and Water Percent

S&W = Sediment and Water Volume

Xw = Water Cut

4.13.2 Liquid Linear Meter – General

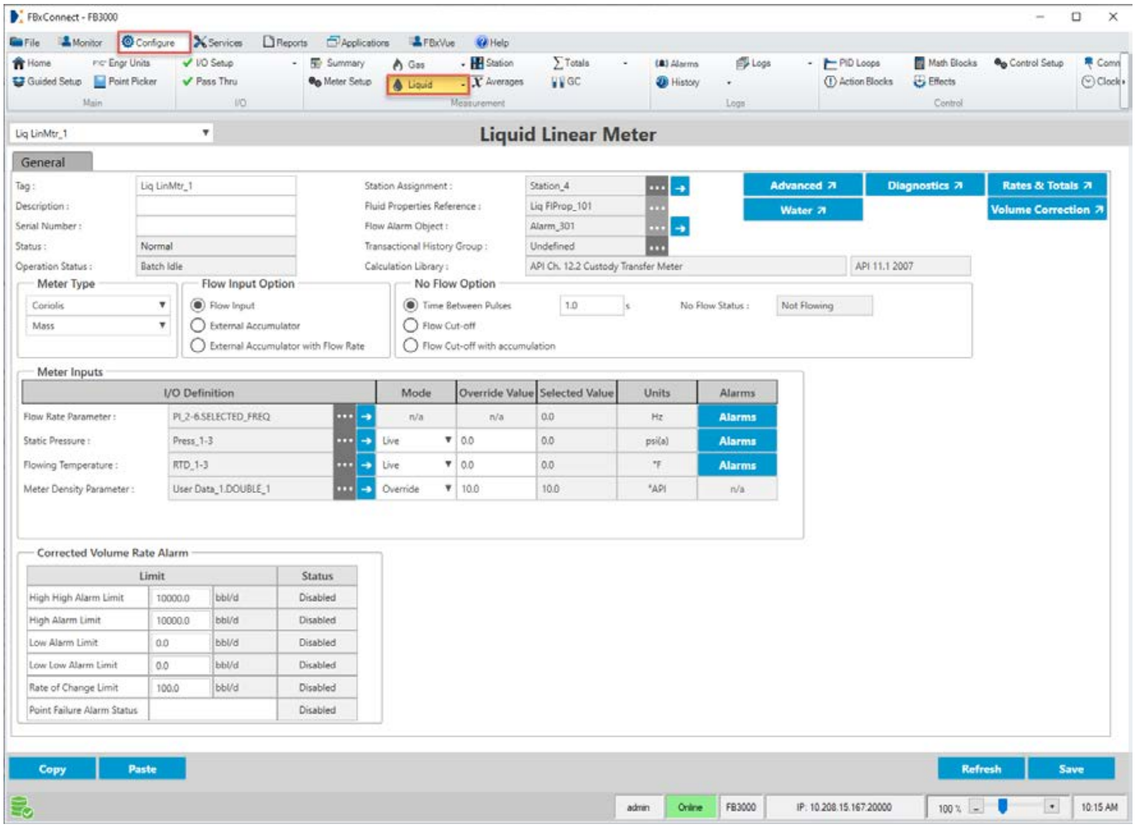
Use this tab to define basic parameters for liquid linear meters.

To access this display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu. The Liquid Linear Meter display opens.

2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.

Figure 202. Liquid Linear Meter– General



Tag : Liq LinMtr_1
Description :
Serial Number :
Status : Normal
Operation Status : Batch Idle

Station Assignment : Station_4
Fluid Properties Reference : Liq FlProp_101
Flow Alarm Object : Alarm_301
Transactional History Group : Undefined
Calculation Library : API Ch. 12.2 Custody Transfer Meter API 11.1 2007

Meter Type
Coriolis ▼
Mass ▼

Flow Input Option
● Flow Input
○ External Accumulator
○ External Accumulator with Flow Rate

No Flow Option
● Time Between Pulses 1.0 s
○ Flow Cut-off
○ Flow Cut-off with accumulation
No Flow Status : Not Flowing

Meter Inputs

	I/O Definition	Mode	Override Value	Selected Value	Units	Alarms
Flow Rate Parameter :	PI_2-6.SELECTED_FREQ	n/a	n/a	0.0	Hz	Alarms
Static Pressure :	Press_1-3	Live	0.0	0.0	psi(a)	Alarms
Flowing Temperature :	RTD_1-3	Live	0.0	0.0	°F	Alarms
Meter Density Parameter :	User Data_1.DOUBLE_1	Override	10.0	10.0	°API	n/a

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	bbl/d	Disabled
High Alarm Limit	10000.0	bbl/d	Disabled
Low Alarm Limit	0.0	bbl/d	Disabled
Low Low Alarm Limit	0.0	bbl/d	Disabled
Rate of Change Limit	100.0	bbl/d	Disabled
Point Failure Alarm Status			Disabled

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected meter.
Description	Sets a description (up to 20-alphanumeric characters) for the selected meter.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Serial Number</td><td colspan="2">Enter a description (up to 20-alphanumeric characters) for the serial number or other identifier of the selected meter.</td></tr>
<tr><td rowspan="6">Status</td><td colspan="2">This read-only field indicates the overall health of the selected meter. Possible values are:</td></tr>
<tr><td>Normal</td><td>Indicates the meter is not in an alarm, failure, or override condition.</td></tr>
<tr><td>In alarm</td><td>Indicates an active flow rate, I/O, property calculation, or flow calculation alarm.</td></tr>
<tr><td>Failure</td><td>Indicates a point fail on a meter input that is used in flow calculations or a severe calculation error that prevented calculations from continuing.</td></tr>
<tr><td>Override</td><td>Indicates a meter input that is used in flow calculations in override mode that is not typically in override.</td></tr>
<tr><td colspan="2">Note
The status is based on the health of the uncorrected volume, corrected volume, and mass of the meter. You can configure which parameters determine the health of the meter in the Fault Health Configuration field on the Station – Advanced display.
The associated parameter (OBJ_STATUS) is a 32-bit binary value, where individual bits have different meaning. We currently use 3 bits. Starting from LSB (Least Significant Bit), Bit 1 represents “In Alarm,” Bit 2 represents “Failure,” and Bit 3 represents “Override.” When viewing this parameter via a host system, the value is represented as a decimal number. For example, a value of 0 means no bits are set and the meter status is Normal. A value of 1 means the meter status is In Alarm. A value of 2 means the meter status is Failure. A value of 4 means the meter status is Override. A value of 7 means Bits 1, 2, and 3 are all set, and the meter status is In Alarm, Failure, and Override.</td></tr>
</table>

Field	Description
Operation Status	This **read-only** field shows the current state of the batch. Possible values are Batch Idle or Batch Active. **Note** - This field applies **only** for Stations with a **Fluid Type** of **Liquid**. - For more information about starting or stopping a batch, refer to the Station – Batching display.
Station Assignment	Click … to open a Point Picker dialog and select the station to which this meter belongs. **Note** - After selecting a Station, click → to open the **Station** configuration display. - Stations measuring different fluid types are hidden in the Point Picker. - Gas meters and liquid meters **cannot** belong to the same station. If you assign a gas meter to a liquid station or a liquid meter to a gas station, a Flow Calculation alarm is raised.
Fluid Properties Reference	This **read-only** field shows the fluid properties instance currently assigned to the selected meter. **Note** Click → to open the Fluid Properties configuration display.
Flow Alarm Object	This **read-only** field shows the alarm instance currently assigned to the selected meter.
Transactional History Group	Click … to open a Point Picker dialog and select the transaction history group to use for the selected instance. **Note** You **must** enable Transaction History on the History – Advanced Setup display **before** you can select a Transaction History group.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Calculation Library</td><td>These read-only fields show the flow and property calculation methodologies used to calculate the liquid flow rates and quantities for the selected meter. The flow calculation is shown in the left-hand field, and the property calculation is shown in the right-hand field.
Note
For crude oil, the flow calculation shown is determined at the station level by your selection in the Crude Oil Options fields on the Station – General display. For all other liquid products, the flow calculation will use API Ch. 12.2 Custody Transfer Meter flow calculations.
For crude oil, the property calculation shown is determined at the station level by your selection in the Crude Oil Options field on the Station – General display. For all other liquid products, the property calculation shown is determined by the liquid product type selection on the Liquid Product display.
<table><tr><td>API Ch. 12.2 Custody Transfer Meter</td><td>This meter uses API Ch. 12.2 for liquid measurement. This standard is typically used for custody transfer but can also be utilized for crude oil allocation applications. For crude oil, the standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. The same calculation is used for refined products and lubricating oils with % water set to 0.
The meter calculates flow rates and accumulations representing indicated quantity, gross volume, gross standard volume, net standard volume, water volume, and mass. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch 12.2 Table 6.
Note
CTL, CPL, CCF, and Meter Factor (MF) are rounded as per API Ch. 12.2 Table 6. The associated Station provides flow rates and accumulations</td></tr></table></td></tr>
</table>

Field	Description	
		representing gross volume, net standard volume, water volume, and mass.
	API Ch. 20.1 Procedure A (Oil Correction Factor Used for Water)	This meter uses API Ch. 20.1 Procedure A for oil measurement. The standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. API Ch. 20.1 (2016) suggests using this method when the sediment and water is generally **less** than 5.0 percent. The meter calculates the same quantities as the API Ch. 12.2 Custody Transfer Meter, but a shrinkage factor is applied to the gross standard volume. If the shrinkage factor includes a correction for temperature, the CTL should be set to override mode with a value of 1.0, otherwise it should be set to calculated mode. If pressure correction is included in the SF or pressure correction is not required, CPL should be set to override mode at 1.0, otherwise CPL should be set to calculated mode. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch 12.2 Table 6. The water fraction is calculated using the in-use CSW. **Note** CTL, CPL, CCF, and Meter Factor (MF) are rounded as per API Ch. 12.2 Table 6. Station quantity calculations are **not** supported for allocation meters.
	API Ch. 20.1 Procedure C (Separate Correction Factor Used for Water)	This meter uses API Ch. 20.1 Procedure C for oil measurement. The oil and water have separate volume correction factors and are split before volume correction is applied. API Ch. 20.1 (2016) suggests using this method when the sediment and water is generally **greater** than 5.0 percent.

Field	Description	
		The meter calculates flow rates and accumulations representing indicated quantity, gross volume, oil unshrunk volume, net standard volume, water metered volume and water net volume. Additionally, a flash gas net volume and an NGL net volume may be calculated by entering an override flash gas factor and NGL factor. The correction factor for the oil is entered via an override or external shrinkage factor (SF). The Shrinkage Factor is assumed to include any correction for shrinkage, temperature, and pressure. CTL, CPL, CTPL, CCF and CSW are assumed to be 1.0. The correction factor for water is calculated according to API Ch. 20.1 A.1 (2016). **Note** The flow calculation uses unrounded correction factors. Station quantity calculations are **not** supported for allocation meters.
	API 11.1 2007	This meter uses the 2007 version of the API / ASTM / IP Volume Correction tables.
	GPA 8217 / API 11.24	This meter uses GPA 8217 / API 11.2.4 Volume Correction Tables (formerly GPA TP-27). This method uses the following set of standards: • **Temperature Correction** – GPA 8217 / API 11.2.4 Standard (2019) (formerly GPA TP-27) • **Pressure Correction** – API 11.2.2 (1986) and API 11.1 (2007) • **Equilibrium Pressure** – GPA 8117 / API 11.2.5 (2017) (formerly GPA TP-15)

Field	Description	
	Allocation Measurement	This meter is configured for allocation measurement. For flow calculations, refer to the API Ch. 20.1 Procedure A (Oil Correction Factor Used for Water) description. For property calculations, refer to API Ch. 20.1 Procedure C (Separate Correction Factor Used for Water) description.
Advanced	Click this button to open the Liquid Linear Meter – Advanced pop-up display and configure advanced properties for the selected liquid linear meter, including meter factor and K-factor.	
Volume Correction	Click this button to open the Liquid Linear Meter – Volume Correction pop-up display and configure temperature and pressure volume correction options for the selected liquid linear meter.	
Water	Click this button to open the Liquid Linear Meter – Water pop-up display and configure correction options for sediment in water present in the selected liquid linear meter.	
Additional Factors	Click this button to open the Liquid Linear Meter – Additional Factors pop-up display and configure additional properties for the fluid flowing through the meter, including NGL, shrinkage, and flash gas factors.	
Diagnostics	Click this button to open the Liquid Linear Meter – Diagnostics pop-up display and view read-only diagnostic information for the selected liquid linear meter, including calculated factors, calculated values, and alarm codes.	
Rates & Totals	Click this button to open the Liquid Linear Meter – Rates & Totals pop-up display and view read-only flow rates and accumulations for the selected liquid linear meter.	
Meter Type	Click ▼ to specify the type of liquid linear meter you are configuring. Possible options are:	
	Turbine	Select if measuring flow through a turbine meter or other linear meter with a frequency or analog signal representing actual volumetric flow rate.

Field	Description	
	Coriolis	Select if measuring flow through a Coriolis meter or other linear meter with a frequency or analog signal representing a mass or volume flow rate. **Note** If you select Coriolis, a new field appears directly below. Click ▼ to specify if you are measuring mass or volume flow rate.
	Ultrasonic	Select if measuring flow through an ultrasonic meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
	Positive Displacement	Select if measuring flow through a positive displacement meter. This meter type option performs the same flow calculations as the Turbine option, and this option is provided for equipment identification. CFX files generated by FBxConnect include this option in the configuration section of the CFX file.
Flow Input Option	Sets how instantaneous flow rates and totals are calculated by the system. Possible options are:	
	Flow Input Only	Instantaneous flow rates and totals are determined by the selected Flow Rate Parameter. If the selected Flow Rate Parameter is associated with a pulse input object, the instantaneous flow rates are calculated from the frequency and the totals are calculated from the pulse accumulation. If the selected Flow Rate Parameter is associated with any other object type, the instantaneous flow rates are calculated from the selected parameter and the totals are calculated by integrating the instantaneous rates.

Field	Description	
		Note An External Accumulator Parameter is **not** required.
	External Accumulator Only	Instantaneous flow rates and totals are determined by the selected External Accumulator Parameter. The instantaneous flow rates are calculated from the increment in the external accumulator value over time and the totals are calculated by summing the increments. **Note** A Flow Rate Parameter is **not** required.
	External Accumulator with Flow Rate	Instantaneous flow rates are calculated from the selected Flow Rate Parameter and totals are calculated from the selected External Accumulator Parameter. **Note** Both the Flow Rate Parameter and External Accumulator Parameter **must** be defined.
No Flow Option	Sets how the system calculates a "no flow" condition for the meter, and sets the calculated flow equal to zero. Possible options are:	
	Time Between Pulses / Increments	If the amount of time between pulses is greater than or equal to the time you enter in the text field, then system sets the calculated flow equal to zero. **Note** • This option is available **only** if you select a **pulse input** object in the **Indicated Flow** field. • You **must** enter a time (in seconds) for the system to use in the text field. • The label of this option changes based on your selection in the **Flow Input Option** field. If you select **Flow Input Only**, then the label shows **Time Between Pulses**. If you select **External Accumulator** or **External**

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>Accumulator with Flow Rate, then the label shows Time Between Increments.</td></tr>
<tr><td>Flow Cut-off</td><td>If the value of the uncorrected volume or mass input is less than or equal to the value you enter in the text field, then the system sets the calculated flow rates equal to zero. Enter a value (in units based on the table below) for the system to use in the text field.
<table>
<tr><th>Indicated Flow Input Type</th><th>Meter Type</th><th>Unit Type</th></tr>
<tr><td rowspan="2">Pulse Input</td><td>Turbine</td><td>Hz</td></tr>
<tr><td>Coriolis</td><td>Hz</td></tr>
<tr><td rowspan="2">AI or User Data</td><td>Turbine</td><td>Volume Rate</td></tr>
<tr><td>Coriolis</td><td>Mass Rate</td></tr>
</table>
Note

You must enter a value (in the indicated units) in the text field for the system to use.
The lowest frequency the system can accurately measure is 1 divided by the PI Scan Period (configured on the Pulse Input display). Flow control may be erratic below this threshold.
</td></tr>
<tr><td>Flow Cut-off with accumulation</td><td>If the value of the uncorrected volume or mass input is less than or equal to the value you enter in the text field, then the system sets the calculated flow rates equal to zero, but any accumulations are still counted.
Note

You must enter a value (in the indicated units) in the text field for the system to use.
</td></tr>
</table>
</td></tr>
</table>

Field	Description	
		• For details on the unit types used by different indicated flow input and meter types, refer to the table in the **Flow Cut-off** field description.
No Flow Status	This **read-only** field shows the current flowing status of the selected meter.	
Flow Rate Parameter	**I/O Definition**	Click ... to open a Point Picker dialog and select a flow rate input to use for the selected meter. This field represents the Pulse Frequency for a Turbine or Coriolis meter type. • PI object – RATE or SELECTED FREQUENCY **Note** A Pulse Input (PI) is **not** a valid selection for the Flow Rate Parameter if you select **External Accumulator with Flow Rate** in the Flow Input Option field. • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – Any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Selected Value	This **read-only** field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	**Description**	
Static Pressure	**I/O Definition**	Click ⋯ to open a Point Picker dialog and select the static pressure input to use for the selected meter. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. If you select an **AI object**, the firmware determines the pressure input type from the configurable Units Type selection that is associated with the selected analog input. If you select a **User Data object**, you must indicate the pressure input type in the Pressure Transmitter Type field. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • Press object – SELECTED VALUE • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 2. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.

Field	**Description**	
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This **read-only** field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Flowing Temperature	**I/O Definition**	Click ... to open a Point Picker dialog and select the flowing temperature input to use for the selected meter. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. - RTD object – SELECTED VALUE

Field	Description	
		• AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – DOUBLE FLOATING POINT 3. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field). **Note** This option is **not available** if you select a **User Data** object.
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**. **Note** This value is **not available** if you select a **User Data** object.
	Selected Value	This **read-only** field shows the value currently used in calculations based on the selected options.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	**Description**	
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
Meter Density Parameter	**I/O Definition**	Click … to open a Point Picker dialog and select the meter density input to use for the selected meter. • AI object – SELECTED VALUE **Note** You **must** first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • FBxNData object – SELECTED DOUBLE. For more information, refer to FBxNet. • HART object – PV SELECTED VALUE • User Data – Any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	Click ▼ to set how the system acquires this value. Possible options are **Live** (the system uses the current value of the input) or **Override** (the system uses the value you set in the override field).
	Override Value	Sets the value to use in calculations when the **Mode** field is set to **Override**.
	Selected Value	This **read-only** field shows the value currently used in calculations based on the selected options.

Field	**Description**	
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure – Alarms display for the User Data value.
	Note This field appears **only** in certain configuration scenarios: • If the meter is assigned to a Station where the Density Option is set to **Meter Observed Density**, and the Crude Oil Option is set to **API Ch. 12.2** or **API Ch. 20.1** with **Use Oil Correction Factor for Water**. • If the meter is assigned to a Station with Crude Oil Options set to **API Ch. 20.1** and **Use Separate Correction Factor for Water**, and the meter type of **Coriolis** is selected.	
External Accumulator Parameter	**I/O Definition**	Click ⋯ to open a Point Picker dialog and select a flow accumulator input to use for the selected meter. This field represents the accumulated volume for a turbine meter type or accumulated mass for a Coriolis meter type. • FBxNData object – Any parameter. For more information, refer to FBxNet. **Note** The value is assumed to be in the same units selected for the associated station. • User Data – Any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Mode	This selection is **not available**.

Field	Description	
	Override Value	This selection is **not available**.
	Selected Value	This **read-only** field shows the current value of the external accumulator being read from the selected parameter.
	Units	This **read-only** field shows the shows the accumulator engineering units.
	Alarms	This selection is **not available**; however, you can configure an alarm object separately on the Configure – Alarms display for the selected parameter.
	Note This field appears **only** if you select either **External Accumulator Only** or **External Accumulator with Flow Rate** in the Flow Input Option frame.	
Pressure Transmitter Type	Indicates the type of static pressure transmitter (absolute or gauge) configured for the selected meter. **Note** This field appears **only** if you select an **FBxNData**, **HART**, or **User Data** instance in the **Static Pressure Object I/O Definition** field.	
Corrected Volume Rate Alarm	Sets the rate alarm limits for the corrected flow rate, and shows the status of each alarm. Possible statuses are: • **Normal –** The alarm is enabled and is not in an alarm condition. • **Disabled –** The alarm has been disabled. • **In Alarm –** The alarm is enabled and is in an alarm condition.	
External Accumulator	Indicates the rollover value and maximum flow rate for the accumulator.	
	External Accumulator Rollover	Value at which the external accumulator will reset to 0. Set the value to 0 if the external accumulator does not rollover or the rollover value is unknown.
	Maximum Indicated Quantity Flow Rate	Maximum rate the physical meter run was designed to measure. This is used as an integrity check against the accumulator increment. Set the value to 0 if this integrity check is not required.

4. Select **Save** to save your changes if you modify any of the fields on this display.

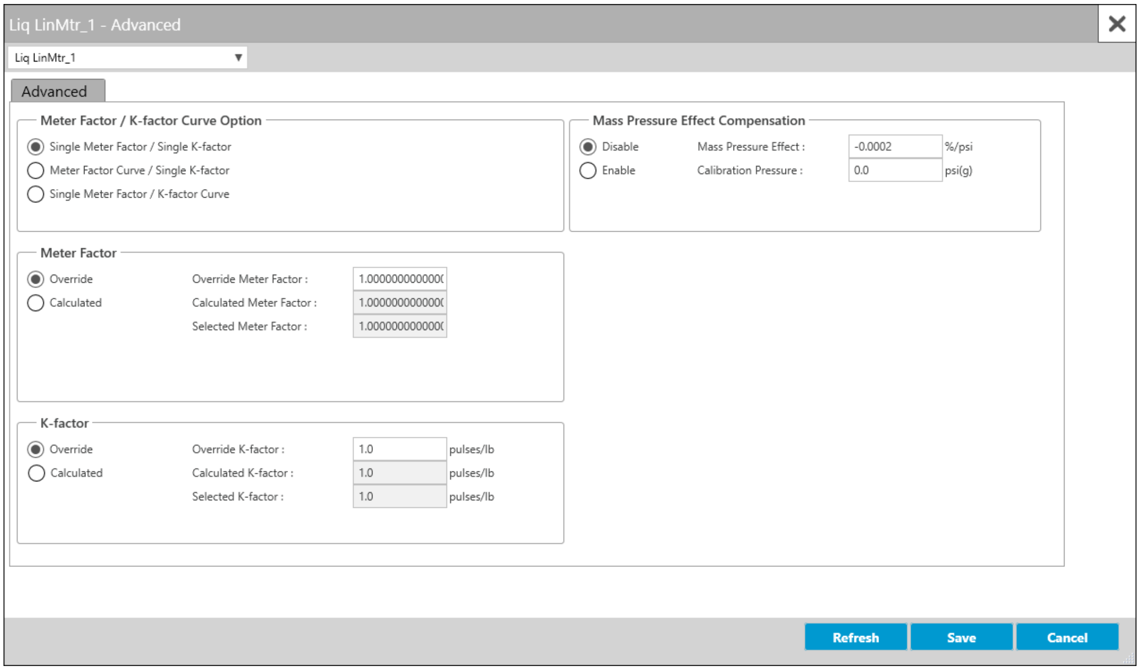
4.13.3 Liquid Linear Meter – Advanced

Use this pop-up display to configure advanced properties for the selected liquid linear meter, including meter factor and K-factor.

To access this pop-up display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The Liquid Linear Meter – Advanced pop-up display opens.

Figure 203. Liquid Linear Meter – Advanced



Meter Factor / K-factor Curve Option

● Single Meter Factor / Single K-factor
○ Meter Factor Curve / Single K-factor
○ Single Meter Factor / K-factor Curve

Mass Pressure Effect Compensation

● Disable
○ Enable

Mass Pressure Effect : -0.0002 %/psi
Calibration Pressure : 0.0 psi(g)

Meter Factor

● Override
○ Calculated

Override Meter Factor : 1.000000000000
Calculated Meter Factor : 1.000000000000
Selected Meter Factor : 1.000000000000

K-factor

● Override
○ Calculated

Override K-factor : 1.0 pulses/lb
Calculated K-factor : 1.0 pulses/lb
Selected K-factor : 1.0 pulses/lb

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Meter Factor / K-factor Curve Option	Sets how system uses calculates K-factors or Meter Factors in the flow calculation. Possible options are:	
	Single Meter Factor / Single K-factor	Uses a single Meter Factor and a single K-factor for the meter. This is the simplest choice and means that a value for the meter factor and a value for the K-factor are fixed for all flow rates and the values are taken from the last prove or an entered value. Select this option when using either the K-factor or meter factor proving, as long as neither the K-factor or meter factor will vary with flow rate or product.
	Meter Factor Curve / Single K-factor	A meter factor calculates for the current flow rate based on a linear interpolation of the meter factor versus flow rate values entered under the Factor Curve heading, but the K-factor will be fixed. Select this option when using meter factor proving if proving is done at multiple flow rates.
	Single Meter Factor / K-factor Curve	A K-factor calculates for the current flow input frequency based on a linear interpolation of the meter factor versus frequency values entered under the Factor Curve, but the meter factor will be a single value from the last prove or entered value. The K-factor curve can come from multiple proves at different flow rates with a meter factor of 1.0 (K-factor proving) or the K-factor curve can come from factory calibration and a single meter factor from a prove (meter factor proving).
Curve Setup	Click to open the Curve Setup dialog and configure the meter factor/K-factor curve. For more information, refer to [Curve Setup (Liquid Linear Meter)](). **Note** This field appears **only** if you select either Meter Factor Curve / Single K-factor or Single Meter Factor / K-factor Curve in the Meter Factor / K-factor Curve Option field.	

Field	Description	
Meter Factor	Sets how the system obtains the meter factor value used in calculations. Possible options are:	
	Override	The system uses the value set in the **Override Meter Factor** field for the meter factor value.
	Calculate	The system calculates a value for the meter factor.
Override Meter Factor	Sets the meter factor value to use in calculations when you select **Override** in the **Meter Factor** field.	
Calculated Meter Factor	This **read-only** field shows the meter factor value as calculated by the system. **Note** This value is used by the system when you select **Calculated** in the **Meter factor** field.	
Selected Meter Factor	This **read-only** field shows the meter factor currently used in calculations based on the selected options.	
K-factor	Sets how the system obtains the K-factor value used in calculations. Possible options are:	
	Override	The system uses the value set in the **Override K-factor** field for the K-factor value.
	Calculated	The system calculates a value for the K-factor.
Override K-factor	Sets the discharge coefficient value to use in calculations when you select **Override** in the **K-factor** field.	
Calculated K-factor	This **read-only** field shows the discharge coefficient value as calculated by the system. **Note** This value is used by the system when you select **Calculated** in the **K-factor** field.	
Selected K-factor	This **read-only** field shows the K-factor currently used in calculations based on the selected options.	

Field	Description
Mass Pressure Effect Compensation	This option allows for the compensation for the effects of high pressure on the accuracy of the meter mass flow rate and accumulation. This may be necessary in applications where the operating pressure is significantly different from the meter's calibration pressure. **Note** This field appears **only** if you select **Coriolis** as the **Meter Type** on the Liquid Linear Meter – General display.
	Enable — The system compensates for the effects of pressure on accuracy. **Note** You must enter a value in the **Mass Pressure Effect** and **Calibration Pressure** fields.
	Disable — The system **does not** compensate for the effects of pressure on accuracy.
Mass Pressure Effect	Enter a value (in units of per psi or per bar) to be used when performing mass pressure effect compensation. **Note** • This value is supplied by the manufacture of the mass meter and is typically a small negative number. • This field appears **only** if you select **Coriolis** as the **Meter Type** on the Liquid Linear Meter – General display.
Calibration Pressure	Sets the pressure (in units of gauge psi or bar) of the mass meter as calibrated. **Note** • This value is supplied by the manufacture of the mass meter and is typically a small negative number. • This field appears **only** if you select **Coriolis** as the **Meter Type** on the Liquid Linear Meter – General display.

5. Select **Save** to save your changes if you modify any of the fields on this display.

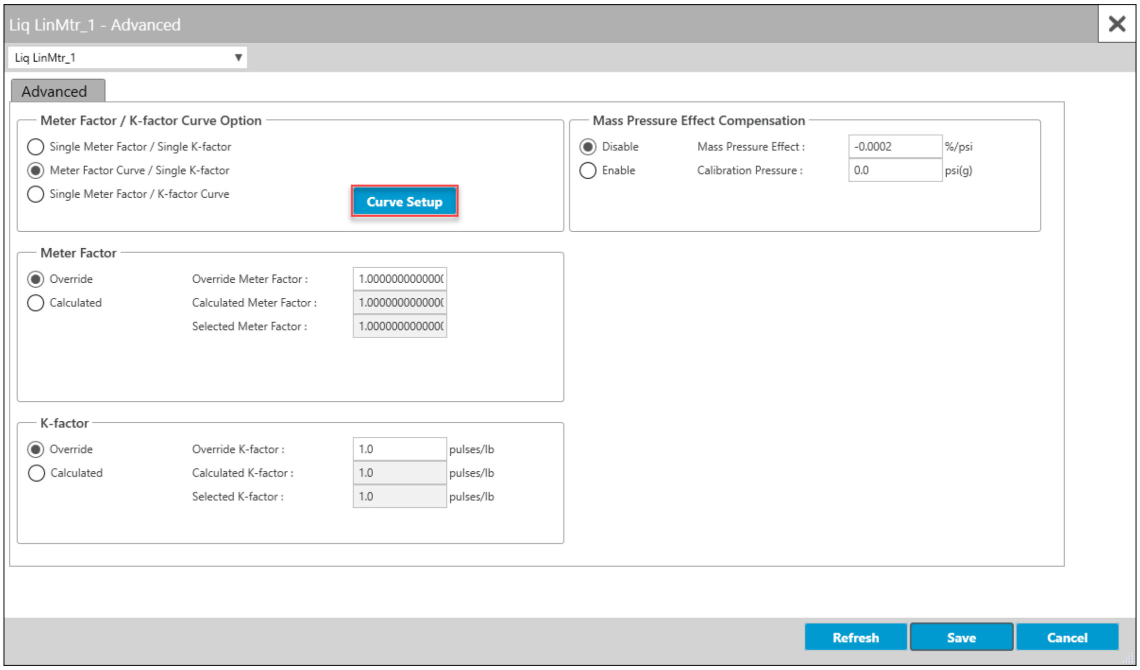
4.13.3.1 Curve Setup (Liquid Linear Meter)

Use this option to enter a meter factor curve or K-factor curve.

To access this option:

1. Select **Configure > Liquid > Liquid Linear Meter**. The Liquid Linear Meter display opens showing the General tab.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Advanced** button. The Liquid Linear Meter – Advance pop-up display opens.

Figure 204. Liquid Linear Meter – Advanced



Meter Factor / K-factor Curve Option
○ Single Meter Factor / Single K-factor
● Meter Factor Curve / Single K-factor
○ Single Meter Factor / K-factor Curve

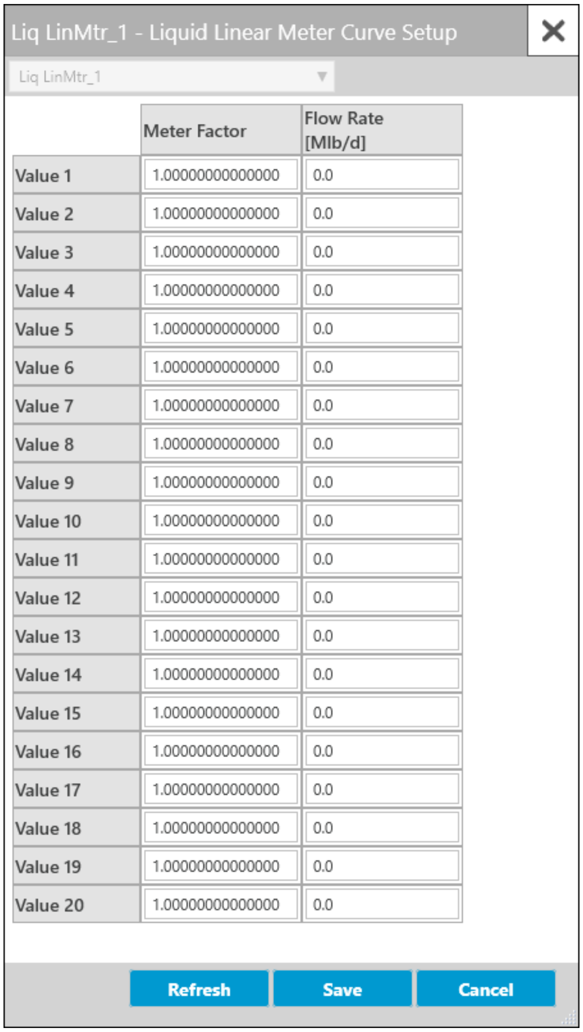
Mass Pressure Effect Compensation
● Disable
○ Enable
Mass Pressure Effect : -0.0002 %/psi
Calibration Pressure : 0.0 psi(g)

Meter Factor
● Override
○ Calculated
Override Meter Factor : 1.000000000000(
Calculated Meter Factor : 1.000000000000(
Selected Meter Factor : 1.000000000000(

K-factor
● Override
○ Calculated
Override K-factor : 1.0 pulses/lb
Calculated K-factor : 1.0 pulses/lb
Selected K-factor : 1.0 pulses/lb

4. Select either **Meter Factor Curve / Single K-factor** or **Single Meter Factor / K-factor Curve** in the Meter Factor / K-factor Curve Option frame and **Save** your changes.
5. Select the **Curve Setup** button. The Curve Setup pop-up display opens.

Figure 205. Curve Setup



Liq LinMtr_1 - Liquid Linear Meter Curve Setup

Liq LinMtr_1

	Meter Factor	Flow Rate [Mlb/d]
Value 1	1.00000000000000	0.0
Value 2	1.00000000000000	0.0
Value 3	1.00000000000000	0.0
Value 4	1.00000000000000	0.0
Value 5	1.00000000000000	0.0
Value 6	1.00000000000000	0.0
Value 7	1.00000000000000	0.0
Value 8	1.00000000000000	0.0
Value 9	1.00000000000000	0.0
Value 10	1.00000000000000	0.0
Value 11	1.00000000000000	0.0
Value 12	1.00000000000000	0.0
Value 13	1.00000000000000	0.0
Value 14	1.00000000000000	0.0
Value 15	1.00000000000000	0.0
Value 16	1.00000000000000	0.0
Value 17	1.00000000000000	0.0
Value 18	1.00000000000000	0.0
Value 19	1.00000000000000	0.0
Value 20	1.00000000000000	0.0

6. If you selected **Meter Factor Curve / Single K-factor** on the previous display, enter up to 20 points on the curve (pairs of meter factor and flow rate) and a meter factor is calculated for use in the flow equation by linear interpolation of the current indicated quantity flow rate. If you selected **Single Meter Factor / K-factor Curve** on the previous display, enter up to 20 points on the curve (pairs of K-factor and frequency) and a K-factor is calculated for use in the flow equation by linear interpolation of the current flow meter input frequency.

Note

A valid point **must** have a flow rate/frequency greater than zero and a factor greater than zero. The points may be entered in any order and will be internally sorted by flow rate (MF curve) or frequency (K-Factor Curve), discarding any invalid points. No extrapolation is done beyond the lowest and highest points on the curve. If the flow rate/frequency is less than the lowest point on the curve, the calculated factor will be the factor for the lowest point on the curve. If the flow rate/frequency is greater than the highest point on the curve, the calculated factor will be the factor for the highest point on the curve. If there are no valid points, then a default factor of 1.0 is used.

---

7. Select **Save** to save any changes you make to this pop-up display.

4.13.4 Liquid Linear Meter – Volume Correction

Use this pop-up display to configure temperature and pressure volume correction options for the selected liquid linear meter.

Note

- If you select a **Liquid Product Type** of **Crude Oil** (defined on the Liquid Product display), this tab appears **only** if you select **API Ch. 12.2** or **API Ch. 20.1** and **Use Oil Correction Factor for Water** in the **Crude Oil Options** fields on the Station – General display.
- If you select a **Liquid Product Type** of **Light Hydrocarbon** (defined on the Liquid Product display), the system calculates the volume correction factors and shows the calculated values in the Selected CTL/CPL fields.

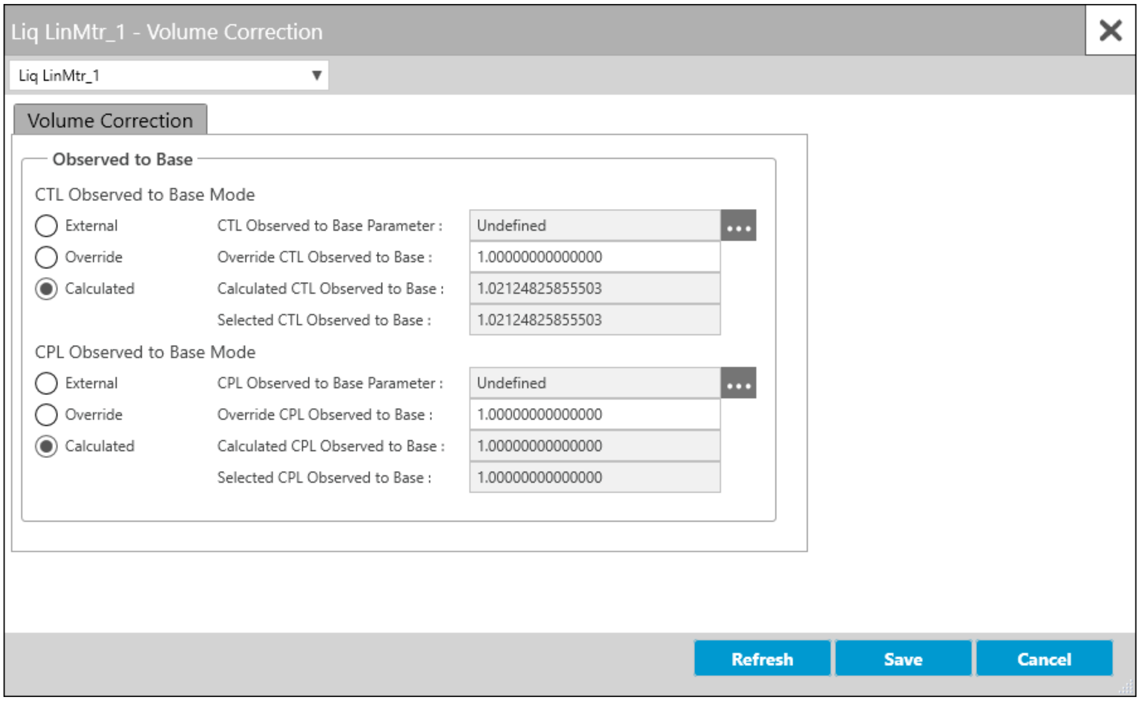
To understand the options available, you need to understand the concept of volume correction in general. Mass does not change with pressure and temperature, but we measure fluids by volume which does vary with pressure and temperature. Therefore, in order not to have your product worth less on cold days, fluids are bought and sold based on a corrected or standard volume, where the volume is calculated at some agreed upon pressure and temperature, which is the next best thing to mass. Most of the calculations require a density at some known temperature and pressure as an input. Of course, fluids are actually measured at widely varying pressures and temperatures and sometimes densities are measured at that same temperature and pressure and sometimes at a different temperature and pressure, so everything has to be converted to the agreed upon base conditions, thus the need for volume correction.

The temperature and pressure that the density is measured at is typically referred to as “observed” conditions, the agreed upon contract temperature and pressure as “base” conditions, and the conditions at the meter as “alternate” or “line” conditions. When you see references to “Observed to Base”, it is referring to the calculations involved in converting a density from the conditions it was measured at to the base conditions. When you see references to “Base to Meter”, it is referring to calculations involved in converting a density at base conditions to a density at alternate / meter / line conditions, which is the heart of volume correction, as the ratio of meter density to base density is the volume correction factor. Multiplying the measured volume at the meter by the volume correction factor gives you the base or standard volume.

To access this pop-up display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Volume Correction** button. The Liquid Linear Meter – Volume Correction pop-up display opens.

Figure 206. Liquid Linear Meter – Volume Correction



Liq LinMtr_1 - Volume Correction

Liq LinMtr_1 ▼

Volume Correction

Observed to Base

CTL Observed to Base Mode

○ External
○ Override
● Calculated

CTL Observed to Base Parameter : Undefined
Override CTL Observed to Base : 1.00000000000000
Calculated CTL Observed to Base : 1.02124825855503
Selected CTL Observed to Base : 1.02124825855503

CPL Observed to Base Mode

○ External
○ Override
● Calculated

CPL Observed to Base Parameter : Undefined
Override CPL Observed to Base : 1.00000000000000
Calculated CPL Observed to Base : 1.00000000000000
Selected CPL Observed to Base : 1.00000000000000

4. Review the values in the following fields:

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">CTL Observed to Base Mode</td><td colspan="2">Sets how the system acquires the observed to base hydrocarbon CTL (correction for the effect of temperature on liquid) value. This is the temperature portion of the correction from observed conditions to base conditions and is calculated from the observed temperature. Possible options are:</td></tr>
<tr><td>External</td><td>The system uses a parameter you configure in the CTL Observed To Base Parameter field to acquire the value.
Note
The system ignores negative or invalid external CTL values and uses a value of 0.0 instead.</td></tr>
<tr><td>Override</td><td>The system uses the fixed value you define in the Override CTL Observed to Base field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the observed to base CTL value, based on the appropriate calculation method for the product.</td></tr>
<tr><td>CTL Observed To Base Parameter</td><td colspan="2">Click … to open a Point Picker dialog and select a parameter to acquire the hydrocarbon CTL observed to base value.</td></tr>
<tr><td>Override CTL Observed To Base</td><td colspan="2">Sets the CTL observed to base value to use in calculations when Override is selected in the CTL Observed To Base Mode field.</td></tr>
<tr><td>Calculated CTL Observed To Base</td><td colspan="2">This read-only field shows the hydrocarbon CTL observed to base value as calculated by the system.</td></tr>
<tr><td>Selected CTL Observed To Base</td><td colspan="2">This read-only field shows the current hydrocarbon CTL observed to base value, based on the selected mode option. This is the CTL value in-use by the calculations.</td></tr>
<tr><td>CPL Observed to Base Mode</td><td colspan="2">Sets how the system acquires the observed to base hydrocarbon CPL (correction for the effect of pressure on liquid) value. This is the pressure portion of the correction from observed conditions to base conditions, and is calculated from the observed pressure. Possible options are:</td></tr>
</table>

Field	Description	
	External	The system uses a parameter you configure in the **CPL Observed To Base Parameter** field to acquire the value. **Note** The system ignores negative or invalid external CPL values and uses a value of 0.0 instead.
	Override	The system uses the fixed value you define in the **Override CPL Observed to Base** field.
	Calculated	The system calculates the observed to base CPL value, based on the appropriate calculation method for the product.
CPL Observed To Base Parameter	Click ⋯ to open a Point Picker dialog and select a parameter to acquire the hydrocarbon CPL observed to base value.	
Override CPL Observed To Base	Sets the CPL observed to base value to use in calculations when **Override** is selected in the **CPL Observed To Base Mode** field.	
Calculated CPL Observed To Base	This **read-only** field shows the hydrocarbon CPL observed to base value as calculated by the system.	
Selected CPL Observed To Base	This **read-only** field shows the current hydrocarbon CPL observed to base value, based on the selected mode option. This is the CPL value in-use by the calculations.	
CTL Base to Meter Mode	Sets how the system acquires the base to meter hydrocarbon CTL (correction for the effect of temperature on liquid) value. This is the temperature portion of the correction from base conditions to meter conditions, and is calculated from the base temperature. Possible options are:	
	External	The system uses a parameter you configure in the **CTL Base to Meter Parameter** field to acquire the value. **Note** The system ignores negative or invalid external CTL values and uses a value of 0.0 instead.
	Override	The system uses the fixed value you define in the **Override CTL Base to Meter** field.

Field	Description	
	Calculated	The system calculates the observed to base CTL value, based on the appropriate calculation method for the product.
CTL Base to Meter Mode Parameter	Click … to open a Point Picker dialog and select a parameter to acquire the hydrocarbon CTL base to meter value.	
Override CTL Base to Meter Mode	Sets the CTL base to meter value to use in calculations when **Override** is selected in the **CTL Base to Meter Mode** field.	
Calculated CTL Base to Meter Mode	This **read-only** field shows the hydrocarbon CTL base to meter value as calculated by the system.	
Selected CTL Base to Meter Mode	This **read-only** field shows the current hydrocarbon CTL base to meter value, based on the selected mode option. This is the CTL value in-use by the calculations.	
CPL Base to Meter Mode	Sets how the system acquires the base to meter hydrocarbon CPL (correction for the effect of pressure on liquid) value. This is the pressure portion of the correction from base conditions to meter conditions, and is calculated from the base pressure. Possible options are:	
	External	The system uses a parameter you configure in the **CPL Base to Meter Parameter** field to acquire the value. **Note** The system ignores negative or invalid external CPL values and uses a value of 0.0 instead.
	Override	The system uses the fixed value you define in the **Override CPL Base to Meter** field.
	Calculated	The system calculates the base to meter CPL value, based on the appropriate calculation method for the product.
CPL Base to Meter Mode Parameter	Click … to open a Point Picker dialog and select a parameter to acquire the hydrocarbon CPL base to meter value.	
Override CPL Base to Meter Mode	Sets the CPL base to meter value to use in calculations when **Override** is selected in the **CPL Base to Meter Mode** field.	

Field	Description
Calculated CPL Base to Meter Mode	This **read-only** field shows the hydrocarbon CPL base to meter value as calculated by the system.
Selected CPL Base to Meter Mode	This **read-only** field shows the current hydrocarbon CPL base to meter value, based on the selected mode option. This is the CPL value in-use by the calculations.

5. Select **Save** to save your changes if you modify any of the fields on this display.

4.13.5 Liquid Linear Meter – Water

Use this pop-up display to configure correction options for sediment in water present in the selected liquid linear meter.

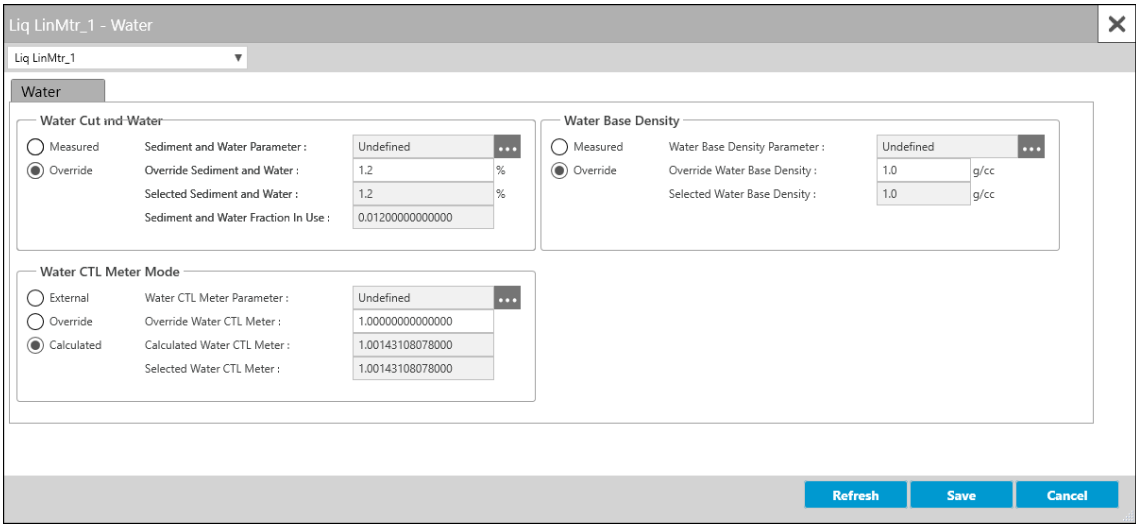
Note

The **Water** button appears **only** if you select **Crude Oil** in the **Liquid Product Type** field on the Liquid Product display.

To access this pop-up display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to configure.
3. Select the **Water** button. The Liquid Linear Meter – Water pop-up display opens.

Figure 207. Liquid Linear Meter – Water



Water Cut and Water

○ Measured
● Override

Sediment and Water Parameter : Undefined
Override Sediment and Water : 1.2 %
Selected Sediment and Water : 1.2 %
Sediment and Water Fraction In Use : 0.01200000000000

Water Base Density

○ Measured
● Override

Water Base Density Parameter : Undefined
Override Water Base Density : 1.0 g/cc
Selected Water Base Density : 1.0 g/cc

Water CTL Meter Mode

○ External
○ Override
● Calculated

Water CTL Meter Parameter : Undefined
Override Water CTL Meter : 1.00000000000000
Calculated Water CTL Meter : 1.00143108078000
Selected Water CTL Meter : 1.00143108078000

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Sediment and Water / Water Cut	Sets how the system acquires the sediment and water or water cut value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Sediment and Water Parameter** field to acquire the value. **Note** The system ignores negative or invalid sediment and water values and uses a value of 0.0 instead.
	Override	The system uses the fixed value you define in the **Override Sediment and Water** field.
	Note The label changes based on your selection in the **Crude Oil Options** fields on the Station – General display. If you select **API Ch. 20.1** and **Use Separate Correction Factor for Water**, this field is labeled **Water Cut**.	
Sediment and Water Parameter	Click … to open a Point Picker dialog and select a parameter to acquire the sediment and water value.	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Override Sediment and Water</td><td colspan="2">Sets a fixed sediment and water value to use in calculations when Override is selected in the Sediment and Water field.</td></tr>
<tr><td>Selected Sediment and Water</td><td colspan="2">This read-only field shows the current sediment and water value, based on the selected mode option. This is the sediment and water value in-use by the calculations.</td></tr>
<tr><td>Sediment and Water Fraction In Use</td><td colspan="2">This read-only field shows the volume fraction of water applied to the gross volume of fluid measured to determine uncorrected (actual) water volume at metering conditions.</td></tr>
<tr><td rowspan="5">Water CTL Meter Mode</td><td colspan="2">Sets how the system acquires the water CTL meter value. The water CTL meter is the ratio of water at allocation point temperature to the water at base temperature. Possible options are:</td></tr>
<tr><td>External</td><td>The system uses a parameter you configure in the Water CTL Meter Parameter field to acquire the value.
Note
The system ignores negative or invalid water CTL meter values and uses a value of 0.0 instead.</td></tr>
<tr><td>Override</td><td>The system uses the fixed value you define in the Override Water CTL Meter field.</td></tr>
<tr><td>Calculated</td><td>The system calculates the water CTL meter value.</td></tr>
<tr><td colspan="2">Note
These fields appear only if you select API Ch. 20.1 and Use Separate Correction Factor for Water in the Crude Oil Option fields on the selection on the Station – General display.</td></tr>
<tr><td>Water CTL Meter Parameter</td><td colspan="2">Click … to open a Point Picker dialog and select a parameter to acquire the water CTL meter value.</td></tr>
<tr><td>Override Water CTL Meter</td><td colspan="2">Sets the water CTL meter value to use in calculations when Override is selected in the Water CTL Meter Mode field.</td></tr>
<tr><td>Calculated Water CTL Meter</td><td colspan="2">This read-only field shows the water CTL meter value as calculated by the system.</td></tr>
</table>

Field	**Description**	
Selected Water CTL Meter	This **read-only** field shows the current water CTL meter value, based of the selected options, used in calculations.	
Water Base Density	Sets how the system acquires the water base density value. Possible options are:	
	Measured	The system uses a parameter you configure in the **Water Base Density Parameter** field to acquire the value. **Note** The system ignores negative or invalid water base density values and uses a value of 0.0 instead.
	Override	The system uses the fixed value you define in the **Override Water Base Density** field.
	Note These fields appear **only** if you select **API Ch. 20.1** and **Use Separate Correction Factor for Water** in the **Crude Oil Option** fields on the selection on the Station – General display.	
Water Base Density Parameter	Click ••• to open a Point Picker dialog and select a parameter to acquire the water base density value.	
Override Water Base Density	Sets the water base density value to use in calculations when **Override** is selected in the **Water Base Density** field.	
Selected Water Base Density	This **read-only** field shows the current water base density value, based of the selected options, used in calculations.	

5. Select **Save** to save your changes if you modify any of the fields on this display.

4.13.6 Liquid Linear Meter – Additional Factors

Use this pop-up display to configure additional properties for the fluid flowing through the meter, including NGL, shrinkage, and flash gas factors.

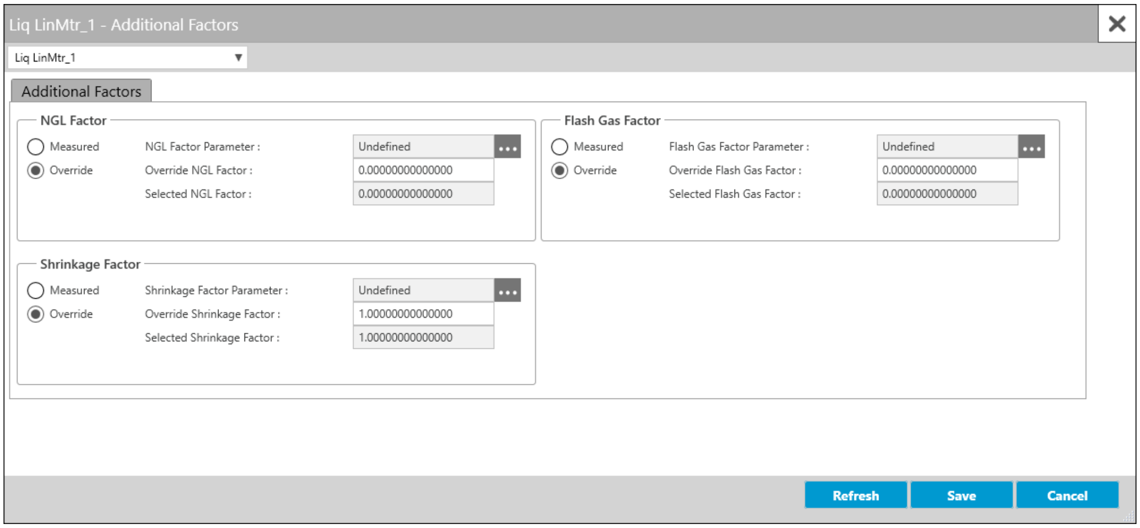
Note

The **Additional Factors** button appears **only** if you select **Crude Oil** in the **Liquid Product Type** field on the Liquid Product display and **API Ch. 20.1** in the **Crude Oil Options** field on the Station – General display.

To access this pop-up display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Additional Factors** button. The Liquid Linear Meter – Additional Factors pop-up display opens.

Figure 208. Liquid Linear Meter – Additional Factors



Liq LinMtr_1 - Additional Factors

Liq LinMtr_1 ▼

Additional Factors

NGL Factor
○ Measured
● Override
NGL Factor Parameter : Undefined
Override NGL Factor : 0.00000000000000
Selected NGL Factor : 0.00000000000000

Flash Gas Factor
○ Measured
● Override
Flash Gas Factor Parameter : Undefined
Override Flash Gas Factor : 0.00000000000000
Selected Flash Gas Factor : 0.00000000000000

Shrinkage Factor
○ Measured
● Override
Shrinkage Factor Parameter : Undefined
Override Shrinkage Factor : 1.00000000000000
Selected Shrinkage Factor : 1.00000000000000

4. Review – and change as necessary – the values in the following fields:

Field	**Description**	
NGL Factor	Sets how the system acquires the NGL factor. Possible options are:	
	Measured	The system uses a parameter you configure in the **NGL Factor Parameter** field to acquire the value.
	Override	The system uses the fixed value you define in the **Override NGL Factor** field.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">Note
These fields appear only if you select API Ch. 20.1 and Use Oil Correction for Water in the Crude Oil Options field on the Station – General display.</td></tr>
<tr><td>NGL Factor Parameter</td><td colspan="2">Click ... to open a Point Picker dialog and select a parameter to acquire the NGL factor value.</td></tr>
<tr><td>Override NGL Factor</td><td colspan="2">Sets the NGL Factor value to use in calculations when Override is selected in the NGL Factor field.</td></tr>
<tr><td>Selected NGL Factor</td><td colspan="2">This read-only field shows the current NGL factor value, based of the selected options, used in calculations.</td></tr>
<tr><td rowspan="3">Shrinkage Factor</td><td colspan="2">Sets how the system acquires the shrinkage factor. Possible options are:</td></tr>
<tr><td>Measured</td><td>The system uses a parameter you configure in the Shrinkage Factor Parameter field to acquire the value.</td></tr>
<tr><td>Override</td><td>The system uses the fixed value you define in the Override Shrinkage Factor field.</td></tr>
<tr><td>Shrinkage Factor Parameter</td><td colspan="2">Click ... to open a Point Picker dialog and select a parameter to acquire the shrinkage factor value.</td></tr>
<tr><td>Override Shrinkage Factor</td><td colspan="2">Sets the shrinkage factor value to use in calculations when Override is selected in the Shrinkage Factor field.</td></tr>
<tr><td>Selected Shrinkage Factor</td><td colspan="2">This read-only field shows the current shrinkage factor value, based of the selected options, used in calculations.</td></tr>
<tr><td rowspan="3">Flash Gas Factor</td><td colspan="2">Sets how the system acquires the flash gas factor. Possible options are:</td></tr>
<tr><td>Measured</td><td>The system uses a parameter you configure in the Flash Gas Factor Parameter field to acquire the value.</td></tr>
<tr><td>Override</td><td>The system uses the fixed value you define in the Override Flash Gas Factor field.</td></tr>
</table>

Field	Description
	Note These fields appear **only** if you select **API Ch. 20.1** and **Use Oil Correction for Water** in the **Crude Oil Options** field on the Station – General display.
Flash Gas Factor Parameter	Click ••• to open a Point Picker dialog and select a parameter to acquire the flash gas factor value.
Override Flash Gas Factor	Sets, in percent, the sediment and water value to use in calculations when **Override** is selected in the **Flash Gas Factor** field.
Selected Flash Gas Factor	This **read-only** field shows the current flash gas factor value, based of the selected options, used in calculations.

5. Select **Save** to save your changes if you modify any of the fields on this display.

4.13.7 Liquid Linear Meter – Diagnostics

Use this pop-up display to view **read-only** diagnostic information for the selected liquid linear meter, including calculated factors, calculated values, and alarm codes.

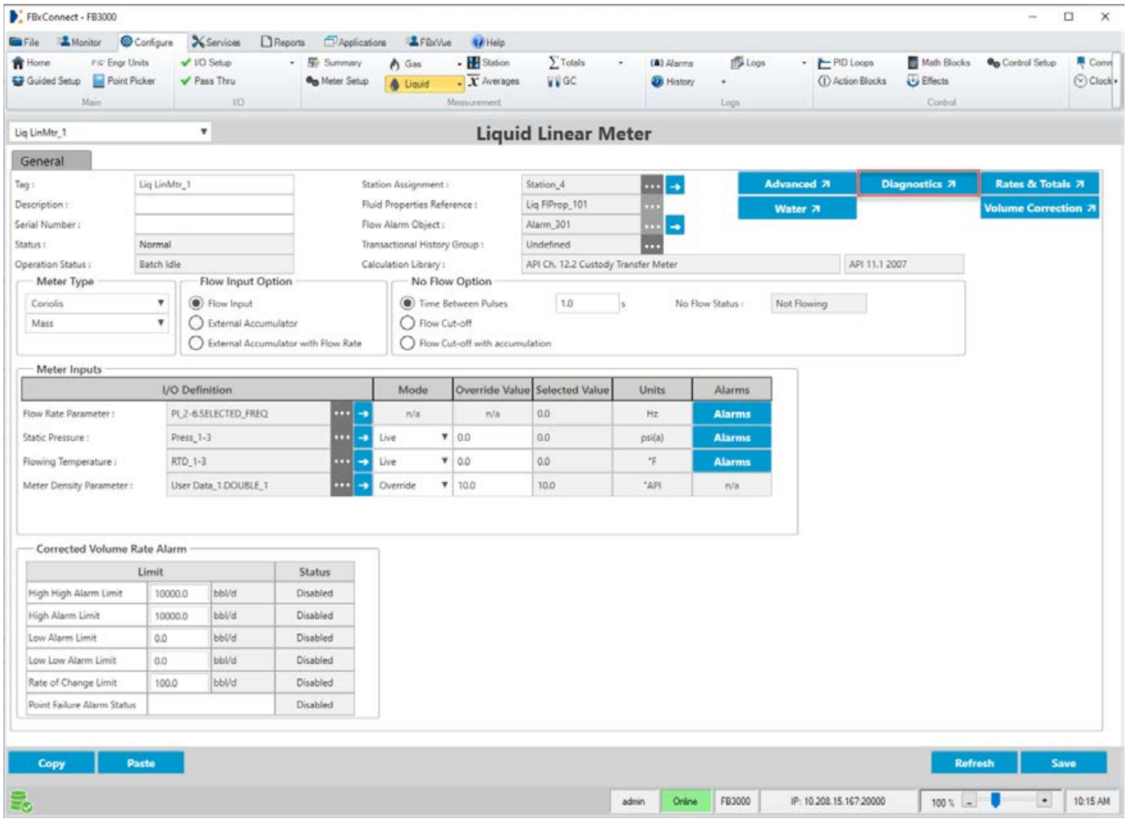
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- Physically impossible inputs may be clamped at a high or low limit value in order to ensure reasonable results. If a value is clamped at a high or low limit, a corresponding flow or property alarm is raised.

To access this display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 209. Liquid Linear Meter – Diagnostics Button



Liq LinMtr_1

Liquid Linear Meter

General

Tag : Liq LinMtr_1
Description :
Serial Number :
Status : Normal
Operation Status : Batch Idle
Station Assignment : Station_4
Fluid Properties Reference : Liq FlProp_101
Flow Alarm Object : Alarm_301
Transactional History Group : Undefined
Calculation Library : API Ch. 12.2 Custody Transfer Meter | API 11.1 2007

Meter Type
Coriolis
Mass

Flow Input Option
● Flow Input
○ External Accumulator
○ External Accumulator with Flow Rate

No Flow Option
● Time Between Pulses 1.0 s
○ Flow Cut-off
○ Flow Cut-off with accumulation
No Flow Status : Not Flowing

Meter Inputs

	I/O Definition	Mode	Override Value	Selected Value	Units	Alarms
Flow Rate Parameter :	PI_2-6.SELECTED_FREQ	n/a	n/a	0.0	Hz	Alarms
Static Pressure :	Press_1-3	Live	0.0	0.0	psi(a)	Alarms
Flowing Temperature :	RTD_1-3	Live	0.0	0.0	°F	Alarms
Meter Density Parameter :	User Data_1.DOUBLE_1	Override	10.0	10.0	°API	n/a

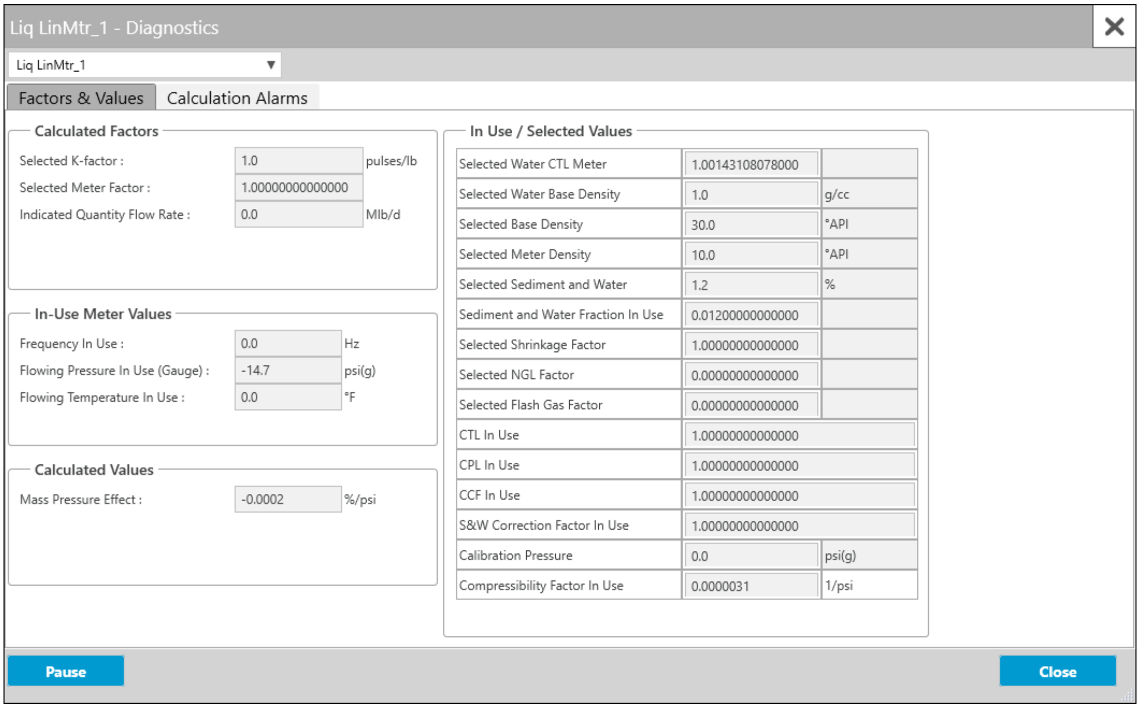
Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	bbl/d	Disabled
High Alarm Limit	10000.0	bbl/d	Disabled
Low Alarm Limit	0.0	bbl/d	Disabled
Low Low Alarm Limit	0.0	bbl/d	Disabled
Rate of Change Limit	100.0	bbl/d	Disabled
Point Failure Alarm Status			Disabled

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 10:15 AM

3. Select the **Diagnostics** button. The Liquid Linear Meter Diagnostics display opens showing the Factors and Values tab.

Figure 210. Liquid Linear Meter Diagnostics



Calculated Factors

Selected K-factor :	1.0	pulses/lb
Selected Meter Factor :	1.00000000000000	
Indicated Quantity Flow Rate :	0.0	Mlb/d

In-Use Meter Values

Frequency In Use :	0.0	Hz
Flowing Pressure In Use (Gauge) :	-14.7	psi(g)
Flowing Temperature In Use :	0.0	°F

Calculated Values

Mass Pressure Effect :	-0.0002	%/psi

In Use / Selected Values

Selected Water CTL Meter	1.00143108078000	
Selected Water Base Density	1.0	g/cc
Selected Base Density	30.0	°API
Selected Meter Density	10.0	°API
Selected Sediment and Water	1.2	%
Sediment and Water Fraction In Use	0.01200000000000	
Selected Shrinkage Factor	1.00000000000000	
Selected NGL Factor	0.00000000000000	
Selected Flash Gas Factor	0.00000000000000	
CTL In Use	1.00000000000000	
CPL In Use	1.00000000000000	
CCF In Use	1.00000000000000	
S&W Correction Factor In Use	1.00000000000000	
Calibration Pressure	0.0	psi(g)
Compressibility Factor In Use	0.0000031	1/psi

The Liquid Linear Meter Diagnostics display contains the following tabs:

Factors and Values – This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

Calculation Alarms – This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with the meter.

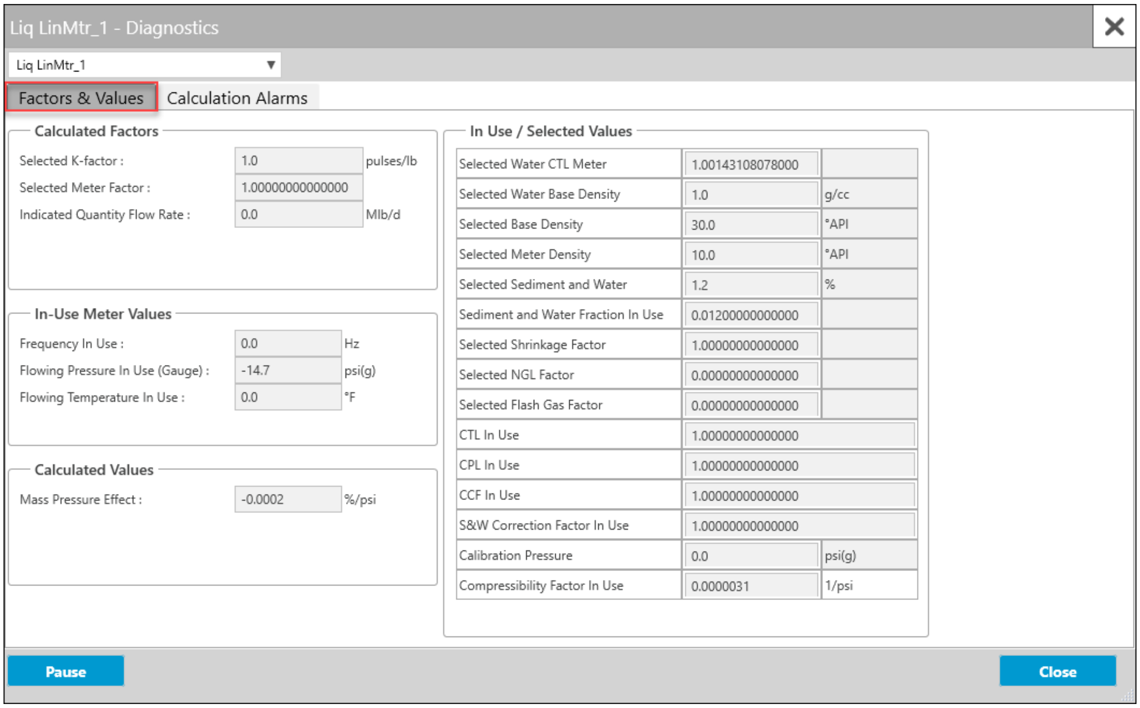
4.13.7.1 Liquid Linear Meter Diagnostics – Factors and Values Tab

This tab displays the **read-only** current values for inputs and interim figures used for the meter calculations.

To access this display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The Liquid Linear Meter Diagnostics display opens showing the Factors and Values tab.

Figure 211. Liquid Linear Meter Diagnostics – Factors and Values Tab



Calculated Factors

Selected K-factor : 1.0 pulses/lb
Selected Meter Factor : 1.00000000000000
Indicated Quantity Flow Rate : 0.0 Mlb/d

In-Use Meter Values

Frequency In Use : 0.0 Hz
Flowing Pressure In Use (Gauge) : -14.7 psi(g)
Flowing Temperature In Use : 0.0 °F

Calculated Values

Mass Pressure Effect : -0.0002 %/psi

In Use / Selected Values

Selected Water CTL Meter	1.00143108078000	
Selected Water Base Density	1.0	g/cc
Selected Base Density	30.0	°API
Selected Meter Density	10.0	°API
Selected Sediment and Water	1.2	%
Sediment and Water Fraction In Use	0.01200000000000	
Selected Shrinkage Factor	1.00000000000000	
Selected NGL Factor	0.00000000000000	
Selected Flash Gas Factor	0.00000000000000	
CTL In Use	1.00000000000000	
CPL In Use	1.00000000000000	
CCF In Use	1.00000000000000	
S&W Correction Factor In Use	1.00000000000000	
Calibration Pressure	0.0	psi(g)
Compressibility Factor In Use	0.0000031	1/psi

4. Review the values in the following fields:

Field	Description	
Calculated Factors	**Selected K-factor**	This **read-only** field shows the pulses per unit quantity generated by a pulse output type flow meter (also system factor). The nominal value is determined by flow meter design and factory water flow calibration. The "average" K-factors for the flow meters are usually displayed on the flow meter nameplates.
	Selected Meter Factor	This **read-only** field shows the number obtained by dividing the actual volume of liquid passed through a flow meter during a meter proving operation by the volume registered by the flow meter. The meter factor is used in flow calculations to correct the indicated volume (end flow meter registration minus start flow meter registration) to the observed gross volume (actual flow meter throughput at operating conditions).

Field	**Description**	
		Meter factor = (Meter prover volume corrected to standard conditions) / (Flow meter indicated volume corrected to standard conditions)
	Indicated Quantity Flow Rate	This **read-only** field shows the raw flow rate from the meter in Volumetric or Mass Flow Rate units, depending on the meter type. This value is prior to any meter factor correction.
In-Use Meter Value	**Frequency In Use**	This **read-only** field shows the value of the indicated flow input configured on the Liquid Linear Meter – General display.
	Flowing Pressure In Use (Gauge)	This **read-only** field shows the flowing gauge pressure being used by the flow calculation. It will reflect the absolute pressure in the selected pressure units of the station.
	Flowing Temperature In Use	This **read-only** field shows the flowing temperature being used by the flow calculation. It will reflect the temperature in the selected temperature units of the station.
	External Accumulator Value	This **read-only** field shows the flow accumulator value being used by the flow calculation. This field represents the accumulated volume for a turbine meter type or accumulated mass for a Coriolis meter type.
Calculated Values	**Mass Pressure Effect**	This **read-only** field shows the mass pressure effect currently used in calculations. The mass pressure effect accounts for the effect of pressure on the vibrating tube of the Coriolis meter.
In Use / Selected Values	These **read-only** fields show the current values being used by the flow calculation. **Note** The In Use/Selected Values shown vary depending on your selections in the **Liquid Product Type** field on the Liquid Product display and **Crude Oil Options** field on the Station – General display.	

Field	Description
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.

4.13.7.2 Liquid Linear Meter Diagnostics – Calculation Alarms Tab

This tab displays any current alarms that apply to the meter calculations. Use this tab to aid in the diagnosis of problems with meter. Alarm codes are comprised of two parts: Alarm Category (the reason for the alarm) and Alarm Value (the part of the calculation that raised the alarm). For example, if you assign a voltage signal to a pressure input, **Invalid Input** would be selected in the **Alarm Category** frame and **Pressure** would be selected in the **Alarm Value** frame.

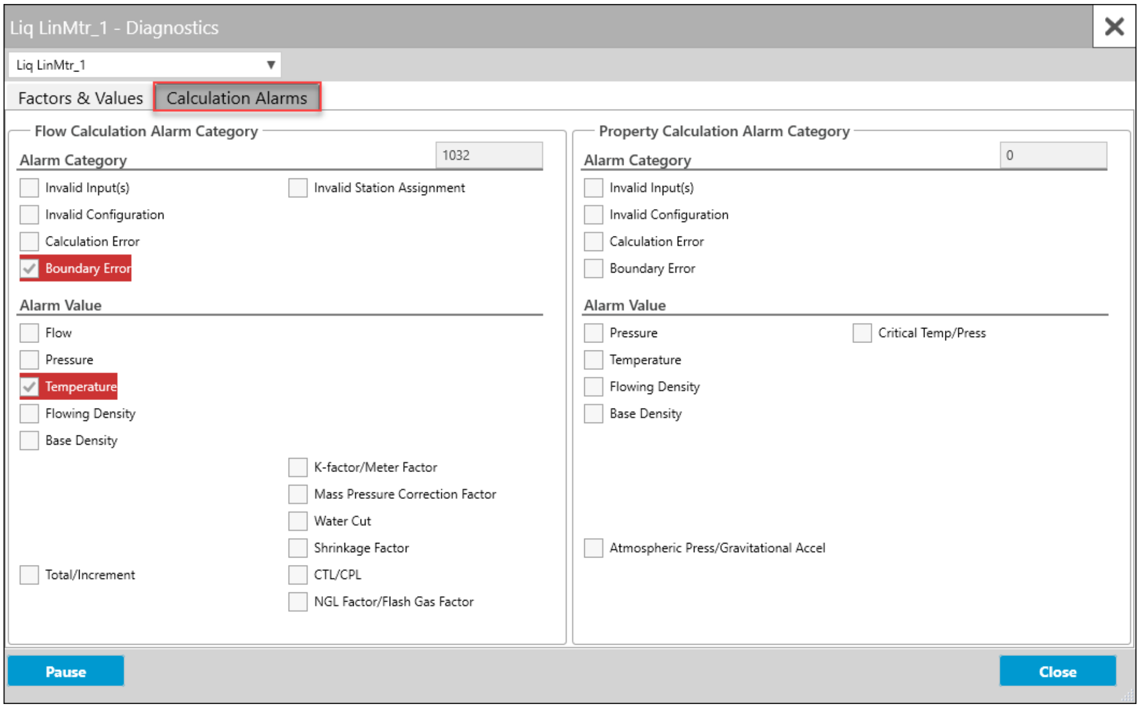
Note

- The fields shown on this display are determined by your selection in the **Liquid Product Type** field on the Liquid Product display.
- The alarm code is a decimal representation of which alarm bits are set. Each bit is identified in the table below.
- The error code can be a composite of one or more errors.
- Error codes are generated according to your selection in the **Calculation Failure Option** field on the Station – Advanced display.
- Alarms are raised if calculation inputs and interim values do not fall within certain ranges based on the calculation you have selected. To view the boundary limits for calculations, refer to Calculation Library Limit Checks.

To access this display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.
3. Select the **Diagnostics** button. The Liquid Linear Meter Diagnostics display opens.
4. Select the **Calculation Alarms** tab.

Figure 212. Liquid Linear Meter Diagnostics – Calculation Alarms Tab



Liq LinMtr_1 - Diagnostics

Liq LinMtr_1 ▼

Factors & Values | Calculation Alarms

Flow Calculation Alarm Category

Alarm Category: 1032

☐ Invalid Input(s)
☐ Invalid Configuration
☐ Calculation Error
☑ Boundary Error
☐ Invalid Station Assignment

Alarm Value

☐ Flow
☐ Pressure
☑ Temperature
☐ Flowing Density
☐ Base Density
☐ Total/Increment
☐ K-factor/Meter Factor
☐ Mass Pressure Correction Factor
☐ Water Cut
☐ Shrinkage Factor
☐ CTL/CPL
☐ NGL Factor/Flash Gas Factor

Property Calculation Alarm Category

Alarm Category: 0

☐ Invalid Input(s)
☐ Invalid Configuration
☐ Calculation Error
☐ Boundary Error

Alarm Value

☐ Pressure
☐ Temperature
☐ Flowing Density
☐ Base Density
☐ Critical Temp/Press
☐ Atmospheric Press/Gravitational Accel

5. Review the values in the following fields:

Field	**Description**	
Flow Calculation Alarm Category	These **read-only** fields show flow calculation alarm information.	
	Flow Calculation Alarm Code	This **read-only** field shows a code that indicates whether the flow calculation is within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set. **Note** • This is the same alarm code shown in the Alarm report. • The Alarm Code may show 0 if Calculation Failure Option has been set to Alarm Disabled on the Station – Advanced display.
	Alarm Category	These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:

Field	Description	
	Invalid Input(s) (Bit 0)	A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.
	Invalid Configuration (Bit 1)	Database or program corruption. **Note** If detected, this alarm is asserted even when calculation alarms are disabled.
	Calculation Error (Bit 2)	An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.
	Boundary Error (Bit 3)	Something exceeded stated boundary of the calculation standard.
	Invalid Station Assignment (Bit 4)	The meter type not is valid for the station type or station fluid type.

Field	Description	
	Alarm Value	These **read-only** fields show, if checked, which part of the flow calculation is associated with the Alarm Category. • Flow (Bit 8) • Pressure (Bit 9) • Temperature (Bit 10) • Flowing Density (Bit 11) • Base Density (Bit 12) • Total/Increment (Bit 17) • K-factor / Meter Factor (Bit 25) • Mass Pressure Correction Factor (Bit 26) • Water Cut (Bit 27) • Shrinkage Factor (Bit 28) • CTL (Bit 29) • NGL/Flash Gas Factor (Bit 30)

Field	Description		
Property Calculation Alarm Category	These **read-only** fields show property calculation alarm information.		
	Property Calculation Alarm Code	This **read-only** field shows a code that indicates whether the property calculations (density, compressibility, and heating value) are within the specified boundaries of the selected method. The alarm code is a decimal representation of which alarm bits are set. **Note** • This is the same alarm code shown in the Alarm report. • The Alarm Code may show **0** if Calculation Failure Option has been set to Alarm Disabled on the Station – Advanced display.	
	Alarm Category	These **read-only** fields show, if checked, a general reason an alarm condition exists. Possible categories are:	
		Invalid Input(s) (Bit 0)	A required input is undefined, bad object type, wrong measurement type, measured input is not a valid floating-point number, or invalid combination of selections.
		Invalid Configuration (Bit 1)	Database or program corruption. **Note** If detected, this alarm is asserted even when calculation alarms are disabled.
		Calculation Error (Bit 2)	An error occurred in a calculation. Possible reasons are a conversion error, failure to converge, iteration limit, or divide by 0.
		Boundary Error (Bit 3)	Something exceeded stated boundary of the calculation standard.

Field	Description	
	Alarm Value	These **read-only** fields show, if checked, shows which part of the flow calculation is associated with the Alarm Category. • Pressure (Bit 8) • Temperature (Bit 9) • Flowing Density (Bit 10) • Base Density (Bit 11) • Atmospheric Press/Gravitational Accel (Bit 16) • Critical Temp/Press (Bit 20)
Pause/Resume	Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.	

4.13.8 Liquid Linear Meter – Rates & Totals

Use this pop-up display to view **read-only** flow rates and accumulations for the selected liquid linear meter.

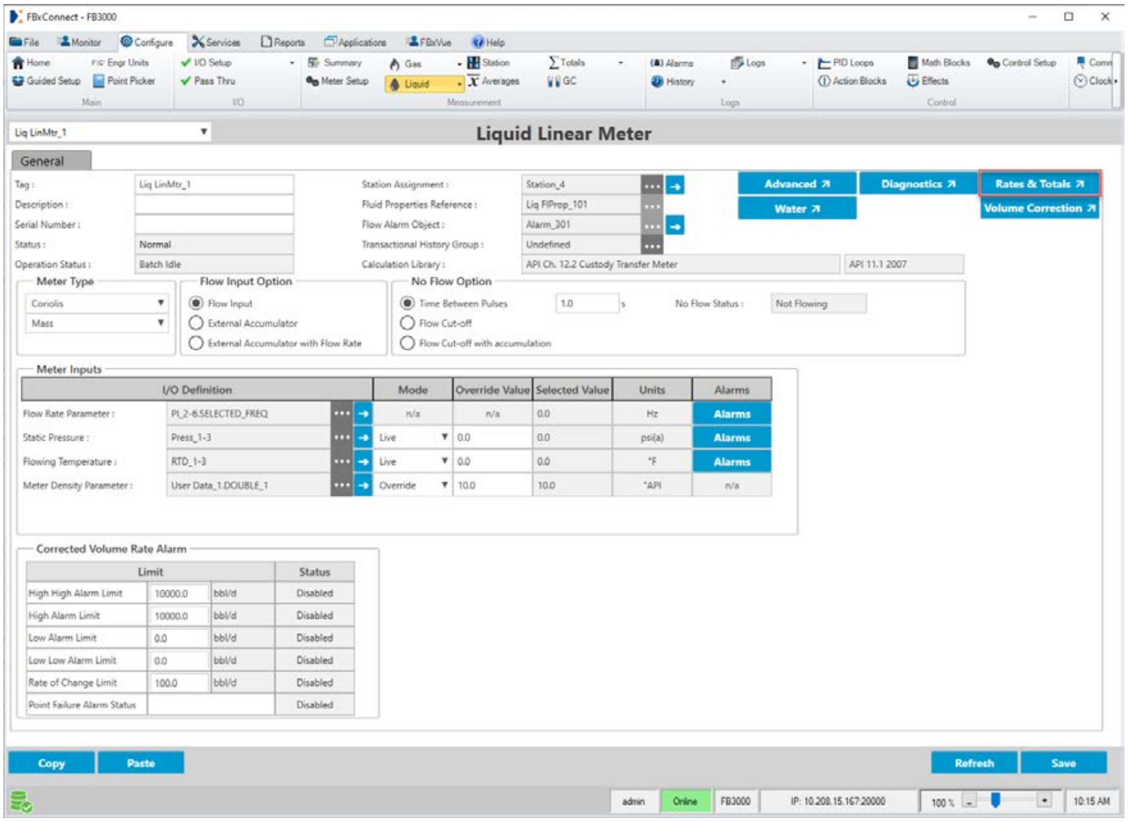
Note

- This pop-up can remain open while you change values on the other tabs of this display.
- The flow rates and totals shown vary depending on you selections in the **Liquid Product Type** field on the Liquid Product display and **Crude Oil Options** field on the Station – General tab.
- The system uses different calculations based on three possible configurations. Refer to Liquid Linear Meter Flow Calculations for a list of flow calculations used with different configurations.

To access this pop-up display:

1. Select **Configure > Liquid > Liquid Linear Meter** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a meter to view.

Figure 213. Liquid Linear Meter – Rates & Totals Button



Liq LinMtr_1

Liquid Linear Meter

General

Tag : Liq LinMtr_1
Description :
Serial Number :
Status : Normal
Operation Status : Batch Idle

Station Assignment : Station_4
Fluid Properties Reference : Liq FlProp_101
Flow Alarm Object : Alarm_301
Transactional History Group : Undefined
Calculation Library : API Ch. 12.2 Custody Transfer Meter | API 11.1 2007

Meter Type
Coriolis
Mass

Flow Input Option
● Flow Input
○ External Accumulator
○ External Accumulator with Flow Rate

No Flow Option
● Time Between Pulses 1.0 s
○ Flow Cut-off
○ Flow Cut-off with accumulation

No Flow Status : Not Flowing

Meter Inputs

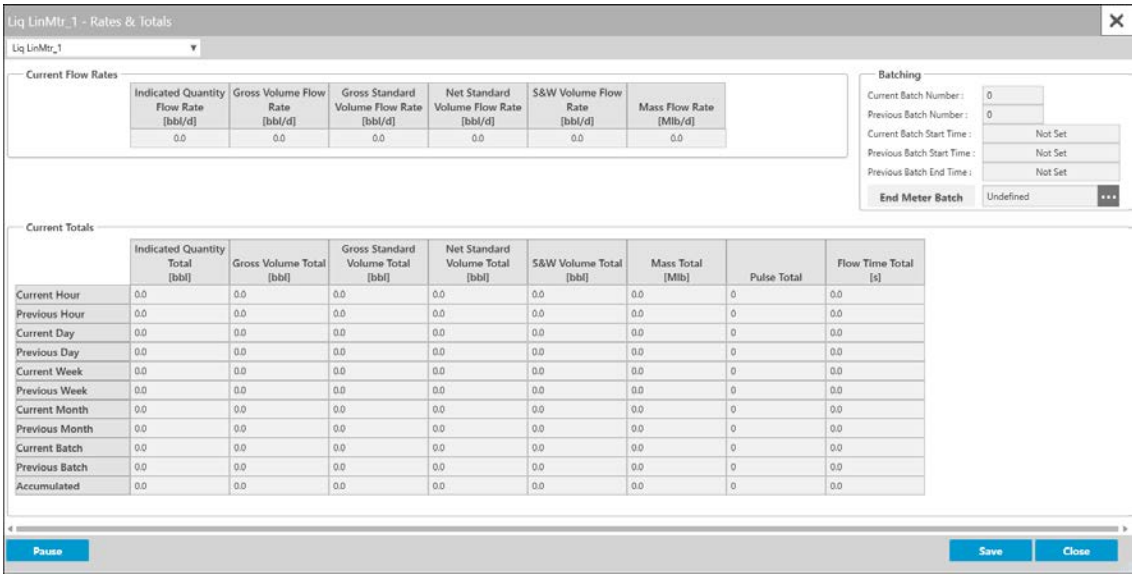
	I/O Definition	Mode	Override Value	Selected Value	Units	Alarms
Flow Rate Parameter :	PI_2-6.SELECTED_FREQ	n/a	n/a	0.0	Hz	Alarms
Static Pressure :	Press_1-3	Live	0.0	0.0	psi(a)	Alarms
Flowing Temperature :	RTD_1-3	Live	0.0	0.0	°F	Alarms
Meter Density Parameter :	User Data_1.DOUBLE_1	Override	10.0	10.0	°API	n/a

Corrected Volume Rate Alarm

Limit			Status
High High Alarm Limit	10000.0	bbl/d	Disabled
High Alarm Limit	10000.0	bbl/d	Disabled
Low Alarm Limit	0.0	bbl/d	Disabled
Low Low Alarm Limit	0.0	bbl/d	Disabled
Rate of Change Limit	100.0	bbl/d	Disabled
Point Failure Alarm Status			Disabled

3. Select the **Rates & Totals** button. Liquid Linear Meter Rates & Totals display opens.

Figure 214. Liquid Linear Meter Rates & Totals



Liq LinMtr_1

Current Flow Rates

Indicated Quantity Flow Rate [bbl/d]	Gross Volume Flow Rate [bbl/d]	Gross Standard Volume Flow Rate [bbl/d]	Net Standard Volume Flow Rate [bbl/d]	S&W Volume Flow Rate [bbl/d]	Mass Flow Rate [Mlb/d]
0.0	0.0	0.0	0.0	0.0	0.0

Batching

Current Batch Number : 0
Previous Batch Number : 0
Current Batch Start Time : Not Set
Previous Batch Start Time : Not Set
Previous Batch End Time : Not Set
End Meter Batch : Undefined

Current Totals

	Indicated Quantity Total [bbl]	Gross Volume Total [bbl]	Gross Standard Volume Total [bbl]	Net Standard Volume Total [bbl]	S&W Volume Total [bbl]	Mass Total [Mlb]	Pulse Total	Flow Time Total [s]
Current Hour	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Previous Hour	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Current Day	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Previous Day	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Current Week	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Previous Week	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Current Month	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Previous Month	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Current Batch	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Previous Batch	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Accumulated	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0

4. Review the values in the following fields:

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Current Flow Rates</td><td colspan="2">These read-only fields show the current flow rates for the selected meter.</td></tr>
<tr><td>Current Totals</td><td colspan="2">These read-only fields show the total accumulation, as well as the current and previous hourly, daily, weekly, monthly, and batch accumulations for the selected meter.</td></tr>
<tr><td rowspan="2">Batching</td><td colspan="2">These read-only fields show the current and previous batch numbers, batch start times, and previous batch end time.
Note
These fields show only if the Batch Option field is set to Enable on the Station – General display.</td></tr>
<tr><td>End Meter Batch</td><td>Select this button to end a currently running batch. Click … to open a Point Picker dialog and select a numeric read/write parameter used by an external host to end a batch when the value is non-zero.
Note
If you select a parameter, a non-zero value is interpreted as a command and a zero value is interpreted as an idle state. After reading a non-zero value and taking the specified action (start or end), the FB3000 resets the command by setting the parameter back to 0 if the parameter selected is a R/W parameter. If you select a discrete input, it is recommended that the discrete input is configured as latched. After reading an “on” status from the discrete input and taking the specified action (start or end), the FB3000 sends a reset latch command to the discrete input.</td></tr>
<tr><td>Pause/Resume</td><td colspan="2">Select the Pause button to prevent the values on this display from updating. Select the Resume button to restart automatically refreshing the values shown on the display.</td></tr>
</table>

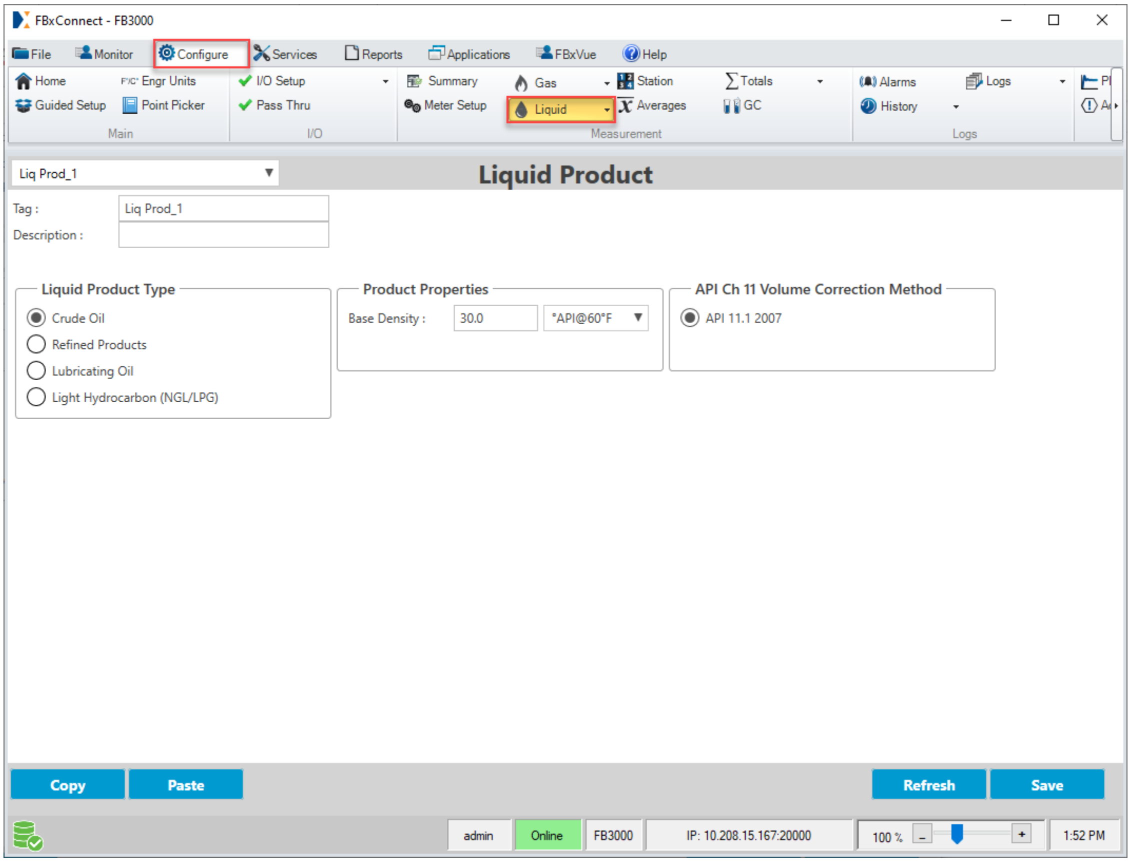
4.14 Liquid Product

Use this display to define liquid products and their fluid properties. A liquid product flows through one or more meters that make up a station. In liquid pipeline applications, the product that flows through a given station may need to change dynamically. To facilitate this need for flexibility, the product definition is separate from the station definition and you assign the product to the station. At this point, you define all of the products that might ever need to be measured, even if you currently do not assign them to a station.

To access this tab:

1. Select **Configure > Liquid > Liquid Product** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a liquid product instance to configure.

Figure 215. Liquid Product



Liquid Product

Liq Prod_1 ▼

Tag : Liq Prod_1

Description :

Liquid Product Type
- ● Crude Oil
- ○ Refined Products
- ○ Lubricating Oil
- ○ Light Hydrocarbon (NGL/LPG)

Product Properties
Base Density : 30.0 °API@60°F ▼

API Ch 11 Volume Correction Method
- ● API 11.1 2007

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Description	Sets a description (up to 20-alphanumeric characters) for the selected product instance.	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected product instance.	
Liquid Product Type	Sets the specific type of hydrocarbon fluid for the selected product instance. Possible options are:	
	Crude Oil	A liquid hydrocarbon is generally considered to be a crude oil if its density falls between approximately 0.61120 to 1.16464 relative density (100 to −10 °API). Crude oils that have been stabilized for transportation or storage purposes with API gravities within this range are considered to be part of this group.
	Refined Products	A liquid hydrocarbon is generally considered to be a refined product if it falls into one of the following product groups: • **Gasoline** – Motor gasoline and unfinished gasoline blending stock with a base density range between approximately 50° API and 85° API. • **Jet Fuels** – Jet fuels, kerosene, and Stoddard solvents with a base density range between approximately 37° API and 50° API. • **Fuel Oils** – Diesel oils, heating oils and fuel oils with a base density range between approximately -10° API and 37° API.
	Lubricating Oil	A liquid hydrocarbon is generally considered to be a lubricating oil if it is a base stock derived from crude oil fractions by distillation or asphalt precipitation. Lubricating oils have densities in the range between approximately -10 to 45° API.

Field	Description
	Light Hydrocarbon (NGL/LPG) A liquid hydrocarbon is generally considered to be a light hydrocarbon if its density falls between approximately 0.3500 to 0.6880 relative density (272.8 to 72.2 °API). Light hydrocarbons are often referred to as LPGs (Liquified Petroleum Gases) or NGLs (Natural Gas Liquids) and are predominantly composed of lighter hydrocarbons, such as methane, ethane, butane, and propane.
Base Density	Sets a density for the Liquid Product Type you select at contract (base) temperature and pressure. Select ▼ to set the base density units and the base temperature that apply to the entered base density value. **Note** If the base density and temperature units are different than the station's base conditions, the system converts the value to the station's base conditions using the option selected in the **API Ch 11 Volume Correction Method** field.
API Ch 11 Volume Correction Method	Sets the volume correction calculation used by all stations and meters associated with the selected product instance. The FBx products currently support the 2007 version of the API / ASTM / IP Volume Correction tables. **Note** This field appears **only** if you select **Crude Oil** in the **Liquid Product Type** field.
Light Hydrocarbon Method	Sets the volume correction calculation used by all stations and meters associated with the selected product instance. The FBx products currently support the GPA 8217 / API 11.2.4 Volume Correction Tables (formerly GPA TP-27). This method uses the following set of standards: • **Temperature Correction –** GPA 8217 / API 11.2.4 Standard (2019) (formerly GPA TP-27) • **Pressure Correction –** API 11.2.2 (1986) and API 11.1 (2007) • **Equilibrium Pressure –** GPA 8117 / API 11.2.5 (2017) (formerly GPA TP-15) **Note** This field appears **only** if you select **Light Hydrocarbon** in the **Liquid Product Type** field.

4. Select **Save** to save any changes you make to this display.

4.15 Liquid Density

Use this display to configure liquid density inputs. For the **FB3000 RTU**, you can configure up to 12 Liquid Density instances.

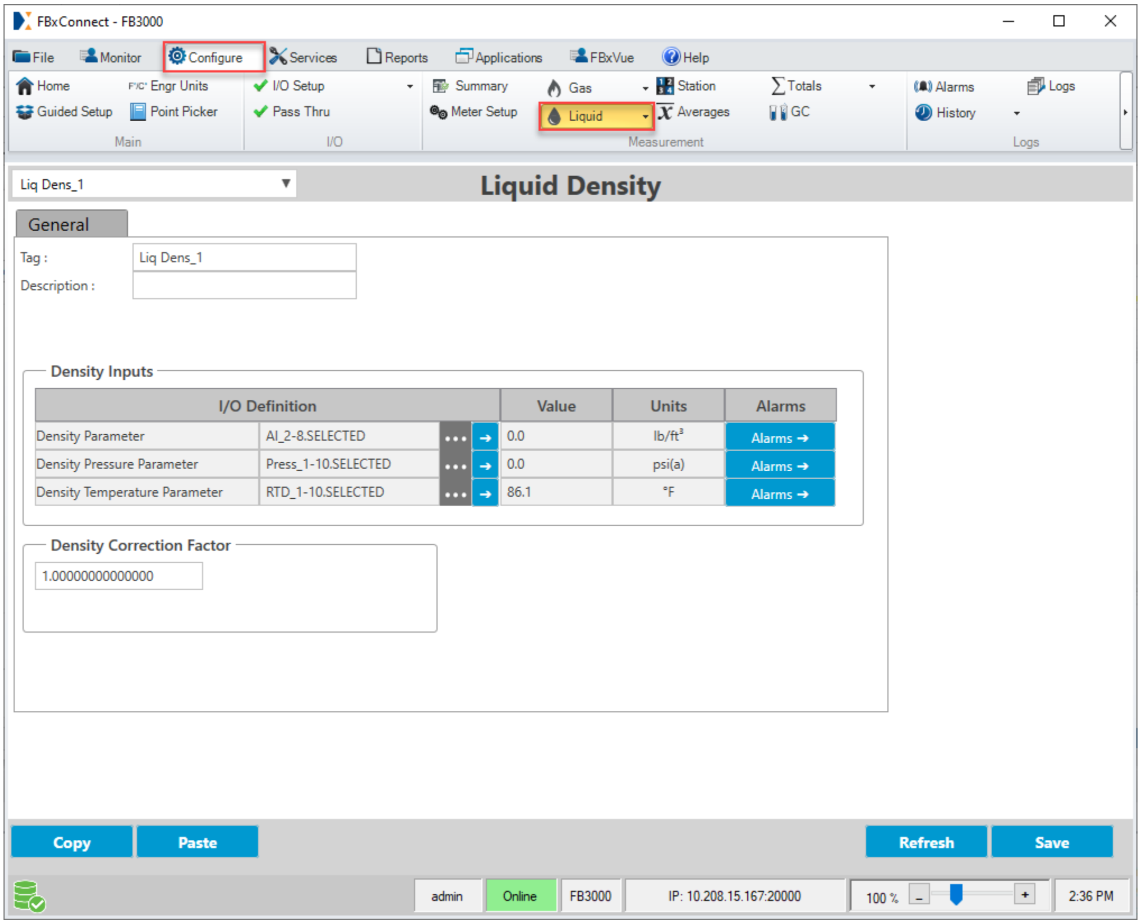
Note

- If you select **Station Header Density** in the **Density Option** field on the Station – General display, then you **must** configure the **Density Parameter** field.
- The **Density Pressure Parameter** and **Density Temperature Parameter** fields are **optional**, but a property calculation alarm is raised at any associated liquid linear meter if the **Density Temperature Parameter** is **Undefined**.

To access this display:

1. Select **Configure > Liquid > Liquid Density** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a liquid density instance to configure.

Figure 216. Liquid Density



Liq Dens_1

Liquid Density

Tag : Liq Dens_1

Description :

Density Inputs

I/O Definition		Value	Units	Alarms
Density Parameter	AI_2-8.SELECTED	0.0	lb/ft³	Alarms →
Density Pressure Parameter	Press_1-10.SELECTED	0.0	psi(a)	Alarms →
Density Temperature Parameter	RTD_1-10.SELECTED	86.1	°F	Alarms →

Density Correction Factor

1.00000000000000

3. Review the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected product instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected product instance.

Field	**Description**	
Density Parameter	**I/O Definition**	Click … to open a Point Picker dialog and select the density input to use for the selected Liquid Density instance. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • User Data – You can manually select any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure > Alarms display for the User Data value.

Field	**Description**	
Density Pressure Parameter	**I/O Definition**	Click ... to open a Point Picker dialog and select the density pressure input to use for the Liquid Density instance. If you select a **Press object**, the firmware determines the pressure input type (absolute or gauge) directly from the sensor. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • Press object – SELECTED VALUE • User Data – You can manually select any parameter. For more information, refer to User Data. **Note** • The value is assumed to be in the same units (psi, kPa, etc.) selected for the associated station. • When you select a parameter without explicit units, the value is assumed to be gauge pressure.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	Description	
	Alarms	Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the Configure > Alarms display for the User Data value.
Density Temperature Parameter	**I/O Definition**	Click ••• to open a Point Picker dialog and select the density temperature input to use for the Liquid Density instance. **Note** Only an object is chosen, and the parameter is determined by the system based on the type of object. • AI object – SELECTED VALUE **Note** You must first configure an AI instance to use the correct measurement type before it is visible in the Point Picker. For more information, refer to AI. • RTD object – SELECTED VALUE • User Data – You can manually select any parameter. For more information, refer to User Data. **Note** The value is assumed to be in the same units selected for the associated station.
	Value	This **read-only** field shows the value currently used in calculations based on the selected options. **Note** If you select a **User Data** object, enter a value to use for the selected parameter.
	Units	This **read-only** field shows the engineering units used for the selected input.

Field	Description
	Alarms Click to open the Alarms display and configure the alarm currently assigned to the input. **Note** This selection is **not available** if you select a **User Data** object; however, you can configure an alarm object separately on the **Configure > Alarms** display for the User Data value.
Density Correction Factor	Sets the multiplier value to correct the observed density provided by a pycnometer or similar device. The Density Correction Factor (sometimes referred to as DCF) is a unitless scaler used to adjust the density referenced by the density parameter.

4. Select **Save** to save any changes you make to this tab.

4.16 Station

Use this display to configure parameters for stations. The FB Series product organizes meter runs into stations. The meter runs can be grouped among the stations in any combination based on the type of fluid being measured (natural gas or liquid). You should configure stations before you configure meter runs.

Meters are assigned to stations on the DP Meter, Linear Meter, and Liquid Linear Meter displays. Meter runs belong in the same station when they have the same gas data, calculation methods, and base/contract conditions. Each station may be given a unique Tag and Description.

To access this display, select **Configure > Station** from the FBxConnect™ main menu.

Figure 217. Configure – Station

The Station display contains the following items:

General – Use this display to configure general station parameters, including the contract date/time, compressibility/density calculation, and base temperature/pressure.

Advanced – Use this pop-up display to configure advanced station options, including location of the station, water content of the fluid flowing through the meters, and heating value parameters.

Batching – Use this pop-up display to configure options related to batching, including the batch identifier, batch start and end triggers, and logging in transaction history.

Rates & Totals – Use this pop-up display to view flow rates and accumulations for the selected station.

4.16.1 Station – General

Use this display to configure general station parameters, including the contract date/time, compressibility/density calculation, and base temperature/pressure.

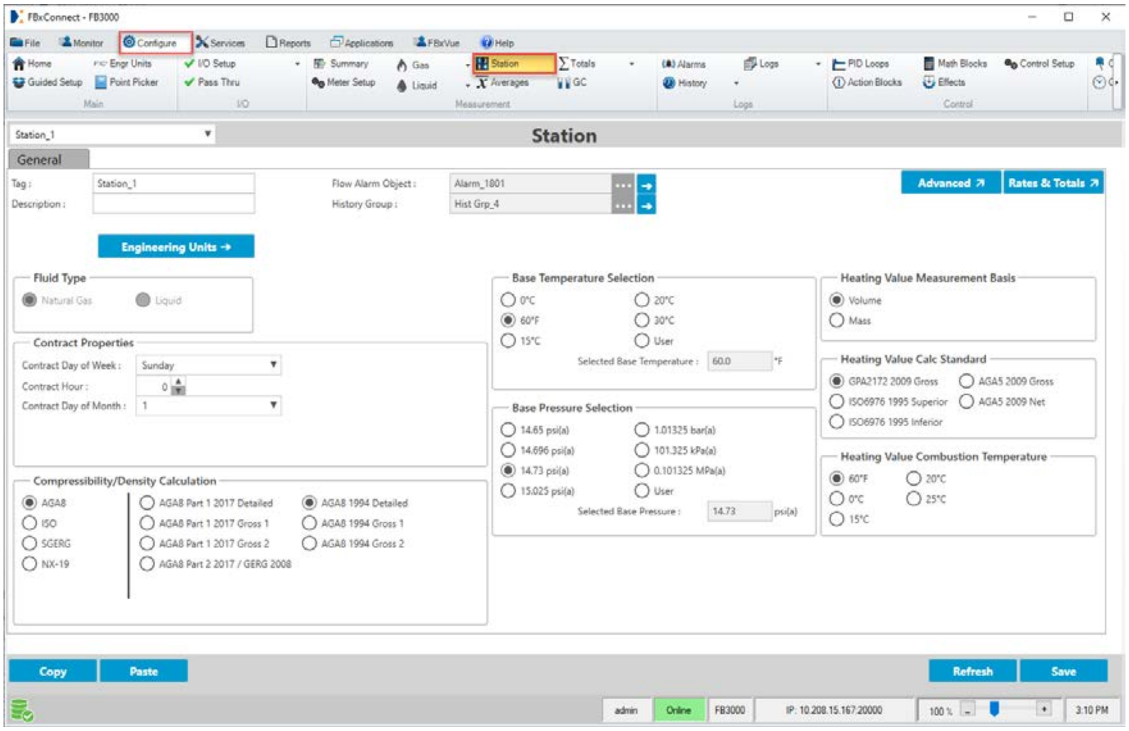
Note

The fields shown on this display vary based on the selected fluid type.

To access this display:

1. Select **Configure > Station** from the FBxConnect™ main menu. The Station display opens.
2. Click ▼ in the drop-down list at the top of the display and select a Station instance to configure.

Figure 218. Station – General (Natural Gas Station shown)



Station_1

Tag : Station_1

Description :

Flow Alarm Object : Alarm_1801

History Group : Hist Grp_4

Fluid Type

● Natural Gas ○ Liquid

Contract Properties

Contract Day of Week : Sunday

Contract Hour : 0

Contract Day of Month : 1

Compressibility/Density Calculation

● AGA8
○ ISO
○ SGERG
○ NX-19

○ AGA8 Part 1 2017 Detailed
○ AGA8 Part 1 2017 Gross 1
○ AGA8 Part 1 2017 Gross 2
○ AGA8 Part 2 2017 / GERG 2008
● AGA8 1994 Detailed
○ AGA8 1994 Gross 1
○ AGA8 1994 Gross 2

Base Temperature Selection

○ 0°C ○ 20°C
● 60°F ○ 30°C
○ 15°C ○ User

Selected Base Temperature : 60.0 °F

Base Pressure Selection

○ 14.65 psi(a) ○ 1.01325 bar(a)
○ 14.696 psi(a) ○ 101.325 kPa(a)
● 14.73 psi(a) ○ 0.101325 MPa(a)
○ 15.025 psi(a) ○ User

Selected Base Pressure : 14.73 psi(a)

Heating Value Measurement Basis

● Volume
○ Mass

Heating Value Calc Standard

● GPA2172 2009 Gross ○ AGA5 2009 Gross
○ ISO6976 1995 Superior ○ AGA5 2009 Net
○ ISO6976 1995 Inferior

Heating Value Combustion Temperature

● 60°F ○ 20°C
○ 0°C ○ 25°C
○ 15°C

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.
Operation Status	This **read-only** field shows the current state of the batch. Possible values are Batch Idle or Batch Active. **Note** • This field applies **only** for Stations with a **Fluid Type** of **Liquid**. • For more information about starting or stopping a batch, refer to the Station – Batching display.

Field	Description
Engineering Units	Click to open the Engineering Units display and configure the engineering units used by the station for measurements. **Note** Changes to engineering units are written to all meters assigned to the selected station even if the meters have previously been configured. For the FB3000 RTU, refer to Configure – Summary to view your meter station assignments.
Flow Alarm Object	This **read-only** field shows which alarm is associated with the selected station. Select → to open the Alarms display and configure the alarm. When you have finished configuration options, select ◀ to return to this display.
History Group	This **read-only** field shows which history group is associated with the selected station. The history group you select determines the contact hour and which history group is used to record average and periodic data for this station. Select → to open the Group Configuration display and configure the history group. When you have finished configuration options, select ◀ to return to this display. **Note** • If an error occurs reading the contact hour and/or history group settings, an event is logged and totalization continues using default contract settings. • At the end of each reporting period, the station checks to see if the station historic data was correctly recorded. If there is an error, the system logs a **No Response From History** event to the Event log.

Field	Description
Liquid Product Reference	Sets the Liquid Product instance associated with the selected station. Click ⋯ to open a Point Picker dialog and choose the liquid product instance used by the selected station. Select ➔ to open the Liquid Product display and configure the liquid product. When you have finished configuration options, select ◀ to return to this display. **Note** This field appears **only** for Stations with a **Fluid Type** of **Liquid**.
Header Density Object	Sets the Liquid Density instance associated with the selected station. Click ⋯ to open a Point Picker dialog and choose the liquid density instance used by the selected station. Select ➔ to open the Liquid Density display and configure the liquid density parameters. When you have finished configuration options, select ◀ to return to this display. **Note** This field appears **only** for Stations with a **Fluid Type** of **Liquid** and a **Density Option** set to **Station Header Density**.
Advanced	Select this button to open the Station – Advanced pop-up display and configure advanced station options, including location of the station, water content of the fluid flowing through the meters, and heating value parameters.
Batching	Select this button to open the Station – Batching pop-up display and configure options related to batching, including the batch identifier, batch start and end triggers, and transaction history logging options. **Note** This button shows **only** for **liquid stations** on the **FB3000 RTU** with the **Batch Option** field set to **Enable**.
Rates & Totals	Select this button to open the Station – Rates & Totals pop-up display and view gas totals and accumulations for the selected station.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Fluid Type</td><td colspan="2">Specifies the type of fluid measured by the meters assigned to the selected station. Possible options are:</td></tr>
<tr><td>Natural Gas</td><td>The selected station is used to for natural gas applications. Station settings apply to all meters assigned to the station. Station rates and totals are calculated based on the differential pressure and linear meters assigned to the station.</td></tr>
<tr><td>Liquid</td><td>The selected station is used for liquid applications. Station settings apply to all meters assigned to the station. Station rates and totals do not calculate based on the liquid linear meters assigned to the station.</td></tr>
<tr><td colspan="2">Note
This field is read-only if you have already assigned a meter to the selected station. In this case, you must first remove any meters assigned to the selected station before you are able to change the Fluid Type field.</td></tr>
<tr><td rowspan="4">Batch Option</td><td colspan="2">Sets the status of the batching feature on the selected station.</td></tr>
<tr><td>Disable</td><td>Batching is not implemented on the selected station.</td></tr>
<tr><td>Enable</td><td>Batching is implemented on the selected station.</td></tr>
<tr><td colspan="2">Note
This field applies only for Stations with a Fluid Type of Liquid.</td></tr>
<tr><td rowspan="4">Contract Properties</td><td colspan="2">These fields set the time at which totals rollover and history records are logged.</td></tr>
<tr><td>Contract Day of Week</td><td>Click ▼ to set the day of the week at which totals rollover and history records are logged (for weekly-based reports).</td></tr>
<tr><td>Contract Hour</td><td>Click ▼ to set the hour at which daily, weekly, and totals rollover and history records are logged (for daily-based, weekly-based, or monthly-based reports).</td></tr>
<tr><td>Contract Day of Month</td><td>Click ▼ to set the day of the month at which totals rollover and history records are logged (for monthly-based reports).</td></tr>
</table>

Field	Description		
Compressibility / Density Calculation	Sets the desired compressibility/density calculation for the selected station. Select a standard from the list on the left, and then select a version/method to use from the list on the right. **Note** • This field appears **only** for stations with a **Fluid Type** of **Natural Gas**. • Some compressibility/density standards are based on a specific set of reference conditions. For the most accurate results, ensure the reference conditions outlined below are configured based on the Compressibility/Density Calculation you select.		
	AGA8	**AGA8 Part 1 2017 Detailed**	Property calculations performed in accordance with the detailed method provided in AGA Report No. 8 - Part 1 - 2017 Edition - Thermodynamic Properties of Natural Gas and Related Gases. **Reference Conditions** Any reference conditions.
		AGA8 Part 1 2017 Gross 1	Property calculations performed in accordance with the Gross 1 method provided in AGA Report No. 8 - Part 1 - 2017 Edition - Thermodynamic Properties of Natural Gas and Related Gases. **Reference Conditions** Any reference conditions. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
		AGA8 Part 1 2017 Gross 2	Property calculations performed in accordance with the Gross 2 method provided in AGA Report No. 8 - Part

Field	Description	
		1 - 2017 Edition - Thermodynamic Properties of Natural Gas and Related Gases. **Reference Conditions** Any reference conditions. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	AGA8 Part 2 2017 / GERG 2008	Property calculations performed in accordance with AGA Report No. 8 - Part 2 - 2017 Edition - Thermodynamic Properties of Natural Gas and Related Gases GERG–2008 Equation of State. **Reference Conditions** Any reference conditions. **Note** AGA8 2017 Part 2 / GERG 2008 can be used for both natural gas and pure gas measurement. For more information about pure gas measurement, refer to Measuring Pure Gas.
	AGA8 Part 1 1994 Detailed	Property calculations performed in accordance with the detailed method provided in AGA Report No. 8 1994 Edition – Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases. **Reference Conditions** Any reference conditions.

Field	Description		
		AGA8 Part 1 1994 Gross 1	Property calculations performed in accordance with the Gross 1 method provided in AGA Report No. 8 1994 Edition – Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases. **Reference Conditions** Any reference conditions. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
		AGA8 Part 1 1994 Gross 2	Property calculations performed in accordance with the Gross 2 method provided in AGA Report No. 8 1994 Edition – Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases. **Reference Conditions** Any reference conditions. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	ISO	**ISO12213-2 2009**	Property calculations performed in accordance with the method provided in ISO12213 Part 2 2009 Edition – Natural Gas - Calculation of compression factor - Part 2: Calculation using molar-composition analysis.

Field	Description	
		Reference Conditions Any reference conditions.
	ISO12213-3 2006 CV/RD/CO2/H2 (Pref)	Property calculations performed in accordance with the preferred method using heating value, relative density, mole % CO2 and mole % H2 provided in ISO12213 Part 3 2006 Edition – Natural gas - Calculation of compression factor - Part 3: Calculation using physical properties. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**. • The **Heating Value Combustion Temperature** field is set to **25°C**.
	ISO12213-3 2006 N2/CV/RD/H2 (Set B)	Property calculations performed in accordance with the method using physical property set B (heating value, relative density, mole % N2 and mole % H2) provided in ISO12213 Part 3 2006 Edition – Natural gas - Calculation of compression factor - Part 3: Calculation using physical properties. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**.

Field	Description	
		- The **Heating Value Combustion Temperature** field is set to **25°C**.
	ISO12213-3 2006 N2/CO2/RD/H2 (Set C)	Property calculations performed in accordance with the method using physical property set C (relative density, mole % N2, mole % CO2 and mole % H2) provided in ISO12213 Part 3 2006 Edition – Natural gas - Calculation of compression factor - Part 3: Calculation using physical properties. **Reference Conditions** - The **Base Temperature Selection** field is set to **0°C**. - The **Base Pressure Selection** field is set to **1.01325 bar**.
	ISO12213-3 2006 N2/CO2/CV/H2 (Set D)	Property calculations performed in accordance with the method using physical property set D (heating value, mole % N2, mole % CO2 and mole % H2) provided in ISO12213 Part 3 2006 Edition – Natural gas - Calculation of compression factor - Part 3: Calculation using physical properties. **Reference Conditions** - The **Base Temperature Selection** field is set to **0°C**. - The **Base Pressure Selection** field is set to **1.01325 bar**. - The **Heating Value Combustion Temperature** field is set to **25°C**.

Field	Description		
	SGERG	**SGERG 1991 CV/RD/CO2/H2 (Std)**	Property calculations performed in accordance with the standard method using heating value, relative density, mole % CO2 and mole % H2 provided in "Simplified GERG Virial Equation for Field Use" published 1991. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**. • The **Heating Value Combustion Temperature** field is set to **25°C**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
		SGERG 1991 CV/RD/N2/H2	Property calculations performed in accordance with the alternative method using heating value, relative density, mole % N2 and mole % H2 provided in "Simplified GERG Virial Equation for Field Use" published 1991. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**.

Field	Description	
		- The **Heating Value Combustion Temperature** field is set to **25°C**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	SGERG 1991 RD/N2/CO2/H2	Property calculations performed in accordance with the alternative method using relative density, mole % N2, mole % CO2 and mole % H2 provided in "Simplified GERG Virial Equation for Field Use" published 1991. **Reference Conditions** - The **Base Temperature Selection** field is set to **0°C**. - The **Base Pressure Selection** field is set to **1.01325 bar**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	SGERG CV/N2/CO2/H2	Property calculations performed in accordance with the alternative method using heating value, mole % N2, mole % CO2 and mole % H2 provided in "Simplified GERG Virial Equation for Field Use" published 1991. **Reference Conditions**

Field	**Description**		
			• The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**. • The **Heating Value Combustion Temperature** field is set to **25°C**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	NX-19	**NX19 1962 (Z VDI/VDE)**	Fpv calculation based on PAR Research Project NX-19 1962, Zf calculation based on VDI/VDE modification of NX-19. **Reference Conditions** • The **Base Temperature Selection** field is set to **60°F**. • The **Base Pressure Selection** field is set to **14.73 psi(a)**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
		NX-19 1962 (Z Miller)	Fpv calculation based on PAR Research Project NX-19 1962, Zf calculation based on Flow Measurement Engineering Handbook by Richard W. Miller. **Reference Conditions**

Field	Description	
		• The **Base Temperature Selection** field is set to **60°F**. • The **Base Pressure Selection** field is set to **14.73 psi(a)**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	NX-19 Mod	Fpv and Zf calculation based on “Correction of the AGA NX-19 Mod Data Processing System for Real Gas Factors of type H Natural Gas” published in 1982. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**. **Note** The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
	NX-19 VDI/VDE	Fpv and Zf calculation based on “VDI/VDE 2040 Part 2” published in 1987. **Reference Conditions** • The **Base Temperature Selection** field is set to **0°C**. • The **Base Pressure Selection** field is set to **1.01325 bar**.

Field	Description	
		Note The real heating value and real relative density base compressibility are calculated using your selection in the **Heating Value Calc Standard** field.
Crude Oil Options	Sets the flow calculation methodology used to calculate crude oil, crude oil byproducts, and water quantities. Possible options are: **Note** This field appears **only** for stations with a **Fluid Type** of **Liquid** and a **Liquid Product Type** of **Crude Oil** (defined on the Liquid Product display).	
	API Ch.12.2	Meters assigned to the selected station use API Ch. 12.2 for liquid measurement. This standard is typically used for custody transfer but can also be utilized for crude oil allocation applications. For crude oil, the standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. The same calculation is used for refined products and lubricating oils with % water set to 0. The meter calculates flow rates and accumulations representing indicated quantity, gross volume, gross standard volume, net standard volume, water volume, and mass. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch 12.2 Table 6. **Note** The associated Station provides flow rates and accumulations representing gross volume, net standard volume, water volume, and mass.
	API Ch. 20.1	Meters assigned to the selected station use API Ch. 20.1 standard for allocation measurement. The standard handles unstable crude oil and/or higher

Field	Description	
	water cases. The standard is partitioned by its water volume correction methodology.	
	Use Oil Correction Factor for Water	Meters assigned to the selected station use API Ch. 20.1 Procedure A for oil measurement. The standard assumes a low amount of water in the measured fluid and treats the water stream as an oil for volume correction purposes. API Ch. 20.1 2016 suggests using this method when the sediment and water is generally **less** than 5.0 percent. The meter calculates the same quantities as the API Ch. 12.2 Custody Transfer Meter, but a shrinkage factor is applied to the gross standard volume. If the shrinkage factor includes a correction for temperature, the CTL should be set to override mode with a value of 1.0, otherwise it should be set to calculated mode. If pressure correction is included in the SF or pressure correction is not required, CPL should be set to override mode at 1.0, otherwise CPL should be set to calculated mode. CTPL is calculated as the product of the rounded CTL and CPL, which is in turn rounded as per correction factors in API Ch 12.2 Table 6. The water fraction is calculated using the in-use CSW. **Note** Station quantity calculations are **not** supported for allocation meters.

Field	Description	
	Use Separate Correction Factor for Water	Meters assigned to the selected station use API Ch. 20.1 Procedure C for oil measurement. The oil and water have separate volume correction factors and are split before volume correction is applied. API Ch. 20.1 2016 suggests using this method when the sediment and water is generally **greater** than 5.0 percent. The meter calculates flow rates and accumulations representing indicated quantity, gross volume, oil unshrunk volume, net standard volume, water metered volume and water net volume. Additionally, a flash gas net volume and an NGL net volume may be calculated by entering an override flash gas factor and NGL factor. The correction factor for the oil is entered via an override or external shrinkage factor (SF). The Shrinkage Factor is assumed to include any correction for shrinkage, temperature, and pressure. CTL, CPL, CTPL, CCF and CSW are assumed to be 1.0. The correction factor for water is calculated according to API Ch. 20.1 A.1 2016. **Note** The flow calculation uses unrounded correction factors. Station quantity calculations are **not** supported for allocation meters.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Base Temperature Selection</td><td colspan="2">Sets the flow measurement Base Temperature specified in the gas contract. The temperature units are in degrees Fahrenheit or degrees Celsius.
Note
Select User to enter a custom temperature value.</td></tr>
<tr><td>Selected Base Temperature</td><td colspan="2">This read-only field shows the current Base Temperature value used in calculations.</td></tr>
<tr><td>Base Pressure Selection</td><td colspan="2">Sets the flow measurement Base Pressure specified in the gas contract. The pressure units are in psi(a) or kPa.
Note
• Select User to enter a custom pressure value.
• This field appears only for stations with a Fluid Type of Natural Gas.</td></tr>
<tr><td>Selected Base Pressure</td><td colspan="2">This read-only field shows the current Base Pressure value used in calculations.
Note
This field appears only for stations with a Fluid Type of Natural Gas.</td></tr>
<tr><td rowspan="4">Heating Value Measurement Basis</td><td colspan="2">Sets the option to have the heating (calorific) values represented on a volume basis or a mass basis.</td></tr>
<tr><td>Volume</td><td>Heating (calorific) value represents energy of combustion per unit volume at base conditions and specified combustion reference conditions, units determined by Volume Heating Value units. Energy is calculated from SVOL.</td></tr>
<tr><td>Mass</td><td>Heating (calorific) value represents energy of combustion per unit mass and specified combustion reference conditions, units determined by Mass Heating Value units. Energy is calculated from MASS.</td></tr>
<tr><td colspan="2">Note
This field appears only for stations with a Fluid Type of Natural Gas.</td></tr>
</table>

Heating Value Calc Standard	Sets the calculation standard used in heating value, relative density of the gas to air, and Wobbe Index calculations. Options are GPA 2172 2009 Gross, ISO 6976 1995 Superior, ISO 6976 1995 Inferior, AGA5 2009 Gross, and AGA5 2009 Net. **Note** • This field appears **only** for stations with a **Fluid Type** of **Natural Gas.** • GPA 2172 2009 uses GPA 2145 2016. • ISO 6976 1995 Superior and ISO 6976 1995 Inferior use the base compressibility (Zb) value calculated per ISO 6976 in the heating value calculation when base temperature selection is 0°C, 15°C, or 20°C; in these cases a base pressure of 1.01325 bar is used for the real Heating Value and Real Relative density. For other base temperature selections, the selected Zb from the compressibility calculation is used. The base pressure for combustion is always 1.01325 bar. • If the base compressibility method is dependent upon the Heating value or relative density, GPA 2172 uses the Base Compressibility using the GPA 2172 2009 method. Otherwise, GPA 2172 2009 uses the Selected Base Compressibility value found on the Fluid Properties – Advanced display in the heating value calculation. • If the base compressibility method is dependent upon the heating value or relative density, then GPA 2172 2009 Gross, AGA5 2009 Gross, and AGA5 2009 Net use the base compressibility from their respective internal compressibility method. Otherwise, GPA 2172 2009 Gross, AGA5 2009 Gross, and AGA5 2009 Net use the Selected Base Compressibility value found on the Fluid Properties – Advanced display in the heating value calculation. • Although AGA5 says the base temperature and the combustion temperature shall be the same, the calculation will handle any base temperature and combustion temperature combination. • Since the components Benzene and Toluene are not included in AGA5, their properties are calculated separately. This calculation closely follows *Example Process for Supporting Additional Compounds* in Appendix A of AGA5 2009.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">The AGA5 2009 Net (Inferior / Lower) heating value option assumes that the water formed in the combustion reaction remains in the ideal (gaseous) state. The AGA5 2009 Gross (Superior / Higher) heating value option assumes that water formed in the combustion reaction condenses totally to the liquid state. For fiscal measurement applications, the gross heating value is more commonly used.</td></tr>
<tr><td>Heating Value Combustion Temp</td><td colspan="2">Temperature at which the heating value was determined (Energy measured with reactants at this temperature prior to combustion and products returned to this temperature after combustion).
Note
This field appears only for stations with a Fluid Type of Natural Gas.
GPA 2172 only supports heating value combustion temperatures of 60°F and 15°C. If you select a heating value combustion temperature of 0°C, 20°C or 25°C, then the heating value is calculated using a heating value combustion temperature of 15°C and base pressure selection of 101.325 kPa.</td></tr>
<tr><td rowspan="3">Density Option</td><td colspan="2">Sets the source of the density values used in volume correction calculations. Possible options are:</td></tr>
<tr><td>Station Base Density</td><td>Use the static density value you define for the Liquid Product instance you select in the Liquid Product Reference field. No densitometer is at the meter. A base to alternate calculation occurs using the meter temperature and pressure as the alternate conditions.
Note
If the base density and temperature units are different than the station's base conditions, the system converts the value to the station's base conditions.</td></tr>
<tr><td>Meter Observed Density</td><td>Use the dynamic density value measured at the meter by a densitometer. You configure the densitometer in the Meter Density Parameter field on the Liquid Linear Meter – General display. The observed to base density calculation uses the meter temperature and</td></tr>
</table>

Field	Description	
		pressure as the observed density conditions. In most cases where the meters have individual live density measurement, there is only one temperature measurement and one pressure measurement to cover both the density and the meter. This means that the meter density is set equal to the observed density and only an observed to base calculation is performed.
	Station Header Density	Use the dynamic density value measured at the station/header (with header temperature and pressure). You configure the measurement source in the **Header Density Object** field. This selection performs an observed to base density calculation assuming the density, pressure, and temperature values referenced by the Header Density Object are at observed density conditions. The resulting station base density is used to perform a base to alternate calculation at each meter using the meter temperature and pressure as the alternate conditions. If the pressure is not measured at the station header, then the pressure parameter is undefined and the observed pressure is assumed to be at 0 psig. Similarly, if the temperature is not measured at the station header, then the temperature parameter is undefined and the temperature is assumed to be at the station base temperature. An alarm is raised if there is no Header Density Object assigned to the station or if the Header Density Object's temperature or density is Undefined. Any parameter referenced via the Header Density Object that has no engineering unit is assumed to use the same engineering units as the station. If the pressure has no units, it is assumed to be gauge.
	Note This field appears **only** for Stations with a **Fluid Type** of **Liquid** and either a **Liquid Product Type** of **Light Hydrocarbon** (defined on the Liquid Product display) or a **Liquid Product Type** of **Crude Oil**	

Field	Description
	and one of the following options selected in the **Crude Oil Options** field: • **API Ch. 12.2** • **API Ch. 20.1** and **Use Oil Correction Factor for Water**
In Use Values	These **read-only** fields show the density values used in the volume correction calculations. **Note** • These fields appear **only** for Stations with a **Fluid Type** of **Liquid** and a **Density Option** set to either **Station Header Density** or **Station Base Density** (Selected Density **only**). • The **Header Density** value is calculated as the observed header density (from the object you select in the **Header Density Object** field) multiplied by the density correction factor (configured on the Liquid Density display).

4. Select **Save** to save any changes you make to this tab.

4.16.2 Station – Advanced

Use this pop-up display to configure advanced station options, including location of the station, water content of the fluid flowing through the meters, and heating value parameters.

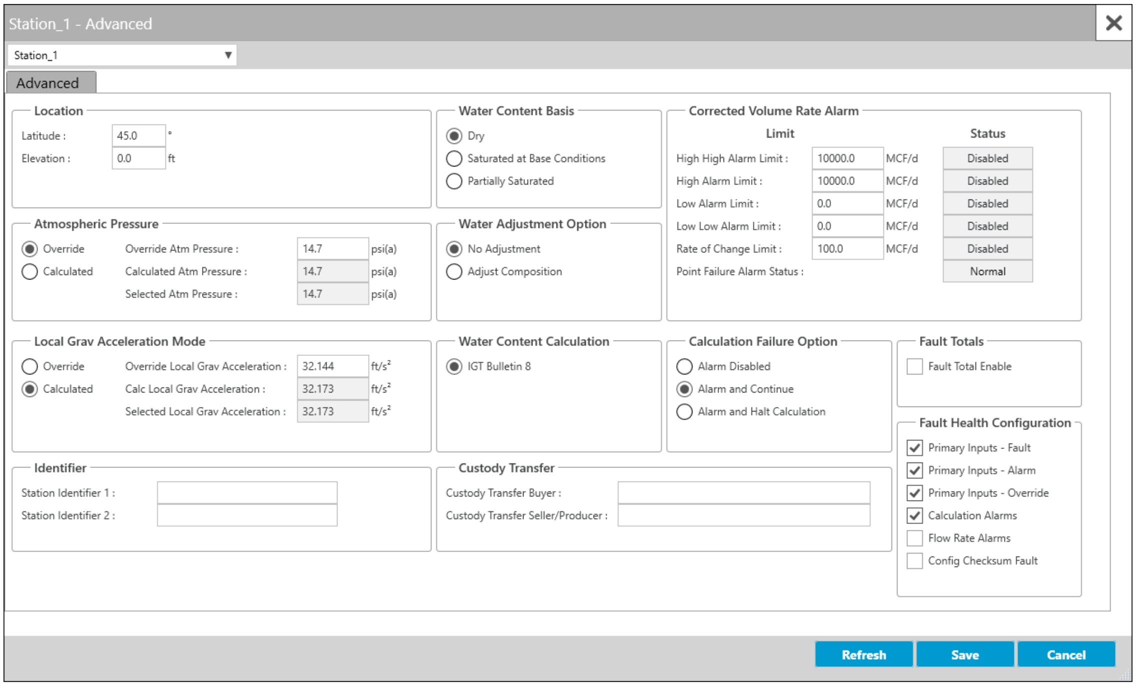
Note

The fields shown on this display vary based on the selected fluid type.

To access this pop-up display:

1. Select **Configure > Station** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a station to configure.
3. Select the **Advanced** button. The Station – Advanced pop-up display opens.

Figure 219. Station – Advanced (Natural Gas Station shown)



Location
Latitude : 45.0 °
Elevation : 0.0 ft

Water Content Basis
● Dry
○ Saturated at Base Conditions
○ Partially Saturated

Corrected Volume Rate Alarm

	Limit		Status
High High Alarm Limit :	10000.0	MCF/d	Disabled
High Alarm Limit :	10000.0	MCF/d	Disabled
Low Alarm Limit :	0.0	MCF/d	Disabled
Low Low Alarm Limit :	0.0	MCF/d	Disabled
Rate of Change Limit :	100.0	MCF/d	Disabled
Point Failure Alarm Status :			Normal

Atmospheric Pressure
● Override
○ Calculated
Override Atm Pressure : 14.7 psi(a)
Calculated Atm Pressure : 14.7 psi(a)
Selected Atm Pressure : 14.7 psi(a)

Water Adjustment Option
● No Adjustment
○ Adjust Composition

Local Grav Acceleration Mode
○ Override
● Calculated
Override Local Grav Acceleration : 32.144 ft/s²
Calc Local Grav Acceleration : 32.173 ft/s²
Selected Local Grav Acceleration : 32.173 ft/s²

Water Content Calculation
● IGT Bulletin 8

Calculation Failure Option
○ Alarm Disabled
● Alarm and Continue
○ Alarm and Halt Calculation

Fault Totals
☐ Fault Total Enable

Fault Health Configuration
☑ Primary Inputs - Fault
☑ Primary Inputs - Alarm
☑ Primary Inputs - Override
☑ Calculation Alarms
☐ Flow Rate Alarms
☐ Config Checksum Fault

Identifier
Station Identifier 1 :
Station Identifier 2 :

Custody Transfer
Custody Transfer Buyer :
Custody Transfer Seller/Producer :

4. Review – and change as necessary – the values in the following fields:

Field	Description
Latitude	Specifies the geographic latitude of the metering location. The units are in degrees and minutes, separated by a decimal point. For example: 46.15.
Elevation	Specifies the elevation or altitude of the metering location. The units are in feet or meters.
Atmospheric Pressure	Sets how the system acquires the atmospheric pressure value used in calculations. Possible options are: **Override** The system uses a value you define in the **Override Atm Pressure** field. **Calculated** The system calculates the atmospheric pressure value.
Override Atm Pressure	Sets a value to use for the atmospheric pressure in calculations when **Override** is selected in the **Atmospheric Pressure** field.
Calculated Atm Pressure	This **read-only** field shows the atmospheric pressure value as calculated by the system using AGA3 2012.

Field	Description	
Selected Atm Pressure	This **read-only** field shows the current atmospheric pressure value used in calculations based on the options you select.	
Local Gravitation Acceleration Mode	Sets how the system acquires the local gravitation acceleration value used in calculations. Possible options are:	
	Override	The system uses a value you define in the **Override Local Grav Acceleration** field.
	Calculated	The system calculates the local gravitation acceleration value.
	Note This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.	
Override Local Grav Acceleration	Sets a value to use for the local gravitation acceleration in calculations when **Override** is selected in the **Local Gravitation Acceleration** field. **Note** This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.	
Calc Local Grav Acceleration	This **read-only** field shows the local gravitational acceleration value as calculated by the system. **Note** This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.	
Selected Local Grav Acceleration	This **read-only** field shows the current local gravitational acceleration value used in calculations based on the selected options. **Note** This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.	
Rounding Option	Sets the rounding applied to volume correction factors when calculating totals. Possible options are:	
	No Rounding	No rounding is applied to volume correction factors.

Field	Description	
	Rounding Per API 12.2	Rounding is applied to volume correction factors per API 12.2. This is the **default**. When this option is selected, rounding is used for the following parameters: • %S&W = XX.XX • CSW = X.XXXXX • CTL = X.XXXX • CPL = X.XXXX • MF = X.XXXX • CMF = X.XXXX • CCF = X.XXXX
	Note This field appears **only** for stations with a **Fluid Type** of **Liquid**.	
Water Content Basis	Sets the option for assumptions about water content in the fluid.	
	Dry	Water content is set to 0.
	Saturated at Base Conditions	Water content is calculated based on the fluid being fully saturated at base temperature and pressure.
	Partially Saturated	Water content is entered by the user.
	Note This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.	
Water Adjustment Option	Sets the option to adjust the composition based on water content. Possible options are:	
	No Adjustment	No adjustment is made to the in-use composition of the meters that are assigned to this station.
	Adjust Composition	Mole % water is calculated from water content and other component values are re-normalized to add up to 100% for the meters that are assigned to this station. **Note** In order for the adjustment to occur, you **must** also select **Full Normalization** in the Normalization

Field	Description
	Option field on the Components – General display for each Components instance used by meters assigned to this station. **Note** • This field appears **only** for stations with a **Fluid Type** of **Natural Gas**. • This is a separate option from Water Content Basis, and you have option to obtain a value for water content for informational purposes without affecting the calculation.
Water Content Calculation	Sets the calculation standard used in water content calculations. **Note** This field appears **only** for stations with a **Fluid Type** of **Natural Gas**.
Shrinkage Factor Option	Selects how the shrinkage factor is applied to the flow calculation for all liquid meters assigned to the selected station. Possible options are: **Apply to Gross Standard Volume**: The shrinkage factor is applied to the Gross Standard Volume (GSV) flow rate and totals as follows: GSV = GV * CTL * CPL * SF Since the Net Standard Volume and Sediment and Water Volume are calculated from the Gross Standard Volume, the shrinkage factor is accounted for in the Net Standard Volume and the Sediment and Water Volume is reduced. **Apply to Net Standard Volume**: The shrinkage factor is applied to the Net Standard Volume (GSV) flow rate and totals as follows: NSV = GSV * (1 – SW / 100) * SF The Gross Standard Volume is not reduced by the shrinkage factor. **Note** • This field appears **only** for stations with a **Fluid Type** of **Liquid**, **Liquid Product Type** set to **Crude Oil**, and **Crude Oil Options** set to **API Ch. 20.1** and **Use Oil Correction Factor for Water**.

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td></td><td>This is otherwise referred to as the Allocation – Low Water use-case.
• Refer to Liquid Linear Meter Flow Calculations for a list of flow calculations used with different configurations.</td></tr>
<tr><td>Corrected Volume Rate Alarm</td><td>These fields show the alarm limits and statuses of the volume rate alarms.</td></tr>
<tr><td>Calculation Failure Option</td><td>Sets how the FB Series product responds if a calculation failure occurs. Possible options are:
<table>
<tr><td>Alarm Disabled</td><td>No alarm is logged if a calculation failure occurs.</td></tr>
<tr><td>Alarm and Continue</td><td>An alarm is logged and the calculation continues if a calculation failure occurs.</td></tr>
<tr><td>Alarm and Halt Calculation</td><td>An alarm is logged and the calculation stops if a calculation failure occurs.</td></tr>
</table>
Note
Refer to Calculation Failure Options for more information.</td></tr>
<tr><td>Station Identifier 1</td><td>Allows for the entry of a user specified identifier (up to 20-alphanumeric characters) for the station.
Note
When generating BLM reports, this field is used to specify the lease number.</td></tr>
<tr><td>Station Identifier 2</td><td>Allows for the entry of a user specified identifier (up to 20-alphanumeric characters) for the station.
Note
When generating BLM reports, this field is used to specify the flow measurement point (FMP) number.</td></tr>
<tr><td>Custody Transfer Buyer</td><td>Sets an identifier (up to 20-alphanumeric characters) for the purchaser of the fluid.</td></tr>
<tr><td>Custody Transfer Seller/Producer</td><td>Sets an identifier (up to 20-alphanumeric characters) for the seller of the fluid.</td></tr>
</table>

Field	Description	
Fault Total Enable	Place a check mark to enable the system to calculate fault totals. Fault totals are used to accumulate meter quantities separately from the normal totals when the system becomes unhealthy and measurement accuracy may be compromised. Fault totals are separate for each meter. If a fault occurs for a meter assigned to a station configured to calculate fault totals, fault totals are calculated **only** for that meter. Station totals include **all** totals - they continue to increment regardless of the fault status of associated meters. **Note** • These fields are shown **only** for Stations with a **Fluid Type** set to **Natural Gas**. • You configure which faults or alarms cause the system to become unhealthy in the **Fault Health Configuration** field.	
Fault Health Configuration	Use these fields to determine which faults and alarms cause the system to become unhealthy. Each calculated station and meter parameter includes health (data quality) information (as seen on History Reports). Changes to these options determine if the parameter health takes into account the selected item. **Note** These fields are shown **only** for Stations with a **Fluid Type** set to **Natural Gas**.	
	Primary Inputs - Fault	Place a check mark to include primary meter input parameter faults when determining health. Examples of primary input faults include a point fail on a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or a point fail on optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.).

Field	Description	
	Primary Inputs - Alarm	Place a check mark to include primary meter input parameter alarms when determining health. Examples of primary input alarms include Low, High High, or Rate of Change alarms on a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.).
	Primary Inputs - Override	Place a check mark to include primary input override conditions when determining health. Examples include a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.) with a value currently in override.
	Calculation Alarms	Place a check mark to include flow and property calculation alarms when determining health. For more information, refer to DP Meter Diagnostics - Calculation Alarms Tab and Linear Meter Diagnostics - Calculation Alarms Tab.
	Flow Rate Alarms	Place a check mark to include flow rate calculation alarms when determining the health. The flow rate alarms that can have an effect on the health of the totals are limited to uncorrected volume, corrected volume, and mass. For more information, refer to DP Meter Diagnostics - Calculation Alarms Tab and Linear Meter Diagnostics - Calculation Alarms Tab.

5. Select **Save** to save any changes you make to this tab.

4.16.2.1 Calculation Failure Options

You can set how the FB Series product responds if a calculation failure occurs on the Station – Advanced display. Note that alarms indicating a system integrity failure (e.g., firmware corruption or hardware failure) are always logged if detected. Meter inputs are always checked, and the meter status (as shown in the **Status** field on the DP Meter – General, Linear Meter – General, and Liquid Linear Meter – General displays) and meter runs parameter health attribute will indicate failure if an invalid configuration or physically impossible value is detected, but the system only logs alarms for these conditions based on the selection below. Possible calculation failure options are:

- **Alarm Disabled –** Do not log alarms and continue the calculation when parameters are outside of the published calculation limits, if possible. Use this option if you need to use flow or property calculations outside of their published limits.
- **Alarm and Continue –** Log alarms and continue the calculation when parameters are outside of the published calculation limits, if possible. Use this option if you need to be notified if a calculation is operating outside of the calculation limits.
- **Alarm and Halt –** Log alarms and stop the calculation when parameters are outside of the published calculation limits. Use this option if you need the flow or property calculation to strictly function within their published limits and need all alarms to logged.

The behavior of FB Series products is determined by which calculation failure option you select. Refer to the table below for more information:

Table 40. Calculation Failure Option Behaviors

Behavior	Alarm Disabled	Alarm and Continue	Alarm and Halt
Raise alarm when inputs are outside of published ranges		X	X
Halt when inputs are outside of published ranges			X
Raise alarm if intermediate calculation results are outside of published ranges		X	X
Halt if intermediate calculation results are outside of published ranges			X
Raise alarm on fatal calculation error		X	X
Halt on fatal calculation error	X	X	X

Behavior	**Alarm Disabled**	**Alarm and Continue**	**Alarm and Halt**
Raise alarm if a secondary rate calculation fails		X	X
On a property calculation failure, set calculated property values to predefined defaults & attempt to continue calculating flow	X	X	
On a property calculation failure, set calculated property values to 0			X

Note

- Examples of physically impossible inputs: negative density, heating value or absolute pressure. Temperature less than absolute zero.
- Example of an invalid configuration: a temperature value assigned to a differential pressure.
- Examples of intermediate results: Reynolds number, beta.
- Examples of fatal errors: divide by zero, square root of negative number.
- Examples of primary rates: ISO 5167 mass rate, Coriolis mass rate, Turbine volume rate.
- A secondary rate is a rate derived from the primary rate. For example, turbine mass rates is calculated from volume and density.
- Example of a property calculation failure: cannot calculate because composition is invalid.
- Predefined default property values are based on methane.
- If a calculation halts, its results are set to 0 and the parameter fault bit is set.
- If a calculation continues, the results are written to the database with the parameter alarm bit set.
- Flow and properties calculated outside of the range of their respective standards must be treated with caution; the results may be inaccurate and may affect overall measurement uncertainty of the flow calculations.

4.16.3 Station – Batching

Use this pop-up display to configure options related to batching, including the batch identifier, batch start and end triggers, and transaction history logging options.

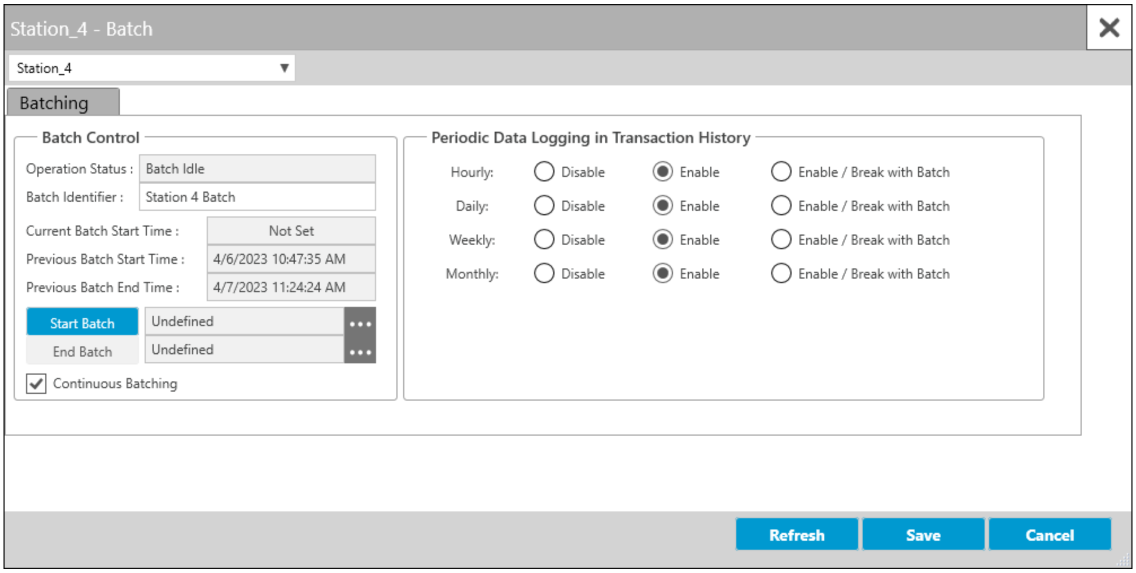
Note

- This tab shows **only** for liquid stations with the **Batch Option** field set to **Enable** (set on the Station – General display).
- There are multiple ways to start/end a batch:
  - Use the **Start**/**End Batch** buttons available on the FBxConnect display.
  - Write a value of 1 to the command parameters (Station_x.BATCH_START_CMD or Station_x.BATCH_END_CMD) from an application or from a SCADA/HMI.
  - Assign any numeric parameter using the point picker and set the value of the assigned parameter to a non-zero value. For example, use a push button wired to a DI.
- All batch commands and trigger parameters are reset to zero after each calculation cycle.
- Only valid commands are executed. For example, you can only start a batch if it is currently idle and only end a batch if it is currently running.

To access this pop-up display:

1. Select **Configure** > **Station** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a station to configure.
3. Select the **Batching** button. The Station – Batching pop-up display opens.

Figure 220. Station – Batching



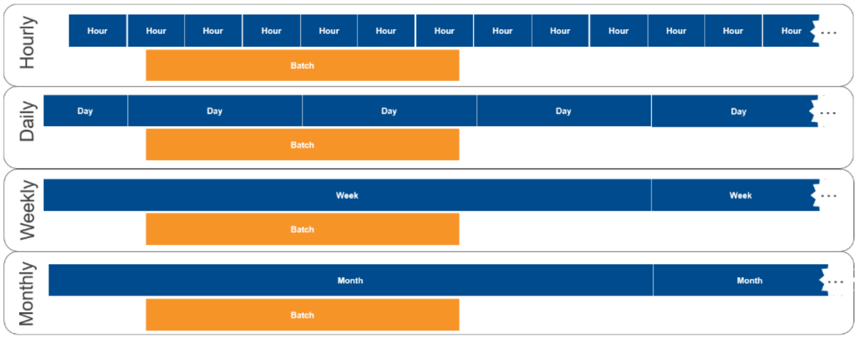
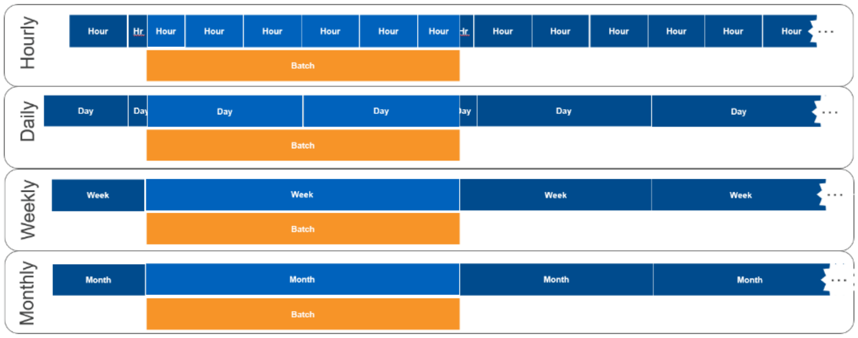
Operation Status : Batch Idle
Batch Identifier : Station 4 Batch
Current Batch Start Time : Not Set
Previous Batch Start Time : 4/6/2023 10:47:35 AM
Previous Batch End Time : 4/7/2023 11:24:24 AM
Start Batch: Undefined
End Batch: Undefined
☑ Continuous Batching

Hourly: ○ Disable ● Enable ○ Enable / Break with Batch
Daily: ○ Disable ● Enable ○ Enable / Break with Batch
Weekly: ○ Disable ● Enable ○ Enable / Break with Batch
Monthly: ○ Disable ● Enable ○ Enable / Break with Batch

4. Review – and change as necessary – the values in the following fields:

Field	Description
Operation Status	This **read-only** field shows the current state of the selected batch.
Batch Identifier	Sets an identifier (up to 20-alphanumeric characters) for the selected batch. The batch identifier is recorded with every batch transaction. It is also recorded with a period that is configured to 'break with batch' when the batch is active.
Current Batch Start Time	This **read-only** field shows the date and time that the current batch was started. If the **Operation Status** field shows **Batch Idle**, then this field shows **Not Set**.
Previous Batch Start Time	This **read-only** field shows the date and time that the previous batch was started. This field shows **Not Set** until the first batch has completed.
Previous Batch End Time	This **read-only** field shows the date and time that the previous batch was ended. This field shows **Not Set** until the first batch has completed.

Field	Description
Start Batch	Select this button to start a batch. Click … to open a Point Picker dialog and select a numeric read/write parameter used by an external input to start a batch when the value is non-zero. **Note** If you select a parameter, a non-zero value is interpreted as a command and a zero value is interpreted as an idle state. After reading a non-zero value and taking the specified action (start or end), the FB3000 resets the command by setting the parameter back to 0 if the parameter selected is a R/W parameter. If you select a discrete input, it is recommended that the discrete input is configured as latched. After reading an "on" status from the discrete input and taking the specified action (start or end), the FB3000 sends a reset latch command to the discrete input.
End Batch	Select this button to end a batch. Click … to open a Point Picker dialog and select a numeric read/write parameter used by an external input to end a batch when the value is non-zero. **Note** If you select a parameter, a non-zero value is interpreted as a command and a zero value is interpreted as an idle state. After reading a non-zero value and taking the specified action (start or end), the FB3000 resets the command by setting the parameter back to 0 if the parameter selected is a R/W parameter. If you select a discrete input, it is recommended that the discrete input is configured as latched. After reading an "on" status from the discrete input and taking the specified action (start or end), the FB3000 sends a reset latch command to the discrete input.
Continuous Batching	Select to enable the next batch to begin as soon as the current batch is ended.
Periodic Data Logging in Transaction History	Sets if standard periodic history is logged along with liquid batch transactions. Possible options for each period (hourly, daily, weekly, monthly) are: **Disable** Do not log this type of periodic history in Transaction History. If configured, this data is logged in periodic history.

Field	Description	
	Enable	Log this type of periodic history in Transaction History based on top of hour, contract hour, contract day of week and/or contract day of month. Periodic data logging is **not** affected by batch start or batch end. Transaction history groups **must** be configured and assigned at the meter level.
		
	Enable / Break with Batch	Log this type of periodic history in Transaction history as described in the "Enable" option above, and also log when a batch starts and when a batch ends. Transaction history groups **must** be configured and assigned at the meter level.
		

5. Select **Save** to save any changes you make to this display.

4.16.4 Station – Rates & Totals

Use this pop-up display to view totals and accumulations for the selected station. Station rates and totals are calculated based on the differential pressure, gas linear, and liquid linear meters assigned to the station.

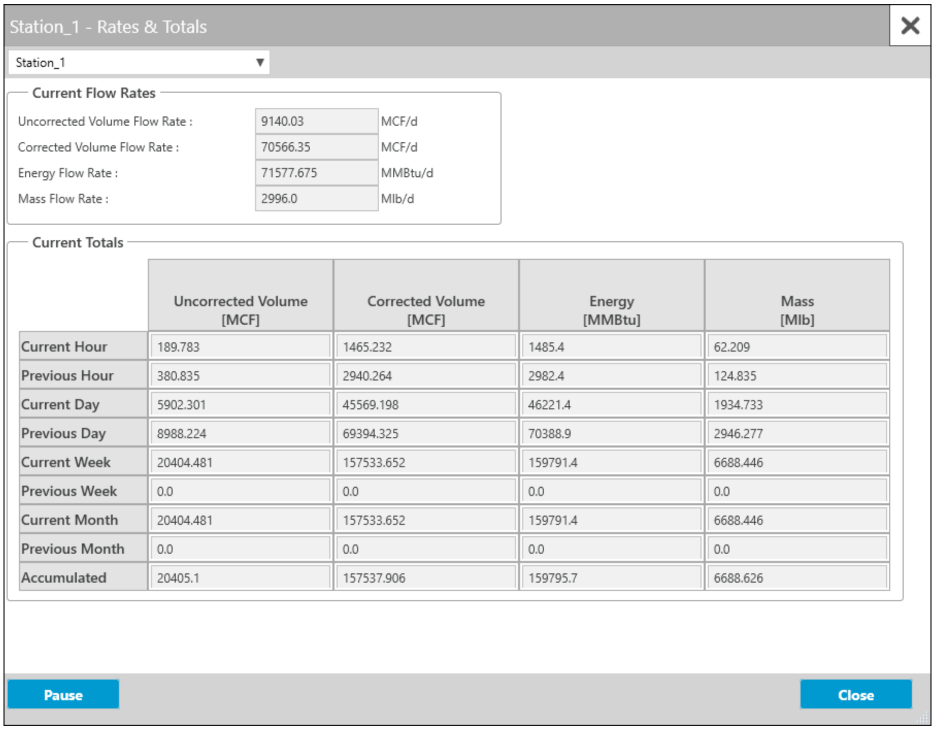
Note

- The fields shown on this display vary based on the selected fluid type and calculation options.
- Stations **do not** keep flow rates or totals for liquid linear meters configured to use **API Ch. 20.1** flow calculation methodology. For meters configured to use API Ch. 20.1, totals are available on the Liquid Linear Meter - Rates & Totals display.

To access this pop-up display:

1. Select **Configure > Station** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a station to configure.
3. Select the **Rates & Totals** button. The Station – Rates & Totals pop-up display opens.

Figure 221. Station – Rates & Totals (Natural Gas Station shown)



Current Flow Rates

Uncorrected Volume Flow Rate :	9140.03	MCF/d
Corrected Volume Flow Rate :	70566.35	MCF/d
Energy Flow Rate :	71577.675	MMBtu/d
Mass Flow Rate :	2996.0	Mlb/d

Current Totals

	Uncorrected Volume [MCF]	Corrected Volume [MCF]	Energy [MMBtu]	Mass [Mlb]
Current Hour	189.783	1465.232	1485.4	62.209
Previous Hour	380.835	2940.264	2982.4	124.835
Current Day	5902.301	45569.198	46221.4	1934.733
Previous Day	8988.224	69394.325	70388.9	2946.277
Current Week	20404.481	157533.652	159791.4	6688.446
Previous Week	0.0	0.0	0.0	0.0
Current Month	20404.481	157533.652	159791.4	6688.446
Previous Month	0.0	0.0	0.0	0.0
Accumulated	20405.1	157537.906	159795.7	6688.626

4. Review the values in the following fields:

Field	Description
Current Flow Rates	For stations measuring natural gas, these **read-only** fields show the current uncorrected volume, corrected volume, energy, and mass flow rates for the selected station. For stations measuring liquids, these **read-only** fields show the current gross volume, net standard volume, sediment & water volume, and mass flow rates.
Current Totals	These **read-only** fields show the total accumulation, as well as the current and previous hourly, daily, weekly, monthly, and batch accumulations for the selected station. **Note** Batch accumulations are shown for liquid stations **only**.

4.17 Averages

Use this display to configure which inputs the system uses to calculate averages and view the results of those calculations. For the FB3000 RTU, up to 400 inputs are averaged.

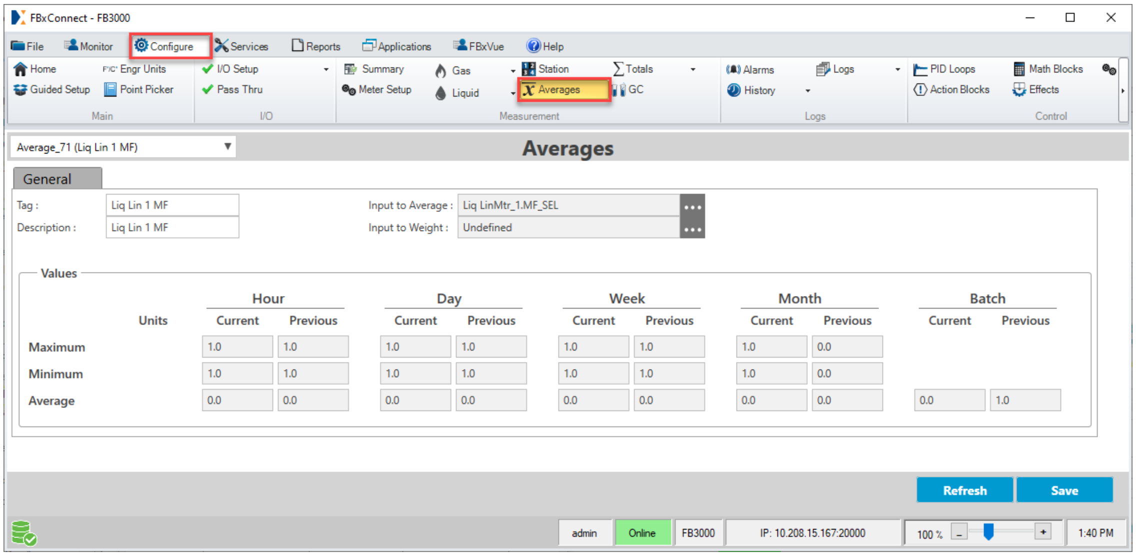
Note

- The average parameter health is a composite of the parameter health of every sample used to calculate the average.
- Average samples of NAN or INF are ignored.

To access this display:

1. Select **Configure > Averages** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select an Averages instance to configure.

Figure 222. Averages



Average_71 (Liq Lin 1 MF)

Tag : Liq Lin 1 MF

Description : Liq Lin 1 MF

Input to Average : Liq LinMtr_1.MF_SEL

Input to Weight : Undefined

Values

	Units	Hour		Day		Week		Month		Batch	
		Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous
Maximum		1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0		
Minimum		1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0		
Average		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 1:40 PM

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.
Input to Average	Click ••• to open a Point Picker dialog and choose an input to sample for averaging calculations. **Note** • Averages associated with liquid linear meters are **always** flow-weighted based on API 12.2.2, and periods of no flow produce averages of 0. • In order to map history correctly in reports, select the Input to Average by first selecting the meter, then the associated reference parameter for the desired input (e.g. DP Mtr_1.DP_OBJ.SELECTED).

Input to Weight

Click ••• to open a Point Picker dialog and choose a Meter Object to use as the weighting factor. If the input you select in the Input to Average field is a meter parameter (DP Mtr, Linear Mtr, or Liq LinMtr), then the average will be based on the flow rate as described below and an Input to Weight does not need to be defined. If the input you select in the Input to Average field is not a meter parameter, then either a meter can be chosen to get an average based on the flow rate or left undefined to calculate a simple linear average that is not based on a flow rate. Only an object is chosen, and the parameter is determined by the system based on the type of object. Use of the weighting factor is determined by the Meter Averaging Method specified on the Meter Setup display.

The weighting factor used is based on the configuration of the selected Meter Object :

Meter Type	**Configuration**	**Weighting Factor**
DP Meter	AGA 3 Orifice (Volume) 1595 Conditioning Orifice Cone	Square Root of the Differential Pressure
	AGA 3 (Mass) AGA3 (Relative Density) ISO 5167 405C	Mass Rate
Gas Linear Meter	Turbine Auto-Adjust	Indicated Quantity (Volume)
	Coriolis	Indicated Quantity (Mass)
Liquid Linear Meter	Turbine	Indicated Quantity (Volume)
	Coriolis	Indicated Quantity (Mass)

Field	Description
Values	These **read-only** fields show (for the selected input) the maximum, minimum, and average values for the current and previous hour, day, week, month, and batch. **Note** Batch averages apply to liquid meters **only**.

4. Select **Save** to save any changes you make to this display.

4.18 Totals Drop-Down Menu

Use the options in the Totals drop-down menu to view meter and station totals, and to configure fault totals. To access these displays, select **Configure > Totals** from the FBxConnect™ main menu and select one of the options from the Totals drop-down menu.

Figure 223. Totals Drop-Down Menu

The Totals drop-down menu contains the following options:

Totals – Use this display to view current and previous period totals associated with meters and stations, and to set the rollover value for each total.

Totals Setup – Use the Totals Setup wizard to automatically configure optional fault totals in the FB Series device.

4.18.1 Totals

Use this display to view current and previous period totals associated with meters and stations, and to set the rollover value for each total. For the **FB3000 RTU**, up to 456 inputs are totalized. The following totals are captured:

Station/Meter Type	Totals
Gas Station	Corrected Volume Uncorrected Volume Mass Energy

Station/Meter Type	Totals
Gas DP Meter	Flow Time Integral Value Corrected Volume Corrected Volume Fault Uncorrected Volume Uncorrected Volume Fault Mass Mass Fault Energy Energy Fault
Gas Linear Meter	Pulses Corrected Volume Corrected Volume Fault Uncorrected Volume Uncorrected Volume Fault Mass Mass Fault Energy Energy Fault
Liquid Linear Meter	Indicated Volume Gross Volume Oil Unshrunk Volume Oil Net Volume Water Uncorrected Volume Water Net Volume NGL Net Volume Flash Gas Net Volume

Note

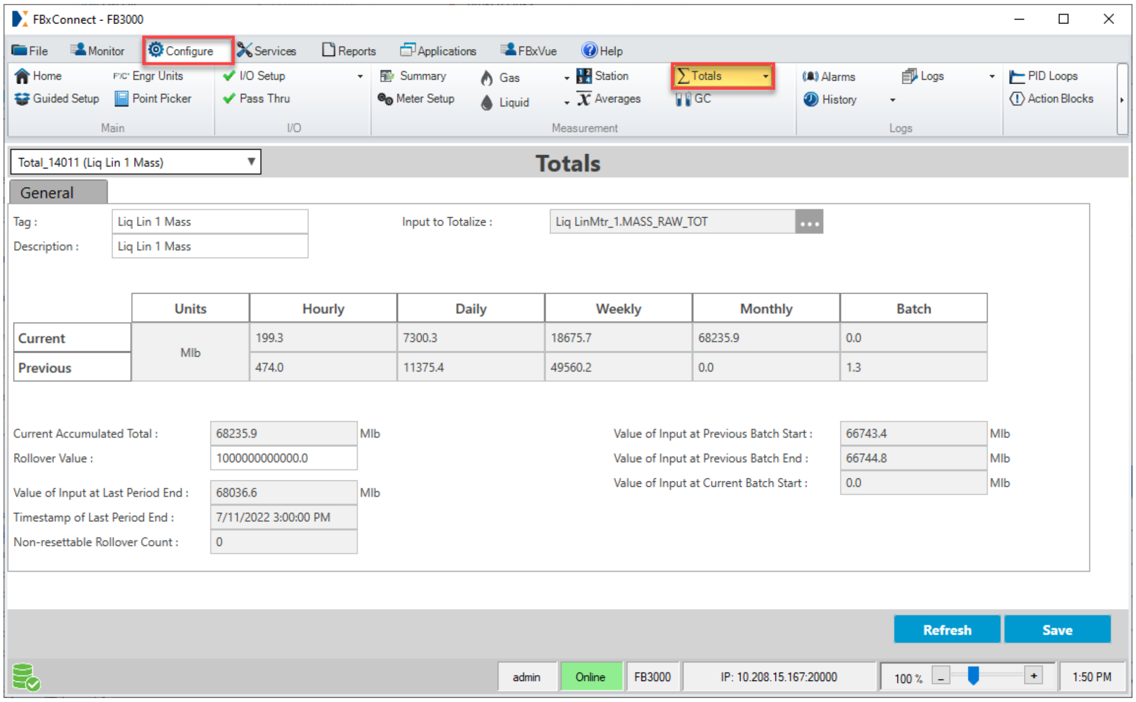
- Totals are also provided on the Rates and Totals tab for individual gas meters, liquid meters, and gas stations.

- The total parameter health is a composite of the parameter health of every increment used to calculate the total.
- When a total rolls over, a "Total rollover" event is added to the event log. The event indicates how many times the total rolled over.
- If a totalization error occurs, a total/increment alarm is raised at the meter, regardless of the station calculation failure option.
- You can configure up to four spare totals instances per meter with a maximum of 144 instances. New instances of the Totals object start with Total_50001. For more information about spare totals, refer to the **Number of Spare Totals** field on the Meter Setup display.

To access this display:

1. Select **Configure** > **Totals** > **Totals** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select an instance to configure.

Figure 224. Totals



Total_14011 (Liq Lin 1 Mass) ▼

Totals

General

Tag : Liq Lin 1 Mass
Description : Liq Lin 1 Mass
Input to Totalize : Liq LinMtr_1.MASS_RAW_TOT

	Units	Hourly	Daily	Weekly	Monthly	Batch
Current	Mlb	199.3	7300.3	18675.7	68235.9	0.0
Previous		474.0	11375.4	49560.2	0.0	1.3

Current Accumulated Total : 68235.9 Mlb
Rollover Value : 1000000000000.0
Value of Input at Last Period End : 68036.6 Mlb
Timestamp of Last Period End : 7/11/2022 3:00:00 PM
Non-resettable Rollover Count : 0
Value of Input at Previous Batch Start : 66743.4 Mlb
Value of Input at Previous Batch End : 66744.8 Mlb
Value of Input at Current Batch Start : 0.0 Mlb

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.
Input to Totalize	This **read-only** field shows the input totalized by the selected instance.
Current	These **read-only** fields show the total accumulation for the current hour, day, week, month, and batch. **Note** Batch totals apply to liquid meters **only**.
Previous	These **read-only** fields show the total accumulation for the previous hour, day, week, month, and batch. **Note** Batch totals apply to liquid meters **only**.
Current Accumulated Total	This **read-only** field shows the total accumulation over the life of the input. This value resets only on a rollover or restart to factory defaults.
Rollover Value	Sets the value that (when reached) the Current Accumulated Total resets to 0.
Value of Input at Last Period End	This **read-only** field shows the value of the Current Accumulated Total at the time of the last period end.
Timestamp of Last Period End	This **read-only** field shows the timestamp at the time of the last period end. This will typically be top of hour, but it may be different based on configuration changes and QTR log break options specified.
Non-resettable Rollover Count	This **read-only** field shows the number of times a rollover has occurred.
Value of Input at Previous Batch Start	This **read-only** field shows the value of the selected input at the time that the previous batch was started.
Value of Input at Previous Batch End	This **read-only** field shows the value of the selected input at the time that the previous batch was ended.

Field	Description
Value of Input at Current Batch Start	This **read-only** field shows the value of the selected input at the time that the current batch was started.

4. Select **Save** to save any changes you make to this display.

4.18.2 Totals Setup

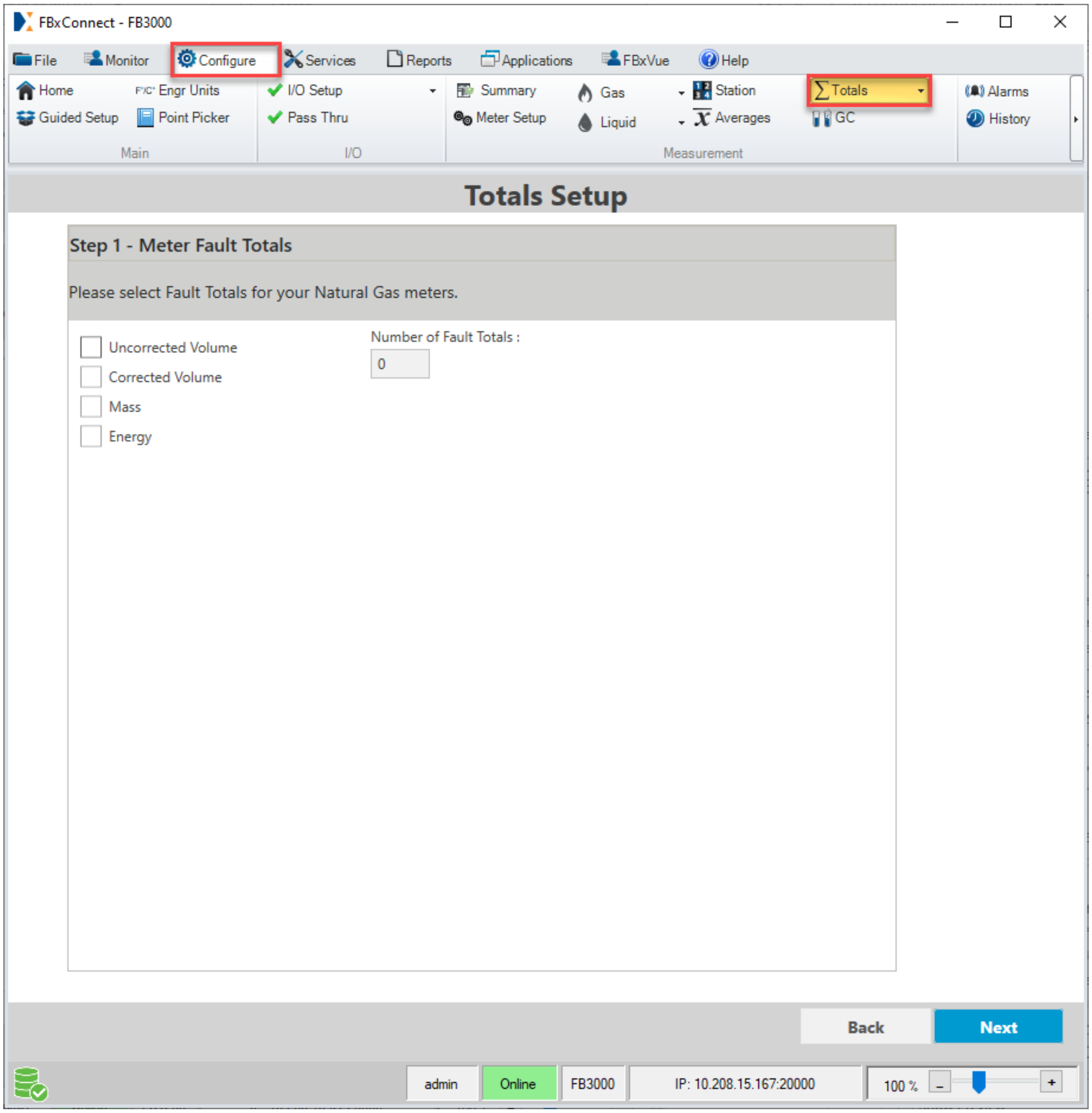
Use the Totals Setup wizard to automatically configure optional fault totals in the FB Series device. Fault totals are calculated when the system becomes unhealthy and can be used to determine how measurement quantities are affected by faults and alarms. You can select which fault totals are calculated and which conditions cause fault totals to increase, and the Totals Setup wizard automatically configures the associated Totals instances in the FB Series product database based on your selections.

Note

- You **must** have at least one natural gas station configured.
- Fault totals apply to **all** natural gas meters that are configured in your FB Series product.
- Fault totals are separate for each meter. If a fault occurs for a meter assigned to a station configured to calculate fault totals, fault totals are calculated **only** for that meter. Station totals include **all** totals.
- Using the Totals Setup wizard overwrites existing fault totals and may cause the total objects assignments, descriptors, and tags to be changed.

To access the Totals Setup wizard, select **Configure > Totals > Totals Setup** from the FBxConnect™ main menu. The first page of Totals Setup wizard opens.

Figure 225. Totals Setup



Totals Setup

Step 1 - Meter Fault Totals

Please select Fault Totals for your Natural Gas meters.

☐ Uncorrected Volume
☐ Corrected Volume
☐ Mass
☐ Energy

Number of Fault Totals : 0

The Totals Setup wizard contains the following steps:

Meter Fault Totals – Use this step to select which fault totals are calculated by the FB Series product.

Meter Fault Triggers – Use this step to enable fault total calculations and configure which parameter faults and alarms are considered when determining the health of a meter.

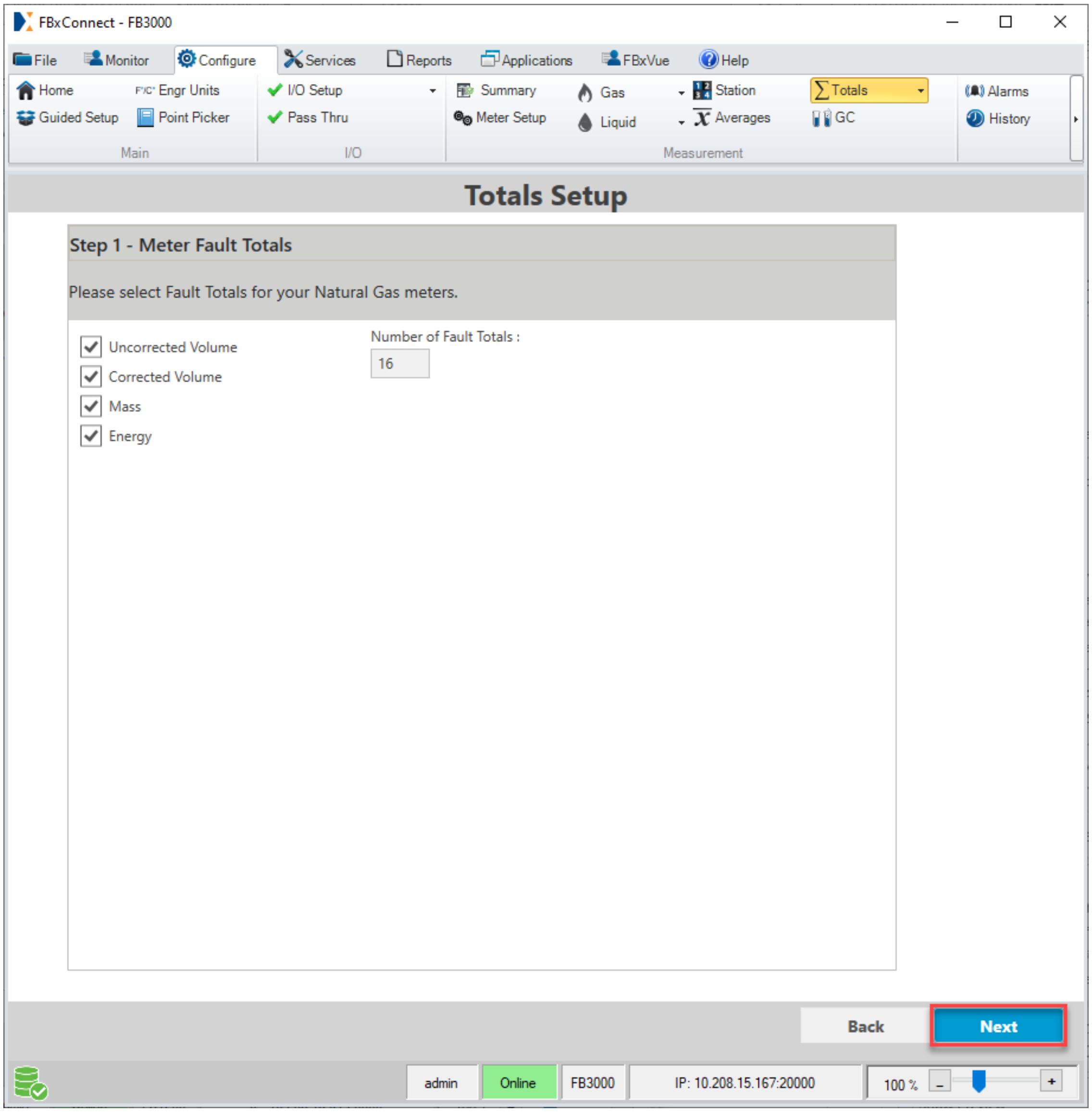
Summary – Use this step to review which instances of the Totals object will log fault totals before applying any changes to your FB Series product.

Finish – Use this step to review the configuration changes performed by the Totals Setup wizard.

4.18.2.1 Totals Setup – Meter Fault Totals

Use this step of the Totals Setup wizard to select which fault totals are calculated by the FB Series product. Fault Totals apply to **all** natural gas meters. This means if you have two natural gas meters configured in the FB Series product and select only one fault total type to calculate, then two instances of the Totals object in the FB Series product database will be configured to log fault totals (as shown in the **Number of Fault Totals** field).

Figure 226. Totals Setup – Meter Fault Totals



Totals Setup

Step 1 - Meter Fault Totals

Please select Fault Totals for your Natural Gas meters.

☑ Uncorrected Volume
☑ Corrected Volume
☑ Mass
☑ Energy

Number of Fault Totals : 16

1. Review – and change as necessary – the values in the following fields:

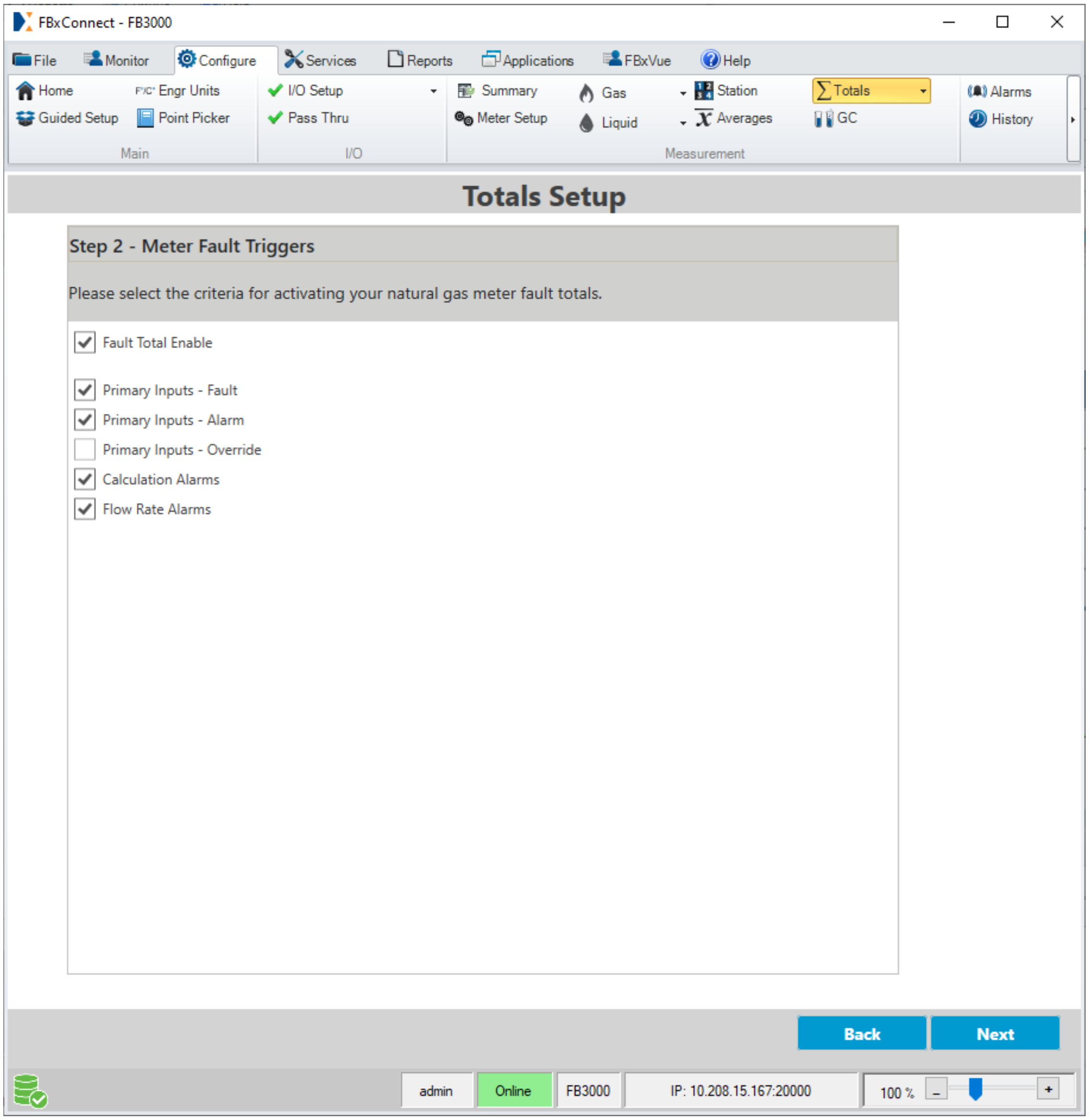
Field	Description
Uncorrected Volume	Place a check mark to calculate uncorrected volume fault totals for **all** natural gas meters.
Corrected Volume	Place a check mark to calculate corrected volume fault totals for **all** natural gas meters.
Mass	Place a check mark to calculate mass fault totals for **all** natural gas meters.
Energy	Place a check mark to calculate energy fault totals for **all** natural gas meters.
Number of Fault Totals	This **read-only** field shows the number fault totals that will be configured based on the selected fault totals and the number of natural gas meters.

2. Select **Next** to advance to the next step in the Totals Setup wizard.

4.18.2.2 Totals Setup – Meter Fault Triggers

Use this step of the Totals Setup wizard to enable fault total calculations and configure which parameter faults and alarms are considered when determining the health of a meter.

Figure 227. Totals Setup – Meter Fault Triggers



Totals Setup

Step 2 - Meter Fault Triggers

Please select the criteria for activating your natural gas meter fault totals.

☑ Fault Total Enable

☑ Primary Inputs - Fault
☑ Primary Inputs - Alarm
☐ Primary Inputs - Override
☑ Calculation Alarms
☑ Flow Rate Alarms

1. Review – and change as necessary – the values in the following fields:

Field	Description
Fault Total Enable	Place a check mark to enable the system to calculate fault totals. Fault totals are calculated when the system becomes unhealthy and can be used to determine how measurement quantities are affected by faults and alarms. Fault totals are separate for each meter. If a fault occurs for a meter assigned to a station configured to calculate fault totals, fault totals are calculated **only** for that meter. Station totals include **all** totals. **Note** You configure which faults or alarms cause the system to become unhealthy using the fields below.
Primary Inputs - Fault	Place a check mark to include primary meter input parameter faults when determining health. Examples of primary input faults include a point fail on a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or a point fail on optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.).
Primary Inputs - Alarm	Place a check mark to include primary meter input parameter alarms when determining health. Examples of primary input alarms include Low, High High, or Rate of Change alarms on a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.).
Primary Inputs - Override	Place a check mark to include primary input override conditions when determining health. Examples include a meter input (for example, differential pressure, indicated flow, static pressure, or flowing temperature) or optional meter input alarm that is used in flow calculations (for example, measured relative density, measured base density, measured flowing density, measured heating value, etc.) with a value currently in override.
Calculation Alarms	Place a check mark to include flow and property calculation alarms when determining health. For more information, refer to Gas DP Meter Diagnostic – Calculation Alarms Tab and Gas Linear Meter Diagnostics – Calculation Alarms Tab.

Field	Description
Flow Rate Alarms	Place a check mark to include flow rate calculation alarms when determining the health. The flow rate alarms that can affect the health of the totals are limited to uncorrected volume, corrected volume, and mass. For more information, refer to Gas DP Meter Diagnostic – Calculation Alarms Tab and Gas Linear Meter Diagnostics – Calculation Alarms Tab.

2. Select **Next** to advance to the next step in the Totals Setup wizard.

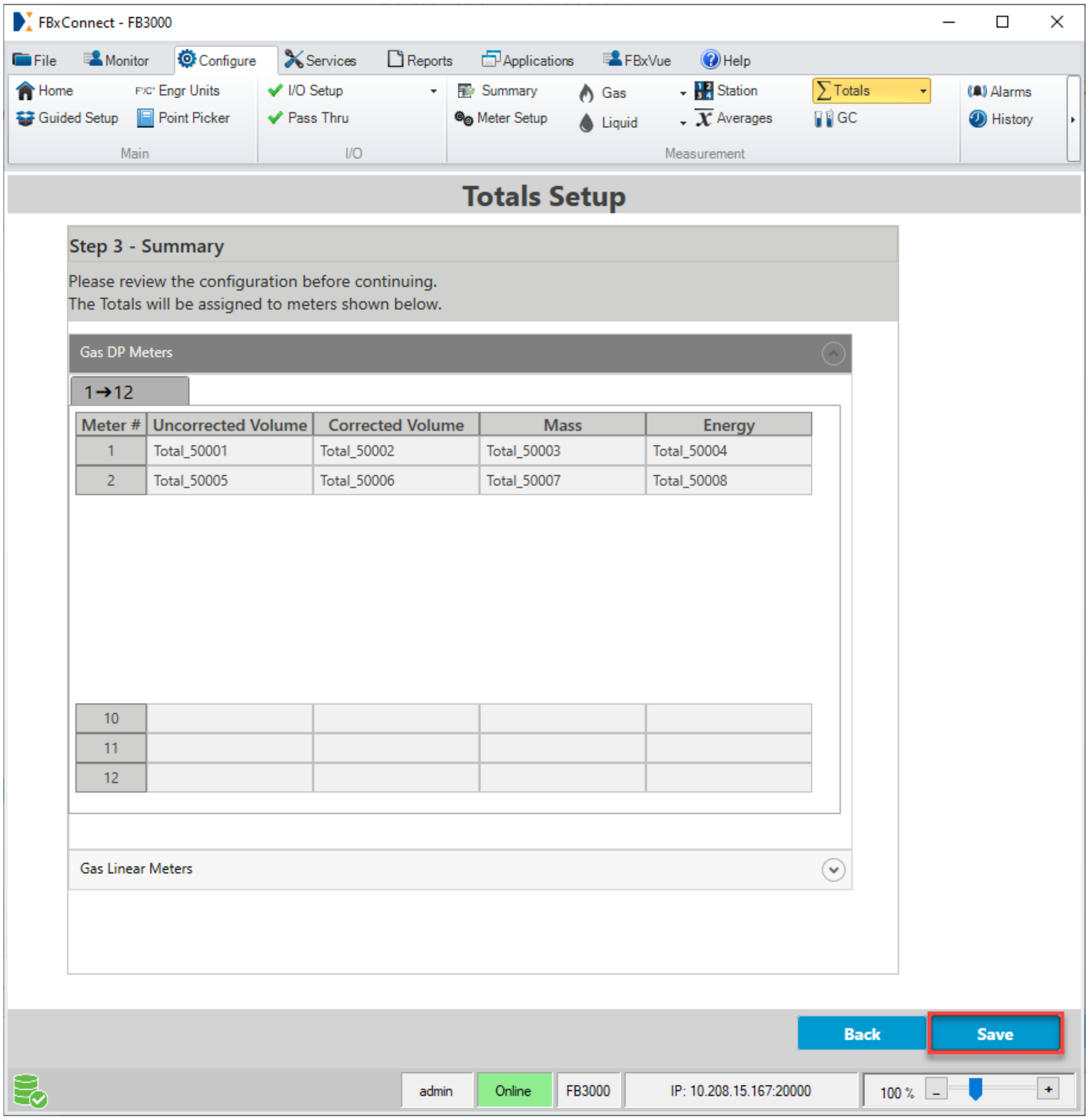
4.18.2.3 Totals Setup – Summary

Use this step of the Totals Setup wizard to review which instances of the Totals object will be configured to log fault totals before applying the changes to your FB Series product.

Note

Information for Gas DP and Gas Linear Meters is contained in separate drop-down boxes. To view information each meter type, select the down arrow (⌄) next to each meter type.

Figure 228. Totals Setup – Summary



Totals Setup

Step 3 - Summary

Please review the configuration before continuing.
The Totals will be assigned to meters shown below.

Gas DP Meters

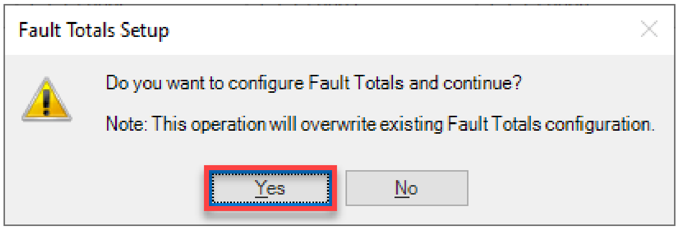
1→12

Meter #	Uncorrected Volume	Corrected Volume	Mass	Energy
1	Total_50001	Total_50002	Total_50003	Total_50004
2	Total_50005	Total_50006	Total_50007	Total_50008
10				
11				
12				

Gas Linear Meters

1. Select **Next** to advance to the next step in the Totals Setup wizard. A confirmation message opens.

Figure 229. Fault Totals Setup Confirmation



Do you want to configure Fault Totals and continue?

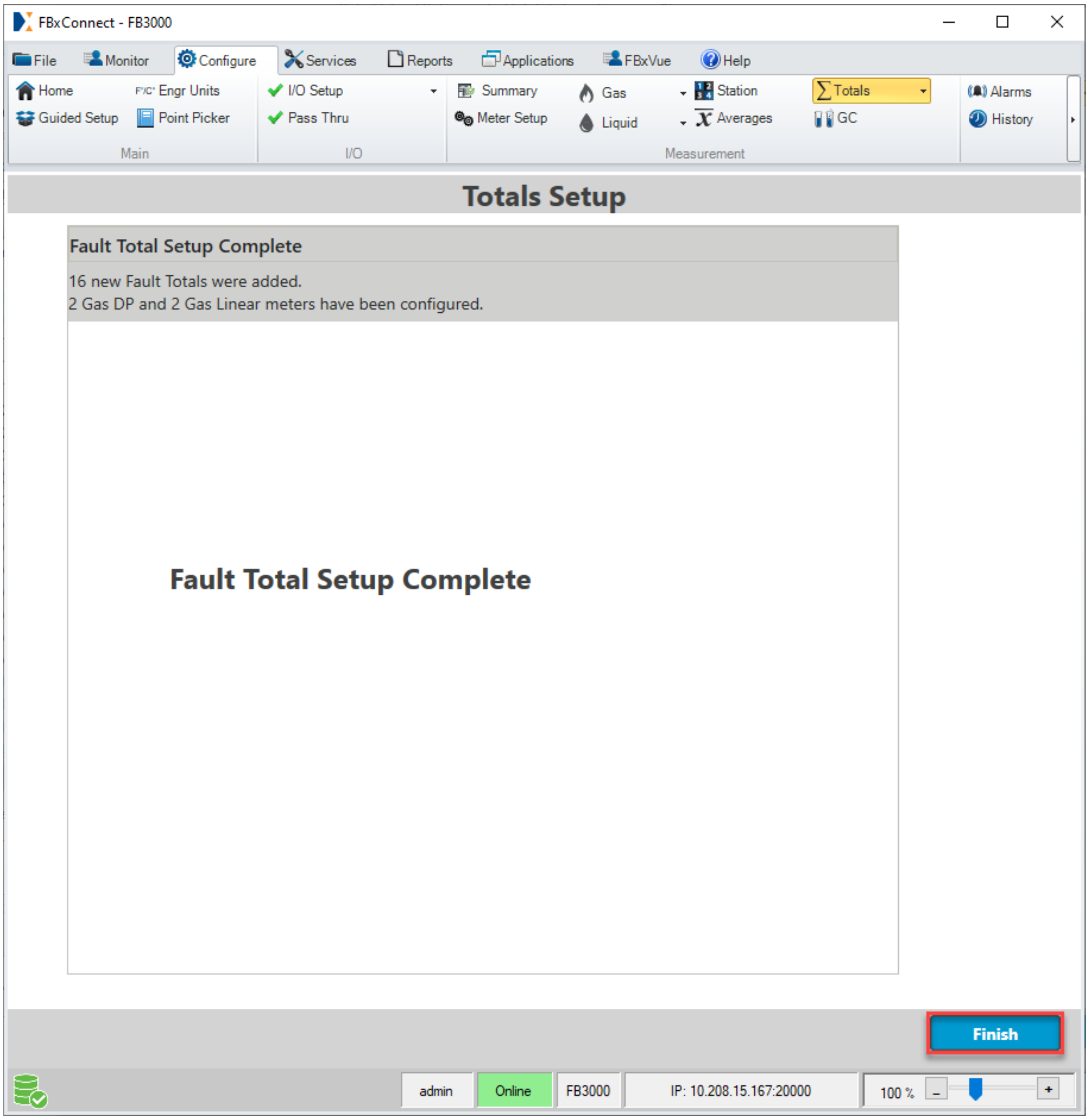
Note: This operation will overwrite existing Fault Totals configuration.

2. Select **Yes** to save your fault totals configuration.

4.18.2.4 Totals Setup – Finish

Use this step of the Totals Setup wizard to review the configuration changes performed by the wizard based on your selections. Select **Finish** to exit Totals Setup wizard.

Figure 230. Totals Setup – Finish



Fault Total Setup Complete

16 new Fault Totals were added.
2 Gas DP and 2 Gas Linear meters have been configured.

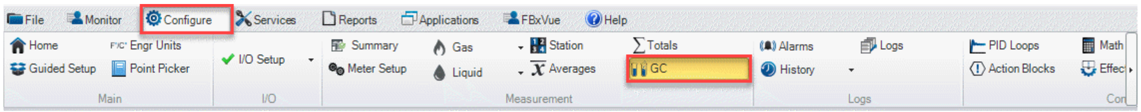
Fault Total Setup Complete

4.19 Gas Chromatograph

Use the Gas Chromatograph display to configure gas chromatograph options, and to view data from each configured gas chromatograph.

To access this display, select **Configure > GC** from the FBxConnect™ main menu.

Figure 231. Configure – GC



The Gas Chromatograph display contains the following tabs:

Last Poll – Use this tab to view the mole percentage values of each component and other fluid properties returned from the gas chromatograph, set limits, and view alarms related to the gas composition.

Configuration – Use this tab to configure the parameters required to communicate with the connected gas chromatographs.

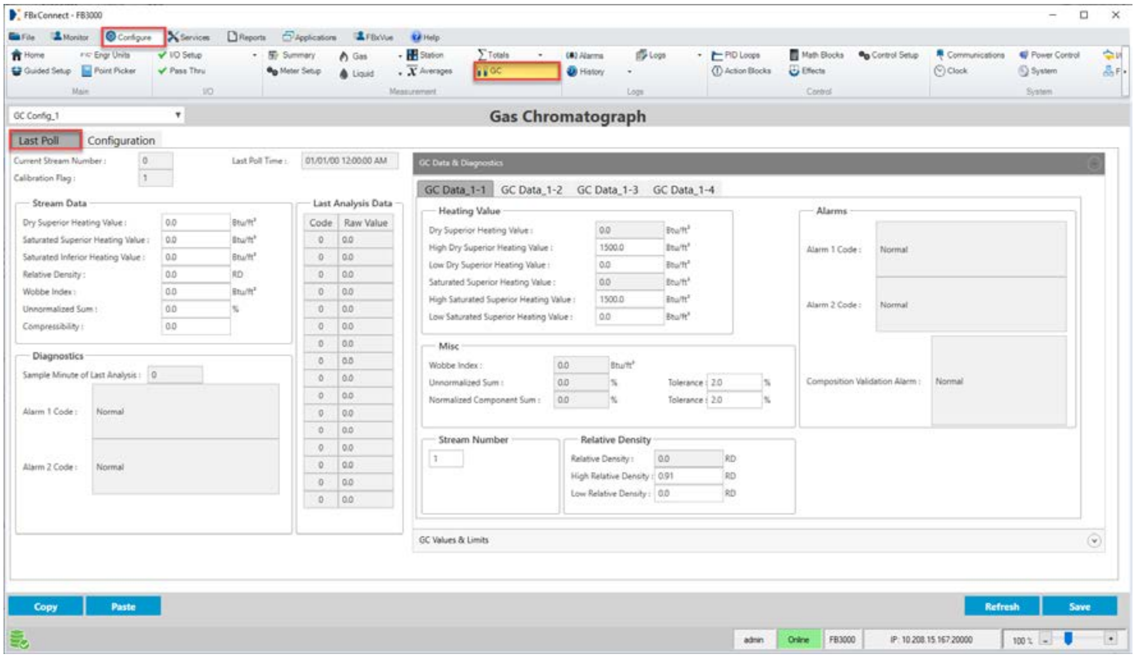
4.19.1 Gas Chromatograph – Last Poll Tab

Use this tab to view the mole percentage values of each component and other fluid properties returned from the gas chromatograph, set limits, and view alarms related to the gas composition.

To access this display:

1. Select **Configure > GC** from the FBxConnect™ main menu. The Gas Chromatograph display opens showing the Last Poll tab.
2. Click ▼ in the drop-down list at the top of the display to select an instance to configure.

Figure 232. Gas Chromatograph – Last Poll Tab



GC Config_1

Current Stream Number : 0

Calibration Flag : 1

Last Poll Time : 01/01/00 12:00:00 AM

Stream Data

Dry Superior Heating Value : 0.0 Btu/ft³
Saturated Superior Heating Value : 0.0 Btu/ft³
Saturated Inferior Heating Value : 0.0 Btu/ft³
Relative Density : 0.0 RD
Wobbe Index : 0.0 Btu/ft³
Unnormalized Sum : 0.0 %
Compressibility : 0.0

Diagnostics

Sample Minute of Last Analysis : 0
Alarm 1 Code : Normal
Alarm 2 Code : Normal

Last Analysis Data

Code	Raw Value
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0
0	0.0

Heating Value

Dry Superior Heating Value : 0.0 Btu/ft³
High Dry Superior Heating Value : 1500.0 Btu/ft³
Low Dry Superior Heating Value : 0.0 Btu/ft³
Saturated Superior Heating Value : 0.0 Btu/ft³
High Saturated Superior Heating Value : 1500.0 Btu/ft³
Low Saturated Superior Heating Value : 0.0 Btu/ft³

Misc

Wobbe Index : 0.0 Btu/ft³
Unnormalized Sum : 0.0 % Tolerance : 2.0 %
Normalized Component Sum : 0.0 % Tolerance : 2.0 %

Stream Number

1

Relative Density

Relative Density : 0.0 RD
High Relative Density : 0.91 RD
Low Relative Density : 0.0 RD

Alarms

Alarm 1 Code : Normal
Alarm 2 Code : Normal
Composition Validation Alarm : Normal

3. Review – and change as necessary – the values in the following fields:

Field	Description
Current Stream Number	This **read-only** field shows the current cycle stream number of the gas chromatograph. **Note** This field appears **only** if you select American in the Chromatograph Settings field on the General tab of the GC Config display (Gas Chromatograph – Configuration Tab).
Calibration Flag	This **read-only** field shows the gas chromatograph's status. Possible statuses are Analysis or Self Calibration. **Note** The FB Series product **does not** copy gas analysis data if the Calibration Flag is set to **Self Calibration**.
Last Poll Time	This **read-only** field shows the time and date of the last time the system polled the external gas chromatograph.
Stream Data	Use these fields to view data from the most recent analysis returned from the gas chromatograph.

Field	Description	
	Dry Superior Heating Value	This **read-only** field shows the last dry superior heating value calculated and returned from the gas chromatograph.
	Saturated Superior Heating Value	This **read-only** field shows the last saturated superior heating value calculated and returned from the gas chromatograph.
	Relative Density	This **read-only** field shows the last relative density (specific gravity) calculated and returned from the gas chromatograph.
	Wobbe Index	This **read-only** field shows the last Wobbe Index value calculated and returned from the gas chromatograph.
	Unnormalized Sum	This **read-only** field shows the total un-normalized mole percent returned from gas chromatograph.
	Compressibility	This **read-only** field shows the compressibility returned from gas chromatograph.
Diagnostics	Use these fields to view alarms returned by the gas chromatograph.	
	Sample Minute of Last Analysis	This **read-only** field shows the sample minute at the start of the Modbus requests. The current sample minute must be different than the previous sample minute or the program does not copy gas analysis data to the station. **Note** This field appears **only** when the Chromatograph Settings field is set to **American** (Gas Chromatograph – Configuration Tab).
	Alarm 1 Code	This **read-only** field shows the current alarm 1 status returned by the gas chromatograph.
	Alarm 2 Code	This **read-only** field shows the current alarm 2 status returned by the gas chromatograph.
Last Analysis Data	These **read-only** fields show the raw data returned from the gas chromatograph.	
	Component	Sequence number to show number of components returned from gas chromatograph.

Field	Description	
	Code	The component ID's of different composition values read from the gas chromatograph.
	Raw Value (%)	Mole % of components read from the gas chromatograph.
GC Data & Diagnostics	Use the fields in this drop down box to set the stream number, heating value limits, relative density limits, and to view the Wobbe Index, normalized sum, un-normalized sum, and active alarms for a specified stream. A separate tab exists for each configured GC stream. **Note** Select the **GC Data & Diagnostics** heading to expand this section of the display.	
	Dry Superior Heating Value	This **read-only** field shows the last dry superior heating value calculated and returned from the gas chromatograph.
	High Dry Superior Heating Value	Sets the dry superior heating value high limit. If the value returned from the gas chromatograph is greater than this value, then a Composition Validation alarm is triggered.
	Low Dry Superior Heating Value	Sets the dry superior heating value low limit. If the value returned from the gas chromatograph is less than this value, then a Composition Validation alarm is triggered.
	Saturated Superior Heating Value	This **read-only** field shows the last saturated superior heating value calculated and returned from the gas chromatograph.
	High Saturated Superior Heating Value	Sets the saturated superior heating value high limit. If the value returned from the gas chromatograph is greater than this value, then a Composition Validation alarm is triggered.
	Low Saturated Superior Heating Value	Sets the saturated superior heating value low limit. If the value returned from the gas chromatograph is less than this value, then a Composition Validation alarm is triggered.
	Wobbe Index	This **read-only** field shows the last Wobbe Index value calculated and returned from the gas chromatograph.

Field	Description	
	Unnormalized Sum	This **read-only** field shows the total un-normalized component mole percent returned from gas chromatograph. If the un-normalized component sum returned from gas chromatograph exceeds the Unnormalized Deviation Limit set in the **GC Values & Limits** drop down box, then a Composition Validation alarm is triggered.
	Normalized Component Sum	This **read-only** field shows the normalized component sum as calculated by the FB Series product based on the values returned from the gas chromatograph. If the normalized component sum returned from gas chromatograph exceeds the Component Sum Deviation Limit set in the **GC Values & Limits**, then a Composition Validation alarm is triggered.
	Stream Number	Sets the stream number from which to retrieve data.
	Relative Density	This **read-only** field shows the last specific gravity/relative density calculated and returned from the GC.
	High Relative Density	Sets the relative density high limit. If the value returned from the gas chromatograph is greater than this value, then a Composition Validation alarm is triggered.
	Low Relative Density	Sets the relative density low limit. If the value returned from the gas chromatograph is less than this value, then a Composition Validation alarm is triggered.
	Alarm 1 Code	This **read-only** field shows the status of Alarm 1 register returned from the GC for the selected stream. If an Alarm 1 condition is present and enabled in the **GC Data & Diagnostics** drop down box, then a Composition Validation alarm is triggered.

Field	Description	
	Alarm 2 Code	This **read-only** field shows the status of Alarm 2 register returned from the GC for the selected stream. If an Alarm 2 condition is present and enabled in the **GC Data & Diagnostics** drop down box, then a Composition Validation alarm is triggered.
	Composition Validation Alarm	This **read-only** field shows the status of the Composition Validation alarm. If the Composition Validation alarm is Normal, the FB Series product accepts the gas chromatograph data and copies the gas composition to the Components object for use in fluid property calculations. If the Composition Validation alarm is any value other than Normal, the Components object is not updated. Possible values are: • Normal • Component Limit Alarm • Heating Value Limit Alarm • Relative Density Limit Alarm • Un-normalized Mole Sum Alarm • Total Mole Sum Alarm • Composition Deviation Alarm • Alarm 1 • Alarm 2
GC Values & Limits	Use the fields in this drop down box to view the mole percentage values of each component, and to set the high component, low component, and deviation limits. A separate tab exists for each configured GC stream. **Note** Select the **GC Values & Limits** heading to expand this section of the display.	
	Component Name	This **read-only** field shows the name of the component.
	Code	This **read-only** field shows the code used by the gas chromatograph for this component.

Field	Description	
	Updated	This **read-only** field shows the update status for each component. If the box is checked, the component value is updated by the GC. If the box is unchecked, the component value is not part of the GC analysis.
	Value	This **read-only** field shows the mole percentage value returned from gas chromatograph.
	High Limit	Sets mole percentage value high limit. If the value returned from the gas chromatograph is greater than this value, then a Composition Validation alarm is triggered.
	Low Limit	Sets mole percentage value low limit. If the value returned from the gas chromatograph is less than this value, then a Composition Validation alarm is triggered.
	Component Deviation Alarm Limit % of %	Sets the allowable deviation of an individual component's mole percentage compared to the previous analysis (in percent). If the value of one of the components changes by more than this percentage from one analysis to the next, then a Composition Validation alarm is triggered.

4. Select **Save** to save any changes you make to this tab.

4.19.2 Gas Chromatograph – Configuration Tab

Use this tab to configure the parameters required to communicate with the connected gas chromatographs.

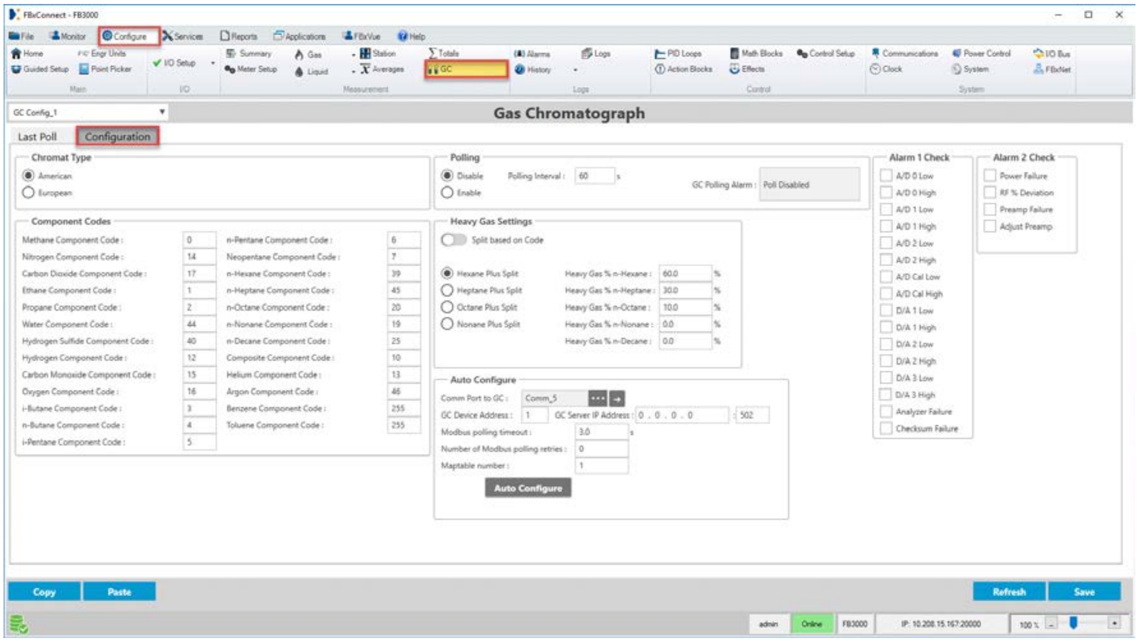
To access this tab:

1. Select **Configure > GC** from the FBxConnect™ main menu.

2. Click ▼ in the drop-down list and select an instance to configure.

3. Select the **Last Poll** tab on the Gas Chromatograph display.

Figure 233. Gas Chromatograph – Configuration Tab



GC Config_1

Chromat Type
● American
○ European

Component Codes

Methane Component Code :	0	n-Pentane Component Code :	6
Nitrogen Component Code :	14	Neopentane Component Code :	7
Carbon Dioxide Component Code :	17	n-Hexane Component Code :	39
Ethane Component Code :	1	n-Heptane Component Code :	45
Propane Component Code :	2	n-Octane Component Code :	20
Water Component Code :	44	n-Nonane Component Code :	19
Hydrogen Sulfide Component Code :	40	n-Decane Component Code :	25
Hydrogen Component Code :	12	Composite Component Code :	10
Carbon Monoxide Component Code :	15	Helium Component Code :	13
Oxygen Component Code :	16	Argon Component Code :	46
i-Butane Component Code :	3	Benzene Component Code :	255
n-Butane Component Code :	4	Toluene Component Code :	255
i-Pentane Component Code :	5		

Polling
● Disable
○ Enable
Polling Interval : 60 s
GC Polling Alarm : Poll Disabled

Heavy Gas Settings
Split based on Code
● Hexane Plus Split
○ Heptane Plus Split
○ Octane Plus Split
○ Nonane Plus Split
Heavy Gas % n-Hexane : 60.0 %
Heavy Gas % n-Heptane : 30.0 %
Heavy Gas % n-Octane : 10.0 %
Heavy Gas % n-Nonane : 0.0 %
Heavy Gas % n-Decane : 0.0 %

Auto Configure
Comm Port to GC : Comm_5
GC Device Address : 1
GC Server IP Address : 0 . 0 . 0 . 0 : 502
Modbus polling timeout : 3.0 s
Number of Modbus polling retries : 0
Maptable number : 1

Alarm 1 Check
☐ A/D 0 Low
☐ A/D 0 High
☐ A/D 1 Low
☐ A/D 1 High
☐ A/D 2 Low
☐ A/D 2 High
☐ A/D Cal Low
☐ A/D Cal High
☐ D/A 1 Low
☐ D/A 1 High
☐ D/A 2 Low
☐ D/A 2 High
☐ D/A 3 Low
☐ D/A 3 High
☐ Analyzer Failure
☐ Checksum Failure

Alarm 2 Check
☐ Power Failure
☐ RF % Deviation
☐ Preamp Failure
☐ Adjust Preamp

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Chromat Type	Specifies either the American or European version of the SIM-2251 Modbus map and polling sequences.	
Polling	Enables or disables polling of the gas chromatograph.	
	Polling Interval	Sets the delay (in seconds) the system waits before asking the gas chromatograph for the next set of results.
	GC Polling Alarm	This **read-only** field shows the status of the poll result. Possible alarms are: • Normal • Poll Failed • Comp Code Match Error • Poll Disabled • Auto-config Fail

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td>Component Codes</td><td colspan="3">Enter the identification code for each component being measured by the gas chromatograph.
Note
The codes you enter must match the codes set in the gas chromatograph.</td></tr>
<tr><td rowspan="4">Heavy Gas Settings</td><td colspan="3">Use these fields to configure heavy gas options for your gas chromatograph.</td></tr>
<tr><td rowspan="3">Split based on code</td><td colspan="2">If enabled, the system reads the gas chromatograph's automatic split percentage for heavy gasses.</td></tr>
<tr><td>Enabled</td><td>Enables the gas chromatograph's automatic split percentage for heavy gasses. The received mole percent value split takes place based on the component code:
<table>
<tr><th>Component Code (American / European)</th><th>C6%</th><th>C7%</th><th>C8%</th></tr>
<tr><td>08 / 108</td><td>47.466</td><td>35.34</td><td>17.194</td></tr>
<tr><td>09 / 109</td><td>50</td><td>50</td><td>0</td></tr>
<tr><td>10/ 110</td><td>60</td><td>30</td><td>10</td></tr>
<tr><td>11 / 111</td><td>57.143</td><td>28.572</td><td>14.285</td></tr>
</table></td></tr>
<tr><td>Disabled</td><td>Disables the gas chromatograph's automatic split percentage for heavy gasses. The received mole percent value split takes place based on the percentages you configure in the Heavy Gas Settings fields.</td></tr>
</table>

Field	Description	
	Hexane Plus Split	Select for chromatographs that return a component that is a composite of hexane and heavier components. Enter the percentages that should be allocated from the composite to hexane, heptane, octane, nonane, and decane. **Note** The values you enter in the Heavy Gas % fields **must** add up to 100%.
	Heptane Plus Split	Select for chromatographs that return a component that is a composite of heptane and heavier components. Enter the percentages that should be allocated from the composite to heptane, octane, nonane, and decane. **Note** The values you enter in the Heavy Gas % fields **must** add up to 100%.
	Octane Plus Split	Select for chromatographs that return a component that is a composite of octane and heavier components. Enter the percentages that should be allocated from the composite to octane, nonane, and decane. **Note** The values you enter in the Heavy Gas % fields **must** add up to 100%.
	Nonane Plus Split	Select for chromatographs that return a component that is a composite of nonane and heavier components. Enter the percentages that should be allocated from the composite to nonane and decane. **Note** The values you enter in the Heavy Gas % fields **must** add up to 100%.
Auto Configure	Use these fields to configure parameters for communicating to your GC.	

Field	**Description**	
	Comm Port to GC	Select ⋯ to open a [Point Picker](#) dialog and define which communications port on the FB Series product is connected to the gas chromatograph. After you have selected a communications port, select **Save** to view additional options. **Note** • You must select **Save** after you configure the **Comm Port to GC** field to view additional options. • Select → to open the configuration page for the selected port.
	GC Device Address	Indicates the Modbus address the FB Series product uses to communicate with the gas chromatograph. You must set this value before the program can poll data and write it to the meter run. **Note** You **must** select **Save** after you configure the **Comm Port to GC** field to view this field.
	GC Server IP Address	Specifies the IP address and port number of the GC. **Note** • This field applies only to GC connections using the Ethernet port. • You **must** select **Save** after you configure the **Comm Port to GC** field to view this field.
	Modbus polling timeout	Sets the length of time (in seconds) the system waits for the GC to respond to a Modbus poll. **Note** You **must** select **Save** after you configure the **Comm Port to GC** field to view this field.
	Number of Modbus polling retries	Sets the number of retries the FB Series product makes without a response from the gas chromatograph before cancelling the polling request. **Note** You **must** select **Save** after you configure the **Comm Port to GC** field to view this field.

Field	Description	
	Maptable number	Identifies the number of the Modbus Map Register Table in the FB Series product where the gas chromatograph data is stored. Valid values are 1–11. **Note** • You must select **Save** after you configure the **Comm Port to GC** field to view this field. • The program uses this value for automatic configuration. • Verify the table does not contain any vital information before polling the gas chromatograph. Any information contained in the configured Modbus Map Table Register will be overwritten during gas chromatograph polling.
	Auto Configure	Select this button to automatically configure the communication ports and Modbus parameters necessary to poll the gas chromatograph. The port owner is automatically changed to Modbus Master for selected communications port. For a list of the parameters automatically configured when you select the Auto Configure button, refer to Automatically Configured Parameters. **Note** • You must select **Save** after you configure the **Comm Port to GC** field to view this field. • You **must** first specify an address in the **GC Modbus Address** field, select **Disabled** in the **Polling** field, and **Save** your changes **before** selecting the **Auto Configure** button.
Alarm 1 Check	Place a check mark next to an Alarm 1 Condition to prevent the FB Series product from updating the gas composition if that alarm condition is active. **Note** The FB Series product updates the gas composition if an alarm condition is unchecked and that alarm condition is active.	

Field	Description
Alarm 2 Check	Place a check mark next to an Alarm 2 Condition to prevent the FB Series product from updating the gas composition if that alarm condition is active. **Note** The FB Series product updates the gas composition if an alarm condition is unchecked and that alarm condition is active.

5. Select **Save** to save any changes you make to this tab.

4.19.3 Automatically Configured Parameters

When you select Auto Configure on the GC display, the automatically configures the following parameters:

Port Settings (Serial ports only)

If you select a **serial** communications port in the **Comm Port to GC** field, the system automatically configures the following port settings:

Note

If you select an **Ethernet** communications port in the **Comm Port to GC** field, **no** port settings are automatically configured.

Serial Port Settings	
Port Owner	Modbus Master
Baud Rate	19,200
Data Bits	8
Stop Bits	1
Parity	None
Key-on Delay	0.0 seconds
Key-off Delay	0.0 seconds

Master Modbus Settings

The system automatically configures the following Master Modbus settings:

Master Modbus Settings	
Modbus Transmission Mode	RTU
Byte Order	MSB
Continuous Polling	Disabled

Note

Do not edit the **Starting Request Number** and **Number of Requests** fields on the Master Modbus tab for the selected communications port as they are used by the polling algorithm. Each row in the poll table is requested separately, and the number of request is always 1.

Master Modbus Poll Table Register

The system automatically configures the following Master Modbus Poll Table Registers (using the values in the Comm Port to GC and GC Device Address fields to poll the following register in the GC:

Table 41.Master Modbus Poll Table Register

Register Number	Configuration
3001–3016	Component IDs, Table 1:
3017–3032	Component IDs, Table 2
3034	Current Stream
3035	Mask of Streams associated with Table 1
3045	Cycle Start Time – minutes
3046	GC Alarm 1
3047	GC Alarm 2
3059	Calibration/Analysis Flag
7001–7016	Gas Composition Values Mole % Comp 1–16
7033	BTU (day)
7034	BTU (saturated)

Register Number	Configuration
7035	Specific Gravity
7036	Compressibility
7037	Wobbe Index
7038	Total Unnormalized Mole %
7039	Total GPM CF

GC Poll Sequence

The actual poll sequence is:

Table 42.GC Poll Sequence

GC Poll Sequence
3045–3047
3001–3032
3034–3035
3059
7001–7016
7033–7038
3045–3047

Modbus Map Table Registers

The Modbus Map Table Registers assign parameters to registers. The system automatically maps the necessary parameters to the register table you specify in the **Maptable number** field on the GC Config display.

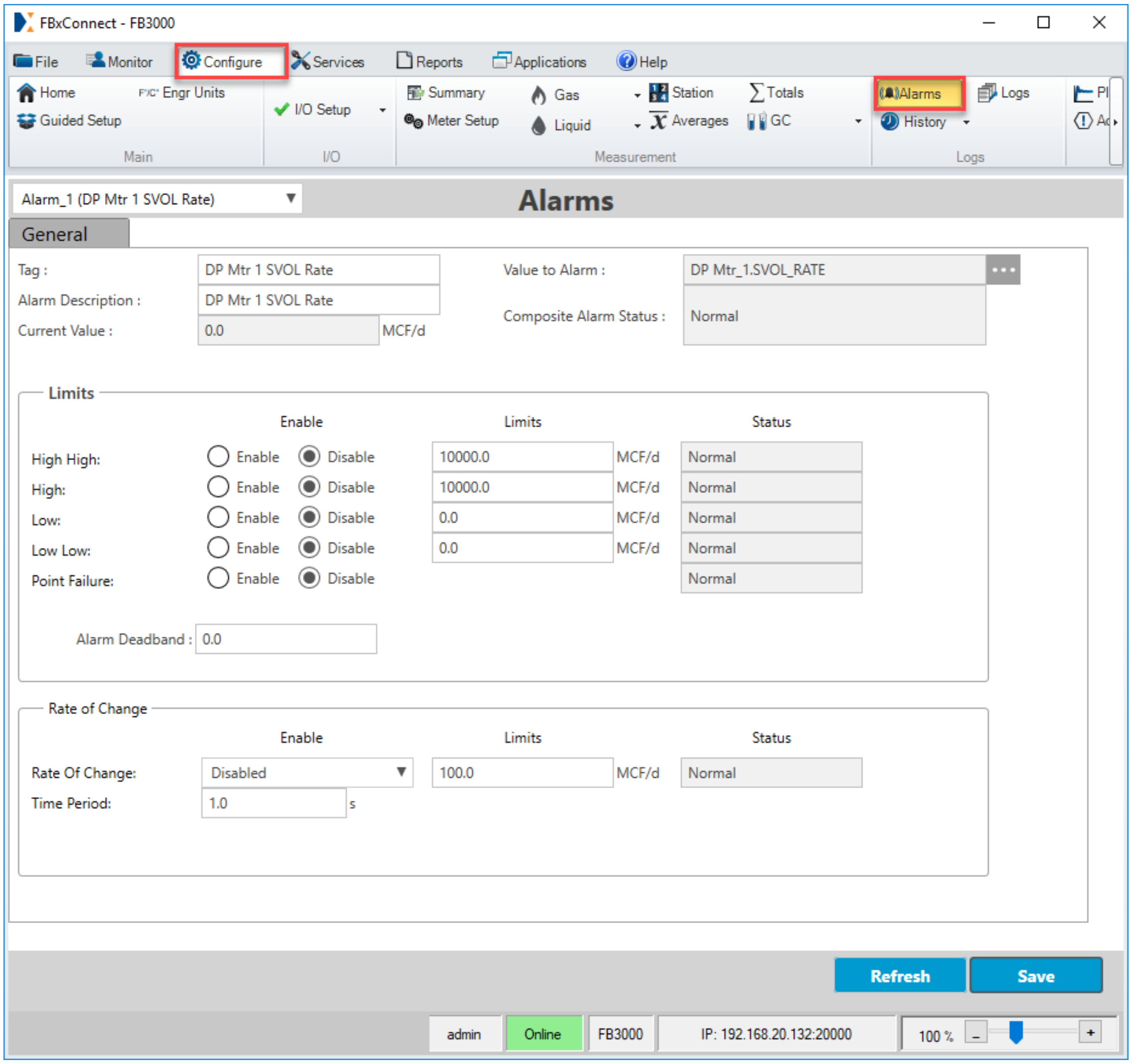
4.20 Alarms

Use the Alarms screen to configure the alarms in your device. Alarm 1 through 35, and Alarm 46 and 47 are pre-configured to alarm a specific parameter. Alarm 36 through Alarm 45 are user alarms, and they can be configured to alarm any parameter of your choice. You can configure the parameter to alarm, alarm limits, alarm deadband, and rate of change alarming for each parameter.

To access this screen:

1. Select **Configure > Alarms** from the FBxConnect™ main menu.
2. Click ▼ in the alarm drop-down list to select an instance to configure.

Figure 234. Alarms



Alarm_1 (DP Mtr 1 SVOL Rate) ▼

Tag : DP Mtr 1 SVOL Rate
Alarm Description : DP Mtr 1 SVOL Rate
Current Value : 0.0 MCF/d
Value to Alarm : DP Mtr_1.SVOL_RATE
Composite Alarm Status : Normal

Limits

	Enable		Limits		Status
High High:	○ Enable	● Disable	10000.0	MCF/d	Normal
High:	○ Enable	● Disable	10000.0	MCF/d	Normal
Low:	○ Enable	● Disable	0.0	MCF/d	Normal
Low Low:	○ Enable	● Disable	0.0	MCF/d	Normal
Point Failure:	○ Enable	● Disable			Normal

Alarm Deadband : 0.0

Rate of Change

	Enable	Limits		Status
Rate Of Change:	Disabled ▼	100.0	MCF/d	Normal
Time Period:	1.0	s		

admin | Online | FB3000 | IP: 192.168.20.132:20000 | 100 %

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Set an identifier (up to 20-alphanumeric characters) for the selected instance.

Field	Description	
Alarm Description	Set a description (up to 20-alphanumeric characters) for the selected instance.	
Current Value	This **read-only** field shows the current value of the selected point in the Value to Alarm field.	
Value to Alarm	Displays the point currently being monitored by the system. Click … to open a Point Picker dialog and select a parameter for the alarm to monitor. **Note** Instance 1 through 35 are preconfigured. You can configure instance 36 through 45 to monitor any point available in the device.	
Composite Alarm Status	This **read-only** field shows the current active alarms for the selected point in the Value to Alarm field. The Composite Alarm Status is Normal if there are no active alarms. Possible composite alarm statuses are Normal, Low, Low Low, High, High High, Rate of Change and Point Fail.	
Limits	Use this section to configure the alarm limits for the selected input. You can configure a High High, High, Low, and Low Low alarm limit.	
	Enable	Select Enable to allow the system to monitor the point for the specified alarm limit. Select Disable to make the system ignore the specified alarm limit.
	Limit	Sets a limit value (in engineering units) to which the input must rise (High High and High) or fall (Low and Low Low) to generate an alarm.
	Status	This **read-only** field shows the current state specified limit. Possible statuses are Disabled, Normal, and Alarm.
	Alarm Deadband	Sets the value (in engineering units) that is an inactive zone above the low alarm and below the high alarm. The purpose of the Alarm Deadband is to prevent the alarm from being set and cleared continuously when the input value is oscillating around the alarm limit. This also prevents the Alarm Log from being over-filled with data.

Field	**Description**	
Rate of Change	Use this section to configure alarming based on the speed of variability in the value of the alarm input.	
	Enable	Click ▼ to configure the input value changes which trigger an alarm. Possible values are Disabled, Alarm on Positive Changes, Alarm on Negative Changes, and Alarm on Both.
	Limit	Sets a limit value (in engineering units) to which the input must rise or fall during the configured time period to generate an alarm.
	Status	This **read-only** field shows the current state Rate of Change alarm.
	Time Period	Sets the time duration (in seconds) that the system uses to determine the Rate of Change for an input.

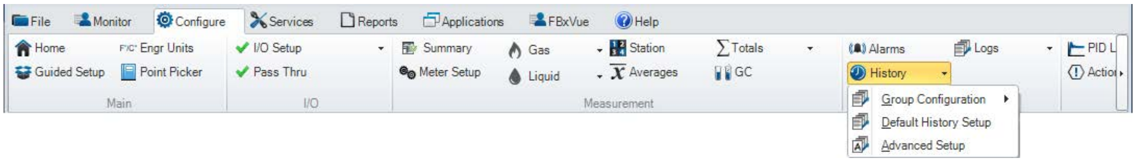
4. Select **Save** to save any changes you make to this screen.

4.21 History

Use the History displays to allocate the number of history points in each history group, and to configure the parameters to be archived in each group. For more information about the structure of history stored in the FB Series products, refer to History Overview.

To access these displays, select **Configure > History** from the FBxConnect™ main menu and select one of the options from the History drop-down menu.

Figure 235. History Drop-Down Menu



The History drop-down menu contains the following options:

Periodic History – Use this option to configure history points for each periodic history group in your FB Series product. You can also use this display to import or export your history configuration to a CSV file.

Transaction History Group Configuration – Use this option to configure history points for each transaction history group in your FB Series product. You can also use this display to import or export your transaction history configuration to a CSV file.

Default History Setup – Use this option to configure history points in your FB Series product using the default history values.

Advanced Setup – Use this option to configure the total number of history points, configure the number records (hourly, daily, weekly, and monthly), and allocate the history points among the history groups in your FB Series product.

4.21.1 History Overview

There are two types of history available – periodic history and transaction history. Periodic history is recorded based on regular intervals with each record beginning at the same time the previous record ends. Only numeric data can be recorded in periodic history groups. Transaction history is recorded based on a trigger that causes the interval to start and another trigger that causes the interval to stop. The next transaction may be triggered at the end of the previous transaction but can also be triggered by a separate event. Both string and numeric data can be recorded in transaction history. Before history can be configured for either periodic or transaction history, you must allocate the number of history points and the number of records required for each type of history.

Periodic History

Periodic history is further divided into standard history and user periodic history. Standard history groups provide logging at four fixed intervals: hourly, daily, weekly, and monthly. User periodic history groups provide logging at one user-selectable interval per group.

Standard History

There are two types of standard history groups – general history and station history.

The FB3000 RTU supports up to 36 stations. Each station is associated with a separate station history group. You can adjust the number of points between any of the periodic history groups. For more information about history point reallocation, refer to Advanced – Standard History Sizing Tab.

General History – Contains hourly, daily, weekly and monthly history not associated with a meter or station. General history groups should **not** be used to record meter totals or averages calculated by the meter run.

Station History – Contains hourly, daily, weekly and monthly history associated with the station and any meters assigned to the station.

Note

For the station history groups, Emerson recommends that you configure the inputs to average on the Averages display **before** configuring history.

Station history groups are typically used to archive metrologically significant data from the meters belonging to that station. When used together with meter data (represented via Average and Total objects), the station history groups read the previous period values calculated by the meter application and log them as configured in the history points.

Configuring station history involves selecting Average and Total objects which contain the meter data. For this reason, it is recommended to configure Averages first and then configure Station History.

The archive type for each history point is limited by which object is selected:

- Average, minimum, and maximum archive types can only be selected for an Average object.
- Total/Difference can only be selected for a Total object.
- Snapshot values can be selected for either type, as both Averages and Totals store a snapshot of the value at the last period end.

Station history also includes the ability to archive any numeric database parameters alongside meter data (for example, an ambient temperature or a well casing pressure). When adding numeric parameters directly to the station history group, you **must** select an appropriate archive type for each history point (Average, Total / Difference, Snapshot, Minimum, Maximum, Integration).

User Periodic

There are two user periodic history groups with a fixed number of points in each group. 10 history points are allocated to the User Periodic 1 history group, and 20 history points are allocated to the User Periodic 2 history group. You can configure the logging interval independently for each group. Regardless of the selected logging interval, User Periodic 1 has a capacity of 4000 records and User Periodic 2 has a capacity of 500 records. User periodic history groups should **not** be used to record meter totals or averages calculated by the meter run.

Averages and Totals

Fiscal averages and totals for audit trail purposes are calculated by the metering application and stored in the database. Averages and minimum/maximum values for the current and previous periods are stored in the Average object, and the cumulative total and current and previous period totals are stored in the Total object.

Totals – Total objects are not configurable and have been pre-defined for flowtime, uncorrected volume, corrected volume, mass, and energy for all meter types. DP meters have a pre-defined total for Integral Value (IV) and Linear meters have a pre-defined total for raw pulses.

Averages – The first four averages are defaulted for a single DP meter application to average DP Mtr_1 values of the DP input value, Flowing Pressure input value, Flowing Temperature input value, and Integral Multiplier Value (IMV); however, you may re-define these to point to other meters or other parameters as required by your application.

The averaging method is based on the selection in Meter Setup for Meter Averaging Method and are either flow dependent or flow weighted, which means they must be associated with a meter run. This association can either be by the selection of the Input to Average starting with the selection of a meter (DP Mtr or Linear Mtr instance), or by selecting a parameter from another object and then defining the associated meter run through the Input to Weight.

Note

You can select Station, Fluid Properties, or meter run input parameters by first selecting the meter, then the meter parameter that references that object (Station Assignment, Fluid Property Reference, Differential Pressure Object, Static Pressure Object, Flowing Temperature Object), then a parameter from that object.

For instance, the default configuration of Average_2 is configured as DP Mtr_1.PF_OBJ.SELECTED. This will average the raw I/O value from the input assigned to DP Mtr_1 (which might be a downstream gauge pressure value). Another option would be to select DP Mtr_1 (Instance1) and then the PF_INUSE parameter. This will average the pressure as it is used in the flow equation, so in this case converted to upstream, absolute pressure.

Daylight Saving Time

The day that Daylight Saving Time starts, 23 hourly history records are recorded. The day that Daylight Saving Time ends, 25 hourly records are recorded. You configure Daylight Saving Time on the Clock display.

Transaction History

Transaction history allows you to define any parameter to be recorded as part of the transaction. When a transaction starts, the start time is recorded. When a transaction ends, the stop time is recorded and a snapshot is taken of the selected parameters. Each transaction history group has independent triggers to start a transaction (Start), end a transaction (Stop) or end a transaction and immediately start another transaction (Next). You can configure up to 100 transaction history groups. Each group can contain up to 650 points with a maximum of 3100 points allowed across all transaction history groups. For more information about adjusting the number of transaction history groups and points, refer to Transaction History Sizing Tab.

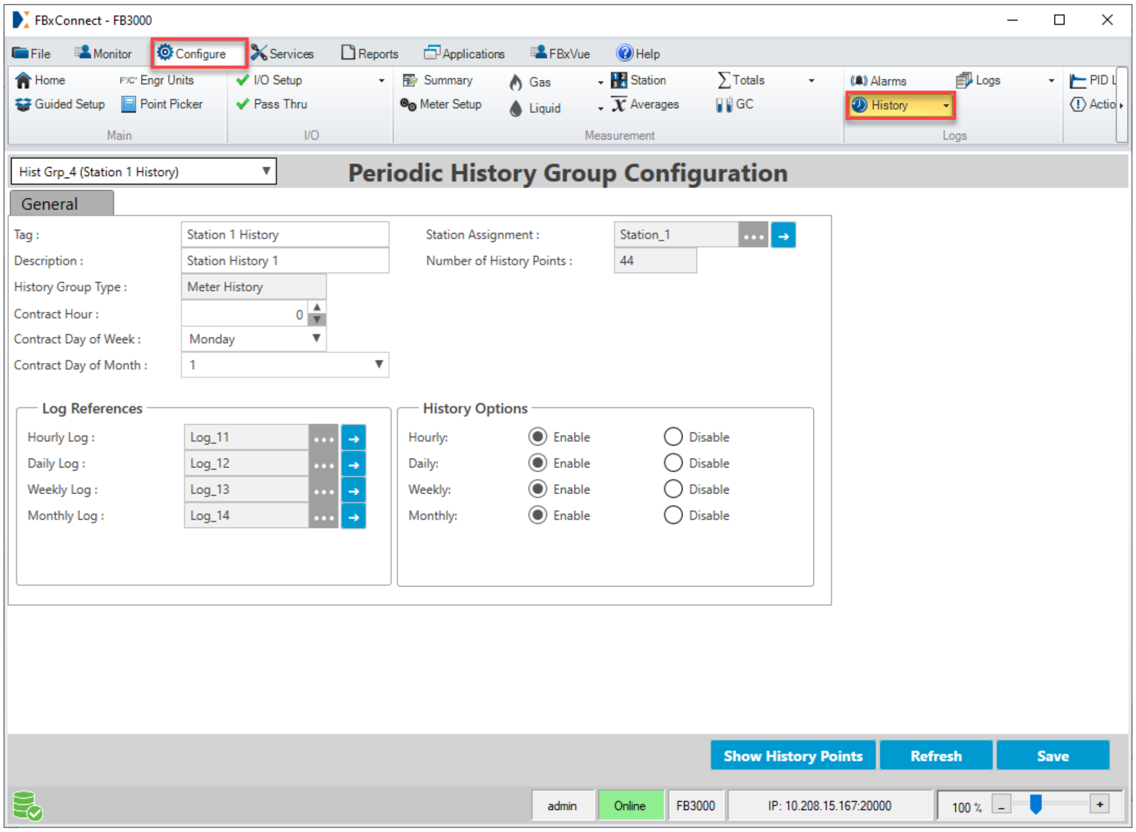
4.21.2 Periodic History Group Configuration

Use this display to configure history points and logging options for each periodic history group in your FB Series product.

To access this display:

1. Select **Configure > History > Group Configuration > Periodic History** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select a history group to configure.

Figure 236. Periodic History Group Configuration



Hist Grp_4 (Station 1 History)

Periodic History Group Configuration

General

Tag : Station 1 History
Description : Station History 1
History Group Type : Meter History
Contract Hour : 0
Contract Day of Week : Monday
Contract Day of Month : 1
Station Assignment : Station_1
Number of History Points : 44

Log References
Hourly Log : Log_11
Daily Log : Log_12
Weekly Log : Log_13
Monthly Log : Log_14

History Options
Hourly: ● Enable ○ Disable
Daily: ● Enable ○ Disable
Weekly: ● Enable ○ Disable
Monthly: ● Enable ○ Disable

Note

The fields available on this display change based on the type of history group you select in the drop-down list.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected history group.
Description	Sets a description (up to 20-alphanumeric characters) for the selected history group.
History Group Type	This **read-only** field shows the history group type currently selected in drop-down list at the top of the display. Possible group types are User Periodic, General History and Meter History.

Field	Description
Contract Hour	Click ⬍ to set the hour at which daily, weekly, and totals rollover and history records are logged (for daily-based, weekly-based, or monthly-based reports). **Note** This field appears **only** for the **General History** and **Meter History** History Group Type.
Contract Day of Week	Click ⬍ to set the day of the week at which totals rollover and history records are logged (for weekly-based reports). **Note** This field appears **only** for the **General History** and **Meter History** History Group Type.
Contract Day of Month	Click ⬍ to set the day of the month at which totals rollover and history records are logged (for monthly-based reports). **Note** This field appears **only** for the **General History** and **Meter History** History Group Type.
Station Assignment	This **read-only** field shows which station is associated with the selected Meter history group. Select ➔ to open the Station Configuration display and configure the station. **Note** This field appears **only** for the **Meter History** History Group Type.
Number of History Points	This **read-only** field shows the current number of history points allocated to the selected history group.
User Period	Sets the amount of time (in seconds) between data samples. **Note** This field appears **only** for the **User Periodic** History Group Type.
Log References	These fields show which logs are used for each log type (Hourly, Daily, Weekly, Monthly, and User Periodic). Click ➔ to open the Logs display and configure logging options. **Note** • The Hourly, Daily, Weekly, and Monthly Log references appear **only** for the **General History** and **Meter History** History Group Types.

Field	Description
	- The User Periodic Log reference appears **only** for the **User Periodic** History Group Type.
History Options	Enables each of the log types (Hourly, Daily, Weekly, and Monthly). **Note** This field appears **only** for the **General History** and **Meter History** History Group Type.
Show History Points	Click to configure which parameters are logged and their archival type for the selected History Group Type. For more information, refer to Show History Points.

4. Select **Save** to save any changes you make to this display.

4.21.2.1 Show History Points

Use this screen to configure history points of the selected history group.

To access this screen:

1. **For Periodic History:**
   Select **Configure** > **History** > **Group Configuration** > **Periodic History** from the FBxConnect™ main menu.

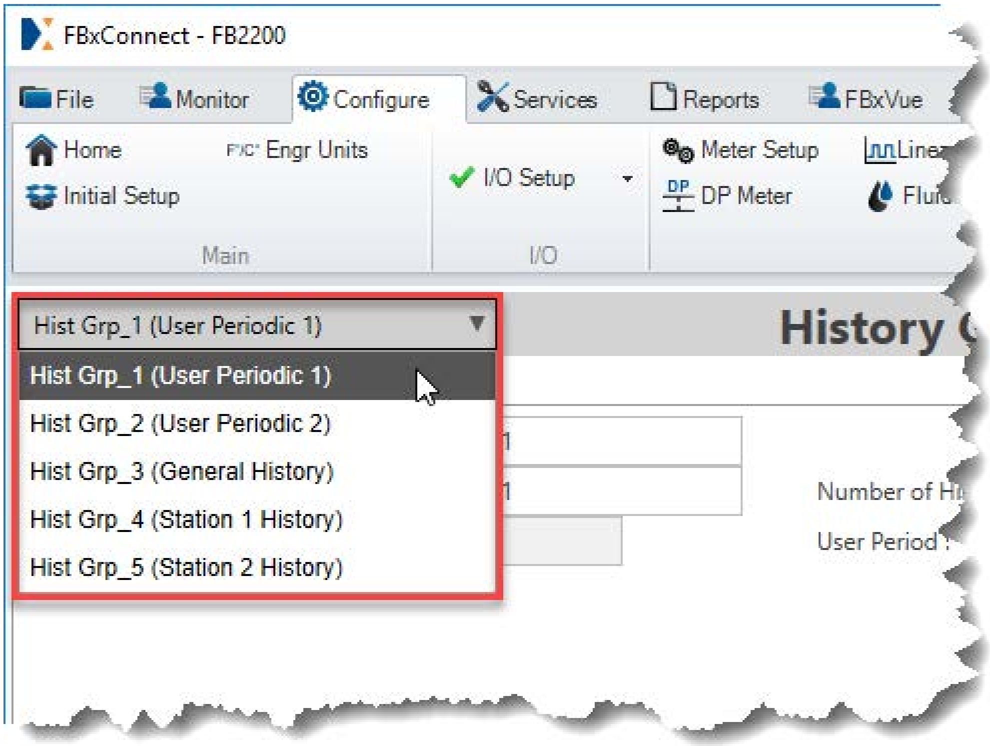
   For Transaction History:
   Select **Configure** > **History** > **Group Configuration** > **Transaction History** from the FBxConnect™ main menu.

   Note

   You **must** enable **Transaction History** on the History Setup - Advanced display before you can access this display.

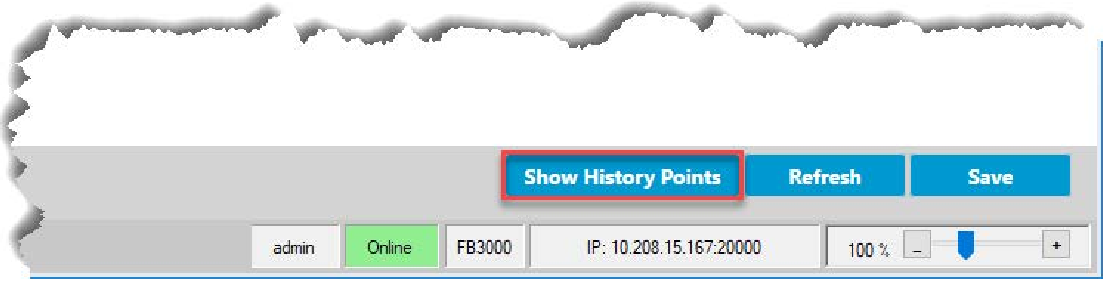
2. Click ▼ in the drop-down list at the top of the screen to select a History Group to configure.

Figure 237. History Group Drop-Down List



3. At the bottom of the screen, select **Show History Points**.

Figure 238. Show History Points

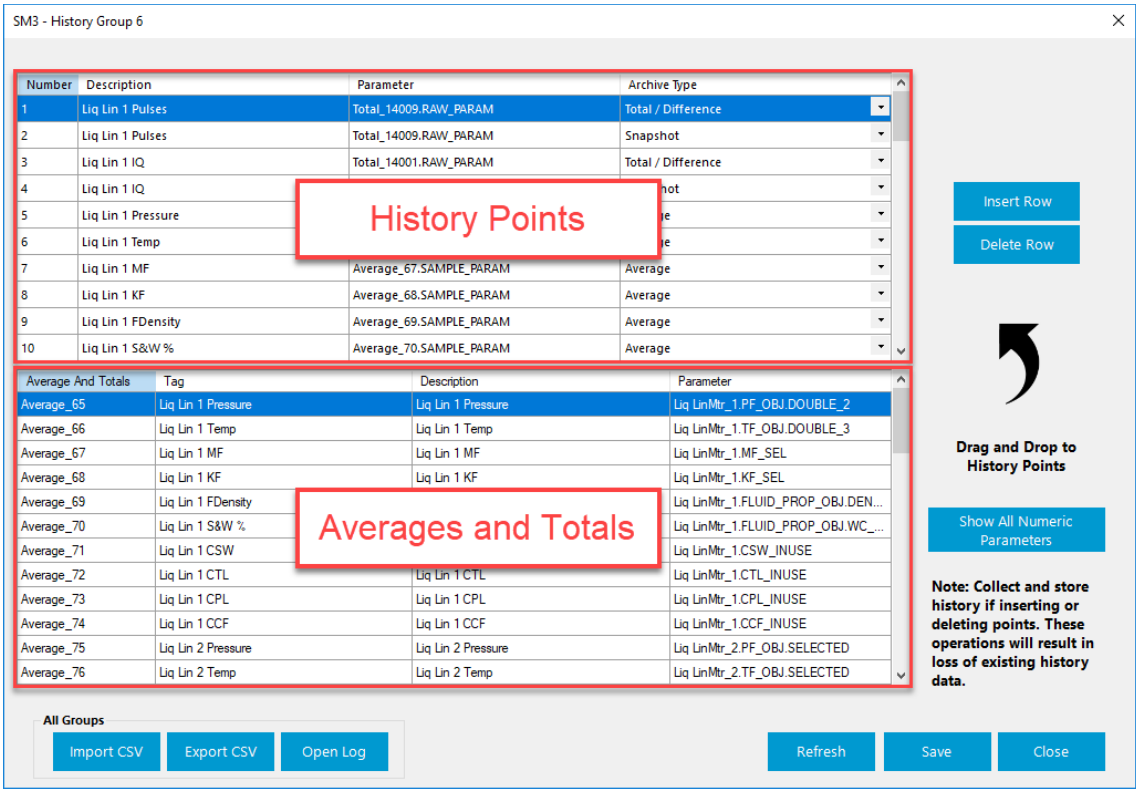


The History Group screen is divided into the following sections:

- **History Points** – This section shows for **all** History Group Types. You can configure each history point of the selected History Group, and each point's archival type. You assign a parameter to a history point by dragging an entry from either the "Averages and Totals" section or from "Objects, Instances and Parameters" section (depending on the selected History Group Type) and dropping it on to a history point.

- **Averages and Totals –** This section show **only** for **Meter History** History Group Types based on the status of the **Show All Numeric Parameters / Show Station Averages and Totals Only** button. You can drag and drop the Averages or Totals objects onto a history point in the History Points section.
- **Objects, Instances, and Parameters –** This section **always** shows for **User Periodic**, **General History**, and **Transaction History** History Group Types. This section shows for the **Meter History** History Group Type based on the status of the **Show All Numeric Parameters / Show Station Averages and Totals Only** button. You can drag and drop the selected Object, Instance or Parameter onto a history point in the History Points section.

Figure 239. History Group (Meter History)



Number	Description	Parameter	Archive Type
1	Liq Lin 1 Pulses	Total_14009.RAW_PARAM	Total / Difference
2	Liq Lin 1 Pulses	Total_14009.RAW_PARAM	Snapshot
3	Liq Lin 1 IQ	Total_14001.RAW_PARAM	Total / Difference
4	Liq Lin 1 IQ		hot
5	Liq Lin 1 Pressure		e
6	Liq Lin 1 Temp		e
7	Liq Lin 1 MF	Average_67.SAMPLE_PARAM	Average
8	Liq Lin 1 KF	Average_68.SAMPLE_PARAM	Average
9	Liq Lin 1 FDensity	Average_69.SAMPLE_PARAM	Average
10	Liq Lin 1 S&W %	Average_70.SAMPLE_PARAM	Average

Average And Totals	Tag	Description	Parameter
Average_65	Liq Lin 1 Pressure	Liq Lin 1 Pressure	Liq LinMtr_1.PF_OBJ.DOUBLE_2
Average_66	Liq Lin 1 Temp	Liq Lin 1 Temp	Liq LinMtr_1.TF_OBJ.DOUBLE_3
Average_67	Liq Lin 1 MF	Liq Lin 1 MF	Liq LinMtr_1.MF_SEL
Average_68	Liq Lin 1 KF	Liq Lin 1 KF	Liq LinMtr_1.KF_SEL
Average_69	Liq Lin 1 FDensity		Liq LinMtr_1.FLUID_PROP_OBJ.DEN...
Average_70	Liq Lin 1 S&W %		Liq LinMtr_1.FLUID_PROP_OBJ.WC_...
Average_71	Liq Lin 1 CSW		Liq LinMtr_1.CSW_INUSE
Average_72	Liq Lin 1 CTL	Liq Lin 1 CTL	Liq LinMtr_1.CTL_INUSE
Average_73	Liq Lin 1 CPL	Liq Lin 1 CPL	Liq LinMtr_1.CPL_INUSE
Average_74	Liq Lin 1 CCF	Liq Lin 1 CCF	Liq LinMtr_1.CCF_INUSE
Average_75	Liq Lin 2 Pressure	Liq Lin 2 Pressure	Liq LinMtr_2.PF_OBJ.SELECTED
Average_76	Liq Lin 2 Temp	Liq Lin 2 Temp	Liq LinMtr_2.TF_OBJ.SELECTED

Note: Collect and store history if inserting or deleting points. These operations will result in loss of existing history data.

4. Review – and change as necessary – the values in the following fields:

Field	Description		
History Points	You can configure each history point of the selected History Group, and each point's archival type. You assign a parameter to a history point by dragging an entry from either the "Averages and Totals" section or from "Objects, Instances and Parameters" section (depending on the selected History Group Type) and dropping it on to a history point.		
	Description	Enter a description of the selected parameter. **Note** This field is automatically populated when you select a parameter. Modify this field after you select a parameter to archive.	
	Parameter	Select a parameter to be archived in history.	
	Archive Type	Select ▼ to choose the archival type for the selected history point. Possible options are:	
		Average	Archives the average value of the selected parameter over the period. Any numeric parameter in the database can be selected. The values are simple linear averages with all samples included.
		Total / Difference	**For Meter History History Group Type**, archives the total accumulated value for the selected parameter. **For User Periodic and General History History Group Types**, archives the difference between period start value and period end value for the selected parameter.
		Snapshot	Archives the snapshot value of the selected parameter at the end of the period. **Note** For Transaction History groups, this is the **only** valid option.

Field	Description		
		Minimum	Archives the minimum value of the selected parameter over the period.
		Maximum	Archives the maximum value of the selected parameter over the period.
		Integration	Archives the total accumulated samples for the selected parameter over the period.
	Data Type	This **read-only** field shows the Data Type for each point as configured on the **Transaction History Group Details** pop-up display accessed from the Advanced Setup – Transaction History Sizing Tab. **Note** This field applies to **Transaction History** groups **only**.	
Insert Row	Click to insert a row before the currently selected row.		
Delete Row	Click to delete the currently selected row from the table.		
Averages and Totals	Drag and drop the Averages or Totals objects onto a history point in the History Points section. If you select an Average object, the values are averaged based on the Averaging Type selected on the Meter Setup display. If you select a numeric parameter, you **must** select an appropriate archive type for each history point (Average, Total / Difference, Snapshot, Minimum, Maximum, Integration). **Note** This section shows **only** for the **Meter History** History Group Type based on the status of the **Show All Numeric Parameters / Show Station Averages and Totals Only** button.		
Objects and Instances / Parameters / Referenced Parameters	You can drag and drop the selected Object, Instance, Parameter, or Referenced Parameter onto a history point in the History Points section. For more information, refer to Point Picker. **Note** This section **always** shows for **User Periodic**, **General History**, and **Transaction History** History Group Types. This section shows for the **Meter History** History Group Type based on the status of the **Show All Numeric Parameters / Show Station Averages and Totals Only** button.		

Field	Description
Show All Numeric Parameters / Show Station Averages and Totals Only	Click to switch between viewing **Objects and Instances / Parameters / Referenced Parameters** and viewing **Averages and Totals**. **Note** This button shows **only** for the **Meter History** and **Transaction History** History Group types.
Import CSV	Click to import a CSV file into your FB Series product that contains your desired history configuration. Navigate to the location of the saved CSV file and select **Open** to start the import process. For more information, refer to Importing a History Configuration CSV File. **Note** • You **must** configure Averages **before** importing a history CSV file. The easiest way to configure Averages is by completing the Default Meter History Setup. • The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. Any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.
Export CSV	Click to save a CSV file to your computer that contains the current history configuration of your FB Series product. A Select Table dialog opens where you can select which history groups to include in the export. Click **Start**, select a name and location for the exported file on your computer, and click **Save** to begin the export process. For more information, refer to Exporting a History Configuration CSV File. **Note** By default, all selected data is exported into a single file. Select **Export to individual file** to have the system create individual files for each history group you select.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect™ import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.
Refresh	Click to reload the table with the data stored in the FB Series product.

Field	Description
Save	Click to save any changes you have made to the table.
Close	Click to close the current window.

5. Select **Save** to save any changes you make to this screen.

4.21.2.1.1 Importing a History Configuration CSV File

You can import a CSV file that contains your configuration for a single history group, multiple history groups, or your entire history configuration for use in the FB Series product.

Note

- For more information about history in the FB Series product, refer to History.
- You **must** configure Averages **before** importing a history CSV file. The easiest way to configure Averages is by completing the Default Meter History Setup.
- For more information about creating your own history CSV file, refer to Creating a History Configuration CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current history configuration, refer to Exporting a History Configuration CSV File.

To import a CSV file that contains your history configuration:

1. **For Periodic History:**
   Select **Configure > History > Group Configuration > Periodic History** from the FBxConnect™ main menu.

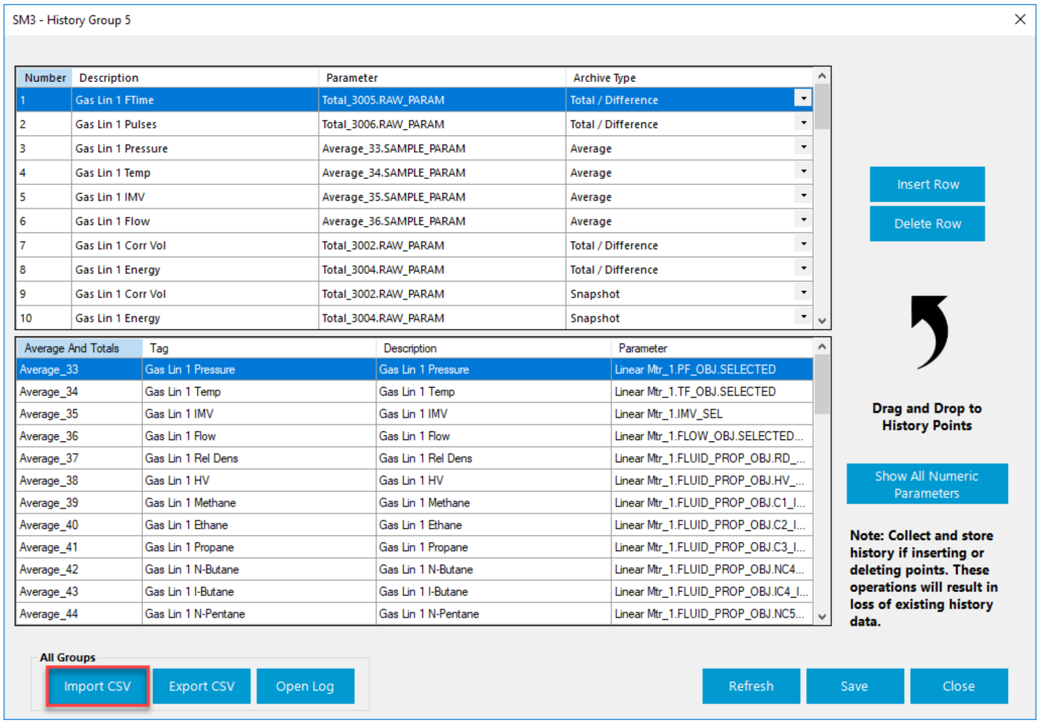
   For Transaction History:
   Select **Configure > History > Group Configuration > Transaction History** from the FBxConnect™ main menu.

   Note

   You **must** enable **Transaction History** on the History Setup - Advanced display before you can access this display.

2. At the bottom of the screen, select **Show History Points**. The History Group pop-up display opens.

Figure 240. History Group – Import CSV



Number	Description	Parameter	Archive Type
1	Gas Lin 1 FTime	Total_3005.RAW_PARAM	Total / Difference
2	Gas Lin 1 Pulses	Total_3006.RAW_PARAM	Total / Difference
3	Gas Lin 1 Pressure	Average_33.SAMPLE_PARAM	Average
4	Gas Lin 1 Temp	Average_34.SAMPLE_PARAM	Average
5	Gas Lin 1 IMV	Average_35.SAMPLE_PARAM	Average
6	Gas Lin 1 Flow	Average_36.SAMPLE_PARAM	Average
7	Gas Lin 1 Corr Vol	Total_3002.RAW_PARAM	Total / Difference
8	Gas Lin 1 Energy	Total_3004.RAW_PARAM	Total / Difference
9	Gas Lin 1 Corr Vol	Total_3002.RAW_PARAM	Snapshot
10	Gas Lin 1 Energy	Total_3004.RAW_PARAM	Snapshot

Average And Totals	Tag	Description	Parameter
Average_33	Gas Lin 1 Pressure	Gas Lin 1 Pressure	Linear Mtr_1.PF_OBJ.SELECTED
Average_34	Gas Lin 1 Temp	Gas Lin 1 Temp	Linear Mtr_1.TF_OBJ.SELECTED
Average_35	Gas Lin 1 IMV	Gas Lin 1 IMV	Linear Mtr_1.IMV_SEL
Average_36	Gas Lin 1 Flow	Gas Lin 1 Flow	Linear Mtr_1.FLOW_OBJ.SELECTED...
Average_37	Gas Lin 1 Rel Dens	Gas Lin 1 Rel Dens	Linear Mtr_1.FLUID_PROP_OBJ.RD_...
Average_38	Gas Lin 1 HV	Gas Lin 1 HV	Linear Mtr_1.FLUID_PROP_OBJ.HV_...
Average_39	Gas Lin 1 Methane	Gas Lin 1 Methane	Linear Mtr_1.FLUID_PROP_OBJ.C1_I...
Average_40	Gas Lin 1 Ethane	Gas Lin 1 Ethane	Linear Mtr_1.FLUID_PROP_OBJ.C2_I...
Average_41	Gas Lin 1 Propane	Gas Lin 1 Propane	Linear Mtr_1.FLUID_PROP_OBJ.C3_I...
Average_42	Gas Lin 1 N-Butane	Gas Lin 1 N-Butane	Linear Mtr_1.FLUID_PROP_OBJ.NC4...
Average_43	Gas Lin 1 I-Butane	Gas Lin 1 I-Butane	Linear Mtr_1.FLUID_PROP_OBJ.IC4_I...
Average_44	Gas Lin 1 N-Pentane	Gas Lin 1 N-Pentane	Linear Mtr_1.FLUID_PROP_OBJ.NC5...

Note: Collect and store history if inserting or deleting points. These operations will result in loss of existing history data.

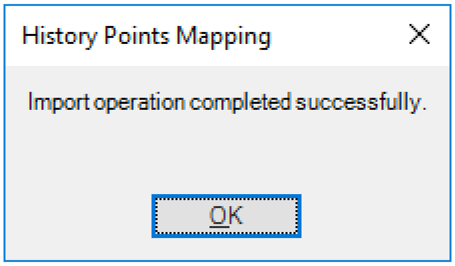
3. Select the **Import CSV** button.
4. Navigate to the file location of your CSV file and select **Open**.

Note

The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

5. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Figure 241. Confirmation



Import operation completed successfully.

4.21.2.1.2 Exporting a History Configuration CSV File

You can export your FB Series product's current history configuration to a CSV file saved on your computer.

Note

- For more information about history in the FB Series product, refer to History.
- For more information about creating your own history configuration CSV file, refer to Creating a History Configuration CSV File.
- For more information about importing a CSV file that contains the FB Series product's current history configuration, refer to Importing a History Configuration CSV File.

To export a CSV file that contains your history configuration:

1. **For Periodic History:**
   Select **Configure > History > Group Configuration > Periodic History** from the FBxConnect™ main menu.

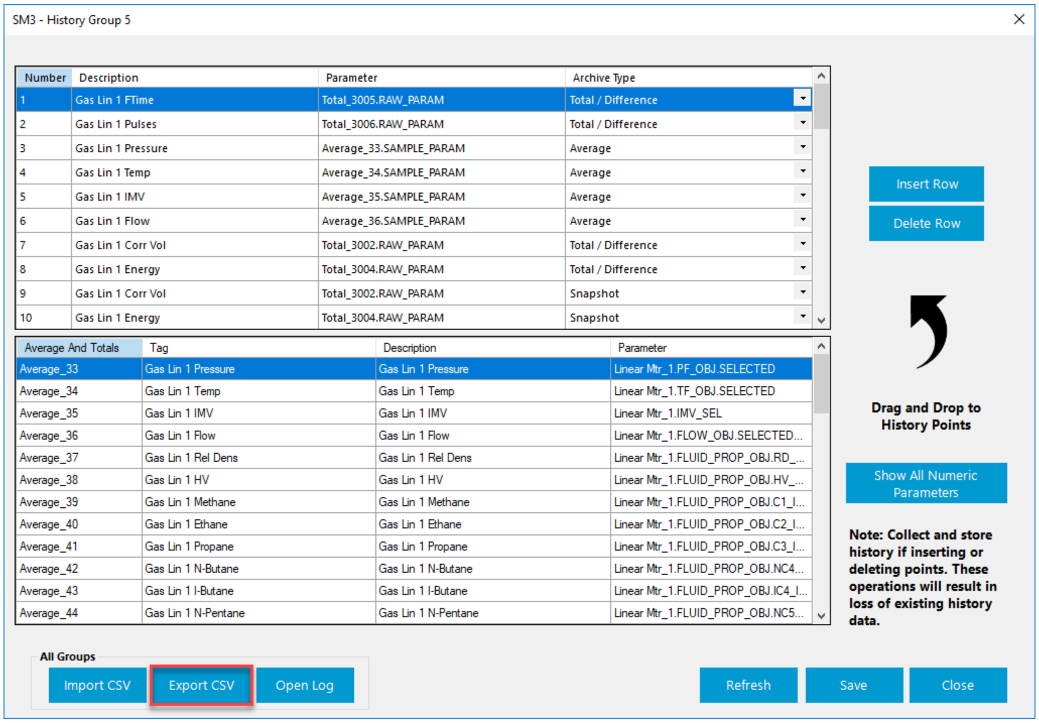
   For Transaction History:
   Select **Configure > History > Group Configuration > Transaction History** from the FBxConnect™ main menu.

   Note

   You **must** enable **Transaction History** on the History Setup - Advanced display before you can access this display.

2. At the bottom of the screen, select **Show History Points**. The History Group pop-up display opens.

Figure 242. History Group – Export CSV



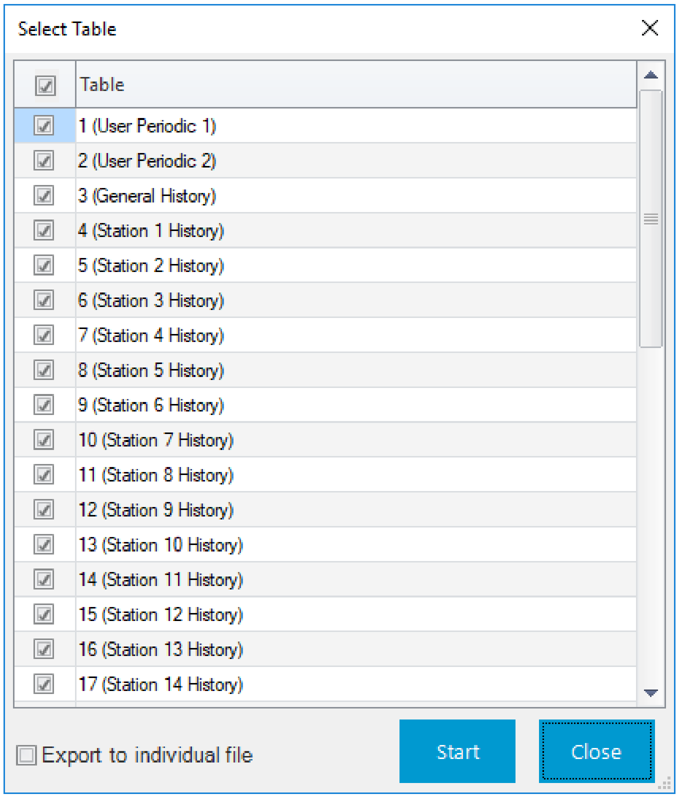
Number	Description	Parameter	Archive Type
1	Gas Lin 1 FTime	Total_3005.RAW_PARAM	Total / Difference
2	Gas Lin 1 Pulses	Total_3006.RAW_PARAM	Total / Difference
3	Gas Lin 1 Pressure	Average_33.SAMPLE_PARAM	Average
4	Gas Lin 1 Temp	Average_34.SAMPLE_PARAM	Average
5	Gas Lin 1 IMV	Average_35.SAMPLE_PARAM	Average
6	Gas Lin 1 Flow	Average_36.SAMPLE_PARAM	Average
7	Gas Lin 1 Corr Vol	Total_3002.RAW_PARAM	Total / Difference
8	Gas Lin 1 Energy	Total_3004.RAW_PARAM	Total / Difference
9	Gas Lin 1 Corr Vol	Total_3002.RAW_PARAM	Snapshot
10	Gas Lin 1 Energy	Total_3004.RAW_PARAM	Snapshot

Average And Totals	Tag	Description	Parameter
Average_33	Gas Lin 1 Pressure	Gas Lin 1 Pressure	Linear Mtr_1.PF_OBJ.SELECTED
Average_34	Gas Lin 1 Temp	Gas Lin 1 Temp	Linear Mtr_1.TF_OBJ.SELECTED
Average_35	Gas Lin 1 IMV	Gas Lin 1 IMV	Linear Mtr_1.IMV_SEL
Average_36	Gas Lin 1 Flow	Gas Lin 1 Flow	Linear Mtr_1.FLOW_OBJ.SELECTED...
Average_37	Gas Lin 1 Rel Dens	Gas Lin 1 Rel Dens	Linear Mtr_1.FLUID_PROP_OBJ.RD_...
Average_38	Gas Lin 1 HV	Gas Lin 1 HV	Linear Mtr_1.FLUID_PROP_OBJ.HV_...
Average_39	Gas Lin 1 Methane	Gas Lin 1 Methane	Linear Mtr_1.FLUID_PROP_OBJ.C1_I...
Average_40	Gas Lin 1 Ethane	Gas Lin 1 Ethane	Linear Mtr_1.FLUID_PROP_OBJ.C2_I...
Average_41	Gas Lin 1 Propane	Gas Lin 1 Propane	Linear Mtr_1.FLUID_PROP_OBJ.C3_I...
Average_42	Gas Lin 1 N-Butane	Gas Lin 1 N-Butane	Linear Mtr_1.FLUID_PROP_OBJ.NC4...
Average_43	Gas Lin 1 I-Butane	Gas Lin 1 I-Butane	Linear Mtr_1.FLUID_PROP_OBJ.IC4_I...
Average_44	Gas Lin 1 N-Pentane	Gas Lin 1 N-Pentane	Linear Mtr_1.FLUID_PROP_OBJ.NC5...

Note: Collect and store history if inserting or deleting points. These operations will result in loss of existing history data.

3. Select the **Export CSV** button. The Select Table pop-up display opens.

Figure 243. Select Table



☑	Table
☑	1 (User Periodic 1)
☑	2 (User Periodic 2)
☑	3 (General History)
☑	4 (Station 1 History)
☑	5 (Station 2 History)
☑	6 (Station 3 History)
☑	7 (Station 4 History)
☑	8 (Station 5 History)
☑	9 (Station 6 History)
☑	10 (Station 7 History)
☑	11 (Station 8 History)
☑	12 (Station 9 History)
☑	13 (Station 10 History)
☑	14 (Station 11 History)
☑	15 (Station 12 History)
☑	16 (Station 13 History)
☑	17 (Station 14 History)

☐ Export to individual file

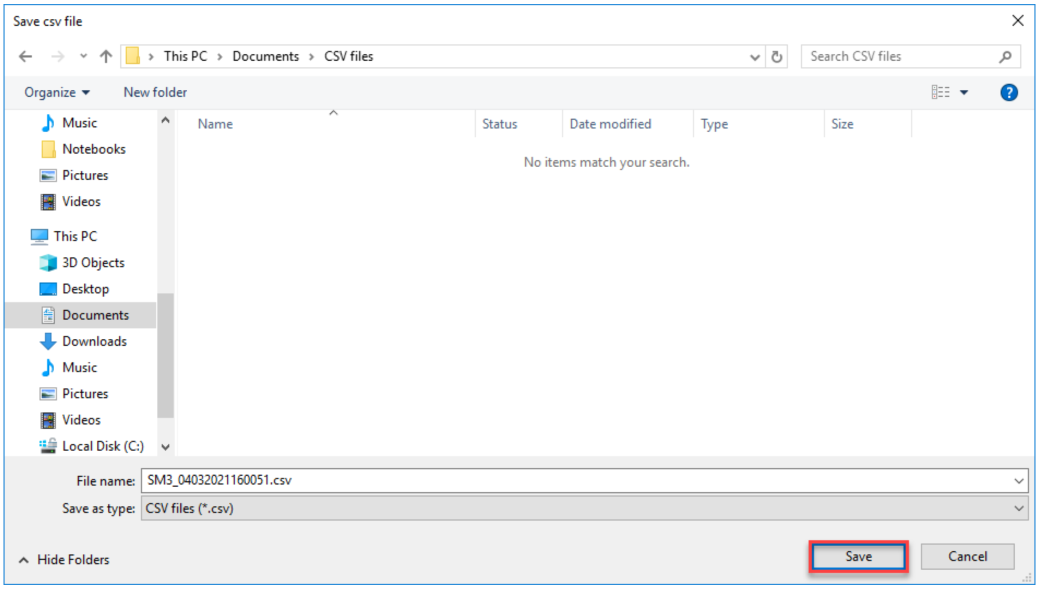
4. Place a check mark next to each table you want to export.

Note

By default, all selected tables are exported to a single file. If you want each selected table to be exported to individual files, place a check mark next to **Export to individual file**.

5. Select **Start**. A Save csv file window opens.

Figure 244. Save csv file



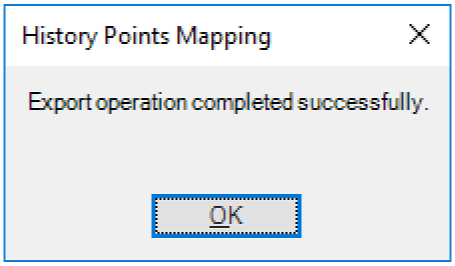
No items match your search.

File name: SM3_04032021160051.csv

Save as type: CSV files (*.csv)

6. Navigate to a location on your computer to save your exported CSV file and select **Save**. The system exports the CSV file and displays a progress bar at the top of the display.
7. A confirmation message displays after exporting the CSV file. Select **OK** to complete the process.

Figure 245. Confirmation



Export operation completed successfully.

4.21.2.1.3 Creating a History Configuration CSV File

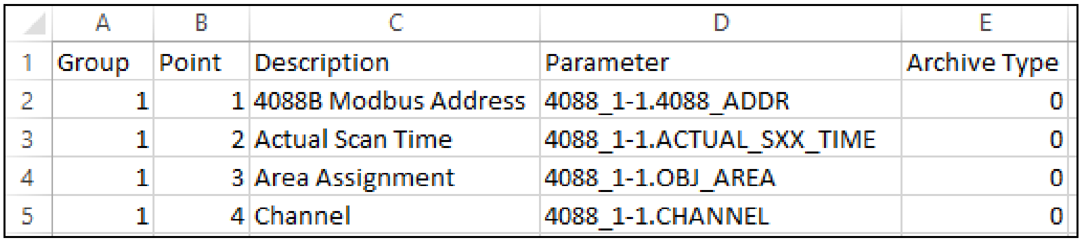
You can create a history configuration file on your computer and then import the file for use in the FB Series product. If your history configuration contains a large amount of points, then it may be easier to create a CSV file on your computer than it is to configure history in FBxConnect™.

Note

- For more information about history in the FB Series product, refer to History.

- The History CSV **must** contain the format shown below. The easiest way to begin creating a history CSV file is to export a CSV that contains the current FB Series product configuration and then edit that file. For more information about exporting a CSV file, refer to the Exporting a History CSV File.

Figure 246. Example Periodic History CSV Format



	A	B	C	D	E
1	Group	Point	Description	Parameter	Archive Type
2	1	1	4088B Modbus Address	4088_1-1.4088_ADDR	0
3	1	2	Actual Scan Time	4088_1-1.ACTUAL_SXX_TIME	0
4	1	3	Area Assignment	4088_1-1.OBJ_AREA	0
5	1	4	Channel	4088_1-1.CHANNEL	0

To create a history configuration CSV file:

1. Open a blank spreadsheet (or open your previously exported history CSV file).
2. In row one of the spreadsheet, enter the following text:
   - Column A = Group
   - Column B = Point
   - Column C = Description
   - Column D = Parameter
   - Column E = Archive Type
   - Column F = Data Type (Transaction History **only**)
3. Each additional row is used to configure a row in the history table. Enter information in each column according to the descriptions below:

Column Heading	Description
Group	Enter the number corresponding to the history group the for the selected row. **Periodic History** **1** = User Periodic 1 **2** = User Periodic 2 **3** = General History **4 – 39** = Station 1 History – Station 36 History **Transaction History** **1 – 100** = Transaction History

Column Heading	Description
Point	For **Periodic History**, you can adjust the number of points between any of the periodic history groups. For more information about standard history point reallocation, refer to Advanced – Standard History Sizing Tab. The FB Series product also contains two groups of user periodic history points. User periodic history consists of 30 fixed history points. Ten points are allocated to the User Periodic 1 group and 20 points are allocated to the User Periodic 2 group. For **Transaction History**, you can adjust the number of points with the following limitations: • A maximum of 25 string points per group. • A maximum of 650 string points and numeric points combined.
Description	Enter a description of the selected parameter.
Parameter	Enter a parameter from the FB Series product's database to be archived in history.
Archive Type	Enter a number that corresponds to the archival type for the selected history point. Possible options are:
	0 **Average** Archives the average value of the selected parameter over the period.
	1 **Total / Difference** For **Meter History** History Group Type, archives the total accumulated value for the selected parameter. For **User Periodic** and **General History** History Group Types, archives the difference between period start value and period end value for the selected parameter.
	2 **Snapshot** Archives the snapshot value of the selected parameter at the end of the period. **Note** For **Transaction History** groups, this is the **only** valid option.

Column Heading	Description
	3 **Minimum** Archives the snapshot value of the selected parameter at the end of the period.
	4 **Maximum** Archives the maximum value of the selected parameter over the period.
	5 **Integration** Archives the total accumulated samples for the selected parameter over the period. **Note** This archival type is **only** used with **User Periodic** and **General History** History Group Types.

4. Save your changes. You can now import your CSV file for use in your FB Series product. For more information, refer to Importing a History Configuration CSV File.

Note

Make sure to save the file with a **.csv** file extension.

4.21.3 Transaction History Group Configuration

Use this display to configure which history points are logged for each transaction history group in your FB Series product and to start or stop individual transactions.

Note

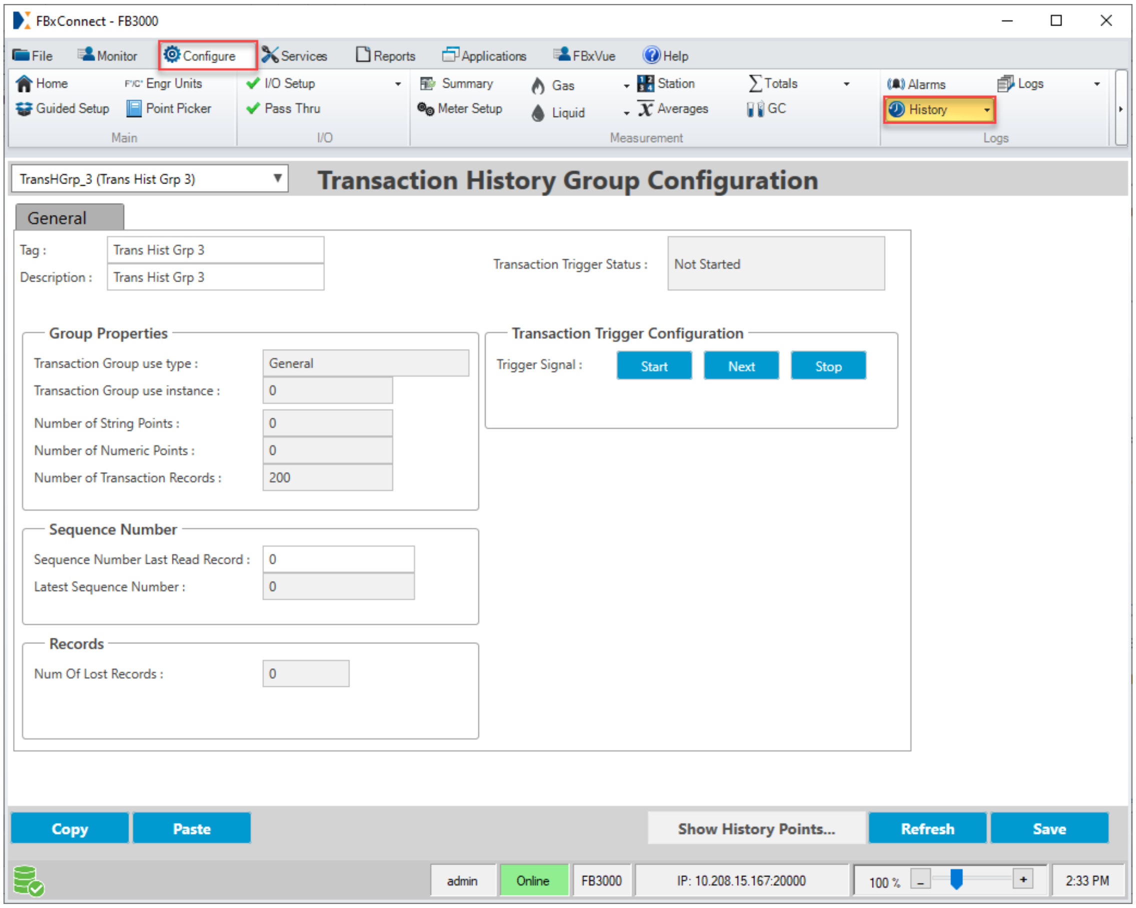
You **must** enable Transaction History on the History Setup - Advanced display before you can view this option in the FBxConnect™ main menu.

To access this display:

1. Select **Configure** > **History** > **Group Configuration** > **Transaction History** from the FBxConnect™ main menu. The Transaction History Group Configuration display opens.

2. Click ▼ in the drop-down list at the top of the display to select a transaction history group to configure.

Figure 247. Transaction History Group Configuration



TransHGrp_3 (Trans Hist Grp 3)

Transaction History Group Configuration

Tag : Trans Hist Grp 3
Description : Trans Hist Grp 3
Transaction Trigger Status : Not Started
Transaction Group use type : General
Transaction Group use instance : 0
Number of String Points : 0
Number of Numeric Points : 0
Number of Transaction Records : 200
Trigger Signal :
Sequence Number Last Read Record : 0
Latest Sequence Number : 0
Num Of Lost Records : 0

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 2:33 PM

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected transaction history group.
Description	Sets a description (up to 20-alphanumeric characters) for the selected transaction history group.
Transaction Trigger Status	This **read-only** field shows the stage of the currently selected transaction. Possible statuses are: **Note** This field **does not** show for transaction history groups configured for liquid linear meter batching.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td></td><td>Not Started</td><td>No transactions have been started.</td></tr>
<tr><td></td><td>In progress</td><td>The transaction is currently in process.</td></tr>
<tr><td></td><td>Stopped</td><td>The transaction is currently stopped.</td></tr>
<tr><td></td><td>Invalid Trigger</td><td>An incorrect trigger sequence has occurred. For example, issuing a Stop trigger before issuing Start trigger or issuing a Start trigger when a transaction is already in progress.</td></tr>
<tr><td></td><td>Short Trigger</td><td>A second trigger signal (Next or Stop) has been issued too quickly.
Note
A transaction must be in progress for at least 5 seconds before you issue a second trigger. At the end of the 5 second window, the Short Trigger status will clear and you must issue the command again.</td></tr>
<tr><td></td><td>No Points Added</td><td>No history points have been configured for the selected transaction history group.</td></tr>
<tr><td>Transaction Group use type</td><td colspan="2">This read-only field indicates the assigned purpose for the transactional history group, when configured for a standard application use-case. When not configured for a standard application use-case, this field shows the default text of General and indicates the group is either not configured or is configured for a custom user-defined data set.
Note
You configure this value in the Application Assignment Group Type column on the Transaction History Group Details pop-up display.</td></tr>
</table>

Field	Description
Transaction Group use instance	This read-only field indicates which instance of the Transaction Group use type is configured for this transactional history group. Where there are multiple instances of the same data set (for example, multiple liquid meters or multiple production wells), multiple transactional history groups may be used to organize the data. The use instance identifies which use type instance applies to this transactional history group. **Note** You configure this value in the **Application Assignment Instance** column on the Transaction History Group Details pop-up display.
Number of String Points	This **read-only** field shows the current number of string points allocated to the selected transaction history group. **Note** This value is configured on the **Transaction History Group Details** pop-up display accessed from the Advanced Setup – Transaction History Sizing Tab.
Number of Numeric Points	This **read-only** field shows the current number of numeric points allocated to the selected transaction history group. **Note** This value is configured on the **Transaction History Group Details** pop-up display accessed from the Advanced Setup – Transaction History Sizing Tab.
Number of Transaction Records	This **read-only** field shows the current number of transaction records allocated to the selected transaction history group. **Note** • This value is configured on the **Transaction History Group Details** pop-up display accessed from the Advanced Setup – Transaction History Sizing Tab. • The FB Series product retains transaction history records for at least 2 hours. The FB Series product generates a Trigger Limit Reached alarm and declines new triggers if more than N/2 transaction records are recorded in one hour (N = number of transaction records set in this field). If transactions are expected to generate at a rate faster than N/2 in one hour, then you must increase the value of N to a higher number.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Sequence Number Last Read</td><td colspan="2">Sets the last record sequence number that was retrieved from the selected transaction history group.
Note
FBxConnect automatically updates this field when you generate a transaction history report and select By last sequence no. in the Collection period field. For more information about generating transaction history reports, refer to Transaction History Reports.</td></tr>
<tr><td>Latest Sequence Number</td><td colspan="2">This read-only field shows the last sequence number generated by the FB Series product.</td></tr>
<tr><td>Num Of Lost Records</td><td colspan="2">This read-only field shows the number of records that occurred but were not archived in the selected transaction history group.</td></tr>
<tr><td rowspan="4">Trigger Signal</td><td colspan="2">Use these buttons to control transactions on your FB Series product.
Note
• These buttons are disabled for offline configurations.
• These buttons do not show for transaction history groups configured for liquid linear meter batching. For more information about starting and stopping liquid linear meter batching, refer to the Station – Batching Tab.</td></tr>
<tr><td>Start</td><td>Select this button to begin a transaction.
Note
To issue this command via an external system (such as a SCADA host), write a value of 1 to TransHGrp_x.TRANS_TRIG_SIGNAL.</td></tr>
<tr><td>Next</td><td>Select this button to end the current transaction and immediately start another transaction.
Note
To issue this command via an external system (such as a SCADA host), write a value of 2 to TransHGrp_x.TRANS_TRIG_SIGNAL.</td></tr>
<tr><td>Stop</td><td>Select this button to end the current transaction.
Note
To issue this command via an external system (such as a SCADA host), write a value of 3 to TransHGrp_x.TRANS_TRIG_SIGNAL.</td></tr>
</table>

Field	Description
Show History Points	Click to open a pop-up display where you can configure which parameters are logged for the selected History Group Type. You can also set a description and archive type for each logged parameter. For more information, refer to Show History Points. **Note** This button is disabled if the string and numeric points for the selected transaction history group is 0 (as configured on the **Transaction History Group Details** pop-up display). For more information, refer to Transaction History Group Details.

4. Select **Save** to save any changes you make to this display.

4.21.4 Default Meter History Setup

Use this display to configure history points in your FB3000 RTU using the default history values for all configured meters.

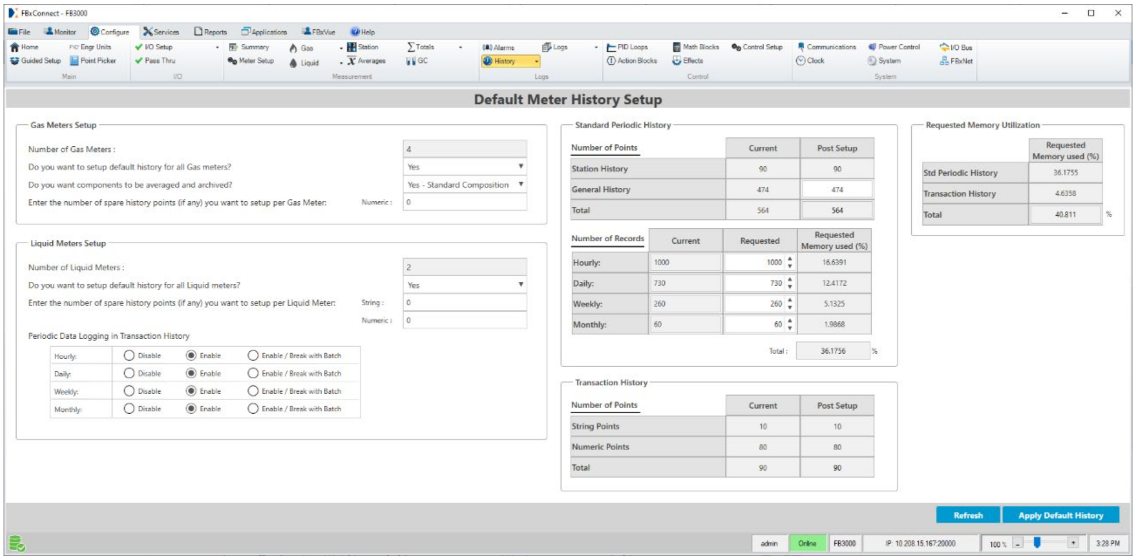
Note

- You **must** configure meter inputs **before** applying the default history setup.
- For more information about the structure of history store in the FB Series products, refer to History Overview.
- To view the default configuration, refer to Default History Configuration.

To access this display:

1. Select **Configure > History > Default History Setup** from the FBxConnect™ main menu.

Figure 248. Default Meter History Setup



Default Meter History Setup

Gas Meters Setup

Number of Gas Meters : 4
Do you want to setup default history for all Gas meters? Yes
Do you want components to be averaged and archived? Yes - Standard Composition
Enter the number of spare history points (if any) you want to setup per Gas Meter: Numeric : 0

Liquid Meters Setup

Number of Liquid Meters : 2
Do you want to setup default history for all Liquid meters? Yes
Enter the number of spare history points (if any) you want to setup per Liquid Meter: String : 0
Numeric : 0

Periodic Data Logging in Transaction History

Hourly:	○ Disable	● Enable	○ Enable / Break with Batch
Daily:	○ Disable	● Enable	○ Enable / Break with Batch
Weekly:	○ Disable	● Enable	○ Enable / Break with Batch
Monthly:	○ Disable	● Enable	○ Enable / Break with Batch

Standard Periodic History

Number of Points	Current	Post Setup
Station History	90	90
General History	474	474
Total	564	564

Number of Records	Current	Requested	Requested Memory used (%)
Hourly:	1000	1000	16.6391
Daily:	730	730	12.4172
Weekly:	260	260	5.1325
Monthly:	60	60	1.9868

Total : 36.1756 %

Transaction History

Number of Points	Current	Post Setup
String Points	10	10
Numeric Points	80	80
Total	90	90

Requested Memory Utilization

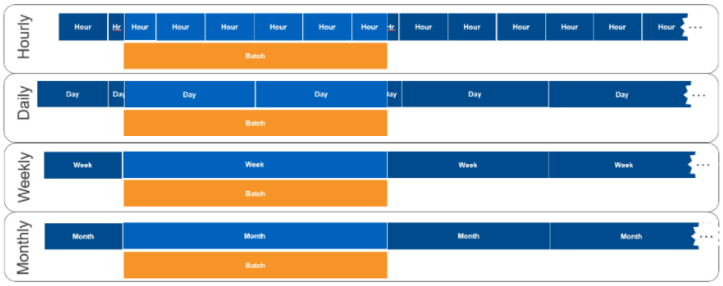
	Requested Memory used (%)
Std Periodic History	36.1755
Transaction History	4.6358
Total	40.811 %

2. Review – and change as necessary – the values in the following fields:

Field	Description	
Gas Meters Setup	Use these fields to configure the gas meter history types that are archived by the FB Series product.	
	Number of Gas Meters	This **read-only** field shows the number of gas meters configured on the Meter Setup display for your FB Series product.
	Do you want to setup default history for all Gas meters?	
	No	The FB Series product **does not** archive standard periodic history for gas meters.
	Yes	The FB Series product **does** archive standard periodic history for gas meters.
	Do you want components to be averaged and archived?	
	No	The FB Series product **does not** archive component averages for gas meters.

Field	Description		
		Yes – Standard Composition	The FB Series product **does** archive standard composition component averages for gas meters.
		Yes – Extended Composition	The FB Series product **does** archive extended composition (includes C7, C8, C9, and C10) component averages for gas meters.
	Enter the number of spare history points (if any) you want to setup per Gas Meter		
		Numeric	Enter the number of additional numeric points that the system adds to the end of the standard periodic history configuration for each meter.
Liquid Meters Setup	Use these fields to configure the liquid meter history types that are archived by the FB Series product.		
	Number of Liquid Meters	This **read-only** field shows the number of liquid meters configured on the Meter Setup display for your FB Series product.	
	Do you want to setup default history for all Liquid meters?		
		No	The FB Series product **does not** archive standard periodic history and/or does not archive transaction history for liquid meters.
		Yes	The FB Series product **does** archive standard periodic history and/or does archive transaction history for liquid meters.
	Enter the number of spare history points (if any) you want to setup per Liquid Meter		
		Numeric	Enter the number of additional numeric points that the system adds to the end of the standard periodic history configuration for each meter.

Field	Description		
		String	Enter the number of additional string points that the system adds to the end of the transaction history configuration for each meter.
	Periodic Data Logging in Transaction History	Sets if standard periodic history is logged along with liquid batch transactions. Possible options for each period (hourly, daily, weekly, monthly) are: **Note** These fields are shown **only** if you have enabled Batching on the Station Fluid Type pop-up display.	
		Disable	Do not log this type of periodic history in Transaction History. If configured, this data is logged in periodic history.
		Enable	Log this type of periodic history in Transaction History based on top of hour, contract hour, contract day of week and/or contract day of month. Periodic data logging is **not** affected by batch start or batch end. Transaction history groups **must** be configured and assigned at the meter level.
			

Field	Description	
	Enable / Break with Batch	Log this type of periodic history in Transaction history as described in the "Enable" option above, and also log when a batch starts and when a batch ends. Transaction history groups **must** be configured and assigned at the meter level.
		
Standard Periodic History	Use these fields to view and adjust the amount of history points used by standard periodic history.	
	Station History	These **read-only** fields show the number of standard history points used by the FB Series product at the present time (**Current**) and after applying the default history setup (**Post Setup**) based on your current selections.
	General History	These fields show the number of general history points used by the FB Series product at the present time (**Current**) and after applying the default history setup (**Post Setup**) based on your current selections. **Note** Enter a value in the **Post Setup** column to manually adjust the total number of points allocated to standard periodic history.
	Total	These **read-only** fields show the total number of history points used by the FB Series product at the present time (**Current**) and after applying the default history setup (**Post Setup**) based on your current selections.

Field	Description	
Transaction History	Use these fields to view the number of string points, numeric points, and total points used by transaction history. **Note** When applying the default history for the first time, the system configures contiguous transaction history group instances for Liquid Batching. The system configures these groups after and **does not** overwrite any history groups set to a specific application (other than General) in the **Application Assignment** field on the Transaction History Group Details display. If you apply the default history more than once, the system reconfigures the transaction history groups previously set to Liquid Batching. If you add new liquid meters and apply the default history, the system first reconfigures transaction history groups previously set to Liquid Batching before adding additional history groups.	
	String Points	These **read-only** fields show the number of string points, used by transaction history. The value in the **Current** column shows the total number of string points used by all transaction history groups at the present time. The value in the **Post Setup** column shows the total number of string points that will be used by all transaction history groups after applying the default history, and this value changes based on your selections in the Set Default Meter History and Transaction History fields.
	Numeric Points	These **read-only** fields show the number of numeric points used by transaction history. The value in the **Current** column shows the total number of numeric points used by all transaction history groups the present time. The value in the **Post Setup** column shows the total number of numeric points that will be used by all transaction history groups after applying the default history, and this value changes based on your selections in the Set Default Meter History and Transaction History fields.

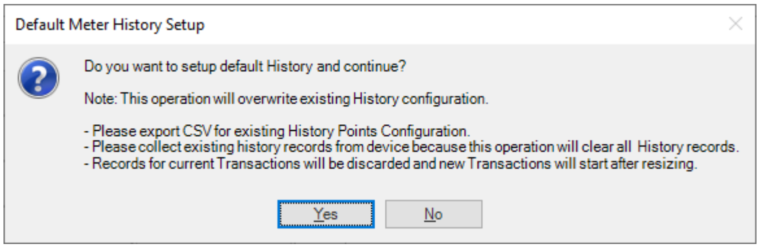
Field	Description	
	Total	These **read-only** fields show the total number points used by transaction history. The value in the **Current** column shows the total number of points used by all transaction history groups at the present time. The value in the **Post Setup** column shows the total number of points that will be used by all transaction history groups after applying the default history, and this value changes based on your selections in the Set Default Meter History and Transaction History fields.
Requested Memory Utilization	These **read-only** fields display the amount of memory that would be used based on currently requested memory allocation. Transaction history and standard periodic history share the same memory resource. The combination of memory used by transaction history and standard periodic history **must** be less than or equal to 100%.	
	Transaction History	Shows the amount of memory that would be used by transaction history based on the values you enter in the **Requested Number of Transaction History Groups** field on the Transaction History Sizing Tab and the **Requested** number of **String Points**, **Numeric Points**, and **Records** on the Transaction History Group Details pop-up display.
	Std Periodic History	Shows the amount of memory that would be used by standard periodic history based on the values you enter in the **Requested Number of Points** field and the **Requested Number of Records** fields on the Standard Periodic History Tab.
	Total	Shows the total amount of memory that would be used based on the currently requested transaction history and standard periodic history allocation. This value **must** be less than or equal to 100%. **Note** If this value is more than 100%, you **must** modify the requested transaction history and standard periodic history allocation to be less than or equal to 100% before you can successfully history sizing.

3. Select **Apply Default History** to save the default history configuration to your FB3000 RTU. A confirmation message opens.

CAUTION

- Please export your current history configuration (Exporting a History Configuration CSV) in case you need to restore your FB Series product to the previous configuration.
- Changes made to history sizing results in a reallocation of device memory and erases **all** existing history data. It is recommended to save any existing history data using the Reports Menu before applying any history size changes.
- Current Transactions will be discarded and new Transactions will start after resizing.

Figure 249. Confirmation



Do you want to setup default History and continue?

Note: This operation will overwrite existing History configuration.

- Please export CSV for existing History Points Configuration.
- Please collect existing history records from device because this operation will clear all History records.
- Records for current Transactions will be discarded and new Transactions will start after resizing.

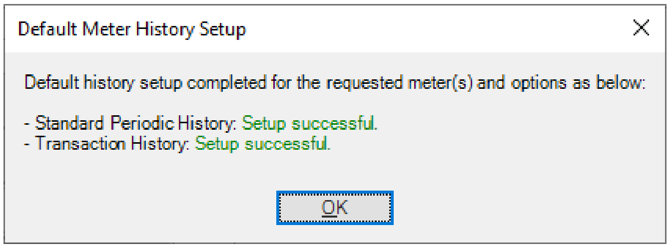
4. Select **Yes** to continue the setup.

Note

A message appears if have previously sized history and the FB Series product does not have the number of history points required to perform the default history setup. If this occurs, you must first increase the number of points on the History Setup – Advanced – Standard History Sizing Tab before you perform the default history setup.

5. When the setup completes, select **OK** to close the dialog.

Figure 250. Default history successfully setup



Default history setup completed for the requested meter(s) and options as below:

- Standard Periodic History: Setup successful.
- Transaction History: Setup successful.

4.21.4.1 Default History Configuration

The table below shows the default history configuration for the FB3000 RTU:

Note

For more information about the configured history points after using the Default History Setup feature, refer the Appendix C, Default History Setup Point Configurations.

Table 43. Default History Configuration

FB Series Product Type	History Groups		Total History Points	Total Standard History Points	Total History Points per Group	Log Intervals	Number of Records
FB3000 RTU	**User Periodic**	User Periodic 1 (Group 1)	640	N/A	10	User Configurable	4000
		User Periodic 2 (Group 2)			20		500
	Standard History	General (Group 3)		610	10	Hourly Daily Weekly Monthly	4380 730 260 60
		Station 1-24 (Group 4-27)			25 per group		
		Station 25-36 (Group 28-39)			0 per group		

4.21.5 History – Advanced Setup

Use the tabs on this display to configure the total number of history points, configure the number records (hourly, daily, weekly, and monthly), and allocate the history points amongst the periodic history groups in your FB Series product. You can also configure the total number of transaction history groups and the number of points and records for each group.

To access this display, select **Configure > History > Advanced Setup** from the FBxConnect™ main menu. The History Setup - Advanced display opens showing the Standard History Sizing tab.

Figure 251. History – Advanced Setup

The History Setup - Advanced display contains the following tabs:

Transaction History Sizing – Use this tab to configure the total number of transaction history groups and the details of each group.

Note

You **must** select **Yes** in the **Do you want to enable Transaction History?** drop-down to view this tab.

Standard Periodic History – Use this tab to adjust the total number of history points, configure the number of records, and configure the allocation of history points amongst the standard history groups in your FB Series product.

4.21.5.1 History Setup - Advanced – Transaction History Sizing Tab

Use this tab to configure the number of transaction history groups that are logged by your FB Series product.

Note

- You **must** select **Yes** in the **Do you want to enable Transaction History?** drop-down list to view this tab.
- You **must** have FB3000 RTU firmware version 2.11 or later to use this feature.

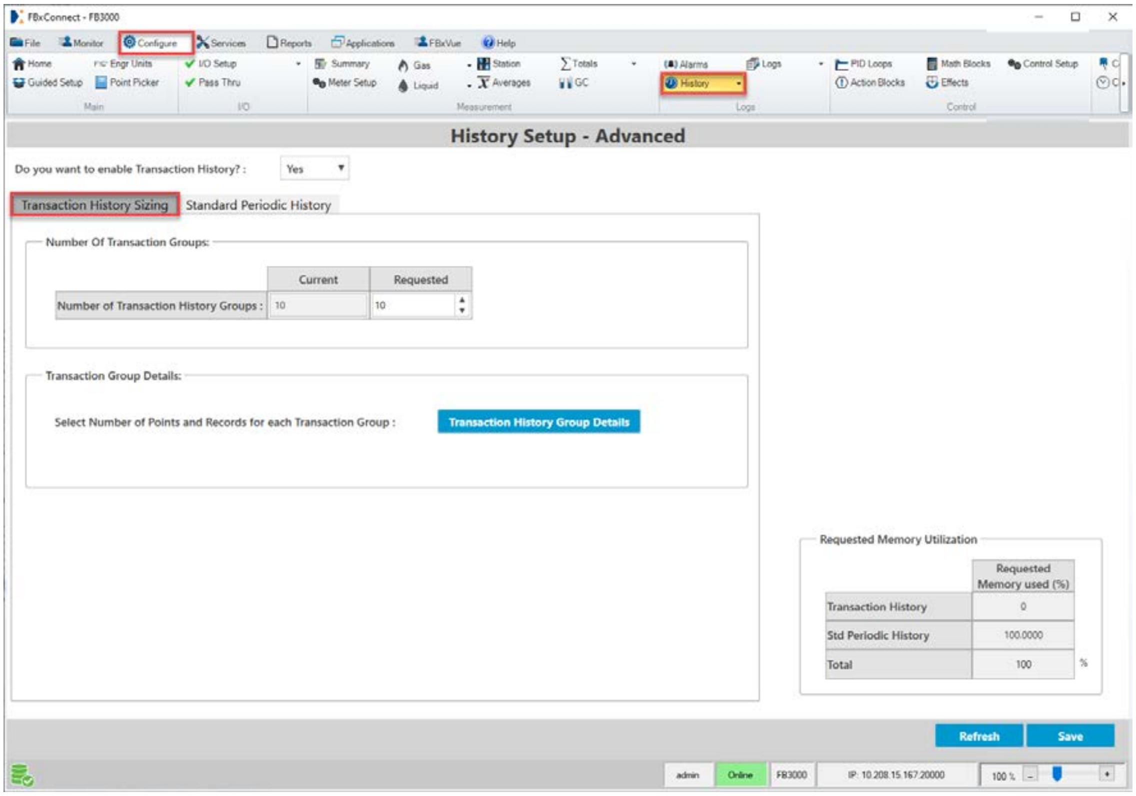
To access this display:

1. Select **Configure > History > Advanced Setup** from the FBxConnect™ main menu. The History Setup - Advanced display opens.
2. Select the **Transaction History Sizing** tab.

Note

If you do not see this tab, select **Yes** in the **Do you want to enable Transaction History?** drop-down list.

Figure 252. History Setup - Advanced – Transaction History Sizing Tab



History Setup - Advanced

Do you want to enable Transaction History? : Yes

Transaction History Sizing | Standard Periodic History

Number Of Transaction Groups:

	Current	Requested
Number of Transaction History Groups :	10	10

Transaction Group Details:

Select Number of Points and Records for each Transaction Group : Transaction History Group Details

Requested Memory Utilization

	Requested Memory used (%)
Transaction History	0
Std Periodic History	100.0000
Total	100 %

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Do you want to enable Transaction History?	Sets if transaction history will be configured on your FB Series product. Possible options are:	
	Yes	Transaction history will be configured on your FB Series product. If you select this option, a Transaction History Sizing tab appears on the display. **Note** You must configure the number of transaction history groups and select **Apply Number of Groups** before proceeding.

Field	**Description**	
	No	Transaction history will **not** be configured on your FB Series product. If you have previously enabled transaction history, a confirmation message opens. Select **Yes** on the confirmation message to disable transaction history. When complete, the Transaction History Sizing tab is removed and a confirmation message appears. Select **OK** to continue. **Note** If you previously enabled and configured transaction history, selecting this option causes history to be resized and erases **all** periodic and transaction history records. Please collect existing history records before proceeding.
Number of Transaction History Groups	Use these fields to adjust the number of transaction history groups stored in the memory of the FB Series product.	
	Current	The **read-only** field shows the number of currently enabled transaction history groups.
	Requested	Enter the desired number of transaction history groups. The maximum number of transaction history groups is 100.
	Apply Number of Groups	Select this button to adjust the number of transaction history groups based on the value set in the **Requested** column. A confirmation message displays. Select **Yes** to proceed. When complete, a confirmation message appears. Select **OK** to continue. **Note** • When transaction history groups are added, no string or numeric points are configured for the group. You can configure these parameters on the Transaction History Group Details pop-up display. • This button appears only if you modify the number in the **Requested** column.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Transaction History Group Details</td><td colspan="2">Select this button to open the Transaction History Group Details pop-up display and configure the required number of points and records for transaction history groups.</td></tr>
<tr><td rowspan="4">Requested Memory Utilization</td><td colspan="2">These read-only fields display the amount of memory that would be used based on currently requested memory allocation. Transaction history and standard periodic history share the same memory resource. The combination of memory used by transaction history and standard periodic history must be less than or equal to 100%.</td></tr>
<tr><td>Transaction History</td><td>Shows the amount of memory that would be used by transaction history based on the values you enter in the Requested Number of Transaction History Groups field on the Transaction History Sizing Tab and the Requested number of String Points, Numeric Points, and Records on the Transaction History Group Details pop-up display.</td></tr>
<tr><td>Std Periodic History</td><td>Shows the amount of memory that would be used by standard periodic history based on the values you enter in the Requested Number of Points field and the Requested Number of Records fields on the Standard Periodic History Tab.</td></tr>
<tr><td>Total</td><td>Shows the total amount of memory that would be used based on the currently requested transaction history and standard periodic history allocation. This value must be less than or equal to 100%.
Note
If this value is more than 100%, you must modify the requested transaction history and standard periodic history allocation to be less than or equal to 100% before you can successfully history sizing.</td></tr>
</table>

4. Select **Save** to save any changes you make to this display and commit any history allocation changes to memory in the FB Series product.

CAUTION

- Saving changes to the points and records allocation of transaction history groups will clear **all** periodic and transaction history records. Please collect existing history records before proceeding.
- If you adjust the total number of string points for a previously configured transaction history group, the existing configuration of numeric points for that transaction history group (as configured on the Transaction History Group Configuration display) is cleared during the resizing process.

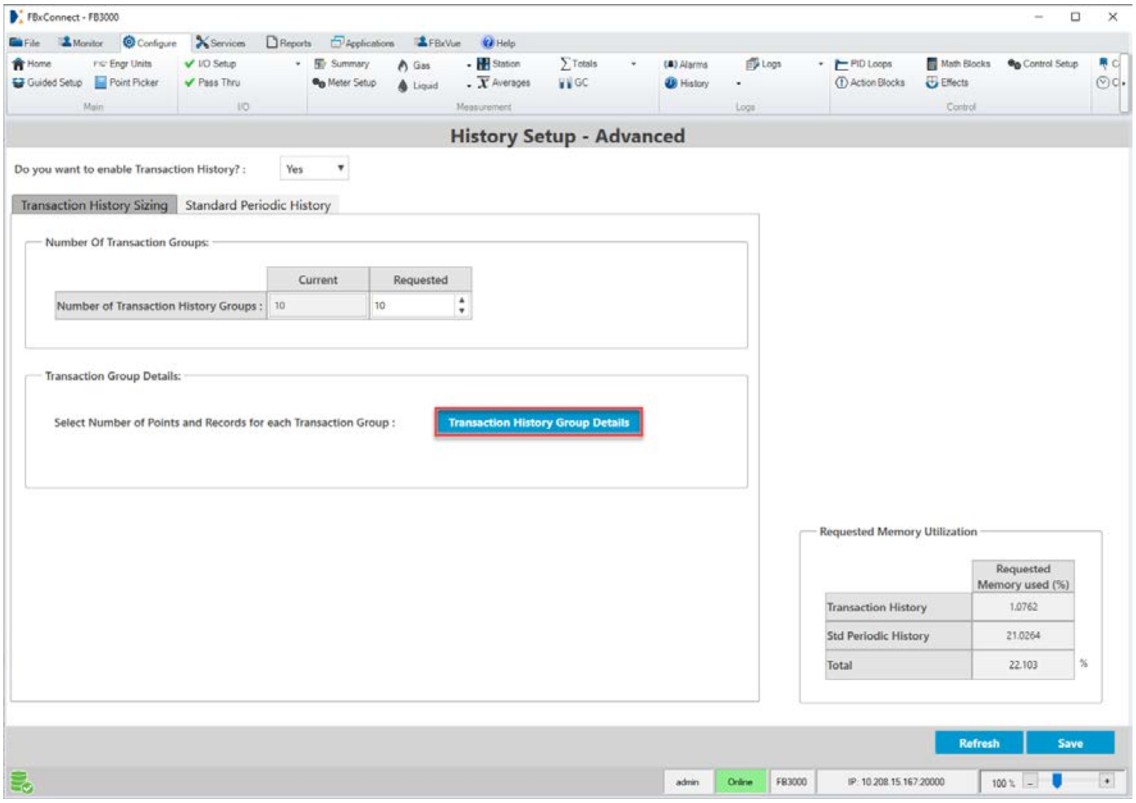
4.21.5.1.1 Transaction History Group Details

Use this pop-up display to configure the type and quantity of data to be stored by each transaction history group, including the number of string points, numeric points, and transaction records. You can configure up to 100 transaction history groups, and each row on the display corresponds to a separate group. Each group can contain up to 25 string points and up to 650 numeric points as long as the total number of points in a single group **does not** exceed 650 and the total number of points in all groups **does not** exceed 3100. The default number of transaction records in each group is 200. As you are making configuration changes, the memory needed for these changes is shown at the bottom of the display.

To access this display:

1. Select **Configure > History > Advanced Setup** from the FBxConnect™ main menu. The History Setup - Advanced display opens.
2. Select the **Transaction History Sizing** tab.

Figure 253. Transaction History Group Details Button



History Setup - Advanced

Do you want to enable Transaction History? : Yes

Number Of Transaction Groups:

	Current	Requested
Number of Transaction History Groups :	10	10

Transaction Group Details:

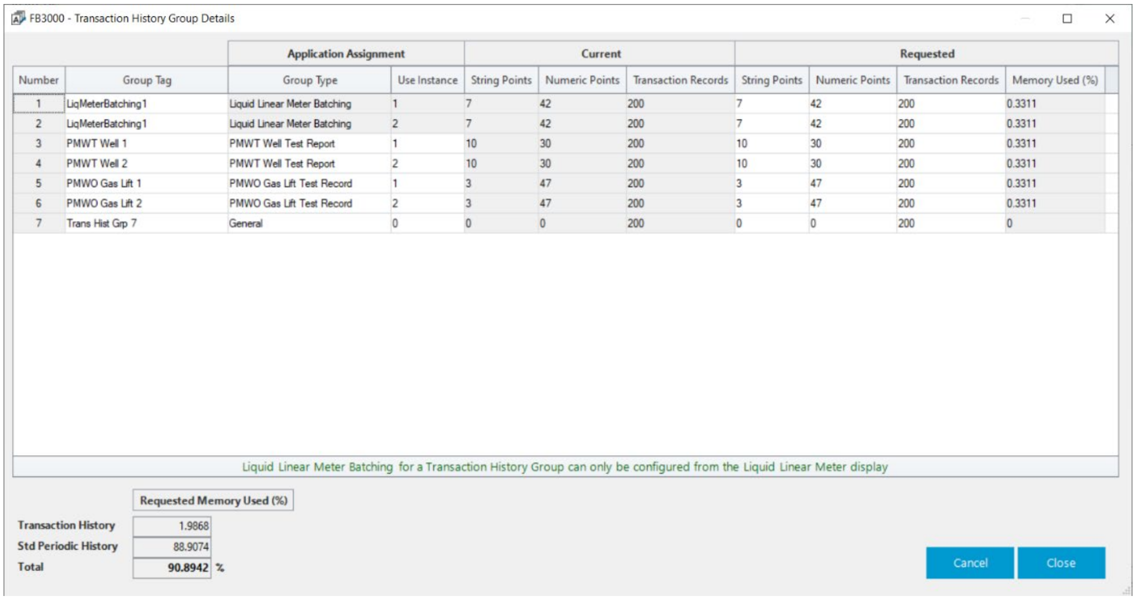
Select Number of Points and Records for each Transaction Group :

Requested Memory Utilization

	Requested Memory used (%)
Transaction History	1.0762
Std Periodic History	21.0264
Total	22.103 %

3. Select the **Transaction History Group Details** button. The Transaction History Group Details pop-up display opens.

Figure 254. Transaction History Group Details



FB3000 - Transaction History Group Details

		Application Assignment		Current			Requested			
Number	Group Tag	Group Type	Use Instance	String Points	Numeric Points	Transaction Records	String Points	Numeric Points	Transaction Records	Memory Used (%)
1	LiqMeterBatching1	Liquid Linear Meter Batching	1	7	42	200	7	42	200	0.3311
2	LiqMeterBatching1	Liquid Linear Meter Batching	2	7	42	200	7	42	200	0.3311
3	PMWT Well 1	PMWT Well Test Report	1	10	30	200	10	30	200	0.3311
4	PMWT Well 2	PMWT Well Test Report	2	10	30	200	10	30	200	0.3311
5	PMWO Gas Lift 1	PMWO Gas Lift Test Record	1	3	47	200	3	47	200	0.3311
6	PMWO Gas Lift 2	PMWO Gas Lift Test Record	2	3	47	200	3	47	200	0.3311
7	Trans Hist Grp 7	General	0	0	0	200	0	0	200	0

Liquid Linear Meter Batching for a Transaction History Group can only be configured from the Liquid Linear Meter display

	Requested Memory Used (%)
Transaction History	1.9868
Std Periodic History	88.9074
Total	90.8942 %

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Number	Each numbered row corresponds to a separate transaction history group in your FB Series product.	
Group Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected transaction history group.	
Application Assignment	Assigns transactional history groups to standard application use cases, therefore determining the type and quantity of data to be stored.	
	Group Type	Click ▼ to select the use case for the transaction history group. Pre-defined standard application use cases are selectable. For custom user defined transactional history use cases, select a group type of General. **Note** To configure a transaction history group for liquid linear meter batching, you **must** set this field to **General** and then configure the **Transactional History Group** field on the Liquid Linear Meter – General Tab.
	Instance	Click ⬍ or enter the associated instance number that corresponds to the group type and intended purpose for the transactional history group. When there are multiple instances of the same functionality (for example, multiple liquid meters or multiple production wells), each instance can be stored in its own transactional history group. For example, transaction history group 1 can be used to store data for well instance 1, transaction history group 2 can be used to store data for well instance 2, etc. **Note** The instance is **not used** when the **Group Type** is set to **General**.

Field	Description
Current	These **read-only** fields show the total number of string points, numeric points, and transaction records configured for each transaction history group.
Requested	These fields set the total number of string points, numeric points, and transaction records for each transaction history group. To change these values, select a field in the appropriate column and type in your desired value. The amount of memory used by the new configuration is shown in the **Memory Used (%)** column for each Transaction History Group. The requested number of points and records have the following limits: • The maximum number of string points allowed in a single group is 25. • The maximum combined number of string points and numeric points allowed in a single group is 650. • The maximum combined number of string points and numeric points allowed across all transaction history groups is 3100. **Note** • You **must** save your changes on the Transaction History Sizing tab before the Transaction History Group Details configuration will take effect. • If you adjust the total number of string points for a previously configured transaction history group, the existing configuration of numeric points for that transaction history group (as configured on the Transaction History Group Configuration display) is cleared during the resizing process.
Requested Memory Utilization	These **read-only** fields display the amount of memory that would be used based on currently requested memory allocation. Transaction history and standard periodic history share the same memory resource. The combination of memory used by transaction history and standard periodic history **must** be less than or equal to 100%.

Field	Description	
	Transaction History	Shows the amount of memory that would be used by transaction history based on the values you enter in the **Requested Number of Transaction History Groups** field on the Transaction History Sizing and the **Requested** number of **String Points**, **Numeric Points**, and **Records** on the Transaction History Group Details pop-up display.
	Std Periodic History	Shows the amount of memory that would be used by standard periodic history based on the values you enter in the **Requested Number of Points** field and the **Requested Number of Records** fields on the Standard Periodic History Tab.
	Total	Shows the total amount of memory that would be used based on the currently requested transaction history and standard periodic history allocation. This value **must** be less than or equal to 100%. **Note** If this value is more than 100%, you **must** modify the requested transaction history and standard periodic history allocation to be less than or equal to 100% before you can successfully history sizing.

5. Select **Close** to return to the Transaction History Sizing tab.

Note

Select **Cancel** to revert any changes and return to the Transaction History Sizing tab.

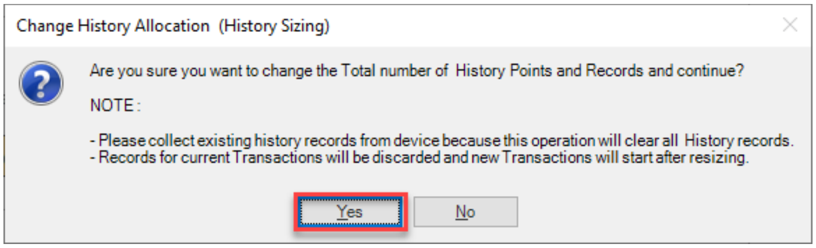
---

6. If you made changes to the points or records allocation for any transaction history group, a note appears that reminds you to save your changes on the Transaction History Sizing tab to apply your changes to memory in the FB Series product. Select **Save**. A confirmation message displays.

CAUTION

- Please export your current history configuration (Exporting a History Configuration CSV) in case you need to restore your FB Series product to the previous configuration.
- Changes made to history sizing results in a reallocation of device memory and erases **all** existing history data. It is recommended to save any existing history data using the Reports Menu before applying any history size changes.
- Current Transactions will be discarded and new Transactions will start after resizing.

Figure 255. Confirmation



Change History Allocation (History Sizing)

Are you sure you want to change the Total number of History Points and Records and continue?

NOTE :

- Please collect existing history records from device because this operation will clear all History records.
- Records for current Transactions will be discarded and new Transactions will start after resizing.

7. Select **Yes** to commit any history allocation changes to memory in the FB Series product.

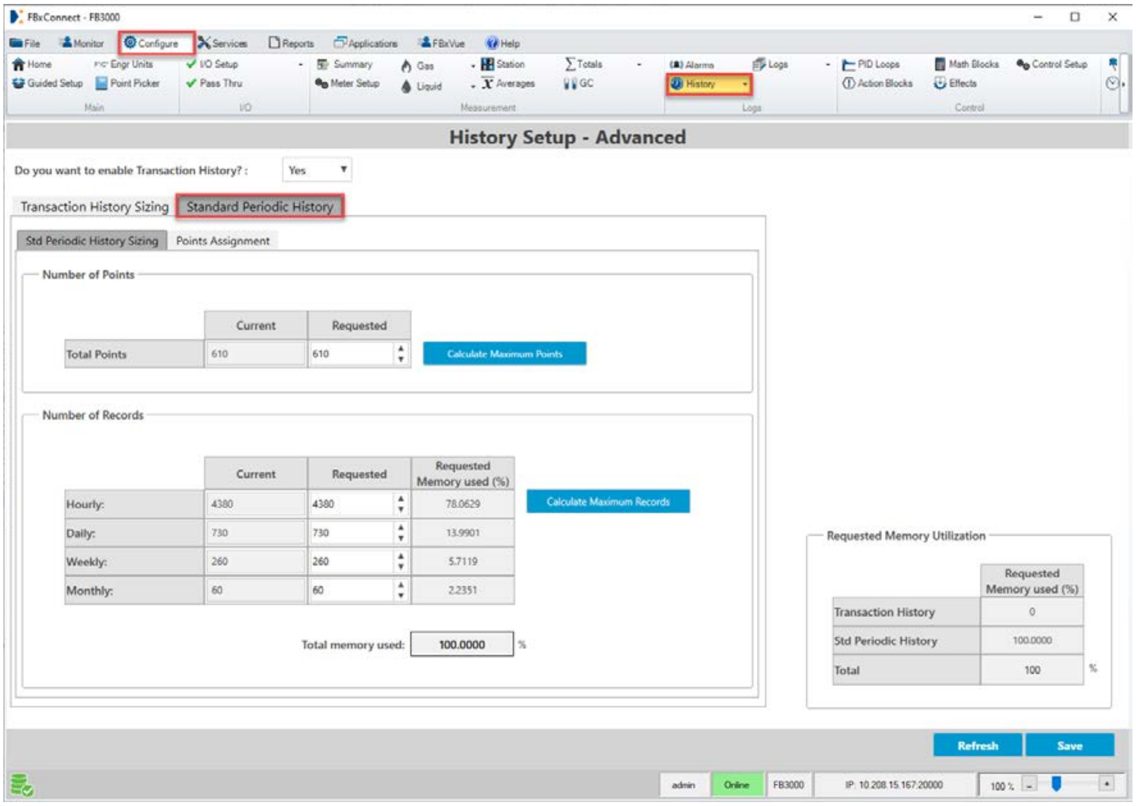
4.21.5.2 History Setup - Advanced – Standard Periodic History Sizing Tab

Use this tab to adjust the total number of history points, configure the number of records, and configure the allocation of history points amongst the standard periodic history groups in your FB Series product.

To access this display:

1. Select **Configure > History > Advanced Setup** from the FBxConnect™ main menu. The History Setup - Advanced display opens.
2. Select the **Standard Periodic History** tab.

Figure 256. History Setup - Advanced – Standard Periodic History Tab



History Setup - Advanced

Do you want to enable Transaction History? : Yes

Number of Points

	Current	Requested
Total Points	610	610

Number of Records

	Current	Requested	Requested Memory used (%)
Hourly:	4380	4380	78.0629
Daily:	730	730	13.9901
Weekly:	260	260	5.7119
Monthly:	60	60	2.2351

Total memory used: 100.0000 %

Requested Memory Utilization

	Requested Memory used (%)
Transaction History	0
Std Periodic History	100.0000
Total	100 %

The History Setup - Advanced display contains the following tabs:

Standard History Sizing – Use this tab to adjust the total number of history points available in the standard periodic history groups and configure the number of hourly, daily, weekly, and monthly records.

Points Assignment **–** Use this tab to view and configure the allocation of history points amongst the standard periodic history groups in your FB Series product.

4.21.5.2.1 History Setup - Advanced – Std Periodic History Sizing Tab

Use this tab to adjust the number of history points available in the standard history groups and configure the number of hourly, daily, weekly, and monthly records. This feature allows you to configure the history memory to fit your needs. You can configure the history to store a few records (for example, 50 or 100) and store the data for a very long time (for example, over one year). Alternatively, you can configure the history to store a large number of records (for example, 1000) and store the data for a short period of time (for example, 30 days). If you only care about daily and hourly data, you can configure 0 weekly and 0 monthly records and reclaim that memory.

There are trade-offs to consider as you configure the items on this display. The maximum number of points is based the number of requested records (Hourly, Daily, Weekly, and Monthly), and the maximum number of records (Hourly, Daily, Weekly, and Monthly) is based on the number of requested points. Adjust both the number of points and records based on your organization's history requirements. Whatever you pick, it **must** fit within 100% or less of the available memory.

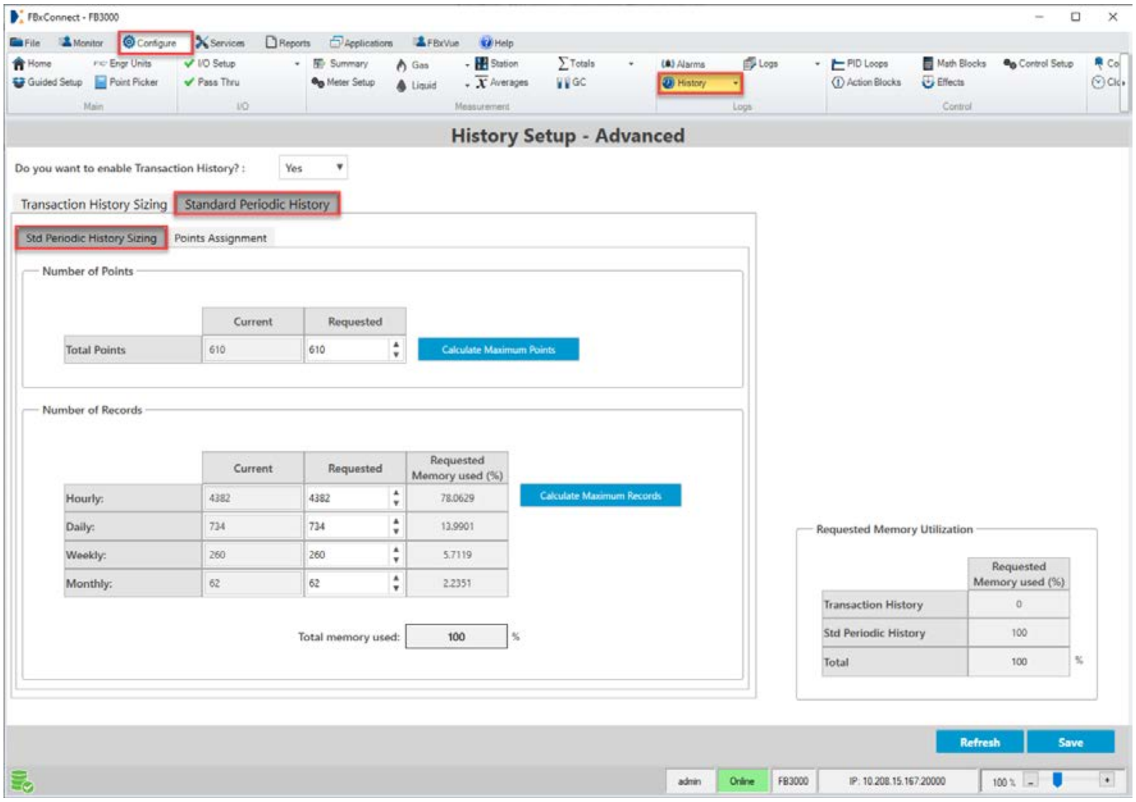
Note

- Changes made to history sizing results in a reallocation of device memory and erases any existing history data. It is recommended to save any existing history data before applying any history size changes.
- For more information about standard history groups, refer to History Overview.
- After sizing history, use the Points Assignment tab to view and allocate history points amongst the standard history groups.
- After sizing history, if the number of records for a history group is smaller than the values set in the **Log Nearly Full Remaining Records** or the **Log Full Remaining Records** fields on the Log Properties display, the system sets the **Log Nearly Full Remaining Records** field to **10%** and the **Log Full Remaining Records** field to **5%** of the total number of records.

To access this display:

1. Select **Configure > History > Advanced Setup** from the FBxConnect™ main menu. The History Setup - Advanced display opens showing the Standard History Sizing tab.

Figure 257. History Setup - Advanced – Standard History Sizing Tab



History Setup - Advanced

Do you want to enable Transaction History? : Yes

Number of Points

	Current	Requested
Total Points	610	610

Number of Records

	Current	Requested	Requested Memory used (%)
Hourly:	4382	4382	78.0629
Daily:	734	734	13.9901
Weekly:	260	260	5.7119
Monthly:	62	62	2.2351

Total memory used: 100 %

Requested Memory Utilization

	Requested Memory used (%)
Transaction History	0
Std Periodic History	100
Total	100 %

2. Review – and change as necessary – the values in the following fields:

Field	Description
Number of Points	Use these fields to adjust the number of history points available in the standard history groups, which includes general history and station history. For example, if you are configuring a FB3000 RTU for 24 meters and a need to historize 10 points for each meter, a minimum of 24 x 10 = 240 history points would be required.
	Current This **read-only** field shows the number of history points currently allocated to the standard history groups.

Field	Description	
	Requested	Click ⬍ to set the number of history points to allocate for the standard history groups. **Note** • The maximum number of points is **1350**. • The total number of points combined with the total number of records cannot cause the value in the **Total memory used** field to exceed 100%.
	Calculate Maximum Points	Select this button to calculate the maximum number history points that can be provided given the requested number of Hourly, Daily, Weekly, and Monthly records, and the **Requested** column will be updated with a value that utilizes 100% of the available history memory. Fill out the requested hourly, daily, weekly, and monthly records **before** selecting this button. For example, if a long duration of history is not required, then it might be typical to save 35 days of history (which is 840 hours, 4 weeks, 2 months). You should enter these values in the **Requested** column of the **Number of Records** section first. Then, before selecting the **Save** button, select the **Calculate Maximum Points** button to determine the number of possible history points that can be allocated for the selected configuration.
Number of Records	Use these fields to reallocate the number of records stored in the memory of the FB Series product. These selections determine the duration that history is stored for the various available record types. Note that the various record types are not required to be equal in duration. For example, if weekly and monthly history are not required, then the number of weekly and monthly records can be set to 0.	
	Current	This **read-only** field shows the number of hourly, daily, weekly, and monthly history records currently allocated to the standard history groups.

Field	Description	
	Requested	Click ⬍ to set the number of records to allocate for the hourly, daily, weekly, and monthly history logs. **Note** The total number of points combined with the total number of records cannot cause the value in the Total memory used field to exceed 100%.
	Requested Memory Used	These **read-only** fields shows, in percentage, the amount of FB Series product memory used by the hourly, daily, weekly, and monthly records based on the number of Requested Points and the number of Requested Records.
	Total memory used	This **read-only** field shows, in percentage, the total amount of FB Series device memory used by the combined total number of Requested Points and the total number of Requested Records. **Note** The Total memory used is **not** required to equal 100%, only that it is less than or equal to 100%.
	Calculate Maximum Records	Select this button to calculate the maximum number of records (Hourly, Daily, Weekly, and Monthly) that can be provided given the requested number points, and the **Requested** column will be updated with a value that utilizes 100% of the available history memory. Fill out the above requested total points **before** selecting this button. For example, if 500 history points will be required to store meter and station audit trial data, then you should enter a value of 500 in the **Requested** column of the **Number of Points** section first. Then, before selecting the **Save** button, select the **Calculate Maximum Records** button to determine the number of possible records (duration) that can be allocated for the selected configuration.

Field	Description
Total Points	This **read-only** field shows the total number of standard history points (General, Station 1, Station 2) in the FB Series product, and the total number of requested history points.

3. Select **Save** to save any changes you make to this display.

CAUTION

Changes made to history sizing results in a reallocation of device memory and erases any existing history data. It is recommended to save any existing history data before applying any history size changes.

4.21.5.2.2 History Setup - Advanced – Points Assignment Tab

Use this tab to view and allocate history points amongst the standard history groups in your FB Series product.

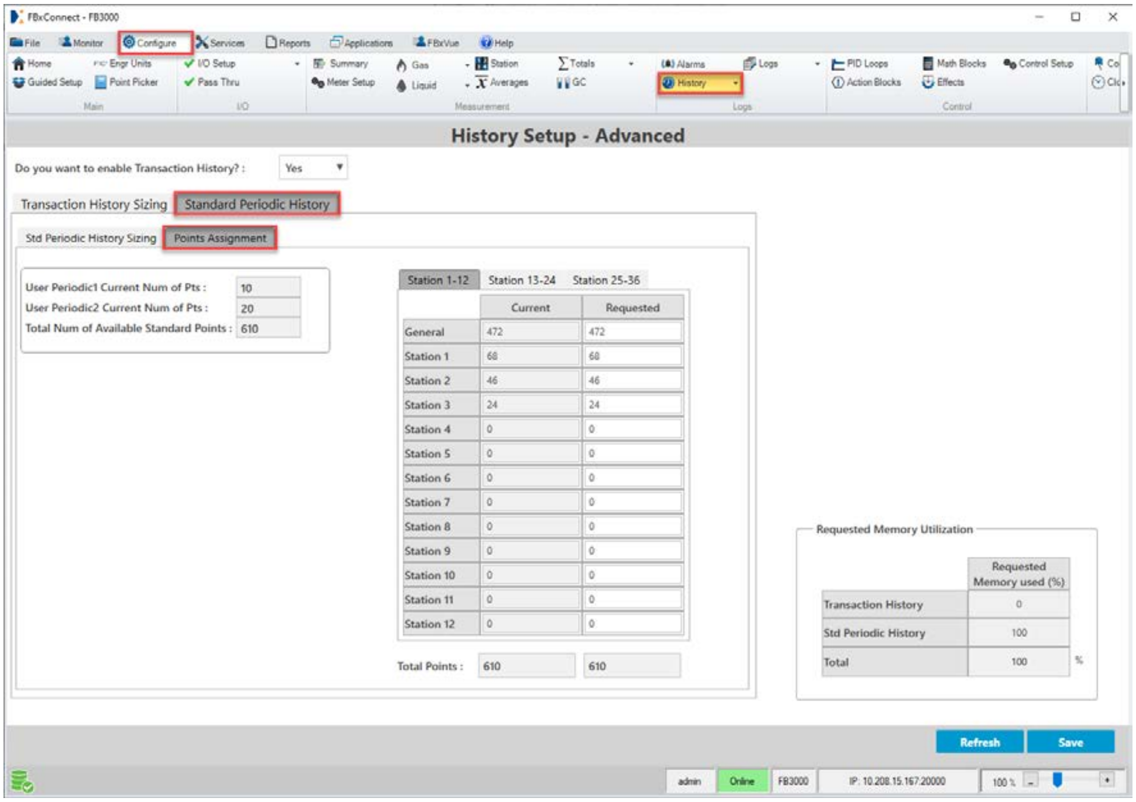
The FB Series product also contains two groups of user periodic history points. User periodic history consists of 30 fixed history points. Ten points are allocated to the User Periodic 1 group and 20 points are allocated to the User Periodic 2 group.

To access this display:

1. Select **Configure > History > Advanced Setup > Points Assignment** from the FBxConnect™ main menu. The History Setup - Advanced display opens showing the Standard History Sizing tab.

2. Select the **Points Assignment** tab.

Figure 258. History Setup - Advanced – Points Assignment Tab



History Setup - Advanced

Do you want to enable Transaction History? : Yes

User Periodic1 Current Num of Pts : 10
User Periodic2 Current Num of Pts : 20
Total Num of Available Standard Points : 610

	Current	Requested
General	472	472
Station 1	68	68
Station 2	46	46
Station 3	24	24
Station 4	0	0
Station 5	0	0
Station 6	0	0
Station 7	0	0
Station 8	0	0
Station 9	0	0
Station 10	0	0
Station 11	0	0
Station 12	0	0

Total Points : 610 610

Requested Memory Utilization

	Requested Memory used (%)
Transaction History	0
Std Periodic History	100
Total	100 %

3. Review – and change as necessary – the values in the following fields:

Field	Description
User Periodic1 Current Num of Pts	This **read-only** field shows the total number of user history points allocated to the User Periodic 1 group.
User Periodic 2 Current Num of Pts	This **read-only** field shows the total number of user history points allocated to the User Periodic 2 group.
Total Num of Available Standard Points	This **read-only** field shows the number of available history points not currently allocated to a standard history group.
Station 1-12, Station 13-24, and Station 25-36 tabs	Select a tab to configure history points assigned to each respective station. **Note** The Station 1-12 tab also shows the history points assigned to the General history group.

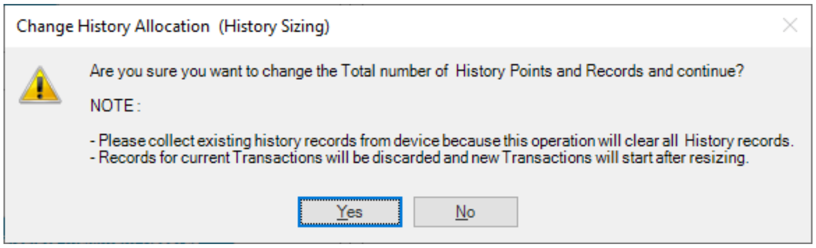
Field	Description	
General	The General history group contains hourly, daily, weekly, and monthly history not associated with a meter or station.	
	Current	This **read-only** field shows the number of history points currently allocated to the Standard General history group.
	Requested	Sets the number of history points to allocate for the Standard General history group. **Note** The total allocated number of standard history points cannot exceed the value in the Total Standard Points field.
Station (#)	The Station (#) history group contains hourly, daily, weekly, and monthly history associated with Station x and any meters assigned to Station x.	
	Current	This **read-only** field shows the number of history points currently allocated to the Standard Station x history group.
	Requested	Sets the number of history points to allocate for the Standard Station x history group. **Note** The total allocated number of standard history points cannot exceed the value in the Total Standard Points field.
Total Points	This **read-only** field shows the total number of standard history points (General, Station 1, Station 2) in the FB Series product, and the total number of requested history points.	

4. Select **Save** to save any changes you make to this display and commit any history allocation changes to memory in the FB Series product. A confirmation message opens.

CAUTION

- Changes made to history sizing results in a reallocation of device memory and erases **all** existing history data. It is recommended to save any existing history data using the Reports Menu before applying any history size changes.
- Current Transactions will be discarded and new Transactions will start after resizing.

Figure 259. Confirmation



Change History Allocation (History Sizing)

Are you sure you want to change the Total number of History Points and Records and continue?

NOTE :

- Please collect existing history records from device because this operation will clear all History records.
- Records for current Transactions will be discarded and new Transactions will start after resizing.

5. Select **Yes** to continue the setup.

4.22 Logs

Use the displays in the Logs drop-down menu to configure how logs are created in your FB Series product. You can configure if the FB Series product creates separate or combined legal and non-legal event logs, enable or disable various logs, and verify the system.

To access these displays, select **Configure > Logs** from the FBxConnect™ main menu and select one of the options from the Logs drop-down menu.

Figure 260. Logs Drop-Down Menu

Refer to the following topics for more information:

Event Setup – Use this display to configure how event logs are created by the FB Series product.

Log Properties – Use this display to configure options for history, alarm, and event logs.

Log Descriptions – View a description of each log created by the FB Series product.

4.22.1 Event Setup

Use this display to configure how event logs are created by your FB Series product. You can configure the system to create a single event log that contains both legal and non-legal events, to create separate event logs for legal and non-legal events, or to create separate event logs for legal and non-legal events that are verifiable and exportable.

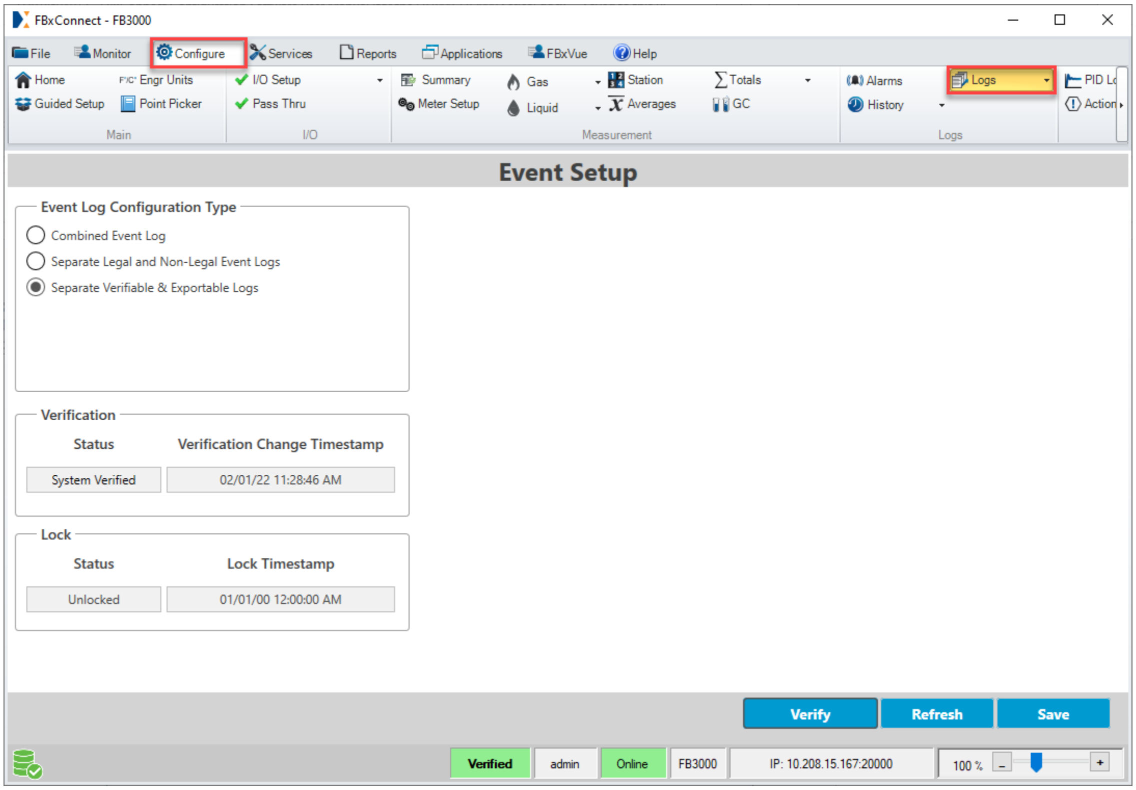
Note

If you chose to have verifiable logs, this display allows you to verify the system configuration.

To access this display:

1. Select **Configure > Logs > Event Setup** from the FBxConnect™ main menu.

Figure 261. Event Setup



Event Setup

Event Log Configuration Type

○ Combined Event Log
○ Separate Legal and Non-Legal Event Logs
● Separate Verifiable & Exportable Logs

Verification

Status	Verification Change Timestamp
System Verified	02/01/22 11:28:46 AM

Lock

Status	Lock Timestamp
Unlocked	01/01/00 12:00:00 AM

---

2. Review – and change as necessary – the values in the following fields:

Field	**Description**	
Event Log Configuration Type	Sets the type of event log created by the FB Series product. **Note** Changing the Event Log Configuration Type between a combined log type (Combined Event) and a separate log type (Separate Legal and Non-Legal Event Logs or Separate Verifiable & Exportable Logs) will clear the Event Log.	
	Combined Event Log	The FB Series product creates one event log that contains both legal and non-legal events. The combined event log consists of 8000 entries.
	Separate Legal and Non-Legal Event Logs	The FB Series product creates two event logs: one for legal events and one for non-legal events. Each event log consists of 4000 entries.
	Separate Verifiable & Exportable Logs	The FB Series product creates two event logs: one for legal events and one for non-legal events. Each event log consists of 4000 entries. When the legal event log is full, the Lock Status changes to Locked and a warning message appears. The device no longer accepts changes to legal parameters, firmware updates, calibration, or configuration download. The legal event log **must** be exported before these actions are permitted and additional events can be created. **Note** • After you save your changes, a color-coded verification status field appears in the FBxConnect™ status bar. This field allows you to quickly determine the verification status of your FB Series product when viewing any display within FBxConnect™. • If your FB Series product becomes locked due to a full event log, refer to Export Events. • FBxConnect calculates the generated file's MD5 hash and stores the result as a new event in the FB Series product's legal event log. This allows you to verify the integrity of the event report by

Field	Description	
		calculating the file's MD5 hash and comparing the results with the MD5 hash stored in the FB Series product's legal event log.
Verification	Use these fields to verify the configuration of your FB Series product. **Note** These field appear **only** if you select **Separate Verifiable & Exportable Logs**.	
	Status	This **read-only** field shows the current verification state of the FB Series product. Possible options are System Unverified or System Verified. **Note** A verification icon is also visible in the FBxConnect™ status bar at the bottom of the screen.
	Verification Change Timestamp	This **read-only** field shows the time and date of the last change to the Verification Status field.
	Verify	Select this button after you have verified the current configuration is correct, and a confirmation message displays. Select **OK** to verify the system. The Verification Status field changes to System Verified and a verification field appears in the FBxConnect™ status bar at the bottom of the screen.
Lock	Use these fields to view information about your FB Series product's current lock status. An FB Series product becomes locked when the Event Log Configuration Type is set to **Separate Verifiable & Exportable Logs** and the legal event log becomes full. When the legal event log is full, the Lock Status changes to Locked and a warning message appears. The device no longer accepts changes to legal parameters, firmware updates, calibrations, or configuration downloads. To unlock the device, you **must** export the legal event log to allow additional events to be created. **Note** • These field appear **only** if you select **Separate Verifiable & Exportable Logs**.	

Field	Description	
	• If your FB Series product becomes locked due to a full event log, refer to Export Events.	
	Status	This **read-only** field shows the current state of the legal event log. Possible options are Unlocked or Locked.
	Lock Timestamp	This **read-only** field shows the time and date of the last change to the Lock Status field.

3. Select **Save** to save any changes you make to this display.

4.22.2 Log Properties

Use this display to configure options for history, alarm, and event logs. You can enable/disable individual logs, and configure the number of remaining records before an alarm is raised.

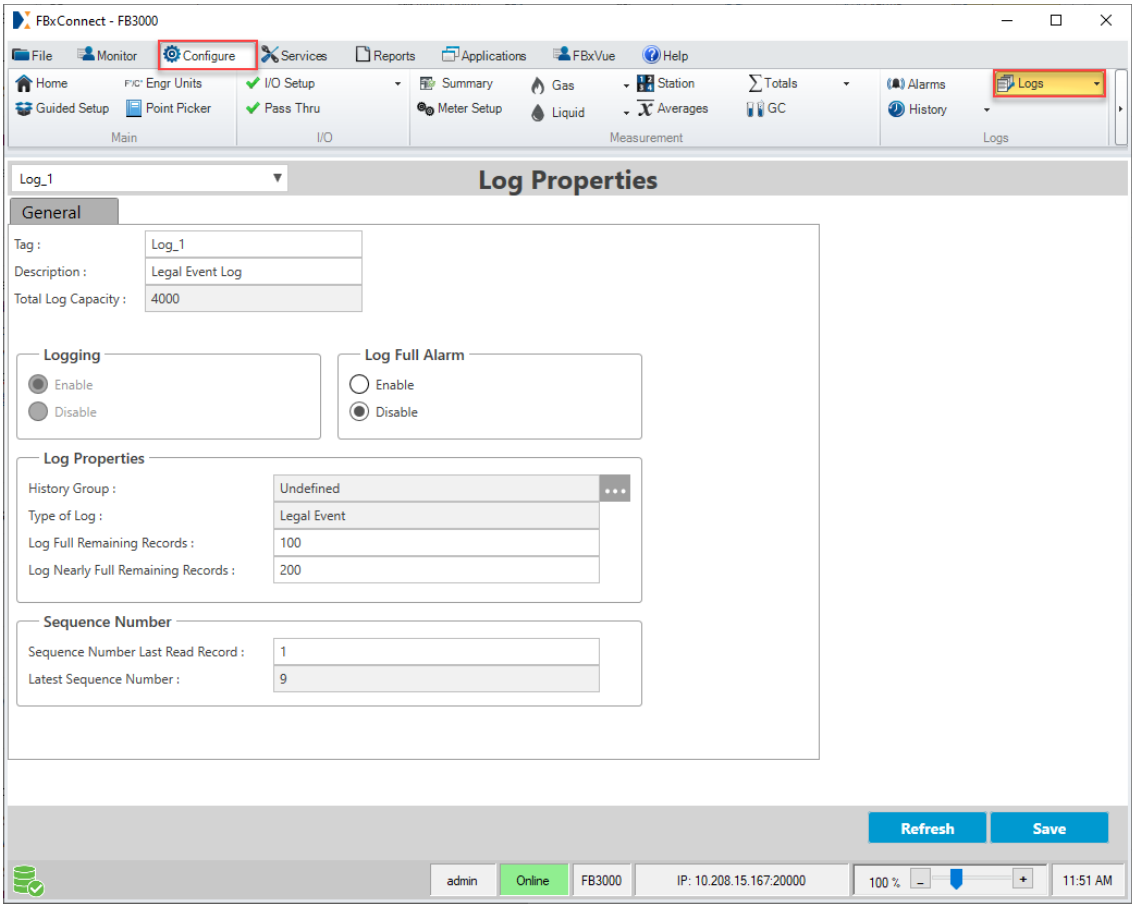
To access this display:

1. Select **Configure > Logs > Log Properties** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display to select an instance to configure.

Note

Refer to Log Descriptions for more information.

Figure 262. Log Properties



Log_1

Log Properties

General

Tag : Log_1
Description : Legal Event Log
Total Log Capacity : 4000

Logging
● Enable
○ Disable

Log Full Alarm
○ Enable
● Disable

Log Properties
History Group : Undefined
Type of Log : Legal Event
Log Full Remaining Records : 100
Log Nearly Full Remaining Records : 200

Sequence Number
Sequence Number Last Read Record : 1
Latest Sequence Number : 9

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.
Total Log Capacity	This **read-only** field shows the maximum number of records that can be stored in the currently selected log.
Logging	Enables the system to collect data for the selected log.
Log Full Alarm	Enables the system to log **Log Nearly Full**, **Log Full** and **Log Integrity** alarms for the selected log.

Field	Description
History Group	This **read-only** field shows the History Group Object Reference to which the selected log belongs. Possible History Group Object References are Hist Grp_1, Hist Grp_2, Hist Grp_3, Hist Grp_4, Hist Grp_5 and Undefined.
Type of Log	This **read-only** field shows the Log Type of the selected log. Possible Log Types are Legal Event, Non Legal Event, Legal Alarm, Non Legal Alarm, Legal History and Non Legal History.
Log Full Remaining Records	Sets a limit value to which the number of remaining records in the selected log must fall to log a Log Full alarm.
Log Nearly Full Remaining Records	Sets a limit value to which the number of remaining records in the selected log must fall to log a Log Nearly Full alarm. **Note** The Log Nearly Full limit should be greater than or equal to the Log Full Limit.
Sequence Number Last Read Record	This parameter allows the SCADA host to store the sequence number of the last successfully read alarm, event, or history record in the FB Series product. The system then uses this number to determine the number of remaining records using the formula: Remaining Records = Total Records - Unread Records Where: Unread Records = Sequence Number of Newest Record - Sequence Number Last Read
Latest Sequence Number	This **read-only** field shows the last sequence number generated by the FB Series product.

4. Select **Save** to save any changes you make to this display.

4.22.3 Log Descriptions

The FB3000 RTU stores a total of 154 logs. Refer to the table below for a description of each log.

Table 44. Log Descriptions

Log	Description
Log 1	Legal Event Log
Log 2	Non Legal Event Log
Log 3	Alarm Log
Log 4	Undefined
Log 5	User Periodic 1 Log
Log 6	User Periodic 2 Log
Log 7	General Hourly Log
Log 8	General Daily Log
Log 9	General Weekly Log
Log 10	General Monthly Log
Logs 11 – 14	Station 1's Hourly, Daily, Weekly, and Monthly Logs
Logs 15 – 18	Station 2's Hourly, Daily, Weekly, and Monthly Logs
Logs 19 – 22	Station 3's Hourly, Daily, Weekly, and Monthly Logs
Logs 23 – 26	Station 4's Hourly, Daily, Weekly, and Monthly Logs
Logs 27 – 30	Station 5's Hourly, Daily, Weekly, and Monthly Logs
Logs 31 – 34	Station 6's Hourly, Daily, Weekly, and Monthly Logs
Logs 35 – 38	Station 7's Hourly, Daily, Weekly, and Monthly Logs
Logs 39 – 42	Station 8's Hourly, Daily, Weekly, and Monthly Logs
Logs 43 – 46	Station 9's Hourly, Daily, Weekly, and Monthly Logs
Logs 47 – 50	Station 10's Hourly, Daily, Weekly, and Monthly Logs
Logs 51 – 54	Station 11's Hourly, Daily, Weekly, and Monthly Logs
Logs 55 – 58	Station 12's Hourly, Daily, Weekly, and Monthly Logs
Logs 59 – 62	Station 13's Hourly, Daily, Weekly, and Monthly Logs
Logs 63 – 66	Station 14's Hourly, Daily, Weekly, and Monthly Logs
Logs 67 – 70	Station 15's Hourly, Daily, Weekly, and Monthly Logs
Logs 71 – 74	Station 16's Hourly, Daily, Weekly, and Monthly Logs
Logs 75 – 78	Station 17's Hourly, Daily, Weekly, and Monthly Logs
Logs 79 – 82	Station 18's Hourly, Daily, Weekly, and Monthly Logs

Log	Description
Logs 83 – 86	Station 19's Hourly, Daily, Weekly, and Monthly Logs
Logs 87 – 90	Station 20's Hourly, Daily, Weekly, and Monthly Logs
Logs 91 – 94	Station 21's Hourly, Daily, Weekly, and Monthly Logs
Logs 95 – 98	Station 22's Hourly, Daily, Weekly, and Monthly Logs
Logs 99 – 102	Station 23's Hourly, Daily, Weekly, and Monthly Logs
Logs 103 – 106	Station 24's Hourly, Daily, Weekly, and Monthly Logs
Logs 107 – 110	Station 25's Hourly, Daily, Weekly, and Monthly Logs
Logs 111 – 114	Station 26's Hourly, Daily, Weekly, and Monthly Logs
Logs 115 – 118	Station 27's Hourly, Daily, Weekly, and Monthly Logs
Logs 119 – 122	Station 28's Hourly, Daily, Weekly, and Monthly Logs
Logs 123 – 126	Station 29's Hourly, Daily, Weekly, and Monthly Logs
Logs 127 – 130	Station 30's Hourly, Daily, Weekly, and Monthly Logs
Logs 131 – 134	Station 31's Hourly, Daily, Weekly, and Monthly Logs
Logs 135 – 138	Station 32's Hourly, Daily, Weekly, and Monthly Logs
Logs 139 – 142	Station 33's Hourly, Daily, Weekly, and Monthly Logs
Logs 143 – 146	Station 34's Hourly, Daily, Weekly, and Monthly Logs
Logs 147 – 150	Station 35's Hourly, Daily, Weekly, and Monthly Logs
Logs 151 – 154	Station 36's Hourly, Daily, Weekly, and Monthly Logs

4.23 PID Loops

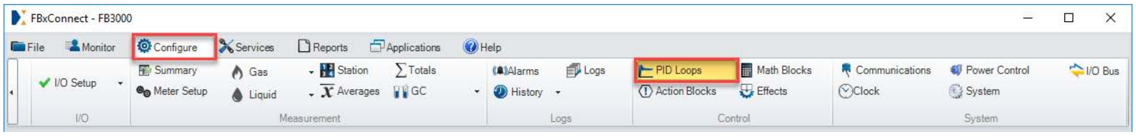
Proportional, Integral, and Derivative (PID) controls enable you to provide smooth and stable operation for feedback control loops that employ a regulating device, such as a control valve or a motor. The typical use for PID is to control a process variable to a setpoint. FB3000 RTUs allow you to dynamically resize the number of instances to fit your specific needs on the Control Setup display.

PID is the most common control methodology in process control. PID is a continuous feedback loop that keeps the process flowing normally by taking corrective action whenever any deviation from the desired value (setpoint) of the process variable (rate of flow, temperature, voltage, and such) occurs. An "error" occurs when an operator manually changes the setpoint or when an event (such as a valve opening or closing) or a disturbance changes the load, thus causing a change in the process variable.

The PID controller receives signals from sensors and computes corrective action to the actuators from a computation based on the error (proportional), the sum of all previous errors (integral) and the rate of change of the error (derivative).

To access this display, select **Configure > PID Loops** from the FBxConnect™ main menu.

Figure 263. PID Loops



The PID Loops display contains the following items:

General – Use this display to configure general PID loop parameters, including enabling the PID loop, selecting the PID loop type, and configuring the setpoints.

Inputs/Outputs – Use this pop-up display to configure the inputs and outputs of the PID loop.

Advanced – Use this pop-up display to configure advanced PID parameters, including the loop period, ramp rates, and output deadband.

Tuning – Use this pop-up display to configure the PID tuning parameters.

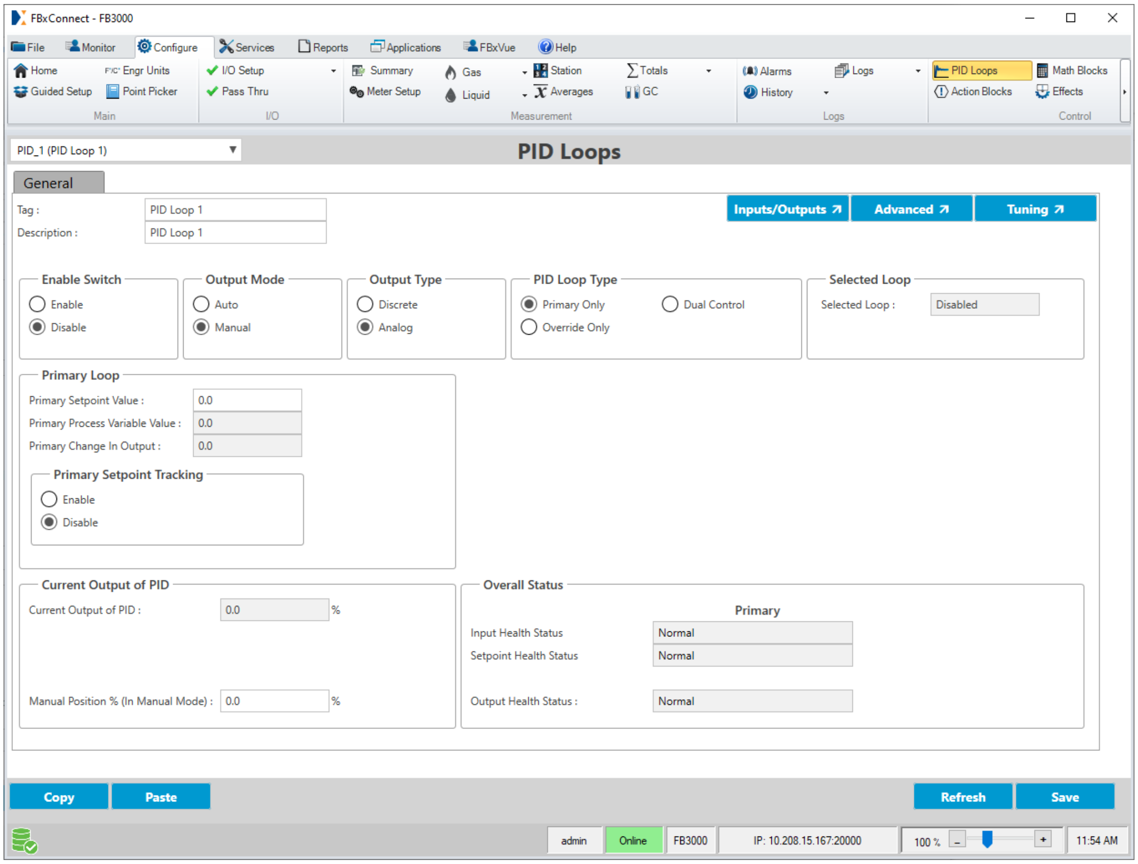
4.23.1 PID Loops – General

Use this display to configure general PID loop parameters, including enabling the PID loop, selecting the PID loop type, and configuring the setpoints.

To access this display:

1. Select **Configure > PID Loops** from the FBxConnect™ main menu. The PID Loops display opens showing the General tab.
2. Click ▼ in the drop-down list at the top of the display to select an instance to configure.

Figure 264. PID Loops – General



Tag : PID Loop 1
Description : PID Loop 1

Enable Switch
○ Enable
● Disable

Output Mode
○ Auto
● Manual

Output Type
○ Discrete
● Analog

PID Loop Type
● Primary Only
○ Dual Control
○ Override Only

Selected Loop
Selected Loop : Disabled

Primary Loop
Primary Setpoint Value : 0.0
Primary Process Variable Value : 0.0
Primary Change In Output : 0.0

Primary Setpoint Tracking
○ Enable
● Disable

Current Output of PID
Current Output of PID : 0.0 %
Manual Position % (In Manual Mode) : 0.0 %

Overall Status
Primary
Input Health Status: Normal
Setpoint Health Status: Normal
Output Health Status : Normal

3. Review – and change as necessary – the values in the following fields:

Field	**Description**	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.	
Enable Switch	Sets the status of the selected PID loop instance.	
	Enable	The PID loop **is** active.
	Disable	The PID loop **is not** active, no inputs are updated, and no calculations are performed.
Output Mode	Sets the output mode of the selected PID loop instance. Possible options are:	

Field	Description	
	Auto	Active control is performed. You enter a setpoint and the system automatically sends the calculated output to the configured output point. **Note** You cannot set the output mode to auto, until a valid process variable input and control output have been defined on the Inputs/Outputs tab.
	Manual	No active control is performed. The PID control output is assigned to the value you enter for the manual position.
Output Type	Sets the output type for the PID loop. Possible options are:	
	Discrete	The system writes the PID control output to the assigned DO used to raise the control element if the change in output is positive, or write to the assigned DO used to lower the control element if the change in output is negative.
	Analog	The system writes the PID control output to the assigned analog output point, or equivalent analog style parameter.
	Note The system calculates the change in output using the following algorithm: Change in Output = DF * PG * (errCng + (IG * ALP * err) + (DG * ΔRPC)) Where: DF = Direction Factor (forward = 1.0 and reverses = -1.0) PG = Proportional Gain (entered by user) IG = Integral Gain (entered by user) DG = Derivative Gain (entered by user) errCng = Error Change (error – last error) ALP = Actual Loop Period (measured in minutes) err = Error (Process Variable – Setpoint) ΔRPC = Delta Rate of Process Variable Change (Rate of PV Change – Last Rate of PV Change)	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">PID Loop Type</td><td colspan="2">Sets the control type for PID loop. Possible options are:</td></tr>
<tr><td>Primary Only</td><td>Sets the Primary loop as the only active loop. The system uses the output the Primary loop calculates to adjust the control output.</td></tr>
<tr><td>Override Only</td><td>Sets the Override loop as the only active loop. The system uses the output the Override loop calculates to adjust the control output.
Note
This control type is used mainly for tuning the Override loop, or when the loop selection is controlled by other logic external to the PID algorithm.</td></tr>
<tr><td>Dual Control</td><td>Sets both the Primary and Override loops as active. The system compares the outputs from the two loops and uses either the lesser or greater of the two outputs (based on the selection in the Override Type Select field) to adjust the control output.</td></tr>
<tr><td>Selected Loop</td><td colspan="2">This read-only field shows the status of the selected PID loop instance.</td></tr>
<tr><td>Primary/Override Setpoint Value</td><td colspan="2">Sets a setpoint value for controlling the Primary PID loop's process variable and the Override PID loop's process variable.</td></tr>
<tr><td>Primary/Override Process Variable Value</td><td colspan="2">This read-only field shows the current value of the primary and override process variables.
Note
The process variables are configured on the PID Loops – Inputs/Outputs pop-up display.</td></tr>
<tr><td>Primary/Override Change in Output</td><td colspan="2">This read-only field shows the calculated change in output from the associated loop.</td></tr>
<tr><td>Primary/Override Setpoint Tracking</td><td colspan="2">Sets how the system tracks setpoint and process variable values when moving between Auto and Manual modes in the Output Mode field. Possible options are:</td></tr>
</table>

Field	Description	
	Enable	If **Setpoint Tracking** is set to **Enable** and the **Output Mode** is **Auto**, then the system sets the value in the **Manual Position** field equal to the current output value. If **Setpoint Tracking** is set to **Enable** and the **Output Mode** is **Manual**, then the system sets the value in the Setpoint field equal to the process variable.
	Disable	If **Setpoint Tracking** is set to **Disable** and the **Output Mode** is **Auto**, then the value in the **Current Output** field is copied to the **Manual Position** field to provide for a bumpless transfer when switching from Auto to Manual mode. If **Setpoint Tracking** is set to **Disable** and the **Output Mode** is **Manual**, then the setpoint value remains unchanged and the system sets the integral action field to the value required to maintain the current position.
Override Threshold Value	Sets the threshold to prevent premature selection of the Override loop. If the Override process variable is outside of this threshold on the safe side of the Override setpoint, the system always selects the Primary loop. However, if the Override process variable is within the threshold of the Override setpoint or is on the unsafe side of that setpoint, the system can select the Override loop. **Note** If you set the **Override Threshold Value** to 0.0, the system uses the high/low value of the **Override Type Select** field to select the appropriate change, regardless of the error in the Override loop.	
Override Type Select	Sets the control output for the Override Type. Possible options are:	
	High	Selects as the change in the control output either the **higher of** the **Primary Change In Output** value or the **Override Change In Output** value.
	Low	Selects as the change in the control output either the **lesser of** the **Primary Change In Output** value or the **Override Change In Output** value.

Field	Description
Current Output of PID	This **read-only** field shows the value of the PID loop.
Digital Output 1 (Raise)	This **read-only** field shows the value of the Digital Output (Raise) configured on the PID Loops – Inputs/Outputs pop-up display. **Note** This field appears **only** if you select **Discrete** in the **Output Type** field.
Digital Output 2 (Lower)	This **read-only** field shows the value of the Digital Output (Lower) configured on the PID Loops – Inputs/Outputs pop-up display. **Note** This field appears **only** if you select **Discrete** in the **Output Type** field.
Manual Position % (In Manual Mode)	Sets the value that will be assigned to the PID control output when the **Output Mode** is set to **Manual**.
Input Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Primary/Override Process Variable Input** field on the PID Loops – Inputs/Outputs pop-up display.
Setpoint Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Primary/Override Setpoint Input** field on the PID Loops – Inputs/Outputs pop-up display.
Output Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Analog Output Point** field on the PID Loops – Inputs/Outputs pop-up display. **Note** This field appears **only** if you select **Analog** in the **Output Type** field.

4. Select **Save** to save any changes you make to this display.

4.23.2 PID Loops – Inputs/Outputs

Use this pop-up display to configure the inputs and outputs of the PID loop.

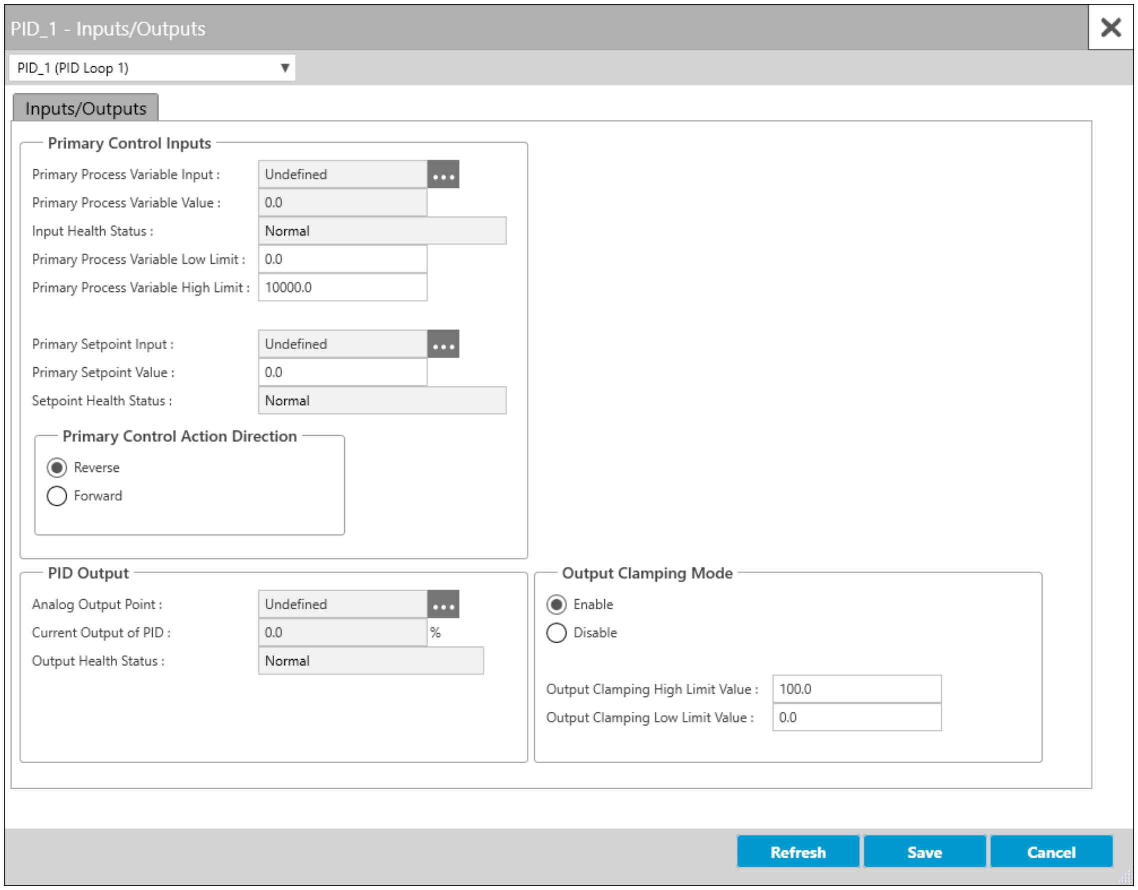
To access this tab:

1. Select **Configure > PID Loops** from the FBxConnect™ main menu. The PID Loops display opens.

2. Click ▼ in the drop-down list at the top of the display to select a PID loop to configure.

3. Select the **Inputs/Outputs** button. The PID Loops – Inputs/Outputs pop-up display opens.

Figure 265. PID Loops – Inputs/Outputs



PID_1 - Inputs/Outputs

PID_1 (PID Loop 1) ▼

Inputs/Outputs

Primary Control Inputs

Primary Process Variable Input : Undefined
Primary Process Variable Value : 0.0
Input Health Status : Normal
Primary Process Variable Low Limit : 0.0
Primary Process Variable High Limit : 10000.0

Primary Setpoint Input : Undefined
Primary Setpoint Value : 0.0
Setpoint Health Status : Normal

Primary Control Action Direction
● Reverse
○ Forward

PID Output
Analog Output Point : Undefined
Current Output of PID : 0.0 %
Output Health Status : Normal

Output Clamping Mode
● Enable
○ Disable

Output Clamping High Limit Value : 100.0
Output Clamping Low Limit Value : 0.0

4. Review – and change as necessary – the values in the following fields:

Field	Description
Primary / Override Process Variable Input	Click ••• to open a Point Picker dialog and select a parameter to use as the primary and override process variable.

Field	Description
Primary / Override Process Variable Value	This **read-only** field shows the current value of the parameter selected in the **Primary/Override Process Variable Input** field.
Input Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Primary/Override Process Variable Input** field.
Primary / Override Process Variable Low Limit	Sets the low limit for the process variable in the same engineering units of the process variable.
Primary / Override Process Variable High Limit	Sets the high limit for the process variable in the same engineering units of the process variable.
Primary / Override Setpoint Input	Click ••• to open a Point Picker dialog and select a parameter to use as the setpoint.
Primary / Override Setpoint Value	If a parameter is defined in the Primary/Override Setpoint Input field, this **read-only** field shows the value of that parameter. If the Primary/Override Setpoint Input field is Undefined, enter a setpoint value.
Primary / Override Setpoint Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Primary/Override Setpoint Input** field.
Primary / Override Control Action Direction	Selects the direction in which the PID control loop will act. **Reverse** The control output decreases as the process variable increases. **Forward** The control output increases as the process variable increases.

Field	Description
Analog Output Point	Click ••• to open a Point Picker dialog and select an analog output point for the loop. **Note** This field appears **only** if you select **Analog** in the **Output Type** field on the PID Loops – General display.
Current Output of PID	This **read-only** field shows the current value of the parameter selected in the **Analog Output Point** field. **Note** This field appears **only** if you select **Analog** in the **Output Type** field on the PID Loops – General display.
Output Health Status	This **read-only** field shows the quality of the data received from the parameter selected in the **Analog Output Point** field. **Note** This field appears **only** if you select **Analog** in the **Output Type** field on the PID Loops – General display.
Digital Output 1 (Raise)	Click ••• to open a Point Picker dialog and select an open point for the loop. **Note** • The Digital Output (Raise) and Digital Output (Lower) values, respectively, open or close the valve or other device. • This field appears **only** if you select **Discrete** in the **Output Type** field on the PID Loops – General display.
Digital Output 2 (Lower)	Click ••• to open a Point Picker dialog and select a close point for the loop. **Note** • The Digital Output (Raise) and Digital Output (Lower) values, respectively, open or close the valve or other device. • This field appears **only** if you select **Discrete** in the **Output Type** field on the PID Loops – General display.
Output Clamping Mode	Select to prevent the output from going above the value set in the High Limit field or falling below the value set in the Low Limit field. **Enable** Output value is limited to values between the output Low Limit and the High Limit (recommended).

Field	Description
	Disable Output value is not limited. **Note** This field appears **only** if you select **Analog** in the **Output Type** field on the PID Loops – General display.
Output Clamping High Limit Value	Sets the high limit for the analog. If a change in output causes the current value to rise above this value, the system sets the output to High Limit value.
Output Clamping Low Limit Value	Sets the low limit for the analog. If a change in output causes the current value to fall below this value, the system sets the output to the Low Limit value.

5. Select **Save** to save any changes you make to this display.

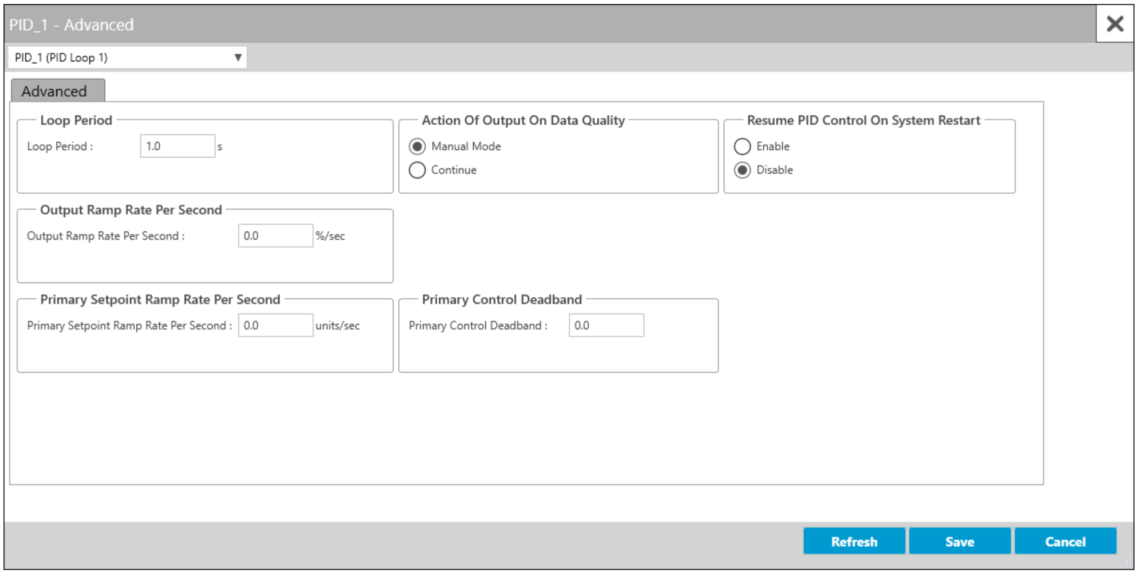
4.23.3 PID Loops – Advanced

Use this pop-up display to configure advanced PID parameters, including the loop period, ramp rates, and output deadband.

To access this pop-up display:

1. Select **Configure > PID Loops** from the FBxConnect™ main menu. The PID Loops display opens.
2. Click ▼ in the drop-down list at the top of the display to select a PID loop instance to configure.
3. Select the **Advanced** button. The PID Loops – Advanced pop-up display opens.

Figure 266. PID Loops – Advanced



PID_1 (PID Loop 1)

Loop Period
Loop Period : 1.0 s

Action Of Output On Data Quality
● Manual Mode
○ Continue

Resume PID Control On System Restart
○ Enable
● Disable

Output Ramp Rate Per Second
Output Ramp Rate Per Second : 0.0 %/sec

Primary Setpoint Ramp Rate Per Second
Primary Setpoint Ramp Rate Per Second : 0.0 units/sec

Primary Control Deadband
Primary Control Deadband : 0.0

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Loop Period	Sets the period (in seconds) of time between executions of the PID algorithm. This is the amount of time between executions from the beginning of one execution to the beginning of the next. **Note** If you select Dual Control, both loops are executed in this time period.	
Action of Output on Unhealthy Data Quality	Selects the action to be taken when the process variable or live setpoint values report a data quality of Fault. **Note** This feature does not apply to data quality indications of Override or Alarm.	
	Manual Mode	The **Output Mode** is changed to **Manual** and the value you configure in the Manual Position field (PID Loops – General) is applied to the control output.
	Continue	The PID control loop continues in the current output mode and no action is taken.

Field	Description	
Resume PID Control On System Restart	Sets if the PID loop automatically resumes when the system restarts.	
	Enable	The PID loop **does** automatically resume when the system restarts.
	Disable	The PID loop **does not** automatically resume when the system restarts.
Output Ramp Rate Per Second	Sets the allowed limit of change in the control output from one cycle to the next. A value of zero disables this feature.	
Primary Setpoint Ramp Rate Per Second	Sets a length of time (in seconds) the maximum rate at which the Primary PID setpoint can ramp to a new value.	
Primary Control Deadband	Sets a "window" around the setpoint for the Primary PID loop. When the process variable is within this window, the system does not apply the calculated change in output. If you enter 5, the deadband is a region of 5 units above and 5 units below the setpoint in which the process variable can move without affecting the output.	
Override Setpoint Ramp Rate Per Second	Sets a length of time (in seconds) the maximum rate at which the Override PID setpoint can ramp to a new value.	
Override Control Deadband	Sets a "window" around the setpoint for the Override PID loop. When the process variable is within this window, the system does not apply the calculated change in output. If you enter 5, the deadband is a region of 5 units above and 5 units below the setpoint in which the process variable can move without affecting the output	

5. Select **Save** to save any changes you make to this display.

4.23.4 PID Loops – Tuning

Use this pop-up display to configure the PID tuning parameters. The trend appears in a chart at the bottom of the display.

Note

- If you select **Primary Only** in the **PID Loop Type** field on the **PID – General** display, the Primary Process Variable Value, Primary Setpoint Value, and Current Output of PID are shown in the chart.
- If you select **Override Only** in the **PID Loop Type** field on the **PID – General** display, the Override Process Variable Value, Override Setpoint Value, and Current Output of PID are shown in the chart.
- If you select **Dual Control** in the **PID Loop Type** field on the **PID – General** display, the Primary Process Variable Value, Primary Setpoint Value, Override Process Variable Value, Override Setpoint Value, and Current Output of PID are shown in the chart.

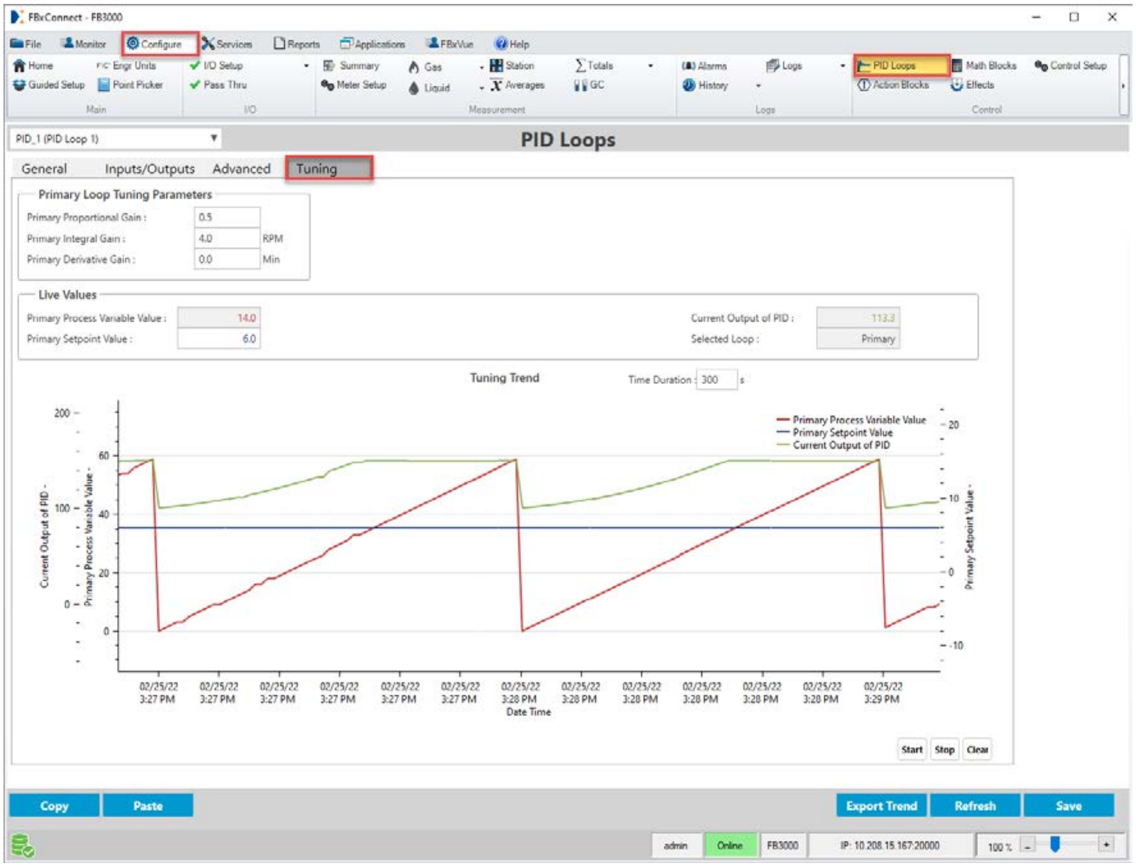
When viewing a chart on the display, your mouse has the following functionality:

- **Mouse Wheel –** Scroll the mouse wheel to zoom the x-axis and y-axis based on your cursor position. You can zoom each axis individually (by placing your cursor over a single axis) or simultaneously (by placing your cursor over the chart).
- **Right Button** – Click and drag the right mouse button to pan the chart. You can pan each axis individually (by placing your cursor over a single axis) or simultaneously (by placing your cursor over the chart).

To access this pop-up display:

1. Select **Configure > PID Loops** from the FBxConnect™ main menu. The PID Loops display opens .
2. Click ▼ in the drop-down list at the top of the display to select a PID loop instance to configure.
3. Select the **Tuning** button. The PID Loops – Tuning pop-up display.

Figure 267. PID Loops – Tuning



PID_1 (PID Loop 1)

PID Loops

Primary Loop Tuning Parameters

Primary Proportional Gain : 0.5

Primary Integral Gain : 4.0 RPM

Primary Derivative Gain : 0.0 Min

Live Values

Primary Process Variable Value : 14.0

Primary Setpoint Value : 6.0

Current Output of PID : 113.3

Selected Loop : Primary

Time Duration : 300 s

4. Review – and change as necessary – the values in the following fields:

Field	Description
Primary / Override Proportional Gain	Sets proportional gain as the ratio of the change in output to the change in the error.
Primary / Override Integral Gain	Sets integral gain as the ratio of the change in output to the change in the integral of the error with respect to time. This value is in terms of repeats per minute. Typically calculated as either (Primary Process Variable – Primary Setpoint) or (Override Process Variable – Override Setpoint).

Field	Description
Primary / Override Derivative Gain	Sets the derivative gain as the ratio of the change in output to the change in the error with respect to time. This value is in terms of minutes. Typically calculated as either (Primary Process Variable / Primary Setpoint) or (Override Process Variable / Override Setpoint).
Live Values	Theses fields show the current value of the configured PID loop parameters.
Time Duration	Enter the amount of time (in seconds) to display data in the Tuning Trend chart. After the configured amount of time has elapsed, this rolling chart adds new samples to the end of the chart and removes the oldest data. The **default** is **300**.
Start	Select this button to begin displaying data in the chart.
Stop	Select this button to prevent new data from being added to the chart. Data collected before selecting this button is preserved in the chart.
Clear	Select this button to remove all data from the chart.
Export Trend	Select this button to extract PID trend data and save it to a file on your computer. The extracted data is saved in a CSV file to your computer's home directory using the current year, month, date, hour, minute, second, and millisecond for naming convention (YYYY-MM-DD HH-MM-SS.FFF.csv).

5. Select **Save** to save any changes you make to this display.

4.24 Action Blocks

Action Blocks are configurable programming components that check a basic logic condition, and use the result to activate effects or perform other actions (such as opening or closing a valve). FB3000 RTUs allow you to dynamically resize the number of instances to fit your specific needs on the Control Setup display.

To access this display, select **Configure > Action Blocks** from the FBxConnect™ main menu.

Figure 268. Action Blocks

The Action Blocks display contains the following items:

General – Use this display to configure the logic performed by each Action Block, and what action the system takes when the Action Block is active.

Bypass – Use this pop-up display to configure temporary overrides for the result of the raw action block logic.

Chain – Use this pop-up display to logically link one action block to another.

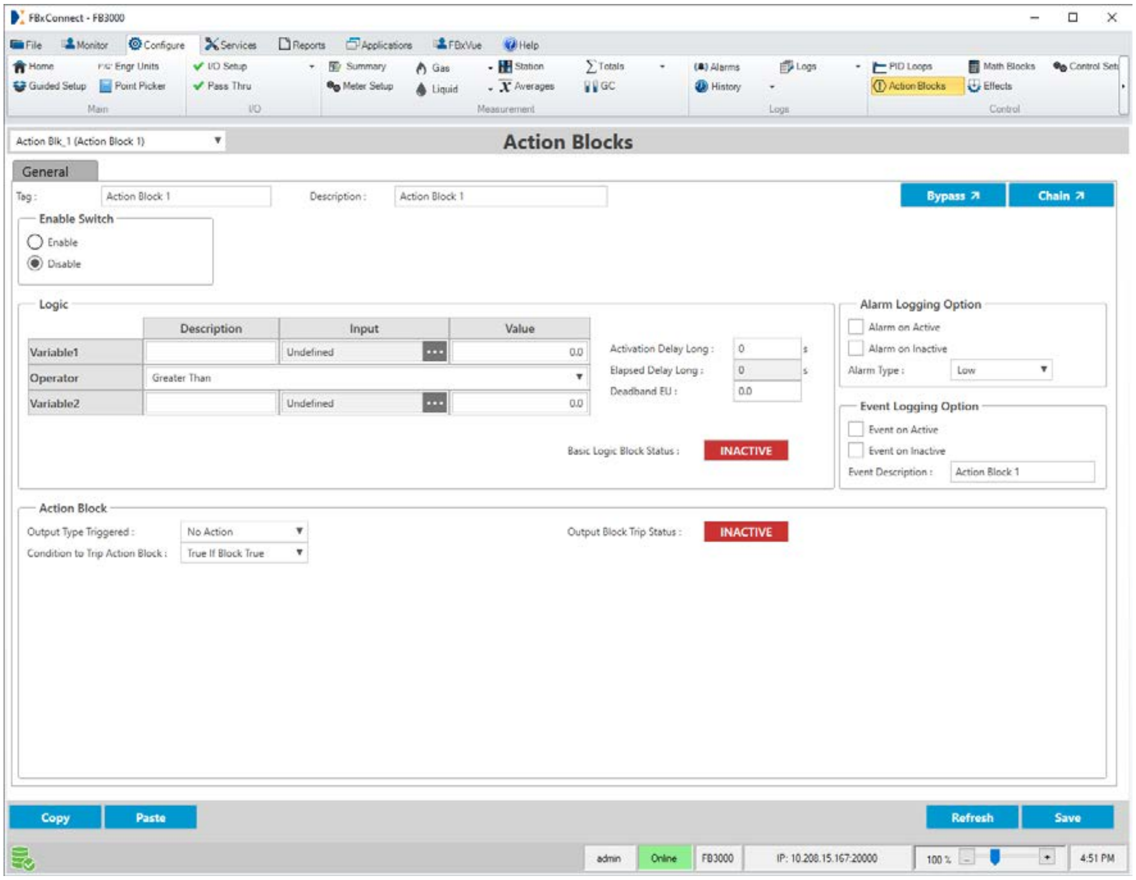
4.24.1 Action Blocks – General

Use this display to configure the logic performed by each Action Block, and what action the system takes when the Action Block is active.

To access this display:

1. Select **Configure > Action Blocks** from the FBxConnect™ main menu. The Action Blocks display opens.
2. Click ▼ in the drop-down list at the top of the display to select an instance to configure.

Figure 269. Action Blocks – General



Action Blk_1 (Action Block 1)

Tag: Action Block 1
Description: Action Block 1

Enable Switch
○ Enable
● Disable

Logic

	Description	Input	Value
Variable1		Undefined	0.0
Operator	Greater Than		
Variable2		Undefined	0.0

Activation Delay Long: 0 s
Elapsed Delay Long: 0 s
Deadband EU: 0.0
Basic Logic Block Status: INACTIVE

Alarm Logging Option
☐ Alarm on Active
☐ Alarm on Inactive
Alarm Type: Low

Event Logging Option
☐ Event on Active
☐ Event on Inactive
Event Description: Action Block 1

Action Block
Output Type Triggered: No Action
Condition to Trip Action Block: True If Block True
Output Block Trip Status: INACTIVE

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 % | 4:51 PM

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.	
Enable Switch	Sets the status of the selected Action Block instance.	
	Enable	The Action Block **is** evaluated and logic is performed.
	Disable	The Action Block **is not** evaluated and **no** logic is performed.
Logic	The fields in this section configure the logic performed by the Action Block.	
	Variable 1	Defines the first variable to use in the Action Block.

Field	**Description**		
		Description	Sets an identifier (up to 20-alphanumeric characters) for the selected variable.
		Input	Click … to open a Point Picker dialog and select a parameter from the FB Series product database used as the first variable in a logic expression, as defined by the action block operator. Any read/write numerical parameter from the FB Series product's database can be selected.
		Value	Shows the value of the selected parameter. If you leave the parameter undefined, you can manually enter a value in this field.
	Operator	**Greater Than**	If Variable 1 is greater than the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.
		Less Than	If Variable 1 is less than the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.
		Equal To	If Variable 1 is equal to the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.
		Greater Than Or Equal To	If Variable 1 is greater than or equal to the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.
		Not Equal To	If Variable 1 is not equal to the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.

Field	Description		
		Less Than Or Equal To	If Variable 1 is less than or equal to the Variable 2 value for the **Activation Delay** time, the **Logic Trip Status** is set to active.
		AND (Bitwise)	Compares each bit in Variable 1 to each bit in Variable 2. If ALL of the bits set in Variable 2 are also set in Variable 1, the **Logic Trip Status** is set to active.
		OR (Bitwise)	Compares each bit in Variable 1 to each bit in Variable 2. If ANY of the bits set in Variable 2 are also set in Variable 1, the **Logic Trip Status** is set to active.
		Watchdog	Monitors the Variable 1 value for a transition. When a transition occurs, the watchdog counter starts over. If the counter reaches the time defined in the **Activation Delay** time, the **Logic Trip Status** is set to active.
		Soft Timer	Monitors the Variable 1 Value for a transition from 0 to any number. Once this transition occurs the block is set true and a time delay starts for the amount of seconds specified in the **Activation Delay** field. When the timer expires the block is set to inactive and the Variable 1 Value is forced back to a zero.
	Variable 2	Defines the second variable to use in the Action Block.	
		Description	Sets an identifier (up to 20-alphanumeric characters) for the selected variable. **Note** This field applies only if you select **Greater Than**, **Less Than**, **Equal To**, **Greater Than Or Equal To**, **Not Equal**

Field	Description		
			To, **Less Than Or Equal To**, **AND (Bitwise)**, or **OR (Bitwise)** in the **Operator** field.
		Input	Click ... to open a Point Picker dialog and select a parameter from the FB Series product database which will be used as the second variable in a logic expression, as defined by the action block operator. Any read/write numerical parameter from the FB Series product's database can be selected. **Note** This field applies only if you select **Greater Than**, **Less Than**, **Equal To**, **Greater Than Or Equal To**, **Not Equal To**, **Less Than Or Equal To**, **AND (Bitwise)**, or **OR (Bitwise)** in the **Operator** field.
		Value	Shows the value of the selected parameter. If you leave the parameter undefined, you can manually enter a value in this field. **Note** This field applies only if you select **Greater Than**, **Less Than**, **Equal To**, **Greater Than Or Equal To**, **Not Equal To**, **Less Than Or Equal To**, **AND (Bitwise)**, or **OR (Bitwise)** in the **Operator** field.

Field	Description		
	Activation Delay	Sets the delay in seconds. This delay acts as either a delay before logic functions set the **Logic Trip Status** to an active state, or as the time for the soft timer and watchdog operations. **Note** For more information about the **Activation Delay**, refer to the **Operator** description.	
	Elapsed Delay	This **read-only** field shows the time delay that has elapsed in seconds, starts by counting up from zero to the **Activation Delay** time and the action block trip status changes when the **Activation Delay** time is reached.	
	Deadband EU	Sets the deadband (in engineering units) used when comparing Variable 1 and Variable 2. **Note** This field applies only if you select **Greater Than**, **Less Than**, **Greater Than Or Equal To**, or **Less Than Or Equal To** in the **Operator** field.	
	Basic Logic Block Status	This **read-only** field shows the status of the action block based only on the block logic operation, and before any bypasses are applied. Possible values are Active or Inactive	
Action Block	The fields in this section determine the behavior of the action block trip status, and what action (if any) is taken when the action block trip status is active.		
	Output Type Triggered	Selects what output (if any) is desired from this action block when it is active. Possible options are:	
		No Action	No output action will take place when the **Basic Logic Block Status** is active.

Field	Description		
		Effect	One or more associated effects is activated when the **Basic Logic Block Status** is active. **Note** See **Trip Effect Links** for additional configuration.
		Binary Action	A value of 1 or 0 will be written out to the selected parameter when the **Basic Logic Block Status** is active. Typically used with a discrete output. **Note** See the Output Boolean Behavior for additional configuration.
		Move Value	The input variable 1 is moved to the output action point when the **Basic Logic Block Status** is active.
		Load Value	Saves the value in the output action point into the internal result register when the **Basic Logic Block Status** is active.
		Write Value	Retrieves the internal result register value, and writes it to the parameter defined for the output action point when the **Basic Logic Block Status** is active.
	Condition to Trip Action Block	Sets how the **Basic Logic Block Status** is determined. Possible options are:	
		True If Block True	The **Basic Logic Block Status** is active if the basic block logic trip status is active, and no bypasses are active.
		True If Chain True	The **Basic Logic Block Status** is active if the chain trip status is active.

Field	Description		
		True If Either True	The **Basic Logic Block Status** is active if either the Chain trip status, or the Bypass block trip status is active.
		True If Both True	The **Basic Logic Block Status** is active only if the Chain trip status and the Bypass block trip status is active.
	Trip Effect Links	Each Action Block can trigger up to 20 Effect instances. Click ▼ and select an Effect instance that is triggered by this Action Block. **Note** This field appears **only** when the **Action Type** is set to **Effect**.	
	Output Actions	The fields in this section configure the output parameters for the action block.	
		Output Action Point	Click ••• to open a Point Picker dialog and select a parameter from the FB Series product database to be used in one of the action types. **Note** This field appears only when the **Action Type** is set to **Binary Action**, **Move Value**, **Load Value**, or **Write Value**.
		Output Boolean Behavior	Sets the discrete signal style written to the selected output parameter, where “Poke” means write a value once, and “Force” means to write a value continuously. Possible options are: • Force 1 If True & 0 If False • Force 0 If True & 1 If False • Poke 1 If True • Poke 0 If True • Poke 1 If True & 0 If False • Poke 0 If True & 1 If False • Force 1 If True & Poke 0 If False

Field	Description	
		• Force 0 If True & Poke 1 If False • Force 1 If True • Force 0 If True **Note** This field appears **only** when the **Action Type** is set to **Binary Action**.
	Output Block Trip Status	This **read-only** field shows the status of the action block, and determines if any action is taken by the action block (such as moving a value or activating an effect). Possible values are Active or Inactive
Alarm Logging Option	Sets if the system writes to the Alarm Log with the action block. **Note** The text of the action block description string is used for each entry in the alarm log created by the action block.	
	Alarm on Active	Action block transitions from inactive to active will write a Set Alarm record to the alarm log.
	Alarm on Inactive	Action block transitions from active to inactive will write a Clear Alarm record to the alarm log.
	Alarm Type	Click ▼ to select what type of application alarm is written to the FB Series product alarm log. Possible options are Low, Low Low, High, High High, Rate of Change, and Other.
Event Logging Option	Sets if the system writes to the Event Log with the action block.	
	Event on Active	Action block transitions from inactive to active will create a record in the event log.
	Event on Inactive	Action block transitions from active to inactive will create a record in the event log.
	Event Description	This 40-character message will appear with any event created by the action block. The default value is “Action Block X”, where X is the instance number (1 through 30).

4. Select **Save** to save any changes you make to this display.

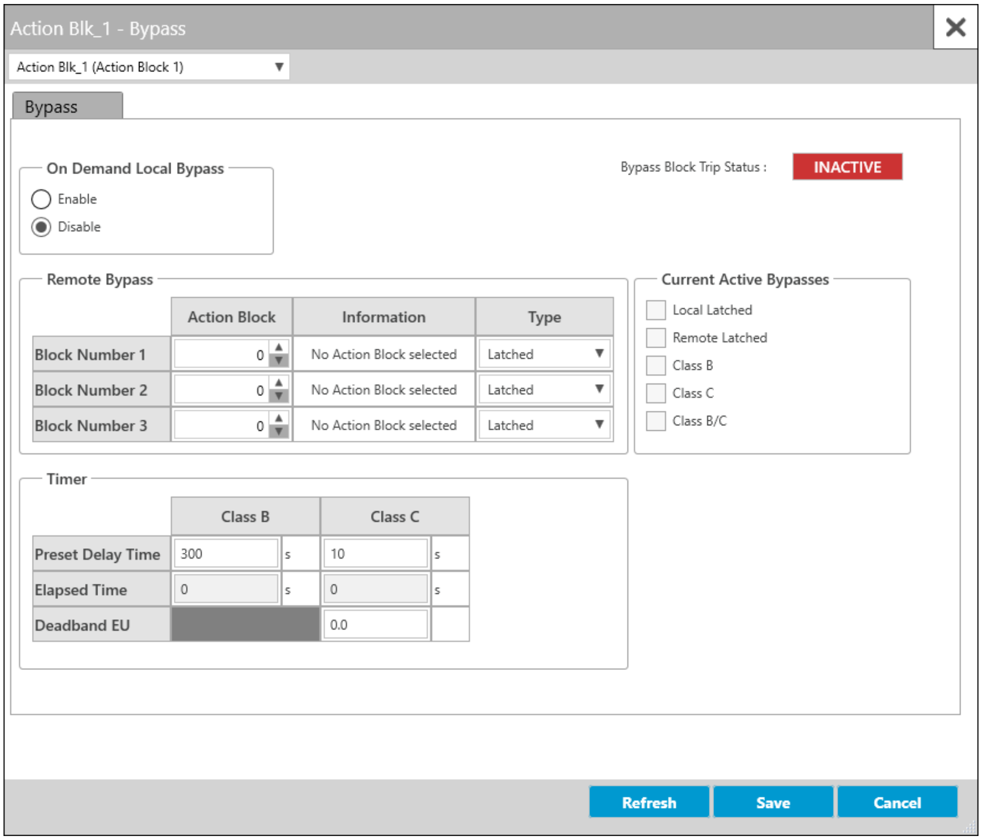
4.24.2 Action Blocks – Bypass

Use this pop-up display to configure temporary overrides for the result of the raw action block logic.

To access this pop-up display:

1. Select **Configure > Action Blocks** from the FBxConnect™ main menu. The Action Blocks display opens.
2. Click ▼ in the drop-down list at the top of the display to select an Action Block instance to configure.
3. Select the **Bypass** button. The Action Blocks – Bypass pop-up display opens.

Figure 270. Action Block – Bypass



Action Blk_1 - Bypass

Action Blk_1 (Action Block 1)

Bypass

On Demand Local Bypass
○ Enable
● Disable

Bypass Block Trip Status : INACTIVE

Remote Bypass

	Action Block	Information	Type
Block Number 1	0	No Action Block selected	Latched
Block Number 2	0	No Action Block selected	Latched
Block Number 3	0	No Action Block selected	Latched

Current Active Bypasses
☐ Local Latched
☐ Remote Latched
☐ Class B
☐ Class C
☐ Class B/C

Timer

	Class B		Class C	
Preset Delay Time	300	s	10	s
Elapsed Time	0	s	0	s
Deadband EU			0.0	

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Bypass Block Trip Status	This **read-only** field shows the combination of the **Basic Logic Block Status** and any active bypasses. If any bypass is active, this trip status shows a state of Inactive. If no bypasses are active, then this field can either have a state of Active or a state of Inactive, depending on the basic logic.	
On Demand Local Bypass	Controls the manual latched bypass. This value could be set or removed from an HMI, host system, or from another action block.	
	Enable	The manual latched bypass is active.
	Disable	The manual latched bypass is inactive.
Remote Bypass	Allows you to use other action blocks to define bypass functionality. When the remote action block is true, the bypass for this block is true.	
	Action Block	Click ⬍ to select a remote action block to serve as the trigger to enter a bypass state. When the remote action block is active, the bypass for this block is active.
	Information	This **read-only** field shows the user-defined tag associated with the selected action block. When no block is selected, this field reads “NO BLOCK ASSOCIATED”.
	Type	Click ▼ to select the type of bypass you desire. Possible options are: • **Latched** – Bypassed while the Remote Bypass block is active. • **Class B** – Bypassed for the amount of time set in the Class B Timer field once the Remote Bypass block is active. • **Class C** – Bypassed until the block clears once the Remote Bypass block is active. • **Class B/C** – Bypassed for the amount of time in the Class B Timer field or unless the Block clears before the timer expires once the Remote Bypass block is active.
Current Bypass Active	Shows a check mark next to all currently active bypasses. Note that there can be more than one bypass active simultaneously.	

Field	Description	
	Local Latched	Activates the manual latched bypass when selected. This value could be set or removed from an action block.
	Remote Latched	Bypassed while the Remote Bypass block is true.
	Class B	Bypassed for the amount of time in the Class B Timer field once the Remote Bypass block is true.
	Class C	Bypassed until the block clears once the Remote Bypass block is true.
	Class B/C	Bypassed for the amount of time in the Class B Timer field or unless the Block clears before the timer expires once the Remote Bypass block is true.
Timer	Sets the timers used with Class B and Class C bypasses.	
	Class B Preset Delay Time	Sets the amount of time (in seconds) that a Class B status should be clear, before the bypass is no longer active.
	Class B Elapsed Time	Shows the elapsed time (in seconds) for a Class B bypass.
	Class C Preset Delay Time	Sets the amount of time (in seconds) that a Class C status should be clear, before the bypass is no longer active.
	Class C Elapsed Time	Shows the elapsed time (in seconds) for a Class C bypass.
	Class C Deadband EU Value	Sets the deadband for Class C bypass.

5. Select **Save** to save any changes you make to this display.

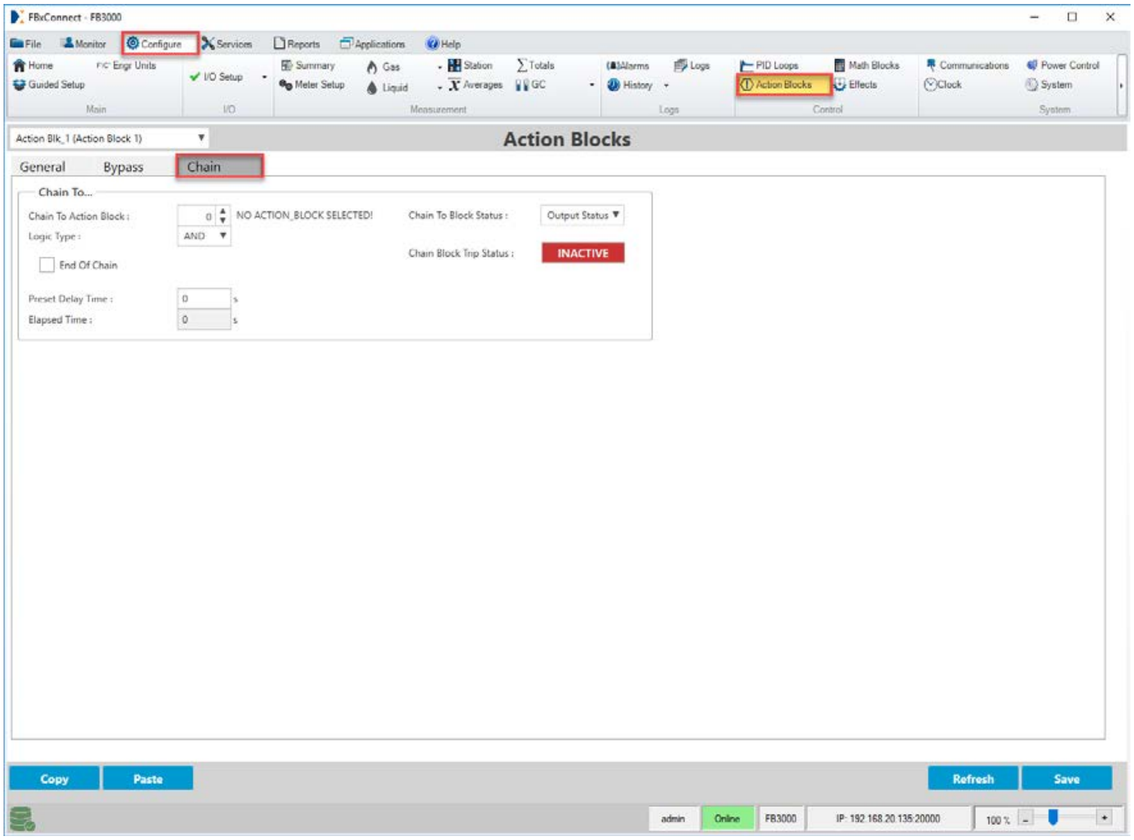
4.24.3 Action Blocks – Chain

Use this pop-up display to logically link one action block to another.

To access this pop-up display:

1. Select **Configure > Action Blocks** from the FBxConnect™ main menu. The Action Blocks display opens.
2. Click ▼ in the drop-down list at the top of the display to select an Action Block instance to configure.
3. Select the **Chain** button. The Action Blocks – Chain pop-up display opens.

Figure 271. Action Blocks – Chain



Action Blk_1 (Action Block 1)

Chain To...

Chain To Action Block : 0 NO ACTION_BLOCK SELECTED!

Logic Type : AND

☐ End Of Chain

Preset Delay Time : 0 s

Elapsed Time : 0 s

Chain To Block Status : Output Status

Chain Block Trip Status : INACTIVE

4. Review – and change as necessary – the values in the following fields:

Field	Description
Action Block	Click ▼ to select an Action Block instance to be chained to this one. The results of the two action blocks (this action block and the action block you select) are compared using the logic you select in the **Using Operation** field.

Field	**Description**	
Using Operation	Selects the logic to be used to chain the user-configured trip status (set in the **Chain Selected Block Status** field) of an action block (set in the **Action Block** field) to the current action block's **Bypass Block Trip Status** (shown on the Bypass tab). Possible options are:	
	AND	If the Action Trip Status of the chained Action Block instance and the current Action Block instance are both Active, the Chain Block Trip Status is set to Active.
	OR	If either the Action Trip Status of the chained Action Block instance or the current Action Block instance are Active, the Chain Block Trip Status is set to Active.
	NAND	If the Action Trip Status of the chained Action Block instance and the current Action Block instance are both Active, the Chain Block Trip Status is set to Inactive. Any other combination of Active and Inactive causes the Chain Block Trip Status to be Active.
Chain Preset Delay Time	Sets the value for the delay timer in seconds. This is the number of seconds that a chain combination must remain active, before the **Chain Block Trip Status** becomes active.	
Chain Elapsed Delay Time	Shows the delay time elapsed in seconds.	
This Block Is The End Of The Chain	Indicates the current action block is the last in the chain.	
Chain Selected Block Status	Selects which status (from the action block selected in the **Action Block** field) chained to this action block.	
	Block Status	The **Logic Trip Status** defined on the Action Block – General display.
	Chain Status	The **Chain Block Trip Status** defined on the Action Block – Chain display. **Note** This is typically used in chains of more than two action blocks.
	Output Status	The **Action Trip Status** defined on the Action Block – General display.

Field	Description
Chain Block Trip Status	This **read-only** field shows the status of this action block result, with the action block it is chained to. Possible values are Active or Inactive.

5. Select **Save** to save any changes you make to this display.

4.25 Math Blocks

Math Blocks perform mathematical equations using live variables from the system as inputs. Each calculation is updated once per second. The Math Blocks display is divided into three sections: Input Variables, Calculation, and Results. FB3000 RTUs allow you to dynamically resize the number of instances to fit your specific needs on the Control Setup display.

Input Variables – Use this section to define up to four parameters to be used as variables (A, B, C, and D) in the Calculation section. You can enter a description for each variable.

Calculation – Use this section to enter up to three mathematical equations (X, Y, and Z) using variables defined in the Input Variables section (A, B, C, or D), constants, and operators. Equations can be up to 40 characters in length. Each equation is checked for correct syntax before it can be evaluated. You can use standard math functions (POW, EXP, LOG, SQRT, etc.), and double precision floating point math is used throughout the equation.

Note

Boolean logic is **not** supported.

Results – Use this section to display the results of each equation (X, Y, and Z) entered into the Calculation section. You can enter a description for each result. You can also configure the system to write the result value to a specific parameter in the database.

Note

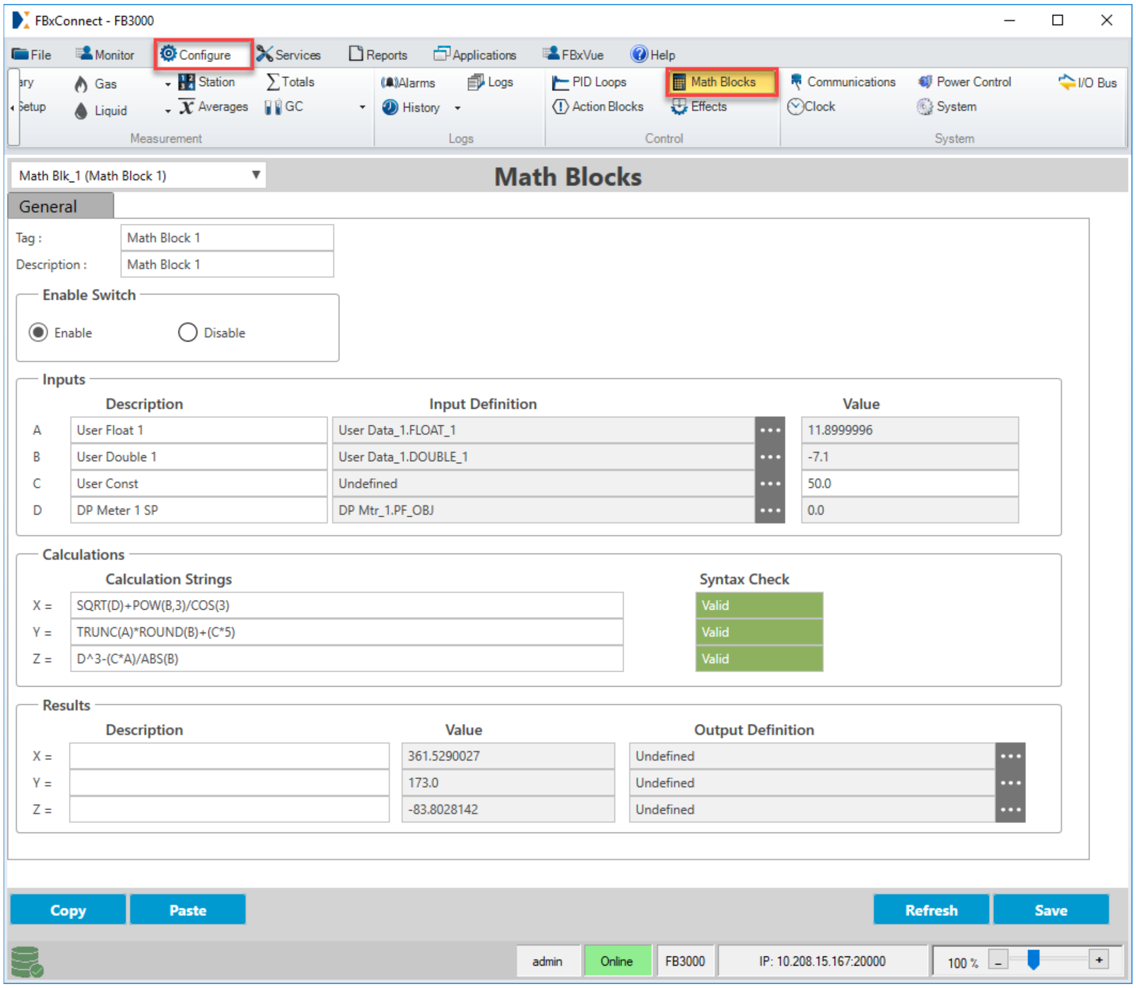
Logic and syntax validity checks are **not** performed until you select **Enable** in the **Enable Switch** field.

To access this display:

1. Select **Configure > Math Blocks** from the FBxConnect™ main menu.

2. Click ▼ in the drop-down list at the top of the display and select an instance to configure.

Figure 272. Math Blocks



Tag : Math Block 1
Description : Math Block 1

Enable Switch
● Enable ○ Disable

Inputs

	Description	Input Definition	Value
A	User Float 1	User Data_1.FLOAT_1	11.8999996
B	User Double 1	User Data_1.DOUBLE_1	-7.1
C	User Const	Undefined	50.0
D	DP Meter 1 SP	DP Mtr_1.PF_OBJ	0.0

Calculations

	Calculation Strings	Syntax Check
X =	SQRT(D)+POW(B,3)/COS(3)	Valid
Y =	TRUNC(A)*ROUND(B)+(C*5)	Valid
Z =	D^3-(C*A)/ABS(B)	Valid

Results

	Description	Value	Output Definition
X =		361.5290027	Undefined
Y =		173.0	Undefined
Z =		-83.8028142	Undefined

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 %

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.	
User Enable Switch	Sets the status of the current math block instance.	
	Enable	Input variables are updated and calculations are performed.
	Disable	No input variables are updated and no calculations are performed.

Field	**Description**	
Input Variables	Use the fields in this section to configure up to four variables (**A**, **B**, **C**, and **D**) for use in math block calculations. You can use a parameter to automatically provide a value or manually enter a value to use as the variable.	
	Description	Sets a 20-character text description for the input variable.
	Input Definition	Click ••• to open a Point Picker dialog and select a live input to use in the calculation. You can select any numerical parameter from the FB Series product database. When integers are selected, they are converted to floating point values. **Note** When an input is not required, this field should be set to **Undefined**.
	Value	When a parameter is defined in the Input Definition field, this **read-only** field shows the value of the defined parameter. When no parameter is defined in the Input Definition field, enter a value to use as an input variable.
Calculation	Use this section to configure up to three equations (**X**, **Y**, and **Z**).	
	Enter Calculation String	Enter the calculation to be solved using Input Variables (**A**, **B**, **C**, **D**, **X**, **Y**, **and Z**), constants, operators, and functions. For more details on the available operators and functions, refer to Supported Operators and Functions.
	Validity Check	The syntax is checked for validity when the **Enable Switch** field is set to **Enable**. Possible values are Valid (the calculation string has no issues) or Invalid (the calculation string has a problem or is empty).
Results	This section shows the results for the three equations entered in the Calculation section (**X**, **Y**, and **Z**).	
	Description	Sets a description (up to 20-characters) for the calculation result value.

Field	Description	
	Value	This **read-only** field shows the numerical result for the equation. **Note** When an equation is considered invalid, the value is set to 0.0.
	Optional Output Definition	Used to "push" the result value out to a user selected parameter somewhere else in the database (for example, a User Data float, or an Analog Output override value). Click ••• to open a Point Picker dialog and select a parameter. Any read/write numerical parameter from the FB Series product's database can be selected.

4. Select **Save** to save any changes you make to this display.

4.25.1 Supported Operators and Functions

You can use the following operators and functions in math block calculation strings:

Table 45. Supported Operators

Symbol	Function	Description	Example
+	Addition	Add two numbers	A+B or (A+B)+C
-	Subtraction	Subtract two numbers	A-B or (A-B)-C
*	Multiplication	Multiply two numbers	A*B or (A*B)*C
/	Division	Divide two numbers	A/B or (A/B)/C
^	Exponent	Take one number to the power of another	A^B

Table 46. Supported Functions

Abbreviation	Function	Description	Example
ABS	Absolute Value	Returns the absolute value of a number	ABS(A)

Abbreviation	Function	Description	Example
SQRT	Square Root	Returns the square root of a number	SQRT(A)
LOG10	Base 10 Log	Returns the logarithm (base 10) of a number	LOG10(A)
LOG	Natural Log	Returns the logarithm (base e) of a number	LOG(A)
EXP	Exponent	Returns the value of an "e" to the power of a number	EXP(A)
POW	Power	Returns the result of a number raised to a power	POW(A,B)
MOD	Modulus	Returns the remainder of division	MOD(A,B)
ROUND	Round	Rounds a value to the nearest whole number	ROUND(A)
TRUNC	Truncate	Truncates a value to a whole number	TRUNC(A)
SIN	Sine	Returns the sine of the number	SIN(A)
COS	Cosine	Returns the cosine of the number	COS(A)
TAN	Tangent	Returns the tangent of the number	TAN(A)

4.26 Effects

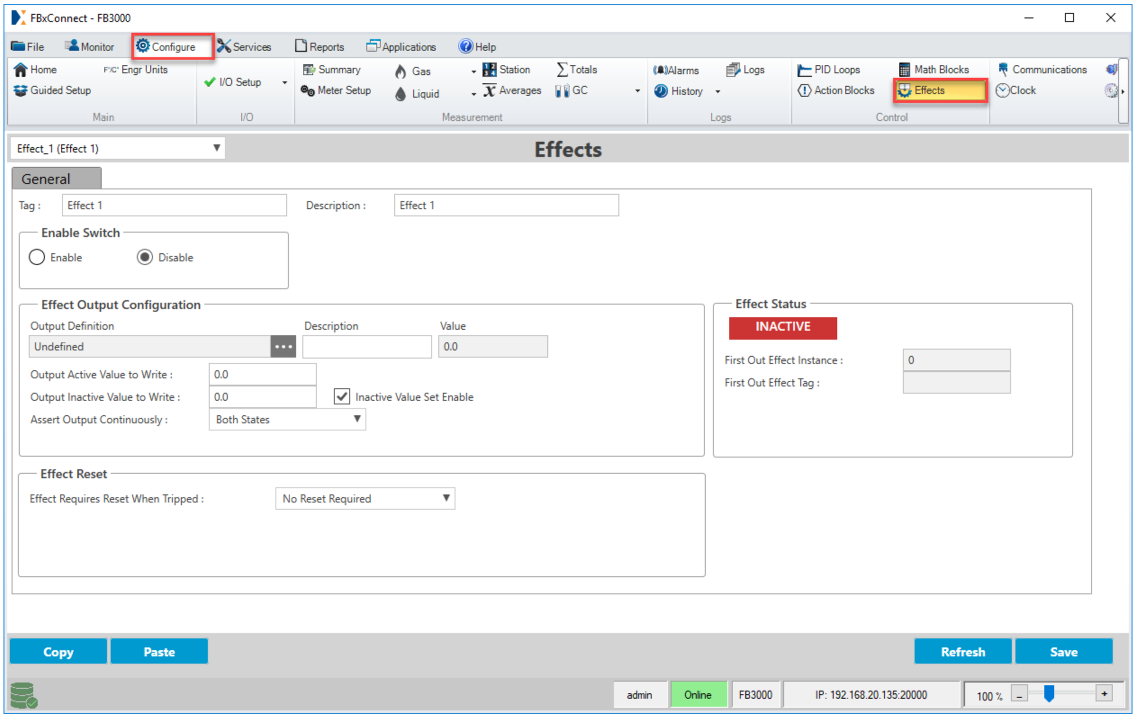
Effects are configurable custom logic components that drive a selected FB Series product parameter to a user defined value. They are similar to the concept of "cause and effect," where the action block replaces the "cause" and is used to activate one or more effects. FB3000 RTUs allow you to dynamically resize the number of instances to fit your specific needs on the Control Setup display.

To access this display:

1. Select **Configure > Effects** from the FBxConnect™ main menu.

2. Click ▼ in the drop-down list at the top of the display and select an instance to configure.

Figure 273. Effects



Effect_1 (Effect 1) ▼

Tag : Effect 1
Description : Effect 1

Enable Switch
○ Enable
● Disable

Effect Output Configuration

Output Definition	Description	Value
Undefined		0.0

Output Active Value to Write : 0.0
Output Inactive Value to Write : 0.0
☑ Inactive Value Set Enable
Assert Output Continuously : Both States ▼

Effect Status
INACTIVE
First Out Effect Instance : 0
First Out Effect Tag :

Effect Reset
Effect Requires Reset When Tripped : No Reset Required ▼

admin | Online | FB3000 | IP: 192.168.20.135:20000 | 100 %

---

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected instance.	
Description	Sets a description (up to 20-alphanumeric characters) for the selected instance.	
Enable Switch	Sets the status of the selected Effects instance.	
	Enable	The effect is evaluated and logic is performed.
	Disable	No logic is performed.
Effect Output Configuration	Use the fields in this section to configure an output parameter driven by the effect.	

Field	Description	
	Output Definition	Click … to open a Point Picker dialog and select an output parameter to be driven by the effect. You can select any read/write numerical parameter from the FB Series product's database. If you select an integer, they are converted to floating point values. **Note** When an output is not required, this field should be set to **Undefined**.
	Description	Sets a description (up to 20-alphanumeric characters) for the output parameter.
	Value	This **read-only** field shows the current numerical value of the defined output parameter.
	Output Active Value to Write	Sets the value written to the **Output Variable Param Reference** when the effect is tripped (Active).
	Output Inactive Value to Write	Sets the value written to the **Output Variable Param Reference** when the effect is not tripped (Inactive).
	Inactive Value Set Enable	Selects if the value configured in the **Output Inactive Value to Write** field is used. If unchecked, this value is not written to the defined output parameter when the effect is not tripped (inactive).
	Assert Output Continuously	Click ▼ to select how the system writes the values defined in the **Output Active Value to Write** and **Output Inactive Value to Write** fields to the effect output parameter defined in the **Output Variable Parameter Reference** field. • **Neither State –** The system writes the value configured in the **Output Active Value to Write** field to the output parameter one time when the **Effect Status** changes to **Active**. and writes the value configured in the **Output Inactive Value to Write** field to the output parameter one time when the **Effect Status** changes to **Inactive**.

Field	Description	
		• **Active State Only –** The system continuously writes the value configured in the **Output Active Value to Write** field to the output parameter while the **Effect Status** is **Active**. • **Inactive State Only** – The system continuously writes the value configured in the **Output Inactive Value to Write** field to the output parameter while the **Effect Status** is **Inactive**. • **Both States –** The system continuously writes the value configured in the **Output Active Value to Write** field to the output parameter while the **Effect Status** is **Active**, and continuously writes the value configured in the **Output Inactive Value to Write** field to the output parameter while the **Effect Status** is **Inactive**.
Effect Status	Shows the current trip status of the effect. Possible values are Active or Inactive.	
	First Out Effect Instance	Shows the numerical value of the associated Action Block (1 through 30) that first tripped this effect to go active. If the effect is associated with multiple action blocks (all of which could be active), this field indicates which Action Block was active first.
	First Out Effect Tag	Shows the tag of the associated Action Block that first tripped this effect to go active.
Effect Reset	Use the fields in this section to configure parameters used to manually reset the effect.	
	Effect Requires Reset When Tripped	Select this option if the effect requires a manual reset (user intervention). When selected, the effect will not leave the active state until explicitly told to do so via a reset. If this option is not selected, the effect moves to the inactive state automatically when the action block(s) that tripped it become inactive.

Field	Description	
	Reset Definition	Click … to open a Point Picker dialog and select a parameter used to force a manual reset of the active effect. When the effect is ready to be reset, any non-zero value written to the referenced parameter resets the effect. For example, you might select a discrete input or a User Data byte value. Any read/write numerical parameter from the FB Series product's database can be selected. **Note** You **must** select **Reset Required** in the **Effect Requires Reset When Tripped** field and **Save** your changes to view this field.
	Reset Command	If a dynamic external input is not required to reset a "latched" effect, this field can be used to reset the effect. Any non-zero value written to this parameter will perform the effect reset. **Note** You **must** select **Reset Required** in the **Effect Requires Reset When Tripped** field and **Save** your changes to view this field.

4. Select **Save** to save any changes you make to this display.

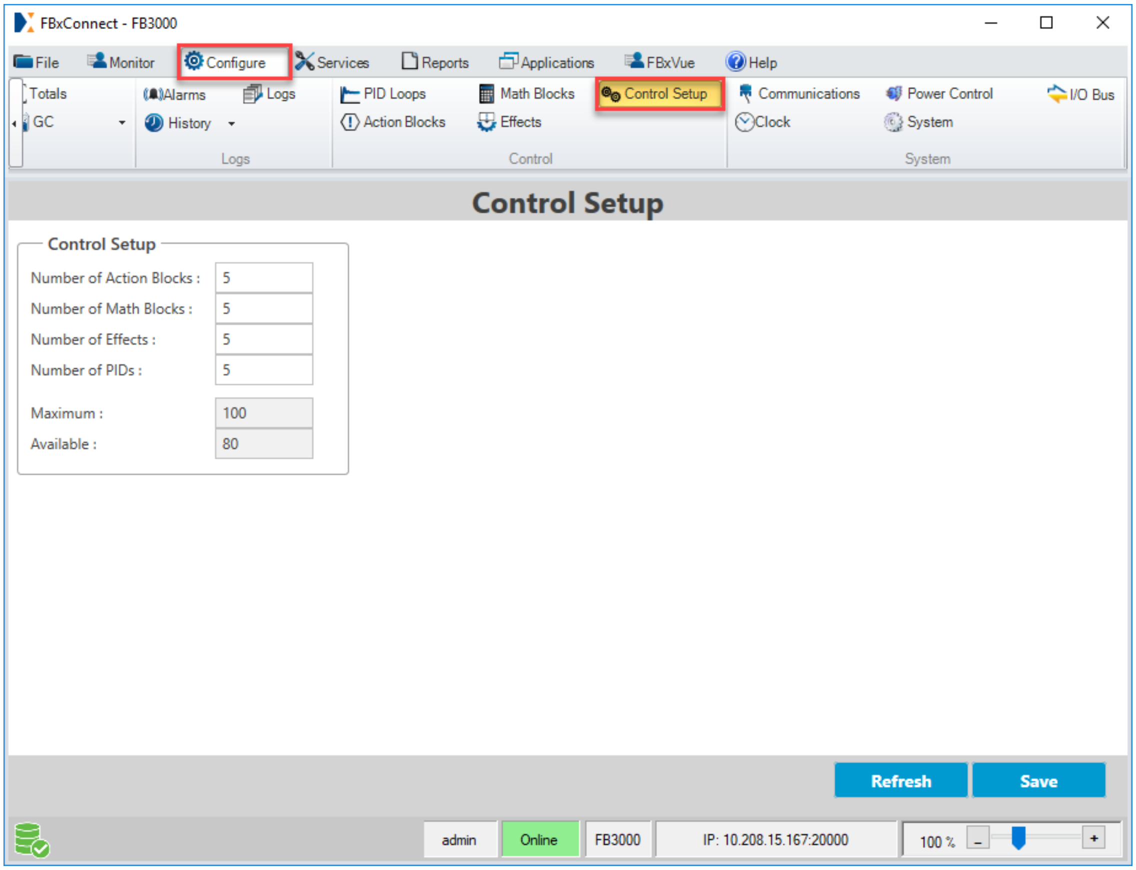
4.27 Control Setup

Use this display to configure the number of Action Blocks, Math Blocks, Effects, and PID Loops instances available on your FB3000 RTU. The FB3000 RTU allows you to dynamically resize the number of instances for each control type (Action Blocks, Math Blocks, Effects, and PID Loops) to fit your specific needs. Enter the number of desired instances for each control type and save your changes.

To access this display:

1. Select **Configure > Control Setup** from the FBxConnect™ main menu.

Figure 274. Control Setup



Control Setup
Number of Action Blocks : 5
Number of Math Blocks : 5
Number of Effects : 5
Number of PIDs : 5
Maximum : 100
Available : 80

2. Review – and change as necessary – the values in the following fields:

Field	Description
Number of Action Blocks	Sets the number of Action Blocks instances available on your FB3000.
Number of Math Blocks	Sets the number of Math Blocks instances available on your FB3000.
Number of Effects	Sets the number of Effects instances available on your FB3000.
Number of PIDs	Sets the number of PID Loops instances available on your FB3000.
Maximum	This **read-only** field shows the total number of control instances you can configure on your FB3000. You can assign these instances to Action Blocks, Math Blocks, Effects, and PID Loops in any combination using the fields above, but the total of those instances cannot exceed this number.

Field	Description
Available	This **read-only** field shows the remaining control instances not yet assigned to Action Blocks, Math Blocks, Effects, or PID Loops.

3. Select **Save** to save any changes you make to this display.

4.28 Communications

Use this display to configure the communications ports on your FB Series product.

To access this display, select **Configure > Communications** from the FBxConnect™ main menu.

Figure 275. Communications

CAUTION

When making multiple FBxConnect™ connections to the same FB Series product (as with a remote and a local connection), be aware that the changes one connection makes to the FB Series product may not be immediately visible to other connections, and may even require the other connections to restart FBxConnect™ before changes become visible. For example, simple changes (such as changes to setpoints) may be immediately visible to all connections, but changing the number of meters, configuring I/O, adding/deleting menu items, or other major configuration changes may require re-establishing the connection using FBxConnect™.

The Communications display contains the following items:

General – Use this display configure general settings for the selected port, including enabling the port and setting the protocol used by the port.

DNP3 – Use this pop-up display to configure protocol options for communications ports using DNP3 protocol.

Modbus Slave – Use this pop-up display to configure protocol options for communications ports using Modbus Slave protocol.

Modbus Master – Use this pop-up display to configure protocol options for communications ports using Modbus Master protocol.

4.28.1 Communications – General

Use this display to configure general settings for the selected port, including enabling the port and setting the protocol.

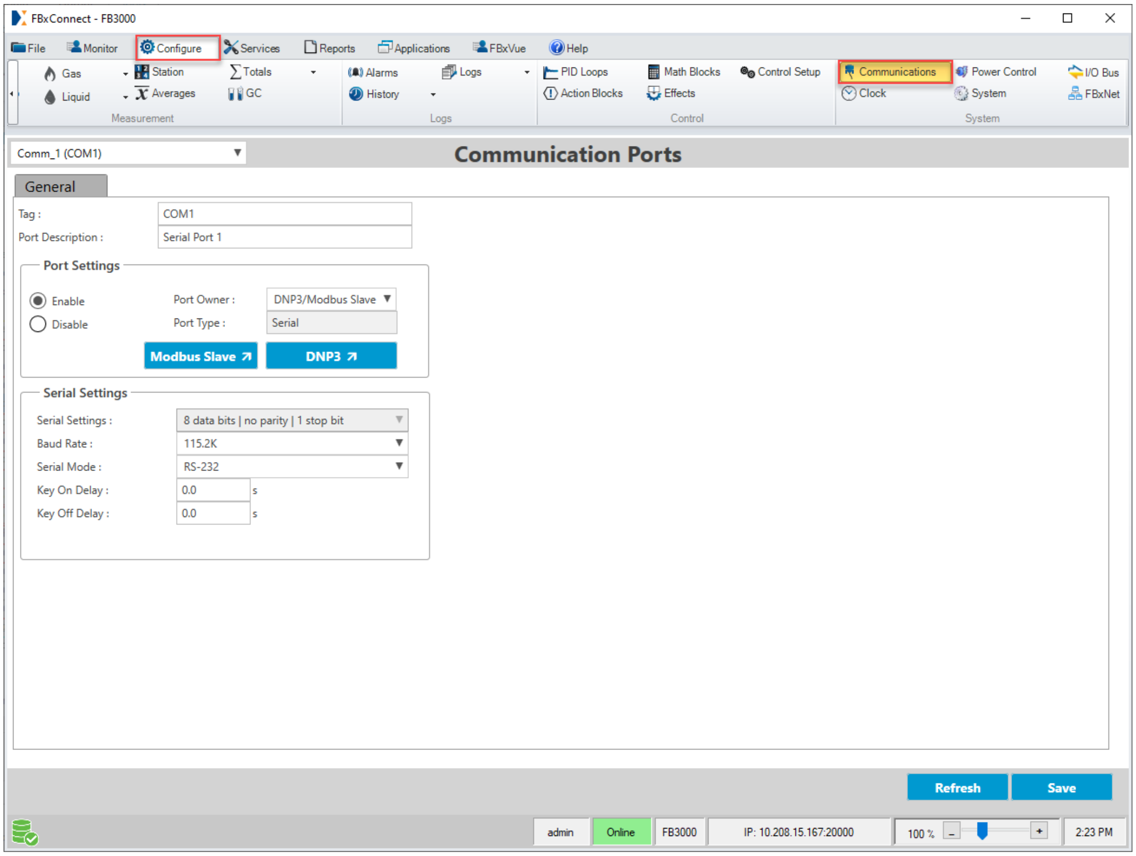
To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the drop-down list at the top of the display and choose a communications port to configure.

Note

FBxDesigner™ connections are currently supported **only** on **Comm5 (ENET1)**.

Figure 276. Communications – General (Serial port)



Comm_1 (COM1) ▼

Tag : COM1
Port Description : Serial Port 1

Port Settings
● Enable
○ Disable
Port Owner : DNP3/Modbus Slave ▼
Port Type : Serial

Serial Settings
Serial Settings : 8 data bits | no parity | 1 stop bit ▼
Baud Rate : 115.2K ▼
Serial Mode : RS-232 ▼
Key On Delay : 0.0 s
Key Off Delay : 0.0 s

3. Review – and change as necessary – the values in the following fields:

Field	Description	
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected communications port.	
Port Description	Sets a description (up to 20-alphanumeric characters) for the selected communications port.	
Port Settings	Sets if communications are allowed using the selected port.	
	Enable	Allow communications using the selected port.
	Disable	Prevent communications using the selected port. **WARNING:** To prevent flow calculation errors, do not disable a communications port when the Port Owner is MVS4088B and the 4088B's inputs are used for flow calculations. If you need to temporarily disable a specific 4088B, you can select **Disable** in the **Transmitter Scanning** field for that single 4088B. For more information, refer to 4088B – General tab.
Port Owner	Click ▼ to set the communications protocol used on the selected port. Possible protocols include: **Note** This field applies **only** to **Serial** and **Wi-Fi** communications ports.	
	DNP3/ Modbus Slave	Sets the selected port to **only** communicate using DNP3 protocol messages and to act as a Modbus slave device.
	DNP3	Sets the selected port to **only** communicate using DNP3 protocol messages.
	Modbus Slave	Sets the selected port to allow the FB Series product to act **only** as a Modbus slave device.
	Master Modbus	Sets the selected port to allow the FB Series product to poll Modbus devices.

Field	Description	
	MVS4088B	Sets the selected port to **only** communicate with 4088B devices. The FB Series product automatically configures settings to match the defaults of the 4088B's serial port. **Note** This field applies **only** to the **Com3** or **Com4** communications port.
	Application Master	Sets the selected port to **only** communicate as a master device for an installed application.
	Application Slave	Sets the selected port to **only** communicate as a slave device for an installed application.
Port Type	This **read-only** field shows the type of communications port currently selected.	
Modbus Slave	Select this button to open the Modbus Slave pop-up display and configure Modbus Slave protocol options. **Note** This button appears **only** if you select either **DNP3/Modbus Slave** or **Modbus Slave** in the **Port Owner** field.	
DNP3	Select this button to open the DNP3 pop-up display and configure DNP3 Slave protocol options. **Note** This button appears **only** if you select either **DNP3/Modbus Slave** or **DNP3** in the **Port Owner** field.	
Modbus Master	Select this button to open the Modbus Master pop-up display and configure Modbus Master protocol options. **Note** This button appears **only** if you select **Modbus Master** in the **Port Owner** field.	
Serial Settings	Use these fields to configure the selected serial port. **Note** These fields appear **only** if you select a **Serial** port in the Communications drop-down list.	

Field	Description	
	Serial Settings	Click ▼ to set the number of data bits and stop bits contained in an asynchronous byte, and the parity value used for communications on the port. **Note** Communications with FBxConnect™ software support **only** the default option of **8 data bits/no parity/1stop bit**.
	Baud Rate	Click ▼ to set the transmit and receive data baud rate (in bits per second) for the communications port.
	Serial Mode	Click ▼ to set the type of interface used by the communications port. Possible options are RS-232, RS-485 2-Wire (No Termination), RS-485 2-Wire (Terminated), RS-485 4-Wire (No Termination), and RS-485 4-Wire (Terminated).
	Key On Delay	Sets the time (in seconds) from RTS signal activation to the transmission of the first character. **Note** This field **does not** appear if you select **MVS4088B** in the Port Owner field.
	Key Off Delay	Sets the time (in seconds) from the transmission of the last character to RTS signal de-activation. **Note** This field **does not** appear if you select **MVS4088B** in the Port Owner field.
IP Settings	Use these fields to configure the selected Ethernet port. **Note** These fields appear **only** if you select the **Ethernet** port in the Communications drop-down list.	
	IPv4 IP Address	Sets the IP address for the FB Series product when using the Ethernet port. **Note** You **must** have separate IP Addresses for each Ethernet port.

Field	Description	
	Gateway Address (IPv4)	Sets the gateway address for the FB Series product. The gateway address identifies the network node that serves as an entrance to the network on which the FB Series product resides.
	Subnet Mask (IPv4)	Sets a value for the subnet mask portion of the IP address. The subnet mask indicates the subnet to which an IP address belongs.
	MAC 48-bit Address	This **read-only** field shows the MAC address for the FB Series product when using the Ethernet port.
Properties	Use these fields to enable or disable communications protocols on the Ethernet port, and to set the IP port number used by each protocol. **Note** These fields appear **only** if you select the **Ethernet** port in the Communications drop-down list**.**	
	Protocol	Place a check mark next to the communications protocols that are enabled on the Ethernet port. Possible options are DNP3, Modbus Slave, HART_IP (slave), and Modbus Master. **Note** • You **must** have a physical HART module to enable HART protocol. • If you enable HART protocol on the port, you also **must** enable Pass Through Mode on the HART module for the HART pass through feature to work. For more information, refer to HART I/O.
	Port #	Sets the IP port number to be used by the protocol. **Note** **Do not** enter **9009** for this number; it is reserved by FBxNet.

Field	Description	
	Enable	Place a check mark next to each protocol to enable the FB Series product to use the selected communication protocol on the Ethernet port. Removing a check mark disables use of the selected protocol on the Ethernet port.
	Allow Application Use of Port	Place a check mark next to this option to allow applications installed on your FB3000 RTU to communicate using the selected Ethernet port.
IP Connections	Use these fields to configure the number of connections and the protocols used with communications over the Ethernet ports. **Note** - These fields appear **only** if you select either **Comm_5** or **Comm_6** in the Communications drop-down list. - FBxNet and Modbus Master Ethernet connections are managed separately and **do not** count towards the Maximum Number of Connections.	
	Maximum Number of Connections	This **read-only** field shows the maximum number of connections allowed on the selected Ethernet port.
	Current Number of Connections	This **read-only** field shows the current number of connections active on the selected Ethernet port.
	Reserved	Sets, for each protocol, the minimum number of connections dedicated to using only that protocol on the selected Ethernet port. For example, if you enter 6 in the DNP3 row, you reserve at least 6 DNP3 connections of DNP3 type, leaving 14 connections (20 max - 6 reserved) available to use with any type of protocol, including DNP3.
	Active	This **read-only** field shows, for each protocol, the current number of connections using the protocol on the selected Ethernet port.

Field	Description	
	Current Application Connections	This **read-only** field shows the current number of application connections active on the selected Ethernet port. **Note** These connections **do not** count towards the maximum number of connections.

4. Select **Save** to save any changes you make to this display.

4.28.1.1 Port Owners

You can configure the port owner (communications protocol) used by each communications port. Possible options for each communications port type are listed below:

Table 47. Port Owners

Communications Port Type	Port Owner
Serial	• DNP3 • DNP3/Modbus Slave • Modbus Slave • Modbus Master • MVS4088B • Application Master • Application Slave
Ethernet	One session dedicated to: • Modbus Master Six sessions configurable as: • DNP3 • Modbus SlaveHART IP Slave

Note

For a detailed description of the **DNP3 protocol** usage, refer to the *DNP3 Protocol Specifications Manual (for the Emerson FB3000 RTU)* (D301858X012).

4.28.2 Communications – DNP3

Use this pop-up display to configure options when using the DNP3 protocol. FB Series products can be implemented as DNP3 outstations for communication and configuration with Emerson Field Tools software and SCADA hosts. DNP3 is an open and public protocol used to ensure standards-based inter-operability between DNP3 outstations and a SCADA host.

FB Series products use DNP3 tunnel command messaging for RDI data collection and FB Series product configuration. A single message size can be 4096 bytes in size. Messages tunnel using the DNP3 string object (group 110).

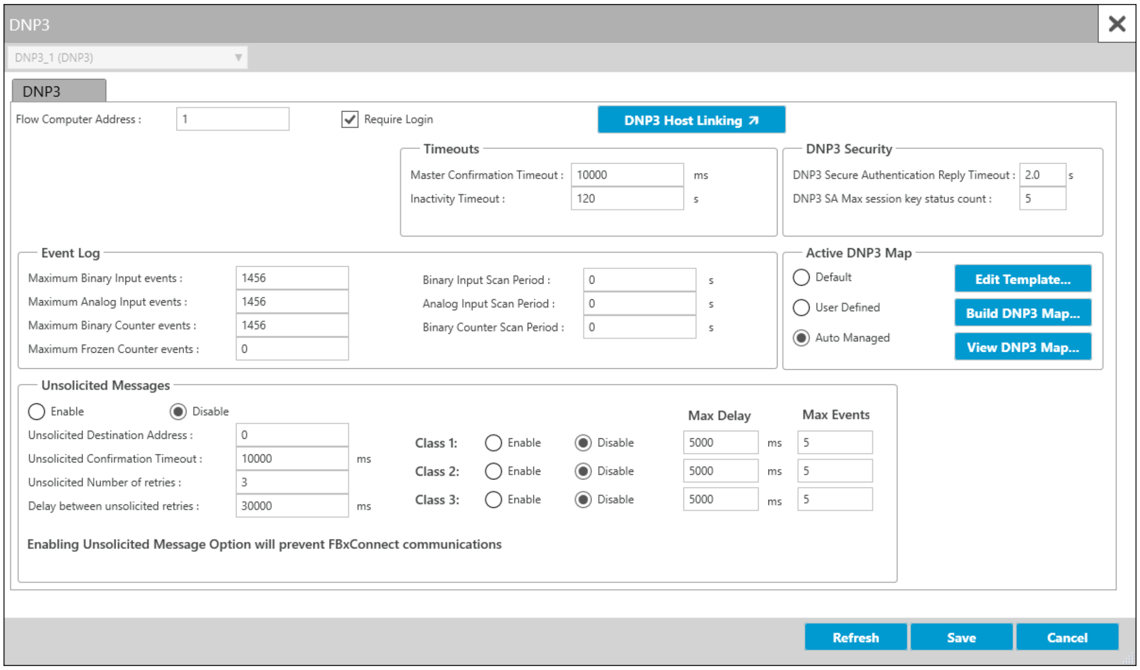
Note

- This pop-up display is available **only** if you select either **DNP3** or **DNP3/Modbus Slave** in the **Port Owner** drop-down list on the Communications – General display.
- For a detailed description of the **DNP3 protocol** usage, refer to the *DNP3 Protocol Specifications Manual (for the Emerson FB3000RTU)* (D301858X012).

To access this pop-up display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.

Figure 277. Communications – DNP3



Flow Computer Address : 1
☑ Require Login

Timeouts
Master Confirmation Timeout : 10000 ms
Inactivity Timeout : 120 s

DNP3 Security
DNP3 Secure Authentication Reply Timeout : 2.0 s
DNP3 SA Max session key status count : 5

Event Log
Maximum Binary Input events : 1456
Maximum Analog Input events : 1456
Maximum Binary Counter events : 1456
Maximum Frozen Counter events : 0
Binary Input Scan Period : 0 s
Analog Input Scan Period : 0 s
Binary Counter Scan Period : 0 s

Active DNP3 Map
○ Default
○ User Defined
● Auto Managed

Unsolicited Messages
○ Enable ● Disable
Unsolicited Destination Address : 0
Unsolicited Confirmation Timeout : 10000 ms
Unsolicited Number of retries : 3
Delay between unsolicited retries : 30000 ms

			Max Delay		Max Events
Class 1:	○ Enable	● Disable	5000	ms	5
Class 2:	○ Enable	● Disable	5000	ms	5
Class 3:	○ Enable	● Disable	5000	ms	5

Enabling Unsolicited Message Option will prevent FBxConnect communications

4. Review – and change as necessary – the values in the following fields:

Field	Description
Flow Computer Address	Sets the address of the FB Series product. Valid values are 0 – 65519.
Require Login	Place a check mark to require login credentials be entered for all requests using DNP3 protocol on the selected communication port. **Note** If Require Login is Disabled, activity for the selected communication port is logged under user account UNSECURED_DNP3.
DNP3 Host Linking	Select to open the DNP3 Host Linking display and define which communications ports on the FB Series product are used to communicate with SCADA hosts using DNP3 protocol. For more information, refer to DNP3 Host Information. **Note** • Events are divided evenly between each configured host. • The maximum number of events (configured in the **Event Log** frame) for each communications port decreases for each DNP3 Host Link you add.

Field	Description
TCP/IP	Enables or disables DNP3 protocol communications for this port. **Note** This field applies **only** to the Ethernet port.
TCP/IP Port	Sets the communications IP port number on the FB Series product to be used by DNP3 protocol. **Note** • This field applies **only** to the Ethernet port. • **Do not** enter **9009** for this number; it is reserved by FBxNet.
Master Confirmation Timeout	Sets the length of time (in milliseconds) the slave DNP3 device waits for a confirmation message from the master for a response sent to a master device before retrying the request. The default is 10000 milliseconds.
Inactivity Timeout	Sets the length of time (in seconds) without a valid DNP3 message being received before the user login is timed out. The default is 120 seconds.
DNP3 Secure Authentication Reply Timeout	Sets the length of time (in seconds) the system waits for the master to respond to a request. **Note** • This field is applicable only if you have SAv5 enabled. For more information, refer to Apply Security File. • For security, the length of time you enter should be kept as short as possible. • Care needs to be taken when tuning this parameter as setting the value too short relative to the network speed can cause failure to communicate with hosts.
DNP3 SA Max session key status count	Sets the number of session key exchanges that, when exceeded, causes the system to log an event in the security log.

Field	Description
Maximum Binary Input Events	Sets the number of the most recent binary events to be maintained for a host device to request. The high limit is 17. Refer to *DNP3 Protocol Specifications Manual (for the Emerson FB3000RTU)* (D301858X012) for a list of supported binary input points. **Note** • If the desired maximum number of events is 0, then the Group 2 Scan Period field should be set to 0 (disabled). • The maximum number of events decreases for each DNP3 Host Link you add (configured on the DNP3 Host Linking display).
Maximum Analog Input Events	Sets the number of the most recent analog input events to be maintained for a host to request. The high limit is 115. **Note** • If the desired maximum number of events is 0, then the Group 32 Scan Period field should be set to 0 (disabled). • The maximum number of events decreases for each DNP3 Host Link you add (configured on the DNP3 Host Linking display).
Maximum Binary Counter Events	Sets the number of the most recent binary counter events to be maintained for a host to request. The high limit is 10. **Note** • If the desired maximum number of events is 0, then the Group 22 Scan Period field should be set to 0 (disabled). • The maximum number of events decreases for each DNP3 Host Link you add (configured on the DNP3 Host Linking display).
Maximum Frozen Counter Events	Sets the number of the most recent frozen counter events to be maintained for a host to request. **Note** This feature is **not** currently supported.
Binary Input Scan Period	Sets the scan period (in seconds) for the binary input group. A value of 1 indicates that all supported binary input points are scanned for changes every one second. The default is 0 (scanning disabled). Refer to *DNP3 Protocol Specifications Manual (for the Emerson FB3000RTU)* (D301858X012) for a list of supported binary input points. **Note** Scanning the database increases CPU loading.

<table>
<tr><th>Field</th><th colspan="5">Description</th></tr>
<tr><td>Analog Input Scan Period</td><td colspan="5">Sets the scan period (in seconds) for the analog input group. A value of 1 indicates that all supported analog input points are scanned for changes every one second. Refer to <i>DNP3 Protocol Specifications Manual (for the Emerson FB3000RTU)</i> (D301858X012) for a list of supported analog input points.</td></tr>
<tr><td>Binary Counter Scan Period</td><td colspan="5">Sets the scan period (in seconds) for the counter group. A value of 1 indicates that all supported binary input points are scanned for changes every one second.</td></tr>
<tr><td rowspan="6">Active DNP3 Map</td><td colspan="5">Specifies the DNP3 map used by the FB Series product.</td></tr>
<tr><td>Default</td><td colspan="4">The FB Series product uses the default DNP3 map.</td></tr>
<tr><td rowspan="2">User Defined</td><td colspan="4">The FB Series product uses a user-defined DNP3 map. If you select this option, save your changes and use the button below to define the DNP3 mapping used by the FB Series product.</td></tr>
<tr><td>DNP3 Mapping</td><td colspan="3">Select to open the DNP3 Map Table and define the DNP3 mapping used by the FB Series product. For more information, refer to DNP3 Map Table.
Note
This button appears only if you select User Defined and Save your changes.</td></tr>
<tr><td rowspan="2">Auto Managed</td><td colspan="4">The FB Series product uses Object Mapping Template files to define the DNP3 map. If you select this option, save your changes and use the buttons below to define the DNP3 mapping used by the FB Series product.
Note
The following buttons appear only if you select Auto Managed and Save your changes.</td></tr>
<tr><td>Edit Template</td><td colspan="3">Select this button to open the Object Mapping Template Editor and edit the template. For more information, refer to Creating an Object Mapping Template.</td></tr>
</table>

Field	Description	
	Build DNP3 Map	Select this button to open the DNP3 Map Generator and immediately begin building the DNP3 map based on the currently configured Object Mapping Template files. For more information, refer to Building a DNP3 Map.
	View DNP3 Map	Select this button to open a **read-only** version of the currently configured DNP3 map. For more information, refer to Viewing a DNP3 Map.
Unsolicited Messages	Enables the FB Series product to send unsolicited messages on the selected port. **Note** Enabling unsolicited messages will prevent FBxConnect communications on the selected port.	
Unsolicited Destination Address	Sets the destination device address to use when sending unsolicited messages to a host system.	
Unsolicited Confirmation Timeout	Sets the length of time (in milliseconds) the FB Series product waits for a confirmation message from the host device for an unsolicited data transmission before marking the message as retry needed.	
Unsolicited Number of Retries	Specifies the maximum number of unsolicited retries to the host before discarding the message.	
Delay Between Unsolicited Retries	Sets the length of time (in milliseconds) to wait after an unsolicited confirmation from the host before retrying the unsolicited message to the host device.	
Class 1/2/3	Enables unsolicited messages for class 1 (highest importance), class 2, and class 3 (lowest importance) events. Sends out an unsolicited message based on the maximum time (in milliseconds) or when the maximum number of events have been queued for transmission.	

Field	Description
Max Delay	Sets the maximum amount of time (in milliseconds) before an unsolicited message is generated and sent to the host for class 1, class 2, and class 3 event categories. If this value is set to 5000, the FB Series product sends an unsolicited message to the host every five seconds with any events changes since the last unsolicited message.
Max Events	Specifies the maximum number of events that will be queued before an unsolicited message is generated and sent to the host for class 1, class 2, and class 3 event categories.

5. Select **Save** to save any changes you make to this pop-up display.

4.28.2.1 DNP3 Host Information

Use this pop-up display to define which communications ports on the FB Series product are used to communicate with SCADA hosts using DNP3 protocol. For the FB3000 RTU, you can define up to ten communications ports.

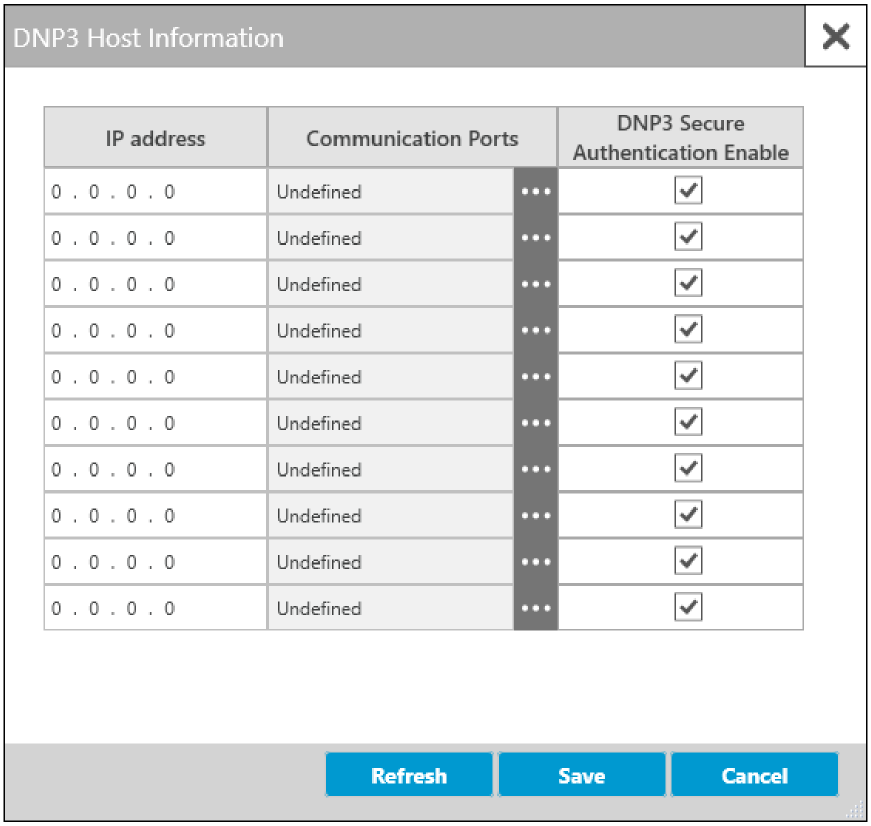
Note

It is possible to exceed the maximum number of DNP3 connections (as configured on the Communications – General display) when adding multiple IP addresses to the DNP3 Host Information display without saving between each entry. If you exceed the allowed number, the connections will appear to save but will not work. To avoid this issue, you should save the DNP3 Host Information display after each IP address you enter.

To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port that is configured to use the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.
4. Select the **DNP3 Host Linking** button. The DNP3 Host Information display opens.

Figure 278. DNP3 Host Information



IP address	Communication Ports	DNP3 Secure Authentication Enable
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑
0 . 0 . 0 . 0	Undefined •••	☑

5. Click ••• in the Communication Ports field to open a Point Picker dialog and select the desired communications port.

Note

- The Port Owner of each selected communications port **must** be set to DNP3 or DNP3/Modbus Slave.
- If you select an Ethernet port, you **must** enter the IP address of the SCADA host in the IP address field.
- Events are divided evenly between each configured host.
- The maximum number of events (configured in the **Event Log** frame on the Communications – DNP3 pop-up display) for each communications port decreases for each DNP3 Host Link you add.

6. The **DNP3 Secure Authentication Enable** checkbox sets if SAv5 is enabled (checked) or disabled (unchecked) for all DNP3 traffic on individual serial ports or specific IP

addresses on Ethernet ports. This is useful if you need to communicate with a host/device that does not support SAv5. The default is checked.

Note

This field appears **only** if you have enabled SAv5 on the FB Series product. For more information, refer to Apply Security File.

7. Select **Save** to save any changes you make to this pop-up display.

4.28.2.2 DNP3 Map Table

Use this pop-up display to configure the DNP3 groups and point indexes stored in the FB Series product. You can add a parameter to the DNP3 map table by clicking and dragging the parameter onto the desired position in the table or selecting the desired parameter (or referenced parameter) and clicking the **Add** button.

Note

For a description of the data types contained in the internal FB Series product database, refer to Native Data Types.

DNP3 Mapping Basics

- Different signal types have separate map tables.
- Each entry in a map table is identified by its Point Index.
- You add a device parameter to a Point Index.
- You assign a class to each added parameter. Each class can have a user-defined significance based on your own definition.
- Each parameter belongs to a certain group. Groups enable you to classify the data types within a message. Each group number shares a common point type and a common method of data generation, creation, and collection.
- Variations are different encoding formats for the data types within a group.
- Static data refers to a point’s current or most recently recorded value. For binary input points, “static data” refers to the present on/off condition.
- Events are associations with changes in points, such as state changes, measurement at some threshold, or an analog input changing by more than its defined dead band.

Note

For a complete description of DNP3 implementation in the FB Series devices, refer to the *DNP3 Protocol Specifications Manual (for the Emerson FB3000RTU)* (D301858X012).

To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.
4. Select **User Defined** in the Active DNP3 Map field.
5. Select **Save** to save your changes. A DNP3 Mapping button appears.
6. Select the **DNP3 Mapping** button. The DNP3 Map Table display opens.

Figure 279. DNP3 Map Table

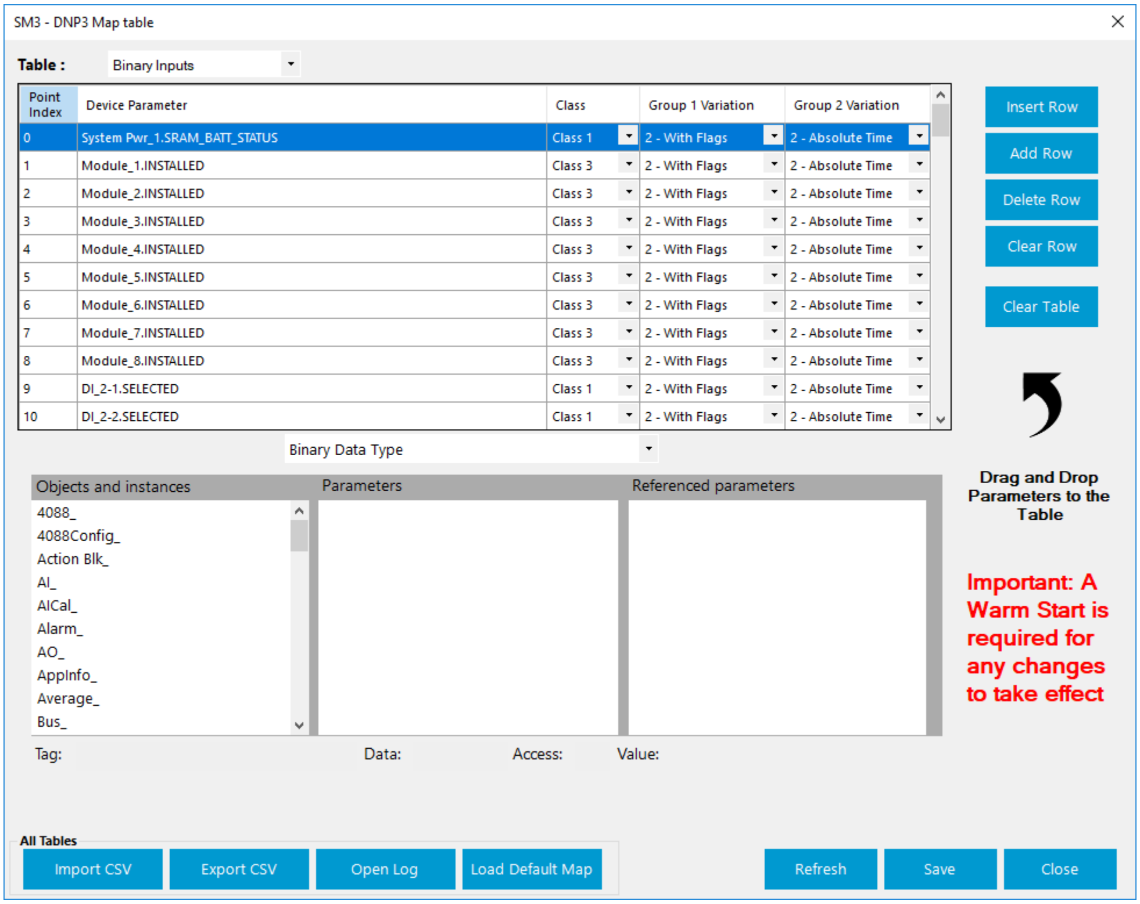


Table : Binary Inputs

Point Index	Device Parameter	Class	Group 1 Variation	Group 2 Variation
0	System Pwr_1.SRAM_BATT_STATUS	Class 1	2 - With Flags	2 - Absolute Time
1	Module_1.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
2	Module_2.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
3	Module_3.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
4	Module_4.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
5	Module_5.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
6	Module_6.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
7	Module_7.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
8	Module_8.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
9	DI_2-1.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
10	DI_2-2.SELECTED	Class 1	2 - With Flags	2 - Absolute Time

Binary Data Type

Tag: Data: Access: Value:

Drag and Drop Parameters to the Table

Important: A Warm Start is required for any changes to take effect

7. A separate map table is used for different signal types. Select ▼ in the Table drop-down list and choose the table with the signal type you want to map. Possible options and the maximum number of points are:
    - Binary Inputs – 10000 points
    - Binary Outputs – 10000 points
    - Analog Inputs – 10000 points
    - Analog Outputs – 10000 points
    - Counters – 10000 points
    - Strings – 10000 points

8. Review – and change as necessary – the values in the following fields:

Field	Description
Point Index	Identifies the point in the selected table.
Device Parameter	Identifies the parameter in the FB3000 RTU.
Class	Class 1, 2, and 3 are event classes. DNP3 does not assign significance to these event classes. Implementations can use different strategies around these classes, such as assigning highest priority events to class 1 and lowest priority events to class 3. Host devices may request events from one or more of these classes. Click ▼ to assign the selected parameter to a class. Possible options are: • Class 1 • Class 2 • Class 3 • All
Group 1 Variation	Binary Input Static. Used to report the current value of a binary input point. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = CHATTER_FILTER

Field	Description	
	Bit 6 = Reserved, always 0 Bit 7 = STATE **Note** This field appears **only** if you select **Binary Inputs** in the Table field.	
	None	No variation
	1 - Packed Format	Package format having single bit binary input state.
	2 - With Flags	Package format having single bit binary input state, with status flags.
Group 2 Variation	Binary Input Events. Used to report events related to a binary input point. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = CHATT_FILTER Bit 6 = Reserved, always 0 Bit 7 = STATE **Note** This field appears **only** if you select **Binary Inputs** in the Table field.	
	None	No variation
	1 - Without Time	Package format having single bit binary input state, with status flags
	2 - Absolute Time	Package format having single bit binary input state, with status flags, and the absolute time when the event occurred.
	3 - Relative Time	Package format having single bit binary input state, with status flags, and the relative time when the event occurred.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">Group 10 Variation</td><td colspan="2">Binary Output Static. Used to control or report the state of one or more binary output points. Possible status flags include:
Bit 0 = ONLINE
Bit 1 = RESTART
Bit 2 = COMM_LOST
Bit 3 = REMOTE_FORCED
Bit 4 = LOCAL_FORCED
Bit 5 = Reserved, always 0
Bit 6 = Reserved, always 0
Bit 7 = STATE
Note
This field appears only if you select Binary Outputs in the Table field.</td></tr>
<tr><td>None</td><td>No variation</td></tr>
<tr><td>1 - Packed Format</td><td>Package format having single bit binary output state.</td></tr>
<tr><td>2 - With Flags</td><td>Package format having single bit binary output state, with status flags</td></tr>
<tr><td rowspan="5">Group 12 Variation</td><td colspan="2">Binary Output Command or Control Relay Output Block. Used to perform digital control operations at binary output points.
Note
This field appears only if you select Binary Outputs in the Table field.</td></tr>
<tr><td>None</td><td>No variation</td></tr>
<tr><td>1 - CROB</td><td>Control Relay Output Block</td></tr>
<tr><td>2 - PCB</td><td>Pattern Control Block (PCB); this variation is not supported.</td></tr>
<tr><td>3 - Pattern Mask</td><td>Pattern Control Mask; this variation is not supported.</td></tr>
<tr><td>Group 30 Variation</td><td colspan="2">Analog Input Static. Used to report the current value of an analog input point. Possible status flags include:
Bit 0 = ONLINE
Bit 1 = RESTART
Bit 2 = COMM_LOST
Bit 3 = REMOTE_FORCED</td></tr>
</table>

Field	Description	
	Bit 4 = LOCAL_FORCED Bit 5 = OVER_RANGE Bit 6 = REFERENCE_ERR Bit 7 = Reserved, always 0 **Note** This field appears **only** if you select **Analog Inputs** in the Table field.	
	None	No variation
	1 - 32 bit w Flag	Package format containing a 32-bit signed integer, with status flags.
	2 - 16 bit w Flag	Package format containing a 16-bit signed integer, with status flags.
	3 - 32 bit wo Flag	Package format containing a 32-bit signed integer.
	4 - 16 bit wo Flag	Package format containing a 16-bit signed integer.
	5 - Float w Flag	Package format containing a single precision floating point value, with status flags.
	6 - Double w Flag	Package format containing a double precision floating point value, with status flags.
Group 32 Variation	Analog Input Events. Used to report events related to an analog input point. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = OVER_RANGE Bit 6 = REFERENCE_ERR Bit 7 = Reserved, always 0 **Note** This field appears **only** if you select **Analog Inputs** in the Table field.	
	None	No variation

Field	Description	
	1 - 32 bit wo Time	Package format containing a 32-bit signed integer, with status flags.
	2 - 16 bit wo Time	Package format containing a 16-bit signed integer, with status flags.
	3 - 32 bit w Time	Package format containing a 32-bit signed integer, with status flags, and the time when the event occurred.
	4 - 16 bit w Time	Package format containing a 16-bit signed integer, with status flags, and the time when the event occurred.
	5 - Float wo Time	Package format containing a single precision floating point value.
	6 - Double wo Time	Package format containing a double precision floating point value.
	7 - Float w Time	Package format containing a single precision floating point value, and the time when the event occurred.
	8 - Double w Time	Package format containing a double precision floating point value, and the time when the event occurred.
Group 40 Variation	Analog Output Status. Used to report the status of an analog output point. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = OVER_RANGE Bit 6 = REFERENCE_ERR Bit 7 = Reserved, always 0 **Note** This field appears **only** if you select **Analog Outputs** in the Table field.	
	1 - 32 bit w Flag	Package format containing a 32-bit signed integer, with status flags.

Field	Description	
	2 - 16 bit w Flag	Package format containing a 16-bit signed integer, with status flags.
	3 - Float w Flag	Package format containing a single precision floating point value, with status flags.
	4 - Double w Flag	Package format containing a double precision floating point value, with status flags.
Group 41 Variation	Analog Outputs. Used to set an analog output point. **Note** This field appears **only** if you select **Analog Outputs** in the Table field.	
	1 - 32 bit	Package format containing a 32-bit signed integer.
	2 - 16 bit	Package format containing a 16-bit signed integer.
	3 - Float	Package format containing a single precision floating point value.
	4 - Double	Package format containing a double precision floating point value.
Group 20 Variation	Counters Static. Used to report the current value of a counter point. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = ROLLOVER Bit 6 = DISCONTINUITY Bit 7 = Reserved, always 0 **Note** This field appears **only** if you select **Counters** in the Table field.	
	None	No variation
	1 - 32 bit w Flag	Package format containing a 32-bit unsigned integer, with status flags.

Field	Description	
	2 - 16 bit w Flag	Package format containing a 16-bit unsigned integer, with status flags.
	5 - 32 bit wo Flag	Package format containing a 32-bit unsigned integer.
	6 - 16 bit wo Flag	Package format containing a 16-bit unsigned integer.
Group 22 Variation	Counters Events. Used to report the value of a counter point after the count has changed. Possible status flags include: Bit 0 = ONLINE Bit 1 = RESTART Bit 2 = COMM_LOST Bit 3 = REMOTE_FORCED Bit 4 = LOCAL_FORCED Bit 5 = ROLLOVER Bit 6 = Reserved, always 0 Bit 7 = Reserved, always 0 **Note** This field appears **only** if you select **Counters** in the Table field.	
	None	No variation
	1 - 32 bit w Flag	Package format containing a 32-bit unsigned integer, with status flags.
	2 - 16 bit w Flag	Package format containing a 16-bit unsigned integer, with status flags.
	5 - 32 bit w Time & Flag	Package format containing a 32-bit unsigned integer, with status flags, and the time when the event occurred.
	6 - 16 bit w Time & Flag	Package format containing a 16-bit unsigned integer, with status flags, and the time when the event occurred.
Insert Row	Click to insert a row before the currently selected row.	
Add Row	Click to add a new row at the end of the selected table.	
Delete Row	Click to delete the currently selected row from the table.	
Clear Row	Click to delete the information in the currently selected row.	

Field	Description
Clear Table	Click to delete the current configuration for the selected table.
Filter	Click ▼ to narrow the number of parameters shown in the parameter list by object type.
Object and instances	Lists the available database objects (types) and instances (iterations) of each object. Select an Object and Instance to view the available parameters.
Parameters	Lists the available parameters (properties) for the selected object and instance.
Referenced Parameters	Lists the available parameters for the referenced object, when the data type of the parameter in the Parameters column is an OBJREF.
Tag	This **read-only** field shows the name of the parameter selected in the parameter list.
Data Type	This **read-only** field shows the data type of the parameter selected in the parameter list.
Access Type	This **read-only** field shows the read/write access of the parameter selected in the parameter list.
Value	This **read-only** field shows the value of the parameter selected in the parameter list.
Import CSV	Click to import a CSV file into your FB Series product that contains your desired DNP3 configuration. Navigate to the location of the saved CSV file and select **Open** to start the import process. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. Any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

Field	Description
Export CSV	Click to save a CSV file to your computer that contains the current DNP3 configuration of your FB Series product. A Select Table dialog opens where you can select which DNP3 tables to include in the export. Click **Start**, select a name and location for the exported file on your computer, and click **Save** to begin the export process. **Note** By default, all selected data is exported into a single file. Select **Export to individual file** to have the system create individual files for each DNP3 table you select.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect™ import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.
Load Default Map	Click to load the default DNP3 map into your FB Series product.
Refresh	Reloads the table with the data stored in the FB Series product.
Save	Saves any changes you have made to the selected table.
Close	Closes the current display.

9. Select an Object and Instance of that Object from the **Objects and instances** frame. A list of available parameters appears in the Parameters frame.
10. Click and drag a parameter from the **Parameters** frame (or the Referenced Parameters frame) to the desired Point Index in selected the Map Table.
11. Click ▼ in the **Class** column to assign a Class to the selected parameter.
12. Click ▼ in the **Variations** columns to assign the required variations to the selected parameter.
13. Select **Save** to save any changes you make to this pop-up display.

Note

A Warm Start is required before changes take effect.

4.28.2.2.1 Importing a DNP3 Map Table CSV File

You can import a CSV file that contains your DNP3 map table configuration for use in your FB Series product.

Note

- For more information about DNP3 map tables in the FB Series product, refer to DNP3 Map Table.
- For more information about creating your own DNP3 map table CSV file, refer to Creating a DNP3 Map Table CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current Modbus poll table configuration, refer to Exporting a DNP3 Map Table CSV File.

To import a CSV file that contains your DNP3 map table configuration:

1. Select Configu**re > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.
4. Set the Active DNP3 Map field to **User Defined**.
5. Select **Save** to save the changes to the display.
6. Select the **DNP3 Mapping** button. The DNP3 Map Table pop-up display opens.

Figure 280. DNP3 Map Table – Import CSV

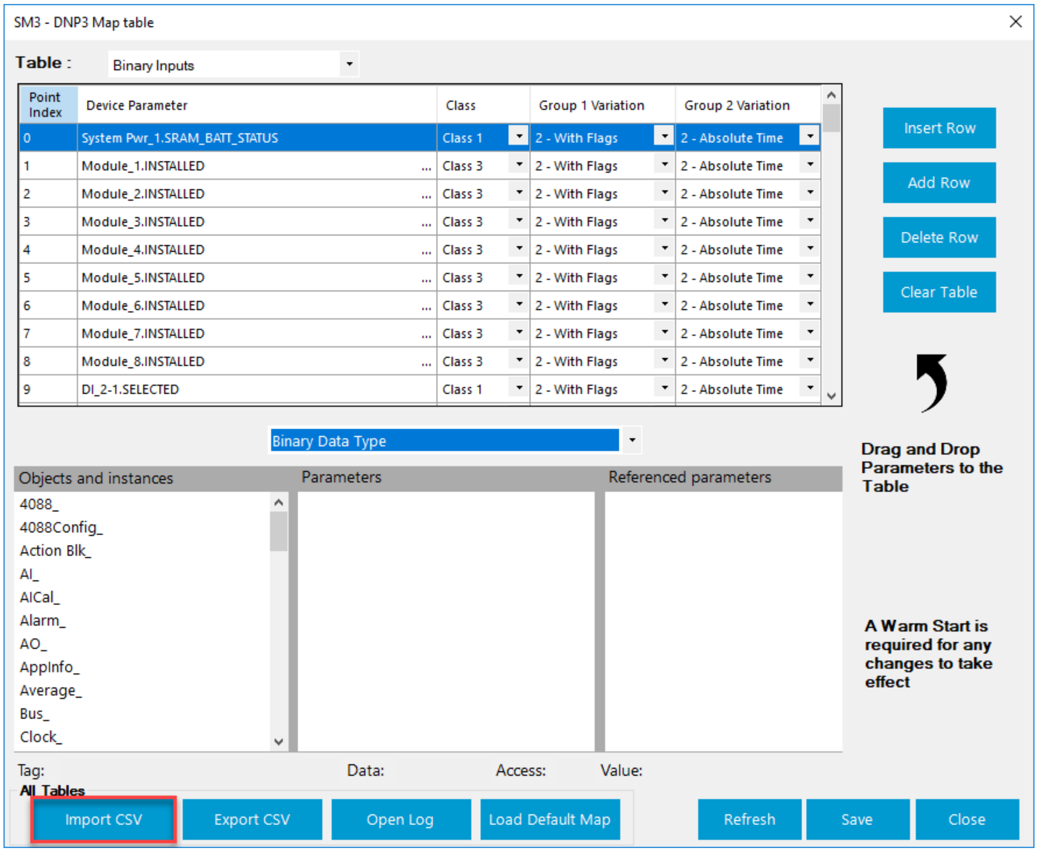


Table : Binary Inputs

Point Index	Device Parameter	Class	Group 1 Variation	Group 2 Variation
0	System Pwr_1.SRAM_BATT_STATUS	Class 1	2 - With Flags	2 - Absolute Time
1	Module_1.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
2	Module_2.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
3	Module_3.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
4	Module_4.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
5	Module_5.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
6	Module_6.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
7	Module_7.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
8	Module_8.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
9	DI_2-1.SELECTED	Class 1	2 - With Flags	2 - Absolute Time

Drag and Drop Parameters to the Table

A Warm Start is required for any changes to take effect

7. Select the **Import CSV** button.
8. Navigate to the file location of your CSV file and select **Open**.

Note

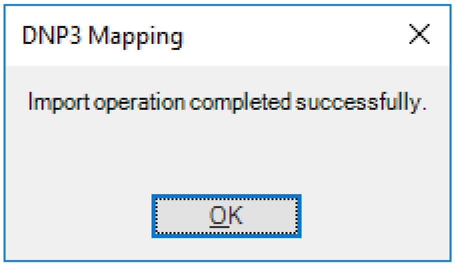
The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

9. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Note

A Warm Start is required before changes take effect.

Figure 281. Confirmation



Import operation completed successfully.

4.28.2.2.2 Exporting a DNP3 Map Table CSV File

You can export your FB Series product's current DNP3 map table configuration to a CSV file saved on your computer.

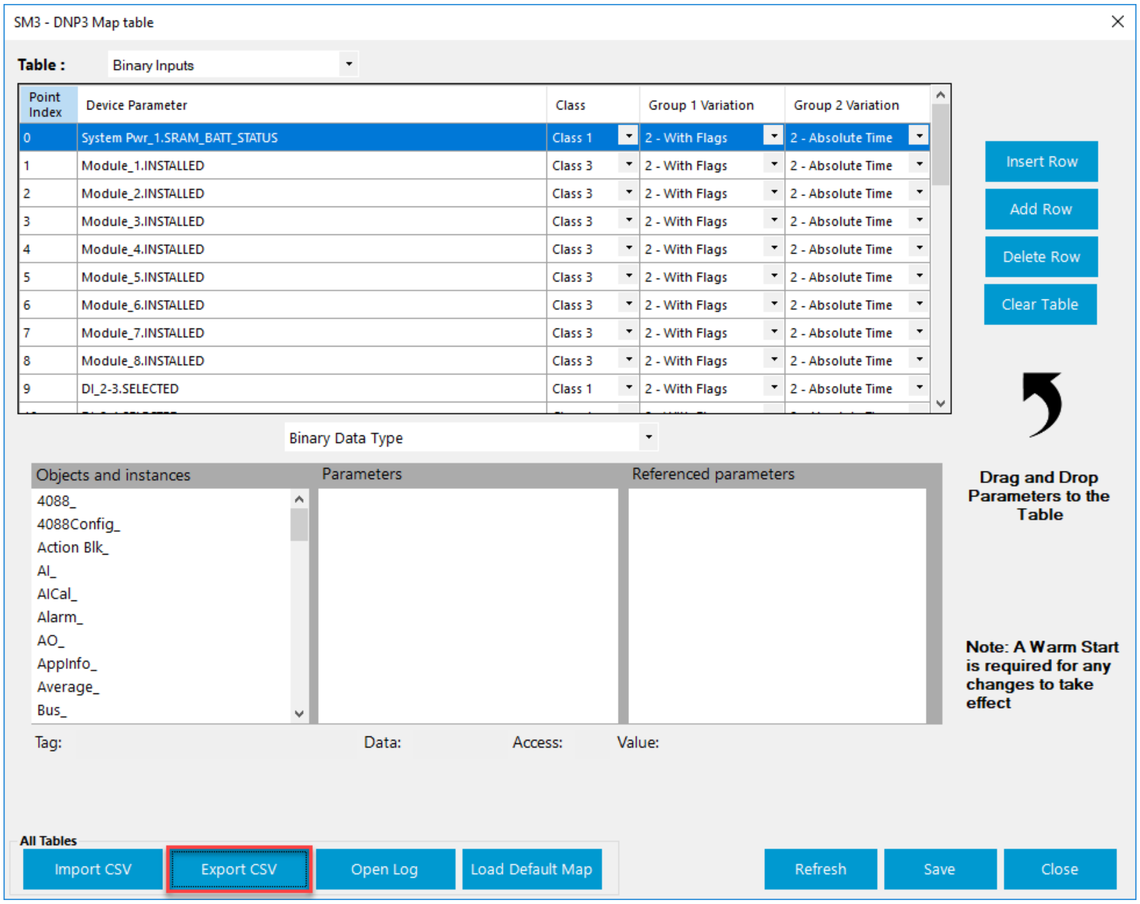
Note

- For more information about DNP3 map tables in the FB Series product, refer to DNP3 Map Table.
- For more information about creating your own DNP3 map table CSV file, refer to Creating a DNP3 Map Table CSV File.
- For more information about importing a CSV file that contains your DNP3 map table configuration for use in your FB Series product, refer to Importing a DNP3 Map Table CSV File.

To export a CSV file that contains your DNP3 map table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.
4. Set the Active DNP3 Map field to **User Defined**.
5. Select **Save** to save the changes to the display.
6. Select the **DNP3 Mapping button**. The DNP3 Map Table pop-up display opens.

Figure 282. DNP3 Map Table – Export CSV



SM3 - DNP3 Map table

Table : Binary Inputs

Point Index	Device Parameter	Class	Group 1 Variation	Group 2 Variation
0	System Pwr_1.SRAM_BATT_STATUS	Class 1	2 - With Flags	2 - Absolute Time
1	Module_1.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
2	Module_2.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
3	Module_3.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
4	Module_4.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
5	Module_5.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
6	Module_6.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
7	Module_7.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
8	Module_8.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
9	DI_2-3.SELECTED	Class 1	2 - With Flags	2 - Absolute Time

Binary Data Type

Objects and instances: 4088_, 4088Config_, Action Blk_, AI_, AICal_, Alarm_, AO_, AppInfo_, Average_, Bus_

Drag and Drop Parameters to the Table

Note: A Warm Start is required for any changes to take effect

7. Select the **Export CSV** button. The Select Table pop-up display opens.

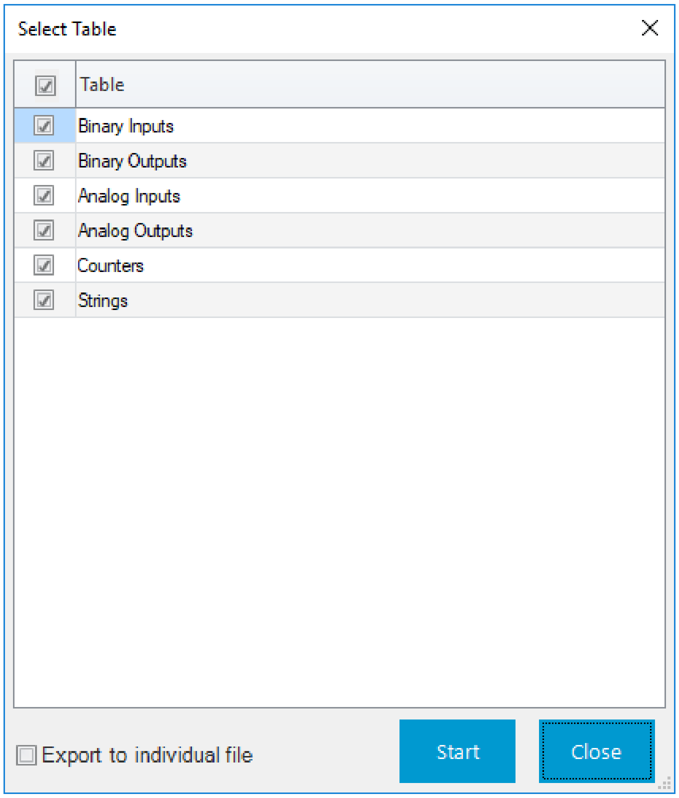


Figure 283. Select Table

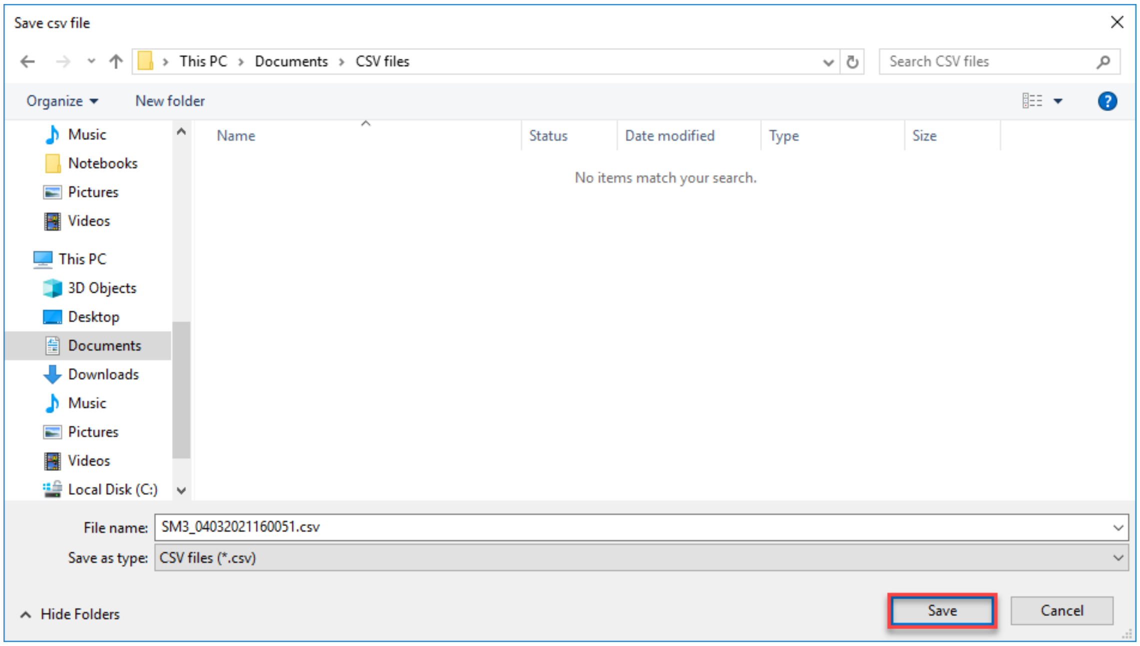
8. Place a check mark next to each table you want to export.

Note

By default, all selected tables are exported to a single file. If you want each selected table to be exported to individual files, place a check mark next to **Export to individual file**.

9. Select **Start**. A Save csv file window opens.

Figure 284. Save csv file



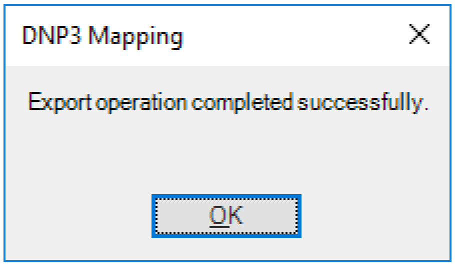
File name: SM3_04032021160051.csv

Save as type: CSV files (*.csv)

10. Navigate to a location on your computer to save your exported CSV file and select **Save**. The system exports the CSV file and displays a progress bar at the top of the display.

11. A confirmation message displays after exporting the CSV file. Select **OK** to complete the process.

Figure 285. Confirmation



Export operation completed successfully.

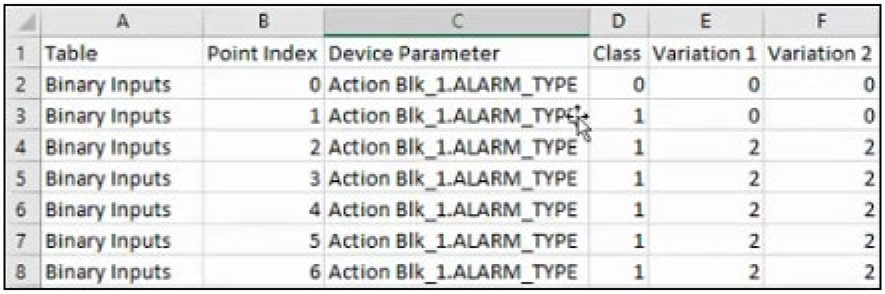
4.28.2.2.3 Creating a DNP3 Map Table CSV File

You can create a CSV file that contains your DNP3 map table on your computer, and then import the CSV file for use in the FB Series product. If your DNP3 map is large, it may be easier to create a CSV file on your computer than it is to configure the table in FBxConnect™.

Note

- For more information about DNP3 map tables, refer to DNP3 Map Table.
- For more information about importing CSV file that contains your DNP3 map table configuration for use in your FB Series product, refer to Importing a DNP3 Map Table CSV File.
- The DNP3 map CSV **must** contain the format shown below. The easiest way to begin creating a custom map is to export a CSV that contains the current configuration and then edit that file. For more information about exporting a CSV file, refer to Exporting a DNP3 Map Table CSV File.

Figure 286. Example DNP3 Map CSV Format



	A	B	C	D	E	F
1	Table	Point Index	Device Parameter	Class	Variation 1	Variation 2
2	Binary Inputs	0	Action Blk_1.ALARM_TYPE	0	0	0
3	Binary Inputs	1	Action Blk_1.ALARM_TYPE	1	0	0
4	Binary Inputs	2	Action Blk_1.ALARM_TYPE	1	2	2
5	Binary Inputs	3	Action Blk_1.ALARM_TYPE	1	2	2
6	Binary Inputs	4	Action Blk_1.ALARM_TYPE	1	2	2
7	Binary Inputs	5	Action Blk_1.ALARM_TYPE	1	2	2
8	Binary Inputs	6	Action Blk_1.ALARM_TYPE	1	2	2

To create a CSV file that contains your Modbus map table configuration:

1. Open a blank spreadsheet (or open your previously exported Modbus poll table CSV file).
2. In row one of the spreadsheet, enter the following text:
    - Column A = Table
    - Column B = Point Index
    - Column C = Device Parameter
    - Column D = Class
    - Column E = Variation 1
    - Column F = Variation 2
3. In the proceeding rows, enter information for each table entry according to the descriptions below:

Note

Drop-down lists on the FBxConnect™ display are represented as numbers in the CSV file. See the descriptions below for a description for each number.

Column Heading	Description
Table	Specifies which DNP3 table the selected row belongs to. Valid values and the number of points available in each table are listed below: • Binary Inputs – 10000 points • Binary Outputs – 10000 points • Analog Inputs – 10000 points • Analog Outputs – 10000 points • Counters – 10000 points • Strings – 10000 points
Point Index	Enter a number to specify the point in the selected table.
Device Parameter	Enter a parameter for the FB Series product's database.
Class	Enter a number to assign the selected parameter to a class. Possible options are: **0** None **1** Class 1 **2** Class 2 **4** Class 3 **7** All
Variation 1	Group variations are associated with different table types. Enter a number that corresponds to a bit for the selected table type. Refer to DNP3 Map Table for a complete list of variations and their associated bits. The variations for each table type are below: • Binary Input = Group 1 Variation • Binary Output = Group 10 Variation • Analog Input = Group 30 Variation • Analog Output = Group 40 Variation • Counters = Group 20 Variation

Column Heading	Description
Variation 2	Group variations are associated with different table types. Enter a number that corresponds to a bit for the selected table type. Refer to DNP3 Map Table for a complete list of variations and their associated bits. • Binary Input = Group 2 Variation • Binary Output = Group 12 Variation • Analog Input = Group 32 Variation • Analog Output = Group 41 Variation • Counters = Group 22 Variation

4. Save your changes. You can now import your CSV file for use in your FB Series product. For more information, refer to Importing a DNP3 Map Table CSV File.

Note

Make sure to save the file with a **.csv** file extension.

4.28.2.3 Auto Managed DNP3 Map

Use the Auto Managed Object DNP3 Map option to create templates that map parameters in the FB Series product database to DNP3 data points. You can generate a DNP3 map file based on these templates and then import the DNP3 map file into your SCADA system to easily retrieve information contained in your FB Series product.

There are two types of files used in the Auto Managed Object Mapping process: an Object Mapping Template file and a generated DNP3 Map file.

Object Mapping Template

An Object Mapping Template file is needed as the first step in the Auto Managed DNP3 Mapping process. An Object Mapping Template file contains parameters from the FB Series product database that are mapped to DNP3 data types. A default Object Mapping Template file (DefaultOMT.omt) is included with FBxConnect that contains default mapping for the FB Series products. You can edit this Object Mapping Template file and/or create your own Object Mapping Template files that contain mapping only for the specific object parameters you select. You can then import the template files into different FB Series products and easily create consistent DNP3 maps.

Applications installed on an FB3000 RTU may include their own template file. An application template is a file that contains application parameter names that are mapped to DNP3 data types. Application templates are created by the application developer and copied to your FB Series product when you install the application. If an application does not contain a template, you can create your own template for the parameters used by the application.

Note

- The default location for the default Standard Configuration Object Mapping Template file (DefaultOMT.omt) is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\DNP3 Map Templates*.
- For more information about creating your own Object Mapping Template file(s), refer to Creating an Object Mapping Template.
- Application templates are created by the application developer and are **not** included with every application.

DNP3 Map

A DNP3 map is the final output of the Auto Managed DNP3 Mapping process. A DNP3 map is a set of binary files that contain parameters mapped to DNP3 points. There is a DNP3 binary file for each DNP3 group (Binary Inputs, Binary Outputs, Analog Inputs, Analog Outputs, Counters and Strings). You can import these files into your SCADA system to identify which parameters you want to include in your SCADA database. This process saves you time and reduces the need to manually configure these parameters within your SCADA system.

Note

- Referenced parameters are **not currently** supported when building a DNP3 map from an Object Mapping Template file.
- Not all SCADA systems support DNP3 maps. Please check with your SCADA vendor to see if this feature is supported.

To create this file, select which parameters you want to include from your Object Mapping Template(s) and then either select the **Build DNP3 Map** button on the Communications – DNP3 pop-up display or the **Generate DNP3 Map files** on the Object Mapping Template Editor dialog box. The system builds a DNP3 Map based on the configured Object Mapping Template and either replaces the current DNP3 map or merges any newly defined parameters to the existing map, dependent on the option you select, in the connected FB Series product.

Note

- If you add meters to an FB Series product after mapping your device, you **must** generate a new DNP3 Map.
- For more information about creating a DNP3 map, refer to Building a DNP3 Map.
- To remove an existing DNP3 Map file from the FB Series product, either perform a Cold Start and select **Clear user protocol maps** or delete the DNP3 Map files (located in the *protocol* > *dnp3* > *map_1* folder) using the File Transfer dialog box.

For more information, refer to the following topics:

Object Mapping Template Editor

Creating an Object Mapping Template

Building a DNP3 Map

Viewing a DNP3 Map

4.28.2.4 Object Mapping Template Editor

Use this dialog box to create an Object Mapping Template file that contains parameters in your FB Series product that are mapped to DNP3 Map Groups.

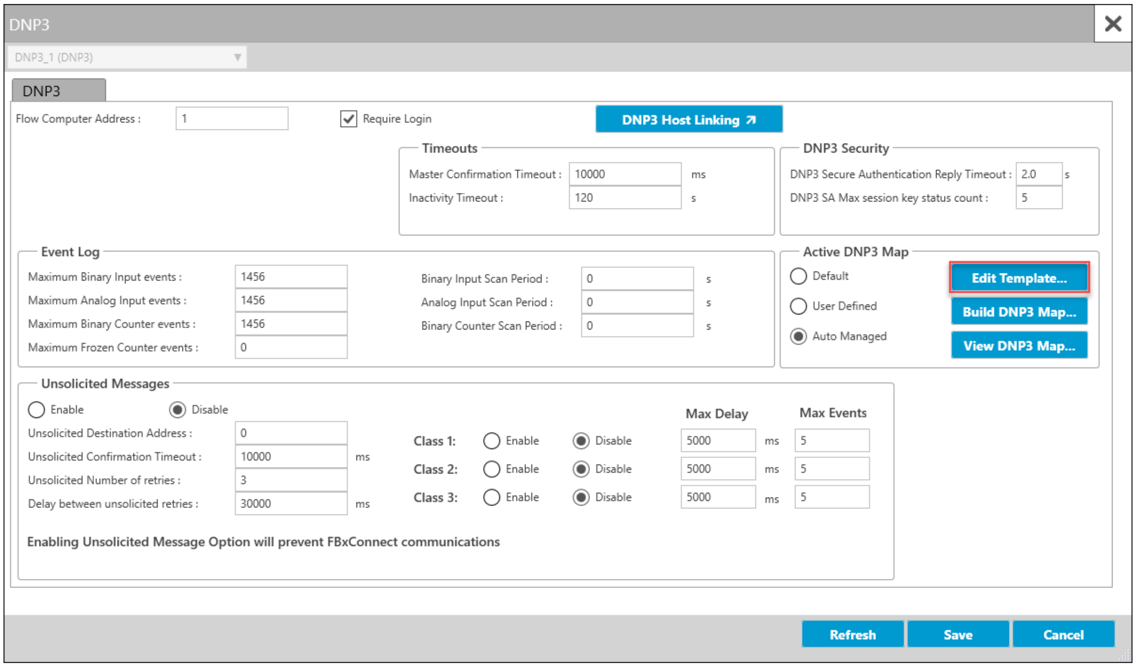
Note

- This topic contains field descriptions for the Object Mapping Template Editor dialog box. For more information on the process of creating an Object Mapping Template, refer to Creating an Object Mapping Template.
- If you add meters to an FB Series product after mapping your device, you **must** generate a new DNP3 map.
- To remove an existing DNP3 Map file from the FB Series product, perform a Cold Start and select **Clear user protocol maps**.

To access this pop-up display:

1. Select **Configure > Communications** for the FBxConnect™ main menu. The Communications display opens.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.

Figure 287. DNP3 – Edit Template Button



Flow Computer Address : 1
☑ Require Login

Timeouts
Master Confirmation Timeout : 10000 ms
Inactivity Timeout : 120 s

DNP3 Security
DNP3 Secure Authentication Reply Timeout : 2.0 s
DNP3 SA Max session key status count : 5

Event Log
Maximum Binary Input events : 1456
Maximum Analog Input events : 1456
Maximum Binary Counter events : 1456
Maximum Frozen Counter events : 0
Binary Input Scan Period : 0 s
Analog Input Scan Period : 0 s
Binary Counter Scan Period : 0 s

Active DNP3 Map
○ Default
○ User Defined
● Auto Managed

Unsolicited Messages
○ Enable ● Disable
Unsolicited Destination Address : 0
Unsolicited Confirmation Timeout : 10000 ms
Unsolicited Number of retries : 3
Delay between unsolicited retries : 30000 ms

			Max Delay		Max Events
Class 1:	○ Enable	● Disable	5000	ms	5
Class 2:	○ Enable	● Disable	5000	ms	5
Class 3:	○ Enable	● Disable	5000	ms	5

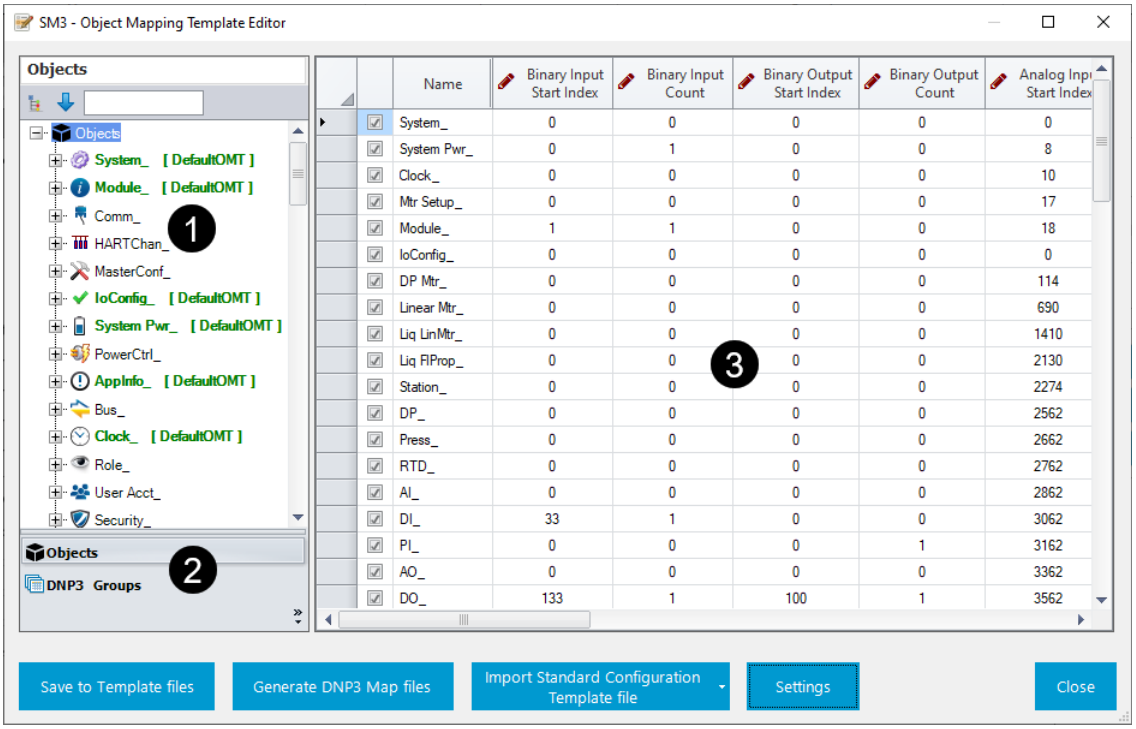
Enabling Unsolicited Message Option will prevent FBxConnect communications

4. Select **Auto Managed** in the Active DNP3 Map field.

5. Select **Save** to save your selection.

6. Select the **Edit Template** button. The Object Mapping Template Editor dialog box opens.

Figure 288. Object Mapping Template Editor



	Name	Binary Input Start Index	Binary Input Count	Binary Output Start Index	Binary Output Count	Analog Inpu Start Index
☑	System_	0	0	0	0	0
☑	System Pwr_	0	1	0	0	8
☑	Clock_	0	0	0	0	10
☑	Mtr Setup_	0	0	0	0	17
☑	Module_	1	1	0	0	18
☑	IoConfig_	0	0	0	0	0
☑	DP Mtr_	0	0	0	0	114
☑	Linear Mtr_	0	0	0	0	690
☑	Liq LinMtr_	0	0	0	0	1410
☑	Liq FlProp_	0	0	0	0	2130
☑	Station_	0	0	0	0	2274
☑	DP_	0	0	0	0	2562
☑	Press_	0	0	0	0	2662
☑	RTD_	0	0	0	0	2762
☑	AI_	0	0	0	0	2862
☑	DI_	33	1	0	0	3062
☑	PI_	0	0	0	1	3162
☑	AO_	0	0	0	0	3362
☑	DO_	133	1	100	1	3562

#	Description
1	Objects Tree / DNP3 Groups Tree
2	Objects / DNP3 Groups Buttons
3	Information Grid

7. Review – and change as necessary – the values in the following fields:

Field	Description
Objects Tree	Shows the Objects in the FB Series product internal database and the Objects in any installed applications. **Note** Objects that you have included in the Object Mapping Template file are shown using the color green.
DNP3 Groups Tree	Shows the DNP3 map currently in the FB Series product.
Objects Button	Select this button to show the Objects tree on the Object Mapping Template Editor dialog box.

Field	Description
DNP3 Groups Button	Select this button to show the DNP3 Groups tree on the Object Mapping Template Editor dialog box.
Information Grid	Shows information associated with your selection in the Objects Tree or DNP3 Tree. For more information, refer to Objects Grid, Object Attributes Grid, Parameters Grid, and Viewing a DNP3 Map.
Save to Template files	Select this button to save the currently defined Object Mapping to a template file(s). **Note** Template files are stored as part of the solution file.
Generate DNP3 Map files	Select this button to build a DNP3 map based on an Object Mapping Template and transfer the DNP3 map to the connected FB Series product. For more information, refer to Building a DNP3 Map.
Import Standard Configuration Template file	Select this button to load a previously saved Standard Configuration Object Mapping Template file into the Object Mapping Template Editor. The import functionality supports two different modes: • **Merge** – Merges with existing standard configuration templates. This is the default option. • **Replace** – Replace existing standard configuration templates. Click ▼ to select this option. **Note** A default Object Mapping Template file (DefaultOMT.omt) is included with FBxConnect that contains default mapping for the FB Series products.
Settings	Select this button to open the Object Mapping Template Editor Settings dialog box and customize the layout of the Object Mapping Template Editor and to configure the mapping of FBx data types to DNP data types.

8. Select **Close** to exit the Object Mapping Template Editor dialog box.

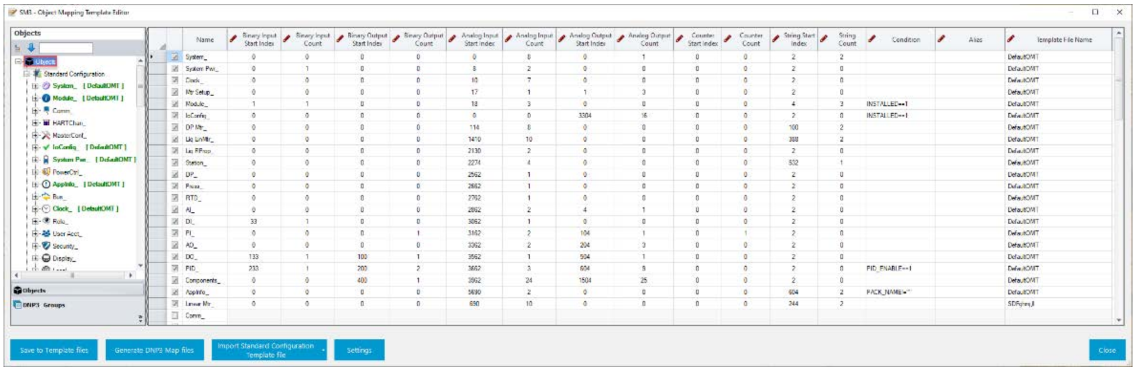
4.28.2.4.1 Objects Grid (Object Mapping Template Editor)

Use the Objects Grid to select which objects from the FB Series product are included in the Object Mapping Template and to configure how each object is mapped to the DNP3 map groups.

To access the Objects Grid:

1. From the Object Mapping Template Editor dialog box, select the **Objects Button** at the bottom left-hand side of the dialog box to show the Objects tree.
2. Select the **Objects** node in the Objects tree. The Objects Grid lists all Objects in the right-hand side of the dialog box.

Figure 289. Objects Grid



	Name	Binary Input Start Index	Binary Input Count	Binary Output Start Index	Binary Output Count	Analog Input Start Index	Analog Input Count	Analog Output Start Index	Analog Output Count	Counter Start Index	Counter Count	String Start Index	String Count	Condition	Alias	Template File Name
☑	System_	0	0	0	0	0	8	0	1	0	0	2	2			DefaultOMT
☑	System Pwr_	0	1	0	0	8	2	0	0	0	0	2	0			DefaultOMT
☑	Clock_	0	0	0	0	10	7	0	0	0	0	2	0			DefaultOMT
☑	Mtr Setup_	0	0	0	0	17	1	1	3	0	0	2	0			DefaultOMT
☑	Module_	1	1	0	0	18	3	0	0	0	0	4	3	INSTALLED==1		DefaultOMT
☑	IoConfig_	0	0	0	0	0	0	3304	16	0	0	2	0	INSTALLED==1		DefaultOMT
☑	DP Mtr_	0	0	0	0	114	8	0	0	0	0	100	2			DefaultOMT
☑	Liq LinMtr_	0	0	0	0	1410	10	0	0	0	0	388	2			DefaultOMT
☑	Liq PProp_	0	0	0	0	2130	2	0	0	0	0	2	0			DefaultOMT
☑	Station_	0	0	0	0	2274	4	0	0	0	0	532	1			DefaultOMT
☑	DP_	0	0	0	0	2562	1	0	0	0	0	2	0			DefaultOMT
☑	Press_	0	0	0	0	2662	1	0	0	0	0	2	0			DefaultOMT
☑	RTD_	0	0	0	0	2762	1	0	0	0	0	2	0			DefaultOMT
☑	AI_	0	0	0	0	2862	2	4	1	0	0	2	0			DefaultOMT
☑	DI_	33	1	0	0	3062	1	0	0	0	0	2	0			DefaultOMT
☑	PI_	0	0	0	1	3162	2	104	1	0	1	2	0			DefaultOMT
☑	AO_	0	0	0	0	3362	2	204	3	0	0	2	0			DefaultOMT
☑	DO_	133	1	100	1	3562	1	504	1	0	0	2	0			DefaultOMT
☑	PID_	233	1	200	2	3662	3	604	9	0	0	2	0	PID_ENABLE==1		DefaultOMT
☑	Components_	0	0	400	1	3962	24	1504	25	0	0	2	0			DefaultOMT
☑	AppInfo_	0	0	0	0	5690	2	0	0	0	0	604	2	PACK_NAME!=""		DefaultOMT
☑	Linear Mtr_	0	0	0	0	690	10	0	0	0	0	244	2			[illegible]
☐	Comm_															

3. Review – and change as necessary – the values in the following fields:

Field	Description
Checkbox	Place a check mark in the row next to the Object name to include the Object in the Object Mapping Template.
Name	This column shows the Object names from the FB Series product's internal database and any installed applications.
Binary Input Start Index	Click ⬍ to set the selected Object's starting position in the DNP3 map group.
Binary Input Count	Click ⬍ to set the number of entries reserved for the selected Object in the DNP3 map group.
Binary Output Start Index	Click ⬍ to set the selected Object's starting position in the DNP3 map group.

Field	Description
Binary Output Count	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Analog Input Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Analog Input Count	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Analog Output Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Analog Output Count	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Counter Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Counter Count	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
String Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
String Count	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Condition	Enter a simple logical expression that indicates when the selected object is included in the resulting DNP3 Map. Valid logical operators are: ==, !=, >, <, >=, <=. For example, when the expression is PID_ENABLE == 1, the PID parameters are included in the DNP3 Map only when the value of the PID_1.PID_ENABLE parameter is 1.
Alias	Enter an alternate name used by your SCADA system when polling for the selected object.
Template File Name	Click ▼ and select an existing Object Mapping Template file or enter a file name to create a new Object Mapping Template file that the system uses to save the object mapping configuration for the selected row.

4.28.2.4.2 Object Attributes Grid (Object Mapping Template Editor)

Use the Objects Attributes Grid to configure if the selected Object is included in an Object Mapping Template and to configure how the selected Object is mapped to the DNP3 map groups.

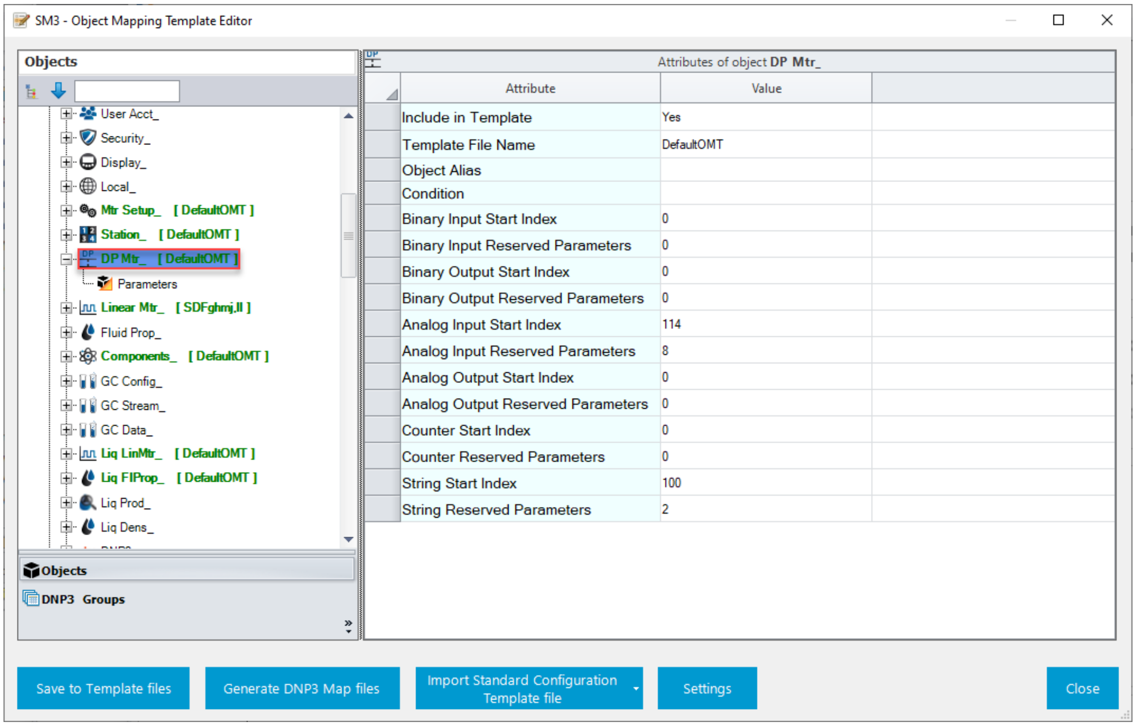
Note

You can also configure the Object parameters for multiple Objects from the Objects Grid.

To access the Objects Attributes Grid:

1. From the Object Mapping Template Editor dialog box, select the **Objects Button** at the bottom left-hand side of the dialog box to show the Objects tree.
2. Select an object name from the Object tree (**DP Mtr_** in the example below). The Object Attributes Grid lists all attributes for the selected Object in the right-hand side of the dialog box.

Figure 290. Object Attributes Grid



Attribute	Value
Include in Template	Yes
Template File Name	DefaultOMT
Object Alias	
Condition	
Binary Input Start Index	0
Binary Input Reserved Parameters	0
Binary Output Start Index	0
Binary Output Reserved Parameters	0
Analog Input Start Index	114
Analog Input Reserved Parameters	8
Analog Output Start Index	0
Analog Output Reserved Parameters	0
Counter Start Index	0
Counter Reserved Parameters	0
String Start Index	100
String Reserved Parameters	2

3. Review – and change as necessary – the values in the following fields:

Field	Description
Include in Template	Click ▼ to configure if the selected Object is included in the Object Mapping Template (Yes) or not (No).
Template File Name	Click ▼ and select an existing Object Mapping Template file or enter a file name to create a new Object Mapping Template file that the system uses to save the object mapping configuration for the selected row.
Object Alias	Enter an alternate name used by your SCADA system when polling for the selected object.
Condition	Enter a simple logical expression that indicates when the selected object is included in the resulting DNP3 Map. Valid logical operators are: ==, !=, >, <, >=, <=. For example, when the expression is PID_ENABLE == 1, the PID parameters are included in the DNP3 Map only when the value of the PID_1.PID_ENABLE parameter is 1.
Binary Input Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Binary Input Reserved Parameters	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Binary Output Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Binary Output Reserved Parameters	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.
Analog Input Start Index	Click ▲▼ to set the selected Object's starting position in the DNP3 map group.
Analog Input Reserved Parameters	Click ▲▼ to set the number of entries reserved for the selected Object in the DNP3 map group.

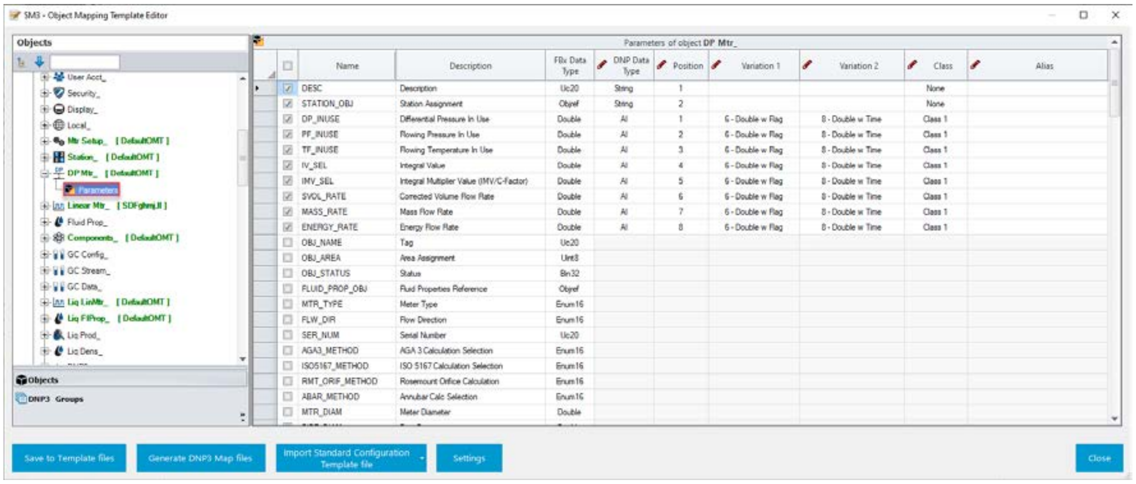
Field	Description
Analog Output Start Index	Click ⬍ to set the selected Object's starting position in the DNP3 map group.
Analog Output Reserved Parameters	Click ⬍ to set the number of entries reserved for the selected Object in the DNP3 map group.
Counter Start Index	Click ⬍ to set the selected Object's starting position in the DNP3 map group.
Counter Reserved Parameters	Click ⬍ to set the number of entries reserved for the selected Object in the DNP3 map group.
String Start Index	Click ⬍ to set the selected Object's starting position in the DNP3 map group.
String Reserved Parameters	Click ⬍ to set the number of entries reserved for the selected Object in the DNP3 map group.

4.28.2.4.3 Parameters Grid (Object Mapping Template Editor)

Use the Parameters Grid to configure if individual parameters for the selected Object are included in an Object Mapping Template and how each parameter is mapped to the DNP3 map groups.

To view the Parameters Grid:

1. From the Object Mapping Template Editor dialog box, select the **Objects Button** at the bottom left-hand side of the dialog box to show the Objects tree.
2. Click ⊕ next an Object Name in the Object tree to expand the Object (**DP Mtr_** in the example below).
3. Select **Parameters** underneath the expanded Object. The Parameters Grid lists all parameters for the selected Object in the right-hand side of the dialog box.



Parameters of object **DP Mtr_**

☐	Name	Description	FBx Data Type	DNP Data Type	Position	Variation 1	Variation 2	Class	Alias
☑	DESC	Description	Uc20	String	1			None	
☑	STATION_OBJ	Station Assignment	Objref	String	2			None	
☑	DP_INUSE	Differential Pressure In Use	Double	AI	1	6 - Double w Flag	8 - Double w Time	Class 1	
☑	PF_INUSE	Flowing Pressure In Use	Double	AI	2	6 - Double w Flag	8 - Double w Time	Class 1	
☑	TF_INUSE	Flowing Temperature In Use	Double	AI	3	6 - Double w Flag	8 - Double w Time	Class 1	
☑	IV_SEL	Integral Value	Double	AI	4	6 - Double w Flag	8 - Double w Time	Class 1	
☑	IMV_SEL	Integral Multiplier Value (IMV/C-Factor)	Double	AI	5	6 - Double w Flag	8 - Double w Time	Class 1	
☑	SVOL_RATE	Corrected Volume Flow Rate	Double	AI	6	6 - Double w Flag	8 - Double w Time	Class 1	
☑	MASS_RATE	Mass Flow Rate	Double	AI	7	6 - Double w Flag	8 - Double w Time	Class 1	
☑	ENERGY_RATE	Energy Flow Rate	Double	AI	8	6 - Double w Flag	8 - Double w Time	Class 1	
☐	OBJ_NAME	Tag	Uc20						
☐	OBJ_AREA	Area Assignment	Uint8						
☐	OBJ_STATUS	Status	Bin32						
☐	FLUID_PROP_OBJ	Fluid Properties Reference	Objref						
☐	MTR_TYPE	Meter Type	Enum16						
☐	FLW_DIR	Flow Direction	Enum16						
☐	SER_NUM	Serial Number	Uc20						
☐	AGA3_METHOD	AGA 3 Calculation Selection	Enum16						
☐	ISO5167_METHOD	ISO 5167 Calculation Selection	Enum16						
☐	RMT_ORIF_METHOD	Rosemount Orifice Calculation	Enum16						
☐	ABAR_METHOD	Annubar Calc Selection	Enum16						
☐	MTR_DIAM	Meter Diameter	Double						

Figure 291. Parameters Grid

4. Review – and change as necessary – the values in the following fields:

Field	Description
Checkbox	Place a check mark in the row next to a Parameter Name to include the parameter in your Object Mapping Template. **Note** Place a check mark in the column heading row to select all parameters belonging to the selected object.
Name	This **read-only** column shows the name of the parameter in the FB Series product's internal database for the selected row.
Description	This **read-only** column shows a description of the parameter in the FB Series product's internal database for the selected row.
FBx Data Type	This **read-only** column shows the data type of the parameter in the FB Series product's internal database for the selected row.
DNP Data Type	Click ▼ to select the data type stored in the DNP3 map for the selected row.

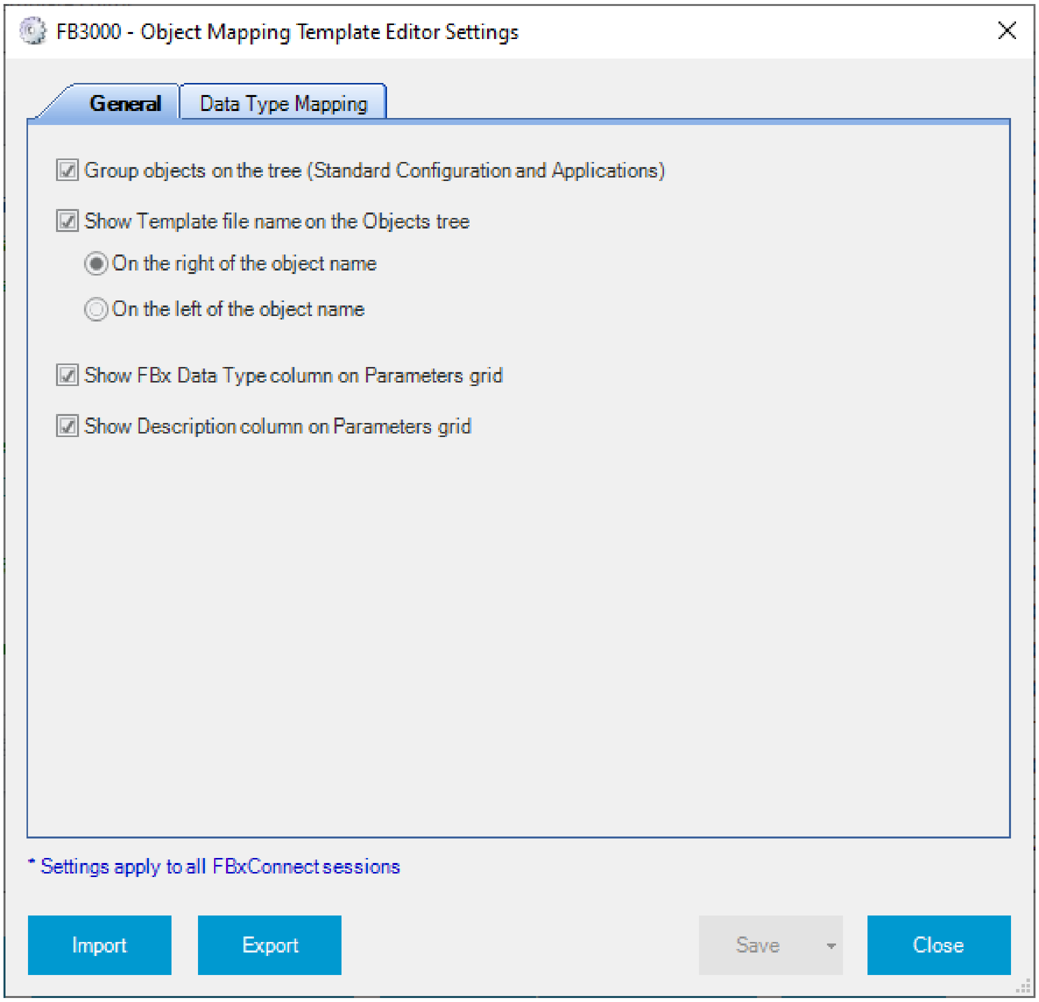
Field	Description
Position	Click ⬍ to set the position in the DNP3 map group of the data in the selected row. **Note** • Positions **must** start at 1 and **must** be consecutive. • The system automatically increments the position number for each DNP3 map group when you select a parameter for inclusion in the template. • Different signal types have separate map groups, and each map group has its own positions. For example, if you have two parameters with a DNP Data Type of AI and three parameters with a DNP Data Type of Counter, then the AI positions would be 1 and 2 and the Counter positions would be 1, 2, and 3.
Variation 1	Click ▼ to set the data type encoding formats for the data types. For more information on the different variations for different data types, refer to DNP3 Map Table.
Variation 2	Click ▼ to set the data type encoding formats for the data types. For more information on the different variations for different data types, refer to DNP3 Map Table.
Class	Click ▼ to set an event class for the selected parameter. For more information on the different variations for different data types, refer to DNP3 Map Table.
Alias	Enter an alternate name used by your SCADA system when polling for the selected parameter.

4.28.2.5 Object Mapping Template Editor Settings

Use this dialog box to customize the layout of the Object Mapping Template Editor and to configure the mapping of FBx data types to DNP data types.

To customize the Object Mapping Template Editor, select the **Settings** button on the Object Mapping Template Editor dialog box. The Object Mapping Template Editor Settings dialog box opens showing the General tab.

Figure 292. Object Mapping Template Editor Settings



FB3000 - Object Mapping Template Editor Settings

☑ Group objects on the tree (Standard Configuration and Applications)

☑ Show Template file name on the Objects tree

● On the right of the object name

○ On the left of the object name

☑ Show FBx Data Type column on Parameters grid

☑ Show Description column on Parameters grid

* Settings apply to all FBxConnect sessions

The Object Mapping Template Editor Settings display contains the following tabs:

General – Use this tab to customize the layout of the Object Mapping Template Editor.

Data Type Mapping – Use this tab to customize how data types in the FB Series product's internal database (FBx Data Type) are mapped to DNP3 data types.

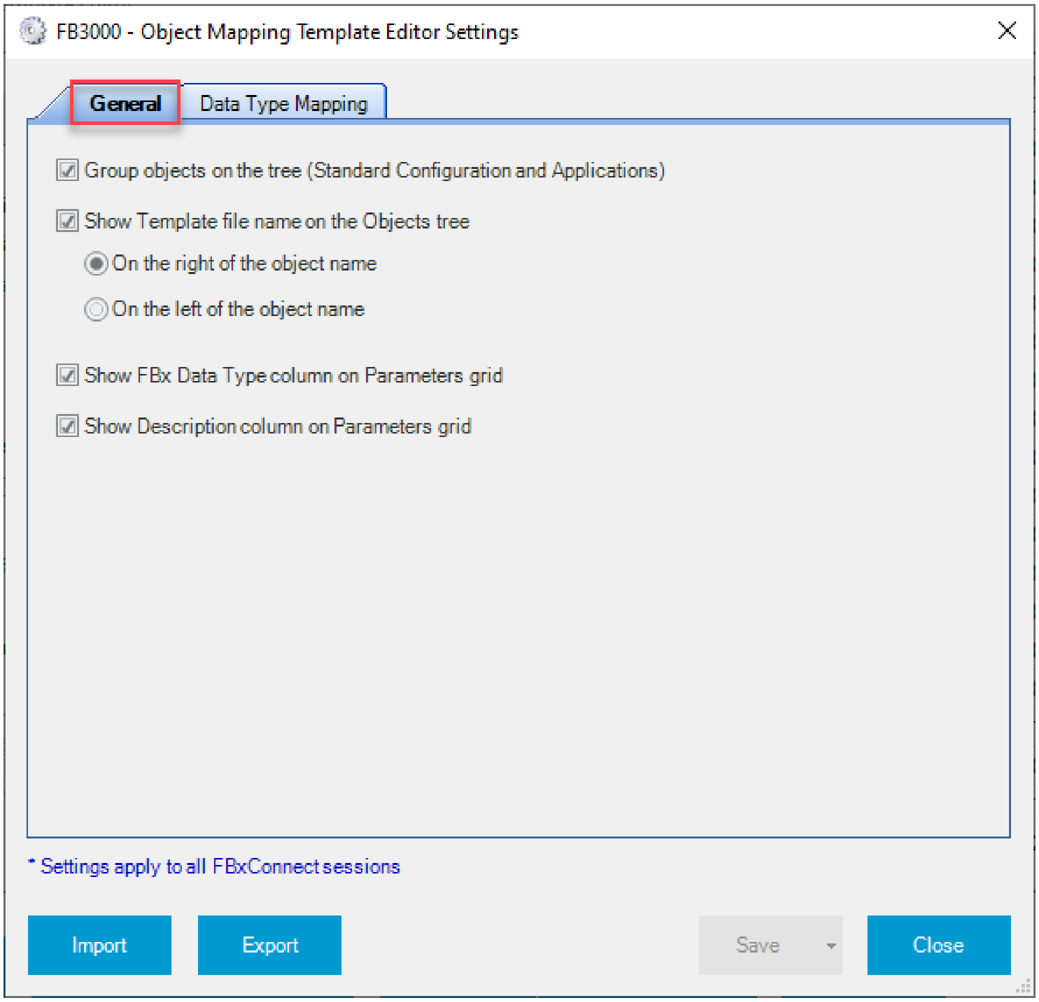
4.28.2.5.1 Object Mapping Template Editor Settings – General Tab

Use this tab to customize the layout of the Object Mapping Template Editor.

To customize the Object Mapping Template Editor dialog box:

1. Select the **Settings** button on the Object Mapping Template Editor dialog box. The Object Mapping Template Editor Settings showing the General tab.

Figure 293. Object Mapping Template Editor Settings – General Tab



FB3000 - Object Mapping Template Editor Settings

☑ Group objects on the tree (Standard Configuration and Applications)

☑ Show Template file name on the Objects tree

● On the right of the object name

○ On the left of the object name

☑ Show FBx Data Type column on Parameters grid

☑ Show Description column on Parameters grid

* Settings apply to all FBxConnect sessions

2. Review – and change as necessary – the values in the following fields:

Field	Description
Group objects on the tree (Standard Configuration and Applications)	Place a check mark to have the objects shown in the Objects tree be separated based on if the objects are included in the standard FB Series product configuration or if the objects are included in applications. **Note** If this option is **not** selected, all objects are shown in the Objects tree with no grouping.

Field	Description
Show template file name on the Objects tree	Place a check mark to show the Object Mapping Template name next to the object name in the Objects tree. You can also configure if you want the name to appear on the left-hand side or right-hand side of the Object name in the Objects tree.
Show FBx Data Type column on the Parameters grid	Place a check mark to show the FBxData Type column when viewing the Parameters grid.
Show Description column on the Parameters grid	Place a check mark to show the Description column when viewing the Parameters grid.
Import	Select this button to import a saved Object Mapping Template Editor Settings file. **Note** Importing an Object Mapping Template Editor Settings file applies to all FBxConnect sessions on this PC.
Export	Select this button to export your Object Mapping Template Editor Settings to a file on your PC. The exported file uses the file extension .OMTS.

4.28.2.5.2 Object Mapping Template Editor Settings – Data Type Mapping Tab

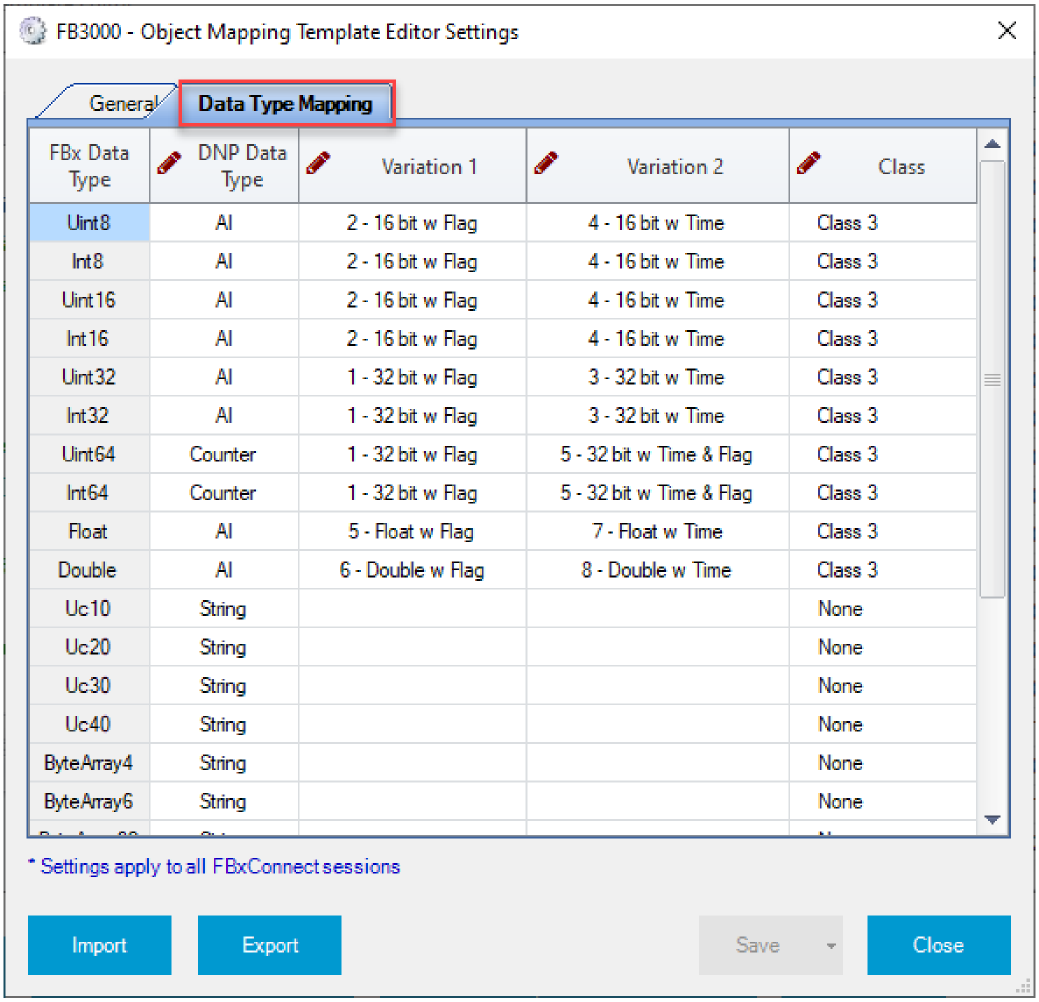
Use this tab to customize how data types in the FB Series product's internal database (FBx Data Type) are mapped to DNP3 data types.

To customize the Object Mapping Template Editor dialog box:

1. Select the **Settings** button on the Object Mapping Template Editor dialog box. The Object Mapping Template Editor Settings dialog box opens showing the General tab.

2. Select the **Data Type Mapping** tab.

Figure 294. Object Mapping Template Settings – Data Type Mapping Tab



FBx Data Type	DNP Data Type	Variation 1	Variation 2	Class
Uint8	AI	2 - 16 bit w Flag	4 - 16 bit w Time	Class 3
Int8	AI	2 - 16 bit w Flag	4 - 16 bit w Time	Class 3
Uint16	AI	2 - 16 bit w Flag	4 - 16 bit w Time	Class 3
Int16	AI	2 - 16 bit w Flag	4 - 16 bit w Time	Class 3
Uint32	AI	1 - 32 bit w Flag	3 - 32 bit w Time	Class 3
Int32	AI	1 - 32 bit w Flag	3 - 32 bit w Time	Class 3
Uint64	Counter	1 - 32 bit w Flag	5 - 32 bit w Time & Flag	Class 3
Int64	Counter	1 - 32 bit w Flag	5 - 32 bit w Time & Flag	Class 3
Float	AI	5 - Float w Flag	7 - Float w Time	Class 3
Double	AI	6 - Double w Flag	8 - Double w Time	Class 3
Uc10	String			None
Uc20	String			None
Uc30	String			None
Uc40	String			None
ByteArray4	String			None
ByteArray6	String			None

* Settings apply to all FBxConnect sessions

3. In the rows for each FBx Data Type, select what type of data is stored in the DNP3 Map when converting data from FBx Data Types to DNP Data Types.

4. Select **Close** to exit the Object Mapping Template Settings dialog box.

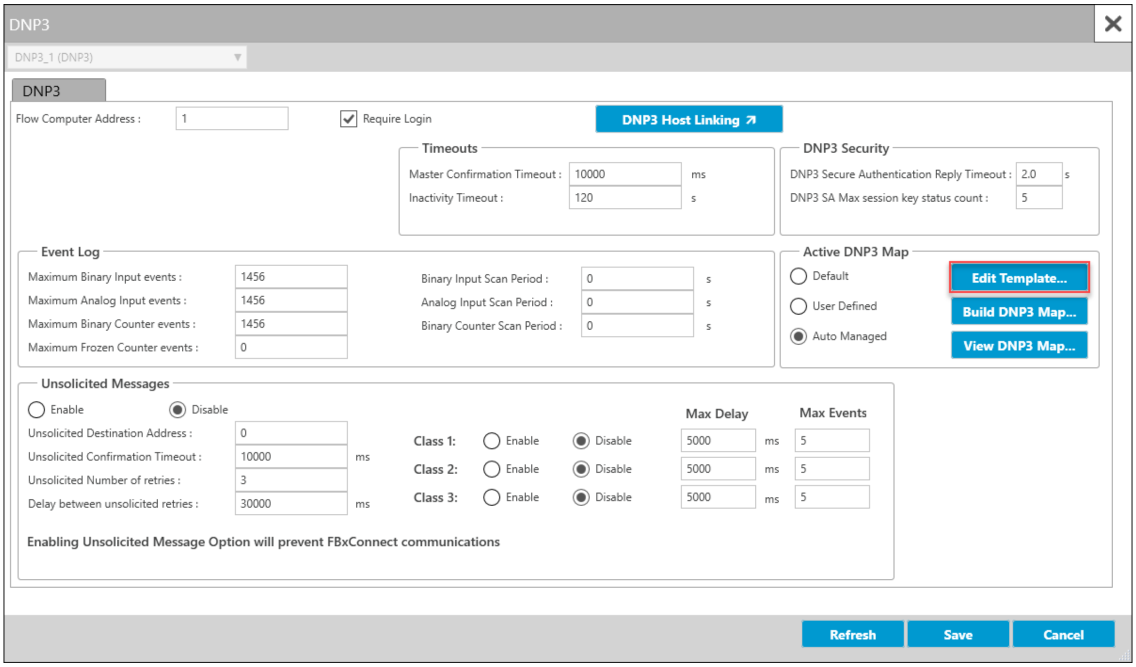
4.28.2.6 Creating an Object Mapping Template

Use the Object Mapping Template Editor to create a template file that maps parameters in the FB Series product database to DNP3 data types. Creating an Object Mapping Template file is the first step that is required to generate an Auto Managed DNP3 Map. You can select which objects and parameters from the FB Series product database that you want to include in the Object Mapping Template file. After you have created the Object Mapping Template file, you can then use the file to create DNP3 maps for multiple FB Series products. For more information, refer to Generating a DNP3 Map.

To create an Object Mapping Template file:

1. Select **Configure > Communications** for the FBxConnect™ main menu. The Communications display opens.
2. Select ▼ in the Communications drop-down list and choose a communications port using the DNP3 protocol.
3. Select the **DNP3** button. The DNP3 pop-up display opens.

Figure 295. DNP3 – Edit Template Button



Flow Computer Address : 1
☑ Require Login

Timeouts
Master Confirmation Timeout : 10000 ms
Inactivity Timeout : 120 s

DNP3 Security
DNP3 Secure Authentication Reply Timeout : 2.0 s
DNP3 SA Max session key status count : 5

Event Log
Maximum Binary Input events : 1456
Maximum Analog Input events : 1456
Maximum Binary Counter events : 1456
Maximum Frozen Counter events : 0
Binary Input Scan Period : 0 s
Analog Input Scan Period : 0 s
Binary Counter Scan Period : 0 s

Active DNP3 Map
○ Default
○ User Defined
● Auto Managed

Unsolicited Messages
○ Enable ● Disable
Unsolicited Destination Address : 0
Unsolicited Confirmation Timeout : 10000 ms
Unsolicited Number of retries : 3
Delay between unsolicited retries : 30000 ms

			Max Delay		Max Events
Class 1:	○ Enable	● Disable	5000	ms	5
Class 2:	○ Enable	● Disable	5000	ms	5
Class 3:	○ Enable	● Disable	5000	ms	5

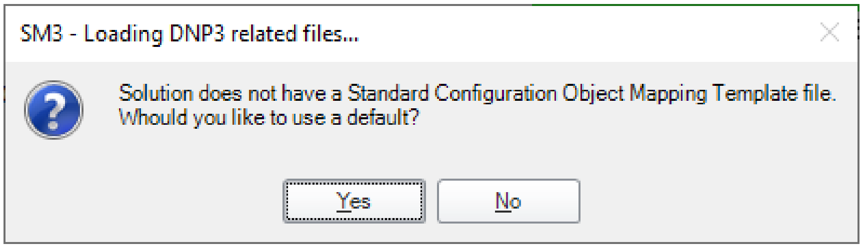
Enabling Unsolicited Message Option will prevent FBxConnect communications

4. Select **Auto Managed** in the Active DNP3 Map field.
5. Select **Save** to save your selection.
6. Select the **Edit Template** button. The Object Mapping Template Editor opens showing the Objects tree.

Note

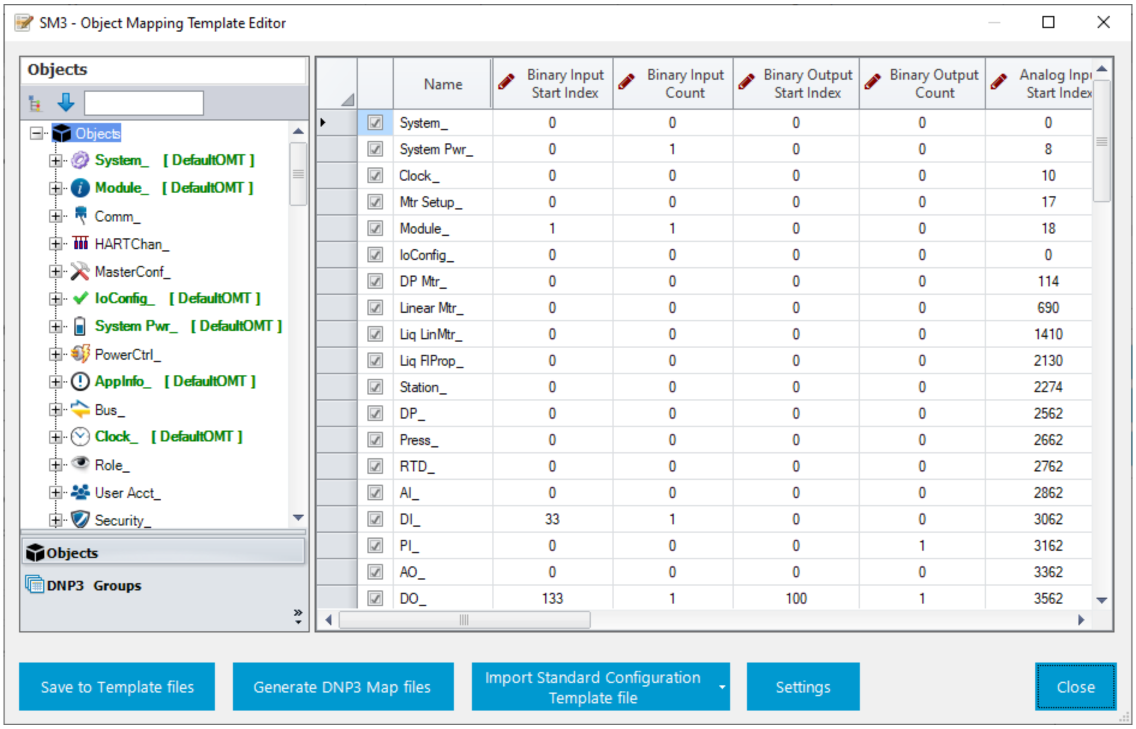
If you do not currently have an Object Mapping Template configured, a message opens asking if you would like to import a default template. Select **Yes** to import the default template or a template you have previously created on another FB Series product. Select **No** to start from an empty template with no Objects or Parameters selected.

Figure 296. Use Default Question



Solution does not have a Standard Configuration Object Mapping Template file.
Whould you like to use a default?

Figure 297. Object Mapping Template Editor



	Name	Binary Input Start Index	Binary Input Count	Binary Output Start Index	Binary Output Count	Analog Inp Start Index
☑	System_	0	0	0	0	0
☑	System Pwr_	0	1	0	0	8
☑	Clock_	0	0	0	0	10
☑	Mtr Setup_	0	0	0	0	17
☑	Module_	1	1	0	0	18
☑	IoConfig_	0	0	0	0	0
☑	DP Mtr_	0	0	0	0	114
☑	Linear Mtr_	0	0	0	0	690
☑	Liq LinMtr_	0	0	0	0	1410
☑	Liq FlProp_	0	0	0	0	2130
☑	Station_	0	0	0	0	2274
☑	DP_	0	0	0	0	2562
☑	Press_	0	0	0	0	2662
☑	RTD_	0	0	0	0	2762
☑	AI_	0	0	0	0	2862
☑	DI_	33	1	0	0	3062
☑	PI_	0	0	0	1	3162
☑	AO_	0	0	0	0	3362
☑	DO_	133	1	100	1	3562

7. Place a check mark next to an **Object Name** for each Object you want to include in the DNP3 map.

8. For each selected Object, enter the **Start Index** to set the starting position in the DNP3 map for each DNP3 map group (Binary Input, Binary Output, Analog Input, Analog Output, Counters, and Strings).

9. For the selected Object, enter the **Count** to set the number of entries that are reserved for the Object in the DNP3 map groups.

10. For the selected Object, click ▼ in the **Template File Name** column and select an existing Object Mapping Template file or enter a file name to create a new Object Mapping Template file that the system uses to save the object mapping configuration.

Note

For descriptions of the other columns, refer to the Objects Grid or Object Attributes Grid topics.

11. Click ⊕ next an Object Name in the Object tree to expand the Object (**DP Mtr_** in the example below).
12. Select **Parameters** underneath the expanded Object. The Parameters Grid shows in the right-hand side of the dialog box listing all parameters for the selected Object.
13. Place a check mark next to each parameter name you want the include in the DNP3 Map.

Note

For descriptions of the other columns, refer to the Parameters Grid topic.

14. When you have finished configuring which Objects and Parameters to add to your template, select the **Save to Template files** button. The system saves your configuration to the file name(s) you configured in the Template File Name field for each object. You can now build a DNP3 Map that contains DNP3 data types that are mapped to parameters in your FB Series product. For more information, refer to Building a DNP3 Map.

4.28.2.7 Building a DNP3 Map

Use this feature to create an DNP3 Map file that contains DNP3 data types that are mapped to parameters in your FB Series product.

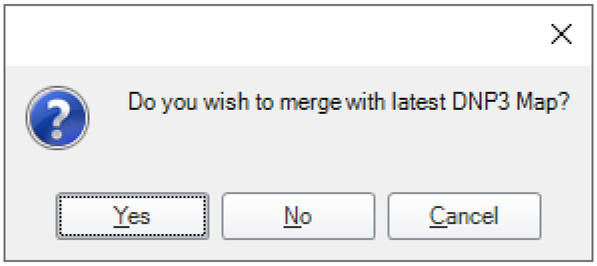
Note

- Before you can build a DNP3 map, you first need to either create a Object Mapping Template file or select a default Object Mapping Template file.
- If you add meters to an FB Series product after mapping your device, you **must** edit your Object Mapping Template and generate a new DNP3 map.
- Referenced parameters are **not currently** supported when building a DNP3 map from an Object Mapping Template file.
- To remove an existing DNP3 Map file from the FB Series product, perform a Cold Start and select **Clear user protocol maps**.

To generate a DNP3 map:

1. From the Communications – DNP3 pop-up display: Select the **Build DNP3 Map** button. FBxConnect uploads the current DNP3 map from the FB Series product to compare it against the new map.
   or
   From the Object Template Mapping Editor dialog box: Select the **Generate DNP3 Map files** button. FBxConnect uploads the current DNP3 map from the FB Series product to compare it against the new map.

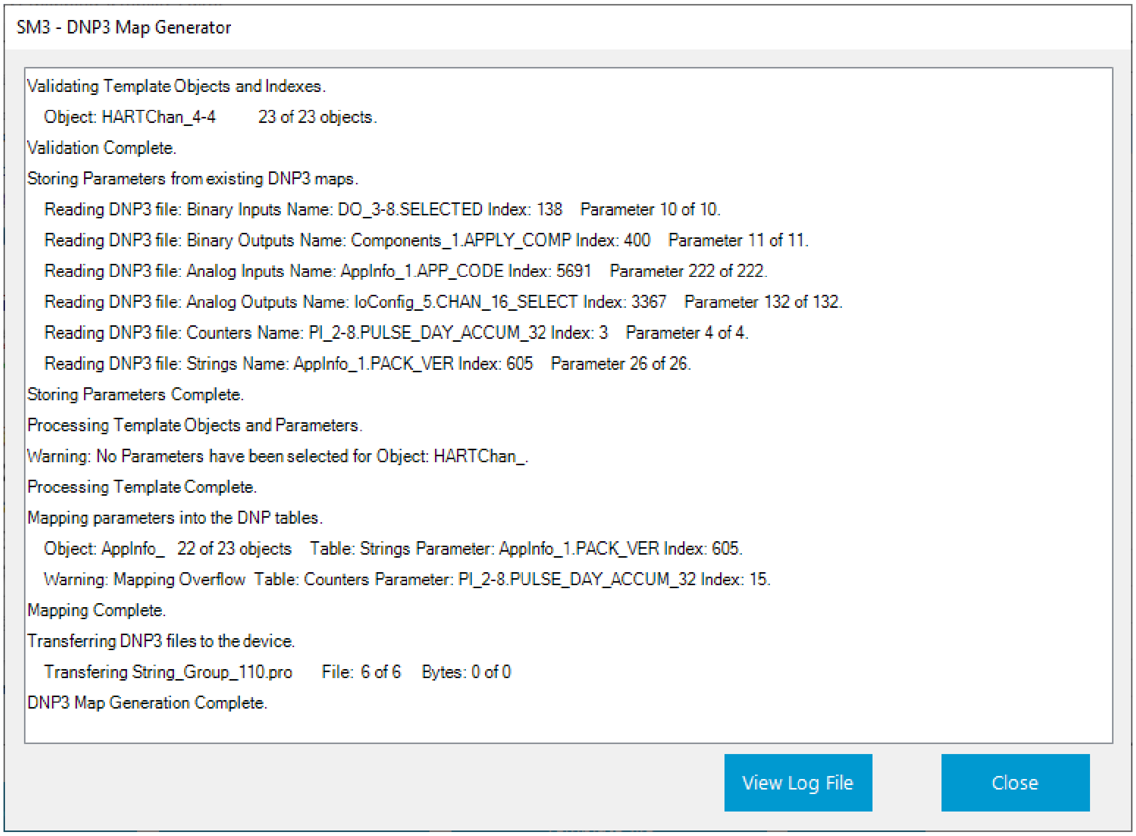
Figure 298. Merge Dialog



Do you wish to merge with latest DNP3 Map?

2. A message box opens asking if you want to merge the map currently in the FB Series product with the newest map.
   - Select **Yes** to keep the map currently in the FB series product and add any new information to the end of the map. The DNP3 Map Generator dialog box opens.
   - Select **No** to replace the map currently in the FB Series product with the newest map. The DNP3 Map Generator dialog box opens.
   - Select **Cancel** to return to the DNP3 display.
3. If you select **Yes** or **No** in the previous step, the DNP3 Map Generator opens and processes your request to either merge or replace the DNP3 map in the FB Series product. When the process is finished and the DNP3 map is transferred to the FB Series product, a message on the DNP3 Map Generator says **DNP3 Map Generation Complete**.

Figure 299. DNP3 Map Generator



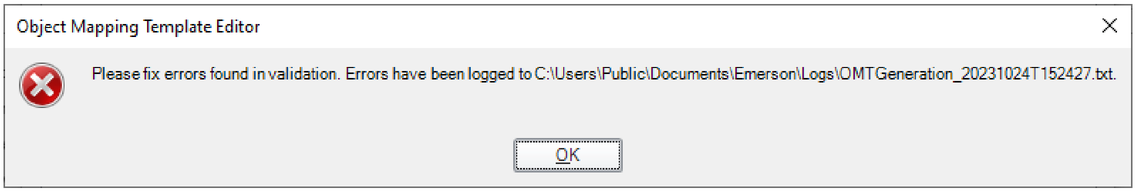
SM3 - DNP3 Map Generator

```
Validating Template Objects and Indexes.
   Object: HARTChan_4-4       23 of 23 objects.
Validation Complete.
Storing Parameters from existing DNP3 maps.
   Reading DNP3 file: Binary Inputs Name: DO_3-8.SELECTED Index: 138    Parameter 10 of 10.
   Reading DNP3 file: Binary Outputs Name: Components_1.APPLY_COMP Index: 400    Parameter 11 of 11.
   Reading DNP3 file: Analog Inputs Name: AppInfo_1.APP_CODE Index: 5691    Parameter 222 of 222.
   Reading DNP3 file: Analog Outputs Name: IoConfig_5.CHAN_16_SELECT Index: 3367    Parameter 132 of 132.
   Reading DNP3 file: Counters Name: PI_2-8.PULSE_DAY_ACCUM_32 Index: 3    Parameter 4 of 4.
   Reading DNP3 file: Strings Name: AppInfo_1.PACK_VER Index: 605    Parameter 26 of 26.
Storing Parameters Complete.
Processing Template Objects and Parameters.
Warning: No Parameters have been selected for Object: HARTChan_.
Processing Template Complete.
Mapping parameters into the DNP tables.
   Object: AppInfo_   22 of 23 objects    Table: Strings Parameter: AppInfo_1.PACK_VER Index: 605.
   Warning: Mapping Overflow  Table: Counters Parameter: PI_2-8.PULSE_DAY_ACCUM_32 Index: 15.
Mapping Complete.
Transferring DNP3 files to the device.
   Transfering String_Group_110.pro     File: 6 of 6    Bytes: 0 of 0
DNP3 Map Generation Complete.
```

Note

An error messages opens if the system encounters any errors when building the DNP3. Select **OK** to close this error message and select the **View Log File** button on the DNP3 Map Generator dialog box to open a log file and view the results of building the DNP3 map.

Figure 300. Object Mapping Template Error Message



Object Mapping Template Editor

Please fix errors found in validation. Errors have been logged to C:\Users\Public\Documents\Emerson\Logs\OMTGeneration_20231024T152427.txt.

4. Select **Close** to exit the DNP3 Map Generator dialog box.

Note

A Warm Start is required before changes take effect.

4.28.2.8 Viewing a DNP3 Map

Use this feature to view the DNP3 map currently used by the FB Series product.

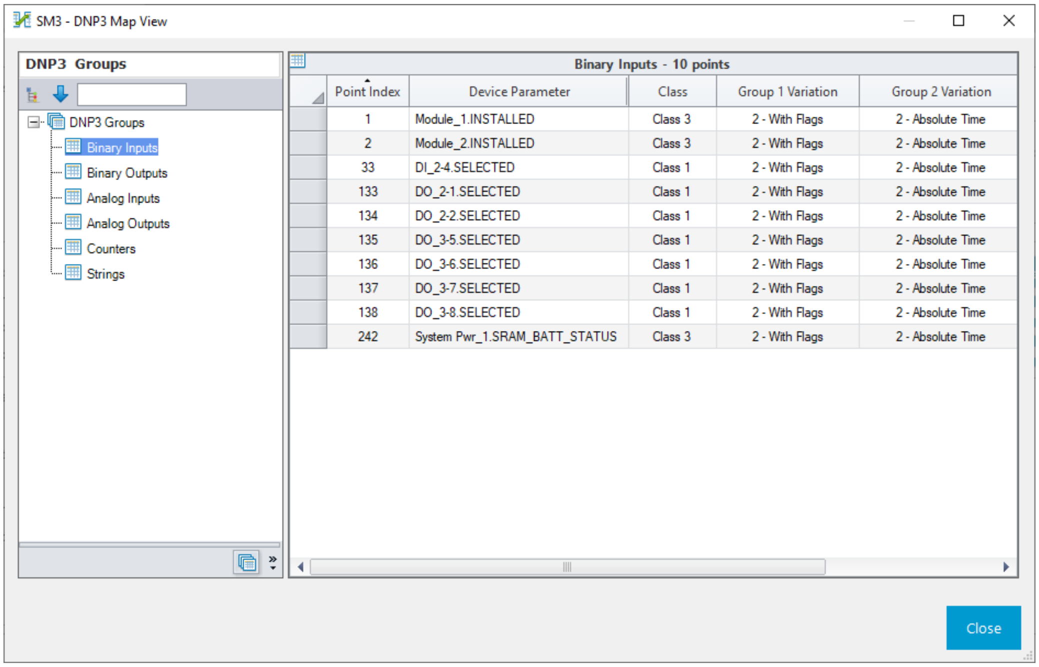
Note

You can also view the DNP3 Map by selecting the **DNP3 Groups** button on from the Object Mapping Template Editor dialog box.

To view the current DNP3 map:

1. From the Communications – DNP3 pop-up display: Select the **View DNP3 Map** button. The DNP3 Map View dialog box opens.
   or
   From the Object Template Mapping Editor dialog box: Select the **View DNP3 Map** button. The DNP3 Map View dialog box opens.

Figure 301. DNP3 Map View



Binary Inputs - 10 points

Point Index	Device Parameter	Class	Group 1 Variation	Group 2 Variation
1	Module_1.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
2	Module_2.INSTALLED	Class 3	2 - With Flags	2 - Absolute Time
33	DI_2-4.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
133	DO_2-1.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
134	DO_2-2.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
135	DO_3-5.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
136	DO_3-6.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
137	DO_3-7.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
138	DO_3-8.SELECTED	Class 1	2 - With Flags	2 - Absolute Time
242	System Pwr_1.SRAM_BATT_STATUS	Class 3	2 - With Flags	2 - Absolute Time

2. Select a DNP3 data type from the tree on the left-hand side of the dialog box to view **read-only** information about the DNP3 map currently in use.

Note

- You **must** select a DNP3 data type (Binary Inputs, Analog Outputs, etc.) before information is shown in the right-hand side of the dialog box.

- You **must** build a DNP3 map before any information is shown on this dialog box. If you do not build a DNP3 before viewing this dialog box, no information is shown when you select a DNP3 data type.

---

3. Select **Close** to exit the DNP3 Map View dialog box.

4.28.3 Communications – Modbus Slave

Use this pop-up display to configure Modbus Slave protocol options for each communications port that is configured to use Modbus Slave protocol.

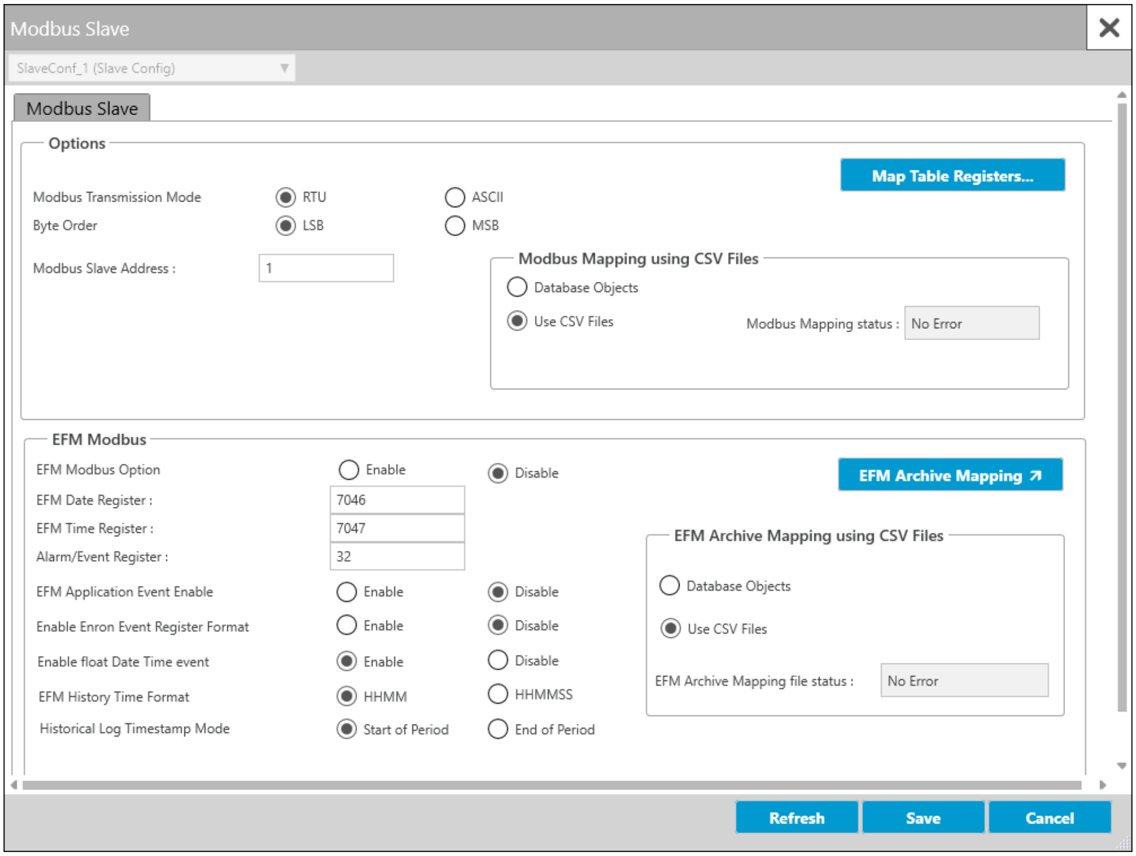
Note

This pop-up display is available only if you select either **Modbus Slave** or **DNP3/Modbus Slave** in the **Port Owner** drop-down list on the Communications – General display.

To access this pop-up display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.

Figure 302. Communications – Modbus Slave



Modbus Slave

SlaveConf_1 (Slave Config)

Modbus Slave

Options

Modbus Transmission Mode ● RTU ○ ASCII
Byte Order ● LSB ○ MSB
Modbus Slave Address : 1

Modbus Mapping using CSV Files
○ Database Objects
● Use CSV Files
Modbus Mapping status : No Error

EFM Modbus

EFM Modbus Option ○ Enable ● Disable
EFM Date Register : 7046
EFM Time Register : 7047
Alarm/Event Register : 32
EFM Application Event Enable ○ Enable ● Disable
Enable Enron Event Register Format ○ Enable ● Disable
Enable float Date Time event ● Enable ○ Disable
EFM History Time Format ● HHMM ○ HHMMSS
Historical Log Timestamp Mode ● Start of Period ○ End of Period

EFM Archive Mapping using CSV Files
○ Database Objects
● Use CSV Files
EFM Archive Mapping file status : No Error

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Modbus TCP Enable/Disable	Sets if Modbus messages are recognized on the Ethernet port. **Note** This field applies **only** to the Ethernet port.	
	Enable	Modbus messages **are** recognized on the Ethernet port.
	Disable	Modbus messages **are not** recognized on the Ethernet port.

Field	Description	
Modbus Transmission Mode	Sets the communications mode for the selected communications port. **Note** You must configure all devices in the same communications network with the same mode of transmission. Additionally, in either ASCII or RTU mode, the transmitting device places the Modbus message into a frame that has a known beginning and ending point.	
	RTU	Remote Terminal Unit mode allows for greater character density and better data throughput than ASCII for the same baud rate. Each message is transmitted in a continuous stream. Data is sent in 8-bit binary characters. RTU mode uses Cyclic Redundancy Check (CRC) error checking. By default, RTU is enabled.
	ASCII	American Standard Code for Information Interchange mode represents each 8-bit byte of data as two ASCII characters that are the hexadecimal representation of the value. This allows the messages to be read with the use of a dumb terminal but uses twice as many characters as the RTU mode. Each character sent is composed of a start bit, 7 or 8 data bits, and one or two stop bits with Even, Odd, or No parity. ASCII mode uses Longitudinal Redundancy Checking (LRC) error checking.
	TCP	Adds a 6-byte header to Modbus messages, and then encapsulates it for transmission over TCP/IP. The header consists of the following: • A 2-byte transaction ID that increments for each packet sent. • A 2-byte protocol ID. The protocol ID for Modbus is 0. • A 2-byte indicator of the packet length. **Note** This field applies **only** to the **Ethernet** port.

Field	Description	
Byte Order	Sets the order of data bytes in a transmission or requests, which can be reversed. This only affects the Data field of a Modbus message and has no effect on the data bytes for Function Codes 01, 02, and 05.	
	LSB	Least Significant Byte First (places the Least Significant Byte first). This is the default value.
	MSB	Most Significant Byte First (places the Most Significant Byte first).
Modbus Slave Address	Sets the Modbus Slave address for the selected communications port on the FB Series product.	
Modbus TCP Port Num	Sets the TCP port to use for Modbus messages on the Ethernet port. The default is **502.** **Note** • This field applies **only** to the Ethernet port. • **Do not** enter **9009** for this number; it is reserved by FBxNet.	
Map Table Registers	Click to open the Map Table Register pop-up display and configure the Modbus registers stored in the FB Series product. **Note** • Map Table Registers are shared between **all** communications ports that are configured to use either Modbus Slave or Modbus Master protocol. • You can create a Modbus Map Table as a CSV file on your computer and then import the CSV file for use in the FB Series product. For more information about creating, importing, and exporting your own Modbus Map Table CSV files, refer to Creating a Modbus Map Table CSV File, Importing a Modbus Map Table CSV File, and Exporting a Modbus Map Table CSV File and Remote Data Types.	

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td rowspan="8">**Modbus Mapping using CSV Files**</td><td colspan="3">Sets the location where the Modbus map table is stored by the FB Series product.
Note
- If you change this option, you **must** perform a warm start before any changes are applied.
- Your selection applies to **both** Modbus Slave and Modbus Master protocols.</td></tr>
<tr><td>**Database Objects**</td><td colspan="2">Select this radio button to store the Modbus map table in the FB Series product's internal database.</td></tr>
<tr><td>**Use CSV Files**</td><td colspan="2">Select this radio button to store the Modbus map table as CSV files in the FB Series product.
Note
- This option removes the Modbus map table from the internal database and increases the available amount of memory in the FB Series product.
- To avoid losing data, export your current Modbus map table **before** you select this option. For more information, refer to Exporting a Modbus Map Table CSV File.</td></tr>
<tr><td rowspan="5">**Modbus Mapping Status**</td><td colspan="2">This **read-only** field shows the current condition of the Modbus map table. Possible values are:</td></tr>
<tr><td>**No Error (0)**</td><td>The CSV file is valid.</td></tr>
<tr><td>**No Mapping Found (1)**</td><td>There is no mapping file currently on the device.</td></tr>
<tr><td>**Column Mismatch (2)**</td><td>The CSV file is not formatted correctly. Some rows have more or less columns than the header. Open the Log within the EFM Registers window for a detailed analysis.</td></tr>
<tr><td>**Missing Req Column (3)**</td><td>The CSV file is missing a required column. Open the Log within the EFM Registers window for a detailed analysis.</td></tr>
</table>

Field	Description		
		Exceeded Max Data (4)	The CSV file contained more rows than the firmware supports.
		Invalid Row Data (5)	The CSV file contains a row with invalid data. This can be out of range data or mappings that cannot be processed. Open the Log within the EFM Registers window for a detailed analysis.
		Duplicate Data (7)	The CSV file contains two mappings with similar data or identical register numbers. Open the Log within the EFM Registers window for a detailed analysis.
EFM Modbus Option	Sets whether the selected communications port supports EFM Modbus reporting.		
	Enable	The selected port supports EFM Modbus reporting.	
	Disable	The selected port supports standard Modbus reporting.	
EFM Date Register	Sets the Modbus register used to access (read/write) the date when using the selected communications port. **Note** The Current Date value identifies the current date from the FB Series product. This may be useful when you desire the date as a floating-point number.		
EFM Time Register	Sets the Modbus register used to access (read/write) the time when using the selected communications port. **Note** The Current Time value identifies the current time from the FB Series product. This may be useful when you desire the time as a floating-point number.		
Alarm/Event Register	Sets the Modbus Register Number used to acquire the most current unacknowledged Event and Alarms Log entries when using the selected communications port.		
	Sets whether the selected communications port supports retrieval of Application Events, User Application Events, String Events,		

Field	Description	
EFM Application Event Enable	Application Alarms, and User Application Alarms contained in the Event and Alarm logs via Modbus. For a list of the Modbus registers used when retrieving EFM Application Events, refer to Modbus Registers for EFM Application Events.	
	Enable	Allows these Events and Alarms to be retrieved via Modbus.
	Disable	Does not allow these Events and Alarms to be retrieved via Modbus.
Enable Enron Modbus Register Format	Sets the type of EFM Modbus register mapping used for the selected communications port.	
	Enable	Multiple FB Series product events are mapped to one Modbus register. For more information, contact Emerson technical support.
	Disable	One FB Series product event is mapped to one Modbus register. This is the default.
Enable Float Date Time Event	Sets if date and time changes are added to the event log when a time sync request is received via Modbus. **Note** Enable Float Date Time Event settings are shared between **all** communications ports that are configured to use Modbus Slave protocol.	
	Enable	When a time sync request is received, the following three events are added to the event log. The date and time events are retrievable via Modbus: • Clock_1.TIME – Change • Clock_1.FLOAT_DATE • Clock_1.FLOAT_TIME **Note** • The Clock_1.FLOAT_DATE event is added to the event log **only** if the date is changed. • The Clock_1.FLOAT_TIME event is added to the event log **only** if the time is changed.

Field	Description	
	Disable	When a time sync request is received, the following event is added to the event log. The data and time events are not retrievable via Modbus: • Clock_1.TIME – Change
EFM History Time Format	Sets the EFM history timestamp format used for the selected communications port.	
	HHMM	Two-digit hour and two-digit minute.
	HHMMSS	Two-digit hour, two-digit minute, and two-digit second.
Historical Log Timestamp Mode	Sets whether the system logs (stamps) history data with the time from the beginning of a period or from the end of the period.	
	Start of Period	The system logs history data with the time from the beginning of the period. For example, the system time-stamps data it collects from 8:00 to 9:00 as 8:00.
	End of Period	The system logs history data with the time from the end of the period. For example, the system time-stamps data it collects from 8:00 to 9:00 as 9:00.
EFM Archive Mapping	Click to open an EFM archive mapping pop-up display that allows you to configure the EFM archive mapping used for the selected communications port. **Note** The display that opens is dependent on your selection in the EFM Archive Mapping using CSV Files field. If you select **Database Objects** in the EFM Archive Mapping using CSV Files field, the EFM Archive Mapping pop-up display opens. If you select **Use CSV Files** in the EFM Archive Mapping using CSV Files field, the EFM Registers pop-up display opens.	
EFM Archive Mapping using CSV Files	Sets the location where the EFM archive mapping table is stored by the FB Series product. **Note** If you change this option, you **must** perform a warm start before any changes are applied.	

Field	Description		
	Database Objects	Select this radio button to store the EFM Archive Mapping table in the FB Series product's internal database. EFM Archive Mapping using this option is unique for each communications port. This allows you to access different history data through each communications port.	
	Use CSV Files	Select this radio button to store the EFM Archive Mapping table as a CSV file in the FB Series product. EFM Archive Mapping using this option is shared between **all** communications ports.	
	EFM Archive Mapping file status	This **read-only** field shows the current condition of the EFM Archive Mapping in the FB Series product. Possible values are:	
		No Mapping Found	There is no mapping file currently on the device.
		Column Mismatch	The CSV file is not formatted correctly. Some rows have more or less columns than the header. Open the Log within the EFM Registers window for a detailed analysis.
		Missing Req Column	The CSV file is missing a required column. Open the Log within the EFM Registers window for a detailed analysis.
		Exceeded Max Data	The CSV file contained more rows than the firmware supports.
		Invalid Row Data	The CSV file contains a row with invalid data. This can be out of range data or mappings that cannot be processed. Open the Log within the EFM Registers window for a detailed analysis.

Field	Description	
	Duplicate Data	The CSV file contains two mappings with similar data or identical register numbers. Open the Log within the EFM Registers window for a detailed analysis.

5. Select **Save** to save any changes you make to this pop-up display.

4.28.3.1 Map Table Register

Use this pop-up display to configure the Modbus registers stored in the FB Series product. Map Table Registers can store values received from FB Series product parameters or values received from remote devices. A SCADA system can then retrieve data stored in the FB Series product from the Map Table Register.

Note

Register tables are shared by all communication ports, and by both Modbus slave and master port owners.

Your selection (**Database Objects** or **Use CSV Files**) in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display affects the functionality and fields shown on this display.

- If you select **Database Objects**, each register map is contained in separate register tables and stored in the FB Series product's internal database. You can configure 48 register tables. Each register table is comprised of 15 individual register entries (rows). Indexing allows for each entry to configure multiple registers (i.e., a single entry can represent 10 contiguous registers).
- If you select **Use CSV Files**, information for all register maps is contained in a single CSV file that is stored in the FB Series product. The register table can contain up to 65,535 rows.

You can map one line in the Map Table Register to more than one register or parameter pair by using either Point Indexing or Parameter Indexing.

- **Point Indexing** – Maps the same parameter for multiple instances of an object.
- **Parameter Indexing** – Maps consecutive parameters for the same instance of an object.

Note

The order of parameters in the database can change from one firmware version to the next.

You can add a parameter to the register table by clicking and dragging the parameter onto the desired position in the table.

To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.
4. Select the **Map Table Registers** button. The Map Table Register pop-up display opens.

Figure 303. Map Table Register (configured to use Database Objects)

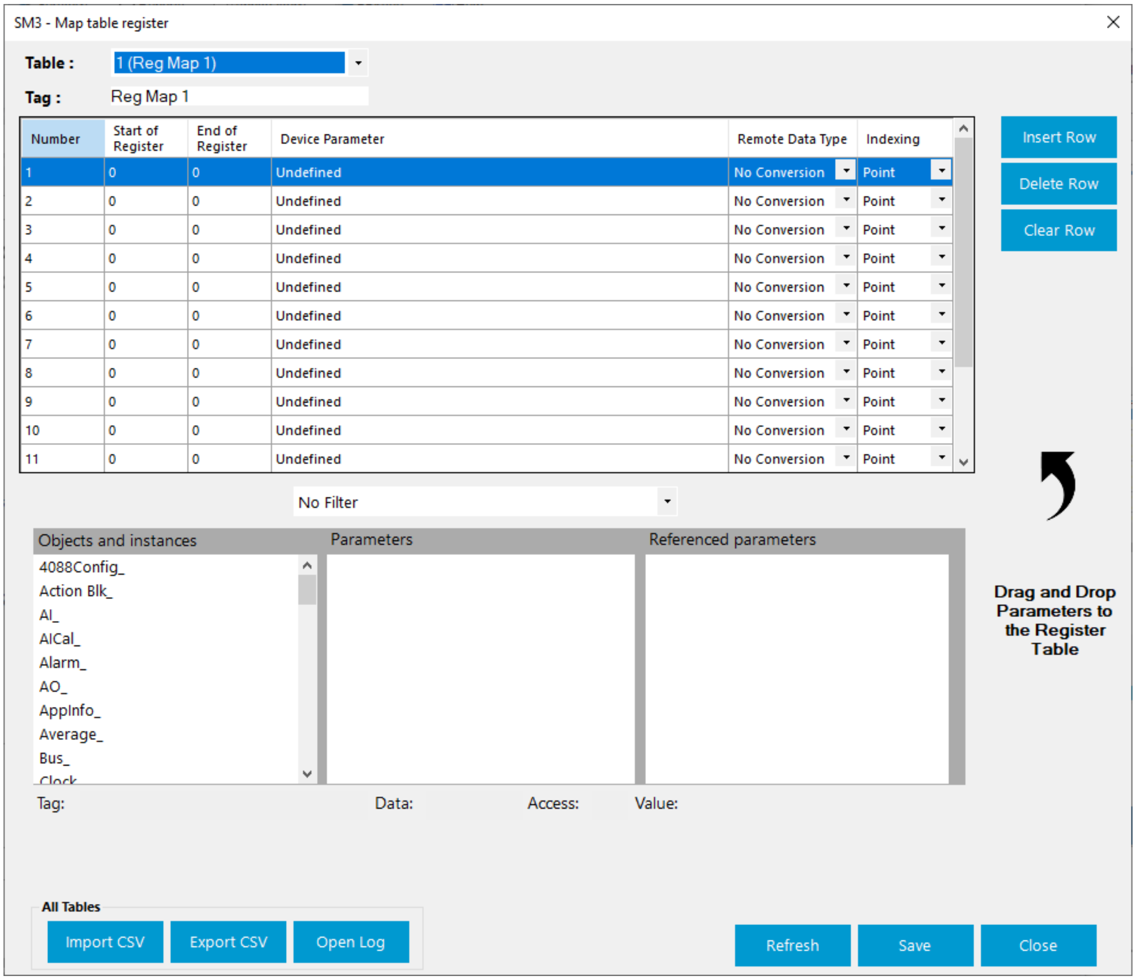

SM3 - Map table register

Table : 1 (Reg Map 1)

Tag : Reg Map 1

Number	Start of Register	End of Register	Device Parameter	Remote Data Type	Indexing
1	0	0	Undefined	No Conversion	Point
2	0	0	Undefined	No Conversion	Point
3	0	0	Undefined	No Conversion	Point
4	0	0	Undefined	No Conversion	Point
5	0	0	Undefined	No Conversion	Point
6	0	0	Undefined	No Conversion	Point
7	0	0	Undefined	No Conversion	Point
8	0	0	Undefined	No Conversion	Point
9	0	0	Undefined	No Conversion	Point
10	0	0	Undefined	No Conversion	Point
11	0	0	Undefined	No Conversion	Point

No Filter

Objects and instances: 4088Config_, Action Blk_, AI_, AICal_, Alarm_, AO_, AppInfo_, Average_, Bus_, Clock

Tag:

Data:

Access:

Value:

Drag and Drop Parameters to the Register Table

5. Review – and change as necessary – the values in the following fields:

Field	Description
Table	Click ▼ to select a map table register to configure. **Note** This field is shown **only** if you select **Database Objects** in the **Modbus Mapping using CSV Files** field on either the [Communications – Modbus Slave](#) or [Communications – Modbus Master](#) pop-up display.

Field	Description
Tag	Sets a name for the selected instance of the map table. **Note** This field is shown **only** if you select **Database Objects** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.
Number	This **read-only** field shows the instance of the map table being accessed.
Start of Register	Sets the first data register in the address span. Any number from 0 to 65535 is valid. You can duplicate register numbers as long as you assign them to separate communication ports. Number the tables from smallest to largest. For example, configure a starting register of 400 and an ending register of 700. When the host device requests starting register 500 through ending register 700, all the host-requested register numbers (500 through 700) are valid and elicit responses: the requested register numbers (500 through 700) match (or fall between) the starting register and ending register numbers (400 through 700). **Note** In certain Modbus Host devices, the register 40101 is actually transmitted as "100". The value "100" should be placed in this field as the FB Series product uses the actual number sent by the host.
End of Register	Sets the last register in the address span. Compute the value for this field by adding the total number of registers used to the Start or Starting Register number and subtracting 1.
Device Parameter	Defines the parameter of the object and instance in the database to set or to acquire. Be aware of the different data types (Character, Integer, Long, Float) and the size of the data types.
Remote Data Type	Click ▼ to select the data format sent to and received from the remote device. The FB Series product automatically converts the data as transmitted to/from the remote device to the correct data type for the parameter defined in the Device Parameter field. For more information, see Remote Data Types. **Note** No conversion sends the data type as stored in the FB Series product.

Field	Description	
Indexing	Sets a block of register values as successive Logical Point Numbers or Parameters without having to define each separately. Possible options are:	
	Point	Maps the Start or Starting Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Object and Parameter, and increment the Instance.
	Parameter	Maps the Start or Starting Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Object and Instance, and increment the Parameter Number. **Note** The order of parameters in the database can change from one firmware version to the next.
Read/Write	Click ▼ to set if the data in the selected row of the map table register can be modified by a remote device. Possible options are: **Note** This field is shown **only** if you select **Use CSV Files** in **the Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.	
	Read Only	The data **cannot** be modified by a remote device.
	Read/Write	The data can be modified by a remote device.
Ports	Click this cell to open a **Select Comm port instance** pop-up display and configure which communications ports instances that a remote device **must** use to access data in the selected row of the map table register. Place a check mark next each allowed communications port. Select **OK** to save your changes and return to the previous display. **Note** This field is shown **only** if you select **Use CSV Files** in **the Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.	

Field	Description
Insert Row	Select to add a new row to the map table register at the location of the currently highlighted row. Existing entries are moved down one row. **Note** If you select **Database Objects** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display, then the last row in the Map Table Register (row 15) is overwritten by the previous row (row 14).
Delete Row	Select to remove the currently highlighted row from the map table register. Existing entries are moved up one row. **Note** If you select **Database Objects** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display, then an empty row is added to the last row in the Map Table Register (row 15).
Clear Row	Select to remove data from the currently highlighted row of the map table register.
Add Row	Select to add a row to the end of the map table register. **Note** This field is shown **only** if you select **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.
Filter	Click ▼ to narrow the number of parameters by object type.
Object and instances	Lists the available database objects (types) and instances (iterations) of each object. Select an Object and Instance to view the available parameters.
Parameters	Lists the available parameters (properties) for the selected object and instance.
Referenced Parameters	Lists the available parameters for the referenced object, when the data type of the parameter in the Parameters column is an OBJREF.
Parameter's Tag	This **read-only** field shows the name of the selected parameter.
Data Type	This **read-only** field shows the data type of the selected parameter.

Field	Description
Access Type	This **read-only** field shows the read/write access of the selected parameter.
Value	This **read-only** field shows the value of the selected parameter.
Import CSV	Click to import a CSV file into your FB Series product that contains your desired Modbus configuration. Navigate to the location of the saved CSV file and select **Open** to start the import process. For more information, refer to Importing a Modbus Map Table CSV File. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. Any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.
Export CSV	Click to save a CSV file to your computer that contains the current Modbus configuration of your FB Series product. A Select Table dialog opens where you can select which Modbus tables to include in the export. Click **Start**, select a name and location for the exported file on your computer, and click **Save** to begin the export process. For more information, refer to Exporting a Modbus Map Table CSV File. **Note** By default, all selected data is exported into a single file. Select **Export to individual file** to have the system create individual files for each Modbus table you select.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect™ import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.
Refresh	Select to re-display the map table entries currently stored in memory of the FB Series product.
Save	Select to save the current map table and any changes to memory in the FB Series product.
Close	Select to exit the Map Table Register display.

6. If you're starting from a blank map table, click **Add Row** to add a new row to the map table.

7. Select an Object and Instance of that Object from the **Objects and instances** frame. A list of available parameters displays in the Parameters frame.

8. Click and drag a parameter from the **Parameters** frame to the desired register number in selected the Map Table.

9. Enter the first data register in the address span in the **Start of Register** field.

10. Enter the last register in the address span in the **End of Register** field.

11. Click ▼ in the **Remote Data Type** field to set the data format sent to and received from the remote device.

12. Click ▼ in the **Indexing** field to set a block of register values as successive Object Numbers or Parameters.

13. Click ▼ to set if the data in the selected row of the map table register can be either read (Read Only) or modified (Read/Write) by a remote device.

    Note

    This field is shown **only** if you select **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.

14. Click the **Ports** cell to open a **Select Comm port instance** display and configure which communications ports instances that a remote device is allowed to use to access the data in the selected row of the map table register. Place a check mark next each allowed communications port. Select **OK** to save your changes and return to the previous display.

    Note

    This field is shown **only** if you select **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display.

15. Select **Save** to save any changes you make to this pop-up display.

Note

If you selected **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display, you **must** perform a warm start before any changes take effect.

4.28.3.1.1 Importing a Modbus Map Table CSV File

You can import a CSV file that contains your Modbus map table configuration for use in your FB Series product.

Note

- For more information about Modbus map tables in the FB Series product, refer to Map Table Register.
- For more information about creating your own Modbus map table CSV file, refer to Creating a Modbus Map Table CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current Modbus map table configuration, refer to Exporting a Modbus Map Table CSV File.
- Your selection in the **Modbus Mapping using CSV files** field (either **Database Objects** or **Use CSV Files**) affects the format of Modbus map table. To import a CSV file that was created by an FB Series product with a different selection in the **Modbus Mapping using CSV files** field, then you **must** first modify the CSV file to have the correct format. For more information about the format required for each selection (either **Database Objects** or **Use CSV Files**), refer to Creating a Modbus Map Table CSV File.

To import a CSV file that contains your Modbus map table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave or Modbus Master protocol.
3. Depending on the protocol used by the selected communications port, select either the **Modbus Slave** or **Modbus Master** button. The Modbus Slave or Modbus Master pop-up display opens.
4. Select the **Map Table Registers** button. The Map Table Register pop-up display opens.

Figure 304. Map Table Register – Import CSV

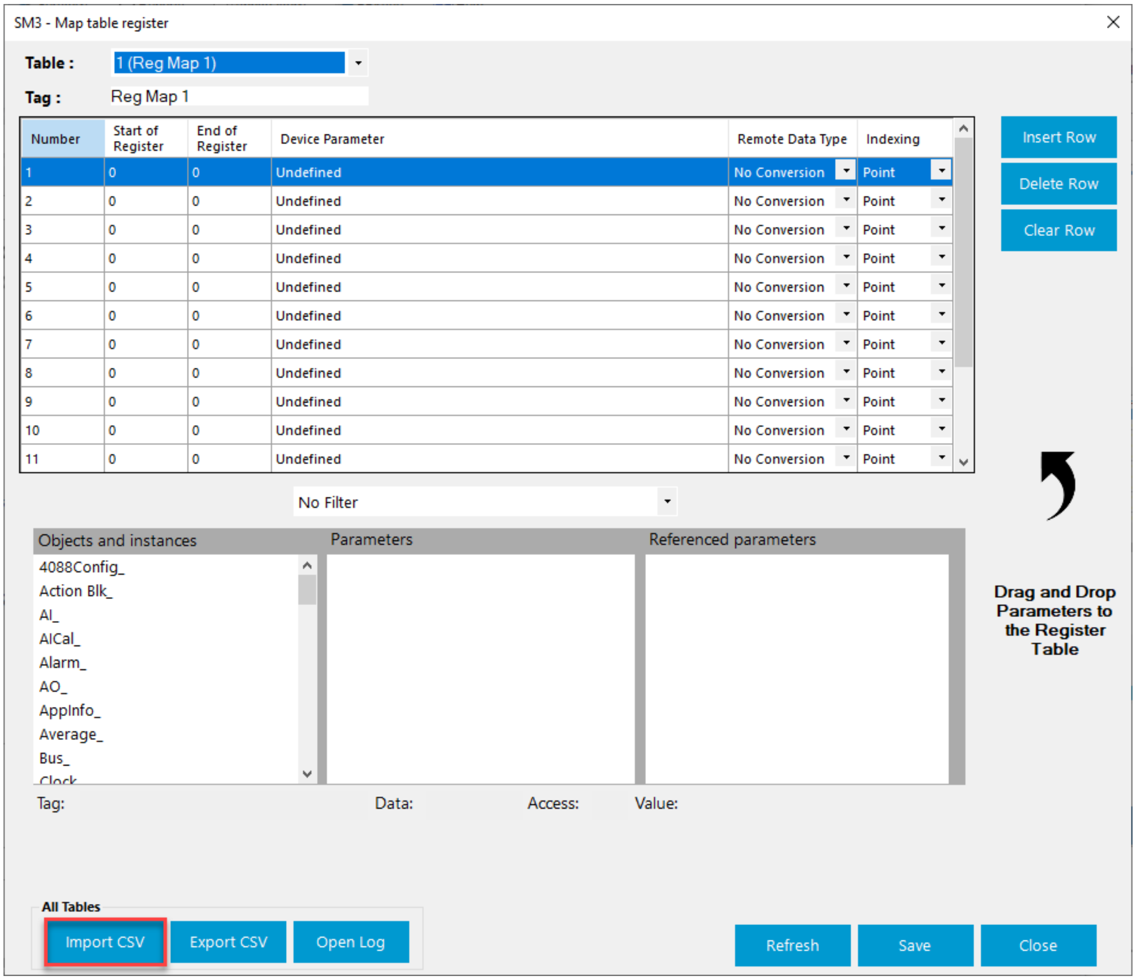


Table : 1 (Reg Map 1)

Tag : Reg Map 1

Number	Start of Register	End of Register	Device Parameter	Remote Data Type	Indexing
1	0	0	Undefined	No Conversion	Point
2	0	0	Undefined	No Conversion	Point
3	0	0	Undefined	No Conversion	Point
4	0	0	Undefined	No Conversion	Point
5	0	0	Undefined	No Conversion	Point
6	0	0	Undefined	No Conversion	Point
7	0	0	Undefined	No Conversion	Point
8	0	0	Undefined	No Conversion	Point
9	0	0	Undefined	No Conversion	Point
10	0	0	Undefined	No Conversion	Point
11	0	0	Undefined	No Conversion	Point

4088Config_
Action Blk_
AI_
AICal_
Alarm_
AO_
AppInfo_
Average_
Bus_
Clock

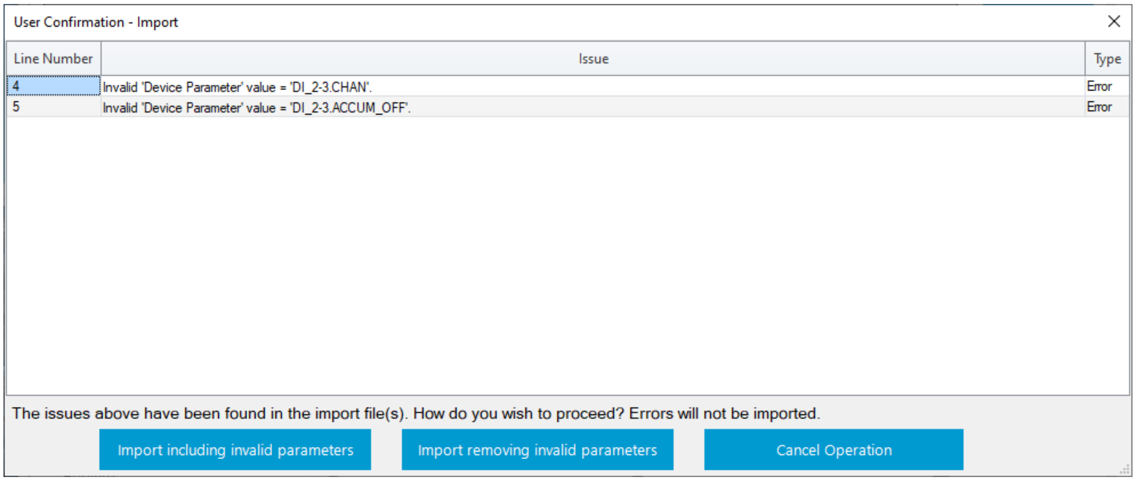
Drag and Drop Parameters to the Register Table

5. Select the **Import CSV** button.
6. Navigate to the file location of your CSV file and select **Open**.

Note

The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

Figure 305. Example Import Map Table Errors



User Confirmation - Import

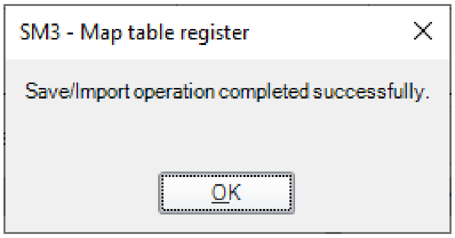
Line Number	Issue	Type
4	Invalid 'Device Parameter' value = 'DI_2-3.CHAN'.	Error
5	Invalid 'Device Parameter' value = 'DI_2-3.ACCUM_OFF'.	Error

The issues above have been found in the import file(s). How do you wish to proceed? Errors will not be imported.

---

7. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Figure 306. Confirmation



SM3 - Map table register

Save/Import operation completed successfully.

4.28.3.1.2 Exporting a Modbus Map Table CSV File

You can export your FB Series product's current Modbus map table configuration to a CSV file saved on your computer.

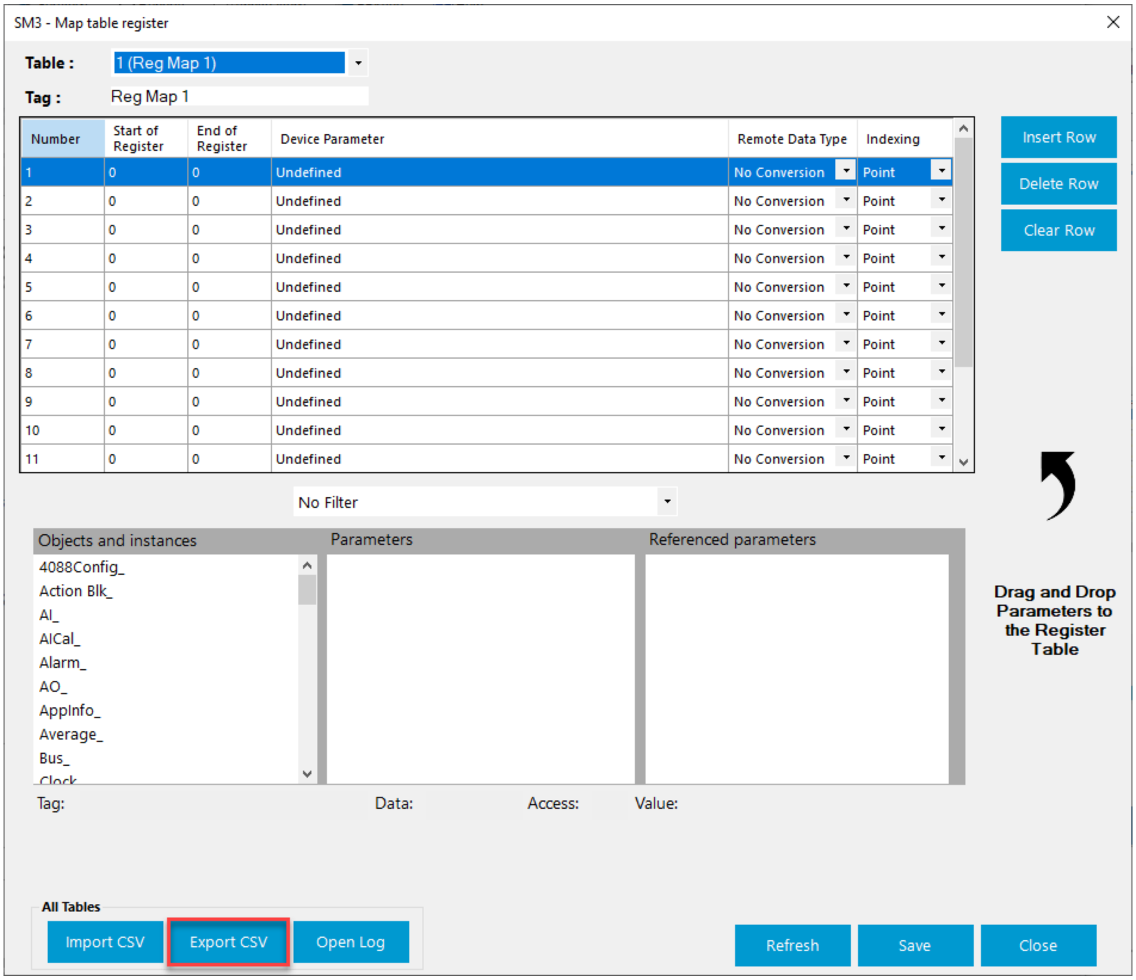
Note

- For more information about Modbus map tables in the FB Series product, refer to Map Table Register.
- For more information about creating your own Modbus map table CSV file, refer to Creating a Modbus Map Table CSV File.
- For more information about importing a CSV file that contains the FB Series product's current Modbus map table configuration, refer to Importing a Modbus Map Table CSV File.

To export a CSV file that contains your Modbus map table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave or Modbus Master protocol.
3. Depending on the protocol used by the selected communications port, select either the **Modbus Slave** or **Modbus Master** button. The Modbus Slave or Modbus Master pop-up display opens.
4. Select the **Map Table Registers** button. The Map Table Register pop-up display opens.

Figure 307. Map Table Register – Export CSV



SM3 - Map table register

Table : 1 (Reg Map 1)

Tag : Reg Map 1

Number	Start of Register	End of Register	Device Parameter	Remote Data Type	Indexing
1	0	0	Undefined	No Conversion	Point
2	0	0	Undefined	No Conversion	Point
3	0	0	Undefined	No Conversion	Point
4	0	0	Undefined	No Conversion	Point
5	0	0	Undefined	No Conversion	Point
6	0	0	Undefined	No Conversion	Point
7	0	0	Undefined	No Conversion	Point
8	0	0	Undefined	No Conversion	Point
9	0	0	Undefined	No Conversion	Point
10	0	0	Undefined	No Conversion	Point
11	0	0	Undefined	No Conversion	Point

No Filter

Objects and instances	Parameters	Referenced parameters
4088Config_ Action Blk_ AI_ AICal_ Alarm_ AO_ AppInfo_ Average_ Bus_ Clock		

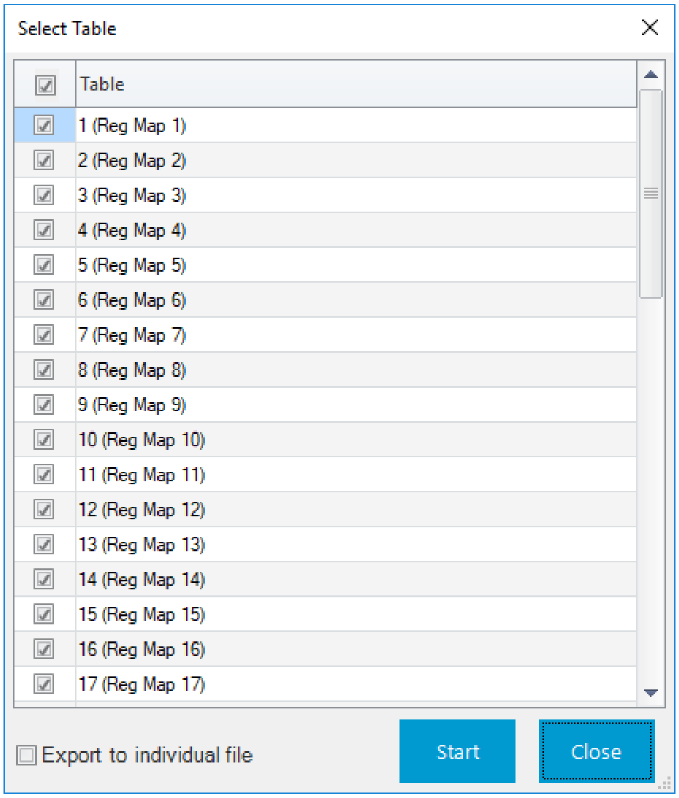
Tag: Data: Access: Value:

Drag and Drop Parameters to the Register Table

5. Select the **Export CSV** button. One of two things happens based on your selection in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display:

- If you select **Database Objects**, the Select Table pop-up display opens. Proceed to step 6.
- If you select **Use CSV Files**, the Save csv File window opens. Proceed to step 8.

Figure 308. Select Table



Select Table

☑	Table
☑	1 (Reg Map 1)
☑	2 (Reg Map 2)
☑	3 (Reg Map 3)
☑	4 (Reg Map 4)
☑	5 (Reg Map 5)
☑	6 (Reg Map 6)
☑	7 (Reg Map 7)
☑	8 (Reg Map 8)
☑	9 (Reg Map 9)
☑	10 (Reg Map 10)
☑	11 (Reg Map 11)
☑	12 (Reg Map 12)
☑	13 (Reg Map 13)
☑	14 (Reg Map 14)
☑	15 (Reg Map 15)
☑	16 (Reg Map 16)
☑	17 (Reg Map 17)

☐ Export to individual file

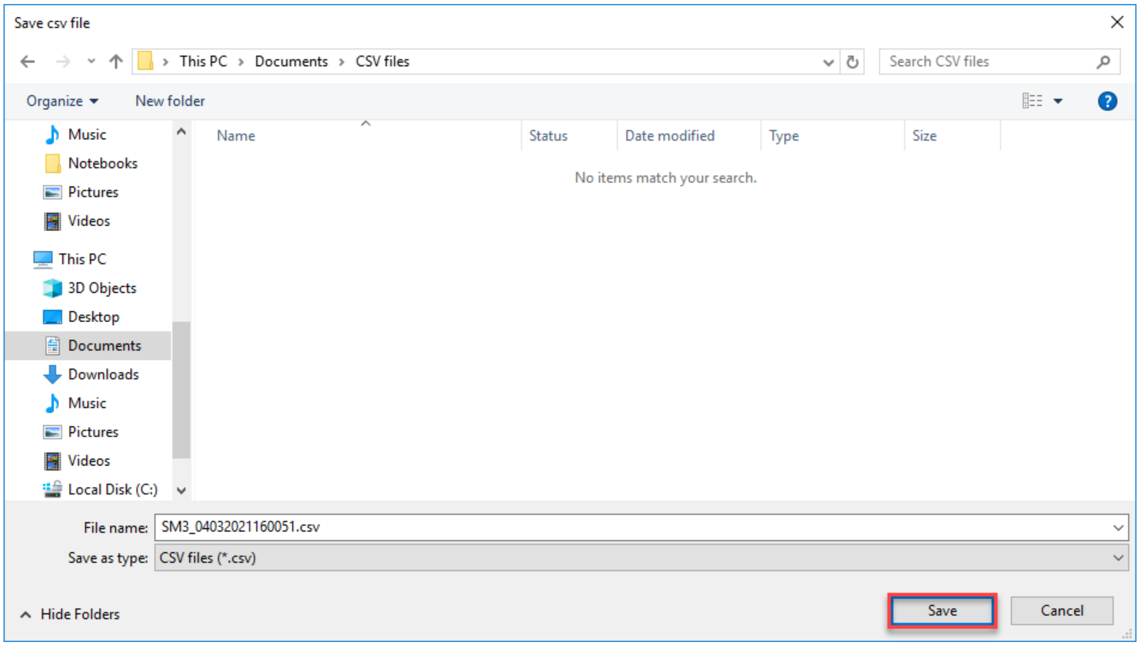
6. Place a check mark next to each table you want to export.

Note

By default, all selected tables are exported to a single file. If you want each selected table to be exported to individual files, place a check mark next to Export to individual file.

7. Select **Start**. A Save csv file window opens.

Figure 309. Save csv file



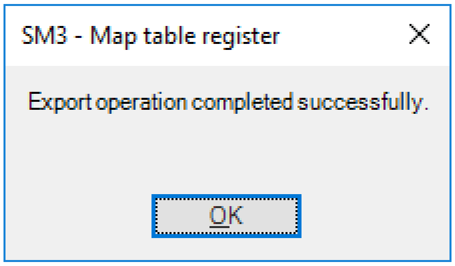
No items match your search.

File name: SM3_04032021160051.csv

Save as type: CSV files (*.csv)

8. Navigate to a location on your computer to save your exported CSV file and select **Save**. The system exports the CSV file and displays a progress bar at the top of the display.
9. A confirmation message displays after exporting the CSV file. Select OK to complete the process.

Figure 310. Confirmation



Export operation completed successfully.

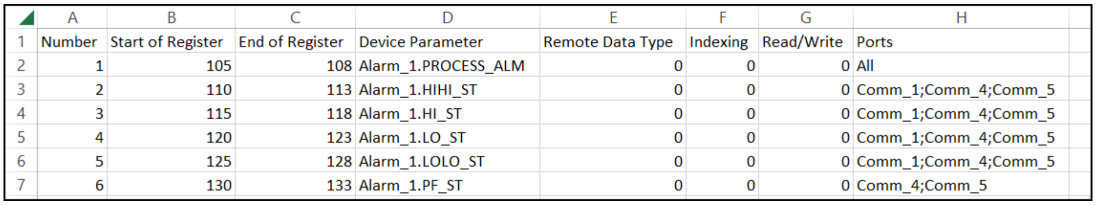
4.28.3.1.3 Creating a Modbus Map Table CSV File

You can create a Modbus Map Table on your computer and then import the file for use in the FB Series product. If your Modbus Map Table contains a large amount of points, it may be easier to create a CSV file on your computer than it is to configure the table in FBxConnect™.

Note

- For more information about Modbus Map Tables, refer to Map Table Register.
- The easiest way to begin creating a custom map is to export a CSV that contains the current configuration and then edit that file. For more information about exporting a CSV file, refer to the Exporting a Modbus Map Table CSV File.

Figure 311. Example Modbus Map Table CSV Format (configured to use CSV Files)



	A	B	C	D	E	F	G	H
1	Number	Start of Register	End of Register	Device Parameter	Remote Data Type	Indexing	Read/Write	Ports
2	1	105	108	Alarm_1.PROCESS_ALM	0	0	0	All
3	2	110	113	Alarm_1.HIHI_ST	0	0	0	Comm_1;Comm_4;Comm_5
4	3	115	118	Alarm_1.HI_ST	0	0	0	Comm_1;Comm_4;Comm_5
5	4	120	123	Alarm_1.LO_ST	0	0	0	Comm_1;Comm_4;Comm_5
6	5	125	128	Alarm_1.LOLO_ST	0	0	0	Comm_1;Comm_4;Comm_5
7	6	130	133	Alarm_1.PF_ST	0	0	0	Comm_4;Comm_5

To create a CSV file that contains your Modbus map table configuration:

1. Open a blank spreadsheet (or open your previously exported Modbus poll table CSV file).
2. Your selection (**Database Objects** or **Use CSV Files**) in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display affects the format of the CSV file. In row one of the spreadsheet, enter the following text based on your configuration:

Table 48. Modbus Map Table CSV Headers

Database Objects	Use CSV Files
• Column A = Table • Column B = Number • Column C = Start of Register • Column D = End of Register • Column E = Device Parameter • Column F = Remote Data Type • Column G = Indexing	• Column A = Number • Column B = Start of Register • Column C = End of Register • Column D = Device Parameter • Column E = Remote Data Type • Column F = Indexing • Column G = Read/Write • Column F = Ports

3. In the proceeding rows, enter information for each table entry according to the descriptions below:

Note

Drop-down lists on the FBxConnect™ display are represented as numbers in the CSV file. See the descriptions below for a description for each number.

Column Heading	Description
Table	Indicates the map table register for the selected row. Valid values are: **1** through **48** **Note** • Register tables are shared by all communication ports, and by both Modbus Slave and Master port owners. • This column is required **only** if you select **Database Objects** in the **Modbus Mapping using CSV Files** option on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display. For more information, refer to Map Table Register.
Number	Enter the row of the selected map table register. The number of possible rows is dependent on your selection in the **Database Objects** in the **Modbus Mapping using CSV Files** option on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display: • If you select **Database Objects**, valid values are 1 through 15. • If you select **Use CSV Files**, valid values are 1 through 65,000.
Start of Register	Enter the first data register in the address span. Any number from 0 to 65535 is valid. You can duplicate register numbers as long as you assign them to separate communication ports. Number the tables from smallest to largest. For example, configure a starting register of 400 and an ending register of 700. When the host device requests starting register 500 through ending register 700, all the host-requested register numbers (500 through 700) are valid and elicit responses: the requested register numbers (500 through 700) match (or fall between) the starting register and ending register numbers (400 through 700). **Note** In certain Modbus Host devices, the register 40101 is actually transmitted as "100". The value "100" should be placed in this field as the FB Series product uses the actual number sent by the host.

Column Heading	Description
End of Register	Enter the last register in the address span. Compute the value for this field by adding the total number of registers used to the Start or Starting Register number and subtracting 1. Any number from 0 to 65535 is valid.
Device Parameter	Enter the parameter of the object and instance in the database to set or to acquire. Be aware of the different data types (Character, Integer, Long, Float) and the size of the data types.
Remote Data Type	Enter the number that corresponds to the data format sent to and received from the remote device. The FB Series product automatically converts the data as transmitted to/from the remote device to the correct data type for the parameter defined in the Device Parameter field. For more information, refer to the CSV Value field in the Remote Data Types topic. **Note** No conversion sends the data type as stored in the FB Series product.
Indexing	Sets a block of register values as successive Logical Point Numbers or Parameters without having to define each separately. Possible options are: **0 Point** Maps the Start or Starting Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Object and Parameter, and increment the Instance. **1 Parameter** Maps the Start or Starting Register to the selected Device Parameter. Subsequent registers, through the End Register, are mapped to the same Object and Instance, and increment the Parameter Number. **Note** The order of parameters in the database can change from one firmware version to the next.

Column Heading	Description
Read/Write	Sets if the data in the selected row of the map table register can be modified by a remote device. Possible options are Read Only (the data cannot be modified) or Read/Write (the data can be modified). **Note** This column is required **only** if you select **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display. For more information, refer to Map Table Register.
Ports	Enter the communications port instances that a remote device **must** use to access the data in the selected row of the map table register. **Note** • At least one communications port instance **must** be defined. • To allow multiple communications ports access to the data, place a semicolon between each instance (for example, Comm_1;Comm_4;Comm_5). • Typing **All** enables all communications port instances to access the data. • This column is required **only** if you select **Use CSV Files** in the **Modbus Mapping using CSV Files** field on either the Communications – Modbus Slave or Communications – Modbus Master pop-up display. For more information, refer to Map Table Register.

4. Save your changes. You can now import your CSV file for use in your FB Series product. For more information, refer to Importing a Modbus Map Table CSV File.

Note

Make sure to save the file with a **.csv** file extension.

4.28.3.1.4 Remote Data Types

Remote data types in the Modbus register table tell the FB Series product what data type to send to and receive from the remote device. The FB Series products support the following remote data types.

Table 49. Remote Data Types

CSV Value	Data Type	Description
0	**No Conversion**	Format of selected parameter (byte order determined by LSB/MSB option).
1	**UINT8**	8-bit unsigned integer.
2	**INT8**	8-bit signed integer.
3	**UINT16**	16-bit unsigned integer (byte order determined by LSB/MSB option).
4	**INT16**	16-bit signed integer (byte order determined by LSB/MSB option).
5	**UINT32 (2 Registers 0-1-2-3)**	32-bit unsigned integer value to be sent or received in two Modbus registers with byte order of 0-1-2-3 (where 0 is the least significant byte).
6	**UINT32 (2 Registers 1-0-3-2)**	32-bit unsigned integer value to be sent or received in two Modbus registers with byte order of 1-0-3-2 (where 0 is the least significant byte).
7	**UINT32 (2 Registers 2-3-0-1)**	32-bit unsigned integer value to be sent or received in two Modbus registers with byte order of 2-3-0-1 (where 0 is the least significant byte).
8	**UINT32 (2 Registers 3-2-1-0)**	32-bit unsigned integer value to be sent or received in two Modbus registers with byte order of 3-2-1-0 (where 0 is the least significant byte).
9	**INT32 (2 Registers 0-1-2-3)**	32-bit signed integer value to be sent or received in two Modbus registers with byte order of 0-1-2-3 (where 0 is the least significant byte).
10	**INT32 (2 Registers 1-0-3-2)**	32-bit signed integer value to be sent or received in two Modbus registers with byte order of 1-0-3-2 (where 0 is the least significant byte).

CSV Value	Data Type	Description
11	**INT32 (2 Registers 2-3-0-1)**	32-bit signed integer value to be sent or received in two Modbus registers with byte order of 2-3-0-1 (where 0 is the least significant byte).
12	**INT32 (2 Registers 3-2-1-0)**	32-bit signed integer value to be sent or received in two Modbus registers with byte order of 3-2-1-0 (where 0 is the least significant byte).
13	**UINT64 (4 Registers 0-1-2-3-4-5-6-7)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 0-1-2-3-4-5-6-7 (where 0 is the least significant byte).
14	**UINT64 (4 Registers 2-3-0-1-6-7-4-5)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 2-3-0-1-6-7-4-5 (where 0 is the least significant byte).
15	**UINT64 (4 Registers 4-5-6-7-0-1-2-3)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 4-5-6-7-0-1-2-3 (where 0 is the least significant byte).
16	**UINT64 (4 Registers 6-7-4-5-2-3-0-1)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 6-7-4-5-2-3-0-1 (where 0 is the least significant byte).
17	**UINT64 (4 Registers 1-0-3-2-5-4-7-6)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 1-0-3-2-5-4-7-6 (where 0 is the least significant byte).
18	**UINT64 (4 Registers 3-2-1-0-7-6-5-4)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 3-2-1-0-7-6-5-4 (where 0 is the least significant byte).
19	**UINT64 (4 Registers 5-4-7-6-1-0-3-2)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 5-4-7-6-1-0-3-2 (where 0 is the least significant byte).
20	**UINT64 (4 Registers 7-6-5-4-3-2-1-0)**	64-bit unsigned integer value to be sent or received in four Modbus registers with byte order of 7-6-5-4-3-2-1-0 (where 0 is the least significant byte).
21	**INT64 (4 Registers 0-1-2-3-4-5-6-7)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 0-1-2-3-4-5-6-7 (where 0 is the least significant byte).

CSV Value	Data Type	Description
22	**INT64 (4 Registers 2-3-0-1-6-7-4-5)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 2-3-0-1-6-7-4-5 (where 0 is the least significant byte).
23	**INT64 (4 Registers 4-5-6-7-0-1-2-3)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 4-5-6-7-0-1-2-3 (where 0 is the least significant byte).
24	**INT64 (4 Registers 6-7-4-5-2-3-0-1)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 6-7-4-5-2-3-0-1 (where 0 is the least significant byte).
25	**INT64 (4 Registers 1-0-3-2-5-4-7-6)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 1-0-3-2-5-4-7-6 (where 0 is the least significant byte).
26	**INT64 (4 Registers 3-2-1-0-7-6-5-4)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 3-2-1-0-7-6-5-4 (where 0 is the least significant byte).
27	**INT64 (4 Registers 5-4-7-6-1-0-3-2)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 5-4-7-6-1-0-3-2 (where 0 is the least significant byte).
28	**INT64 (4 Registers 7-6-5-4-3-2-1-0)**	64-bit signed integer value to be sent or received in four Modbus registers with byte order of 7-6-5-4-3-2-1-0 (where 0 is the least significant byte).
29	**FLOAT (2 Registers 0-1-2-3)**	32-bit single precision floating point value to be sent or received in two Modbus registers with byte order of 0-1-2-3 (where 0 is the least significant byte).
30	**FLOAT (2 Registers 1-0-3-2)**	32-bit single precision floating point value to be sent or received in two Modbus registers with byte order of 1-0-3-2 (where 0 is the least significant byte).
31	**FLOAT (2 Registers 2-3-0-1)**	32-bit single precision floating point value to be sent or received in two Modbus registers with byte order of 2-3-0-1 (where 0 is the least significant byte).
32	**FLOAT (2 Registers 3-2-1-0)**	32-bit single precision floating point value to be sent or received in two Modbus registers with byte order of 3-2-1-0 (where 0 is the least significant byte).

CSV Value	Data Type	Description
33	**DOUBLE (4 Registers 0-1-2-3-4-5-6-7)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 0-1-2-3-4-5-6-7 (where 0 is the least significant byte).
34	**DOUBLE (4 Registers 2-3-0-1-6-7-4-5)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 2-3-0-1-6-7-4-5 (where 0 is the least significant byte).
35	**DOUBLE (4 Registers 4-5-6-7-0-1-2-3)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 4-5-6-7-0-1-2-3 (where 0 is the least significant byte).
36	**DOUBLE (4 Registers 6-7-4-5-2-3-0-1)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 6-7-4-5-2-3-0-1 (where 0 is the least significant byte).
37	**DOUBLE (4 Registers 1-0-3-2-5-4-7-6)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 1-0-3-2-5-4-7-6 (where 0 is the least significant byte).
38	**DOUBLE (4 Registers 3-2-1-0-7-6-5-4)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 3-2-1-0-7-6-5-4 (where 0 is the least significant byte).
39	**DOUBLE (4 Registers 5-4-7-6-1-0-3-2)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 5-4-7-6-1-0-3-2 (where 0 is the least significant byte).
40	**DOUBLE (4 Registers 7-6-5-4-3-2-1-0)**	64-bit double precision floating point value to be sent or received in four Modbus registers with byte order of 7-6-5-4-3-2-1-0 (where 0 is the least significant byte).
41	**SINGLE REGISTER FLOATING POINT**	32-bit single precision floating point value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).
42	**SINGLE REGISTER DOUBLE**	64-bit double precision floating point value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).
43	**SINGLE REGISTER INT32**	32-bit signed integer value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).

CSV Value	Data Type	Description
44	**SINGLE REGISTER UINT32**	32-bit unsigned integer value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).
45	**SINGLE REGISTER INT64**	64-bit signed integer value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).
46	**SINGLE REGISTER UINT64**	64-bit unsigned integer value to be sent or received as a single Modbus register (byte order determined by LSB/MSB option).
47	**STRING (10 Characters)**	A 10-character string value provided as two characters per consecutive register. To be sent or received as five Modbus registers. Strings with less than 10 characters are padded with extra space characters to become 10 characters in length.
48	**STRING (20 Characters)**	A 20-character string value provided as two characters per consecutive register. To be sent or received as ten Modbus registers. Strings with less than 20 characters are padded with extra space characters to become 20 characters in length.
49	**STRING (30 Characters)**	A 30-character string value provided as two characters per consecutive register. To be sent or received as fifteen Modbus registers. Strings with less than 30 characters are padded with extra space characters to become 30 characters in length.
50	**STRING (40 Characters)**	A 40-character string value provided as two characters per consecutive register. To be sent or received as twenty Modbus registers. Strings with less than 40 characters are padded with extra space characters to become 40 characters in length.

4.28.3.2 Modbus Registers for EFM Application Events

The following registers are used when you enable EFM Application Events and retrieve events via Modbus.

Table 50. Application Events

Register	Description
60000	String Event
61001	Power Applied
61002	Power Removed
61003	Battery Changed
61004	Firmware Update Start
61005	Firmware Apply Package Version
61006	Firmware Update Complete
61007	Firmware Update Package Restore Fail
61008	Task Restarted
61009	CPU Module Changed
61010	PM Module Changed
61011	CPU Module Previous
61012	PM Module Previous
61013	Schedule Slip Detected
61014	Event Type 14
61015	Event Type 15
61016	Login Success
61017	Login Fail Invalid Credentials
61018	Account Locked
61019	Logout
61020	Account Added
61021	Account Removed
61022	Account Modified
61023	Log Clear
61024	Log Clear Due to CRC Corrupt
61025	History Point Cleared
61026	System Down
61027	Action Block Trip Status Changed

Register	Description
61028	Database Initialized
61029	Daylight Saving Time Change
61030	Total Rollover
61031	System Restart
61032	Pulse Accum Rollover
61033	Firmware Apply Image Version
61034	Firmware I/O Board Disabled
61035	Restart During Calc Cycle
61036	Configuration Counter Changed
61037	Log Clear for Combined Event Log
61038	Log Clear for Separate Event Logs
61039	History Clear
61040	Alarm Clear
61041	Event Clear
61042	History Records Lost
61043	Alarm Records Lost
61044	Event Records Lost
61045	Standard History Point Archival Reset
61046	GC Data Read Failed
61047	Hist Group Read Failed
61048	Application Clear
61049	Users Clear
61050 - 62000	Reserved for Future Events
62001	Informational
62002	Error
62003	Status
62004	Calculated Factor
62005	Message
62006	Data

Register	Description
62007	Notice
62008	Feedback
62009	Confirmation
62010	Program Adjusted
62011	Estimated Result
62012	User Input
62013	System Change
62014	HMI Input
62015	Other
62016 - 63000	Reserved for Future Events
63001	Low
63002	Low Low
63003	High
63004	High High
63005	Rate of Change
63006	User Account Locked
63007	Log Full Limit Exceeded
63008	Log Nearly Full Limit Exceeded
63009	Log Integrity Failure
63010	Battery Status
63011	Low Voltage
63012	Override
63013	Point Fail
63014	Digital ON Status Alarm
63015	No Response From History
63016	Analysis Timeout
63017	Normalization Failure
63018	Flow Calculation Alarm
63019	Properties Calculation Alarm

Register	Description
63020	Auto-Adjust System Alarm
63021	Auto-Adjust Flow Alarm
63022	Auto-Adjust Delta A Alarm
63023	History Point Movement Failure
63024	Door Open Status Alarm
63025	Other
63026	Flow Calc Alarm: Invalid Input(s)
63027	Flow Calc Alarm: Invalid Config
63028	Flow Calc Alarm: Calculation Error
63029	Flow Calc Alarm: Boundary Error
63030	Flow Calc Alarm: Invalid Station Assign
63031	Flow Calc Alarm: Reserved
63032	Flow Calc Alarm: Reserved
63033	Flow Calc Alarm: Reserved
63034	Flow Calc Alarm: DP/Flow
63035	Flow Calc Alarm: Pressure
63036	Flow Calc Alarm: Temperature
63037	Flow Calc Alarm: Flowing Density/Z
63038	Flow Calc Alarm: Base Density/Z
63039	Flow Calc Alarm: Relative Density
63040	Flow Calc Alarm: HV/Enthalpy
63041	Flow Calc Alarm: Viscosity
63042	Flow Calc Alarm: User Corr Factor
63043	Flow Calc Alarm: Total/Incement
63044	Flow Calc Alarm: Integral Mult Value
63045	Flow Calc Alarm: Reserved
63046	Flow Calc Alarm: Reserved
63047	Flow Calc Alarm: Reserved
63048	Flow Calc Alarm: Reserved

Register	Description
63049	Flow Calc Alarm: Reserved
63050	Flow Calc Alarm: Reserved
63051	Flow Calc Alarm: Beta Ratio
63052	Flow Calc Alarm: DP/P Ratio
63053	Flow Calc Alarm: Isentropic Exponent
63054	Flow Calc Alarm: Reynolds Number
63055	Flow Calc Alarm: Pressure Loss/Ratio
63056	Flow Calc Alarm: Alpha
63057	Flow Calc Alarm: Expansion Factor
63058	Flow Calc Alarm: K-factor/Meter Factor
63059	Flow Calc Alarm: Mass Press Corr Factor
63060	Flow Calc Alarm: Reserved
63061	Flow Calc Alarm: Reserved
63062	Flow Calc Alarm: Reserved
63063	Flow Calc Alarm: Reserved
63064	Flow Calc Alarm: Reserved
63065	Flow Calc Alarm: K-factor/Meter Factor
63066	Flow Calc Alarm: Mass Press Corr Factor
63067	Flow Calc Alarm: Water Cut
63068	Flow Calc Alarm: Shrinkage Factor
63069	Flow Calc Alarm: CTL
63070	Flow Calc Alarm: NGL Factor/Flash Fctr
63071	Flow Calc Alarm: Reserved
63072	Prop Calc Alarm: Invalid Input(s)
63073	Prop Calc Alarm: Invalid Config
63074	Prop Calc Alarm: Calculation Error
63075	Prop Calc Alarm: Boundary Error
63076	Prop Calc Alarm: Reserved
63077	Prop Calc Alarm: Reserved

Register	Description
63078	Prop Calc Alarm: Reserved
63079	Prop Calc Alarm: Reserved
63080	Prop Calc Alarm: Pressure
63081	Prop Calc Alarm: Temperature
63082	Prop Calc Alarm: Flowing Density/Z
63083	Prop Calc Alarm: Base Density/Z
63084	Prop Calc Alarm: Relative Density
63085	Prop Calc Alarm: HV/Enthalpy
63086	Prop Calc Alarm: Composition
63087	Prop Calc Alarm: Water Content
63088	Prop Calc Alarm: Atm Press/Grav Accel
63089	Prop Calc Alarm: Viscosity
63090	Prop Calc Alarm: Isentropic Exponent
63091	Prop Calc Alarm: Speed of Sound
63092	Prop Calc Alarm: Reserved
63093	Prop Calc Alarm: Reserved
63094	Prop Calc Alarm: Reserved
63095	Prop Calc Alarm: Reserved
63096	Prop Calc Alarm: Reserved
63097	Prop Calc Alarm: Reserved
63098	Prop Calc Alarm: Reserved
63099	Prop Calc Alarm: Reserved
63100	Prop Calc Alarm: Reserved
63101	Prop Calc Alarm: Reserved
63102	Prop Calc Alarm: Reserved
63103	Prop Calc Alarm: Reserved
63104	Parameter Health Status
63105	Meter Task Detected Fatal Error
63106 - 64000	Reserved for Future Alarms

Register	Description
64001	Low
64002	Low Low
64003	High
64004	High High
64005	Rate of Change
64006	Discrete
64007	Calculation
64008	Manual
64009	Scanning Disabled
64010	Calibration
64011	Failure
64012	Failsafe
64013	Permanent Shutdown
64014	Temporary Shutdown
64015	Action On Failure
64016	Other
64017 - 65000	Reserved for Future Alarms

4.28.3.3 Modbus Events and Alarms

The record formats for the event log and alarm log are the same size and have similar contents. The first word in a record is a bit map in which bit 9 indicates if the log record is an Event (1) or an Alarm (0). The meanings of the other bits are specific to either the Event or the Alarm Log records. Refer to Event & Alarm Change Bit Map Contents.

The FB Series products support the Modbus with EFM extensions method for retrieving alarms and events. When the FB Series product receives a Function Code 03 request referencing defined Events and Alarms Register (usually 32), the FB Series product begins to collect records from first the Event Log and then the Alarm Log, starting where the last poll left off. The FB Series product collects records until either there are not any more new events, alarms, or it collects the maximum of 12 records. The FB Series product sends the information back to the Host, which in return replies with Function Code 05, referencing the same Events and Alarms Register, indicating that the points have been received and that the Host is ready for the next 12 records.

The following paragraphs detail how FB Series products place event log and alarms log information in Modbus event and alarm messages, and how (or what) is generated upon the event or alarm condition.

Normal Event Record

A normal Event record format:

Bit Map		Register			Time as float			Date as float				Old Value as float				New Value as float			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

System Text Events

When you set the System Command Change Bit (bit 7) in the Operator Change Bit Map of the Event, it sets the Register number for all System Command Change events to the Event/Alarm Register number (default is **32**).

Bit Map		Register			Time as float			Date as float				Code	New Value as float						
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Refer to the following topics for more information:

Reading Events and Alarms

Acknowledging Events and Alarms

Event and Alarm Change Bit Map Contents

4.28.3.3.1 Reading Events and Alarms Register

The Modbus request to read the Event Log and Alarm Log uses the standard read Function Codes 03 or 04 and the Register Number defined in the Alarm/Event field on the Communications – Modbus Slave pop-up display. In this request, the number of Registers is included to maintain format compatibility but is ignored by the receiving FB Series product.

Twenty bytes are returned for each event and alarm in the response. Up to 12 events and alarms can be returned in a single response. If no events and alarms have occurred since the last collection, the response contains 0 data bytes.

For the date stamp in the events and alarms returned, the year (YY) is really the number of years since 1980. For example, if the current year is 2007, the year (YY) for the date stamp would be 27.

Following is an example of a request for events and alarms with the history access event/alarm register defined as 32 (0x0020 hex).

Table 51. Host Event/Alarm Request Example Message

Message Field	Device Address	Function Code	Register Offset		Num Reads (ignored)		Error Check	
Bytes	1	1	2		2		2	
TX Order			MS	LS	MS	LS	LS	MS
Value	01H	03H	00H	20H	00H	01H	CRC-16	

The following example shows a response returning three events and alarms.

Table 52. Event/Alarm Response Example Message

Message Field	Device Address	Function Code	Byte Count	Data		Error Check	
Bytes	1	1	1	(20 bytes per event or alarm)		2	
TX Order				Integers — MS	LS	LS	MS
				Floats — Selectable			
Value	01H	03H	3CH	CRC-16			

4.28.3.3.2 Acknowledging Events and Alarms

After receiving event and alarm data, the host transmits an acknowledgement message to the FB Series product to clear these events and alarms from the Modbus buffer. Until an acknowledgement message is received, the FB Series product continues to send the same event and alarm records to the host. The Modbus acknowledgement (to clear the Event Log and Alarm Log buffer) uses Function Code 05 and the Register Number defined in the History Access configuration. In this request, the data value is always one (1).

Table 53. Event and Alarm Acknowledgement Response Example Message

Message Field	Device Address	Function Code	Register	Data	Error Check
Bytes	1	1	2	2	2

Message Field	Device Address	Function Code	Register		Data		Error Check	
TX Order	MS	LS	MS	LS	MS	LS	MS	LS
Value	01H	05H	00H	20H	FFH	00H	CRC-16	

4.28.3.3.3 Event & Alarm Change Bit Map Contents

The following table shows the contents of event and alarm bit maps.

Table 54. Event and Alarm Change Bit Map Contents

Bit	Operator Change Bit Map	Alarm Change Bit Map
0	Fixed value – change to an EU value on an I/O point in Manual Mode	Not Used
1	Zero scale – change to the 0% Adjusted on an AO or AI	Not Used
2	Full scale – change to the 100% Adjusted on an AO or AI	Not Used
3	Operator entry work value – change to any parameter other than those described	Not Used
4	Boolean fixed bit – change to Status in DO or DI	Not Used
5	Fixed/variable flag – change to Manual Mode for an I/O point	Manual Alarm
6	Table entry change – change to Modbus Function Tables	Status Change Alarm
7	System command change – events logged by system (Power up)	No Flow Alarm
8	Not Used	Point Fail Alarm
9	Operator change (Event Log) identifier bit	0 for Alarm
10	Low Low Limit – change to Low Low Alarm parameter	Low Low Alarm
11	Low Limit – change to Low Alarm parameter	Low Alarm

Bit	Operator Change Bit Map	Alarm Change Bit Map
12	High Limit – change to High Alarm parameter	High Alarm
13	High High Limit – change to High High Alarm parameter	High High Alarm
14	Rate of Change Limit – change to Rate Alarm parameter	Rate Alarm
15	Not Used	Set/Clear Alarm (1 = Set or 0 = Clear)

4.28.3.4 EFM Archive Mapping

Use this pop-up display to configure EFM Archive Mapping for the FB Series products. EFM archive mapping allows you to access history data stored on the FB Series product.

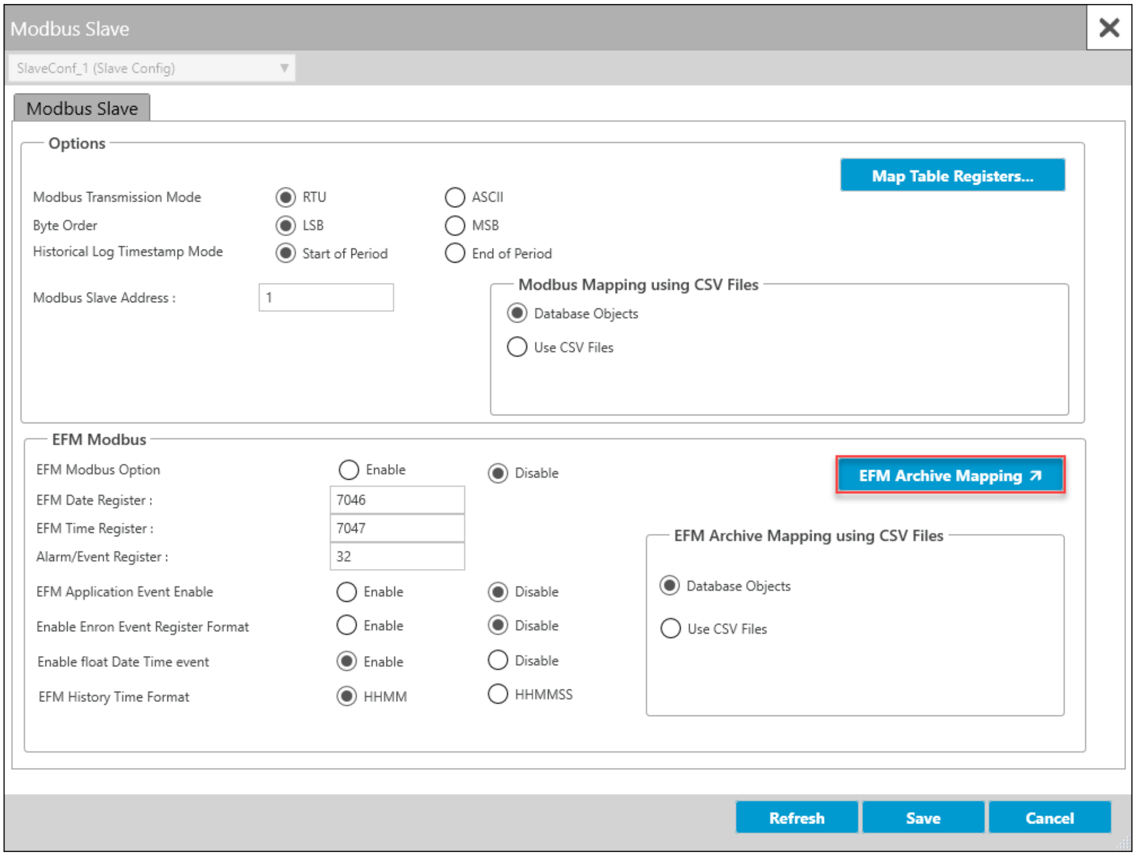
Note

- EFM Archive Mapping using **Database Objects** is unique for each communications port.
- EFM Archive Mapping using **CSV Files** is shared between **all** communications ports.

To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.
4. Select **Database Objects** in the EFM Archive Mapping using CSV Files frame.
5. Select the **EFM Archive Mapping** button.

Figure 312. EFM Archive Mapping Button



Modbus Transmission Mode ● RTU ○ ASCII
Byte Order ● LSB ○ MSB
Historical Log Timestamp Mode ● Start of Period ○ End of Period
Modbus Slave Address : 1

Modbus Mapping using CSV Files
● Database Objects
○ Use CSV Files

EFM Modbus Option ○ Enable ● Disable
EFM Date Register : 7046
EFM Time Register : 7047
Alarm/Event Register : 32
EFM Application Event Enable ○ Enable ● Disable
Enable Enron Event Register Format ○ Enable ● Disable
Enable float Date Time event ● Enable ○ Disable
EFM History Time Format ● HHMM ○ HHMMSS

EFM Archive Mapping using CSV Files
● Database Objects
○ Use CSV Files

Depending on your selection in the EFM Archive Mapping using CSV Files frame, one of the following two displays will open:

EFM Archive Mapping Display – Use this pop-up display to configure EFM Archive Mapping using database objects for the FB Series products. Mapping is unique foe each communications port.

EFM Registers – Use this pop-up display to configure EFM Archive Mapping using CSV files for the FB Series products. Mapping is shared between **all** communications ports.

Note

- For more information about importing a CSV file that contains EFM Archive Mapping, refer to Importing an EFM Archive Mapping CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current EFM Archive Mapping, refer to Exporting an EFM Archive Mapping CSV File.
- For more information about creating your own EFM Archive Mapping using CSV files, refer to Creating an EFM Archive Mapping CSV File.

4.28.3.4.1 EFM Archive Mapping Display

Use this pop-up display to configure EFM archive mapping for the FB Series products.

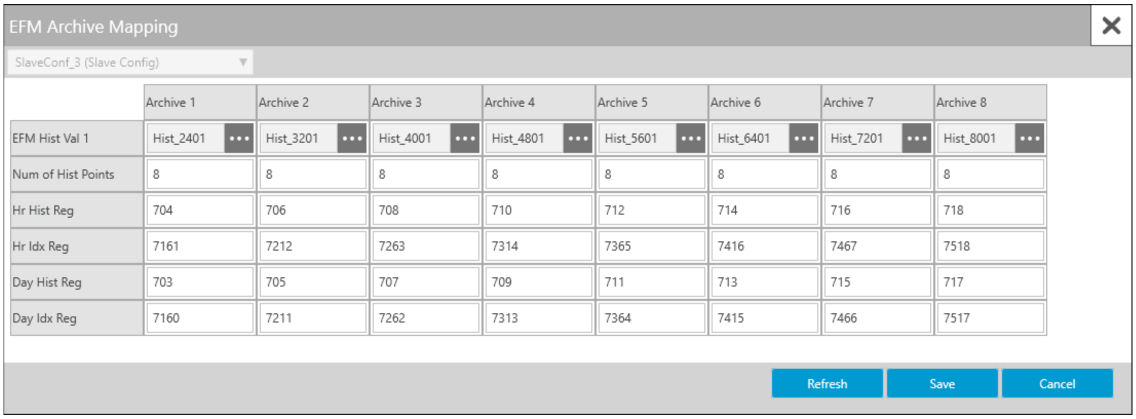
Note

EFM Archive Mapping using database objects is unique for each communications port (unlike the EFM Archive Mapping using CSV files, which is shared between all communications ports). This allows you to access different history data through each communications port.

To access this pop-up display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.
4. Select **Database Objects** in the EFM Archive Mapping using CSV Files frame.
5. Select the **EFM Station Mapping** button.

Figure 313. EFM Archive Mapping Display



SlaveConf_3 (Slave Config) ▼

	Archive 1	Archive 2	Archive 3	Archive 4	Archive 5	Archive 6	Archive 7	Archive 8
EFM Hist Val 1	Hist_2401	Hist_3201	Hist_4001	Hist_4801	Hist_5601	Hist_6401	Hist_7201	Hist_8001
Num of Hist Points	8	8	8	8	8	8	8	8
Hr Hist Reg	704	706	708	710	712	714	716	718
Hr Idx Reg	7161	7212	7263	7314	7365	7416	7467	7518
Day Hist Reg	703	705	707	709	711	713	715	717
Day Idx Reg	7160	7211	7262	7313	7364	7415	7466	7517

6. Review – and change as necessary – the values in the following fields:

Field	Description
EFM Hist Val 1	Click … to open a Point Picker dialog and select the a history. This selection defines the first history point returned when you request history data with an hourly or daily history register. **Note** Each history group is offset by 800 points. History group 1 starts at Hist_1, history group 2 starts at Hist_801, history group 3 starts at Hist_1601, history group 4 starts at Hist_2401, and so on.
Num of Hist Points	Sets the number of history points to collect. This selection defines how many history values are returned when you request history data with an hourly or daily history register. **Note** The starting history point is the point configured in the EFM History Value 1 field.
Hr Hist Reg	Sets the Modbus Register Number to acquire hourly history values.
Hr Idx Reg	Sets the Modbus Register Number to acquire the hourly index value.
Day Hist Reg	Sets the Modbus Register Number to acquire daily history values.
Day Idx Reg	Sets the Modbus Register Number to acquire the daily index value.

7. Select **Save** to save any changes you make to this pop-up display.

4.28.3.4.2 EFM Registers

Use this pop-up display to configure EFM Archive Mapping using CSV files for the FB Series products.

Note

- EFM Archive Mapping using CSV files is shared between **all** communications ports.
- You can configure a maximum of **100** rows for the EFM Registers table.

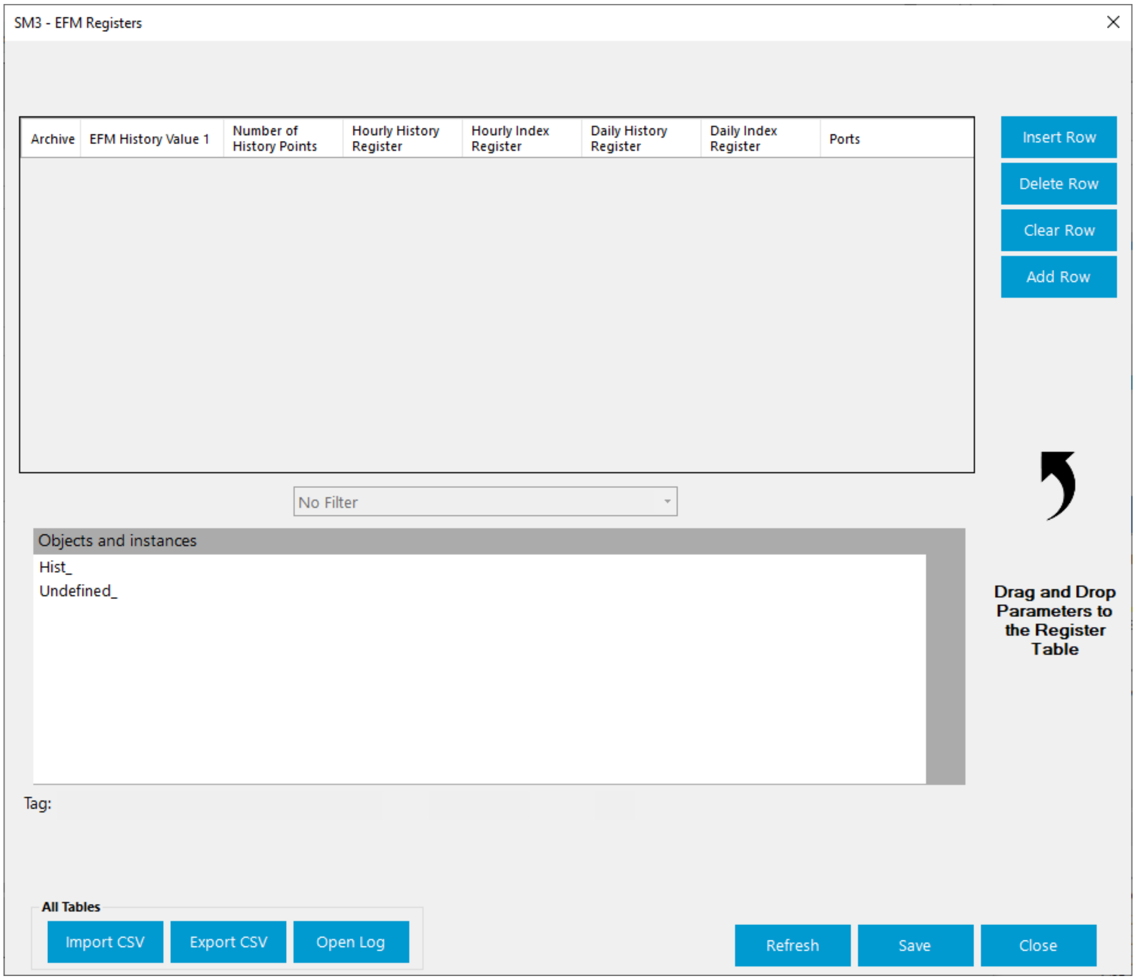
To access this pop-up display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.

4. Select **Use CSV Files** in the EFM Archive Mapping using CSV Files frame.

5. Select the **EFM Archive Mapping** button. The EFM Registers pop-up display opens.

Figure 314. EFM Registers



6. Review – and change as necessary – the values in the following fields:

Field	Description
EFM History Value 1	This field defines the first history point returned when you request history data with an hourly or daily history register. **Note** Each history group is offset by 800 points. History group 1 starts at Hist_1, history group 2 starts at Hist_801, history group 3 starts at Hist_1601, history group starts at Hist_2401, and so on.

Field	Description
Number of History Points	Sets the number of history points to collect. This selection defines how many history values are returned when you request history data with an hourly or daily history register. **Note** The starting history point is the point configured in the EFM History Value 1 field.
Hourly History Register	Sets the Modbus Register Number to acquire hourly history values.
Hourly Index Register	Sets the Modbus Register Number to acquire the hourly index values.
Daily History Register	Sets the Modbus Register Number to acquire daily history values.
Daily Index Register	Sets the Modbus Register Number to acquire the daily index value.
Ports	Click this cell to open a **Select Comm port instance** pop-up display and configure which communications ports instances that a remote device **must** use to access data in the selected row of the map table register. Place a check mark next each allowed communications port. Select **OK** to save your changes and return to the previous display.
Insert Row	Select to add a new row to the EFM register at the location of the currently highlighted row. Existing entries are moved down one row.
Delete Row	Select to remove the currently highlighted row from the EFM register. Existing entries are moved up one row.
Clear Row	Select to remove data from the currently highlighted row of the EFM register.
Add Row	Select to add a row to the end of the EFM register.
Object and instances	Lists the available database objects (types) and instances (iterations) of each object.

Field	Description
Import CSV	Click to import a CSV file into your FB Series product that contains your desired EFM archive mapping configuration. Navigate to the location of the saved CSV file and select **Open** to start the import process. For more information, refer to Importing an EFM Archive Mapping CSV File. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. Any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.
Export CSV	Click to save a CSV file to your computer that contains the current Modbus map table configuration of your FB Series product. A Select Table dialog opens where you can select which Modbus tables to include in the export. Click **Start**, select a name and location for the exported file on your computer, and click **Save** to begin the export process. For more information, refer to Exporting an EFM Archive Mapping CSV File.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.
Refresh	Select to re-display the table entries currently stored in memory of the FB Series product.
Save	Select to save the current table and any changes to memory in the FB Series product.
Close	Select to exit the Map Table Register display.

7. Select the History object (**Hist_**) in the **Objects and instances** frame to view a list of history instances in the FB Series product.

8. Select the history instance you want to include in your EFM archive mapping.

9. Drag and drop the instance from the Objects and instances frame to the Register Table frame. A new row is added to the Register Table frame.

10. Enter the number of history points to collect in the **Number of History Points** field.

11. Enter the Modbus Register Number to acquire the hourly index values in the **Hourly History Register** field.

12. Enter the Modbus Register Number to acquire hourly index values in the **Hourly Index Register** field.

13. Enter the Modbus Register Number to acquire daily history values in the **Daily History Register** field.

14. Enter the Modbus Register Number to acquire daily index values in the **Daily Index Register** field.

15. Click the **Ports** cell to open a **Select Comm port instance** pop-up display and configure which communications ports instances that a remote device **must** use to access data in the selected row of the map table register. Place a check mark next each allowed communications port. Select **OK** to save your changes and return to the previous display.

16. Select **Save** to save any changes you make to this pop-up display.

4.28.3.4.3 Importing an EFM Archive Mapping CSV File

You can import a CSV file that contains your Modbus poll table configuration for use in your FB Series product.

Note

- For more information about EFM Archive Mapping using CSV file, refer to EFM Registers.
- For more information about creating your own EFM Archive Mapping using CSV files, refer to Creating an EFM Archive Mapping CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current EFM Archive Mapping, refer to Exporting an EFM Archive Mapping CSV File.

To import a CSV file that contains your Modbus poll table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.

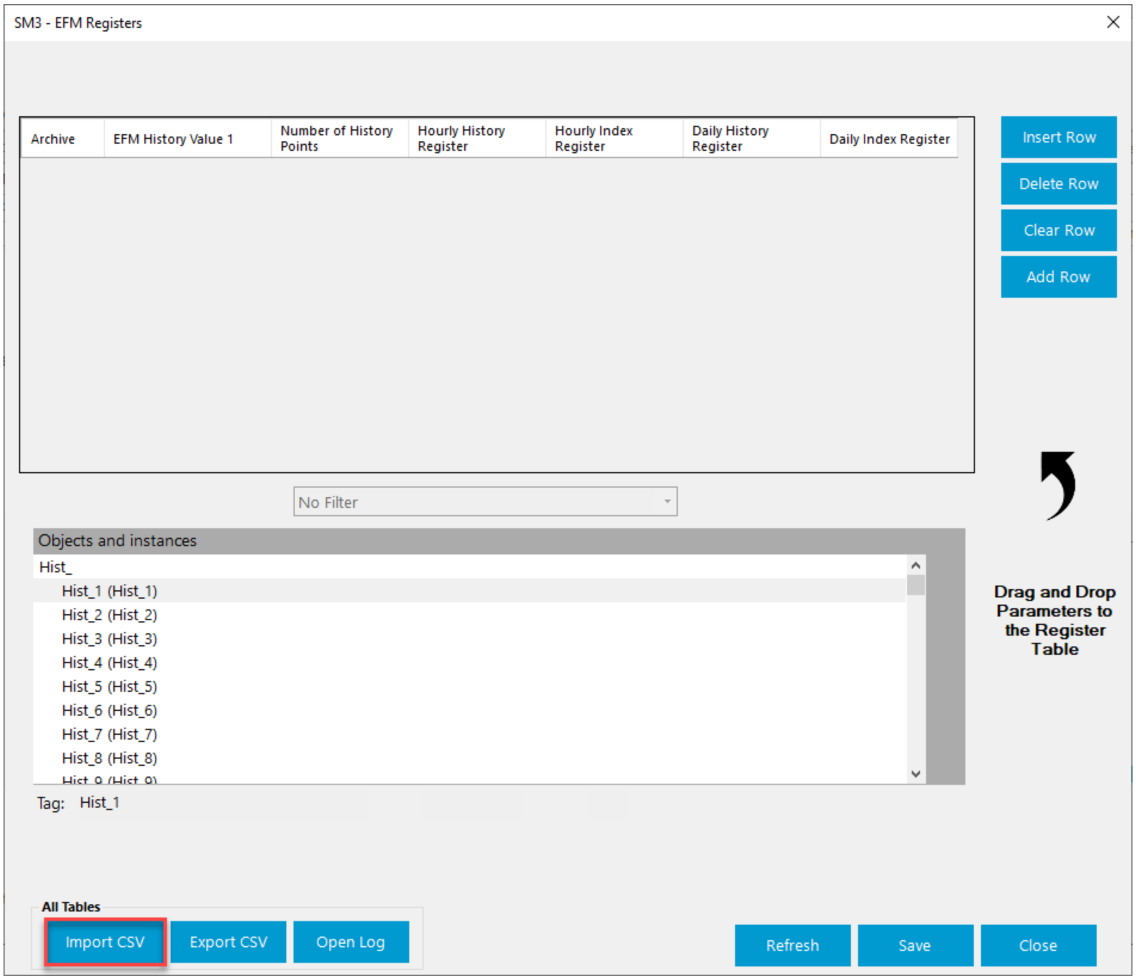
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave protocol.

3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.

4. Select **Use CSV Files** in the EFM Archive Mapping using CSV Files frame.

5. Select the **EFM Archive Mapping** button. The EFM Registers pop-up display opens.

Figure 315. EFM Registers – Import CSV



6. Select the **Import CSV** button.

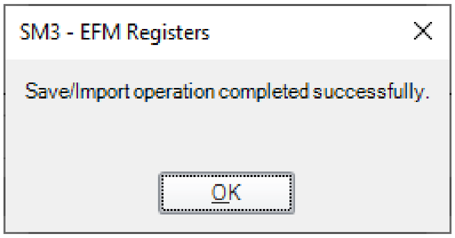
7. Navigate to the file location of your CSV file and select **Open**.

Note

The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

8. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Figure 316. Confirmation



Save/Import operation completed successfully.

4.28.3.4.4 Exporting an EFM Archive Mapping CSV File

You can export your FB Series product's current EFM archive mapping to a CSV file saved on your computer.

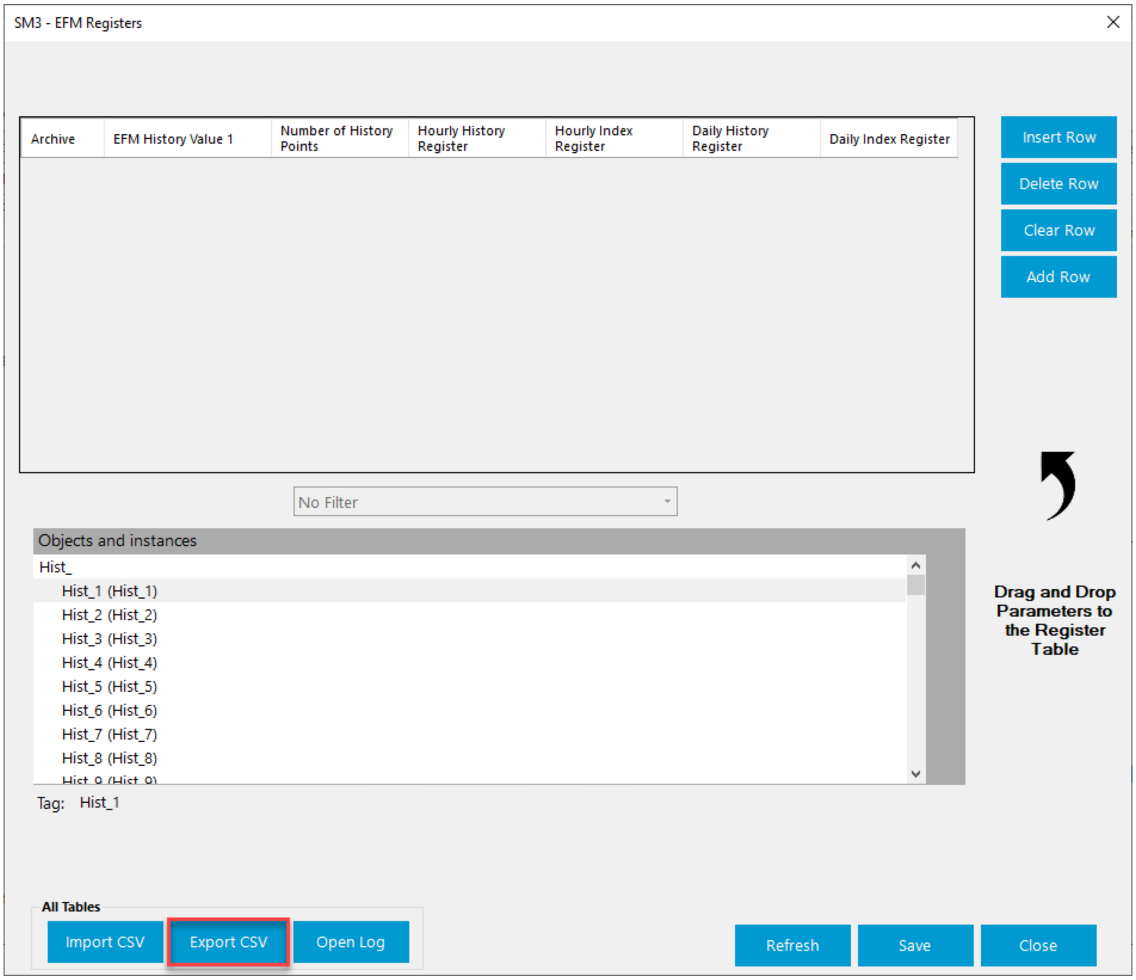
Note

- For more information about EFM Archive Mapping using CSV file, refer to EFM Registers.
- For more information about creating your own EFM Archive Mapping using CSV files, refer to Creating an EFM Archive Mapping CSV File.
- For more information about importing a CSV file that contains EFM Archive Mapping, refer to Importing an EFM Archive Mapping CSV File.

To export a CSV file that contains your EFM archive mapping:

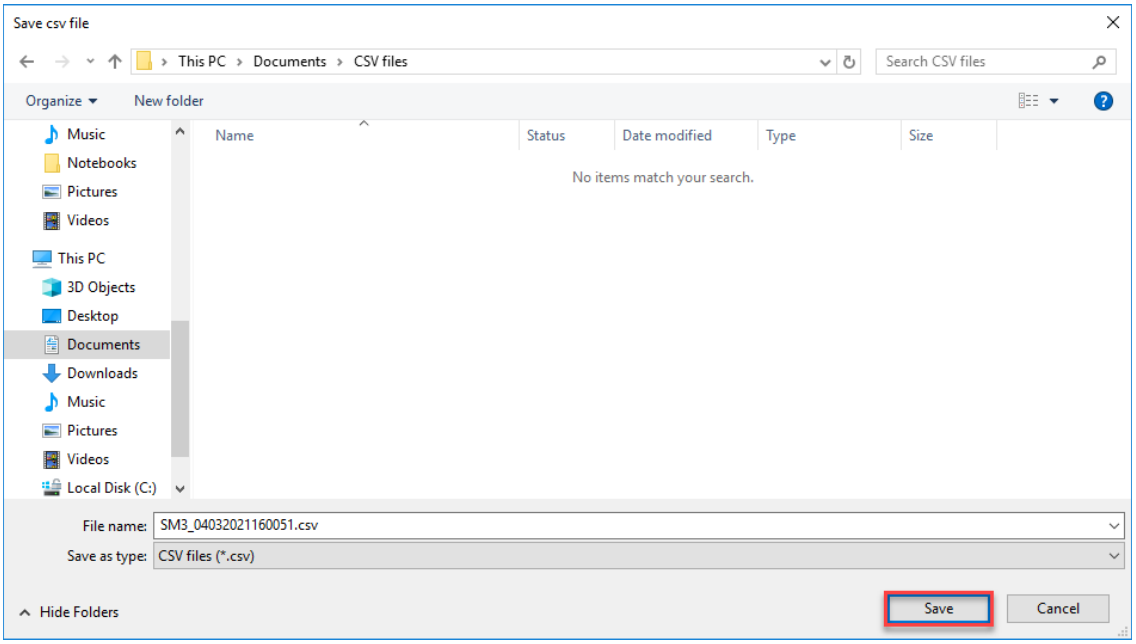
1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Slave or Modbus Master protocol.
3. Select the **Modbus Slave** button. The Modbus Slave pop-up display opens.
4. Select **Use CSV Files** in the EFM Archive Mapping using CSV Files frame.
5. Select the **EFM Archive Mapping** button. The EFM Registers pop-up display opens.

Figure 317. EFM Registers – Export CSV



6. Select the **Export CSV** button. A Save csv file window opens.

Figure 318. Save csv file



No items match your search.

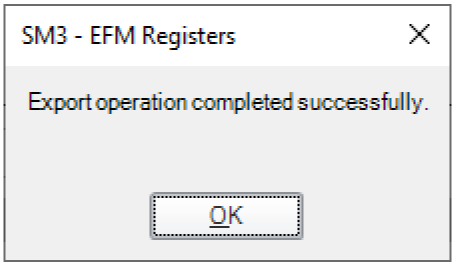
File name: SM3_04032021160051.csv

Save as type: CSV files (*.csv)

7. Navigate to a location on your computer to save your exported CSV file and select **Save**. The system exports the CSV file and displays a progress bar at the top of the display.

8. A confirmation message displays after exporting the CSV file. Select **OK** to complete the process.

Figure 319. Confirmation



Export operation completed successfully.

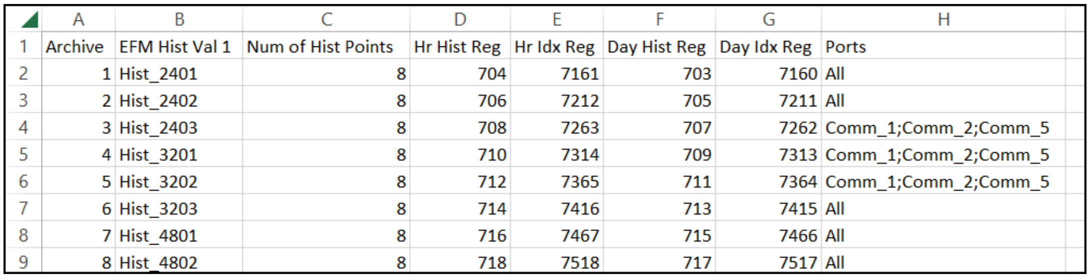
4.28.3.4.5 Creating an EFM Archive Mapping CSV File

You can create an EFM Archive Map on your computer and then import the file for use in the FB Series product. If your EFM Archive Map contains a large amount of points, it may be easier to create a CSV file on your computer than it is to configure the map in FBxConnect.

Note

- For more information about EFM Archive Mapping using CSV file, refer to EFM Registers.
- For more information about importing a CSV file that contains the FB Series product's current EFM Archive Mapping, refer to Importing an EFM Archive Mapping CSV File.
- The easiest way to begin creating a custom map is to export a CSV that contains the current configuration and then edit that file. For more information about exporting a CSV file, refer to Exporting an EFM Archive Mapping CSV File.

Figure 320. Example EFM Archive Map CSV Format



	A	B	C	D	E	F	G	H
1	Archive	EFM Hist Val 1	Num of Hist Points	Hr Hist Reg	Hr Idx Reg	Day Hist Reg	Day Idx Reg	Ports
2	1	Hist_2401	8	704	7161	703	7160	All
3	2	Hist_2402	8	706	7212	705	7211	All
4	3	Hist_2403	8	708	7263	707	7262	Comm_1;Comm_2;Comm_5
5	4	Hist_3201	8	710	7314	709	7313	Comm_1;Comm_2;Comm_5
6	5	Hist_3202	8	712	7365	711	7364	Comm_1;Comm_2;Comm_5
7	6	Hist_3203	8	714	7416	713	7415	All
8	7	Hist_4801	8	716	7467	715	7466	All
9	8	Hist_4802	8	718	7518	717	7517	All

To create a CSV file that contains your EFM archive mapping:

1. Open a blank spreadsheet (or open your previously exported EFM Registers CSV file).
2. In row one of the spreadsheet, enter the following text based on your configuration:
   - Column A = Archive
   - Column B = EFM Hist Val 1
   - Column C = Num of Hist Points
   - Column D = Hr Hist Reg
   - Column E = Hr Idx Reg
   - Column F = Day Hist Reg
   - Column G = Day Idx Reg
   - Column H = Ports
3. In the proceeding rows, enter information for each table entry according to the descriptions below:

Column Heading	Description
Archive	The row number of the EFM register table as displayed in FBxConnect. **Note** You can configure a maximum of **100** rows for the EFM Registers table (rows 2-101 in the CSV file).
EFM Hist Val 1	This column defines the first history point returned when you request history data with an hourly or daily history register. **Note** Each history group is offset by 800 points. History group 1 starts at Hist_1, history group 2 starts at Hist_801, history group 3 starts at Hist_1601, history group 4 starts at Hist_2401, and so on.
Num of Hist Points	Sets the number of history points to collect. This selection defines how many history values are returned when you request history data with an hourly or daily history register. **Note** The starting history point is the point configured in the EFM Hist Val 1 column.
Hr Hist Reg	Sets the Modbus Register Number to acquire hourly history values.
Hr Idx Reg	Sets the Modbus Register Number to acquire the hourly index values.
Day Hist Reg	Sets the Modbus Register Number to acquire daily history values.
Day Idx Reg	Sets the Modbus Register Number to acquire the daily index value.

Column Heading	Description
Ports	Enter the communications port instances that a remote device must use to access the data in the selected row of the EFM archive. **Note** • At least one communications port instance must be defined. • To allow multiple communications ports access to the data, place a semicolon between each instance (for example, Comm_1;Comm_4;Comm_5). • Typing **All** enables all communications port instances to access the data.

4. Save your changes. You can now import your CSV file for use in your FB Series product. For more information, refer to Importing an EFM Archive CSV File.

Note

Make sure to save the file with a **.csv** file extension.

4.28.4 Communications – Modbus Master

Use this pop-up display to configure communications ports using Modbus Master protocol. The Modbus Master mode of operation allows the FB Series products to simulate a master device that can poll other devices for data and to store that data in Modbus registers within the FB Series product. The FB Series products can also send commands to set outputs and write data to a slave device. Each command can transmit or receive up to 240 bytes of data.

Each master request you configure uses data read from or written to registers defined in the Modbus Table Registers. When using Modbus function codes 1, 2, 3, and 4, the FB Series product reads data from a slave device and writes it to the parameter specified in the Modbus Registers table. When using Modbus function codes 5, 6, 15, and 16, the FB Series product reads data from the parameter specified in the Modbus Registers table and writes it to the slave device.

You can configure the Modbus Master functionality on the serial or Ethernet ports.

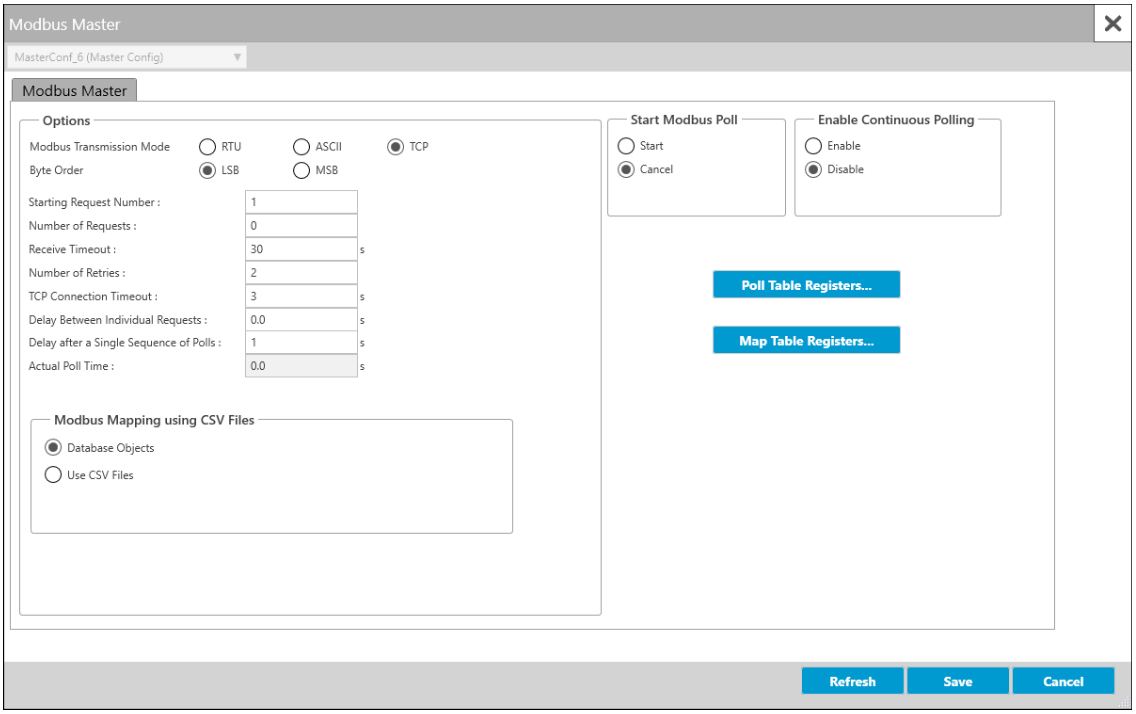
Note

This pop-up display is available **only** if you select **Modbus Master** in the **Port Owner** drop-down list on the Communications – General display.

To access this pop-up display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Master protocol.
3. Select the **Modbus Master** button. The Modbus Master pop-up display opens.

Figure 321. Communications – Modbus Master



Options

Modbus Transmission Mode ○ RTU ○ ASCII ● TCP
Byte Order ● LSB ○ MSB

Starting Request Number : 1
Number of Requests : 0
Receive Timeout : 30 s
Number of Retries : 2
TCP Connection Timeout : 3 s
Delay Between Individual Requests : 0.0 s
Delay after a Single Sequence of Polls : 1 s
Actual Poll Time : 0.0 s

Modbus Mapping using CSV Files
● Database Objects
○ Use CSV Files

Start Modbus Poll
○ Start
● Cancel

Enable Continuous Polling
○ Enable
● Disable

4. Review – and change as necessary – the values in the following fields:

Field	Description	
Modbus Transmission Mode	Sets the communications mode for the selected communications port. The Modbus protocol supports two modes of transmission, ASCII and RTU. RTU is the default. **Note** You must configure all devices in the same communications network with the same mode of transmission. Additionally, in either ASCII or RTU mode, the transmitting device places the Modbus message into a frame that has a known beginning and ending point.	
	RTU	Remote Terminal Unit mode allows for greater character density and better data throughput than ASCII for the same baud rate. Each message is transmitted in a continuous stream. Data is sent in 8-bit binary characters. RTU mode uses Cyclic Redundancy Check (CRC) error checking. By default, RTU is enabled.
	ASCII	American Standard Code for Information Interchange mode represents each 8-bit byte of data as two ASCII characters that are the hexadecimal representation of the value. This allows the messages to be read with the use of a dumb terminal but uses twice as many characters as the RTU mode. Each character sent is composed of a start bit, 7 or 8 data bits, and one or two stop bits with Even, Odd, or No parity. ASCII mode uses Longitudinal Redundancy Checking (LRC) error checking.
	TCP	Adds a 6-byte header to Modbus messages, and then encapsulates it for transmission over TCP/IP. The header consists of the following: • A 2-byte transaction ID that increments for each packet sent. • A 2-byte protocol ID. The protocol ID for Modbus is 0. • A 2-byte indicator of the packet length. **Note** This field appears **only** for the **Ethernet** port.

Field	Description
Byte Order	Sets the order of data bytes in a transmission or requests, which can be reversed. This only affects the Data field of a Modbus message and has no effect on the data bytes for Function Codes 01, 02, and 05. Possible options are: **LSB** Least Significant Byte First (places the Least Significant Byte first). This is the default value. **MSB** Most Significant Byte First (places the Most Significant Byte first).
Starting Request Number	Sets a beginning value from which the Modbus Master polling sequence begins. This number corresponds to a line number on the Modbus Master Poll Table associated with this comm port.
Number of Requests	Sets the total number of requests (polls) the Modbus Master makes for this polling sequence. This value specifies the total number of lines in the Master polling tables on which to execute the polls. The default value 0 prevents the polling from occurring. **Note** You can define up to six Modbus Master tables for each communications port. Each Modbus Master table is comprised of 25 lines. The tables are contiguous. If you indicate more requests than are on a single table, the system accesses the subsequent table to complete the request.
Receive Timeout	Sets the amount of time (in seconds) that the Master (Host) waits to receive a valid message after the FB Series product sends a request to a device. The default is 30 seconds.
Number of Retries	Sets the number of times (after the initial try) that the FB Series product attempts to establish communications with the specified device before reporting a timeout error. The default is 2.
TCP Connection Timeout	Sets the time (in seconds) the system waits for a valid Modbus Master protocol message before closing the TCP/IP connection. The timeout resets after each valid message. The default is 3. **Note** This field applies **only** to the Ethernet port.

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td>**Delay Between Individual Requests**</td><td colspan="3">Sets a delay time (in seconds) between individual polling requests. The default is 0.0.
Note
The system considers each line in a Modbus Master Polling Table as a request.</td></tr>
<tr><td>**Delay after a Single Sequence of Polls**</td><td colspan="3">Sets a delay time (in seconds) between polling request sequences. This field is valid only when you enable Continuous Polling. The default is 1.0.</td></tr>
<tr><td>**Actual Poll Time**</td><td colspan="3">This **read-only** field shows (in seconds) the actual time required to complete the polling sequence.</td></tr>
<tr><td rowspan="5">**Modbus Mapping using CSV Files**</td><td colspan="3">Sets the location where the Modbus map table is stored by the FB Series product.
Note
• If you change this option, you **must** perform a warm start before any changes are applied.
• Your selection applies to **both** Modbus Slave and Modbus Master protocols.</td></tr>
<tr><td>**Database Objects**</td><td colspan="2">Select this radio button to store the Modbus map table in the FB Series product's internal database.</td></tr>
<tr><td>**Use CSV Files**</td><td colspan="2">Select this radio button to store the Modbus map table as CSV files in the FB Series product.
Note
• Using this option removes the Modbus map table from the internal database and increases the available amount of memory in the FB Series product.
• To avoid losing data, export your current Modbus map table **before** you select this option. For more information, refer to Exporting a Modbus Map Table CSV File.</td></tr>
<tr><td rowspan="2">**Modbus Mapping Status**</td><td colspan="2">This **read-only** field shows the current condition of the Modbus map table. Possible values are:</td></tr>
<tr><td>**No Error (0)**</td><td>The CSV file is valid.</td></tr>
</table>

Field	Description		
		No Mapping Found (1)	There is no mapping file currently on the device.
		Column Mismatch (2)	The CSV file is not formatted correctly. Some rows have more or less columns than the header. Open the Log within the EFM Registers window for a detailed analysis.
		Missing Req Column (3)	The CSV file is missing a required column. Open the Log within the EFM Registers window for a detailed analysis.
		Exceeded Max Data (4)	The CSV file contained more rows than the firmware supports.
		Invalid Row Data (5)	The CSV file contains a row with invalid data. This can be out of range data or mappings that cannot be processed. Open the Log within the EFM Registers window for a detailed analysis.
		Duplicate Data (7)	The CSV file contains two mappings with similar data or identical register numbers. Open the Log within the EFM Registers window for a detailed analysis.
Start Modbus Poll	Controls whether the system begins a Modbus Master polling sequence.		
	Start	Select **Start** and **Save** to begin a Modbus Master polling sequence. The system clears this field when the polling sequence completes.	
	Cancel	Select **Cancel** and **Save** to discontinue a Modbus Master polling sequence.	

Field	**Description**
Enable Continuous Polling	Indicates whether the system continually executes the Modbus Master polling sequence. **Enable** — The system **does** continually execute the Modbus Master polling sequence as defined in the polling table. **Disable** — The system **does not** continually execute the Modbus Master polling sequence.
Poll Table Registers	Click to open the Poll Table Register pop-up display and map parameters in remote devices to Modbus Map Table Registers in the FB Series product. **Note** You can create a Modbus Poll Table as a CSV file on your computer and then import the CSV file for use in the FB Series product. For more information about creating, importing, and exporting your own Modbus Poll Table CSV files, refer to Creating a Modbus Poll Table CSV File, Importing a Modbus Poll Table CSV File, and Exporting a Modbus Poll Table CSV File.
Map Table Registers	Click to open the Map Table Register pop-up display and configure the Modbus registers stored in the FB Series product. **Note** • To view documentation for the Modbus Master Map Table Register pop-up display, refer to Modbus Slave Map Table Register. • Map Table Registers are shared between **all** communications ports that are configured to use either Modbus Slave or Modbus Master protocol. • You can create a Modbus Map Table as a CSV file on your computer and then import the CSV file for use in the FB Series product. For more information about creating, importing, and exporting your own Modbus Map Table CSV files, refer to Creating a Modbus Map Table CSV File, Importing a Modbus Map Table CSV File, Exporting a Modbus Map Table CSV File, and Remote Data Types.

5. Select **Save** to save any changes you make to this pop-up display.

4.28.4.1 Poll Table Register

Use this pop-up display to configure the Modbus Poll Table Register. The Modbus Poll Table Register maps Modbus registers in slave devices to the Modbus register in the FB Series product. Each communications port with Modbus Master support is assigned its own tables, and each table contains 25 available entries:

- **COM1** – Tables 1 through 6
- **COM2 –** Tables 7 through 12
- **COM3 –** Tables 13 through 18
- **COM4 –** Tables 19 through 24
- **Ethernet 1 –** Tables 25 through 30
- **Ethernet 2 –** Tables 31 through 36

For additional communication modules, the system assigns tables in numerical order based on the slot number and the next six consecutive tables to each port. For example, an FB3000 with a single 4-port ommunications module installed in slot 3 would be assigned the following tables:

- **COM31** – Tables 37 through 42
- **COM32** – Tables 43 through 48
- **COM33** – Tables 49 through 54
- **COM34** – Tables 55 through 60

To access this display:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Master protocol.
3. Select the **Modbus Master** button. The Modbus Master pop-up display opens.
4. Select the **Poll Table Registers** button. The Poll Table Register pop-up display opens.

Figure 322. Poll Table Register

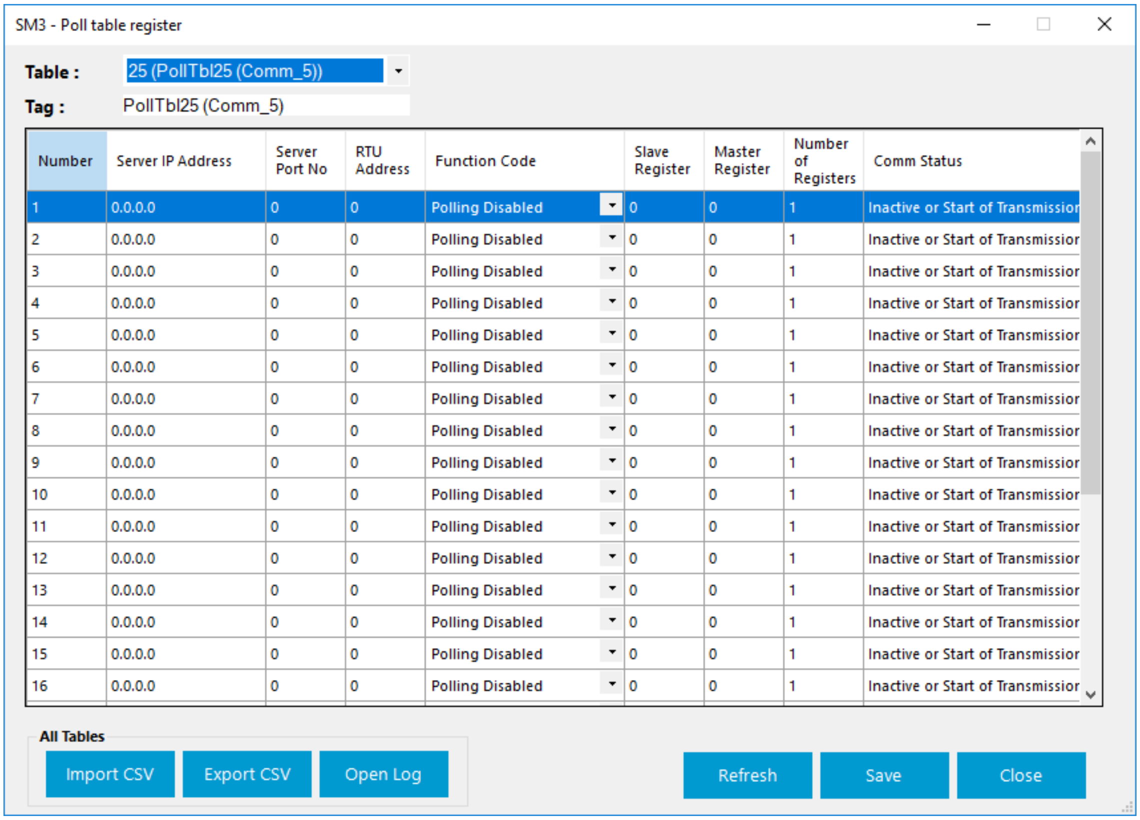


Table : 25 (PollTbl25 (Comm_5))

Tag : PollTbl25 (Comm_5)

Number	Server IP Address	Server Port No	RTU Address	Function Code	Slave Register	Master Register	Number of Registers	Comm Status
1	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
2	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
3	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
4	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
5	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
6	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
7	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
8	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
9	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
10	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
11	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
12	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
13	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
14	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
15	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior
16	0.0.0.0	0	0	Polling Disabled	0	0	1	Inactive or Start of Transmissior

5. Review – and change as necessary – the values in the following fields:

Field	Description
Table	Click ▼ to select a poll table register to configure.
Tag	Sets a name for the selected poll table register.
Number	This **read-only** field shows the poll request number.
Server IP Address	Specifies the IP address of the device to be polled. **Note** This field applies **only** to the Ethernet communications port.
Server Port No	Specifies the IP port number of the device to be polled. **Note** This field applies **only** to the Ethernet communications port.
RTU Address	Specifies the Modbus RTU address of the device to be polled.
Function Code	Click ▼ to select the Modbus function code to be sent to the slave device. Possible options are:

Field	Description	
	Polling Disabled	This line in the polling table will be skipped.
	Read Coil Status	Function code 1 – Read coil status.
	Read Input Status	Function code 2 – Read input status.
	Read Holding Registers	Function code 3 – Read holding registers.
	Read Input Registers	Function code 4 – Read Input registers.
	Force Single Coil	Function code 5 – Force single coil.
	Set Single Register	Function code 6 – Set single register.
	Force Multiple Coils	Function code 15 – Force multiple coils.
	Set Multiple Registers	Function code 16 – Set multiple registers.
Slave Register	Sets the starting register number from which data is drawn from or to which data is written in the slave device.	
Master Register	Sets the starting register number in the FB Series product to which data is stored, as defined in the Modbus Map Table.	
Number of Registers	Sets the total number of registers to poll (read/write) in a single request.	
Comm Status	This **read-only** field shows the status of the selected poll. Possible statuses are: • Inactive or Start of Transmission • Response Timeout • Function Code Error • Invalid Register Error • Invalid Request Data Error • Exception Error Code Received • Mapping Table Error	

Field	Description
	• Invalid Response Received • CRC or LRC Check Error • Database Read Error • Valid Response Received • Request Framing Error • Transmit Timeout Error • Database Write Error • Broadcast Request Transmitted
Import CSV	Click to import a CSV file into your FB Series product that contains your desired Modbus poll table configuration. Navigate to the location of the saved CSV file and select **Open** to start the import process. For more information, refer to Importing a Modbus Poll Table CSV File. **Note** The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. Any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.
Export CSV	Click to save a CSV file to your computer that contains the current Modbus poll table configuration of your FB Series product. A Select Table dialog opens where you can select which tables to include in the export. Click **Start**, select a name and location for the exported file on your computer, and click **Save** to begin the export process. For more information, refer to Exporting a Modbus Poll Table CSV File. **Note** By default, all selected data is exported into a single file. Select **Export to individual file** to have the system create individual files for each table you select.
Open Log	Click to open the *ImportExportLogs* folder on your computer that contains FBxConnect™ import/export error logs. Any errors encountered when importing a CSV file are stored in a log in this folder. **Note** Log file name includes the date and time the log was created.

Field	Description
Refresh	Select to re-display the table entries currently stored in memory of the FB Series product.
Save	Select to save the current table and any changes to memory in the FB Series product.
Close	Select to exit the Poll Table Register display.

6. Select **Save** to save any changes you make to this pop-up display.

4.28.4.1.1 Importing a Modbus Poll Table CSV File

You can import a CSV file that contains your Modbus poll table configuration for use in your FB Series product.

Note

- For more information about Modbus poll tables in the FB Series product, refer to Poll Table Register.
- For more information about creating your own Modbus poll table CSV file, refer to Creating a Modbus Poll Table CSV File.
- For more information about exporting a CSV file that contains the FB Series product's current Modbus poll table configuration, refer to Exporting a Modbus Poll Table CSV File.

To import a CSV file that contains your Modbus poll table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Master protocol.
3. Select the **Modbus Master** button. The Modbus Master pop-up display opens.
4. Select the **Poll Table Registers** button. The Poll Table Register pop-up display opens.

Figure 323. Poll Table Register – Import CSV

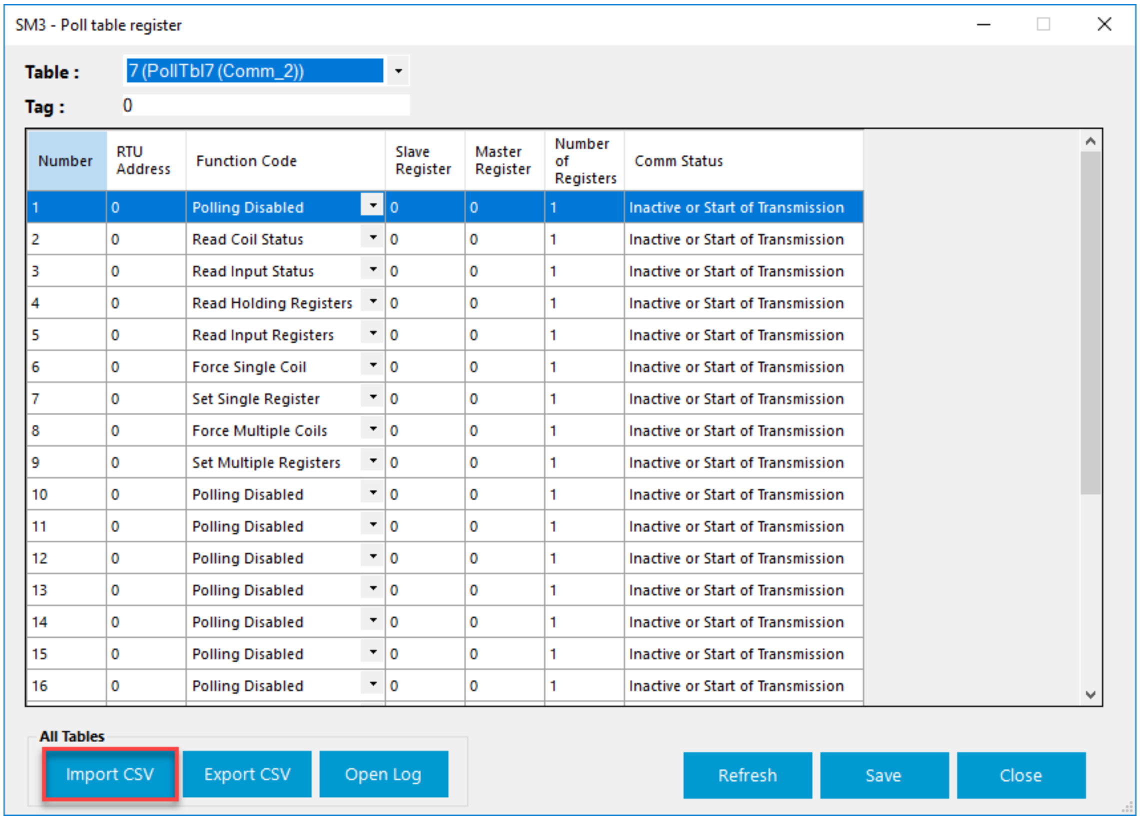


Table : 7 (PollTbl7 (Comm_2))

Tag : 0

Number	RTU Address	Function Code	Slave Register	Master Register	Number of Registers	Comm Status
1	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
2	0	Read Coil Status	0	0	1	Inactive or Start of Transmission
3	0	Read Input Status	0	0	1	Inactive or Start of Transmission
4	0	Read Holding Registers	0	0	1	Inactive or Start of Transmission
5	0	Read Input Registers	0	0	1	Inactive or Start of Transmission
6	0	Force Single Coil	0	0	1	Inactive or Start of Transmission
7	0	Set Single Register	0	0	1	Inactive or Start of Transmission
8	0	Force Multiple Coils	0	0	1	Inactive or Start of Transmission
9	0	Set Multiple Registers	0	0	1	Inactive or Start of Transmission
10	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
11	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
12	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
13	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
14	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
15	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
16	0	Polling Disabled	0	0	1	Inactive or Start of Transmission

5. Select the **Import CSV** button.

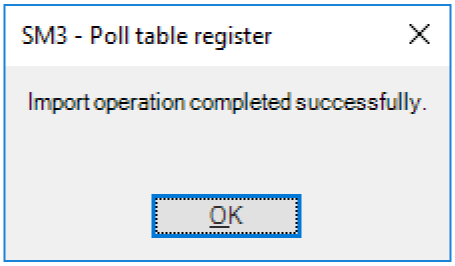
6. Navigate to the file location of your CSV file and select **Open**.

Note

The system verifies the integrity of the CSV and asks for confirmation before continuing if any errors are found. If you select **Import removing invalid parameters**, any invalid lines in the CSV file are ignored and data currently in the FB Series device is maintained.

7. A confirmation message displays after importing the CSV. Select **OK** to complete the process.

Figure 324. Confirmation



SM3 - Poll table register

Import operation completed successfully.

4.28.4.1.2 Exporting a Modbus Poll Table CSV File

You can export your FB Series product's current Modbus poll table configuration to a CSV file saved on your computer.

Note

- For more information about Modbus poll tables in the FB Series product, refer to Poll Table Register.
- For more information about creating your own Modbus poll table CSV file, refer to Creating a Modbus Poll Table CSV File.
- For more information about importing a CSV file that contains the FB Series product's current Modbus poll table configuration, refer to Importing a Modbus Poll Table CSV File.

To export a CSV file that contains your Modbus poll table configuration:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Select ▼ in the Communications drop-down list and choose a communications port using the Modbus Master protocol.
3. Select the **Modbus Master** button. The Modbus Master pop-up display opens.
4. Select the **Poll Table Registers** button. The Poll Table Register pop-up display opens.

Figure 325. Poll Table Register – Export CSV

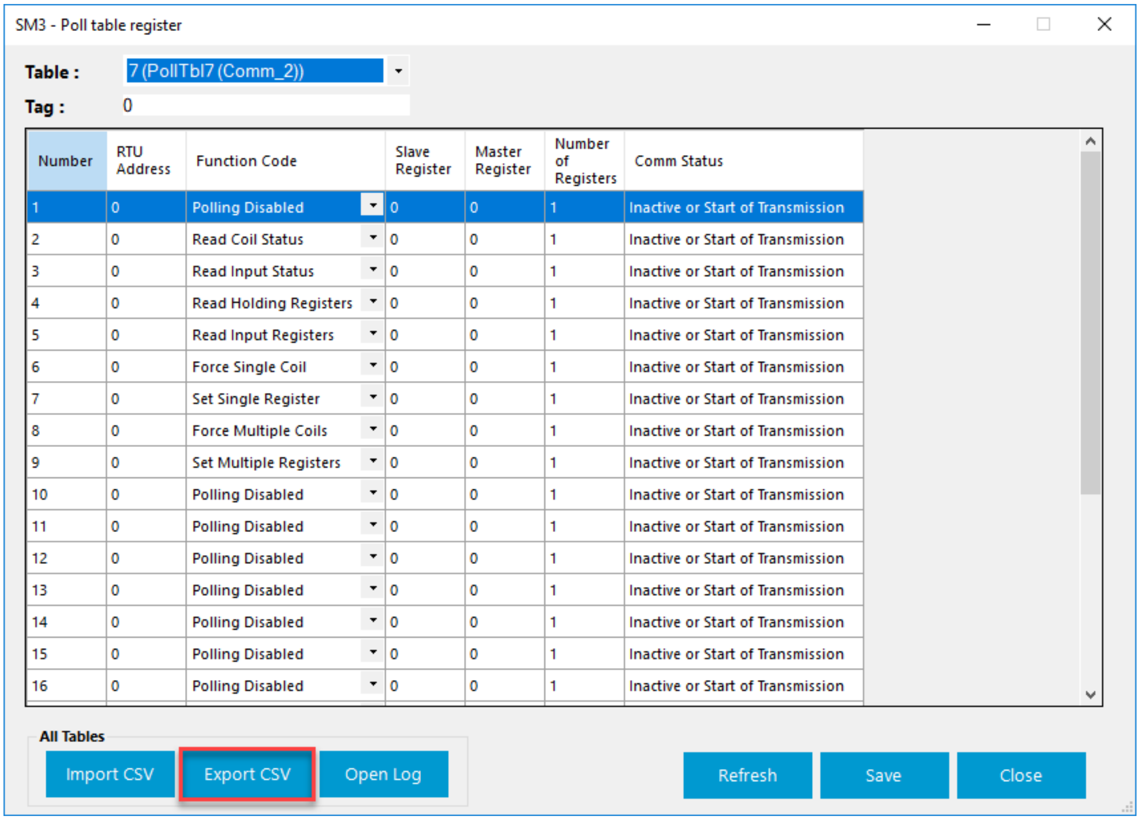
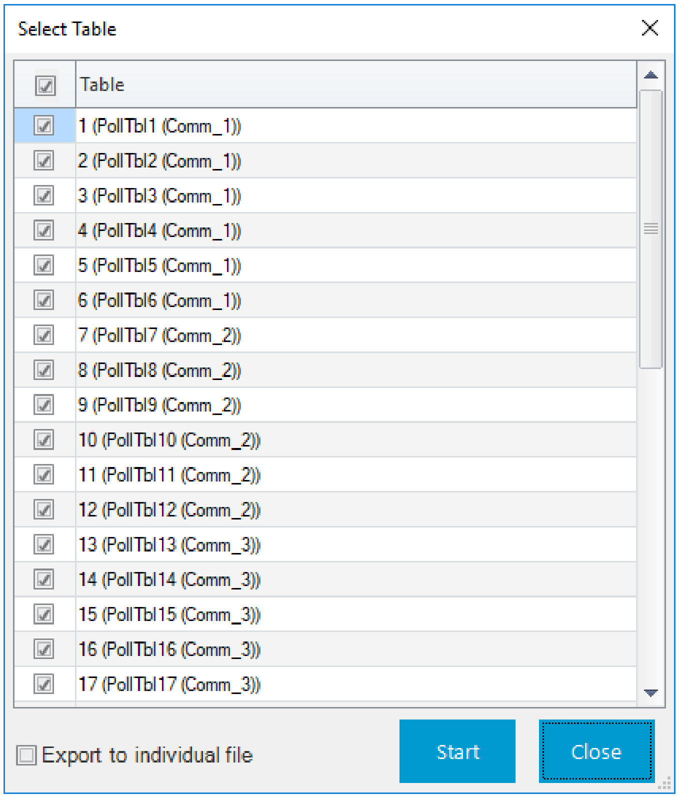


Table : 7 (PollTbl7 (Comm_2))
Tag : 0

Number	RTU Address	Function Code	Slave Register	Master Register	Number of Registers	Comm Status
1	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
2	0	Read Coil Status	0	0	1	Inactive or Start of Transmission
3	0	Read Input Status	0	0	1	Inactive or Start of Transmission
4	0	Read Holding Registers	0	0	1	Inactive or Start of Transmission
5	0	Read Input Registers	0	0	1	Inactive or Start of Transmission
6	0	Force Single Coil	0	0	1	Inactive or Start of Transmission
7	0	Set Single Register	0	0	1	Inactive or Start of Transmission
8	0	Force Multiple Coils	0	0	1	Inactive or Start of Transmission
9	0	Set Multiple Registers	0	0	1	Inactive or Start of Transmission
10	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
11	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
12	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
13	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
14	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
15	0	Polling Disabled	0	0	1	Inactive or Start of Transmission
16	0	Polling Disabled	0	0	1	Inactive or Start of Transmission

5. Select the **Export CSV** button. The Select Table pop-up display opens.

Figure 326. Select Table



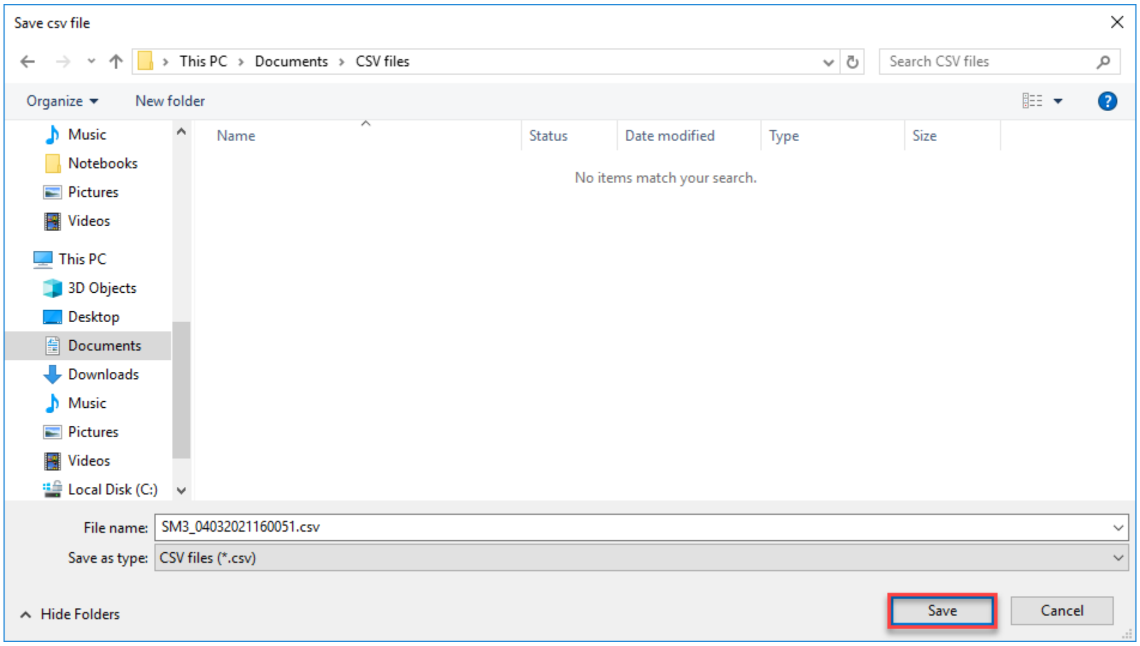
6. Place a check mark next to each table you want to export.

Note

By default, all selected tables are exported to a single file. If you want each selected table to be exported to individual files, place a check mark next to **Export to individual file**.

7. Select **Start**. A Save csv file window opens.

Figure 327. Save csv file



No items match your search.

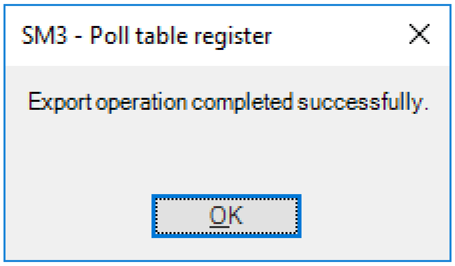
File name: SM3_04032021160051.csv

Save as type: CSV files (*.csv)

8. Navigate to a location on your computer to save your exported CSV file and select **Save**. The system exports the CSV file and displays a progress bar at the top of the display.

9. A confirmation message displays after exporting the CSV file. Select **OK** to complete the process.

Figure 328. Confirmation



SM3 - Poll table register

Export operation completed successfully.

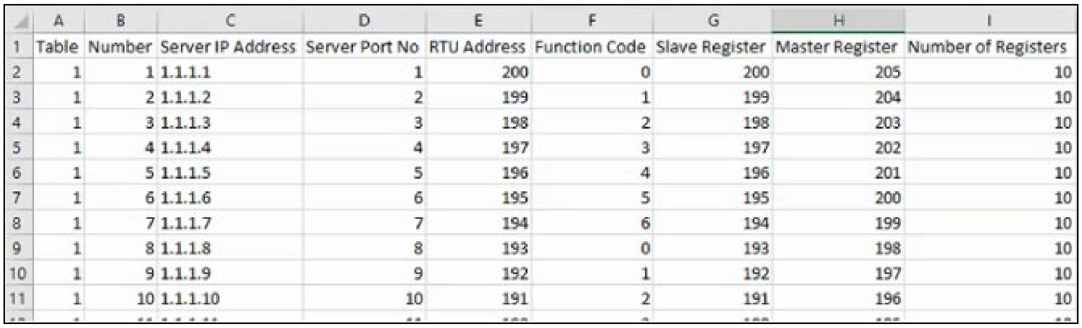
4.28.4.1.3 Creating a Modbus Poll Table CSV File

You can create a Modbus poll table on your computer and then import the file for use in the FB Series product. If your Modbus poll table contains a large amount of points, then it may be easier to create a CSV file on your computer than it is to configure the table in FBxConnect™.

Note

- For more information about Modbus poll tables, refer to Poll Table Register.
- The Modbus poll table CSV **must** contain the format shown below. The easiest way to begin creating a custom map is to export a CSV that contains the current configuration and then edit that file. For more information about exporting a CSV file, refer to the Exporting a Modbus Poll Table CSV File.

Figure 329. Example Modbus Poll Table CSV Format



	A	B	C	D	E	F	G	H	I
1	Table	Number	Server IP Address	Server Port No	RTU Address	Function Code	Slave Register	Master Register	Number of Registers
2	1	1	1.1.1.1	1	200	0	200	205	10
3	1	2	1.1.1.2	2	199	1	199	204	10
4	1	3	1.1.1.3	3	198	2	198	203	10
5	1	4	1.1.1.4	4	197	3	197	202	10
6	1	5	1.1.1.5	5	196	4	196	201	10
7	1	6	1.1.1.6	6	195	5	195	200	10
8	1	7	1.1.1.7	7	194	6	194	199	10
9	1	8	1.1.1.8	8	193	0	193	198	10
10	1	9	1.1.1.9	9	192	1	192	197	10
11	1	10	1.1.1.10	10	191	2	191	196	10

To create a CSV file that contains your Modbus poll table configuration:

1. Open a blank spreadsheet (or open your previously exported Modbus poll table CSV file).
2. In row one of the spreadsheet, enter the following text:
    - Column A = Table
    - Column B = Number
    - Column C = Server IP Address
    - Column D = Server Port No
    - Column E = RTU Address
    - Column F = Function Code
    - Column G = Slave Register
    - Column H = Master Register
    - Column I = Number of Registers
3. In the proceeding rows, enter information for each table entry according to the descriptions below:

Note

Drop-down lists on the FBxConnect™ display are represented as numbers in the CSV file. See the descriptions below for a description for each number.

Column Heading	Description
Table	Enter a number that specifies which poll register table number the selected row belongs to. Each communications port with Modbus Master support is assigned its own tables. Valid values are: • **1** through **6** = Com1 • **7** through **12** = Com2 • **13** through **18** = Com3 • **19** through **24** = Com4 s • **25** through **30** = Ethernet 1 • **31** through **36** = Ethernet 2
Number	Enter a number that specifies the poll request number (or row) for table number you entered in the previous column. Each table contains up to 25 poll request numbers. Valid values are 1 through 25.
Server IP Address	Enter the IP address of the device to be polled. **Note** This field applies **only** to the **Ethernet** communications port.
Server Port No	Enter the IP port number of the device to be polled. **Note** This field applies **only** to the **Ethernet** communications port.
RTU Address	Enter the Modbus RTU address of the device to be polled.
Function Code	Specifies the Modbus function code to be sent to the slave device. Only a number is entered and corresponds to the following values: • **0** = Polling Disabled. This line in the polling table will be skipped. • **1** = Read Coil Status • **2** = Read Input Status • **3** = Read Holding Registers • **4** = Read Input Registers • **5** = Force Single Coil • **6** = Set Single Register • **15** = Force Multiple Coils • **16** = Set Multiple Registers
Slave Register	Enter the starting register number from which data is drawn from or to which data is written in the slave device.

Column Heading	Description
Master Register	Enter the starting register number in the FB Series product to which data is stored, as defined in the Modbus Map Table.
Number of Registers	Enter the total number of registers to poll (read/write) in a single request.

4. Save your changes. You can now import your CSV file for use in your FB Series product. For more information, refer to Importing a Modbus Poll Table CSV File.

Note

Make sure to save the file with a **.csv** file extension.

4.28.5 Configuring Communications Ports

Use these steps to configure a communications port.

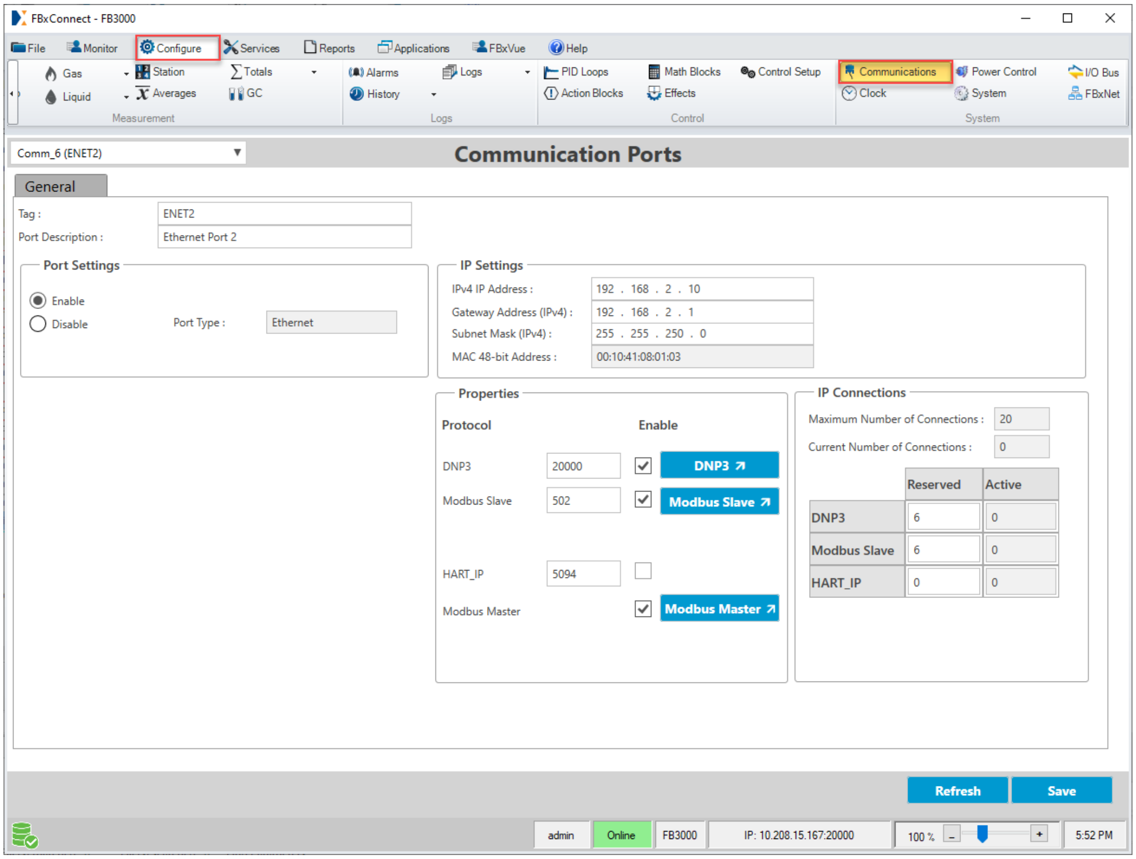
CAUTION

When making multiple FBxConnect™ connections to the same FB Series product (as with a remote and a local connection), be aware that the changes one connection makes to the FB Series product may not be immediately visible to other connections, and may even require the other connections to restart FBxConnect™ before changes become visible. For example, simple changes (such as changes to setpoints) may be immediately visible to all connections, but changing the number of meters, configuring I/O, adding/deleting menu items, or other major configuration changes may require re-establishing the connection using FBxConnect™.

To configure a communications port:

1. Select **Configure > Communications** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select a communications port to configure.

Figure 330. Communications – General (Ethernet port)



Communication Ports

Tag : ENET2

Port Description : Ethernet Port 2

Port Settings

● Enable

○ Disable

Port Type : Ethernet

IP Settings

IPv4 IP Address : 192 . 168 . 2 . 10

Gateway Address (IPv4) : 192 . 168 . 2 . 1

Subnet Mask (IPv4) : 255 . 255 . 250 . 0

MAC 48-bit Address : 00:10:41:08:01:03

Properties

Protocol		Enable	
DNP3	20000	☑	DNP3 ↗
Modbus Slave	502	☑	Modbus Slave ↗
HART_IP	5094	☐	
Modbus Master		☑	Modbus Master ↗

IP Connections

Maximum Number of Connections : 20

Current Number of Connections : 0

	Reserved	Active
DNP3	6	0
Modbus Slave	6	0
HART_IP	0	0

3. In the **Tag** field, enter a name for the selected communications port.

4. In the **Port Description** field, enter a description for the selected communications port.

5. In the **Port Settings** frame, select **Enable** to allow communications on the selected port.

6. **For Serial communications ports**, click ▼ in the **Port Owner** drop-down list and select the communications protocol used by selected communications port.

7. Review – and change as necessary – the values in the remaining fields. For more information about the available fields, refer to Communications – General display.

8. Select **Save** to save your changes to device memory and enable additional pop-up displays for the selected protocols. You **must** also configure the additional pop-up displays for each selected protocol.

For more information about the additional pop-up displays, refer to the following topics:

[Communications – DNP3]()

[Communications – Modbus Slave]()

[Communications – Modbus Master]()

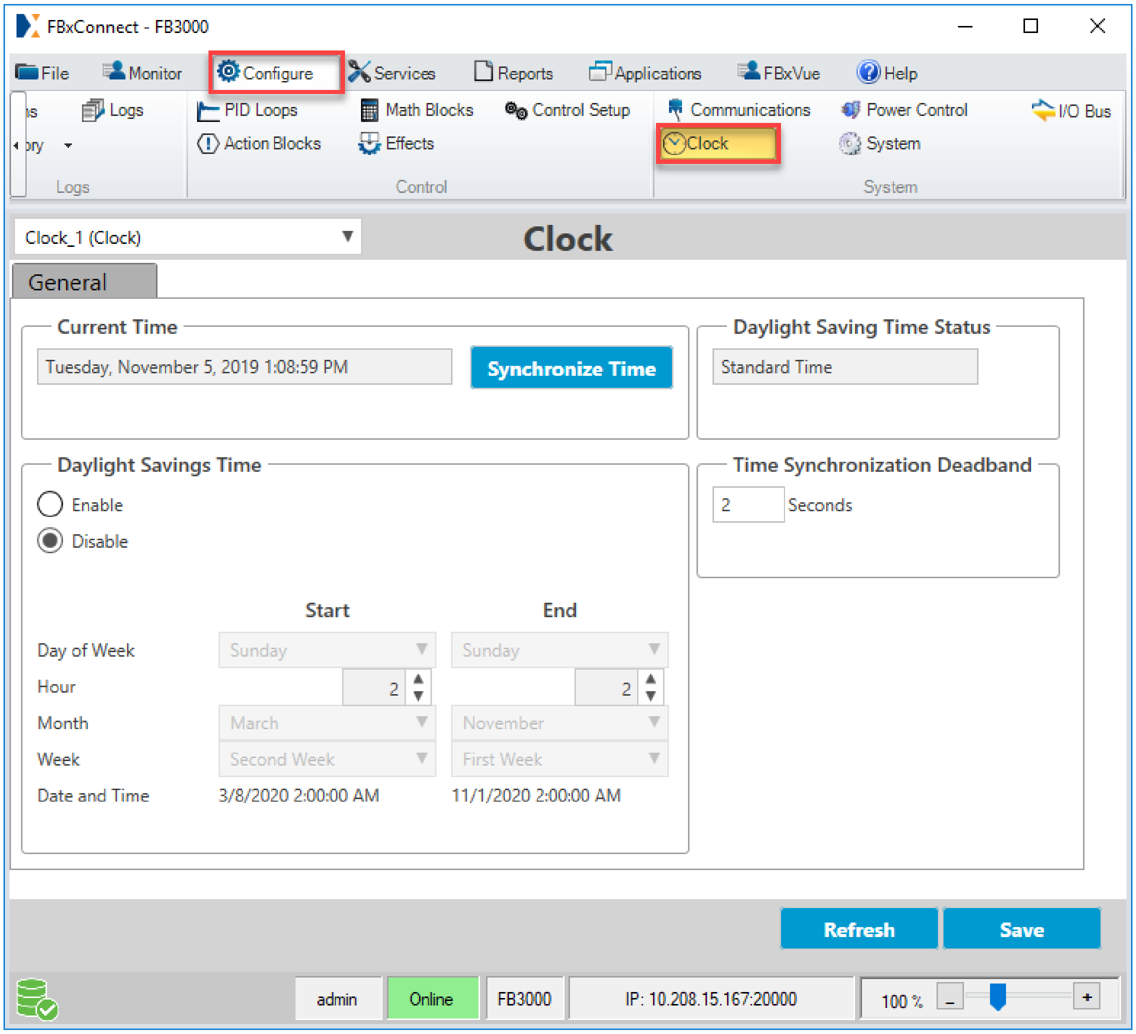
4.29 Clock

Use the Clock screen to set the clock in the FB Series product, and to configure daylight saving time options.

To access this screen:

1. Select **Configure > Clock** from the FBxConnect™ main menu. The Clock screen displays:

Figure 331. Clock



Clock_1 (Clock)

Current Time

Tuesday, November 5, 2019 1:08:59 PM

Daylight Saving Time Status

Standard Time

Daylight Savings Time

○ Enable
● Disable

	Start	End
Day of Week	Sunday	Sunday
Hour	2	2
Month	March	November
Week	Second Week	First Week
Date and Time	3/8/2020 2:00:00 AM	11/1/2020 2:00:00 AM

Time Synchronization Deadband

2 Seconds

admin | Online | FB3000 | IP: 10.208.15.167:20000 | 100 %

2. Review – and change as necessary – the values in the following fields:

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Current Time</td><td colspan="2">Shows the current time and date of the device clock.</td></tr>
<tr><td>Synchronize Time</td><td colspan="2">Select this button to synchronize the device clock with your PC clock. Refer to Time Sync.</td></tr>
<tr><td>Daylight Saving Time Status</td><td colspan="2">This read-only field displays if daylight saving time is currently in effect. Possible values are Standard Time (Daylight Saving Time is not in effect), Saving Time (Daylight Saving Time is in effect), or Gift Time (the extra hour from 1AM to 2AM after the clock is set back one hour).</td></tr>
<tr><td rowspan="5">Daylight Savings Time</td><td colspan="2">Enable or disable Daylight Saving Time clock changes.
Note
If you enable Daylight Saving Time, select Save and configure the starting and ending times for Daylight Saving Time in the Start and End columns.</td></tr>
<tr><td>Day of the Week</td><td>Click ▼ to select the day of the week to start and end Daylight Saving Time.</td></tr>
<tr><td>Hour</td><td>Click ▼ to select the hour to start and end Daylight Saving Time.
Note
Entered in military time (0 through 23).</td></tr>
<tr><td>Month</td><td>Click ▼ to select the month to start and end Daylight Saving Time.
Note
1 = January, 2 = February, 3 = March, 4 = April, etc.</td></tr>
<tr><td>Week</td><td>Click ▼ to select the week of the month to start and end Daylight Saving Time.
Note
The Last Week option configures Daylight Saving Time on the last week of the month, regardless of what week that falls on.</td></tr>
</table>

Field	Description	
	Date and Time	These **read-only** fields show the next pending Daylight Savings Time start and end times for validation of the above configuration. As these start and end time pass, these fields will be automatically updated with the new start and end times for the next year. **Note** You **must** save any changes to update this field.
	Note For example, suppose you make the following Daylight Saving Start configuration: • Day of Week = Sunday • Hour = 2 • Month = 3 • Week of Month = Second Week Daylight Saving Time would begin at 2:00 am on the second Sunday of March.	
Time Synchronization Deadband	Enter a time (in seconds) that a new time must be different than the old time to be accepted by the FB Series product. Any request to synch/write time that does not exceed the deadband is ignored. Valid values are 0 through 30.	

3. Select **Save** to save your changes if you modify any of the fields on this screen.

4.30 Power Control

Use the Power Control screen to enable and disable power to a radio or other device via a DO or other I/O, as well as wake the device from low power to communicate. You can configure three separate power control instances, and each instance can be configured with independent timer values and output parameters.

For each Power Control instance, the power cycling can be configured to automatically change four times a day. During each of these four periods (Time 1, Time 2, Time 3, and Time 4), the ON (Time On) and OFF (Time Off) times can be set up to operate at various intervals to conserve battery power.

During the **ON** time:

- The selected Control to Toggle is set to ON.

During the **OFF** time:

- The selected Control to Toggle is set to OFF.

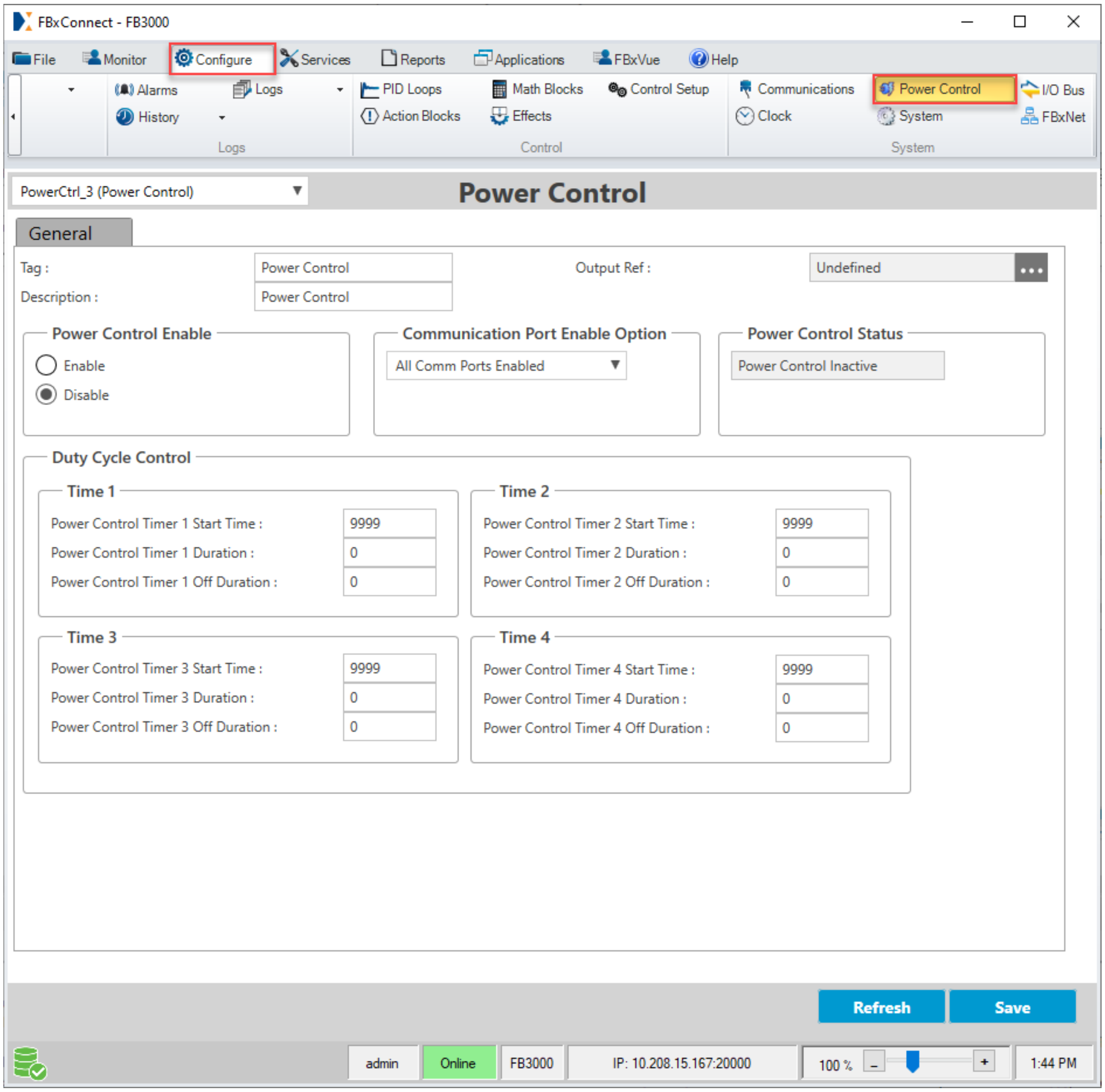
If communications occur during the ON time, the ON time is extended by the idle timeout of the communicating device.

Set a value in the Low Battery Shutoff Voltage field to automatically disable Radio Power Control if the input voltage to the device falls below this value. Radio Power Control is automatically re-enabled when the input voltage rises to this value.

To access this screen:

1. Select **Configure > Power Control** from the FBxConnect™ main menu.
2. Click ▼ in the drop-down list at the top of the display and select an instance to configure.

Figure 332. Power Control



PowerCtrl_3 (Power Control)

Power Control

Tag : Power Control
Description : Power Control
Output Ref : Undefined

Power Control Enable
○ Enable
● Disable

Communication Port Enable Option
All Comm Ports Enabled

Power Control Status
Power Control Inactive

Duty Cycle Control

Time 1
Power Control Timer 1 Start Time : 9999
Power Control Timer 1 Duration : 0
Power Control Timer 1 Off Duration : 0

Time 2
Power Control Timer 2 Start Time : 9999
Power Control Timer 2 Duration : 0
Power Control Timer 2 Off Duration : 0

Time 3
Power Control Timer 3 Start Time : 9999
Power Control Timer 3 Duration : 0
Power Control Timer 3 Off Duration : 0

Time 4
Power Control Timer 4 Start Time : 9999
Power Control Timer 4 Duration : 0
Power Control Timer 4 Off Duration : 0

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Set an identifier (up to 20-alphanumeric characters) for the selected instance.
Description	Set a description (up to 20-alphanumeric characters) for the selected instance.
Output Ref	Click ••• to open the point picker dialog and choose an output that is controlled by the selected power control instance.

Field	Description
Power Control Enable	Enables or disables the selected power control instance.
Communication Port Enable Option	Click ▼ to select the communications ports controlled by the selected power control instance.
Power Control Status	This **read-only** field shows the status of the selected power control instance.
Power Control Timer Start Time	Sets the time of day (in hours and minutes, HHMM) that the selected power control instance starts. You can configure up to four separate Start Times (Time 1, Time 2, Time 3, and Time 4) for each power control instance. Each Start Time configuration stays active until the next Start Time occurs. **Note** The Start Time's Time On and Time Off alternate throughout the period the Start Time is active. Enter a non-zero Time On or Time Off if you wish power control to remain on or off.
Power Control Timer Duration	Sets the length of time (in seconds) power control remains on while it's Start Time (Time 1, Time 2, Time 3, and Time 4) is active.
Power Control Timer Off Duration	Sets the length of time (in seconds) power control remains off while it's Start Time (Time 1, Time 2, Time 3, and Time 4) is active.

4. Select **Save** to save your changes if you modify any of the fields on this screen.

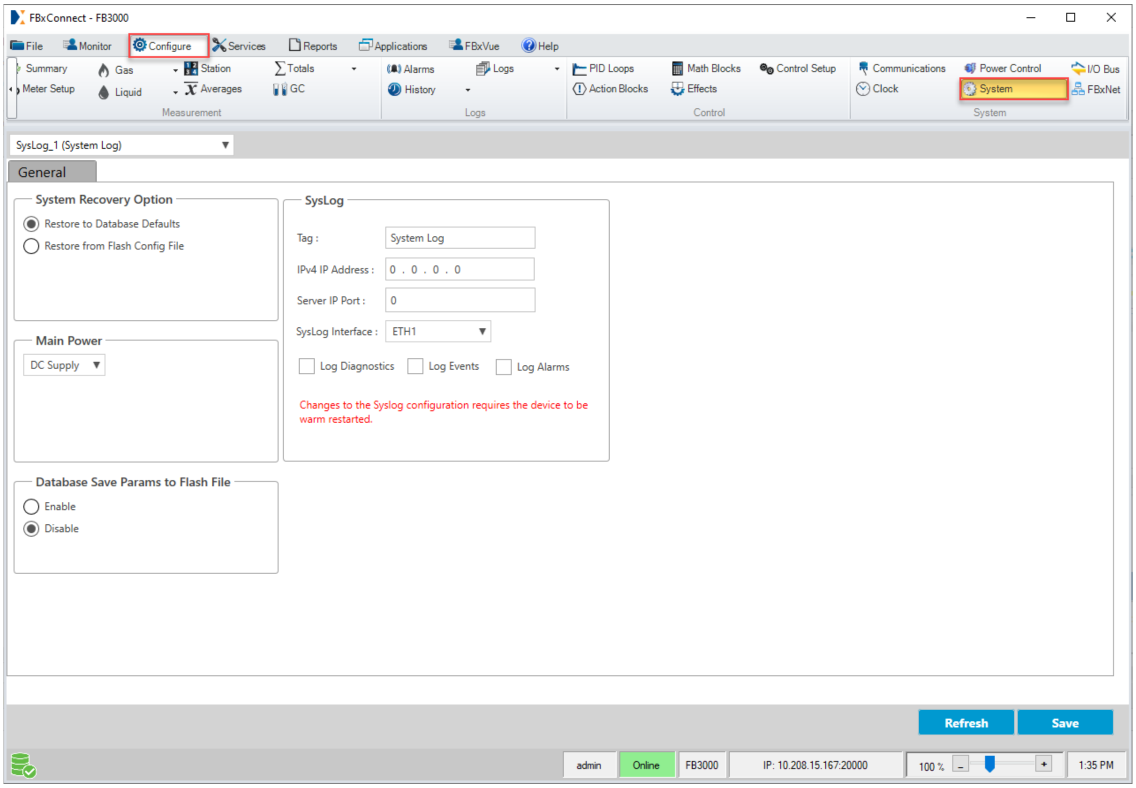
4.31 System

Use the System screen to configure how your FB Series product restores the device database after a failure and set the minimum voltage required to power the device.

To access this screen:

1. Select **Configure > System** from the FBxConnect™ main menu.

Figure 333. System



SysLog_1 (System Log)

System Recovery Option
● Restore to Database Defaults
○ Restore from Flash Config File

Main Power
DC Supply

Database Save Params to Flash File
○ Enable
● Disable

SysLog
Tag : System Log
IPv4 IP Address : 0 . 0 . 0 . 0
Server IP Port : 0
SysLog Interface : ETH1
☐ Log Diagnostics ☐ Log Events ☐ Log Alarms

Changes to the Syslog configuration requires the device to be warm restarted.

2. Review – and change as necessary – the values in the following fields:

Field	Description	
System Recovery Option	Sets how the FB Series product restores the device database after a failure. Failures can happen for several reasons including static electricity, radiation, software issues, etc. Possible recovery options are:	
	Restore to Database Defaults	Restores the FB Series product configuration to the original defaults after a failure.
	Restore from Flash Config File	Restores read-only values to the FB Series product defaults and read/write values from a configuration file previously stored in flash memory of the FB Series product (if one exists). **Note** If you select this option, you **must** save a configuration file to flash memory. For more information, refer to Download to Flash.

Field	Description
Main Power	Click ▼ to set the set the minimum voltage required to power the device. Possible options are Solar Supply (powered by solar panel) and DC Supply (powered by a DC power supply). There are two trip points for the FB3000: a power fail trip point and a shutdown trip point. If power drops to the power fail trip point, the RTU firmware initiates an orderly shutdown procedure. If power falls below that to the shutdown trip point, hardware shuts down abruptly. The trip points for each option are as follows: **Solar Supply** Power Fail Trip Point = 10.49 V Shutdown Trip Point = 10.19 V **DC Supply** Power Fail Trip Point = 9.38 V Shutdown Trip Point = 8.5 V **Note** Because of variation in power measurements, the trip points are approximate.
Database save Params to Flash File	Enables the FB Series product to use memory from the flash file system as an extension of the standard database memory. This allows certain configuration parameters to be removed from the database and stored as files on the FB Series product’s flash file system. This setting is useful if the overall product features and installed applications exceed the standard database memory allocation (as viewed on the Services – Service Info display). **Note** If you change this option, you **must** perform a Warm Start before any changes are applied.

Field	Description	
	Enable	Certain parameters are stored in the flash file system resulting in an increase to the available memory of the standard database. You may need to enable this option when installing large applications or enabling a large number of features. **Note** Parameters stored in this manner are pre-determined and not selectable. These are typically configuration parameters of larger data types, such as strings or parameter references. The files used to store this data are not visible, but they do consume a portion of the flash file system (as viewed on the Services – Service Info display).
	Disable	All parameters are stored in the default standard database. Although this limits the amount of memory available for the standard database, it is sufficient for the majority of configuration scenarios. This is the default. **Note** If you select Disable after the feature has been enabled, then the database is reset to defaults. To prevent loss of data, you should save your configuration (refer to Upload Solution) and collect history (History Report).
SysLog	Use these fields to configure parameters used to communicate with a SysLog server for system management and auditing purposes. **Note** If you change the SysLog configuration, you **must** perform a Warm Start before any changes are applied.	
	Tag	Sets an identifier (up to 20-alphanumeric characters) that the FB Series product will use when logging to the SysLog server.
	IPv4 IP Address	Enter the IP address of the SysLog server used for communications.

Field	Description		
	Server IP Port	Enter the TCP/IP port number of the SysLog server used for communications.	
	SysLog Interface	Click ▼ to set which communications port on the FB Series product is used to send messages to the SysLog server. Possible options are:	
		ETH1	Use Ethernet 1 to send messages to the SysLog server.
		ETH2	Use Ethernet 2 to send messages to the SysLog server.
	Log Diagnostics	Place a check mark to include diagnostic log information when sending messages to the SysLog server.	
	Log Events	Place a check mark to include event log information when sending messages to the SysLog server.	
	Log Alarms	Place a check mark to include alarm log information when sending messages to the SysLog server.	

3. Select **Save** to save your changes if you modify any of the fields on this screen.

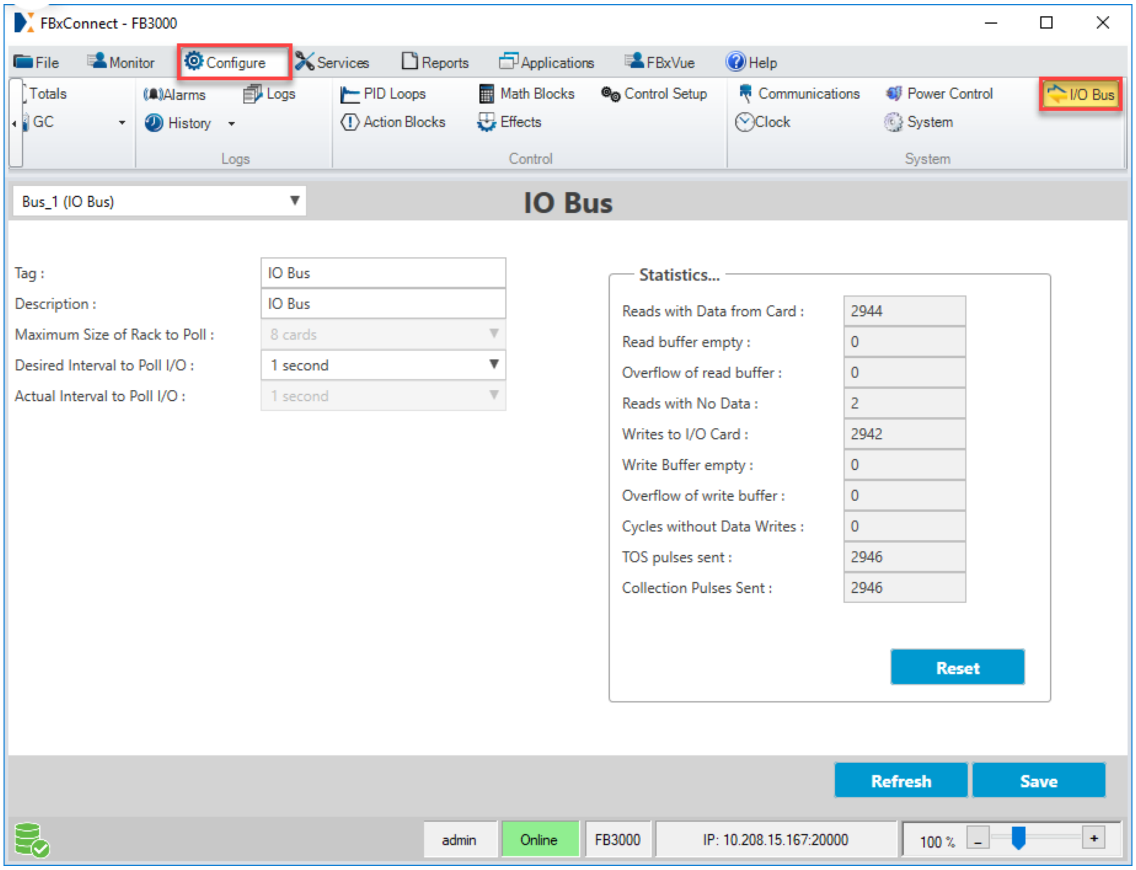
4.32 I/O Bus

Use the I/O Bus display to configure the polling interval and view statistics for each I/O module installed in an FB3000 RTU.

To access this display:

1. Select **Configure > I/O Bus** from the FBxConnect™ main menu. The I/O Bus display opens:

Figure 334. I/O Bus



Tag : IO Bus
Description : IO Bus
Maximum Size of Rack to Poll : 8 cards
Desired Interval to Poll I/O : 1 second
Actual Interval to Poll I/O : 1 second

Statistics...
Reads with Data from Card : 2944
Read buffer empty : 0
Overflow of read buffer : 0
Reads with No Data : 2
Writes to I/O Card : 2942
Write Buffer empty : 0
Overflow of write buffer : 0
Cycles without Data Writes : 0
TOS pulses sent : 2946
Collection Pulses Sent : 2946

2. Click ▼ in the drop-down list at the top of the display to select a I/O bus to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected I/O bus.
Description	Sets a description (up to 20-alphanumeric characters) for the selected I/O bus.

Field	Description
Maximum Size of Rack to Poll	This **read-only** field shows the maximum number of I/O cards you can install. **Note** The system auto-detects the size of the rack based on an I/O module's physical slot location. For example, if there is only one I/O module and it is installed in slot 19, then system detects the rack size as 24. Every extended rack can house a maximum 8 I/O modules.
Desired Interval to Poll I/O	Sets the time the system waits between reads of the I/O modules. **Note** This is your desired interval. The actual interval is based on your requested interval and the maximum frequency allowed based on the number of installed racks.
Actual Interval to Poll I/O	This **read-only** field shows the actual time the system waits between reads of the I/O modules. **Note** This time may differ from you desired Interval to Poll I/O. The actual interval is based on your requested interval and the maximum frequency allowed based on the number of installed racks.
Statistics	These **read-only** fields show statistical information for the currently selected I/O bus.
Reset	Select to zero-out the information contained in the Statistics fields.

4. Select **Save** to save your changes if you modify any of the fields on this display.

4.33 FBxNet

Use the this display to configure the FB Series product to communicate over FBxNet. FBxNet is a peer-to-peer communication network for exchanging data between Emerson RTUs and flow computers over Ethernet connections. The network consists of publishers and subscribers. You can configure the **FB3000 RTU** as an FBxNet publisher or FBxNet subscriber.

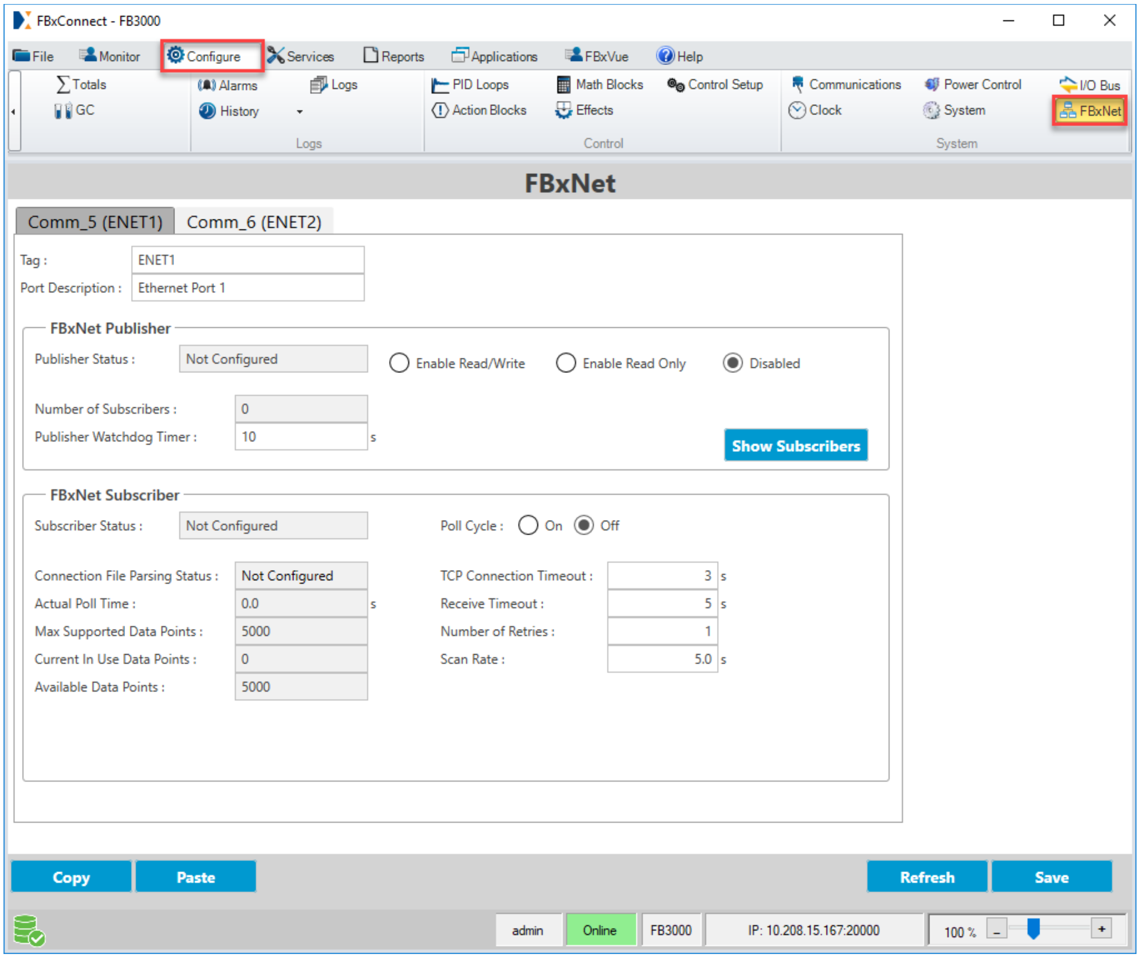
Note

For more information about FBxNet, refer to *Field Tools Quick Start Guide* (D301703X412).

To access this display:

1. Select **Configure > FBxNet** from the FBxConnect™ main menu. The FBxNet display opens.

Figure 335. FBxNet



Tag : ENET1
Port Description : Ethernet Port 1

FBxNet Publisher

Publisher Status : Not Configured ○ Enable Read/Write ○ Enable Read Only ● Disabled
Number of Subscribers : 0
Publisher Watchdog Timer : 10 s

FBxNet Subscriber

Subscriber Status : Not Configured
Poll Cycle : ○ On ● Off
Connection File Parsing Status : Not Configured
Actual Poll Time : 0.0 s
Max Supported Data Points : 5000
Current In Use Data Points : 0
Available Data Points : 5000
TCP Connection Timeout : 3 s
Receive Timeout : 5 s
Number of Retries : 1
Scan Rate : 5.0 s

2. A tab shows at the top of the display for each communications port that supports FBxNet communications. Select the tab corresponding to the communications port you want to configure.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected communications port.

<table>
<tr><th>Field</th><th colspan="3">Description</th></tr>
<tr><td>**Port Description**</td><td colspan="3">Sets a description (up to 20-alphanumeric characters) for the selected communications port.</td></tr>
<tr><td rowspan="8">**FBxNet Publisher**</td><td colspan="3">These fields display parameters associated with FBxNet publishers.</td></tr>
<tr><td>**Publisher Status**</td><td colspan="2">This **read-only** field shows if the FB Series device is currently configured as an FBxNet publisher.</td></tr>
<tr><td>**Enable Read/Write**</td><td colspan="2">Select to enable subscribers to read data from and write data to this device.</td></tr>
<tr><td>**Enable Read Only**</td><td colspan="2">Select to enable subscribers to **only** read data from this device.</td></tr>
<tr><td>**Disabled**</td><td colspan="2">Select to prevent subscribers from reading data from or writing data to the device.</td></tr>
<tr><td>**Number of Subscribers**</td><td colspan="2">This **read-only** field shows the number of FBxNet subscribers configured to receive information from the currently connected FB Series product.</td></tr>
<tr><td>**Publisher Watchdog Timer**</td><td colspan="2">Sets the amount of time, in seconds, that a publisher must receive an update from a subscriber before determining that the subscriber has stopped communication. If this timer expires, any applicable fault modes are applied and the subscriber is forced to re-authenticate with the publisher.</td></tr>
<tr><td>**Show Subscribers**</td><td colspan="2">Select this button to open a pop-up display that contains a list of IP addresses belonging to the FBxNet subscribers configured to receive information from the currently connected FB Series product.</td></tr>
<tr><td rowspan="5">**FBxNet Subscriber**</td><td colspan="3">These fields display parameters associated with FBxNet subscribers.</td></tr>
<tr><td>**Subscriber Status**</td><td colspan="2">This **read-only** field shows if the FB Series device is currently configured as an FBxNet subscriber.</td></tr>
<tr><td>**Poll Cycle**</td><td colspan="2">Enables/disables polling for the selected port.</td></tr>
<tr><td rowspan="2">**Connection File Parsing Status**</td><td colspan="2">This **read-only** field shows the current parsing status of the publisher device’s parameter mapping file. Possible status messages include:</td></tr>
<tr><td>**No Error**</td><td>Parse was successful.</td></tr>
</table>

Field	Description		
		File Open Fail	Could not open the file or the file is corrupt.
		Column Mismatch	Column of the file is invalid. Can be either in the connection or map file.
		Missing Required Column	Missing required column. Can be either in the connection or map file.
		Too Much Data	The number of entries in the map file exceed the number supported.
		Invalid Subscriber Tag	There is a subscriber tag in the file that is invalid (see diagnostic log for details).
		Invalid FBx Instance Number	There is an entry in the file that has an invalid FBx Instance Number (see diagnostic log for details).
		Missing or Invalid Required Value	One of the values in the FBxData columns (i.e., mode, fault value, instance number) is missing or invalid (see diagnostics log for details).
		Duplicate FBx Instance Number	There are duplicate entries in the file. Each fault handling number must be unique.
		Parse Not Configured	There is no connection or map file configured for the given port.
	Actual Poll Time	This **read-only** field shows the time (in seconds) to complete the poll.	
	Max Supported Data Points	This **read-only** field shows the maximum number of data points possible.	
	Current In Use Data Points	This **read-only** field shows the number of data points currently in use.	
	Available Data Points	This **read-only** field shows the number of data points still available to be used.	

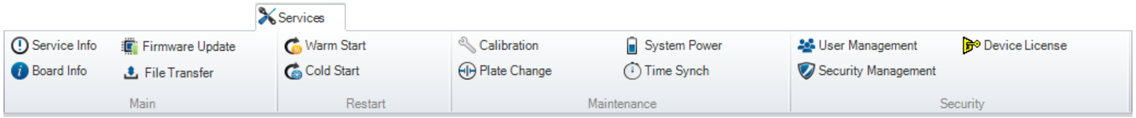
Field	Description	
	TCP Connection Timeout	Sets the number of seconds the subscriber waits for a response from a connection request before a timeout occurs.
	Receive Timeout	Sets the number of seconds the subscriber waits for a response from the publisher after the connection has been established.
	Number of Retries	Sets the number of retry attempts when a timeout occurs.
	Scan Rate	Sets the frequency (in seconds) at which the subscriber polls its publishers.

4. Select **Save** to save your changes if you modify any of the fields on this display.

Section 5: Services Menu

Use the options in this menu to access utilities and perform maintenance on your FB Series product, such as user management, firmware updates, and calibration.

Figure 336. Services Menu



The Services menu contains the following options:

Service Info – View information about the connected FB Series product, including the part number, application version, and creation date.

Board Info – Set a name and description for each module installed in your FB Series product and view general information for each module.

Firmware Update – Update the firmware on your FB Series product.

Warm Start – Perform a warm start on the connected FB Series product.

Cold Start – Perform a cold start on your FB Series product.

Calibration – Opens the Calibration Wizard to calibrate various I/O points.

Plate Change – Opens the Plate Change Wizard which walks you through the steps to successfully change the size of an orifice plate under flowing or non-flowing conditions.

System Power – View battery diagnostics and reset battery timers.

Time Synch – Use this pop-up display to synchronize the FB Series product clock with your PC clock.

User Management – Add, delete, and modify the user accounts able to log in to the FB Series product.

Security Management – Set a minimum password length and configure the lock out functionality.

Device License – Manage licenses for your device.

Apply Security File – Use this option to enable DNP3 Secure Authentication version 5 (SAv5) on the FB Series product.

Disable Sav5 – Use this option to turn off DNP3 Secure Authentication version 5 (SAv5) on the FB Series product.

5.1 Service Info

Use this display to view **read-only** information about the connected FB Series product, including the part number, firmware version, and system resources.

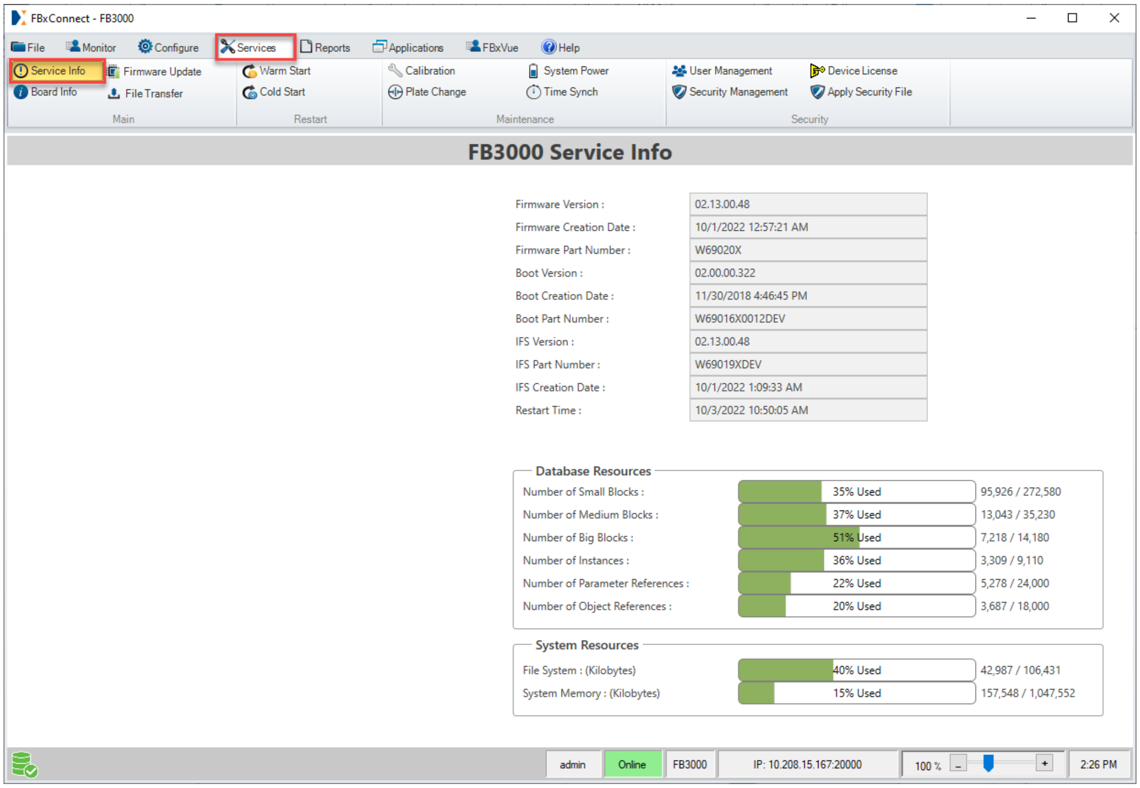
Note

The Restart Time field shows the date and time the FB Series product last finished rebooting following a restart (warm start, cold start, etc.). Restarts that are not user-initiated, such as a power failure, are recorded in the Event Log. Refer to Event Report for more information about retrieving Event Log data.

To access this display:

1. Select **Services > Service Info** from the FBxConnect™ main menu. The Service Info display opens.

Figure 337. Service Info



FB3000 Service Info

Firmware Version : 02.13.00.48
Firmware Creation Date : 10/1/2022 12:57:21 AM
Firmware Part Number : W69020X
Boot Version : 02.00.00.322
Boot Creation Date : 11/30/2018 4:46:45 PM
Boot Part Number : W69016X0012DEV
IFS Version : 02.13.00.48
IFS Part Number : W69019XDEV
IFS Creation Date : 10/1/2022 1:09:33 AM
Restart Time : 10/3/2022 10:50:05 AM

Database Resources

Number of Small Blocks :	35% Used	95,926 / 272,580
Number of Medium Blocks :	37% Used	13,043 / 35,230
Number of Big Blocks :	51% Used	7,218 / 14,180
Number of Instances :	36% Used	3,309 / 9,110
Number of Parameter References :	22% Used	5,278 / 24,000
Number of Object References :	20% Used	3,687 / 18,000

System Resources

File System : (Kilobytes)	40% Used	42,987 / 106,431
System Memory : (Kilobytes)	15% Used	157,548 / 1,047,552

2. Review the values in the following fields:

Field	Description
Firmware Version	This **read-only** field shows the version of the firmware installed in the FB Series product.
Firmware Creation Date	This **read-only** field shows the date and time that the installed version of firmware was created.
Firmware Part Number	This **read-only** field shows the part number of the installed version of firmware.
Boot Version	This **read-only** field shows the version of the boot firmware installed in the FB Series product.
Boot Creation Date	This **read-only** field shows the date and time that the installed boot firmware was created.
Boot Part Number	This **read-only** field shows the part number of the installed boot firmware.
IFS Version	This **read-only** field shows the version of the initial file system installed in the FB Series product.
IFS Creation Date	This **read-only** field shows the date and time that the installed initial file system was created.
IFS Part Number	This **read-only** field shows the part number of the installed initial file system.
Restart Time	The Restart Time field shows the date and time the FB Series product last finished rebooting following a restart (warm start, cold start, etc.). **Note** Restarts that are **not** user-initiated, such as a power failure, are recorded in the Event Log. Refer to Event Report for more information about retrieving Event Log data.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Database Resources</td><td colspan="2">These read-only fields represent the status of the system database. The database is a shared resource that is common to all FB3000 functionality. While the memory allocated for the database is sufficient for the vast majority of use-cases, caution is advised for larger systems. Additional database resources are used whenever the number of meters is increased, the number of history points is increased, or new I/O modules are installed. The same is true when adding applications with user defined objects. When you commission a new system, or expand the functionality of an existing system, you should review these fields for any areas of concern.
The color of these fields change based on the following conditions:
Green = This color shows if the resource usage is between 0-74%.
Orange – This color shows if the resource usage is between 75-89%.
Red – This color shows if the resource usage is between 90-100%.
Note
A red field is not necessarily a problem for operation, but increasing the system functionality (additional meters, history, IO, applications, etc.) may not be possible.</td></tr>
<tr><td></td><td>Number of Small Blocks</td><td>This field shows the current and maximum possible usage of “small” data type parameters in the database. These parameters are 8 bytes or less in size and consist of the following data types: UINT8, INT8, UINT16, INT16, UINT32, INT32, UINT64, INT64, FLOAT, DOUBLE, ENUM16, BIN8, BIN16, BIN32, and TIME. For more information about native system data types, refer to Native Data Types.</td></tr>
</table>

Field	Description	
	Number of Medium Blocks	This field shows the current and maximum possible usage of "medium" data type parameters in the database. These parameters are 10 or 20 bytes in length and consist of the following data types: UC10 (String 10), UC20 (String 20), and OBJREF. For more information about native system data types, refer to Native Data Types.
	Number of Big Blocks	This field shows the current and maximum possible usage of "Large" (or Big) data type parameters in the database. These parameters are 30 bytes or greater in length and consist of the following data types: UC30 (String 30), UC40 (String 40), BYTE32 and PRMREF. For more information about native system data types, refer to Native Data Types.
	Number of Instances	This field shows the current and maximum possible usage of database object instances. For every database object, there is at least one instance. For most database objects, there are multiple instances. The total number of instances (for both firmware objects and application objects) must **not** exceed the limit shown here.
	Number of Parameter References	This field shows the current and maximum possible usage of parameter reference database parameters in the database. Parameter reference parameters (often represented in FBxConnect via a [•••] button) are a special type of database parameter used throughout the system for pointing to or linking to an individual piece of data. Sometimes these links are defined by the user and other times they are predefined in a fixed manner.

Field	Description	
	Number of Object References	This field shows the current and maximum possible usage of object reference database parameters in the database. Object Reference parameters (often represented in FBxConnect via a [•••] button) are a special type of database parameter used throughout the system for linking data and groups of data together. These references are used to point to other related objects. Sometimes these links are defined by the user and other times they are predefined in a fixed manner.
System Resources	These fields represent the memory utilization for the system. The color of these fields change based on the following conditions: • **Green** = This color shows if the resource usage is between 0-74%. • **Orange** – This color shows if the resource usage is between 75-89%. • **Red** – This color shows if the resource usage is between 90-100%.	
	File System	This field represents the usage of the FB Series product's flash file system. Data stored in flash is persistent, meaning it is retained following a power cycle or restart. This memory is used for application files, protocol files, license files, and other system related or user stored files. The contents of the flash file system can be viewed via the File Transfer display.
	System Memory	This field represents the usage of the FB Series product's SDRAM. SDRAM (synchronous DRAM) is non-persistent, meaning data is not retained upon a power cycle or restart. This memory is used for firmware and application execution, variables, stacks, and heaps.

5.2 Board Info

Use this display to set a name and description for each module installed in your FB Series product and view general information for each module. Displayed information includes details about the module type, firmware version, and boot code. Each module is assigned a number by FBxConnect™, and you can select each module from the drop-down list at the top of the display.

Note

All flow calculations, alarms, events, and history reside in the main CPU (Module_1).

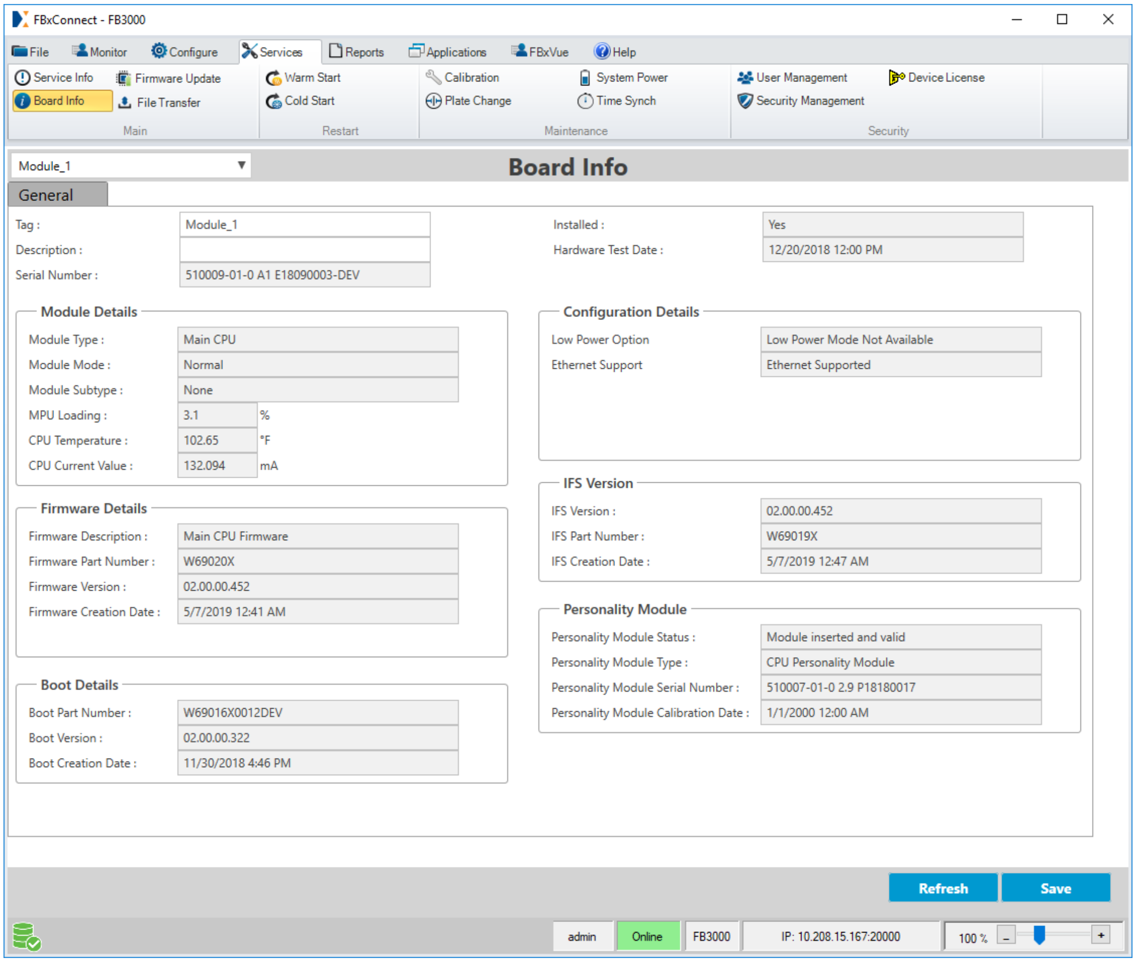
The module number assignments are listed below:

- Module_1 – CPU
- Module_2 through Module_32 – I/O Cards

To access this display:

1. Select **Services > Board Info** from the FBxConnect™ main menu. The Board Info display opens.

Figure 338. Board Info (Module 1 - CPU)



Module_1 ▼

Tag : Module_1
Description :
Serial Number : 510009-01-0 A1 E18090003-DEV
Installed : Yes
Hardware Test Date : 12/20/2018 12:00 PM

Module Details
Module Type : Main CPU
Module Mode : Normal
Module Subtype : None
MPU Loading : 3.1 %
CPU Temperature : 102.65 °F
CPU Current Value : 132.094 mA

Configuration Details
Low Power Option: Low Power Mode Not Available
Ethernet Support: Ethernet Supported

IFS Version
IFS Version : 02.00.00.452
IFS Part Number : W69019X
IFS Creation Date : 5/7/2019 12:47 AM

Firmware Details
Firmware Description : Main CPU Firmware
Firmware Part Number : W69020X
Firmware Version : 02.00.00.452
Firmware Creation Date : 5/7/2019 12:41 AM

Personality Module
Personality Module Status : Module inserted and valid
Personality Module Type : CPU Personality Module
Personality Module Serial Number : 510007-01-0 2.9 P18180017
Personality Module Calibration Date : 1/1/2000 12:00 AM

Boot Details
Boot Part Number : W69016X0012DEV
Boot Version : 02.00.00.322
Boot Creation Date : 11/30/2018 4:46 PM

2. Click ▼ to select a module from the drop-down list at the top of the display.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected module.
Description	Sets a description (up to 20-alphanumeric characters) for the selected module.
Serial Number	This **read-only** field shows the serial number assigned to the selected module.
Installed	This **read-only** field shows if the module is installed.

Field	Description	
Hardware Test Date	This **read-only** field shows the date and time of the hardware test.	
Module Details	**Module Type**	This **read-only** field shows the module type. Possible options are Unknown, Main CPU, I/O Cards, HMI, On-Board I/O, Optional I/O, and Expanded I/O.
	Module Mode	This **read-only** field shows the status of the selected module. For more information about possible statuses, refer to I/O Configuration – Properties Tab.
	Module Subtype	This **read-only** field shows the module subtype.
	MPU Loading	This **read-only** field shows the current MPU loading of the system. **Note** This field appears **only** for Module 1 (Main CPU).
	CPU Temperature	This **read-only** field shows the current temperate of the CPU. **Note** This field appears **only** for Module 1 (Main CPU).
	CPU Current Value	This **read-only** field shows the current value, in mA, of the CPU. **Note** This field appears **only** for Module 1 (Main CPU).
Firmware Details	**Firmware Description**	This **read-only** field shows the description for the firmware of the selected module.
	Firmware Part Number	This **read-only** field shows the part number for the firmware installed on the selected module.

Field	Description	
	Firmware Version	This **read-only** field shows the current firmware version installed on the selected module. **Note** The firmware, boot and IFS version numbers are displayed in the following format w.x.y.z Where: w = major release x = minor (feature) release y = issue release z = build number
	Firmware Creation Date	This **read-only** field shows the date and time the current firmware version was created.
Boot Details	**Boot Part Number**	This **read-only** field shows the part number for the boot installed on the selected module.
	Boot Version	This **read-only** field shows the current boot version installed on the selected module.
	Boot Creation Date	This **read-only** field shows the date and time the current boot version was created.
Configuration Details	**Low Power Option**	This **read-only** field shows if the low power mode is available. **Note** This field appears **only** for Module 1 (Main CPU).
	Ethernet Support	This **read-only** field shows if Ethernet support is available. **Note** This field appears **only** for Module 1 (Main CPU).
IFS Version	**IFS Version**	This **read-only** field shows the current IFS version installed on the selected module.
	IFS Part Number	This **read-only** field shows the part number for the IFS installed on the selected module.
	IFS Creation Date	This **read-only** field shows the date and time the current boot version was created.

Field	Description	
Personality Module	**Personality Module Status**	This **read-only** field shows the status of the personality module installed for the selected module.
	Personality Module Type	This **read-only** field shows the type of personality module installed for the selected module.
	Personality Module Serial Number	This **read-only** field shows the serial number of the personality module installed for the selected module.
	Personality Module Calibration Date	This **read-only** field shows the date and time the personality module was calibrated by the factory.

4. Select **Save** to save any changes you make to this display.

5.3 Firmware Update

Use this option to update the firmware on your device. The firmware update functionality is used for updates to the main CPU application firmware, as well as the firmware for any of the expansion or accessory boards (HMI Module, expanded I/O, etc.).

Note

- Firmware updates and versions are audited in the Event log via the following events: Firmware Update Start, Firmware Update Complete, Firmware Apply Image Version, and Firmware Apply Package Version.
- The FB Series product continues to operate as normal while firmware is being downloaded. Once the firmware download is complete, the FB Series product goes offline, applies the downloaded firmware, and restarts.
- For a list of possible firmware update error codes and their solutions, refer to Firmware Update Error Codes.

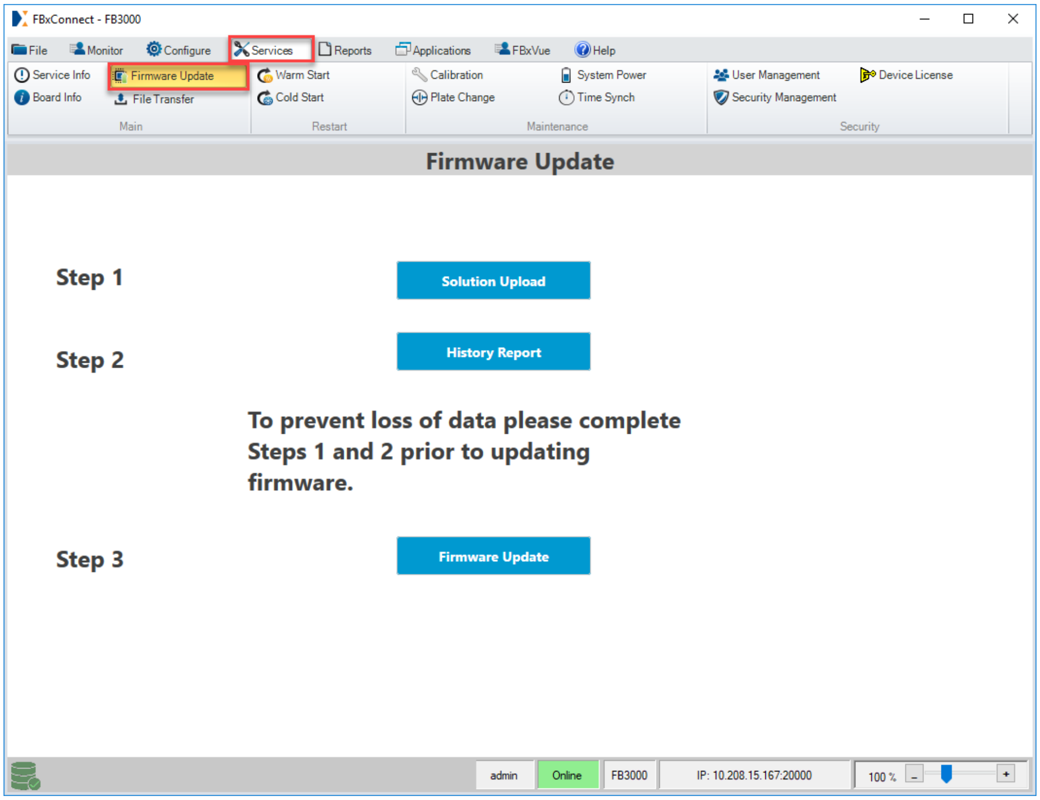
To access this screen:

1. Select **Services > Firmware Update** from the FBxConnect™ main menu. The Firmware Update screen opens.

Note

To prevent loss of data, perform steps 1 and 2 prior to updating firmware.

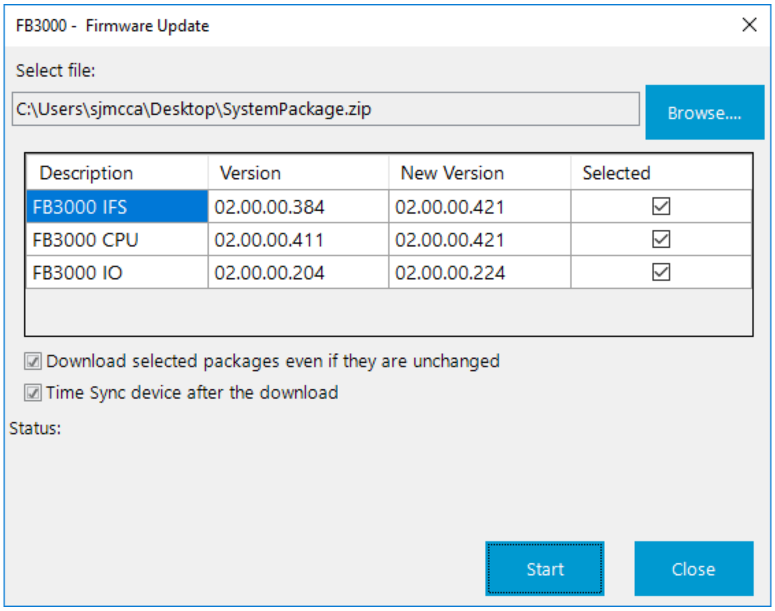
Figure 339. Firmware Update



To prevent loss of data please complete Steps 1 and 2 prior to updating firmware.

2. Select **Solution Upload**. The Solution Upload display opens. For more information, refer to [Upload Solution](#).
3. Select **History Report**. The History Report display opens. For more information, refer to [History Report](#).
4. Select **Firmware Update**. The Firmware download display opens.
5. Select **Browse…** to open a file explorer window.
6. Navigate to the location on your PC of the firmware file and select **Open**.

Figure 340. Firmware Update



Select file: C:\Users\sjmcca\Desktop\SystemPackage.zip

Description	Version	New Version	Selected
FB3000 IFS	02.00.00.384	02.00.00.421	☑
FB3000 CPU	02.00.00.411	02.00.00.421	☑
FB3000 IO	02.00.00.204	02.00.00.224	☑

☑ Download selected packages even if they are unchanged
☑ Time Sync device after the download

Status:

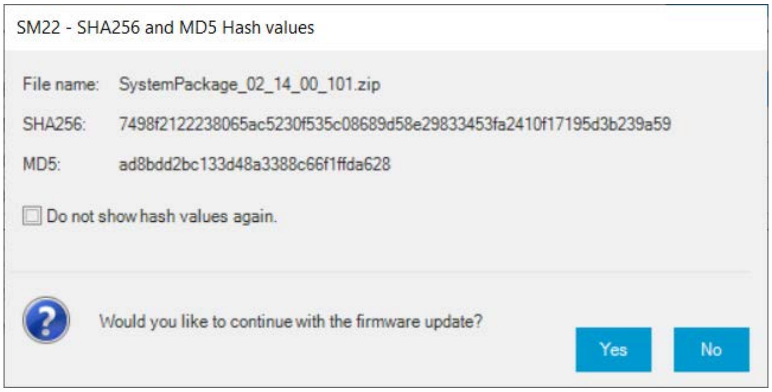
7. A firmware package may contain multiple firmware components. Place a check mark in the **Selected** column of the firmware you want to download.

8. Place a check mark next to **Download even if unchanged** to update the firmware even if it is the same version already in the device.

9. Place a check mark next to **Time Synch device after the download** to synchronize the device clock with your PC clock after the firmware update is complete.

10. Select **Start** to begin the firmware update process. A dialog opens showing the SHA256 and MD5 Hash values of the firmware package.

Figure 341. Hash Values Dialog



File name: SystemPackage_02_14_00_101.zip
SHA256: 7498f2122238065ac5230f535c08689d58e29833453fa2410f17195d3b239a59
MD5: ad8bdd2bc133d48a3388c66f1ffda628

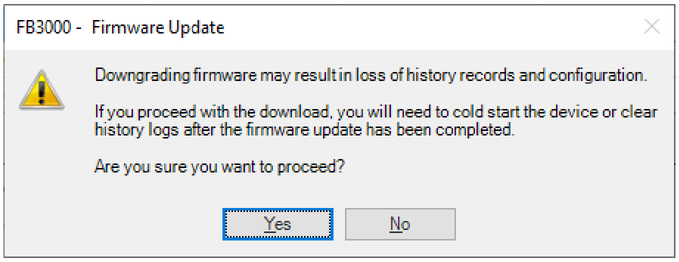
☐ Do not show hash values again.

Would you like to continue with the firmware update?

11. After confirming the hash values of the package, select **Yes** to begin the firmware update. A progress bar shows you the status of the update process.

Note

- Place a check mark next to **Do not show hash values again** to prevent FBxConnect from showing the hash values dialog during future firmware updates. To show this dialog again after turning it off, refer to the Settings menu in Field Tools.
- A warning dialog opens if you attempt to download an older version of firmware to the FB Series device. Some features and parameters may not be present in older versions of firmware. Downgrading firmware may result in the loss of history records and configuration. Select **Yes** to continue or **No** to cancel the download. If you continue, you **must** perform a cold start and clear history after the download completes.

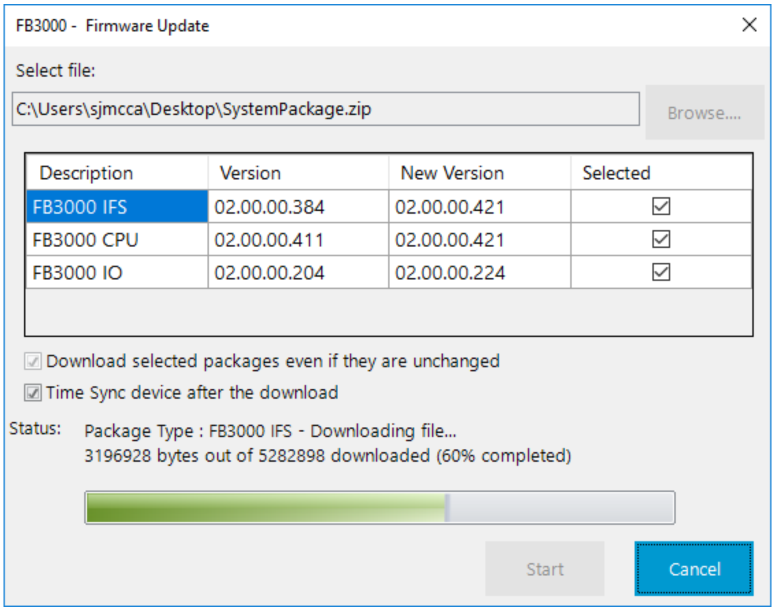


Downgrading firmware may result in loss of history records and configuration.

If you proceed with the download, you will need to cold start the device or clear history logs after the firmware update has been completed.

Are you sure you want to proceed?

Figure 342. Status



Select file: C:\Users\sjmcca\Desktop\SystemPackage.zip

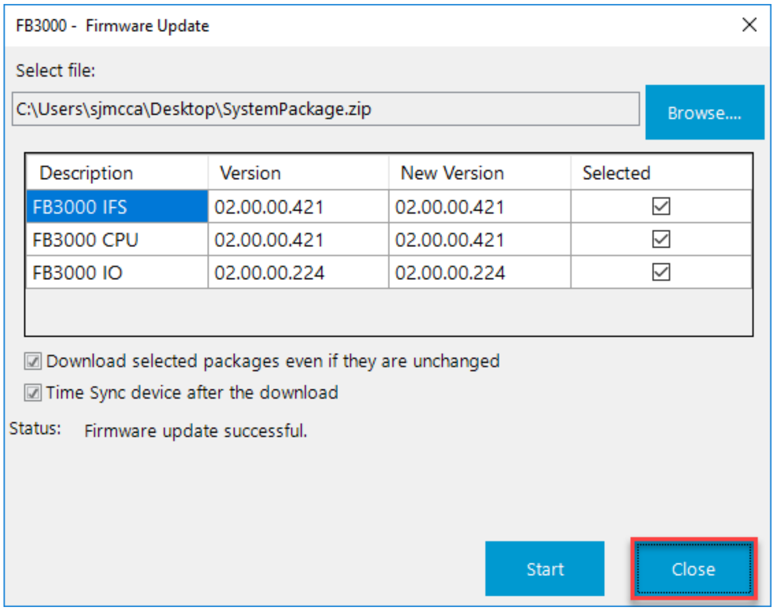
Description	Version	New Version	Selected
FB3000 IFS	02.00.00.384	02.00.00.421	☑
FB3000 CPU	02.00.00.411	02.00.00.421	☑
FB3000 IO	02.00.00.204	02.00.00.224	☑

☑ Download selected packages even if they are unchanged
☑ Time Sync device after the download

Status: Package Type : FB3000 IFS - Downloading file...
3196928 bytes out of 5282898 downloaded (60% completed)

12. A status message displays saying the firmware update has completed successfully. Select **Close** to return to the Firmware Update screen.

Figure 343. Firmware Update Successful



C:\Users\sjmcca\Desktop\SystemPackage.zip

Description	Version	New Version	Selected
FB3000 IFS	02.00.00.421	02.00.00.421	☑
FB3000 CPU	02.00.00.421	02.00.00.421	☑
FB3000 IO	02.00.00.224	02.00.00.224	☑

☑ Download selected packages even if they are unchanged

☑ Time Sync device after the download

Status: Firmware update successful.

5.3.1 Firmware Update Error Codes

An error code appears if you encounter problems updating the firmware on your FB Series product. Possible error codes and the steps you can take to correct the errors are listed below:

- **Error Code: 18 – The device has received too much data which cannot process**

  The device flash file system likely does not have sufficient space to download and manage the new firmware image. Review the contents of the flash file system for items that can be manually removed to free up more space.

- **Error Code: 206 – The CRC check of the package file has failed**

  The firmware image downloaded to the FB Series product is incorrect for the device type or has otherwise become corrupted. Contact your local Emerson representative for a new version of the file.

- **Error Code: 207 – File system error occurred during firmware update**

  There was a problem when opening or writing files on the FB Series product's flash file system. Power cycle the FB Series device to free up resources for the process to complete successfully.

Note

You **must** power cycle the FB Series product to restart the operating system. The operating system does not restart during a warm start or cold start.

- **Error Code: 208 – File system write failure during firmware update**

  The device flash file system likely does not have sufficient space to unzip and manage the new firmware image. Review the contents of the flash file system for items that can be manually removed to free up more space.

Note

You can view the status of the system database in the Database Resources fields on the Services > Service Info display.

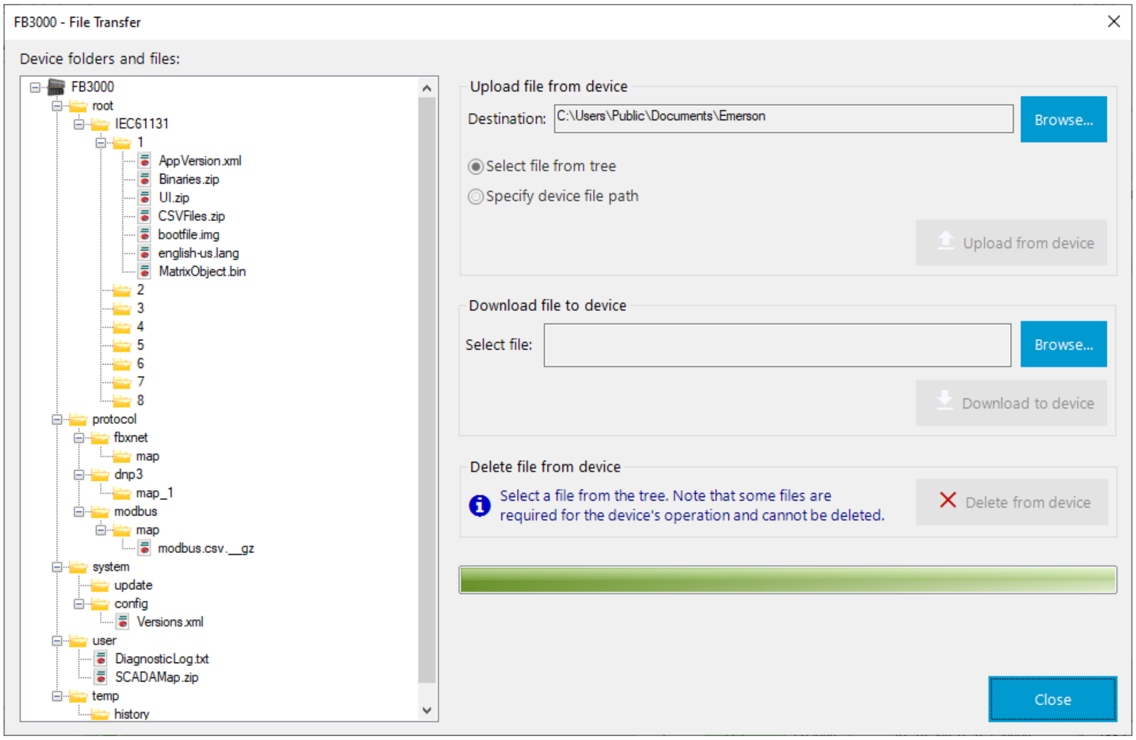
5.4 File Transfer

Use this pop-up display to upload a file from the FB Series product to your computer, download a file from your computer to the FB Series product, or delete a file from the FB Series product. This display is mainly used by developers to verify files that are transferred to and from the FB Series product programmatically.

To access this display:

1. Select **Services > File Transfer**. The File Transfer pop-up display opens.

Figure 344. File Transfer



Destination: C:\Users\Public\Documents\Emerson

● Select file from tree
○ Specify device file path

Select a file from the tree. Note that some files are required for the device's operation and cannot be deleted.

2. Review – and change as necessary – the values in the following fields:

Field	Description	
Device folders and files	This frame shows the file tree of the FB Series product.	
Upload file from device	Use these fields to transfer a file from your FB Series product to your computer.	
	Destination	This field shows the folder location on your computer to save the uploaded file. The default location is *C:\Users\Public\Documents\Emerson*. To choose a different folder, select **Browse** to open a Browse For Folder window and navigate to a location on your computer to save the file.
	Select file from tree	Select this radio button to choose a file to upload to your computer by selecting it from the file tree on the left side of the display.
	Specify device file path	Select this radio button to choose which file to upload to your computer by manually entering the file path.

Field	Description	
	Upload from device	Select this button to transfer the chosen file from you FB Series product to the destination on your computer.
Download file to device	Use these fields to transfer a file from your computer to your FB Series product.	
	Select file	This field shows the file path on your computer of the file to transfer to the FB Series product. Select **Browse** to open a window and navigate to the desired file.
	Download to device	Select this button to transfer the file specified in the Select file field from your computer to your FB Series product.
Delete file from device	Select a file from the file tree on the left side of the display and select **Delete from device** to permanently remove the file from the FB Series product. **Note** You cannot delete files from the FB Series product that are required for operation.	

3. Select **Close** to exit the File Transfer pop-up display.

5.5 Warm Start

Use this option to force the FB Series product to perform a warm start. A warm start resets the FB Series product's processor and restarts all tasks. Database values **are not** reset to default.

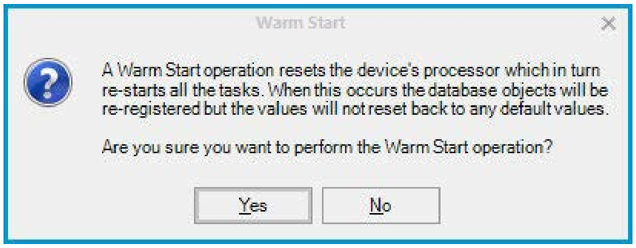
Note

When a warm start occurs, the system logs a **System Restart** event to the Event log. Additionally, the system logs a **System Down** event along with the number of seconds that the system was offline.

To perform a warm start:

1. Select **Services > Warm Start** from the FBxConnect™ main menu. A confirmation dialog displays.

Figure 345. Warm Start Confirmation Dialog

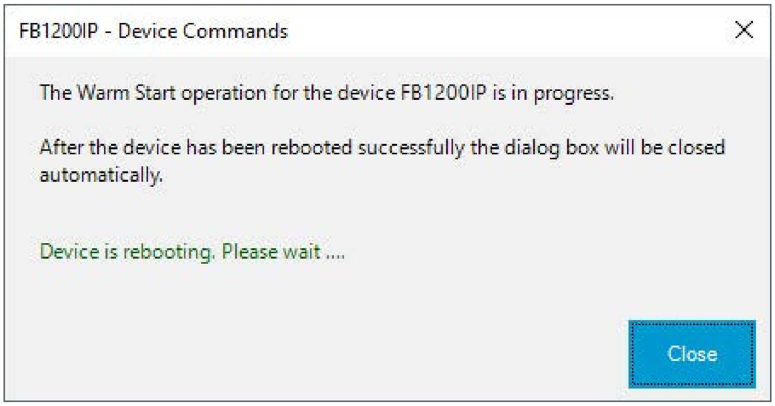


A Warm Start operation resets the device's processor which in turn re-starts all the tasks. When this occurs the database objects will be re-registered but the values will not reset back to any default values.

Are you sure you want to perform the Warm Start operation?

2. Select **Yes** to perform a warm start on the connected FB Series product. The system resets the processor and displays the following dialog.

Figure 346. Warm Start In Progress



The Warm Start operation for the device FB1200IP is in progress.

After the device has been rebooted successfully the dialog box will be closed automatically.

Device is rebooting. Please wait ....

3. Select **Close** and wait for the FB Series product to restart or wait for the FB Series product to restart and the dialog automatically closes.

5.6 Cold Start

Use this option to force the FB Series product to perform a cold start. You can configure the actions a cold start performs including clearing of alarm, event, and history logs. You can also configure if the FB Series product parameters are restored using previously saved values or reset to default values (configured on the System display).

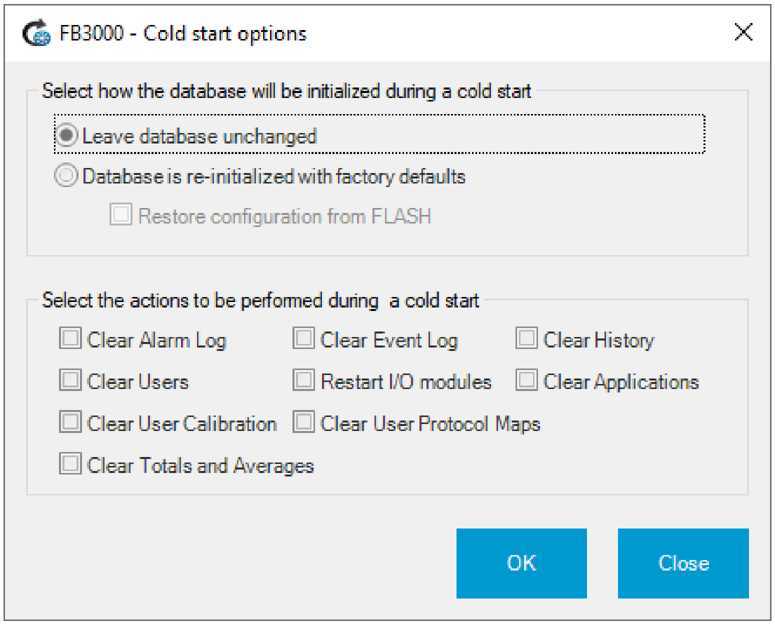
Note

When a cold start occurs, the system logs a **System Restart** event to the Event log. Additionally, the system logs a **System Down** event along with the number of seconds that the system was offline.

To perform a cold start:

1. Select **Services > Cold Start** from the FBxConnect™ main menu. The Cold start options display opens.

Figure 347. Cold Start Options



FB3000 - Cold start options

Select how the database will be initialized during a cold start

● Leave database unchanged
○ Database is re-initialized with factory defaults
☐ Restore configuration from FLASH

Select the actions to be performed during a cold start

☐ Clear Alarm Log ☐ Clear Event Log ☐ Clear History
☐ Clear Users ☐ Restart I/O modules ☐ Clear Applications
☐ Clear User Calibration ☐ Clear User Protocol Maps
☐ Clear Totals and Averages

2. Select the radio button next to your desired database initialization option. Possible options are:

- **Leave database unchanged** – No changes are made to the read/write parameters.
- **Database is re-initialized with factory defaults** – The read/write parameters restored to factory defaults.

Note

This option clears Alarm, Event, and History logs and any stored calibration reports.

- **Configuration restored from FLASH** – The read/write parameters are restored from a configuration stored in flash memory of the FB Series product.

Note

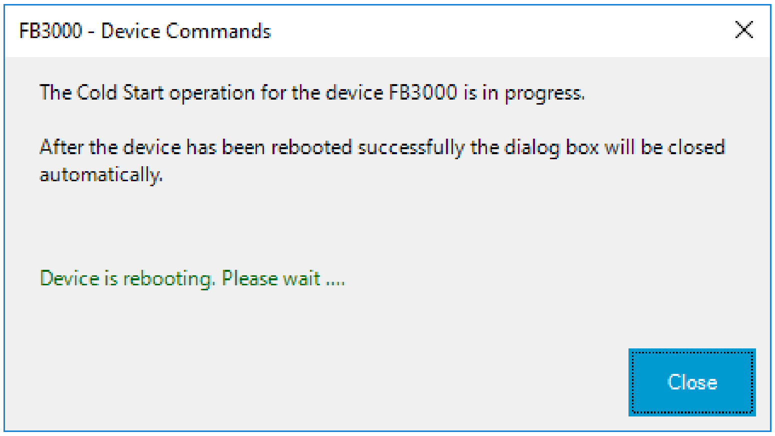
This option is **only** available if you have previously saved a configuration file to flash memory. For more information, refer to Download to Flash.

3. Place a check mark next to the additional actions you want the system to perform during the cold start. Possible options are:

   - **Clear alarm log** – Deletes all entries in the alarm log, and logs an **Alarm Clear** event to the Event log.
   - **Clear event log** – Deletes all entries in the event log, and logs an **Event Clear** event to the Event log.
   - **Clear history** – Deletes all entries in the history log, and logs a **History Clear** event to the Event log.
   - **Clear users** – Deletes all user log on information.
   - **Reset I/O modules** – Restarts the firmware in the I/O modules. Module configuration remains unchanged.
   - **Clear applications** – Removes all installed applications.
   - **Clear user calibration** – Removes any previous input point calibration and restores the factory defaults. Deletes any stored calibration reports
   - **Clear user protocol maps** – Removes any custom DNP3 or Modbus maps and restores the factory defaults.
   - **Clear Totals and Averages** – Deletes all station and meter totals and averages.

4. Select **OK** to perform the cold start using the selected options. The following dialog displays.

Figure 348. Cold Start In Progress



The Cold Start operation for the device FB3000 is in progress.

After the device has been rebooted successfully the dialog box will be closed automatically.

Device is rebooting. Please wait ....

5. Select **Close** and wait for the FB Series product to restart or wait for the FB Series product to restart and the dialog automatically closes.

5.7 Calibration

Use the Calibration Wizard to calibrate various input points on your FB Series product, verify a current calibration, or set the zero shift. You can perform a calibration in one of two ways: By Meter and By Point. Calibration By Meter allows you to calibrate all inputs for a specific meter. Calibration By Point allows you to calibrate a specific I/O point.

The test equipment used to perform a calibration should be at least three times more accurate than the device being calibrated. You may actually achieve better results with the factory default calibration, rather than narrowing the calibrated span using equipment that is only accurate to +/- 1%.

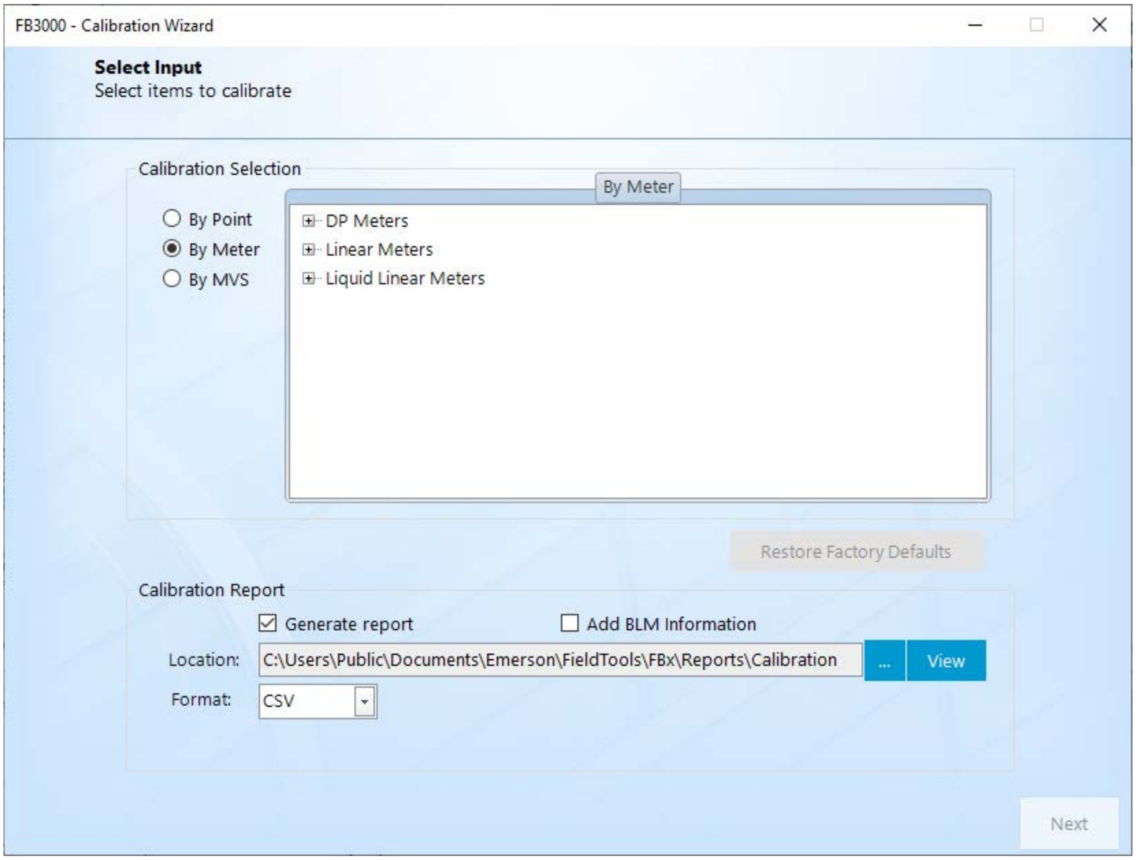
In some instances, it may be more meaningful to simply verify an existing calibration instead of performing a complete calibration. If the existing calibration is good, then there is no need to spend unnecessary time and risk replacing a good calibration with a bad calibration.

Note

The default location for calibration reports is *C:\ProgramData\Emerson\OpenEnterprise\FBx\Reports\Calibration*.

To open the Calibration Wizard, select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard displays.

Figure 349. Calibration Wizard



FB3000 - Calibration Wizard

Select Input
Select items to calibrate

Calibration Selection

○ By Point
● By Meter
○ By MVS

Calibration Report

☑ Generate report ☐ Add BLM Information

Location: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration

Format: CSV

For more information, refer to the following topics:

BLM Required Information – Configure information included on calibration reports required by the Bureau of Land Management (BLM).

Calibrating Inputs – Calibrate analog inputs, static pressure inputs, differential pressure inputs, and remote temperature devices.

Verifying a Calibration – Verify the calibration for analog inputs, static pressure inputs, differential pressure inputs, and remote temperature devices.

Setting Zero Shift – Use the Zero Shift to set a value (offset) to compensate for any slight errors in your input readings.

Resetting a Calibration – Use this option to clear a previous calibration and restore the factory defaults.

Viewing a Calibration Report – Follow these steps to view a previously generated calibration report.

Calibration Errors – Possible errors you may encounter during the calibration process.

5.7.1 BLM Required Information

Use this pop-up display to configure information included on calibration reports required by the Bureau of Land Management (BLM). FBxConnect™ stores BLM information on your PC, and unique BLM information is associated with each device connection in Field Tools. If the BLM information is similar between device connections, you can copy information associated with a device connection into the current calibration report.

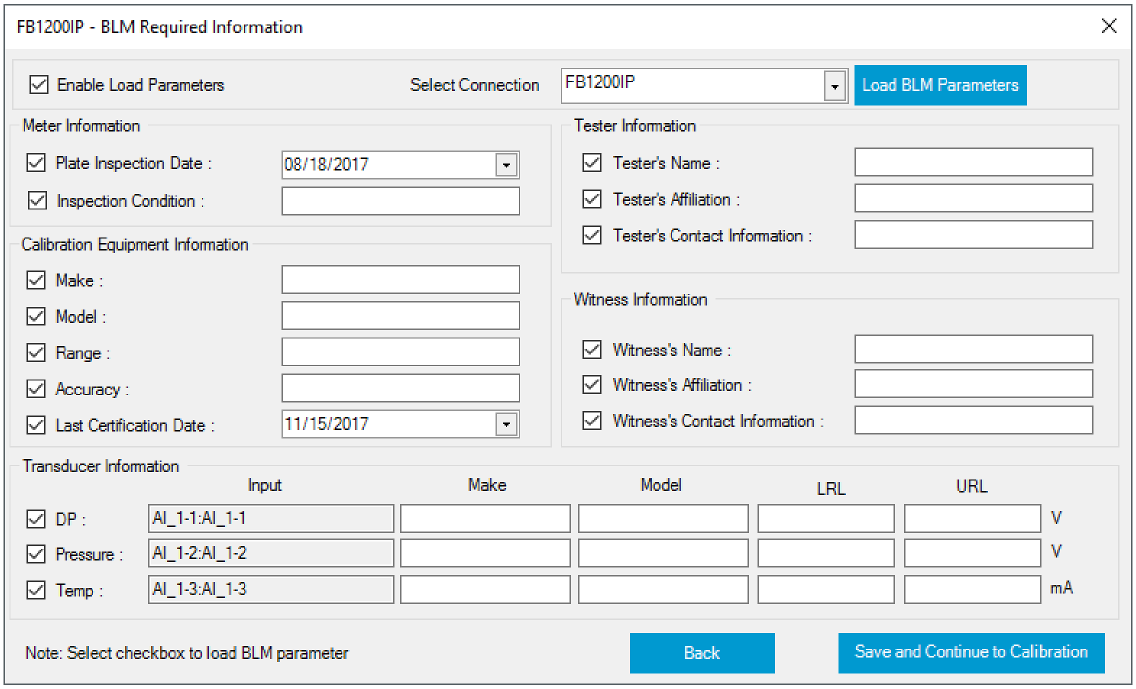
Note

For more information about device connections, refer to the "Using the Connections List Pane" topic in Field Tools' online help file.

To access this display:

1. Select **Services > Calibration** from the FBxConnect™ main menu.
2. Select the meter you wish to calibrate.
3. Place a check mark next to **Generate report** in the Calibration Report frame to have FBxConnect™ create a calibration report that details the calibration results.
4. Place a check mark next to **Add BLM Information** in the Calibration Report frame to have FBxConnect™ include Bureau of Land Management information on the calibration report.
5. Select **Next**. The BLM Required Information display opens.

Figure 350. BLM Required Information



FB1200IP - BLM Required Information

☑ Enable Load Parameters

Select Connection: FB1200IP

Meter Information

☑ Plate Inspection Date : 08/18/2017
☑ Inspection Condition :

Calibration Equipment Information

☑ Make :
☑ Model :
☑ Range :
☑ Accuracy :
☑ Last Certification Date : 11/15/2017

Tester Information

☑ Tester's Name :
☑ Tester's Affiliation :
☑ Tester's Contact Information :

Witness Information

☑ Witness's Name :
☑ Witness's Affiliation :
☑ Witness's Contact Information :

Transducer Information

	Input	Make	Model	LRL	URL	
☑ DP :	AI_1-1:AI_1-1					V
☑ Pressure :	AI_1-2:AI_1-2					V
☑ Temp :	AI_1-3:AI_1-3					mA

Note: Select checkbox to load BLM parameter

6. Review – and change as necessary – the values in the following fields:

Field	Description
Enable Load Parameters	Select this checkbox to enable the Select Connection drop-down, the Load BLM Parameters button, and checkboxes next to each field to be copied from BLM information associated with a device connection to this calibration report. **Note** To enable this checkbox, you **must** have previously created a calibration report containing BLM information on this PC for the device.
Select Connection	Select ▼ to choose a device connection associated with the BLM information you want to copy to the current calibration report. **Note** For information to be successfully copied from a device connection, you **must** have previously created a calibration report containing BLM information on this PC for the device you select in the Select Connection drop-down.

Field	Description
Load BLM Parameters	Select to copy BLM information associated with the device connection you select in the Select Connection drop-down to the current calibration report. **Note** For information to be successfully copied from a device connection, you **must** have previously created a calibration report containing BLM information on this PC for the device you select in the Select Connection drop-down.
Meter Information	Enter information about the meter being inspected.
Calibration Equipment Information	Enter information about the equipment used in the calibration process.
Tester Information	Enter information about the person who is performing the calibration process.
Witness Information	Enter information about the person who is observing the calibration process.
Transducer Information	Enter information about the differential pressure, static pressure, and temperature sensors. **Note** The LRL (Lower Range Limit) and URL (Upper Range Limit) columns display **only** if you select analog inputs for use as meter inputs.

7. Select **Save** to save any changes you make to this pop-up display.

5.7.2 Calibrating Inputs

Follow these steps to calibrate analog inputs, static pressure inputs, differential pressure inputs, and remote temperature devices. During the calibration process, you can create a calibration report to keep a record of your calibration. The default location for calibration reports is *C:\ProgramData\Emerson\OpenEnterprise\FBx\Reports\Calibration*.

Note

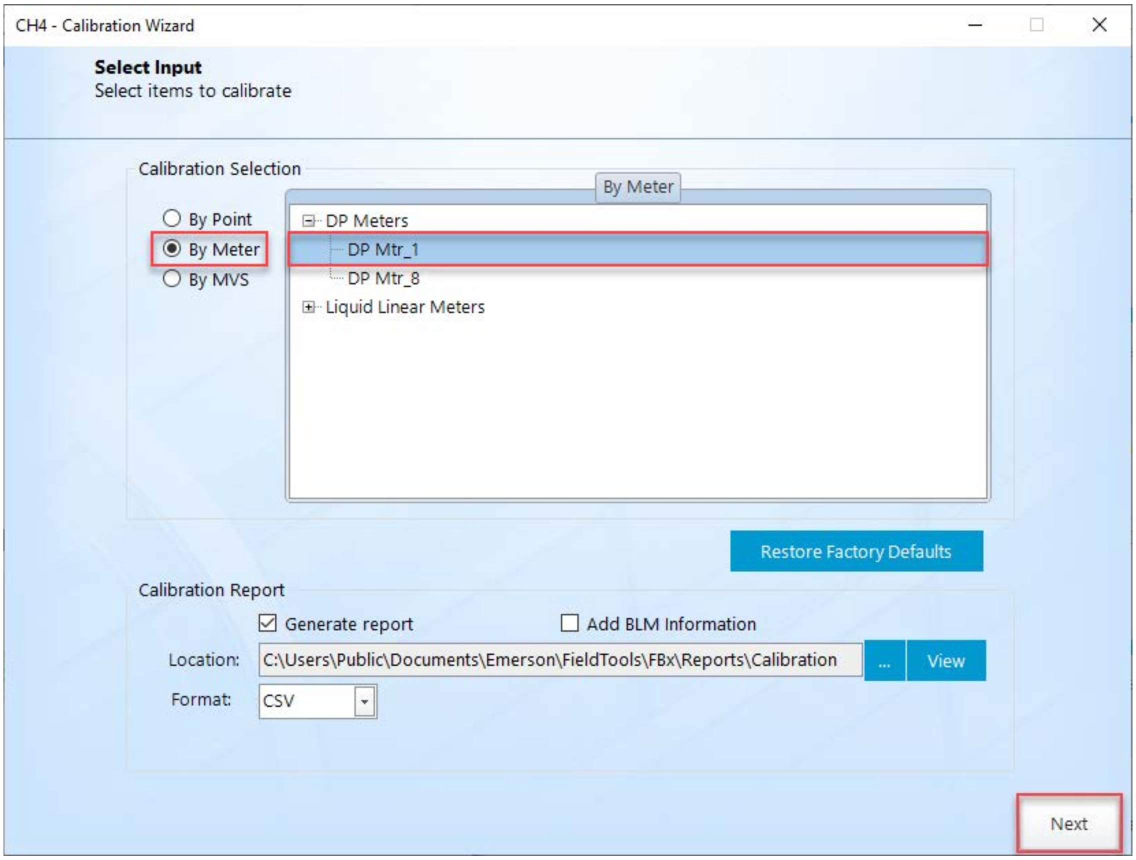
- You cannot calibrate a 4088B if the Transmitter Security switch on the device is enabled.
- HART inputs **only** support freezing and unfreezing the input value.

- The 4088B provides range checking on input values. The calibration process fails if the input values deviate to an extent that would degrade sensor performance. Use an input source that is at least three times more accurate than the transmitter and allow the input to stabilize for 10 seconds before entering any values.
- If you have a 4088B and click **Cancel** at any time during the calibration process, you must start the calibration process over from the beginning.
- If you still have trouble calibrating a 4088B, power cycle the 4088B and try the calibration again.

To calibrate an input:

1. Select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard opens.

Figure 351. Calibration Wizard



CH4 - Calibration Wizard

Select Input
Select items to calibrate

Calibration Selection

○ By Point
● By Meter
○ By MVS

By Meter

DP Meters
DP Mtr_1
DP Mtr_8
Liquid Linear Meters

Calibration Report

☑ Generate report ☐ Add BLM Information

Location: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration

Format: CSV

2. In the Calibration Selection field, select **By Meter** to group all inputs together for a specific meter, **By Point** to group all inputs together by input type, or **By MVS** to group inputs by 4088 instance.

Note

- The process is the same for each Calibration Selection option. The only difference is how each input is grouped. This example shows **By Meter** in the Calibration Selection field.
- If you select **By Meter** in the Calibration Selection field, select a meter and the system automatically selects the meter inputs.
- If you select **By Point** in the Calibration Selection field, place a check mark next to one or more inputs.
- If you select **By MVS** in the Calibration Selection field, select the communications port connected to the MVS and select the 4088 instance. The system automatically selects the inputs of the 4088 instance.

---

3. Select ⊞ next to the type of meter you want to calibrate to show all available meters of that type.
4. Select a meter to calibrate.
5. Place a check mark next to **Generate report** in the Calibration Report frame if you want FBxConnect™ to create a calibration report.
6. Place a check mark next to **Add BLM Information** in the Calibration Report frame if you want FBxConnect™ to include Bureau of Land Management information on the calibration report.
7. Select a format for the generated report in the **Format** field. Possible options are CSV or PDF.

Note

If you select PDF, you can password protect the file by placing a check mark in the Secure PDF box and entering a password.

---

8. The calibration report is saved to a default location on your PC. If you want to save the report to a different location, select **Browse** and navigate to your desired location.

Note

FB3000 RTUs with firmware version 2.15 or later also save CSV versions of the previous five calibration reports to internal memory. The reports are stored in the

"/user/calibration" folder using the following naming convention: Calibration_Report_D[YYYYMMDD]-T[hhmmss].csv.

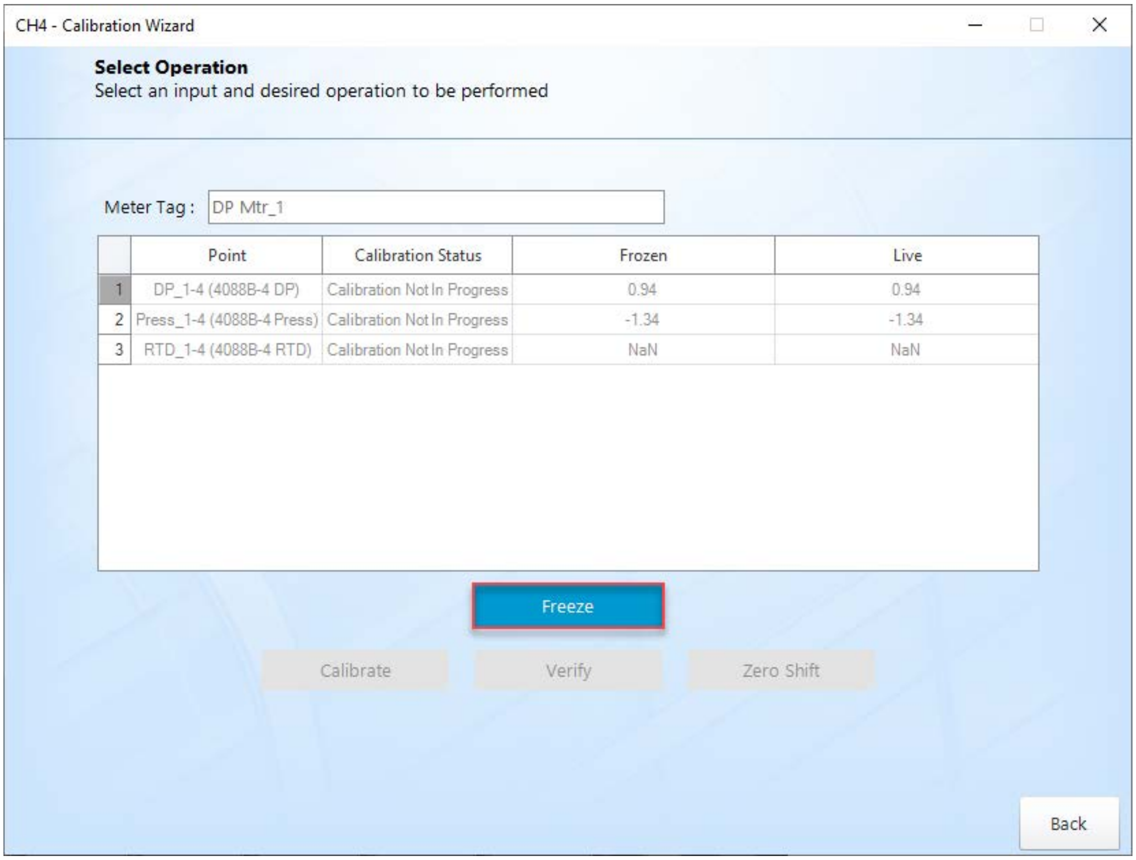
9. Select **View** to open a saved calibration report. This is useful to compare previous calibration values against the current values.
10. Select **Next**.
11. If you selected BLM Info option, enter the required BLM information and select **Save and Continue to Calibration**.

Note

For more information, refer to BLM Required Information.

12. The Calibration Wizard shows all inputs associated with the selected meter (or the selected channel).

Figure 352. Freeze



Select Operation

Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

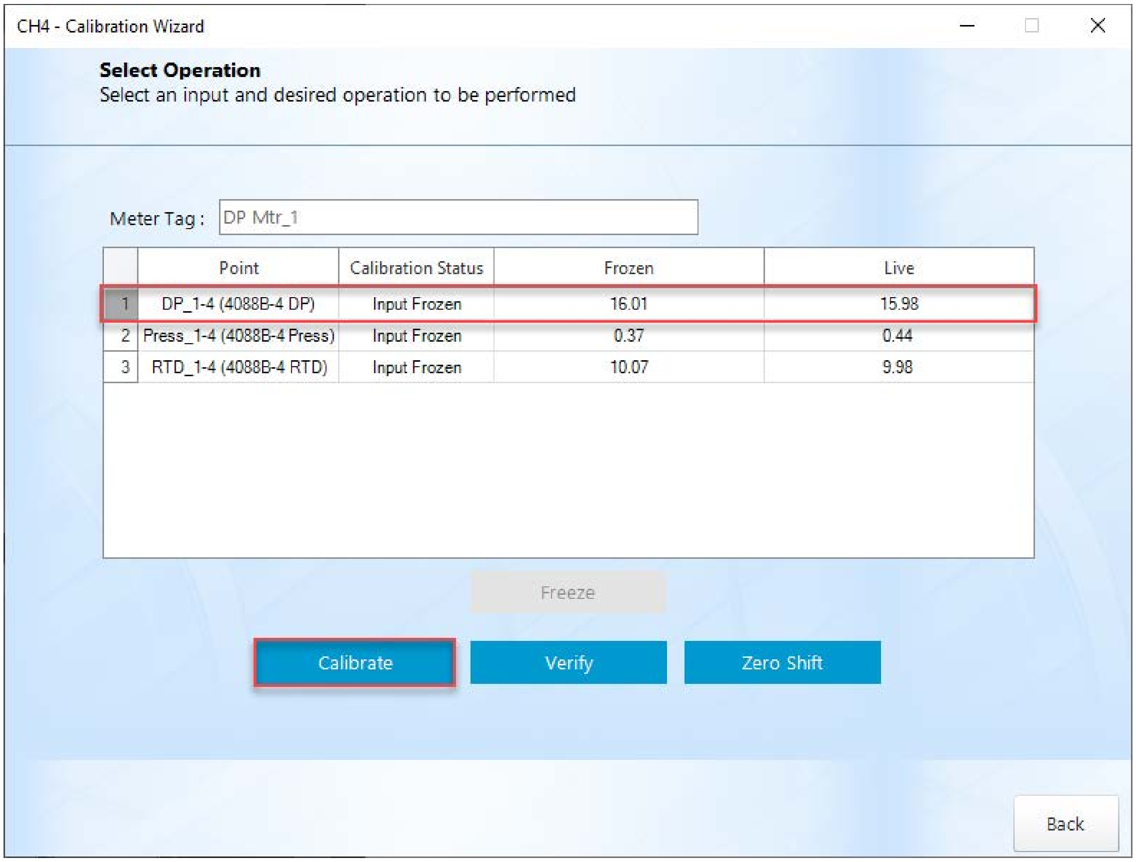
	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Calibration Not In Progress	0.94	0.94
2	Press_1-4 (4088B-4 Press)	Calibration Not In Progress	-1.34	-1.34
3	RTD_1-4 (4088B-4 RTD)	Calibration Not In Progress	NaN	NaN

13. Select **Freeze** to freeze all inputs listed in the table and stop the values from being updated during the calibration process.

Note

If you selected the BLM Report option, select **Modify BLM Info** to open the BLM Required Information display and revise any report information.

Figure 353. Calibrate



CH4 - Calibration Wizard

Select Operation
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	16.01	15.98
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.37	0.44
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.07	9.98

14. Select the input you want to calibrate and select **Calibrate**.

15. For the selected input, disconnect the field sensor and connect a decade box (or comparable equipment) to the terminals of the device.

Note

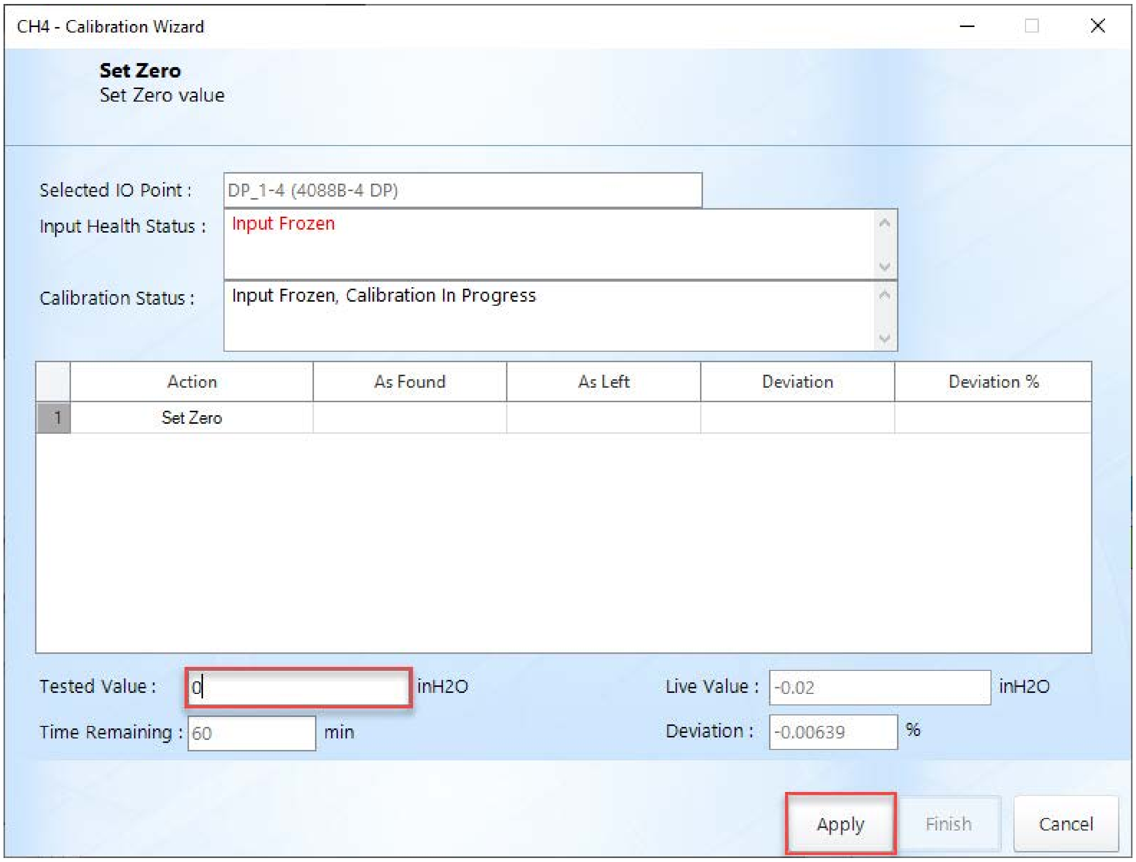
You can also use a pocket current source or another deadweight test input source to test this value.

---

16. Set the test equipment to produce a value equal to zero.

17. Enter the value produced by the test equipment and select **Apply**.

Figure 354. Set Zero



CH4 - Calibration Wizard

Set Zero
Set Zero value

Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Calibration In Progress

	Action	As Found	As Left	Deviation	Deviation %
1	Set Zero				

Tested Value : 0 inH2O
Time Remaining : 60 min
Live Value : -0.02 inH2O
Deviation : -0.00639 %

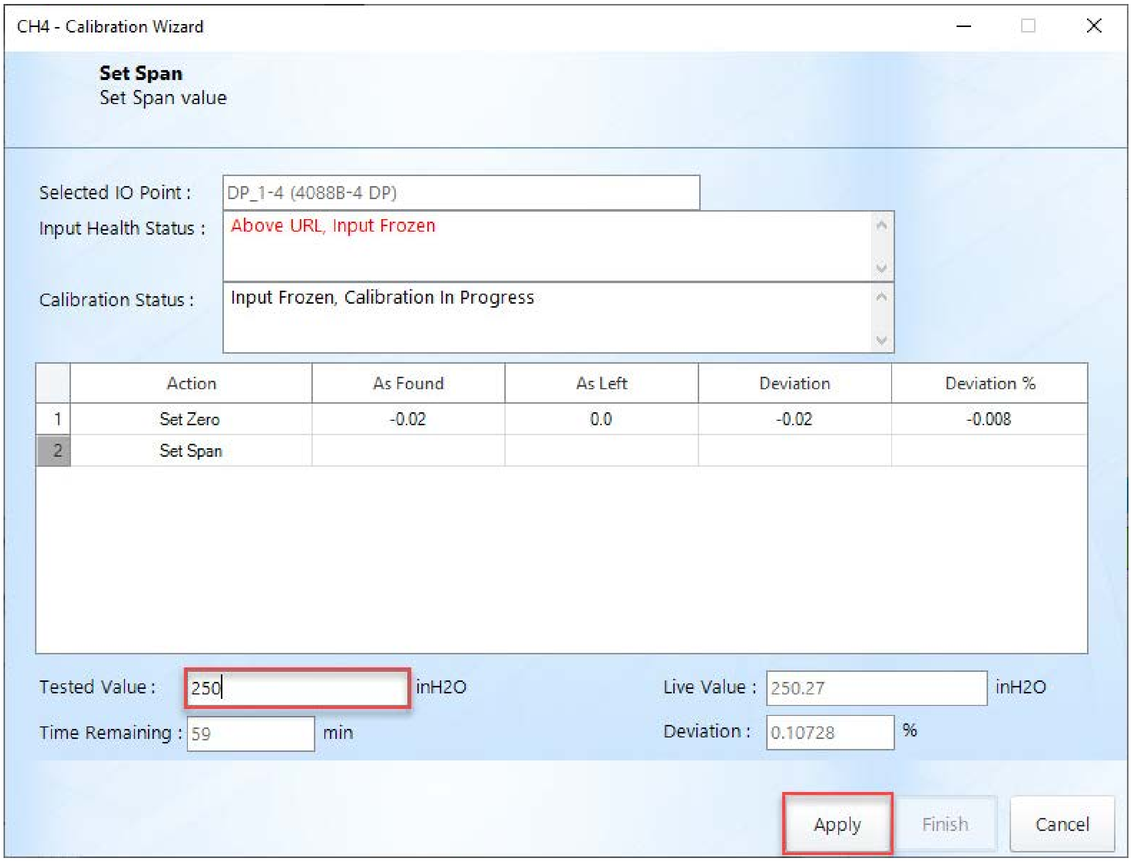
Field	Description	
Selected I/O Point	This **read-only** field shows the name of the currently selected input.	
Calibration Status	This **read-only** field shows the current calibration status.	
Input Health Status	This **read-only** field shows the current operating status of the selected channel.	
Action Grid	This grid reflects the calibration commands that have been performed on the selected input.	
	Action	Indicates the current action and shows any previous actions you have taken.

Field	Description	
	As Found	This **read-only** field shows the value of the input before any adjustments have been applied.
	As Left	This **read-only** field shows the value entered in the **Tested Value** field.
	Deviation	This **read-only** field shows the amount of deviation between the **As Found** and **As Left** values.
	Deviation %	This **read-only** field shows a percentage deviation between the **As Found** and **As Left** values.
Tested Value	Enter the value produced by the test equipment.	
Live Value	This **read-only** field shows the current value of the input.	
Deviation	This **read-only** field shows a percentage deviation between the **Tested Value** and **Live Value** fields.	
Apply	Select to log the value entered in the **Tested Value** field.	
Finish	Select to end the current calibration process.	
Cancel	Select to exit the Calibration Wizard and restore the previous calibration.	

18. Set your test equipment to produce a value for the span.

19. Enter the value produced by the test equipment and select **Apply**.

Figure 355. Set Span



Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Above URL, Input Frozen
Calibration Status : Input Frozen, Calibration In Progress

	Action	As Found	As Left	Deviation	Deviation %
1	Set Zero	-0.02	0.0	-0.02	-0.008
2	Set Span				

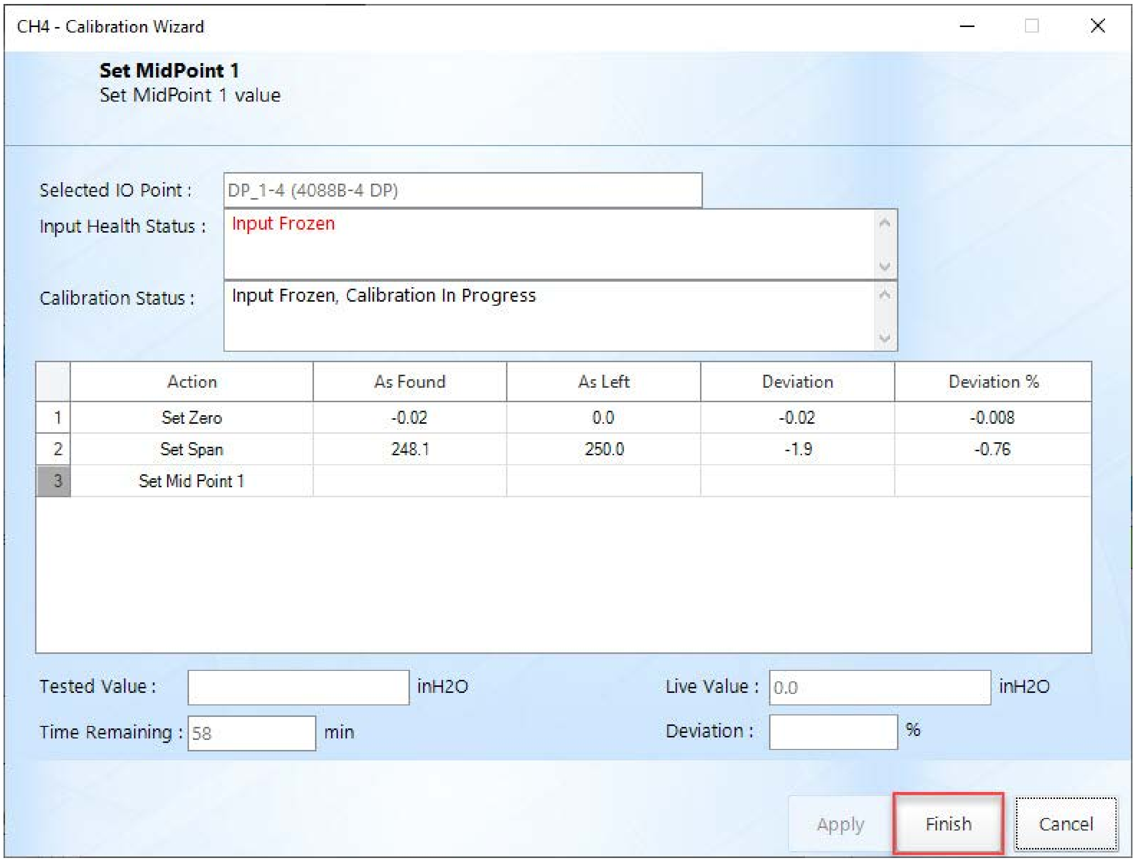
Tested Value : 250 inH2O
Time Remaining : 59 min
Live Value : 250.27 inH2O
Deviation : 0.10728 %

Note

A calibration requires only two points (zero and span). Your organization determines whether additional points (up to five) are necessary for a calibration.

20. After you are done entering midpoint values, select **Finish**.

Figure 356. Set Midpoint 1



Set MidPoint 1
Set MidPoint 1 value

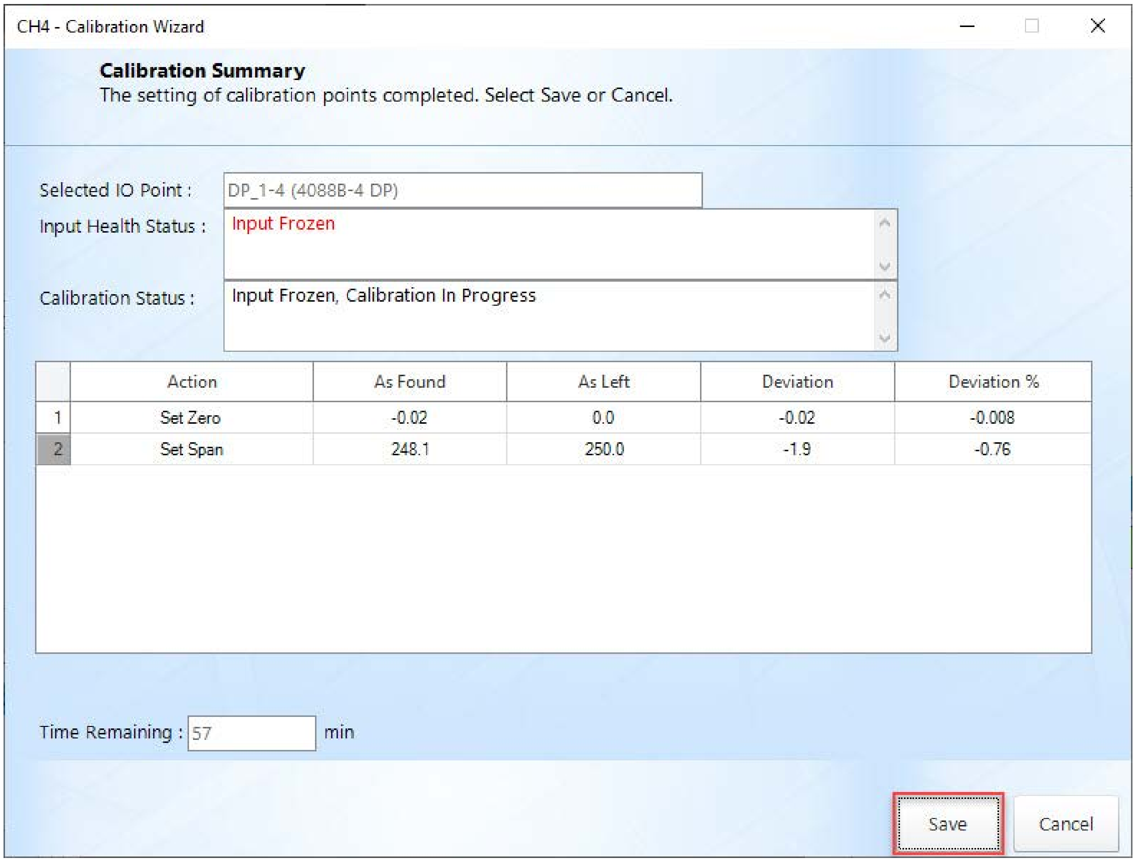
Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Calibration In Progress

	Action	As Found	As Left	Deviation	Deviation %
1	Set Zero	-0.02	0.0	-0.02	-0.008
2	Set Span	248.1	250.0	-1.9	-0.76
3	Set Mid Point 1				

Tested Value : inH2O
Live Value : 0.0 inH2O
Time Remaining : 58 min
Deviation : %

21. Select **Save** if you are satisfied with the calibration.

Figure 357. Calibration Summary



Calibration Summary
The setting of calibration points completed. Select Save or Cancel.

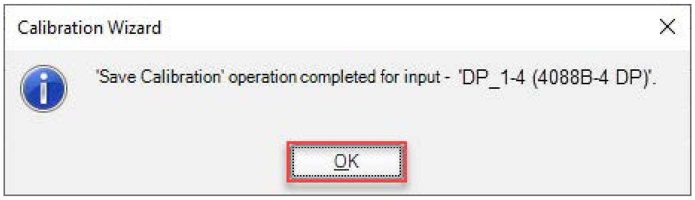
Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Calibration In Progress

	Action	As Found	As Left	Deviation	Deviation %
1	Set Zero	-0.02	0.0	-0.02	-0.008
2	Set Span	248.1	250.0	-1.9	-0.76

Time Remaining : 57 min

22. Select **OK** to close the dialog and return to the Select Operation display.

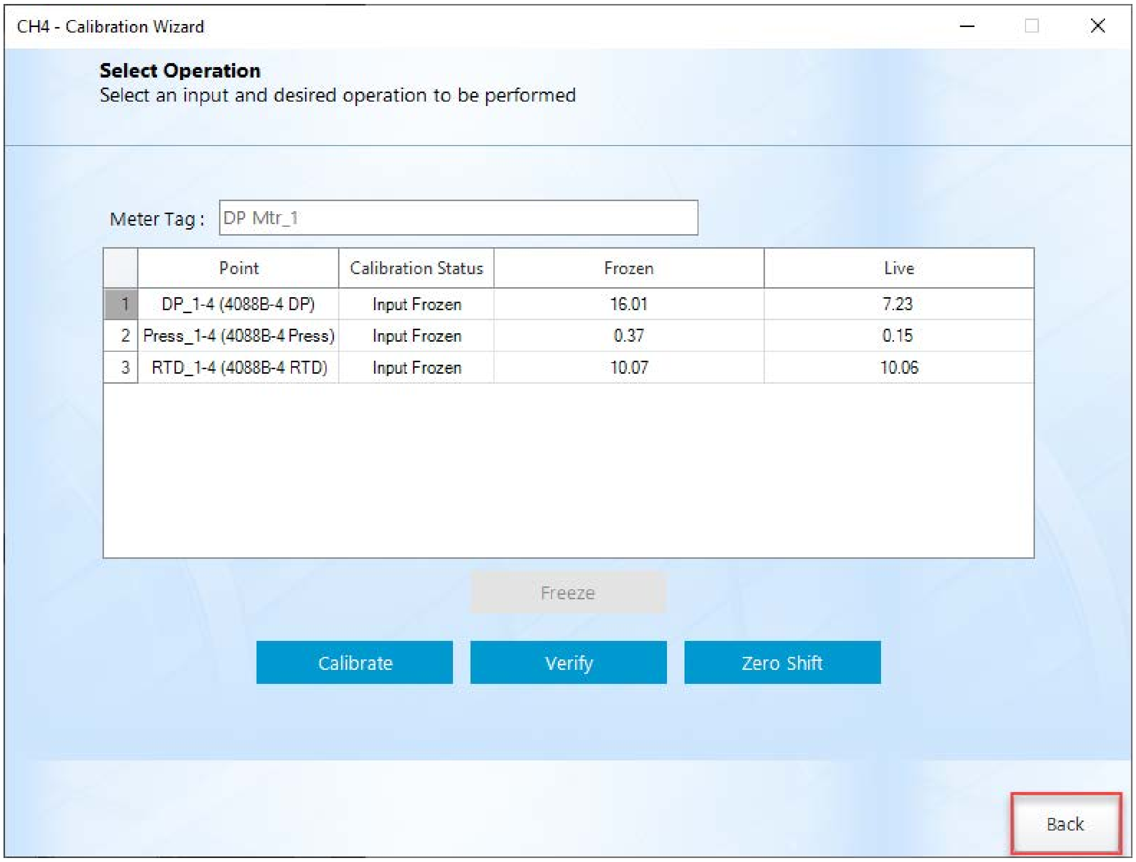
Figure 358. Calibration Completed



'Save Calibration' operation completed for input - 'DP_1-4 (4088B-4 DP)'.

23. You can now perform a verification (Verifying a Calibration) or set the offset (Setting Zero Shift) of the input. Select **Back** to exit the Calibration Wizard.

Figure 359. Calibration Wizard

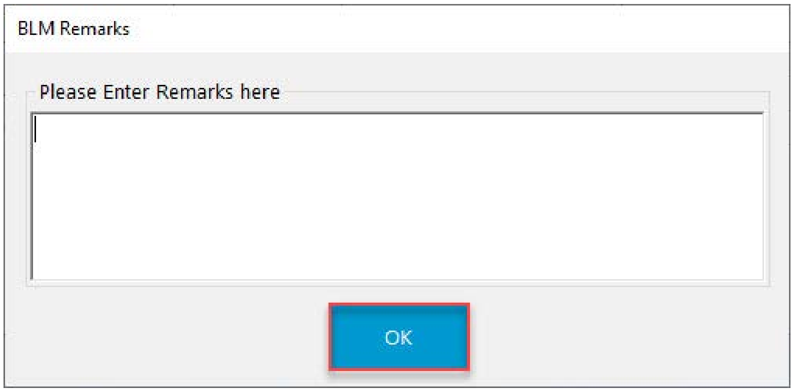


Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	16.01	7.23
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.37	0.15
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.07	10.06

24. If you selected to include BLM Info on your calibration report, a BLM Remarks display opens. Enter any additional information to be included in the report.

Figure 360. BLM Remarks



25. Select **OK** when you are finished to create your calibration report.

5.7.3 Verifying a Calibration

Use this process to verify that the input is within operating limits. Typically, you verify the same points you calibrate. Temperature might be an example (–100, 200, 50). For each test point, you set your test equipment to produce a certain value, enter that value in the Tested Value field, wait for the live input to stabilize, and then log the value. You can verify up to seven verification points.

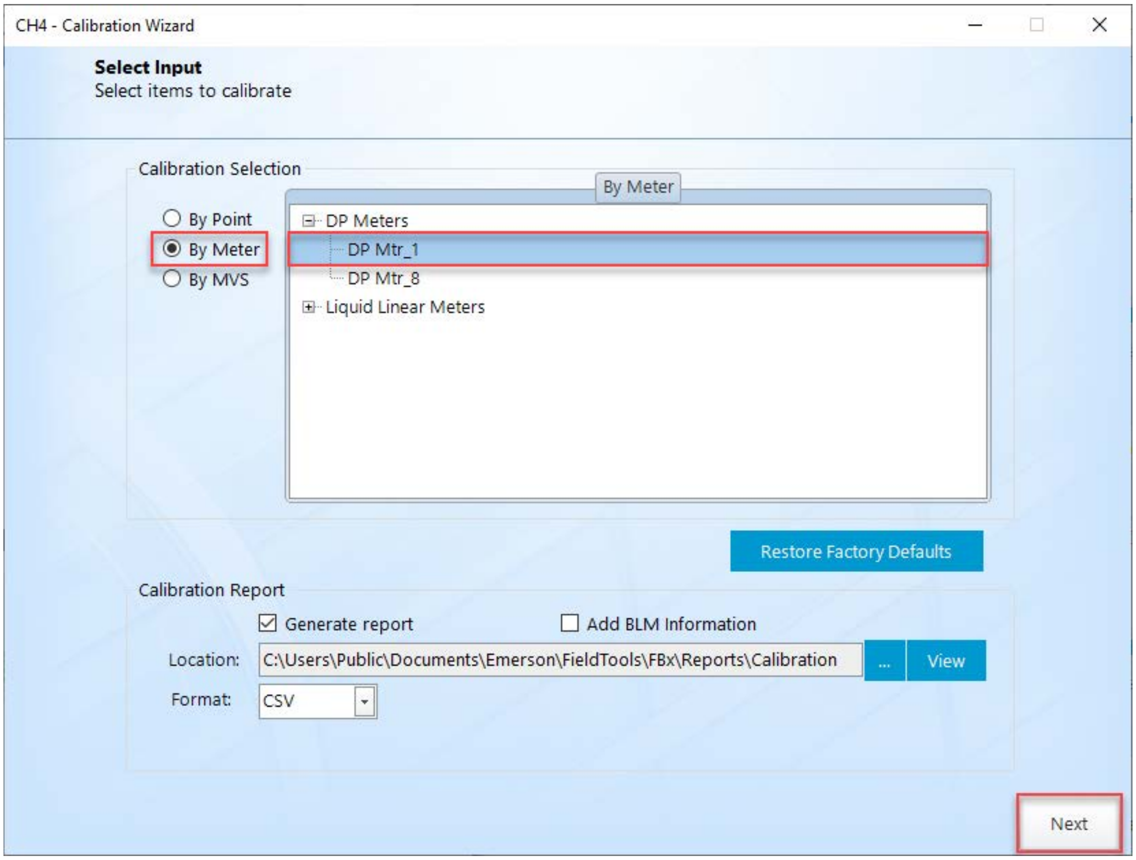
Note

If the value is incorrect, calibrate the input.

To verify an input:

1. Select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard displays.

Figure 361. Calibration Wizard



2. In the Calibration Selection field, select **By Meter** to group all inputs together for a specific meter, **By Point** to group all inputs together by input type, or **By MVS** to group inputs by 4088 instance.

Note

- The process is the same for each Calibration Selection option. The only difference is how each input is grouped. This example shows **By Meter** in the Calibration Selection field.
- If you select **By Meter** in the Calibration Selection field, select a meter and the system automatically selects the meter inputs.
- If you select **By Point** in the Calibration Selection field, place a check mark next to one or more inputs.
- If you select **By MVS** in the Calibration Selection field, select the communications port connected to the MVS and select the 4088 instance. The system automatically selects the inputs of the 4088 instance.

---

3. Select ⊞ next to the type of meter you want to calibrate to show all available meters of that type.
4. Select a meter to calibrate.
5. Place a check mark next to **Generate report** in the Calibration Report frame if you want FBxConnect™ to create a calibration report.
6. Place a check mark next to **Add BLM Information** in the Calibration Report frame if you want FBxConnect™ to include Bureau of Land Management information on the calibration report.
7. Select a format for the generated report in the **Format** field. Possible options are CSV or PDF.

Note

If you select **PDF**, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

---

8. The calibration report is saved to a default location on your PC. If you want to save the report to a different location, click **Browse** and navigate to your desired location.

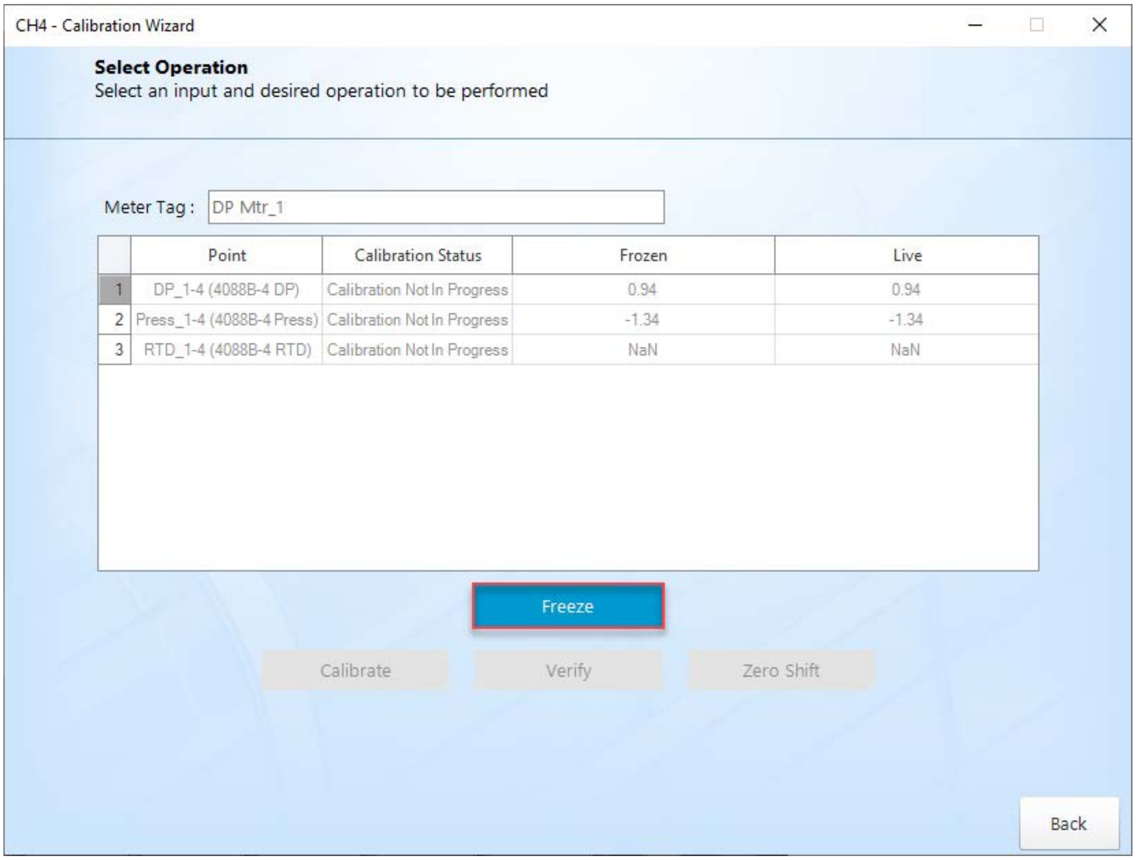
9. Select **View** to open a saved calibration report. This is useful to compare previous calibration values against the current values.
10. Click **Next**.
11. If you selected BLM Info option, enter the required BLM information and select **Save and Continue to Calibration**.

Note

For more information, refer to BLM Required Information.

12. The Calibration Wizard displays all inputs associated with the selected meter.

Figure 362. Freeze



CH4 - Calibration Wizard

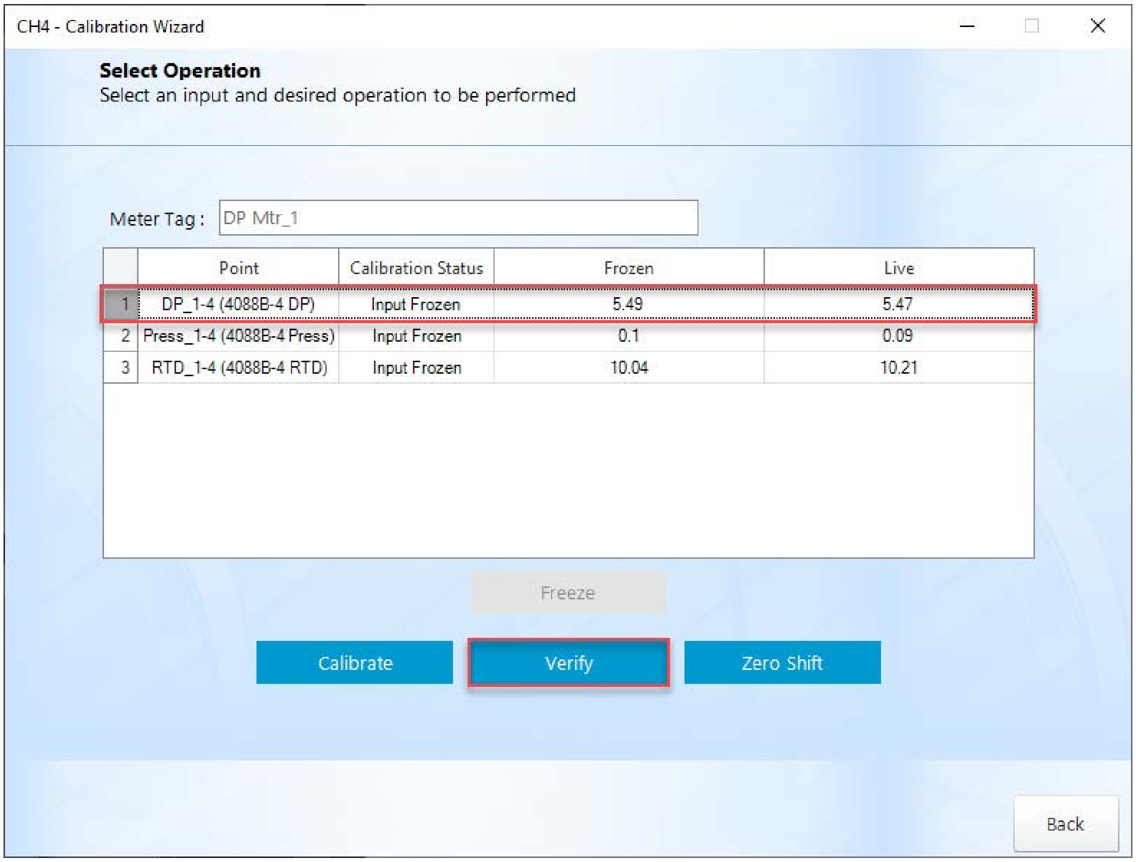
Select Operation
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Calibration Not In Progress	0.94	0.94
2	Press_1-4 (4088B-4 Press)	Calibration Not In Progress	-1.34	-1.34
3	RTD_1-4 (4088B-4 RTD)	Calibration Not In Progress	NaN	NaN

13. Select **Freeze** to stop the values from being updated during the calibration process.

Figure 363. Verify



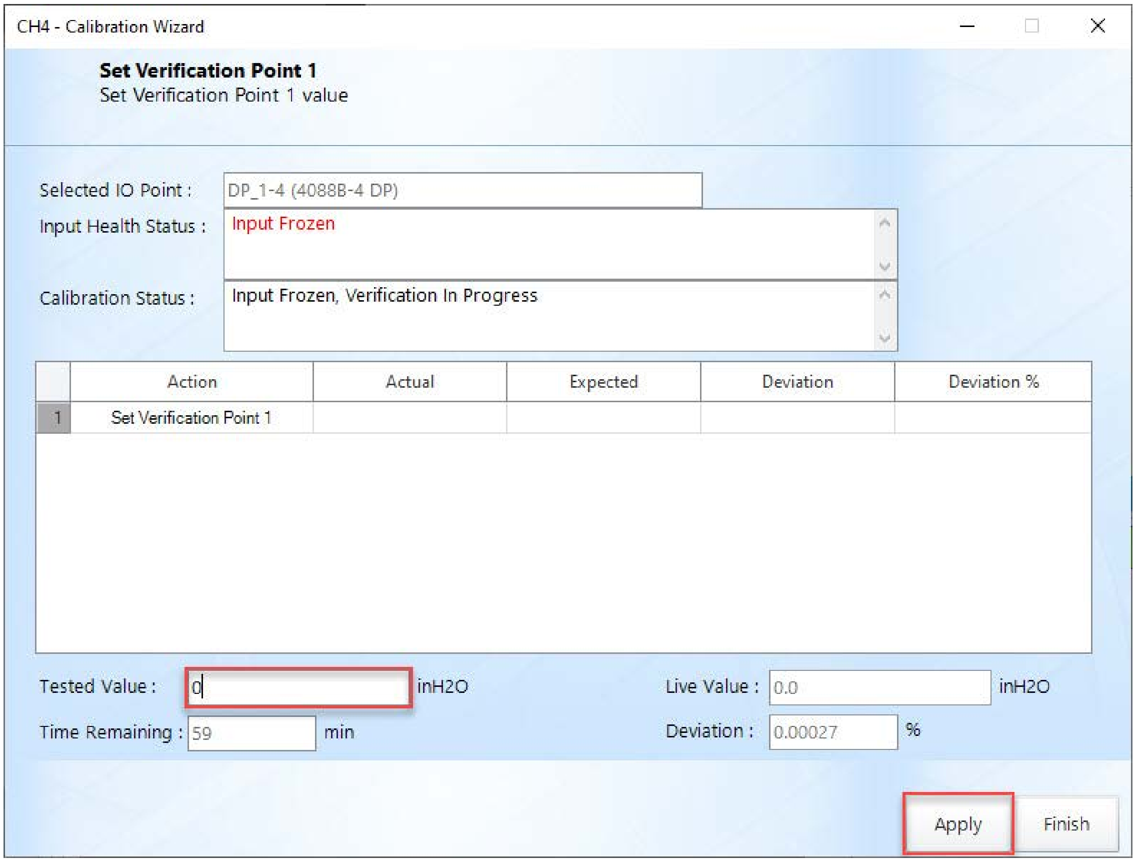
Select Operation
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	5.49	5.47
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.1	0.09
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.04	10.21

14. Select the input you want to verify and select **Verify**.

Figure 364. Set Verification Point 1



Set Verification Point 1
Set Verification Point 1 value

Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Verification In Progress

	Action	Actual	Expected	Deviation	Deviation %
1	Set Verification Point 1				

Tested Value : 0 inH2O
Live Value : 0.0 inH2O
Time Remaining : 59 min
Deviation : 0.00027 %

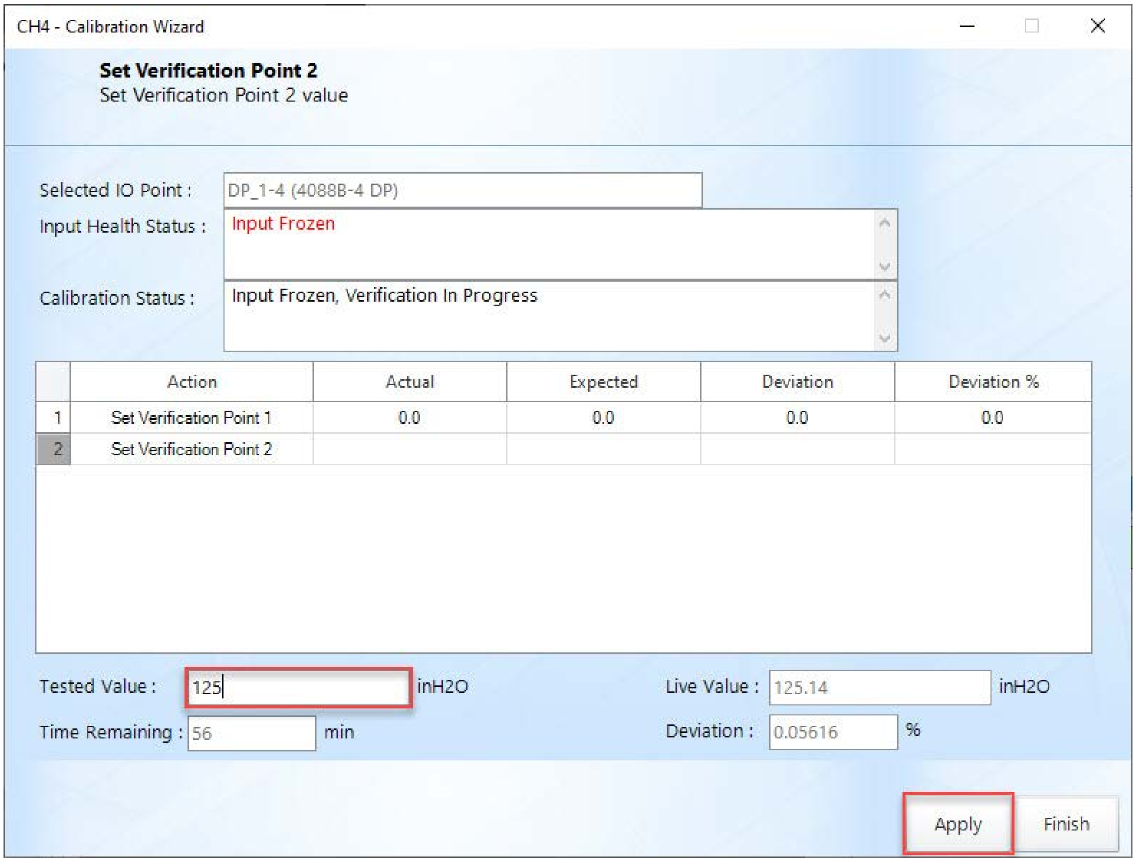
Field	Description	
Selected I/O Point	This **read-only** field shows the name of the currently selected input.	
Calibration Status	This **read-only** field shows the current calibration status.	
Input Health Status	This **read-only** field shows the current operating status of the selected channel.	
Action Grid	This grid reflects the calibration commands that have been performed on the selected input.	
	Action	Indicates the current action, and shows any previous actions you have taken.
	Expected	This **read-only** field shows the value of the input before any adjustments have been applied.
	Actual	This **read-only** field shows the value entered in the **Tested Value** field.

Field	Description	
	Deviation	This **read-only** field shows the amount of deviation between the **As Found** and **As Left** values.
	Deviation %	This **read-only** field shows a percentage deviation between the **As Found** and **As Left** values.
Tested Value	Enter the value produced by the test equipment.	
Live Value	This **read-only** field shows the current value of the input.	
Deviation	This **read-only** field shows a percentage deviation between the **Tested Value** and **Live Value** fields.	
Apply	Click to log the value entered in the **Tested Value** field.	
Finish	Click to end the current calibration process.	
Cancel	Click to exit the Calibration Wizard and restore the previous calibration.	

15. Set the test equipment to produce a value equal to the desired verification point.

16. Enter the value produced by the test equipment and click **Apply**.

Figure 365. Set Verification Point 2



Set Verification Point 2
Set Verification Point 2 value

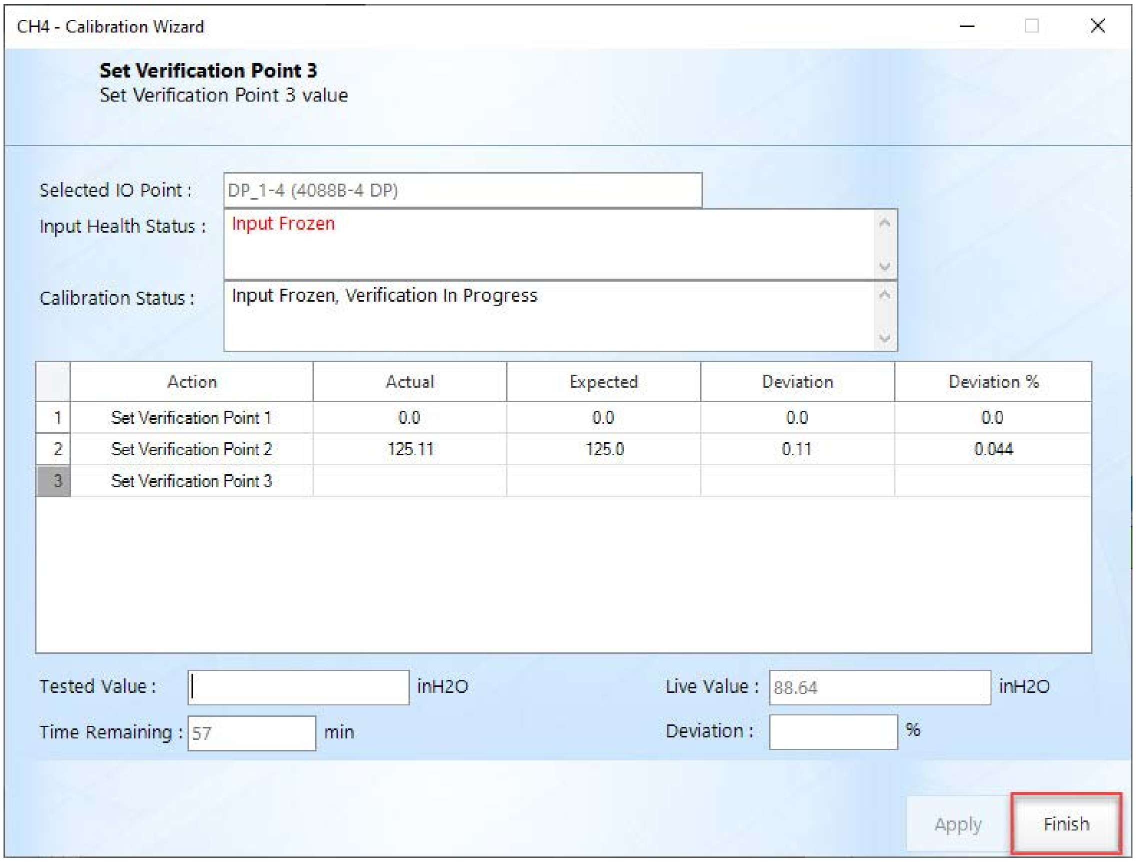
Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Verification In Progress

	Action	Actual	Expected	Deviation	Deviation %
1	Set Verification Point 1	0.0	0.0	0.0	0.0
2	Set Verification Point 2				

Tested Value : 125 inH2O
Live Value : 125.14 inH2O
Time Remaining : 56 min
Deviation : 0.05616 %

17. Repeat the previous two steps for as many verification points as are required

Figure 366. Finish



Set Verification Point 3
Set Verification Point 3 value

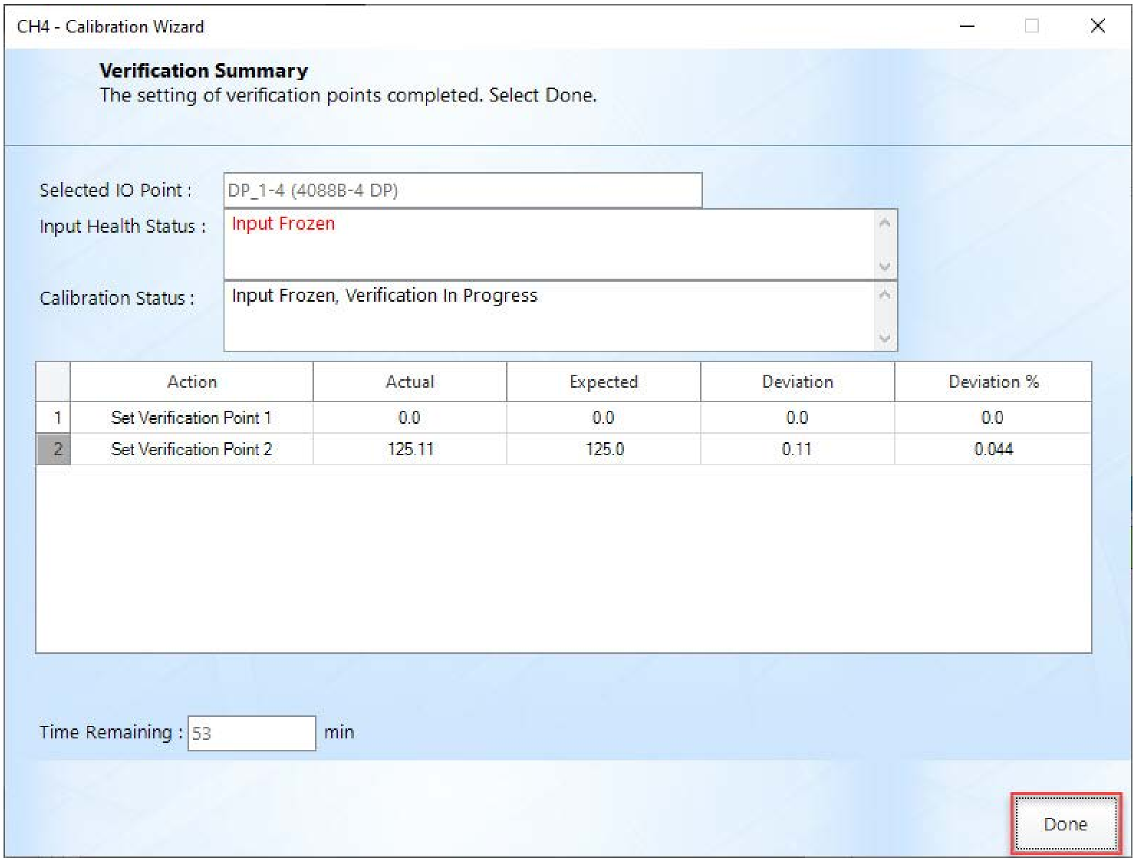
Selected IO Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen, Verification In Progress

	Action	Actual	Expected	Deviation	Deviation %
1	Set Verification Point 1	0.0	0.0	0.0	0.0
2	Set Verification Point 2	125.11	125.0	0.11	0.044
3	Set Verification Point 3				

Tested Value : inH2O
Live Value : 88.64 inH2O
Time Remaining : 57 min
Deviation : %

18. After you are done entering verification points, click **Finish**. A summary of the verification displays.

Figure 367. Verification Summary



Verification Summary

The setting of verification points completed. Select Done.

Selected IO Point : DP_1-4 (4088B-4 DP)

Input Health Status : Input Frozen

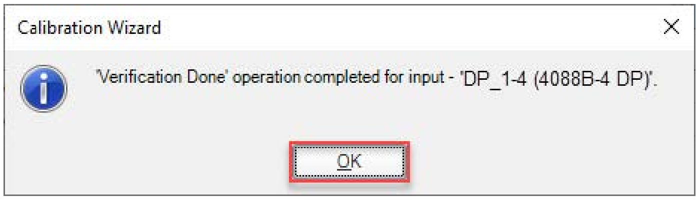
Calibration Status : Input Frozen, Verification In Progress

	Action	Actual	Expected	Deviation	Deviation %
1	Set Verification Point 1	0.0	0.0	0.0	0.0
2	Set Verification Point 2	125.11	125.0	0.11	0.044

Time Remaining : 53 min

19. Click **Done** to exit the Calibration Wizard.

Figure 368. Verification Confirmation

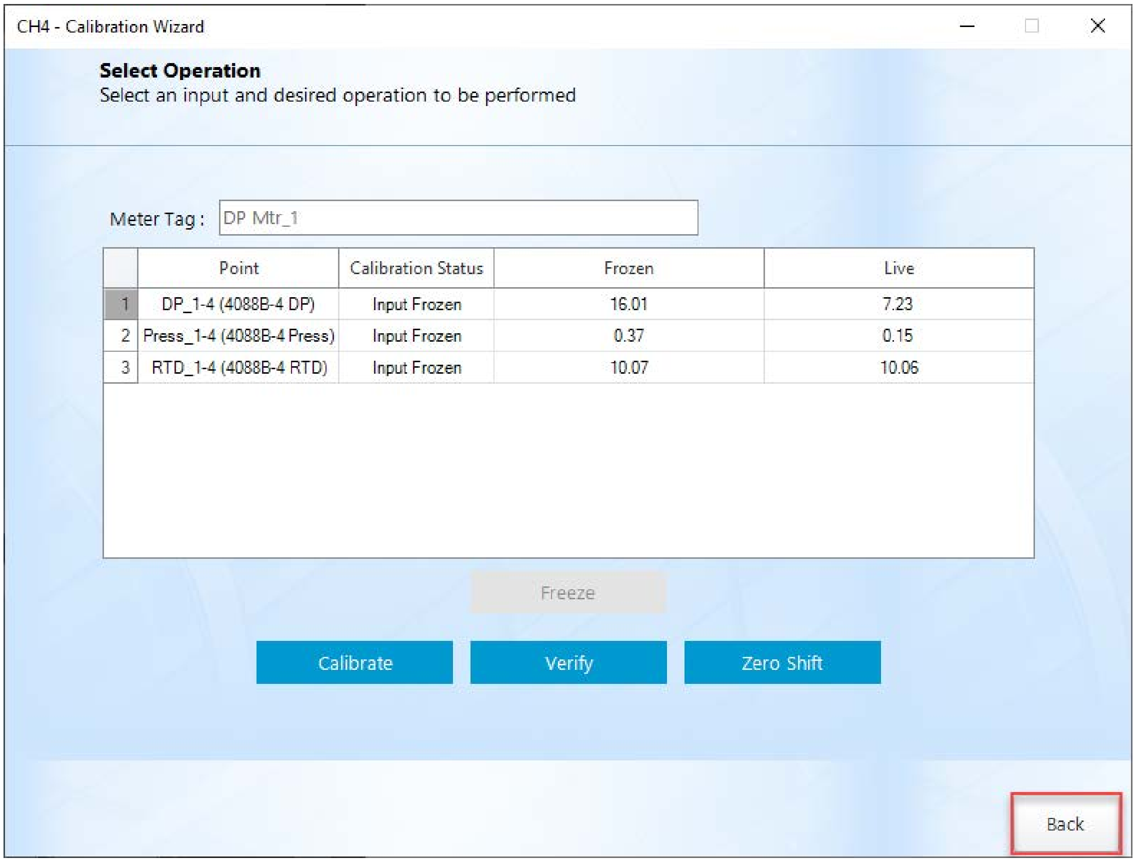


'Verification Done' operation completed for input - 'DP_1-4 (4088B-4 DP)'.

20. Click **OK** to exit the dialog to return to the Select Operation display.

21. You can now perform a new calibration (Calibrating Inputs) or set the offset (Setting Zero Shift) of the input. Select **Back** to exit the Calibration Wizard.

Figure 369. Calibration Wizard

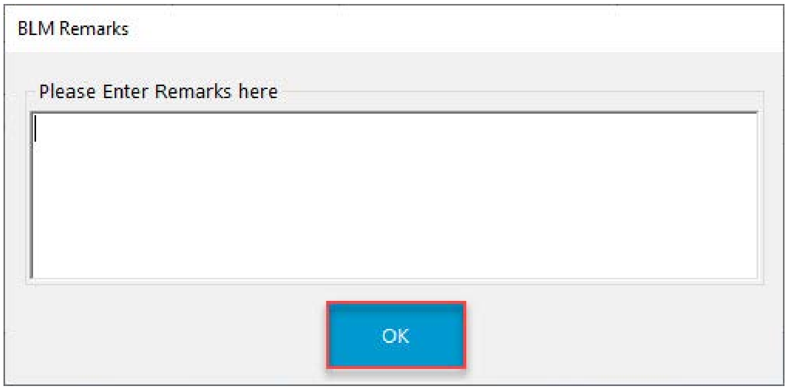


Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	16.01	7.23
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.37	0.15
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.07	10.06

22. If you selected to include BLM Info on your calibration report, a BLM Remarks display opens. Enter any additional information to be included in the report.

Figure 370. BLM Remarks



23. Select **OK** when you are finished to create your calibration report.

5.7.4 Setting Zero Shift

Use the Zero Shift to set a value (offset) to compensate for any slight errors in your input readings.

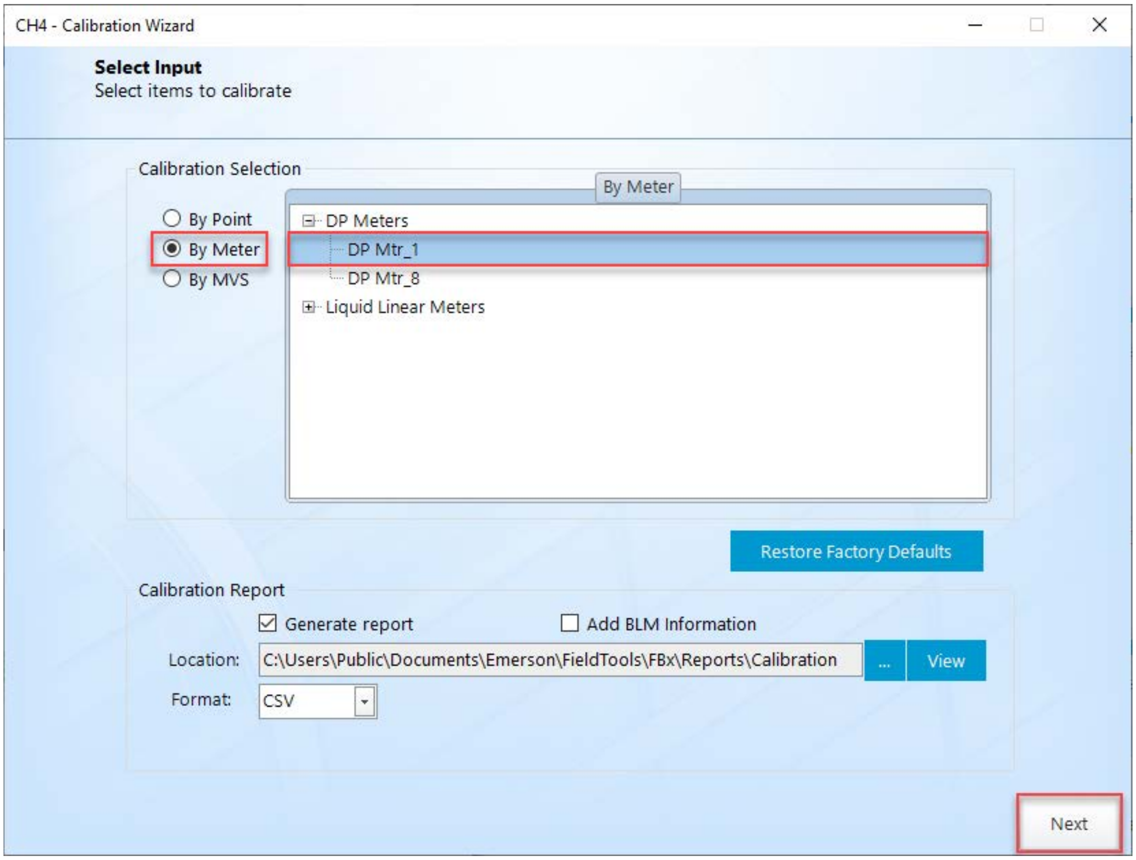
Note

HART inputs **only** support freezing and unfreezing the input value.

To set the zero shift:

1. Select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard displays.

Figure 371. Calibration Wizard



○ By Point
● By Meter
○ By MVS

☑ Generate report
☐ Add BLM Information

Location: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration

Format: CSV

2. In the Calibration Selection field, select **By Meter** to group all inputs together for a specific meter, **By Point** to group all inputs together by input type, or **By MVS** to group inputs by 4088 instance.

Note

- The process is the same for each Calibration Selection option. The only difference is how each input is grouped. This example shows **By Meter** in the Calibration Selection field.
- If you select **By Meter** in the Calibration Selection field, select a meter and the system automatically selects the meter inputs.
- If you select **By Point** in the Calibration Selection field, place a check mark next to one or more inputs.
- If you select **By MVS** in the Calibration Selection field, select the communications port connected to the MVS and select the 4088 instance. The system automatically selects the inputs of the 4088 instance.

---

3. Select ⊞ next to the type of meter you want to calibrate to show all available meters of that type.
4. Select a meter to calibrate.
5. Place a check mark next to **Generate report** in the Calibration Report frame if you want FBxConnect™ to create a calibration report.
6. Place a check mark next to **Add BLM Information** in the Calibration Report frame if you want FBxConnect™ to include Bureau of Land Management information on the calibration report.
7. Select a format for the generated report in the **Format** field. Possible options are CSV or PDF.

Note

If you select PDF, you can password protect the file by placing a check mark in the Secure PDF box and entering a password.

---

8. The calibration report is saved to a default location on your PC. If you want to save the report to a different location, click **Browse** and navigate to your desired location.
9. Select **View** to open a saved calibration report. This is useful to compare previous calibration values against the current values.
10. Click **Next**.

11. If you selected BLM Info option, enter the required BLM information and select **Save and Continue to Calibration**.

Note

For more information, refer to BLM Required Information.

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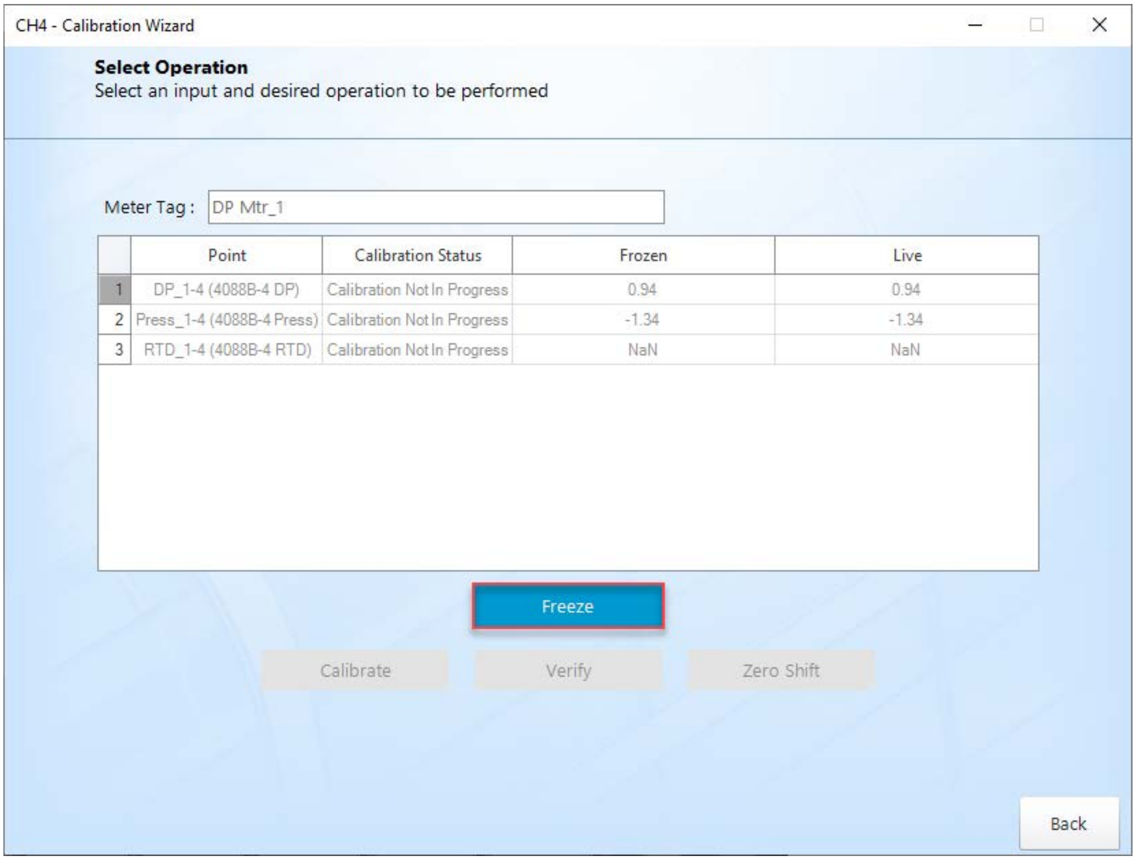
12. The Calibration Wizard displays all inputs associated with the selected meter.

Figure 372. Freeze



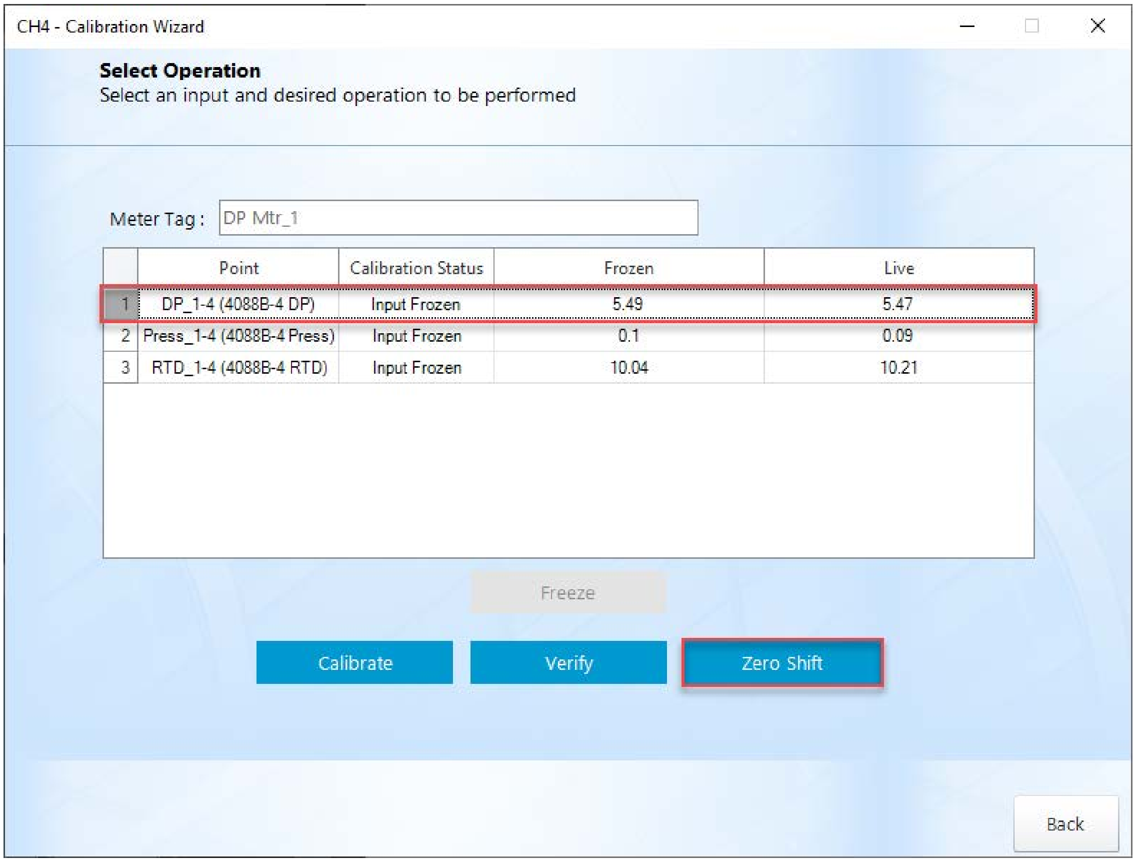
Select Operation
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Calibration Not In Progress	0.94	0.94
2	Press_1-4 (4088B-4 Press)	Calibration Not In Progress	-1.34	-1.34
3	RTD_1-4 (4088B-4 RTD)	Calibration Not In Progress	NaN	NaN

13. Select **Freeze** to stop the values from being updated during the calibration process.

Figure 373. Set Zero Shift



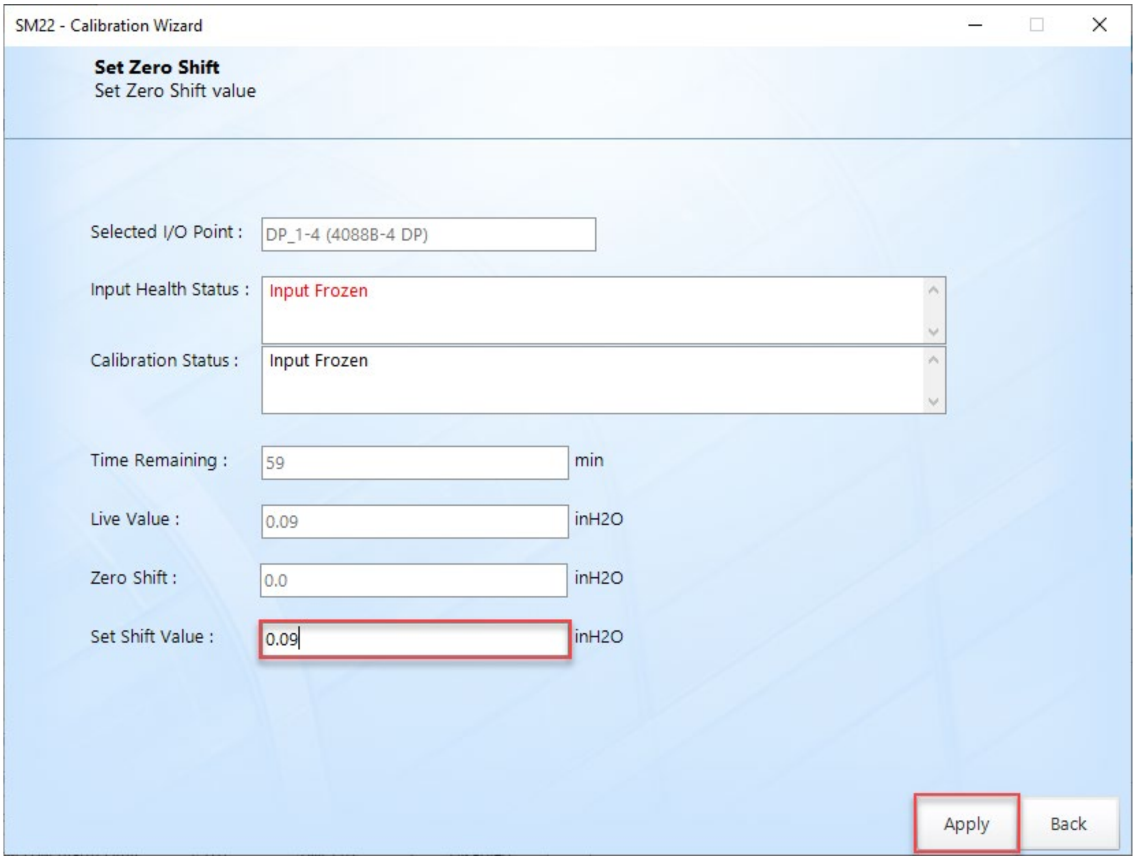
Select Operation
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	5.49	5.47
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.1	0.09
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.04	10.21

14. Select the input you want to calibrate and select **Set Zero Shift**.

Figure 374. Set Zero Shift Value

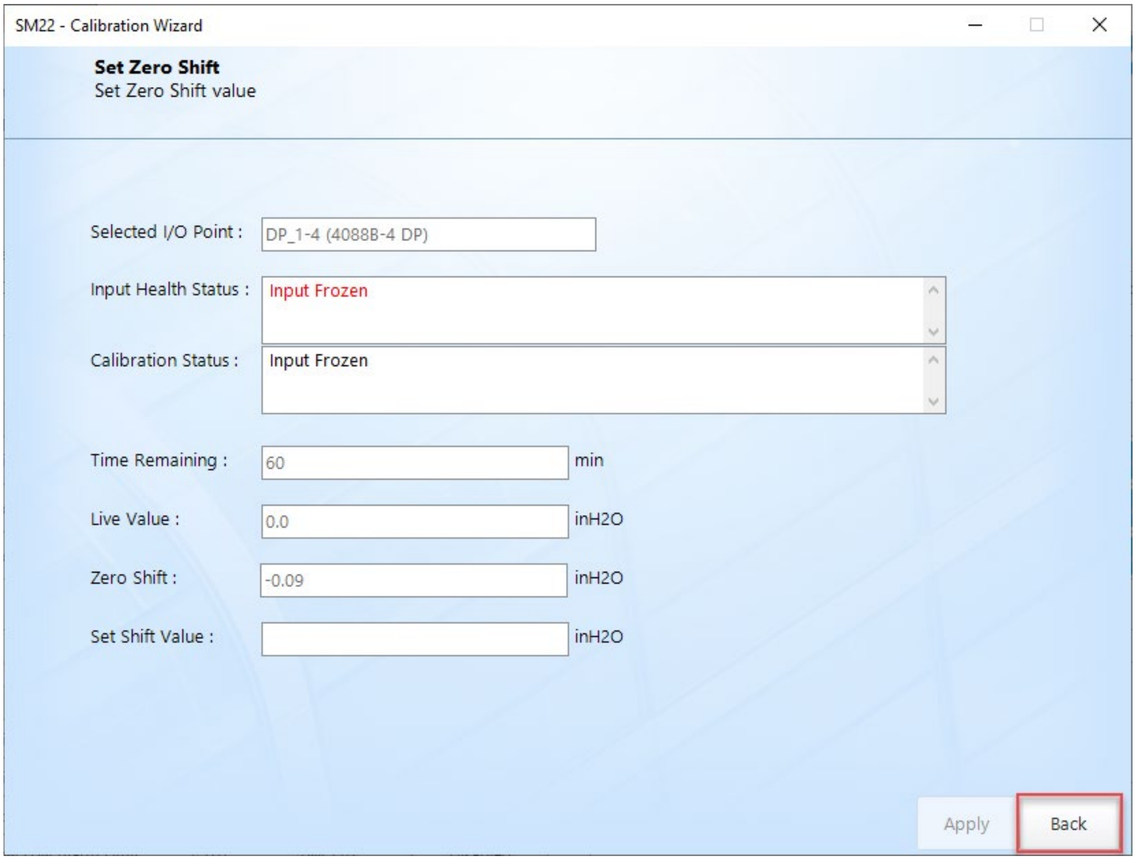


Set Zero Shift
Set Zero Shift value

Selected I/O Point : DP_1-4 (4088B-4 DP)
Input Health Status : Input Frozen
Calibration Status : Input Frozen
Time Remaining : 59 min
Live Value : 0.09 inH2O
Zero Shift : 0.0 inH2O
Set Shift Value : 0.09 inH2O

15. Enter a value in the **Set Shift Value** field by which to offset the value in the **Live Value** field to equal a value of zero and click **Apply**.

Figure 375. Zero Shift Applied



SM22 - Calibration Wizard

Set Zero Shift
Set Zero Shift value

Selected I/O Point : DP_1-4 (4088B-4 DP)

Input Health Status : Input Frozen

Calibration Status : Input Frozen

Time Remaining : 60 min

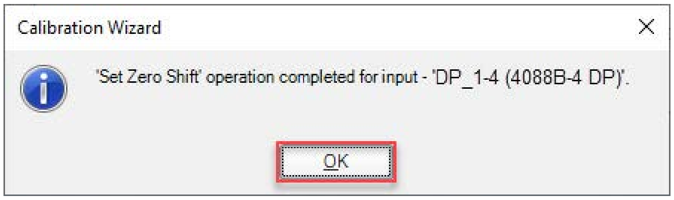
Live Value : 0.0 inH2O

Zero Shift : -0.09 inH2O

Set Shift Value : inH2O

16. Click **Back** to exit the display. A confirmation dialog displays.

Figure 376. Confirmation Dialog



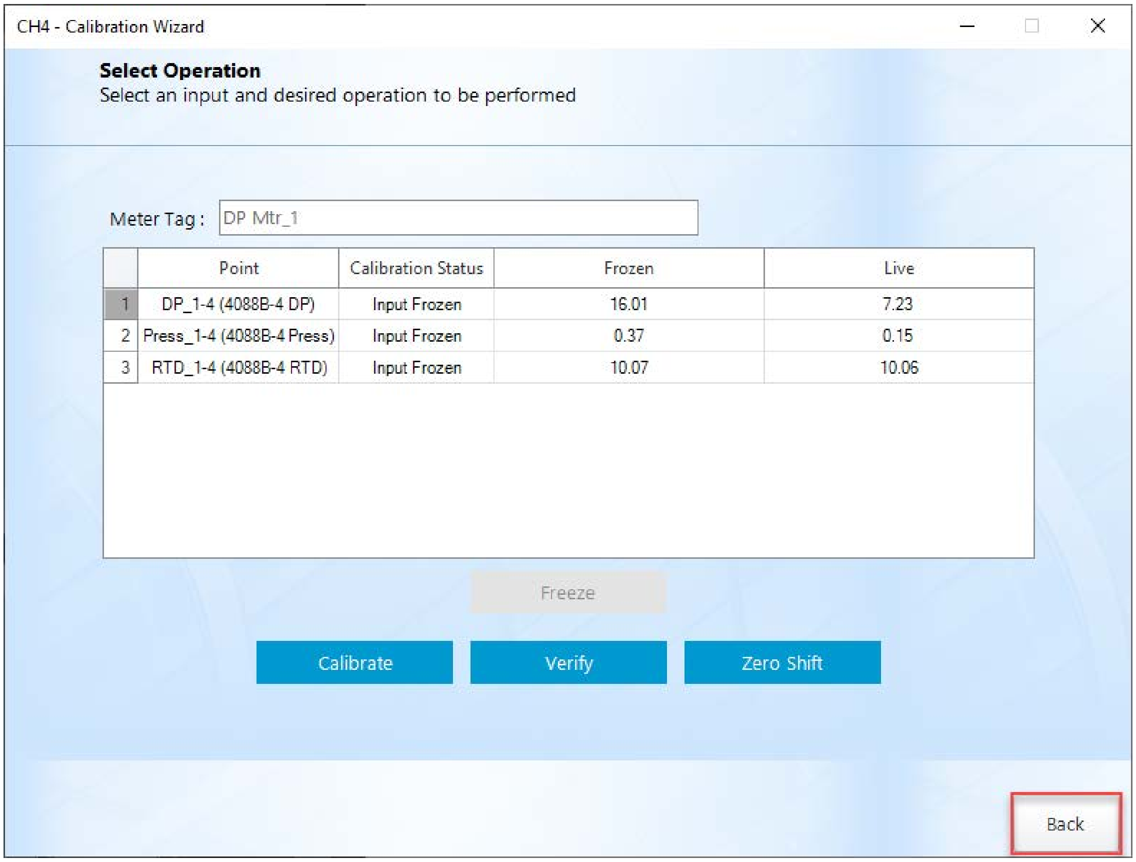
Calibration Wizard

'Set Zero Shift' operation completed for input - 'DP_1-4 (4088B-4 DP)'.

17. Click **OK** to exit the dialog and return to the Select Operation display.

18. You can now perform a new calibration (Calibrating Inputs) or verification (Verifying a Calibration) of the input. Select **Back** to exit the Calibration Wizard.

Figure 377. Calibration Wizard



CH4 - Calibration Wizard

Select Operation

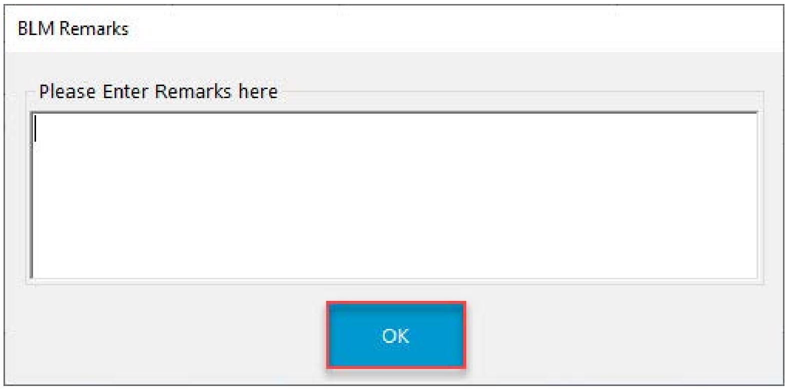
Select an input and desired operation to be performed

Meter Tag : DP Mtr_1

	Point	Calibration Status	Frozen	Live
1	DP_1-4 (4088B-4 DP)	Input Frozen	16.01	7.23
2	Press_1-4 (4088B-4 Press)	Input Frozen	0.37	0.15
3	RTD_1-4 (4088B-4 RTD)	Input Frozen	10.07	10.06

19. If you selected to include BLM Info on your calibration report, a BLM Remarks display opens. Enter any additional information to be included in the report.

Figure 378. BLM Remarks



BLM Remarks

Please Enter Remarks here

20. Select **OK** when you are finished to create your calibration report.

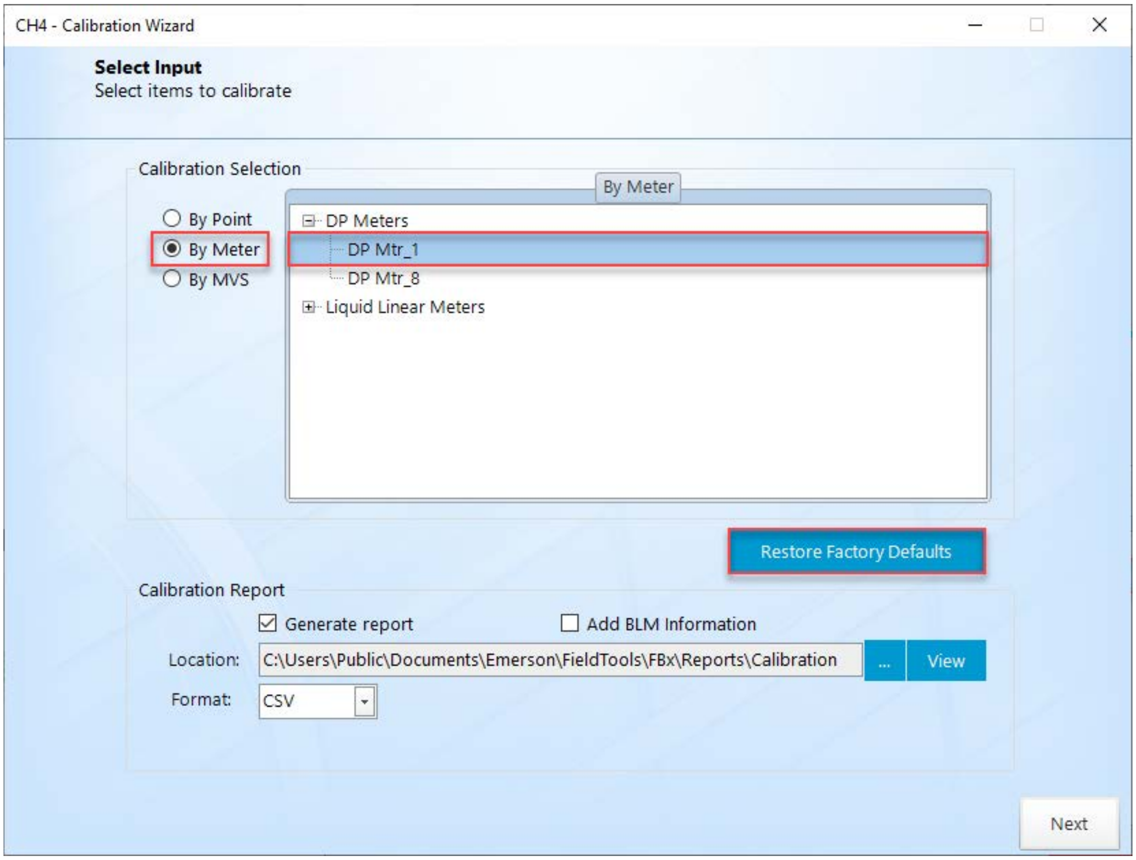
5.7.5 Resetting a Calibration

Use this option to clear a previous calibration and restore the factory defaults.

To reset a calibration:

1. Select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard displays.

Figure 379. Calibration Wizard


CH4 - Calibration Wizard

Select Input
Select items to calibrate

Calibration Selection

○ By Point
● By Meter
○ By MVS

By Meter
- DP Meters
  - DP Mtr_1
  - DP Mtr_8
- Liquid Linear Meters

Calibration Report

☑ Generate report ☐ Add BLM Information

Location: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration

Format: CSV

2. In the Calibration Selection field, select **By Meter** to group all inputs together for a specific meter, **By Point** to group all inputs together by input type, or **By MVS** to group inputs by 4088 instance.

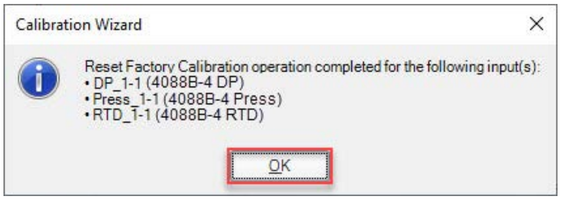
Note

- The process is the same for each Calibration Selection option. The only difference is how each input is grouped. This example shows **By Meter** in the Calibration Selection field.

- If you select **By Meter** in the Calibration Selection field, select a meter and the system automatically selects the meter inputs.
- If you select **By Point** in the Calibration Selection field, place a check mark next to one or more inputs.
- If you select **By MVS** in the Calibration Selection field, select the communications port connected to the MVS and select the 4088 instance. The system automatically selects the inputs of the 4088 instance.

3. Select ⊞ next to the type of meter you want to reset calibration data for to show all of the available meters of that type.
4. Select a meter to reset.
5. Select **Restore Factory Defaults**:
   - If you selected **By meter** in the Calibration Selection field, the system resets the inputs configured for the selected meter to factory defaults values.
   - If you selected **By point** in the Calibration Selection field, the system resets the selected input channel(s) to factory default values.
   - If you selected **By MVS** in the Calibration Selection field, the system resets the inputs configured for the selected MVS instance to factory default values.
6. FBxConnect™ restores the factory default calibration and displays a confirmation dialog.

Figure 380. Confirmation



Reset Factory Calibration operation completed for the following input(s):
• DP_1-1 (4088B-4 DP)
• Press_1-1 (4088B-4 Press)
• RTD_1-1 (4088B-4 RTD)

7. Select **OK** to close the dialog.

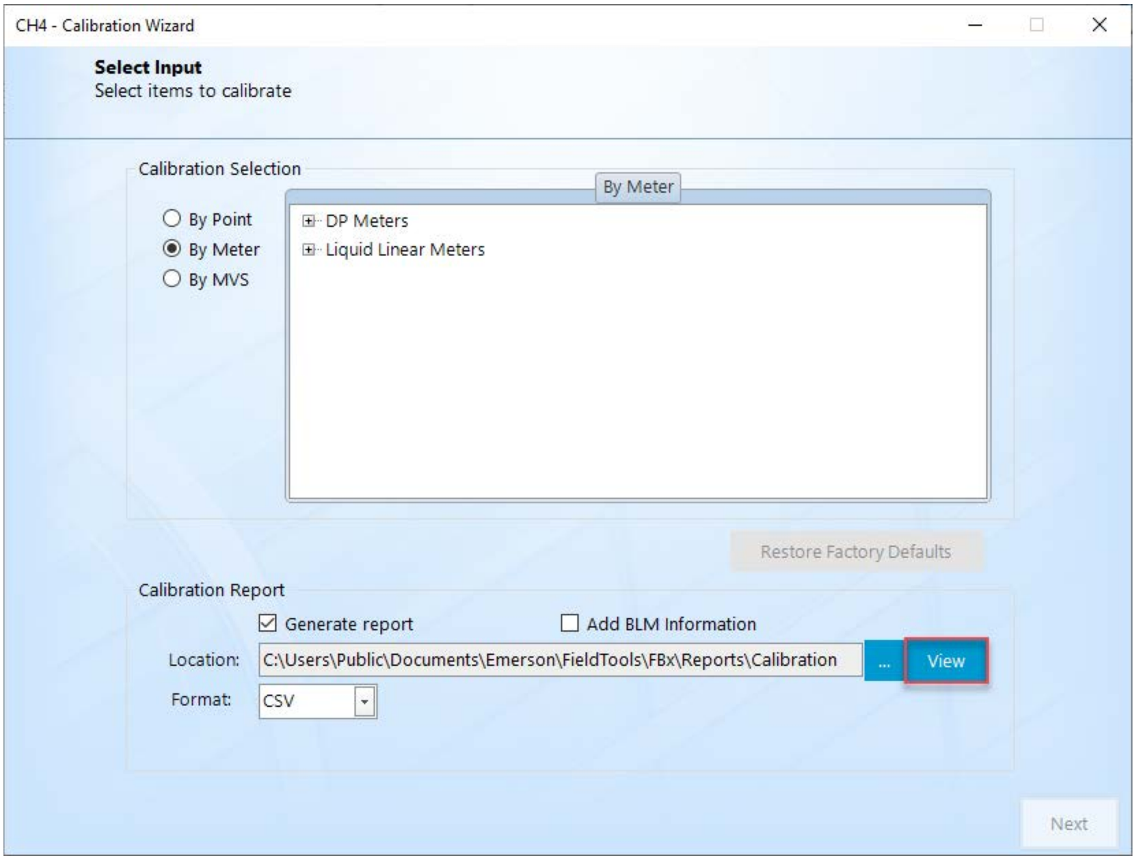
5.7.6 Viewing a Calibration Report

Follow these steps to view a previously generated calibration report.

To view a calibration report:

1. Select **Services > Calibration** from the FBxConnect™ main menu. The Calibration Wizard displays.

Figure 381. Calibration Wizard



○ By Point
● By Meter
○ By MVS

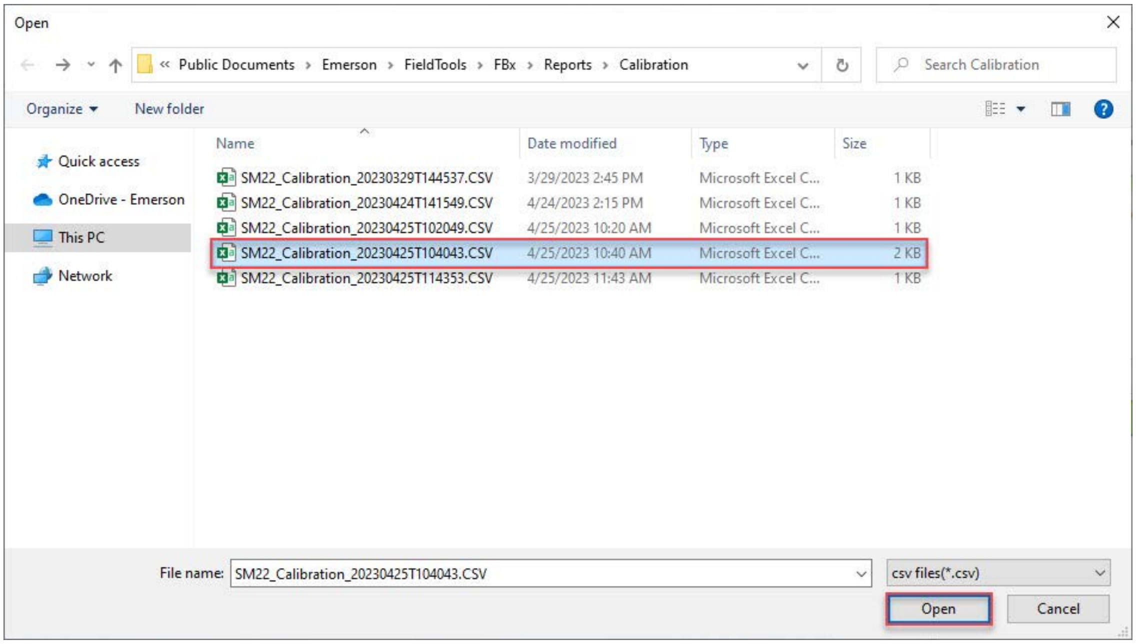
☑ Generate report
☐ Add BLM Information

Location: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration

Format: CSV

2. Select **View**. A window opens showing the default location for calibration reports.

Figure 382. Default Calibration Report File Location



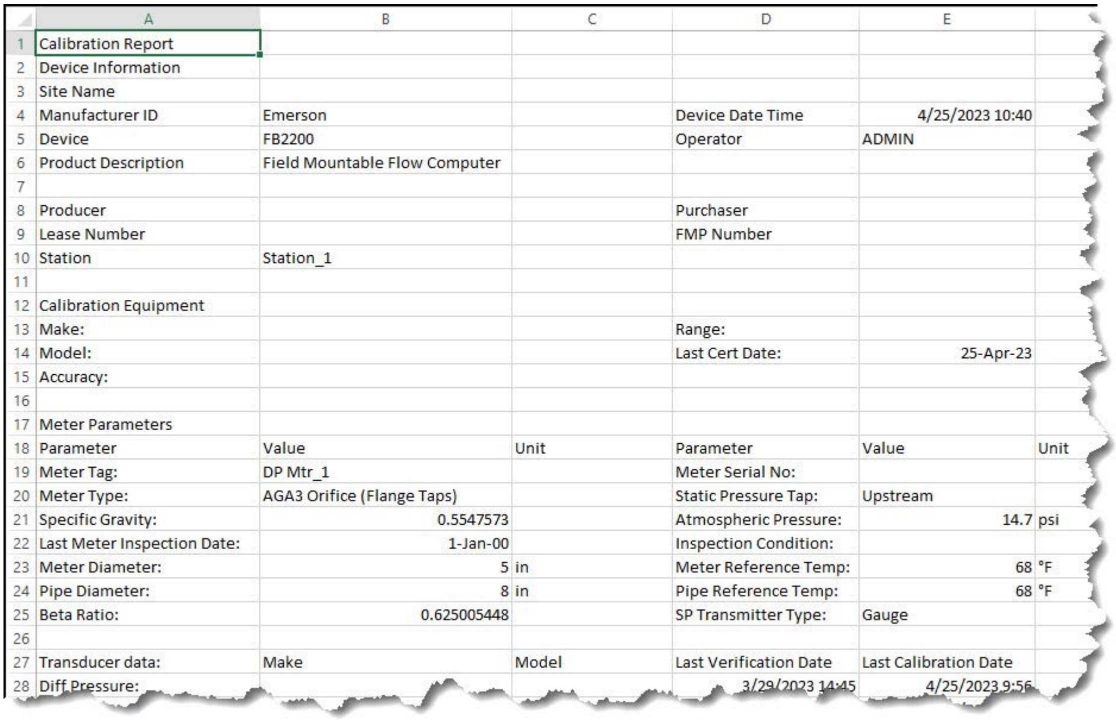
Name	Date modified	Type	Size
SM22_Calibration_20230329T144537.CSV	3/29/2023 2:45 PM	Microsoft Excel C...	1 KB
SM22_Calibration_20230424T141549.CSV	4/24/2023 2:15 PM	Microsoft Excel C...	1 KB
SM22_Calibration_20230425T102049.CSV	4/25/2023 10:20 AM	Microsoft Excel C...	1 KB
SM22_Calibration_20230425T104043.CSV	4/25/2023 10:40 AM	Microsoft Excel C...	2 KB
SM22_Calibration_20230425T114353.CSV	4/25/2023 11:43 AM	Microsoft Excel C...	1 KB

File name: SM22_Calibration_20230425T104043.CSV

csv files(*.csv)

3. Select the report you want to view and select **Open** to view the calibration report.

Figure 383. Calibration Report Example



	A	B	C	D	E	
1	Calibration Report					
2	Device Information					
3	Site Name					
4	Manufacturer ID	Emerson		Device Date Time	4/25/2023 10:40	
5	Device	FB2200		Operator	ADMIN	
6	Product Description	Field Mountable Flow Computer				
7						
8	Producer			Purchaser		
9	Lease Number			FMP Number		
10	Station	Station_1				
11						
12	Calibration Equipment					
13	Make:			Range:		
14	Model:			Last Cert Date:	25-Apr-23	
15	Accuracy:					
16						
17	Meter Parameters					
18	Parameter	Value	Unit	Parameter	Value	Unit
19	Meter Tag:	DP Mtr_1		Meter Serial No:		
20	Meter Type:	AGA3 Orifice (Flange Taps)		Static Pressure Tap:	Upstream	
21	Specific Gravity:	0.5547573		Atmospheric Pressure:	14.7	psi
22	Last Meter Inspection Date:	1-Jan-00		Inspection Condition:		
23	Meter Diameter:	5	in	Meter Reference Temp:	68	°F
24	Pipe Diameter:	8	in	Pipe Reference Temp:	68	°F
25	Beta Ratio:	0.625005448		SP Transmitter Type:	Gauge	
26						
27	Transducer data:	Make	Model	Last Verification Date	Last Calibration Date	
28	Diff Pressure:			3/29/2023 14:45	4/25/2023 9:56	

5.7.7 Calibration Errors

When calibrating your equipment, you may encounter a variety of errors based on your selected calibration point. Refer to the following error descriptions for each I/O type.

Analog Input (AI) Calibration Errors

4088B Calibration Errors

215 MultiVariable ™ Sensor Calibration Errors

5.7.7.1 Analog Input (AI) Calibration Errors

The following list provides possible errors you may encounter while calibrating an analog input (AI).

Bit	Error	Description
No Bit Set	Calibration Not In Progress	Set when no calibration is performed.
0	Input Frozen	Set when a live value is frozen.
1	Calibration In Progress	Set after the Start Calibration command is issued and remains until the Save or Cancel command is issued.
2	Reserved	Not used.
3	Set Command Failed	Set when the last command failed due to an error.
4	Timeout Occurred	Set when the calibration has timed out due to inactivity.
5	Span Too Small	Not used.
6	Excess Correction	Set when the slope of applied value is out +/- 5% of range limits.
7	Passed Parameter Too Small	Not used.
8	Passed Parameter Too Large	Not used.
9	Ideal Value Too Small	Not used.
10	Ideal Value Too Large	Not used.

Bit	Error	Description
11	Wrong Command	This error is set for the following reasons: • The channel is disabled. • The module is in point fail due to communication failure or termination missing. • The last command issued is not as per calibration command sequence.
12	Verification In Progress	When verification is in progress.

5.7.7.2 4088B Calibration Errors

The following list provides possible errors you may encounter while calibrating a 4088B.

Bit	Error	Description
No Bit Set	Calibration Not In Progress	Set when no calibration is performed.
0	Input Frozen	Set when a live value is frozen.
1	Calibration In Progress	Set after the Start Calibration command is issued and remains until the Save or Cancel command is issued.
2	Reserved	Not used.
3	Set Command Failed	This error is set for the following reasons: • 4088 Polling is disable. • The command failed due to a • Communications error during calibration. Or when one of the following exceptions is returned from 4088B: • Illegal command or value • Slave fail or busy • Transmitter sensor error • Write protect switch ON • Out of sensor limits

Bit	Error	Description
		• Measurement in point fail • Transmitter in communication failure.
4	Timeout Occurred	Set when the calibration has timed out due to inactivity.
5	Span Too Small	Set when one of the following exceptions is returned from the 4088B: • Span less than zero • Midpoint less than zero
6	Excess Correction	Not used.
7	Passed Parameter Too Small	Not used.
8	Passed Parameter Too Large	Not used.
9	Ideal Value Too Small	Not used.
10	Ideal Value Too Large	Not used.
11	Wrong Command	Set when one of the following exceptions is returned from 4088B: • Measurement not supported • Calibration already in progress • Measurement in simulation • Invalid calibration sequence • Invalid command
12	Verification In Progress	When verification is in progress.

5.7.7.3 215 MultiVariable™ Sensor Calibration Errors

The following list provides possible errors you may encounter while calibrating the integral 215 MultiVariable™ Sensor.

Bit	Error	Description
No Bit Set	Calibration Not In Progress	Set when no calibration is performed.
0	Input Frozen	Set when a live value is frozen.

Bit	Error	Description
1	Calibration In Progress	Set after the Start Calibration command is issued and remains until the Save or Cancel command is issued.
2	Reserved	Not used.
3	Set Command Failed	Set when the last command failed due to an error or point fail.
4	Timeout Occurred	Set when the calibration has timed out due to inactivity.
5	Span Too Small	Set when the Span is less than zero, the Midpoint is less than zero, or the difference of span and zero is less than the minimum span.
6	Excess Correction	Set when the slope of applied value is out +/- 5% of range limits.
7	Passed Parameter Too Small	**DP/SP** Set when the value is less than Lower range limit. **RTD** Set when the value < LRL+5% of LRL.
8	Passed Parameter Too Large	**DP/SP** Set when the value is greater than Upper range limit. **RTD** Set when the value > URL+5% of URL.
9	Ideal Value Too Small	**DP/SP** Set when the value is less than LRL+ 5% of LRL. **RTD** Not used.

Bit	Error	Description
10	Ideal Value Too Large	**DP/SP** Set when the value is greater than URL+ 5% of URL. **RTD** Not used.
11	Wrong Command	Set when the last commend issued is not as per calibration command sequence. The channel is disabled.
12	Verification In Progress	When verification is in progress.

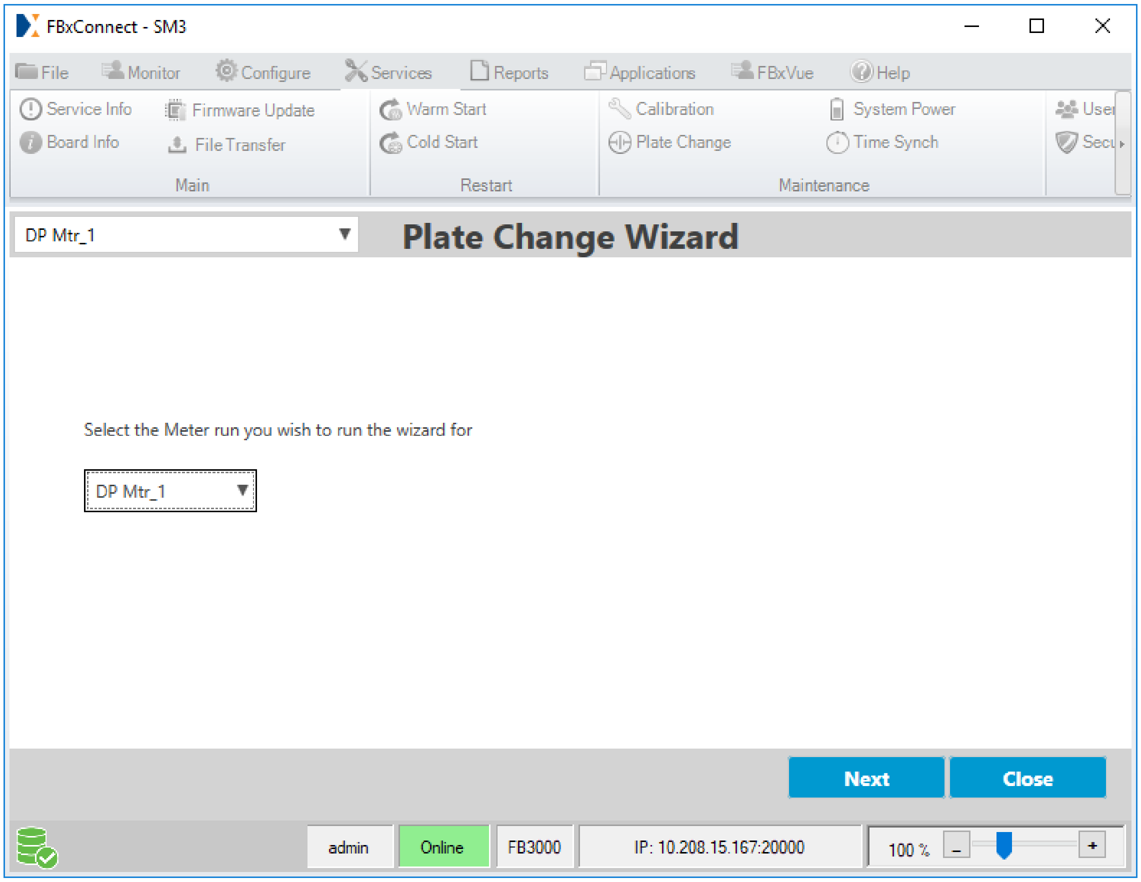
5.8 Plate Change

The Plate Change Wizard allows you to change the size of an orifice plate under flowing or non-flowing conditions.

To perform a plate change:

1. Select **Services > Plate Change** from the FBxConnect™ main menu. The Plate Change Wizard display opens.

Figure 384. Plate Change Wizard - Select Meter



Select the Meter run you wish to run the wizard for

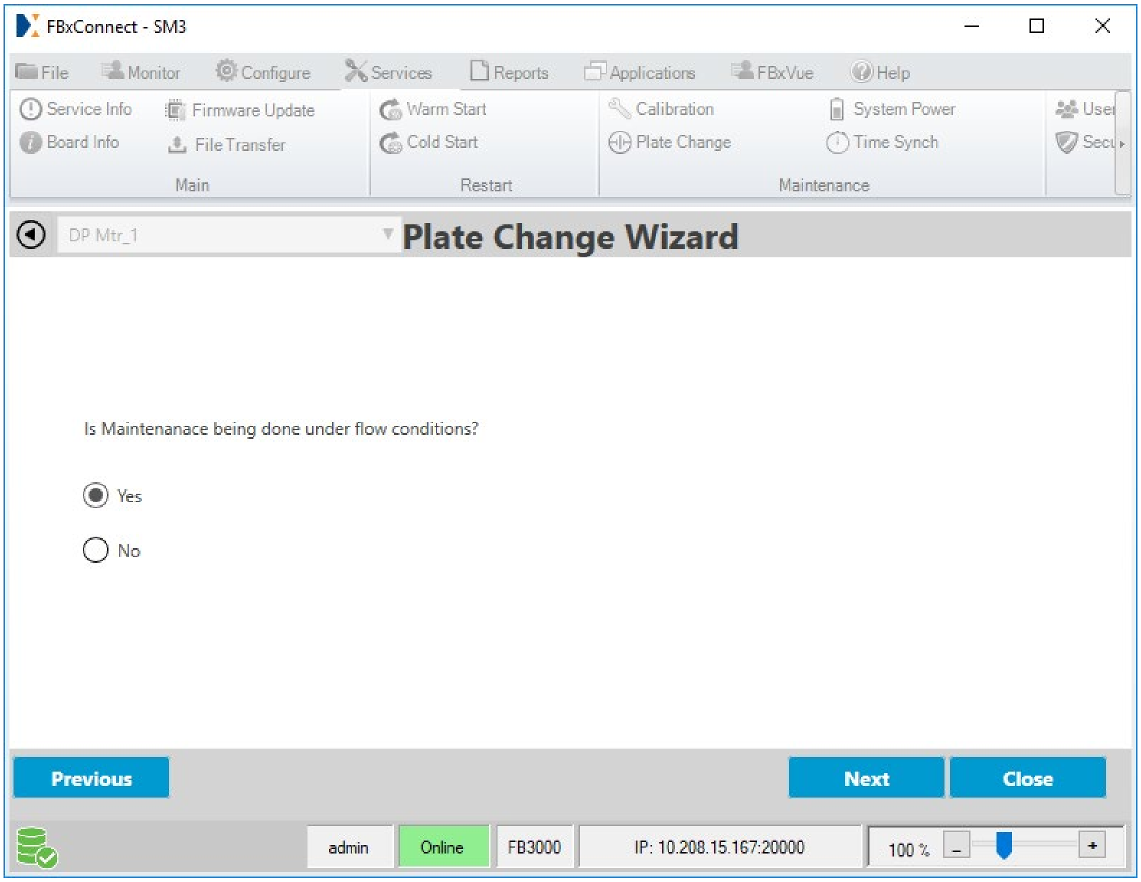
DP Mtr_1

2. Select ▼ to choose the meter with the plate you want to change and select **Next**.

Note

For meters with inputs assigned to a HART input, HART inputs **must** be enabled and configured with a **Poll Mode** set to either **PV only** or **All Process**.

Figure 385. Plate Change Wizard - Flowing Conditions



Is Maintenanace being done under flow conditions?

● Yes

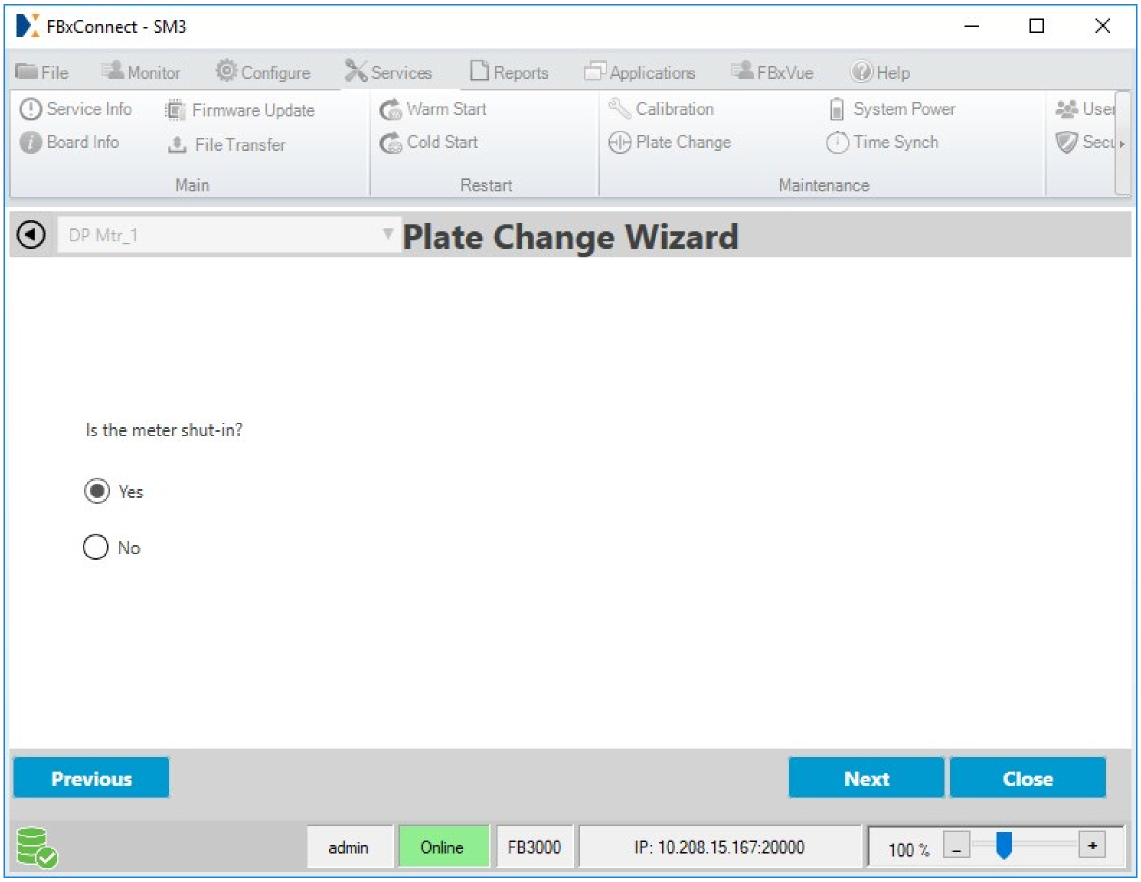
○ No

3. Select **Yes** if the plate change occurs during flowing conditions. You will be allowed to freeze the inputs for the duration of the Plate Change process. Select **Next** and **proceed to step 5**.

   or

   Select **No** if the plate change occurs during non-flowing conditions. Select **Next** and **proceed to step 4**.

Figure 386. Plate Change Wizard - Meter Shut-In



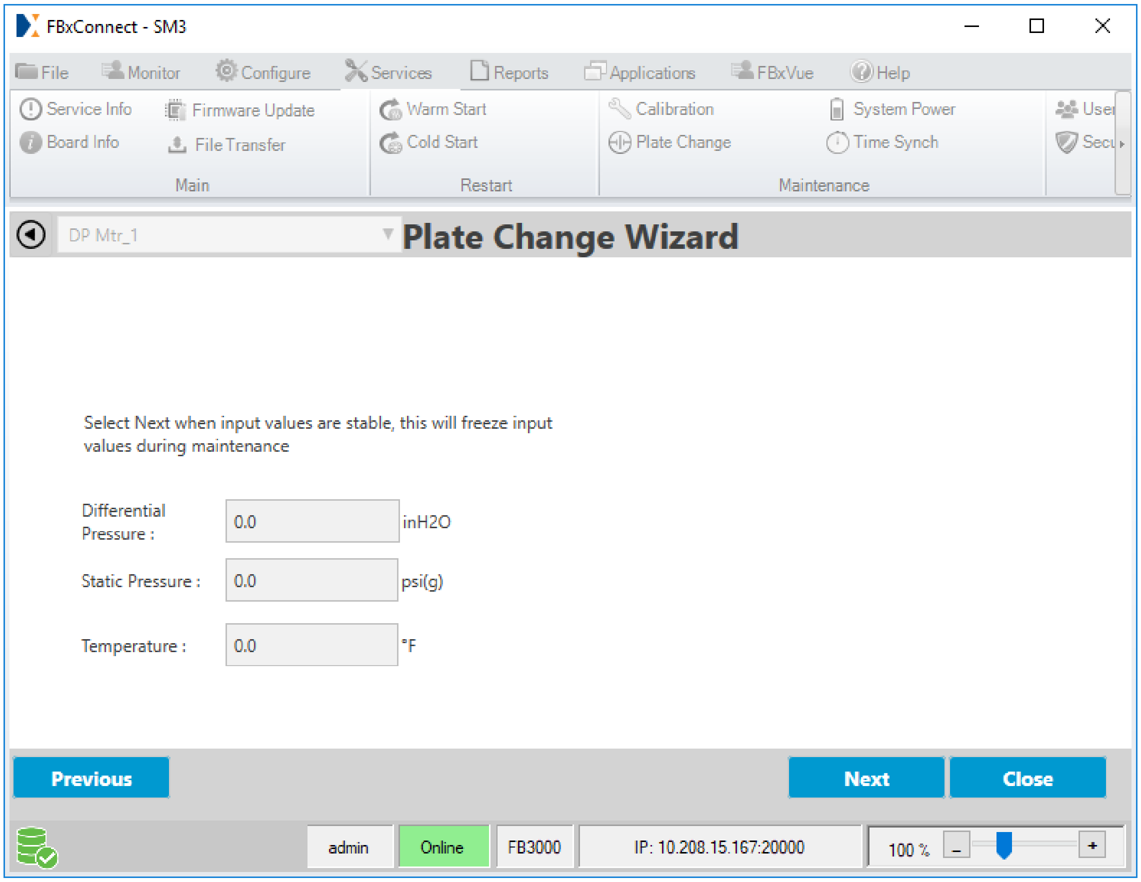
Is the meter shut-in?

● Yes

○ No

4. Select **Yes** if the meter is shut-in. Select **Next** and **proceed to step 6**.
   or
   Select **No** if the meter is not shut-in. Select **Next** and **proceed to step 9**.

Figure 387. Plate Change Wizard - Next When Stable



Select Next when input values are stable, this will freeze input values during maintenance

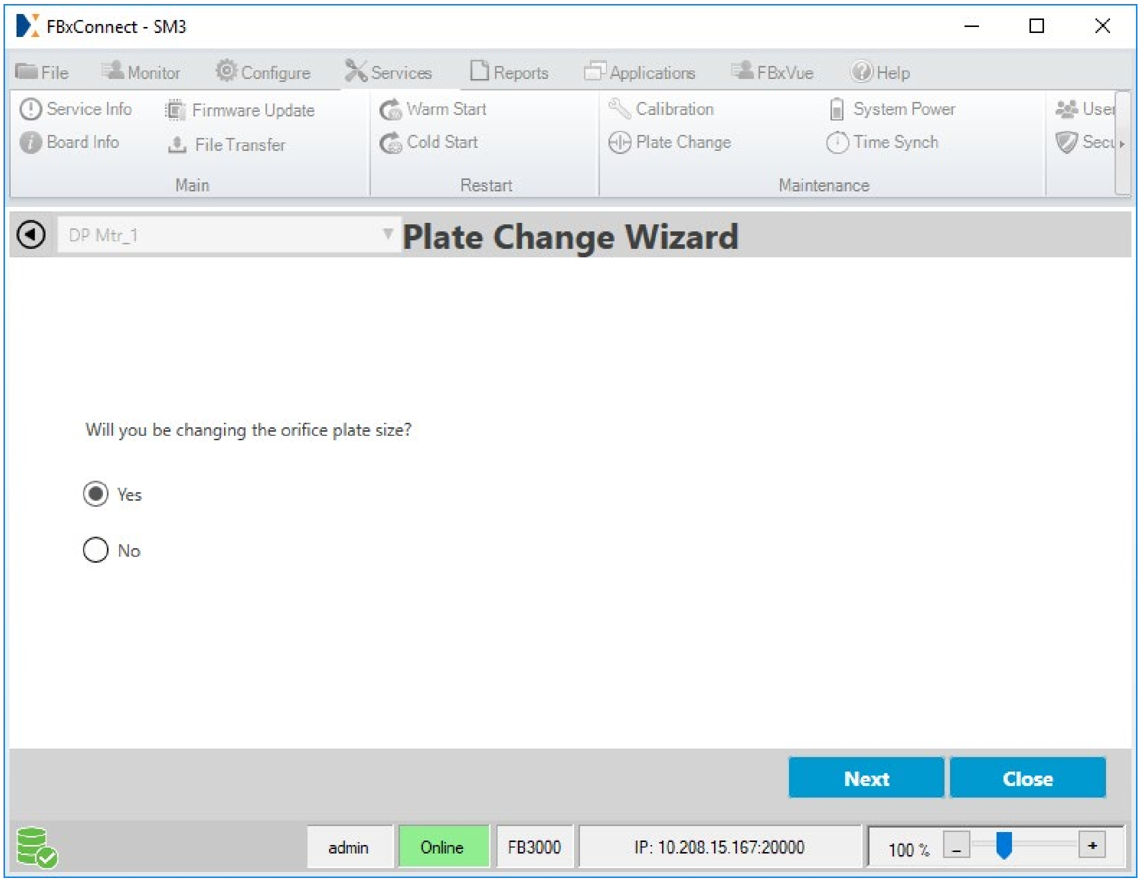
Differential Pressure : 0.0 inH2O

Static Pressure : 0.0 psi(g)

Temperature : 0.0 °F

5. Wait until the input values are stable, and then select **Next** to freeze the values.

Figure 388. Plate Change Wizard - Orifice Plate Size



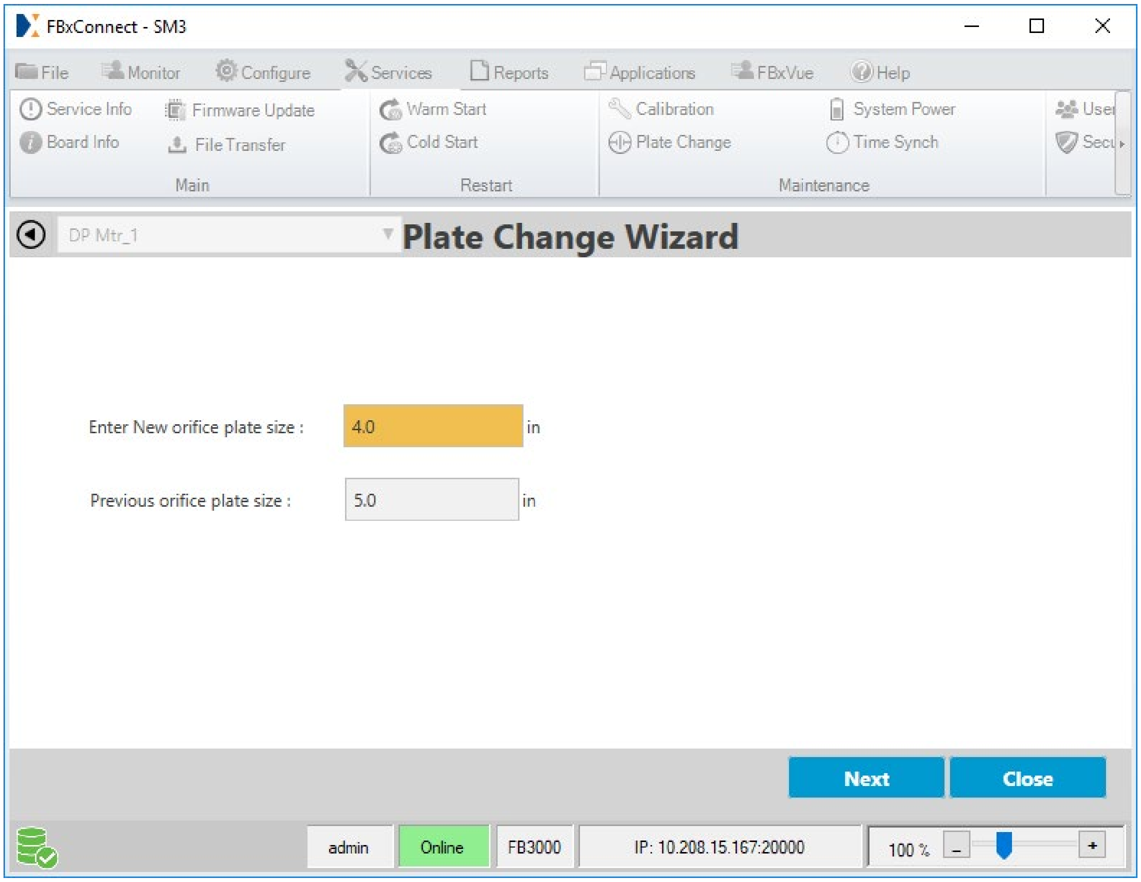
Will you be changing the orifice plate size?

● Yes

○ No

6. Select **Yes** if you are changing the size of the orifice. Select **Next** and **proceed to step 7**.
   or
   Select **No** if you are installing a new plate with the same size orifice as the old plate. Select **Next** and **proceed to step 10**.

Figure 389. Plate Change Wizard - New Orifice Plate Size

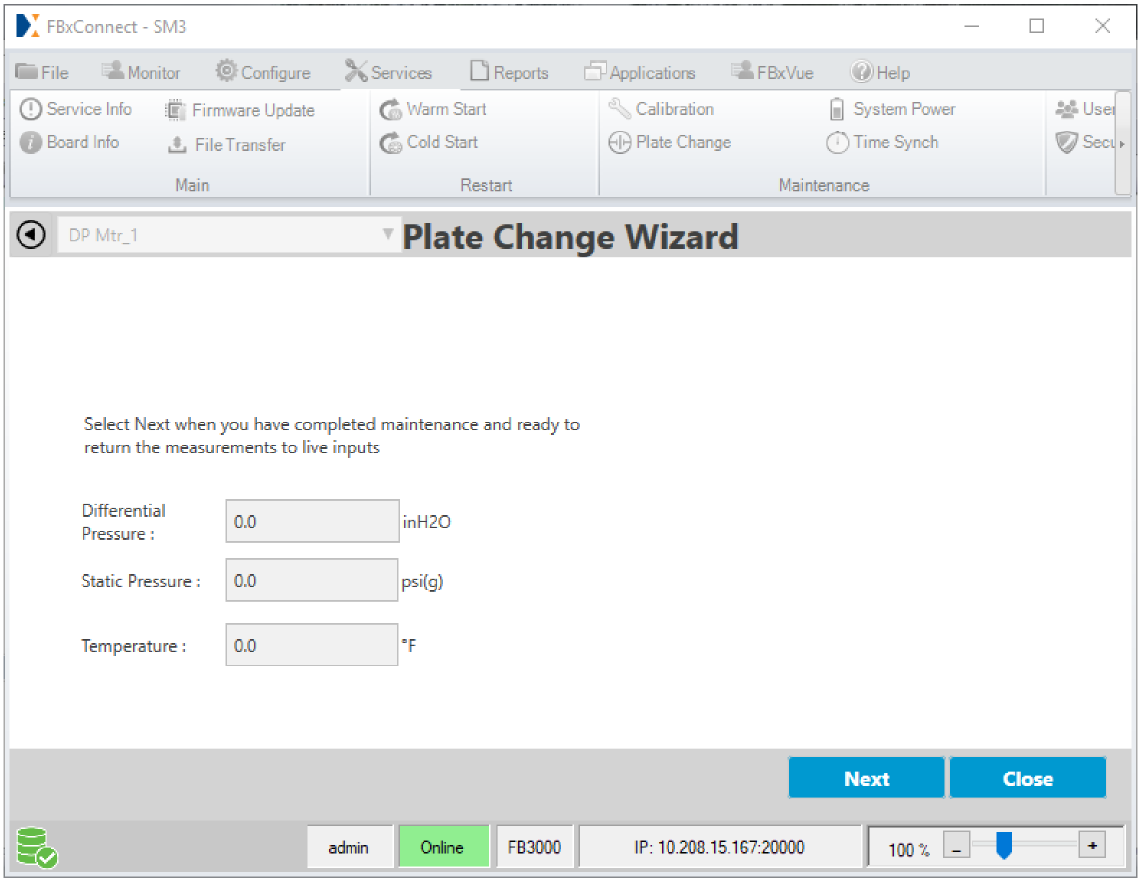


Enter New orifice plate size : 4.0 in

Previous orifice plate size : 5.0 in

7. Enter the size of the new orifice plate and select **Next**.

Figure 390. Plate Change Wizard - Next to Complete



Select Next when you have completed maintenance and ready to return the measurements to live inputs

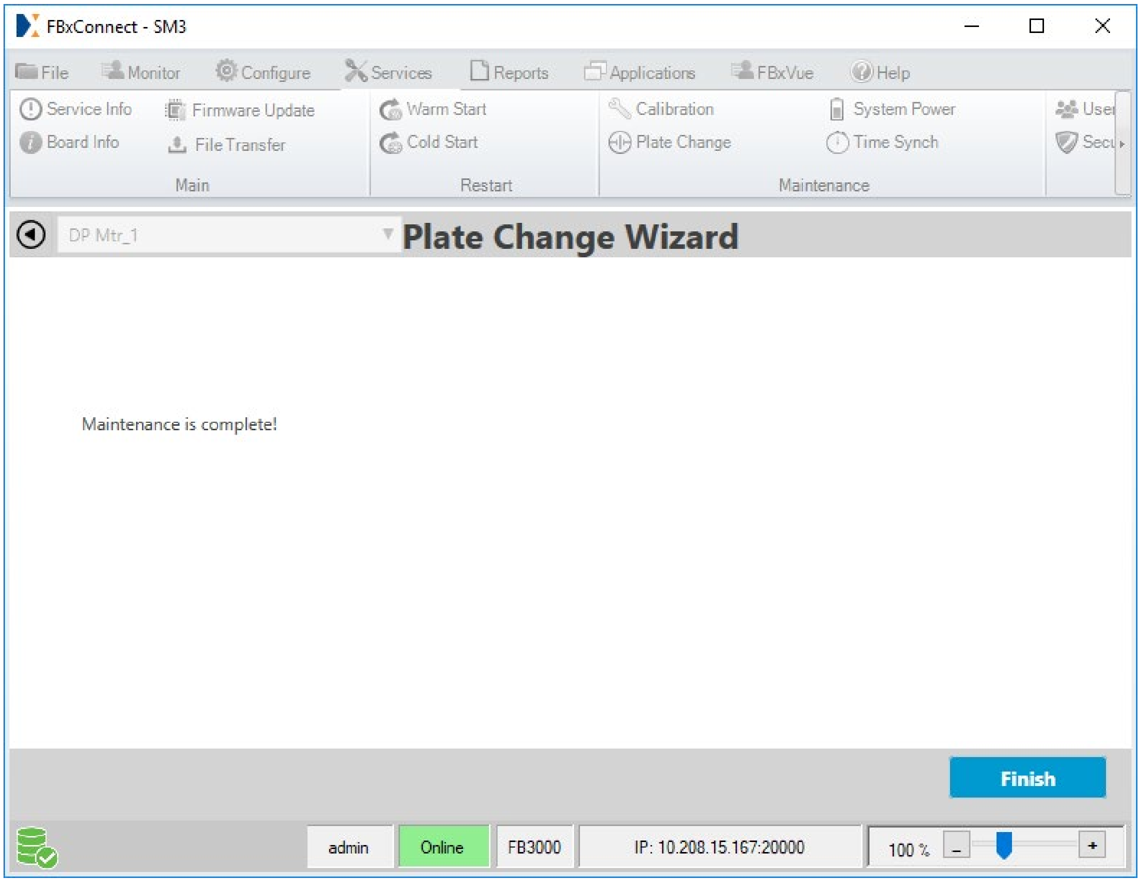
Differential Pressure : 0.0 inH2O

Static Pressure : 0.0 psi(g)

Temperature : 0.0 °F

8. Select **Next** after you have completed maintenance of the meter and you are ready to return to live inputs.

Figure 391. Plate Change Wizard - Maintenance Complete



Maintenance is complete!

9. Select **Finish** to close the Plate Change Wizard. A Confirmation message appears.

Figure 392. Plate Change Wizard - Maintenance Complete

Do you wish to exit Plate Change Wizard?

10. Select **Yes** to exit the Plate Change Wizard.

5.9 System Power

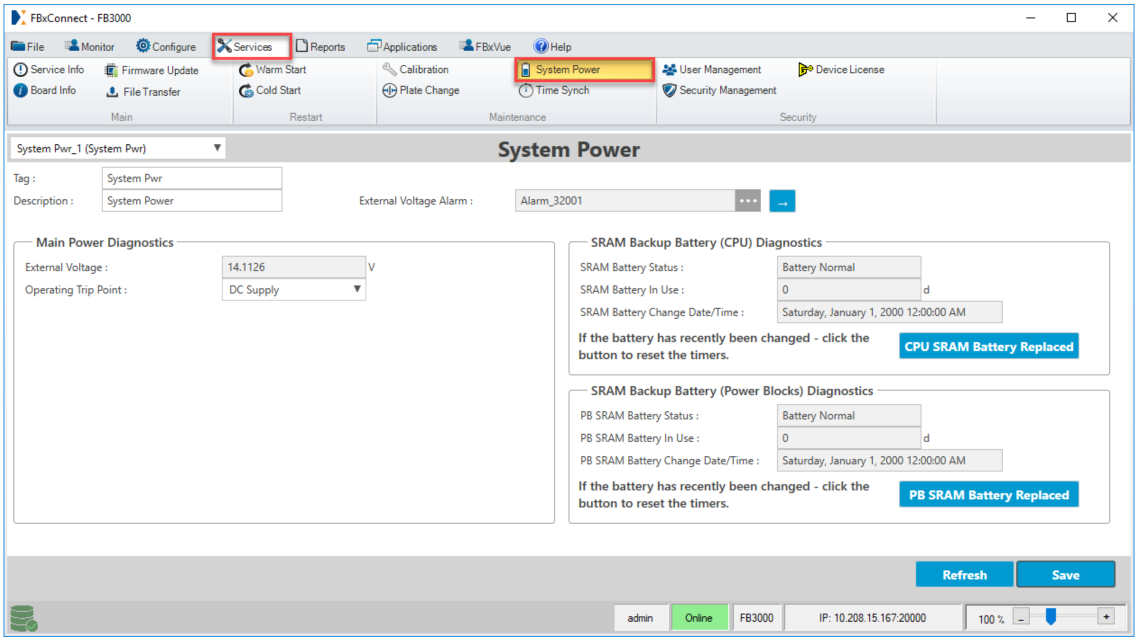
FBxConnect™ monitors battery health and displays battery diagnostics, including the last time the battery was changed. If you change the device battery or SRAM battery, you should reset the timers displayed in FBxConnect™.

You can also set the operating trip point. The operating trip point is the external voltage required to power the device. The device enters a low-power mode when the external and battery (if applicable) voltage falls below the operating trip point.

To access this screen:

1. Select **Services > System Power** from the FBxConnect™ main menu. The System Power screen displays.

Figure 393. System Power



Tag : System Pwr
Description : System Power
External Voltage Alarm : Alarm_32001

External Voltage : 14.1126 V
Operating Trip Point : DC Supply

SRAM Battery Status : Battery Normal
SRAM Battery In Use : 0 d
SRAM Battery Change Date/Time : Saturday, January 1, 2000 12:00:00 AM
If the battery has recently been changed - click the button to reset the timers.

PB SRAM Battery Status : Battery Normal
PB SRAM Battery In Use : 0 d
PB SRAM Battery Change Date/Time : Saturday, January 1, 2000 12:00:00 AM
If the battery has recently been changed - click the button to reset the timers.

2. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Enter a short name (up to 20-alphanumeric characters) for the point.
Description	Enter a short description (up to 20-alphanumeric characters) for the point.

Field	Description
External Voltage Alarm	This **read-only** field shows you which alarm is currently configured for the external voltage. **Note** Click ➔ to open the Alarms screen and configure the alarm parameters.
External Voltage	This **read-only** field shows the current voltage from the external power source.
Operating Trip Point	Click ▼ to set the set the minimum voltage required to power the device. The device enters a low power mode when the voltage falls below the configured trip point. Possible options are Solar Supply (powered by solar panel) and DC Supply (powered by a DC power supply).
SRAM Battery Status	This **read-only** field shows the status of the CPU SRAM battery. Possible statuses include Battery Normal and Battery Failure or Removal. **Note** This field is updated once per day at 8 a.m. and when the FB Series product is power cycled.
SRAM Battery In Use	This **read-only** field shows the number of days the CPU SRAM battery has been in use. The CPU SRAM battery is considered in use when the external voltage and battery voltage are too low to power the device.
SRAM Battery Change Date/Time	This **read-only** field shows the date for the last time the user indicated a CPU SRAM battery change.
CPU SRAM Battery Replaced	Click to indicate the CPU SRAM battery has been replaced. The software updates the Backup Battery Diagnostics and Battery Change Events fields, including resetting the CPU SRAM battery runtime.
PB SRAM Battery Status	This **read-only** field shows the status of the Power Blocks (PB) SRAM battery. Possible statuses include Battery Normal and Battery Failure or Removal. **Note** This field is updated once per day at 8 a.m. and when the FB Series product is power cycled.

Field	Description
PB SRAM Battery In Use	This **read-only** field shows the number of days the PB SRAM battery has been in use. The PB SRAM battery is considered in use when the external voltage and battery voltage are too low to power the device.
PB SRAM Battery Change Date/Time	This **read-only** field shows the date for the last time the user indicated a PB SRAM battery change.
PB SRAM Battery Replaced	Click to indicate the PB SRAM battery has been replaced. The software updates the Backup Battery Diagnostics and Battery Change Events fields, including resetting the CPU SRAM battery runtime.

3. Select **Save** to save any changes you make to this screen.

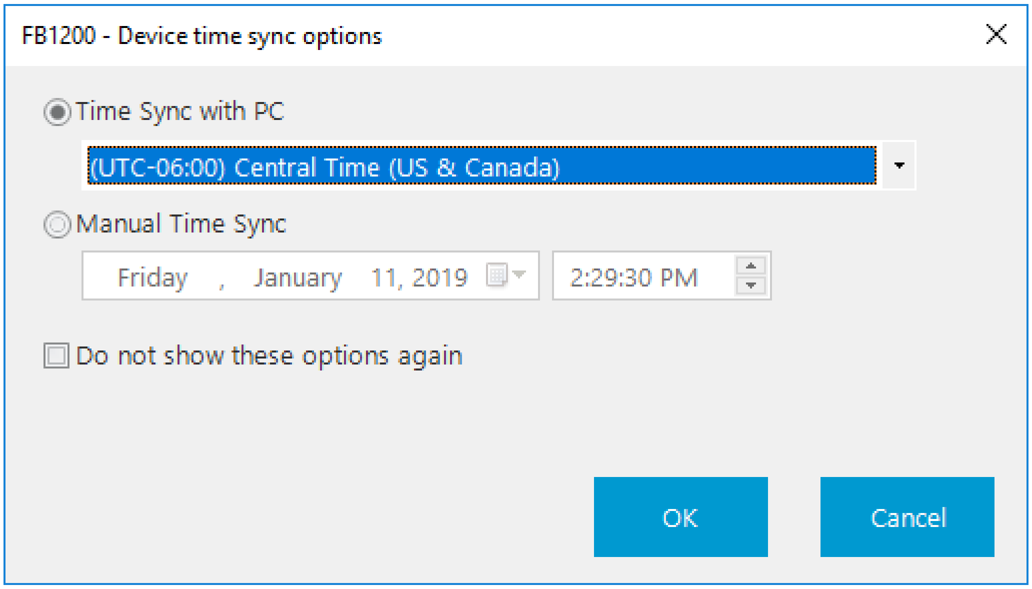
5.10 Time Sync

Use this pop-up display to synchronize the FB Series product clock with your PC clock.

To synchronize the FB Series product clock with your PC clock:

1. Select **Services > Time Sync** from the FBxConnect™ main menu. The following display opens.

Figure 394. Time Sync



FB1200 - Device time sync options

● Time Sync with PC

(UTC-06:00) Central Time (US & Canada)

○ Manual Time Sync

Friday , January 11, 2019

2:29:30 PM

☐ Do not show these options again

2. Select a time sync option. Possible options are:

- **Time Sync with PC** – Copy the PC clock time to the FB Series product.

Note

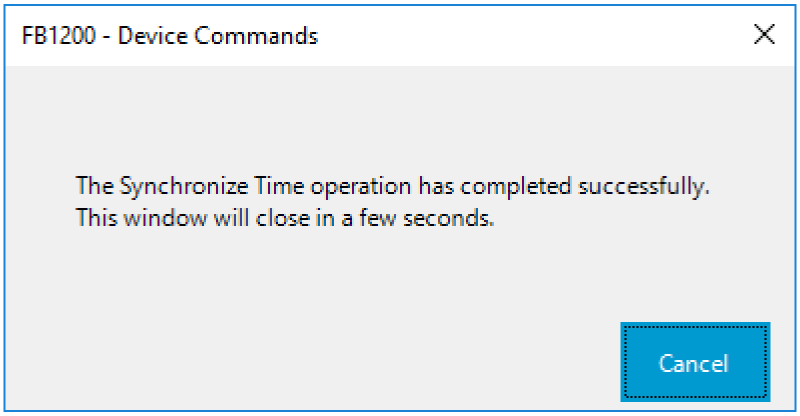
If the time zone displayed is incorrect, select ▼ to in the drop-down list and select your desired time zone.

- **Manual Time Sync** – Manually set the date and time of the FB Series product.

3. Place a check mark in the box next to **Do not show these options again** if you do not want to have the option to manually change the time when synchronizing the time in the future.

4. Select **OK** to synchronize the clock. A confirmation message displays stating the synchronization operation completed successfully.

Figure 395. Confirmation Message



The Synchronize Time operation has completed successfully.
This window will close in a few seconds.

5.11 User Management

Use the User Management display to add, delete, and modify user accounts that are able to log in to the FB Series product. The username and password defined in the FB Series product should match the username and password used to log into Field Tools. For more information about creating and modifying a username or password in Field Tools, refer to the Field Tools online help.

Note

- Changes to user accounts are audited in the event log via the Account Added, Account Removed, Account Modified and Account Locked events.

- Whenever a user logs in or logs out of the system, Login Success and Logout events are recorded in the event log along with the username.
- Unsuccessful login attempts are recorded in the event log as Login Fail Invalid Credentials.
- The “admin” user account is created by default and is counted towards your total number of user accounts. You must be logged in using a different username that is assigned a Role of Admin in order to delete the “admin” user account.

The **FB3000 RTU** supports a total of 100 user accounts. The total number of user accounts **does not** include the internal user accounts (SEC_DISABLE_DNP3, SEC_DISABLE_MODBUS, and FBxNet_Internal), and you **cannot** delete the internal user accounts from the Accounts list.

The Accounts list shows internal user accounts **only** if a communications port is configured to use that particular internal user account. The internal user accounts are used in the following situations:

- The **SEC_DISABLE_DNP3** user account is used when DNP3 protocol communications occur on a communications port with security disabled. Event log entries show changes were performed by the SEC_DISABLE_DNP3 user account.
- The **SEC_DISABLE_MODBUS** user account is used when MODBUS protocol communications occur on a communications port with security disabled. Event log entries show changes were performed by the SEC_DISABLE_MODBUS user account.
- The **FBxNet_Internal** user account is used when FBxNet read/write operations occur. Event log entries show changes were performed by the FBxNet_Internal user account.

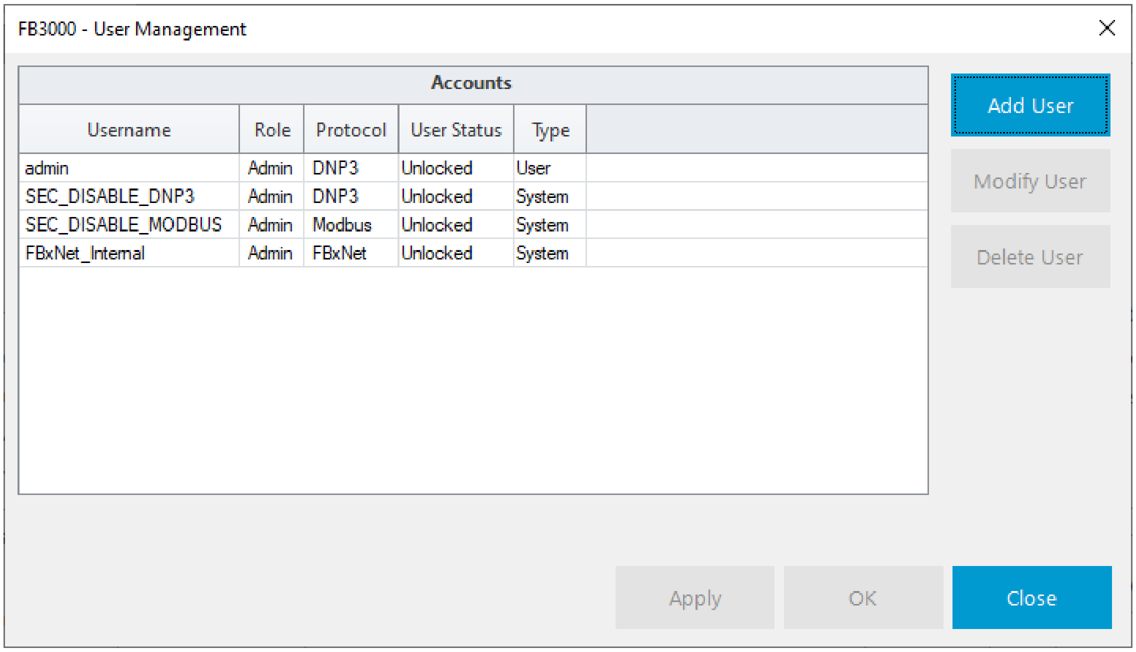
CAUTION

If you require changes to be made on-site **only**, configure the internal user accounts with a Role of Auditor. This prevents anyone from logging in remotely and changing your configuration. Refer to Roles for more information.

To access this display:

1. Select **Services > User Management** from the FBxConnect™ main menu.

Figure 396. User Management



Accounts

Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_DNP3	Admin	DNP3	Unlocked	System
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System

2. Review – and change as necessary – the values in the following fields:

Field	Description	
Accounts	Shows a list of all currently configured user accounts on the FB Series product. **Note** The Accounts list shows internal user accounts **only** if a communications port is configured to use that particular internal user account.	
	Username	This **read-only** field shows the name configured for the user account.
	Role	This **read-only** field shows the organizational role assigned to the user account. Roles limit the access a user account has to the system. For example, the Admin role has full R/W access to parameters while the Auditor role has read-only access to parameters. For more information, refer to Roles.

Field	Description	
	Protocol	This **read-only** field shows what protocol type is used to log on to the FB Series product with the user account. Possible options are DNP3, Modbus, and FBxNet.
	User Status	This **read-only** field shows the status of the selected user account. Possible options are Unlocked and Locked.
	Type	Shows if the user account was created by a user (User) or is a default internal user account (System).
Add User	Select this button to add a new user account to the FB Series product. For more information, refer to Adding a User.	
Modify User	Select a user account from the Accounts list and select this button to modify the selected user account. For more information, refer to Modifying a User.	
Delete User	Select a user account from the Accounts list and select this button to remove the selected user account from the FB Series product. For more information, refer to Deleting a User.	
Apply	Select this button to save any user account changes to FB Series product memory.	
OK	Select this button to save any user account changes to FB Series product memory and exit the display.	
Close	Select this button to exit the display.	

3. Select **Close** to exit this display.

5.11.1 Adding a User

You must first add a user account for them to be able to log in to the FB Series product. When adding a user account, you can configure the user name, password, and organizational role. The FB3000 supports a total of 100 user accounts.

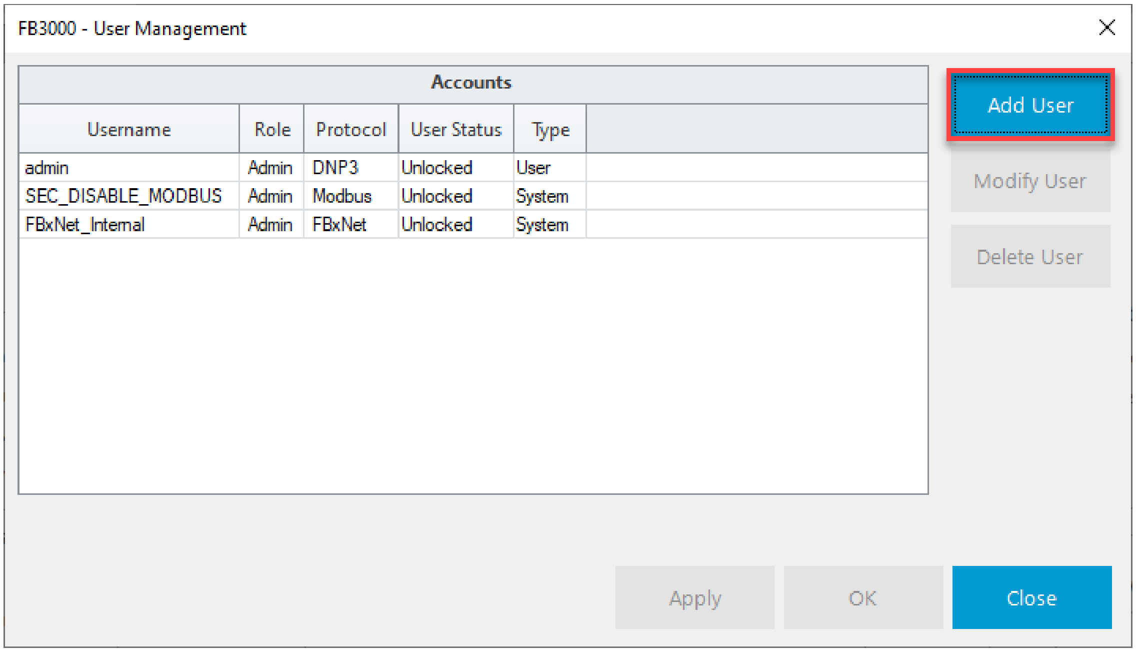
Note

The total number of user accounts includes the **does not** include the default user accounts.

To add a new user:

1. Select **Services > User Management** from the FBxConnect™ main menu. The User Management display opens.

Figure 397. User Management

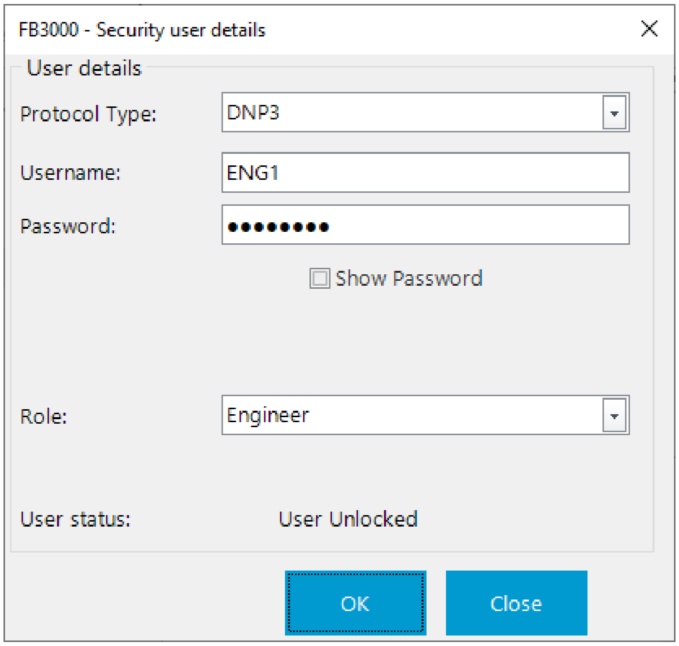


Accounts

Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System

2. Select **Add User**. The Security user details display opens.

Figure 398. Security user details


FB3000 - Security user details

User details

Protocol Type: DNP3

Username: ENG1

Password: ●●●●●●●●●

☐ Show Password

Role: Engineer

User status: User Unlocked

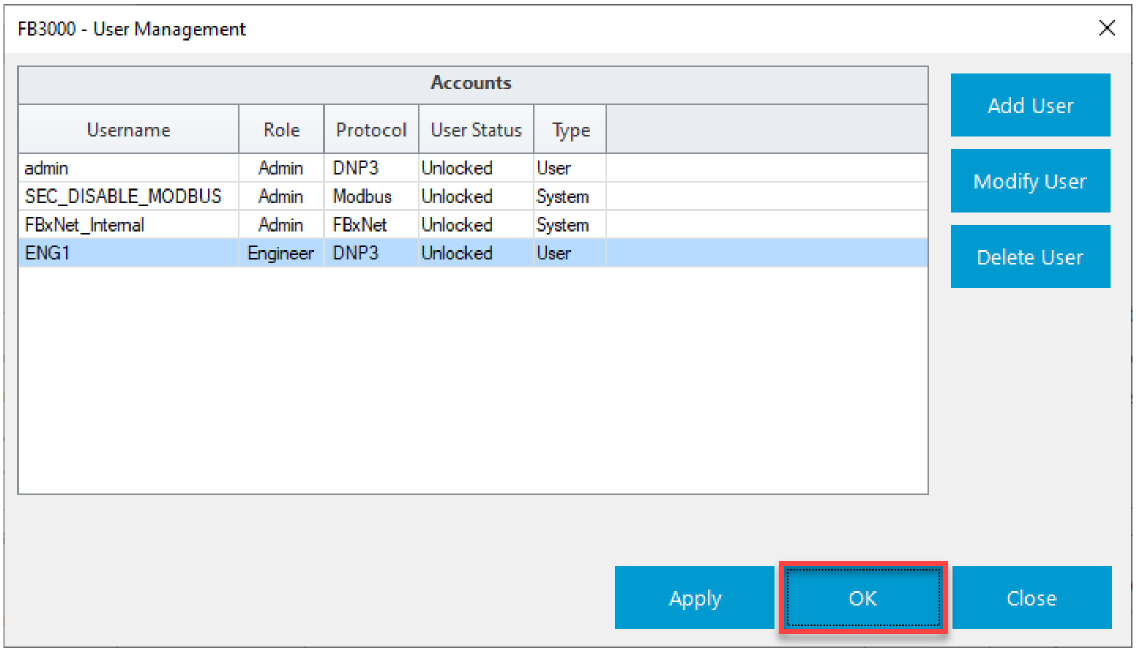
3. Review – and change as necessary – the values in the following fields:

Field	Description
Protocol Type	Click ▼ to select the what protocol type is used to log on to the FB Series product. Possible options are: • DNP3 – Login through FBxConnect™ or another DNP3 host. • FBxNet – Login through FBxNet connections. **Note** If you are modifying an existing user account, this field is **read-only**.
Username	Enter a name for the new user account. • DNP3 – Up to 30-alphanumeric characters. • FBxNet – Up to 30-alphanumeric characters. **Note** If you are modifying an existing user account, this field is **read-only**.

Field	Description
Password	Enter a password for the new user account. • DNP3 – Up to 32-alphanumeric characters. • FBxNet – Up to 32-alphanumeric characters. **Note** The minimum password is set on the Security Management display.
Show Password	Place a check mark to display the characters entered in the Password field.
Role	Click ▼ to assign an organizational role for the user account. Roles limit the access a user account has to the system. For example, the Admin role has full R/W access to parameters while the Auditor role has **read-only** access to parameters. For more information, refer to Roles.
Localization Profile	Click ▼ to assign a Localization profile to use when the selected user account logs in to the device. For more information, refer to Localization.
User Status	This **read-only** field displays the status of the selected user account. Possible options are User unlocked and User locked.

4. Press **OK** to close the Security user details display. The User Management display opens showing the newly added user account in the Accounts frame.

Figure 399. User Management



Accounts				
Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System
ENG1	Engineer	DNP3	Unlocked	User

5. Select **OK** to save your changes and close the User Management display.

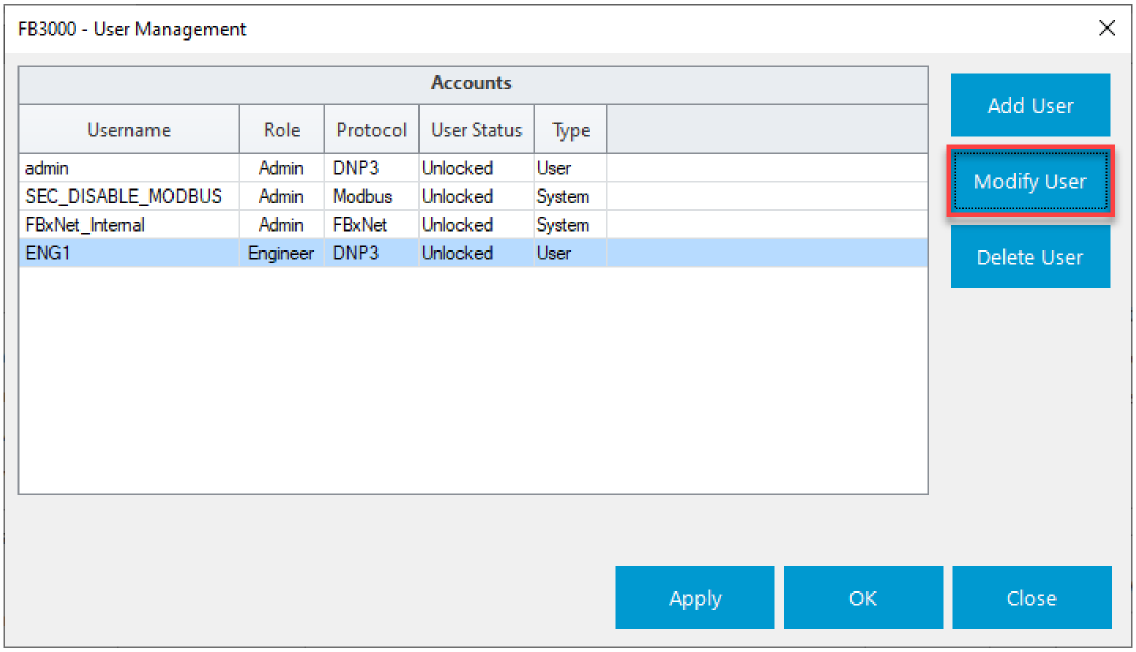
5.11.2 Modifying a User

Use this option to change the login details of a user account.

To modify a user:

1. Select **Services > User Management** from the FBxConnect™ main menu. The User Management display opens.

Figure 400. User Management



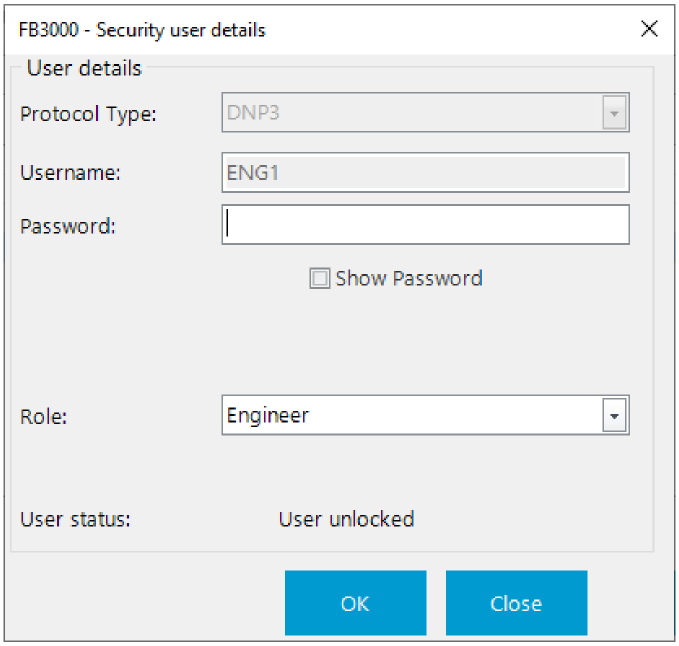
Accounts

Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System
ENG1	Engineer	DNP3	Unlocked	User

2. Select the user account whose login details you want to change.

3. Select **Modify User**. The Security user details display opens.

Figure 401. Security User Details



User details

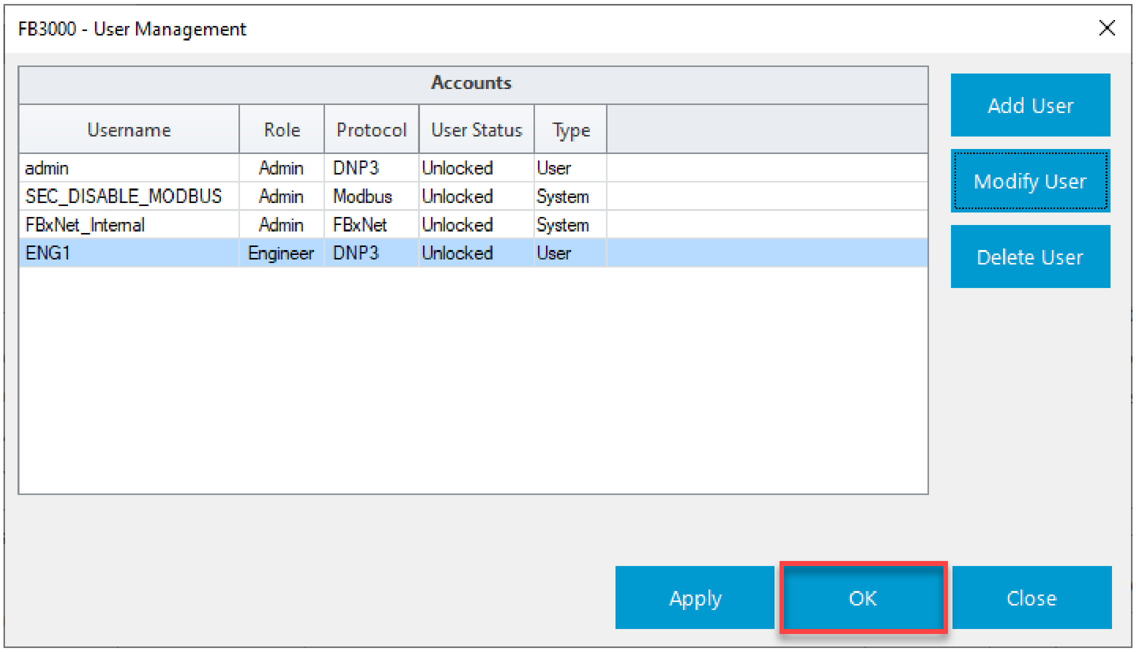
Protocol Type: DNP3
Username: ENG1
Password:
☐ Show Password
Role: Engineer
User status: User unlocked

4. Review – and change as necessary – the values in the following fields:

Field	Description
Protocol Type	Click ▼ to select the what protocol type is used to log on to the FB Series product. Possible options are: • DNP3 – Login through FBxConnect™ or another DNP3 host. • FBxNet – Login through FBxNet connections. **Note** If you are modifying an existing user account, this field is **read-only**.
Username	Enter a name for the new user account. • DNP3 – Up to 30-alphanumeric characters. • FBxNet – Up to 30-alphanumeric characters. **Note** If you are modifying an existing user account, this field is **read-only**.
Password	Enter a password for the new user account. • DNP3 – Up to 32-alphanumeric characters. • FBxNet – Up to 32-alphanumeric characters. **Note** The minimum password is set on the Security Management display.
Show Password	Place a check mark to display the characters entered in the Password field.
Role	Click ▼ to assign an organizational role for the user account. Roles limit the access a user account has to the system. For example, the Admin role has full R/W access to parameters while the Auditor role has **read-only** access to parameters. For more information, refer to Roles.
User Status	This **read-only** field displays the status of the selected user account. Possible options are User unlocked and User locked.

5. Select **OK** when you are finished modifying the user account details. The display closes and FBxConnect™ shows the User Management display.

Figure 402. User Management



Accounts				
Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System
ENG1	Engineer	DNP3	Unlocked	User

6. Select **OK** to save your modifications and exit the User Management display.

5.11.3 Deleting a User

You can prevent users from logging into the FB Series product by removing their user accounts from the Accounts list.

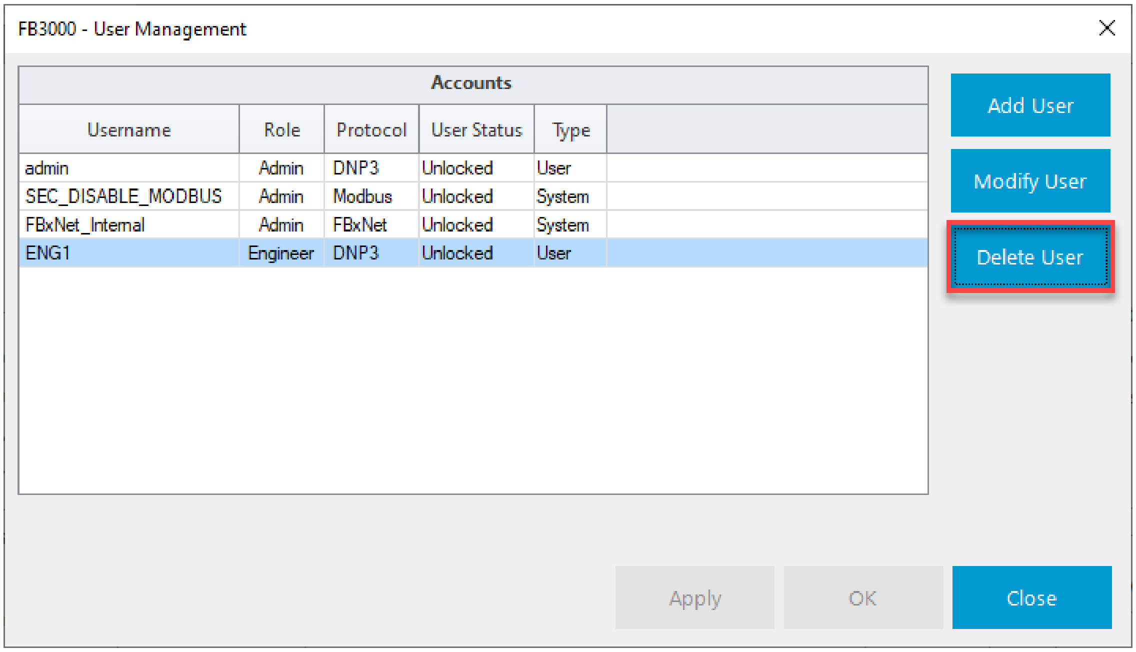
Note

You **cannot** delete the default user accounts from the Accounts list.

To delete a user:

1. Select **Services > User Management** from the FBxConnect™ main menu. The User Management display opens.

Figure 403. User Management



FB3000 - User Management

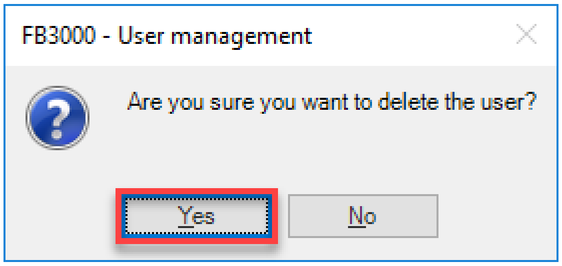
Accounts

Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System
ENG1	Engineer	DNP3	Unlocked	User

2. Select the user account you want to remove.

3. Select **Delete User**. A confirmation dialog opens.

Figure 404. Delete User Confirmation

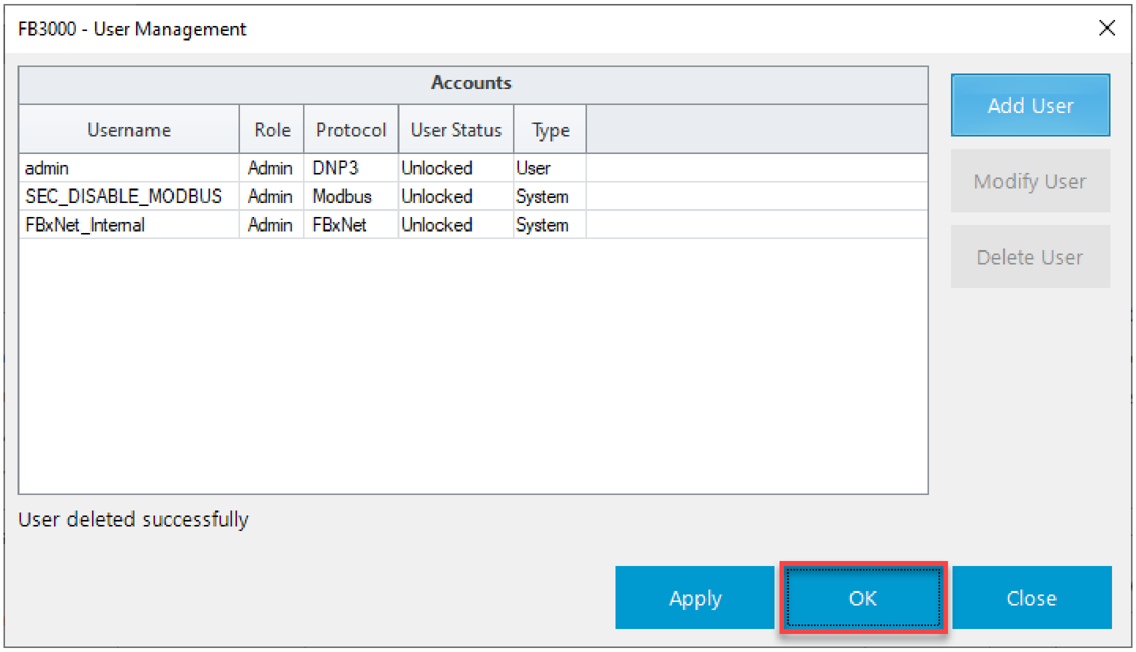


FB3000 - User management

Are you sure you want to delete the user?

4. Select **Yes**. The system removes the user account from the Accounts list.

Figure 405. User Deleted Successfully



Username	Role	Protocol	User Status	Type
admin	Admin	DNP3	Unlocked	User
SEC_DISABLE_MODBUS	Admin	Modbus	Unlocked	System
FBxNet_Internal	Admin	FBxNet	Unlocked	System

User deleted successfully

5. Select **OK** to save your changes and exit the display.

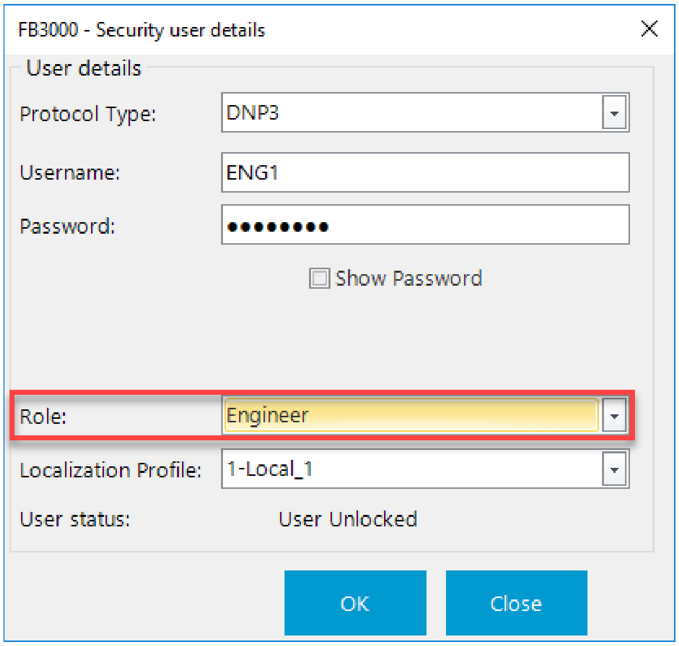
5.11.4 Roles

Roles control access to specific parameters in the FB Series product. You assign a "role" to each user account in FBxConnect™, and each parameter in the FB Series product also has a "role" attribute. For example, a user account with a role set to Admin has access to all read/write parameters in the FB Series product. A user account with a role set to Auditor has read-only access to all parameters in the FB Series product.

Note

- The role assigned to each parameter is detailed in the *DNP3 Protocol Specifications Manual (for the Emerson FB3000 RTU)* (D301858X012).
- Functions not associated with one specific parameter (such as firmware update or configuration download) are controlled by Permissions. Use the Permissions display to configure which roles have access to perform these functions in FBxConnect™.

Figure 406. Security User Details – Role


FB3000 - Security user details

User details

Protocol Type: DNP3

Username: ENG1

Password: ●●●●●●●●●

☐ Show Password

Role: Engineer

Localization Profile: 1-Local_1

User status: User Unlocked

The following table outlines the permissions available to each role:

Note

At least one user account needs to be assigned a role of **Admin**.

Role	Description
Admin	Access to all R/W parameters; setup user accounts; download configurations; update firmware; update the FB Series product clock; collect data; clear alarms, events, history, and totals.
Engineer	Same access as Admin, but cannot setup user accounts or configure roles.
Measurement Tech	Same access as Engineer.
Operator	Access to collect data, adjust alarm limits, and permission to configure PID setpoints, modes, and manual output values.
Auditor	Access to **only** view data.

5.12 Security Management

Use this pop-up display to configure password and login requirements for users logging into the FB Series product, and to configure which user roles have access to perform specific functions in the software.

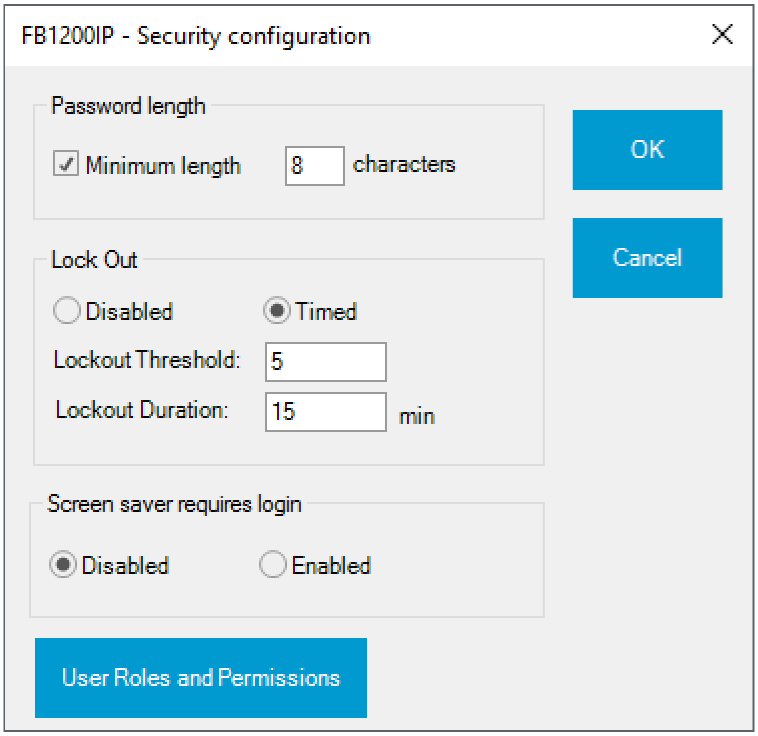
Note

Changes made to the Security Configuration display apply to **all** users on the FB Series product.

To access this display:

1. Select **Services > Security Management**. The Security Configuration display opens:

Figure 407. Security Configuration



FB1200IP - Security configuration

Password length

☑ Minimum length 8 characters

Lock Out

○ Disabled ● Timed

Lockout Threshold: 5

Lockout Duration: 15 min

Screen saver requires login

● Disabled ○ Enabled

2. Review – and change as necessary – the values in the following fields:

Field	Description
Password length	Sets a required minimum number of characters for a valid user password. To enable this feature, place a check mark in the **Minimum length** field and enter the required number of characters in the **characters** field. **Note** • Modifying this field does not affect existing passwords. • This field applies **only** to passwords set through FBxConnect™.
Lock Out	The lock out feature prevents an account from logging in to an FB Series product if that account's credentials have been incorrectly entered a pre-configured number of times. **Disabled** Prevents a user from becoming locked out. **Timed** Enables a user to be locked out for a configurable amount of time. **Note** An alarm is active on the FB Series product for the Lock Out duration.
Lockout Threshold	Sets the number of consecutive invalid login attempts that must occur before the account becomes locked.
Lockout Duration	Sets the length of time (in minutes) you must wait after being locked out before you can successfully log in. **Note** You can cancel the Lockout Duration by restarting the FB Series product.
User Roles and Permissions	Select to open the Permissions pop-up and configure which user Roles have access to specific functions in the software.

3. Select **OK** to save any changes and close this display.

5.12.1 Permissions

Permissions allow you to control access to functions not associated with one specific parameter in the FB Series product (such as firmware update or configuration download). Use this display to configure which user roles have access to perform these functions in FBxConnect™.

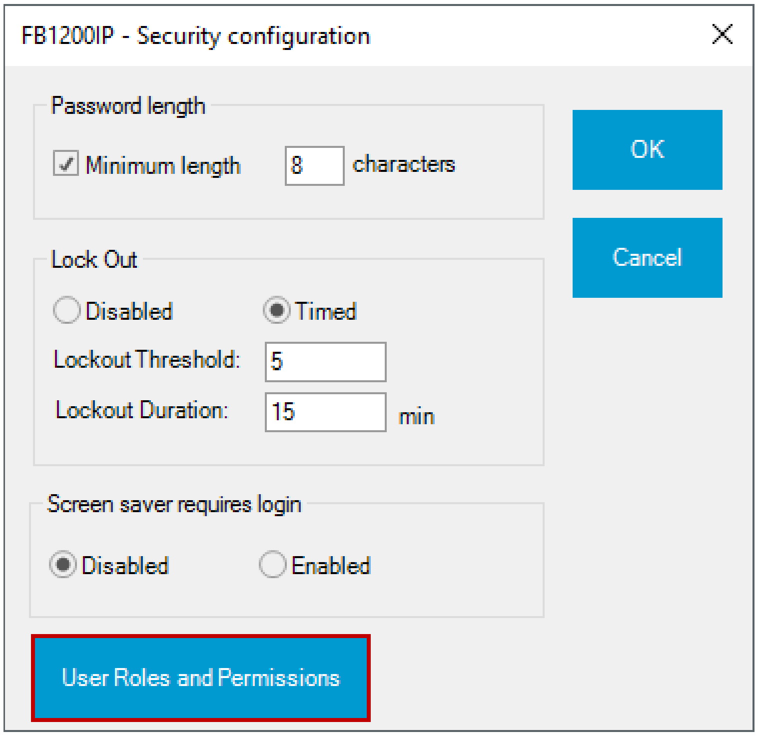
Note

- Refer to Roles for more information about which roles have access to what parameters in the FB Series product.
- Refer to User Management to configure which role is assigned to a user.

To access this display:

1. Select **Services > Security Management**. The Security Configuration display opens:

Figure 408. Security Configuration



FB1200IP - Security configuration

Password length

☑ Minimum length 8 characters

Lock Out

○ Disabled ● Timed

Lockout Threshold: 5

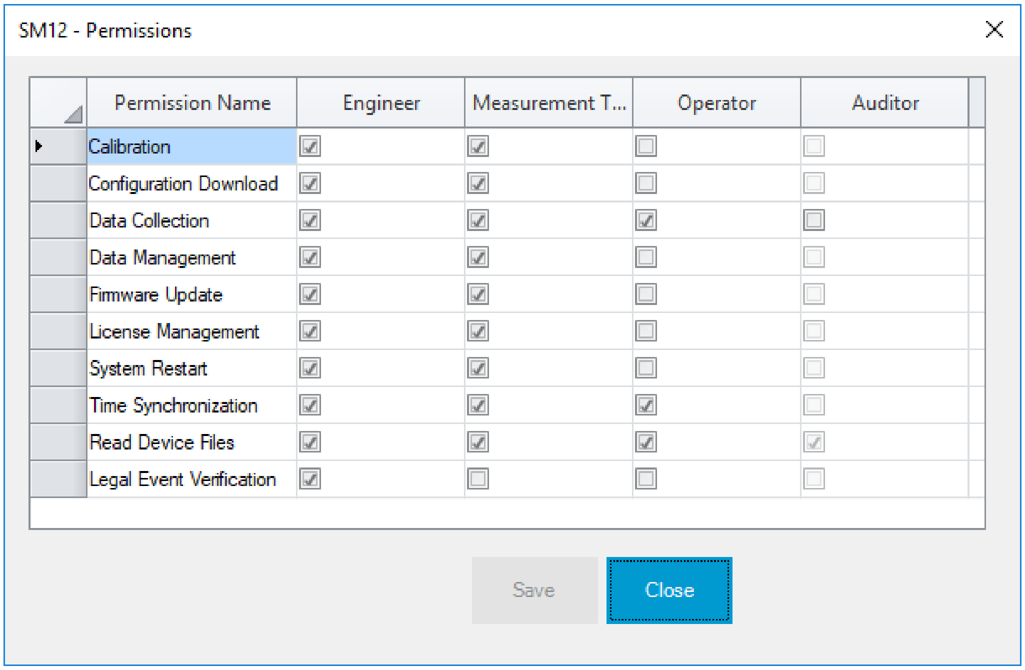
Lockout Duration: 15 min

Screen saver requires login

● Disabled ○ Enabled

2. Select **User Roles and Permissions**. The Permissions display opens:

Figure 409. Permissions



SM12 - Permissions

Permission Name	Engineer	Measurement T...	Operator	Auditor
Calibration	☑	☑	☐	☐
Configuration Download	☑	☑	☐	☐
Data Collection	☑	☑	☑	☐
Data Management	☑	☑	☐	☐
Firmware Update	☑	☑	☐	☐
License Management	☑	☑	☐	☐
System Restart	☑	☑	☐	☐
Time Synchronization	☑	☑	☑	☐
Read Device Files	☑	☑	☑	☑
Legal Event Verification	☑	☐	☐	☐

3. To grant functional permissions to user roles, place a check mark in the user role column for each Permission Name. In the graphic above, the Engineer and Measurement Tech have permission to all system functions, while the Operator has permissions only for Data Collection, Time Synchronization, and Read Device Files. Any user you assign to those roles have those permissions.

   Functions associated with each Permission Name are as follows:

Permission Name	Description
Calibration	Allows you to calibrate an input, verify a calibration, reset a calibration, set zero shift, and perform a plate change.
Configuration Download	Allows you to download a configuration to the FB Series product. **Note** You must also select **Data Management** for a user role to be able to successfully download a configuration.
Data Collection	Allows you to create history, alarm, and event reports from the FB Series product.
Data Management	Allows you to create diagnostic reports and clear alarm, event, and history data from the FB Series product.

Permission Name	Description
Firmware Update	Allows you to update the firmware on the FB Series product. **Note** You must also select **Data Management** for a user role to be able to successfully apply a update firmware.
License Management	Allows you to add and remove product licenses from the FB Series product.
System Restart	Allows you to perform a warm or cold start on the FB Series product.
Time Synchronization	Allows you to adjust the clock on the FB Series product.
Read Device Files	Allows you **read-only** access to the files stored on the FB Series product.
Legal Event Verification	Allows you to verify the configuration of the FB Series product.

4. Select **Save** to save any changes you make to this display
5. Select **Close** to return to the previous display.

5.13 Device License

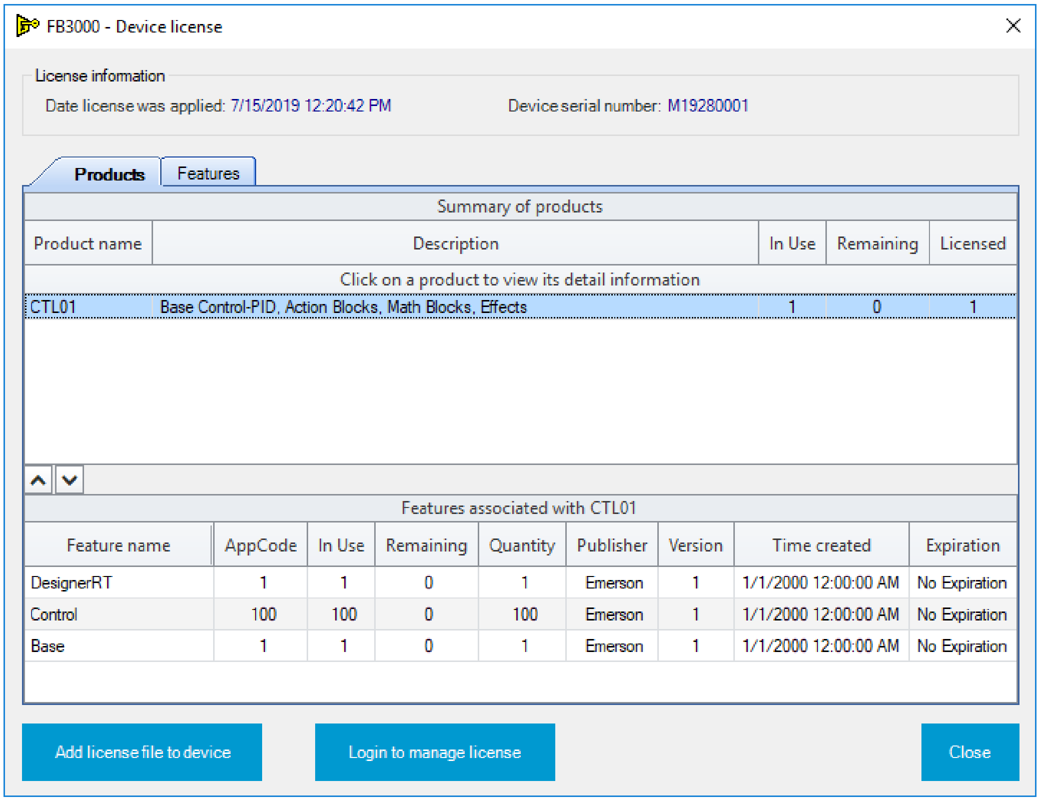
Use the Device License pop-up display to view products licensed on your FB3000 RTU, add a previously downloaded license file to your FB3000 RTU, or login to the Cloud Licensing Portal to manage licenses for your device.

The Device License display has two tabs (Products and Features), and each tab is split into an upper (Summary of Products/Features) and lower (Associated Products/Features) section. Select a Product or Feature in the upper section to display the corresponding product or features in the lower section.

To access this display:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 410. Device License



License information

Date license was applied: 7/15/2019 12:20:42 PM

Device serial number: M19280001

Summary of products

Product name	Description	In Use	Remaining	Licensed
Click on a product to view its detail information				
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

Features associated with CTL01

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

2. Review – and change as necessary – the values in the following fields:

Field	Description	
Summary of Products / Features	Shows a table of products/features currently licensed on the FB3000 RTU. Each row of the table contains information specific to the product/feature described in that row. Click on a product/features row to view information about the associated product/features in the section below.	
	Product Name	This **read-only** field shows the code of the product licensed on the FB Series device. **Note** This column appears **only** for the Products tab.
	Description	This **read-only** field shows a description of the product/feature licensed on the FB Series device.

Field	Description	
	In Use	This **read-only** field shows the number of product/features currently used by the FB Series product.
	Remaining	This **read-only** field shows the number of product/features not currently used by the FB Series product.
	Licensed	This **read-only** field shows the total number of product/features licensed on the FB Series product.
Features Associated with a Product/ Products Associated with a Feature	Shows the information for the product or feature selected in the Summary section.	
	Feature Name/Product Name	This **read-only** field shows the product name or feature description associated with the product/feature selected in the Summary section.
	AppCode	This **read-only** field shows a code the vendor or developer has associated with the particular application. Refer to the vendor's application documentation for a meaning of the application code. **Note** Do not mistake the AppCode for the license quantity.
	In Use	This **read-only** field shows the number of a product/feature currently used by the FB Series product.
	Remaining	This **read-only** field shows the allowed number of a product/feature not currently used by the FB Series product.
	Quantity	This **read-only** field shows the total number of a product/feature available of the FB Series product.
	Publisher	This **read-only** field shows the organization who issued the license for a product/feature.
	Version	This **read-only** field shows the revision level of the product/feature.
	Time Created	This **read-only** field shows the date and time the license was created for a product/feature.

Field	Description
	Expiration This **read-only** field shows the date and time the license will expire for a product/feature.
Add license file to device	Click to add a license file to your FB3000 RTU. **Note** License files are downloaded from the Emerson license website. For more information, refer to Add License File to Device.
Login to manage license	Click to login to the Cloud Licensing Portal and open the License Management window. The License Management display allows you to add or remove product licenses between the Cloud Licensing Portal and the FB Series product. For more information, refer to License Management.
Close	Click to close the Device License display.

5.13.1 Add License File to Device

You can add a previously downloaded license file to your FB3000.

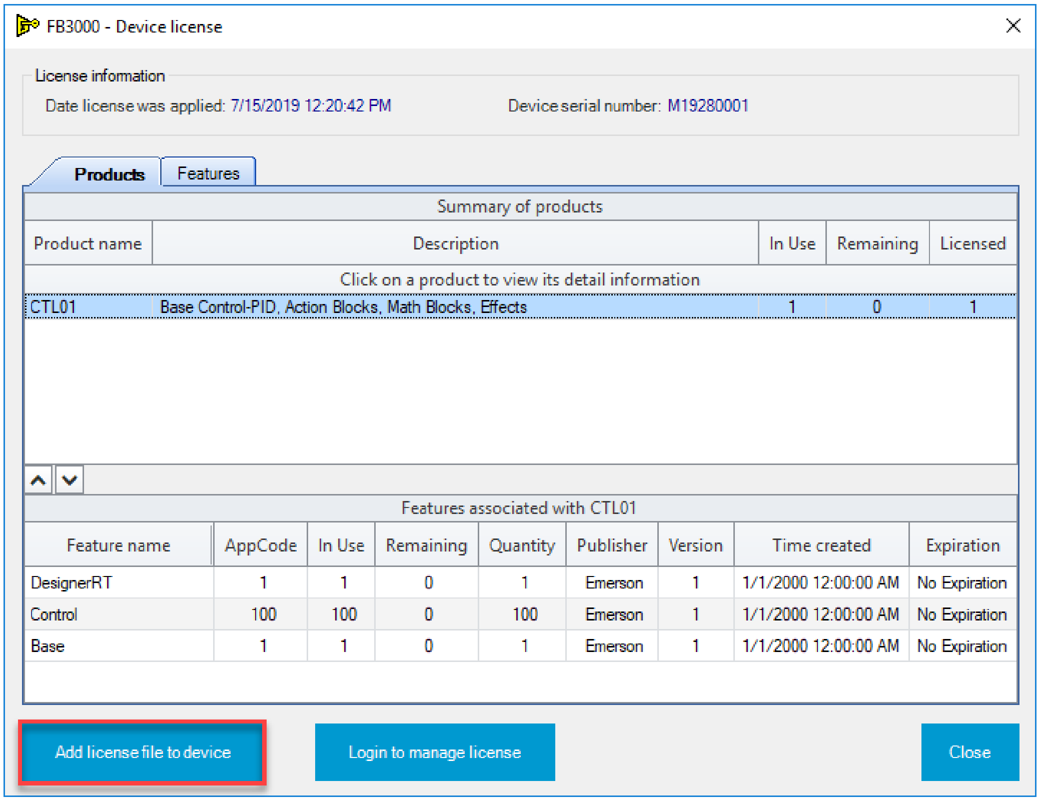
Note

You can download a license file through the Cloud Licensing Portal.

To add a license file to your device:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 411. Device License



Date license was applied: 7/15/2019 12:20:42 PM

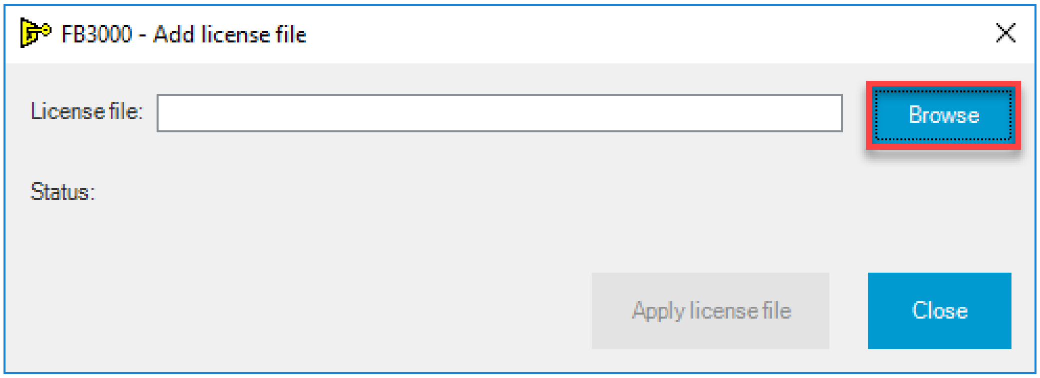
Device serial number: M19280001

Product name	Description	In Use	Remaining	Licensed
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

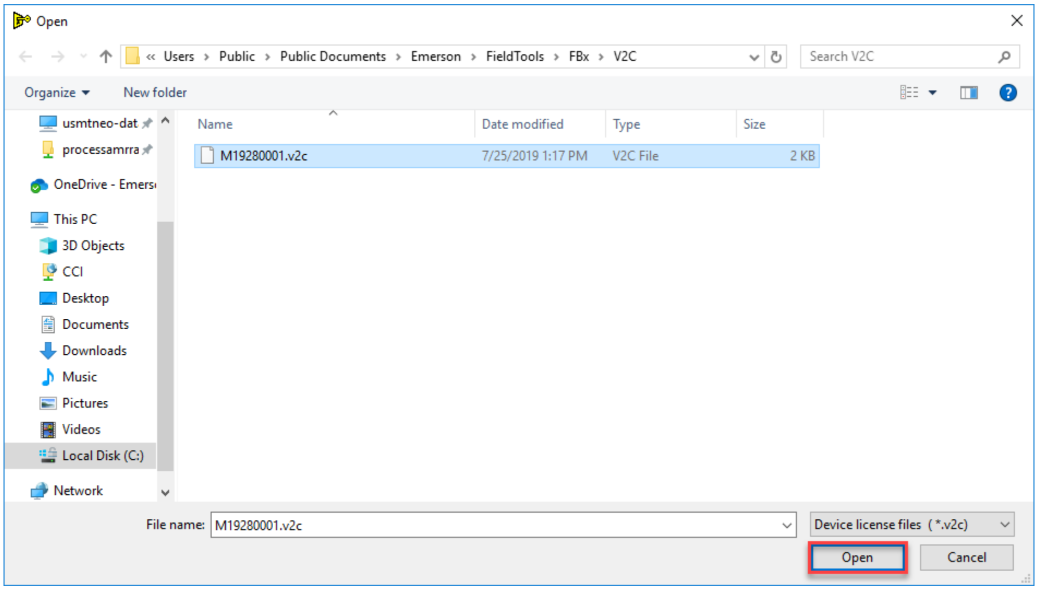
2. Select **Add license file to device**. The Add license file pop-up opens.

Figure 412. Add license file



3. Select **Browse**. A file window dialog opens.

Figure 413. Add license file

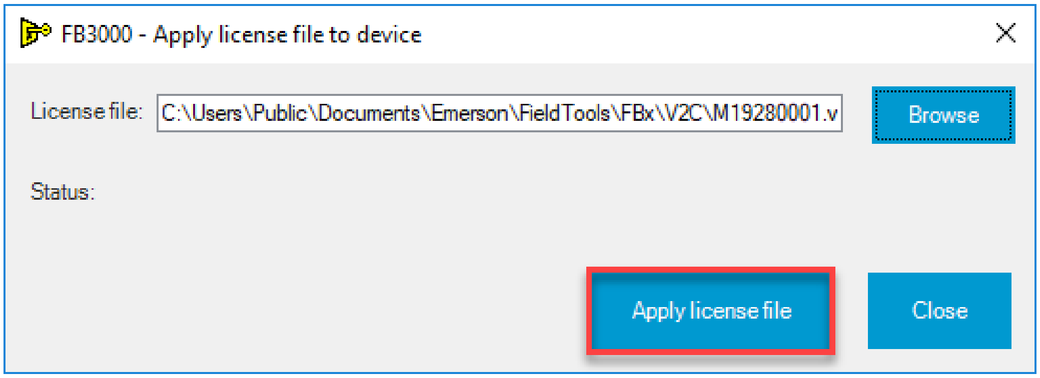


Name	Date modified	Type	Size
M19280001.v2c	7/25/2019 1:17 PM	V2C File	2 KB

File name: M19280001.v2c
Device license files (*.v2c)

4. Navigate to the location of the downloaded license file on your PC, select the file, and then select **Open**.

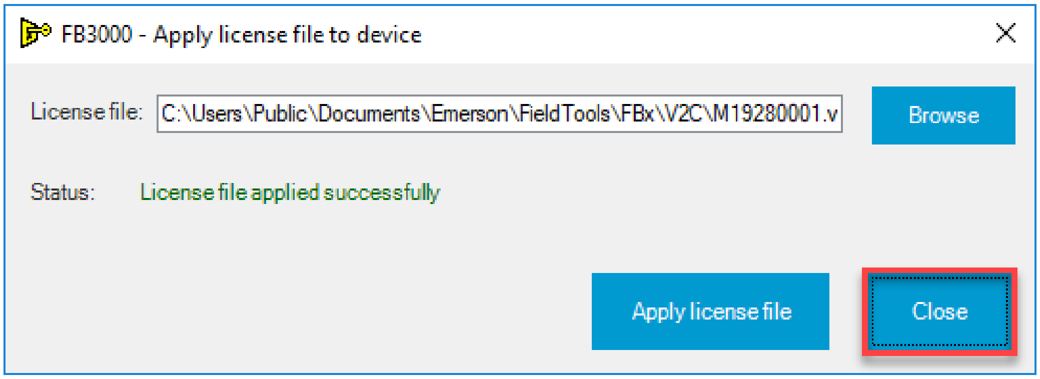
Figure 414. Add license file



License file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\V2C\M19280001.v
Status:

5. Select **Apply license file** to add the selected license file to your device. The system applies the license to your device and updates the Status field.

Figure 415. License File Applied Successfully



License file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\V2C\M19280001.v

Status: License file applied successfully

6. Select **Close** to return to the previous screen.

5.13.2 License Management

The License Management pop-up display allows you to add or remove licensed products between the Cloud Licensing Portal and the FB Series product. After you make a change to the products licensed to your FB Series device, a new license file is downloaded from the Cloud Licensing Portal and applied to your device.

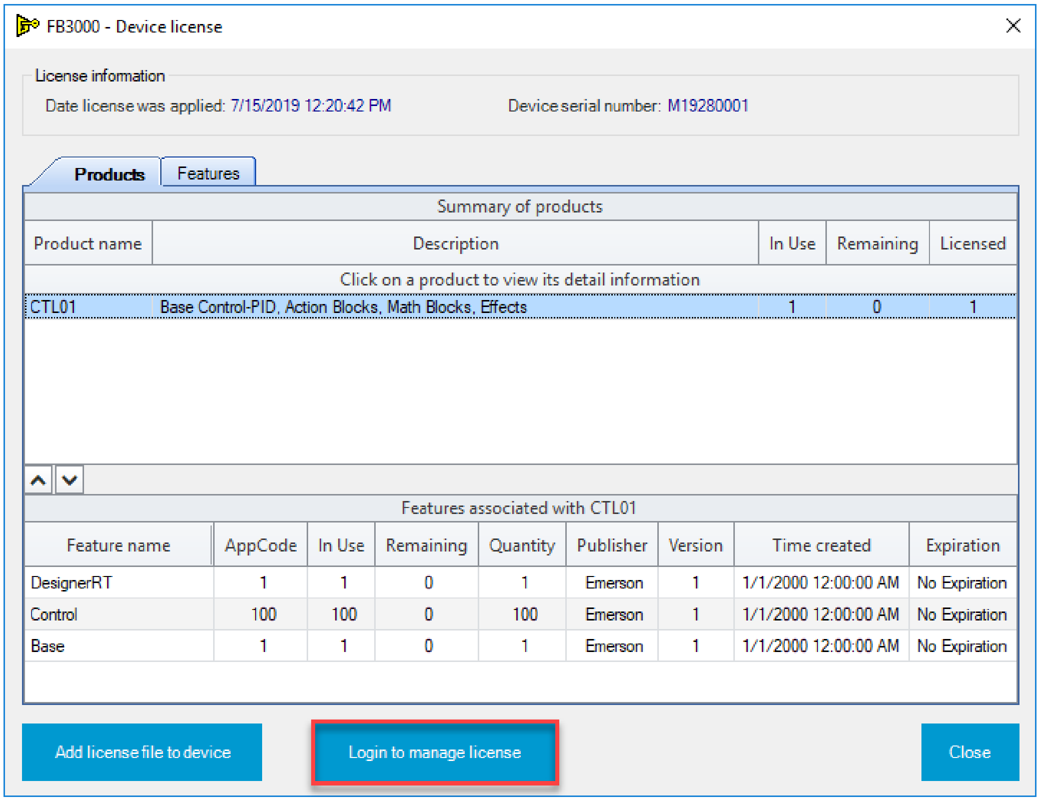
Note

If the license information becomes corrupt on your device, use the **Restore** feature to download and apply a new license file based on the information stored in the Cloud Licensing Portal.

To open the License Management pop-up display:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 416. Device License



License information

Date license was applied: 7/15/2019 12:20:42 PM

Device serial number: M19280001

Summary of products

Product name	Description	In Use	Remaining	Licensed
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

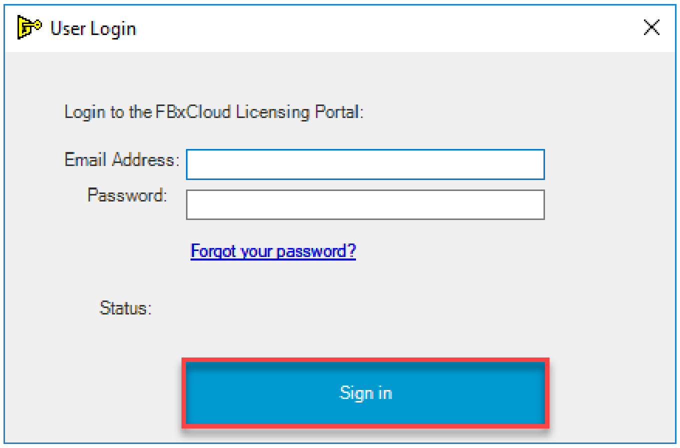
Click on a product to view its detail information

Features associated with CTL01

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

2. Select **Login to manage license**. The User Login dialog displays.

Figure 417. User Login



Login to the FBxCloud Licensing Portal:

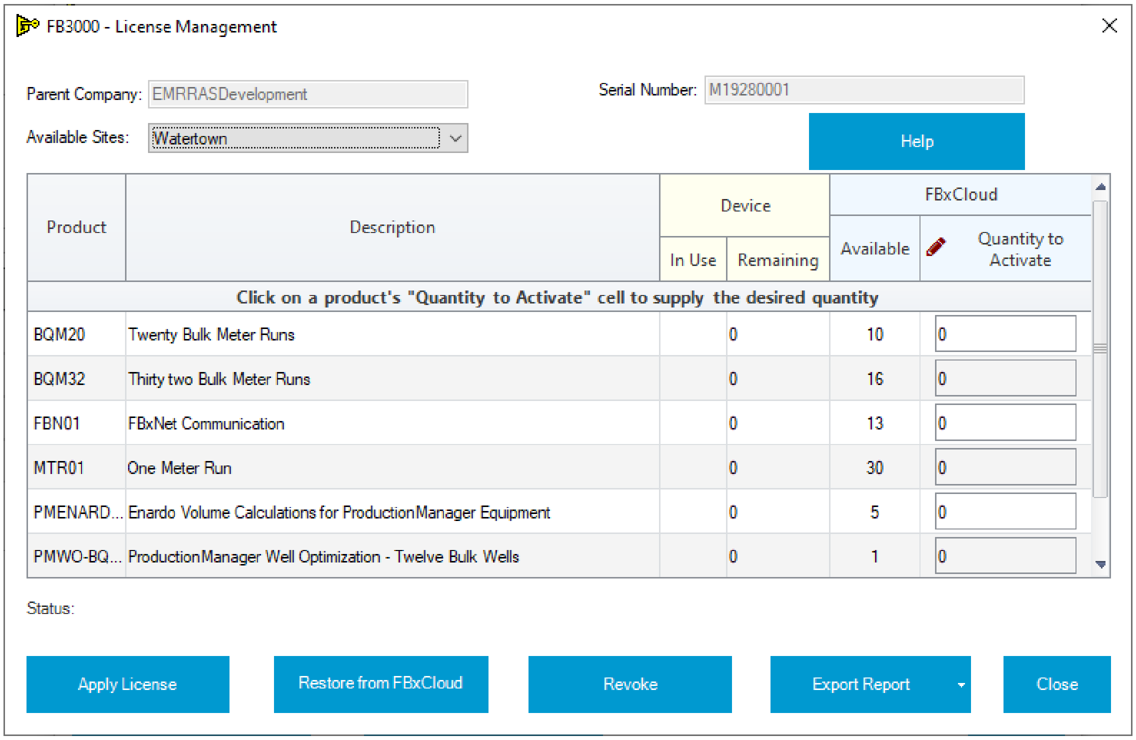
Email Address:

Password:

Status:

3. Enter the e-mail address and password required to login to the Cloud Licensing Portal, and then select **Sign in**. The License Management display opens.

Figure 418. License Management



FB3000 - License Management

Parent Company: EMRRASDevelopment

Serial Number: M19280001

Available Sites: Watertown

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	✎ Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status:

4. Review – and change as necessary – the values in the following fields:

Field	Description
Parent Company	This **read-only** field shows the name of your company as configured in the Cloud Licensing Portal.
Available Sites	Click ▼ to select a site and view the products assigned to the selected site. **Note** You **must** be assigned to a site in the Cloud Licensing Portal before it is available in the drop-down list.

Field	Description	
Serial Number	Shows the serial number of the currently connected FB Series product. **Note** • This field is **read-only** if you are connected to a FB Series product. • This field is blank and **read/write** if you are **not** connected to an FB Series product. For information on activating a license while not connected to an FB Series product, refer to Add License Offline.	
Help	Select to open the online help and view the location on the module of the serial number.	
Product	Shows the product code for a software application/feature assigned to the selected site.	
Description	Shows an explanation of the product code.	
Device	These columns show the products currently activated on your FB Series product.	
	In Use	Shows the number of products currently activated and being used by the FB Series product.
	Remaining	Shows the number of products activated, but **not** currently being used by the FB Series product.
Cloud	These columns show products currently available for your FB Series product through the Cloud Licensing Portal based on the selected Available Site.	
	Available	Shows the number of products on the Cloud Licensing Portal for the selected site.
	Quantity to Activate	In the row for the product you want to activate, double click this field and enter the an amount to assign to the FB Series product.
Apply License	Select to activate the products you configured in the Quantity to Activate column, download, and then apply a new license file to your FB Series product. For more information, refer to Add License from Cloud.	

Field	Description
Restore from Cloud	Select to download and apply a new license file based on the information associated with your serial number that is stored in the Cloud Licensing Portal. For more information, refer to Restore License Info from Cloud.
Revoke	Select to open the License Revocation pop-up display and remove products currently activated on your FB Series product, transfer them to the Cloud Licensing Portal, and download a new license file. For more information, refer to Remove a Licensed Product.
Export Report	Click ▼ and select a site to export a CSV file to your computer that contains a list of all license files assigned to the site. You can choose to export licenses assigned to the site currently selected in the Available Sites field or all sites associated with your login.

5. Select **Close** to return to the Device License pop-up display.

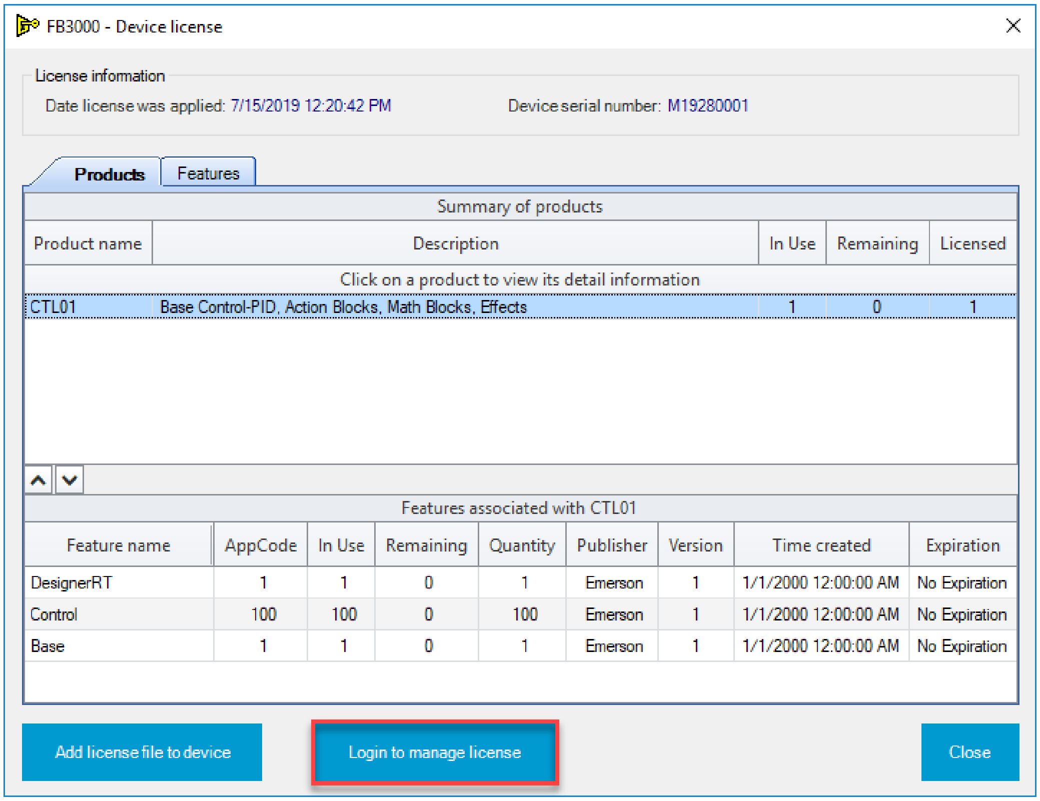
5.13.2.1 Add Licensed Product from the Cloud

You can login to the FBxCloud Licensing Portal directly from within FBxConnect™. This allows you to add products and features to your FB Series product, download a new license file from the Cloud Licensing Portal, and apply the new license file to your device.

To add a product license from the FBxCloud Licensing Portal:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 419. Device License



License information

Date license was applied: 7/15/2019 12:20:42 PM

Device serial number: M19280001

Summary of products

Product name	Description	In Use	Remaining	Licensed
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

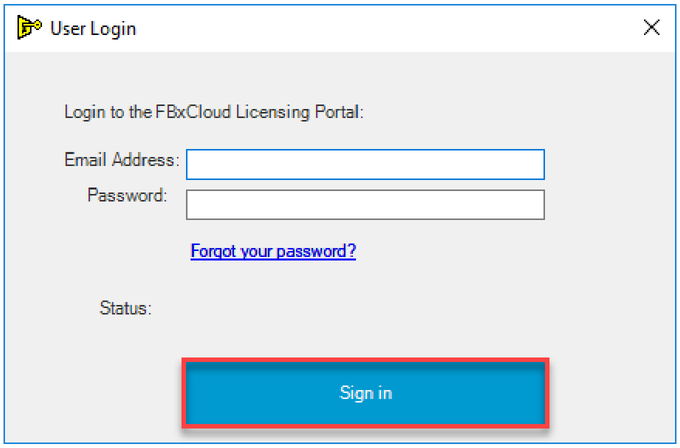
Click on a product to view its detail information

Features associated with CTL01

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

2. Select **Login to manage license**. The User Login dialog displays.

Figure 420. User Login



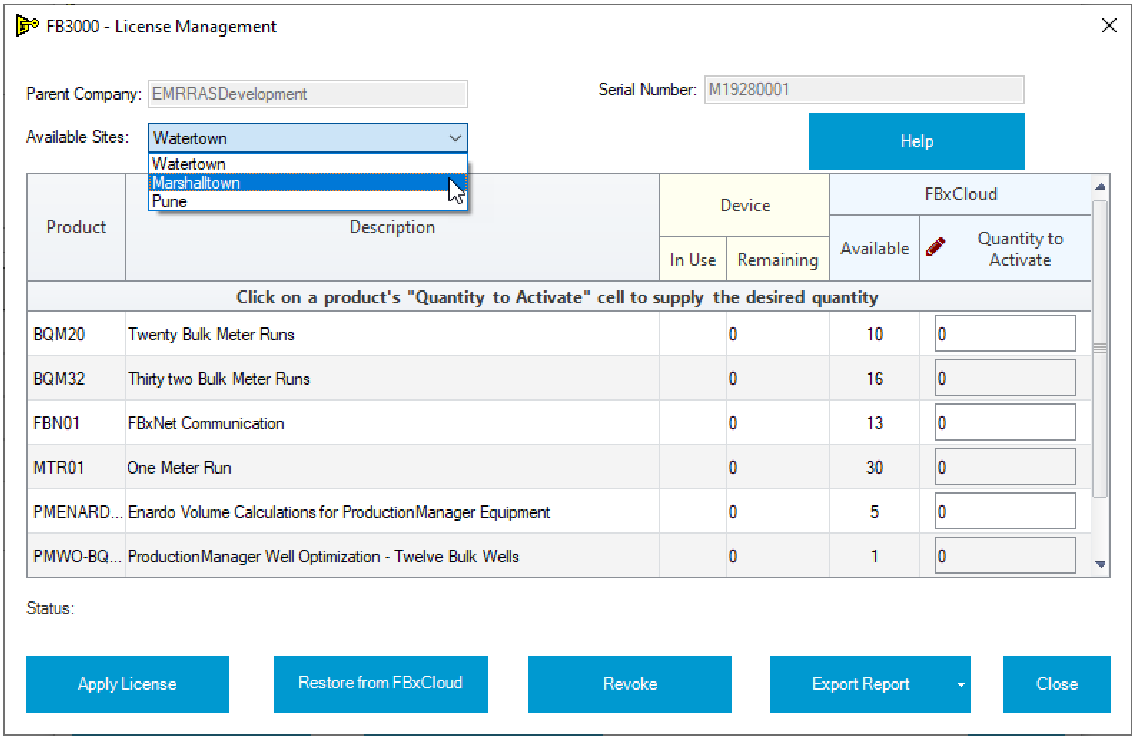
Login to the FBxCloud Licensing Portal:

Email Address:

Password:

3. Enter the e-mail address and password required to login to the FBxCloud Licensing Portal, and then select **Sign in**. The License Management display opens.

Figure 421. License Management



Parent Company: EMRRASDevelopment

Serial Number: M19280001

Available Sites: Watertown

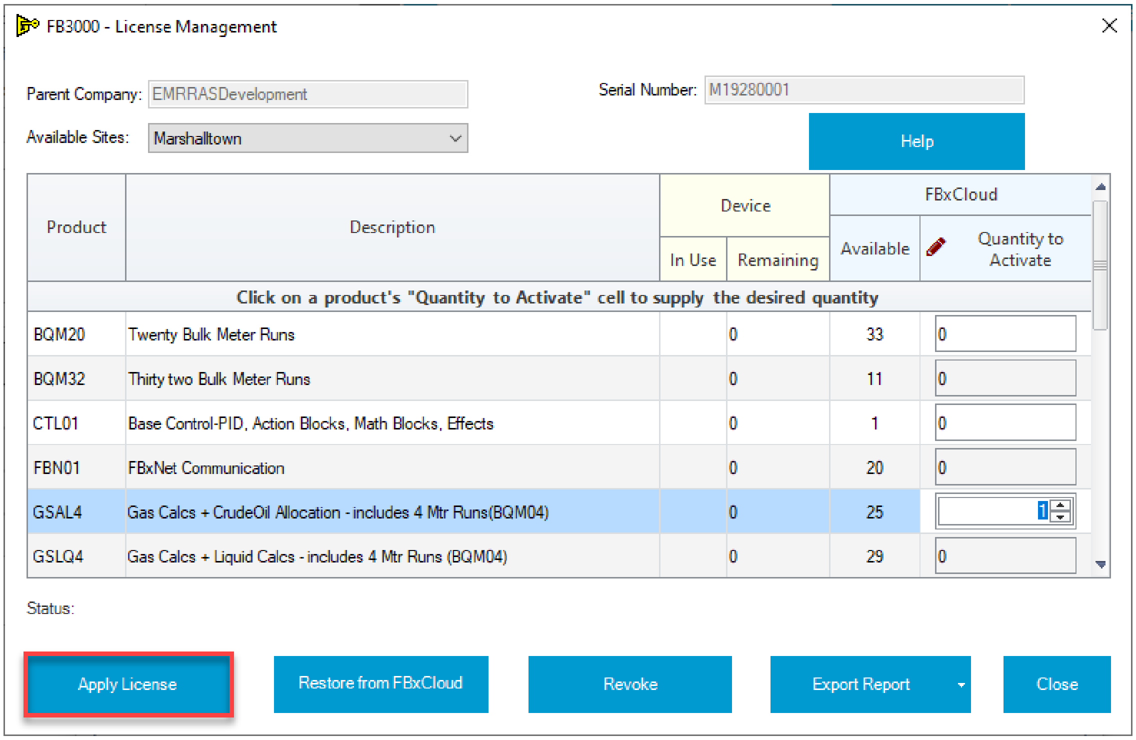
Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status:

4. Click ▼ in the Available Sites field to select your site.

5. The **Device** columns show the products currently licensed on your device. The **FBxCloud** columns show products currently available for your device through the licensing website. In the row for the product you want to activate, double click in the **Quantity to Activate** column and enter the number of licenses to assign to the serial number of the connected FB Series product.

Figure 422. Apply License



Parent Company: EMRRASDevelopment

Serial Number: M19280001

Available Sites: Marshalltown

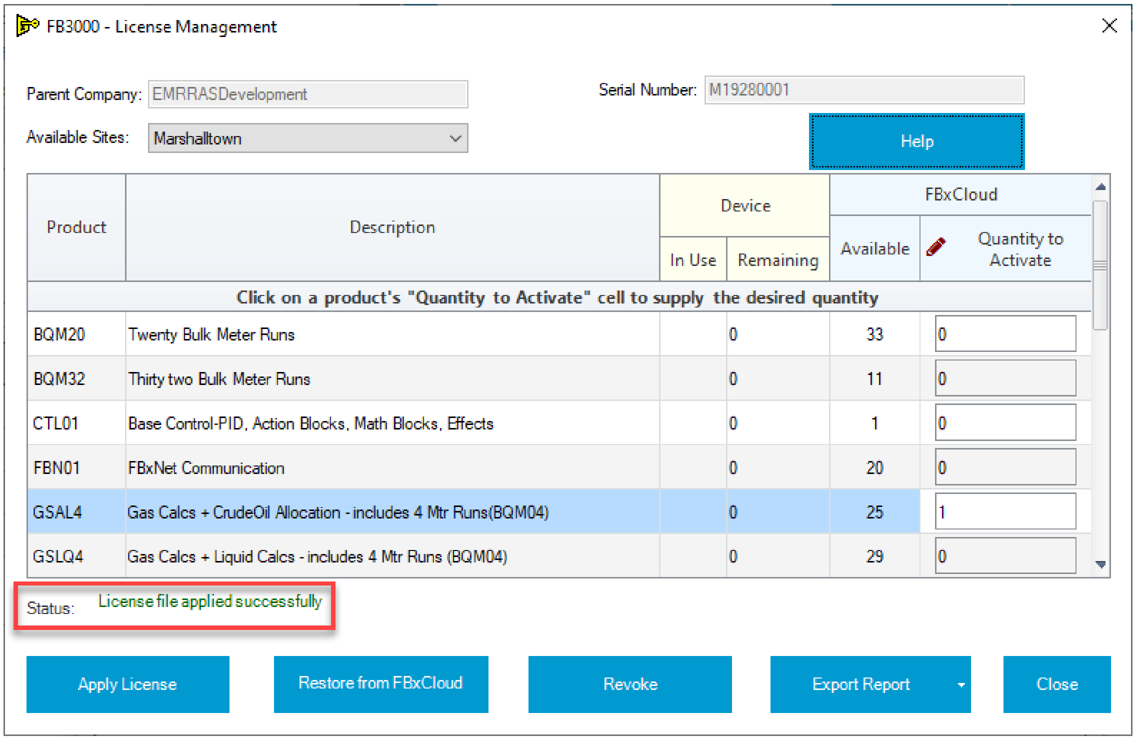
Click on a product's "Quantity to Activate" cell to supply the desired quantity

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
BQM20	Twenty Bulk Meter Runs		0	33	0
BQM32	Thirty two Bulk Meter Runs		0	11	0
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects		0	1	0
FBN01	FBxNet Communication		0	20	0
GSAL4	Gas Calcs + CrudeOil Allocation - includes 4 Mtr Runs(BQM04)		0	25	1
GSLQ4	Gas Calcs + Liquid Calcs - includes 4 Mtr Runs (BQM04)		0	29	0

Status:

6. Select **Apply License** to activate the selected product/feature on your FB Series product. The system downloads a new license file and applies it to the FB Series product. When the transfer is complete, the Status field shows **License file applied successfully**.

Figure 423. License File Applied Successfully



Parent Company: EMRRASDevelopment

Serial Number: M19280001

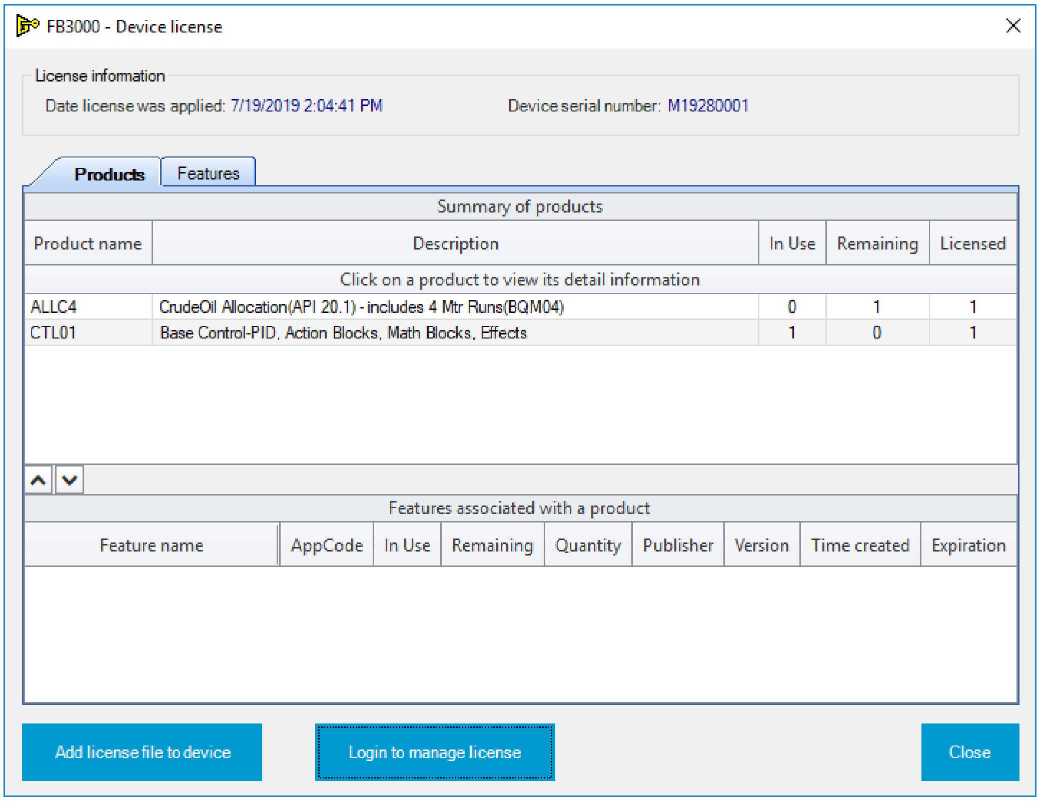
Available Sites: Marshalltown

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	33	0
BQM32	Thirty two Bulk Meter Runs		0	11	0
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects		0	1	0
FBN01	FBxNet Communication		0	20	0
GSAL4	Gas Calcs + CrudeOil Allocation - includes 4 Mtr Runs(BQM04)		0	25	1
GSLQ4	Gas Calcs + Liquid Calcs - includes 4 Mtr Runs (BQM04)		0	29	0

Status: License file applied successfully

7. Select **Close** to exit the License Management display. The Device License display now shows the new license on your FB Series product.

Figure 424. Device License



License information

Date license was applied: 7/19/2019 2:04:41 PM

Device serial number: M19280001

Summary of products

Product name	Description	In Use	Remaining	Licensed
Click on a product to view its detail information				
ALLC4	CrudeOil Allocation(API 20.1) - includes 4 Mtr Runs(BQM04)	0	1	1
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

Features associated with a product

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration

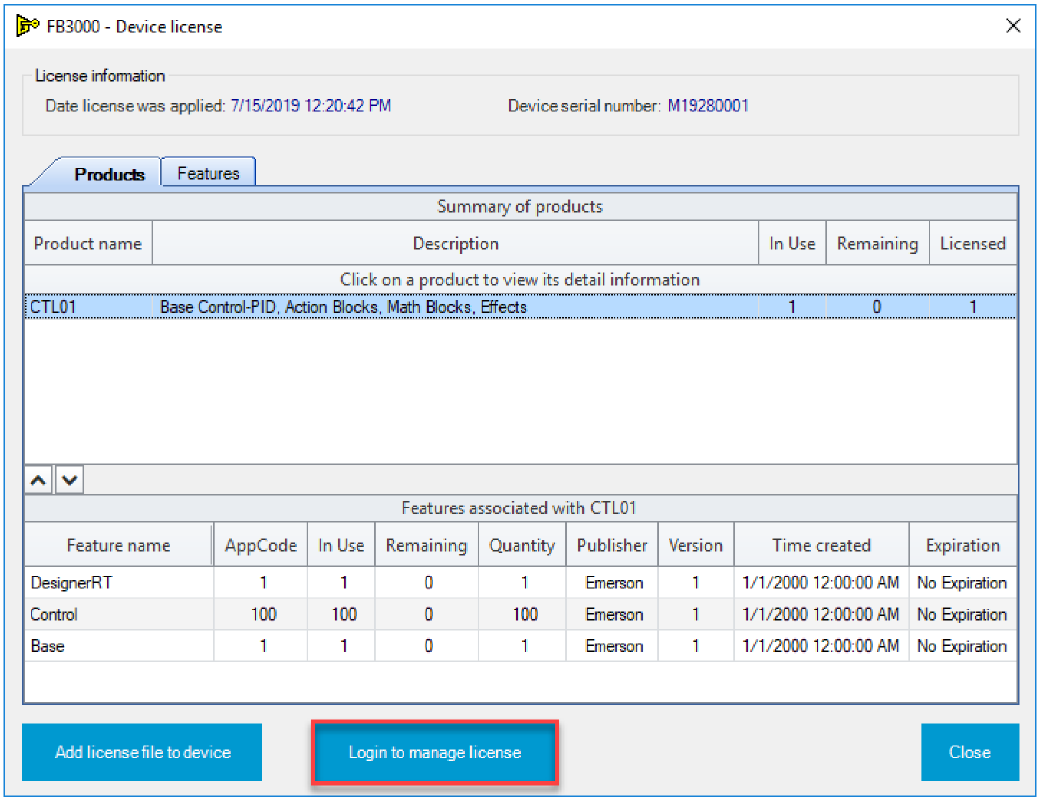
5.13.2.2 Restore License from Cloud

Use this feature to download and apply a new license file based the information stored in the FBxCloud Licensing Portal for your serial number.

To restore a license:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 425. Device License



FB3000 - Device license

License information

Date license was applied: 7/15/2019 12:20:42 PM

Device serial number: M19280001

Summary of products

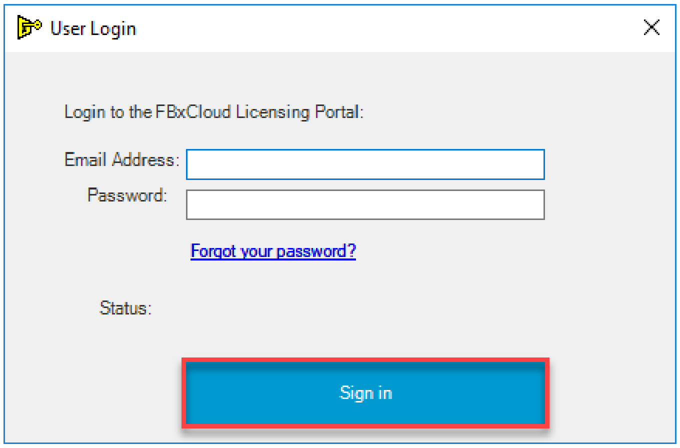
Product name	Description	In Use	Remaining	Licensed
Click on a product to view its detail information				
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

Features associated with CTL01

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

2. Select **Login to manage license**. The User Login dialog displays.

Figure 426. User Login



User Login

Login to the FBxCloud Licensing Portal:

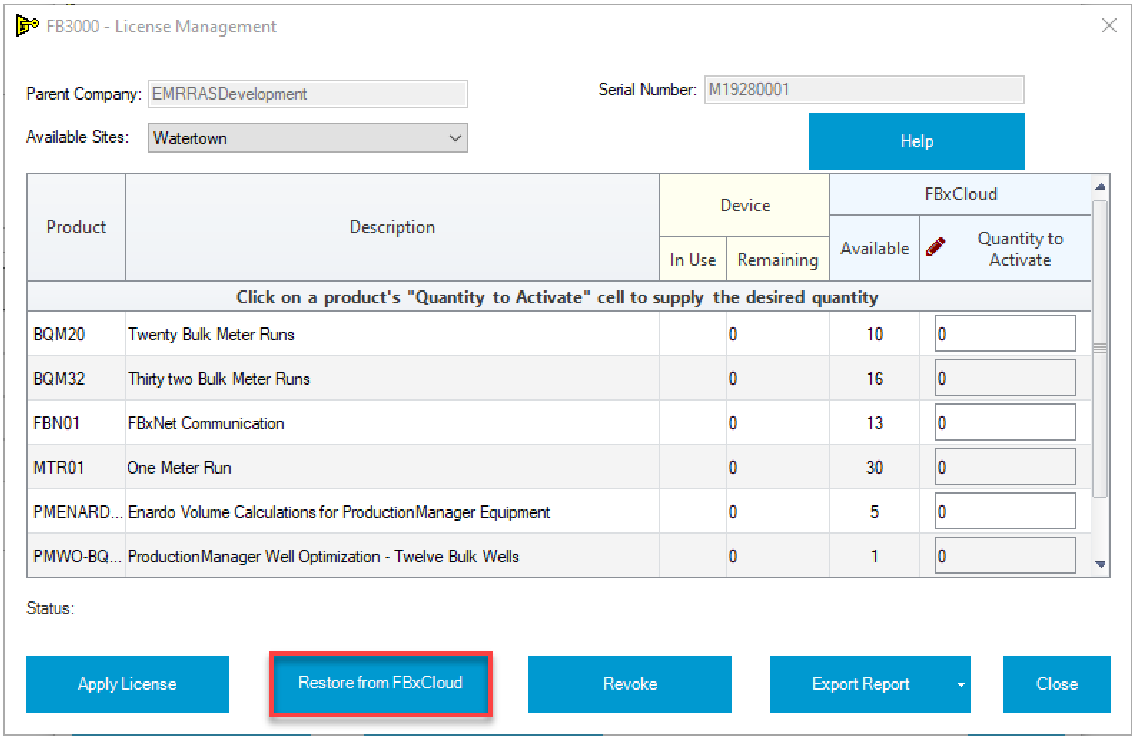
Email Address:

Password:

Status:

3. Enter the e-mail address and password required to login to the FBxCloud Licensing Portal, and then select **Sign in**. The License Management display opens.

Figure 427. License Management



Parent Company: EMRRASDevelopment

Serial Number: M19280001

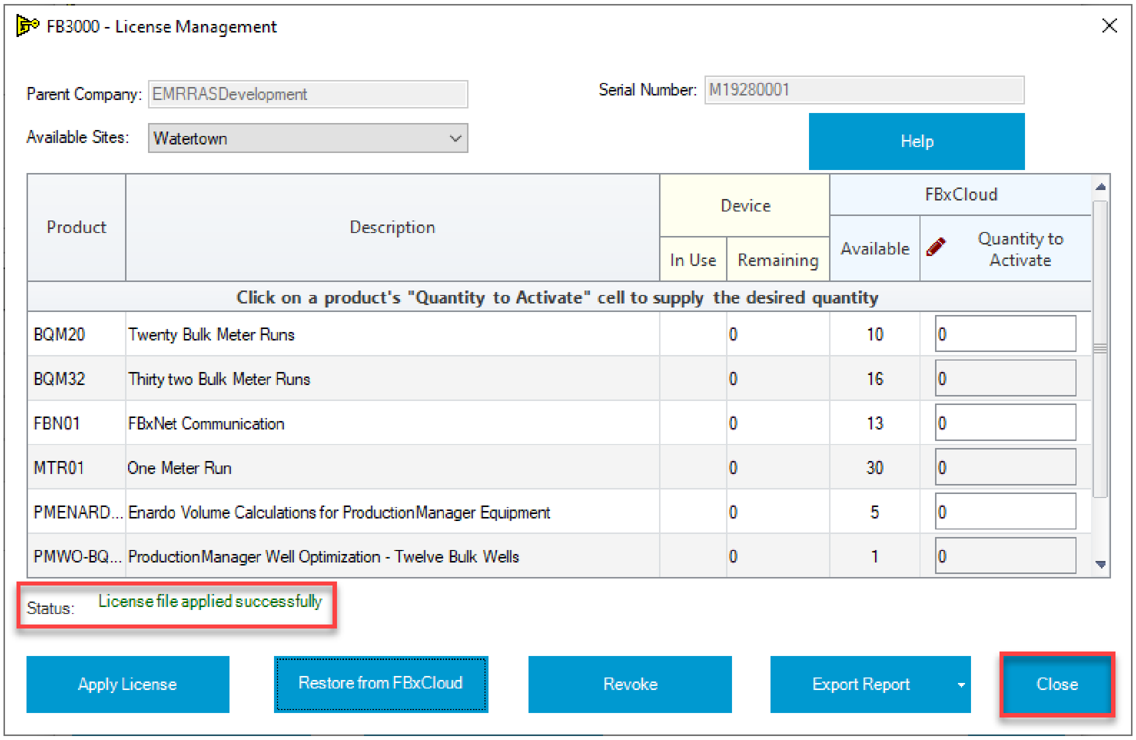
Available Sites: Watertown

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status:

4. Click **Restore from FBxCloud**. The system downloads a new license file and applies it to the FB Series product. When the transfer is complete, the Status field shows **License file applied successfully**.

Figure 428. License File Applied Successfully



Parent Company: EMRRASDevelopment

Available Sites: Watertown

Serial Number: M19280001

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status: License file applied successfully

5. Select **Close** to return to the previous screen.

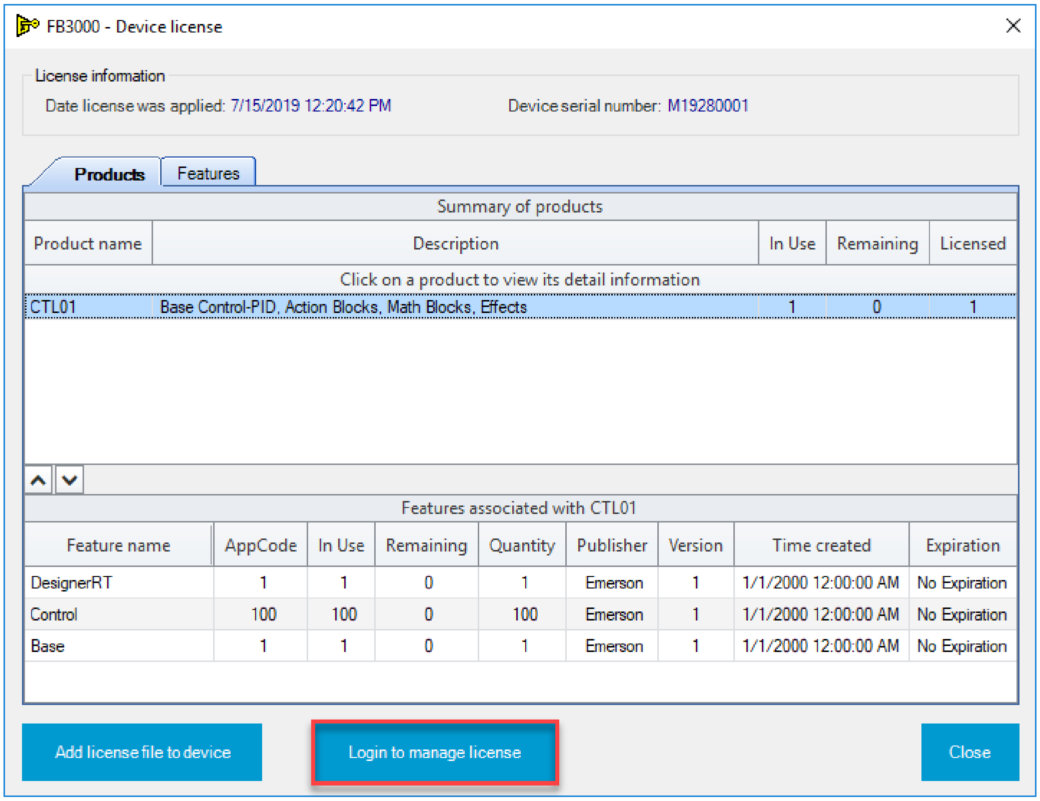
5.13.2.3 Remove a Licensed Product

Use the License Revocation pop-up display to remove user activated product licenses from your FB Series product, download a new license file from the FBxCloud Licensing Portal, and apply the new license file to your FB Series product.

To remove a license:

1. Select **Services > Device License** from the FBxConnect™ main menu. The Device License display opens.

Figure 429. Device License



License information

Date license was applied: 7/15/2019 12:20:42 PM

Device serial number: M19280001

Summary of products

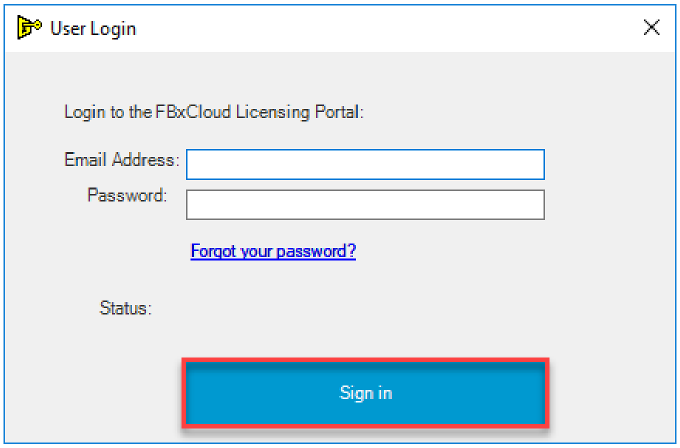
Product name	Description	In Use	Remaining	Licensed
Click on a product to view its detail information				
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1	0	1

Features associated with CTL01

Feature name	AppCode	In Use	Remaining	Quantity	Publisher	Version	Time created	Expiration
DesignerRT	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Control	100	100	0	100	Emerson	1	1/1/2000 12:00:00 AM	No Expiration
Base	1	1	0	1	Emerson	1	1/1/2000 12:00:00 AM	No Expiration

2. Select **Login to manage license**. The User Login dialog displays.

Figure 430. User Login



Login to the FBxCloud Licensing Portal:

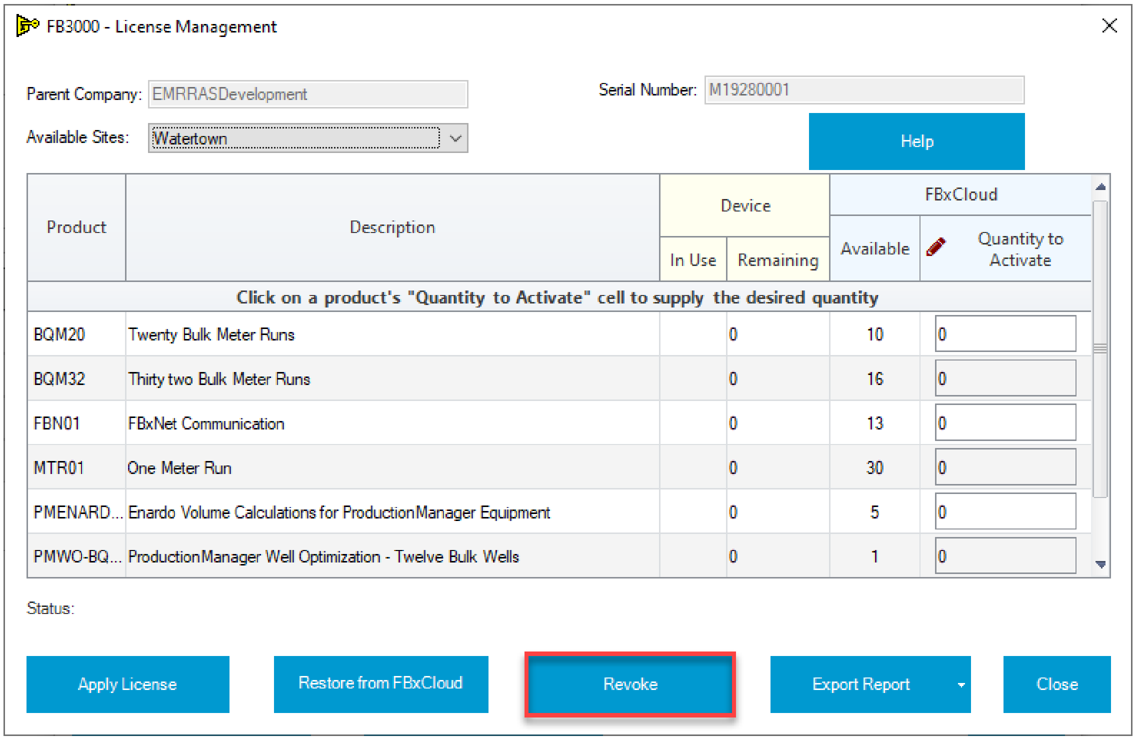
Email Address:

Password:

Status:

3. Enter the e-mail address and password required to login to the Cloud Licensing Portal, and then select **Sign in**. The License Management display opens.

Figure 431. License Management



Parent Company: EMRRASDevelopment

Serial Number: M19280001

Available Sites: Watertown

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

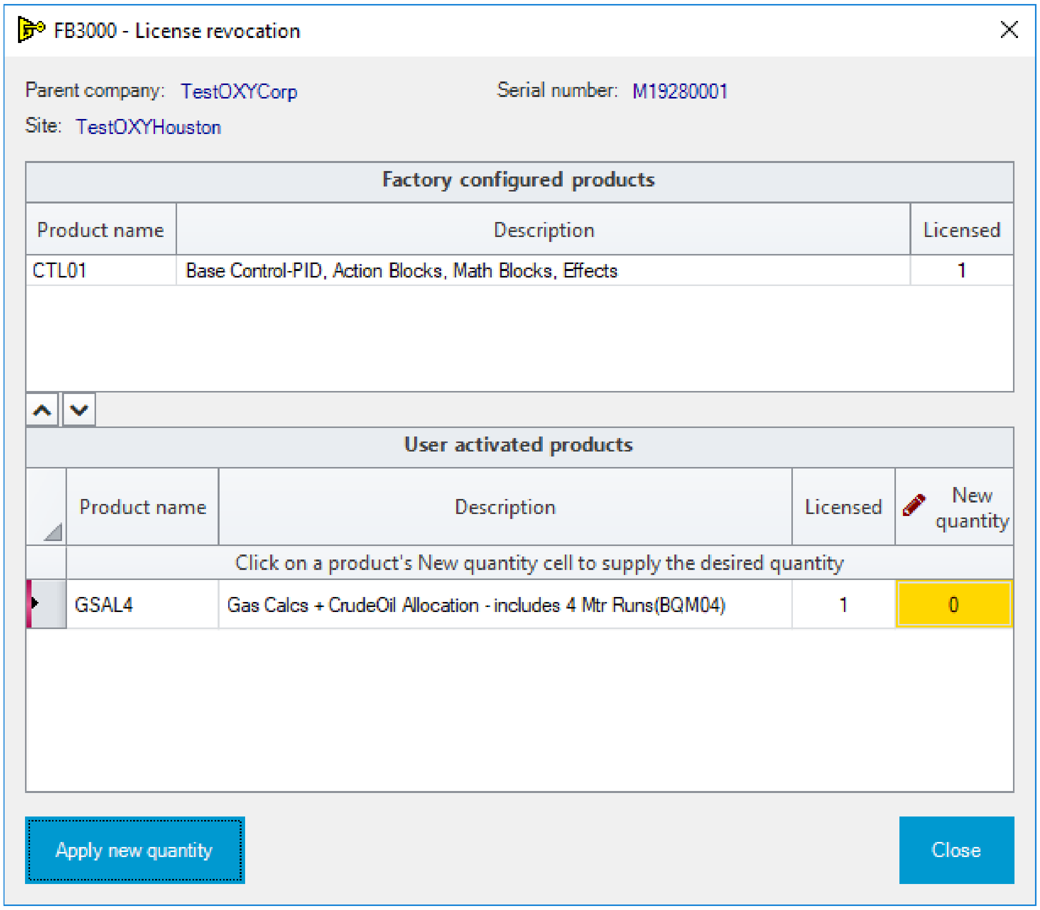
Status:

4. Select **Revoke**. The License Revocation pop-up display opens showing the user activated products that may be removed in the bottom portion of the display.

Note

You can **only** remove user activated products, not factory configured products.

Figure 432. License Revocation



Parent company: TestOXYCorp

Serial number: M19280001

Site: TestOXYHouston

Factory configured products

Product name	Description	Licensed
CTL01	Base Control-PID, Action Blocks, Math Blocks, Effects	1

User activated products

Click on a product's New quantity cell to supply the desired quantity

Product name	Description	Licensed	New quantity
GSAL4	Gas Calcs + CrudeOil Allocation - includes 4 Mtr Runs(BQM04)	1	0

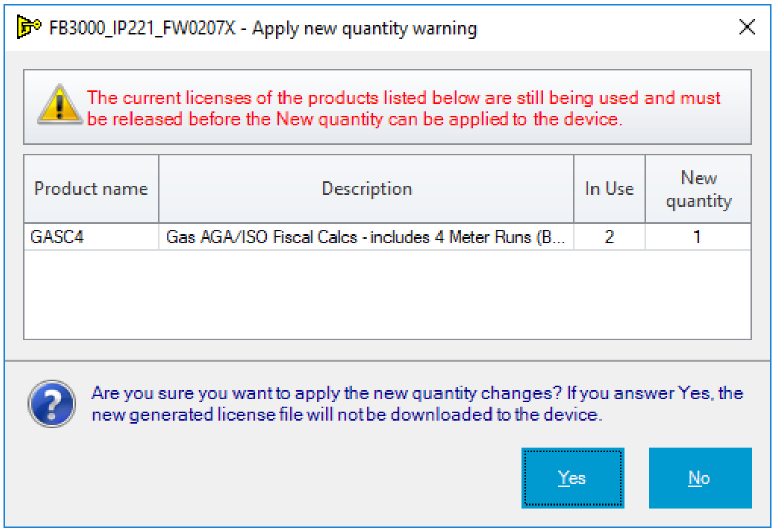
5. In the row of the product you want to remove, double-click in the **New Quantity** column.

6. Enter the new number of products and press **Enter** on your keyboard.

7. Select **Apply New Quantity** to remove selected products from your device and transfer them back to the Cloud Licensing Portal. The Apply License File to Device display opens. When the transfer is complete, the Status field shows **License file applied successfully**.

Note

- In order for the system to apply a license successfully, the new license file **must** contain a minimum quantity of currently configured features. For example, if you have three gas meters currently configured, the new license file **must** contain at least three meter runs and gas calculations. If you attempt to revoke a license for a product that is currently configured in the FB Series product, the following error message opens:


FB3000_IP221_FW0207X - Apply new quantity warning

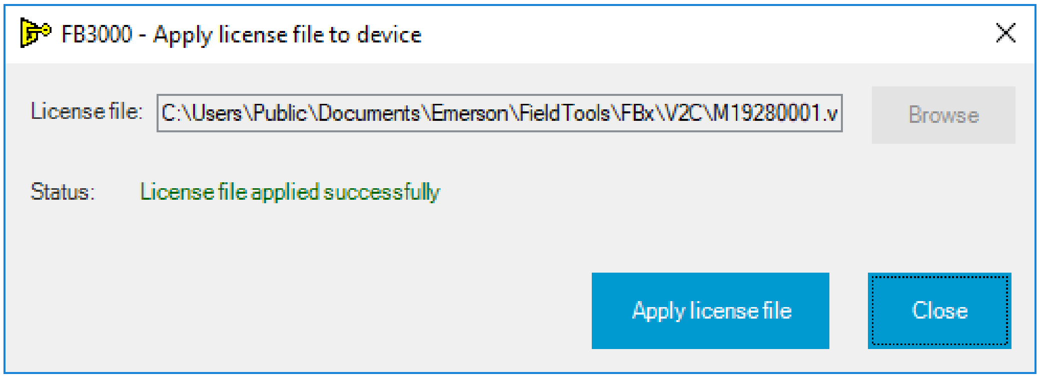
The current licenses of the products listed below are still being used and must be released before the New quantity can be applied to the device.

Product name	Description	In Use	New quantity
GASC4	Gas AGA/ISO Fiscal Calcs - includes 4 Meter Runs (B...	2	1

Are you sure you want to apply the new quantity changes? If you answer Yes, the new generated license file will not be downloaded to the device.

- If a downloaded license fails to apply, reconfigure your device with **only** the products contained in the new license before you apply the new license file. For more information about adding a previously downloaded license to an FB Series product, refer to Add License File to Device.

Figure 433. License File Applied Successfully


FB3000 - Apply license file to device

License file: C:\Users\Public\Documents\Emerson\FieldTools\FBx\V2C\M19280001.v

Status: License file applied successfully

8. Select **Close** to return to the License Management display.

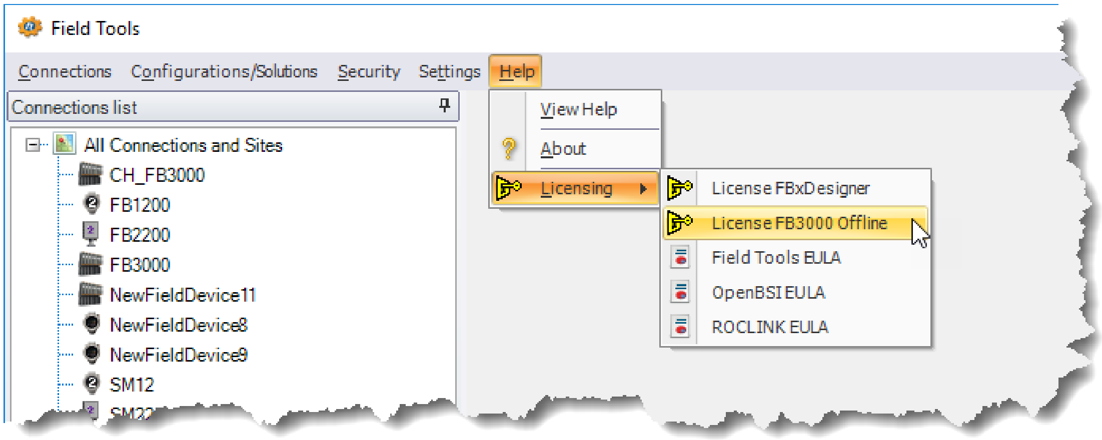
5.13.2.4 Add License Offline

You can login to the Cloud Licensing Portal and manage your licensed products without being connected to an FB3000 RTU. This allows you to login to the Cloud Licensing Portal, associate licensed products with a serial number, download a license file, then add the license file to the FB3000 RTU in the field.

To add a license offline:

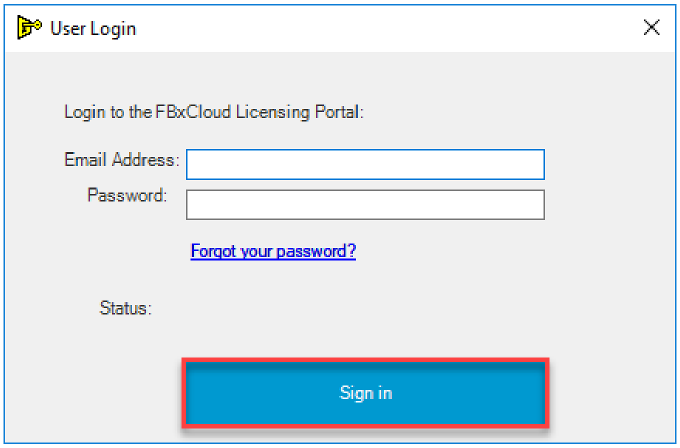
1. Select **Help > Licensing > License FB3000 Offline** from the Field Tools main menu. The Device License display opens.

Figure 434. Field Tools



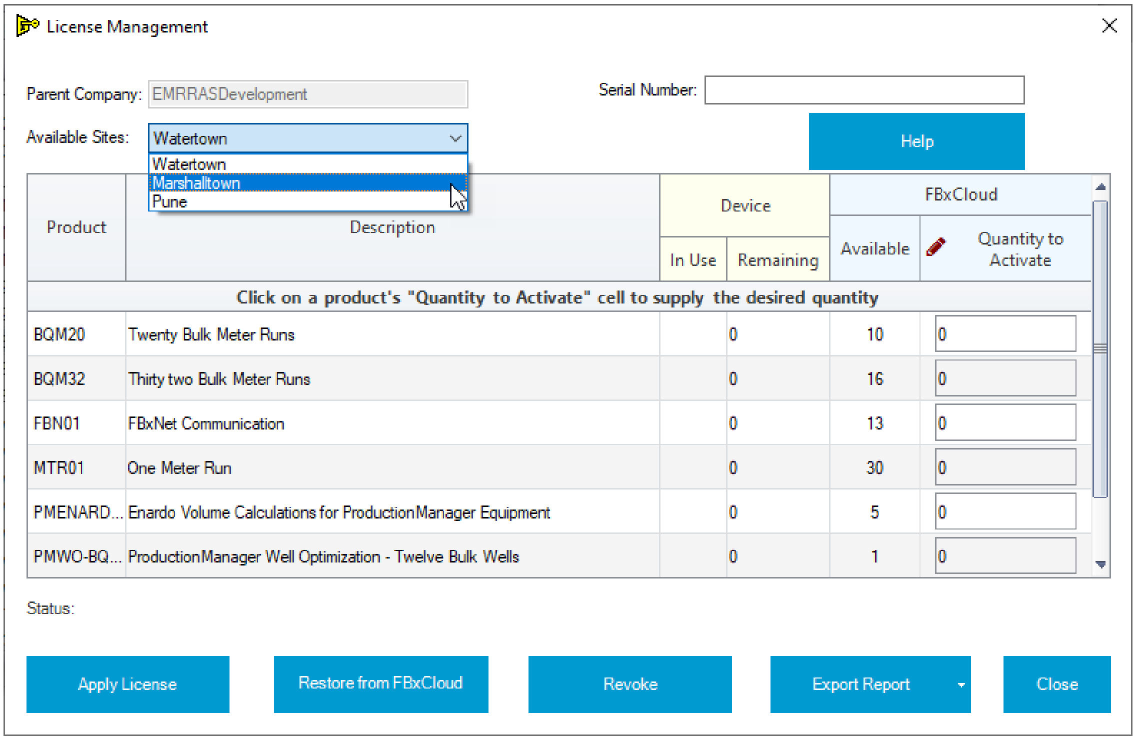
2. Select **Login to manage license**. The User Login dialog displays.

Figure 435. User Login



3. Enter the e-mail address and password required to login to the Cloud Licensing Portal, and then select **Sign in**. The License Management display opens.

Figure 436. License Management – Sites



Parent Company: EMRRASDevelopment

Serial Number:

Available Sites: Watertown

- Watertown
- Marshalltown
- Pune

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	0
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status:

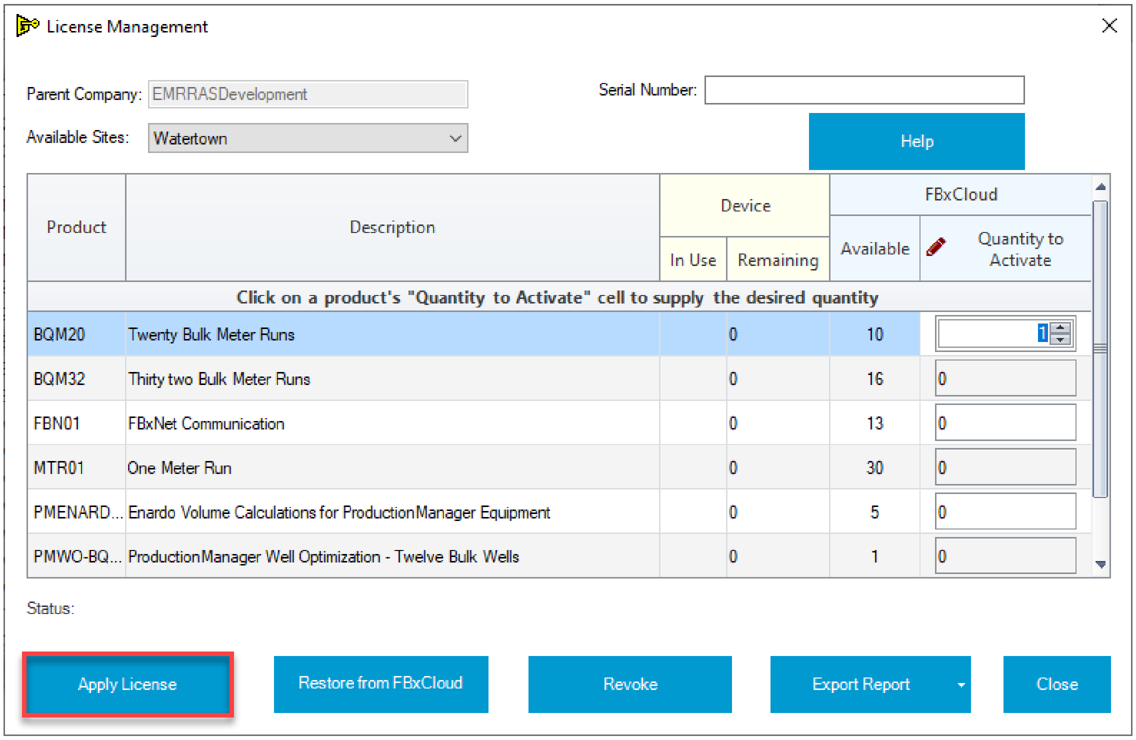
4. Click ▼ in the Available Sites field to select your site.
5. Enter the serial number of your FB3000 RTU in the Serial Number field.

Note

Select **Help** to open instructions for locating your serial number.

6. In the row for the product you want to activate, double click in the **Quantity to Activate** column and enter the number of products to activate.

Figure 437. License Management – Apply License



Parent Company: EMRRASDevelopment

Serial Number:

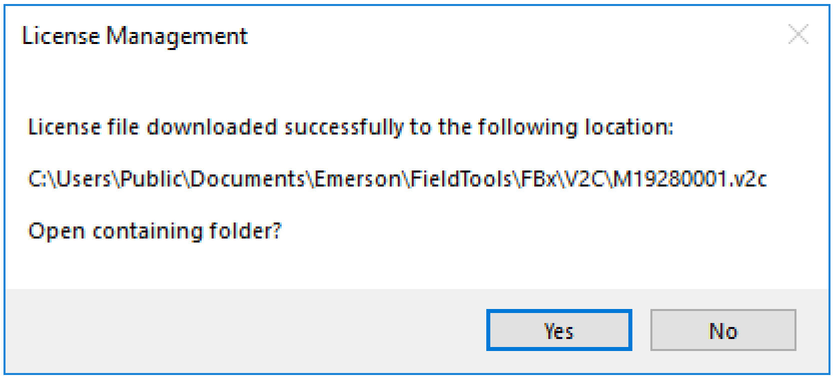
Available Sites: Watertown

Product	Description	Device		FBxCloud	
		In Use	Remaining	Available	Quantity to Activate
Click on a product's "Quantity to Activate" cell to supply the desired quantity					
BQM20	Twenty Bulk Meter Runs		0	10	1
BQM32	Thirty two Bulk Meter Runs		0	16	0
FBN01	FBxNet Communication		0	13	0
MTR01	One Meter Run		0	30	0
PMENARD...	Enardo Volume Calculations for ProductionManager Equipment		0	5	0
PMWO-BQ...	ProductionManager Well Optimization - Twelve Bulk Wells		0	1	0

Status:

7. Select **Apply License** to add the selected products to your device. A confirmation dialog appears.

Figure 438. Confirmation Message



License Management

License file downloaded successfully to the following location:

C:\Users\Public\Documents\Emerson\FieldTools\FBx\V2C\M19280001.v2c

Open containing folder?

8. Select **Yes** to open a Windows Explorer window to view the downloaded file.

Note

To add the license file to your FB3000 RTU, refer to Add License File to Device.

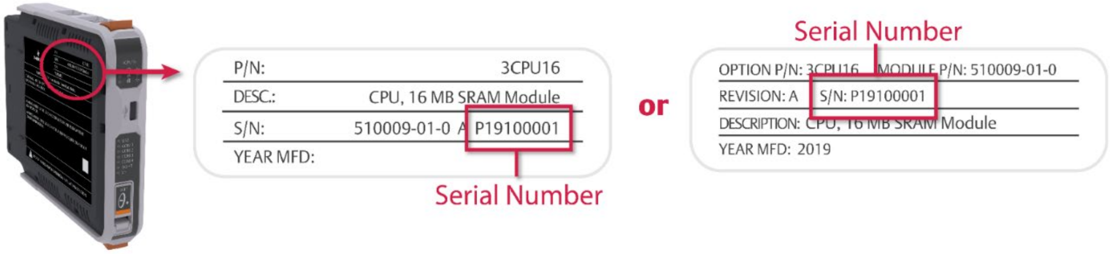
5.13.3 Serial Number Location

The serial number is located on the side of your module. The serial number will be one of two formats. The picture below shows the location and possible formats of a module serial number.

Note

The serial number is case-sensitive.

Figure 439. Serial Number Location



5.14 Apply Security File

Use this option to enable DNP3 Secure Authentication version 5 (SAv5) on the FB Series product. You create the security file using Field Tools and apply the file to the FB Series product using FBxConnect.

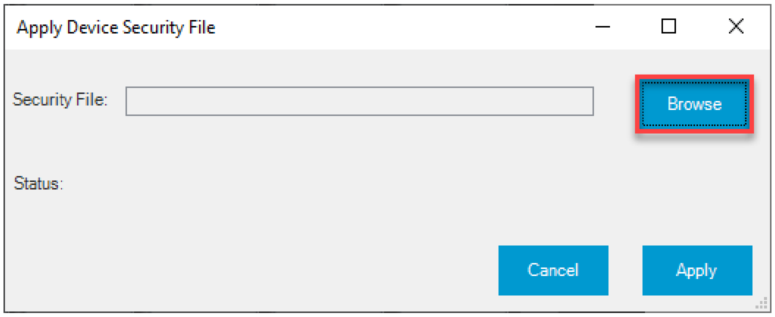
Note

- For more information about creating the security file using Field Tools, refer to *D301703X412, Emerson Field Tools Quick Start Guide*.
- This appears **only** if you are physically connected via the USB port.

To add a SAv5 security file to your device:

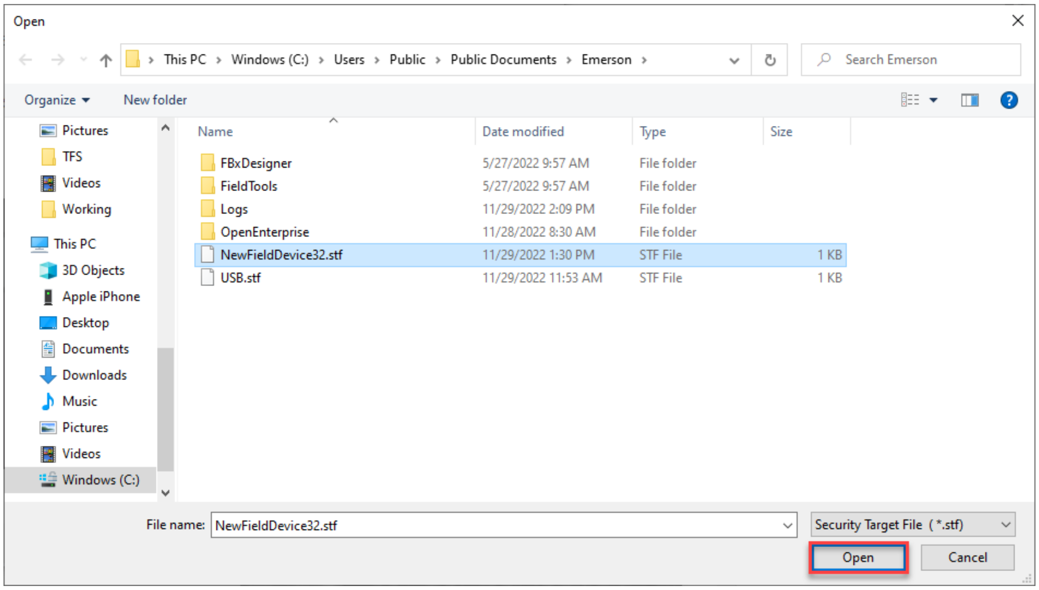
1. Select **Services > Apply Security File** from the FBxConnect™ main menu. The Apply Device Security File pop-up display opens.

Figure 440. Browse



2. Select **Browse**. A file window dialog opens.

Figure 441. Open



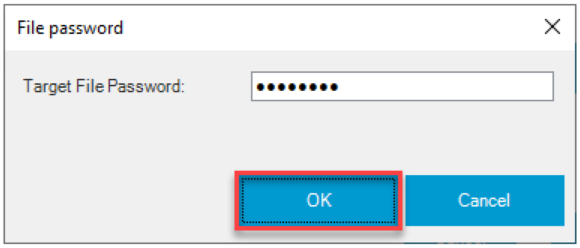
Name	Date modified	Type	Size
FBxDesigner	5/27/2022 9:57 AM	File folder	
FieldTools	5/27/2022 9:57 AM	File folder	
Logs	11/29/2022 2:09 PM	File folder	
OpenEnterprise	11/28/2022 8:30 AM	File folder	
NewFieldDevice32.stf	11/29/2022 1:30 PM	STF File	1 KB
USB.stf	11/29/2022 11:53 AM	STF File	1 KB

File name: NewFieldDevice32.stf

Security Target File (*.stf)

3. Navigate to the location of the security file on your PC, select the file, and select **Open**.

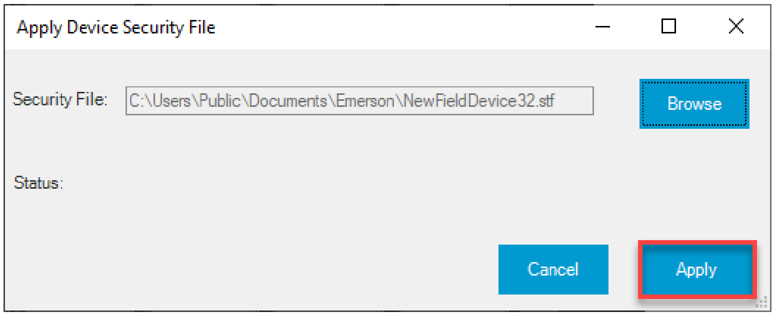
Figure 442. Password



Target File Password: ••••••••

4. Enter the file password and click **OK**. The system applies the security file to your device.

Figure 443. Apply



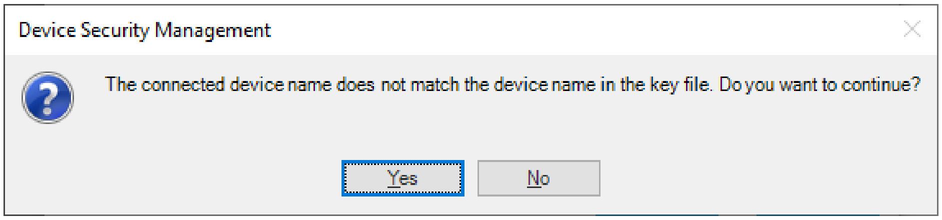
Apply Device Security File

Security File: C:\Users\Public\Documents\Emerson\NewFieldDevice32.stf

Status:

Note

An error appears if the connected device name does not match the device name in the security file. Click **Yes** to continue applying the security file to the connected device. Click **No** to cancel the operation and select a new security file.



Device Security Management

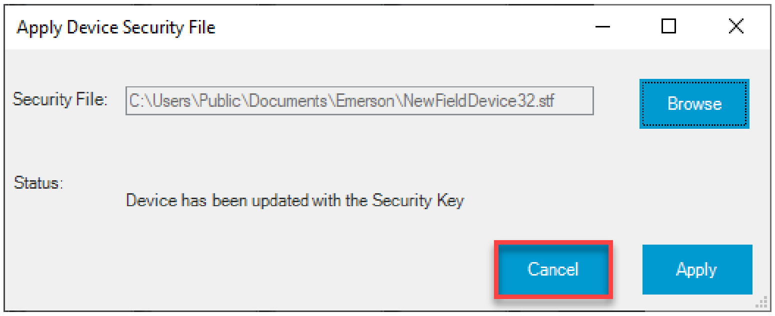
The connected device name does not match the device name in the key file. Do you want to continue?

5. A status message appears telling you that the Security Key has been applied to the device successfully. Select **Cancel** to return to the previous screen.

Note

If you apply a security file to an FB Series product that previously had security disabled, the FB Series product performs a warm start.

Figure 444. Security Key Applied Successfully



Apply Device Security File

Security File: C:\Users\Public\Documents\Emerson\NewFieldDevice32.stf

Status: Device has been updated with the Security Key

5.15 Disable SAv5

Use this option to turn off DNP3 Secure Authentication version 5 (SAv5) on the FB Series product.

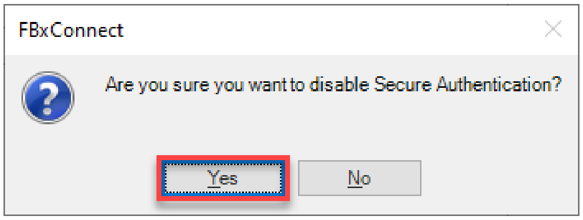
Note

This option appears **only** after you have enabled SAv5 of the FB Series product and are physically connected via the USB port.

To add a license file to your device:

1. Select **Services > Disable SAv5** from the FBxConnect™ main menu. A confirmation message opens.

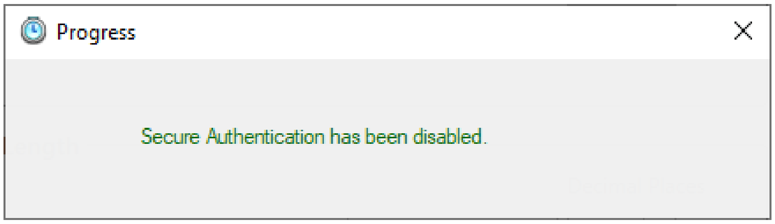
Figure 445. Disable SAv5 Confirmation



Are you sure you want to disable Secure Authentication?

2. Select **Yes** to disable SAv5 security. A progress dialog opens confirming that secure authentication has been disabled, and the FB Series product performs a warm start.

Figure 446. Disable SAv5 Progress



Secure Authentication has been disabled.

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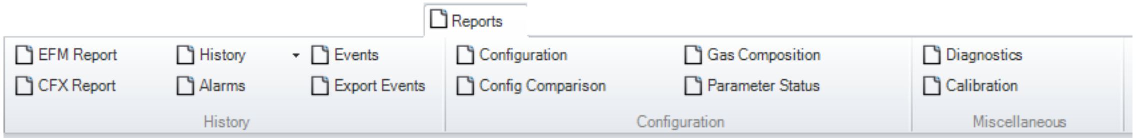
Section 6: Reports Menu

Use the Reports menu to collect data from the FB Series product and create various history, configuration, calibration, and diagnostic reports.

Note

- If you change the time zone of your PC, you **must** restart your PC before reports include the updated time zone.
- Report file names include the connection/device name, report type, and timestamp of report creation.

Figure 447. Reports Menu



The Reports menu contains the following options:

EFM Report – Generates an Electronic Flow Measurement (EFM) report from the data stored in your FB Series product.

CFX Report – Generates a CFX (Flow-Cal) report from the data stored in your FB Series product.

History

Periodic History – Generates a report from the periodic history data stored in your FB Series product.

Transaction History – Generates a report from the transaction history data stored in your FB Series product.

Alarms – Generates an alarm report from the data stored in your FB Series product.

Events – Generates an event report from the data stored in your FB Series product.

Export Events – Exports events stored in the legal event log of your FB Series product as a CSV or PDF file.

Configuration – Generates a report that shows you all of the parameters and parameter values in the connected FB Series product.

Config Comparison – Generates a report that compares multiple device configurations.

Gas Composition – Generates a report that details the gas components and mole percentages of the fluid flowing through each station and meter.

Parameter Status – Generates a report showing the status of all parameters in the FB Series product.

Diagnostics – Generates a report that is used to assist Emerson's technical support team when investigating issues with an FB Series product.

Calibration – View previously generated calibration reports.

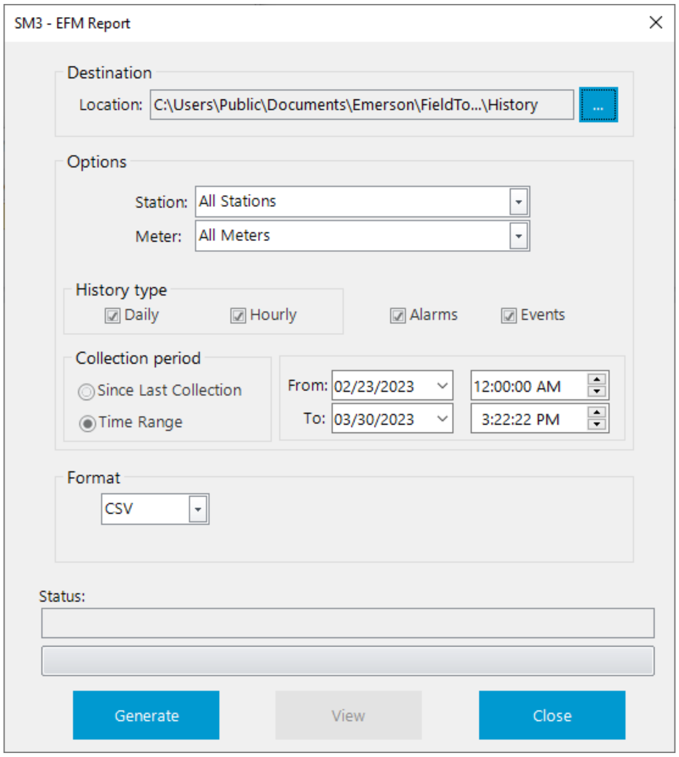
6.1 EFM Report

Use the EFM Report option to generate an electronic flow measurement (EFM) report from the data stored in your device. An EFM report is a combination of meter configuration, history, alarms and events.

To generate an EFM Report:

1. Click **Reports > EFM Report** from the FBxConnect™ main menu. The EFM Report screen displays.

Figure 448. EFM Report



SM3 - EFM Report

Destination
Location: C:\Users\Public\Documents\Emerson\FieldTo...\History

Options
Station: All Stations
Meter: All Meters

History type
☑ Daily ☑ Hourly ☑ Alarms ☑ Events

Collection period
○ Since Last Collection
● Time Range
From: 02/23/2023 12:00:00 AM
To: 03/30/2023 3:22:22 PM

Format
CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\History*.

---

3. Click ▼ in the **Station** field and select the station that contains the data you want to collect.
4. Click ▼ in the **Meter** field and select the meter that contains the data you want to collect.
5. Select the time frequencies (Daily and/or Hourly) of the collected data in the **History Type** field.
6. Place a check mark in the box next to **Alarms** if you want alarm data to be included in the report.
7. Place a check mark in the box next to **Events** if you want event data to be included in the report.
8. Select a **Collection period** in the Options frame. Possible options are:
   - **Since last collection –** Collects all EFM data created since the last EFM report was generated.
   - **Time range –** Collects all EFM data created during the time frame you specify in the **From** and **To** fields.
9. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

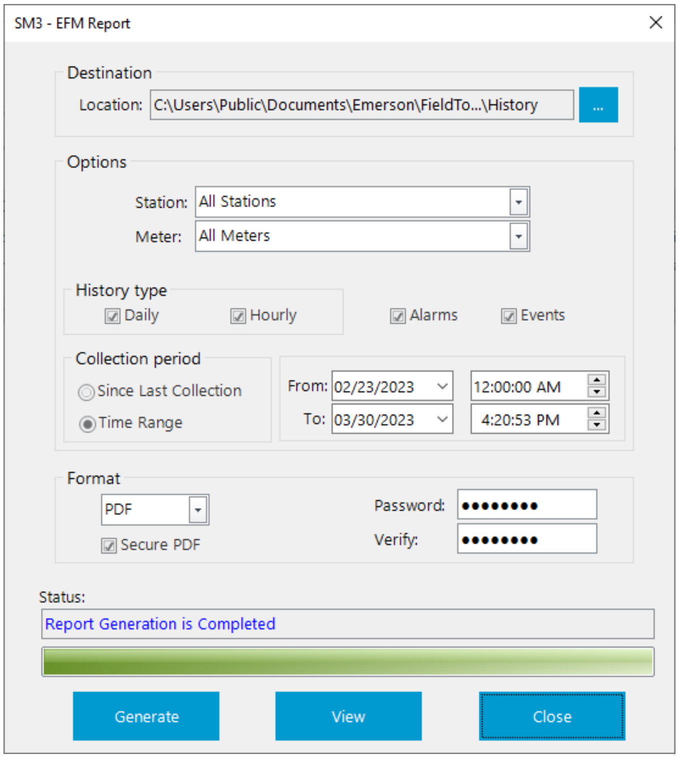
Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

---

10. Click **Generate**. A status bar provides you with the current progress of the report creation.

Figure 449. EFM Report Generation Completed



Location: C:\Users\Public\Documents\Emerson\FieldTo...\History

Station: All Stations

Meter: All Meters

☑ Daily ☑ Hourly ☑ Alarms ☑ Events

○ Since Last Collection

● Time Range

From: 02/23/2023 12:00:00 AM

To: 03/30/2023 4:20:53 PM

PDF

☑ Secure PDF

Password: ••••••••

Verify: ••••••••

Status:

Report Generation is Completed

11. After the report is generated, click **View** to open the completed report.

12. Click **Close** to return to the previous screen.

6.2 CFX Report

Use the CFX Report option to generate a CFX (Flow-Cal) report from the data stored in your device. You can generate reports using CFX version 5 (gas) or CFX version 7 (gas or liquid) formats.

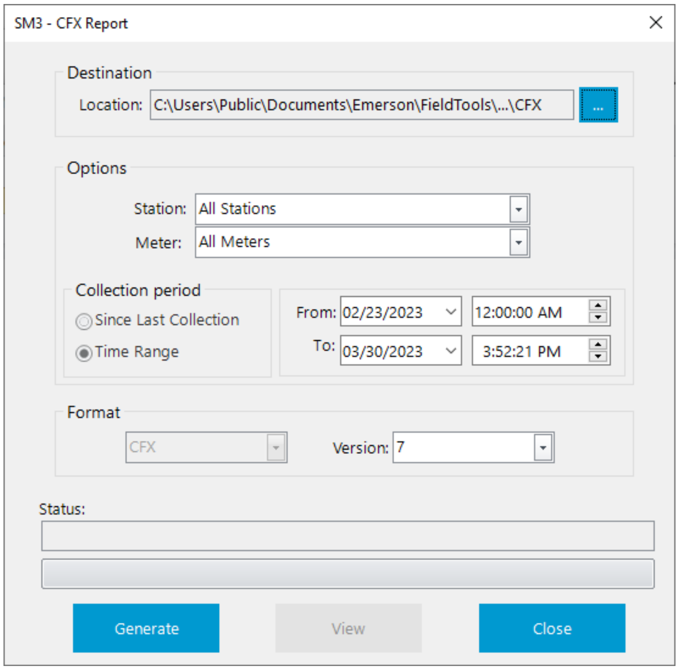
Note

Some fields on the report may be blank if you incorrectly configure the **Input to Average** in your FB Series product. For more information, refer to Averages.

To collect a CFX Report:

1. Click **Reports > CFX Report** from the FBxConnect™ main menu. The CFX Report screen displays.

Figure 450. CFX Report



SM3 - CFX Report

Destination

Location: C:\Users\Public\Documents\Emerson\FieldTools\...\CFX

Options

Station: All Stations

Meter: All Meters

Collection period

○ Since Last Collection

● Time Range

From: 02/23/2023 12:00:00 AM

To: 03/30/2023 3:52:21 PM

Format

CFX

Version: 7

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

- The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\History\CFX*.
- The file name of the saved CFX report includes Station and Meter Tags. Invalid characters (\, /, :, *, ?, <, >, |) in Station and Meter Tags are replaced by an underscore (_) in the CFX report file name.

3. Click ▼ in the **Station** field and select the station that contains the data you want to collect.
4. Click ▼ in the **Meter** field and select the meter that contains the data you want to collect.
5. Select a **Collection period** in the Options frame. Possible options are:
   - **Since last collection** – Collects all CFX data created since the last CFX report was generated.

- **Time range –** Collects all CFX data created during the start and end date you specify in the **From** and **To** fields.

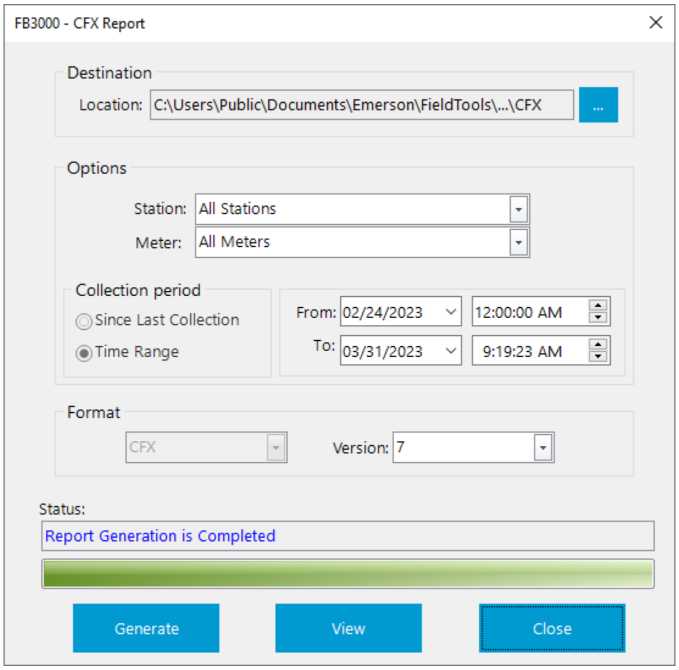
6. Click ▼ in the **Format** field to select the type of CFX file version.

Note

Liquid linear meters support **only** CFX file version 7.

7. Select the CFX version of the generated report in the **Version** field.
8. Click **Generate**. A status bar provides you with the current progress of the report creation.

Figure 451. CFX Report Generation Completed



Location: C:\Users\Public\Documents\Emerson\FieldTools\...\CFX

Station: All Stations

Meter: All Meters

○ Since Last Collection

● Time Range

From: 02/24/2023 12:00:00 AM

To: 03/31/2023 9:19:23 AM

CFX

Version: 7

Status:

Report Generation is Completed

9. After the report is generated, click **View** to open the location on your PC of the completed report.
10. Click **Close** to return to the previous screen.

6.3 Periodic History Report

Use the Periodic History Report option to generate a report from the periodic history data stored in your FB Series product. You can configure the report to include only periodic history data that occurred during a specific time period or to include periodic history data that has occurred since the last periodic history report was generated. You can generate reports using CSV or PDF formats.

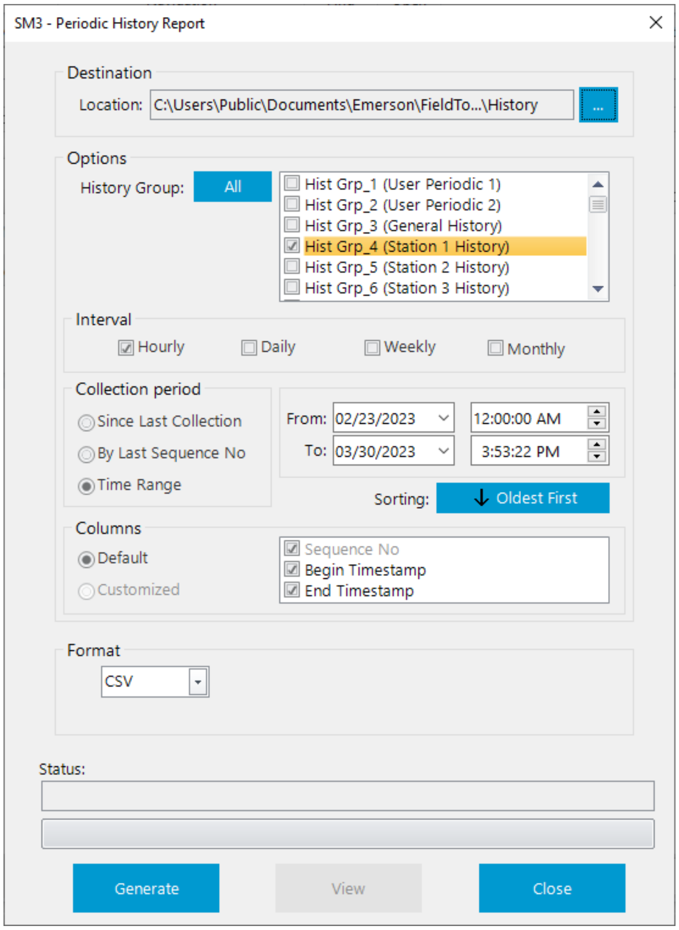
Note

- You **must** first configure history in the device before creating a history report. For more information, refer to Configure – History.
- The integrity of each history record is checked, and only history records with good integrity are shown.
- Each history record has an associated sequence number. A missing history record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To generate a Periodic History Report:

1. Click **Reports > History > Periodic History** from the FBxConnect™ main menu. The Periodic History Report screen displays.

Figure 452. Periodic History Report



SM3 - Periodic History Report

Destination

Location: C:\Users\Public\Documents\Emerson\FieldTo...\History

Options

History Group: All

☐ Hist Grp_1 (User Periodic 1)
☐ Hist Grp_2 (User Periodic 2)
☐ Hist Grp_3 (General History)
☑ Hist Grp_4 (Station 1 History)
☐ Hist Grp_5 (Station 2 History)
☐ Hist Grp_6 (Station 3 History)

Interval

☑ Hourly ☐ Daily ☐ Weekly ☐ Monthly

Collection period

○ Since Last Collection
○ By Last Sequence No
● Time Range

From: 02/23/2023 12:00:00 AM
To: 03/30/2023 3:53:22 PM

Sorting: Oldest First

Columns

● Default
○ Customized

☑ Sequence No
☑ Begin Timestamp
☑ End Timestamp

Format

CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\History*.

3. Place a check mark next to the history groups to include in the report in the **History Group** field.

Note

Select the **All** button to automatically select all available history groups.

4. Select the time frequency of the collected data in the **Interval** field.

Note

You can select more than one time frequency in the **Interval** field.

5. Select a **Collection period** in the Options frame. Possible options are:

   - **Since last collection** – Collects all history data created since the last history report was generated.
   - **By last sequence no.** – Collects all history data from the Last Sequence Number which is contained in the FB Series product. Once completed, FBxConnect™ sets the Last Sequence Number in the FB Series product.

     Note

     The Historical, Event, Alarm logs each have their own last sequence number.

   - **Time range** – Collects all history data created during the start and end date you specify in the **From** and **To** fields.

6. Click the **Sorting** button to configure the order of information in the generated report. Possible options are:

   - **Oldest to newest** – The report presents data showing the oldest entries first and the newest entries last.
   - **Newest to oldest** – The report presents data showing the newest entries first and the oldest entries last.

7. In the Columns field, select or deselect the columns you want to include in the report.

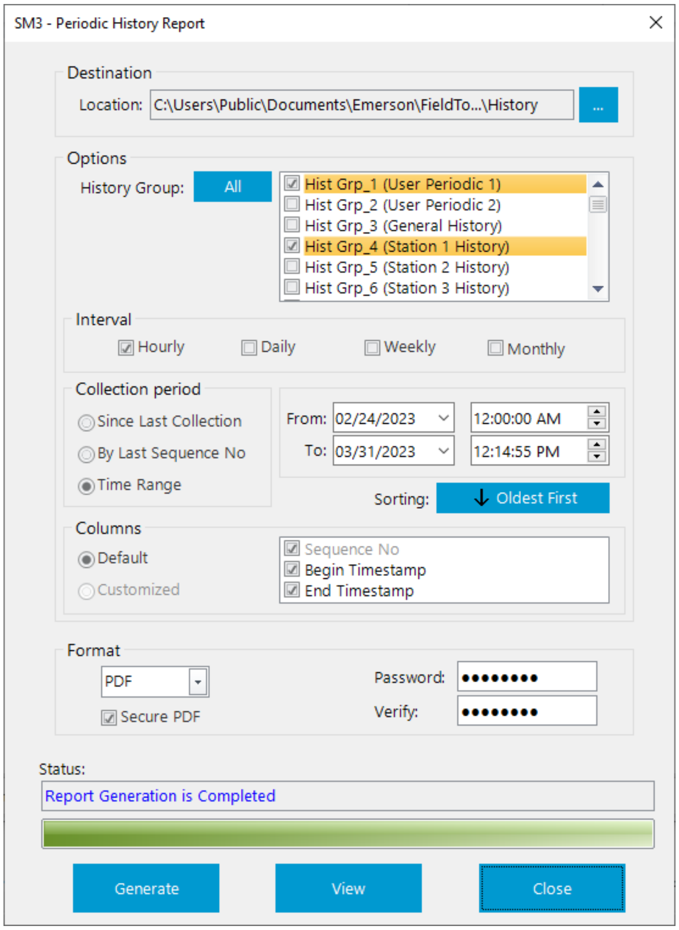
8. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

9. Click **Generate**. A status bar provides you with the current progress of the report creation.

Figure 453. Periodic History Report Generation Completed



Destination

Location: C:\Users\Public\Documents\Emerson\FieldTo...\History

Options

History Group: All

☑ Hist Grp_1 (User Periodic 1)
☐ Hist Grp_2 (User Periodic 2)
☐ Hist Grp_3 (General History)
☑ Hist Grp_4 (Station 1 History)
☐ Hist Grp_5 (Station 2 History)
☐ Hist Grp_6 (Station 3 History)

Interval

☑ Hourly ☐ Daily ☐ Weekly ☐ Monthly

Collection period

○ Since Last Collection
○ By Last Sequence No
● Time Range

From: 02/24/2023 12:00:00 AM
To: 03/31/2023 12:14:55 PM

Sorting: Oldest First

Columns

● Default
○ Customized

☑ Sequence No
☑ Begin Timestamp
☑ End Timestamp

Format

PDF
☑ Secure PDF

Password: ••••••••
Verify: ••••••••

Status:
Report Generation is Completed

10. After the report is generated, click **View** to open the completed report.

Note

Every calculated parameter in meter runs has a health attribute. The status of this attribute is determined by a combination of the inputs used to calculate the parameter and the status of the calculation. A symbol is placed after values with questionable data integrity. The top of the report contains a legend that explains the meaning of the symbols. The symbol definitions are below:

? = In Fault
# = In Override
X = Unverified Value
! = In Alarm
> = Over Range Limit
^ = Stale Value

***** = Invalid History

@ = Undefined History

---

11. Click **Close** to return to the previous screen.

6.4 Transaction History Report

Use the Transaction History Report option to generate a report from the transaction history data stored in your FB Series product. You can configure the report to include only transaction history data that occurred during a specific time period or to include transaction history data that has occurred since the last transaction history report was generated. You can generate reports using CSV or PDF formats.

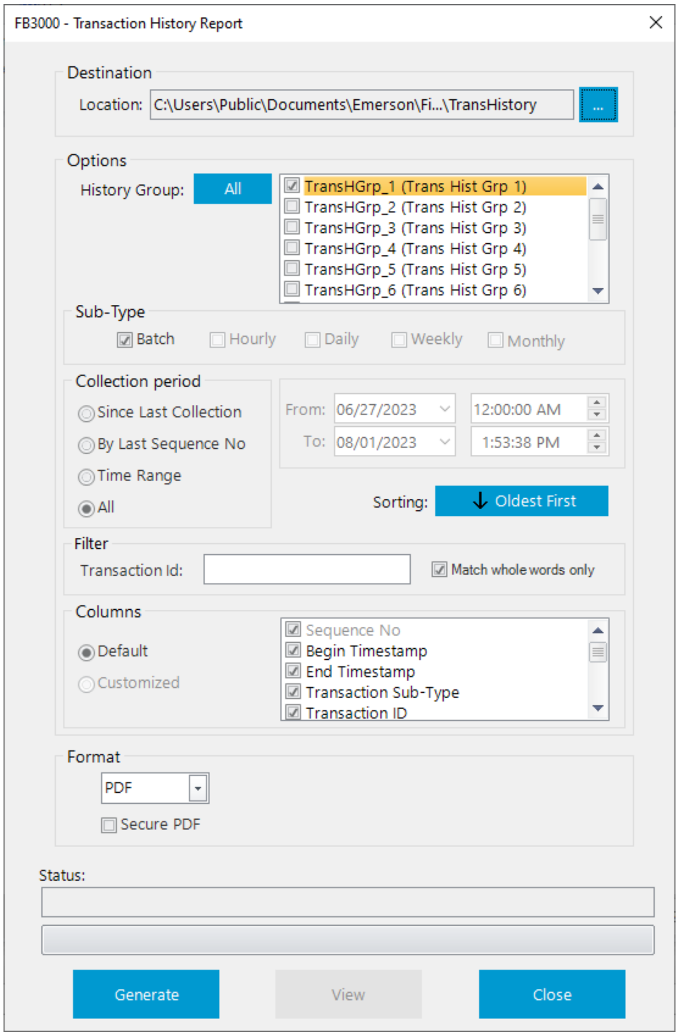
Note

- You **must** first configure history in the device before creating a history report. For more information, refer to Configure – History.
- The integrity of each history record is checked, and only history records with good integrity are shown.
- Each history record has an associated sequence number. A missing history record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To generate a Transaction History Report:

1. Click **Reports > History > Transaction History** from the FBxConnect™ main menu. The Transaction History Report display opens.

Figure 454. Transaction History Report



FB3000 - Transaction History Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fi...\TransHistory

Options

History Group:
- ☑ TransHGrp_1 (Trans Hist Grp 1)
- ☐ TransHGrp_2 (Trans Hist Grp 2)
- ☐ TransHGrp_3 (Trans Hist Grp 3)
- ☐ TransHGrp_4 (Trans Hist Grp 4)
- ☐ TransHGrp_5 (Trans Hist Grp 5)
- ☐ TransHGrp_6 (Trans Hist Grp 6)

Sub-Type: ☑ Batch ☐ Hourly ☐ Daily ☐ Weekly ☐ Monthly

Collection period:
- ○ Since Last Collection
- ○ By Last Sequence No
- ○ Time Range
- ● All

From: 06/27/2023 12:00:00 AM

To: 08/01/2023 1:53:38 PM

Sorting: Oldest First

Filter

Transaction Id:

☑ Match whole words only

Columns: ● Default ○ Customized
- ☑ Sequence No
- ☑ Begin Timestamp
- ☑ End Timestamp
- ☑ Transaction Sub-Type
- ☑ Transaction ID

Format: PDF

☐ Secure PDF

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\TransHistory*.

3. Place a check mark next to the history groups to include in the report in the **History Group** field.

Note

Select the **All Groups** button to automatically select all available history groups.

---

4. In the **Sub-Type** field, select the type of history to include in the report. The default selection is **Batch**.

Note

If you select **Hourly**, **Daily**, **Weekly**, or **Monthly** in the **Sub-Type** field, you **must** have previously configured transaction history to include periodic data in the **Periodic Data Logging in Transaction History** field on the Station – Batching Tab **and** configured transaction history to include this data on the Transaction History Group Configuration display.

---

5. Select a **Collection period** in the Options frame. Possible options are:
   - **Since last collection** – Collects all transaction history data created since the last history report was generated.
   - **By last sequence no.** – Collects all transaction history data from the Last Sequence Number which is contained in the FB Series product. Once completed, FBxConnect™ sets the Last Sequence Number in the FB Series product.

   Note

   The Historical, Event, Alarm logs each have their own last sequence number.

   - **Time range** – Collects all transaction history data created during the start and end date you specify in the **From** and **To** fields.
   - **All –** Collects all transaction history data stored in the FB Series product.
6. Click the **Sorting** button to configure the order of information in the generated report. Possible options are:
   - **Oldest to newest** – The report presents data showing the oldest entries first and the newest entries last.
   - **Newest to oldest** – The report presents data showing the newest entries first and the oldest entries last.
7. In the **Filter** field, enter a Transaction ID to narrow the results to show **only** specific transactions.

Note

- This field is **not** case sensitive.
- For transactions assigned to a meter, you configure the Transaction ID in the **Batch Identifier** field on the Station – Batching display.
- For transactions **not** assigned to a meter, you configure the Transaction ID in the **Transaction ID** field on the Transaction History Group Configuration display.

---

8. Place a check mark in the **Match whole words only** field to search **only** for Transaction IDs that contain the entire word you entered in the **Filter** field.
9. In the **Columns** field, select or deselect the columns you want to include in the report.
10. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

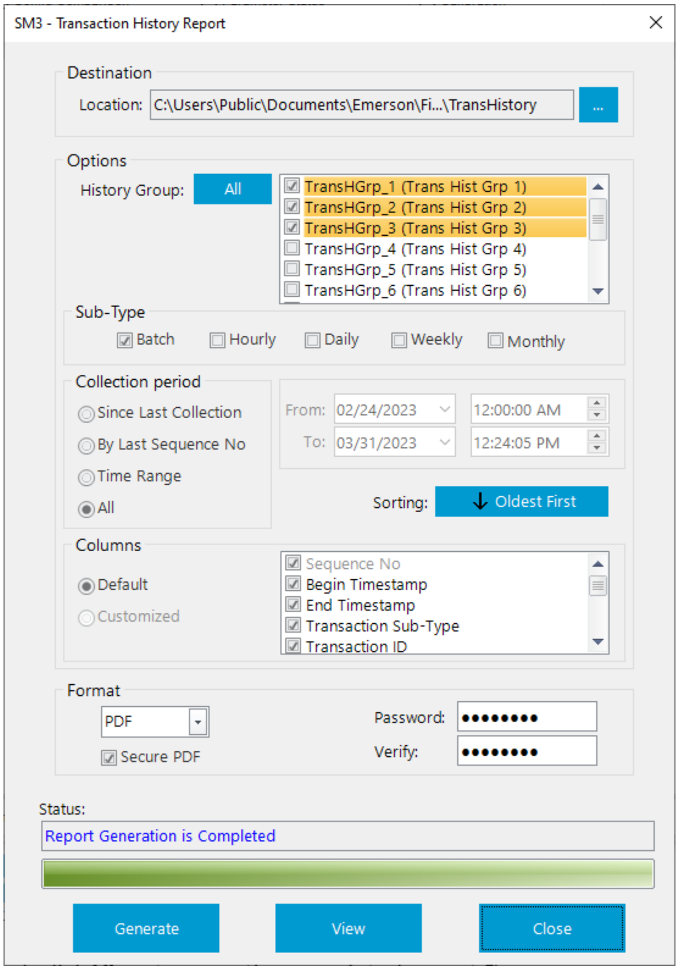
Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

---

11. Click **Generate**. A status bar provides you with the current progress of the report creation.

Figure 455. Transaction History Report Generation Completed



SM3 - Transaction History Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fi...\TransHistory

Options

History Group: All

- ☑ TransHGrp_1 (Trans Hist Grp 1)
- ☑ TransHGrp_2 (Trans Hist Grp 2)
- ☑ TransHGrp_3 (Trans Hist Grp 3)
- ☐ TransHGrp_4 (Trans Hist Grp 4)
- ☐ TransHGrp_5 (Trans Hist Grp 5)
- ☐ TransHGrp_6 (Trans Hist Grp 6)

Sub-Type

☑ Batch ☐ Hourly ☐ Daily ☐ Weekly ☐ Monthly

Collection period

- ○ Since Last Collection
- ○ By Last Sequence No
- ○ Time Range
- ● All

From: 02/24/2023 12:00:00 AM
To: 03/31/2023 12:24:05 PM

Sorting: Oldest First

Columns

- ● Default
- ○ Customized

- ☑ Sequence No
- ☑ Begin Timestamp
- ☑ End Timestamp
- ☑ Transaction Sub-Type
- ☑ Transaction ID

Format

PDF

☑ Secure PDF

Password: ••••••••
Verify: ••••••••

Status:

Report Generation is Completed

12. After the report is generated, click **View** to open the completed report.

Note

Every calculated parameter in meter runs has a health attribute. The status of this attribute is determined by a combination of the inputs used to calculate the parameter and the status of the calculation. A symbol is placed after values with questionable data integrity. The top of the report contains a legend that explains the meaning of the symbols. The symbol definitions are below:

? = In Fault
# = In Override
X = Unverified Value
! = In Alarm
> = Over Range Limit
^ = Stale Value

***** = Invalid History

@ = Undefined History

---

13. Click **Close** to return to the previous screen.

6.5 Alarms Report

Use the Alarms Report option to generate a report from the alarm data stored in your device. You can configure the report to include only alarm data that occurred during a specific time period or to include alarm data that has occurred since the last alarm report was generated. You can generate reports using CSV or PDF formats.

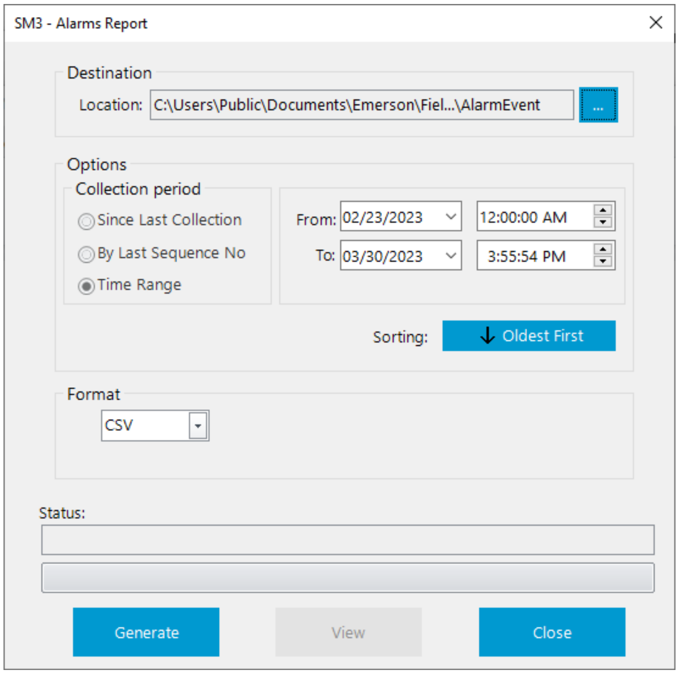
Note

- The integrity of each alarm record is checked, and only alarm records with good integrity are shown.
- Each alarm record has an associated sequence number. A missing alarm record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To generate an Alarms Report:

1. Click **Reports > Alarms** from the FBxConnect™ main menu. The Alarms Report screen displays.

Figure 456. Alarms Report



SM3 - Alarms Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fiel...\AlarmEvent

Options

Collection period

○ Since Last Collection
○ By Last Sequence No
● Time Range

From: 02/23/2023 12:00:00 AM

To: 03/30/2023 3:55:54 PM

Sorting: Oldest First

Format

CSV

Status:

2. Click **...** in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\AlarmEvent*.

3. Select a **Collection period** in the Options frame. Possible options are:
    - **Since last collection –** Collects all history data created since the last history report was generated.
    - **By last sequence no. –** Collects from the Last Sequence Number which is contained in the device. Once completed FBxConnect™ sets the Last Sequence Number in the device.

    ### Note

    The Historical, Event, Alarm logs each have their own last sequence number.

    - **Time range –** Collects all history data created during the start and end date you specify in the **From** and **To** fields.

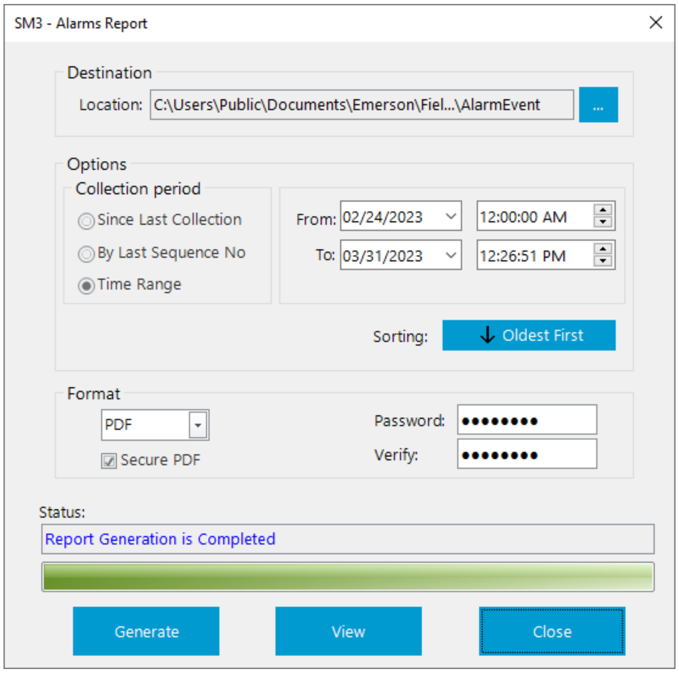
4. Click the **Sorting** button to configure the order of information in the generated report. Possible options are:
   - **Oldest to newest –** The report presents data showing the oldest entries first and the newest entries last.
   - **Newest to oldest –** The report presents data showing the newest entries first and the oldest entries last.
5. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

6. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 457. Alarms Report Generation Completed



SM3 - Alarms Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fiel...\AlarmEvent

Options

Collection period

○ Since Last Collection

○ By Last Sequence No

● Time Range

From: 02/24/2023 12:00:00 AM

To: 03/31/2023 12:26:51 PM

Sorting: Oldest First

Format

PDF

☑ Secure PDF

Password: ••••••••

Verify: ••••••••

Status:

Report Generation is Completed

7. After the report is generated, click **View** to open the completed report.
8. Click **Close** to return to the previous screen.

6.6 Events Report

Use the Events Report option to generate a report that from the event data stored in your device. You can configure the report to include only events that occurred during a specific time period or to include events that occurred since the last event report was generated. You can generate reports using CSV or PDF formats.

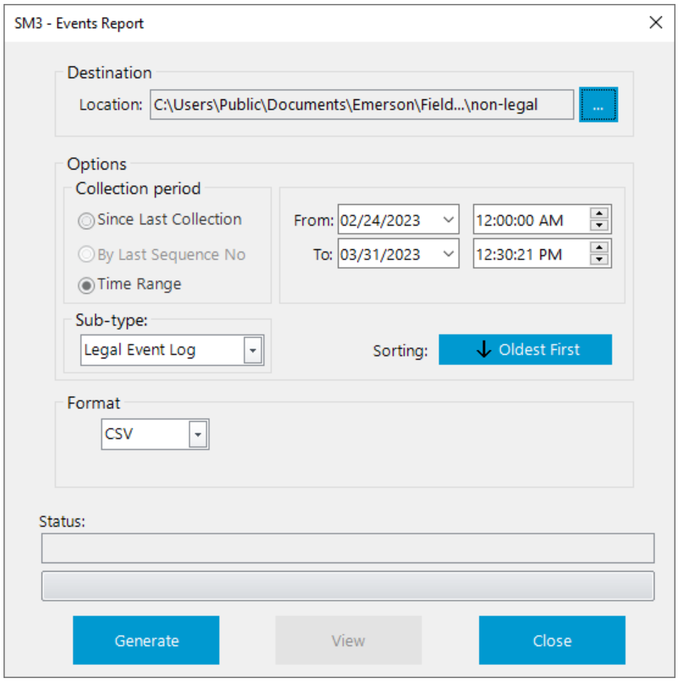
Note

- The integrity of each event record is checked, and only event records with good integrity are shown.
- Each event record has an associated sequence number. A missing event record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.

To generate an Events Report:

1. Click **Reports > Events** from the FBxConnect™ main menu. The Events Report screen displays.

Figure 458. Events Report



SM3 - Events Report

Destination
Location: C:\Users\Public\Documents\Emerson\Field...\non-legal

Options
Collection period
○ Since Last Collection
○ By Last Sequence No
● Time Range
From: 02/24/2023 12:00:00 AM
To: 03/31/2023 12:30:21 PM
Sub-type: Legal Event Log
Sorting: Oldest First

Format
CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\AlarmEvent*.

---

3. Select a **Collection period** in the Options frame. Possible options are:
    - **Since last collection –** Collects all history data created since the last history report was generated.
    - **By last sequence no. –** Collects from the Last Sequence Number which is contained in the device. Once completed FBxConnect™ sets the Last Sequence Number in the device.

      Note

      - This option is available **only** if you select **Non Legal Event Log** in the **Sub-Type** field.
      - The Historical, Event, Alarm logs each have their own last sequence number.
    - **Time range –** Collects all history data created during the start and end date you specify in the **From** and **To** fields.
4. Click the **Sorting** button to configure the order of information in the generated report. Possible options are:
    - **Oldest to newest –** The report presents data showing the oldest entries first and the newest entries last.
    - **Newest to oldest –** The report presents data showing the newest entries first and the oldest entries last.
5. In the **Sub-type** field, select if you want to view legal or non-legal events.

Note

You **must** configure your FB Series product to keep separate legal and non-legal event logs on the Configure – System screen to view this field.

---

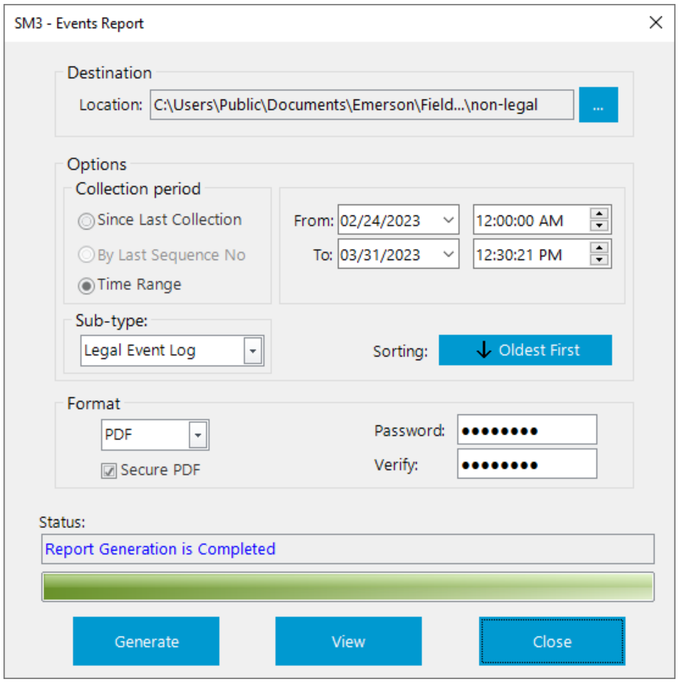
6. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

7. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 459. Events Report Generation Completed



Location: C:\Users\Public\Documents\Emerson\Field...\non-legal

○ Since Last Collection
○ By Last Sequence No
● Time Range

From: 02/24/2023 12:00:00 AM
To: 03/31/2023 12:30:21 PM

Sub-type: Legal Event Log

Sorting: Oldest First

Format: PDF

☑ Secure PDF

Password: ••••••••
Verify: ••••••••

Status: Report Generation is Completed

8. After the report is generated, click **View** to open the completed report.

9. Click **Close** to return to the previous screen.

6.7 Export Events Report

Use the Export Events Report option to export events stored in the legal event log of your device. The Export Events Report differs from the regular Events Report and is used to permanently acknowledge and export a set of legal events from the device. Once exported, events included in the report are marked as “read” in the device and will be overwritten by new events. Therefore, it should **only** be performed by an appropriate authority and the generated report should be archived externally in the host system for audit trial purposes.

The Export Events Report is also used to unlock a device which has become locked due to a full legal event log. After an Export Events Report is generated, sufficient event log space is freed to allow for additional legal events and the FB Series product is unlocked.

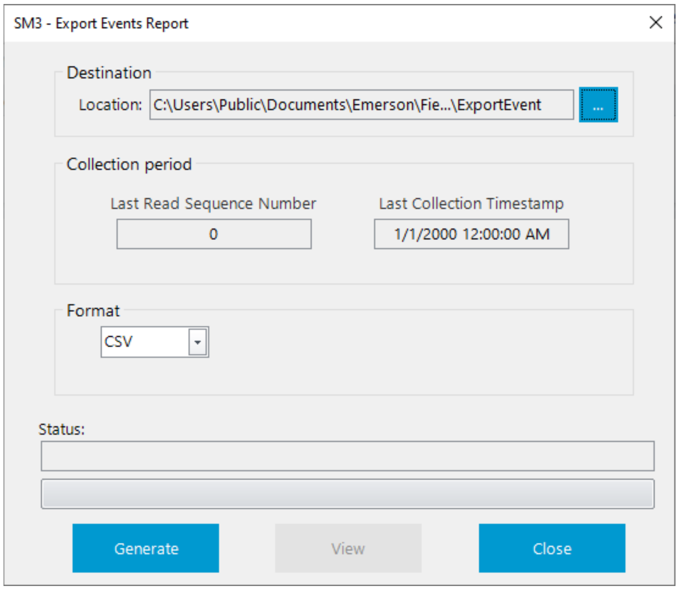
Note

- This option is available **only** when the Event Log Configuration Type is set to **Separate Verifiable & Exportable Logs**. For more information, refer to Event Setup.
- The integrity of each event record is checked, and only event records with good integrity are shown.
- Each event record has an associated sequence number. A missing event record sequence number indicates a deleted or lost record.
- If you change the time zone of your PC, you **must** restart your PC before reports reflect the updated time zone.
- FBxConnect calculates the generated file's MD5 hash and stores the result as a new event in the FB Series product's legal event log. This allows you to verify the integrity of the event report by calculating the file's MD5 hash and comparing the results with the MD5 hash stored in the FB Series product's legal event log.

To generate an Export Events Report:

1. Click **Reports** > **Export Events** from the FBxConnect main menu. The Export Events Report screen displays.

Figure 460. Export Events Report



SM3 - Export Events Report

Destination
Location: C:\Users\Public\Documents\Emerson\Fie...\ExportEvent

Collection period
Last Read Sequence Number: 0
Last Collection Timestamp: 1/1/2000 12:00:00 AM

Format: CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\ExportEvent*.

3. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

4. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation, and a dialog opens after the report is created.

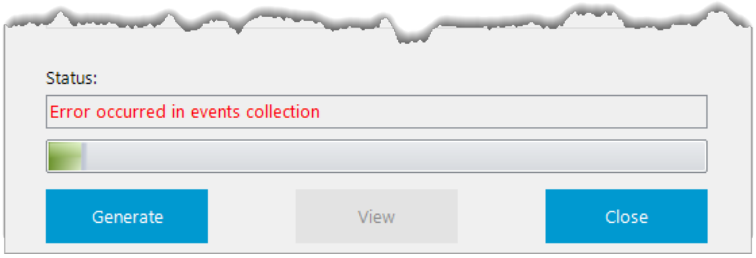
Figure 461. Archive Dialog

Event records have been exported from the device. Please archive the generated report for audit trials.

Note

- Remember to archive the generated report file for audit purposes.
- FBxConnect calculates the generated file's MD5 hash and stores the result as a new event in the FB Series product's legal event log. This allows you to verify the integrity of the event report by calculating the file's MD5 hash and comparing the results with the MD5 hash stored in the FB Series product's legal event log.

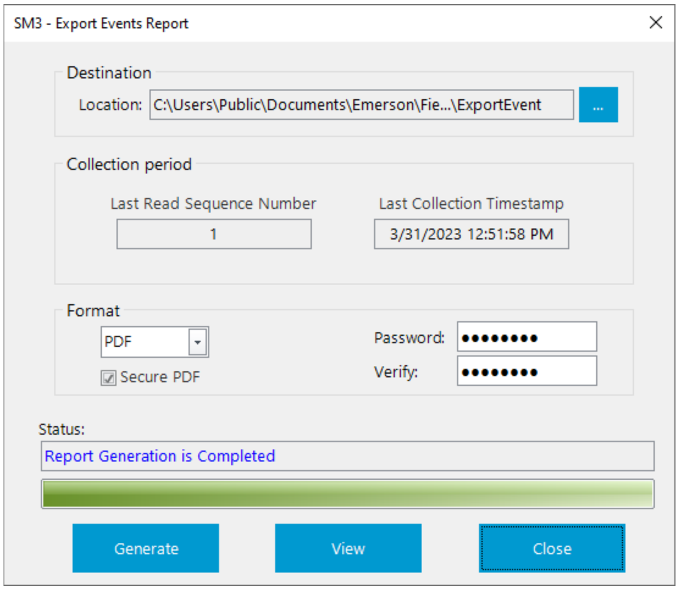
- If the report cannot be generated, an error message appears in the status bar.



Status: Error occurred in events collection

5. Select **OK** to acknowledge the message and close the dialog.

Figure 462. Export Events Report Generation Completed



SM3 - Export Events Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fie...\ExportEvent

Collection period

Last Read Sequence Number: 1

Last Collection Timestamp: 3/31/2023 12:51:58 PM

Format: PDF

☑ Secure PDF

Password: ••••••••

Verify: ••••••••

Status: Report Generation is Completed

6. After the report is generated, click **View** to open the completed report.
7. Click **Close** to return to the previous screen.

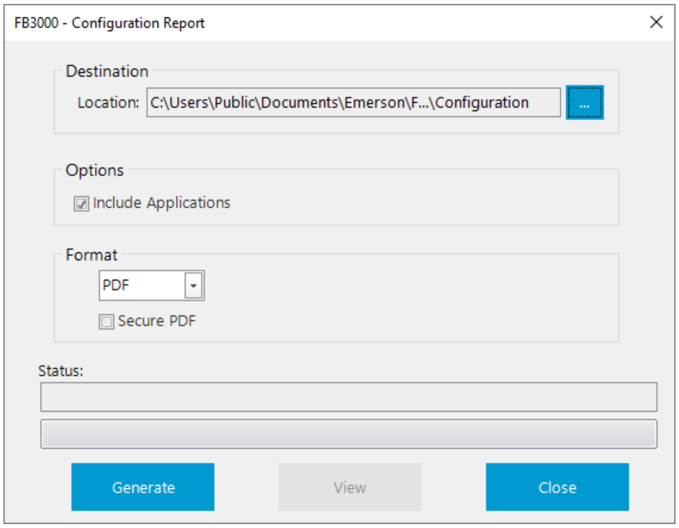
6.8 Configuration Report

Use the Configuration Report option to generate a report that shows you all of the parameters and parameter values in the connected device. You can generate reports using CSV or PDF formats.

To generate a Configuration Report:

1. Select **Reports > Configuration** from the FBxConnect™ main menu. The Configuration Report screen displays.

Figure 463. Configuration Report



Location: C:\Users\Public\Documents\Emerson\F...\Configuration

☑ Include Applications

PDF

☐ Secure PDF

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Configuration*.

3. Place a check mark next to **Include Applications** if you want the generated report to include the configuration of applications installed on your device.

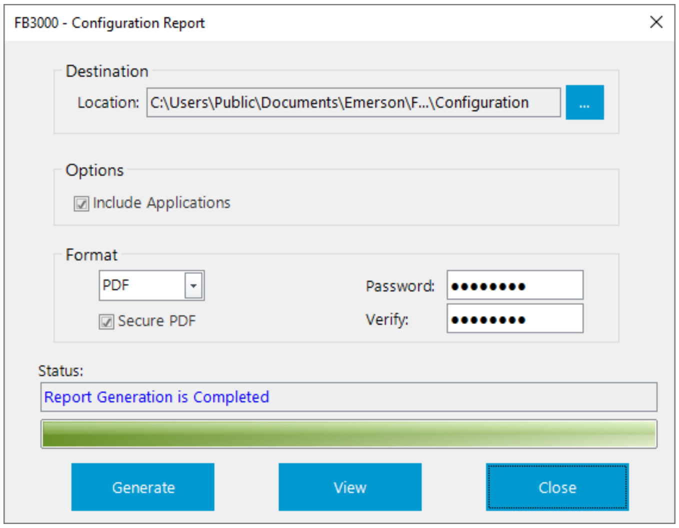
4. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

5. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 464. Configuration Report Generation Completed



Location: C:\Users\Public\Documents\Emerson\F...\Configuration

☑ Include Applications

PDF

☑ Secure PDF

Password: ••••••••

Verify: ••••••••

Status: Report Generation is Completed

6. After the report is generated, click **View** to open the completed report.
7. Click **Close** to return to the previous screen.

6.9 Configuration Comparison Report

Use the Configuration Comparison Report option to generate a report that compares multiple device configurations. You can compare two previously saved configuration files or compare the configuration of the currently connected device to a saved configuration file. Reports can be generated in CSV or PDF file formats.

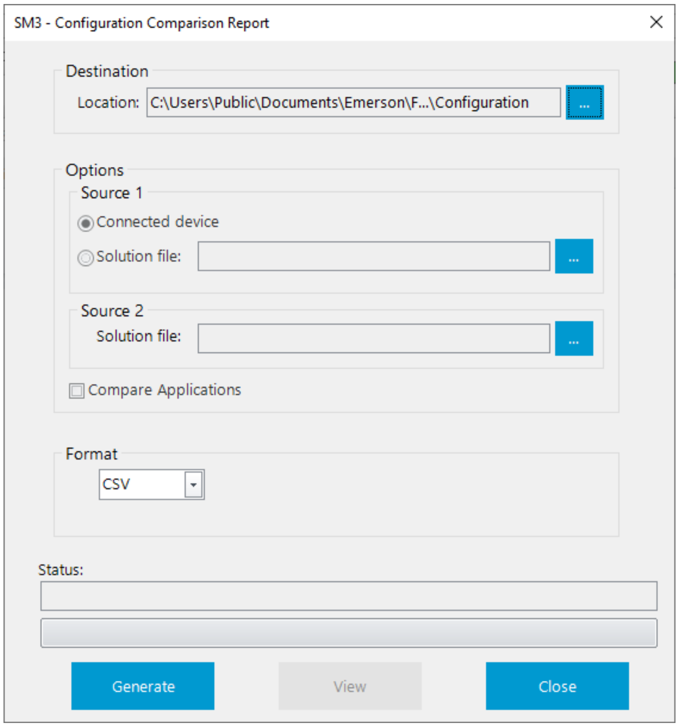
Note

The completed report contains **only** the R/W parameters which are different between the two configurations.

To generate a Configuration Comparison Report:

1. Select **Reports > Config Comparison**. The Configuration Comparison Report dialog displays.

Figure 465. Configuration Comparison Report



SM3 - Configuration Comparison Report

Destination

Location: C:\Users\Public\Documents\Emerson\F...\Configuration

Options

Source 1

● Connected device

○ Solution file:

Source 2

Solution file:

☐ Compare Applications

Format

CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Configuration*.

3. In the **Source 1** frame, select the first configuration as either **Connected device** (the currently connected device) or **Solution** (a solution file stored on your PC).
4. If you select Configuration, select ... and navigate to a configuration file stored on your PC to use in the comparison.
5. In the **Source 2** frame, select ... and navigate to a solution or configuration file stored on your PC to use in the comparison.
6. Place a check mark in the **Compare Applications** field to compare the applications installed in each configuration.

7. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

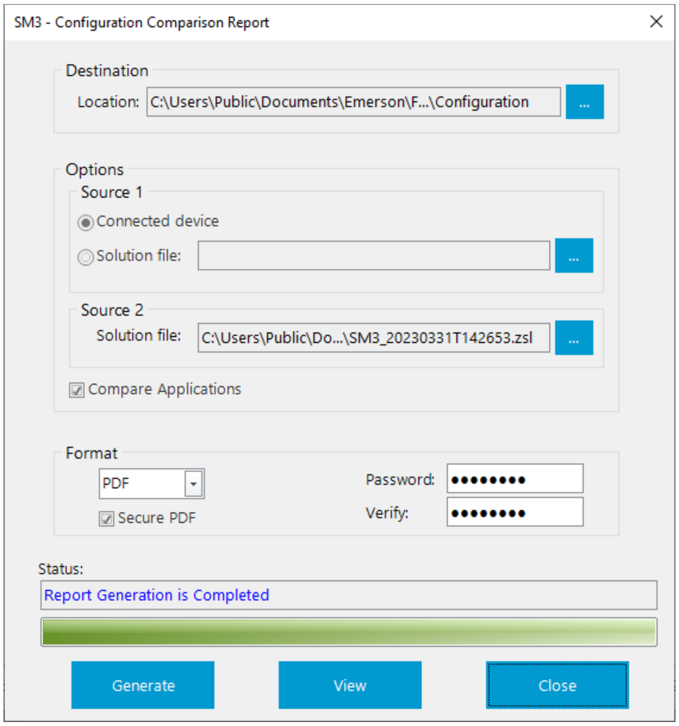
Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

---

8. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 466. Configuration Comparison Report Generation Completed



SM3 - Configuration Comparison Report

Destination
Location: C:\Users\Public\Documents\Emerson\F...\Configuration

Options
Source 1
● Connected device
○ Solution file:
Source 2
Solution file: C:\Users\Public\Do...\SM3_20230331T142653.zsl
☑ Compare Applications

Format
PDF
☑ Secure PDF
Password: ••••••••
Verify: ••••••••

Status:
Report Generation is Completed

---

9. After the report is generated, click **View** to open the completed report. The report lists only parameters that are different between the two configurations.

10. Click **Close** to return to the previous screen.

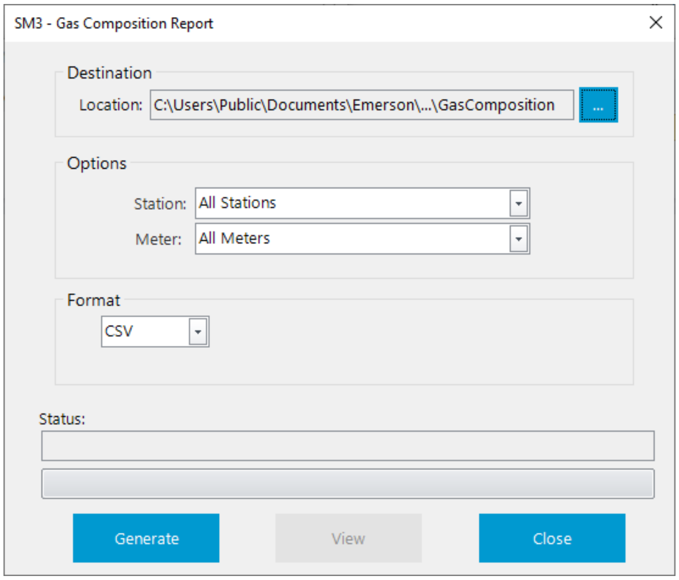
6.10 Gas Composition Report

Use the Gas Composition Report option to generate a report that details the gas components and mole percentages of the fluid flowing through each station and meter. You can generate reports using CSV or PDF formats.

To generate a Gas Composition Report:

1. Select **Reports > Gas Composition** from the FBxConnect™ main menu. The Gas Composition Report dialog displays.

Figure 467. Gas Composition Report



SM3 - Gas Composition Report

Destination

Location: C:\Users\Public\Documents\Emerson\...\GasComposition

Options

Station: All Stations

Meter: All Meters

Format

CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Operations\GasComposition*.

3. Click ▼ in the **Station** field and select the station that contains the data you want to collect.

4. Click ▼ in the **Meter** field and select the meter that contains the data you want to collect.

5. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

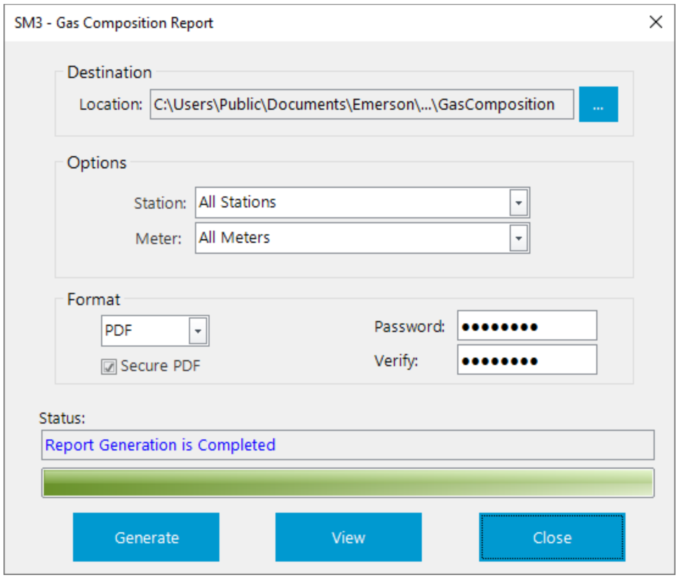
Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

---

6. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 468. Gas Composition Report Generation is Completed



SM3 - Gas Composition Report

Destination
Location: C:\Users\Public\Documents\Emerson\...\GasComposition

Options
Station: All Stations
Meter: All Meters

Format
PDF
☑ Secure PDF
Password: ••••••••
Verify: ••••••••

Status:
Report Generation is Completed

---

7. After the report is generated, click **View** to open the completed report.

8. Click **Close** to return to the previous screen.

6.11 Parameter Status Report

Use the Parameter Status report to help identify measurement issues with your FB Series product. The Parameter Status report contains a list of parameters in the following conditions:

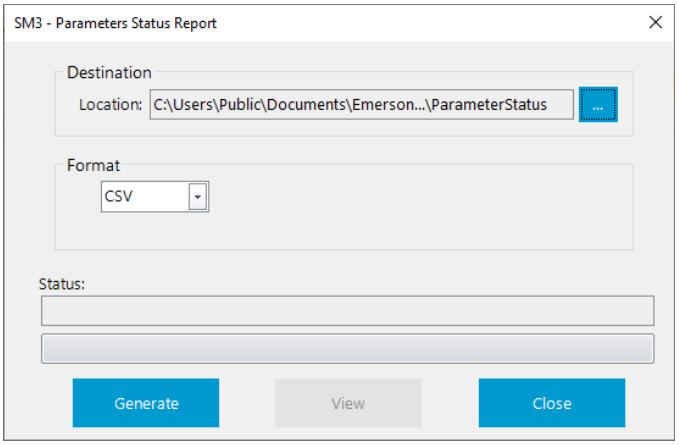
- **Override –** A list of all selectable options that could be "live" but are instead in override.

- **Fault** – A list of all selectable items (parameters that end in "_SEL") with the fault bit set in the data quality attribute (PrmStatus).
- **Default** – A list of metrology parameters that have **not** been changed from their default values.

To generate a Parameter Status Report:

1. Select **Reports > Parameter Status** from the FBxConnect™ main menu. The Parameter Status Report dialog displays.

Figure 469. Parameter Status Report


SM3 - Parameters Status Report

Destination

Location: C:\Users\Public\Documents\Emerson...\ParameterStatus

Format

CSV

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Configuration\ParameterStatus*.

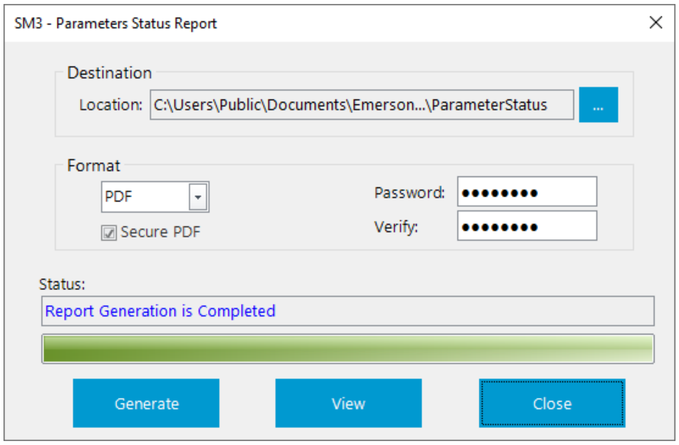
3. Click ▼ in the **Format** field to select the file type of the created report. Options include CSV or PDF formats.

Note

If you select PDF, you can password protect the file by placing a check mark in the **Secure PDF** box and entering a password.

4. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 470. Parameter Status Report Generation Completed



Location: C:\Users\Public\Documents\Emerson...\ParameterStatus

PDF

☑ Secure PDF

Password: ••••••••

Verify: ••••••••

Status:

Report Generation is Completed

5. After the report is generated, click **View** to open the completed report.

6. Click **Close** to return to the previous screen.

6.12 Diagnostic Report

Use the Diagnostic Report option to generate a report used to aid in investigations by Emerson's technical support team.

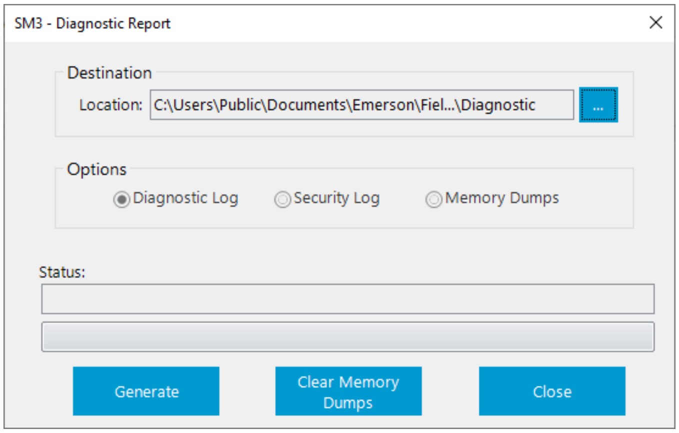
Note

The Diagnostic Report option creates an encrypted file that is **only** useful to Emerson's technical support team.

To generate a Diagnostic Report:

1. Select **Reports > Diagnostics** from the FBxConnect™ main menu. The Diagnostic Report dialog displays.

Figure 471. Diagnostic Report



SM3 - Diagnostic Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fiel...\Diagnostic

Options

● Diagnostic Log ○ Security Log ○ Memory Dumps

Status:

2. Click ... in the Destination field to open a Save As dialog and navigate to a location on your PC to store the report.

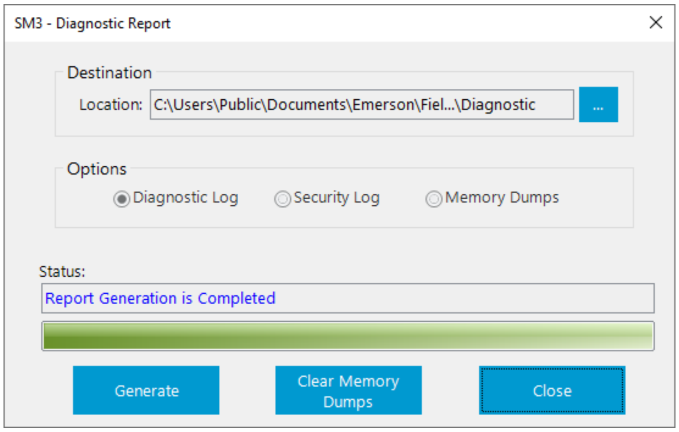
Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Operations\Diagnostic*.

3. Select the type of report you want to generate. Possible options are **Diagnostic log**, **Security log** ,or **Memory dumps**.

4. Click **Generate** to create the report. A status bar provides you with the current progress of the report creation.

Figure 472. Diagnostic Report Generation Completed



SM3 - Diagnostic Report

Destination

Location: C:\Users\Public\Documents\Emerson\Fiel...\Diagnostic

Options

● Diagnostic Log ○ Security Log ○ Memory Dumps

Status:

Report Generation is Completed

Note

Select the **Clear memory dumps** button to permanently delete any memory dumps on your device

5. After the report is generated, click **Close** to return to the previous screen.

6.13 Calibration Report

Use this option to view previously generated calibration reports stored on your PC.

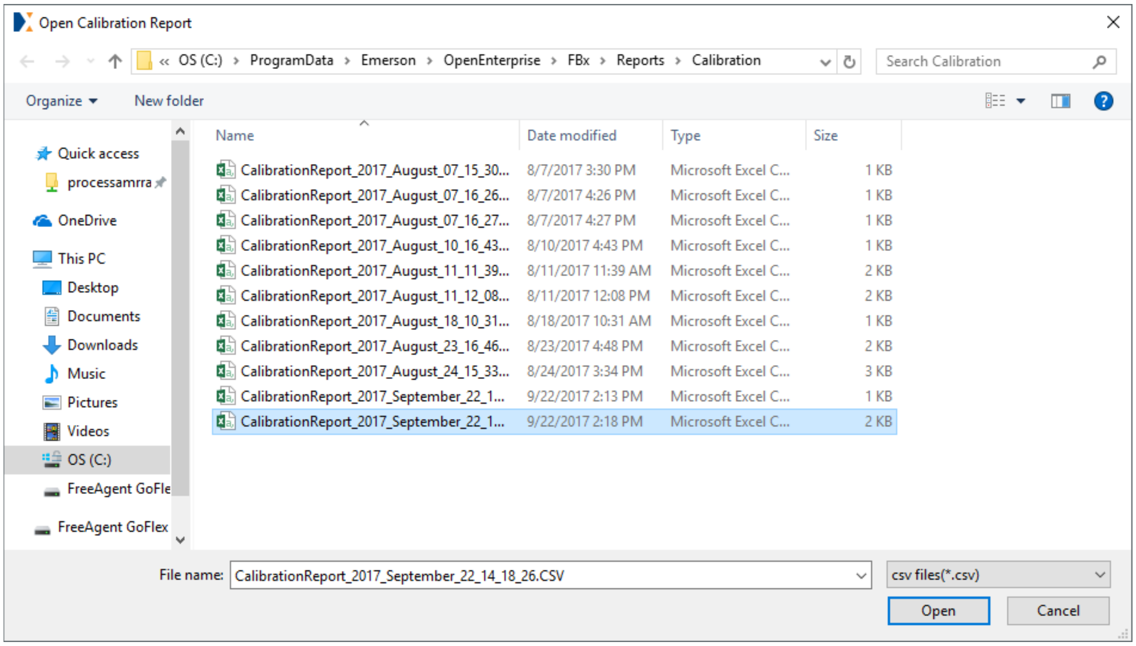
To view a Calibration Report:

1. Select **Reports > Calibration** from the FBxConnect™ main menu. A file explorer window displays showing calibration reports stored on your PC.

Note

The default location is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Reports\Calibration*.

Figure 473. Open Calibration Report



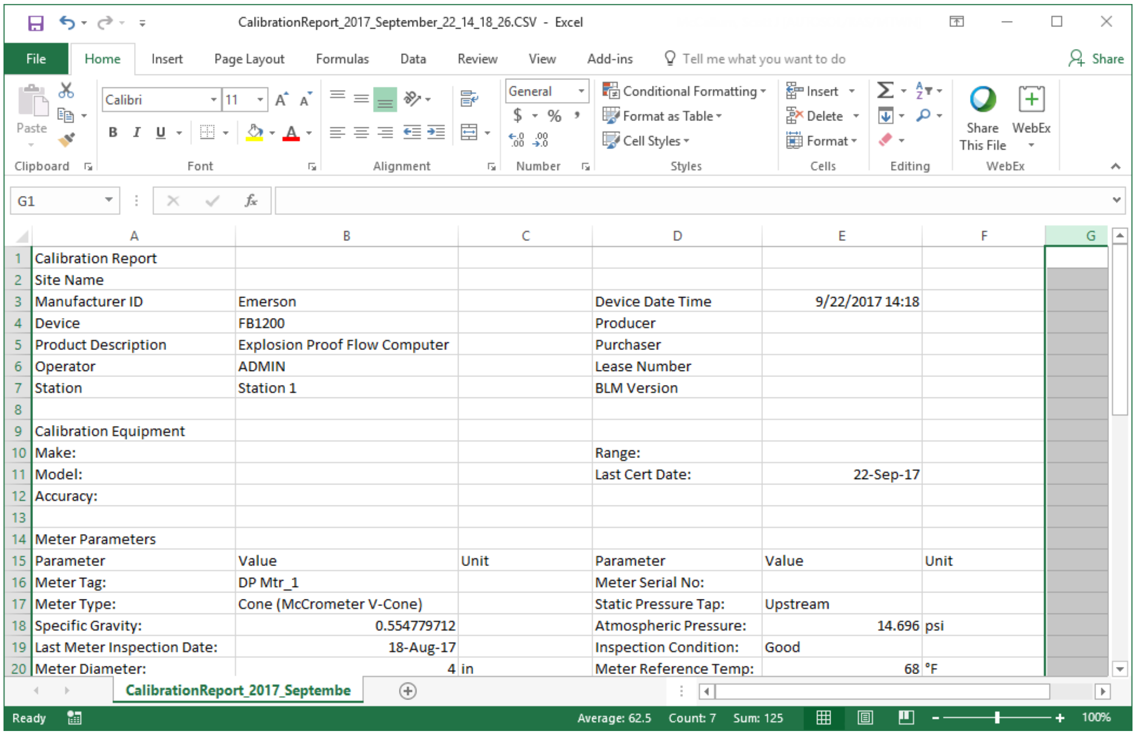
Name	Date modified	Type	Size
CalibrationReport_2017_August_07_15_30...	8/7/2017 3:30 PM	Microsoft Excel C...	1 KB
CalibrationReport_2017_August_07_16_26...	8/7/2017 4:26 PM	Microsoft Excel C...	1 KB
CalibrationReport_2017_August_07_16_27...	8/7/2017 4:27 PM	Microsoft Excel C...	1 KB
CalibrationReport_2017_August_10_16_43...	8/10/2017 4:43 PM	Microsoft Excel C...	1 KB
CalibrationReport_2017_August_11_11_39...	8/11/2017 11:39 AM	Microsoft Excel C...	2 KB
CalibrationReport_2017_August_11_12_08...	8/11/2017 12:08 PM	Microsoft Excel C...	2 KB
CalibrationReport_2017_August_18_10_31...	8/18/2017 10:31 AM	Microsoft Excel C...	1 KB
CalibrationReport_2017_August_23_16_46...	8/23/2017 4:48 PM	Microsoft Excel C...	2 KB
CalibrationReport_2017_August_24_15_33...	8/24/2017 3:34 PM	Microsoft Excel C...	3 KB
CalibrationReport_2017_September_22_1...	9/22/2017 2:13 PM	Microsoft Excel C...	1 KB
CalibrationReport_2017_September_22_1...	9/22/2017 2:18 PM	Microsoft Excel C...	2 KB

File name: CalibrationReport_2017_September_22_14_18_26.CSV

csv files(*.csv)

2. Select a calibration report and select **Open**. The calibration report displays.

Figure 474. Calibration Report



	A	B	C	D	E	F
1	Calibration Report					
2	Site Name					
3	Manufacturer ID	Emerson		Device Date Time	9/22/2017 14:18	
4	Device	FB1200		Producer		
5	Product Description	Explosion Proof Flow Computer		Purchaser		
6	Operator	ADMIN		Lease Number		
7	Station	Station 1		BLM Version		
8						
9	Calibration Equipment					
10	Make:			Range:		
11	Model:			Last Cert Date:	22-Sep-17	
12	Accuracy:					
13						
14	Meter Parameters					
15	Parameter	Value	Unit	Parameter	Value	Unit
16	Meter Tag:	DP Mtr_1		Meter Serial No:		
17	Meter Type:	Cone (McCrometer V-Cone)		Static Pressure Tap:	Upstream	
18	Specific Gravity:	0.554779712		Atmospheric Pressure:	14.696	psi
19	Last Meter Inspection Date:	18-Aug-17		Inspection Condition:	Good	
20	Meter Diameter:	4	in	Meter Reference Temp:	68	°F

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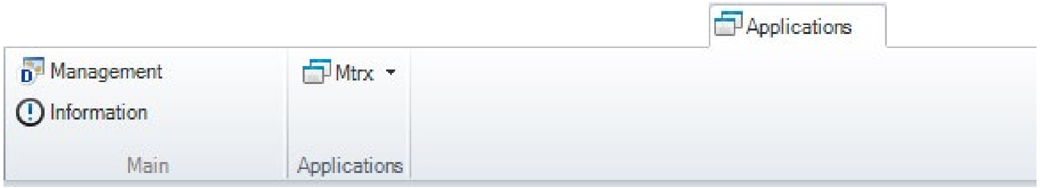
Section 7: Applications Menu

Use the Applications menu to install, remove, and view information about each application installed on your FB3000.

Figure 475. Applications Menu



The Applications menu contains the following options:

Management – Add, remove, or export applications.

Information – View information for each application installed in the FB3000 including resource usage, starting, and stopping the application.

Note

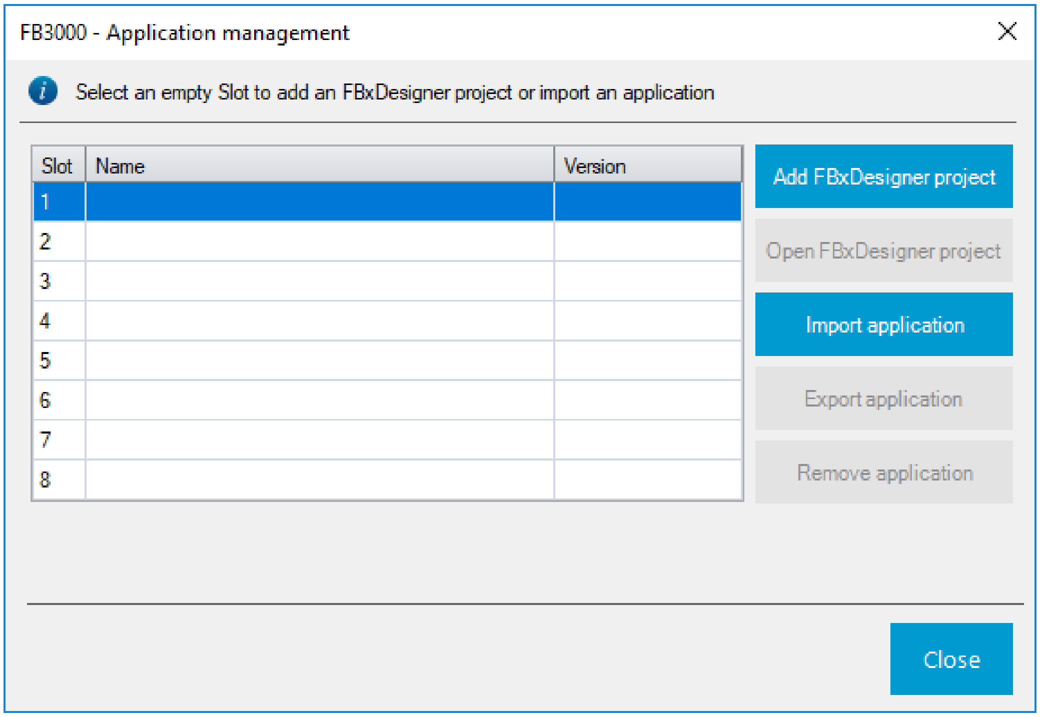
Any installed applications also display in this menu. For instructions about a specific application, refer to that application's documentation.

7.1 Management

Applications allow your FB3000 RTU to perform additional functions. You can create a custom application using FBxDesigner™ or import an application and load it into your FB Series product. The Application management window allows you to add, remove, or export applications.

To access this display, select **Applications > Management** from the FBxConnect™ main menu. The Application management window opens.

Figure 476. Application management



You can perform the following actions with the Application management window:

Add FBxDesigner Project – Add a project created in FBxDesigner™ to your FB3000, and optionally include user defined objects and/or user displays made using FBxVue.

Open FBxDesigner Project – Open an existing FBxDesigner™ project for editing.

Import Application – Import and start an application package (.zap).

Export Application – Export an application package (.zap).

Remove Application – Remove an application package, including the FBxDesigner™ program, user defined objects and user displays.

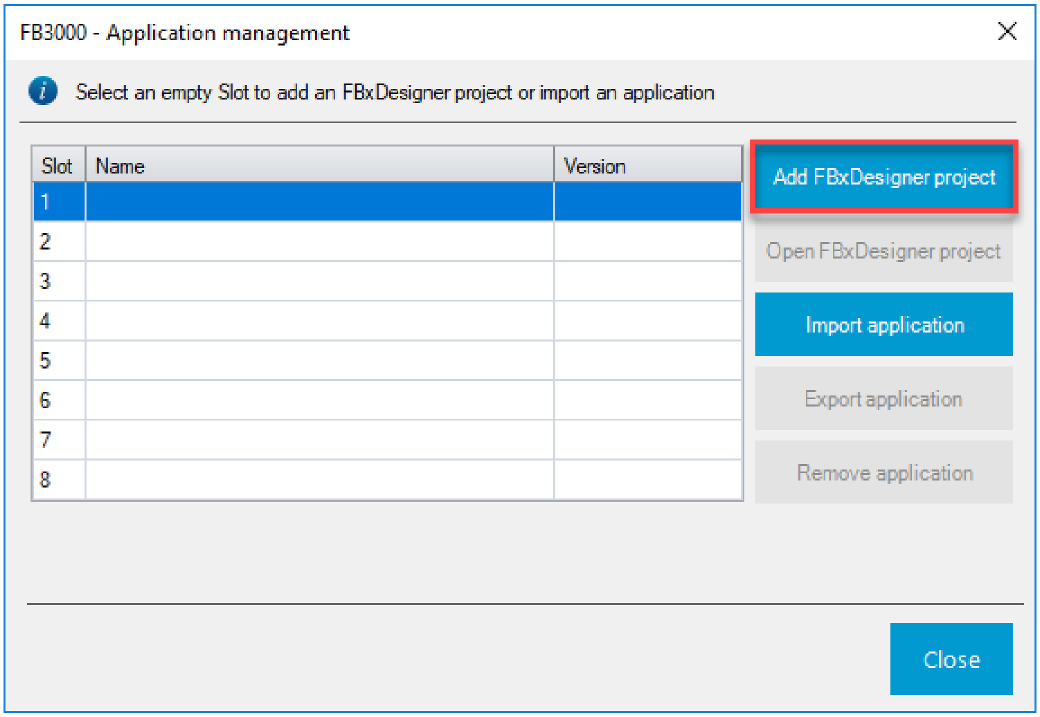
7.1.1 Add FBxDesigner™ Project

You can create custom applications in FBxDesigner™ and then load them in an FB Series product. Use this option to load an FBxDesigner™ project on your FB3000, and optionally include user defined objects and/or user displays created using FBxVue.

To add an FBxDesigner™ project:

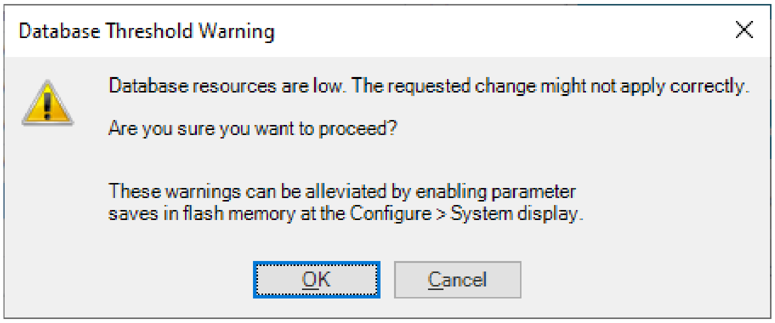
1. Select **Applications > Management** from the FBxConnect™ main menu. The Application management window opens.

Figure 477. Add FBxDesigner™ project



Note

The following warning appears if your FB Series product's database resources are low. You can free up database resources by removing certain configuration parameters from the database and storing those parameters as files on the FB Series product’s flash file system. For more information, refer to the **Database save Params to Flash File** field on the Configure – System display.



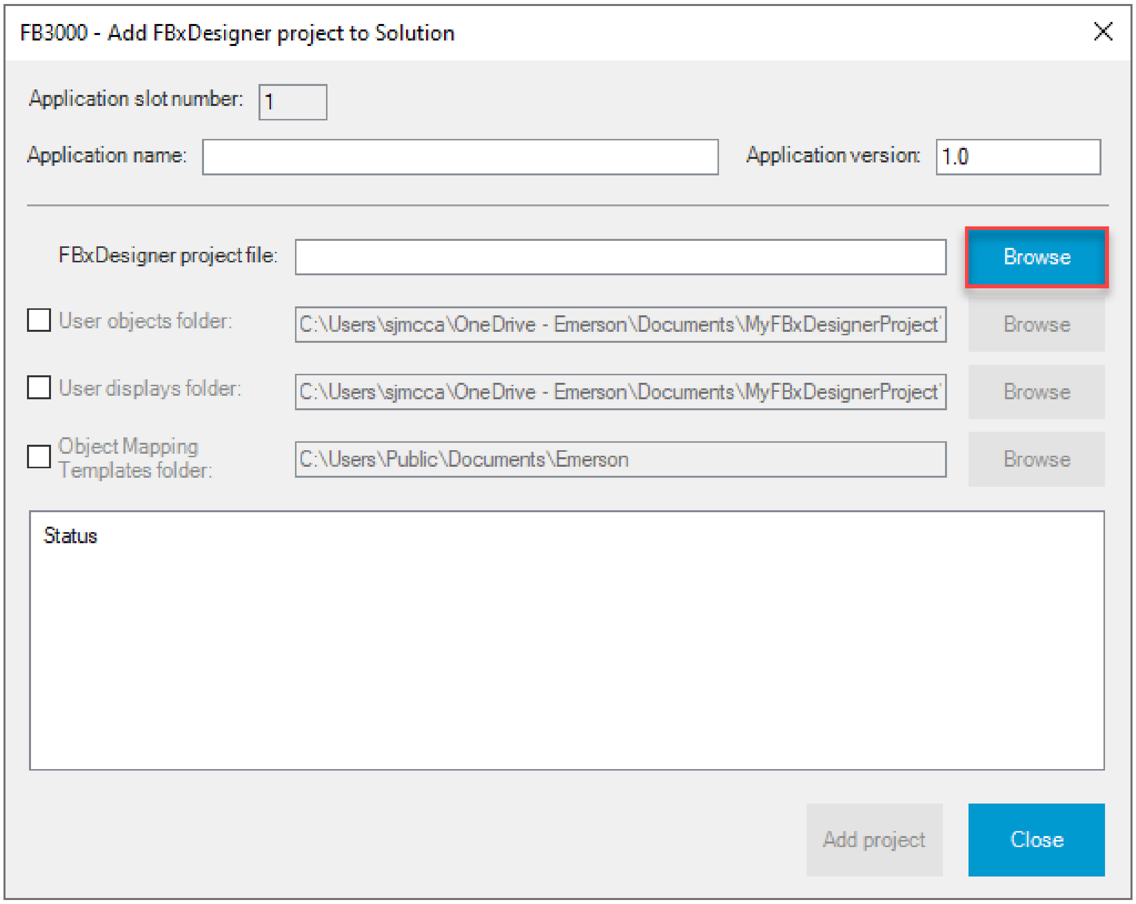
Database resources are low. The requested change might not apply correctly.

Are you sure you want to proceed?

These warnings can be alleviated by enabling parameter saves in flash memory at the Configure > System display.

2. Select which slot the FBxDesigner™ project should be loaded into and select **Add FBxDesigner project**. The Add FBxDesigner project to Solution pop-up display opens.

Figure 478. Add FBxDesigner™ project to Solution



FB3000 - Add FBxDesigner project to Solution

Application slot number: 1

Application name:

Application version: 1.0

FBxDesigner project file:

☐ User objects folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject'

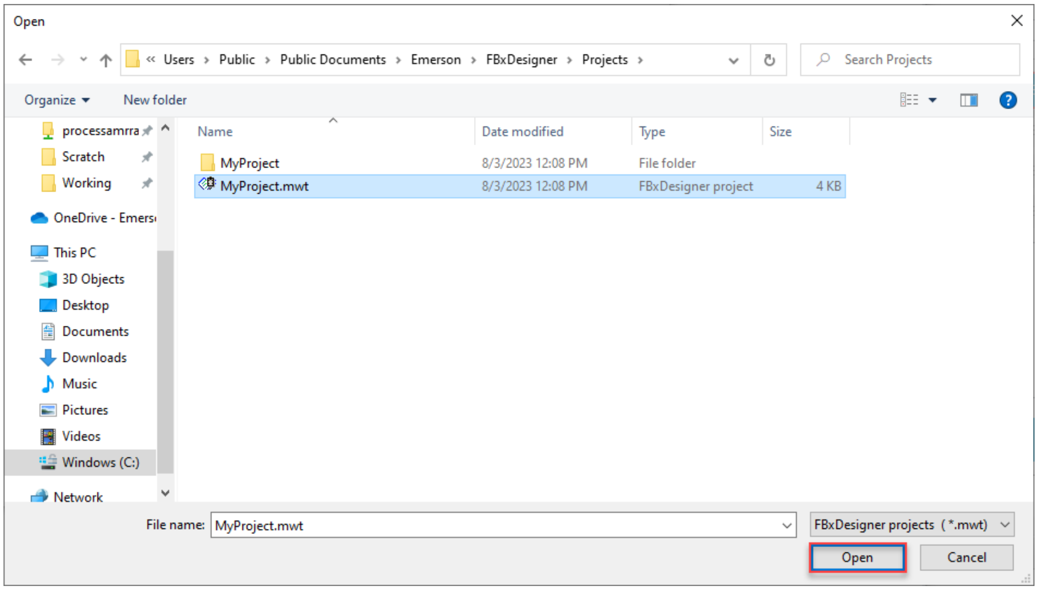
☐ User displays folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject'

☐ Object Mapping Templates folder: C:\Users\Public\Documents\Emerson

Status

3. Select **Browse** in the FBxDesigner project file field. A file explorer window opens.

Figure 479. Open



File name: MyProject.mwt

4. Navigate to the location of the FBxDesigner™ project file on your PC, select the file, and then select **Open**.

Note

The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FBxDesigner\Projects*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.

5. To add user defined objects to your FBxDesigner™ project, place a check mark next to **User objects folder**, select **Browse**, select the folder on you PC that contains the user defined objects, and then select **OK**.

Note

- Adding user defined objects is optional.
- Creating user defined objects is an advanced feature of the FB3000. For more information about the steps involved in creating user defined objects, please contact technical support.

6. To add displays created with FBxVue to your FBxDesigner™ project, place a check mark next to **User displays folder**, select **Browse**, select the folder on you PC that contains the custom displays, and then select **OK**.

Note

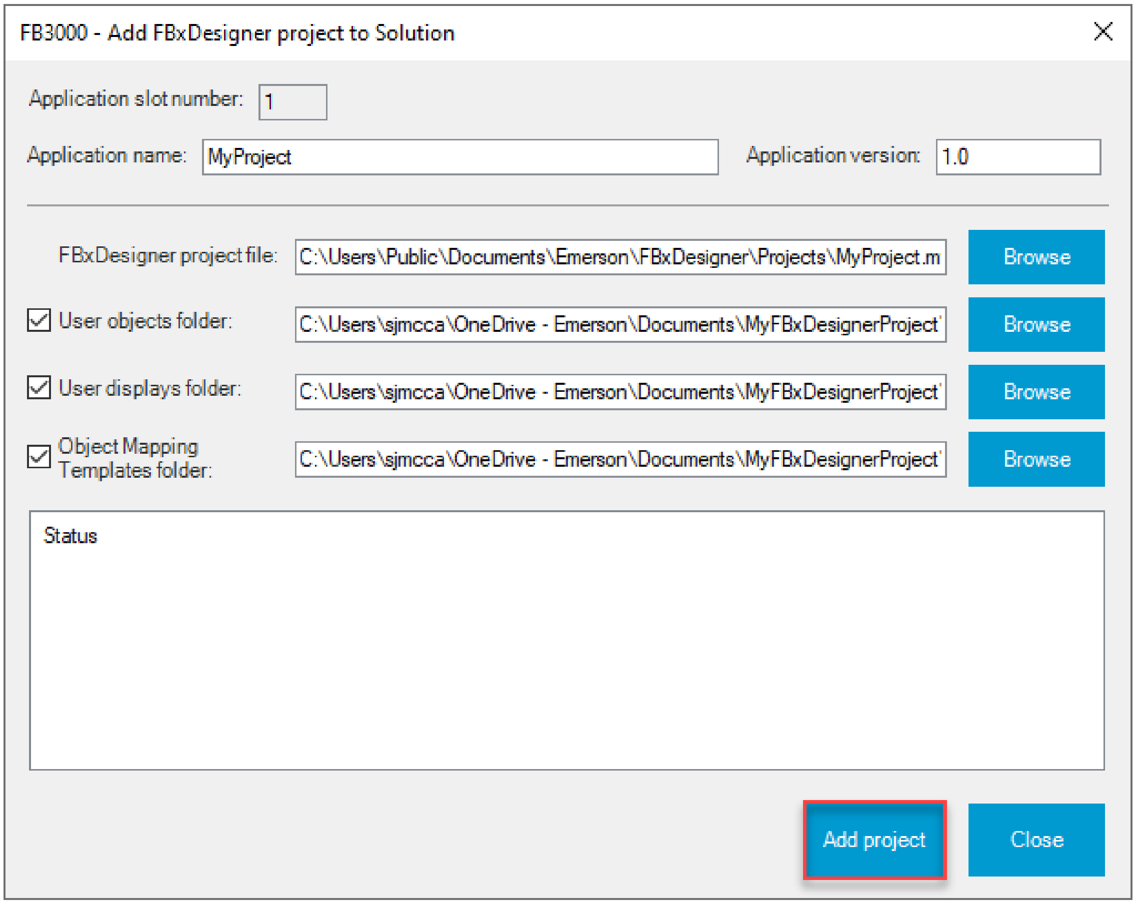
Adding displays is optional.

7. To add object mapping templates to your FBxDesigner™ project, place a check mark next to **Object Mapping Templates folder**, select **Browse**, select the folder on you PC that contains the custom Object Mapping Templates (OMT), and then select **OK**.

Note

Adding Object Mapping Templates is optional.

Figure 480. Add project



FB3000 - Add FBxDesigner project to Solution

Application slot number: 1

Application name: MyProject

Application version: 1.0

FBxDesigner project file: C:\Users\Public\Documents\Emerson\FBxDesigner\Projects\MyProject.m

☑ User objects folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

☑ User displays folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

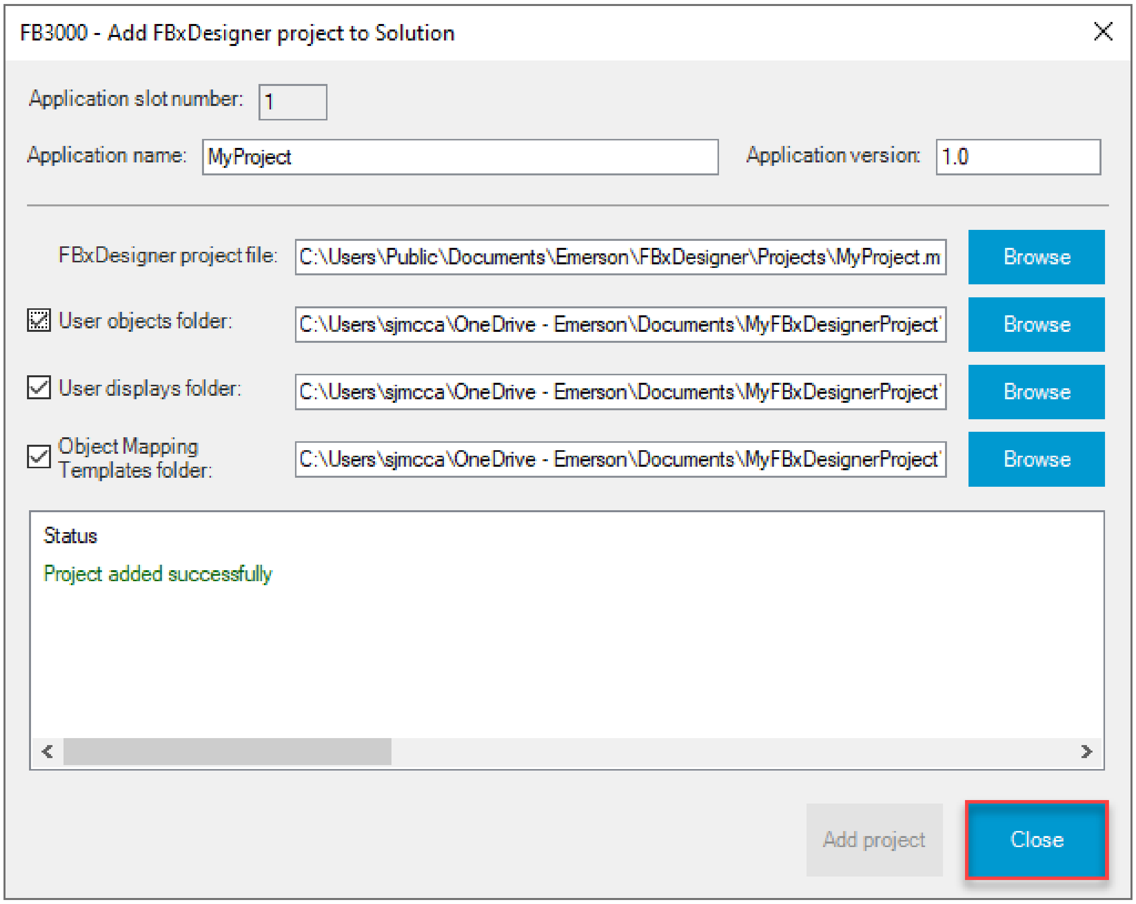
☑ Object Mapping Templates folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

8. Select **Add project** to add the FBxDesigner™ project to your FB3000. The Status field shows Project added successfully.

Note

An error message appears if the FBxDesigner project contains an object with a major and/or minor version equal to zero (as defined in the application's Objects.csv file). To fix this error, update the major and/or minor version in the application's Objects.csv file to a number greater than zero and try again.

Figure 481. Project Added Successfully



Application slot number: 1

Application name: MyProject

Application version: 1.0

FBxDesigner project file: C:\Users\Public\Documents\Emerson\FBxDesigner\Projects\MyProject.m

☑ User objects folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

☑ User displays folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

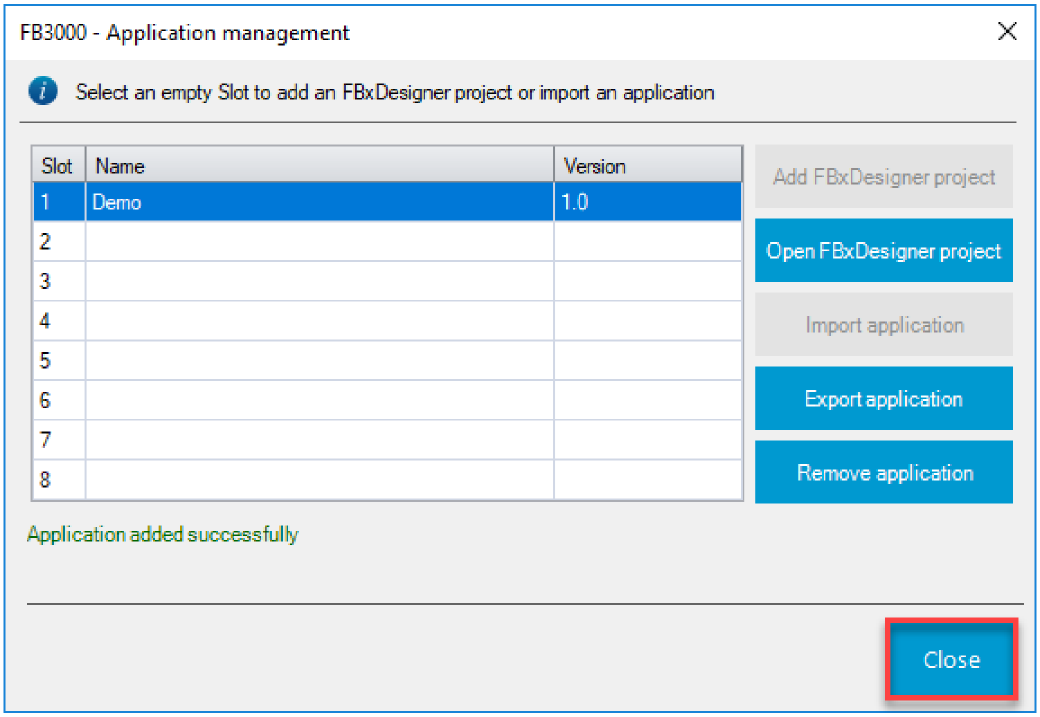
☑ Object Mapping Templates folder: C:\Users\sjmcca\OneDrive - Emerson\Documents\MyFBxDesignerProject

Status

Project added successfully

9. Select **Close** to return to the main Application management window.

Figure 482. Application Added Successfully



FB3000 - Application management

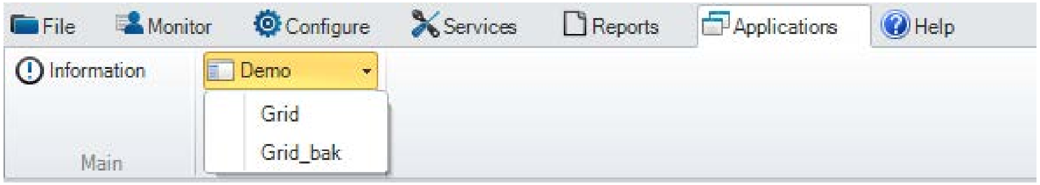
Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1	Demo	1.0
2		
3		
4		
5		
6		
7		
8		

Application added successfully

10. FBxConnect™ downloads the FBxDesigner™ project to your FB3000. Select **Close** to exit the Application management window. Any user displays are now available from the Application menu.

Figure 483. Application Showing User Displays



Note

When creating a display, the system periodically creates a backup copy (_bak) of your display. You can safely remove the application, delete the file from the display folder, and re-add the application to the FB3000 to prevent this from showing in the UI.

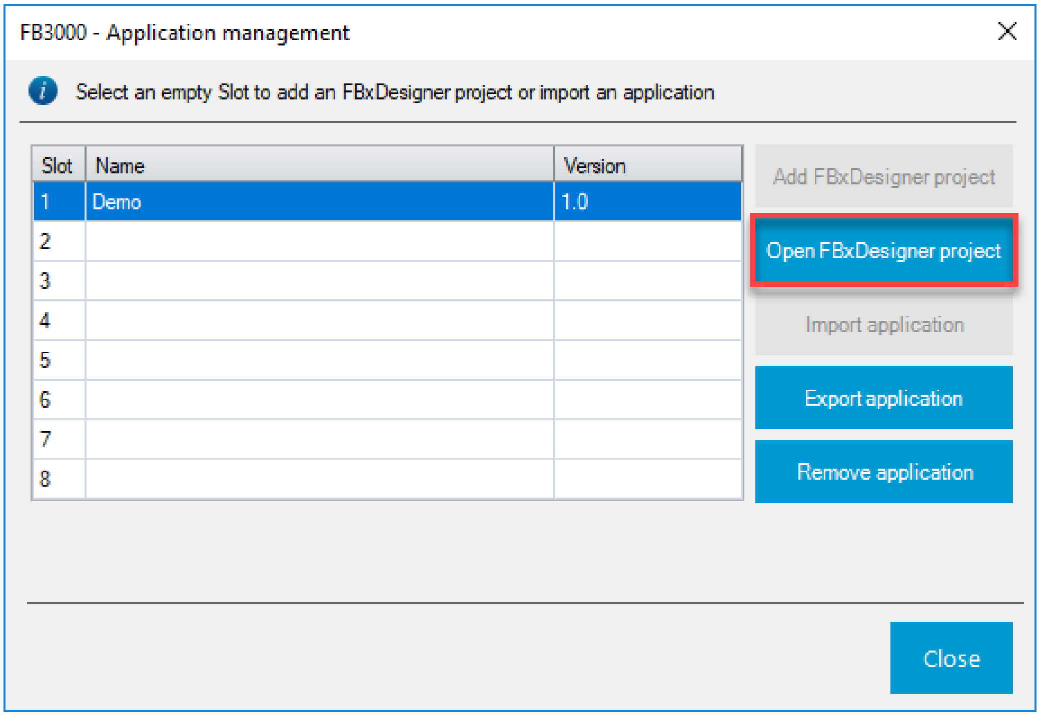
7.1.2 Open FBxDesigner Project

You can open and edit an existing FBxDesigner™ project that is loaded in you FB3000.

To open an FBxDesigner™ project:

1. Select **File > Manage Applications** from the FBxConnect™ main menu. The Application Management window opens.

Figure 484. Open FBxDesigner project



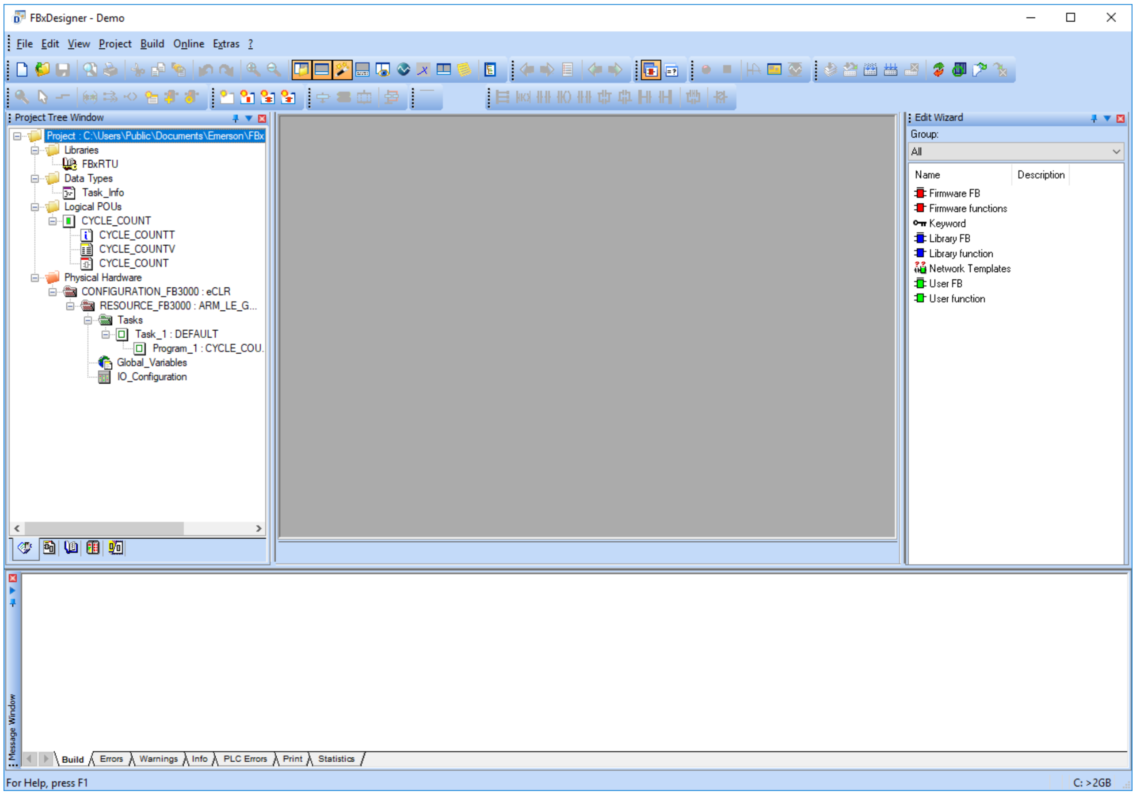
FB3000 - Application management

Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1	Demo	1.0
2		
3		
4		
5		
6		
7		
8		

2. Select the slot that contains the FBxDesigner™ project and select **Open FBxDesigner project**. The project opens in FBxDesigner™.

Figure 485. Open



3. You can now view and modify the FBxDesigner™ project.

Note

You **must** save any changes you make to the FBxDesigner™ project to a new project file, and then add the new project file to the FB Series product.

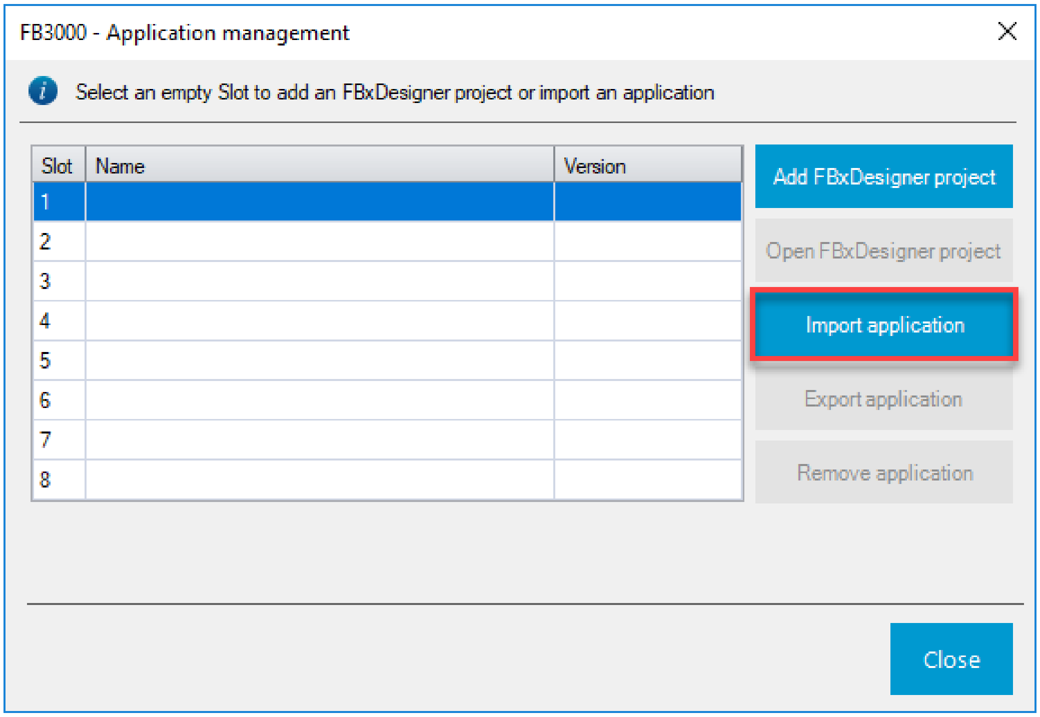
7.1.3 Import Application

Applications allow your FB Series product to perform additional functions. Use this option to import and start an application (.zap) package.

To import an application:

1. Select **File > Manage Applications** from the FBxConnect™ main menu. The Application management window opens.

Figure 486. Import Application



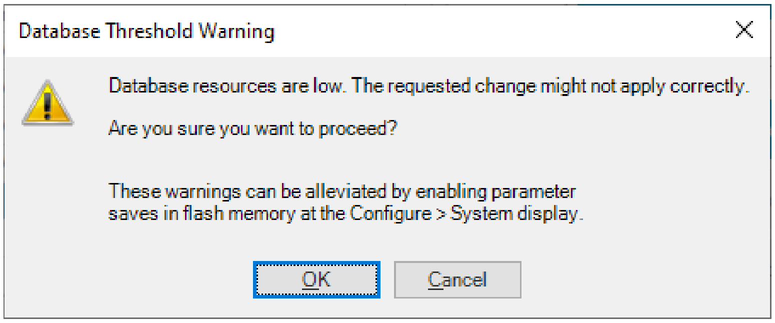
FB3000 - Application management

Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1		
2		
3		
4		
5		
6		
7		
8		

Note

The following warning appears if your FB Series product's database resources are low. You can free up database resources by removing certain configuration parameters from the database and storing those parameters as files on the FB Series product’s flash file system. For more information, refer to the **Database save Params to Flash File** field on the Configure – System display.



Database Threshold Warning

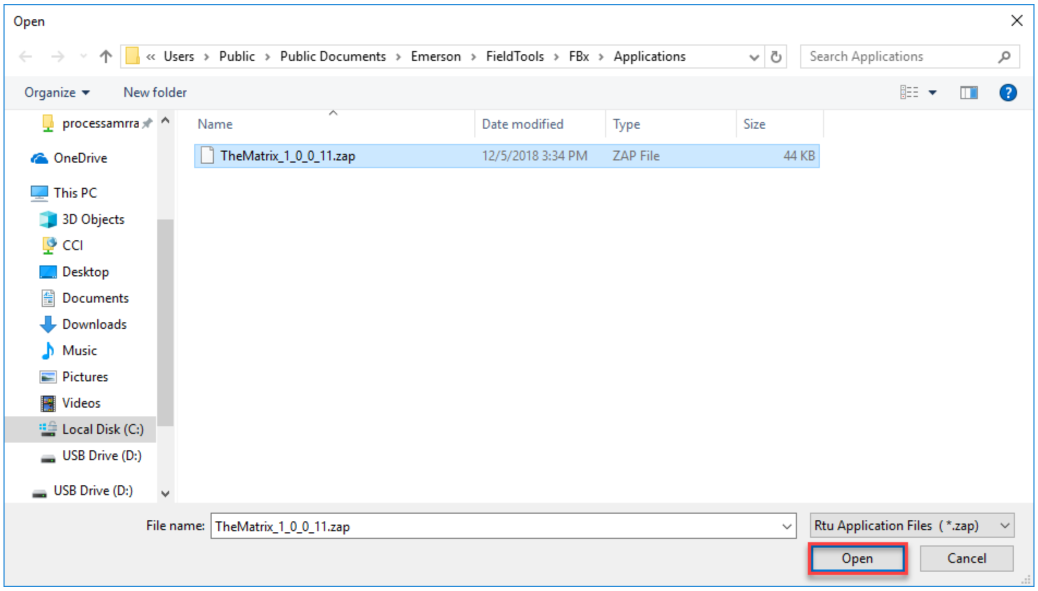
Database resources are low. The requested change might not apply correctly.

Are you sure you want to proceed?

These warnings can be alleviated by enabling parameter saves in flash memory at the Configure > System display.

2. Select which slot the application should be loaded into and select **Import Application**. A file explorer window opens.

Figure 487. Open

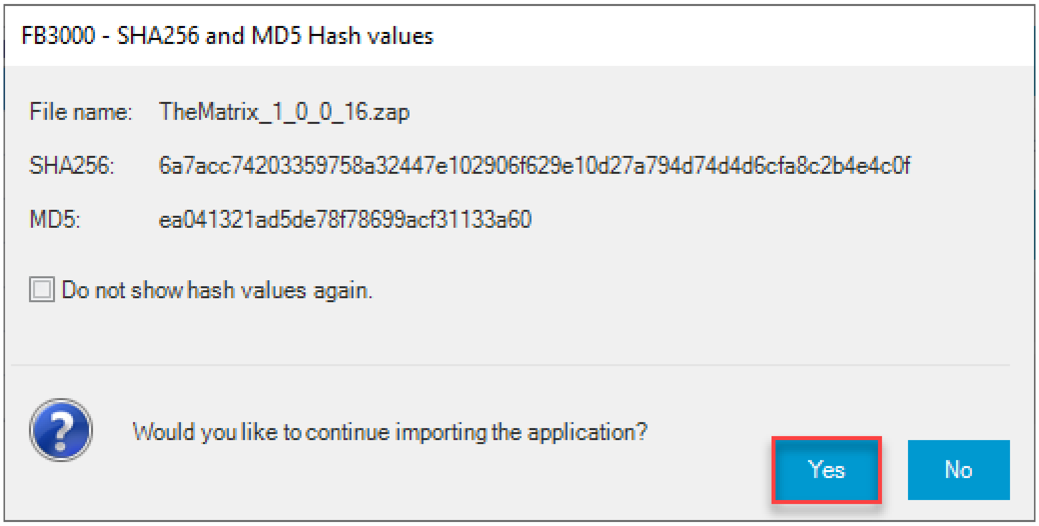


3. Navigate to the location of the application file on your PC, select the file, and then select **Open**. A dialog opens showing the SHA256 and MD5 Hash values of the application file.

Note

The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Applications*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.

Figure 488. Hash Values Dialog



FB3000 - SHA256 and MD5 Hash values

File name: TheMatrix_1_0_0_16.zap

SHA256: 6a7acc74203359758a32447e102906f629e10d27a794d74d4d6cfa8c2b4e4c0f

MD5: ea041321ad5de78f78699acf31133a60

☐ Do not show hash values again.

Would you like to continue importing the application?

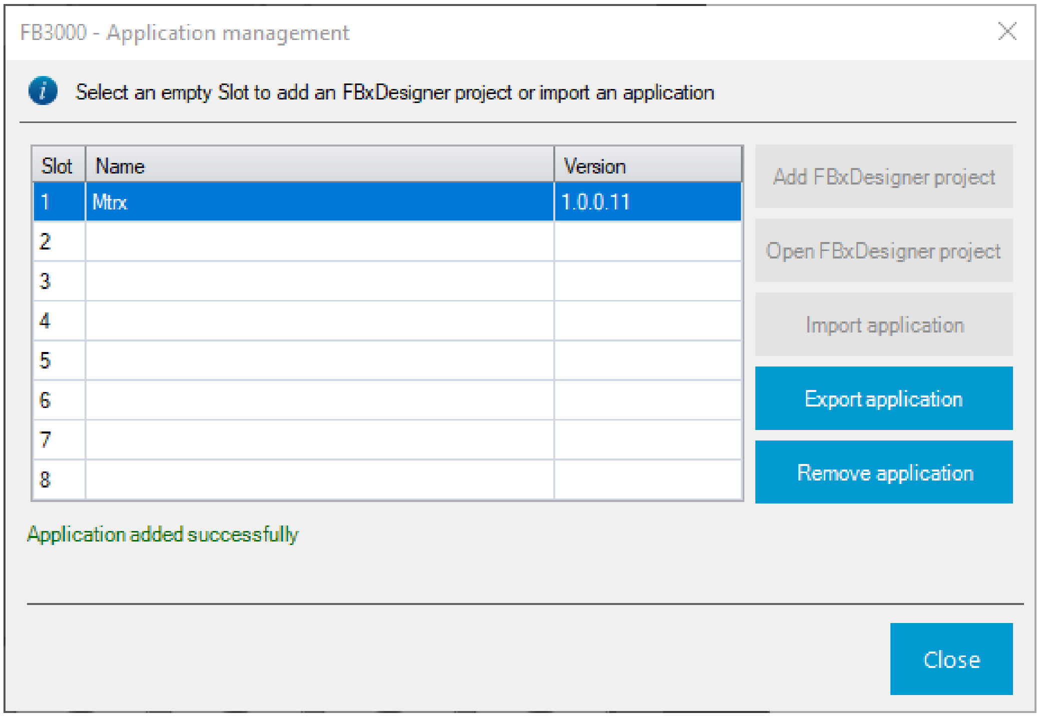
4. After confirming the hash values of the package, select **Yes** to begin the firmware update. A progress bar shows you the status of the update process.

Note

- The application is immediately loaded on your FB Series product.
- An error message appears if the new application contains an object with a major and/or minor version equal to zero (as defined in the application's Objects.csv file). To fix this error, update the major and/or minor version in the application's Objects.csv file to a number greater than zero and try again.

5. When the application is added successfully, select **Close** to return to the main FBxConnect™ display.

Figure 489. Application Added Successfully



Slot	Name	Version
1	Mtrx	1.0.0.11
2		
3		
4		
5		
6		
7		
8		

Application added successfully

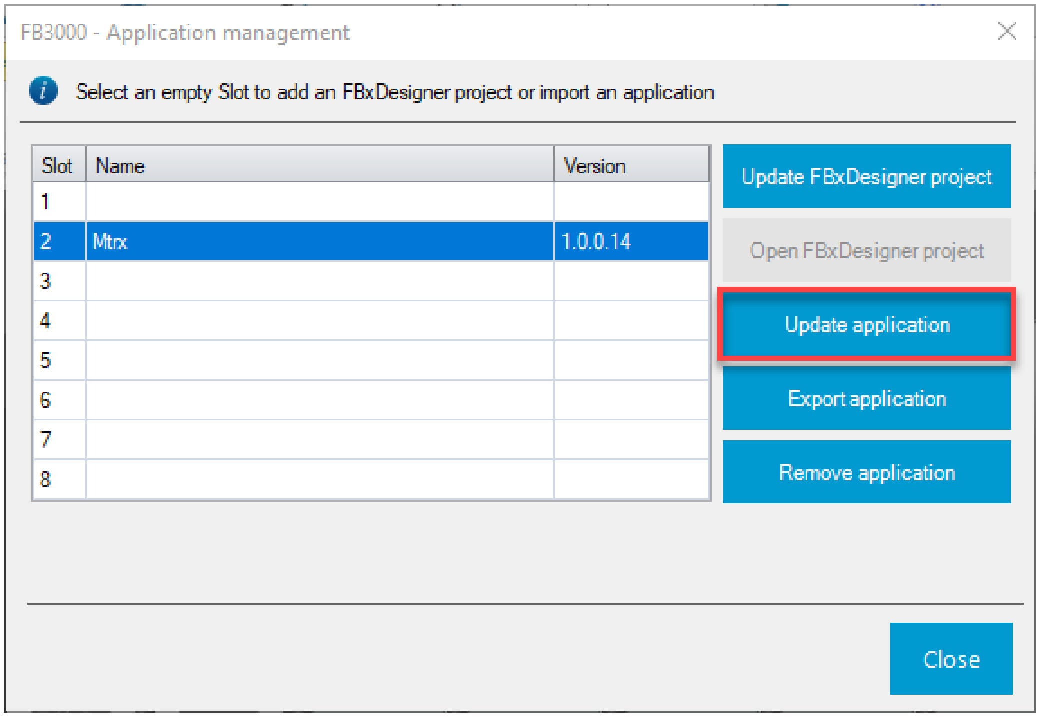
7.1.4 Update Application

You can update applications installed on your FB Series product without the need to remove the previous version first. This allows you to keep any configured program data when installing the new version.

To update an application:

1. Select **File > Manage Applications** from the FBxConnect™ main menu. The Application management window displays.
2. Select the slot containing the application you want to update.

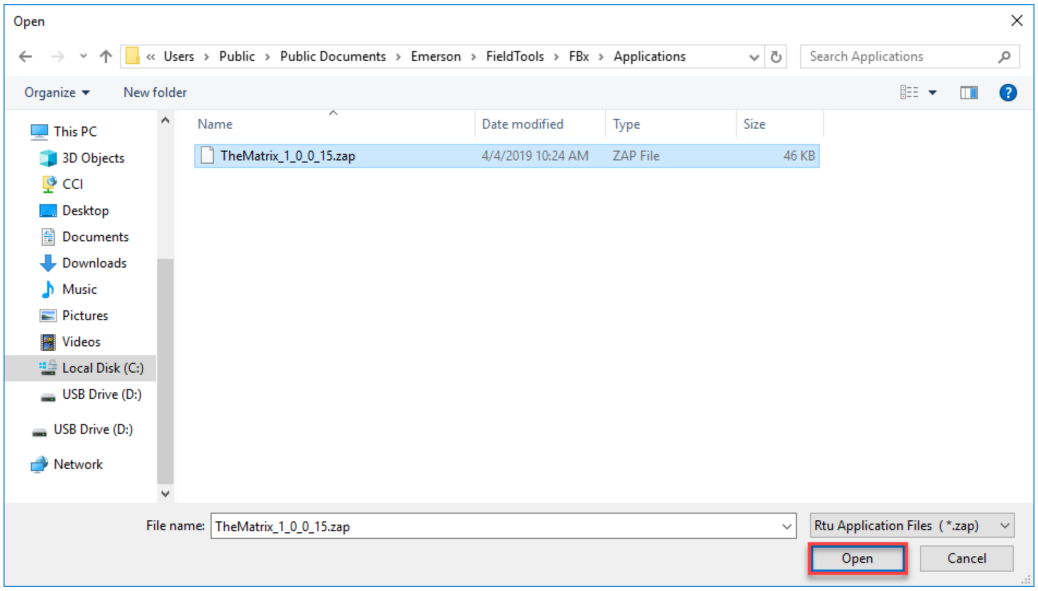
Figure 490. Update Application



Slot	Name	Version
1		
2	Mtrx	1.0.0.14
3		
4		
5		
6		
7		
8		

3. Select **Update Application**. A file explorer window opens.

Figure 491. Open



Name	Date modified	Type	Size
TheMatrix_1_0_0_15.zap	4/4/2019 10:24 AM	ZAP File	46 KB

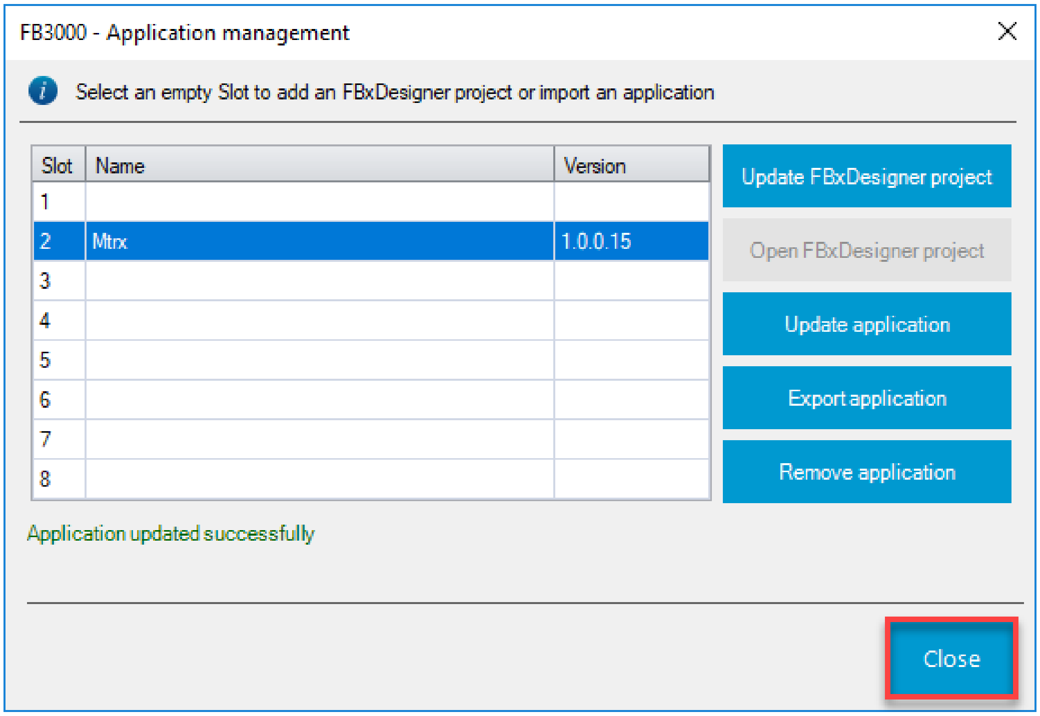
File name: TheMatrix_1_0_0_15.zap

4. Navigate to the location of the new version of the application file on your PC, select the file, and then select **Open**.

Note

- The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Applications*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.
- The application is immediately loaded on your FB Series product.
- An error message appears if the new application contains an object with a major and/or minor version equal to zero (as defined in the application's Objects.csv file). To fix this error, update the major and/or minor version in the application's Objects.csv file to a number greater than zero and try again.

Figure 492. Application Updated Successfully



FB3000 - Application management

Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1		
2	Mtrx	1.0.0.15
3		
4		
5		
6		
7		
8		

Application updated successfully

5. When the application is updated successfully, select **Close** to return to the main FBxConnect™ display.

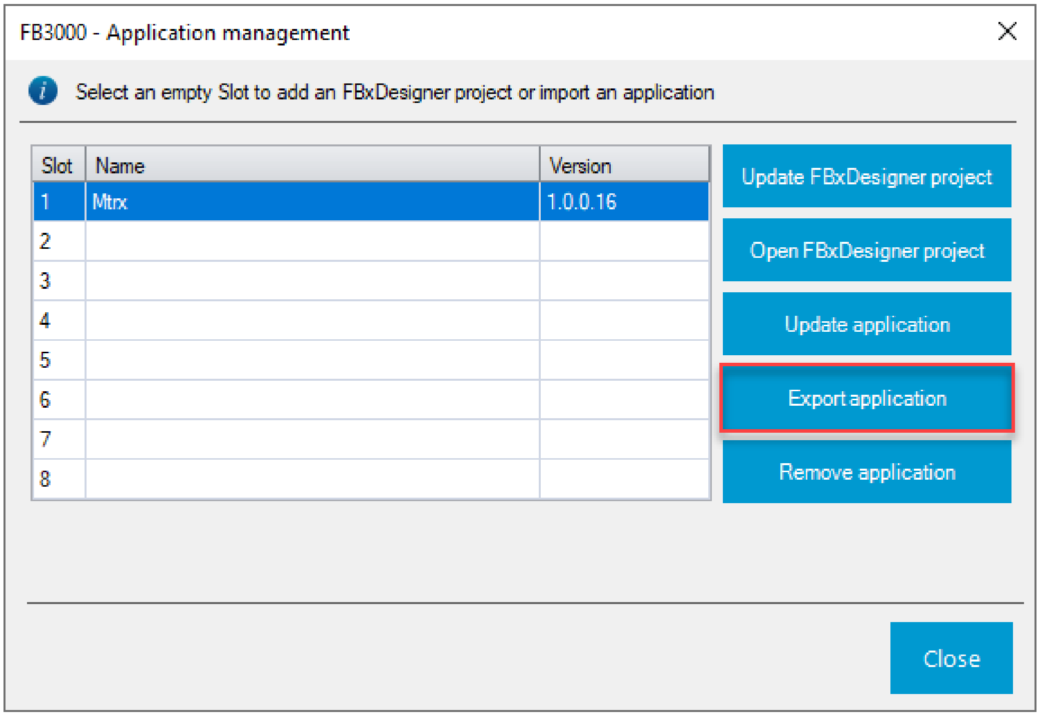
7.1.5 Export Application

You can export applications from an FB Series product and save them as solution files on your PC. Use this option to export an application package (.zap), select the destination path, and assign an application version number to the exported application package.

To export an application package:

1. Select **File > Manage Applications** from the FBxConnect™ main menu. The Application management window opens.

Figure 493. Export Application



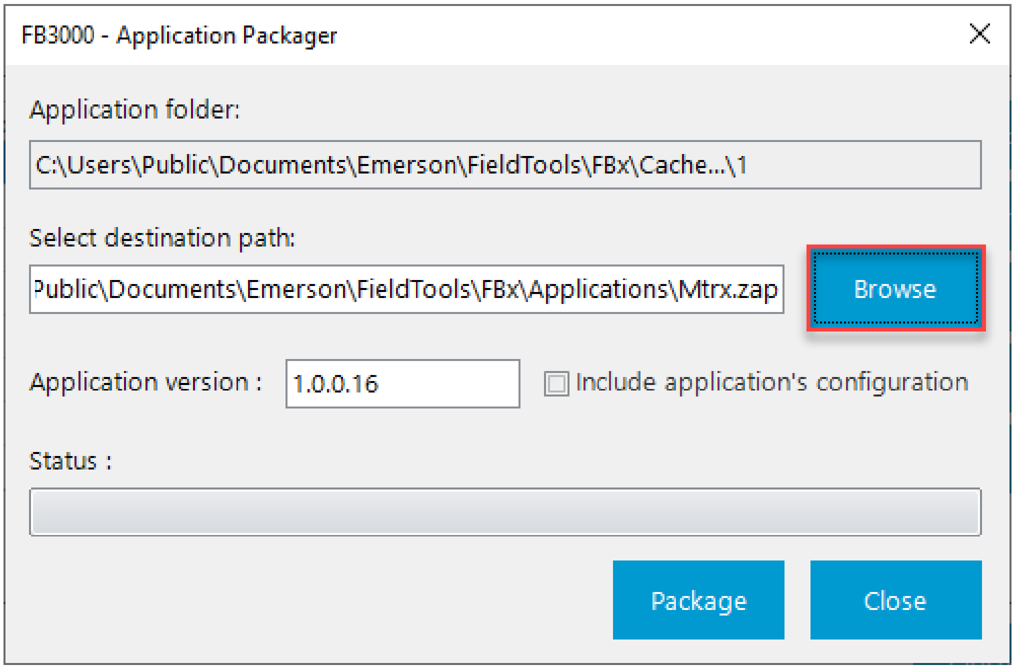
FB3000 - Application management

Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1	Mtrx	1.0.0.16
2		
3		
4		
5		
6		
7		
8		

2. Select the slot with the application you want to export and click **Export application**. The Application Packager window opens.

Figure 494. Application Packager


FB3000 - Application Packager

Application folder:

C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache...\1

Select destination path:

Public\Documents\Emerson\FieldTools\FBx\Applications\Mtrx.zap

Application version : 1.0.0.16

☐ Include application's configuration

Status :

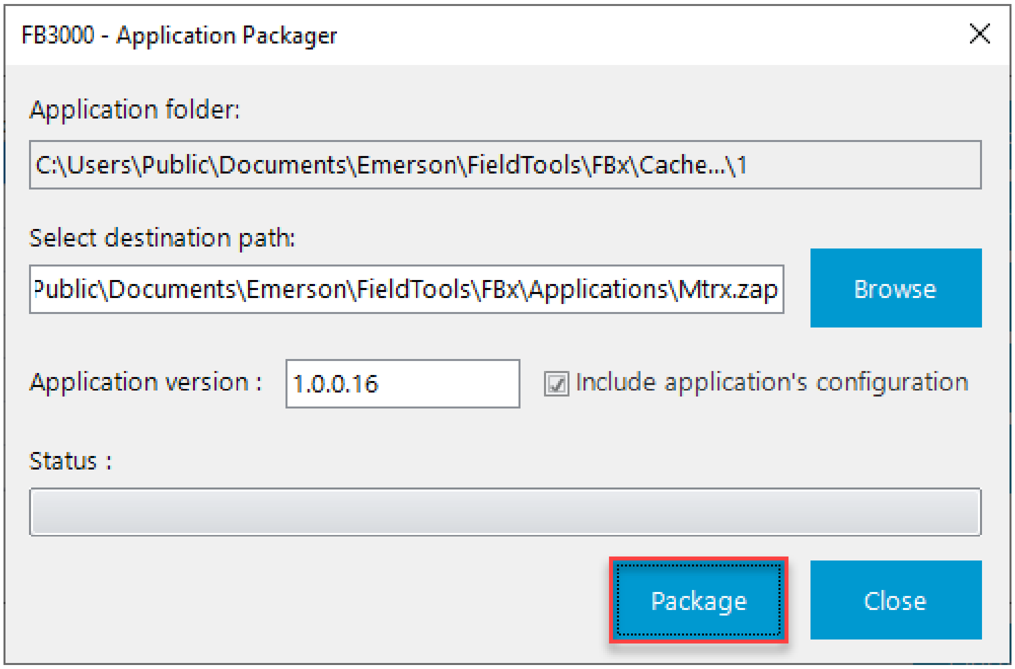
3. Select **Browse** to open a File Explorer window.
4. Navigate to the location on your PC you want to save the application, enter a name for the file and select **Save**.

Note

The default location for saved Solutions is *C:\Users\Public\Documents\Emerson\FieldTools\FBx\Applications*. This location is in a hidden folder, and you may need to select "show hidden files" on your computer to view this folder.

5. Enter a version number in the **Application Version** field.
6. Place a check mark next to **Include application's configuration** if you want to include your customized configuration in the application package.
7. Select **Package** to save the application in a Solution file on your PC.

Figure 495. Application Packager



Application folder:
C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache...\1

Select destination path:
Public\Documents\Emerson\FieldTools\FBx\Applications\Mtrx.zap

Application version : 1.0.0.16

☑ Include application's configuration

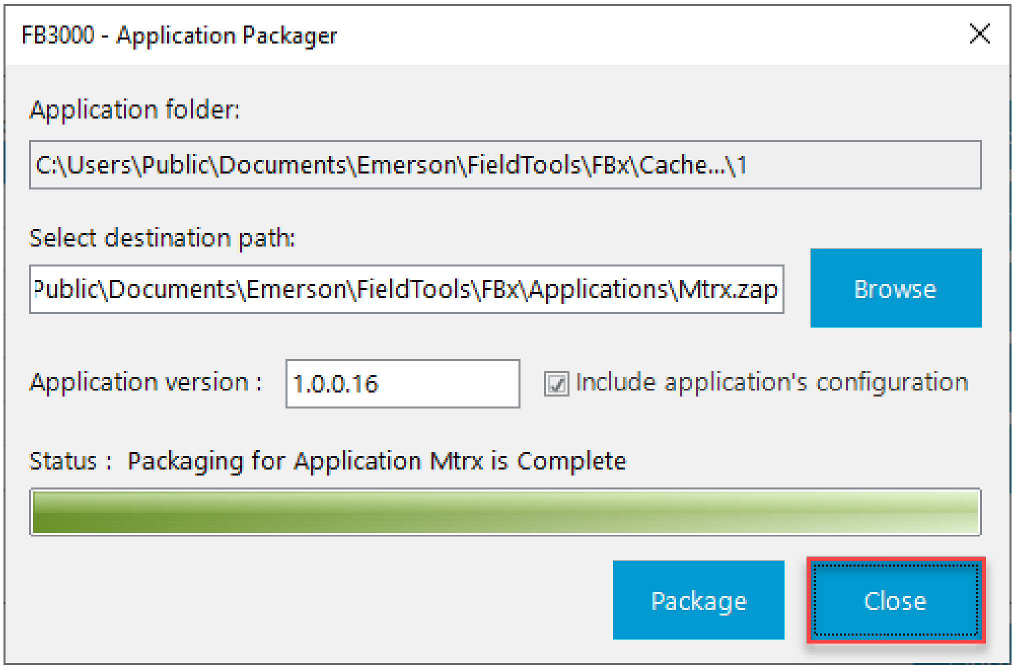
Status :

Note

- If the application package file name already exists on your computer, the system asks you want to overwrite the existing file. Select **Yes** to overwrite the file or select **No** to cancel the operation and enter a unique name for this application package.
- An error message appears if any application object contains a major and/or minor version equal to zero (as defined in the application's Objects.csv file). If this occurs, you cannot export the application.

8. Select **Close** to return to the main FBxConnect™ display.

Figure 496. Application Exported Successfully



Application folder: C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache...\1

Select destination path: ublic\Documents\Emerson\FieldTools\FBx\Applications\Mtrx.zap

Application version : 1.0.0.16

☑ Include application's configuration

Status : Packaging for Application Mtrx is Complete

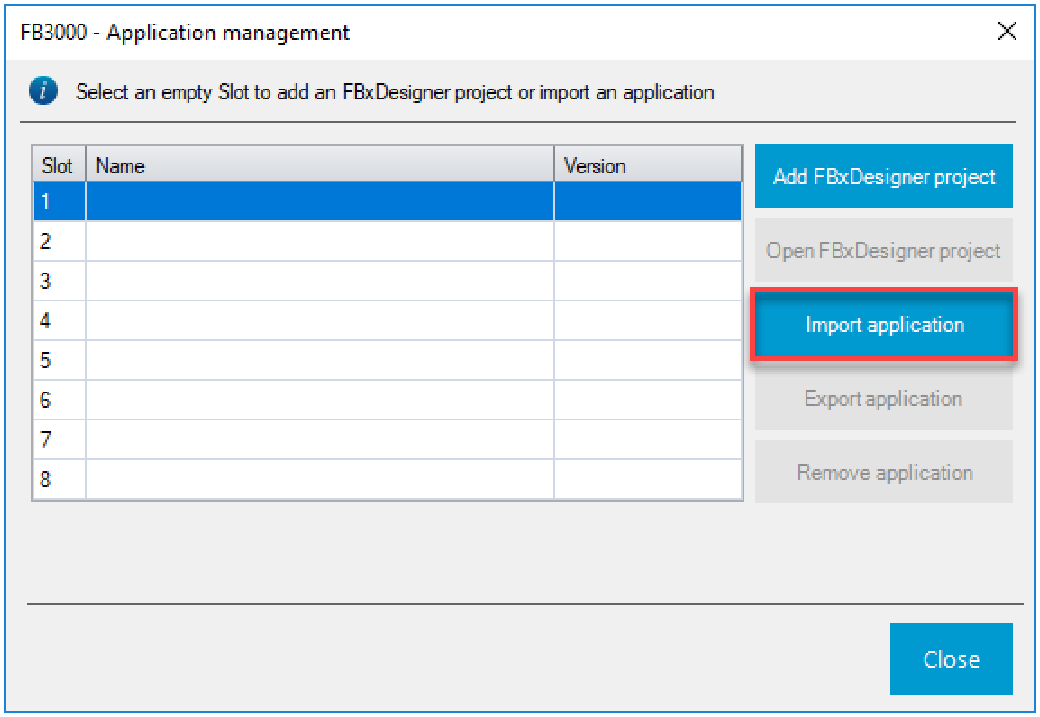
7.1.6 Remove Application

Use this option to remove an application package from the device, including the FBxDesigner™ program, user defined objects and user displays.

To remove an application:

1. Select **File > Manage Applications** from the FBxConnect™ main menu. The Application management window opens.

Figure 497. Application management


FB3000 - Application management

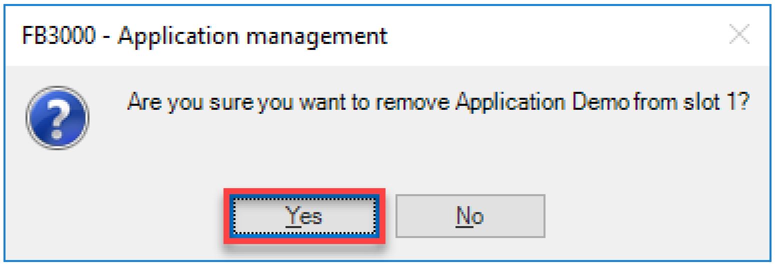
Select an empty Slot to add an FBxDesigner project or import an application

Slot	Name	Version
1		
2		
3		
4		
5		
6		
7		
8		

2. Select the slot that contains the application you want to remove.

3. Select **Remove application**. A confirmation dialog opens.

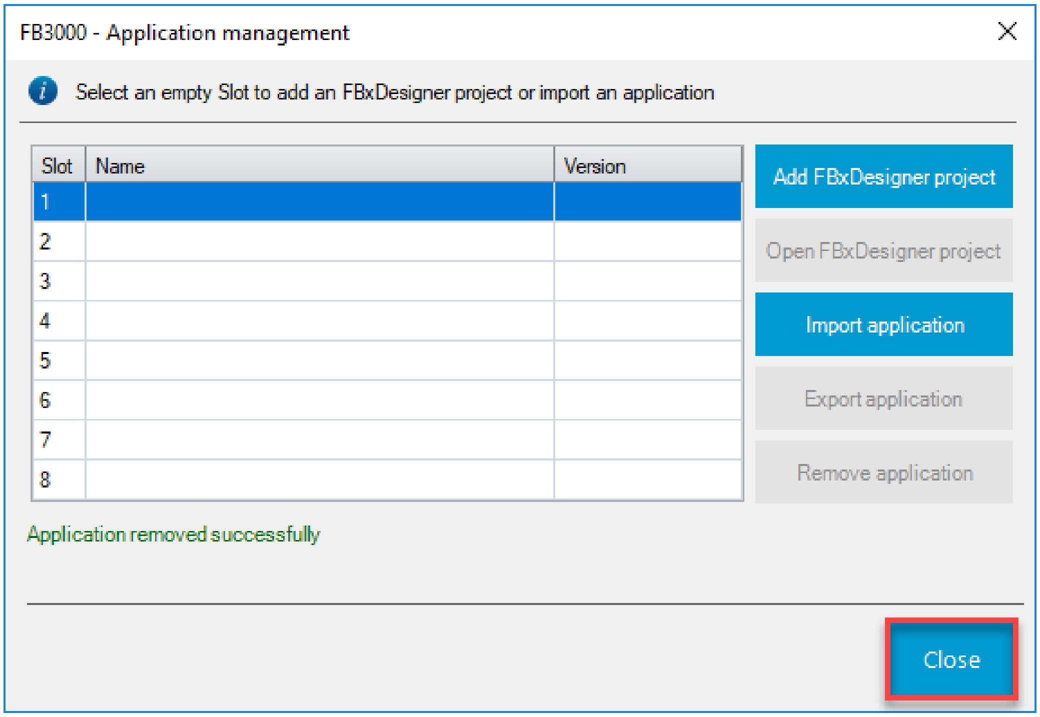
Figure 498. Remove Confirmation


FB3000 - Application management

Are you sure you want to remove Application Demo from slot 1?

4. Select **Yes**. The Application management window shows Application removed successfully.

Figure 499. Removed Successfully



Application removed successfully

5. Select **Close** to exit the Application management window.

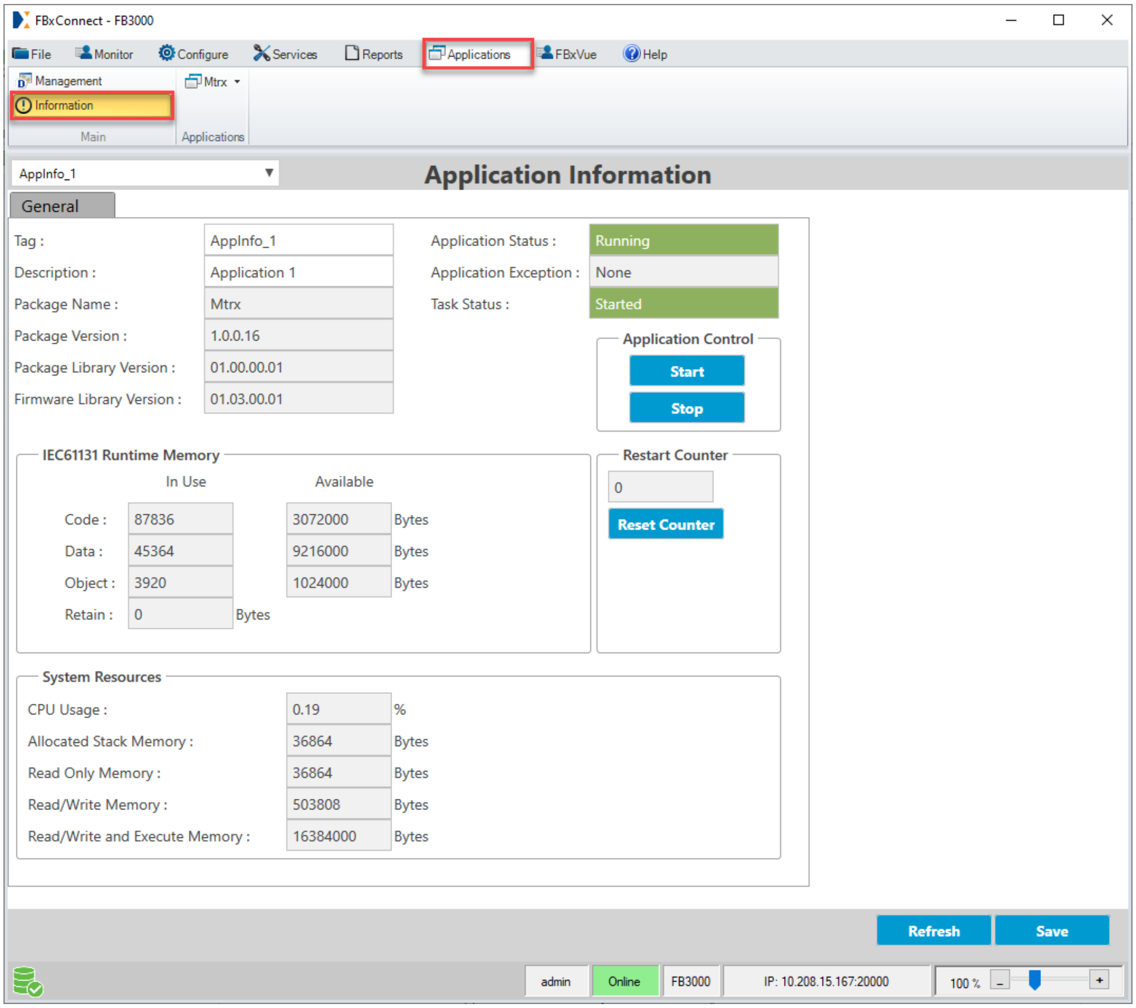
7.2 Application Information

Use this display to start or stop an application from executing, and to view information for each application installed in the FB3000.

To access this display:

1. Select **Applications > Information**. The Application Information display opens.

Figure 500. Application Information



Tag : AppInfo_1
Description : Application 1
Package Name : Mtrx
Package Version : 1.0.0.16
Package Library Version : 01.00.00.01
Firmware Library Version : 01.03.00.01
Application Status : Running
Application Exception : None
Task Status : Started

IEC61131 Runtime Memory

	In Use	Available	
Code :	87836	3072000	Bytes
Data :	45364	9216000	Bytes
Object :	3920	1024000	Bytes
Retain :	0 Bytes		

Restart Counter: 0

System Resources

CPU Usage :	0.19	%
Allocated Stack Memory :	36864	Bytes
Read Only Memory :	36864	Bytes
Read/Write Memory :	503808	Bytes
Read/Write and Execute Memory :	16384000	Bytes

2. Click ▼ in the drop-down list at the top of the display to select an application slot that contains the application information you want to view.

3. Review – and change as necessary – the values in the following fields:

Field	Description
Tag	Sets an identifier (up to 20-alphanumeric characters) for the selected application slot.
Description	Sets a description (up to 20-alphanumeric characters) for the selected application slot.
Package Name	This **read-only** field shows the name of the application package installed in the selected application slot.

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td>Package Version</td><td colspan="2">This read-only field shows the version number of the installed application package.</td></tr>
<tr><td>Package Library Version</td><td colspan="2">This read-only field shows the FB3000 RTU firmware library version that the application package was compiled with. The Package Library Version needs to be less than or equal to the Application Library Version in order for the application to run.</td></tr>
<tr><td>Firmware Library Version</td><td colspan="2">This read-only field shows the FB3000 RTU firmware library version that is currently supported by firmware.</td></tr>
<tr><td rowspan="5">Application Status</td><td colspan="2">This read-only field shows the status of the application runtime regarding application packages (.zap files) in the selected application slot. When an application package is installed via FBxConnect™, this color-coded field provides an indication of the status for that application package. If an IEC61131 project is loaded separately via FBxDesigner™ (without an application package), then this field is considered not applicable.</td></tr>
<tr><td>Unloaded</td><td>No application is loaded in the selected application slot</td></tr>
<tr><td>Loaded</td><td>An application is loaded in the selected application slot but has not been started. The field showing this status is colored red.</td></tr>
<tr><td>Running</td><td>An application is currently executing in the selected application slot. The field showing this status is colored green.</td></tr>
<tr><td>Stopped</td><td>An application is currently stopped but was previously running in the selected application slot. The field showing this status is colored red.</td></tr>
<tr><td rowspan="3">Application Exception</td><td colspan="2">This read-only field shows any errors that occur when running the application. Possible values are:</td></tr>
<tr><td>None</td><td>No errors have occurred.</td></tr>
<tr><td>String Error</td><td>An error occurred during runtime while performing string manipulation. Review any application code involving string data types for correct usage.</td></tr>
</table>

Field	Description	
	Watchdog Exceeded	Applications which execute on a cyclic basis (once per 100 milliseconds, once per second, etc.) can be developed with an optional watchdog timer. If the amount of time the application code takes to run exceeds the configured watchdog time, then this exception occurs. Consider increasing the watchdog time or revising the application code to execute within the configured time.
	Max CPU Load Exceeded	The maximum allowed CPU strain for an application has been exceeded. Consider revising the application code or splitting it across multiple applications.
	System Error	An internal runtime error has occurred. Retrieve the device's diagnostic log and contact technical support.
Task Status	This **read-only** field shows the status of the IEC 61131 runtime task in the firmware. IEC 61131 projects can be loaded into the device as an application package (via FBxConnect™) or as a raw project via FBxDesigner™. When IEC 61131 application code is loaded in the device, this color-coded field provides an indication if the programmed logic is executing.	
	Stopped	The application **is not** currently executing. The field showing this status is colored red.
	Started	The application **is** currently executing. The field showing this status is colored green.
	No License	The application requires a license to be installed before it will run. The field showing this status is colored red.
Application Control	Use these buttons to start and stop the application in the selected application slot.	
IEC61131 Runtime Memory	These **read-only** fields show the amount of IEC61131 runtime memory currently being used and the maximum amount of memory available by the application loaded in the selected application slot.	

<table>
<tr><th>Field</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2">Restart Counter</td><td colspan="2">This read-only field shows the number of times the selected application has been restarted. When an application encounters an error during execution, rather than halting the application, the application is restarted. This can happen if the runtime encounters an exception (such as watchdog timer being exceeded) or if the runtime itself restarts due to an unexpected fault.
When this sort of restart occurs, an entry is created in the device event log. If the restart counter increments to a value of 10, then it is assumed there is a significant problem with the application, and the application is not restarted automatically until the counter has been manually reset.</td></tr>
<tr><td>Reset Counter Button</td><td>Click to zero out the value in the Restart Counter field.</td></tr>
<tr><td>System Resources</td><td colspan="2">These read-only fields show the system memory and CPU used by the application loaded in the selected application slot.</td></tr>
</table>

4. Select **Save** to save any changes you make to this display.

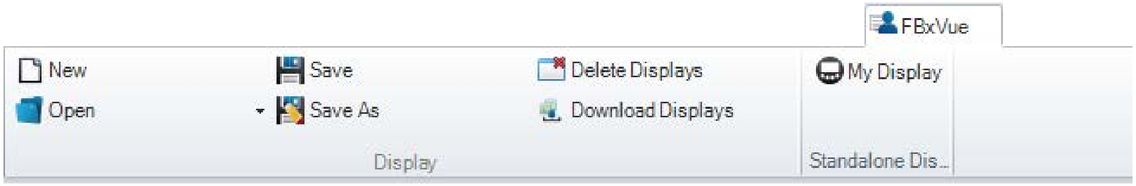
Section 8: FBxVue Menu

Use the FBxVue menu to create customized displays for the FB Series products.

Note

FBxVue allows you to create customized displays using the C# programming language and store them as files on your PC or FB Series product, load and edit displays from a file, or include custom displays as part of a Solution file. You can add controls to a custom display to monitor flow, I/O points, and other object or parameter references. For detailed instructions about using the features in FBxVue, refer to the *FBxVue User Manual* (D301925X012).

Figure 501. FBxVue Menu



The FBxVue menu contains the following options:

New – Create a new custom display using FBxVue.

Open – Open and edit a previously saved display file in FBxVue.

Save – Save the currently opened display to your PC.

Save As – Specify a file name and location when saving the currently opened display.

Delete Displays – Remove displays from the FB Series product and your PC.

Download Displays – Download displays to the FB Series product.

Standalone Displays – View displays not tied to a specific application.

8.1 New Display

Use this option to create a new custom display using FBxVue. Select **FBxVue > New** from the FBxConnect™ main menu. A blank canvas opens in FBxVue.

Note

For more information about managing display files, refer to FBxVue Overview.

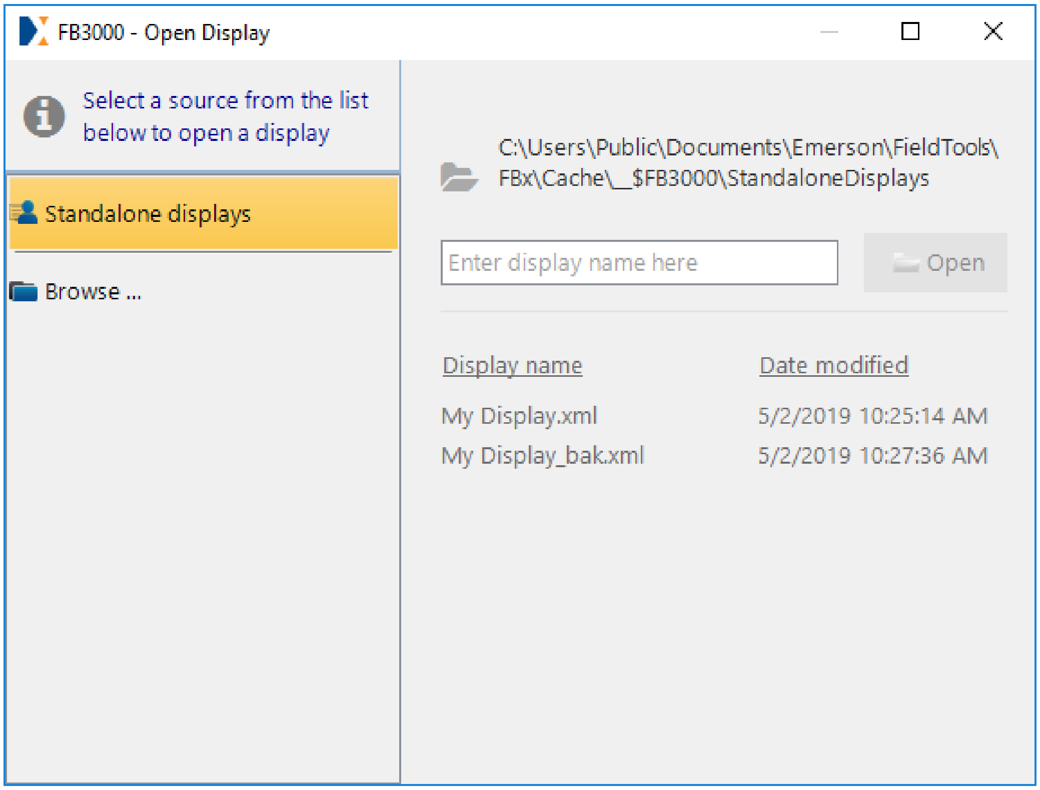
8.2 Open Display

Use this option to open and edit a previously saved display file in FBxVue.

To open a display file:

1. Select **FBxVue > Open > Browse** from the FBxConnect™ main menu. The Open Display dialog opens.

Figure 502. Open Display



FB3000 - Open Display

Select a source from the list below to open a display

Standalone displays

Browse ...

C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache_$FB3000\StandaloneDisplays

Enter display name here

Open

Display name	Date modified
My Display.xml	5/2/2019 10:25:14 AM
My Display_bak.xml	5/2/2019 10:27:36 AM

2. Select **Standalone displays** as the source on the left side of the dialog. A list of displays stored in the default location on your PC shows on the right side of the dialog.

3. Select a display from the list and select **Open**. The display file opens in FBxVue.

Note

To open a display file not saved in the default location, select **Browse** to open a File Explorer window. Navigate to a location on your PC, select the display file, and then select **Open**. The display file opens in FBxVue.

8.3 Save Display

Use this option to save the currently opened display to your PC. With a display file opened in FBxVue, select **FBxVue > Save** to save the display file.

Note

If this is your first time saving the display, the Save Display As dialog opens.

8.4 Save Display As

Use this option to specify a file name and location when saving the currently opened display. You can save a display as a standalone file or as part of an installed application.

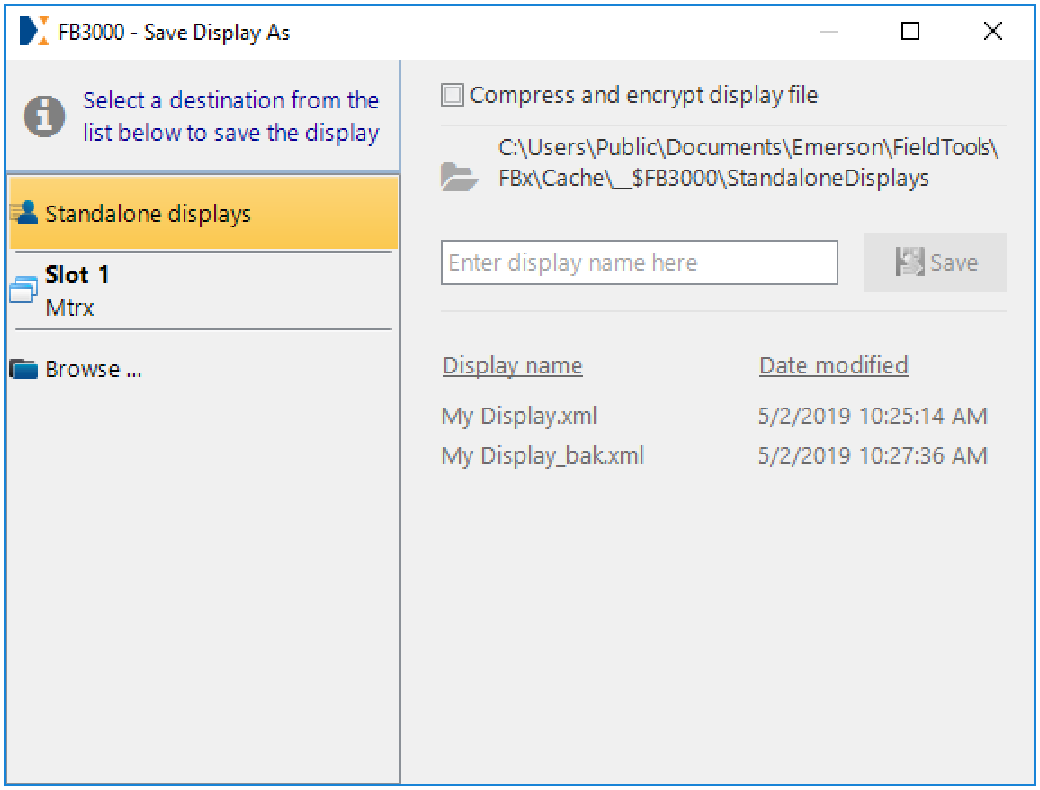
You can save displays using two different file extensions (.XML and .BIN):

- **.XML** – The file extension used when you save a display file and **do not** select the encryption option. You can open and edit the saved display file using FBxVue.
- **.BIN** – The file extension used when you save a display file and **do** select the encryption option. You **cannot** open or edit the saved file using FBxVue.

To save a display file:

1. Select **FBxVue > Save As** from the FBxConnect™ main menu. The Save Display As dialog opens.

Figure 503. Save Display As


FB3000 - Save Display As

Select a destination from the list below to save the display

☐ Compress and encrypt display file

C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache_$FB3000\StandaloneDisplays

Display name	Date modified
My Display.xml	5/2/2019 10:25:14 AM
My Display_bak.xml	5/2/2019 10:27:36 AM

2. Optional - Place a check mark next to the **Compress and encrypt display file** option to reduce the size and save an encrypted display file (.BIN).

Note

Emerson recommends you save an unencrypted version (.XML) of your display **before** you save an encrypted version. You **cannot** open or edit a display file after it has been encrypted.

3. Select the location of the saved display. Possible options are:

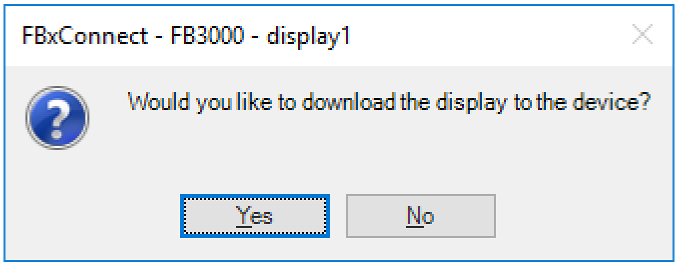
   - **Standalone Displays** – Saves the display to the default location on your PC for FB3000 RTU displays not associated with an application. Displays stored as standalone displays are available from the Standalone displays group in the FBxVue menu.
   - **Slot #** – Saves the display to the folder on you PC associated with the application installed in the selected application slot. Displays stored as part of an application are accessible from the Applications menu.
   - **Browse** – Navigate to a location on your PC to save the file.

4. Enter the name of the display in the file name box.

5. Select **Save** to save the display.

6. If you select **Standalone Displays** or a **Slot #** as the location of the saved display, a dialog asks if you want to download the display to the FB Series product. Select **Yes** to allow the display to reside on the FB Series product and not be tied a particular PC. Select **No** to **only** have the display available on your PC.

Figure 504. Download Display Confirmation



FBxConnect - FB3000 - display1

Would you like to download the display to the device?

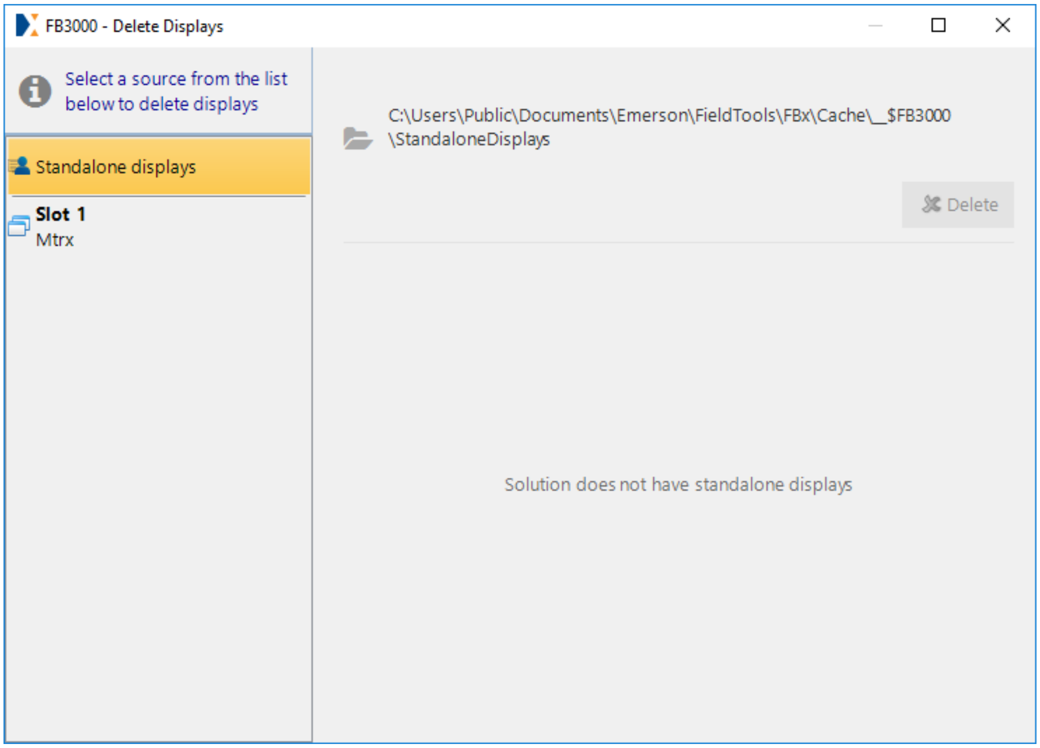
8.5 Delete Displays

Use this option to remove displays from the FB Series product and your PC. You can delete both standalone displays and displays tied to an application.

To delete a display:

1. Select **FBxVue > Delete Displays** from the FBxConnect™ main menu.

Figure 505. Delete Displays



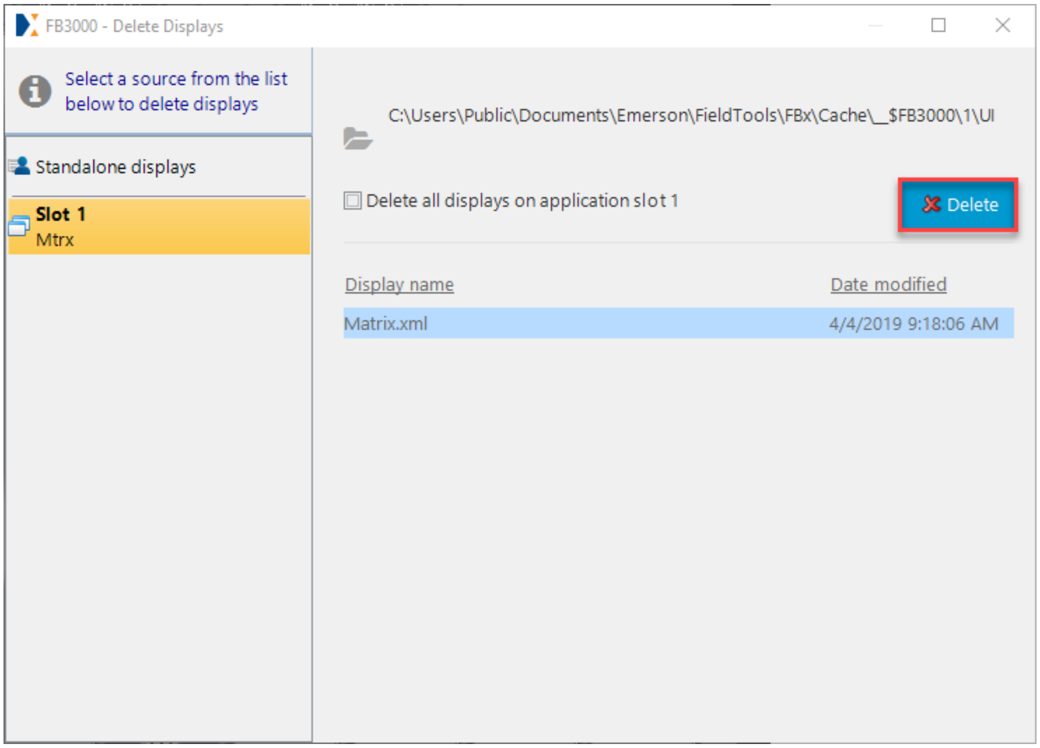
C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache_$FB3000\StandaloneDisplays

Solution does not have standalone displays

2. Select the location of the display that you want to delete from the list on the left. Possible options are:

- **Standalone displays –** Displays not associated with an application.
- **Slot # –** Displays associated with the application installed in the selected application slot.

Figure 506. Delete Displays – Delete



FB3000 - Delete Displays

Select a source from the list below to delete displays

C:\Users\Public\Documents\Emerson\FieldTools\FBx\Cache__$FB3000\1\UI

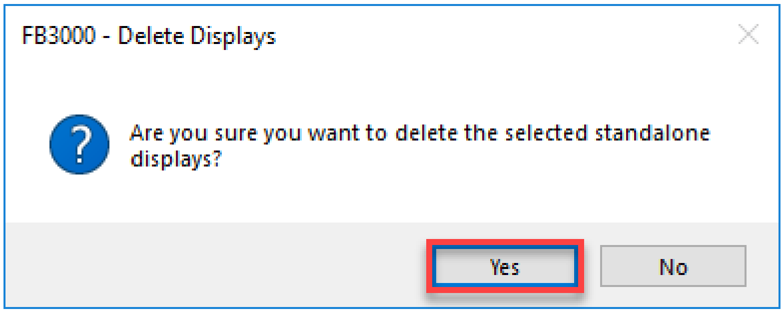
Display name	Date modified
Matrix.xml	4/4/2019 9:18:06 AM

3. Choose a **Display name** from the list on the right and select **Delete** to remove the selected display. A confirmation dialog displays.

Note

Select the **Delete all** checkbox to remove all standalone/application slot displays from your computer and the FB Series product.

Figure 507. Delete Confirmation



FB3000 - Delete Displays

Are you sure you want to delete the selected standalone displays?

4. Select **Yes** to remove the display from your computer and FB Series product.

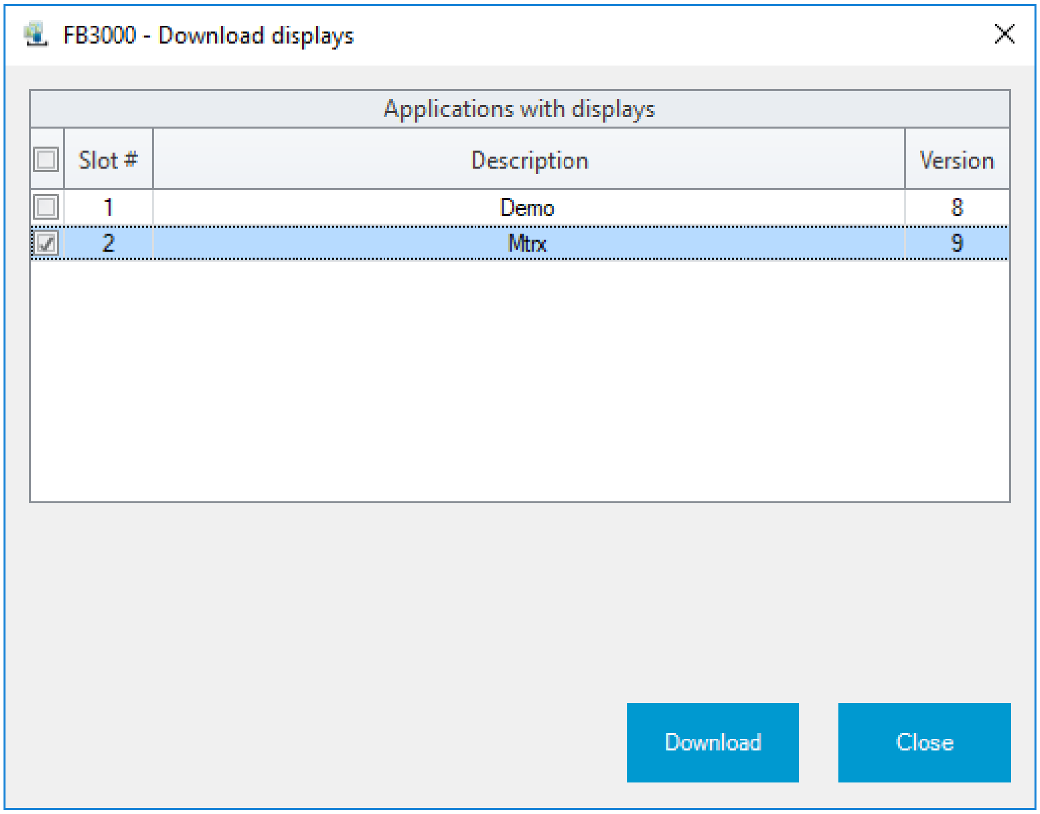
8.6 Download Displays

Use this option to download displays to the FB Series product. This allows the display to reside on the FB Series product and not be tied a particular PC. Any custom controls and text styles are also downloaded to the FB Series product, and anyone who connects to the device can access the display.

To download a display:

1. Select **FBxVue > Download Displays** from the FBxConnect™ main menu.

Figure 508. Download Displays



Applications with displays

☐	Slot #	Description	Version
☐	1	Demo	8
☑	2	Mtrx	9

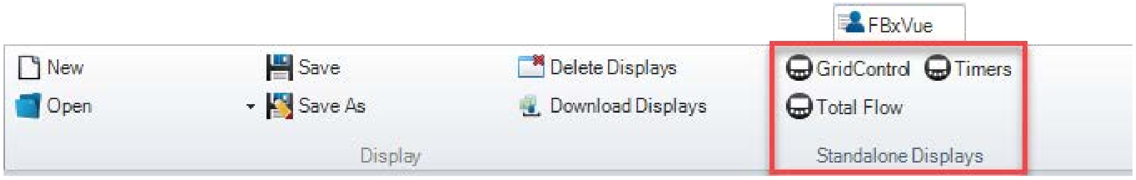
2. Place a check mark next to the application that contains the display(s) you want to download to your FB Series product.

3. Select **Download** to download the displays. Downloaded displays are accessible from the FBxVue menu tab.

8.7 Standalone Displays

Use this option to open a previously saved display file not tied to a specific application. To open a standalone display, select **FBxVue** from the FBxConnect™ main menu and choose a display from the **Standalone Displays** group.

Figure 509. Standalone Displays



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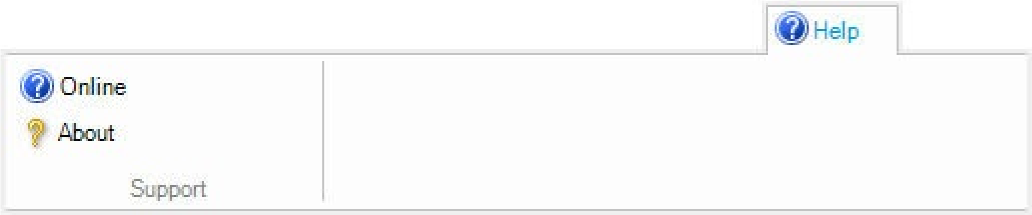
Section 9: Help Menu

Use the Help menu to access the online help system and view software version information about Field Tools.

Figure 510. Help Menu



The Help menu contains the following options:

Online – FBxConnect™ includes a comprehensive help system that describes the features and functions of the software.

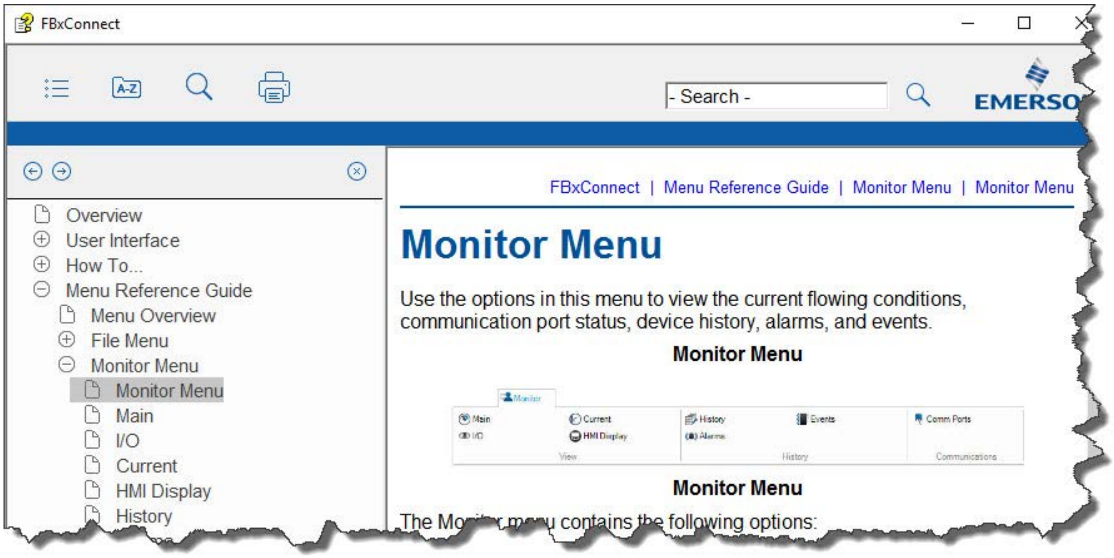
About – View information about the Field Tools software versions installed on your computer.

9.1 Online

FBxConnect™ includes a comprehensive help system that describes the features and functions of the software. Press **F1** while viewing an FBxConnect™ display to display context-sensitive help for that display.

Select **Help > Online** to display the FBxConnect™ help system:

Figure 511. FBxConnect™ Online Help



Use the options in this menu to view the current flowing conditions, communication port status, device history, alarms, and events.

Monitor Menu

Monitor Menu

The Monitor menu contains the following options:

9.2 About

Use the **About** display to view software version information for Field Tools. To access this display, select **Help > About**. The About Field Tools display opens.

Figure 512. About Field Tools

Field Tools

Version: 3.14.0.92

Phone: +1 800 537 9313

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Supporting Versions	
ROCLINK	2.71.0004
TECHVIEW	5.9.3.1
Measurement Canada	3

Appendix A: Measuring Pure Gas

Pure gas measurement is supported by the FB Series products.

To measure pure gases:

1. Select the **AGA8 Part 2 2017 / GERG 2008** in the **Compressibility/Density Calculation** field on the Station – General Tab.
2. Enter the required gas composition on the Components – Component Tab.

The following gases, temperature ranges, and maximum pressures are supported:

Note

Pure gas calculations in the FB Series products can measure both Gaseous CO2 as well as Dense Phase CO2.

Table 55. Supported Pure Gas Measurements

Gas	Temperature Range	Maximum Pressure
• Methane • Nitrogen • Carbon Dioxide • Ethane • Propane • Isobutane • n-Butane • Isopentane • n-pentane • n-Hexane • n-Heptane • Octane • Nonane • Decane • Hydrogen • Oxygen • Carbon monoxide	-297.7 to 800°F 90 to 700 K -183 to 426.85°C	≤ 10,150 psia ≤ 70.0 MPa ≤ 700 Bara

Gas	Temperature Range	Maximum Pressure
• Water • Hydrogen sulfide • Helium • Argon		

Appendix B: Liquid / Dense Phase Measursement Using a Gas DP Meter

Differential Pressure (or DP) meters are perhaps most commonly used in gas measurement; however, the same basic concept is applicable to liquid measurement as well. You can configure the FB Series Gas DP meters for use with liquid phase or dense phase fluids - with certain caveats and considerations. The following provides background information for this concept, and configuration considerations for using FB Series Gas DP meters with liquid or dense phase fluids.

The basic equation for measuring fluid through a differential pressure meter is given as follows:

$$q_m = C_d E_v Y(\pi/4)d^2\sqrt{2g_c\rho_{t,p}\Delta P}$$

Where:

C_d is the orifice plate coefficient of discharge;

d is the orifice plate bore diameter calculated at flowing temperature T_f;

ΔP is the orifice differential pressure;

E_v is the velocity of approach factor;

g_c is the dimensional conversion constant;

π is the universal constant 3.14159;

q_m is the mass flow rate;

$\rho_{t,p}$ is the density of the fluid at flowing conditions $(P_f T_f)$;

Y is the expansion factor;

Corrected volume quantities are calculated from the mass and the base density as follows:

$$q_b = \frac{q_m}{\rho_b}$$

Where:

q_b is the corrected volume flowrate;

q_m is the mass flowrate;

ρ_b is the base density.

This equation is applicable to measuring single-phase gas, liquid, or dense phase (supercritical) fluids. The expansion factor (Y) corrects the flow rate for the effects of the density change caused by the pressure drop through a differential pressure type meter. Because incompressible or slightly compressible fluids do not undergo a significant density change across the meter, the expansion factor is set equal to 1 for liquid and dense phase fluids. For this reason, the Gas DP Meter can be used for liquids and dense phase fluids with the following considerations:

- The flowing density and base density are known – AGA 8 Part 2 (GERG) supports all phases for pure gas or gas mixtures. Other density sources may be configured by setting flowing density and base density to measured mode (set on the Fluid Properties – General display)and defining the database parameters to read for these values.
- The mass form of the equation above is used which includes the flowing density as an input and does not use relative density – for a meter type of AGA 3 Orifice (Flange Taps), select either AGA 3 Mass 1992 or AGA 3 Mass 2013. The following combinations for meter type and AGA 3 Calculation Selection can **not** be used:
    - AGA 3 Orifice (Flange) – AGA 3 1992 Volume
    - AGA 3 Orifice (Flange) – AGA 3 1992 Relative Density
    - AGA 3 Orifice (Flange) – AGA 3 2013 Volume
    - AGA 3 Orifice (Flange) – AGA 3 2013 Relative Density

  All other differential pressure meter types use a form of the mass equation and can be used. For more information, refer to the Meter Type field on the DP Meter – General display.
- The expansion factor is set to override mode with an override value = 1.0. For more information, refer to the **Upstream Expansion Factor (Y1) Mode** field on the DP Meter – Advanced display.
- Set the station fluid type to gas. For more information, refer to the Fluid Type field on the Station – General display.
- Set the units for the station as desired for properties and calculated quantities. For more information, refer the Engineering Units.

Note

The gas DP meter **must** be assigned to a station with fluid type of gas, but you can set the engineering units for gas density, gas volume, and gas volume rate that are used by the station to the appropriate liquid units.

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Appendix C: Default History Setup Point Configurations

The tables in this section detail the history point configuration after running the Default History Setup wizard.

- Gas Differential Pressure Meter – Default History Setup Point Configuration
- Gas Linear Meter – Default History Setup Point Configuration
- Liquid Linear Meter – Default History Setup Point Configuration
- Liquid Linear Meter – Default Transaction History Setup Point Configuration

C.1 Gas DP Meter – Default History Setup Point Configurations

The table below shows the history point configuration for gas differential pressure meters after using the default history setup feature.

Note

- For Totals, the Total_X.RAW_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Total/Diff or Snapshot.
- For Averages, the Average_X.SAMPLE_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Average.

Table 56. Gas DP Meter – Default History Setup Point Configurations

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
1	FTime	DP Mtr_X.FLWTM_RAW_TOT	Total / Diff				GasDPxx FTime
2	DP	DP Mtr_X.DP_INUSE	Average				GasDPxx DP
3	Pressure	DP Mtr_X.PF_OBJ.SELECTED	Average			• If PF_OBJ is assigned to User Data_ object then average DOUBLE2. • If PF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. • If PF_OBJ is assigned to HART_ object then average PV_SELECTED.	GasDPxx Pressure

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
4	Temp	DP Mtr_X.TF_OBJ.SELECTED	Average			• If TF_OBJ is assigned to User Data_ object then average DOUBLE3. • If TF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. • If TF_OBJ is assigned to HART_ object then average PV_SELECTED.	GasDPxx Temp
5	IMV	DP Mtr_X.IMV_SEL	Average				GasDPxx IMV
6	IV	DP Mtr_X.IV_RAW_TOT	Total / Diff				GasDPxx IV
7	Corr Vol	DP Mtr_X.SVOL_RAW_TOT	Total / Diff				GasDPxx Corr Vol
8	Energy	DP Mtr_X.ENERGY_RAW_TOT	Total / Diff				GasDPxx Energy
9	CorrVol Snap	DP Mtr_X.SVOL_RAW_TOT	Snapshot				GasDPxx CorrVol Snap
10	Energy Snap	DP Mtr_X.ENERGY_RAW_TOT	Snapshot				GasDPxx Energy Snap
11	Rel Dens	DP Mtr_X.FLUID_PROP_OBJ.RD_REAL_SEL	Average	**Yes**	**Yes**		GasDPxx Rel Dens
12	HV	DP Mtr_X.FLUID_PROP_OBJ.HV_REAL_SEL	Average	**Yes**	**Yes**		GasDPxx HV

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
13	Methane	DP Mtr_X.FLUID_PROP_OBJ.C1_INUSE	Average	**Yes**	**Yes**		GasDPxx Methane
14	Ethane	DP Mtr_X.FLUID_PROP_OBJ.C2_INUSE	Average	**Yes**	**Yes**		GasDPxx Ethane
15	Propane	DP Mtr_X.FLUID_PROP_OBJ.C3_INUSE	Average	**Yes**	**Yes**		GasDPxx Propane
16	N-Butane	DP Mtr_X.FLUID_PROP_OBJ.NC4_INUSE	Average	**Yes**	**Yes**		GasDPxx N-Butane
17	I-Butane	DP Mtr_X.FLUID_PROP_OBJ.IC4_INUSE	Average	**Yes**	**Yes**		GasDPxx I-Butane
18	N-Pentane	DP Mtr_X.FLUID_PROP_OBJ.NC5_INUSE	Average	**Yes**	**Yes**		GasDPxx N-Pentane
19	I-Pentane	DP Mtr_X.FLUID_PROP_OBJ.IC5_INUSE	Average	**Yes**	**Yes**		GasDPxx I-Pentane
20	N-Hexane	DP Mtr_X.FLUID_PROP_OBJ.C6_INUSE	Average	**Yes**	**Yes**		GasDPxx N-Hexane
21	Heptane	DP Mtr_X.FLUID_PROP_OBJ.C7_INUSE	Average	No	**Yes**		GasDPxx Heptane
22	Octane	DP Mtr_X.FLUID_PROP_OBJ.C8_INUSE	Average	No	**Yes**		GasDPxx Octane
23	Nonane	DP Mtr_X.FLUID_PROP_OBJ.C9_INUSE	Average	No	**Yes**		GasDPxx Nonane
24	Decane	DP Mtr_X.FLUID_PROP_OBJ.C10_INUSE	Average	No	**Yes**		GasDPxx Decane
25	Nitrogen	DP Mtr_X.FLUID_PROP_OBJ.N2_INUSE	Average	**Yes**	**Yes**		GasDPxx Nitrogen
26	C02	DP Mtr_X.FLUID_PROP_OBJ.CO2_INUSE	Average	**Yes**	**Yes**		GasDPxx C02

C.2 Gas Linear Meter – Default History Setup Point Configurations

The table below shows the history point configuration for gas linear meters after using the default history setup feature.

Note

- For Totals, the Total_X.RAW_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Total/Diff or Snapshot.
- For Averages, the Average_X.SAMPLE_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Average.

Table 57. Gas Linear Meter – Default History Setup Point Configurations

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
1	FTime	Linear Mtr_X.FLWTM_RAW_TOT	Total / Diff				GasLinxx FTime
2	Pulses	Linear Mtr_X.PULSE_RAW_TOT	Total / Diff				GasLinxx Pulses
3	Pressure	Linear Mtr_X.PF_OBJ.SELECTED	Average			• If PF_OBJ is assigned to User Data_ object then average DOUBLE2. • If PF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. • If PF_OBJ is assigned to HART_ object then average PV_SELECTED.	GasLinxx Pressure

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
4	Temp	Linear Mtr_X.TF_OBJ.SELECTED	Average			• If TF_OBJ is assigned to User Data_ object then average DOUBLE3. • If TF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. • If TF_OBJ is assigned to HART_ object then average PV_SELECTED.	GasLinxx Temp
5	MF	Linear Mtr_X.MF_SEL	Average			Meter type = Turbine (0) or Ultrasonic (3) or PD (4) or Coriolis (1)] and Curve Option = 1 (Meter Factor Curve / Single K-factor)	GasLinxx MF
5	KF	Linear Mtr_X.KF_SEL	Average			Meter type = Turbine (0) or Ultrasonic (3) or PD (4) or Coriolis (1)] and Curve Option = 2 (Single Meter Factor / K-factor Curve) • If FLOW_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE.	GasLinxx KF

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
						• If FLOW_OBJ is assigned to HART_ object then average PV_SELECTED.	
5	Flow	Linear Mtr_X.FLOW_OBJ.SELECTED	Average			For all other conditions: • If FLOW_OBJ is assigned to PI_ object then average SELECTED_FREQ. • If FLOW_OBJ is assigned to User Data_ object then average DOUBLE1.	GasLinxx Flow
6	Corr Vol	Linear Mtr_X.SVOL_RAW_TOT	Total / Diff				GasLinxx Corr Vol
7	Energy	Linear Mtr_X.ENERGY_RAW_TOT	Total / Diff				GasLinxx Energy
8	CorrVolSnap	Linear Mtr_X.SVOL_RAW_TOT	Snapshot				GasLinxx CorrVolSnap
9	Energy Snap	Linear Mtr_X.ENERGY_RAW_TOT	Snapshot				GasLinxx Energy Snap
10	UVol	Linear Mtr_X.UVOL_RAW_TOT	Total / Diff			Meter type = Turbine (0), Auto-Adjust (2), Ultrasonic (3), PD(4)	GasLinxx UVol
11	Mass	Linear Mtr_X.MASS_RAW_TOT	Total / Diff			Meter type = Coriolis (1)	GasLinxx Mass
12	Rel Dens	Linear Mtr_X.FLUID_PROP_OBJ.RD_REAL_SEL	Average	**Yes**	**Yes**		GasLinxx Rel Dens

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
13	HV	Linear Mtr_X.FLUID_PROP_OBJ.HV_REAL_SEL	Average	**Yes**	**Yes**		GasLinxx HV
14	Methane	Linear Mtr_X.FLUID_PROP_OBJ.C1_INUSE	Average	**Yes**	**Yes**		GasLinxx Methane
15	Ethane	Linear Mtr_X.FLUID_PROP_OBJ.C2_INUSE	Average	**Yes**	**Yes**		GasLinxx Ethane
16	Propane	Linear Mtr_X.FLUID_PROP_OBJ.C3_INUSE	Average	**Yes**	**Yes**		GasLinxx Propane
17	N-Butane	Linear Mtr_X.FLUID_PROP_OBJ.NC4_INUSE	Average	**Yes**	**Yes**		GasLinxx N-Butane
18	I-Butane	Linear Mtr_X.FLUID_PROP_OBJ.IC4_INUSE	Average	**Yes**	**Yes**		GasLinxx I-Butane
19	N-Pentane	Linear Mtr_X.FLUID_PROP_OBJ.NC5_INUSE	Average	**Yes**	**Yes**		GasLinxx N-Pentane
20	I-Pentane	Linear Mtr_X.FLUID_PROP_OBJ.IC5_INUSE	Average	**Yes**	**Yes**		GasLinxx I-Pentane
21	N-Hexane	Linear Mtr_X.FLUID_PROP_OBJ.C6_INUSE	Average	**Yes**	**Yes**		GasLinxx N-Hexane
22	Heptane	Linear Mtr_X.FLUID_PROP_OBJ.C7_INUSE	Average	No	**Yes**		GasLinxx Heptane
23	Octane	Linear Mtr_X.FLUID_PROP_OBJ.C8_INUSE	Average	No	**Yes**		GasLinxx Octane

ID	History Point (Description)	Parameter	Archive Type	Components Average (Standard Composition)	Components Average (Extended Composition)	Condition	Full Description
24	Nonane	Linear Mtr_X.FLUID_PROP_OBJ.C9_INUSE	Average	No	**Yes**		GasLinxx Nonane
25	Decane	Linear Mtr_X.FLUID_PROP_OBJ.C10_INUSE	Average	No	**Yes**		GasLinxx Decane
26	Nitrogen	Linear Mtr_X.FLUID_PROP_OBJ.N2_INUSE	Average	**Yes**	**Yes**		GasLinxx Nitrogen
27	C02	Linear Mtr_X.FLUID_PROP_OBJ.CO2_INUSE	Average	**Yes**	**Yes**		GasLinxx C02

C.3 Liquid Linear Meter – Default History Setup Point Configurations

The tables below show the compact and expanded history point configurations for liquid linear meters, based on your selected liquid product configuration (Use Case), after using the default history setup feature.

FBxConnect first attempts to configure the FB Series product's default history using the points described in the Expanded Liquid History table below. If the FB Series product does not have sufficient memory to log all the points in expanded history, then FBxConnect configures the FB Series product's default history using the points described in the Compact Liquid History table below.

The history points logged are also dependant on the use case/liquid product configuration of your FB Series product:

Note

- For Totals, the Total_X.RAW_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Total/Diff or Snapshot.
- For Averages, the Average_X.SAMPLE_PARAM signal is used to set Hist_Y.HIST_PARAM. The Archive Type is set as Average.

Table 58. Use Case

Use Case	Liquid Product Configuration	Compact History	Expanded History
Crude Oil Custody Transfer	• Crude Oil (Liq Prod_X.LIQ_TYPE = 0) • API Ch.12.2 (Station_X.OIL_METHOD = 0)	**Yes**	**Yes**
Crude Oil Allocation - Low Water	• Crude Oil (Liq Prod_X.LIQ_TYPE = 0) • API Ch.20.1 (Station_X.OIL_METHOD = 1) • Station_X.WATER_OPT = 0	**Yes**	No
Crude Oil Allocation - High Water	• Crude Oil (Liq Prod_X.LIQ_TYPE = 0) • API Ch.20.1 (Station_X.OIL_METHOD = 1) • Station_X.WATER_OPT = 1	**Yes**	No
Refined Products / Lubricating Oil	• Refined Products / Lubricating Oil (Liq Prod_X.LIQ_TYPE = 1 or 3)	**Yes**	**Yes**

Use Case	Liquid Product Configuration	Compact History	Expanded History
Light Hydrocarbons	- Light Hydrocarbon - NGL/LPG (Liq Prod_X.LIQ_TYPE = 6)	**Yes**	**Yes**

Table 59. Compact Liquid History

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Crude Oil Allocation – Low Water	Crude Oil Allocation – High Water	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
1	FDensity	Liq LinMtr_X.FLUID_PROP_OBJ.DENSF_SEL	Average	Yes	Yes	• Coriolis = **Yes** • Turbine = No • Ultrasonic = No • Positive Displacement = No	Yes	Yes		LiqLinxx FDensity
2	Pressure	Liq LinMtr_X.PF_OBJ.SELECTED	Average	Yes	Yes	Yes	Yes	Yes	• If PF_OBJ is assigned to User Data_ object then average DOUBLE2. • If PF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE • If PF_OBJ is assigned to HART_ object then	LiqLinxx Pressure

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Crude Oil Allocation – Low Water	Crude Oil Allocation – High Water	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
									average PV_SELECTED.	
3	Temp	Liq LinMtr_X.TF_OBJ.SELECTED	Average	Yes	Yes	Yes	Yes	Yes	• If TF_OBJ is assigned to User Data_ object then average DOUBLE3. • If TF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE • If TF_OBJ is assigned to HART_ object then average PV_SELECTED.	LiqLinxx Temp

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Crude Oil Allocation – Low Water	Crude Oil Allocation – High Water	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
4	MF or KF	Liq LinMtr_X.MF_SEL or KF_SEL	Average	• Set to MF_SEL when FACTOR_CURVE_OPT = 0 or 1 (Single MF/KF or MF Curve) • Set to KF_SEL when FACTOR_CURVE_OPT = 2 (KF Curve)	• Set to MF_SEL when FACTOR_CURVE_OPT = 0 or 1 (Single MF/KF or MF Curve) • Set to KF_SEL when FACTOR_CURVE_OPT = 2 (KF Curve)	• Set to MF_SEL when FACTOR_CURVE_OPT = 0 or 1 (Single MF/KF or MF Curve) • Set to KF_SEL when FACTOR_CURVE_OPT = 2 (KF Curve)	• Set to MF_SEL when FACTOR_CURVE_OPT = 0 or 1 (Single MF/KF or MF Curve) • Set to KF_SEL when FACTOR_CURVE_OPT = 2 (KF Curve)	• Set to MF_SEL when FACTOR_CURVE_OPT = 0 or 1 (Single MF/KF or MF Curve) • Set to KF_SEL when FACTOR_CURVE_OPT = 2 (KF Curve)		LiqLinxx MF or KF
5	IQ	Liq LinMtr_X.IQ_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		LiqLinxx IQ
6	IQ Snap	Liq LinMtr_X.IQ_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		LiqLinxx IQ Snap
7	Oil UVol	UVol Liq LinMtr_X.UVOL_O_RAW_TOT	Total / Diff	No	No	**Yes**	No	No		LiqLinxx Oil UVol

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Crude Oil Allocation – Low Water	Crude Oil Allocation – High Water	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
7	GS Vol	Liq LinMtr_X.GSVOL_RAW_TOT	Total / Diff	**Yes**	**Yes**	No	**Yes**	**Yes**		LiqLinxx GS Vol
8	GS Vol Snap	Liq LinMtr_X.GSVOL_RAW_TOT	Snapshot	No	No	No	**Yes**	**Yes**		LiqLinxx GS Vol Snap
8	Oil SVol	Liq LinMtr_X.SVOL_O_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**	No	No		LiqLinxx Oil SVol
9	OilSVolSnap	Liq LinMtr_X.SVOL_O_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**	No	No		LiqLinxx OilSVolSnap
10	CSW	Liq LinMtr_X.CSW_INUSE	Average	**Yes**	**Yes**	No	No	No		LiqLinxx CSW
10	S&W %	Liq LinMtr_X.FLUID_PROP_OBJ.WC_SEL	Average	No	No	**Yes**	No	No		LiqLinxx S&W %
10	Pe	Liq LinMtr_X.FLUID_PROP_OBJ.PE_INUSE	Average	No	No	No	No	**Yes**		LiqLinxx Pe
11	CTL	Liq LinMtr_X.CTL_INUSE	Average	Yes	Yes	No	Yes	Yes		LiqLinxx CTL
12	CPL	Liq LinMtr_X.CPL_INUSE	Average	Yes	Yes	No	Yes	Yes		LiqLinxx CPL

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Crude Oil Allocation – Low Water	Crude Oil Allocation – High Water	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
13	Mass	Liq LinMtr_X.MASS_RAW_TOT	Total / Diff	Yes	No	No	Yes	Yes		LiqLinxx Mass
14	HDens	Liq LinMtr_X.STATION_OBJ.DENSH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	No	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HDens
15	HPres	Liq LinMtr_X.STATION_OBJ.PH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	No	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HPres
16	HTemp	Liq LinMtr_X.STATION_OBJ.TH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	No	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HTemp

Table 60. Expanded Liquid History

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
1	Pulses	Liq LinMtr_X.PULSE_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**		LiqLinxx Pulses
2	Pulses Snap	Liq LinMtr_X.PULSE_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**		LiqLinxx Pulses Snap
3	IQ	Liq LinMtr_X.IQ_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**		LiqLinxx IQ
4	IQ Snap	Liq LinMtr_X.IQ_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**		LiqLinxx IQ Snap
5	FDensity	Liq LinMtr_X.FLUID_PROP_OBJ.DENSF_SEL	Average	**Yes**	**Yes**	**Yes**		LiqLinxx FDensity
6	Pressure	Liq LinMtr_X.PF_OBJ.SELECTED	Average	**Yes**	**Yes**	**Yes**	• If PF_OBJ is assigned to User Data_ object then average DOUBLE2. • If PF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. • If PF_OBJ is assigned to HART_ object then av	LiqLinxx Pressure
7	Temp	Liq LinMtr_X.TF_OBJ.SELECTED	Average	**Yes**	**Yes**	**Yes**	• If TF_OBJ is assigned to User Data_ object then average DOUBLE3. • If TF_OBJ is assigned to	LiqLinxx Temp

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
							FBxNData_ object then average SELECTED_DOUBLE. • If TF_OBJ is assigned to HART_ object then average PV_SELECTED.	
8	MF	Liq LinMtr_X.MF_SEL	Average	**Yes**	**Yes**	**Yes**		LiqLinxx MF
9	KF	Liq LinMtr_X.KF_SEL	Average	**Yes**	**Yes**	**Yes**		LiqLinxx KF
10	S&W %	Liq LinMtr_X.FLUID_PROP_OBJ.WC_SEL	Average	**Yes**	No	No		LiqLinxx S&W %
10	Pe	Liq LinMtr_X.FLUID_PROP_OBJ.PE_SEL	Average	No	No	**Yes**		LiqLinxx Pe
11	CSW	Liq LinMtr_X.CSW_INUSE	Average	**Yes**	No	No		LiqLinxx CSW
12	CTL	Liq LinMtr_X.CTL_INUSE	Average	**Yes**	**Yes**	**Yes**		LiqLinxx CTL
13	CPL	Liq LinMtr_X.CPL_INUSE	Average	**Yes**	**Yes**	**Yes**		LiqLinxx CPL
14	CCF	Liq LinMtr_X.CCF_INUSE	Average	**Yes**	**Yes**	**Yes**		LiqLinxx CCF
15	GVol	Liq LinMtr_X.GVOL_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**		LiqLinxx GVol
16	GS Vol	Liq LinMtr_X.GSVOL_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**		LiqLinxx GS Vol
17	Oil SVol	Liq LinMtr_X.SVOL_O_RAW_TOT	Total / Diff	**Yes**	No	No		LiqLinxx Oil SVol
18	Wtr SVol	Liq LinMtr_X.SVOL_W_RAW_TOT	Total / Diff	**Yes**	No	No		LiqLinxx Wtr SVol
19	Mass	Liq LinMtr_X.MASS_RAW_TOT	Total / Diff	**Yes**	**Yes**	**Yes**		LiqLinxx Mass

ID	History Point (Description)	Parameter	Archive Type	Crude Oil Custody Transfer	Refined Products / Lubricating Oil	Light Hydrocarbon	Condition	Full Description
20	GVol Snap	Liq LinMtr_X.GVOL_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**		LiqLinxx GVol Snap
21	GSVol Snap	Liq LinMtr_X.GSVOL_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**		LiqLinxx GSVol Snap
22	OilSVolSnap	Liq LinMtr_X.SVOL_O_RAW_TOT	Snapshot	**Yes**	No	No		LiqLinxx OilSVolSnap
23	WtrSVolSnap	Liq LinMtr_X.SVOL_W_RAW_TOT	Snapshot	**Yes**	No	No		LiqLinxx WtrSVolSnap
24	Mass Snap	Liq LinMtr_X.MASS_RAW_TOT	Snapshot	**Yes**	**Yes**	**Yes**		LiqLinxx Mass Snap
25	HDens	Liq LinMtr_X.STATION_OBJ.DENSH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HDens
26	HPres	Liq LinMtr_X.STATION_OBJ.PH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HPres
27	HTemp	Liq LinMtr_X.STATION_OBJ.TH_INUSE	Average	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)	Set when Station_X.DENS_OPT = 2 (Station Header Density)		LiqLinxx HTemp

C.4 Liquid Linear Meter – Default Transaction History Setup Point Configurations

The tables below show the default transaction history parameters for Strings, Totals, and Averages.

Table 61. Default Transaction Hisotory Setup – Strings

Batch Ticket	Description	Parameter	Archive Type	Full Description
Device ID	Device ID	System_1.OBJ_NAME	Snapshot	End Device ID
Meter ID	Meter ID	Liq LMtr_X.OBJ_NAME	Snapshot	End LiqLinxx Meter ID
Product Number	Prod Num	Liq LMtr_X.STATION_OBJ.LIQ_PROD_OBJ	Snapshot	End LiqLinxx Prod Num
Product ID	Prod ID	Future	Snapshot	End LiqLinxx Prod ID
Product Table	Prod Tbl	Future	Snapshot	End LiqLinxx Prod Tbl

Table 62. Default Transaction Hisotory Setup – Totals

Batch Ticket	Description	Parameter	Archive Type	Full Description
Opening Reading (Pulses)	PulsesStart	Liq LinMtr_X.PULSE_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx PulsesStart
Closing Reading (Pulses)	Pulses End	Liq LinMtr_X.PULSE_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx Pulses End
Pulses	Pulses	Liq LinMtr_X.PULSE_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx Pulses
Opening Reading (IQ)	IQ Start	Liq LinMtr_X.IQ_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx IQ Start
Closing Reading (IQ)	IQ End	Liq LinMtr_X.IQ_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx IQ End
Indicated Quantity	IQ	Liq LinMtr_X.IQ_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx IQ
Opening Reading (GV)	GVol Start	Liq LinMtr_X.GV_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx GVol Start
Closing Reading (GV)	GVol End	Liq LinMtr_X.GV_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx GVol End
GV	GVol	Liq LinMtr_X.GV_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx GVol
Opening Reading (GSV)	GSVol Start	Liq LinMtr_X.GSV_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx GSVol Start
Closing Reading (GSV)	GSVol End	Liq LinMtr_X.GSV_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx GSVol End
GSV	GSVol	Liq LinMtr_X.GSV_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx GSVol

Batch Ticket	Description	Parameter	Archive Type	Full Description
Opening Reading (NSV)	NSVol Start	Liq LinMtr_X.SVOL_O_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx NSVol Start
Closing Reading (NSV)	NSVol End	Liq LinMtr_X.SVOL_O_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx NSVol End
NSV	Net SVol	Liq LinMtr_X.SVOL_O_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx Net SVol
Opening Reading (S&W)	S&W Start	Liq LinMtr_X.SVOL_W_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx S&W Start
Closing Reading (S&W)	S&W End	Liq LinMtr_X.SVOL_W_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx S&W End
S&W	S&W	Liq LinMtr_X.SVOL_W_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx S&W
Opening Reading (Mass)	Mass Start	Liq LinMtr_X.MASS_TOT_OBJ.RAW_PARAM	Snapshot Start	LiqLinxx Mass Start
Closing Reading (Mass)	Mass End	Liq LinMtr_X.MASS_TOT_OBJ.RAW_PARAM	Snapshot End	LiqLinxx Mass End
Mass	Mass	Liq LinMtr_X.MASS_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx Mass
Flow Time	Flow Time	Liq LinMtr_X.FLWTM_TOT_OBJ.RAW_PARAM	Total/Difference	LiqLinxx Flow Time

Table 63. Default Transaction History Setup – Averages

Batch Ticket	Description	Average Parameter	History Parameter	Archive Type	Condition	Full Description
FWA Pressure	Pressure	Liq LinMtr_X.PF_OBJ.NNNNN	Average_X.SAMPLE_PARAM	Average	If PF_OBJ is assigned to User Data_ object then average DOUBLE2. If PF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. If PF_OBJ is assigned to HART_ object then	LiqLinxx Pressure

Batch Ticket	Description	Average Parameter	History Parameter	Archive Type	Condition	Full Description
					average PV_SELECTED.	
FWA Temperature	Temp	Liq LinMtr_X.TF_OBJ.NNNNN	Average_X.SAMPLE_PARAM	Average	If TF_OBJ is assigned to User Data_ object then average DOUBLE3. If TF_OBJ is assigned to FBxNData_ object then average SELECTED_DOUBLE. If TF_OBJ is assigned to HART_ object then average PV_SELECTED.	LiqLinxx Temp
Average Meter Factor	MF	Liq LinMtr_X.MF_SEL	Average_X.SAMPLE_PARAM	Average		LiqLinxx MF
Average K-Factor	KF	Liq LinMtr_X.KF_SEL	Average_X.SAMPLE_PARAM	Average		LiqLinxx KF
Average CTL	CTL	Liq LinMtr_X.CTL_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx CTL
Average CPL	CPL	Liq LinMtr_X.CPL_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx CPL
Average CTPL	CTPL	Liq LinMtr_X.CTPL_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx CTPL
Average CCF	CCF	Liq LinMtr_X.CCF_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx CCF
Average %S&W	S&W %	Liq LinMtr_X.FLUID_PROP_OBJ.WC_SEL	Average_X.SAMPLE_PARAM	Average		LiqLinxx S&W %

Batch Ticket	Description	Average Parameter	History Parameter	Archive Type	Condition	Full Description
Average CSW	CSW	Liq LinMtr_X.CSW_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx CSW
Average Meter Density	FDensity	Liq LinMtr_X.FLUID_PROP_OBJ.DENSF_SEL	Average_X.SAMPLE_PARAM	Average		LiqLinxx FDensity
Average Observed Density	HDens	Liq LinMtr_X.STATION_OBJ.DENSH_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx HDens
Average Density Pressure	HPres	Liq LinMtr_X.STATION_OBJ.PH_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx HPres
Average Density Temperature	HTemp	Liq LinMtr_X.STATION_OBJ.TH_INUSE	Average_X.SAMPLE_PARAM	Average		LiqLinxx HTemp
Average Base Density	Base Dens	Liq LinMtr_X.FLUID_PROP_OBJ.DENSB_O_SEL	Average_X.SAMPLE_PARAM	Average		LiqLinxx Base Dens
Average Flow Rate	Flow Rate	Liq LinMtr_X.GV_RATE	Average_X.SAMPLE_PARAM	Average		LiqLinxx Flow Rate
Average Indicated Density	IDens	Future				LiqLinxx IDens
Average Density Correction Factor	Dens CF	Future				LiqLinxx Dens CF

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FBxConnect™ Configuration Software User Manual (for the FB3000 RTU)

D301882X012

January 2024

For customer service and technical support,
visit Emerson.com/SupportNet.

Global Headquarters,
North America, and Latin America:
Emerson Automation Solutions
Energy and Transportation Solutions
6005 Rogerdale Road
Houston, TX 77072 U.S.A.
T +1 281 879 2699 | F +1 281 988 4445
Emerson.com/EnergyandTransportation

United Kingdom:
Emerson Process Management Limited
Regulatory Compliance Department
Company No. 00671801
Meridian East
Leicester LE19 1UX UK
T +44 11 6828 23 64
ukproductcompliance@emerson.com

Europe:
Emerson S.R.L
Regulatory Compliance Shared Services Department
Company No. J12/88/2006
Emerson 4 Street
Parcul Industrial Tetarom 11
Romania
T +40 374 132 000

Middle East/Africa:
Emerson Automation Solutions
Energy and Transportation Solutions
Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone – South 2
Dubai U.A.E.
T +971 4 8118100 | F +971 4 8865465

Asia-Pacific:
Emerson Automation Solutions
Energy and Transportation Solutions
1 Pandan Crescent
Singapore 128461
T +65 6777 8211| F +65 6777 0947

Energy and Transportation Solutions

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